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About This Bulletin

The graduate and professional bulletins are the catalogs of programs, degree requirements and policies of the following schools of Washington University in St. Louis: Architecture & Urban Design; Art; Arts & Sciences; Engineering & Applied Science; Law; Medicine; and Social Work & Public Health.

The University College Bulletin is the catalog of University College, the professional and continuing education division of Arts & Sciences at Washington University in St. Louis. The catalog includes programs, degree requirements, course descriptions, and pertinent university policies for students earning a degree through University College.

The 2018-19 bulletins are entirely online but may be downloaded in PDF format for printing. Individual pages may be downloaded in PDF format using the "Download This Page as a PDF" option on each page. To download a full PDF, please choose from the following:

- Architecture & Urban Design (PDF): coming soon
- Art (PDF): coming soon
- Arts & Sciences (PDF): coming soon
- Engineering & Applied Science (PDF): coming soon
- Law (PDF): coming soon
- Medicine (PDF): coming soon
- Social Work & Public Health (PDF): coming soon
- University College (undergraduate and graduate) (PDF): coming soon

The degree requirements and policies in the 2018-19 Bulletin apply to students entering Washington University during the 2018-19 academic year.

Every effort is made to ensure that the information, applicable policies and other materials presented in the Bulletin are accurate and correct as of the date of publication (June 28, 2018). Washington University reserves the right to make changes at any time without prior notice. Therefore, the electronic version of the Bulletin may change from time to time without notice. The governing document at any given time is the then-current version of the Bulletin, as published online, and then-currently applicable policies and information are those contained in that Bulletin.

For the most current information about available courses and class scheduling, visit WebSTAC (https://acadinfo.wustl.edu). Please email questions concerning the Bulletin to the Bulletin editor (bulletin_editor@wustl.edu).

For more graduate and professional programs, please visit the following website:

- Olin Business School (http://olin.wustl.edu)
About Washington University in St. Louis

Who We Are Today

Washington University in St. Louis, a medium-sized, independent university, is dedicated to challenging its faculty and students alike to seek new knowledge and greater understanding of an ever-changing, multicultural world. The university is counted among the world’s leaders in teaching and research, and draws students from all 50 states, the District of Columbia, Guam, Puerto Rico and the Virgin Islands. Students and faculty come from more than 100 countries around the world.

The university offers more than 90 programs and almost 1,500 courses leading to bachelor’s, master’s and doctoral degrees in a broad spectrum of traditional and interdisciplinary fields, with additional opportunities for minor concentrations and individualized programs. For more information about the university, please visit the University Facts (http://wustl.edu/about/facts) page of our website.

Enrollment by School

For enrollment information (https://wustl.edu/about/university-facts/#students), please visit the University Facts page of our website.

Committed to Our Students: Mission Statement

Washington University’s mission is to discover and disseminate knowledge, and protect the freedom of inquiry through research, teaching and learning. Washington University creates an environment to encourage and support an ethos of wide-ranging exploration. Washington University’s faculty and staff strive to enhance the lives and livelihoods of students, the people of the greater St. Louis community, the country and the world.

Our goals are:

- to welcome students, faculty and staff from all backgrounds to create an inclusive community that is welcoming, nurturing and intellectually rigorous;
- to foster excellence in our teaching, research, scholarship and service;
- to prepare students with attitudes, skills and habits of lifelong learning and leadership thereby enabling them to be productive members of a global society; and
- to be an institution that excels by its accomplishments in our home community, St. Louis, as well as in the nation and the world.

To this end we intend:

- to judge ourselves by the most exacting standards;
- to attract people of great ability from diverse backgrounds;
- to encourage faculty and students to be bold, independent and creative thinkers;
- to provide an exemplary, respectful and responsive environment for living, teaching, learning and working for present and future generations; and
- to focus on meaningful measurable results for all of our endeavors.

Trustees & Administration

Board of Trustees

Please visit the Board of Trustees website (http://boardoftrustees.wustl.edu) for more information.

University Administration

In 1871, Washington University co-founder and then-Chancellor William Greenleaf Eliot sought a gift from Hudson E. Bridge, charter member of the university's Board of Directors, to endow the chancellorship. Soon it was renamed the "Hudson E. Bridge Chancellorship."

Led by the chancellor, the officers of the university administration (http://wustl.edu/about/leadership) are detailed on the university website.

Academic Calendar

The academic calendar of Washington University in St. Louis is designed to provide an optimal amount of classroom instruction and examination within a manageable time frame, facilitating our educational mission to promote learning among both students and faculty. Individual schools, particularly our graduate and professional schools, may have varying calendars due to the nature of particular fields of study. Please refer to each school’s website for more information.

Fall Semester 2018

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 27</td>
<td>Monday</td>
<td>Classes begin</td>
</tr>
<tr>
<td>September 3</td>
<td>Monday</td>
<td>Labor Day holiday</td>
</tr>
<tr>
<td>October 13-16</td>
<td>Saturday-Tuesday</td>
<td>Fall Break</td>
</tr>
<tr>
<td>November 21-25</td>
<td>Wednesday-Sunday</td>
<td>Thanskgiving Break</td>
</tr>
<tr>
<td>December 7</td>
<td>Friday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>December 10-19</td>
<td>Monday-Wednesday</td>
<td>Reading and Exams</td>
</tr>
</tbody>
</table>
Spring Semester 2019

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 14</td>
<td>Monday</td>
<td>Classes begin</td>
</tr>
<tr>
<td>January 21</td>
<td>Monday</td>
<td>Martin Luther King Jr. holiday</td>
</tr>
<tr>
<td>March 10-16</td>
<td>Sunday-Saturday</td>
<td>Spring Break</td>
</tr>
<tr>
<td>April 26</td>
<td>Friday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>April 29 - May 8</td>
<td>Monday-Wednesday</td>
<td>Reading and Exams</td>
</tr>
<tr>
<td>May 17</td>
<td>Friday</td>
<td>Commencement</td>
</tr>
</tbody>
</table>

Summer Semester 2019

<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 20</td>
<td>Monday</td>
<td>First Summer Session begins</td>
</tr>
<tr>
<td>May 27</td>
<td>Monday</td>
<td>Memorial Day holiday</td>
</tr>
<tr>
<td>July 4</td>
<td>Thursday</td>
<td>Independence Day holiday</td>
</tr>
<tr>
<td>August 15</td>
<td>Thursday</td>
<td>Last Summer Session ends</td>
</tr>
</tbody>
</table>

Washington University recognizes the individual student’s choice in observing religious holidays that occur during periods when classes are scheduled. Students are encouraged to arrange with their instructors to make up work missed as a result of religious observance, and instructors are asked to make every reasonable effort to accommodate such requests.

Campus Resources

Student Support Services

Cornerstone: The Learning Center is located on the ground floor of Gregg House on the South 40, and it is the hub of academic support at Washington University in St. Louis. We provide undergraduate students with assistance in a variety of forms. Most services are free, and each year more than 2,000 students participate in one or more of our programs. For more information, visit the Cornerstone website (http://cornerstone.wustl.edu) or call 314-935-5970. The three teams housed within Cornerstone:

- **Academic Mentoring Programs** offers academic support in partnership with the academic departments in a variety of forms. Academic mentoring programs are designed to support students in their course work by helping them develop the lifelong skill of learning how to learn and by stimulating their independent thinking. Programs include: course-specific, weekly structured study groups facilitated by highly trained peer leaders; course-specific weekly walk-in sessions facilitated by academic mentors in locations, at times and in formats convenient for the students. Cornerstone also offers individual consulting/coaching for academic skills such as time management, study skills, note-taking, accessing resources, and more. Other services include fee-based graduate and professional school entrance preparation courses.

- **Disability Resources** supports students with disabilities by fostering and facilitating an equal access environment for the Washington University community of learners. Disability Resources partners with faculty and staff to facilitate academic and housing accommodations for students with disabilities on the Danforth Campus. Students enrolled in the School of Medicine should contact their program's director. Please visit the Disability Resources website (http://cornerstone.wustl.edu/disability-resources) or contact Cornerstone: The Learning Center at 314-935-5970 for more information.

- **TRiO: Student Support Services** is a federally funded program that provides customized services for undergraduate students who are low-income, the first in their family to go to college, and/or have a documented disability. Services include academic coaching, academic peer mentoring, cultural and leadership programs, summer internship assistance, and post-graduation advising. First-year and transfer students are considered for selection during the summer before entering their first semester. Eligible students are encouraged to apply when notified, as space in this program is limited.

Office for International Students and Scholars. If a student is joining the university from a country other than the United States, this office can assist that individual through its orientation programs, by issuing certificates of eligibility (visa documents), and by offering special services for non-native English speakers in the English Language Programs. In addition, the office provides personal and cross-cultural counseling and arranges social, cultural, and recreational activities that foster international understanding on campus.

The Office for International Students and Scholars is located in the Stix International House at 6470 Forsyth Boulevard and on the Medical School campus in the Mid Campus Center (MCC Building), 4590 Children's Place, Room 2043. For more information, visit the Office for International Students and Scholars website (http://oiss.wustl.edu) or call 314-935-5910.

Medical Student Support Services. For information about Medical Student Support Services, please visit the School of Medicine website (https://medicine.wustl.edu).

Relationship and Sexual Violence Prevention (RSVP) Center. The Relationship and Sexual Violence Prevention (RSVP) Center offers free and confidential services including 24/7 crisis intervention, counseling services, resources, support, and prevention education for all Danforth students. The RSVP Center operates from a public health model, utilizing trauma-informed practices to address the prevalent issues of relationship and sexual violence. Our goal in supporting impacted students is...
to foster post-traumatic growth and resilience to better ensure academic retention and success. Our prevention efforts call for community engagement to engender an intolerance of violence and an active stance to challenge issues that perpetuate such a culture. Learn more at the RSVP Center website (https://rsvpcenter.wustl.edu).

WashU Cares. WashU Cares assists the university in handling situations involving the safety and well-being of Danforth Campus students. As such, WashU Cares is committed to fostering student success and campus safety through a proactive, collaborative, and systematic approach to the identification, intervention, and support of students of concern while empowering all university community members to create a culture of caring. If you are concerned about the physical or mental well-being of a student, please file a WashU Cares (https://washucares.wustl.edu) report.

The Writing Center. The Writing Center, a free service, offers writing advice to all Washington University undergraduate and graduate students. Tutors will read and discuss any kind of work in progress, including student papers, senior theses, application materials, dissertations and oral presentations. The Writing Center staff is trained to work with students at any stage of the writing process, including brainstorming, developing and clarifying an argument, organizing evidence, and improving style. Rather than editing or proofreading, tutors will emphasize the process of revision and teach students how to edit their own work. Appointments (http://writingcenter.wustl.edu) are preferred and can be made online.

The Writing Center is located in Olin Library on level one.

Student Health Services, Danforth Campus

The Habif Health and Wellness Center, formerly known as Student Health Services, provides medical and mental health care for undergraduate and graduate students. Habif staff members include licensed professionals in Medical Services, Mental Health Services, and Health Promotion Services. Please visit us in Dardick House on the South 40, or visit the Habif Health and Wellness Center website (http://shs.wustl.edu) for more information about each of our services and staff members.

Hours:
Monday, Tuesday and Thursday 8 a.m.-6 p.m.
Wednesday 10 a.m.-6 p.m.
Friday 8 a.m.-5 p.m.
Saturday 9 a.m.-1 p.m.

A nurse answer line is available to answer any medical questions a student may have when Habif is closed. For after-hours care, please call: 314-935-6666.

Medical Services staff members provide care for the evaluation and treatment of an illness or injury, preventive health care and health education, and nutrition, physical therapy, travel medicine and women’s health services. Habif Health and Wellness Center providers are considered in-network and are participating members of the Washington University in St. Louis Physician’s Network. Any condition requiring specialized medical services will be referred to an appropriate community specialist. Habif accepts most health insurance plans and will be able to bill the plan according to plan benefits when care is accessed at Habif. The student health insurance plan requires a referral any time care is not provided at Habif. Call 314-935-6666 or visit our website to schedule an appointment (http://shs.wustl.edu) for medical care, including allergy injections prescribed by your allergist, health consultations, for HIV or other STD testing, or for immunizations.

Appointments also are available for assessment, treatment and referral for students who are struggling with substance abuse.

The Habif Health and Wellness Center pharmacy is available to all Washington University students and their dependents who participate in the student health insurance plan. The pharmacy accepts most prescription insurance plans; please check with the pharmacist to see if your prescription plan is accepted at the pharmacy.

The Habif Health and Wellness Center lab provides full laboratory services. Approximately 20 tests can be performed in the lab. The remainder of all testing that is ordered by Habif is completed by LabCorp. LabCorp serves as our reference lab and is on the student health insurance plan as a preferred provider. This lab can collect any test ordered by our providers or by outside providers.

All incoming students must provide proof of immunization for two measles, mumps, rubella vaccines after the age of one year old. (A titer may be provided in lieu of the immunizations.) Meningococcal vaccine proof is required for all incoming undergraduate students. A PPD skin test in the past six months is required for students entering the university from certain countries. This list of countries may be found on our website. We suggest all students also have Tetanus Diphtheria immunization within the past five years, Hepatitis A vaccine series, Hepatitis B vaccine series and Varicella vaccine. Medical History Forms (http://shs.wustl.edu) are available online. Failure to complete the required forms will delay registration and will prevent entrance into housing assignment. Please visit our website for complete information about requirements and deadlines (http://shs.wustl.edu).

Mental Health Services staff members work with students to resolve personal and interpersonal difficulties, including conflicts with or worry about friends or family, concerns about eating or drinking patterns, and feelings of anxiety and depression. Although some concerns are more frequent than others, students’ experiences are as varied as the students themselves. Staff members help each person figure out their own situation. Services include individual, group and couples counseling; crisis counseling; psychiatric consultation; and referral for off-campus
Information concerning opting out of the student health insurance if there is proof of existing comprehensive insurance coverage. Students may opt out of this coverage automatically enrolled in the Student Health Insurance Plan upon completion of registration. Washington University students including alcohol and other drugs, weight and body image, sexual health, sleep and stress; customize professional health education programs for groups; and work with groups of students dedicated to educating their peers about healthy decision making. Call 314-935-7139 for more information.

**Important Information About Health Insurance, Danforth Campus**

Washington University has a student health fee designed to improve the health and wellness of the entire Washington University community. This fee supports health and wellness services and programs on campus. In addition, all full-time, degree-seeking Washington University students are automatically enrolled in the Student Health Insurance Plan upon completion of registration. Students may opt out of this coverage if there is proof of existing comprehensive insurance coverage. Information concerning opting out of the student health insurance plan (http://shs.wustl.edu) can be found online after June 1 of each year. Habif does provide billing services to many of the major insurance companies in the United States. Specific fees and co-pays apply to students using Medical Services and Mental Health Services; these fees may be billable to your insurance plan. More information is available on the Habif Health and Wellness Center website (http://shs.wustl.edu).

**Student Health Services, Medical Campus**

For information about student health services on the Medical Campus, please visit the Student Health Services page (p. 385) of the medical school Bulletin.

**Campus Security**

The Washington University campus is among the most attractive in the nation and enjoys a safe, relaxed atmosphere. Your personal safety and the security of your property while on campus is a shared responsibility. Washington University has made safety and security a priority through our commitment to a full-time professional police department, use of closed circuit television, card access, good lighting, shuttle services, emergency telephones, and ongoing educational safety awareness programs. The vast majority of crimes that occur on college campuses are crimes of opportunity, which can be prevented.

The best protection against crime is an informed, alert campus community. Washington University has developed several programs to help make your experience here a safe and secure one. An extensive network of emergency telephones, including more than 200 "blue light" telephones, is connected directly to the University Police Department and can alert the police to your exact location. In addition to the regular shuttle service, an evening walking escort service or mobile Campus Circulator is available on the Danforth Campus.

The Campus2Home shuttle will provide a safe ride home for those living in four designated areas off campus — Skinker-DeBaliviere, Loop South, north of The Loop and just south of the campus — from 6:00 p.m. to 4:00 a.m. seven days a week. The shuttle leaves from the Mallinckrodt Center and takes passengers directly to the front doors of their buildings. Shuttle drivers then will wait and watch to make sure passengers get into their buildings safely. Community members can track the shuttle using the WUSTL Mobile App. The app can be downloaded free of charge from the iOS App Store or the Google Play store.

The University Police Department is a full-service organization staffed by certified police officers who patrol the campus 24 hours a day throughout the entire year. The Police Department offers a variety of crime prevention programs including a high-security bicycle lock program, free personal-safety whistles, computer security tags, personal safety classes for women and men, property inventory services and security surveys. Community members are encouraged to download the personal safety app SafeTrek which allows users to call for help during emergencies. The SafeTrek app (https://www.safetrekapp.com/affiliate/WUSTL) can be downloaded online. For more information on these programs, check out the Washington University Police Department website (http://police.wustl.edu).

In compliance with the Campus Crime Awareness and Security Act of 1990, Washington University publishes online an annual report (http://police.wustl.edu/clerylogsandreports/Pages/default.aspx), Safety & Security: Guide for Students, Faculty, and Staff, Annual Campus Security and Fire Safety Reports, which is available to all current and prospective students on the Danforth Campus and university employees on the Danforth, North and West campuses. To request a hard copy, contact the Washington University Police Department, CB 1038, One Brookings Drive, St. Louis, MO 63130-4899, 314-935-9011.

For information regarding protective services at the School of Medicine, please visit the Security page (https://facilities.med.wustl.edu/security) of the Washington University Operations & Facilities Management Department.

**University Policies**

Washington University has various policies and procedures that govern our faculty, staff and students. Highlighted below are several key policies of the university. Web links to key policies and procedures are available on the Office of the University Registrar website (http://registrar.wustl.edu) and on the university’s Compliance and Policies page (http://wustl.edu/policies). Please note that the policies identified on these websites and in this Bulletin do not represent an entire repository.
of university policies, as schools, offices and departments may implement policies that are not listed. In addition, policies may be amended throughout the year.

**Nondiscrimination Statement**

Washington University encourages and gives full consideration to all applicants for admission, financial aid and employment. The university does not discriminate in access to, or treatment or employment in, its programs and activities on the basis of race, color, age, religion, sex, sexual orientation, gender identity or expression, national origin, veteran status, disability or genetic information.

**Policy on Discrimination and Harassment**

Washington University is committed to having a positive learning and working environment for its students, faculty and staff. University policy prohibits discrimination on the basis of race, color, age, religion, sex, sexual orientation, gender identity or expression, national origin, veteran status, disability or genetic information. Harassment based on any of these classifications is a form of discrimination and violates university policy and will not be tolerated. In some circumstances such discriminatory harassment may also violate federal, state or local law. A copy of the Policy on Discrimination and Harassment (http://hr.wustl.edu/policies/Pages/DiscriminationAndHarassment.aspx) is available on the Human Resources website.

**Sexual Harassment**

Sexual harassment is a form of discrimination that violates university policy and will not be tolerated. It is also illegal under state and federal law. Title IX of the Education Amendments of 1972 prohibits discrimination based on sex (including sexual harassment and sexual violence) in the university’s educational programs and activities. Title IX also prohibits retaliation for asserting claims of sex discrimination. The university has designated the Title IX Coordinator identified below to coordinate its compliance with and response to inquiries concerning Title IX.

For more information or to report a violation under the Policy on Discrimination and Harassment, please contact:

**Discrimination and Harassment Response Coordinators**

Apryle Cotton, Asst. Vice Chancellor for Human Resources
Section 504 Coordinator
Phone: 314-362-6774
Email (apryle.cotton@wustl.edu)

Leanne Stewart, Employee Relations Manager
Phone: 314-362-8278
Email (leannerstewart@wustl.edu)

**Title IX Coordinator**

Jessica Kennedy, Director of Title IX Office
Title IX Coordinator

Phone: 314-362-6774
Email (jwkennedy@wustl.edu)

You may also submit inquiries or a complaint regarding civil rights to the United States Department of Education’s Office of Civil Rights at 400 Maryland Avenue, SW, Washington, DC 20202-1100 or by visiting the U.S. Department of Education website (http://ed.gov) or calling 800-421-3481.

**Student Health**

**Drug and Alcohol Policy**

Washington University is committed to maintaining a safe and healthful environment for members of the university community by promoting a drug-free environment as well as one free of the abuse of alcohol. Violations of the Washington University Drug and Alcohol Policy (http://hr.wustl.edu/policies/Pages/DrugandAlcoholPolicy.aspx) or Alcohol Service Policy (http://pages.wustl.edu/prograds/alcohol-service-policy) will be handled according to existing policies and procedures concerning the conduct of faculty, staff and students. This policy is adopted in accordance with the Drug-Free Workplace Act and the Drug-Free Schools and Communities Act.

**Tobacco-Free Policy**

Washington University is committed to providing a healthy, comfortable and productive work and learning environment for all students, faculty and staff. Research shows that tobacco use in general, including smoking and breathing secondhand smoke, constitutes a significant health hazard. The university strictly prohibits all smoking and other uses of tobacco products within all university buildings and on university property, at all times. A copy of our complete tobacco-free policy (http://hr.wustl.edu/policies/Pages/tobaccofreepolicy.aspx) is available on the Human Resources website.

**Medical Examinations**

Entering students must provide medical information to the Habif Health and Wellness Center. This will include completion of a health history and a record of all current immunizations. The university strongly recommends appropriate vaccination for meningococcal disease.

If students fail to comply with these requirements prior to registration, they will be required to obtain vaccinations for measles, mumps and rubella at the Habif Health and Wellness Center. If there is no evidence of immunity, they will be assessed the cost of the vaccinations. Students will be unable to complete registration for classes until all health requirements have been satisfied.

If students are unimmunized, they may be barred from classes and from all university facilities, including housing units, if in the judgment of the university their continued presence would pose a health risk to themselves or to the university community.
Medical and immunization information is to be given via the Habif Health and Wellness Center (http://shs.wustl.edu) website. All students who have completed the registration process should access the website and create a student profile by using their WUSTL key. Creating a student profile enables a student to securely access the medical history form. Fill out the form and follow the instructions for transmitting it to the Habif Health and Wellness Center. Student information is treated securely and confidentially.

**Student Conduct**

The Student Conduct Code sets forth community standards and expectations for Washington University students. These community standards and expectations are intended to foster an environment conducive to learning and inquiry. Freedom of thought and expression is essential to the university's academic mission.

Disciplinary proceedings are meant to be informal, fair and expeditious. Charges of non-serious misconduct are generally heard by the student conduct officer. With limited exceptions, serious or repeated allegations are heard by the campuswide Student Conduct Board or the University Sexual Assault Investigation Board where applicable.

Complaints against students that include allegations of sexual assault or certain complaints that include allegations of sexual harassment in violation of the Student Conduct Code are governed by the procedures found in the University Sexual Assault Investigation Board Policy (https://wustl.edu/about/compliance-policies/governance/usaib-procedures-complaints-sexual-assault-filed-students), which is available online or in hard copy from the Title IX coordinator or the director of Student Conduct and Community Standards.

Students may be accountable to both governmental authorities and to the university for acts that constitute violations of law and the Student Conduct Code.

For a complete copy of the Student Conduct Code (https://wustl.edu/about/compliance-policies/academic-policies/university-student-judicial-code), visit the university website.

**Undergraduate Student Academic Integrity Policy**

Effective learning, teaching and research all depend upon the ability of members of the academic community to trust one another and to trust the integrity of work that is submitted for academic credit or conducted in the wider arena of scholarly research. Such an atmosphere of mutual trust fosters the free exchange of ideas and enables all members of the community to achieve their highest potential.

In all academic work, the ideas and contributions of others must be appropriately acknowledged, and work that is presented as original must be, in fact, original. Faculty, students and administrative staff all share the responsibility of ensuring the honesty and fairness of the intellectual environment at Washington University.

**Scope and Purpose**

This statement on academic integrity applies to all undergraduate students at Washington University. Graduate students are governed by policies in each graduate school or division. All students are expected to adhere to the highest standards of behavior. The purpose of the statement is twofold:

- To clarify the university’s expectations with regard to undergraduate students’ academic behavior, and
- To provide specific examples of dishonest conduct. The examples are only illustrative, not exhaustive.

**Violations of This Policy Include, but Are Not Limited To:**

1. **Plagiarism**

   Plagiarism consists of taking someone else’s ideas, words or other types of work product and presenting them as one’s own. To avoid plagiarism, students are expected to be attentive to proper methods of documentation and acknowledgment. To avoid even the suspicion of plagiarism, a student must always:

   - Enclose every quotation in quotation marks and acknowledge its source.
   - Cite the source of every summary, paraphrase, abstraction or adaptation of material originally prepared by another person and any factual data that is not considered common knowledge. Include the name of author, title of work, publication information and page reference.
   - Acknowledge material obtained from lectures, interviews or other oral communication by citing the source (name of the speaker, the occasion, the place and the date).
   - Cite material from the internet as if it were from a traditionally published source. Follow the citation style or requirements of the instructor for whom the work is produced.

2. **Cheating on an Examination**

   A student must not receive or provide any unauthorized assistance on an examination. During an examination a student may use only materials authorized by the faculty.

3. **Copying or Collaborating on Assignments without Permission**

   When a student submits work with their name on it, this is a written statement that credit for the work belongs to that student alone. If the work was a product of collaboration, each student is expected to clearly acknowledge in writing all persons who contributed to its completion. Unless the instructor explicitly states otherwise, it is dishonest to collaborate with others when completing any
assignment or test, performing laboratory experiments, writing and/or documenting computer programs, writing papers or reports, and completing problem sets. If the instructor allows group work in some circumstances but not others, it is the student's responsibility to understand the degree of acceptable collaboration for each assignment, and to ask for clarification if necessary. To avoid cheating or unauthorized collaboration, a student should never:

- Use, copy or paraphrase the results of another person's work and represent that work as one's own, regardless of the circumstances.
- Refer to, study from or copy archival files (e.g., old tests, homework, solutions manuals or backfiles) that were not approved by the instructor.
- Copy another's work or permit another student to copy one's work.
- Submit work as a collaborative effort if they did not contribute a fair share of the effort.

4. Fabrication or Falsification of Data or Records
   It is dishonest to fabricate or falsify data in laboratory experiments, research papers or reports or in any other circumstances; to fabricate source material in a bibliography or "works cited" list; or to provide false information on a résumé or other document in connection with academic efforts. It is also dishonest to take data developed by someone else and present them as one's own. Examples of falsification include:
   - Altering information on any exam, problem set or class assignment being submitted for a re-grade.
   - Altering, omitting or inventing laboratory data to submit as one's own findings. This includes copying laboratory data from another student to present as one's own; modifying data in a write-up; and providing data to another student to submit as one's own.

5. Other Forms of Deceit, Dishonesty or Inappropriate Conduct
   Under no circumstances is it acceptable for a student to:
   - Submit the same work, or essentially the same work, for more than one course without explicitly obtaining permission from all instructors. A student must disclose when a paper or project builds on work completed earlier in their academic career.
   - Request an academic benefit based on false information or deception. This includes requesting an extension of time, a better grade or a recommendation from an instructor.
   - Make any changes (including adding material or erasing material) on any test paper, problem set or class assignment being submitted for a re-grade.
   - Willfully damage the efforts or work of other students.
   - Steal, deface or damage academic facilities or materials.
   - Collaborate with other students planning or engaging in any form of academic misconduct.
   - Submit any academic work under someone else's name other than one's own. This includes but is not limited to sitting for another person's exam; both parties will be held responsible.
   - Engage in any other form of academic misconduct not covered here.

This list is not intended to be exhaustive. To seek clarification, students should ask the professor or the assistant in instruction for guidance.

**Reporting Misconduct**

**Faculty Responsibility**
Faculty and instructors are strongly encouraged to report incidents of student academic misconduct to the academic integrity officer in their school or college in a timely manner so that the incident may be handled fairly and consistently across schools and departments. Assistants in instruction are expected to report instances of student misconduct to their supervising instructors. Faculty members are expected to respond to student concerns about academic dishonesty in their courses.

**Student Responsibility**
If a student observes others violating this policy, the student is strongly encouraged to report the misconduct to the instructor, to seek advice from the academic integrity officer of the school or college that offers the course in question, or to address the student(s) directly.

**Exam Proctor Responsibility**
Exam proctors are expected to report incidents of suspected student misconduct to the course instructor and/or the Disability Resource Center, if applicable.

**Procedure**

**Jurisdiction**
This policy covers all undergraduate students, regardless of their college of enrollment. Cases will be heard by school-specific committees according to the school in which the class is listed, not the school in which the student is enrolled. All violations and sanctions will be reported to the student's college of enrollment.

**Administrative Procedures**
Individual undergraduate colleges and schools may design specific procedures to resolve allegations of academic misconduct by students in courses offered by that school, so long as the procedures are consistent with this policy and with the Student Conduct Code.
**Student Rights and Responsibilities in a Hearing**

A student accused of an academic integrity violation, whether by a professor, assistant in instruction, academic integrity officer or student, is entitled to:

- Review the written evidence in support of the charge.
- Ask any questions.
- Offer an explanation as to what occurred.
- Present any material that would cast doubt on the correctness of the charge.
- Determination of the validity of the charge without reference to any past record of misconduct.

When responding to a charge of academic misconduct, a student may:

- Deny the charges and request a hearing in front of the appropriate academic integrity officer or committee.
- Admit the charges and request a hearing to determine sanction(s).
- Admit the charges and accept the imposition of sanctions without a hearing.
- Request a leave of absence from the university. The academic integrity matter must be resolved prior to re-enrollment.
- Request to withdraw permanently from the university with a transcript notation that there is an unresolved academic integrity matter pending.

A student has the following responsibilities in resolving the charge of academic misconduct:

- Admit or deny the charge. This will determine the course of action to be pursued.
- Provide truthful information regarding the charges. It is a Student Conduct Code violation to provide false information to the university or anyone acting on its behalf.

**Sanctions**

**If Found Not in Violation of the Academic Integrity Policy**

If the charges of academic misconduct are not proven, no record of the allegation will appear on the transcript.

**If Found in Violation of the Academic Integrity Policy**

If, after a hearing, a student is found to have acted dishonestly, or if a student has admitted to the charges prior to a hearing, the school's academic integrity officer or committee may impose sanctions, including but not limited to the following:

- Issue a formal written reprimand.
- Impose educational sanctions, such as completing a workshop on plagiarism or academic ethics.
- Recommend to the instructor that the student fail the assignment. (A grade is ultimately the prerogative of the instructor.)
- Recommend to the instructor that the student fail the course.
- Recommend to the instructor that the student receive a course grade penalty less severe than failure of the course.
- Place the student on disciplinary probation for a specified period of time or until defined conditions are met. The probation will be noted on the student's transcript and internal record while it is in force.
- In cases serious enough to warrant suspension or expulsion from the university, refer the matter to the Student Conduct Board for consideration.

Additional educational sanctions may be imposed. This list is not intended to be exhaustive.

Withdrawing from the course will not prevent the academic integrity officer or hearing panel from adjudicating the case, imposing sanctions or recommending grade penalties, including a failing grade in the course.

A copy of the sanction letter will be placed in the student's academic file.

**Appeals**

If a student believes the academic integrity officer or the committee did not conduct a fair hearing, or if a student believes the sanction imposed for misconduct is excessive, they may appeal to the Student Conduct Board within 14 days of the original decision. Appeals are governed by Section VII C of the Student Conduct Code.

**Records**

**Administrative Record-Keeping Responsibilities**

It is the responsibility of the academic integrity officer in each school to keep accurate, confidential records concerning academic integrity violations. When a student has been found to have acted dishonestly, a letter summarizing the allegation, the outcome and the sanction shall be placed in the student's official file in the office of the school or college in which the student is enrolled.

Additionally, each school's academic integrity officer shall make a report of the outcome of every formal accusation of student academic misconduct to the director of Student Conduct and Community Standards, who shall maintain a record of each incident.
Multiple Offenses
When a student is formally accused of academic misconduct and a hearing is to be held by an academic integrity officer, a committee, or the Office of Student Conduct and Community Standards, the person in charge of administering the hearing shall query the Office of Student Conduct and Community Standards about the student(s) accused of misconduct. The director shall provide any information in the records concerning that student to the integrity officer. Such information will be used in determining sanctions only if the student is found to have acted dishonestly in the present case. Evidence of past misconduct may not be used to resolve the issue of whether a student has acted dishonestly in a subsequent case.

Reports to Faculty and Student Body
School and college academic integrity officers are encouraged to make periodic (at least annual) reports to the students and faculty of their school concerning accusations of academic misconduct and the outcomes, without disclosing specific information that would allow identification of the student(s) involved.

Graduate Student Academic Integrity Policies
For graduate student academic integrity policies, please refer to each individual graduate school.

Statement of Intent to Graduate
Students are required to file an Intent to Graduate at WebSTAC (https://acadinfo.wustl.edu) prior to the semester in which they intend to graduate. Additional information is available in the dean's offices of each school and in the Office of the University Registrar (http://registrar.wustl.edu).

Student Academic Records and Transcripts
The Family Educational Rights and Privacy Act of 1974 (FERPA) — Title 20 of the United States Code, Section 1232g, as amended — provides current and former students of the university with specific rights of access to and control over their student record information. In compliance with the statute, appropriate federal regulations and guidelines recommended by the American Association of Collegiate Registrars and Admissions Officers, the university has adopted procedures that implement these rights.

A copy of the university policies regarding educational records and the release of student record information is available from the Office of the University Registrar (http://registrar.wustl.edu) and the university website (https://wustl.edu).

Transcript requests for Danforth Campus students may be submitted to the Office of the University Registrar through WebSTAC. The School of Medicine registrar (http://registrar.med.wustl.edu/services/transcripts-and-certification) accepts requests for transcripts and certification records for students and alumni of: Audiology and Communication Sciences, Clinical Investigation, Genetic Epidemiology, Health Administration, Nurse Anesthesia, Occupational Therapy, Pediatric Nurse Practitioner, Physical Therapy, Psychiatric Epidemiology, School of Dentistry and School of Medicine. Instructions and additional information are available on the University Registrar website (http://registrar.wustl.edu).

University Affiliations
Washington University is accredited by the Higher Learning Commission (https://www.hlcommission.org) (800-621-7440). Washington University is a member of the Association of American Universities, the American Council on Education, the College Board, and the Independent Colleges and Universities of Missouri.

The College of Arts & Sciences is a member of the American Association of Collegiate Registrars and Admissions Officers (AACRAO) and the International Center for Academic Integrity (ICAI).

The College of Architecture was one of the eight founding members of the Association of Collegiate Schools of Architecture (ACSA) in 1912.

The Graduate School is a founding member of both the Association of Graduate Schools and the Council of Graduate Schools.

The Graduate School of Architecture & Urban Design's Master of Architecture degree is accredited by the National Architectural Accreditation Board (NAAB).

The Sam Fox School of Visual Arts & Design (Art) is a founding member of, and is accredited by, the National Association of Schools of Art and Design (NASAD).

The Olin Business School is a charter member of the Association to Advance Collegiate Schools of Business International (1921) (AACSB).

In the School of Engineering & Applied Science, many of the professional degrees are accredited by the Engineering Accreditation Commission of ABET (http://abet.org).

University College is a member of the University Professional and Continuing Education Association, the North American Association of Summer Sessions, the Association of University Summer Sessions and the Center for Academic Integrity. Business-related programs in University College are not accredited by the Association to Advance Collegiate Schools of Business (AACSB International).

The School of Law is accredited by the American Bar Association. The School of Law is a member of the Association of American Law Schools, the American Society of Comparative
Law, the Clinical Legal Education Association, the Southeastern Association of Law Schools, the Central Law Schools Association, the Mid-America Law Library Consortium, the American Association of Law Libraries, and the American Society of International Law.

The School of Medicine is a member of the Liaison Committee on Medical Education.

The Brown School at Washington University is accredited by the Council on Social Work Education and the Council on Education for Public Health.

The University Libraries are a member of the Association of Research Libraries.

The Mildred Lane Kemper Art Museum is nationally accredited by the American Alliance of Museums.
School of Medicine

Washington University School of Medicine is a world leader in medical education, research and patient care. Its graduate programs in medical education (p. 15), occupational therapy (http://www.ot.wustl.edu) and physical therapy (https://pt.wustl.edu/Pages/Home.aspx) are perennially ranked among the nation's best by U.S. News & World Report. Faculty lead a robust research enterprise, supported by $411.4 million from the National Institutes of Health (NIH) in the fiscal year ending June 30, 2017. The school's physicians provide care to almost half a million individuals each year, in partnership with nationally ranked Barnes-Jewish Hospital (http://www.barnesjewish.org) and St. Louis Children's Hospital (http://www.stlouischildrens.org).

Official Course Catalog
The Bulletin of Washington University School of Medicine presents the academic policies, services, and course and degree program offerings of the school. It also includes academic calendars, leadership and directories for faculty, students and staff.

Contact Information
Washington University School of Medicine
660 S. Euclid Ave.
St. Louis, MO 63110
Website: https://medicine.wustl.edu/education

Overview of the School of Medicine

Mission & Vision

University Mission

Washington University's mission is to discover and disseminate knowledge, and protect the freedom of inquiry through research, teaching and learning.

Washington University creates an environment to encourage and support an ethos of wide-ranging exploration. Washington University's faculty and staff strive to enhance the lives and livelihoods of students, the people of the greater St. Louis community, the country, and the world.

Our goals are:

• to welcome students, faculty and staff from all backgrounds to create an inclusive community that is welcoming, nurturing and intellectually rigorous;
• to foster excellence in our teaching, research, scholarship and service;
• to prepare students with attitudes, skills, and habits of lifelong learning and leadership thereby enabling them to be productive members of a global society; and
• to be an institution that excels by its accomplishments in our home community, St. Louis, as well as in the nation and the world.

To this end we intend:

• to judge ourselves by the most exacting standards;
• to attract people of great ability from diverse backgrounds;
• to encourage faculty and students to be bold, independent and creative thinkers;
• to provide an exemplary, respectful, and responsive environment for living, teaching, learning and working for present and future generations; and
• to focus on meaningful measurable results for all of our endeavors.

Washington University School of Medicine Mission and Vision

Our Mission

Washington University School of Medicine will lead in advancing human health through the best clinical care, innovative research, and the education of tomorrow's leaders in biomedicine in a culture that supports diversity, inclusion, critical thinking and creativity.

Our Vision

In leading the advancement of human health, Washington University School of Medicine will:

• cultivate excellence and collegiality within an inclusive community
• attract and develop a diverse, talented, academic workforce
• lead the revolution in biomedicine
• enhance our intellectual and technological environment to foster exceptionally creative research and education
• develop and maintain excellent clinical programs to provide outstanding care
• observe the highest standards of ethics, integrity and compassionate care
• apply advances in research and medicine to the betterment of the human condition locally and globally

Approved by Executive Faculty at their September 4, 2013, meeting.

History

The education of physicians at Washington University began in 1891. Under an ordinance enacted April 14, 1891, establishing a Medical Department of Washington University, the St. Louis Medical College (an independent medical college in St. Louis) was brought under the wing of the well-established university.
The faculty of the college eagerly agreed to the union, stating "Most of the great medical schools of the world have always been integrant departments of universities, and the examples which America furnishes give added testimony to the fructifying influence of the contact of students and teachers of professional schools with the workers in universities." Eight years later, the Missouri Medical College (another independent college in the city) also joined Washington University, and thus the two most famous medical colleges in the city were merged with the university.

In 1909, Abraham Flexner began a survey of 155 medical schools in the United States and Canada for the Carnegie Foundation for the Advancement of Teaching. The survey created a national sensation. Some schools collapsed, others pooled their resources, while still others reorganized. The Medical School of Washington University did not escape criticism. In the report Flexner made to Henry Smith Pritchett, PhD, president of the Carnegie Foundation for the Advancement of Teaching and former professor of astronomy at Washington University, he said that one of two courses must be adopted: "The department must be either abolished or reorganized."

Dr. Pritchett mailed the report to Robert S. Brookings, a St. Louis merchant who was president of the Board of Directors of Washington University. Brookings was shocked and immediately went to New York to see Flexner, demanding proof that the conditions were as bad as described. Both returned to St. Louis and the two men went through the school. In less than two hours, Brookings was convinced that drastic action was necessary if the school was to be one of the foremost institutions of medical education and research. The meeting in 1909 of Brookings and Flexner was of unsurpassed significance in the history of the Washington University School of Medicine, for it led to the complete reorganization of the school and the establishment of the present Medical Center. Abraham Flexner inspired the dream of a model medical school; Robert Brookings accepted the challenge, and with the energy and vision which characterized all his enterprises, made the dream a reality.

No time was lost in making changes. The Bulletin of the Medical School for July 1910 made the following statement: "The Corporation of the University, becoming convinced that in no other direction could greater service be rendered than through a great, modern medical school, determined to reorganize the School and to place it in the front rank of American medical institutions. It has called to the heads of a number of leading departments the ablest men it could secure."

When Robert A. Barnes died in 1892, he left a will which directed the trustees of his estate to use $840,000 for the erection and equipment of a hospital "for sick and injured persons, without distinction of creed, under the auspices of the Methodist Episcopal Church, South." Investigation by the trustees into the cost of building a modern hospital convinced them that the sum was not large enough to build an efficient, fireproof building, and they therefore invested the trust. By 1912 the value had increased to $2 million, a sum which permitted the building of a hospital and left an endowment greater than the original fund.

At the same time the trustees were studying hospital construction, Robert Brookings was studying medical schools. It was apparent to everyone concerned that the two projects, the building of a medical school and the construction of a modern hospital, were so interrelated that the purpose of each would be more successfully fulfilled by an affiliation. A medical school would provide a highly trained staff and would assure the most modern methods and superior laboratory facilities for the hospital. A teaching hospital would give patients superior care and, at the same time, provide the essential clinical experience consistent with modern medical teaching methods.

In the spring of 1912, construction was begun on the medical school and hospital buildings which today form the nucleus of the present center. The laboratories were moved from their old quarters in downtown St. Louis into the new buildings on Euclid Avenue and Kingshighway Boulevard during the summer of 1914, and late in the fall of the same year the activities of the Washington University Hospital were transferred to Barnes Hospital. Concomitantly, the St. Louis Children's Hospital, then located on Jefferson Avenue, became affiliated with the School of Medicine and moved to its new quarters in the Medical Center.

On April 28, 29 and 30, 1915, exercises were held to celebrate the completion of this group of buildings designed to promote the practice, the teaching and the progress of medicine. The dedication ceremonies marked what Dr. William H. Welch of The Johns Hopkins University called "one of the most significant events in the history of medical education in America." Robert S. Brookings, the one man most responsible for the reorganization, voiced the hope that "our efforts will contribute, in some measure, to raising the standard of medical education in the West, and that we will add, through research activities, our fair quota to the sum of the world's knowledge of medicine." These prophetic words have been realized.

In the ensuing years, the Medical Center has continued to grow, and now its facilities are among the best in the world. With the increase in size of the physical plant there has come a substantial increase in the number of the faculty; the expansion has been made without compromise to the standards that marked the early development of the Medical Center. As a result, significant achievements in both research and clinical areas have been steadily recorded.

Statistics

Washington University Medical Center is one of the nation's biggest academic medical centers and among the largest employers in the St. Louis metropolitan area.

2017-2018 By the Numbers (as of Fall 2017)

Total Students: 1,409
• MD, MD/PhD, MA/MD: 629
• Applied Health Behavior: 19
• Audiology and Communication Sciences: 67
• Clinical Investigation: 99
• Genetic Epidemiology or Biostatistics: 18
• Occupational Therapy: 299
• Physical Therapy: 255
• Population Health Sciences: 23

Faculty: 2,263
Staff: 7,522
Total Employees: 9,785
Clinical Faculty: 1,503
Residents and Clinical Fellows: 1,187

Faculty at a Glance (2017)

Washington University School of Medicine has one of the finest faculties of any medical school in the nation. Recognized for their distinguished achievements in original research, 15 faculty members are among the fellows of the prestigious National Academy of Sciences; 29 are members of the National Academy of Medicine. Eighteen Nobel laureates have been associated with the School of Medicine.

During fiscal year 2017, 144 members of the faculty held individual and/or institutional career development awards. Some individual faculty members may hold multiple awards:

• 101 from National Institutes of Health (including direct-pay and pass-through awards)
• 1 from Agency for Healthcare Research and Quality
• 1 from Alfred P. Sloan Foundation
• 1 from Alzheimer's Disease Association
• 1 from American Academy of Neurology
• 1 from American Association for Plastic Surgeons
• 1 from American Board of Psychiatry & Neurology
• 2 from American Cancer Society
• 1 from American College of Rheumatology
• 1 from American Gastrointestinal Association
• 3 from American Heart Association
• 1 from American Society for Radiation Oncology
• 1 from American Urological Association Foundation
• 2 from Brain & Behavior Research Foundation
• 3 from Burroughs Welcome Fund
• 1 from Central Society for Clinical and Translational Research
• 1 from Crohn’s & Colitis Foundation
• 1 from Cystic Fibrosis Foundation
• 2 from Damon Runyon Cancer Research Foundation
• 1 from Dermatology Foundation
• 6 from Doris Duke Charitable Foundation
• 1 from Ellison Medical Foundation
• 1 from Endocrine Fellows Foundation
• 1 from General Hospital Corporation
• 1 from Helen Hay Whitney Foundation
• 1 from Johann Jacobs Foundation
• 1 from Leukemia and Lymphoma Society
• 1 from Muscular Dystrophy Association
• 2 from National Multiple Sclerosis Society
• 1 from NephCure Foundation
• 1 from New York Stem Cell Foundation
• 1 from North American Society for Pediatric Gastroenterology, Hepatology & Nutrition
• 1 from Research to Prevent Blindness
• 1 from Rheumatology Research Foundation
• 1 from Robert Wood Johnson Foundation
• 1 from Sarcoma Alliance for Research
• 1 from Sidney Kimmel Foundation for Cancer Research
• 2 from Society for Vascular Surgery Foundation
• 1 from St. Baldrick's Foundation
• 3 from Susan G. Komen Breast Cancer Foundation
• 1 from V Foundation
• 1 from VascularCures – The Foundation for Accelerated Vascular Research

The School of Medicine has six faculty members with Method to Extend Research in Time (MERIT) status, a special recognition given to only a few NIH grantees, which provides long-term, uninterrupted financial support to investigators who have demonstrated superior achievement during previous research projects.

In 2017, the school employed 2,155 full-time, salaried faculty members in its 20 preclinical and clinical departments. The clinical departments are further strengthened by 1,413 voluntary and adjunct faculty members, a group of physicians who practice their medical specialties in St. Louis and are members of one or more of the staffs of the hospitals in the Washington University Medical Center.

Summary of Students in the School of Medicine 2017-2018

Doctor of Medicine (MD) (as of October 1, 2017)

Graduating Class Level: 101
Five-Year Research Program or equivalent: 8
Third-Year Class: 105
Second-Year Class: 96
First-Year Class: 98
Doctor of Medicine and Doctor of Philosophy (MD/PhD)
Graduating Class Level: 20
Clinical/Third-Year Class: 11
Seventh-Year Research: 1
Sixth-Year Research: 4
Fifth-Year Research: 15
Fourth-Year Research: 24
Third-Year Research: 18
Second-Year Research: 24
First-Year Research: 18
Second-Year Class: 29
First-Year Class: 26

Doctor of Medicine and Master of Arts (MD/MA)
Second-Year Class or Higher: 4

Doctor of Medicine and Master of Population Health Sciences (MD/MPHS)
Second-Year Class or Higher: 12

Doctor of Medicine and Master of Science in Clinical Investigation (MD/MSCI)
Second-Year Class or Higher: 1

Doctor of Physical Therapy
Third-Year Class: 81
Second-Year Class: 86
First-Year Class: 88

Doctor of Occupational Therapy
Affiliation-Year: 22
Third-Year Class: 19
Second-Year Class: 34
First-Year Class: 42

Doctor of Audiology
Fourth-Year Class: 15
Third-Year Class: 12
Second-Year Class: 12
First-Year Class: 15

Master of Science in Occupational Therapy
Affiliation-Year: 73
Second-Year Class: 51
First-Year Class: 58

Master of Science in Population Health Sciences
Second-Year Class: 17
First-Year Class: 6

Master of Science in Genetic Epidemiology
Master/Certificate/SNCD: 3

Master of Science in Biostatistics
Second-Year Class: 15
First-Year Class: 10

Master of Science in Deaf Education
Second-Year Class: 8
First-Year Class: 5

Master of Science in Clinical Investigation
Fourth-Year Class: 2
Third-Year Class: 5
Second-Year Class: 9
First-Year Class: 23
Certificate: 6
SNCD (students non-candidates for degree): 54

Master of Science in Applied Health Behavior Research
Second-Year Class: 11
First-Year Class: 5
Certificate: 3
SNCD (students non-candidates for degree): 0

Medical School Total: 1,409
(629 MD of all types; 780 in Allied Health Programs)

Student Body
The School of Medicine attracts a student body of exceptional quality. The student body of the School of Medicine numbers approximately 600+ medical students. Programs also are conducted for 700+ students who are pursuing graduate degrees in applied health behavior research, audiology and communication sciences, clinical investigation, occupational therapy, physical therapy, population health sciences, biostatistics, or genetic epidemiology. The Division of Biology and Biomedical Sciences has extensive graduate training programs for more than 500+ students seeking the Doctor of Philosophy degree in areas of Biochemistry; Computational and Systems Biology; Developmental, Regenerative and Stem Cell Biology; Evolution Ecology and Population Biology; Human and Statistical Genetics; Immunology; Molecular Biophysics; Molecular Cell Biology; Biochemistry; Molecular Genetics and Genomics; Molecular Microbiology and Microbial Pathogenesis; Neurosciences; and Plant Biology.

The MD Program
The 2017 first-year class consisted of 124 students selected from a pool of 5,032 applicants. The school is a national institution with 31 home states and 6 countries represented in the current enrollment.
In the academic year 2017-18, the school planned to confer the MD degree upon 124 individuals. Graduating students who participated in the 2017 National Resident Matching Program matched in programs recognized for high quality and selectivity.

Research

Research Activities

Grants and contracts totaling more than $548.7 million supported faculty research efforts at the School of Medicine during the fiscal year ending June 30, 2017. Substantial additional support was provided directly to faculty investigators by the Howard Hughes Medical Institute. Gifts and grants from private sources, including alumni, individuals, foundations, corporations and other organizations, totaled $133 million.

During the Washington University fiscal year ending June 30, 2017, the School of Medicine received $373.9 million from the National Institutes of Health. This amount includes direct-pay and pass-through awards.

The many firsts at the School of Medicine include:

- Served as a major contributor of genome sequence data to the Human Genome Project, providing the foundation for personalized medicine.
- Developed screening tests used worldwide to diagnose Alzheimer's disease.
- Created the first positron emission tomography (PET) scanner, a device that images the brain at work.
- Helped pioneer the use of insulin to treat diabetes.
- Developed a genetic test that detects whether an individual will develop a form of thyroid cancer and would benefit from thyroid removal — the first surgical prevention of cancer based on genetic test results.
- Published the first evidence linking smoking and lung cancer.
- Proposed the now-common practice of taking aspirin to help prevent heart attacks.
- Performed the world's first nerve transplant using nerve tissue from a cadaver donor.
- Developed a blood test that quickly and safely identifies whether a patient needs invasive treatment for a heart attack.
- Decoded the entire genome of a cancer patient and used the results to alter the course of treatment, which put the cancer into remission.
- Demonstrated that severely malnourished children given antibiotics along with a therapeutic peanut butter-based food are far more likely to recover and survive than children who only receive the therapeutic food.

Ongoing research includes:

- Participating in a national network to determine new ways to prevent preterm birth.
- Developing new ways to diagnose and treat stroke as part of a national network of state-of-the-art stroke treatment centers.
- Making groundbreaking contributions to decoding the genetics of cancer and developing personalized treatments.
- Leading an international research collaboration to study inherited forms of Alzheimer's disease and one of the first clinical trials to evaluate whether the disease can be prevented before memory loss and dementia develop.
- Pioneering minimally invasive surgical treatments for heart arrhythmias and heart valve replacement.
- Participating in the National Children's Study, the largest U.S. study of child and human health ever conducted.
- Seeking new ways to diagnose and treat stroke as part of a national network of state-of-the-art stroke treatment centers.
- Developing and using nanoparticles for molecular imaging and targeted drug delivery for cancer and heart, lung and vascular diseases.
- Mapping the major circuits in the human brain to understand normal brain function and connectivity errors involved in alcoholism, autism and schizophrenia.
- Exploring the links that connect obesity and malnutrition to the community of microbes that live in the gut.
- Searching for clues in the brain and spinal cord to help physicians diagnose Alzheimer's disease before symptoms develop.
- Leading research, teaching and community engagement to improve population health through Washington University's Institute for Public Health.
- Investigating changes to the brain in soldiers exposed to roadside blasts and athletes who have suffered repeated concussions to understand their long-term mental and physical consequences.
- Exploring the genetic influences at play in alcohol, smoking and drug addiction.
- Leading research to improve care for heart failure and cardiovascular disease, including clinical trials to evaluate mechanical assist devices and studies to look at the link between diabetes and aggressive heart disease.

BioMed 21

Launched in 2003, BioMed 21 creates a multidisciplinary and translational-research imperative for basic scientists and clinician-researchers from many medical disciplines.

BioMed 21 reorganizes the life sciences at Washington University to address the biggest questions about disease: their origins, how they affect us and how we can cure them. Its goal is to reshape the university culture to rapidly convert the knowledge of the genetic blueprint of human beings into effective, individualized treatments.
To successfully make those discoveries and develop those therapies, BioMed 21 advances on many fronts:

It aims to collect and dedicate resources, including NIH support and gifts from friends and supporters. Recent grants include:

- $53 million grant to enhance clinical and translational research
- $42 million in three grants for neuroscience research
- $32 million in three grants for microbiome research
- $183 million in four grants for genomics research

It defines new spaces to house promising research and educational programs, including:

- 240,000 square feet of new research space in the new BJC Institute of Health at Washington University School of Medicine in the center of the medical campus
- the Farrell Learning and Teaching Center, an important teaching component of BioMed 21
- a 40,000-gross-square-foot facility designed to spur development of mouse models for human diseases
- a 32,000-square-foot data center to meet the massive computing needs of The Genome Center
- 15,000 square feet of space added to the previously established Center for Genome Sciences & Systems Biology to support new investigators
- 7,000 square feet of renovated space to house the Center for the Study of Itch

In addition to the Center for Genome Sciences & Systems Biology, it establishes six Interdisciplinary Research Centers (IRCs) housed in the BJC Institute of Health at Washington University School of Medicine. The IRCs are central in promoting scientific and educational innovations across school boundaries. IRCs have the primary goal of promoting innovative interdisciplinary, interdepartmental research and education in the biological and medical sciences. The mission of the IRCs is to assemble talented faculty and students to address key and emerging scientific problems, and to understand fundamental biological processes with broad implications for human health.

- The BRIGHT Institute (Bridging Research with Imaging, Genomics and High-Throughput)
- Center for the Investigation of Membrane Excitability Disorders — The EXCITE Center
- Center for Study of Itch (CSI)
- Center for Women's Infectious Disease Research (cWIDR)
- Diabetic Cardiovascular Disease Center (DCDC)
- Hope Center Program on Protein Aggregation and Neurodegeneration (HPAN)

Research Training

The School of Medicine offers many degree programs focused on research training. Please visit the Departments & Programs (p. 33) section of this Bulletin for more information.

Medical Student Research

Research is a key component of the academic program at Washington University School of Medicine (WUSM). WUSM is an internationally recognized institution where an outstanding faculty directs compassionate patient care and world-class research. Although the medical students come to WUSM for the superb clinical training the school offers, approximately 95 percent of the students also conduct research during their time here. Research provides medical students with the opportunity to engage in scientific inquiry.

The vast size and broad scope of the research activities at WUSM provide many opportunities for medical students to pursue any type of modern medical research. Our academic research programs are as follows: First-year medical students conduct part-time research during the school year with a maximum of 10 hours/week; after first-year, medical students conduct full-time research during the summer and receive a modest stipend for living expenses; second- and third-year medical students conduct part-time research during the school year with a maximum of 10 hours/week; fourth-year medical students conduct full-time research for 6-12 weeks during the school year and receive credit. Medical students can also conduct full-time research in one of the yearlong research programs (YRP) during their medical school years. The YRP includes: the Master's Degree Program for Medical Students (MA/MD), the Master of Science in Clinical Investigation (MSCI), the One-Year Research without Degree (MD9), the Master of Population Health Sciences (MPHS), and the Master of Public Health (MPH). The academic research programs prepare medical students for careers in academic medicine.

Fellowships in basic science or clinical areas will be awarded each year to selected students who undertake research projects under the direction of faculty members. Research allows students to discover firsthand the problems and rewards of obtaining and assessing new information, thus adding another dimension to their experience as investigators.

Most students take the opportunity for research during the summer after their first year of classes. All research must be conducted at the School of Medicine. Students will be awarded a fellowship for the 2.5-month program.

Inquiries should be made to:

Koong-Nah Chung, PhD
Associate Dean for Medical Student Research
Director of the Office of Medical Student Research
Instructor of Cell Biology and Physiology
Washington University School of Medicine
Students at Washington University School of Medicine are active participants in medical student organizations on the local, state and national levels. The American Medical Student Association (AMSA), the Student National Medical Association (SNMA), the American Medical Women’s Association (AMWA), the Asian-Pacific American Medical Students Association (APAMSA), the Medical Student Section of the American Medical Association (AMA-MSS), the Missouri State Medical Association (MSMA), the Organization of Student Representatives (OSR) in the Association of American Medical Colleges (AAMC) and the Student Organized Community Clinic (SOCC) provide forums for addressing the educational, social and political concerns of medical students. The School of Medicine supports student participation in these national organizations and provides partial funding for travel and other expenses on an annual basis. The Medical Student Government (MSG) represents student interests, supports social and educational activities, and expands the perspectives of the future graduates of the medical school.

Visit the Office of Medical Student Affairs for more information about maintaining wellness (https://mdstudentaffairs.wustl.edu/services/wellness-support).

**Student Groups**

Students at Washington University School of Medicine are active participants in medical student organizations on the local, state and national levels. The American Medical Student Association (AMSA), the Student National Medical Association (SNMA), the American Medical Women’s Association (AMWA), the Asian-Pacific American Medical Students Association (APAMSA), the Medical Student Section of the American Medical Association (AMA-MSS), the Missouri State Medical Association (MSMA), the Organization of Student Representatives (OSR) in the Association of American Medical Colleges (AAMC) and the Student Organized Community Clinic (SOCC) provide forums for addressing the educational, social and political concerns of medical students. The School of Medicine supports student participation in these national organizations and provides partial funding for travel and other expenses on an annual basis. The Medical Student Government (MSG) represents student interests, supports social and educational activities, and expands the perspectives of the future graduates of the medical school.

Visit the Office of Medical Student Affairs for a complete list of student groups (https://mdstudentaffairs.wustl.edu/student-groups).

**Academic Societies**

To foster communication between students and faculty, three academic societies — The Joseph Erlanger and Evarts Graham Society, The Carl and Gerty Cori Society, and The Oliver Lowry and Carl Moore Society — meet independently throughout the academic year to enjoy a social hour, dinner and conversation. The societies promote a collegial environment for the medical school’s diverse faculty and student body. Medball, held in March of each year, is hosted in part by the academic societies and provides a formal social evening with medical faculty and medical students.

For a complete list of academic societies (https://mdstudentaffairs.wustl.edu/academic-support/academic-societies), visit the Office of Medical Student Affairs.

**Major Events**

Many events mark a student’s passage through medical school. Browse the Calendar (https://mdstudentaffairs.wustl.edu/events) to learn more.

**Community Service Experience**

Participation in a host of community service projects nurtures students’ altruistic nature and provides an alternative educational experience. University-sponsored, student-run, community-based service activities include the Perinatal Project, which
provides information concerning well-baby care and prenatal care to women from lower socioeconomic groups.

Students Teaching AIDS to Students (STATS) allows trained medical students to provide sixth and seventh graders with information about AIDS. The combined efforts of medical students, faculty, middle school teachers, parents and speakers with AIDS have made STATS a very successful program. The Geriatrics Outreach Program helps prepare students for the challenges and rewards of working with older patients.

Pediatric Outreach Program (POP) matches children in the St. Louis area who are suffering from chronic illnesses and the siblings of these children with big brothers and big sisters from Washington University School of Medicine. Community CPR trains medical students to become instructors in CPR for the medical school curriculum and in the community of St. Louis.

The Mental Health Outreach Program (MHOP) works to increase the awareness of mental health issues among medical students and the general public. The Family Medicine Interest Group works with the local community by providing health screenings and nutritional classes. SPOTS (Sun Protection Outreach Teaching by Students) is piloted to teach middle school students about the dangers of skin cancer and how to protect themselves from the sun.

A newer group, the Public Health Interest Group (PHIG), is a student organization committed to partnering in the St. Louis community to include health screenings, nutrition outreach and public policy discussions. The Smoking Cessation Project works with the American Lung Association Freedom from Smoking Program, and students are trained in counseling smoking cessation groups.

**Student Publications**

Students organize and spearhead several publications at the School of Medicine. The *Dis-Orientation Guide* is produced annually as a student-to-student guide to the curriculum and the city. *Hippocrene* is a literary magazine published once a year containing poetry, short stories, essays and photographs submitted by members of the WUSM community.

**St. Louis**

Situated at the confluence of two great North American rivers — the Mississippi and the Missouri — the St. Louis region has been a favored destination since Lewis & Clark began their historic westward “Corps of Discovery” here in 1804.

Today, the pioneers of St. Louis are the engineers, scientists, business leaders, educators, artists, and other innovative and creative professionals who are working at the forefront of a multitude of fields and endeavors. Thanks in large part to Washington University, other regional universities and key Fortune 500 corporations, St. Louis has developed into a national hub for important research and business development, especially in the fields of biotechnology and plant science.

Consistently ranked among the nation’s most affordable and best places to live and raise a family, the St. Louis region offers many opportunities to watch or participate in a wide range of sports, recreational activities and cultural events. Not far from St. Louis’ urban core are the beautiful rolling hills of the Ozark Mountain region and outdoor activities such as hiking, canoeing and spelunking in some of Missouri’s more than 6,000 caves.

**Cultural Opportunities**

New St. Louisans discover the rich cultural life here in theaters, galleries, museums and festivals. The St. Louis Symphony (https://www.slsymphony.org), among the finest in the nation, performs at historic Powell Hall. Symphony members bring their skills to the community through teaching and chamber concerts as well. In the downtown area, the rich St. Louis traditions in jazz, blues and ragtime music are continued in a number of lounges and clubs. The Community Music School of Webster University (http://www.webster.edu/community-music-school) offers community music education to all ages, and COCA (http://www.cocastl.org) (Center of Creative Arts) is the largest multidisciplinary arts institution in the metropolitan area.

The Opera Theatre of Saint Louis (http://www.opera-stl.org) has been enormously successful, nationally and internationally, bringing English-language versions of the classics and presentation of contemporary operas to the stage. The Repertory Theatre of St. Louis (http://www.repstl.org) has an extensive annual season, which includes experimental works and traditional dramas. The Stages St. Louis Theatre Co., Kirkwood Theatre Guild (http://www.ktg-onstage.org), West End Players Guild (http://www.westendplayers.org), ACT INC (http://www.actincstl.com) and the St. Louis Black Repertory Company (http://www.theblackrep.org) enrich the dramatic offerings available in the immediate area. On campus, Edison Theatre offers the highest quality in national and international programs in theater, dance and music. For open-air summer entertainment, the Shakespeare Festival St. Louis (https://www.sfstl.com) and The Muny (http://muny.org), both in Forest Park, are prime destinations.

Broadway comes to St. Louis at the Fox Theatre (http://www.fabulousfox.com), a renovation of a 1929 example of exotic cinema temple art. Galleries sprinkled throughout the area bring current visual arts to St. Louis, while antique shops remind us of the past. The St. Louis International Film Festival takes place every fall. Supplementing the standard movie fare available throughout the metropolitan area are two cinemas close to campus, the Hi-Pointe (http://hi-pointetheatre.com) and the Tivoli, both offering excellent foreign and independent films.

When the Saint Louis Art Museum (http://slam.org) was built for the 1904 World’s Fair, much of the Washington University collection was housed in it. Ties with the Art Museum remain very close. Students in art and in business intern at the Art Museum, working in arts management and gallery organization. St. Louis also features Laumeier Sculpture Park...
Many major corporations are located here, as are a variety of retail, transportation and banking organizations. Among the top firms are Ameren, Boeing, Edward Jones, Emerson Electric, Enterprise Rent-a-Car and Express Scripts. Many support services have grown up around these corporations — including law, accounting, data processing, advertising, public relations and design firms, as well as photographic and audio-visual studios.

Employing more than 20,000 people, the Washington University Medical Center (WUMC) is made up of the School of Medicine (https://medicine.wustl.edu), the Alvin J. Siteman Cancer Center (http://www.siteman.wustl.edu), Barnes-Jewish Hospital (http://www.barnesjewish.org) and St. Louis Children’s Hospital (http://www.stlouischildrens.org). The medical center generates an annual economic impact of nearly $4.3 billion for the St. Louis area, according to an economic model maintained by the St. Louis Regional Commerce and Growth Association.

The John M. Olin School of Business (http://www.olin.wustl.edu/Pages/default.aspx) at Washington University enjoys a rich and varied partnership with the business community. As a laboratory for internship opportunities, entrepreneurship study, and student practicums offered through Olin’s Center for Experiential Learning, St. Louis plays an integral role in the education of business students. In turn, Olin creates value for area businesses by matching top Olin talent with pivotal positions in their firms.

Similarly, the School of Law (http://law.wustl.edu) has close ties with the St. Louis legal community and, through its clinical program, offers internships in private and local government offices and in state and federal courts. In addition, the law school is fortunate in the active and interested role of the local bar associations in the development of the school’s special programs.

The George Warren Brown School of Social Work (http://brownschool.wustl.edu/Pages/Home.aspx) also is linked in many ways to the St. Louis social work community. Students find practicum assignments throughout the area, and both students and faculty do research and consult with local agencies.

A strong partnership exists between technology-based businesses and industries in St. Louis and the School of Engineering & Applied Science (http://engineering.wustl.edu). There is a network of more than 80 faculty members associated with the Department of Biomedical Engineering, representing numerous divisions of the university, including many from the School of Medicine.

In addition to their ties to local business, both the Danforth Campus and the School of Medicine at Washington University are dedicated to the support of K-12 education. Students from the medical school participate in a variety of outreach programs, including Students Teaching AIDS to Students (STATS), designed to teach awareness and responsible behavior to junior high school students; the Young Scientist Program (http://
ysp.wustl.edu), an interactive learning experience that brings high school students to the medical center; and health and preventive programs on drug and sex education.

In short, Washington University enjoys a special relationship with St. Louis.

### Interesting St. Louis-Area Facts

St. Louis has many nicknames, including the “Gateway City,” “Gateway to the West,” “The Mound City,” “St. Louie,” “River City,” and “The Lou.”

There are more free, world-class attractions in St. Louis than any place in the nation outside of Washington, DC.

The Saint Louis Zoo (http://stlzoo.org) was the first municipally supported zoo in the world and a pioneer in the use of open enclosures, placing animals in natural environments without bars.

Some of the world's favorite foods were popularized and introduced to a wide audience at the 1904 World's Fair in St. Louis. The ice cream cone, iced tea and hamburgers all became food favorites there. It is said that the fair was the first place where hot dogs met French's mustard.

The Eads Bridge over the Mississippi River, near the present site of the Gateway Arch, was the first arched steel truss bridge in the world. When it was first proposed, it was scoffed at as impossible to build. Completed in 1874, it is still in use today.

In 1904, the first World Olympics in the United States and the Western Hemisphere was held in St. Louis at Washington University's Francis Field.

The Cathedral Basilica of Saint Louis (http://cathedralstl.org) contains the largest collection of mosaic art in the world.

In 1876, St. Louis hosted the first national political convention west of the Mississippi.

In 1927, a group of St. Louis businessmen gave financial backing to the first solo transatlantic flight from New York to Paris. The pilot was Charles Lindbergh and the plane was named "The Spirit of St. Louis."

St. Louis’ McDonnell Douglas Corporation, now Boeing, designed and built the space capsule that carried the first men into space in the 1960s.

C.L. Grigg, a soft drink salesman, introduced a drink to St. Louisans in 1929 that would eventually become known as 7-Up.

### Admission to the School of Medicine

This section presents information about the Admissions policies for the programs and degrees offered by the School of Medicine. Refer to the MD (p. 24), Health Professions (p. 26) or Joint (p. 26) sections of this page for more information about individual programs and their admission requirements.

- Applied Health Behavior Research
- Audiology and Communication Sciences
- Biology and Biomedical Sciences
- Biomedical Engineering
- Biostatistics
- Clinical Investigation
- Genetic Epidemiology
- Medicine
- Occupational Therapy
- Physical Therapy
- Population Health Sciences
- Public Health

### MD

#### Admission Requirements for the Study of Medicine

Entrance requirements to the School of Medicine include:

1. Evidence of superior intellectual ability and scholastic achievement;
2. Completion of at least 90 semester hours of college courses in an approved college or university;
3. Completion of the Medical College Admission Test of the Association of American Medical Colleges; and
4. Evidence of character and integrity, a caring and compassionate attitude, scientific and humanitarian interests, effective communication skills, and motivation suitable for a career in medicine.

Chemistry, physics and mathematics provide the tools for modern biology, for medicine and for the biological basis of patient care. Thus, a firm grounding in these subjects is essential for the study of medical sciences. Entering students are expected to have accomplished at least the equivalent of one-year courses at the undergraduate level in physics and biology; mathematics through calculus, including integral equations and differential equations; and chemistry, including one year of general or inorganic chemistry and one year of organic chemistry. Course work in biochemistry is encouraged although not required. In addition, one semester of biochemistry can be substituted for one semester of organic chemistry. Similarly, one semester of statistics can be substituted for one semester of calculus. In selected instances, one or more of these prerequisites may be waived by the Committee on Admissions, but applicants are strongly advised to pursue their interests in these and in other areas of science.

A major goal of undergraduate college work should be development of the intellectual talents of the individual. This often involves the in-depth pursuit of some area of knowledge, whether in the humanities, social sciences or natural sciences. At the same time, a diversity of background is encouraged in
order to provide a necessary foundation for the development of cultural awareness, sensitivity and competence. Specific courses, other than the few in the natural sciences, are not prerequisites because a great variety of courses and life experiences may prepare students for the many roles they may play in their medical careers.

**Technical Standards Statement**

Graduates of Washington University with a Doctor of Medicine degree are expected to have broad competence in the basic skills that underlie the general practice of medicine and surgery. All graduates must be able to take a history, examine a person, and synthesize the findings into a diagnosis and plan of evaluation and treatment independently. Thus, medical students must possess the requisite sensory, motor, communicative and cognitive capabilities to accomplish these requirements in a reliable manner in order to be competent and safe medical practitioners.

**Application Procedure**

General information for prospective medical students and instructions about how to apply can be found on the Medical Student Admissions website (http://mdadmissions.wustl.edu).

Washington University School of Medicine participates in the American Medical College Application Service (AMCAS) of the Association of American Medical Colleges. AMCAS provides a centralized system for applying to any participating medical school with only one application and one set of official transcripts of academic work.

The AMCAS Application for Admission (https://students-residents.aamc.org/applying-medical-school/applying-medical-school-process/applying-medical-school-amcas), common to all participating medical schools, is available online. Applicants are urged to file their applications as early as possible.

Applicants to the first-year class must submit their AMCAS application no later than December 1 of the year prior to that in which they want to matriculate. Additionally, applicants must complete a supplemental application (https://wumsapply.wustl.edu), submit letters of recommendation, and pay a nonrefundable application fee of $100. These materials must be received no later than December 31. The Committee on Admissions will only evaluate an application when it is complete.

Selected applicants are invited for a personal interview, as well as a tour of the School of Medicine and the Washington University Medical Center. This visit provides extensive opportunities for the applicant to meet and talk with students and faculty members.

If an applicant is planning a trip to the St. Louis area, it is appropriate to contact us by email (mdadmissions@wustl.edu) to inquire if an interview has been authorized. The inquiry should be submitted at least three weeks in advance of the anticipated travel. The Office of Admissions is open weekdays from 8:30 a.m. to 5 p.m. Central Time.

Admission decisions are made by the Committee on Admissions on a rolling schedule beginning in early November. Applicants are notified as soon as a final decision has been made on their application, but by April 1, every applicant should be notified whether they are accepted, on the waiting list or not accepted.

Upon notification of acceptance for admission to the school, the applicant is required to file a Statement of Intent to Matriculate within four weeks. Three options are presented: 1) accept the offer of admission; 2) accept the offer of admission and request financial aid materials; or 3) decline the offer of admission. The School of Medicine abides by the traffic rules regarding application timelines as established by AMCAS. Accepted applicants who are noncompliant with AMCAS traffic rules and medical school deadlines may have their acceptance into the class rescinded.

After the applicant has been accepted, matriculation is contingent upon sustained superior academic performance as well as continued ethical, honest and mature deportment. Accepted applicants must report to the Registrar of the School of Medicine all institutional judicial or academic sanctions and/or legal actions in which they have been a party prior to matriculation at the School of Medicine. Accepted applicants must report all institutional judicial and academic charges and/or legal charges brought against them before matriculation at the School of Medicine where such charges could result in sanctions. Concealing or failing to report such sanctions and/or charges promptly and, more generally, failure to maintain high standards of moral and ethical behavior may result in rescission of acceptance or dismissal from the School of Medicine or revocation of the Doctor of Medicine degree.

**Merit-Based Scholarships**

Please consult the Financial Information section (p. 332) of this Bulletin.

**Background Checks and Screening for Controlled Substances**

Students entering the School of Medicine who will have contact with patients are required to have criminal background checks and screening for controlled substances (THC-cannabis, cocaine, opiate, amphetamine, PCP-phencyclidine) in order to qualify for participation in patient care activities at Washington University School of Medicine-affiliated facilities. Drug screening usually will be conducted during student orientation prior to the start of classes. Incoming, prematriculant students, or visiting students will be disqualified to study at the School of Medicine if they do not consent to background checks, if they have significant positive findings on the background checks, or if they have illicit substances detected on drug screening without a bona fide medical indication. Disqualified prematriculant students and disqualified visiting students will be precluded from...
matriculation and will not be registered as students in the School of Medicine.

**Third-Year Class Transfer Program**

Each year, Washington University School of Medicine accepts a limited number of transfer students into its third-year class depending on the availability of positions. Transfer applications are accepted from well-qualified second-year students who are enrolled in good standing and eligible to continue in their LCME-accredited U.S. medical schools. Applicants must also have a compelling personal reason for requesting transfer and must have the full approval of the dean of their current school. Accepted students are required to successfully complete the USMLE Step 1 examination.

Transfer application forms for admittance into the third-year class are available after October 1 for the following academic year. The deadline for submission of applications is March 31. Those applicants selected for an interview will be invited to visit the Washington University Medical Center. Applicants will be notified of the decision of the Committee on Admissions by May 15 or when a position becomes available. Inquiries should be directed to:

Third-Year Class Transfer Program  
Washington University School of Medicine  
Campus Box 8077  
660 S. Euclid Ave.  
St. Louis, MO 63110-1093  
Phone: 314-362-6844  
Fax: 314-362-4658  
Email (mdadmissions@wustl.edu)

Visit the Medical Student Admissions website (http://mdadmissions.wustl.edu) for full admissions information and to check the status of your application.

**Health Professions**

Costs, admission requirements and application procedures vary from program to program.

For additional admissions information, please consult the following sources:

- Applied Health Behavior Research (https://crtc.wustl.edu/programs/degrees/ahbr)
- Program in Audiology and Communication Sciences (https://pacs.wustl.edu/admissions)
- Biology and Biomedical Sciences (PhD (http://dbbs.wustl.edu/prosptstudents/PhDAdmissions/Pages/PhDAdmissions.aspx) or PhD/MD (http://mstp.wustl.edu/admissions/Pages/Admissions.aspx))
- Biomedical Engineering (https://engineering.wustl.edu/prospective-students/graduate-admissions/Pages/default.aspx)
- Clinical Investigation: Clinical Research Training Center (https://crtc.wustl.edu/apply)
- Doctor of Philosophy: Division of Biology and Biomedical Sciences (http://dbbs.wustl.edu/prosptstudents/PhDAdmissions/Pages/PhDAdmissions.aspx)
- Genetic Epidemiology: Division of Biostatistics (https://biostatistics.wustl.edu/education/master-of-science-in-genetic-epidemiology-gems)
- Occupational Therapy (http://www.ot.wustl.edu/admissions-102)
- Physical Therapy (https://pt.wustl.edu/contact-us)
- Master of Population Health Sciences (http://www.mphs.wustl.edu/Admissions/How-To-Apply)
- Master of Public Health (https://brownschool.wustl.edu/Academics/Master-of-Public-Health)

**Joint Medical Scientist Training Program (MSTP)**

**Admission Procedures**

Individuals interested in applying to the Medical Scientist Training Program must complete the MD-PhD sections on the AMCAS application (https://students-residents.aamc.org/applying-medical-school/applying-medical-school-process/applying-medical-school-amcas) and the Washington University School of Medicine supplemental application. The MSTP requires letters of recommendation from the applicant’s research mentors. All application materials are due by 11:59 p.m. on October 31. Approximately 100 applicants will be invited to interview for 25 first-year MD-PhD slots. Interviews (http://mstp.wustl.edu/admissions/Pages/Interview-Visit.aspx) are conducted on designated Fridays from September through January (http://mstp.wustl.edu/admissions/Pages/Interview-Dates.aspx). Decisions are made on a rolling basis, with the first decisions being released in November.

**Admissions Requirements**

Only individuals who have spent the equivalent of at least two years or four semesters in laboratory research should apply to the Medical Scientist Training Program. Applicants must meet the requirements for admission to both the School of Medicine and the doctoral program of their choice. The GRE is not accepted. Superior scholastic performance and outstanding potential for a career in research are key components of a successful application. Applications from international students (http://mstp.wustl.edu/admissions/Pages/International-Students.aspx) are welcome.
Transfer Applicants

Although most individuals enter the program as first-year students, applications will be accepted from students who have already initiated MD or PhD training. The deadline for transfer applications is 11:59 p.m. on October 15. Please review the MSTP Transfer Policy (http://mstp.wustl.edu/admissions/Pages/MD-Transfers.aspx) for additional information.

Doctor of Medicine and Master of Arts (MD/MA)

The School of Medicine offers a combined MD/MA program for current MD students. Please visit the program webpage (http://dbbs.wustl.edu/divprograms/mamd/Pages/mamd.aspx) for more information about admission.

Doctor of Medicine and Master of Science in Clinical Investigation (MD/MSCI)

Admissions

Applications are open September 15-November 1 for January start date, and January 1-April 17 for summer or fall start dates. Applicants must submit the following:

- Application form (https://crtcapply.dom.wustl.edu)
- Current Biosketch or CV
- Individual Development Plan
- Research Plan
- Mentor Letter of Support
- Department Chair or Division Chief Recommendation Letter
- Official Transcripts

Individuals who participate in a Clinical Research Training Center (CRTC) training program (i.e., Postdoctoral MTPCI, KL2, TL1 Intensive, or K12) are eligible to pursue the MSCI degree as their didactic course of study and do not need to complete a separate application.

Doctor of Medicine and Master of Population Health Sciences (MD/MPHS)

Prospective Students

Applicants should be in the process of completing a degree in a clinical training program at the doctoral level or should have completed such a degree. The pace of course work assumes students have familiarity with clinical medicine.

Application Deadlines

For 2018-19 academic year: March 15, 2018
Notification to students of admission decision: April 15, 2018
Commitment deadline: May 1, 2018

Doctor of Medicine and Master of Public Health (MD/MPH)

Prospective Students

Applicants should be in the third year of their medical school program. Prior to entering the MPH program, students should have taken courses (up to 11 credit hours) that count toward their MPH degree.

Application Deadlines for 2018-19 Academic Year

Applicants will apply online (https://sophase.xpress.liaisoncas.com).
Application deadline: December 15, 2018
Admission decisions sent: February 1, 2019
Commitment deadline: April 1, 2019

Degrees & Programs of the School of Medicine

This section presents a full listing of the programs and degrees offered by the School of Medicine. Refer to the MD (p. 27), Health Professions (p. 28) or Joint (p. 28) sections of this page for more information about individual programs and their degree offerings, including information for the following programs:

- Applied Health Behavior Research
- Audiology and Communication Sciences
- Biology and Biomedical Sciences
- Biomedical Engineering
- Biostatistics
- Clinical Investigation
- Genetic Epidemiology
- Medicine
- Occupational Therapy
- Physical Therapy
- Population Health Sciences
- Public Health

MD

Washington University offers some of the nation's finest degree programs in medicine, biomedical research, allied health and public health. An outstanding education from the school provides graduates with solid opportunities for highly sought-after residencies and fellowships, engaging and challenging research endeavors, and successful, rewarding careers in medicine and related fields.

The Bulletin of the School of Medicine provides an overview of the courses, curriculum and faculty of each degree program. For complete information, please visit the Departments & Programs (p. 33) pages of the Bulletin.

- Doctor of Medicine (p. 29)
Health Professions

The Bulletin of the School of Medicine provides an overview of the courses, curriculum and faculty of each degree program. For complete information, please visit the following Departments & Programs sections of the Bulletin:

- Applied Health Behavior Research (p. 269)
- Audiology and Communication Sciences (p. 274)
- Biology and Biomedical Sciences (p. 281)
- Biomedical Engineering (p. 284)
- Biostatistics (p. 292)
- Clinical Investigation (p. 298)
- Doctor of Philosophy (p. 281)
- Genetic Epidemiology (p. 303)
- Occupational Therapy (p. 309)
- Physical Therapy (p. 317)
- Population Health Sciences (p. 327)
- Public Health (p. 331)

Joint

Washington University School of Medicine offers several programs and combined degree programs:

- Doctor of Medicine (five-year program) (p. 28)
- Doctor of Medicine and Master of Arts (p. 28)
- Doctor of Medicine and Master of Science in Clinical Investigation (p. 28)
- Doctor of Medicine and Master of Population Health Sciences (p. 28)
- Doctor of Medicine and Master of Public Health (p. 28)
- Doctor of Medicine and Doctor of Philosophy (MSTP) (p. 29)

Washington University offers some of the nation’s finest degree programs in medicine, biomedical research, allied health and public health. An outstanding education from the school provides graduates with solid opportunities for highly sought-after residencies and fellowships, engaging and challenging research endeavors, and successful, rewarding careers in medicine and related fields.

The Bulletin of the School of Medicine provides an overview of the courses, curriculum and faculty of each degree program. For complete information, please visit the Departments & Programs (p. 33) section of the Bulletin.

For a detailed listing of Interdisciplinary courses (p. 306), please visit the Interdisciplinary section of Departments & Programs.

Doctor of Medicine (five-year program)

In addition to the regular four-year program leading to the MD degree and the MA/MD degree program, students are permitted to spend one additional year in an academic program in a medical or medically related field. In exceptional circumstances, a further additional year may be permitted. The student may receive a stipend but may not be considered an employee of the university. The program must be arranged with an academic adviser and is subject to the approval of the associate dean for Medical Student Research. The Student Research Opportunities brochure available through the Office of Medical Student Research (https://mdstudentresearch.wustl.edu) provides additional important information about participating in this program. Students enrolled in the five-year program must maintain coverage through Student Health while in St. Louis.

Doctor of Medicine (MD) and Master of Arts (MA)

The objective of the MD/MA program is to provide one full year of individual, full-time, in-depth research experience for medical students in preparation for a career in academic medicine. Program participants absent themselves from medical school and spend 12 months working on basic biomedical research or hypothesis-driven clinical research in the lab of a faculty member. Degree requirements include a presentation before a research advisory committee, submission of a publication-quality manuscript, and participation in a research ethics seminar. Additional requirements may include associated course work and a general knowledge exam. No academic credit toward the MD degree will be given, but research may be continued as senior elective for credit.

Please contact the MD/MA program administrator at 314-362-7190 or visit the MD/MA website (http://mamd.wustl.edu) for details.

Doctor of Medicine (MD) and Master of Science in Clinical Investigation (MSCI)

The School of Medicine offers a combined MD/MSCI program. Please visit the Clinical Investigation (p. 298) section of this Bulletin for more information.

Doctor of Medicine (MD) and Master of Population Health Sciences (MPHS)

The School of Medicine offers a combined MD/MPHS program. Please visit the Population Health Sciences (p. 327) section of this Bulletin for more information.

Doctor of Medicine (MD) and Master of Public Health (MPH)

The School of Medicine offers a combined MD/PH program. Please visit the Public Health (p. 331) section of this Bulletin for more information.
Doctor of Medicine and Doctor of Philosophy (MSTP)

Washington University offers a combined MD/PhD degree program that draws on the resources of the School of Arts & Sciences, the School of Engineering & Applied Science, and the School of Medicine under the auspices of the Medical Scientist Training Program (MSTP). The purpose of the program is to train individuals in medicine and biomedical research to prepare them for careers as physician scientists. The program was inaugurated in 1969 and is one of the oldest and largest in the country. The program has been highly successful; more than 75 percent of those who have completed postgraduate training are actively involved in research programs at leading institutions.

The program consists of three parts: 1) two years of an enhanced medical curriculum, 2) at least three years of original research toward a thesis to satisfy the requirements for the PhD degree, and 3) at least 15 months of clinical training based on a student’s career goals. Both degrees are awarded upon the completion of the program. The MSTP curriculum (http://mstp.wustl.edu/program/Pages/MSTP-Curriculum.aspx) integrates to allow for timely completion of training. Students typically complete training in seven or eight years.

All MSTP students in the program receive financial support in the form of stipends (currently $30,500 per year), health coverage, disability and life insurance, and full tuition remission for both the MD and PhD phases of training.

Medical Scientist Training Program
Washington University School of Medicine
CB 8226
660 South Euclid Avenue
St Louis, MO 63110-1093
Phone: 800-852-4625
MSTP Website (http://www.mstp.wustl.edu)

Doctor of Medicine (MD)

By conferring the MD degree, the university certifies that the student is competent to undertake a career as a doctor of medicine. It certifies further that, in addition to medical knowledge and skills, the graduate possesses qualities of personality — compassion, emotional stability and a responsible attitude — essential to an effective professional life.

Curriculum

The curriculum includes a core experience based upon a sequence of courses that introduces students to the many domains and disciplines of medicine. The principles, methods of investigation, problems and opportunities in each of the major disciplines of medical science and medical practice are presented in such a way as to help students select the career best suited to their abilities and goals. Through all four years of the curriculum, key topics known as Threads are woven throughout the learning experience, linking clinical and course work and enhancing the learning experience.

The preclinical curriculum (https://md.wustl.edu/academics/curriculum/first-year) provides a science and investigative foundation for future clinical practice. First-year and second-year course work combines basic science taught in a variety of didactic means including lectures, small groups, simulations and case-based learning with a Practice of Medicine course that uses regular patient interactions and integrative cases to teach students to skillfully interview and examine patients, as well as integrating current health disparities and issues in the present global spectrum.

Students will also have the opportunity during their first year to complete four, 10-hour selective courses (https://md.wustl.edu/academics/curriculum/first-year/selectives-requirements) in the humanities, basic sciences and clinical areas, providing enrichment and in-depth focus on areas beyond the core curriculum. The preclinical curriculum is pass/fail.

The overall goal of the third year is implementation of fundamental interactive clinical skills necessary for the practice of medicine at the highest possible level of excellence. Students achieve this goal by participating in intensive, closely supervised training experiences in the core clinical clerkships involving inpatient and ambulatory settings and interactions with patients who present a spectrum of emergent, urgent, routine and chronic clinical problems. Through these experiences, students exhibit growth and maturation in their abilities to take medical histories, perform complete physical examinations, synthesize findings into a diagnosis, formulate treatment plans, and document and present information in a concise, logical and organized fashion.

In the final year (https://md.wustl.edu/academics/curriculum/electives-fourth-year) of the medical school curriculum, the required elective program helps students to decide where major interests lie. It also enables them to benefit from the wide range of specialized knowledge and skills found in the faculty and lays the foundation for lifelong learning and application of principles. The elective program permits students to select, according to their desires, the areas they wish to explore or to study in depth. Fourth year is also an opportunity to synthesize the learning from third year in preparation for clinical residency. Toward this end, students are required to complete a Capstone course prior to graduation.

Washington University School of Medicine Medical Student Competency-Based Learning Objectives

The educational program is designed to ensure that each student will demonstrate the following:

I. Medical knowledge

Medical students must demonstrate knowledge of core concepts and principles of human biology and genetics, the scientific
foundations of medicine, and the causations, epidemiology, diagnosis and treatment of diseases in individuals and diverse populations.

MK-1 Demonstrate knowledge of normal human structure and function at the molecular, genetic, cellular, tissue, organ-system and whole-body level in growth, development, and health maintenance.

MK-2 Describe the basic mechanisms involved in the causation and treatment of human disease and their influence on clinical presentation and therapy.

MK-3 Demonstrate knowledge of the epidemiology of common diseases.

MK-4 Demonstrate knowledge of the impact of ethnicity and culture, socioeconomic factors, and other social factors on health, disease, and individual patient approaches to health care.

MK-5 Describe the basic scientific and ethical principles of clinical and translational research.

II. Patient care
Medical students must demonstrate the ability to provide appropriate patient care in a multidisciplinary setting for the promotion of health and treatment of health problems across the human life span.

PC-1 Obtain appropriate medical histories that include psychosocial and behavioral factors that influence health.

PC-2 Perform accurate physical examinations.

PC-3 Perform basic procedures necessary for the practice of medicine.

PC-4 Apply the scientific method to the practice of medicine including the processes of problem identification, data collection, hypothesis formulation, and the application of deductive reasoning to problem solving, clinical reasoning, and decision-making.

PC-5 Integrate collected clinical information, including history, physical examination, and relevant laboratory, radiologic, and other studies, to develop and carry out with supervision, appropriate, individualized diagnostic and treatment plans for patients across the broad spectrum of acute and chronic conditions.

PC-6 Perform basic risk assessments and formulate plans to promote patient wellness across the human lifespan.

PC-7 Counsel and educate patients and their families based upon consideration of patient lifestyle, culture, concomitant medical conditions, psychosocial, and socioeconomic factors.

III. Interpersonal and communication skills
Medical students must demonstrate their ability to communicate effectively with members of the medical community and with patients and their families from all socioeconomic and cultural backgrounds. (ED-10)

ICS-1 Demonstrate respectful and effective verbal and nonverbal interpersonal communication skills with patients.

ICS-2 Discuss diagnostic and treatment options in a manner that will facilitate the participation of patients and their families in shared decision-making.

ICS-3 Communicate effectively with members, including both physician and non-physician professionals, of the health care team.

ICS-4 Maintain accurate and thorough medical records and written documents.

IV. Professionalism
Medical students must demonstrate a commitment to professional responsibilities, adherence to ethical behaviors, and sensitivity to patients of diverse backgrounds.

PROF-1 Maintain a professionally appropriate demeanor, exhibit high standards of professional integrity, and demonstrate an awareness of potential conflicts of interest.

PROF-2 Apply legal and ethical principles governing the physician-patient relationship to interactions with patients and their families.

PROF-3 Act in the patient’s best interest and serve as a patient advocate.

PROF-4 Work collaboratively and effectively in interprofessional teams.

PROF-5 Treat all patients and patients’ family members respectfully and compassionately with respect for privacy.

V. Systems-based practice
Medical students must demonstrate an awareness of the larger context and system of health care and its impact on patients and the practice of medicine.

SBP-1 Demonstrate a knowledge of the U.S. health care delivery system, including the impact of financing, health policy, and the regulatory structure on health care.

SBP-2 Describe how health care disparities impact access and delivery of medical care for individuals and describe strategies for addressing these disparities.

SBP-3 Recognize the need for cost awareness and the role of risk benefit analysis in patient and population-based care.

SBP-4 Define patient safety and quality improvement, and discuss strategies to maximize the safety and quality of patient care.
VI. Practice-based learning and improvement

Medical students must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve their patient care skills based on external feedback and self-evaluation.

PBLI-1 Demonstrate the skills needed for lifelong learning including the ability to identify and address personal strengths and weaknesses to incorporate formative feedback, and to self-assess knowledge and performance to develop a self-improvement plan.

PBLI-2 Apply an evidence-based approach to medical practice through selecting, appraising and utilizing evidence from scientific studies related to clinical questions and patients’ health problems.

PBLI-3 Participate in the education of peers and other members of the health care team.

PBLI-4 Identify and address biases (both personal and in others) that may impact health care delivery.

Contact Information

For additional information or specifics about the MD curriculum, please contact:

Washington University School of Medicine
Office of Medical Student Education
Bernard Becker Medical Library, Room 301
CB 8214
660 S. Euclid Ave.
St. Louis, MO 63110
Hours: 8:30 a.m.-5:00 p.m., Monday-Friday
Phone: 314-362-7122
MD Program Website (https://md.wustl.edu)

Degrees & Requirements

Medical Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>Neurosci 501B</td>
<td>Human Body: Anatomy, Embryology, Imaging</td>
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<tr>
<td>Neurosci 502A</td>
<td>Histology and Cell Biology</td>
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<tr>
<td>Biochem 502</td>
<td>Molecular Foundations of Medicine</td>
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<tr>
<td>CellBio 501</td>
<td>Physiology</td>
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<tr>
<td>Genetics 511</td>
<td>Medical Genetics</td>
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<tr>
<td>Path 523</td>
<td>Immunology</td>
<td></td>
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<tr>
<td>MolMB 526</td>
<td>Microbes and Pathogenesis</td>
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<tr>
<td>Neurol 554</td>
<td>Neural Science</td>
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<td>MolBio/Pha 500</td>
<td>Principles of Pharmacology</td>
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</tr>
<tr>
<td>Medicine 507</td>
<td>Practice of Medicine I</td>
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Selectives*

Second Year:

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<tr>
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<td>Clinical Topics In Otolaryngology</td>
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<tr>
<td>Medicine 615A</td>
<td>Endocrinology and Metabolism</td>
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<tr>
<td>Medicine 611B</td>
<td>Cardiovascular Disease</td>
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<td>Medicine 612B</td>
<td>Pulmonary Diseases</td>
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<tr>
<td>Medicine 613B</td>
<td>Renal &amp; Genitourinary Diseases</td>
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<tr>
<td>Medicine 614</td>
<td>Dermatology</td>
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<tr>
<td>Medicine 620A</td>
<td>Gastroint. and Liver Diseases/ Nutrition</td>
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<td>ObGyn 635B</td>
<td>Obstetrics and Gynecology</td>
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<tr>
<td>Neurol 632</td>
<td>Diseases of the Nervous System</td>
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<td>Psych 676A</td>
<td>Diseases of the Nervous System: Psychiatry</td>
</tr>
<tr>
<td>Medicine 605A</td>
<td>Infectious Diseases</td>
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<tr>
<td>Medicine 606A</td>
<td>Rheumatology</td>
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<tr>
<td>Medicine 625A</td>
<td>Hematology and Oncology</td>
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<td>Medicine 607</td>
<td>Practice of Medicine II</td>
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<td>Peds 640</td>
<td>Pediatrics: Physicians, Patients &amp; Society</td>
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<tr>
<td>Path 665</td>
<td>Pathology</td>
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Third Year:

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<tr>
<td>Surgery 790</td>
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<td>Medicine 710</td>
<td>Medicine Clerkship</td>
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<tr>
<td>Neurol 720</td>
<td>Neurology Clerkship</td>
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<td>ObGyn 730</td>
<td>OB-GYN Clerkship</td>
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<td>Peds 760</td>
<td>Pediatric Clerkship</td>
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<td>Psych 770</td>
<td>Psychiatry Clerkship</td>
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<td>Practice of Medicine III</td>
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<tbody>
<tr>
<td>InterDis 849</td>
<td>Fourth-Year Capstone Course</td>
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</table>

Electives**

* All first-year medical students are required to take and successfully complete at least four Selective courses (https://md.wustl.edu/academics/curriculum/first-year/selectives-requirements) with a maximum number of six. Students must enroll in a minimum of one each of humanities, basic sciences, clinical and an additional selective from the basic science or clinical category.

** The elective year allows students to develop a flexible, individualized program of study at a crucial time in the continuum of formal medical education. Course offerings are found within each department on the specific academic departments (p. 33) page and are 800-level.
Research

Students pursuing the Doctor of Medicine degree may receive elective credit for research projects completed in their fourth year. For additional information about the enrollment process and to learn more about research elective opportunities, please contact the Electives Office (wusmelectives@wustl.edu).

Research opportunities are not mandatory, but the majority of MD students participate in some form of research during their educational career at Washington University School of Medicine. Our Medical Student Research Program provides a wide array of research opportunities to complement different student interests and suit various career paths. For more information about these research opportunities and the application process, please reference the Office of Medical Student Research website (https://mdstudentresearch.wustl.edu).

Faculty

2018-2019 Course & Clerkship Directors

First Year

Human Body: Anatomy, Embryology, Imaging
Kari Allen, PhD
Amy Bauernfeind, PhD

Histology and Cell Biology
Paul Bridgman, PhD

Molecular Foundations of Medicine
Linda Pike, PhD

Physiology
Robert Mercer, PhD

Immunology
Brian Edelson, MD, PhD

Medical Genetics
Sabrina Nunez, PhD

Microbes and Pathogenesis
Henry Huang, PhD
Scott Hultgren, PhD

Neural Sciences
David Van Essen, PhD
Krikor Dikranian, MD, PhD
Timothy Holy, PhD

Principles of Pharmacology
Simon Haroutounian, PhD

Practice of Medicine I
Timothy Yau, MD

First-Year Selectives
Faculty members from many departments and divisions at Washington University School of Medicine offer first-year selective course options focused on basic science, clinical experience, or the humanities.

Second Year

Clinical Topics in Otolaryngology
Joseph Bradley, MD

Endocrinology and Metabolism
William Clutter, MD

Cardiovascular Disease
Dana Abendschein, PhD
Justin Sadhu, MD

Pulmonary Disease
Adrian Shifrin, MBBCH

Renal and Genitourinary Diseases
Steven Cheng, MD

Dermatology
David Sheinbein, MD

Gastroenterology and Liver Disease/Nutrition
Sandeep Tripathy, MD, PhD

Obstetrics and Gynecology
Kenan Omurtag, MD

Diseases of the Nervous System
Allyson Zazulia, MD

Diseases of the Nervous System: Psychiatry
Marcie Garland, MD

Infectious Diseases
Nigar Kirmani, MD
Steven Lawrence, MD

Rheumatology
Richard Brasington, MD

Hematology and Oncology
Meagan Jacoby, MD, PhD
Eric Knoche, MD

Pediatrics
Amanda Emke, MD
Ericka Hayes, MD

Pathology
Erika Crouch, MD, PhD

Practice of Medicine II
Megan Wren, MD

Third Year

Integrated Surgical Disciplines Clerkship
Michael Awad, MD, PhD

Medicine Clerkship
Gerome Escota, MD

Neurology Clerkship
Faculty members within all departments and divisions at Washington University School of Medicine offer a vast selection of clinical elective rotations and independent study opportunities for students in their final year of the MD program.

Courses

Descriptions of courses offered for students pursuing the Doctor of Medicine degree are listed within the Academic Department (p. 33) sections in this Bulletin. Please reference the department page for a complete listing of MD courses offered in that specialty. Across all School of Medicine departments, first-year MD courses are designated as 500-level (MXX 5XX), second-year courses are designated as 600-level (MXX 6XX), third-year courses are designated as 700-level (MXX 7XX), and fourth-year courses are designated as 800-level (MXX 8XX).

Departments & Programs of the School of Medicine

This section presents information about the departments and programs of the School of Medicine. Refer to the Academic Departments (p. 33) or Educational Programs (p. 33) sections of this page for more information, including information for the following programs:

Applied Health Behavior Research
Audiology and Communication Sciences
Biology and Biomedical Sciences
Biomedical Engineering
Biostatistics
Clinical Investigation
Genetic Epidemiology
Medicine
Occupational Therapy
Physical Therapy
Population Health Sciences

Public Health

Academic Departments

Washington University School of Medicine has 20 academic departments, all of which support the school's tripartite mission of conducting outstanding patient care, education and research. The school excels applying a multidisciplinary approach to all its endeavors, allowing faculty to easily cross administrative boundaries to address the health industry's biggest challenges.

- Anesthesiology (p. 34)
- Biochemistry and Molecular Biophysics (p. 43)
- Cell Biology and Physiology (p. 47)
- Developmental Biology (p. 51)
- Genetics (p. 55)
- Medicine (p. 60) (Internal Medicine)
- Molecular Microbiology (p. 122)
- Neurology (p. 126)
- Neuroscience (p. 139)
- Neurosurgery (p. 142)
- Obstetrics and Gynecology (p. 147)
- Ophthalmology and Visual Sciences (p. 158)
- Orthopaedic Surgery (p. 171)
- Otolaryngology (p. 175)
- Pathology and Immunology (p. 184)
- Pediatrics (p. 194)
- Psychiatry (p. 223)
- Radiation Oncology (p. 236)
- Radiology (p. 241)
- Surgery (p. 253)

Educational Programs

- Applied Health Behavior Research (p. 269)
- Audiology and Communication Sciences (p. 274)
- Biology and Biomedical Sciences (p. 281)
- Biomedical Engineering (p. 284)
- Biostatistics (p. 292)
- Clinical Investigation (p. 298)
- Genetic Epidemiology (p. 303)
- Interdisciplinary Opportunities (p. 306)
- Medicine (MD) (p. 29)
- Medicine Postgraduate (p. 308)
- Occupational Therapy (p. 309)
- Physical Therapy (p. 317)
- Population Health Sciences (p. 327)
- Public Health (p. 331)

Academic Departments
Department of Anesthesiology

Anesthesiology is a medical specialty encompassing a broad range of medical and scientific activities. The clinical practice of anesthesiology includes:

1. assessment of, consultation for and preparation of patients for anesthesia and surgery;
2. provision of insensibility to pain during surgical, obstetric, therapeutic and diagnostic procedures;
3. monitoring and restoration of physiologic homeostasis during the perioperative period, as well as homeostasis in the critically ill or seriously injured patient;
4. diagnosis and treatment of painful syndromes; and
5. clinical management and teaching of cardiopulmonary resuscitation (CPR).

The realm of scientific investigation in anesthesiology also spans a broad range. Scientific efforts at the cellular and molecular levels are directed to understanding the molecular mechanisms of anesthesia and analgesia. Clinical research in anesthesia includes broad epidemiological approaches to identifying indicators of outcome as well as prospective clinical studies examining new technologies, anesthetic agents and methods.

The Department of Anesthesiology (http://anest.wustl.edu) presents the student with the opportunity to:

1. acquire and apply pharmacologic knowledge related to anesthetic, narcotic, paralytic and sedative drugs and to drugs affecting the autonomic nervous system;
2. understand and apply the basic principles of airway management and mechanical ventilation;
3. understand and apply the principles of cardiopulmonary resuscitation;
4. understand and apply the technical skills and anatomic and pharmacologic knowledge used in performing regional nerve blocks;
5. learn and apply the fundamental principles of acute and chronic pain management; and
6. learn and apply the basic principles of critical care medicine.

Anesthesiology bridges the gap between basic science and clinical medicine. It provides experience in the clinical evaluation and management of patients, and in applied physiology and pharmacology. The Department of Anesthesiology offers student experiences in the operating room, the intensive care unit, the pain clinic and the laboratory.

Website: http://anest.wustl.edu

Degrees & Requirements

While the Department of Anesthesiology does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

Research Electives in Anesthesiology

Special electives in basic science research as it applies to anesthesiology can be arranged with the principal investigators in the Department of Anesthesiology (http://anest.wustl.edu), in the Anesthesiology Research Unit and the Washington University Pain Center under the direction of Rob Gereau, PhD, or the Division of Clinical and Translational Research under the direction of Michael Avidan, MBCh.

These laboratories focus on various aspects of molecular neurobiology, including ion channel structure and function; G-protein molecular biology; molecular mechanisms of anesthetic action; genetics of anesthetic responsiveness; and the molecular, cellular and genetic basis of acute and chronic pain and itch. Arrangements for these special electives are made through the specific investigators: Walter A. Boyle III, MD; Zhou-Feng Chen, PhD; Alex S. Evers, MD; Narasimhan Gautam, PhD; Richard S. Hotchkiss, MD; Christopher J. Lingle, PhD; Gustav Akk, PhD; Michael Bruchas, PhD; Yu-Qing Cao, PhD; Robert W. Gereau, PhD; DP Mohapatra, PhD; or Jose Moron-Concepcion, PhD. In addition, opportunities exist for clinical research under the direction of Michael Avidan, MBCh, or Ben Palanca, MD, PhD.

Faculty

Department Chair
Alex S. Evers, MD

Department Vice Chair
Ellen M. Lockhart, MD

Visit our website for more information about our faculty (http://anest.wustl.edu/about/faculty) and their appointments.

A

Enyo Ama Ablordeppey, MD, M PH
Assistant Professor of Anesthesiology (primary appointment)
Assistant Professor of Emergency Medicine in Medicine
MD University of Pittsburgh 2007
M PH University of Pittsburgh 2007

Sirajuddin Agha, MBBS
Assistant Professor of Anesthesiology (primary appointment)
MBBS Liaquat Medical College 1969

Gustav Akk, PHD
Associate Professor of Anesthesiology (primary appointment)
PhD State Univ of NY Buffalo 1997

Ream Al-Hasani, PHD
Adjunct Assistant Professor of Anesthesiology (primary appointment)
PHD University of Surrey 2009

Umeshkumar Athiraman, MD
Assistant Professor of Anesthesiology (primary appointment)
MD M.G.R. Medical University 2013

Jacob D AuBuchon, MD
Assistant Professor of Anesthesiology (primary appointment)
MD University of MO Kansas City 2008
BA University of MO Kansas City 2005

Michael Simon Avidan, MBBCH
Professor of Anesthesiology (primary appointment)
Professor of Surgery (Cardiothoracic Surgery)
MBBCH University of the Witwatersra 1991

Sennaraj Balasubramanian, MD, PHD
Instructor in Anesthesiology (Pending Dean's Approval) (primary appointment)
MD All-India Inst of Medical Sci 1998
PHD College of Anesthesiology 2008
BS Tirunelveli Medical College 1992

Devin M Barry, PHD
Instructor in Anesthesiology (primary appointment)
PHD University of MO St Louis 2012

Holger Matthias Baumann, MD
Assistant Professor of Anesthesiology (primary appointment)
MD Free University of Berlin 1988

Arbi Ben Abdallah, PHD
Assistant Professor of Anesthesiology (primary appointment)
PHD Washington Univ in St. Louis 2011

George Richard Benzinger III, MD, PHD
Associate Professor of Anesthesiology (primary appointment)
BS California Institute Technolo 1993
MD University of Chicago 2000
PHD University of Chicago 1998

Michael M Bottros, MD
Associate Professor of Anesthesiology (primary appointment)
MD Washington Univ in St. Louis 2006

Walter A Boyle III, MD
Professor of Anesthesiology (primary appointment)
Assistant Professor of Developmental Biology
Professor of Surgery (General Surgery)
MD University of CA San Francisco 1977
BS University of CA San Francisco 1974

Michael Raymond Bruchas, PHD
Henry Eliot Mallinckrodt Professor of Anesthesiology (primary appointment)
Associate Professor of Neuroscience
Associate Professor of Psychiatry

PHD Creighton University 2004
Sarah Buday, PHD
Assistant Professor of Anesthesiology (PEFA) (primary appointment)
BS Washington Univ in St. Louis 2002
PHD University of MO St Louis 2013

Yuqing Cao, PHD
Associate Professor of Anesthesiology (primary appointment)
PHD University of CA San Francisco 1999
BS Fudan University 1989

Laura Francesca Cavallone, MD
Associate Professor of Anesthesiology (primary appointment)
MD University of Milan 1993

Samuel Chandra, MD
Instructor in Clinical Anesthesiology (primary appointment)
MD Patna Medical College 1990

Zhoufeng Chen, PHD, MS
Russell D and Mary B Shelden Professor of Anesthesiology (primary appointment)
Professor of Developmental Biology
Professor of Psychiatry
BS Wuhan University 1983
PHD University of Texas Austin 1994
MS School Not Listed 1987

Ziwei Chen, MBBS, PHD, MS
Assistant Professor of Anesthesiology (primary appointment)
MBBS Dalian Medical University 1995
PHD Peking University 2001
MS Dalian Medical University 1998

Wayland W. Cheng, MD, PHD
Instructor in Anesthesiology (primary appointment)
MD Washington Univ in St. Louis 2012
PHD Washington Univ in St. Louis 2012
BS Wheaton College 2005

Kelly Lynne Chilson, MD
Associate Professor of Anesthesiology (primary appointment)
MD University of MO St Louis 1999

James Close, MD
Associate Professor of Anesthesiology (Pending Executive Faculty Approval) (primary appointment)
MD Washington Univ in St. Louis 1984
BA Washington Univ in St. Louis 1980

Albert Murray Cohen, MD
Assistant Professor of Anesthesiology (primary appointment)
MD Baylor University 1977

Bryan A Copits, PHD
Instructor in Anesthesiology (primary appointment)
PHD Northwestern University 2012

Susan Carlin Cosgrove, MD
Instructor in Anesthesiology (Pending Dean's Approval) (primary appointment)
MD New York Medical College 2012
BA New York University 2008

Thomas E Cox, MD
Professor of Anesthesiology (primary appointment)
BA Johns Hopkins University 1981
MD University of Virginia 1985

Michael John Cuipa, MD
Instructor in Clinical Anesthesiology (primary appointment)
MD University of Massachusetts 1994
BS Tufts University 1988

D

Bakul Dave, MD, MD1
Assistant Professor of Anesthesiology (primary appointment)
MD BJ Medical College 1984
MD1 University of Toledo 1997

Thomas Allen Davis, MD
Assistant Professor of Anesthesiology (Pending Executive Faculty Approval) (primary appointment)
MD University of Tenn Memphis 1969

Charl Johan De Wet, MBCHB
Professor of Anesthesiology (primary appointment)
Professor of Surgery (Cardiothoracic Surgery)
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E

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Head of the Department of Anesthesiology
Professor of Developmental Biology
Professor of Medicine
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F

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Professor of Pediatrics
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G

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Professor of Genetics
PHD University of Bombay 1985
BS School Not Listed 1977
MS School Not Listed 1979

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MBBS Bangalore University 1998

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PHD Emory University 1995
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MD University of London 1986

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PHD Saint Louis University 1994
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BS Saint Louis University 1994
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BS Wabash College 1970
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MBBS University of Ilorin 1990
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MD A T Still University 2007
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MD Hahnemann University 1972
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Professor of Medicine
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K

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MD1 School Not Listed 1998
MD Athens University Med School 1988

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MD Charles University 1993

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MD University of Tuebingen 1987

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DDENT Loyola University Chicago 1982
BS Loyola University Chicago 1977
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MBBS Bangalore University 1994

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Professor of Neuroscience
BS University of Oregon 1972
PHD University of Oregon 1979

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MD Nanjing Medical University 1983

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PHD Chinese Academy of Sciences 2004
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Instructor in Clinical Anesthesiology (primary appointment)
MD Univ Autonoma de Guadalajara 1987

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Professor of Anesthesiology (primary appointment)
Vice Chairman of Anesthesiology
MD University of Texas Southwest 1993

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Jackie Lee Martin, MBA, MD, MA
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BA Howard University 1976
MBA John Hopkins University 2010
MD Meharry Med College 1984
MA Meharry Med College 1980

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MD University of Bologna 1985

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MBBS University of Leipzig 1998

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MD Univ Texas Health Sci San Anto 2012
BS Howard University 2008

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Associate Professor of Anesthesiology (primary appointment)
PHD University of Erlangen 2011

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MME University of MO Columbia 1982
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MA University of Pennsylvania 1983
PHD University of Pennsylvania 1989
BA University of Minnesota 1981

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BS State Univ of NY Buffalo 1996
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Anne Stella Sebastiani, MD  
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Professor of Genetics  
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BS Northwestern University 1981  
PHD Vanderbilt University 1987  
MA University of Toledo 1983

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Rajiv K Shah, MD  
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MD University of Rochester 2010

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BA Government Medical College 1987  
MD Institute of Medical Science 1990

Andrew John Shepherd, PHD  
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PHD University of Manchester 2006

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Xiaoming Xia, PHD, MS  
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PHD Vollum Institute OHSU 1998  
BS Fudan University 1984
MS Shanghai Jiao Tong University 1987
Y

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M10 Anesth 805 Anesthesiology
This clinical elective is designed to familiarize the student with basic aspects of anesthesiology practice. The primary teaching method is patient care in a clinical setting (one-on-one). The student will learn the basics of preoperative evaluation of surgical patients, the use of intraoperative monitoring in patient management and postoperative care. During the four-week rotation, the student will learn airway management skills, practical perioperative fluid and electrolyte therapy, along with general and regional anesthetic techniques. As an integral part of the anesthesia care team, the student will participate actively in the anesthetic management of surgical patients. The student's specific requests to be assigned to certain types of cases will be honored as time and availability dictate. The rotation will include three clinical simulator sessions using a simulator mannequin for practical management of airway problems, resuscitation and trauma emergencies. By the end of the rotation, the student should be able to independently (under supervision) provide anesthesia for uncomplicated surgical procedures. Note: Presence and participation in the three Friday Simulator Sessions and the Presentation on the last day of the rotation are required to receive a grade. If there is a conflict with attendance, prior arrangements can be made to accommodate the student.

M10 Anesth 811 Cardiothoracic Anesthesiology
This clinical elective offers practical experience in the perioperative assessment and management of surgical patients undergoing cardiothoracic procedures. The student, as an integral part of the cardiothoracic anesthesia team that is composed of faculty members, fellows and residents, will learn basic principles of airway management and lung ventilation, essential aspects of pharmacologic treatment of hemodynamic abnormalities and cardiac dysrhythmias, and management of intraoperative coagulation disturbances. Emphasis will be placed on the interpretation of intraoperative hemodynamic data, echocardiographic finding (TEE), and laboratory results. During this rotation, the student will also gain practical experience in endotracheal intubation as well as the placement of intravenous lines and invasive monitoring lines, including radial artery and pulmonary artery catheters. Students will learn how to use these parameters in clinical decision making during anesthesia. At the conclusion of the rotation, the student will have a better understanding of invasive monitoring and data interpretation, as well as a more systematic approach to the management of intra- and postoperative hemodynamic, pulmonary and coagulation abnormalities. The students are expected to attend the didactic sessions of CTA and the Department of Anesthesiology. A presentation will be assigned.

M10 Anesth 812 Pediatric Anesthesia
This clinical elective is designed to teach the theory and practice of pediatric anesthesiology and pain management. It features individualized instruction with faculty who specialize in the perioperative care of pediatric patients. The elective consists of four weeks of active participation with pediatric anesthesiologists at St. Louis Children's Hospital and St. Louis Shriners Hospital learning pre-anesthetic assessment, the performance of routine anesthetics (which includes instruction and practice in pediatric airway skills), learning other technical skills such as intravenous line placement and the management of post-anesthesia care and pain therapies. The final week may be tailored to meet the student's individual interests, needs and career goals. Possibilities include exposure to sedation and anesthesia for procedures outside of the operating rooms, and to subspecialties including cardiovascular anesthesia, neurosurgical anesthesia, and acute and chronic pediatric pain management. Students also will have an opportunity to learn the management of some common medical emergencies in the Clinical Simulation Center.

M10 Anesth 813 Cardiothoracic Critical Care
This clinical elective offers practical experience in the postoperative management of cardiothoracic patients. The student will be fully integrated into the intensive care team and have the opportunity to contribute to the management of critically ill patients. Students will have the opportunity to follow specific patients over the course of their stay on the ICU, during which time they will gain insight into holistic management of patients with multi-organ dysfunction. The CTICU environment is both challenging and exciting. Students will gain unique insight into cardiorespiratory physiology and pharmacology which will be demonstrated at the patients' bedside, an invaluable
and unforgettable learning experience. Students will have opportunities to learn and sometimes assist with procedures, such as central lines, chest tubes, bronchoscopy and pulmonary artery catheter insertion as well as bedside ultrasound including TTE and TEE. Principles of management and resuscitation of hemodynamically unstable patients following surgery will be emphasized as well as ventilator management. Students will also see and help manage patients with unique physiology such as those patients on ventricular assist devices, and on ECMO. We also have a very busy heart and lung transplantation program at the hospital — all of these patients are cared for in the CTICU. At the conclusion of the rotation, the student will have a better understanding of shock, sepsis, multi-organ failure, organ system support and compassionate withdrawal of life support. In addition to bedside teaching, there will be informal teaching sessions on a wide variety of topics as well as teaching on interpreting hemodynamic data and waveforms, and cardiac echo exams. Students will be encouraged to present on their patient at morning rounds, during which constructive feedback and interactive teaching will occur. Students will be required to present on any topic of their choice relevant to the cardiothoracic ICU during the block.

M10 Anesth 820 Critical Care
Students on this rotation are integral members of the multidisciplinary intensivist-led critical care team in the Surgical Intensive Care Unit (SICU). Students learn an organ systems-based approach for evaluation and management of critically ill and injured patients, and application of evidence-based principles in delivery of state-of-the-art critical care. Emphasis is placed on critical care knowledge and techniques used at the bedside in the clinical management of serious traumatic and surgical conditions. Students become familiar with resuscitation and cardiopulmonary support, including methods for non-invasive and invasive hemodynamic monitoring, and techniques for airway management and pulmonary support in respiratory failure. Basic knowledge and skills in the management of blunt and penetrating trauma, neurologic injuries, multi-system organ failure, and life-threatening infections in the surgical patient are also taught, as is the importance of treatments to alleviate anxiety and pain, maintain fluid and electrolyte balance, and providing adequate nutrition. Practical experience is gained in placement of vascular access devices, airway equipment, ultrasonography and its applications, interpretation of imaging and laboratory data, and use of guidelines, protocols and quality assurance tools in the management of critically ill patients.

M10 Anesth 821 Pain Management
Acute pain is the most common symptom of medical illness and is ubiquitous after major surgery. Chronic pain is the leading cause of worker disability. Severe pain afflicts most people with advanced cancer. Learning the fundamentals of pharmacologic, interventional, and multidisciplinary pain management is important for all areas of clinical medicine. Rotation is based at Barnes-Jewish Hospital with focus adjusted to meet student’s interest and career plans.

M10 Anesth 821B Pain Management - Missouri Baptist Medical Center
Acute pain is the most common symptom of medical illness and is ubiquitous after major surgery. Chronic pain is the leading cause of worker disability. Severe pain afflicts most people with advanced cancer. Learning the fundamentals of pharmacologic, interventional, and multidisciplinary pain management is important for all areas of clinical medicine. Rotation is based at Missouri Baptist Medical Center with focus adjusted to meet student's interest and career plans.

M10 Anesth 822 Anesthesia for Neurosurgery
Students will help care for patients having challenging neurosurgical procedures. Students will become familiar with complex procedures, brain monitoring, cardiovascular support and airway management and will be exposed to all kinds of neurosurgical pathology. Student must be prepared to participate in the intricate anesthetic management of patients undergoing surgery in our novel intraoperative MRI rooms. For those interested, clinical research projects are ongoing and student participation is encouraged.

M10 Anesth 823 Obstetrical Anesthesia
The medical students will learn the different analgesia/anesthetic options for the labor patient. They will also learn how the physiological adaptations of pregnancy influence anesthetic management. They will be actively involved in the parturient's management, i.e., starting an IV, placement of spinal, epidural, or CSE (combined spinal epidural) anesthetics. They will also attend the OB anesthesia conferences and interview patients in labor (with an OB anesthesia attending).

M10 Anesth 900 Research Elective - Anesthesiology
Research opportunities may be available. If interested, please contact the Department of Anesthesiology.

Department of Biochemistry and Molecular Biophysics
The faculty of the Department of Biochemistry and Molecular Biophysics perform research in a broad spectrum of biomedically relevant areas, including DNA and RNA structure and enzymology; protein folding, misfolding and aggregation; cellular mechanics, membrane receptor-mediated signaling, and hemostasis, thrombosis and vascular biology. The department offers training opportunities at the crossroads of biochemistry, biophysics, systems biology, computational science and pharmacological sciences.

The department's approaches to research focus on understanding the energetics, structure and mechanisms of biological processes. Investigators employ a variety of experimental methods such as X-ray crystallography, NMR, optical spectroscopy, thermodynamics and rapid kinetics, in combination with computational approaches, to unravel the molecular underpinnings of processes of relevance to health and disease. Novel single-molecule methods are providing new insight into the molecular details of enzyme mechanisms and macromolecule dynamics. High-throughput screening of chemical libraries and synthetic medicinal chemistry to develop small molecule probes of biological systems provide new avenues for translational research and the development of experimental therapeutics.

The faculty in the department organize and teach basic science courses in the medical school curriculum, including Molecular
Foundations of Medicine (Biochem 502). In the Graduate School curriculum, the faculty teach courses in Nucleic Acids & Protein Biosynthesis (Biol 548), Chemistry and Physics of Biomolecules (Biol 5357), and Macromolecular Interactions (Biol 5312). The overarching theme of these courses is to understand the principles of the molecular interactions that underlie the biological process of health and disease. Students in the School of Medicine and the Graduate School are eligible for these courses and may elect to pursue biomedical research under the direction of our faculty. A full listing of advanced courses topics (https://biochem.wustl.edu/studentinfo/courses) can be found on our website.

Website: http://biochem.wustl.edu

Degrees & Requirements

More information about Department of Biochemistry and Molecular Biophysics (http://bulletin.wustl.edu/grad/gsas/dbbs) and requirements can be found in the Graduate School Bulletin.

Research

M15 Biochem 900
Cross-listed with L41 Biol 590

Wayne M. Barnes, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-3351
We are developing a new way to sequence DNA, under the "$1000 Genome Project." This project involves the addition of experimental fluorescent probes to DNA polymerase, with the goal of watching a single molecule flicker as it copies DNA. Student involvement may be at the level of making mutations and purifying mutant enzymes, testing ways to prepare the templates, or testing observations of working molecules.

T7 RNA polymerase is used to express our proteins, and we have double and triple mutants of it that improve expression of problematic proteins, but we only have theory as to how they work better: We think they are slower, and that slower is better. Student involvement may be in constructing comparative strains that use the enzyme, and measuring the speed somehow, in vivo and in vitro.

Greg Bowman, PhD
South Building, 2nd Floor
Phone: 314-362-7433
Systems Biophysics. We combine simulation and experiment to understand the conformational changes proteins undergo and how these changes allow information to flow, both within single proteins and within networks of interacting proteins. Two major application areas are (1) understanding hidden allosteric sites and the opportunities they present for drug design and (2) understanding the molecular mechanisms of vision, especially the origins of inherited forms of blindness. To facilitate these applications, we also develop enhanced sampling algorithms for simulating long timescale dynamics of proteins and nucleic acids.

Peter M.J. Burgers, PhD
South Building, 1st Floor
Phone: 314-362-3872
Molecular biology of DNA replication, DNA damage response mechanisms, and DNA repair in eukaryotes.

John Cooper, MD, PhD
South Building, 2nd Floor
Phone: 314-362-0287
Molecular mechanisms of cell motility and cytoskeleton assembly.

Carl Frieden, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-3872
Molecular biology of DNA replication, DNA damage response mechanisms, and DNA repair in eukaryotes.

Eric A. Galburt, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-5201
Use of single-molecule biophysical techniques such as magnetic and optical trapping to study DNA transcription.

Roberto Galletto, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-4368
Mechanistic studies of DNA motor proteins and telomere binding proteins; single-molecule approaches.

Michael Greenberg, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-8670
Cytoskeletal molecular motors in health and disease. We are currently studying the effects of mutations that cause heart disease.

Kathleen Hall, PhD
North Building, 2nd Floor
Phone: 314-362-4196
RNA structure/function. RNA protein interactions. NMR spectroscopy.

Jim Janetka, PhD
Cancer Research Building, 2nd Floor
Phone: 314-362-0509
The rational structure-based ligand design and synthesis of chemical tools useful for studying cancer and infectious disease.

Andrzej Krezal, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-8482
Structural biology of transcriptional regulation in gastric pathogen Helicobacter pylori.
Weikai Li, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-362-8687
Membrane protein crystallography and functional studies.

Timothy M. Lohman, PhD
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Biophysical chemistry of proteins, nucleic acids and their mechanism of interaction. Mechanisms of DNA unwinding and translocation by helicases and SSB proteins.

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Cancer Research Building, 2nd Floor
Phone: 314-935-7911
Targeting Epigenetic Control in Pathology. A major concern regarding the use of therapeutics targeting the epigenetic control of gene expression is undesirable side effects, particularly those associated with fetal development. Despite the intense interest in targeting histone deacetylases (HDACs, eleven zinc-based enzymes expressed in humans) for multiple therapeutic applications and the fact that two non-specific HDACIs are already FDA-approved in oncology, isoform-specific HDACIs are not available. Professor Marshall and his collaborators in Rome have a comprehensive program to develop isoform-specific inhibitors for applications for reversing HIV latency with Professor Lee Ratner for treatment of HIV, with Dr. Michael D. Onkin for treatment of uveal melanoma, and for potential antiparasitics with Professors Dan Goldberg, Eva Istvan, Makedonka Mitreva and Audrey Odom. Two uniquely specific inhibitors of HDAC6 have already been discovered in the Marshall lab.

The research involves bioinformatics to identify homologs of HDACs in parasites, molecular modeling to generate homology models of target proteins, virtual screening to identify potential inhibitors and bioassays to quantitate efficacy. Projects can be customized to fit individual preferences.

Linda Pike, PhD
South Building, 1st Floor
Phone: 314-362-9502
Mechanism of EGF and ErbB receptor function. We use a combination of radioligand binding and molecular imaging via luciferase fragment complementation to study the interactions of ErbB family receptors. The goal is to gain insight into structure/ function relationships within these receptors to better understand how to target them therapeutically.

Andrea Soranno, PhD
South Building, 2nd Floor
Phone: 314-273-1632
Our main research interests are the physical principles and molecular mechanisms determining biomolecular function.

Rui Zhang, PhD
McDonnell Sciences Building, 2nd Floor
Phone: 314-273-1663
We combine single-molecule fluorescence spectroscopy and concepts from polymer physics to investigate intrinsically disordered proteins; we develop innovative methods to study macromolecular conformations and dynamics within cells and in membraneless organelles.

Faculty
Department Chair
John A. Cooper, MD, PhD
Visit our website for more information about our faculty (http://biochem.wustl.edu/faculty) and their appointments.

Jacques Ulrich Baenziger, MD, PHD
Professor Emeritus of Biochemistry and Molecular Biophysics (primary appointment)
MD Washington Univ in St. Louis 1975
BA New College of Florida 1969
PHD Washington Univ in St. Louis 1975

Wayne Morris Barnes, PHD
Associate Professor of Biochemistry and Molecular Biophysics (primary appointment)
PHD Univ of Wisconsin Madison 1974
BA University of CA Riverside 1969

Gregory R. Bowman, PHD
Assistant Professor of Biochemistry and Molecular Biophysics (primary appointment)
Adjunct Assistant Professor of Chemistry (Courtesy Affiliation)
PHD Stanford University 2010
BS Cornell University 2006

Peter M Burgers, MS, PHD
Marvin A. Brennecke Professor of Biological Chemistry (primary appointment)
BS Leiden University 1969
MS Leiden University 1972
PHD Leiden University 1977

John A Cooper, PHD, MD
Head of the Department of Biochemistry
Professor of Biochemistry and Molecular Biophysics
Professor of Cell Biology and Physiology
PHD Johns Hopkins University 1983
BS Brown University 1977
MD Johns Hopkins University 1982

Sudha Mahajan Cowsik, PHD, MS
Instructor in Biochemistry and Molecular Biophysics (primary appointment)
BS Panjab University 1969
PHD Institute of Medical Science 1976
Roland Ellwood Dolle, MS, PHD
Associate Professor of Biochemistry and Molecular Biophysics (primary appointment)
MS State University of New York 1980
PHD University of Pennsylvania 1984
BS Arizona State University 1978

Thomas E Ellenberger, DVM, PHD
Professor of Biochemistry and Molecular Biophysics (primary appointment)
Chairman of the Executive Council of the Division of Biology and Biomedical Sciences
DVM Iowa State University 1983
PHD Harvard University 1989

Elliot L Elson, PHD
Emeritus Professor of Biochemistry and Molecular Biophysics (primary appointment)
BA Harvard University 1959
PHD Stanford University 1966

Carl Frieden, PHD
Professor of Biochemistry and Molecular Biophysics (primary appointment)
BA Carleton College 1951
PHD Univ of Wisconsin Madison 1955

Eric A Galburt, PHD
Associate Professor of Biochemistry and Molecular Biophysics (primary appointment)
PHD University of Washington 2002

Roberto Galletto, PHD, MS
Associate Professor of Biochemistry and Molecular Biophysics (primary appointment)
PHD University of Texas Galveston 2002
MS University of Genova 1996

Michael Jonathan Greenberg, PHD
Assistant Professor of Biochemistry and Molecular Biophysics (primary appointment)
PHD Boston University 2010
BS Brandeis University 2004

Kathleen Hall, PHD
Professor of Biochemistry and Molecular Biophysics (primary appointment)
PHD University of CA Berkeley 1985

Maxenia Garcia Ilagan, PHD
Assistant Professor of Biochemistry and Molecular Biophysics (primary appointment)
Assistant Professor of Developmental Biology
BS School Not Listed 1992
PHD University of Missouri 2000

James W Janetka, PHD
Associate Professor of Biochemistry and Molecular Biophysics (primary appointment)
PHD Univ of Wisconsin Madison 1996
BS University of Illinois 1990

Michael S Kinch, PHD
Professor of Biochemistry and Molecular Biophysics (primary appointment)
Professor of Radiation Oncology
PHD Duke University 1993
BS Ohio State University 1989

Alexander Kozlov, PHD, MS
Instructor in Biochemistry and Molecular Biophysics (primary appointment)
PHD Moscow State University 1994
MS Moscow State University 1983

Andrzej Modest Krezel, PHD, MS
Associate Professor of Biochemistry and Molecular Biophysics (Pending Executive Faculty Approval) (primary appointment)
PHD Univ of Wisconsin Madison 1991
MS University of Warsaw 1986

Weikai Li, MS, PHD
Assistant Professor of Biochemistry and Molecular Biophysics (primary appointment)
MS University of Tenn Chattanooga 1998
BS East China Univ of Sci & Tech 1993
PHD Yale University 2004

Timothy M Lohman, PHD
Brennecke Professor of Biophysics in Biochemistry and Molecular Biophysics (primary appointment)
PHD Univ of Wisconsin Madison 1977
BA Cornell University 1973

Garland R Marshall, PHD
Professor of Biochemistry and Molecular Biophysics (primary appointment)
Professor of Biomedical Engineering
Courses

The Department of Biochemistry and Molecular Biophysics also offers courses through the Graduate School. For a full listing of courses offered, please visit the university online course catalog (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L41&crsV=5:9).


M15 Biochem 502 Molecular Foundations of Medicine

This course is designed primarily for medical students and will cover fundamental aspects of biochemistry and cell biology. The course begins with a treatment of protein structure and the function of proteins in the cytoskeleton and cell motility. The principles of enzyme kinetics and regulation are then discussed, and basic pathways for the synthesis and metabolism of carbohydrates and lipids are introduced. This leads in to a discussion of membrane structure and the function cellular organelles in biological processes including energy production, protein degradation and protein trafficking. Small group case study sections serve to link the basic science to the clinic. Credit 46.5 units.

M15 Biochem 5068 Fundamentals of Molecular Cell Biology

This is a core course for incoming graduate students in Cell and Molecular Biology programs to learn about research and experimental strategies used to dissect molecular mechanisms that underlie cell structure and function, including techniques of protein biochemistry. Enrolling students should have backgrounds in cell biology and biochemistry, such as courses comparable to L41 Biol 334 and L41 Biol 4501. The format is two lectures and one small group discussion section per week. Discussion section focuses on original research articles. Same as M04 5068 and Arts & Sciences L41 Biol 5068. Credit 47 units.

M15 Biochem 5357 Chemistry and Physics of Biomolecules

This course covers three major types of biomolecular structure: proteins, nucleic acids and membranes. Basic structural chemistry is presented, as well as biophysical techniques used to probe each type of structure. Selected topics include: protein folding, protein design, x-ray crystallography, NMR spectroscopy, nucleic acid bending and supercoiling, nucleic acid:protein interactions, RNA folding, membrane organization, fluidity, permeability and transport, and membrane channels. Weekly discussion section will cover problem sets and present current research papers. One of the required courses for the Biochemistry and for the Molecular Biophysics graduate programs. Prerequisites: Prior course work in Biochemistry and in Physical Chemistry is recommended, but not required. Credit 46.5 units.

Department of Cell Biology and Physiology

Cell biology is one of the primary disciplines in medical research, influencing all areas of basic and clinical investigation. The future holds great opportunities in cell biology research due to inventories of the genes and proteins from which cells are built, new experimental techniques and various model organisms. Further discoveries about the cell biology of human genes will continue to translate into therapeutics. Also on the horizon is a better understanding of how proteins and sets of proteins (e.g.,
macromolecular complexes) are assembled and integrated to produce function.

The Department of Cell Biology and Physiology (http://cellbiology.wustl.edu) is ranked among the top 10 cell biology departments in the country, and the research carried out by its faculty covers a broad range of fields within cellular physiology and molecular cell biology. A unifying theme is the study of fundamental processes and their regulation. These cellular processes include genome maintenance, apoptosis, cell cycle control, dynamic cell motility, angiogenesis, signal transduction and membrane trafficking, presynaptic processes, prion protein misfolding, RNA metabolism, and the structure and function of ion channels. The department's research activities provide a foundation for studies in cancer biology, immunobiology, developmental biology, neurobiology and vascular biology. Its faculty use model organisms as well as human stem cells and a variety of techniques such as deep-etch electron and confocal microscopy to carry out their research. Cellular imaging is a particular strength of the department.

The Department of Cell Biology and Physiology oversees the course Physiology (CellBio 501), which is designed to provide first-year medical students with a foundation for their further study of clinical and applied physiology. The Molecular Cell Biology course for first-year graduate students conveys an understanding of fundamental cell biology research strategies and principles. In addition, advanced courses open to medical and graduate students provide for more detailed study of specific areas of cell biology, physiology and cellular biophysics.

**Website:** http://cellbiology.wustl.edu

**Degrees & Requirements**

More information about Department of Cell Biology and Physiology degrees (http://bulletin.wustl.edu/grad/gsas/dbbs) and requirements can be found in the Graduate School Bulletin.

**Research**

**M75 CellBio 900**

Cross-listed with L41 Biol 590

Kendall J. Blumer, PhD
506 McDonnell Sciences Building
Phone: 314-362-1668
Signaling mechanisms in cardiovascular and neurological disorders.

Sergej Djuranovic, PhD
514 McDonnell Sciences Building
Phone: 314-362-9706
Molecular mechanisms of translational control. Research examines the cellular processes that are regulated by changes in RNA metabolism.

Phyllis I. Hanson, MD, PhD
4625 Cancer Research Building
Phone: 314-747-4233
Study of protein-protein and protein-membrane interactions involved in neuronal and synaptic membrane trafficking using biochemical, biophysical, and cell biological techniques.

James E. Huettner, PhD
4929 South Building
Phone: 314-362-6628
Excitatory amino acid receptors and synaptic transmission in the central nervous system; neural differentiation of embryonic stem cells.

Silvia Jansen, PhD
4900 South Building
Phone: 314-273-1852
Focus is on elucidating the molecular mechanisms that regulate the architecture, dimensions and dynamics of actin filament networks, and tune them to support essential cellular functions ranging from cell migration and cytokinesis to neurogenesis.

David J. Kast, PhD
4900 South Building
Phone: 314-273-1852
Long-term goal of research is to understand fundamental cellular and molecular mechanisms that drive the biogenesis and dynamics of intracellular membrane compartments, including endocytic vesicles, the endoplasmic reticulum, the Golgi apparatus, and mitochondria.

Vitaly Klyachko, PhD
9610 BJC Institute of Health
Phone: 314-362-5517
The mechanisms and regulation of neurotransmitter release at individual synapses; the functional roles of presynaptic processes in synaptic plasticity and information processing.

Robert P. Mecham, PhD
4606 Cancer Research Building
Phone: 314-362-2254
Understanding the complex process of extracellular matrix assembly and organization, including studying the intracellular pathways used to transport matrix components to the cell surface and identifying helper or accessory proteins that facilitate trafficking and matrix assembly. Cell-matrix interactions in development and cellular mechanisms associated with connective tissue remodeling in vascular disease and heritable diseases of connective tissues.

Michael M. Mueckler, PhD
416 McDonnell Sciences Building
Phone: 314-362-2410
Molecular biology of mammalian glucose transporters.
Regulation of glucose transport by insulin and the mechanism of insulin signaling. Subcellular trafficking of the insulin-regulated glucose transporter. Structure and function relationships of glucose transporters. Mechanism of insertion of complex
polytopic proteins into the rough endoplasmic reticulum membrane.

**Colin G. Nichols, PhD**  
9611 BJC Institute of Health  
Phone: 314-362-6630  
Ion channel biology. Multiple levels of analysis from the molecular basis of channel function to in vivo physiology and disease.

**David W. Piston, PhD**  
4912 South Building  
Phone: 314-362-9121  
The intracellular and intercellular dynamics of cells within the islet of Langerhans play a key role in the regulation of blood glucose levels. The islet is made up of different cell types, but very little is known about the interplay between the different cell types and how this affects their secretion of various hormones. The islet a-cells secrete insulin in response to increased blood sugar, and also in response to neurotransmitters and hormones. Glucagon also plays a key role in blood glucose homeostasis, and it is secreted by the islet a-cells. High glucose levels inhibit glucagon secretion from a-cells within the islet, but not from dispersed a-cells, but the mechanism underlying this phenomenon has not been defined. We use quantitative live cell microscopy to measure single cell parameters within intact islets held within microfluidic devices in order to expose them to spatially heterogeneous levels of various stimuli. The resulting data are fit using mathematical models of islet functional dynamics, which we are continually modifying to better fit the observed islet physiology.

**Sheila A. Stewart, PhD**  
7610 BJC Institute of Health  
Phone: 314-362-7437  
Delineation of the molecular mechanisms by which aged stromal cells contribute to tumorigenesis and the molecular mechanisms that ensure high fidelity telomere replication and genomic stability.

**Heather L. True-Krob, PhD**  
413 McDonnell Sciences Building  
Phone: 314-362-3934  
Biological consequences of yeast prions — in both their capacity to function as novel epigenetic elements, and in their utility to serve as a tractable model for the analysis of protein misfolding and aggregation that occurs in several neurodegenerative disorders.

**Zhongsheng You, PhD**  
514 McDonnell Sciences Building  
Phone: 314-362-9893  
Studies of the cellular responses to DNA damage and their cancer relevance, focusing on the functional interplays between the DNA damage checkpoint, DNA repair and chromatin structure.

**Peng Yuan, PhD**  
9608 BJC Institute of Health  
Phone: 314-747-3793  
Structure and function of ion channels and transporters. Ion channels and transporters play essential roles in human physiology and disease. How do channels and transporters recognize their specific substrate ions? How do they respond to various stimuli including chemical ligand, temperature, membrane voltage, and mechanical force? How do they interact with the lipid membrane where they reside? To answer these fundamental questions, we use multidisciplinary approaches including X-ray crystallography, biochemistry, biophysics and electrophysiology. Dysfunction of these membrane proteins could lead to a variety of diseases such as asthma, hypertension, cancer, heart failure, diabetes, chronic pain, and many more. The long-term goal is to provide detailed mechanistic understanding of ion channels and transporters, which will offer novel strategies for drug development and better treatment of diseases.

**Faculty**

**Department Head**  
David W. Piston, PhD  
Visit our website for more information about our faculty (http://www.cellbiology.wustl.edu/faculty) and their appointments.

**B**

**Kendall Jay Blumer, PHD**  
Professor of Cell Biology and Physiology (primary appointment)  
PHD Duke University 1986  
BA Rice University 1977

**Thomas J Broekelmann, MS**  
Instructor in Cell Biology and Physiology (primary appointment)  
MS University of MO St Louis 1982  
BA University of MO St Louis 1977

**D**

**Panyue Deng, MS, PhD, MD**  
Assistant Professor of Cell Biology and Physiology (primary appointment)  
MS CENTRAL SOUTH UNIVERSITY 2001  
PHD CENTRAL SOUTH UNIVERSITY 2004  
MD Hunan Medical University 1995

**Sergej Djuranovic, PHD**  
Assistant Professor of Cell Biology and Physiology (primary appointment)
Subhadra C Gunawardana, PHD, MS  
Associate Professor of Cell Biology and Physiology (primary appointment)  
PHD Cornell University 2002  
MS Iowa State University 1995

Phyllis I Hanson, PHD, MD  
Professor of Cell Biology and Physiology (primary appointment)  
Gerty T Cori Professor  
PHD Stanford University 1993  
BA Yale University 1985  
MD Stanford University 1993

James E Huettner, PHD  
Professor of Cell Biology and Physiology (primary appointment)  
Professor of Biomedical Engineering  
PHD Harvard University 1987  
BS Indiana University 1980  
BA Indiana University 1981

Silvia Jansen, MS, PHD  
Assistant Professor of Cell Biology and Physiology (primary appointment)  
MS Katholieke Universiteit 2003  
PHD Katholieke Universiteit 2007

David John Edward Kast, PHD, MS  
Assistant Professor of Cell Biology and Physiology (primary appointment)  
BS University of Minnesota 2000  
PHD University of Minnesota 2018  
MS University of Minnesota 2004

Vitaly A Klyachko, MS, PHD  
Associate Professor of Cell Biology and Physiology (primary appointment)  
Associate Professor of Biomedical Engineering  
Associate Professor of Neuroscience  
BS Moscow State University 1997  
MS Moscow State University 1998  
PHD Univ of Wisconsin Madison 2002

Grigory Maksaev, MS, PHD  
Instructor in Cell Biology and Physiology (primary appointment)  
MS Moscow Inst of Physics & Techn 1998  
PHD Moscow State University 2002

Robert Paul Mecham, PHD  
Alumni Endowed Professor of Cell Biology and Physiology (primary appointment)  
Professor of Biomedical Engineering  
Professor of Medicine  
Professor of Pediatrics  
PHD Boston University 1977  
BS University of Utah 1973

Robert W Mercer, PHD  
Professor of Cell Biology and Physiology (primary appointment)  
BA San Jose State University 1974  
PHD Syracuse University 1980

Mike Max Mueckler, PHD  
Professor of Cell Biology and Physiology (primary appointment)  
Professor of Medicine  
BA Univ of Wisconsin Madison 1976  
PHD Univ of Wisconsin Madison 1982

Colin G Nichols, PHD  
Professor of Cell Biology and Physiology (primary appointment)  
Carl F Cori Professor  
PHD University of Leeds 1985  
BS University of Leeds 1982

Slavica Pavlovic Djuranovic, PHD, DIP  
Assistant Professor of Cell Biology and Physiology (primary appointment)  
PHD University of Tubingen 2006  
BS UNIVERSITY OF BELGRADE 1999  
DIP UNIVERSITY OF BELGRADE 2001

David William Piston, PHD, MS  
Professor of Cell Biology and Physiology (primary appointment)  
Head of the Department of Cell Biology and Physiology  
BS Grinnell College 1984  
PHD University of Illinois 1989  
MS University of Illinois 1985

Helen Piwnica-Worms, PHD  
Adjunct Professor of Cell Biology and Physiology (primary appointment)  
PHD Duke University 1984  
BA St Olaf College 1979

Jasmina Profirovic, PHD  
Adjunct Assistant Professor of Cell Biology and Physiology (primary appointment)  
PHD University of Illinois Chicago 2005  
BS University of Belgrade 1997

Paul Henry Schlesinger, PHD, MD  
Associate Professor of Cell Biology and Physiology (primary appointment)
BS University of Illinois 1966
PHD University of Chicago 1973
MD University of Chicago 1970
Sheila Stewart-Wigglesworth, PHD
Professor of Cell Biology and Physiology (primary appointment)
Professor of Medicine
PHD University of CA Los Angeles 1996
BS University of Minnesota 1990

Heather L. True, MS, PHD
Professor of Cell Biology and Physiology (primary appointment)
BS Univ of Wisconsin Madison 1992
MS University of Illinois 1995
PHD University of Illinois 1998

Shizhen Wang, PHD
Adjunct Instructor in Cell Biology and Physiology (primary appointment)
PHD Tsinghua University, China 2007

Zhongsheng You, MS, PHD
Associate Professor of Cell Biology and Physiology (primary appointment)
Associate Professor of Medicine
MS Shanghai Inst of Biochemistry 1997
BS Zhejiang Medical University 1994
PHD University of CA San Diego 2002

Peng Yuan, PHD
Assistant Professor of Cell Biology and Physiology (primary appointment)
PHD University of Pennsylvania 2008
BS University of Science & Tech 1997

Courses
The Department of Cell Biology and Physiology also offers courses through the Graduate School. For a full listing of courses, please visit the university online course catalog (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L41&crslvl=5-9).


M75 CellBio 501 Physiology
The structures of cells, tissues, and major organ systems are studied in relationship to their functions. Lectures integrate histology with cell biology and physiology. The laboratories consist of the study of prepared slides and electron micrographs using an iBook or eBook (ePub) guide. An extensive online digital annotated atlas (https://slide-atlas.org) and a video library are used to supplement the slides and electron micrographs. Presentations of case studies provide examples of clinical relevance. A dual-view microscope and slide set will be issued for each pair of students. Limited space is available for non-medical students, who must have permission from the course director to enroll.
Credit 125 units.

M75 CellBio 900 Research Elective - Cell Biology and Physiology
Research opportunities may be available. If interested, please contact the Department of Cell Biology & Physiology.

Department of Developmental Biology
The principal research activities of the Department of Developmental Biology are focused on attaining a mechanistic understanding of animal development, encompassing the earliest cell fate specification and movement processes that shape the early embryo, organogenesis, stem cell biology and engineering, tissue homeostasis and repair, and aging. Students and postdoctoral fellows work closely with faculty and staff on research projects and participate in weekly journal clubs and seminars at which recent literature and ongoing research are discussed.

The developmental biology faculty employ a variety of model organisms and cell-based systems to answer key outstanding questions about the fundamental mechanisms of development and to apply this knowledge to pathogenic mechanisms leading to human birth defects and disease, and to improve future therapies. We take a broad view of developmental biology, with our research groups studying diverse developmental processes including early embryogenesis, organogenesis, and aging, and applying multidisciplinary approaches that include forward and reverse genetics, epigenetics, molecular and chemical, and computational methods. Embryogenesis is a fascinating process during which a fertilized egg undergoes divisions to form a mass of pluripotent cells that signal to one another to establish embryonic polarity, diverse cell types, and organs, and that also undergo massive cell migrations and rearrangements to sculpt the embryonic body.

Research is also carried out on the processes involved in tissue degeneration, repair and regeneration, the biology of embryonic and adult stem cells, and cellular reprogramming. It is a particularly opportune time for developmental biology research, as recent technological breakthroughs in both animal model systems and genomics afford insights into developmental processes at the epigenetic, genetic and molecular levels, and enable the monitoring of cell behaviors in vivo. We are discovering genes that are responsible for birth defects and defining connections between many adult human diseases and their origins during embryogenesis. The studies of stem cells, cellular reprogramming and regeneration are bringing us
closer to curing human diseases, repairing damaged organs, and extending the boundaries of aging.

**Website:**  [http://devbio.wustl.edu](http://devbio.wustl.edu)

**Degrees & Requirements**

More information about Department of Developmental Biology degrees ([http://bulletin.wustl.edu/grad/gsas/dbbs](http://bulletin.wustl.edu/grad/gsas/dbbs)) and requirements can be found in the Graduate School Bulletin.

**Research**

Research in the department occurs in a highly collegial atmosphere and involves interdisciplinary collaborations between the members of the department, as well as investigators from different departments and centers throughout the School of Medicine, as well as the College of Arts & Sciences, and the School of Engineering & Applied Science. Developmental biology faculty have leading roles in several research centers, including the Center of Regenerative Medicine ([http://devbio.wustl.edu/REGMED](http://devbio.wustl.edu/REGMED)), the Center for the Investigation of Membrane Excitability Diseases ([http://cimed.wustl.edu](http://cimed.wustl.edu)), the Center for Cardiovascular Research ([https://cardiovascularresearch.wustl.edu](https://cardiovascularresearch.wustl.edu)), and the Hope Center ([https://hopecenter.wustl.edu](https://hopecenter.wustl.edu)). The department has a rich tradition of mentoring undergraduate, graduate and medical students, and postdoctoral fellows. We are committed to creating a research environment in which our trainees reach their maximum scientific potential and career goals while addressing key outstanding questions and making important discoveries.

**Douglas F. Covey, PhD**

McDonnell Sciences Building, 3rd Floor  
Phone: 314-362-1726  
Medicinal chemistry of steroids.

**Aaron DiAntonio, MD, PhD**

6301 Couch Building  
Phone: 314-362-9925  
Neurodevelopment, neurodegeneration, and axon regeneration in Drosophila and mouse.

**Shin-Ichiro Imai, MD, PhD**

McDonnell Medical Sciences Building, Room 362A  
Phone: 314-362-7228  
Molecular mechanisms of aging and longevity in mammals, particularly focusing on the tissue-specific functions of the mammalian NAD-dependent deacetylase Sirt1 and the physiological significance of systemic NAD biosynthesis mediated by Nampt (nicotinamide phosphoribosyltransferase) in an intimate connection between metabolism and aging.

**Aaron N. Johnson, PhD**

Cancer Research Building, 3rd Floor  
Phone: 314-273-1834  
Molecular mechanisms of muscle development and regeneration.

**Kerry Kornfeld, MD, PhD**

Cancer Research Building, 3rd Floor  
Phone: 314-747-1480  

**Kristen Kroll, PhD**

320 McDonnell Sciences Building  
Phone: 314-362-7045  
Transcriptional networks that regulate the formation of neurons in early embryos and embryonic stem cells. Role of chromatin regulatory complexes in controlling pluripotency and differentiation.

**Helen McNeill, PhD**

McDonnell Sciences Building, 3rd Floor  
Phone: 314-273-3050  
Our lab interests are focused on the cadherin family of molecules and their regulation of cellular polarity, growth, tissue organization and metabolism. The overall goal of our research is to understand how tissue growth and tissue organization are coordinately regulated. We are focusing on how Fat cadherins function in Hippo pathway-regulated growth control, planar cell polarity (PCP) tissue organization and metabolism in flies, mice and hydra. A second, new focus is studying how the nuclear envelope regulates gene expression and fertility.

**Craig Micchelli, PhD**

328 McDonnell Sciences Building  
Phone: 314-362-7036  
Our lab studies the regulation of stem cell biology in development, homeostasis and disease.

**Mayssa Mokalled, PhD**

Cancer Research Building, 3rd Floor  
Phone: 314-273-1835  
Spinal cord injury, degeneration and regeneration in zebrafish and mouse.

**Samantha Morris, PhD**

3316 Couch Building  
Phone: 314-747-8618  
Stem Cell and Developmental Biology. Our research focuses on dissecting the gene regulatory networks that define cell identity, using the developing embryo and tissue regeneration as a guide to engineer fate in vitro.

**Jeanne M. Nerbonne, PhD**

9900 Clinical Sciences Research Building  
Phone: 314-362-2564  
Structure, function and regulation of voltage-dependent ion channels in the cardiovascular and nervous systems. Regulation of membrane excitability in health and disease.
David M. Ornitz, MD, PhD
South Building, 3rd Floor
Phone: 314-362-3908
Regulation of cardiovascular, lung, skeletal, and inner ear development, injury response, and regeneration by Fibroblast Growth Factors.

Zachary Pincus, PhD
5304 Couch Building
Phone: 314-747-5520

Lila Solnica-Krezel, PhD
3911A South Building
Phone: 314-362-8768
Genetic Regulation of Vertebrate Embryogenesis. Genetic mechanisms that regulate cell fates and movements during early vertebrate development using forward and reverse genetics in the zebrafish model and human embryonic stem cells.

Thorold W. Theunissen, PhD
Couch Building, 3rd Floor
Phone: 314-362-8768
The Theunissen Lab seeks to understand the molecular mechanisms regulating pluripotent stem cell states, and develop optimal conditions for the derivation, maintenance and differentiation of human ESCs and iPSCs. We also explore whether naive pluripotent stem cells can be used to model early human development and disease.

Andrew Yoo, PhD
361E McDonnell Sciences Building
Phone: 314-362-1811

Faculty
Department Head
Lilianna Solnica-Krezel, PhD
Visit our website for more information about our faculty (http://devbio.wustl.edu/faculty) and their appointments.

B
Irving Boime, MS, PHD
Professor of Developmental Biology (primary appointment)
Professor of Reproductive Biology in Obstetrics and Gynecology
MS Purdue University 1966
BS St Louis College of Pharmacy 1964
PHD Washington Univ in St. Louis 1970

Angela N Bowman, PHD
Assistant Professor of Developmental Biology (primary appointment)
BA University of Pennsylvania 2006
PHD Stanford University 2012

C
Douglas Floyd Covey, PHD, MA
Professor of Pharmacology in Developmental Biology (primary appointment)
Professor of Anesthesiology
Professor of Psychiatry
PHD Johns Hopkins University 1973
MA Johns Hopkins University 1969
BS Loyola College 1967

D
Aaron DiAntonio, PHD, M PHIL, MD
Professor of Developmental Biology (primary appointment)
Alan A and Edith L Wolff Professor of Developmental Biology
PHD Stanford University 1995
M PHIL Cambridge University 1989
BA Harvard University 1988
MD Stanford University 1995

G
George W Gokel, PHD
Adjunct Professor of Molecular Biology and Pharmacology (primary appointment)
PHD University of Southern Calif 1971
BS Tulane University 1968

H
Tracey O Hermanstyne, PHD
Instructor in Developmental Biology (primary appointment)
PHD Univ of Maryland Baltimore 2012

Didier Hodzic, PHD
Assistant Professor of Developmental Biology (primary appointment)
Assistant Professor of Cell Biology and Physiology
PHD University of Liege 1998
BS University of Liege 1991

I
Shin-Ichiro Imai, MD, PHD
Professor of Developmental Biology (primary appointment)
Professor of Medicine
MD Keio University 1989
PHD Keio University 1995

J
Aaron N Johnson, PHD
Assistant Professor of Developmental Biology (primary appointment)
PHD Arizona State University 2006
BA Arizona State University 1998
Raphael Kopan, PHD, MS
Adjunct Professor of Developmental Biology (primary appointment)
PHD University of Chicago 1989
BS Tel Aviv University 1981
MS Tel Aviv University 1984

Stephen K Kornfeld, PHD, MD
Professor of Developmental Biology (primary appointment)
PHD Stanford University 1991
MD Stanford University 1991
BA Yale University 1984

Kristen Louise Kroll, PHD
Associate Professor of Developmental Biology (primary appointment)
PHD University of CA Berkeley 1994
BA Northwestern University 1988

Yangjian Liu, MS1, PHD, BS1
Instructor in Developmental Biology (primary appointment)
MS1 Chinese Academy of Sciences 2002
PHD John Hopkins University 2006
BS1 Nanjing University 1998

Helen McNeill, PHD, BS1
Professor of Developmental Biology (primary appointment)
PHD Stanford University 1993
BS1 Ramapo College 1985

Craig Anthony Michelli, PHD
Associate Professor of Developmental Biology (primary appointment)
PHD Univ of Wisconsin Madison 1999
BS Univ of Wisconsin Madison 1993

Mayssa Mokalled, PHD, MS
Assistant Professor of Developmental Biology (primary appointment)
PHD University of Dallas 2010
BS American University of Beirut 2003
MS American University of Beirut 2005

Kelly Renee Monk, PHD
Adjunct Professor of Developmental Biology (primary appointment)
BS Elmira College 2001
PHD University of Cincinnati 2006

Samantha A Morris, PHD, BS1
Assistant Professor of Developmental Biology (primary appointment)
Assistant Professor of Genetics
PHD Cambridge University 2007

BS1 University of London 2002

Philip Needleman, PHD, MS
Adjunct Professor of Molecular Biology and Pharmacology (primary appointment)
PHD University of Maryland 1964
BS School Not Listed 1960
MS School Not Listed 1962

David M Ornitz, MD, PHD
Alumni Endowed Professor of Developmental Biology (primary appointment)
BS University of CA Davis 1981
MD University of Washington 1988
PHD University of Washington 1987

John Hall Russell, PHD
Professor of Developmental Biology (primary appointment)
BS Juniata College 1968
PHD Washington Univ in St. Louis 1974

Diane S Sepich, PHD
Assistant Professor of Developmental Biology (primary appointment)
BS University of San Diego 1981
PHD University of Oregon 1994

Jimann Shin, MS, PHD
Instructor in Developmental Biology (primary appointment)
BS Kyung Pook National University 2002
MS Kyung Pook National University 2004
PHD Vanderbilt University 2007

Lilianna Solnica-Krezel, MS, PHD
Professor of Developmental Biology (primary appointment)
Alan A and Edith L Wolff Professor of Developmental Biology
Head of the Department of Developmental Biology
MS Medical University of Warsaw 1985
PHD Univ of Wisconsin Madison 1991

Thorold W Theunissen, MA, PHD
Assistant Professor of Developmental Biology (primary appointment)
BA Harvard 2007
MA Cambridge University 2008
PHD Cambridge University 2011

Yongjun Yin, PHD
Instructor in Developmental Biology (primary appointment)
The department supports a broad program of preclinical and
graduate instruction in genetics, with research opportunities
ranging from studies of transcriptional networks, population
genetics, protein evolution, neurological disorders,
developmental genetics, models of human disease, genome
architecture, statistical genetics and computational biology,
genome technologies and infertility.

A significant portion of the first-year course in basic medical
sciences is devoted to human and clinical genetics, with
emphasis on how genomic information will transform the practice
of medicine. This includes specialized selective courses in
addition to the core genetic curriculum. Advanced training in
clinical genetics and in genetic research is available from the
faculty in the Department of Genetics and from geneticists with
principal appointments in many other departments within the
School of Medicine (http://medicine.wustl.edu).

Advanced courses and seminars are offered that focus on
the genetics of complex disease, gene expression, genome
engineering, induced pluripotent stem cells, single cell genomics,
molecular genetics, genetic epidemiology, computational biology,
developmental genetics, microbial genetics, cancer genetics,
and population and evolutionary genetics. Extraordinary
opportunities for research training and experience are available
in all of these areas and at all levels. The programs are tailored
to meet the needs of medical students, graduate students,
and both MD and PhD postdoctoral fellows pursuing advanced
training in biomedical research.

Website: http://genetics.wustl.edu

Degrees & Requirements

While the Department of Genetics does not offer its own degree,
some of the department’s courses are open to students in the
MD and MSTP (MD/PhD) programs. Further information about
the MD and MSTP degrees can be found in the Degrees &
Programs Offered (p. 27) section of this Bulletin.

Research

M20 Genetics 900
Cross-listed with L41 Biol 590

Barak Cohen, PhD
McKinley Research Building, Room 4308
Phone: 314-362-3674
Email (cohen@wustl.edu)
Functional genomics in yeast. Gene regulatory networks,
complex trait genetics, synthetic biology studies of cis-regulation.

Don Conrad, PhD
McKinley Research Building, Room 6213
Phone: 314-362-4379
Email (don.conrad@wustl.edu)
Our group has a long-standing interest in developing new
methods for characterizing the origin and functional impact of
human genetic variation. Recently completed projects have covered the following topics: mapping of copy number variants, measurement of sex-specific mutation rate and variation in mutation rate among decomposing the relative impact of different types of mutation (SNPs, indels, CNVs, etc.) on gene expression variation and disease susceptibility. Currently, we have a number of active projects that address fundamental unsolved problems related to human reproduction. First: We are trying to unravel the genetic basis for a common form of male infertility, non-obstructive azoospermia, using oligonucleotide arrays and exome sequencing. The short-term goal of this project is to define causal mutations in the >400 cases in which we have access. Our ultimate goal is to provide an unbiased view of the genetic architecture of the disease and establish a definitive reference panel of causal mutations that clinicians can use to facilitate diagnosis of spermatogenic failure. Second: We are using sperm DNA from a longitudinal cohort of semen donors to study the processes of mutation and selection within the population of germ cells of individuals. There are a number of other potential projects ranging from topics of medical relevance such as the biology of the placenta and maternal-fetal compatibility to more basic questions regarding genome biology and evolution. Training in this elective will be primarily computational and can cover skills such as population genetic analysis, rare-variant association study methodology and other aspects of statistical genetics. However, parties interested in using other approaches to address the topics discussed here are welcome.

Joseph Dougherty, PhD
McKinley Research Building, Room 6316
Phone: 314-286-0752
Email (jdougherty@wustl.edu)
Our laboratory utilizes a variety of techniques spanning from human molecular genetics and informatics to mouse behavioral neuroscience and neuroanatomy. We develop and employ mouse models of psychiatric disorder, particularly those that mimic genetic variations we’ve identified from human patient populations, with the goal of trying to understand the cellular and molecular underpinnings of these disorders.

Susan K. Dutcher, PhD
McKinley Research Building, Room 5301
Phone: 314-362-2765
Email (dutcher@wustl.edu)
Studies on the role of centrioles and basal bodies in ciliary signaling, assembly, and motility using molecular genetics, computational, and biochemical approaches.

Heather Lawson, PhD
McKinley Research Building, Room 6312
Phone: 314-362-7269
Email (lawson@wustl.edu)
Translating genetic and epigenetic molecular and analytical observations to physiological endpoints. We apply several complementary and integrated approaches including bench science, cultured cells, mouse phenotyping and husbandry, and computational and systems biology.

Jeffrey Milbrandt, MD, PhD
McKinley Research Building, Room 6306
Phone: 314-362-4651
Email (jmilbrandt@wustl.edu)
We are performing Cas9/CRISPR activation and repression screens in iPSC-derived neurons together with single-cell transcriptomics analysis to evaluate the causal effects of genetic variants associated with neuropsychiatric diseases. We are also studying how metabolism influences axonal/glial interactions important for proper nerve function. We use genetic and metabolomic analysis to identify molecular mechanisms of axonal degeneration, a self-destructive process that plays an important role in many neurodegenerative conditions.

Rob Mitra, PhD
McKinley Research Building, Room 4301
Phone: 314-362-2751
Email (rmitra@wustl.edu)
Systems biology, gene regulation, and technology development. Projects in the lab fall into three general categories: 1) understanding the molecular logic of transcription factor cooperativity, 2) mapping the gene regulatory networks that control developmental processes and using this knowledge to reprogram fibroblasts into useful cell types, 3) developing novel technologies to more efficiently achieve the first two aims listed.

Samantha Morris, PhD
McKinley Research Building, Room 3316
Phone: 314-747-8618
Email (s.morris@wustl.edu)
Engineering cell fate to generate clinically valuable cell populations: stem cell and developmental biology. Our research focuses on dissecting the gene regulatory networks that define cell identity, using the developing embryo and tissue regeneration as a guide to engineer fate in vitro. We apply insight from these analyses to generate clinically relevant populations by differentiating cells from a pluripotent state, or by directly converting cells between mature fates. We employ a combination of computational, single-cell transcriptomics, cell and developmental biology approaches.

Zachary Pincus, PhD
McKinley Research Building, Room 5304
Phone: 314-747-5520
Email (zpincus@wustl.edu)
Inter-individual variability in aging and lifespan. Developmental origins of longevity and adult health. Quantitative microscope and image analysis of C. elegans.

Michael A. Province, PhD
Farrell Learning and Teaching Center (FLTC), 6th floor, Suite 605
Phone: 314-362-3616
Email (mprovince@wustl.edu)
Development and evaluation of novel statistical genetics methodology, especially as applied to genomic identification and validation of variants for human complex quantitative traits, such as heart disease, cancer, pulmonary function, diabetes and human longevity.

Nancy L. Saccone, PhD
Farrell Learning and Teaching Center (FLTC), 6th floor, Suite 606
Phone: 314-747-3263
Email (nlms@wustl.edu)
Statistical genetics and psychiatric genetics. Development and application of analysis methods for studying the genetics of human disease and complex traits.

Tim Schedl, PhD
McKinley Research Building, Room 5305
Phone: 314-362-6162
Email (ts@wustl.edu)
Germ cell development in the model organism Caenorhabditis elegans. The major focuses are: control of the decision to proliferate or enter the meiotic pathway, control and coordination of meiotic prophase progression and gametogenesis, and control of meiotic maturation and ovulation.

James Skeath, PhD
McKinley Research Building, Room 6315
Phone: 314-362-0535
Email (jskeath@wustl.edu)
Identification of the genes and the elucidation of the molecular mechanisms that regulate the early events of Drosophila central neurogenesis; illumination of the mechanisms that form, pattern and specify the individual identities of the progenitor cells of the Drosophila embryonic CNS.

Gary D. Stormo, PhD
McKinley Research Building, Room 4208
Phone: 314-747-5534
Email (stormo@wustl.edu)

Ting Wang, PhD
McKinley Research Building, Room 5211
Phone: 314-286-0865
Email (twang@wustl.edu)
We work in the general field of computational genomics and epigenomics. We study the evolution of human regulatory networks, with a focus on mobile elements (or transposable elements) and their impact on gene regulation, their genetic and epigenetic control, and their roles in human biology and diseases.
Barak Alon Cohen, PHD
Professor of Genetics (primary appointment)
Alvin Goldfarb Distinguished Professor of Computational Biology
PHD Harvard University 1998
BS Cornell University 1992

Donald Franklin Conrad, MS, PHD
Associate Professor of Genetics (primary appointment)
Associate Professor of Pathology and Immunology
MS Stanford University 2017
BS Dartmouth College 1999
PHD University of Chicago 2007

Seth Daniel Crosby, MD
Assistant Professor of Genetics (primary appointment)
MD University Texas San Antonio 1989
BS University of California 1984

Xiaoxia Cui, MS, PHD
Assistant Professor of Genetics (primary appointment)
MS University of Alabama 2017
PHD University of Texas Austin 2017
BS Nanjing University 2017

Joseph D Dougherty, PHD
Associate Professor of Genetics (primary appointment)
Associate Professor of Psychiatry
PHD University of California 2005
BS Truman State University 1999

Susan K. Dutcher, PHD
Professor of Genetics (primary appointment)
Interim Director of the McDonnell Genome Institute
Professor of Cell Biology and Physiology
PHD University of Washington 1980
BA Colorado College 1974

Justin C. Fay, PHD
Adjunct Associate Professor of Genetics (primary appointment)
PHD University of Chicago 2001

Mary F Feitosa, MA, PHD
Associate Professor of Genetics (primary appointment)
MA Sao Paulo University 1985
PHD Sao Paulo University 1990
BA Sao Paulo University 1979

Richard D Head, MS
Associate Professor of Genetics (primary appointment)
Associate Professor of Pathology and Immunology
MS Southern Illinois University 1992

Sungsu Kim, PHD, MS
Instructor in Genetics (primary appointment)
PHD Washington Univ in St. Louis 2010
BS Korea University 2000
MS Korea University 2002

Aldi T Kraja, PHD1, PHD
Associate Professor of Genetics (primary appointment)
PHD1 University of Illinois 1999
PHD University of Tirana 1993

Heather A Lawson, PHD, MA
Assistant Professor of Genetics (primary appointment)
PHD Pennsylvania State University 2008
MA Pennsylvania State University 2004
BA Univ of Wisconsin Milwaukee 2002

Huawen Lin, PHD
Instructor in Genetics (primary appointment)
BS School Not Listed 1998
PHD Washington Univ in St. Louis 2006

Xianrong Mao, PHD, MS
Instructor in Genetics (primary appointment)
PHD University of Arkansas 2001
BS Chinese Academy of Sciences 1996
BS Lanzhou University 1993

James P Mc Carter, MD, PHD
Adjunct Professor of Genetics (primary appointment)
BA Princeton University 1989
MD Washington Univ in St. Louis 1998
PHD Washington Univ in St. Louis 1998

Jeffrey D Milbrandt, MD, PHD
James S McDonnell Professor of Genetics (primary appointment)
Head of the Department of Genetics
Professor of Medicine
Professor of Neurology
Professor of Pathology and Immunology
MD Washington Univ in St. Louis 1978
PHD University of Virginia 1983
BS Univ of Nebraska at Kearney 1974

Robi D. Mitra, PHD
Associate Professor of Genetics (primary appointment)
Alvin Goldfarb Distinguished Professor of Computational Biology
PHD Mass Inst of Technology (MIT) 2000

Zachary Scott Pincus, PHD
Assistant Professor of Genetics (primary appointment)
Assistant Professor of Developmental Biology
PHD Stanford University 2007
BS Stanford University 2002

Michael A Province, MA, PHD
Professor of Genetics (primary appointment)
Professor of Biostatistics
MA Washington Univ in St. Louis 1979
BA University of Dallas 1973
PHD Washington Univ in St. Louis 1987

Nancy L. Saccone, PHD, MS
Associate Professor of Genetics (primary appointment)
Associate Professor of Biostatistics
BA University of California 1988
PHD Brown University 1993
MS Brown University 1990

Yo Sasaki, PHD, MS
Associate Professor of Genetics (primary appointment)
PHD Gunma University, Med School 1997
MS Tokyo U of Agric & Technology 1994
BS Tokyo U of Agric & Technology 1991

Tim B Schedi, PHD
Professor of Genetics (primary appointment)
BA Lawrence University 1977
PHD Univ of Wisconsin Madison 1984

James B Skeath, PHD
Professor of Genetics (primary appointment)
PHD Univ of Wisconsin Madison 1993
BA Haverford College 1988

Gary D Stormo, PHD, MA
Professor of Genetics (primary appointment)
Joseph Erlanger Professor
Professor of Biomedical Engineering
Professor of Computer Science
PHD University of Colorado Boulder 1981
MA University of Colorado Boulder 1975
BS California Institute Technolo 1972

Ting Wang, MS, PHD
Associate Professor of Genetics (primary appointment)
BS School Not Listed 1997
MS Washington Univ in St. Louis 2001
PHD Washington Univ in St. Louis 2006

Michael Aaron White, PHD, MS
Assistant Professor of Genetics (primary appointment)
BA Brigham Young University 2000
PHD University of Rochester 2006

MS University of Rochester 2004
Mary Kaye Wojczynski, PHD
Assistant Professor of Genetics (primary appointment)
PHD Emory University 2006

Y

Jinsheng Yu, MS, MD, PHD
Instructor in Genetics (primary appointment)
MS Tongji University 1995
MD Tongji University 1998
PHD Tongji University 1998
BS Tongji University 1984

Courses

M20 Genetics 511 Medical Genetics
Medical genetics is both a science and a clinical area or specialty of medicine, and the boundary between research and clinical application is increasingly blurred. The pace in which genomic and epigenomic tools are being developed is unprecedented. And these tools result in continual conceptual advancements, which inevitably affect how we approach the study of disease risk, diagnosis and management in all areas of medicine, not just medical genetics. We are moving into a time when the interpretable data from the examination of individual genomes will be incorporated to all other clinical data to assess individual risks and guide clinical management and decision-making. This course is intended as the first step toward lifelong training in medical genetics and genomics. The course begins with a number of sessions devoted to basic principles of genetics. Drawing on this foundation we move on to discuss genomic and epigenomic tools and learn from leaders in their fields about the big questions in genetics and genomics (i.e., microbiome research, cancer genomics, current clinical uses of exome sequencing, etc.) and how the tools are being used to answer these questions. Students are exposed to the use of genetic and genomic databases and information resources; which will allow them to keep up with new information and critically appraise validity and clinical utility. We begin to discuss the implication of this shift to the “genomic era,” particularly regarding ethical aspects, regulatory aspects, equal access, health care costs and patient education. Clinical geneticists actively participate in the course and use a series of genetic disorders to help students apply their knowledge; focusing mainly on genetic etiology, pattern of inheritance, inheritance risk and molecular diagnostic testing. Frequent patient interviews further enhance the exposure to clinical genetics. Overall the course aims to enhance genetic and genomic literacy, which is an essential first step in preparing students to participate in the multidisciplinary teams that effectively make cutting-edge genetic and genomic research results accessible to patients. This course is cross-listed with L41 (Biol 550).
Credit 34 units.
John T. Milliken Department of Medicine

Instruction in Medicine is provided during all four years of the medical curriculum, beginning with Practice of Medicine I (Medicine 507) in the first year. Teaching in the second year has two main objectives: the correlation of the basic sciences with clinical aspects of disease and training in the technical methods of physical examination and laboratory diagnosis. By the beginning of the third year, the student is ready for supervised clinical study of individual patients. A clinical clerkship of 12 weeks, divided into three four-week periods, is served by third-year students on the medical services of the department. In the final year, students may elect a sub-internship in general medicine and a series of elective courses in the medical specialties.

Website: https://internalmedicine.wustl.edu

Research

For information about Primary Care Summer Preceptorships (p. 63), please refer to the information at the bottom of this section.

M25 Medicine 900

Dana R. Abendschein, PhD
9924 Clinical Sciences Research Building
Phone: 314-362-8925

Research in this translational physiology laboratory is focused on development of novel antithrombotic approaches for use during acute myocardial infarction, stroke, and surgery where vascular injury is an underlying mechanism. Current studies are designed to define the efficacy of targeting antithrombotics to the surface of injured vascular cells and activated platelets on thrombus progression. One approach uses nanoparticles covered with epitopes to bind exposed receptors on thrombus and containing inhibitors of coagulation or platelet activation. Students will be expected to participate in experiments using animal models and will develop skills in experiment design, vascular physiology, clinical antithrombotic therapy, coagulation, histopathology and statistics.

John P. Atkinson, MD
Clinical Sciences Research Building, 10th Floor
Phone: 314-362-8391

A clinical research elective is offered in the evaluation of patients with complement deficiency or overactivity states and with undiagnosed rheumatic disease syndromes.

Roberto Civitelli, MD
BJC Institute of Health, 11th Floor, Musculoskeletal Research Center
Phone: 314-454-8408

The biology of cell-cell interactions and communication in bone via gap junctions and cell adhesion molecules. Function of connexins and cadherins in transcriptional control of osteoblast differentiation, osteoclastogenesis, and mechanotransduction. Modulation of mesenchymal lineage allocation and osteogenic differentiation by cadherins and beta-catenin signaling.

Nicholas O. Davidson, MD
910 Clinical Sciences Research Building, North Tower
Phone: 314-362-2027

Genetic pathways for nonalcoholic fatty liver disease (NAFLD) and colorectal cancer development. We have two major areas of research interest. Our laboratory is interested, first, in the molecular mechanisms of hepatic steatosis and the pathogenesis of NAFLD. This is the most prevalent liver disease in the U.S., likely affecting a quarter of the population. We have generated genetically manipulated mouse strains that offer insights into the mechanisms of hepatic steatosis. The student would work as part of a team, designing and conducting experiments that will test hypotheses concerning the mechanisms and consequences of hepatic steatosis. These studies will primarily involve mouse genetics, examining the expression of candidate genes under a variety of nutritional and pharmacologic settings that modulate hepatic lipid metabolism. In addition we are using microarrays to study the spectrum of genetic changes that may predict the extent of hepatic lipid accumulation in patients with steatohepatitis. Our goal is to test hypotheses using mouse genetics and to extend these studies to examine the same pathways in humans with NAFLD. Our second area of interest concerns the genetic pathways involved in colorectal cancer, the second leading cause of cancer-related deaths. We have developed a novel strain of mice in which the dominant effects of mutations in the APC tumor suppressor gene have been abrogated through deletion of an RNA binding protein, apobec-1. This deletion has a major effect on the expression of cox-2, abrogating the increase in expression seen in human colonic adenomas and wild-type mouse intestinal adenomas. These findings suggest that apobec-1 is a genetic modifier of colon cancer development. We will study the importance of apobec-1 expression in human colon cancer specimens and continue our murine genetic studies of this novel pathway for modulating colon cancer development and progression.

Gerome Escota, MD
6604 Wohl Hospital
Phone: 314-362-8050
Email (escotag@wustl.edu)

Special projects in medical education. Through special arrangement with and approval by the course director, fourth-year students will participate in special projects in medical education. Typical projects will require approximately four weeks to complete. These four weeks can occur consecutively (preferred) or be spread out somewhat as needed. Medical education projects should be aimed at improving the curriculum,
Occupational medicine epidemiology and intervention research. Our research involves the use of epidemiology methods to characterize associations between diseases and work-related exposures. We are also doing workplace intervention studies to prevent injuries and illnesses, and to improve healthy diet and physical activity among working populations. During an elective in occupational medicine epidemiology research, students will learn how to use epidemiologic methods to investigate disease processes by working on a mutually agreed-on topic of interest related to occupational diseases. Other activities can include work-site visits and intervention projects, as well as involvement with work-site health promotion and policy making. Elective length is variable depending on individual circumstances. Please contact Dr. Evanoff to discuss this research.

Gregory I. Goldberg, PhD
Wohl Clinic, 4th Floor
Phone: 314-362-8172

Role of secreted extracellular matrix metalloproteases in tissue remodeling. Structure and function of the metalloproteases.

Richard W. Gross, MD, PhD
4525 Scott Avenue, East Building
Phone: 314-362-2690

Lipid mediators of signal transduction in the cardiovascular system. Characterization of regulatory mechanisms responsible for the liberation of lipid second messengers during cellular activation. The roles of phospholipases in mediating the metabolic syndrome and end-organ tissue damage.

Stacey House, MD, PhD
Phone: 314-362-8070
Email (houses@wustl.edu)
or Lisa Hayes
Phone: 314-362-4362
Email (hayesl@wustl.edu)

Emergency medicine clinical research. Emergency medicine clinical research involves the gamut of research designs ranging from retrospective cohort studies (“The Use of B Hydroxy Butyrate Point-of-Care Testing in Diabetic Ketoacidosis”) to prospective clinical trials (“Biomarkers in Traumatic Brain Injury”) to the evaluation of health care systems and Emergency Department processes (“Effects of a Triage Process Conversion on the Triage of High Risk Presentations”) to analyzing health policy issues (“Rate of Follow-up to a Primary Care Clinic and Subsequent Emergency Department Utilization among an Urban ED Population”). Students will learn the basic clinical research designs and will be able to articulate the benefits and drawbacks of each. They will be involved in hypothesis generation and study design for projects that are at that stage. For ongoing projects, they will learn about the informed consent process and be involved in screening for study subjects and subject selection and enrollment. They will be allowed to consent for studies judged to be minimal risk. Students will be taught important rules regarding data acquisition and entry, particularly as it relates to standards that have been set forth in the medical literature. They will learn about bias and inter-rater reliability. Students will participate in data entry, data analysis, and subsequent abstract/ manuscript preparation based on their level of interest and ability for time commitment. Students will meet weekly with one of the course directors to discuss study progress and to identify any roadblocks to study completion. These meetings will also serve as a forum for one-on-one education of the student regarding study methodology, ethical issues in research, and various resources available to the clinical researcher at Washington University.

Sandor J. Kovacs, MD, PhD
9965 Clinical Sciences Research Building
Phone: 314-362-8901

For students with math, physics and engineering background. Cardiovascular biophysics research elective concentrates on physiologic modeling and comparison of model predictions to in vivo human data. Minimum of eight weeks of elective time.

Marc S. Levin, MD, and Deborah C. Rubin, MD
922/924 Clinical Sciences Research Building
Phone: 314-362-8933, 314-362-8935

Students will be members of a collaborative research team headed by Drs. Levin and Rubin (Department of Medicine) investigating the mechanisms underlying the intestinal adaptive response that occurs to compensate for loss of functional small intestine. A second project focuses on epithelial-mesenchymal interactions and their role in regulating gut epithelial proliferation carcinogenesis and the normal and cancer stem cell niche. Specific mechanisms under investigation include the function of an immediate early gene Tis7 on gut adaptation following resection or injury. The role of myofibroblast protein epimorphin in regulating cell proliferation and colon carcinogenesis is being explored. The student will have the opportunity to learn basic molecular biology and physiology as it relates to small intestinal growth and function. Examples of techniques that are used in these studies include small animal surgery and colitis and cancer models (mice and rats), molecular biological techniques including PCR, Northern blotting, vector construction for production of transgenic and knockout mouse models, in situ hybridization and immunohistochemistry.
Jason C. Mills, MD, PhD  
Clinical Sciences Research Building, North Tower, Room 1030  
Phone: 314-362-4213

We investigate the differentiation of epithelial stem cells in the upper GI tract. We study how genes regulate differentiation in mouse models and in vitro in tissue culture, and we correlate our findings with human tissue specimens. Specific projects include: (1) understanding how inflammation leads to aberrant differentiation (metaplasia), which is a precursor for cancer; (2) elucidating how master regulatory transcription factors like Xbp1 and Mist1 coordinate the massive cytoskeletal and organellar expansion of specialized secretory cells as they differentiate from stem cells; and (3) understanding mechanisms regulating how differentiated cells can be reprogrammed into stem cells in GI organs like stomach and pancreas.

Richard E. Ostlund, MD  
8804 Wohl Hospital  
Phone: 314-362-8286

Our laboratory focuses on several aspects of tumor immunology and translational immunotherapy. We utilize mouse tumor models, human tissues and samples, and advanced molecular and immunologic techniques to study leukocyte trafficking in the setting of tumor development and progression. We also have projects focusing on developing novel immunotherapeutics aimed at augmenting the recruitment of beneficial leukocyte subsets into the tumor microenvironment in order to suppress tumor growth. We are utilizing several approaches such as nanoparticles, fusion proteins and viruses.

Katherine Ponder, MD  
8818 Cancer Science Research Building  
Phone: 314-362-5188  
Email (kponder@wustl.edu)

Gene therapy for lysosomal storage diseases. Our laboratory is interested in using gene therapy to treat lysosomal storage diseases such as mucopolysaccharidosis (MPS). We have developed a retroviral vector that can be efficiently delivered to the liver of mice and dogs, and results in expression that is sufficient to reduce many of the clinical manifestations of these genetic diseases. Current studies focus upon assessing the therapeutic effect of gene therapy on sites that are affected in MPS such as the heart, aorta, bones and joints, and developing vectors that might be translated into human patients. In addition, we are evaluating the pathogenesis of disease in MPS, which appears to involve the upregulation of destructive proteases in the aorta and possibly other sites. A better understanding of the pathogenesis of disease might result in additional therapies for MPS.

Clay F. Semenkovich, MD  
Southwest Tower, Room 13116  
Phone: 314-362-1350  
Email (pstein@wustl.edu)

Fatty acid metabolism and its role in atherosclerosis, diabetes, hypertension and obesity. The modulation of respiratory uncoupling for the treatment of aging, obesity and vascular disease.

Phyllis K. Stein, PhD  
Northwest Tower, Room 8th Floor  
Phone: 314-286-1350  
Email (pstein@wustl.edu)

Clinical significance of heart rate variability and ECG-derived waveform parameters obtained from continuous ambulatory monitoring. This elective allows the opportunity to perform research in heart rate variability or in other measurements, like QT variability or T-wave alternans that can be derived from continuous ECG monitoring from Holter recordings or polysomnography recordings in the sleep lab. One area of active research is the identification of heart rate patterns associated with obstructive and central sleep apneas and hypopneas and the relationship of previously unappreciated cycling heart rate patterns and outcomes. Data are also available from mice. Many possible projects are available using our many large existing datasets, using the thousands of stored studies in the sleep lab, or involving de novo data collection in a clinical or animal population and in infants. Also, many possible directions for this research are available from applying traditional and nonlinear HRV to different populations, developing methods to quantify ultradian heart rate variability patterns, to developing novel ECG analysis techniques, etc. Also, we are involved with the Cardiovascular Health Study (CHS), a large population-based longitudinal study of risk factors for heart disease and stroke among community-dwelling people >65 years old. There is a subset of this population who had Holter recordings (~1400 at baseline, ~800 of the same people five years later, and ~370 minority subjects recorded at the same time as the second CHS recording). These recordings have already been analyzed by us so there is a large amount of heart rate variability and heart rate pattern data available. There are also subsets of the CHS and of another study (EPHESUS) who are known to have died suddenly, and we have developed a matched control group in order to examine ECG-based differences in those who died suddenly. We also have electronic sleep studies at two time points for about 300 of the CHS Holter participants who also participated in the Sleep Heart Health Study. We have analyzed an additional ~1500 sleep studies from CHS participants who did not have Holter recordings. Thus, there is also an opportunity in the CHS dataset for studies on the relationship of heart rate...
variability and changes in heart rate variability over time and a huge number of clinical and demographic factors among the elderly. We also have data on the relationship of Holter-based HRV and sleep apnea patterns to the development of atrial fibrillation post-cardiac surgery and data from a study of treatment of depression in treatment-resistant depressed post-MI patients, a study of sickle cell patients, and one of heart rate variability and echo parameters in elderly African Americans. Currently we are also analyzing HRV in both premature infants as they mature and also HRV as a predictor of response to treatment in babies in the NICU and PICU, using stored 24-hour bedside ECGs.

Heart rate variability and clinical outcomes: The student will be learning about HRV methods and will investigate the relationship of HRV and outcomes in one of our datasets. Because we have clinical and demographic data on about 20,000 subjects for whom continuous ECGs from Holter recordings, sleep studies, and ICU studies are available, and also some mouse data, the student will be able to choose a project leading to a publishable result in an area of interest. The HRV Lab has enough computers and software to accommodate the needs of any interested students.

John Turk, MD, PhD  
Southwest Tower, 8th Floor  
Phone: 314-362-8190  
Phospholipid signaling mechanisms in pancreatic islets. Experience in mass spectrometric analysis of complex lipids is available.

H.J. Wedner, MD  
5002 Steinberg Pavilion, Barnes-Jewish Hospital, North Campus  
Phone: 314-454-7377 or 314-454-7377  

1. Asthma care in the inner city: Students will participate in ongoing studies of the delivery of asthma care to inner-city children and adults. The emphasis will be on direct contact between the asthmatic patients and the student, along with an asthma counselor.

2. Biology of pollen and fungal allergens: Our laboratory has been characterizing the important allergenic proteins from molds and pollen. The allergens are identified using skin-test-sensitive individuals, and the proteins are isolated and characterized by a combination of physiochemical and molecular biological techniques. These studies should lead to better forms of allergy immunotherapy. Students will participate in the isolation, characterization and modification of major allergens from a number of molds including Stachybotrys atra, Epicoccum nigrum, and several pollens including those from white oak and Parthenium hysterophorus, a newly recognized allergen.

Primary Care Summer Preceptorships

Since 1996 the school has sponsored a primary care preceptorship program for students during the summer between their first and second years of classes. Students select a preceptor in internal medicine, pediatrics or family practice and spend up to eight weeks observing that physician's clinical practice. A stipend is provided to the student. Although many of the preceptors are in St. Louis, others, particularly alumni, are located in cities throughout the country.

Faculty

The Department of Medicine’s general medicine teaching services at Barnes-Jewish Hospital and the Veterans Administration Medical Center (St. Louis) are under the following directors:

John P. Atkinson, MD  
Samuel Grant Professor of Medicine  
Chief, Division of Rheumatology

Melvin S. Blanchard, MD  
Professor of Medicine  
Chief, Division of Medical Education

Roberto Civitelli, MD  
Sydney M. & Stella H. Schoenberg Professor of Medicine  
Chief, Division of Bone and Mineral Diseases

Lynn A. Cornelius, MD  
Winfred A. and Emma R. Showman Professor of Dermatology in Medicine  
Chief, Division of Dermatology

Jeffrey S. Crippin, MD  
Marilyn E. Bornefeld Chair in Gastrointestinal Research and Treatment  
Professor of Medicine  
Associate Chair for Clinical Programs

Nicholas O. Davidson, MD  
John E. and Adaline Simon Professor of Medicine  
Chief, Division of Gastroenterology

John F. DiPersio, MD, PhD  
Virginia E. and Sam J. Golman Professor of Medicine  
Chief, Division of Oncology

Bradley A. Evanoff, MD, MPH  
Richard A. and Elizabeth Henby Sutter Chair in Occupational, Industrial, and Environmental Medicine  
Chief, Division of General Medical Sciences

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Adolphus Busch Professor of Medicine and Chairman

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David M. and Paula L. Kipnis Distinguished Professor Co-Chief, Division of Infectious Diseases

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Professor of Medicine  
Chief, Veteran's Administration
Richard W. Gross, MD, PhD  
Professor of Medicine  
Chief, Division of Bioorganic Chemistry and Pharmacology

Michael J. Holtzman, MD  
Selma and Herman Seldin Professor of Medicine  
Chief, Division of Pulmonary and Critical Care Medicine

Benjamin D. Humphreys, MD, PhD  
Joseph P. Friedman Associate Professor  
Chief, Division of Nephrology

Samuel Klein, MD  
William H. Danforth Professor of Medicine and Nutritional Science  
Chief, Division of Geriatrics and Nutritional Sciences

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Tobias and Hortense Lewin Professor of Medicine  
Chief, Division of Cardiology

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Dr. J. William Campbell Professor of Medicine  
Co-Chief, Division of Infectious Diseases

J. Evan Sadler, MD, PhD  
The Foundation for Barnes-Jewish Hospital's Ira M. Lang Endowed Chair  
Chief, Division of Hematology

Clay F. Semenkovich, MD  
Irene E. and Michael M. Karl Professor of Endocrinology and Metabolism in Medicine  
Chief, Division of Endocrinology, Metabolism and Lipid Research

Mark S. Thoelke, MD  
Associate Professor of Medicine  
Chief, Division of Hospital Medicine

H. James Wedner, MD  
Dr. Phillip and Arleen Korenblat Professor  
Chief, Division of Allergy and Immunology

Visit our website for more information about our faculty (https://internalmedicine.wustl.edu/divisions) and their appointments.

A

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MD Cornell University 1995  
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MD New York University 1975  
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BS American University of Beirut 1970  
MD American University of Beirut 1974

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MD University of Jordan 2001

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BS State University of New York 1974  
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MS University of Nice 2008  
BS Holy Spirit Univ of Kaslik 2006  
MS University of Paris 2009  
PHD University of Nice 2013

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MD University of Miami 1985  
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Professor of Cell Biology and Physiology  
BS American University of Beirut 1972  
PHD State University of New York 1978

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Instructor in Clinical Medicine (primary appointment)  
BA Carleton College 1985  
MD University of Missouri 1989

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M PH Johns Hopkins University 2001  
MBBS University of Ibadan 1999

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Professor of Medicine (primary appointment)  
BS Wright State University 1982  
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Assistant Professor of Medicine (primary appointment)  
MD UT Medical Branch 2017  
BA UT Permain Basin 2017

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Assistant Professor of Medicine (primary appointment)  
MD Johns Hopkins University Medic 2003  
BA Johns Hopkins University 1999

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Instructor in Medicine (primary appointment)
BS University of Maryland 2017
MD University of Maryland 2017

Abdulla Akfaly, MD
Instructor in Clinical Medicine (primary appointment)
MD Aleppo University 1991

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MBBS King Faisal University Medical 2006

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Assistant Professor of Medicine (primary appointment)
BS Beirut University 1995
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Instructor in Clinical Medicine (primary appointment)

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Instructor in Clinical Medicine (primary appointment)
MD School Not Listed 1965

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Assistant Professor of Pathology and Immunology
MD Washington Univ in St. Louis 2007
BS University of Nebraska 1999
PHD Washington Univ in St. Louis 2007

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Assistant Professor of Medicine (primary appointment)
MD Damascus U. Medical School 2006
MS Pennsylvania State University 2013

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MD School Not Listed 1985

Sami Almaskeen
Assistant Professor of Medicine (primary appointment)

Florence Michelle Almiron-Torralba
Instructor in Clinical Medicine (primary appointment)

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William B Kountz Professor of Gerontology in Medicine (primary appointment)
MD Harvard University 1960
BA Harvard University 1956

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MD Government Medical College 1998

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MD Government Medical College 1997

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BS University of Akron 1997
MD Ohio University 2001

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BA Saint Louis University 2003
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MD Duke University 1982
BA University of California 1975
PHD Duke University 1981

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Assistant Professor of Medicine (primary appointment)
MD University of Illinois Chicago 2010
BS University of Illinois Chicago 2006

Muhammad Jaffer Ansari
Assistant Professor of Clinical Medicine (primary appointment)

George Anstas, MD
Assistant Professor of Medicine (primary appointment)
MD Tishreen Univ College of Med 2001

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Assistant Professor of Medicine (primary appointment)
PHD University of Oklahoma 2010
BS Indiana State University 2005
MS University of Oklahoma 2007

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Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)
MD University of Bombay 1995
MS University of Detroit 1998
PHD Wayne State University 2000

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Adjunct Assistant Professor of Medicine (primary appointment)
MD Ohio State University 2004
MHA Ohio State University 2004

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Assistant Professor of Medicine (primary appointment)
BS Northwestern University 1996
MD University of Texas Southwest 2004
PHD University of Texas Southwest 2004

Saira M Asadullah, MD
Instructor in Clinical Medicine (primary appointment)
MD Aga Khan University 1992

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Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Saint Louis University 1981

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MD Washington Univ in St. Louis 2015

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BS Loyola College 1990
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MD University of Illinois Chicago 2009

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BA University of Missouri 1983
MD University of Missouri 1983

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MD University of Tennessee 1990
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MD Saint Josephs University 1994

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MPH Saint Louis University 2006
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BS Georgetown University 1977
MS New York University 1980
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MS Punjab University 1957

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MD Mayo Clinic 2001

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MS Cornell University 1985

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BA Kalamazoo College 1976
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MD Marshall University 1984

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MD School Not Listed 1983
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BS Univ of Wisconsin Madison 1985
MD Washington Univ in St. Louis 1992
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MD University of Chicago 1967  
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BS University of Illinois 1971

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BBA Trevecca Nazarene College 1987

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MD PUCMM FACULTAT DE CIENCIAS DEL 2004

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BA Eastern Michigan University 2003

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BS University of Notre Dame 1977
MD Saint Louis University 1981

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BS Muhlenberg College 1979

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MD Medical College of Virginia 1991
BS Georgetown University 1986
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Professor of Medicine (primary appointment)
MD Duke University 1980
BA Harvard University 1974

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PHD Washington Univ in St. Louis 2006
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PHD University of Paris 2001
BS University of Paris 1996
MS University of Paris 1997
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Associate Professor of Biochemistry and Molecular Biophysics
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PHD University of Nebraska 1999
BS North Dakota State University 1992

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BS1 Washington Univ in St. Louis 2001
MD Washington Univ in St. Louis 2007

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Professor of Radiology
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PHD Washington Univ in St. Louis 2009
BA Sweet Briar College 2003

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MD Georgetown University 1982

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BS Southern Methodist University 1987
MD Washington Univ in St. Louis 1992

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BS Univ of Wisconsin Madison 1982
PHD Washington Univ in St. Louis 1989

David L. Brown, MD
Professor of Medicine (primary appointment)
MD Baylor University 1982
BA University of Texas Austin 1977

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MD Boston University 2012
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Instructor in Surgery (Public Health Sciences)  
MS Harvard University 2006  
BS Emory University 2003  
PHD University of North Carolina 2014

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BS University of Oklahoma 1993  
MD University of Texas Southwest 2001  
PHD University of Texas Southwest 2001

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Assistant Professor of Clinical Medicine (primary appointment)  
MD Washington Univ in St. Louis 2011  
BS1 Tulane University 2007

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MD School Not Listed 1964

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BA Washington Univ in St. Louis 1973

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Assistant Professor of Neurological Surgery  
PHD University of Louisville 2003  
MS Peking Union Medical College 2000  
MD Tianjin Medical University 1997

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BA Saint Louis University 1996  
MD Saint Louis University 2001

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Rebecca Goodwin Carey  
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BA Wellesley College 2005  
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MD Virginia College 1978

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Assistant Professor of Emergency Medicine in Medicine  
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BA University of Missouri 1981

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BS University of Southern Calif 1995  
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BS Yale University 1995  
BS1 Yale University 1995  
MD Washington Univ in St. Louis 1999

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Assistant Professor of Medicine (primary appointment)

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Professor of Pediatrics  
Professor of Radiology  
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MD University of Missouri 1988
M PH Saint Louis University 1998

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MD University of Missouri 1990

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Professor of Medicine (primary appointment)
BS Duke University 1990
MD Vanderbilt University 1994

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Associate Professor of Medicine (primary appointment)
PHD University of Queensland 2006

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BS Truman State University 2000
PHD Saint Louis University 2007

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Approval) (primary appointment)
MD Northwestern University 2013
BA Northwestern University 2009

Kae Pyng Chang, MD
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BA Washington Univ in St. Louis 1991
MD University of Missouri 1995

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MD Texas Tech University 2009

Douglas Char, MD, MA
Professor of Emergency Medicine in Medicine (primary
appointment)
BS Boston College 1983
MD University of Hawaii 1989
MA Boston University 1985

Siroth Charnond, MD
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MD University of MO Kansas City 1995

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BA Princeton University 1960
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UNKNOWN School Not Listed 1983
MD Nanjing Medical University 1983

MS Nanjing Medical University 1988

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Associate Professor of Cell Biology and Physiology
PHD University of Utah 1998
BS Fudan University 1991

Baosheng Chen, PhD
Instructor in Medicine (primary appointment)
PHD Peking Union Medical College, 2002

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PHD Johns Hopkins University Medic 1999
MD National Taiwan University 1993

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BS University of Michigan 2003
MD Washington Univ in St. Louis 2012
PHD Washington Univ in St. Louis 2012

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MD University of MO Kansas City 2001

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AB Washington Univ in St. Louis 2010
MD Washington Univ in St. Louis 2014

Ying Chen, MD, PHD
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MD Shanghai Medical University 1996
PHD Vanderbilt University 2004

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BS Vanderbilt University 2010

Edward C. Chen, MD
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MD Saint Louis University 2005

Steven Chih Nung Cheng, MD
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MD Northwestern University Med 2002
BA Northwestern University 2001

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MBBS Sri Ramachandra Medical Colleg 2005
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Milan G Chheda, MD
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Assistant Professor of Neurology
MD Albert Einstein College of Med 2002

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MD University of California 2012
BS Washington Univ in St. Louis 2007
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PHD Baylor University 2006
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MD Oregon Health Science Univer 2010

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Professor of Orthopaedic Surgery
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MD University of Alabama 2003

Susan R Colbert-Threats, MD
Assistant Professor of Clinical Medicine (primary appointment)
BS Northwestern University 1986
MD University of Illinois 1991

Patricia L Cole, MD, MA
Associate Professor of Clinical Medicine (primary appointment)
MD Harvard University 1981
BA Mount Holyoke College 1972
MA Brown University 1975

Danita L Cole, MD
Instructor in Clinical Medicine (primary appointment)
BA University of MO Kansas City 1990
MD University of MO Kansas City 1991

Roger Barto Cole, MD, MS, PHD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 2008
BS Rice University 1997
MS Yale University 2001
Sarah F Cole  
Instructor in Clinical Medicine (primary appointment)  
MD Boston University 1980

Laura Ann Colletti-Mann, MD  
Associate Professor of Medicine (primary appointment)  
MD Washington Univ in St. Louis 1978  
BS MO S&T (formerly UofMO Rolla) 1973  
MS University of CA Berkeley 1974

Arthur Hamilton Combs, MD  
Associate Professor of Clinical Medicine (primary appointment)  
MD New York Medical College 1975

Daniel Horatio Cooper, MD  
Associate Professor of Medicine (primary appointment)  
MD Loyola University Chicago 2003  
BS Washington Univ in St. Louis 1999

Matthew Cooper, PHD  
Instructor in Medicine (primary appointment)  
BS University of Surrey 2004  
PHD University of Surrey 2008

Lynn Anne Cornelius, MD, BN  
Winfred A and Emma R Showman Professor of Dermatology in Medicine (primary appointment)  
MD University of Missouri 1984  
BN University of Delaware 1977

Natalie Danielle Cosgrove  
Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)

John Bernard Costello, MD  
Instructor in Clinical Medicine (primary appointment)  
BA Saint Louis University 1974  
MD Saint Louis University 1977

Carrie Christine Coughlin, MD  
Assistant Professor of Medicine (Dermatology) (primary appointment)  
Assistant Professor of Pediatrics  
MD Washington Univ in St. Louis 2010  
BA Yale University 2005

Martha Laurin Council, MD  
Associate Professor of Medicine (Dermatology) (primary appointment)  
BS Louisiana St University 2000  
MD Washington Univ in St. Louis 2004

Daniel W Coyne, MD  
Professor of Medicine (primary appointment)  
MD Case Western Reserve Univ 1983  
BA Saint Louis University 1979

Clarissa S. Craft, PHD  
Assistant Professor of Medicine (primary appointment)  
Assistant Professor of Cell Biology and Physiology  
PHD Northwestern University 2007  
BS Beloit College 2003

Johnetta M Craig, MBA, MD  
Instructor in Clinical Medicine (primary appointment)  
BS University of Missouri 1980  
MBA University of Pennsylvania 1994  
MD University of Iowa 1986

John Jeffrey Cras, MD, MS  
Assistant Professor of Medicine (primary appointment)  
BS Loyola College 1994  
MD Georgetown University 2003  
MS Georgetown University 1998

Charles Crecelius, MD, PHD  
Assistant Professor of Clinical Medicine (primary appointment)  
MD Saint Louis University 1984  
PHD Saint Louis University 1984  
BA Carleton University 1976

Zachary David Crees, MD  
Instructor in Medicine (Pending Dean’s Approval) (primary appointment)  
MD University of Illinois 2015  
BA University of Colorado 2011

Sharon Cresci, MD  
Associate Professor of Medicine (primary appointment)  
Associate Professor of Genetics  
BS State Univ of NY Binghampton 1982  
MD New York University 1986

Stephen R Crespin, MD  
Associate Professor of Clinical Medicine (primary appointment)  
MD Harvard University 1965  
BA Harvard University 1960

Jeffrey S Crippin, MD  
Professor of Medicine (primary appointment)  
BS University of Notre Dame 1980  
MD University of Kansas 1984

Paulina Cruz Bravo, MD  
Assistant Professor of Medicine (primary appointment)  
MD Universidad Automoma de Madrid 2009

Philip E Cryer, MD  
Professor Emeritus of Medicine (primary appointment)  
Adjunct Professor of Medicine  
MD Northwestern University Med 1965  
BA Northwestern University 1962

Phillip S. Cuculich, MD  
Associate Professor of Medicine (primary appointment)  
MD Vanderbilt University 2001
Robert Culverhouse, MA, PHD
Associate Professor of Medicine (primary appointment)
Associate Professor of Biostatistics
MA University of CA Berkeley 1987
BA Vanderbilt University 1983
PHD Washington Univ in St. Louis 1998

Lenise Andrea Cummings-Vaughn, MD, MS
Assistant Professor of Medicine (primary appointment)
MD Saint Louis University 2005
BS Williams College 1995
MS San Francisco St University 1998

Robert B Cusworth, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Rochester 1974

Ann Marie Dale, PHD
Associate Professor of Medicine (primary appointment)
Associate Professor of Occupational Therapy
PHD Saint Louis University 2009
BS University of MO Columbia 1983

William H Danforth, MD
Professor of Medicine (primary appointment)
Vice Chairman and Chancellor Emeritus
BA Princeton University 1947
MD Harvard University 1951

Erik D. Daniels, MD
Instructor in Clinical Medicine (primary appointment)
BS Howard University 1985
MD Howard University 1989

John S Daniels, MA, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1970
MA University of Arkansas 1974
MD University of Arkansas 1974

Peter G Danis
Instructor in Clinical Medicine (primary appointment)

Rand E Dankner, MD
Associate Professor of Clinical Medicine (primary appointment)
BA University of Pennsylvania 1974
MD Baylor University 1978

Maria Cristina Dans, MD
Assistant Professor of Medicine (primary appointment)
MD Washington Univ in St. Louis 1999
BA Princeton University 1989

Bhajan Shewaldas Dara, MD
Instructor in Clinical Medicine (primary appointment)
MD Sindh Medical College 1987

Lakshman Darsi, MBBS
Assistant Professor of Medicine (primary appointment)
MBBS Guntur Medical College 1985

Sundeep Das, MD
Instructor in Clinical Medicine (primary appointment)
MD University College of Med Sci 1986

Koushik Kumar Das, MD
Assistant Professor of Medicine (primary appointment)
MD Columbia University 2016

Carlos Colton Daughaday, MD
Professor of Medicine (primary appointment)
MD Washington Univ in St. Louis 1971
BA Harvard University 1967

Nicholas O Davidson, MBBS
Professor of Medicine (primary appointment)
Professor of Developmental Biology
MBBS King's College London 1974

John D Davidson, MD
Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1948
MD Washington Univ in St. Louis 1952

Victor G Davila-Roman, MD
Professor of Medicine (primary appointment)
Professor of Anesthesiology
Professor of Radiology
MD University of Puerto Rico 1981
BS University of Puerto Rico 1977

Andrea Jill Davis, MSN, MD
Instructor in Clinical Medicine (primary appointment)
MSN Arizona State University 2000
MD St George's University 2004
BS Randolph Macon College 1997

Thomas Edward Davis
Instructor in Clinical Medicine (primary appointment)

Caroline Elizabeth Day, MD, M PH
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1995
M PH San Diego St University 2005
BS University of Colorado Boulder 1990

Lisa De Las Fuentes, MD
Associate Professor of Medicine (primary appointment)
Associate Professor of Biostatistics
BA Stanford University 1991
MD University of Texas Southwest 1996

Anne V Dean, MD
Instructor in Clinical Medicine (primary appointment)
MD Loyola University 1995
BA Bowdoin College 1986

Parakkal Deepak, MBBS
Assistant Professor of Medicine (primary appointment)
MBBS Jawaharlal Institute of PostGr 2004
Angeline Diane DeiSanti, MD
Assistant Professor of Medicine (primary appointment)
BS University of MO Columbia 1998
MD University of MO Columbia 2003

Jennifer A. Delaney, MD
Instructor in Clinical Medicine (primary appointment)
BA Georgetown University 1992
MD Washington Univ in St. Louis 1997

Rowena Bayudan Delos Santos, MD
Assistant Professor of Medicine (primary appointment)
BS Creighton University 2000
MD Creighton University 2004

Bethany L. Dement, MD
Instructor in Medicine (primary appointment)
MD Southeast Missouri St Univers 2001

David G. DeNardo, PHD
Associate Professor of Medicine (primary appointment)
Associate Professor of Pathology and Immunology
PHD Baylor University 2005
BS Willamette University 1999

Amber Zimmer Deptola, MD
Assistant Professor of Medicine (primary appointment)
BS Miami University 2008
MD University of Louisville 2012

Sunny Desai, UNKNOWN, MS
Instructor in Clinical Medicine (primary appointment)
UNKNOWN School Not Listed 1991
MS School Not Listed 1991

Teresa Deshields, PHD, MS
Associate Professor of Clinical Medicine (primary appointment)
Associate Professor of Clinical Psychiatry
PHD University of Georgia 1985
MS University of Georgia 1983
BA Meredith College 1981

Vladimir Novak Despotovic, MD
Assistant Professor of Medicine (primary appointment)
MD Michigan State University 2004
BS Michigan State University 2000

Siddhartha HK Devarakonda, MD
Assistant Professor of Medicine (primary appointment)
MD Indira Gandhi Medical College 2009

Michael D DeVita, MD
Assistant Professor of Medicine (primary appointment)
MD University of Wisconsin 2011
BS University of Wisconsin 2006

Michael Diamond, PHD, MD
Professor of Medicine (primary appointment)
Herbert S Gasser Professor
Professor of Molecular Microbiology

Professor of Pathology and Immunology
PHD Harvard University 1992
MD Harvard University 1994
BA Columbia College 1985

Judith A Dibble, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1986

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Associate Professor of Medicine (primary appointment)
MD Washington Univ in St. Louis 1988
BA University of Kansas 1982
PHD Washington Univ in St. Louis 1987

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Professor of Medicine (primary appointment)
Assistant Dean for Career Counseling
MD University of Missouri 1985
BA University of Missouri 1984

Li Ding, PHD
Associate Professor of Medicine (primary appointment)
Associate Professor of Genetics
PHD University of Utah 1998

John F Dipersio, MD, PHD
Virginia E and Sam J Golman Professor of Medicine (primary appointment)
Professor of Pathology and Immunology
Professor of Pediatrics
MD University of Rochester 1980
PHD University of Rochester 1980
BA Williams College 1973

Richard M Divalerio, MD
Instructor in Clinical Medicine (primary appointment)
BS University of Notre Dame 1984
MD Washington Univ in St. Louis 1988

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Associate Professor of Medicine (primary appointment)
Associate Professor of Cell Biology and Physiology
MD All-India Inst of Medical Sci 1997

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Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Saint Louis University 1983
BS Edinburgh University 1978

Irl Joseph Don, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1969
MD Washington Univ in St. Louis 1972

James W Donnelly, MD
Instructor in Clinical Medicine (Dermatology) (primary appointment)
MD Washington Univ in St. Louis 1986
BA Northwestern University 1982

Balraj Doray, PHD
Assistant Professor of Medicine (primary appointment)
BS Southern Illinois University 1993
PHD University of Illinois 1999

Gerald W. Dorn II, MD
Philip and Sima K Needleman Professor of Medicine (primary appointment)
MD Medical University of Sth Car 1981

William H Dribben, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD University of North Carolina 1990
BA University of North Carolina 1985

Erik R Dubberke, MD, MPH
Professor of Medicine (primary appointment)
MD University of Illinois 1999
MPH Saint Louis University 2008
BA Augustana University College 1995

James Matthew DuBois, PHD, MA, D SC
Steven J Bander Professor of Medical Ethics and Professionalism (primary appointment)
Professor of Psychological & Brain Sciences
PHD Intrnl Academy of Philosophy 1992
MA University of Rhode Island 1990
BA Franciscan University Stubenv 1989
D SC University of Vienna 1997

Nicole Marie Ducharme, DOST
Instructor in Clinical Medicine (primary appointment)
DOST Univ of Health Sciences KC 2003
BS Muhlenberg College 1998

Carolyn Dufault, PHD
Instructor in Medicine (primary appointment)
Assistant Dean for Education and Technology
BS Mount Holyoke College 1997
PHD Washington Univ in St. Louis 2009

Maria C Dumadag-Sabio, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Missouri 1988
BA University of Missouri 1988

Edward Harry DuMontier
Instructor in Clinical Medicine (primary appointment)

William C Dunagan, MS, MD
Professor of Medicine (primary appointment)
BS University of Texas Austin 1978
MS University of Texas Austin 1980
MD Washington Univ in St. Louis 1983

Kirsten F Dunn, MD
Assistant Professor of Medicine (primary appointment)
MD Saint Louis University 2012
BS Harvard University 2007

Julia Passyn Dunn, MD, MS
Assistant Professor of Medicine (primary appointment)
BS Auburn University 1998
MD University of South Alabama 2002
MS Vanderbilt University 2010

Michael Joseph Durkin, MD, M PH1
Assistant Professor of Medicine (primary appointment)
MD Medical College of Wisconsin 2008
BA Illinois Wesleyan University 2004
M PH1 University of North Carolina 2015

Tiffany Biason Dy, MD
Assistant Professor of Medicine (primary appointment)
MD Univ Texas Health Science Ctr 2009
BS University of Miami 2005

E

William Charles Eades Jr, BEE
Associate Professor of Medicine (primary appointment)
BEE MO S&T (formerly UofMO Rolla) 1982

Dayna S Early, MD
Professor of Medicine (primary appointment)
MD University of Missouri 1990
BA University of Missouri 1986

Royal J Eaton, MD
Instructor in Clinical Medicine (primary appointment)
BA University of Missouri 1960
MD University of Missouri 1964

Charmaine E. Edwards, MD
Instructor in Clinical Medicine (primary appointment)
MD Howard University 1992
BS Alcom State University 1987

John R. Edwards, PHD
Associate Professor of Medicine (primary appointment)
PHD Columbia University 2003

Stilianos Efstratiadis
Assistant Professor of Clinical Medicine (primary appointment)

Russell E Eggebrecht, MD
Associate Professor of Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1971
BS University of Illinois 1967

Ali A Ehsani, MD
Professor of Medicine (primary appointment)
MD Tehran University 1965

Zamir Eidelman, MD
Associate Professor of Clinical Medicine (primary appointment)
MD School Not Listed 1987

Seth A Eisen, MS, MD
Professor of Medicine (primary appointment)
MS Harvard University 1989
MD Washington Univ in St. Louis 1966
BA Reed College 1963

Linda G Eissenberg, PHD
Assistant Professor of Medicine (primary appointment)
PHD University of North Carolina 1982
BA University of Tennessee 1977

Lamice R. El-Kholy, MS, UNKNOWN
Instructor in Clinical Medicine (primary appointment)
MS School Not Listed 1986
UNKNOWN School Not Listed 1982

John Ellena, MD
Associate Professor of Clinical Medicine (primary appointment)
BS Southern Illinois University 1980
MD Southern Illinois University 1983

Charlene Ann Ellsworth, PHD, MD
Instructor in Clinical Medicine (primary appointment)
PHD Mass Inst of Technology (MIT) 2004
MD Washington Univ in St. Louis 2008

Amged Eltahir, AB1, MD
Instructor in Clinical Medicine (primary appointment)
AB1 Saint Louis University 2006
MD University of Khartoum 1985

Jill Elizabeth Elwing, MD
Assistant Professor of Clinical Medicine (primary appointment)
MD University of MO Columbia 2000
BS University of MO Columbia 1996

James Michael Epstein, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1969
BS University of Notre Dame 1965

Gerome V Escota, MD
Assistant Professor of Medicine (primary appointment)
MD University of the Philippines 2004
BS University of the Philippines 1999

Neil A Ettinger, MD
Assistant Professor of Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1983
BS Vanderbilt University 1979

Bradley A Evanoff, M PH, MD
Richard A and Elizabeth Henby Sutter Professor of Occupational, Industrial, and Environmental Medicine in Medicine (primary appointment)
Assistant Dean for Clinical and Translational Research Professor of Occupational Therapy
M PH University of Washington 1993
BA Cornell University 1982
MD Washington Univ in St. Louis 1986

Carol Jane Evers, MD
Instructor in Clinical Medicine (primary appointment)
MD Brown University 1977
BA Brown University 1973

Gregory A Ewald, MD
Professor of Medicine (primary appointment)
MD Northwestern University 1989
BS University of Illinois 1985

Elisa Fabbrini, MD, PHD
Adjunct Assistant Professor of Medicine (primary appointment)
MD La Sapienza University 1998
PHD La Sapienza University 2006

Mitch N Faddis, PHD, MD
Professor of Medicine (primary appointment)
PHD Washington Univ in St. Louis 1993
BS Kansas State University 1985
MD Washington Univ in St. Louis 1993

Akinrinola Fatoki, MS
Instructor in Clinical Medicine (primary appointment)
BS School Not Listed 1982
MS School Not Listed 1989

Carol Faulk, MD
Instructor in Medicine (primary appointment)
MD Louisiana St University 2014

Todd A Fehniger, PHD, MD
Associate Professor of Medicine (primary appointment)
BS State Univ of NY Buffalo 1994
PHD Ohio State University 2000
MD Ohio State University 2002

Francesca Ferraro, MD, PHD
Instructor in Medicine (primary appointment)
MD University of Parma 2004
PHD University of Parma 2014

Herman L Ferrell, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Arkansas 1975
BS University of Arkansas 1973

Brian N. Finck, PHD, MS
Associate Professor of Medicine (primary appointment)
BS University of Illinois 1994
PHD University of Illinois 2000
MS University of Illinois 1996

Lewis Conrad Fischbein, MD
Associate Professor of Clinical Medicine (primary appointment)
BA University of Rochester 1970
MD Washington Univ in St. Louis 1974

Peter Uwe Fischer, PHD, MS
Professor of Medicine (primary appointment)
PHD University of Hamburg 1996
MS Free University of Berlin 1991
Norman Fishman, MD
Assistant Professor of Clinical Medicine (primary appointment)
MD School Not Listed 1974
BA School Not Listed 1970
Sean C. Fitzmaurice, MD
Instructor in Emergency Medicine in Medicine (primary appointment)
MD Saint Louis University 1995
BS Georgetown University 1989
Jaquelyn F Fleckenstein, MD
Professor of Medicine (primary appointment)
MD Saint Louis University 1985
BA Cornell University 1981
James M Fleckenstein, MD
Professor of Medicine (primary appointment)
Professor of Molecular Microbiology
BS Xavier University 1981
MD Saint Louis University 1985
Avegail Gascon Flores, MD
Assistant Professor of Medicine (primary appointment)
MD University of Pittsburgh 2007
Emily Fondahn, MD
Assistant Professor of Medicine (primary appointment)
MD Northwestern University 2008
Luigi Fontana, MD, PHD
Professor of Medicine (primary appointment)
MD University of Verona 1994
PHD University of Padova 2004
Randi Elizabeth Foraker, PHD, MA
Associate Professor of Medicine (primary appointment)
PHD University North Carolina 2010
MA University of Iowa 1999
BA University of Iowa 1997
Glennon Joseph Fox, MD
Instructor in Clinical Medicine (primary appointment)
MD University of MO Columbia 1984
Judy Ann Frain, PHD, BN, MSN
Adjunct Assistant Professor of Medicine (primary appointment)
PHD University of MO St Louis 2013
BN Webster University 2003
MSN Saint Louis University 2004
Victoria J Fraser, MD
Adolphus Busch Professor of Medicine (primary appointment)
Head of the Department of Internal Medicine
MD University of MO Columbia 1983
BS William Woods College 1978
James Matthew Freer, MD
Assistant Professor of Medicine (primary appointment)
BS Truman State University 1998
MD University of MO Columbia 2002
Deborah Frenchie, MD
Instructor in Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1984
MD Washington Univ in St. Louis 1993
Ashley Elizabeth Frith, MD
Assistant Professor of Medicine (primary appointment)
BS Christian Brothers University 2004
MD University of AR Med Sciences 2008
Cassandra Delores-Lamar Fritz, MD
Instructor in Medicine (primary appointment)
BS University of Kansas 2010
MD University of Chicago 2015
Brian R. Froelke, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD University of Cincinnati 2002
Michael Paul Fuller, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Brigham Young University 1990
MD University of Utah 1994
Brian M Fuller, MD
Associate Professor of Emergency Medicine in Medicine (primary appointment)
MD University of California 2003
BA University of California 2005
Suzanne Furesz
Instructor in Clinical Medicine (primary appointment)
G
Gary Gaddis, PHD, MD
Professor of Emergency Medicine in Medicine (Pending Executive Faculty Approval) (primary appointment)
PHD Indiana State University 1984
MD Indiana University School of Medicine 1986
Brian F Gage, MS, MD
Professor of Medicine (primary appointment)
BS Stanford University 1984
MS Stanford University 1995
MD University of California 1988
Daniel Gaitan, MD
Associate Professor of Clinical Medicine (primary appointment)
MD University of Mississippi 1986
BS University of AL Birmingham 1980
Arthur H Gale, MD
Associate Professor of Clinical Medicine (primary appointment)
MD University of Missouri 1959
Jane M. Garbutt, MHS, MBCHB  
Professor of Medicine (primary appointment)  
Professor of Pediatrics  
MHS University of Toronto 1988  
MBCHB Bristol University 1977

John A Garcia, MD, MBA  
Instructor in Clinical Medicine (primary appointment)  
BA Carleton College 1985  
MD University of Illinois 1990  
MBA University of MO St Louis 1998

Jacquelyn B Garrett, MD  
Instructor in Clinical Medicine (Dermatology) (primary appointment)  
BS Howard University 1983  
MD Howard University 1985

Francisco J Garriga, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Washington Univ in St. Louis 1970  
BS University of Puerto Rico 1966

Felicitas Z Gatachalian, MD  
Instructor in Clinical Medicine (primary appointment)  
BS University of Santo Tomas 1970  
MD University of Santo Tomas 1976

Joseph H Gatewood, MD  
Instructor in Emergency Medicine in Medicine (primary appointment)  
MD University of Chicago 1970  
BA Swarthmore College 1966

William M Gee, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Washington Univ in St. Louis 1981  
BA Cornell College 1977

Richard A Geisman, MD  
Instructor in Clinical Medicine (primary appointment)  
BS Saint Louis University 1979  
MD Tulane University 1983

Edward M Geltman, MD  
Professor of Medicine (primary appointment)  
Assistant Professor of Radiology  
BS Mass Inst of Technology (MIT) 1967  
MD New York University 1971

Ige A George, MBBS  
Assistant Professor of Medicine (primary appointment)  
MBBS Christian Medical College 1998

Armin Ghobadi, MD  
Assistant Professor of Medicine (primary appointment)  
MD Iran Univ of Medical Sciences 2001

Matthew John Gibfried, MD  
Instructor in Clinical Medicine (primary appointment)  
MD University of MO Columbia 2003

Stephen James Giddings, PHD, MD  
Associate Professor of Medicine (primary appointment)  
PHD Dartmouth College 1973  
MD University of Rochester 1976  
BA Dartmouth College 1968

Thomas J Girard, PHD  
Assistant Professor of Medicine (primary appointment)  
PHD Iowa State University 1985  
BS Univ of Wisconsin Oshkosh 1979

Margo Renee Girardi, MD  
Assistant Professor of Medicine (primary appointment)  
BS University of Illinois 2001  
MD Saint Louis University 2005

Gardar T Gislason  
Adjunct Instructor in Medicine (primary appointment)

Josephine Lee Aguhob Glaser  
Instructor in Clinical Medicine (primary appointment)

Marye J Gleva, MD  
Professor of Medicine (primary appointment)  
MD University of Washington 1988  
BA Wellesley College 1984

Andrew S Gold, MD  
Instructor in Clinical Medicine (primary appointment)  
MD University of Iowa 1989  
BS University of Illinois 1985

Gregory I Goldberg, MA, PHD  
Professor of Medicine (Dermatology) (primary appointment)  
Professor of Biochemistry and Molecular Biophysics  
MA Moscow State University 1969  
PHD Weizmann Institute of Science 1977

Anne Carol Goldberg, MD  
Professor of Medicine (primary appointment)  
MD University of Maryland 1977  
BA Harvard University 1973

Daniel E Goldberg, MD, PHD  
David M and Paula L Kipnis Distinguished Professor (primary appointment)  
Professor of Molecular Microbiology  
MD Washington Univ in St. Louis 1985  
BA Harvard University 1978  
PHD Washington Univ in St. Louis 1985

Seth Goldberg, MD  
Associate Professor of Medicine (primary appointment)  
BS University of South Florida 1999  
MD University of South Florida 2003

Benjamin M Goldstein, MD  
Associate Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1960
MD Washington Univ in St. Louis 1964

Felicia Ismay Gomez, PHD
Instructor in Medicine (primary appointment)
PHD George Washington University 2015

Maria Cristina Gonzalez-Mayda, MD
Assistant Professor of Medicine (primary appointment)
BS University of Puerto Rico 2004
MD University of Puerto Rico 2008

Daniel M Goodenberger, MD
Professor of Medicine (primary appointment)
MD Duke University 1974
BS University of Nebraska 1970

John Gorcsan III, MD
Professor of Medicine (primary appointment)
MD Pennsylvania State University 1983
BA Lehigh University 1979

Mary Jo Gorman, MBA, MD
Instructor in Clinical Medicine (primary appointment)
MBA Washington Univ in St. Louis 1996
BA Saint Louis University 1981
MD Southern Illinois University 1984

Ramaswamy Govindan, MD
Professor of Medicine (primary appointment)
MD University of Madras 1986

Siddhesh Gowda, MD
Associate Professor of Clinical Medicine (primary appointment)
MD School Not Listed 1970

Gregory Alan Grant, PHD
Professor of Biochemistry in Medicine (Dermatology) (primary appointment)
Professor of Developmental Biology
PHD Univ of Wisconsin Madison 1975
BS Iowa State University 1971

Alfred Greco, MD
Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)
MD University of MO Columbia 1975
BS University of MO St Louis 1971

Jonathan M Green, MD
Professor of Medicine (primary appointment)
Associate Dean for Human Studies
Professor of Pathology and Immunology
BS University of Michigan 1982
MD Wayne State University 1986

Aaron Greenspan
Instructor in Clinical Medicine (primary appointment)

Mark H Gregory, MD
Assistant Professor of Clinical Medicine (primary appointment)

MD University of Vermont 1986
BA University of Vermont 1982

Richard T Griffey Jr, M PH, MD
Associate Professor of Emergency Medicine in Medicine (primary appointment)
M PH Harvard University 2004
MD Norfolk General Hospital 1977

Malachi Griffith, PHD, BS1
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Genetics
PHD University of British Columbia 2010
BS University of Winnipeg 2002
BS1 University of Winnipeg 2002

Obi Lee Griffith, PHD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Genetics
BS University of Winnipeg 2002
PHD British Columbia Open Univ 2008

Scott D. Groesch, MD
Instructor in Clinical Medicine (primary appointment)
BS University of Illinois 1990
MD Washington Univ in St. Louis 1994

John R Groll, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Illinois 1988
BA Illinois Wesleyan University 1984

Richard Warren Gross, PHD, AB, MD
Professor of Medicine (primary appointment)
Professor of Chemistry
Professor of Developmental Biology
PHD Washington Univ in St. Louis 1982
AB Columbia University 1972
MD New York University 1976

Brian Anthony Grus, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Pennsylvania 1992
BS University of Pittsburgh 1988

Guner B Gulmen, MD, PHD
Assistant Professor of Clinical Medicine (primary appointment)
MD School Not Listed 1969
PHD University of Minnesota 1974

Vyjanthanath R. Gunasingham, MD
Instructor in Clinical Medicine (primary appointment)
BS School Not Listed 1975
MD School Not Listed 1982

Mark Cobb Gunby, DOST
Assistant Professor of Clinical Medicine (primary appointment)
BS University of Tulsa 1981
DOST Oklahoma St University 1988
Maria Gurrieri, MD, DIP
Instructor in Clinical Medicine (primary appointment)
MD Catholic University 1989
DIP School Not Listed 1982

Kamal Gursahani, MD, MBA
Associate Professor of Medicine in Emergency Medicine (primary appointment)
BA Columbia University 1997
MD University of MO Columbia 2002
MBA Saint Louis University 2012

Reena Gurung, MD
Instructor in Medicine (primary appointment)
MD Kathmandu University 2007

Alexandra Gutierrez, MD, M PH
Associate Professor of Medicine (primary appointment)
MD Case Western Reserve Univ 2000
M PH Harvard University 2006
BS Brown University 1996

Chandra Prakash Gyawali, MD, MBBS
Professor of Medicine (primary appointment)
MD University of Calicut 1990
MBBS University of Calicut 1985

Ramsey R Hachem, BA1, MD1, MD
Professor of Medicine (primary appointment)
Tracey C Marshall - Dr. Elbert P Trulock Distinguished Professor of Medicine
BA Southern Methodist University 1992
BA1 Southern Methodist University 1992
MD1 University of Texas Southwest 1997

Matthew D Hageman, MD
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1996

Jennifer Christine Hagopian
Adjunct Instructor in Medicine (primary appointment)

Ashfaq H Hakim, MBBS, MD
Instructor in Clinical Medicine (primary appointment)
MBBS RNT Medical College 1968
MD RNT Medical College 1973

Ilia Gueorguev Halatchev, MD
Assistant Professor of Medicine (primary appointment)
MD Oregon Health Science Univers 2007

Sarah Eliza Halcomb, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Royal College of Surgeons 2000

Angela Marie Hall, PHD
Assistant Professor of Medicine (primary appointment)
BS University of MO Columbia 1999
PHD Univ of Minnesota Twin Cities 2005

Ira McCarthy Hall, PHD
Associate Professor of Medicine (primary appointment)
Associate Director of the Genome Center
Associate Professor of Genetics
PHD Cold Spring Harbor Laboratory 2003
BS University of CA Berkeley 1998

Yasir A Hamad, MD
Assistant Professor of Medicine (primary appointment)
MD University of Juba 2004

Stephanie M Hammer, MD
Instructor in Clinical Medicine (primary appointment)

Annie Chamren Harmon, PHD, MS
Instructor in Medicine (primary appointment)
PHD University of Michigan 2016
BA University of Evansville 2004
MS Missouri College 2010

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Assistant Professor of Medicine (primary appointment)
Assistant Professor of Developmental Biology
PHD Washington Univ in St. Louis 2002
BS Brown University 1994
MD Washington Univ in St. Louis 2002

Lydia-Ann Lynell Harris, PHD
Assistant Professor of Medicine (primary appointment)
PHD State University of New York 2011

Jeffrey A Haspel, PHD, MD
Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)
MD Case Western Reserve Univ 2010

Anisa Hassan, MD
Instructor in Clinical Medicine (primary appointment)

Annie Chamren Harmon, PHD, MS
Instructor in Medicine (primary appointment)

Ashfaq H Hakim, MBBS, MD
Instructor in Clinical Medicine (primary appointment)

Anisa Hassan, MD
Instructor in Clinical Medicine (primary appointment)
MD Dow Medical College Karachi 1976

Thomas F Hastings, MD
Instructor in Clinical Medicine (primary appointment)
BA Rockhurst College 1981
MD University of Missouri 1986

Krysta Lynn Heath, MD
Instructor in Medicine (primary appointment)
MD University of AR Med Sciences 2011
James N Heins, MD  
Professor of Clinical Medicine (primary appointment)  
Adjunct Professor of Medicine  
MD University of Louisville 1961  
BA University of Louisville 1957

Laura Elaina Heitsch, MD  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
Assistant Professor of Neurology  
BS University of Illinois 1999  
MD University of Illinois 2005

Jason M Held, PHD  
Assistant Professor of Medicine (primary appointment)  
Assistant Professor of Anesthesiology  
PHD University of San Francisco 2006  
BS Duke University 2001

Jeffrey P. Henderson, MD, PHD  
Associate Professor of Medicine (primary appointment)  
Associate Professor of Molecular Microbiology  
MD Washington Univ in St. Louis 2002  
PHD Washington Univ in St. Louis 2002  
BS Univ of Wisconsin Madison 1994

Katherine Eileen Henderson, MD  
Assistant Professor of Clinical Medicine (primary appointment)  
MD University of Minnesota 1998  
BS Univ of Wisconsin Madison 1993

Kristina Louise Henderson, MD  
Instructor in Clinical Medicine (primary appointment)  
BA Saint Louis University 1982  
MD Saint Louis University 1991

Daniel Robert Herleth  
Instructor in Clinical Medicine (primary appointment)

Catherine Hermann, M ENG, MD  
Instructor in Clinical Medicine (primary appointment)  
BA Truman State University 1992  
M ENG Univ of Southern Mississippi 1993  
MD Washington Univ in St. Louis 2000

Leonel F. Hernandez Aya, MD  
Assistant Professor of Medicine (primary appointment)  
MD Universidad Nacional de Columb 2007

Cynthia Joan Herrick, MD  
Assistant Professor of Medicine (primary appointment)  
MD Washington Univ in St. Louis 2006  
BS Princeton University 2002

Andreas Herrlich, PHD, MD  
Associate Professor of Medicine (primary appointment)  
PHD Freie University 1998  
MD Freie University 1994

Alonso Heudebert, MD  
Instructor in Medicine (primary appointment)  
MD University of South Alabama 2016

Scot G Hickman, MD  
Professor of Medicine (primary appointment)  
MD Washington Univ in St. Louis 1970  
BA Duke University 1966

Stuart T. Higano, MD  
Instructor in Clinical Medicine (primary appointment)  
MD University of Massachusetts 1984

SueLin Ming Hilbert, MD  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
MD University of Utah 2006

Elizabeth Hilliker, MA, MD  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
MA Washington Univ in St. Louis 1970  
BA Washington Univ in St. Louis 1965  
MD Washington Univ in St. Louis 1970

Paul Flack Hintze, MD  
Assistant Professor of Clinical Medicine (primary appointment)  
BS Brigham Young University 1974  
MD University of Utah 1978

Angela Christine Hirbe, MD, PHD  
Assistant Professor of Medicine (primary appointment)  
MD Washington Univ in St. Louis 2009  
BS Washington Univ in St. Louis 2001  
PHD Washington Univ in St. Louis 2009

Grant S. Hoekzema, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Washington Univ in St. Louis 1992

J. Langston Hoffman, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Washington Univ in St. Louis 1999  
BS Univ of Wisconsin Madison 1994

Sandra S Hoffmann, MD  
Instructor in Clinical Medicine (primary appointment)  
MD University of Kansas 1976  
BA University of Kansas 1972

Melissa Louise Hollie  
Instructor in Clinical Medicine (primary appointment)

Christopher Vincent Holthaus, MD  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
MD Saint Louis University 2000

Michael J Holtzman, MD  
Selma and Herman Seldin Professor of Medicine (primary appointment)  
Professor of Cell Biology and Physiology
MD Northwestern University 1975  
BA Northwestern University 1971

**Neal Holzum**  
Instructor in Clinical Medicine (primary appointment)

**Hitoshi Honda**  
Adjunct Assistant Professor of Medicine (primary appointment)

**Bruce Jay Hookerman, MD**  
Assistant Professor Emeritus of Clinical Medicine (Dermatology) (primary appointment)  
BA Dartmouth College 1964  
MD Saint Louis University 1968

**Barbra A Horn, MD**  
Instructor in Clinical Medicine (primary appointment)  
BA Clark University 1975  
MD Washington Univ in St. Louis 1982

**Ian Kerst Hornstra, MD, PHD**  
Associate Professor of Medicine (Dermatology) (primary appointment)  
MD University of MO Kansas City 1986  
PHD University of Florida 1993  
BA University of MO Kansas City 1985

**Timothy Adam Horwedel, PHD**  
Adjunct Instructor in Medicine (primary appointment)  
PHD Northeastern University 2008

**Jianghui Hou, PHD, MS**  
Associate Professor of Medicine (primary appointment)  
PHD Edinburgh University 2003  
BS Nanjing University 1999  
MS Edinburgh University 2000

**Dennis Emil Hourcade, MA, PHD**  
Professor of Medicine (primary appointment)  
MA Harvard University 1974  
BS Mass Inst of Technology (MIT) 1971  
PHD Harvard University 1978

**Stacey L House, MD, PHD**  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
MD University of Cincinnati 2007  
PHD University of Cincinnati 2005  
BS Yale University 1999

**Jacqueline Howard, UNKNOWN**  
Instructor in Clinical Medicine (primary appointment)  
UNKNOWN School Not Listed 1995

**Randall A Howell, MD**  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
MD Kansas State University 1978  
BS Kansas State University 1974

**David Thomas Howell**  
Instructor in Clinical Medicine (primary appointment)

**James J Hsieh, PHD, MD**  
Professor of Medicine (primary appointment)  
PHD John Hopkins University 1995  
MD Taipei Medical University 1990

**Chyi-Song Hsieh, MD, PHD**  
Associate Professor of Medicine (primary appointment)  
Alan A and Edith L Wolff Distinguished Professor  
Associate Professor of Pathology and Immunology  
MD Washington Univ in St. Louis 1996  
PHD Washington Univ in St. Louis 1996

**Fong Fu Hsu, MS, PHD**  
Professor of Medicine (primary appointment)  
BS School Not Listed 1970  
MS Tsinghua University, China 1975  
PHD University of Utah 1986

**Kevin Hsueh, BS1, MD**  
Assistant Professor of Medicine (primary appointment)  
BS Williams College 2003  
BS1 Williams College 2003  
MD New York University 2008

**Raymond J Hu, MD**  
Instructor in Clinical Medicine (primary appointment)  
MD University of Missouri 1982  
BA Saint Louis University 1977

**Yafei Huang, MS, PHD**  
Instructor in Medicine (primary appointment)  
MS Beijing Medical University 2000  
PHD Univ of Texas Med Sch Houston 2007

**Wei-Wei Huang**  
Instructor in Clinical Medicine (Dermatology) (primary appointment)

**John W Hubert, MD**  
Associate Professor of Clinical Medicine (primary appointment)  
MD Washington Univ in St. Louis 1975  
BA Wabash College 1971

**Elizabeth Stack Huebner, MD**  
Assistant Professor of Medicine (primary appointment)  
MD Loyola University Chicago 2000  
BA Washington Univ in St. Louis 1995

**Jing Hughes, MD**  
Instructor in Medicine (primary appointment)  
MD University of Pennsylvania 2009  
BS Stanford University 2002

**Michael Evan Hughes, MS, PHD**  
Assistant Professor of Medicine (primary appointment)  
MS Stanford University 2002  
PHD Harvard University 2007  
BS Stanford University 2002
Benjamin Duane Humphreys, AB, MD, PHD
Professor of Medicine (primary appointment)
Professor of Developmental Biology
AB Harvard University 1991
MD Case Western Reserve Univ 1998
PHD Case Western Reserve Univ 2000

Eva A Hurst, MD
Associate Professor of Medicine (Dermatology) (primary appointment)
MD Washington Univ in St. Louis 2002

Mark Albert Hurt, MD
Instructor in Clinical Medicine (Dermatology) (primary appointment)
MD University of Missouri 1982
BS Southeast Missouri St Univers 1978

Richard G. Ihnat, MD
Instructor in Clinical Medicine (primary appointment)
BS Rutgers University 1987
MD Yale University 1991

Belinda K. Ireland, MD
Adjunct Assistant Professor of Medicine (primary appointment)
MD University of MO Columbia 1976

Warren Isakow, MD
Associate Professor of Medicine (primary appointment)
MD University of the Witwatersra 1998

Eva Susanne Istvan, PHD
Assistant Professor of Medicine (primary appointment)
HHMI Specialist II
PHD University of Texas Southwest 2000
BS University of Houston 1993

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Assistant Professor of Medicine (primary appointment)
BS Washington Univ in St. Louis 1993
MD Northwestern University Med 1998

Daryl Jacobs, ME, MD
Instructor in Clinical Medicine (primary appointment)
ME Carnegie Mellon University 1979
BS Washington Univ in St. Louis 1977
MD Washington Univ in St. Louis 1983

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Instructor in Clinical Medicine (primary appointment)
BA Vanderbilt University 1965
MD Louisiana St Univ Hlth Sci 1969

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Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1985

BS Rhodes College 1981

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MD Washington Univ in St. Louis 2005
BS Johns Hopkins University 1996
PHD Washington Univ in St. Louis 2005

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MBBS Maulana Azad Medical College 1986

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MD University of Iowa 1988
BS University of Iowa 1984
JD Saint Louis University 2004

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Associate Professor of Medicine (primary appointment)
Associate Professor of Pathology and Immunology
MD Northwestern University 1999
PHD Northwestern University 1998
BA University of California 1990

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Associate Professor of Medicine (primary appointment)
MD Damascus U. Medical School 1993

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Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)
MBCHB University of Baghdad 2001
M PH Saint Louis University 2008

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Instructor in Clinical Medicine (primary appointment)
BA University of Texas Austin 1990
MD Saint Louis University 1994

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Assistant Professor of Medicine (primary appointment)
MD Government Medical College 2002

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Instructor in Medicine (primary appointment)
BS University of Chicago 2000
MD University of Chicago 2008
BA University of Chicago 2000
PHD University of Chicago 2006

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Professor of Medicine (primary appointment)
MA Washington Univ in St. Louis 1990
BA Washington Univ in St. Louis 1972
PHD Washington Univ in St. Louis 1993

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Assistant Professor of Medicine (primary appointment)
BS Michigan State University 1991
PHD Vanderbilt University 1997

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Professor of Medicine (primary appointment)
MS University of Texas Austin 1990
MD University of Vermont 2000
PHD University of Texas Austin 1992

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Instructor in Medicine (primary appointment)
MD Washington Univ in St. Louis 2016

Xuntian Jiang, PHD
Assistant Professor of Medicine (primary appointment)
PHD China Pharmaceutical Univ 1992

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MD University of Illinois 1967

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Instructor in Medicine (primary appointment)
MD Washington Univ in St. Louis 2016

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PHD China Pharmaceutical Univ 1992

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Assistant Professor of Clinical Medicine (primary appointment)
MD University of Illinois 1967

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Instructor in Medicine (primary appointment)
PHD University of Minnesota 2010
BS University of Saint Thomas 2002
MD University of Minnesota 2012

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Assistant Professor of Medicine (primary appointment)
MD Univ of Wisconsin Madison 1999

William F Johnson
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Assistant Professor of Emergency Medicine in Medicine (primary appointment)
BS1 Morehouse College 1996
MD Howard University College of M 2002
BE Georgia Tech 1996

Heather Jones, MD
Assistant Professor of Medicine (Dermatology) (primary appointment)
BS Michigan State University 2007
MD University of Texas Galveston 2011

Amy M Joseph, MD
Professor of Medicine (primary appointment)
MD Vanderbilt University 1986
BA Johnston Community College 1977

Barbara Jost, MD, MS
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1997
MS Northwestern University 1995
BS University of Missouri 1993

Randall S Jotte, MD
Associate Professor of Emergency Medicine in Medicine (primary appointment)
MD Harvard University 1987

Karen Ellen Joynt Maddox, MD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Social Work
MD Duke University 2004
BA Princeton University 2000

K

Brad S Kahl, MD
Professor of Medicine (primary appointment)
MD Tufts University 1994
BS University of Wisconsin-Madison 1989

Caroline Holleck Kahle, MD
Assistant Professor of Medicine (primary appointment)
MD University of North Carolina 2006

Vinay Gopal Kamat, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Pennsylvania 1994

Sona Sharad Kamat
Instructor in Clinical Medicine (primary appointment)

Deborah Shipley Kane, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD University of MO Kansas City 2006
BA University of MO Kansas City 2006

Patricia F Kao, MS2, MD, BE
Associate Professor of Medicine (primary appointment)
MS2 Ohio State University 1997
MD Case Western Reserve Univ 2001
BE Princeton University 1994

Robert S Karsh, MD
Professor of Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1952
BA Washington Univ in St. Louis 1951

Andrew M. Kates, MD
Professor of Medicine (primary appointment)
BS Tufts University 1990
MD Tufts University 1994

Shashi Krishna Katukoori, MS, MD
Instructor in Medicine (primary appointment)
BS Kakatiya Medical College 2004
MS Eastern Kentucky University 2010
MD Saint Louis University 2011

David A Katzman, MD
Instructor in Clinical Medicine (primary appointment)
BA Brown University 1986
MD Saint Louis University 1991

Andrew L. Kau, PHD, MD
Assistant Professor of Medicine (primary appointment)
PHD Washington St University 2006
BS Emory University 1998
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MD Washington Univ in St. Louis 2006
Charles Kaufman, PHD, MD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Developmental Biology
PHD University of Chicago 2003
BA Washington Univ in St. Louis 1997
MD University of Chicago 2005
Robert L Kaufman, MD
Assistant Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1959
MD Washington Univ in St. Louis 1963
Elizabeth Jane Keath, PHD
Assistant Professor of Medicine (primary appointment)
BA University of MO St Louis 1978
BA University of MO St Louis 1978
PHD Saint Louis University 1985
Dalius Kedainis, MD
Instructor in Clinical Medicine (primary appointment)
MD Kaunas University of Medicine 1998
Eirini Kefalogianni, PHD
Instructor in Medicine (primary appointment)
PHD University of Athens 2007
BS University of Athens 2002
Jesse Wade Keller, MD
Instructor in Medicine (primary appointment)
BS University of Tulsa 2005
MD Johns Hopkns University Medic 2009
Daniel P Kelly, MD
Adjunct Professor of Medicine (primary appointment)
BS University of Illinois 1978
MD University of Illinois 1982
Charlotte J Kennedy, MD, PHD
Assistant Professor of Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1992
BA Agnes Scott College 1984
PHD Washington Univ in St. Louis 1992
Joseph L Kenzora, MD
Associate Professor of Medicine (primary appointment)
MD University of New Mexico 1975
Martin Hurley Kerrigan, MD
Assistant Professor of Medicine (primary appointment)
BS Saint Josephs University 2001
MD Jefferson Medical College 2005
Ahmed Sultan Khan
Adjunct Instructor in Medicine (primary appointment)
Thomas B Kibby, MD, MPH
Instructor in Emergency Medicine in Medicine (primary appointment)
MD Eastern Virginia Med School 1979

MD Washington Univ in St. Louis 2006
George Kichura, MD
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1993
Daniel Jason Kichura, MD
Instructor in Medicine (primary appointment)
BA Indiana University 2008
MD Israel Institute of Technology 2012
Mary Kiehl, MD, AS
Assistant Professor of Clinical Medicine (primary appointment)
MD University of California 1990
AS Long Beach City College 1976
BA University of California 1985
Kenneth Richard Kilian, MD
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1984
BS Saint Louis University 1980
Charles John Kilo, MD
Instructor in Clinical Medicine (primary appointment)
BA University of Kansas 1987
MD Washington Univ in St. Louis 1991
Alfred Kim, PHD, MD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Pathology and Immunology
PHD Drexel University 2005
MD Drexel University 2005
BA University of Pennsylvania 1996
Albert J Kim, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Northwestern University 2009
BS University of Chicago 2005
Brian Kim, MD
Assistant Professor of Medicine (Dermatology) (primary appointment)
Assistant Professor of Anesthesiology
Assistant Professor of Pathology and Immunology
BS Haverford College 2001
MD University of Washington 2007
Sun-Joong Kim, PHD
Instructor in Medicine (primary appointment)
PHD Korea University 2012
BS Hannam University 2004
Miriam Yunhee Kim, MD
Instructor in Medicine (primary appointment)
MD Seoul National University 2008
BS Yonsei University 2004
Helen Young Kim-James, MD
Instructor in Clinical Medicine (Dermatology) (primary appointment)  
MD Washington Univ in St. Louis 2001  
BA Southern Methodist University 1997  

Rosa Anne Kincaid, MD  
Instructor in Clinical Medicine (primary appointment)  
BA City College 1970  
MD Temple University 1984  

Donald Kevin King, MD  
Assistant Professor of Clinical Medicine (primary appointment)  
MD Johns Hopkns University Medic 1970  
BA Fairfield University 1966  

Tinna P King  
Instructor in Clinical Medicine (primary appointment)  
BA University of Missouri 1988  

Kevin Patrick King, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Saint Louis University 2006  

Erik Paul Kirk, PhD, MS  
Adjunct Assistant Professor of Medicine (primary appointment)  
PHD University of Kansas 2004  
BS Drury College 1999  
MS University of Kansas 2001  

Nigar Kirmani, MD  
Professor of Medicine (primary appointment)  
MD King Edward Medical College 1973  

Sameer M. Kirtane, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Jefferson Medical College 2008  

Michael K Klebert, PhD, MSN, BN  
Instructor in Medicine (primary appointment)  
PHD University of MO St Louis 2008  
MSN University of Texas Austin 1987  
BA Southern Illinois University 1979  
BN Southern Illinois University 1981  

Robert E Kleiger, MD  
Professor of Medicine (primary appointment)  
MD Harvard University 1960  
BA Yale University 1956  

Samuel Klein, MD, MS  
Danforth Professor of Medicine (primary appointment)  
Professor of Cell Biology and Physiology  
MD Temple University 1979  
BA Brandeis University 1974  
MS Mass Inst of Technology (MIT) 1984  

Robyn Sue Klein, MD, PhD, MS  
Professor of Medicine (primary appointment)  
Professor of Neuroscience  
Professor of Pathology and Immunology  

Vice Provost and Assoc Dean of Graduate Medical Education  
BA Barnard College 1985  
MD Albert Einstein College of Med 1993  
PHD Albert Einstein College of Med 1993  
MS Albert Einstein College of Med 1990  

Linda Marie Klutho, MD  
Instructor in Clinical Medicine (primary appointment)  
MD University of Missouri 1984  
BA Washington Univ in St. Louis 1980  

Paula J Knapp-Baker  
Instructor in Clinical Medicine (primary appointment)  

Eric Knoche, MD  
Assistant Professor of Medicine (primary appointment)  
BS Davidson College 2001  
MD Washington Univ in St. Louis 2006  

Kathryn Knoop, PHD  
Instructor in Medicine (primary appointment)  
BS Drake University 2006  
PHD Emory University 2011  

Carolyn Koenig, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Saint Louis University 2002  

Adam C Koertner  
Instructor in Clinical Emergency Medicine in Medicine (primary appointment)  

Nita Kohli, MD, M PH  
Assistant Professor of Medicine (Dermatology) (Pending Executive Faculty Approval) (primary appointment)  
MD Louisiana St University 2004  
BS University of New Orleans 2000  
BA University of New Orleans 2000  
M PH Louisiana St University 2004  

Ismail Kola, PHD, UNKNOWN  
Adjunct Professor of Medicine (primary appointment)  
BS Rhodes College 1982  
PHD School Not Listed 1985  
UNKNOWN Rhodes College 1982  

Marin H Kollef, MD  
Professor of Medicine (primary appointment)  
MD University of Rochester 1983  
BS US Military Academy 1979  

Hermann M Koller, MD  
Instructor in Medicine (primary appointment)  
BS Stanford University 1974  
MD Washington Univ in St. Louis 1978  

Sri Devi Kolli, MBBS  
Instructor in Clinical Medicine (primary appointment)  
MBBS Guntur Medical College 1989  

Mary E. Koly, MD
Instructor in Clinical Medicine (primary appointment)
MD University of MO Kansas City 1995
BA University of MO Kansas City 1995
Kevin L Konzen, MD
Assistant Professor of Clinical Medicine (primary appointment)
MD University of Illinois 1984
BA University of Notre Dame 1980
Robert G Kopitsky, MD
Assistant Professor of Clinical Medicine (primary appointment)
BS Emory University 1978
MD Duke University 1982
Kevin Marc Korenblat, MD
Professor of Medicine (primary appointment)
MD Washington Univ in St. Louis 1996
Phillip E Korenblat, MD
Professor of Clinical Medicine (primary appointment)
MD University of Arkansas 1960
BA University of Arkansas 1957
Stuart A Kornfeld, MD
David C and Betty Farrell Professor of Medicine (primary appointment)
Professor of Biochemistry and Molecular Biophysics
BA Dartmouth College 1958
MD Washington Univ in St. Louis 1962
Alex H Kosloff, MD
Instructor in Clinical Medicine (primary appointment)
BS Washington Univ in St. Louis 1975
MD Saint Louis University 1980
Sandor J Kovacs, MS, PHD, MD
Professor of Medicine (primary appointment)
Adjunct Professor of Physics
Professor of Biomedical Engineering
Professor of Cell Biology and Physiology
MS California Institute Technolo 1972
PHD California Institute Technolo 1977
BS Cornell University 1969
MD University of Miami 1979
Attila Kovacs, MD
Associate Professor of Medicine (primary appointment)
BS School Not Listed 1981
MD Semmelweis University of Med 1985
Mark S Krasnoff, MD
Instructor in Clinical Medicine (primary appointment)
BA Amherst College 1987
MD Johns Hopkins University Medic 1991
Ronald J Krone, MD
Professor of Medicine (primary appointment)
John E Simon Scholar in Medicine
BS University of Michigan 1962
MD University of Chicago 1966
Elaine Susan Krul, PHD
Adjunct Associate Professor of Medicine (primary appointment)
BS McGill University 1977
PHD McGill University 1982
Thomas Kuciejczyk-Kernan, MD
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1986
BS University of Illinois 1982
Ralph F Kuhlman, MD
Assistant Professor of Clinical Medicine (primary appointment)
MD University of Illinois 1964
Frederick Matthew Kuhlmann, MD
Assistant Professor of Medicine (primary appointment)
MD Emory University 2002
BS Emory University 1998
Anthony Kulczycki Jr, MD
Associate Professor of Medicine (primary appointment)
Associate Professor of Molecular Microbiology
MD Harvard University 1970
BA Princeton University 1966
Hrishikesh Satish Kulkarni, MBBS
Instructor in Medicine (Pending Dean's Approval) (primary appointment)
MBBS Seth G.S. Medical College 2009
Robin A. Kundra, BS1, MD, PHD
Instructor in Clinical Medicine (primary appointment)
BS University of Georgia 1992
BS1 University of Georgia 1992
MD Washington Univ in St. Louis 2000
PHD Washington Univ in St. Louis 2000
David L. Kuperman, MD
Instructor in Clinical Medicine (primary appointment)
BA Hendrix College 1997
MD University of Arkansas 2001
Howard I. Kurz, MEE, BS1, MD
Professor of Medicine (primary appointment)
MEE Princeton University 1980
BS1 Mass Inst of Technology (MIT) 1979
MD New York Medical College 1984
BS Mass Inst of Technology (MIT) 1979
Vladimir Kushnir, MD
Associate Professor of Medicine (primary appointment)
MD Ohio State University 2006
BS University of Utah 2002
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Assistant Professor of Medicine (primary appointment)
DOST Chicago Coll of OsteopathicMed 2009
BS Univ of IL -Urbana-Champaign 2005
George B Kyei, MD, MS, PHD
Assistant Professor of Medicine (primary appointment)
MD University of Ghana Medical Sc 1998
MS University of Ghana Medical Sc 2003
PHD University of New Mexico 2007

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Associate Professor of Medicine (primary appointment)
BS Columbia University 2000
M PHIL Columbia University 2005
MS Columbia University 2001
PHD Columbia University 2007
MA Columbia University 2004

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MS Osmania Medical College 1971

Michael A. Lane, MD, MS
Assistant Professor of Medicine (primary appointment)
MD Drexel University 2004
BA Colgate University 1995
MS John Hopkins University 2000

Gabriel David Lang, MD
Assistant Professor of Medicine (primary appointment)
BA Northwestern University 2004
MD University of Illinois Chicago 2009

Gregory Mark Lanza, MS, MD, PHD
Oliver M Langenberg Distinguished Professor of Science and Practice of Medicine (primary appointment)
James R Hornsby Family Professor in Biomedical Sciences
Professor of Biomedical Engineering
BA Colby College 1975
MS University of Georgia 1978
MD Northwestern University 1992
PHD University of Georgia 1981

Gina N LaRossa, MD
Assistant Professor of Medicine (primary appointment)
MD Yale University 2007
BA Yale University 2001

Shane Joseph LaRue, MD
Assistant Professor of Medicine (primary appointment)
MD Medical College of Wisconsin 2005

John M Lasala, MD, PHD
Professor of Medicine (primary appointment)
Professor of Surgery (Cardiothoracic Surgery)
MD University of Connecticut 1983
BA Drew University 1975
PHD Saint Louis University 1979

Steven A Lauter, MD
Associate Professor of Medicine (primary appointment)
BS Wayne State University 1967
MD Wayne State University 1971

Kory J. Lavine, PHD, MD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Developmental Biology
PHD Washington Univ in St. Louis 2008
MD Washington Univ in St. Louis 2008
BS University of Rochester 2001

Steven Jay Lavine, MD
Professor of Medicine (primary appointment)
BA Temple University 1972
MD Temple University 1976

Steven J Lawrence, MS, MD
Associate Professor of Medicine (primary appointment)
BS Rose Hulman Institute 1992
MS University of London 2004
MD Washington Univ in St. Louis 1997

Kim Lynette Lee, MD
Instructor in Clinical Medicine (primary appointment)
BS Washington Univ in St. Louis 1979
MD Saint Louis University 1983

Eileen May Lee, MD
Assistant Professor of Medicine (primary appointment)
MD University of Iowa 2006
BA University of Iowa 2002

Caroline Martz Lee, PHD, MD
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BS Knox College 2003
PHD University of North Carolina 2009
MD University of North Carolina 2011

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BA Texas Tech University 1977
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Professor of Medicine (primary appointment)
MD University of Tenn Memphis 1988
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Associate Professor of Pathology and Immunology
PHD1 University of Chicago 1995
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MD1 University of Chicago 1998
BA Wittenberg University 1990
MD University of Chicago 1998

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BA Washington Univ in St. Louis 1991

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MD University of Miami 1976

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BA Drake University 1974
MD Washington Univ in St. Louis 1978

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Associate Professor of Medicine (primary appointment)
MD State Univ of NY Buffalo 1999

Shunqiang Li, PHD
Assistant Professor of Medicine (primary appointment)
PHD Chinese Academy of Med Science 1999

Li Li, MD, PHD
Instructor in Clinical Medicine (primary appointment)
MD Shanghai Medical University 1988
PHD Loyola University Chicago 1998

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Assistant Professor of Medicine (primary appointment)
PHD Texas Tech University 2006
MD Southeast U Medical School 1995
M PH Fudan University 1999

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Assistant Professor of Medicine (primary appointment)
BA1 Cornell University 1998
MD University of Maryland 2004
BA Cornell University 1998

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Instructor in Clinical Medicine (primary appointment)
MD State Univ of NY Buffalo 1993

Stephen Bradley Lillard, MD
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MD Univ of Health Sciences KC 1970

Kian-Huat Lim, PHD, MD
Assistant Professor of Medicine (primary appointment)
PHD Duke University 2006
MD National Taiwan University 1999

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BA Harvard University 1990

Kathryn Jesseca Lindley, MD
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MD Emory University 2007
BS University of Illinois 2003

Brian Richard Lindman, MD, MA
Adjunct Associate Professor of Medicine (primary appointment)
MD Vanderbilt University 2003
MA Reformed Theological Seminary 2001
BS Duke University 1997

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Professor of Pathology and Immunology
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Professor of Medicine (primary appointment)
BA State University of New York 1973
MD State University of New York 1977

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Professor of Medicine (primary appointment)
MD National Autonomous U of Mex 1980

Mary Kathryn Liszewski
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BA University of MO St Louis 1971

Patricia Elizabeth Litkowski, MD
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MD Washington Univ in St. Louis 2013

Adam Daniel Littich, MD
Assistant Professor of Medicine (primary appointment)
MD Saint Louis University 2009

Marina Litvin, MD
Assistant Professor of Medicine (primary appointment)
BA Washington Univ in St. Louis 2003
MD University of MO Columbia 2008

Jianmei Liu, MS, MD
Instructor in Clinical Medicine (primary appointment)
MD Shanghai Medical University 1987
MD Shanghai Medical University 1984

Xinping Liu, MS, PHD
Instructor in Medicine (primary appointment)
MS Southeast Missouri St Univers 1999
BS School Not Listed 1986
PHD Washington Univ in St. Louis 2005

Lin Liu, PHD, A, BAS
Instructor in Medicine (primary appointment)
Adam Edward Locke, PHD
Assistant Professor of Medicine (primary appointment)
PHD Emory University 2010
BA Lawrence University 2003
Irfan J Lodhi, PHD, MS
Assistant Professor of Medicine (primary appointment)
PHD University of Michigan 2007
MS Wayne State University 1996
BS University of Michigan 1993
Beverly A Logan-Morrison, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1982
BA Webster University 1976
Andrea Loiselle, M PH, MD
Assistant Professor of Medicine (primary appointment)
M PH California State University 1999
MD Drexel University 2005
BS University of California 1995
Gregory D Longmore, MD, MS
Professor of Medicine (primary appointment)
Professor of Cell Biology and Physiology
MD McGill University 1983
BS University of Western Ontario 1977
MS University of Toronto 1979
Dwight C Look, MD
Professor of Medicine (primary appointment)
MD University of MO Kansas City 1985
BA University of MO Kansas City 1985
James F Loomis Jr, MBA, MD
Instructor in Clinical Medicine (primary appointment)
MBA Washington Univ in St. Louis 1997
BA Hendrix College 1981
MD University of Arkansas 1985
Herbert Lubowitz, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Clark University 1954
MD Washington Univ in St. Louis 1958
Philip A Ludbrook, MBBS
Professor Emeritus of Medicine (primary appointment)
Professor Emeritus of Psychiatry
BS School Not Listed 1957
MBBS University of Adelaide 1963
Kenneth M Ludmerer, MA, MD
Professor of Medicine (primary appointment)
Mabel Dorn-Reeder Distinguished Professor of the History of Medicine
MA Johns Hopkins University 1971
MD Johns Hopkins University 1973
BA Harvard University 1968
Lauren Michelle Ludwig Lee, MD
Instructor in Clinical Medicine (primary appointment)
MD University of MO Kansas City 2008
Susan L Luedke, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Rochester 1972
Barbara A Lutey, MD, MLS
Assistant Professor of Medicine (primary appointment)
MD University of Iowa 1999
MLS Indiana University Bloomington 1983
BA Indiana University Bloomington 1982
John P Lynch, MD
Professor of Medicine (primary appointment)
MD Georgetown University 1989
BA Saint Louis University 1983
Christopher Raymond Lynch
Instructor in Clinical Medicine (primary appointment)
Alan P Lyss, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1972
MD Washington Univ in St. Louis 1976
Carl A Lyss, MD
Assistant Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1952
MD Washington Univ in St. Louis 1956
BS Washington Univ in St. Louis 1952
M
Liang Ma, PHD
Associate Professor of Medicine (Dermatology) (primary appointment)
Associate Professor of Developmental Biology
PHD University of CA Los Angeles 1995
BA University of CA Berkeley 1989
Cynthia Xiuguang Ma, MD, PHD
Professor of Medicine (primary appointment)
MD Beijing Medical University 1990
PHD University of Cincinnati 1997
Ningning Ma, MD
Instructor in Medicine (primary appointment)
MD Case Western Reserve Univ 2013
BA Washington Univ in St. Louis 2009
Jessica E Ma, MD
Instructor in Medicine (primary appointment)
MD Texas A&M University 2014
Hongming Ma, PHD, MS
Instructor in Medicine (primary appointment)
Julie Kathleen MacPhee, MD
Instructor in Clinical Medicine (primary appointment)
BA Qufu Normal University 1993
PhD Ocean University of China, Qin 2004
MS Fudan University 1996

Thomas M Maddox, MD, MS
Professor of Medicine (primary appointment)
BA Rice University 1993
MD Emory University 1999
MS Harvard University 2007

Blair B Madison, PHD
Assistant Professor of Medicine (primary appointment)
PhD University of Michigan 2005
BS Washington Univ in St. Louis 1998

William Edwin Magee, MD
Associate Professor of Clinical Medicine (primary appointment)
MD Duke University 1950

Leonard B Maggi Jr, PHD, BA1
Assistant Professor of Medicine (primary appointment)
PhD Saint Louis University 2001
BA Cornell College 1995
BA1 Cornell College 1995

Jambunathan Mahadevan
Instructor in Clinical Medicine (primary appointment)

Christopher A Maher, PHD
Associate Professor of Medicine (primary appointment)
Assistant Director of The Genome Institute
PhD Stony Brook School of Medicine 2006

Nicole Maher, PHD
Assistant Professor of Medicine (primary appointment)
PhD Case Western Reserve Univ 2007
BA Ithaca College 1998

Mohamed Mahjoub, PHD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Cell Biology and Physiology
PhD Simon Fraser University 2007
BS Simon Fraser University 2002

Robert John Mahoney, MD
Associate Professor of Medicine (primary appointment)
BA Princeton University 1993
MD Washington Univ in St. Louis 1997

Elaine Michelle Majerus, MD, PHD
Professor of Medicine (primary appointment)
Professor of Cell Biology and Physiology
MD Saint Louis University 1998
BS Washington Univ in St. Louis 1986
PHD Washington Univ in St. Louis 1994

BA Washington Univ in St. Louis 1986

Majesh Makan, MD
Professor of Medicine (primary appointment)
MD Univ of Panama School of Med 1984

Mohsin Ilyas Malik, MBBS
Instructor in Clinical Medicine (primary appointment)
MBBS Army Medical College 1999

Andrew F. Malone, MBCHB1
Assistant Professor of Medicine (primary appointment)
BA Trinity College Dublin 2000
MBCHB1 Royal College of Surgeons 2005

Kartik Mani, MBBS
Assistant Professor of Medicine (primary appointment)
MBBS Delhi University 1998

Shivaprasad Gowda Manjappa, MBBS, MD
Instructor in Clinical Medicine (primary appointment)
MBBS Medical College of India 2004
MD University of Illinois 2011

Caroline Mann, MD, MS
Associate Professor of Medicine (Dermatology) (primary appointment)
MD Indiana University Bloomington 1993
MS Sarah Lawrence College 1988
BS Indiana University Bloomington 1986

Douglas L. Mann, MD
Tobias and Hortense Lewin Professor of Medicine (primary appointment)
Professor of Cell Biology and Physiology
MD Temple University 1979
BA Lafayette College 1973

Sarah K Margolis, MD
Associate Professor of Clinical Medicine (primary appointment)
MD State University of New York 1989
BA Barnard College 1984

Jonas Marschall, MD
Adjunct Assistant Professor of Medicine (primary appointment)
MD University of Basel 1996

Jay Phillips Marshall II, MD
Assistant Professor of Clinical Medicine (primary appointment)
BA De Paul University 1968
MD University of Missouri 1972

Ann G Martin, MD
Associate Professor of Medicine (Dermatology) (primary appointment)
MD Case Western Reserve Univ 1981
BS University of Notre Dame 1977

Thomas F Martin, MD
Associate Professor of Clinical Medicine (primary appointment)
BS Saint Louis University 1961
MD Saint Louis University 1965

**Wade H Martin III, MD**
Associate Professor of Medicine (primary appointment)
BA University of Kansas 1973
MD University of Kansas 1977

**Nathan Russell Martin, MD**
Assistant Professor of Medicine (primary appointment)
BA University of Pennsylvania 2001
MD University of Texas Southwest 2005

**Jerald Arthur Maslanko, MD**
Instructor in Clinical Medicine (primary appointment)
MD Emory University 1975

**Mary Vest Mason, MBA, MD**
Instructor in Clinical Medicine (primary appointment)
MBA Washington Univ in St. Louis 1999
BS University of Illinois 1990
MD Washington Univ in St. Louis 1994

**Joan Alice Mass, MD**
Assistant Professor of Clinical Medicine (primary appointment)
MD Temple University 1977
BA Washington Univ in St. Louis 1971

**Stanley Mathew, MBBS**
Instructor in Clinical Medicine (primary appointment)
MBBS Kerala University 1991

**Anthony J-P Mattaline, DOST**
Assistant Professor of Clinical Medicine (primary appointment)
DOST School Not Listed 1985
BS Northeast Missouri St Univrsy 1981
BA St Edwards University 1979

**Caline Mattar, MD**
Assistant Professor of Medicine (primary appointment)
MD American University of Beirut 2010
BS American University of Beirut 2006

**Henry E Mattis, MD**
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1975
BS University of Illinois 1971

**Kara H Mayes**
Instructor in Clinical Medicine (primary appointment)

**Gabriel Mbalaviele, MA, PHD**
Associate Professor of Medicine (primary appointment)
MA School Not Listed 1987
PHD University of Paris 1992

**Timothy Joseph McCann, MD**
Instructor in Clinical Medicine (primary appointment)
MD American Univ of the Caribbean 1984
BS Saint Louis University 1980

**Donte D McClary, MD**
Instructor in Clinical Medicine (primary appointment)

**MD Meharry Med College 1998**
BS Xavier University 1993

**Kyle Stephan McCommis, PHD**
Assistant Professor of Medicine (primary appointment)
PHD University of MO Columbia 2013
BS University of Kansas 2006

**William H. McCoy IV, MD, BS1, PHD**
Instructor in Medicine (primary appointment)
MD Washington Univ in St. Louis 2013
BS1 University of Pittsburgh 2002
PHD Washington Univ in St. Louis 2013
BS University of Pittsburgh 2002

**Leslie Rose McCrery-Etuk, MD**
Instructor in Clinical Medicine (primary appointment)
MD New York Medical College 2001

**Jay R. McDonald, MD**
Assistant Professor of Medicine (primary appointment)
BA Duke University 1991
BS Portland St University 1994
MD Oregon Health Science Univers 1998

**Debra Ann McDonnell, DPT, MS, AS**
Associate Professor of Emergency Medicine in Medicine (primary appointment)
Associate Professor of Orthopaedic Surgery
Associate Professor of Physical Therapy
DPT Washington Univ in St. Louis 2005
MS Washington Univ in St. Louis 1990
AS Oakton Community College 2000
BS Washington Univ in St. Louis 1990

**Cheryl Riddle McDonough, MD**
Assistant Professor of Medicine (primary appointment)
BS Vanderbilt University 1997
MD University of Tennessee 2001

**Colleen McEvoy, MD**
Assistant Professor of Medicine (primary appointment)
MD University of MO Columbia 2008
BS Fairfield University 2004

**Janet B McGill, MD, MA**
Professor of Medicine (primary appointment)
MD Michigan State University 1979
BS University of Michigan 1972
MA Northern Michigan University 1980

**Oliver McKee, MD**
Instructor in Clinical Medicine (Dermatology) (primary appointment)
BA McGill University 1975
MD School Not Listed 1981

**Clark R McKenzie, MD**
Instructor in Clinical Medicine (primary appointment)
BA University of Missouri 1989
Robert M McMahon, JD, MD
Instructor in Clinical Medicine (primary appointment)
JD University of California 1974
MD Washington Univ in St. Louis 1989
BA University of California 1971

Amy McQueen, PHD, MA
Associate Professor of Medicine (primary appointment)
PHD University of Houston 2002
MA University of Houston 1999
BA University of CA San Diego 1996

Gerald Medoff, MD
Professor Emeritus of Medicine (primary appointment)
BA School Not Listed 1958
MD Washington Univ in St. Louis 1962

Neha Mehta-Shah, MD
Assistant Professor of Medicine (primary appointment)
MD Northwestern University Med 2009
BA Northwestern University 2005

Anibal G Melo, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1991

Gary Jay Meltz, MD
Instructor in Clinical Medicine (primary appointment)
BA University of Missouri 1972
MD University of Miami 1977

Robert S Mendelsohn, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Washington & Lee 1950
MD Washington Univ in St. Louis 1954

Ronald L Mera, MD
Instructor in Clinical Medicine (primary appointment)
BS School Not Listed 1970
MD School Not Listed 1976

Claire Elizabeth Meyer, MD
Assistant Professor of Medicine (primary appointment)
BS Roanoke College 2004
MD Washington Univ in St. Louis 2009

Rabya Mian, MBBS
Instructor in Clinical Medicine (primary appointment)
MBBS King Edward Medical College 1999

Scott Micek, MD
Adjunct Instructor in Medicine (primary appointment)
MD University of Iowa 1999

Gina Michael, MD
Instructor in Clinical Medicine (primary appointment)
MD Duke University 1982
BS University of Missouri 1978

William Samuel Micka, MD
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 2003
BA Saint Louis University 1999

Brent William Miller, MD
Professor of Medicine (primary appointment)
MD Washington Univ in St. Louis 1990
BS Stanford University 1986

Charles William Miller, MD
Assistant Professor of Clinical Medicine (Dermatology) (primary appointment)
BS School Not Listed 1968
MD Washington Univ in St. Louis 1972

Lara Elizabeth Miller, DOST
Instructor in Clinical Medicine (primary appointment)
BS Carleton College 1996
DOST Midwestern University 2000

Mark James Miller, PHD
Associate Professor of Medicine (primary appointment)
Associate Professor of Pathology and Immunology
PHD University of California 1996
BS University of California 1991

Heidi B Miller, MD
Instructor in Clinical Medicine (primary appointment)
MD Harvard University 2000
BS Yale University 1994

Christopher A Miller, BS1, PHD
Assistant Professor of Medicine (primary appointment)
BS1 Truman State University 2005
PHD Baylor University 2011
BS Truman State University 2005

Jeffrey R Millman, PHD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Biomedical Engineering
PHD Mass Inst of Technology (MIT) 2011
BS North Carolina State Universit 2005

Jason C Mills, PHD, MD1, MD, AB
Professor of Medicine (primary appointment)
Professor of Developmental Biology
Professor of Pathology and Immunology
BA Washington Univ in St. Louis 1989
PHD University of Pennsylvania 1997
MD1 University of Pennsylvania 1997
MD University of Pennsylvania 1997
AB Washington Univ in St. Louis 1989

Graeme Mindel, MS, MBBCH
Instructor in Clinical Medicine (primary appointment)
MS University of the Witwatersra 1992
MBBCH University of the Witwatersra 1992

Jeffrey H Miner, PHD
Professor of Medicine (primary appointment)
Professor of Cell Biology and Physiology
PHD California Institute Technolo 1991
BA Northwestern University 1985
Jonathan J Miner, MD, PHD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Molecular Microbiology
Assistant Professor of Pathology and Immunology
MD University of Oklahoma 2010
BS Brigham Young University 2002
PHD University of Oklahoma 2008
Joshua Delbert Mitchell, MD, BE
Assistant Professor of Medicine (Pending Executive Faculty approval) (primary appointment)
MD University of Texas Southwest 2008
BE John Hopkins University 2000
Makedonka Mitreva, MS, PHD
Associate Professor of Medicine (primary appointment)
Associate Professor of Genetics
MS University of Skopje - Macedon 1994
PHD Wageningen University 2001
BS University of Skopje - Macedon 1990
Bettina Mittendorfer, MS, PHD
Professor of Medicine (primary appointment)
MS University of Vienna 1999
PHD University of Texas Austin 1999
Mahshid Mohseni, MD
Instructor in Medicine (primary appointment)
Instructor in Orthopaedic Surgery
MD Isfahan U of Medical Sciences 2004
C. Scott Molden, MD
Instructor in Clinical Medicine (primary appointment)
MD Case Western Reserve Univ 1972
BA De Paul University 1968
Hector D Molina-Vicent, MD
Associate Professor of Medicine (primary appointment)
Associate Professor of Pathology and Immunology
BS University of Puerto Rico 1982
MD University of Puerto Rico 1985
Jennifer Marie Monroy, MD
Assistant Professor of Medicine (primary appointment)
MD Univ Texas Health Science Ctr 2008
BS Incarnate Word College 2003
Austin F Montgomery, MD
Instructor in Clinical Medicine (primary appointment)
BS University of Missouri 1952
MD University of Pittsburgh 1954
BA Washington Univ in St. Louis 1950
Sung Ho Moon, PHD, MS
Instructor in Medicine (primary appointment)
PHD Washington Univ in St. Louis 2006
MS Yonsei University 1999
BS Yonsei University 1997
Nathan Moore, MD
Instructor in Clinical Medicine (primary appointment)
BS Texas College 2007
MD Washington Univ in St. Louis 2013
Timothy D Moore
Instructor in Clinical Medicine (primary appointment)
Zachary Andrew Morgan, MD
Instructor in Medicine (primary appointment)
MD Univ of TN - Health Sci Center 2015
Daniel Morgensztterr, MD
Associate Professor of Medicine (primary appointment)
MD FTE Souza Marques 1995
Donald G Morris, MS, MD
Instructor in Clinical Medicine (primary appointment)
MS Saint Louis University 1989
BA Benedictine College 1987
MD University of Missouri 1993
Aubrey R Morrison, MBBS
Professor of Medicine (primary appointment)
Professor of Developmental Biology
MBBS University of London 1970
Hawnwan P Moy, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Loyola University Chicago 2008
BS Benedictine University 2004
Jessica Mozersky, MS, PHD
Assistant Professor of Medicine (primary appointment)
BS Benedictine University 2004
MD University of Pennsylvania 2017
PHD University College London 2010
BSc University of Toronto 1998
Richard Gerard Mrad
Instructor in Clinical Medicine (primary appointment)
BA University of Missouri 1981
Philip Mudd, PHD, MD
Instructor in Emergency Medicine in Medicine (primary appointment)
MD University of Wisconsin-Madison 2011
BA University of Wisconsin-Madison 2013
Kristen L Mueller, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Medical College of Wisconsin 2010
Faquir Muhammud
Instructor in Clinical Medicine (primary appointment)
BS University of Missouri 1981
Joshua Mutambuki Muia, PHD
Instructor in Medicine (primary appointment)
Daniel Kast Mullady, MD  
Professor of Medicine (primary appointment)  
MD University of Connecticut 2001

Monalisa Mullick, MD  
Assistant Professor of Medicine (primary appointment)  
Assistant Professor of Pediatrics  
MD University of MO Kansas City 1997

Michael E Mullins, MD  
Associate Professor of Emergency Medicine in Medicine (primary appointment)  
MD Hahnemann University 1987

Steven Robert Mumm, MS, PHD  
Associate Professor of Medicine (primary appointment)  
MS University of Missouri 1984  
PHD Saint Louis University 1992  
BS University of Missouri 1978

Amy Musiek, MD  
Associate Professor of Medicine (Dermatology) (primary appointment)  
MD Vanderbilt University 2004  
BS College of William and Mary 1999

Umadevi Muthyalu  
Instructor in Clinical Medicine (primary appointment)

Elna M Nagasako, PHD, MD  
Assistant Professor of Medicine (primary appointment)  
BS Pomona College 1991  
PHD University of Rochester 2001  
MD Washington Univ in St. Louis 2007

Jyotirmaya Nanda  
Instructor in Clinical Medicine (primary appointment)

Nicola Napoli  
Adjunct Research Assistant Professor of Medicine (primary appointment)

Michael J. Naughton, MD  
Associate Professor of Medicine (primary appointment)  
MD State Univ of NY Buffalo 1993  
BA Williams College 1989

Rosanne S Naunheim, MD  
Associate Professor of Emergency Medicine in Medicine (primary appointment)  
MD University of Chicago 1978  
BA Carleton College 1970

Robert F Nease Jr, MA, PHD  
Adjunct Associate Professor of Medicine (primary appointment)  
BS University of California 1980

MA Stanford University 1981  
PHD Stanford University 1989

Burton M Needles, MD  
Instructor in Clinical Medicine (primary appointment)  
BS City College 1970  
MD Loyola University Chicago 1974

Jeanne M Nerbonne, PHD  
Professor of Medicine (primary appointment)  
Alumni Endowed Professor of Molecular Biology and Pharmacology in Developmental Biology  
PHD Georgetown University 1978  
BS Framingham State College 1974

Rodney D Newberry, MD  
Professor of Medicine (primary appointment)  
BA Washington Univ in St. Louis 1987  
MD Washington Univ in St. Louis 1991

Elizabeth P. Newberry, PHD  
Assistant Professor of Medicine (primary appointment)  
BA Knox College 1988  
PHD Washington Univ in St. Louis 1995

Amy C Ney, MD  
Instructor in Clinical Medicine (Dermatology) (primary appointment)  
MD University of Virginia 2001  
BS Mary Washington College 1997

Nguyet Minh Nguyen, MD, BS1, MD1  
Assistant Professor of Medicine (primary appointment)  
BS University of Michigan 1989  
MD Wayne State University 1993  
BS1 University of Michigan 1989  
MD1 Wayne State University 1993

Elizabeth Nieman, MD  
Assistant Professor of Medicine (Dermatology) (primary appointment)  
MD University of MO Columbia 2012

Jonas Gottfried Noe, MD  
Instructor in Medicine (Pending Dean’s Approval) (primary appointment)  
MD Technische Universitat Darmsta 2014

Joan P Noelker, MD  
Assistant Professor of Emergency Medicine in Medicine (primary appointment)  
MD Royal College of Surgeons 2010  
BA University of Virginia 2004

Amit Noheria, MD, MS  
Assistant Professor of Medicine (primary appointment)  
MD All-India Inst of Medical Sci 2006  
MS Harvard University 2007

Lemuel Benedict R Non, MD
Assistant Professor of Medicine (primary appointment)
BS Mindanao State University 2003
MD University of the Philippines 2008

Scott Monroe Nordlicht, MD
Professor of Medicine (primary appointment)
MD State University of New York 1973
BA Columbia University 1969

Tracy Wynette Norfleet, MD
Instructor in Clinical Medicine (primary appointment)
MD Louisiana St Univ Hlth Sci 2002
BS Xavier University Louisiana 1998

Sabrina Nunez, PHD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Genetics
BS University of CA Berkeley 1999
PHD Stony Brook School of Medicine 2007

Samuel R Nussbaum, MD
Professor of Clinical Medicine (primary appointment)
BA New York University 1969
MD School Not Listed 1973

Muhammad Akram Nyazee, UNKNOWN1, UNKNOWN
Instructor in Clinical Medicine (primary appointment)
UNKNOWN1 Nishat Medical College Multa 1974
UNKNOWN Govt College Sarhodha 1968

Frank Joseph O’Brien, MBBCCH
Assistant Professor of Medicine (primary appointment)
MBBCCH University College Cork 2006

G Patrick O’Donnell, MD
Instructor in Clinical Medicine (primary appointment)
MD School Not Listed 1977
BA University of Kansas 1972

Julie O’Neal, PHD
Instructor in Medicine (primary appointment)
BS University of MO Columbia 1999
PHD Washington Univ in St. Louis 2009

Andrew John Odden, MD
Assistant Professor of Medicine (primary appointment)
BS Gustavus Adolphus College 2003
MD University of Minnesota 2007

Devin Christopher Odom, MD
Assistant Professor of Medicine (primary appointment)
MD Wake Forest University 2010

Stephen T. Oh, PHD, MD
Assistant Professor of Medicine (primary appointment)
Assistant Professor of Pathology and Immunology
PHD Northwestern University 2002
MD Northwestern University 2004

BS Harvard University 1996

Adewole L. Okunade, PHD
Associate Professor of Medicine (primary appointment)
PHD University of Ibadan 1981
BS University of Ibadan 1975

George Charles Oliver, MD
Professor Emeritus of Clinical Medicine (primary appointment)
BA Harvard University 1953
MD Harvard University 1957

Margaret Olsen, MPH, PHD
Professor of Medicine (primary appointment)
Professor of Surgery (Public Health Sciences)
MPH Saint Louis University 2001
BS Southern Illinois University 1976
PHD University of Pennsylvania 1986

Robert F Onder Jr, MD
Assistant Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1983
MD Washington Univ in St. Louis 1987

Peter J. Oppelt, MD
Assistant Professor of Medicine (primary appointment)
MD University of MO Columbia 2008
BS Saint Louis University 2004

S. Michael Orgel, MD
Instructor in Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1960
MD Saint Louis University 1965

Matthew J Orland, MD
Associate Professor of Clinical Medicine (primary appointment)
MD University of Miami 1979
BS Yale University 1975

David William Ortbals, MD
Assistant Professor of Clinical Medicine (primary appointment)
BS Saint Louis University 1966
MD Washington Univ in St. Louis 1970

Daniel Scott Ory, MD
Professor of Medicine (primary appointment)
Alan A and Edith L Wolff Professor of Cardiology
Professor of Cell Biology and Physiology
MD Harvard University 1986
BA Harvard University 1982

Richard E Ostlund Jr, MD
Professor of Medicine (primary appointment)
MD University of Utah 1970
BS University of Utah 1966

Theodore Otti, UNKNOWN
Instructor in Clinical Medicine (primary appointment)
UNKNOWN School Not Listed 1983

Jiafu Ou, MD
Assistant Professor of Medicine (primary appointment)
MD Sun Yat-Sen University 1995

Edgar Turner Overton, MD
Adjunct Assistant Professor of Medicine (primary appointment)
BA University of Tennessee 1992
MD University of Tennessee 1999

Toshinao Oyama, PhD, MS
Instructor in Medicine (primary appointment)
PHD Chiba University 2017
MS Chiba University 2002
BS Kitasato University 2000

Vani Pachalla, MD
Instructor in Clinical Medicine (primary appointment)
MD School Not Listed 1990

Russell Kent Pachynski, MD
Assistant Professor of Medicine (primary appointment)
MD Univ of Wisconsin Madison 2003
BS Stanford University 1994

Robert C Packman, MD
Professor of Clinical Medicine (primary appointment)
BS University of Missouri 1954
MD Washington Univ in St. Louis 1956
BA Washington Univ in St. Louis 1953

Ross Ian Palis, MD
Instructor in Clinical Medicine (primary appointment)
MD Vanderbilt University 2002
BS Duke University 1998

Peter D Panagos, MA, MD
Professor of Emergency Medicine in Medicine (primary appointment)
Professor of Neurology
MA Boston University 1994
MD Emory University 1984
BA Dartmouth College 1987

Anupam S Pande, MS, MBBS
Assistant Professor of Medicine (primary appointment)
MS University of Texas Houston 2011
MBBS Byramjee Jeejeebhoy Medical Co 2009

Joseph Pangelinan, MA, PHD
Assistant Professor in Medicine (primary appointment)
MA Southeast Missouri St Univers 1995
PHD University of MO St Louis 2015

Stephanie Sun-Young Park
Instructor in Clinical Medicine (primary appointment)

Andrew Yong-Woo Park, MD
Instructor in Medicine (primary appointment)
MD St. George's University 2006

BA Yale University 1995

Haeseong Park, MD, MS
Assistant Professor of Medicine (primary appointment)
MD Seoul National University 2006
BS Seoul National University 2001
MS Johns Hopkns University Medic 2007

Deborah L Parks, MD
Professor of Medicine (primary appointment)
BA Washington Univ in St. Louis 1978
MD University of Louisville 1982

David A Parks, MD, MBA
Associate Professor of Clinical Medicine (primary appointment)
BS University of MO Rolla 1979
MD Saint Louis University 1994
MBA Southern Illinois University 1985

Rajiv Nanu Patel, MD
Instructor in Clinical Medicine (primary appointment)
MD Saba University School of Med 2001

Dilip H. Patel
Instructor in Clinical Medicine (primary appointment)

Pravinkumar Manjibhai Patel, MD
Instructor in Medicine (primary appointment)
MD BJ Medical College 1980

Rupa R Patel, M PH, MD
Assistant Professor of Medicine (primary appointment)
BA University of Michigan 2000
M PH Johns Hopkins University 2012
MD Wayne State University 2004

Urvi Patel, MD
Assistant Professor of Medicine (Dermatology) (primary appointment)
BA Kent St University 2007
MD University of Tenn Memphis 2011

Amanullah Pathan, MS, UNKNOWN, UNKNOWN1
Instructor in Clinical Medicine (primary appointment)
MS School Not Listed 1969
UNKNOWN1 School Not Listed 1969

Bruce Patterson, PHD
Professor of Medicine (primary appointment)
BS Southern Illinois University 1974
PHD University of Illinois 1980

Philip Richard Orrin Payne, PHD, MA
Professor of Medicine (primary appointment)
Professor of Computer Science and Engineering
Robert J Terry Professor
PHD Columbia University 2006
MA Columbia University 2000
BA University of CA San Diego 1999

Susan E Pearson, MS, PHD, BFA, DOST
Instructor in Clinical Medicine (primary appointment)
MS Central Michigan University 1984
PHD University of Southwestern Lo 1986
BFA Southern Methodist University 1977
DOST School Not Listed 1992

Chelsea Elizabeth Pearson, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 2013

Katrina Sophia Pedersen, MS, MD
Assistant Professor of Medicine (primary appointment)
BA Grinnell College 2003
MS University of Iowa 2005
MD Southern Illinois University 2009

Marybeth Pereira, MD
Associate Professor of Clinical Medicine (primary appointment)
BA Swarthmore College 1973
MD University of California 1978

Julio E Perez, MD
Professor of Medicine (primary appointment)
BS University of Puerto Rico 1970
MD University of Puerto Rico 1973

Laurence F Perlstein, MD
Instructor in Clinical Medicine (primary appointment)
BS Tulane University 1967
MD University of Louisville 1974

Linda R Peterson, MD
Professor of Medicine (primary appointment)
Professor of Radiology
MD Washington Univ in St. Louis 1990
BS Georgetown University 1986

Timothy Richard Peterson, PHD
Assistant Professor of Medicine (primary appointment)
BS University of Michigan 1999
PHD Mass Inst of Technology (MIT) 2010

Lindsay L Peterson, MD
Assistant Professor of Medicine (primary appointment)
BS Tulane University 2000
MD Tulane University 2006

Allegra Pettit, PHD
Assistant Professor of Medicine (primary appointment)
BS Lawrence University 2003
PHD Emory University 2010

Christine T Pham, MD
Professor of Medicine (primary appointment)
Professor of Pathology and Immunology
MD University of Florida 1985
BS University of Florida 1981

Jennifer A Philips, MD, PHD, PHD
Associate Professor of Medicine (primary appointment)

Associate Professor of Molecular Microbiology
MD University of CA San Francisco 2000
PHD University of CA San Francisco 1998
BA Columbia University 1991
PHD University of CA San Francisco 2015

William J Phillips, MD
Assistant Professor of Clinical Medicine (primary appointment)
BA Ohio State University 1959
MD Washington Univ in St. Louis 1963

Joel Picus, MD
Professor of Medicine (primary appointment)
BS University of Illinois 1979
BA University of Illinois 1979
MD Harvard University 1984

Stephen J Pieper, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1988
BA Washington Univ in St. Louis 1983

Bryan Douglas Piotrowski, MD
Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 2004

Beatrice Plougastel Douglas, PHD
Instructor in Medicine (primary appointment)
PHD University of Pierre et Marie 1994

Doug Pogue, MD
Instructor in Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1996

Robert Francis Poirier Jr, MD
Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD American U of Carribean SchMed 1999

Donovan Polack, MD
Assistant Professor of Clinical Medicine (primary appointment)
MD Cornell University 1979

Gregory Polites, MD
Associate Professor of Emergency Medicine in Medicine (primary appointment)
MD University of Illinois Chicago 1996

Kenneth S Polonsky, MBBCH
Adjunct Professor of Medicine (primary appointment)
MBBCH University of the Witwatersra 1973

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Professor of Biochemistry and Molecular Biophysics
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MD Chiang Mai University 2001
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MD University of Missouri 1995
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BS Beaufort Technical College 1968

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MD Washington Univ in St. Louis 1972
BS Northwestern University 1968

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MD National University of Ireland 1979

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BS University of Notre Dame 1967
MD University of Michigan 1971

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BS Union University 1988
PHD Georgia Tech 1993

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MD University of Texas Southwest 1988
BS Southern Methodist University 1984

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BA Texas Christian University 1984
MD Southwestern University 1988

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MD University of California 1991
BA Yale University 1981

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Christopher William Prater, MD
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MD Michigan State University 2017

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BA Northwestern University 1975
MD Saint Louis University 1979

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PHD Washington Univ in St. Louis 2001
MD Washington Univ in St. Louis 2001
BA Scripps College 1990

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Adjunct Instructor in Medicine (primary appointment)

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MD Washington Univ in St. Louis 1975
BS University of Toronto 1962
MS University of Toronto 1966
PHD University of Toronto 1970

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Assistant Professor of Medicine (primary appointment)
MD University of Zagreb 1997

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Instructor in Clinical Medicine (primary appointment)

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Assistant Professor of Medicine (primary appointment)
MD Northwestern University 2007
BS University of Illinois Chicago 2002

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Instructor in Clinical Medicine (primary appointment)
BS University of Illinois 1985
MD University of Illinois 1989

Abdul H Qureshi, MS
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MS School Not Listed 1992

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MBBS Jawaharial Inst of Med Educ 2006

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Professor of Medicine (primary appointment)
MBBS Kilpauk Medical College 1990

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Associate Professor of Medicine (primary appointment)
BS Mysore University 1975
MS Andhra University 1977
PHD University of Bombay 1987
Srinivasan Dubagunta Rao
Adjunct Instructor in Medicine (primary appointment)

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Associate Professor of Surgery (General Surgery)
BA University of Verona 1984
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Instructor in Clinical Radiation Oncology
BA Rice University 1963
MD Washington Univ in St. Louis 1967

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Instructor in Medicine (primary appointment)
BA University of MO Kansas City 2012
MD University of MO Kansas City 2014

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Professor of Medicine (primary appointment)
Alan A and Edith L Wolff Professor of Oncology
Professor of Molecular Microbiology
MD Yale University 1979
BA Harvard University 1973
PHD Yale University 1979
MA Harvard University 1973

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Assistant Professor of Medicine (primary appointment)
BS Augustana College 1996
PHD University of Iowa 2001
BS1 Augustana College 1996

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Professor of Medicine (primary appointment)
MD McGill University 1984
BA Tufts University 1980

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BA Emory University 1993
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Assistant Professor of Medicine (primary appointment)
Assistant Professor of Pathology and Immunology
MD Albert Einstein College of Med 2003
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MD University of MO Columbia 1985
MS University of MO Columbia 1981
BS Southeast Missouri St Univers 1979

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PHD University of Iowa 2007

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MD Texas Tech University 1996
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PHD Saint Louis University 1991
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MD Saint Louis University 1993

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MD University of Missouri 1983
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MD University of Missouri 1990
BA University of MO Kansas City 1989

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MS University of Cordoba 1989
BS University of Cordoba 1987
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PHD University of Illinois 2000  
MS University of Illinois 1997  
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PHD Mount Sinai School of Medicine 2002  
MD Mount Sinai School of Medicine 2004  
BS Lehigh University 1995  
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BA University of MO Columbia 2004  
MD University of MO Columbia 2008  

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BS Illinois State University 1993  
PHD Purdue University 2000  

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MD University of Illinois 1979  
BA University of Illinois 1974  

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Assistant Professor of Medicine (primary appointment)  
BS Murray St University 1982  
PHD Saint Louis University 1998  
MD Saint Louis University 1999  

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MS Rutgers University 1976  
PHD Ohio University 1981  
BS Rutgers University 1974  

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BS Univ of Wisconsin Madison 2001  
MD Washington Univ in St. Louis 2005  

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BFA Tulane University 1996  
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MD Saint Louis University 2000  
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PHD Johns Hopkins University 2009  
BS Western Kentucky University 2004  

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MD Washington Univ in St. Louis 1989  
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MD Tehran University 1988  

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BS Johns Hopkins University 1979  
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MD University of Rochester 1997  
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BA Bard College 1997

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MS Washington Univ in St. Louis 1992
BS Saint Louis University 1977
BS Saint Louis University 1975

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Visiting Assistant Professor of Medicine (primary appointment)
BS University of Palermo 1998
PHD University of Padua 2005
MS University of Padua 1998
BS University of Palermo 1998
MS University of Padua 1998

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S

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Instructor in Medicine (primary appointment)
MD Damascus University 2011

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Assistant Professor of Medicine (primary appointment)
MD Duke University 2001
M PH University North Carolina 2000

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Professor of Medicine (primary appointment)
Professor of Biochemistry and Molecular Biophysics
PHD Duke University 1978
MD Duke University 1979

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Instructor in Clinical Medicine (primary appointment)
MD School Not Listed 2000

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Instructor in Medicine (primary appointment)
BA Cornell University 2003
BA Cornell University 2003
MD Washington Univ in St. Louis 2011
PHD Washington Univ in St. Louis 2009

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Instructor in Clinical Medicine (primary appointment)

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Instructor in Medicine (primary appointment)
MD King Edward Medical College 2007

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Instructor in Clinical Medicine (primary appointment)

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Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)

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MD Washington Univ in St. Louis 1980
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John Mark Samet, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Missouri 1968
BS Washington & Lee 1964

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Assistant Professor of Medicine (primary appointment)
PHD Hebrew University 2009

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Instructor in Clinical Medicine (Dermatology) (primary appointment)
BA University of Texas Austin 1972
MD Washington Univ in St. Louis 1976

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Instructor in Clinical Medicine (Dermatology) (primary appointment)
MD Harvard University 1978
BA Berry College 1974

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Instructor in Medicine (Pending Dean’s Approval) (primary appointment)
MD Medical University of Sth Car 2008

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Professor of Medicine (primary appointment)
Professor of Genetics
PHD State Univ of NY Stonybrook 1990
BS Rochester Institute of Techno 1980

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Assistant Professor of Medicine (primary appointment)
BS Washington Univ in St. Louis 2003
MD University of MO Columbia 2007
MHS Washington Univ in St. Louis 2012

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Instructor in Medicine (primary appointment)
BS Fergusson College 1995
MS Indian Institute Of Technology 1997
PHD Institute of Math Sciences 2003

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MD Universidad del Buenos Aires 1971

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Instructor in Clinical Medicine (primary appointment)
BA Rutgers University 1985
MD University of South Florida 1994
MS University of South Florida 1988
PHD University of South Florida 1990

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Associate Professor of Medicine (primary appointment)
Associate Professor of Psychiatry
MD University of Texas Austin 2000

Lawrence R Schacht, MD
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BA University Wyoming 1971
MD Oregon Health Science Univers 1975

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Professor of Developmental Biology
BA Harvard Radcliffe 1982
MD Harvard University 1986

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BA Emporia State University 1974
MD University of Kansas 1978

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MD Washington Univ in St. Louis 1994

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Assistant Professor of Medicine (primary appointment)
Assistant Professor of Cell Biology and Physiology
PHD University of Michigan 2011
DDENT University of Michigan 2011
BS Michigan State University 2004

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Instructor in Clinical Medicine (primary appointment)
BA University of Missouri 1989
MD University of Missouri 1989

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Instructor in Clinical Medicine (primary appointment)
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BA Washington Univ in St. Louis 1976

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PHD Washington Univ in St. Louis 2001
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Instructor in Clinical Medicine (primary appointment)
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Instructor in Emergency Medicine in Medicine (primary appointment)

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Assistant Professor of Clinical Medicine (primary appointment)
MD Johns Hopkins University 1976  
BA Johns Hopkins University 1973

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Instructor in Clinical Medicine (primary appointment)
MD Brown University 2005

Mark Andrew Schroeder, MD  
Associate Professor of Medicine (primary appointment)
MD University of Cincinnati 2003  
BS University of Toledo 1999

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Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1996  
BA Saint Louis University 1991

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Instructor in Clinical Medicine (primary appointment)
MD Saint Louis University 1973

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Professor of Clinical Medicine (primary appointment)
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PHD School Not Listed 1971  
BA Columbia College 1965  
MD School Not Listed 1972

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MA Washington Univ in St. Louis 1987  
BS University of Michigan 1980  
PPhD Washington Univ in St. Louis 1986  
MD Washington Univ in St. Louis 1987

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Associate Professor of Emergency Medicine in Medicine (primary appointment)
MD University of Texas Austin 2005  
BA University of Texas Austin 2001

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PHD University of Michigan 2011  
BS Washington Univ in St. Louis 2004  
MS Southern Ill Univ Edwardsville 2007

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Associate Professor of Medicine (primary appointment)
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Assistant Professor of Clinical Medicine (primary appointment)

BA University of Missouri 1987  
MD University of Missouri 1987

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Assistant Professor of Emergency Medicine in Medicine (primary appointment)
MD Southeastern Illinois College 1993

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Professor of Cell Biology and Physiology
MD Washington Univ in St. Louis 1981  
BA University of Virginia 1977

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Assistant Professor of Medicine (primary appointment)
MBBS Grant Medical College 1999  
MD University of Mumbai 2003

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Instructor in Clinical Medicine (primary appointment)
BS St Vincent College 1964  
MD Saint Louis University 1968

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Instructor in Clinical Medicine (primary appointment)
MD Johns Hopkins University 1982  
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MD Saint Louis University 1966

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Assistant Professor of Pathology and Immunology
BS Nankai University 2003  
MS Fudan University 2007  
PHD Johns Hopkins University 2012

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Assistant Professor of Medicine (primary appointment)
PHD Oklahoma St University 2002  
BS Nankai University 1996

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Adjunct Instructor in Medicine (primary appointment)

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Assistant Professor of Clinical Medicine (primary appointment)
MD Washington Univ in St. Louis 1974  
BA Northwestern University 1970

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Instructor in Clinical Medicine (primary appointment)
MD University of Jordan 1988

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Instructor in Clinical Medicine (primary appointment)
BA Johns Hopkins University 1991
MD University of Louisville 1995

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MD Saint Louis University 1995

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UNKNOWN Alexandria University 1984

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MS Washington Univ in St. Louis 2011

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PHD University of Pennsylvania 2009
BA Northwestern University 2004

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BS Washington Univ in St. Louis 1972
MD Washington Univ in St. Louis 1977

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Associate Professor of Clinical Medicine (primary appointment)
BS University of Michigan 1978
MD Wayne State University 1982

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Associate Professor of Clinical Medicine (primary appointment)
MD University of Missouri 1981
BA Brandeis University 1977

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MD Ross University School of Medi 2011
BS University of California in Ri 2004

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Associate Professor of Neurological Surgery
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BA New York University 2004

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MD Washington Univ in St. Louis 1975

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Assistant Professor of Emergency Medicine in Medicine (primary appointment)
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BS Harvard University 1992

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Assistant Professor of Clinical Medicine (primary appointment)
MD University of Toronto 1987

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Associate Professor of Medicine (primary appointment)
MD Fiji School of Medicine 1988

Gurcharan J Singh, MD
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BS Delhi University 1968
MD Delhi University 1975

Marc Alan Sintek, MD
Assistant Professor of Medicine (primary appointment)
MD Univ of Nebraska at Kearney 2008

Donald A Skor, MD
Professor of Clinical Medicine (primary appointment)
BA Washington Univ in St. Louis 1973
MD Rush University 1978

Timothy W. Smith, MD, PHD
Associate Professor of Medicine (primary appointment)
MD Duke University 1993
BS Duke University 1986
PHD Oxford University 1989

Raymond P Smith, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Virginia 1984
BA Vassar College 1980

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PHD University of Aberdeen 2006
BS University College Chichester 2001
MS University College Chichester 2002

Timothy Robert Smith, MD
Instructor in Clinical Medicine (primary appointment)
BS University of Mississippi 1983
MD University of Mississippi 1989

Michael C Snyder
Adjunct Instructor in Medicine (primary appointment)

Allen D Soffer, MD
Instructor in Clinical Medicine (primary appointment)
MD University of Missouri 1983

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Rand Washburn Sommer, MD  
Associate Professor of Clinical Medicine (primary appointment)  
BS Davidson College 1976  
MD Washington Univ in St. Louis 1980

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Associate Professor of Clinical Medicine (primary appointment)  
MD School Not Listed 1983  
PHD School Not Listed 1988

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Instructor in Medicine (primary appointment)  
BA Ohio Wesleyan University 2004  
PHD Baylor University 2010

William F Southworth, MD  
Assistant Professor of Clinical Medicine (primary appointment)  
BA Washington Univ in St. Louis 1969  
MD Washington Univ in St. Louis 1975

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Assistant Professor of Clinical Medicine (primary appointment)  
MD Louisiana St University 1976

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Instructor in Clinical Medicine (primary appointment)  
BA Ohio Wesleyan University 2004  
MD University of Toledo 2013

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Assistant Professor of Medicine (primary appointment)  
BS Loyola University Chicago 2005  
MD University of Illinois 2010

David H. Spencer, MD, PHD  
Assistant Professor of Medicine (primary appointment)  
MD University of Washington 2010  
BS University of Washington 2001  
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MD School Not Listed 1983  
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Instructor in Medicine (primary appointment)  
MD Indiana State University 2013  
PHD Indiana State University 2013

Phyllis K Stein, PHD, M ED  
Associate Professor of Medicine (primary appointment)  
MD Indiana State University 2013  
PHD University of Virginia 1990
Michael Gary Stone, MD  
Instructor in Clinical Medicine (primary appointment)  
MD Kansas Cty Univ Med/Bioscience 2008

Cristina Strong, PHD  
Assistant Professor of Medicine (Dermatology) (primary appointment)  
PHD University of Alabama 2002

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Assistant Professor of Medicine (primary appointment)  
Assistant Professor of Developmental Biology  
BS Carleton University 2001  
PHD University of British Columbia 2006

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Assistant Professor of Cell Biology and Physiology  
PHD Washington Univ in St. Louis 2004  
BS Beijing University 1998

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PHD Nanjing Agriculture Univ 2006  
BS Shihzei Medical College 1996  
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PHD Heidelberg University 2007  
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MD Regensburg University 2007

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M PA Johns Hopkins University 2008  
PHD Yokohama City Univ Sch Med 1999  
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MD University of AL Birmingham 1999  
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MBBS University of Madras 1993

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MD Chiang Mai University 1973  
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MD University of MO Columbia 2006  
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BS University of the Philippines 1985  
MD University of the Philippines 1990

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MD Loma Linda University 1997  
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MD Siriraj Medical School 1970

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MD Indiana State University 1995  
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BA Indiana State University 1991

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MD University of Missouri 1970  
BS School Not Listed 1966

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MD Washington Univ in St. Louis 1979  
BA Washington Univ in St. Louis 1975

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BS Cornell University 1991  
PHD U of Colorado Health Sci Ctr 2003

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MD Kerala University 1977

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MD Brown University 1997

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BS Rockhurst College 1956  
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BS University of Illinois 1982  
PHD University of Illinois 1990  
MD University of Illinois 1990

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MD University of MO Columbia 2010  
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BS University of MO Columbia 2005  
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Assistant Professor of Clinical Medicine (primary appointment)  
MD University of Copenhagen 1984  
BS University of Copenhagen 1980

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BS Hebei Medical University 2004  
PHD Beijing Institute of Radiation 2009

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MD University of Illinois 1988  
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MD Washington Univ in St. Louis 1980  
BS State University of New York 1976

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Instructor in Medicine (primary appointment)  
MD Damascus U. Medical School 2005

Garry S Tobin, MD  
Professor of Medicine (primary appointment)  
MD Washington Univ in St. Louis 1985  
BS MO S&T (formerly UofMO Rolla) 1981

Fadi Tohme, MD  
Assistant Professor of Medicine (primary appointment)  
Assistant Professor of Anesthesiology  
MD St. Joseph University, Beirut 2010

Douglas M Tollefsen, PHD, MD  
Professor of Medicine (primary appointment)  
PHD Washington Univ in St. Louis 1977  
BA Grinnell College 1970  
MD Washington Univ in St. Louis 1977

Robert R Townsend, MS, MD, PHD  
Professor of Medicine (primary appointment)  
Professor of Cell Biology and Physiology  
BS Centenary College 1972  
MS Tulane University 1976  
MD Tulane University 1976  
PHD Johns Hopkins University 1982

Elizabeth A Tracy, MD  
Instructor in Clinical Medicine (primary appointment)  
BS Marquette University 1982  
MD Univ of Wisconsin Milwaukee 1986

Doris Janet Tribune-Brown  
Instructor in Clinical Medicine (primary appointment)

Nikolaos Trikalinos, MD  
Assistant Professor of Medicine (primary appointment)  
MD UNIVERSITY OF IOANNINA 2005

Sandeep Kumar Tripathy, MD, PHD  
Assistant Professor of Medicine (primary appointment)  
MD University of Chicago 1998  
BS University of Illinois 1990  
PHD University of Chicago 1995

Elbert P Trulock III, MD  
Rosemary and I Jerome Flance Professor of Pulmonary Medicine in Medicine (primary appointment)  
MD Emory University 1978  
BS Emory University 1968

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BS University of Nebraska 1972  
MD Univ of Nebraska at Omaha 1976

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MD Washington Univ in St. Louis 1974  
BS Saint Mary's College 1958

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MD Saint Louis University 1981  
BS University of Notre Dame 1977

Ann-Marcia C Tukpah, M PH, MD  
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BS Northeastern University 2007
M PH Johns Hopkins University 2011
MD Mount Sinai School of Medicine 2015

Stacey S Tull, M PH, MD
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BS University of Texas Austin 1993
M PH Duke University 1997
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Alan A and Edith L Wolff Professor of Endocrinology
Professor of Pathology and Immunology
BA Washington Univ in St. Louis 1970
MD Washington Univ in St. Louis 1976
PHD Washington Univ in St. Louis 1976

Garima Gupta Tyagi, PHD, MASTERS
Instructor in Medicine (primary appointment)
BA Delhi University 2003
PHD Indian Institute of Science 2011
MASTERS Institute of Medical Science 2005

Robert C. Uchiyama, MD
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MD Saint Louis University 1980
BS Stanford University 1976

Mark C Udey, PHD, MD
Professor of Medicine (primary appointment)
PHD Washington Univ in St. Louis 1982
BS Univ of Wisconsin Madison 1975
MD Washington Univ in St. Louis 1982

Fumihiko Urano, PHD, MD
Samuel E Schechter Professor of Medicine (primary appointment)
Professor of Pathology and Immunology
PHD Keio University 1998
MD Keio University 1994

Geoffrey L Uy, MA, MD, BA1
Associate Professor of Medicine (primary appointment)
BA Cornell University 1996
MA Washington Univ in St. Louis 2001
MD Washington Univ in St. Louis 2001
BA1 Cornell University 1996

Justin Marinus Vader, MD
Assistant Professor of Medicine (primary appointment)
MD University of Texas Southwest 2006

Brij R Vaid, MD
Instructor in Clinical Medicine (primary appointment)

MD Rush University 1992

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MD Washington Univ in St. Louis 1972
BA Washington Univ in St. Louis 1968

Brian Andrew Van Tine, PHD, MD
Associate Professor of Medicine (primary appointment)
PHD University of AL Birmingham 2005
MD University of AL Birmingham 2005
BS University of Arizona 1995

Gil M Vardi, MD
Professor of Medicine (primary appointment)
MD Tel Aviv University 1985

Emmanuel A Venkatesan, MBBS
Associate Professor of Clinical Medicine (primary appointment)
MBBS CMC, Vellore, India 1990

Ravi Vij, MBBS
Professor of Medicine (primary appointment)
BS Delhi University 1991
MBBS Maulana Azad Medical College 1991

Kiran Raj Vij, MD
Associate Professor of Medicine (primary appointment)
Associate Professor of Pathology and Immunology
MD Indira Gandhi Medical College 1993

Anitha Vijayan, MD
Professor of Medicine (primary appointment)
MD University of the West Indies 1990

Dennis T Villareal, MD
Adjunct Associate Professor of Medicine (primary appointment)
BS University of San Carlos 1978
MD CEBU Doctor's College of Med 1982

John L Visconti, MD
Assistant Professor of Medicine (Pending Executive Faculty Approval) (primary appointment)
MD Univ of Health Sciences KC 1990
BS University of MO St Louis 1986

Benjamin Allen Voss, MD, BA1
Instructor in Clinical Medicine (primary appointment)
MD Creighton University 2007
BA1 Saint Louis University 2003
BA Saint Louis University 2003

Stanley G Vriezelaar, MD
Instructor in Clinical Medicine (primary appointment)
BA Simpson College 1977
MD University of Iowa 1981

Harry Lee Wadsworth, MD
Instructor in Clinical Medicine (primary appointment)
BS Texas Tech University 1978
MD Texas Tech University 1983

Jason Cass Wagner, MD
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MD University of Colorado Denver 2001

Stanley M Wald, MD
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MD Washington Univ in St. Louis 1946

David Wallace, MD
Instructor in Clinical Medicine (primary appointment)
BA Saint Anselm College 1980
MD Saint Louis University 1984

Laura A Wallace, MD
Instructor in Emergency Medicine in Medicine (primary appointment)
BA Indiana University Indianopoli 2017
MD Ohio State University 2012

David A Walls, MD
Instructor in Clinical Medicine (primary appointment)
MD Southern Illinois University 1982
BA Southern Illinois University 1979

Sarah N. Walsh
Instructor in Clinical Medicine (Dermatology) (primary appointment)

Matthew John Walter, MD
Professor of Medicine (primary appointment)
Professor of Genetics
MD Saint Louis University 1995
BS The American University 1990

Richard Coburn Walters, MD
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BS University of Illinois 1969
MD Washington Univ in St. Louis 1973

Lawrence L. Wang, MD, PHD
Instructor in Clinical Medicine (Dermatology) (primary appointment)
BA Harvard University 1993
MD Washington Univ in St. Louis 2001
PHD Washington Univ in St. Louis 2001

Jean S Wang, PHD, MD
Professor of Medicine (primary appointment)
Professor of Surgery (General Surgery)

PHD John Hopkins University 2009
MD Brown University 1998

Leyao Wang, MPH, PHD
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M PH Johns Hopkins University 2017
BA Nankai University 2017
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MD University of AR Little Rock 2001
BS1 Ouachita Baptist University 1993
BS Ouachita Baptist University 1993

Saaima Naheed Waqar, MD
Assistant Professor of Medicine (primary appointment)
MD Aga Khan University 2001

Jeffrey Peter Ward, MD, PHD
Instructor in Medicine (primary appointment)
MD SUNY - Empire State College 2010
BS Wilkes University 2002
PHD SUNY - Empire State College 2010

David K. Warren, MPH, MD
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MD University of AR Little Rock 2001
BS1 Ouachita Baptist University 1993
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BS Univ of Wisconsin Madison 1998

Scott P Wasserstrom, MD, MA
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BS University of Illinois 1990
MA Washington Univ in St. Louis 1995

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PHD Saint Louis University 1997
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BS Cornell University 1963
MD Cornell University 1967

Xiaochao Wei, PHD
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Kevin D Weikart, MD
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Professor of Molecular Microbiology
MD Harvard University 1975
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Carla Joy Weinheimer, MS
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BS University of Illinois 1984
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Leonard B Weinstock, MD
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BA University of Vermont 1977

Steven Jay Weintraub, MD, MS
Associate Professor of Medicine (primary appointment)
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Alan N Weiss, MD
Professor of Medicine (primary appointment)
BA Ohio State University 1963
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Peter Douglas Weiss, MD
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BA Harvard University 1975
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PHD University of Maryland 2003

John Sutton Welch, PHD, MD
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BA Dartmouth College 1982  
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BS Illinois State University 1975  
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MD Washington Univ in St. Louis 1960  
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BA Harvard University 1955  
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PHD University of Chicago 2007  
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Professor of Medicine (primary appointment)  
BA Washington Univ in St. Louis 1981  
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MD Washington Univ in St. Louis 1979  
BS Vanderbilt University 1975

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Assistant Professor of Medicine (primary appointment)  
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PHD Columbia University 2010  
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Z

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Associate Professor of Surgery (Cardiothoracic Surgery)
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PHD University of CA Santa Barbara 2003
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MCHEM Xiamen University 1998

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Jian Zhu, PHD
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BA University of Colorado Boulder 1972
PHD University of Colorado Boulder 1980

Courses

M25 Medicine 507 Practice of Medicine I
POM I is a large course which spans all three blocks of the first year. It is composed of three content areas: Clinical Skills Patient, Physician, and Society Clinical Knowledge. Each of these three content areas has two or more sections, each run by a faculty section leader. POM I employs a variety of teaching techniques, instructors and venues. This includes lecture, small group discussions, panel sessions, one-on-one hospital interviews, standardized patient sessions, a patient home visit, and visits to both a primary care office and a city clinic. What are the educational goals of POM I? Students will learn to: 1. Perform a complete history and physical examination with thoroughness, accuracy, sensitivity and compassion. 2. Communicate effectively, efficiently and compassionately with patients, families and other health professionals. 3. Describe and analyze the statistical methodology of clinical studies and apply the results to individuals and groups of patients. 4. Identify and investigate ethical, cultural, socioeconomic and political factors relevant to medical interactions. 5. Examine and analyze personal and professional competencies, limitations and behaviors. How do we accomplish these goals? 1. Learning skills and techniques requires a cycle of steps: preparation, background reading, attempts at skill performance, analysis and reflection on performance, discussion of potential improvements and successive performance of the skill with advancement to a new level of expertise. 2. The focus is on learning skills. You practice each skill, such as interviewing, in a variety of venues and situations of varying complexity. This course is for learning about how to do things that you will use for taking care of patients and families. 3. You work in multiple learning environments. a. Academic environments: small group sessions for discussion, small group practice sessions, peer learning, small group presentations, individual and group writing assignments, and reflections on experiences are the preferred learning locations. b. Clinical environments: inpatient units with faculty and WUMS IV mentors, standardized patient experiences with videotape review, physicians' offices, patients' homes with and without home care professionals, and a city clinic.
Credit 198.5 units.

M25 Medicine 604 Physicians, Patients and Society: Clinical Skills
Credit 43 units.
M25 Medicine 605A Infectious Diseases
The Infectious Diseases course teaches both organism-specific and organ-specific approaches to disease caused by microbes. The course expands upon the material presented in the first year concerning bacteria, viruses, fungi and parasites and their involvement in causation of human disease. It explores the complex interaction between microbes and host in the individual patient, and at the broader public health level. Educational methods include lecture, interactive in-class case discussions and review sessions, and student-led clinical case discussions in small groups. Credit 30 units.

M25 Medicine 606A Rheumatology
A major focus of the course is teaching "how to think like a rheumatologist", emphasizing the concept of clinical diagnosis: the history and physical generate a clinical hypothesis, which is supported by laboratory tests. Inflammatory arthritis (rheumatoid arthritis, spondyloarthropathies, crystalline disorders, and infectious arthritis), classic "autoimmune diseases" (lupus, inflammatory myopathy, and scleroderma), and vasculitic syndromes are presented. A team based learning exercise on rheumatology lab tests gives students a chance to teach one another the details. Two separate sessions with four unknown patients gives students a chance to interview patients and try to make a diagnosis. Credit 17 units.

M25 Medicine 607 Practice of Medicine II
The goal of The Practice of Medicine (POM) course is to provide students with the knowledge, skills and attitudes essential to patient care regardless of specialty. POM II is a continuation of POM I and will continue to address various interfaces between patients, physicians and society and will also introduce the advanced physical exam and approaches to clinical thinking and decision-making. The sections of POM II include Clinical Skills, Case Development, Communication Skills, Ophthalmology, Radiology, Community and Public Health, Ethics and Health Policy Humanities, and Scientific Methods. The learning objectives for each section of POM II emphasize topics and skills used in all fields of medicine, and the majority of the course work will be taught in small groups or through clinical experiences. Credit 89 units.

M25 Medicine 608 Practice of Medicine II: Patient Sessions
Credit 23.5 units.

M25 Medicine 611B Cardiovascular Disease
Cardiovascular disease remains the number one cause of death within the United States, although steady advances in the field have greatly reduced both its associated morbidity and mortality. This course provides a foundation for understanding the pathophysiology, diagnosis, and management of cardiovascular conditions commonly encountered in clinical practice, including hypertension, ischemic heart disease, heart failure, arrhythmias, valvular heart disease, pericardial diseases, aortic diseases, peripheral arterial disease, and venous disorders. An emphasis is placed on describing the current state of knowledge in cardiology while also including some of the exciting new developments that are revolutionizing patient care. The course includes lecture overviews of each topic along with small group and team-based learning sessions to solidify and apply knowledge of the material to patient case scenarios. In addition, "EKGs of the Week" allow students to practice a structured approach to the interpretation of EKGs. Credit 30 units.

M25 Medicine 612B Pulmonary Diseases
The pulmonary pathophysiology course is designed to familiarize medical students with the pathophysiological mechanisms underlying diseases of the pulmonary system. The course begins with a brief review of pertinent pulmonary physiology and pulmonary function, and then explores how pathologic disorders alter normal lung physiology resulting in the clinical presentation of disease. Major categories of clinical pulmonary diseases discussed include obstructive lung diseases, restrictive lung diseases, pulmonary vascular diseases and pleural disease. Educational methods include lectures, team-based learning and review sessions. Credit 22.5 units.

M25 Medicine 613B Renal & Genitourinary Diseases
This course focuses upon the wide variety of renal diseases. It will begin with a brief review of pertinent renal physiology, and then will explore disorders of fluids/electrolytes (abnormalities in plasma water/solute balance), patterns of acute and chronic kidney injury (including nephritic/nephrotic syndromes and renal involvement in systemic disorders), and finally the options available when end stage kidney disease is reached (hemodialysis, peritoneal dialysis, transplantation). The course contains a mixture of lecture, small group, team based learning, case-based presentations, and patient presentation. Credit 38 units.

M25 Medicine 614 Dermatology
The dermatology second-year course is designed to provide medical students with a foundation in dermatology that will support future learning and improve diagnostic skills in general medicine and a wide variety of specialties. Medical students will learn how to describe skin lesions and the pathophysiologic basis and clinical characteristics of major dermatologic diseases. Major categories of clinical skin diseases and their most prominent constituents will be discussed, including papulosquamous diseases, blistering diseases, infectious diseases, and benign and malignant neoplasms. Credit 8 units.

M25 Medicine 615A Endocrinology and Metabolism
The endocrine pathophysiology course aims to provide an understanding of the pathophysiology and clinical manifestations of common endocrine disorders. Emphasis is placed upon relevant clinical history and physical examination as well as the interpretation of investigations for endocrine disorders. Basic principles of treatment of endocrine disorders will also be discussed. Lectures are supplemented by organ-specific clinical case discussions. Credit 31 units.

M25 Medicine 620A Gastroint. and Liver Diseases/Nutrition
This course discusses the pathophysiological mechanisms underlying diseases of the gastrointestinal tract including esophagus, stomach, small and large intestines, liver, gall bladder and pancreas. A series of lectures related to nutrition and the impact of nutritional disorders on health and disease are also included. Lectures are supplemented by group seminars that include discussion of clinical case presentations.
**M25 Medicine 655 Preparation for Clinical Medicine**
Credit 154 units.

**M25 Medicine 707 Practice of Medicine III**
Objectives: 1. To review challenges and dilemmas relevant to the practice of clinical medicine. 2. To examine clinical experiences from a variety of perspectives. In this course, themes and topics relevant to students in their clinical stage of training are discussed. Session formats include lecture, panel discussion and/or small group. As students exchange problematic scenarios and questions, the group develops potential solutions and management schemes. *Topics in the past have included: 1) Diversity 3.0 training; 2) Business of medicine; 3) Individualized Learning Objectives in clinical scenario; 4) PSQI; 5) Mock Deposition, Risk Management, and Adverse Patient Outcomes; 6) Compassion Fatigue, Resilience, and Burnout Part 1; 7) Compassion Fatigue, Resilience, and Burnout Part 2; 8) Caring for Incendiary Patients; 9) Diagnostic Error and Transitions of Care; 10) Strategies for Effective Teaching and Mentoring. Attendance at 8 out of 10 POM III sessions is required to pass this course. Students may use two absences for any reason and are recommended to save them for their ACES rotation, Labor & Deliver rotation, or an emergency.

**M25 Medicine 710 Medicine Clerkship**
The Medicine clerkship provides supervised study of patients in both inpatient and ambulatory settings. For the inpatient rotations, students are assigned as clinical clerks to patients admitted to the general medical teaching services of Barnes-Jewish Hospital and Veterans Administration Medical Center. For the outpatient rotations, students rotate through the ambulatory general medicine clinics at Barnes-Jewish Hospital and a community-based internal medicine practice. Teaching is provided by the chief of service, attending physicians, house officers, consultants, chief residents and regularly scheduled conferences. Formal instructions is given regarding core internal medicine topics during the clerkship. A minimum of 12 weeks is required: three consecutive four-week rotations.
Credit 462 units.

**M25 Medicine 714 Ambulatory Clerkship: Emergency Medicine**
The Urgent Care area (UCA) serves as our site for the WUSM III Ambulatory Care Rotation. Three students at a time are assigned to this four-week rotation. Students will spend their first day in an orientation session learning suturing, ECG interpretation and airway management (including intubation skills) in hands-on laboratories. They will also review pelvic examinations and view an education video on domestic violence. On day two, they begin primarily evaluating non-emergent patients in Urgent Care and report directly to an Emergency Medicine attending. There are four hours of conferences per week (8-10 a.m. on Tuesday and Wednesday mornings) — attendance is mandatory. Discussions are currently underway to allow students to participate in helicopter ride-alongs with ARCH Airmedical Services. Students can expect to gain a wide range of skills in evaluating uncomplicated upper respiratory infections, urinary tract infections, sexually transmitted diseases, lacerations, eye problems, rashes, simple extremity trauma — in general, "bread and butter" medical/surgical problems.
Credit 154 units.

**M25 Medicine 715 Ambulatory Clerkship: Urgent Care**
The Urgent Care area (UCA) serves as our site for the WUSM III Ambulatory Care Rotation. Three students at a time are assigned to this four-week rotation. Students will spend their first day in an orientation session learning suturing, ECG interpretation and airway management (including intubation skills) in hands-on laboratories. They will also review pelvic examinations and view an education video on domestic violence. On day two, they begin primarily evaluating non-emergent patients in Urgent Care and report directly to an Emergency Medicine attending. There are four hours of conferences per week (8-10 a.m. on Tuesday and Wednesday mornings) — attendance is mandatory. Discussions are currently underway to allow students to participate in helicopter ride-alongs with ARCH Airmedical Services. Students can expect to gain a wide range of skills in evaluating uncomplicated upper respiratory infections, urinary tract infections, sexually transmitted diseases, lacerations, eye problems, rashes, simple extremity trauma — in general, "bread and butter" medical/surgical problems.
Credit 154 units.

**M25 Medicine 730 Physical Medicine and Rehabilitation Clerkship**
Clerkship in PM&R for third-year medical students provides an opportunity to gain basic knowledge and clinical skills in evaluation and management of a wide range of neurological and musculoskeletal diseases and conditions that require specialized rehabilitative medical and therapeutic care. Students spend two weeks on the Spinal Cord Injury Unit (SCI) and two weeks on the Brain Injury (BI) and Stroke Unit at The Rehabilitation Institute of St. Louis. Students are expected to become a part of the rehabilitation team, follow three to five patients, participate in daily morning rounds, participate in performing consults, and attend team meetings and family conferences. Students are required to attend several outpatient clinics such as SCI, BI, Amputee and Stroke. During the entire rotation, students work with PM&R residents and fellows, and under direct guidance of the NeuroRehabilitation faculty. The usual duty hours are 7:30 a.m. to 5 p.m. weekdays. There is no night call. Students are required to attend all PM&R curriculum lectures and conferences. On the first day of rotation, students meet with the PM&R program director to go over goals, objectives and schedules. Upon completion of the rotation, students are required to fill out the evaluation form to provide feedback regarding rotation experience.
Credit 154 units.

**M25 Medicine 740 Dermatology Clerkship**
The goal of the dermatology clerkship is to guide the student to appreciate dermatology within the broader perspectives of medicine and biology. The student will develop familiarity with dermatologic vocabulary, learn to recognize and initiate therapy of common dermatologic disorders and become cognizant of uncommon or complicated dermatologic
problems that require specialty care. Emphasis will be placed on careful history taking and physical examination. Students will always work under the direction of the resident physician and the attending physicians in the clinic setting.

Credit 154 units.

M25 Medicine 750 Geriatrics Clerkship
The primary goal of this rotation is for students to gain proficiency in the principles of geriatric evaluation and management, including the medical, psychological, social, and functional assessments of older adults. Students are expected to participate in the evaluation of three to five patients per week, in a variety of settings including the outpatient Geriatric Assessment Clinic, inpatient Geriatric Consult service, Parc Provence nursing home, and the Rehabilitation Institute of St. Louis (TRISL). Students will also have the opportunity to participate in hospice and home care visits, interdisciplinary team meetings, and observe an assessment at the Washington University Alzheimer’s Disease Research Center. Students are expected to attend weekly conferences while on the rotation. The day normally begins at 8:30 a.m. and is usually finished by 5:30 p.m. There is no night or weekend call. Time is provided to read the detailed syllabus/bibliography. Many clinical activities are off-site from the medical campus. Students will be required to coordinate transportation to and from such sites. Students will be expected to give an oral presentation on a topic of their choice once during the rotation.

Credit 154 units.

M25 Medicine 801 Honors Medicine - General Medicine
The purpose of the Honors Medicine elective (sub-internship) is the development of expertise in the care of hospitalized patients in a well-supervised teaching environment. Sub-interns act as their patients’ interns under the supervision of residents and attending physicians. Sub-interns have the same on-call and admitting schedules as the interns on their teams and are assigned up to two new patients on each admitting day. Sub-interns are not required to spend call nights in the hospital. Except in emergencies, sub-interns are the first individuals to evaluate patients admitted to medical service teams. A diagnostic and therapeutic approach to the patient is planned in consultation with the resident. Sub-interns assume primary responsibility for the daily care of their patients, under the supervision of resident and attending physicians. This includes evaluation on daily rounds, scheduling and obtaining results of diagnostic studies, planning therapy, making arrangements for care after discharge and communicating with patients and their families. Sub-interns attend the same conferences as the house staff.

M25 Medicine 805 Rheumatology
Students will be involved in the diagnostic work-up and management of patients with conditions such as systemic lupus erythematosus, rheumatoid arthritis, scleroderma, vasculitis (ANCA-associated vasculitis, temporal arteritis, etc.), spondyloarthropathies (ankylosing spondylitis, psoriatic arthritis, reactive arthritis, etc.), and gout; there is less exposure to osteoarthritis and regional musculoskeletal problems. By working closely with a faculty member, fellows and medical residents, students become integral and active members of the rheumatology service for inpatient consultations and outpatient clinics at Barnes-Jewish Hospital. An emphasis is placed on the physical examination of joints and the musculoskeletal system, synovial fluid analysis, and interpretation of diagnostic tests and radiographs. Students attend two rheumatology conferences held weekly. A rotation limited to outpatient rheumatology is possible by prior arrangement with the course director.

M25 Medicine 807 Honors Medicine - VA Hospital
The purpose of the Honors Medicine elective (sub-internship) at the VA Medical Center is to develop proficiency in the care of hospitalized patients on an internal medicine ward. Sub-interns will have similar responsibilities as interns, with appropriate supervision by the attending and resident physicians. They have the same on-call/admitting schedules as the interns and participate in the same teaching conferences, but they do not take overnight call. Sub-interns should admit at least two patients per call day, and they should be the first to evaluate the patients admitted to the medical service, except in emergencies. A diagnostic and therapeutic approach to evaluating each patient is planned in consultation with the resident. Sub-interns assume primary responsibility for the daily care of their patients, including evaluating each patient daily, presenting on morning rounds entering orders (discussed with and co-signed by the resident), interpreting results of diagnostic studies, calling consults, collaborating with nurses and social work, organizing post-discharge care, and communicating with patients and their families. Sub-interns also attend weekly small group learning sessions during which they discuss, diagnose, and treat patients using example cases. By the end of the VA Honors Medicine rotation, sub-interns will be able to independently: - Synthesize and succinctly present a patient’s history, exam, diagnostic data, assessment, and plan of care. - Support differential diagnoses and proposed care plans with clinical reasoning and evidence. - Demonstrate how to correctly order diagnostic tests and medications that further patient care. - Analyze complex patient cases during interactive small group learning sessions. Integrate feedback from patients, residents, and attending physicians, and formulate a plan for ongoing improvement as a clinician.

M25 Medicine 810 Geriatric Medicine
The primary goal of this rotation is for students to gain proficiency in the principles of geriatric evaluation and management, including the medical, psychological, social, and functional assessments of older adults. Students are expected to participate in the evaluation of three to five patients per week, in a variety of settings including the outpatient Geriatric Assessment Clinic, inpatient Geriatric Consult service, outpatient and home-based Primary Care, and the Rehabilitation Institute of St. Louis (TRISL; optional). Students will also have the opportunity to participate in hospice and home care visits, interdisciplinary team meetings, and observe an assessment at the WU Alzheimer’s Disease Research Center. Students are expected to attend weekly conferences while on the rotation. The day normally begins at 8:30 a.m. and is usually finished by 5:30 p.m. There is no night or weekend call. Time is provided to read the detailed syllabus/bibliography. Many clinical activities are off-site from the Medical Campus; students will be required to coordinate transportation to and from such sites. Students will be expected to give an oral presentation on a topic of their choice once during the rotation.

M25 Medicine 811 Clinical Internal Medicine - Hospitalist
This course allows the student to work one-on-one with hospitalist physicians on a patient care team. The student acts as the intern under the direct supervision of the attending physician. Daily responsibilities include admission history and physicals, daily notes and discharge summaries on assigned patients. They also will have the opportunity to perform indicated
M25 Medicine 814 Clinical Emergency Medicine - Barnes-Jewish Hospital
This rotation offers practical experience in the evaluation and management of acutely sick and injured patients. Students will function as sub-interns, initially evaluating their assigned patients and developing a plan for further diagnostic studies and therapy. They will report to a senior-level resident or an attending physician. The student can expect to get an opportunity to perform a wide variety of procedural skills such as suturing, splinting, peripheral and central venous access, and cardiopulmonary resuscitation. Shifts will be eight hours, and students will rotate between day, evening and night shifts, including weekend shifts, in order to gain maximum exposure to all types of emergencies. A core content of lectures will be provided. Students will gain an understanding of prehospital care by doing a ride-along shift with the St. Louis Fire Department EMS. Students will also gain knowledge of the basics of ultrasound during their time in the department. Students interested in EM will be doing 1:1 shifts with a single attending during their last two weeks of the rotation. Students desiring a letter of recommendation from any EM attending should take this WUSM IV Emergency Medicine rotation. Students will be scheduled for required weekend and overnight shifts, and changes will not be allowed to the schedule unless approved prior to the start of the rotation by the course coordinator. Please be advised that there is a limit of days off while on this rotation during interview season; otherwise, students should arrange to take the elective at a different time during the year. Days off during the rest of the year will conform to university policy. Days off should be requested from the course coordinator at least two weeks prior to the beginning of the rotation for scheduling purposes.

M25 Medicine 821 Inpatient Cardiology
Students will participate as members of the Barnes-Jewish Cardiology at Washington University Consultative Team. They will be part of a team composed of faculty members, fellows, residents, and nurse practitioners that sees a large population of cardiac patients and follows them through all aspects of their in-hospital care. Emphasis will be placed on physical examination and the interpretation of modern cardiac diagnostic tests including electrocardiograms, echocardiograms and coronary angiograms and their role in clinical decision making.

M25 Medicine 822 Honors Medicine - Cardiology
The structure and functioning of the Honors Medicine-Cardiology elective (sub-internship) is very similar to the general medicine sub-internship (M25 801). The basic purpose is to develop expertise in the care of hospitalized patients in a well-supervised teaching environment. The majority of patients admitted to the service will have a cardiology diagnosis as the main reason for admission. Some general medical problems will also be seen. All attendings on the service are cardiology subspecialists. Cardiology fellows act as the chief resident for the service on a monthly basis. Sub-interns act as their patients’ interns under the supervision of residents and attending physicians. Sub-interns have the same on-call and admitting schedules as the interns on their teams and are assigned up to two new patients on each admitting day. Sub-interns are not required to spend call nights in the hospital. Except in emergencies, sub-interns are the first individuals to evaluate patients admitted to medical service teams. A diagnostic and therapeutic approach to the patient is planned in consultation with the resident. Sub-interns assume primary responsibility for the daily care of their patients, under the supervision of resident and attending physicians. This includes evaluation on daily rounds, scheduling and obtaining results of diagnostic studies, planning therapy, making arrangements for care after discharge, and communicating with patients and their families. Sub-interns attend the same conferences as the internal medicine house staff. There are also several conferences specific to the cardiology service.

M25 Medicine 823 Clinical Cardiology - VA Hospital
The major purpose of this elective in clinical cardiology at the John Cochran VA Hospital is to improve evaluation and management skills for diagnosis and treatment of important cardiovascular conditions such as coronary artery disease including acute myocardial infarction, congestive heart failure, hypertension, and valvular heart disease. The rotation is designed to be flexible enough to accommodate a wide variety of course objectives but includes the opportunity to participate in 1-3 outpatient clinics per week; 1-4 weeks of inpatient intensive care, telemetry, or cardiology consultation rounds; and ECGs, stress testing, nuclear imaging, or echocardiographic reading sessions, cardiac catheterization and electrophysiologic procedures. The emphasis will be on improvement of the ability to diagnose and treat cardiovascular disease on the basis of information obtained from a thorough history and physical examination that is integrated with data from appropriate highly targeted laboratory studies in a manner that optimizes patient outcome and minimizes risk and costs.

M25 Medicine 825 Cardiac Arrhythmias and Electrophysiology
This elective provides the student with exposure and teaching in the diagnosis and treatment of complex cardiac rhythm disturbances. Specifically, the student is expected to evaluate patients referred for evaluation and treatment of complex or life-threatening rhythm disturbances, unexplained syncope or sudden cardiac death. Rounds are made daily on hospitalized patients, and students are welcome to observe electrophysiology studies or implantation of pacemakers and defibrillators. This elective also provides an intensive opportunity to learn clinical electrocardiography and the systematic use of anti-arrhythmic drugs. Finally, since patients with chronic, complex rhythm disturbances frequently have organic heart disease, a broad-based exposure to general cardiology is also part of this elective.

M25 Medicine 827 Heart Failure/Cardiac Transplantation
This rotation is intended to provide trainees with a comprehensive experience managing patients with advanced heart failure. In addition to daily rounds, trainees are invited to attend both heart failure and transplant clinics. Further, the curriculum is supplemented by a comprehensive syllabus that contains the critical literature pertinent to this patient population. The trainees will also have experience with the evaluation of patients for operative heart failure therapies and will have the opportunity to observe these surgical procedures.

M25 Medicine 830 Dermatology
The aim of this elective is to provide a guide for students so they are able to appreciate dermatology within the broader perspectives of medicine and biology. Emphasis will be placed on the dermatologic variations encountered in a normal physical examination of the skin, the identification of common skin diseases, dermatologic clues to systemic disease, as well as those dermatologic conditions that are life-threatening. The
student will participate in outpatient care in the Barnes-Jewish Hospital and affiliated clinics. Students will attend all clinical teaching rounds and conferences in addition to the basic science and cutaneous histopathology conferences.

M25 Medicine 831 Pediatric Dermatology
This clinical rotation will be available to students interested in dermatology, pediatrics or both. Students will follow the dermatology rotation (M25 830) with an emphasis on pediatric dermatology by attending pediatric dermatology clinics, seeing consults, etc. Enthusiastic students will have an opportunity to write up a case report if they wish, but need to notify the instructor before the course.

M25 Medicine 834 Clinical Mentoring
This elective is designed to develop the teaching and mentoring skills of our fourth-year medical students through structured hospital sessions with first-year medical students. The primary format of the elective is observation of two first-year students during hospital sessions that span from September-April. During these hospital sessions the first-years perform the H&P, and the fourth-year mentors observe and offer constructive feedback. Each session will have an accompanying H&P written by the first-year student, which is to be thoroughly reviewed and critiqued by the fourth-year mentor. Additional practice sessions are optional and can be individually arranged between teams where the fourth-year mentor can assist the first-year student on personalized skills that are identified by their individualized learning goals. A small number (2-3/year) of in-person sessions will occur with clinical faculty instructors to review teaching methods, assist in giving feedback, and to help the fourth-year mentor to acquire skills necessary for supervision of medical students during internship/residency. The schedule is very flexible, and there are no active clinical responsibilities during December/January to allow time off for interviews.

M25 Medicine 836 Clinical Gastroenterology and Hepatology
The GI Hepatology elective is integrated into a very active inpatient and endoscopy service at Barnes-Jewish Hospital. Students will participate in the evaluation of inpatients with a spectrum of gut and liver disorders, will make patient rounds with the faculty and fellows, and have responsibility for patients on whom consultations have been requested. In addition, they will observe general endoscopic techniques and participate in GI conferences.

M25 Medicine 836A Treatment of Patients with Inflammatory Bowel Disease
This elective will allow students to spend an intensive period of time learning about all aspects of the care of patients with IBD (surgical, endoscopic, and medical management). Although a predetermined schedule has been developed, it can be modified based on the student's interest. Alternative options include: inpatient IBD care (Barnes-Jewish Hospital and Barnes West County); wound clinic / stoma care; specialized endoscopy (chromoendoscopy, ERCP); IBD / colorectal surgery; pathology.

M25 Medicine 838 Medicine Consult Service
The focus of the Medicine Consult Service elective is the evaluation and management of medically complex patients admitted to the hospital on non-medicine services. The issues involved with perioperative management are particularly stressed. The student will function as a member of the consult service team. Duties will include performing initial consultations and follow-up care under the supervision of a Hospital Medicine attending and a senior medical resident. Attendance at Department of Medicine and division conferences is encouraged.

M25 Medicine 842 Introduction To Wilderness Medicine
The purpose of this course is to introduce medical students to common medical problems both emergent and nonemergent seen in various wilderness settings. After taking this course the student should have a basic understanding of the pathophysiology and management of these problems in an environment with limited access to medical aid. The course will involve four days of four-hour lectures each week along with one 1-2 day required overnight camping trip. Requirements to pass this course include completing a presentation on a topic of their choosing that is approved by the course director as well as a skills and written test.

M25 Medicine 843 Medical Toxicology
This rotation offers practical experience in the evaluation and management of the acutely ill poisoned patient. Students will function as sub-interns and either report to the senior resident, fellow, or directly to the toxicology attending. Students will gain familiarity and experience evaluating and treating patients who have intentionally and unintentionally overdosed on medications or illicit drugs, been envenomated (such as by spiders, snakes, or other reptiles), or been exposed to toxic substances or chemicals. Students will also gain experience in administering antidotes and learning to properly decontaminate someone after an ingestion or exposure. There are no overnight or weekend shifts. Daily activities start in the morning and are generally concluded by the early afternoon. A core content of lectures will be provided. The students will also be assigned small projects during their rotation that will enhance their experience particularly in environmental and occupational toxicology. Opportunities to increase their experience with occupational toxicology also exist during this rotation; those with this interest can ask for further information during their rotation. Students will also have the opportunity to go to the Missouri Poison Center and evaluate patients in the outpatient toxicology clinic. Students desiring a letter of recommendation from one of the toxicology attendings (who are also Emergency Medicine and Internal Medicine attendings) or interested in Emergency Medicine or Medical Toxicology should take this elective. Also, students considering other specialties such as Pediatrics or Internal Medicine should consider this rotation as they will be responsible for evaluating these patients as part of their inpatient or outpatient practice. Please be advised that there is a limit of days off while on this rotation during interview season; otherwise, students should arrange to take the elective at a different time during the year. Days off should be requested from the course coordinator at least two weeks prior to the beginning of the rotation for scheduling purposes. Students should receive a course guide just prior to their rotation. However if they do not, they can page the toxicology pager at 314-672-0284 to determine when and where to meet for rounds.

M25 Medicine 844 Hematology and Hemostasis
Activities include work-up of patients at Barnes-Jewish Hospital under the supervision of the hematology fellow and faculty; attendance at daily clinical rounds for 1-1.5 hours per day. These are staffed by a senior faculty in the Division of Hematology. In addition to evaluation of patients with hematologic disorders, the student will gain additional analytic skills including: 1. Interpret and integrate laboratory data in the diagnosis of anemia and pancytopenia; 2. Review peripheral blood and bone marrow
M25 Medicine 847 Bone and Mineral Diseases
The course is designed to acquaint the student with the clinical, radiological and pathological manifestations and treatment of disorders of bone and mineral metabolism, including osteoporosis, Paget's disease of bone, hyperparathyroidism, osteomalacia, and more rare disorders of bone development and homeostasis. The student will rotate through clinics of the Division of Bone and Mineral Diseases, and see patients at Barnes-Jewish Hospital, Barnes-Jewish West County Hospital and Shriners Hospital for Children. Acquired and heritable bone diseases will be studied in the context of derangements of mineral homeostasis with emphasis on vitamin D and peptide hormone metabolism and skeletal formation and remodeling. The role of non-invasive methods for measuring bone mass in the diagnosis and management of skeletal diseases also will be stressed. Faculty and medical students will present interesting cases for discussion or the student can present a pertinent topic related to bone metabolism they have researched during their rotation.

M25 Medicine 853 Bone and Joint Infectious Disease Consult
Study of infectious diseases of the bones and joints, including infections in both native and prosthetic joints. The elective is designed to teach students the fundamentals of evaluating clinical orthopedic infections and formulating plans for workup and therapy. Students see consultations in infectious diseases in every part of Barnes-Jewish Hospital under the supervision of a faculty member who rounds with them every day. They work closely with the infectious diseases attending and nurse practitioner, follow their own patients and play an important role in their management. They are expected to read the literature about their patients and participate in clinical conferences. They attend teaching rounds and conferences and lectures in infectious diseases. They also learn appropriate use of antibiotics and antifungal agents. The role of surgical and medical management is discussed, and the students will interact with surgical staff in understanding the risks and outcomes of these common infections. Two weeks of General Inpatient Infectious Disease are a prerequisite to this course.

M25 Medicine 854 Transplant Infectious Disease
Study of infectious diseases in patients who have had bone marrow or solid organ transplants, or who have a hematologic malignancy. The elective is designed to teach students the fundamentals of evaluating clinical infections in these complex and interesting patients and formulating plans for workup and therapy. Students see consultations in every part of Barnes-Jewish Hospital under the supervision of a faculty member who rounds with them every day. They work closely with infectious disease fellows, follow their own patients and play an important role in their management. They are expected to read the literature about their patients and participate in clinical conferences. They attend teaching rounds and conferences and lectures in infectious diseases. They also learn appropriate use of antibiotics, antifungal and antiviral agents in this highly immune suppressed population. A wide distribution of infectious diseases is covered including management of neutropenic fever, invasive fungal infections in the transplant population, acute and chronic infections, infection prophylaxis and monitoring and interactions between immunosuppressive agents and antibiotics.

M25 Medicine 859 General Inpatient Infectious Disease
Study of patients with infectious diseases, including inpatient care of HIV-infected patients and general infectious disease consults. The elective is designed to teach students the fundamentals of evaluating clinical problems in infection and formulating plans for workup and therapy. Students see consultations in infectious diseases in every part of Barnes-Jewish Hospital under the supervision of a faculty member who rounds with them every day. They work closely with medical residents and infectious disease fellows, follow their own patients and play an important role in their management. They are expected to read the literature about their patients and participate in clinical conferences. They attend teaching rounds and conferences and lectures in infectious diseases. They also learn appropriate use of antibiotics, antifungal and antiviral agents. A wide distribution of infectious diseases is covered including community-acquired acute and chronic infections, opportunistic infections in HIV-infected patients, hospital-acquired infections, and basic infection control practices. This is a four-week rotation. Two-week rotations are allowed, but must be done in conjunction with two weeks of Transplant Infectious Disease or Bone and Joint Infectious Disease.

M25 Medicine 861 Oncology - Inpatient Consult Service
Medical Oncology is a complex subspecialty that is undergoing a rapid evolution as a result of new systemic treatment approaches that stem from biological insights into the nature of cancer. During the course of the elective, medical students will be able to interact with attending physicians and patients for bed side teaching and attend tumor boards and lectures focused on the care of patients with solid tumors. At the end of the rotation, the students will appreciate the principles of our approach to cancer patients and should have gained insights into the evaluation and management of patients with newly diagnosed malignancies. The role of surgery, radiation, and systemic treatment will also be an important theme, as well as the conduct of clinical research in this patient population. Students will also learn to care for hospitalized patients suffering from complications from...
their cancer or from toxicities due to treatments. Oncologic emergencies will be covered. Issues such as palliative care treatment options and end-of-life decision making will be explored as well.

M25 Medicine 862 Honors Medicine - Oncology
The structure and functioning of the Honors Medicine-Oncology elective (sub-internship) is very similar to the general medicine sub-internship (M25 801). The basic purpose is to develop expertise in the care of hospitalized patients in a well-supervised teaching environment. The majority of patients admitted to the service will have an oncology diagnosis as the main reason for admission. Some general medical problems related to their cancer and their therapy will also be seen. All attendings on the service are oncology subspecialists. Sub-interns act as their patients’ interns under the supervision of residents and attending physicians. Sub-interns have the same on-call and admitting schedules as the interns on their teams and are assigned up to two new patients on each admitting day. Sub-interns are not required to spend call nights in the hospital. Except in emergencies, sub-interns are the first individuals to evaluate patients admitted to medical service teams. A diagnostic and therapeutic approach to the patient is planned in consultation with the resident. Sub-interns assume primary responsibility for the daily care of their patients, under the supervision of resident and attending physicians. This includes evaluation on daily rounds, scheduling and obtaining results of diagnostic studies, planning therapy, making arrangements for care after discharge and communicating with patients and their families. Sub-interns attend the same conferences as the internal medicine house staff. There are also several conferences specific to the oncology service.

M25 Medicine 863 Emergency Ultrasound
This rotation will focus on ultrasound and all of its many applications and uses in the Emergency Department. Students will participate in the performance of bedside ultrasound of patients in the Emergency Department. Common applications of Emergency Ultrasound include the FAST exam, pelvic ultrasound, Abdominal Aortic Aneurysm (AAA), vascular access, renal, gallbladder, and DVT. In general, the student will be in the Emergency Department during weekdays to perform these exams. Students will be involved in direct patient care during this rotation. In addition, the student will meet with the elective instructor one to two times per week to review images and have direct hands-on instruction. At the end of the rotation, the student should have gained the knowledge of basic emergency ultrasound, including its indications and applications, as well as becoming more adept at the performance of ultrasound.

M25 Medicine 865 Intensive Care Medicine
This elective in intensive care is offered in the Intensive Care Unit at Barnes-Jewish Hospital, South Campus. This unit has 16 intensive care beds providing intensive nursing care and life-support technology. The patients represent a mixture of patients with primarily medical problems. Patient care responsibility includes night call. In addition to patient responsibility, there are regularly scheduled conferences and attending rounds.

M25 Medicine 867 Medical Intensive Care
This elective is offered as an opportunity to gain additional experience in acute, primary care medicine. The elective is an advanced course in patient care involving complex medical problems. Responsibilities involve working up new patients with the MICU team, case presentations and attendance at conferences. Conferences consist of attending rounds Monday through Saturday, radiology rounds Monday through Saturday, pulmonary conference and medical grand rounds on Thursday, and critical care conference once each month. Call schedule is every third night.

M25 Medicine 869 Palliative Medicine
The Palliative Medicine elective will focus on the care of patients with life-threatening or debilitating illness throughout the course of their care. Skills in symptom management, communication, and interdisciplinary team-based care will be the focus. Students will spend the majority of their time on the BJH Palliative Care Service. Based on the individual student’s interest, there may also be opportunities to work with the BJC Hospice Team and the St. Louis Children’s Hospital Palliative Care Service. While in the hospital, students will be responsible for seeing patients upon initial assessment as well as delivering follow-up care with the team. Patients will be seen for both end-of-life care as well as symptom management. Students will learn to assess and treat refractory symptoms and participate in complicated advanced care planning. Students will attend interdisciplinary team meetings, and may participate in conversations about goals of care and coping with bad news. They may also make home visits with hospice care providers, if desired. Emphasis will be placed on observing and understanding the psychosocial and spiritual needs of the patients, as well as the impact of the burden on caregivers. In addition, students will be expected to lead biweekly presentations/group discussions on selected aspects of Palliative Medicine with the BJH Palliative Care team.

M25 Medicine 870 Endocrinology, Diabetes, and Metabolism
In general, the four-week rotation will be divided into two weeks of general endocrinology and two weeks of diabetes. Students taking this elective will perform consultations with fellows and faculty on the inpatient services at Barnes-Jewish Hospital and will also see patients with endocrine and metabolic diseases in the Outpatient Consultation. They will present these cases daily on teaching rounds. They will also participate in case conferences and will spend one to two hours per week reviewing imaging from the Endocrinology service. Extensive interaction with patients with diabetes and a diabetes education program are included, as is involvement with patients with thyroid, pituitary, adrenal, gonad, metabolic bone disease, and lipid disorders. Ample opportunities will be provided for discussions of patient problems with the members of the division. A variety of outpatient clinics are offered in the division, and interested students should speak with the fellows and faculty members to customize the learning experience to match their career goals. At the end of the rotation, it is expected that students will have the ability to initiate inpatient and outpatient management of diabetes including insulin dosing and glucose monitoring, as well as evaluate and treat a variety of endocrine disorders including but not limited to thyroid, pituitary, and adrenal disease. Students will learn to perform effective inpatient and outpatient consultations.

M25 Medicine 871 Oncology - Outpatient
Students will gain experience in the initial treatment of newly-diagnosed malignancies and the outpatient management of oncology patients. Participation in multidisciplinary tumor conferences will stress a combined-modality approach to management, incorporating chemotherapy, radiotherapy and surgery. Students will see patients with a variety of malignancies, including lymphoma, myeloma, and tumors of the lung, breast, and colon. Management of hypercalcemia and other paraneoplastic syndromes, as well as cancer pain management,
will be covered. Students will have the opportunity to see how most oncologists spend 90 percent of their workday. They will observe different styles that oncologists use when presenting news about prognosis, treatment options, and other information to patients while they also learn about the molecular basis for cancer, the mechanisms of action for our therapies (particularly the newer agents which target specific molecular abnormalities), and the key studies that justify the use of therapies (e.g., randomized studies showing that after surgery, chemotherapy will reduce the risk of recurrence from a particular cancer with a particular regimen). By spending time with clinicians, students will learn how to identify hereditary syndromes, use drugs for symptom relief, and also learn how to perform chest physical exams and interpret abnormalities on physical exams.

**M25 Medicine 877 Intensive ECG Interpretation**
During this two-week elective, students will read 20-25 ECGs obtained from the Barnes-Jewish Cardiac Diagnostic Laboratory, with an overview by an experienced electrocardiographer. There will also be didactic sessions covering infarction, ventricular hypertrophy, heart block, arrhythmias, and aberrant conduction.

**M25 Medicine 879 Pulmonary Clinic for the Underserved**
Clinical setting: Outpatient clinic dedicated to providing pulmonary specialty care to patients who are predominantly uninsured or who rely upon public assistance such as Medicaid. Student role: Students independently interview and examine patients and present findings to the attending, tests and imaging are reviewed, and provider and attending develop plan. Common problems/diseases: Asthma, COPD, sarcoidosis, lung cancer, and obstructive sleep apnea are commonly seen. Also, patients are referred for evaluation of abnormal x-rays and for symptoms such as dyspnea. Primary learning objectives: to understand and practice important history and exam skills in pulmonary medicine: symptoms, smoking history, work and environmental exposures, and important pulmonary physical exam findings; to understand the basics of pulmonary function tests, chest imaging, and methods for tissue sampling; to understand the basis of treatment of common pulmonary disorders. Conferences: There is no conference associated with this clinic, but students may attend the usual Thursday morning Medicine Grand Rounds at 8:00 a.m. and the Pulmonary Grand Rounds at 11:00 a.m. if the subject matter is appropriate.

**M25 Medicine 880 Pulmonary Medicine - Barnes-Jewish Hospital**
Students will acquire skills in the evaluation and management of patients with pulmonary diseases and in the interpretation of pulmonary function tests. They will gain experience in outpatient Lung Center and attend regular pulmonary and critical care medicine conferences.

**M25 Medicine 884 Bone Marrow Transplantation and Stem Cell Biology**
Intense four-week clinical rotation exposing interested fourth-year medical students to the clinical world of bone marrow transplantation and to the basic science of hematopoiesis, leukemia, and stem cell biology. Students will be primarily responsible for the care of autologous and allogeneic BMT recipients and those patients being treated for a variety of hematologic malignancies such as AML, ALL, multiple myeloma and non-Hodgkin's lymphoma. In addition they will be exposed to methods of stem cell harvest, cryopreservation and immunophenotyping. This rotation plans to provide motivated students with an ideal mix of clinical medicine and basic science.

**M25 Medicine 887 Clinical Cardiovascular Medicine**

**M25 Medicine 890 Clinical Nephrology**
Students rotate through inpatient and outpatient experiences to gain exposure to all facets of nephrology. They will spend time the majority of their time on an inpatient consult service, gaining exposure to acute and chronic renal failure, glomerulonephritis, and electrolyte disorders. During this time, they will serve as a fully integrated member of the consult team, evaluating underlying causes of kidney disease, performing diagnostic procedures, formulating management plans, and engaging in decision-making discussions with primary services and families. In addition, students will have the opportunity to experience ICU nephrology, the transplant service, the various CKD clinics, and all modalities of dialysis, including in-center, home, and peritoneal dialysis.

**M25 Medicine 890A Kidney Transplant**
Students participating in this elective will: gain exposure to end-stage renal disease and the treatment options; examine kidney transplantation as the most valuable option; learn about immunosuppression; and gain exposure to infectious diseases like CMV, BK, and adeno virus that are commonly seen in patients that have had a kidney transplant (and not often seen otherwise).

**M25 Medicine 893 Adult Allergy and Clinical Immunology**
Students will participate in the outpatient Allergy Clinics located in Barnes-Jewish Hospital Center for Advanced Medicine, Barnes-Jewish West County, and Center for Advanced Medicine South County. Students will participate in allergy skin testing, pulmonary function testing, and drug desensitization. They can attend allergy conferences on Thursday morning. Students have the option to follow a fellow and see inpatient consults at Barnes-Jewish Hospital.

**M25 Medicine 900 Research Elective - Internal Medicine**
Research opportunities may be available. If interested, please contact the Department of Internal Medicine.

**Department of Molecular Microbiology**
The Department of Molecular Microbiology teaches introductory courses in microbiology and pathogenic microorganisms for first-year medical students and graduate students. In conjunction with the Division of Biology & Biomedical Sciences (DBBS) (http://www.dbbs.wustl.edu/Pages) program in Molecular Microbiology and Microbial Pathogenesis (http://www.dbbs.wustl.edu/dvprograms/micro/Pages/default.aspx), the department also offers a number of advanced courses, primarily designed for graduate students, but open to medical students. Advanced
elective research activities are offered by faculty in the department.

Website: http://www.microbiology.wustl.edu

**Degrees & Requirements**

More information about Department of Molecular Microbiology degrees (http://bulletin.wustl.edu/grad/gsas/dbbs) and requirements can be found in the Graduate School Bulletin.

**Research**

**M30 MolMB 900**

Cross-listed with L41 Biol 590

**Stephen M. Beverley, PhD**
McDonnell Pediatric Research Building, 9th Floor
Phone: 314-747-2630
Molecular genetics of protozoan parasites and tropical diseases; biosynthesis of the parasite surface, genomics, virulence and drug action or resistance.

**Michael Caparon, PhD**
McDonnell Pediatric Research Building, 10th Floor
Phone: 314-362-1485
Molecular genetics and pathogenicity of the streptococci and other pathogenic gram positive bacteria.

**Tamara L. Doering, MD, PhD**
McDonnell Pediatric Research Building, 10th Floor
Phone: 314-747-5597
The Doering lab studies the opportunistic fungal pathogen, Cryptococcus neoformans, with the dual motivations of elucidating basic biology and identifying potential drug targets. Projects include studies of the synthesis and regulation of the main cryptococcal virulence factor, its polysaccharide capsule, and investigation of host fungal interactions. Current approaches include those of biochemistry, cell and molecular biology, and genetics; studies also include high-throughput analysis of host-pathogen interactions and computational approaches to reconstructing the capsule regulatory network.

**Daniel Goldberg, MD, PhD**
McDonnell Pediatric Research Building, 9th Floor
Phone: 314-362-1514
Biochemistry of malaria.

**Henry Huang, PhD**
McDonnell Pediatric Research Building, 8th Floor
Phone: 314-362-2755

**Scott J. Hultgren, PhD**
McDonnell Pediatric Research Building, 10th Floor
Phone: 314-362-6772
Pathogenic mechanisms and disease outcomes in the urinary tract. Work in the Hultgren lab blends multiple scientific disciplines to elucidate bacterial and host mechanisms that determine the onset, course and outcome of interactions between a host mucosal surface and bacterial pathogens. Using genetics, genomics, biochemistry, structural biology, high-resolution imaging, animal models, clinical studies and combinatorial chemistry, we have illuminated new ways in which intracellular lifestyles and community behavior play critical roles in the pathogenesis of urinary tract infection. We have uncovered new principles of adhesive pili biogenesis in Gram Negative bacteria by the chaperone/usher pathway; delineating the fine molecular details of a donor strand complementation and exchange mechanism by which the energy of final subunit folding is used to complete assembly and extrusion of pili across the outer membrane. We revealed how UPEC use type 1 pili to invade and establish biofilm-like intracellular bacterial communities within bladder cells as part of a mechanism that subverts host defenses and how quiescent intracellular reservoirs can seed recurrent infections. We have uncovered complex networks that govern mucosal epithelial response to infection, which we have shown determines disease outcome. Further, we have made seminal contributions to our understanding of the pathogenesis and response to other uropathogens, polymicrobial infections and catheter-associated UTIs and to the mechanisms by which bacteria form a directed amyloid fiber, curli, which is important in biofilm formation. Together, this work is changing the way UTIs are evaluated, re-shaping models of bacterial infections in general and spawning new technologies to design novel vaccines and anti-microbial therapeutics to diagnose, treat and/or prevent UTIs and their sequelae.

**Amanda Lewis, PhD**
BJC Institute of Health, 10th Floor
Phone: 314-286-0016
Polymicrobial Infection and Women's Health. Our lab is using biochemical, cellular and animal models to study infectious processes of the female urogenital tract that involve multiple bacterial species. For example, bacterial vaginosis (BV) is a polymicrobial imbalance of the vaginal flora characterized by reductions in beneficial lactobacilli and an overgrowth of mostly Gram negative bacteria. BV is the most common of all vaginal infections and is associated with increased risks of adverse pregnancy outcomes and greater susceptibility to sexually transmitted infections. We are collaborating with clinical investigators to define molecular and biochemical processes of BV and identify patient groups most at risk for adverse events. Another active area of study in the lab involves polymicrobial urinary tract infection (UTI). We have developed a mouse model of polymicrobial UTI and are currently defining novel processes, bacterial factors and the impact of host that contribute to susceptibility.

**Jennifer Lodge, PhD**
McDonnell Pediatric Research Building, 10210A
Phone: 314-286-2125
Antifungal therapy and vaccine development against a fungal pathogen: Cryptococcus neoformans is a significant fungal pathogen, particularly in immunocompromised patients, that causes pulmonary infections and meningoencephalitis. It has been estimated that over 1,000,000 new cases of Cryptococcus occur, with over 650,000 deaths per year, and the majority of these cases are in Africa. Our lab focuses on understanding the structure and the synthesis of the fungal cell wall. We are working on it as a target for antifungal therapies and for vaccine development.

**David Sibley, PhD**
McDonnell Pediatric Research Building, 9th Floor
Phone: 314-362-8873
We study the intracellular survival mechanisms of protozoan parasites, focusing on the model parasite Toxoplasma gondii. Current approaches include high-resolution microscopy, genetic mapping of virulence traits, comparative genomic analyses and development of animal models for studying pathogenesis and resistance.

**Christina L. Stallings, PhD**
McDonnell Pediatric Research Building, 8th Floor
Phone: 314-286-0276
Molecular Pathogenesis of Mycobacteria. Our laboratory integrates in vivo disease modeling, molecular biology and biochemistry to provide answers to the fundamental biological questions regarding molecular pathogenesis and yield therapeutic strategies for treatment of mycobacterial infections.

**Niraj H. Tolia, PhD**
McDonnell Pediatric Research Building, 8th Floor
Phone: 314-286-0134
Structural and Mechanistic Studies of Malaria Pathogenesis. Our lab is interested in the molecular events that occur during erythrocyte invasion by Plasmodium parasites. We use the tools of structural biology, biochemistry and biophysics to examine proteins and protein complexes associated with these events.

**Joseph P. Vogel, PhD**
McDonnell Pediatric Research Building, 10th Floor
Phone: 314-747-1029
Legionella pneumophila, the causative agent of Legionnaires' pneumonia, replicates inside alveolar macrophages by preventing phagosome-lysosome fusion.

**David Wang, PhD**
McDonnell Pediatric Research Building, 8th Floor
Phone: 314-286-1123
Discovery and characterization of novel viruses. We use functional genomic technologies to identify novel viruses from a variety of clinical samples from diseases of unexplained etiology. We then use epidemiologic and molecular/cellular strategies to define the relevance of newly identified viruses to human disease. A range of new viruses, including polyomaviruses, astroviruses and picornaviruses are under investigation.

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**Faculty**

**Department Chair**
Stephen M. Beverley, PhD

**Program Director**
L. David Sibley, PhD
Visit our website for more information about our faculty (http://www.microbiology.wustl.edu/faculty_research_2014.htm) and their appointments.

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David Wang, PHD
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PHD Mass Inst of Technology (MIT) 1998
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Courses
Visit online course listings to view offerings for M30 MolMB

M30 MolMB 526 Microbes and Pathogenesis
The course will familiarize the student with the diversity of pathogenic microbes and the different ways they can survive and cause disease. It is a concepts-based course, emphasizing the general principles of microbial pathogenesis. Selected pathogenic microbes are used as models to describe pathogen-host interactions in molecular detail. The laboratory will introduce the student to the principles and the basic techniques of diagnostic bacteriology.
Credit 30 units.
M30 MolMB 900 Research Elective - Molecular Microbiology

Research opportunities may be available. If interested, please contact the Department of Molecular Microbiology.

Department of Neurology

Neurology concerns itself with the diseases of brain, spinal cord, peripheral nerves and muscles. An introduction to the anatomy and physiology of the nervous system is presented in the first-year neuroscience course by faculty from the Department of Neuroscience (http://neurosci.wustl.edu), with participation of faculty from the Department of Neurology (http://neuro.wustl.edu). A first-year selective titled Clinical Correlations in Neurosciences (FYSelect 5017) is available, which is an opportunity for interested students to shadow physicians in neuro-related fields and attend basic science or clinical conferences. In the second year, the Department of Neurology presents the course Diseases of the Nervous System (Neur 632) in conjunction with the departments of Pathology & Immunology (http://pathology.wustl.edu), Neurosurgery (http://neurosurgery.wustl.edu) and Ophthalmology & Visual Sciences (http://ophthalmology.wustl.edu). The course emphasizes the pathophysiology, pathology, clinical manifestations and treatment of the major neurological and neurosurgical diseases. The department also participates in the Practice of Medicine course, providing lectures, demonstrations and teaching exercises with patients in neurological physical diagnosis.

For more information about the Department of Neurology and its 13 divisions, please visit the department website.

Website: https://neuro.wustl.edu/education

Degrees & Requirements

While the Department of Neurology does not offer its own degree, some of the department’s courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

M35 Neurol 900

In the fourth year, opportunities exist for many varieties of advanced clinical or research experience.

Beau Ances, MD
Taylor Avenue Building Extension, 2nd Floor
Phone: 314-747-8423

Neuroimaging of Neurodegenerative Disorders. Students can work in a neuroimaging laboratory that is focused on translational discovery of neuroimaging biomarkers for neurodegenerative diseases. The laboratory focuses on the pathogenesis of Alzheimer’s disease (AD) and HIV-associated neurocognitive disorders (HAND). We are investigating the effects of neurodegenerative diseases on brain network level using functional (blood oxygen level dependent imaging, arterial spin labeling), structural (volumetrics, diffusion tensor imaging), and metabolic (PET amyloid and tau). Multiple projects that involve bioengineering, neuroimaging, and infectious disease are available depending on the interest of the student.

Randall Bateman, MD
Biotechnology Center, Room 304
Phone: 314-747-7066
Central nervous system protein metabolism in aging and dementia. This research elective will expose the student to translational research in the study of Alzheimer’s disease and other neurodegenerative diseases. The student will participate in multiple areas of the research including participant recruitment, consent, enrollment, and admission to a research hospital unit. Lumbar puncture for CSF sample collection, blood collection, and intravenous labeling methods will be demonstrated and taught. The student will participate in sample analysis including processing for mass spectrometry quantitation, ELISA, and western gel methods. Quantitation, analysis and modeling of the data will be taught in the context of data interpretation and study design.

Anne H. Cross, MD, and Laura Piccio, MD, PhD
McMillan, 3rd Floor
Phone: 314-747-4591 or 314-747-0405
Understanding interactions of the immune system with the central nervous system as it relates to multiple sclerosis and other neuroimmunological disorders. Our goal is to understand how immune cells cross the blood-brain barrier and initiate the cascade of events leading to lesions of multiple sclerosis. We are also funded to study the effects of diet and adipokines on neuroinflammation. Depending upon the time commitment of the student and their individual interests and goals, they will either assist with ongoing projects or be given a laboratory project on which to work. Projects may involve animal models for MS, cell culture or studies of human samples (CSF, blood, autopsied specimens). Interested students should contact Dr. Cross (crossa@neuro.wustl.edu) or Dr. Piccio (piccio@neuro.wustl.edu) several weeks in advance before signing up for this research to allow for sufficient planning.

Robert T. Naismith, MD
McMillan, Room 310B
Phone: 314-747-0432
Clinical Imaging Research in Multiple Sclerosis (8 weeks). The student will learn about neuroimaging, imaging analyses, data collection, data management, and clinical study endpoints in multiple sclerosis (MS). They will observe patient participants undergoing a detailed evaluation of disability measures, such as ambulation, symptom scales, cognition, vision, upper extremity function, etc. They will witness the entire process of image acquisition, processing, analyses, and data extraction. They will have the opportunity to interact with many people who are vital to the research, including research coordinators, imaging technologists, imaging physicists/chemists, and specialized
research clinicians (i.e., neurocognitive and physical therapy research specialists).

The student will assist with hands-on clinical investigative research. They will gain an excellent appreciation of MS, from its pathophysiology within the central nervous system, to how it affects the neurological function of individuals. Through detailed and quantitative imaging analysis, the student will become very adept at analyzing brain MRI scans. They will mark and track lesions, determine their effects on clinical function, normal appearing white matter, cortex and gray-matter structures. They will become familiar with Amira Imaging Analysis Software, SPSS Statistical Analysis Software, SIENA Volume Analysis Software, and Matlab Imaging Analysis Software.

Steven E. Petersen, PhD
East Building, Room 2108
Phone: 314-362-3319
This lab is interested in brain organization and function, particularly for language, attention, and memory. Our main approaches to these issue is through functional MRI and large-scale network analysis.

Joel S. Perlmutter, MD
East Building, 2nd Floor
Phone: 314-362-6026
Pathophysiology of Movement Disorders. The lab is primarily interested in etiology, pathophysiology and treatment of basal ganglia disorders. We have several studies of PD. We investigate mechanisms of action of deep brain stimulation, a dramatic new treatment. These studies combine PET, cognitive testing and quantified measures of movement. We also test new drugs that might rescue injured nigrostriatal neurons (a model of PD). For these, we use PET to measure dopamine pathways and also quantify motor behavior. We also have an active program developing and validating neuroimaging biomarkers for PD and integrity of the nigrostriatal pathway that includes studies in people and animal models of PD. We have an active program combining a variety of approaches to develop biomarkers and investigate the pathophysiology of dementia associated with PD. We use PET to measure radioligand binding and sensorimotor processing in dystonia. We developed a new animal model of dystonia to investigate pharmacologic and physiologic changes. We use PET to investigate drug-mediated pathways in the brain and parse out the effects of selective dopaminergic agonists. We also are working to develop MR-based methods including DTI and resting-state functional connectivity to investigate brain mechanisms underlying PD and dystonia.

Brad A. Racette, MD
McMillan, 9th Floor
Phone: 314-362-5291
Our lab is primarily interested in environmental risk factors associated with Parkinson’s disease. We use a variety of techniques to study these risk factors, including traditional field epidemiology in which we evaluate workers exposed to metals in the U.S. and residents living near a smelter in South Africa, neuroimaging where we study the pathophysiology of toxin-mediated parkinsonism, geographic information systems research where we associate environmental toxin exposures with incident and prevalent Parkinson’s disease in the U.S. and Finland, and neuropathologic studies in manganese-exposed workers from South Africa. There are numerous opportunities available for students to be involved with any of these projects. Students will have some clinical exposure, as well, to familiarize them with pertinent clinical syndrome.

Marcus E. Raichle, MD
Neuro Imaging Laboratory – East Building, 2nd Floor
Phone: 314-362-6907
In vivo brain hemodynamic, metabolic and functional studies of human cognition and emotion using cyclotron-produced isotopes and emission tomography (PET) as well as functional magnetic resonance imaging (fMRI) in humans. Refer also to the listing on this page for Steven E. Petersen, PhD.

Gregory Wu, MD, PhD
McMillan, 3rd Floor
Phone: 314-362-3293
Understanding how immune responses are generated that target the central nervous system. Specifically, studies on antigen presentation cell contributions to autoimmune animal models of multiple sclerosis. Our goal is to understand what cellular interactions are critical to the development of immune-mediated demyelination.

Faculty

Department Chair
David Holtzman, MD
Visit our website for more information about our faculty (https://neuro.wustl.edu/Faculty) and their appointments.

A

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M35 Neurol 554 Neural Science
Neural Science is an intensive seven-week course that covers the structure, function and development of the nervous system as seen from molecular, cellular and systems-oriented perspectives. The emphasis is on the organization and function of the nervous system in health, but there is frequent reference to the clinical relevance of material presented. The course includes regular lectures, conference sessions and laboratories, plus a number of clinically oriented presentations and Special Topics sessions that address selected issues in greater depth. Computer-aided instructional programs, accessible from a variety of locations, provide auxiliary modes of self-paced learning and review. The midterm and final emphasize the core body of important facts and principles presented in lectures and laboratories. Limited space is available for non-medical students with instructor's permission. Non-medical students should register under the cross-listed number L41 Biol 554 (spring only).
Credit 109 units.

M35 Neurol 632 Diseases of the Nervous System
The goal of this course is to provide an introduction to the diseases of the central and peripheral nervous systems, including their clinical manifestations, pathology, pathophysiology and pharmacotherapy. The course includes reading assignments, lectures, laboratories, team activities, and clinical presentations.
Credit 53 units.

M35 Neurol 720 Neurology Clerkship
During the four-week Neurology clerkship, students will gain proficiency in understanding diseases of the nervous system, the neurologic work-up, localization and differential diagnosis generation, and devising a treatment plan. A variety of settings are available, which could include adults or pediatric services, with both inpatient and outpatient experiences. Students will provide care for patients with neurologic problems under the supervision of residents, fellows and attendings.
Credit 154 units.

M35 Neurol 730 Physical Medicine and Rehabilitation Clerkship
Clerkship in PM&R for third-year medical students provides an opportunity to gain basic knowledge and clinical skills in evaluation and management of a wide range of neurological and musculoskeletal diseases and conditions that require specialized rehabilitative medical and therapeutic care. Students spend two weeks on Spinal Cord Injury Unit (SCI) and two weeks on Brain Injury (BI) & Stroke Unit at The Rehabilitation Institute of St. Louis. Students are expected to be a part of the rehabilitation team, follow two to three patients, participate in daily morning rounds, participate in performing consults, attend team meetings and family conferences. Students are required to attend several outpatient clinics such as SCI, BI, Amputee and Stroke. During the entire rotation, students work together with PM&R residents and fellows, and under direct guidance of the NeuroRehabilitation faculty. The usual duty hours are 7-7:30 a.m. to 5 p.m. during weekdays, and 8 a.m.-noon on Saturdays. There is no night call. Students are required to attend all PM&R curriculum lectures and conferences. On the first day of rotation, students meet with the PM&R program director to go over goals, objectives and schedules. Upon completion of the rotation, students are required to fill out the evaluation form to provide feedback regarding rotation experience.
Credit 154 units.

M35 Neurol 827 Neurology Sub-Internship for WUSM Students
This four-week elective will be customized to include inpatient and outpatient experiences desired by WU students who have completed the WU Neurology Clerkship. Students may choose this elective to further improve their neurology knowledge and skills. Students considering neurology as a career may also desire additional exposure to supplement their prior clerkship experience. The elective is split into two two-week rotations which may include: 1. Adult Inpatient General Service (with one clinic/week) 2. Adult Inpatient Stroke Service (with one clinic/week) 3. Adult Inpatient Consult Service (with one clinic/week) 4. Pediatric Neurology Consult Service (with one clinic/week) 5. Adult Neurology ICU (with one clinic/week) 6. Outpatient Clinics (with 8-10 clinics/week).
M35 Neurol 826 Neurology Sub-Internship for Visiting U.S. Medical Students
This four-week elective for fourth-year visiting students from a U.S. medical school provides the option (space permitting) of four weeks of Adult Inpatient Service (Stroke for two weeks, General Neurology for two weeks), or two weeks on an Adult Inpatient Service and two weeks on the Adult Consult Service. Students on the inpatient service will function as a sub-intern under the supervision of their junior resident, chief resident, and attending physician. The student will also attend weekly clinical conferences and a weekly outpatient clinic experience. This elective is suitable for visiting fourth-year students interested in neurology, who wish to improve their neurology knowledge and skills.

M35 Neurol 830 Neuro-Oncology
Provide an outpatient-oriented combined pediatric and adult neuro-oncology experience for fourth-year medical students.
1. Attend multidisciplinary adult and pediatric neuro-oncology clinics and case conferences (tumor boards); 2. Attend the adult and pediatric radiation oncology clinics; 3. Attend neuropathology brain tumor review; 4. Participate in subspecialty brain tumor clinics; 5. Attend monthly brain tumor research conferences.

M35 Neurol 851 Clinical Aspects of Aging and Dementia
This elective provides the opportunity to learn about clinical research and clinical care in health brain aging and dementia. Students should contact the course directors to discuss this, as the elective is customized based on student interests. This can be a two-week or four-week elective. Students can gain proficiency in interviewing techniques and in the neurologic examination of the geriatric patient, and be introduced to neuropsychology, neuropsychiatry, biomarkers, neuroimaging, genetics, and other biomedical procedures important in the diagnostic evaluation of older adults. The Knight ADRC is an interdisciplinary group, so students have the opportunity to interact with physicians, nurse clinicians, psychologists and social workers, and to explore the neuropsychology, neuropsychiatry, biomarkers, neuroimaging, genetics, and other biomedical procedures used in the diagnosis of dementing disorders such as Alzheimer's disease, dementia with Lewy bodies, frontotemporal dementias, cerebrovascular disorders, and affective disorders.

M35 Neurol 859 Neonatal Neurology
The Neonatal Neurology elective will consist of a combination of inpatient and outpatient experiences designed to provide medical students with comprehensive exposure to the field. Through the rotation, students will actively participate in all aspects of patient care, acquiring the knowledge and skill necessary to effectively manage infants with neurological disorders, including encephalopathy, stroke, seizures, hypotonia, intraventricular hemorrhage, and periventricular leukomalacia, among others. Clinical activities will be tailored to fit the interests and goals of the individual student and include a combination of inpatient and outpatient experiences. Inpatient activities will occur in the St. Louis Children's Hospital Neonatal Intensive Unit as part of the Neonatal Neurology Consultation service. Outpatient activities will occur in the St. Louis Children's Hospital Outpatient Clinics. Students will also attend educational conferences specific to the field during the rotation, including Neonatal Neurology Clinical Conference and Neonatal Neuroradiology Conference.

M35 Neurol 860 Pediatric Neurology
The senior elective experience in child neurology is designed to adapt to the individual goals and objectives of students. The elective takes place in one or two 2-week blocks that occur among five possible venues as chosen by the student:
1. Outpatient clinics, 2. Inpatient ward service, 3. Inpatient general consult service, 4. NICU consult service, and 5. Video EEG (VEEG) monitoring service. The combination of services and experiences will be arranged directly between the student and the course director prior to beginning the rotation. In the outpatient clinics, students will rotate between a variety of subspecialty clinics and work with a variety of attendings in order to experience the breadth of outpatient pediatric neurology. Students rotating on the inpatient ward service will have a different role than the third-year student on pediatrics. The fourth-year student will focus solely on neurology patients and work closely with the pediatric neurology resident to develop neurology-specific care plans. No call or weekend duties will be expected on this rotation. On the general consult services, students will work with the consult attending and pediatric neurology residents on that team to see consults in the PICU, CICU, ER, and other hospital floors. The NICU consult team focuses on infants in the NICU. Student rotating on the VEEG monitoring service will focus on learning the indications and uses of VEEG and basic EEG reading skills.

M35 Neurol 861 Neurology/Neurosurgery ICU
The student will be integrated into the Critical Care Team that provides care in the Neurology/Neurosurgery ICU. Diseases frequently encountered include intracerebral hemorrhage, head trauma, subarachnoid hemorrhage, and stroke. The student will follow patients, participate in rounds and perform some procedures under supervision. Didactic sessions will be provided as conferences or lectures from the ICU attending.

M35 Neurol 865 Adult and Pediatric Epilepsy
Students will learn how epileptologists diagnose and manage epilepsy in adults and children. They will learn how to use the history and physical exam and laboratory studies such as EEG, MRI, PET, and SPECT to diagnose and manage patients with new onset epilepsy, established epilepsy, and medically intractable epilepsy. They will become familiar with the medical management of epilepsy as well as the treatment options for medically intractable epilepsy including surgery, the vagus nerve stimulator, and the ketogenic diet. They will also learn how to manage the co-morbid conditions that accompany epilepsy such as depression, behavioral problems, cognitive impairment, sleep disturbance, and non-epileptic events. Students will accomplish these goals by attending epilepsy clinics and rounding on the inpatient epilepsy service with the epilepsy team at Barnes-Jewish Hospital and St. Louis Children's Hospital. They will attend the Adult Epilepsy Conference, the Pediatric Epilepsy Conference, and Neurology Grand Rounds. Students will also have the opportunity to observe epilepsy surgery if they wish. They will have the option to present one 15-30 minute talk on a topic relevant to epilepsy.

M35 Neurol 872 MS Center/Outpatient - Missouri Baptist
Students will develop their skills in taking histories and performing neurological examinations on patients with multiple sclerosis under direct supervision of multiple sclerosis specialists. Localization of neurological findings and symptoms to the neuro-axis will be emphasized. A major goal for the students will be to increase the understanding of comprehensive patient management including disease treatment, symptom
management, adjunctive therapy services, and psychosocial issues. The outpatient rotation will be four weeks at The MS Center for Innovations in Care at Missouri Baptist Medical Center with Dr. Barry Singer and Dr. Mark Tullman. An additional goal for students will be to understand process of clinical research and translation into approved therapies. The center has been a leader in clinical trial development of therapeutics that have been or will soon be FDA-approved as new medications for multiple sclerosis.

M35 Neurol 900 Research Elective - Neurology
Research opportunities may be available. If interested, please contact the Department of Neurology.

Department of Neuroscience
The structure of the human body is presented in two courses: Human Body: Anatomy, Embryology, Imaging (Neurosci 501B), offered in the first semester, and Histology and Cell Biology (Neurosci 502A), which extends over the first and second semesters. A third course, Neural Science (Neurol 554), is taught at the end of the second semester.

The Human Body: Anatomy, Embryology, Imaging is largely a laboratory course, and lectures deal with anatomical principles and human growth and development. Histology and Cell Biology focuses on cell and tissue biology, with laboratory sessions paralleling the lectures in these areas. Neural Science is an integrated course that deals with the structure, function and development of the nervous system from molecular, cellular and systems perspectives. Throughout all three courses, attention is paid to the results of recent investigations and to major developments in each field. In addition, the departmental faculty have a lead role in many graduate courses that may be taken as electives by students in any of the four years.

The department is well-equipped for specialized work in several areas, including gross anatomy, tissue culture and all aspects of neurobiology.

Website: http://neurosci.wustl.edu

Degrees & Requirements
While the Department of Neuroscience does not offer its own degree, some of the department’s courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research
M05 Neurosci 900
Cross-listed with L41 Biol 590

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Molecular, electrophysiological, and behavioral analyses of neural circuits for vestibular control of spinal function.

Amy Bauernfeind, PhD
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Biological bases of human cognition; comparative neurobiology of primates.

Azad Bonni, MD, PhD
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Principles & mechanisms governing assembly & function of neural circuits, deregulation of mechanisms in neurological diseases.

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Cell biology of the developing nervous system.

Andreas Burkhalter, PhD
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Organization and function of neuronal circuits in mouse visual cortex.

Harold Burton, PhD
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Cortical functional reorganization in response to sensory changes due to unilateral deafness or strabismus.

Valeria Cavalli, PhD
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Cellular, molecular and epigenetic mechanisms controlling axon regeneration.

Krikor Dikranian, MD, PhD
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Development and morphology of the amyloid plaques in experimental animals, neuropathological changes after head trauma.
James Fitzpatrick, PhD
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Optical and charged particle multiscale microscopy application method development.

Harrison Gabel, PhD
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Gene regulation in the developing nervous system; molecular mechanisms of neurodevelopmental disorders.

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Learning-related hippocampal network activation.

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Mammalian pheromones: neural mechanisms of action.

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Neuronal mechanisms of voluntary behavior.

Ashley Morhardt, PhD
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Evolution of neural diversity within and across non-mammalian vertebrate clades, especially dinosaurs.

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Molecular genetic analysis of synaptic development and function.

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Molecular mechanisms underlying neurodegenerative processes. Signaling mechanisms associated with intracellular receptors.

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Neuronal bases of economic choice and decision making.

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Comparative anatomy of the skull in primates as it relates to human evolution.

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The roles of ion channels in neuronal long-term excitability changes.

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Molecular genetics of sleep and circadian rhythms.

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Computational and cognitive issues in cortical control of eye and arm movement: electrophysiology and imaging.

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Organization, function, and development of primate cerebral cortex, especially in humans; generation and utilization of neuroinformatics tools for data mining.

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Molecular pathways shaping nervous system development and function.

Faculty
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A

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MD Queen's University 1986

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Professor of Neuroscience (primary appointment)  
Associate Professor of Biomedical Engineering  
MS University of CA San Diego 1976  
BA University of San Diego 1974  
PhD Purdue University 1980

Andreas H Burkhalter, MS, PhD  
Professor of Neuroscience (primary appointment)  
Associate Professor of Biomedical Engineering  
Associate Professor of Neurobiology in Neurological Surgery  
MS University of Zurich 1973  
PhD University of Zurich 1977

Harold Burton, PhD  
Professor of Neuroscience (primary appointment)  
Professor of Biomedical Engineering  
Professor of Cell Biology and Physiology  
Professor of Radiology  
PhD Univ of Wisconsin Madison 1968  
BA University of Michigan 1964

Valeria Cavalli, PhD, MS  
Associate Professor of Neuroscience (primary appointment)  
BS University of Geneva 1991  
PhD University of Geneva 2000  
MS University of Geneva 1992

Krikor T Dikranian, MD, PhD  
Professor of Anatomy (primary appointment)  
Professor of Physical Therapy  
MD Medical University - Varna 1978  
PhD Medical University - Sofia 1992

Susan M Fitzpatrick, PhD  
Adjunct Associate Professor of Neuroscience (primary appointment)  
Adjunct Associate Professor of Occupational Therapy  
PhD Cornell University 1984  
BS St Johns University 1978

James Alexander John Fitzpatrick, PhD  
Associate Professor of Neuroscience (primary appointment)  
Associate Professor of Cell Biology and Physiology  
BS King's College London 2000

Ilya E. Monosov, MS, PhD  
Assistant Professor of Neuroscience (primary appointment)  
MS NewSchool Architecture Design 2005  
PhD Brown University 2009  
BS University of CA San Diego 2004

Ashley C. Morhardt, MS, PhD  
Assistant Professor of Anatomy (primary appointment)  
MS Western Illinois University 2009  
PhD Ohio University 2016  
BS Illinois College, Jacksonville 2006

Karen Laurel O'Malley, PhD, MS  
Professor of Neuroscience (primary appointment)  
PhD University of Texas Austin 1980  
MS Portland St University 1973  
BA Sonoma State University 1971

Camillo Padoa-Schioppa, MS, PhD  
Associate Professor of Neuroscience (primary appointment)
Courses
Visit online course listings to view offerings for M05 Neurosci (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M05).

M05 Neurosci 501B Human Body: Anatomy, Embryology, Imaging
The course is primarily lab-based, focusing on dissection of the human body. Lectures on functional and topographic anatomy emphasize the principles of organization of the various systems of the body. Lectures on developmental anatomy stress organogenesis as an adjunct to understanding the normal and abnormal anatomy. Small group discussions emphasize radiological anatomy and clinical correlations. Frequent use of CT, MRI, and X-ray images aid in the synthesis of knowledge gained through dissection. Cross-listed with L41 (Biol) 501. Credit 140 units.

M05 Neurosci 502A Histology and Cell Biology
The structures of cells, tissues, and major organ systems are studied in relationship to their functions. Lectures integrate histology with cell biology and physiology. The laboratories consist of the study of prepared slides and electron micrographs using an iBook or eBook (ePub) guide. An extensive online digital annotated atlas (slide-atlas.org) and a video library are used to supplement the slides and electron micrographs. Presentations of case studies provide examples of clinical relevance. A dual-view microscope and slide set will be issued for each pair of students. Limited space is available for non-medical students, who must have permission from the course director to enroll. The topics in this course are timed to integrate with the physiology course and span the fall and winter semesters. Credit 66 units.

M05 Neurosci 810 Advanced Dissection
Different regions of the body will be dissected in detail. A period of four weeks should be allowed for each region: head and neck, thorax and abdomen, and superior and inferior limbs. Surgical approaches, cross-sections, X-rays, and CT scans can be studied.

Department of Neurosurgery
Instruction in neurological surgery begins with an introduction to the anatomy and physiology of the nervous system presented in the first-year course in neural sciences directed by the Department of Neuroscience (http://neurosci.wustl.edu) with participation of the neurosurgery faculty. In the second year, the Department of Neurosurgery (http://www.neurosurgery.wustl.edu) presents the course in Diseases of the Nervous System in conjunction with the departments of Neurology, Pathology & Immunology, Molecular Microbiology, Medicine and Pediatrics. The course emphasizes how knowledge derived from basic or clinical investigations leads to improvements in clinical care. In the third year, students may elect to participate in a two- or four-week Neurosurgery clerkship which introduces them to the clinical care of patients with diseases of the nervous system. Neurosurgical faculty

Associate Professor of Economics (Courtesy)
MS La Sapienza University 1996
PHD Mass Inst of Technology (MIT) 2002

Terrence Bradley Ritzman, MA, PHD
Assistant Professor of Anatomy (primary appointment)
Assistant Professor of Anthropology
BA University of Illinois 1999
MA Colorado St University 2005
PHD Arizona State University 2014

Lawrence B Salkoff, PHD
Professor of Neuroscience (primary appointment)
Professor of Genetics
BA University of CA Los Angeles 1967
PHD University of CA Berkeley 1979

Paul Joseph Shaw, MA, PHD
Associate Professor of Neuroscience (primary appointment)
MA San Jose State University 1990
PHD University of Chicago 1996
BA Niagara University 1985

Lawrence H Snyder, AB, MS, PHD, MD
Professor of Neuroscience (primary appointment)
Professor of Psychological & Brain Sciences
AB Princeton University 1982
MS University of Rochester 1992
PHD University of Rochester 1992
MD University of Rochester 1992

Paul H Taghert, PHD
Professor of Neuroscience (primary appointment)
PHD University of Washington 1981
BA Reed College 1975

David C Van Essen, PHD
Alumni Endowed Professor of Neurobiology (primary appointment)
Professor of Biomedical Engineering
BS California Institute Technolo 1967
PHD Harvard University 1971

Jason Yi, PHD
Assistant Professor of Neuroscience (primary appointment)
PHD Duke University 2009
BS Dickinson College 2001
Peripheral Nerve

Washington University neurosurgeons work with a multidisciplinary group of surgeons, neurologists and therapists to customize patient treatments to maximize functional outcomes. Washington University neurosurgeons have extensive expertise in advance microsurgical reconstructive techniques and are on the forefront for new innovative ways to improve patient outcomes.

Pediatric Neurosurgery

The entire spectrum of neurosurgical disorders in children is treated by pediatric neurosurgeons and physicians in related disciplines. Our pediatric neurosurgeons also are part of multidisciplinary teams that provide care in several specialized pediatric centers: brachial plexus center, center for cerebral palsy spasticity, neurofibromatosis clinic, pediatric epilepsy center, pediatric gamma knife program, pediatric neuro-oncology program, and spina bifida clinic.

Epilepsy

Our neurosurgeons are nationally recognized for epilepsy patient care and research and are part of a multidisciplinary team that works together to develop the optimal plan to control or minimize seizures. The Department of Neurosurgery offers care for both adults and children with medically intractable seizures and provides a full range of surgical options for intractable epilepsy, including implantable seizure-control devices, resection of seizure foci, and vagal nerve stimulation.

Movement Disorders

The multidisciplinary team specializes in the treatment of movement disorders such as ataxia, catatonia, dystonia, essential tremor, Huntington's disease, myoclonus, Parkinson's disease, and Tourette Syndrome. For some patients with Parkinson's disease or essential tremor, medications are often inadequate to control disabling symptoms. These patients may benefit from stereotactic neurosurgical procedures to improve their function.

Degrees & Requirements

While the Department of Neurosurgery does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

Michael R. Chicoine, MD
Phone: 314-747-6143
Outcomes analysis for adult patients with brain tumors. Current clinical studies focus on outcomes of patients with benign
and malignant brain tumors utilizing a prospective brain tumor database. Particular emphasis includes the impact of intraoperative MRI (iMRI) upon outcomes for patients with brain tumors and other diseases. We are establishing a multicenter database pooling data from multiple iMRI centers in North America.

Ian G. Dorward, MD  
Phone: 314-747-6142  
Research interests include outcomes analysis in spinal reconstruction surgery, including the impact of age, obesity, and other clinical variables on costs, complications, and patient satisfaction. Another area of interest is the evaluation of novel techniques in spinal deformity correction and minimally invasive spinal surgery. Additional work focuses on etiologic factors in spinal deformity, both in adolescents and adults.

Gavin P. Dunn, MD, PhD  
Phone: 314-747-6141  
Studies focus on examination of molecular mechanisms in the endothelial cells and smooth muscle cells in the intracerebral microcirculation and the contribution of glial cells to their impairment after hypoxia/reoxygenation. In vitro techniques for studying isolated perfused microvessels are used to examine questions centered on endothelial smooth muscle and glial cell integration of cerebral blood flow responses.

Ammar H. Hawasli, MD, PhD  
Phone: 314-747-6144  
Our functional spinal neurosurgery research laboratory aims to understand the physiological and pathophysiological relationships between the spine and brain. We study brain physiology and connectivity in spinal disorder patients leveraging expertise in both spinal neurosurgery and brain physiology and a network of high-level collaborators at Washington University School of Medicine.

Albert H. Kim, MD, PhD  
Phone: 314-747-6141  
I have laboratory and clinical research interests in the cancer stem cell state and the genetics of glioblastoma using human tumor specimens. I additionally have clinical projects examining patient outcomes for two common types of brain tumors, meningiomas and pituitary tumors.

Eric C. Leuthardt, MD  
Phone: 314-747-6146  
Pursuing research in the areas of neuroprosthetics, brain computer interfaces (BCIs), and advanced imaging modalities. These include opportunities in basic neurophysiology, engineering for BCIs, and functional MRI imaging research for applications toward brain tumors.

David D. Limbrick, MD, PhD  
Phone: 314-454-4630  
Clinical and translational research into newborn brain injuries, including post-hemorrhagic hydrocephalus. Main research areas include cerebrospinal fluid protein markers of disease, MRI diffusion tensor imaging, and prospective clinical trials. Also, multi-institutional clinical research opportunities exist for syringomyelia associated with Chiari I malformation.

T.S. Park, MD  
Phone: 314-454-2810  

Wilson Z. Ray, MD  
Phone: 314-362-3114  
Clinical and translational research on peripheral nerve and spinal cord injuries. Lab-based opportunities for longer research electives investigating peripheral nerve regeneration and peripheral neuroprosthetics incorporating transient electronics.

Keith M. Rich, MD  
Phone: 314-747-6142  
Research on neuronal and glioma cellular apoptosis after treatment with DNA-damaging agents. Techniques include growing human brain tumor cells in culture, bioassay for apoptosis with fluorescent staining, protein immunoblotting, and PCR.

Matthew Smyth, MD  
Phone: 314-454-4454  
Clinical outcomes studies for pediatric epilepsy surgery and craniostenosis surgery, basic and translational research in advanced clinical imaging, and translational research in the development of focal brain cooling devices for the treatment of epilepsy.

Gregory J. Zipfel, MD  
Phone: 314-747-6141  
My NIH-funded research program involves both basic and clinical research efforts focused on two main conditions: 1) Cerebral amyloid angiopathy and its contribution to ischemic stroke, vascular dementia, and Alzheimer's Disease; and 2) Vasospasm-induced delayed cerebral ischemia and long-term cognitive deficits following aneurysmal subarachnoid hemorrhage. My work spans from basic experimental methods including cell culture and ex vivo vascular techniques to in vivo studies utilizing animal models of ischemic stroke and subarachnoid hemorrhage and live animal epifluorescent and confocal imaging to Phase I clinical trials in patients.

Faculty

Department Head

Ralph G. Dacey, MD  
Visit our website for more information about our faculty (http://www.neurosurgery.wustl.edu/patient-care/find-a-physician/clinical-faculty-243) and their appointments.
Michael R Chicoine, MD
Professor of Neurological Surgery (primary appointment)
August A. Busch, Jr. Distinguished Professor
MD University of California 1990
BS University of Illinois 1985

Ralph G Dacey Jr, MD
Henry G and Edith R Schwartz Professor of Neurological Surgery (primary appointment)
Head of the Department of Neurological Surgery
MD University of Virginia 1974
BA Harvard University 1970

Ian G Dorward, MD
Assistant Professor of Neurological Surgery (primary appointment)
MD Washington Univ in St. Louis 2005
BS University of Colorado Boulder 2000

Joshua L Dowling, MD
Professor of Neurological Surgery (primary appointment)
BA Yale University 1985
MD Tulane University 1989

Gavin P. Dunn, PHD, MD
Assistant Professor of Neurological Surgery (primary appointment)
Assistant Professor of Pathology and Immunology
BA Princeton University 1998
PHD Washington Univ in St. Louis 2006
MD Washington Univ in St. Louis 2006

Robert L Grubb Jr, MD
Professor of Neurological Surgery (primary appointment)
Professor of Radiology
MD University of North Carolina 1965
BA University of North Carolina 1961

Ammar H Hawasli, PHD, MD
Assistant Professor of Neurological Surgery (primary appointment)
Assistant Professor of Neuroscience
Assistant Professor of Orthopaedic Surgery
PHD University of Texas Southwest 2009
MD University of Texas Southwest 2009
BA Washington Univ in St. Louis 2002

Matthew A Howard
Adjunct Assistant Professor of Neurological Surgery (primary appointment)

Sarah C. Jost
Adjunct Assistant Professor of Neurological Surgery (primary appointment)

Albert H Kim, MD, MA, PHD
Associate Professor of Neurological Surgery (primary appointment)
Associate Professor of Developmental Biology
Associate Professor of Neurology
MD New York U. School of Medicine 2003
MA Washington Univ in St. Louis 1999
BA Harvard University 1994
PHD New York U. School of Medicine 2002

Eric Claude Leuthardt, MD
Professor of Neurological Surgery (primary appointment)
Professor of Mechanical Engineering and Applied Science.
Professor of Neuroscience
BS Saint Louis University 1995
MD University of Pennsylvania 1999

David D Limbrick Jr, PHD, MD
Professor of Neurological Surgery (primary appointment)
Professor of Pediatrics
PHD Virginia Comm University 2001
MD Virginia Comm University 2001
BS College of William and Mary 1995

Matthew R. MacEwan, PHD
Assistant Professor of Neurosurgery (primary appointment)
BS Case Western Reserve Univ 2004
PHD Washington Univ in St. Louis 2015

James Patterson McAllister, PHD
Professor of Neurological Surgery (primary appointment)
BA Earlham College 1970
PHD Purdue University 1976

Joshua William Osbun, MD
Assistant Professor of Neurosurgery (primary appointment)
BA Texas A&M University 2002
PHD Texas A&M University 2002
MD University of Texas Southwest 2007

Tae Sung Park, MD
Shi Hui Huang Professor of Neurological Surgery (primary appointment)
Professor of Neuroscience
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School of Medicine (07/06/18)

Professor of Pediatrics
BS Yonsei University 1967
MD Yonsei University 1971

Wilson Z Ray, MD
Associate Professor of Neurological Surgery (primary appointment)
Associate Professor of Biomedical Engineering
Associate Professor of Orthopaedic Surgery
MD University of Iowa 2004

Keith M Rich, MD
Professor of Neurological Surgery (primary appointment)
Professor of Neuroscience
Professor of Radiation Oncology
BA Taylor University 1974
MD Indiana University Bloomington 1977

Paul Santiago, MD
Professor of Neurological Surgery (primary appointment)
Professor of Orthopaedic Surgery
BS Stanford University 1990
MD Yale University 1995

Gerwin Schalk
Adjunct Assistant Professor of Neurological Surgery (primary appointment)

Itender Singh, PHD
Assistant Professor of Neurological Surgery (primary appointment)
PHD UNIVERSITY OF DELHI 2004

Matthew D Smyth, MD
Professor of Neurological Surgery (primary appointment)
Professor of Pediatrics
MD University of CA San Francisco 1996
BA Cornell University 1992

Jennifer Mae Strahle, MD
Assistant Professor of Neurological Surgery (primary appointment)
Assistant Professor of Orthopaedic Surgery
Assistant Professor of Pediatrics
BS Bates College 2002
MD University of Minnesota 2008

Neill Marshall Wright, MD
Herbert Lourie Professor of Neurological Surgery (primary appointment)
Professor of Orthopaedic Surgery
MD University of California 1993
BA University of California 1989

Hiroko Yano, MS, PHD
Assistant Professor of Neurological Surgery (primary appointment)
Assistant Professor of Genetics
Assistant Professor of Neurology
BS Science University of Tokyo 1991
MS University of Tokyo 1993
PHD University of Tokyo 1996

Liya Yuan, PHD, MS
Instructor in Neurological Surgery (primary appointment)
PHD Tongji University 1994
MS Tongji University 1987

Gregory Joseph Zipfel, MD
Professor of Neurological Surgery (primary appointment)
Professor of Neurology
MD Northwestern University Med 1995
BS University of Illinois 1991

Courses

Clerkship Opportunities
Students may elect to obtain their neurology clerkship experience on the neurosurgery service, or they can choose neurosurgery as part of the surgical specialty rotations. Third-year students participate with the residents and attendings on hospital rounds, evaluate patients in the neurosurgery outpatient department and participate in the neurosurgical operating room. The main objectives of the rotation include: 1) the evaluation of comatose or head-injured patients; 2) clinical presentation, diagnostic work-up and treatment of cervical and lumbar disc disease; and 3) evaluation and treatment of patients with hemorrhagic and ischemic stroke.

M40 NeurSurg 805 Neurosurgery
The goal of this elective is to provide an overview of neurological surgery. The fourth-year medical student will participate in patient work-ups, pre-, intra- and postoperative care, and diagnostic procedures. Students will also scrub in cases with senior-level and chief residents assisting with neurosurgical procedures and observing the more critical portions of these procedures. It is expected that they will learn how to perform basic neurosurgical procedures such as lumbar punctures, ICP monitor placement, and ventricular drain placement. Fourth-year medical students are encouraged to participate in Grand Rounds, Neurosurgery Resident Curriculum conference, and Journal Club with the neurosurgery residents. At least one day/week is spent in an outpatient neurosurgery office setting. A week spent on the pediatric service at St. Louis Children’s Hospital is a component of this fourth-year elective.
Research

Kelle H. Moley, MD  
Sarah England, PhD  
Indira Mysorekar, PhD  
Celia Santi, PhD  
Katherine Fuh, MD, PhD

BJC Institute of Health, 10th Floor  
Phone: 314-286-1775

In this six-week elective, students will have the opportunity to immerse themselves in bench research in reproductive science.

- Moley’s research focuses on mammalian gametes, fertilization, preimplantation development and implantation.
- England’s laboratory focuses on uterine contractility and ion channels in the uterine myometrium.
- The Mysorekar lab studies the dynamics of tissue regeneration in the adult mammalian urinary bladder pathogenesis of a common infectious disease in women: namely, recurrent urinary tract infections (UTIs) and investigation of potential infectious etiology for preterm birth in pregnant women.
- Santi’s work focuses on ion channels in mouse and human sperm.
- Fuh investigates cell signaling in ovarian cancer and the biology of ovarian cancer metastasis.

The main criteria for this rotation is that the student must have prior experience as an undergraduate or postgraduate in a...
laboratory, not including class work. This rotation is designed for the student planning a career in academic medicine as a physician scientist and one who is interested in considering reproductive science as a field. Prior to signing up for this course, the student must contact Dr. Moley to discuss the schedule and expectations of the rotation.

**Faculty**

**Department Head**
George M. Macones, MD, MSCE

**OB-GYN Student Clerkship Director**
Tammy Sonn, MD

Visit our website for more information about our faculty (http://www.obgyn.wustl.edu/content/199/faculty_listing.aspx) and their appointments.

**A**

John K Appelbaum, MD  
Assistant Professor of Clinical Obstetrics and Gynecology  
(primary appointment)  
BA Saint Louis University 1980  
MD Washington Univ in St. Louis 1984

Tomas Ismael Aquino  
Assistant Professor of Clinical Obstetrics and Gynecology  
(primary appointment)

Yasmin Asvat, BA1, MA, PHD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
BA University of Toronto 2004  
BA1 University of Toronto 2004  
MA San Diego St University 2006  
PHD University of South Florida 2013

**B**

Sangeeta Kaur Babar, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Albany Medical College 2003  
BS Rensselaer Poly Institute 2001

Margaret Elizabeth Baum, BA1, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
BA Saint Louis University 1997  
BA1 Saint Louis University 1997  
MD John Hopkins Univeresity 2001

Michael William Bebbington, MD  
Professor of Obstetrics and Gynecology (primary appointment)  
MD McMaster University 1982

Robert L Becker, MD  
Assistant Professor of Clinical Obstetrics and Gynecology  
(primary appointment)  
BA Cornell University 1965  
MD Washington Univ in St. Louis 1969

James E Belcher, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Washington Univ in St. Louis 1976  
BS University of Texas Austin 1972

Joe E Belew, MD  
Associate Professor of Clinical Obstetrics and Gynecology  
(primary appointment)  
BA Central Methodist College 1953  
MD Saint Louis University 1957

Laura Bergin  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Scott W Biest, MD  
Associate Professor of Obstetrics and Gynecology (primary appointment)  
MD University of MO Kansas City 1989  
BS University of MO Kansas City 1985

Jeffrey D Bloss  
Adjunct Associate Professor of Obstetrics and Gynecology  
(primary appointment)

Richard Gerald Bolanos  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Kathryn L Botney, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
BA Washington Univ in St. Louis 1980  
MD Washington Univ in St. Louis 1984

Lawrence V Boveri, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD University of Missouri 1988

Jessica Naomi Bowers  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Igor Brondz, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD School Not Listed 1978

Robert J Brown, MD  
Assistant Professor of Clinical Obstetrics and Gynecology  
(primary appointment)  
BS St Peters College 1977  
MD Washington Univ in St. Louis 1983
Bruce L Bryan, BE, MD  
Assistant Professor of Clinical Obstetrics and Gynecology  
(primary appointment)  
BE Purdue University 1973

Alison Gale Cahill, MD  
Associate Professor of Obstetrics and Gynecology (primary appointment)  
MD University of Connecticut 2002  
BA Yale University 1997

Ebony Boyce Carter, MS, MD  
Assistant Professor of Obstetrics and Gynecology (primary appointment)  
Assistant Professor of Surgery (Public Health Sciences)  
MS University of Michigan 2002  
BS Stanford University 2000  
MD Duke University 2006

Arthur L Casey, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD University of Missouri 1977

Michael B Chen  
Assistant Professor of Clinical Obstetrics and Gynecology (primary appointment)

Ronald J Chod, MD  
Adjunct Associate Professor of Obstetrics and Gynecology (primary appointment)  
BA University of Texas Austin 1978  
MD Southwestern University 1983

Camaryn E Chrisman Robbins, M PH, MD  
Associate Professor of Obstetrics and Gynecology (primary appointment)  
M PH University of Michigan 1998  
MD Wake Forest University 2004

Christine M Chu, MD  
Assistant Professor of Obstetrics and Gynecology (primary appointment)  
MD Jefferson Medical College 2009

Vicente M Colon-Alcaraz, MD  
Assistant Professor of Clinical Obstetrics and Gynecology (primary appointment)  
BA University of Puerto Rico 1978  
MD School Not Listed 1982

Eric S Colton, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
BS University of CA Irvine 1987  
MD Saint Louis University 1996

Shayna N Conner, MD  
Assistant Professor of Obstetrics and Gynecology (primary appointment)  
BA George Washington University 2003  
MD University of MO Columbia 2008

Robert D Crist  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Veronica Lynn Cross  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Jessica Despotovic  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Michelle R Devera, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Washington Univ in St. Louis 1993  
BA Washington Univ in St. Louis 1985

Jeffrey M Dicke, MD  
Professor of Obstetrics and Gynecology (primary appointment)  
BA University of Toledo 1975  
MD Ohio State University 1978

Shelby Marie Dickison, MD  
Assistant Professor of Obstetrics and Gynecology (primary appointment)  
MD University of MO Columbia 2011  
BS University of MO St Louis 2004

Russell B Dieterich, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD University of Illinois 1970  
BA Knox College 1965

Lakshmi Vilaya Dundoo, MS, UNKNOWN  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
BS School Not Listed 1986  
MS School Not Listed 1992  
UNKNOWN School Not Listed 1992

David Louis Eisenberg, MD, M PH  
Associate Professor of Obstetrics and Gynecology (primary appointment)  
MD University of Alabama 2003  
M PH Northwestern University 2009  
BS University of Pittsburgh 1999

Josiah O. Ekunno, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)
Sarah K England, PHD  
Professor of Obstetrics and Gynecology (primary appointment)  
Alan A and Edith L Wolff Professor of Medicine  
Professor of Cell Biology and Physiology  
PHD Medical College of Wisconsin 1993  
BA Carleton College 1988  

Prabagaran Esakky, PHD, MS  
Instructor in Obstetrics and Gynecology (primary appointment)  
PHD Natl Inst Resrch Reprod Health 2007  
MS Sri Paramakalyani College 1997  
BS Sri Paramakalyani College 1995  

Renee D Ewing, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
BA University of MO St Louis 1979  
MD Southern Illinois University 1984  

Cathleen Rae Faris, MD  
Assistant Professor of Clinical Obstetrics and Gynecology (primary appointment)  
BA University of Kansas 1977  
MD University of Kansas 1982  

Marsha Nicole Fisher, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD University of Missouri 1992  
BA Washington Univ in St. Louis 1988  

Shanon Alex Forseter  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  

Katherine C Fuh, MD  
Assistant Professor of Obstetrics and Gynecology (primary appointment)  
MD Georgetown University 2005  

Andrew E Galakatos, MD  
Professor of Clinical Obstetrics and Gynecology (primary appointment)  
MD University of Missouri 1965  
BS St Louis College of Pharmacy 1960  

Chiara G.I. Ghetti, MD  
Associate Professor of Obstetrics and Gynecology (primary appointment)  
MD Indiana University Indianopoli 1997  

Nicole Marie Gilbert, PHD  
Instructor in Obstetrics and Gynecology (primary appointment)  

Gordon Goldman, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Saint Louis University 1966  
BS University of Toledo 1962  

Diana Lee Gray, MD  
Professor of Obstetrics and Gynecology (primary appointment)  
Associate Dean for Faculty Affairs  
Professor of Engineering  
Professor of Radiology  
MD University of Illinois 1981  
BS University of Illinois 1977  

Margaret Rosanna Gray-Swain, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Washington Univ in St. Louis 2002  

Andrea Ruth Hagemann, MD  
Associate Professor of Obstetrics and Gynecology (primary appointment)  
MD Washington Univ in St. Louis 2004  
BA Princeton University 2000  

Hoosna Haque, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Beaufort Technical College 1996  
BS University of Texas Arlington 1992  

John Conor Hardeman  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  

Richard Alan Hartman, MD  
Associate Professor of Clinical Obstetrics and Gynecology (primary appointment)  
BS Mass Inst of Technology (MIT) 1974  
MD University of Missouri 1978  

Kenneth Edmond Hemba, MD  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  
MD Jefferson Medical College 2011  

Laurel D Hibbs  
Instructor in Clinical Obstetrics and Gynecology (primary appointment)  

Holly R Hoefgen, MD  
Assistant Professor of Gynecology and Obstetrics (primary appointment)  
BS Southern Ill Univ Edwardsville 2002  
MD Southern Illinois University 2008  

John T Hoff, MD
Instructor in Clinical Obstetrics and Gynecology (primary appointment)
MD Medical College of Wisconsin 2006
BS Xavier University 2002

Kathleen M Hogan, MD
Instructor in Clinical Obstetrics and Gynecology (primary appointment)
BA Westminster College 1985
MD University of Missouri 1989

Robert Franklyn Holloway Jr
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

William Edward Houck, MD
Instructor in Clinical Obstetrics and Gynecology (primary appointment)
BS Brown University 1977
MD University of Cincinnati 1981

David H Hua
Instructor in Clinical Obstetrics and Gynecology (primary appointment)
BS University of California 1990

Laura Hulbert, MD
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BA Washington Univ in St. Louis 1976
MD Washington Univ in St. Louis 1981

Saji Jacob, UNKNOWN, MD, DIP, MS
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UNKNOWN School Not Listed 1996
MD School Not Listed 1993
DIP School Not Listed 1998
MS Kerala University 1989

Eboni C January
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Patricia T. Jimenez, MD
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BA Rice University 2001
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Michael K Johnson, MD
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BS Ohio State University 1970

Sandy Lynn Jost

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Mark J Jostes, MD
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BS Rockhurst College 1976
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Emily Susan Junghem, MD
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K

Mary Bridget Keegan, MD
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MD University of MO Columbia 2010
BA Northwestern University 2004

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Jeannie Chen Kelly, MD
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Oroma Beatrice Afiong Nwanodi  
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BA1 Holy Cross College 1985
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Instructor in Clinical Obstetrics and Gynecology (primary appointment)
chief resident lecture series, procedural skill station session and this rotation. Student-directed didactics include the faculty and fellows, residents and nurse practitioners provide teaching for the emergency department/hospital inpatient consults. Faculty, delivery: outpatient faculty clinics within all specialties, Students are actively involved in all settings of health care Credit 16 units.

Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Z

Sandra G.H. Zakroff
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Darryl Thomas Zinck
Instructor in Clinical Obstetrics and Gynecology (primary appointment)

Courses

M45 ObGyn 635B Obstetrics and Gynecology
The obstetric component of this course emphasizes the physiologic basis of normal pregnancy, parturition, and labor and delivery, and adaptations of other organ systems to pregnancy. Pathophysiology of pregnancy and deviations from normal labor will also be introduced. The gynecologic component of the course reviews embryology, and includes the topics pediatric and adolescent gynecology, amenorrhea, abnormal uterine bleeding, infertility, menopause, and diagnosis and treatment of gynecologic neoplasms. Credit 16 units.

M45 ObGyn 730 OB-GYN Clerkship
All third-year medical students participate in a six-week clinical clerkship in Obstetrics and Gynecology. This is divided into three two-week components of outpatient OB-GYN, inpatient obstetrics and inpatient gynecology. Comprehensive study of the reproductive health needs of women in both the office setting and the surgical setting is the focus of the curriculum. Students are actively involved in all settings of health care delivery: outpatient faculty clinics within all specialties, resident ambulatory clinics, operating rooms for all obstetric or gynecologic cases, inpatient floors of L&D and Gynecology, and the emergency department/hospital inpatient consults. Faculty, fellows, residents and nurse practitioners provide teaching for this rotation. Student-directed didactics include the faculty and chief resident lecture series, procedural skill station session and faculty-assigned preceptor groups that meet throughout their six-week rotation. Credit 231 units.

M45 ObGyn 804 OB-GYN Outpatient Care Sub-Internship
This experience is designed to primarily acquaint the student with the diagnosis and care of outpatients. Students will work one-on-one with attending staff, to focus on an overview of evaluation, diagnosis, and treatment of common obstetric and gynecologic concerns. The sub-intern will spend the majority of time attending half day clinics and private offices. Overnight OB call is required (approximately two evening shifts) to acquaint the student with the house staff and hospital, providing opportunity to participate in deliveries. If desired, additional time can be arranged to participate in/observe outpatient surgical procedures. A 30-45 minute presentation to attendings and house staff will culminate the rotation on a selected OB-GYN topic.

M45 ObGyn 810 OB-GYN Endocrinology - Infertility Sub-Internship
The sub-intern will participate (in the office and hospital) in the study and treatment of women with reproductive endocrine disorders and infertility. The student will attend and present in conferences, attend surgery, observe assisted reproductive technology procedures, have assigned reading and be an integral part of the reproductive endocrine service. Opportunities for clinical research projects in reproductive endocrinology are also available.

M45 ObGyn 830 Gynecology Oncology Sub-Internship
The sub-intern will take part in the work-up of tumor patients prior to surgery and/or radiotherapy, assist in pelvic operations, help render perioperative care, and review pathology specimens and slides. The student will participate in GYN Tumor Clinic sessions, make hospital rounds with house staff, accompany chief residents on consultations, and attend OB-GYN conferences. Opportunities for clinical or basic research project in gynecologic malignancy are also available.

M45 ObGyn 833 Special Topics in Reproductive Health
Students will attend a variety of outpatient clinics to interact with patients seeking different reproductive health services. These clinics include family planning and abortion services at Planned Parenthood of the St. Louis Region, the St. Louis County STD clinic, Adolescent and Pediatric Gynecology, Child Sexual Abuse, Teen OB, The SPOT, Ultrasound and Prenatal Diagnosis, and Gynecology clinics at the Contraceptive Choice Center (C3), the Faculty Practice Gyn clinic at the Women's Health Center and the Ob/Gyn Resident clinic both located in the Center for Outpatient Health (COH). Clinical experiences will be ambulatory, but there is potential to work with Dr. Eisenberg in the operating room at Barnes-Jewish Hospital. Conferences include Obstetrics and Gynecology Grand Rounds every Wednesday at 7 a.m., Family Planning service meetings, and monthly Journal Club. Reading will include relevant articles and chapters. Students will be responsible for a brief (15-20 minute) presentation on a reproductive health topic at the conclusion of the course. Opportunities for clinical research in reproductive health are also available.

M45 ObGyn 843 Maternal-Fetal Medicine Outpatient Care Sub-Internship
Students will see a variety of high risk obstetrical patients in the outpatient setting in the Center for Advanced Medicine and the Center for Outpatient Health. The student will evaluate various types of reproductive age patients with medical or obstetrical complications, including preconception consultations, prenatal
care consultations and initial prenatal visits. The student will also see return patients to experience the continuity of prenatal care. Students will participate in antenatal testing and learn basic ultrasonography skills. The student will be responsible for one presentation to be given to the OB teams at the end of the rotation. Students are provided independent study time to put together the presentation which should be in PowerPoint and on a topic of their choice, inspired by a patient-related clinical condition that peaked their interest during the block. In addition, the student will have the option to take overnight call, or call in the Pregnancy Assessment Center in order to gain more hands-on experience with in-patient obstetrics. This is voluntary and not a requisite.

**M45 ObGyn 844 Maternal-Fetal Medicine Inpatient (Antepartum) Sub-Internship**

Sub-interns will participate in the antepartum and intrapartum management of high-risk hospitalized patients. There is limited interaction with outpatients through the High-Risk Obstetrics Clinics and the Center for Diabetes in Pregnancy. Examples include diabetes, hypertension, renal disease, hematologic abnormalities, preterm labor and others. Antepartum evaluation and monitoring of the pregnant woman and her fetus are emphasized. Supervision is by the antepartum chief resident and a maternal-fetal medicine faculty member and fellow.

An opportunity for intense labor and delivery experience with the Night Team is also encouraged. Students will spend time observing diagnostic obstetric ultrasound examinations. The student will prepare a brief talk on a topic of their interest during the course of the rotation.

**M45 ObGyn 856 OB-GYN Ultrasound - Genetics**

Working with the attending physicians in the Ultrasound Units at the Center for Advanced Medicine and the Center for Women’s Wellness at Missouri Baptist Medical Center, the student will learn the principles and techniques of noninvasive screening for fetal disorders and observe the performance of invasive prenatal diagnostic procedures. The student will also learn the standards and guidelines for performance of the antepartum obstetrical ultrasound examination and female pelvic examination. Normal and abnormal fetal and gynecologic anatomy will be reviewed. Experience will be gained in pedigree analysis and familial risk factor assessment by working with genetic counselors. One day is spent in the Cytogenetics Laboratory observing the preparation of prenatal specimens for karyotype analysis. Opportunities for participation in clinical research are also available.

**M45 ObGyn 861 Female Pelvic Med & Reconstructive Surg/ GYN Urogynecology Sub-I**

The sub-intern will take part in the office evaluation of patients (with pelvic floor disorders including pelvic organ prolapse, urinary incontinence, fecal incontinence, birth injuries), assist in pelvic floor reconstructive surgical procedures, and participate in perioperative care. The Sub-I will participate in office sessions, surgical cases and will be responsible for rounding with the Urogynecology resident on service as well as participating in consultations. The Sub-I will attend FPMRS didactic educational sessions and OB-GYN conferences. The Sub-I will be required to do a 45-minute presentation on an urogynecologic topic of choice by the end of the rotation. Opportunities for clinical research projects in Urogynecology are also available.

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**M45 ObGyn 900 Research Elective - Obstetrics and Gynecology**

Research opportunities may be available. If interested, please contact the Department of Obstetrics and Gynecology.

**M45 ObGyn WU OB-GYN Warm-Up**

This course exists to provide a warm-up experience for students returning to their clinical clerkships.

**John F. Hardesty, MD, Department of Ophthalmology and Visual Sciences**

Instruction begins in the first year with examination of the eye and a lecture on various aspects of ocular disease. During the second year, students will receive a refresher lecture and lab on direct ophthalmoscopy as well as a lecture on opthalmic manifestations of systemic disease and primary ocular disease. During the third year, students are given the opportunity during the surgery clerkship to spend four weeks on the ophthalmology services. In addition, during the third year there are lectures given to students during the Internal Medicine rotations. In the fourth year, a four-week intensive clinical rotation is tailored to students interested in pursuing ophthalmology as a career. Also, research electives are available under the guidance of numerous ophthalmology faculty members for fourth-year students.

**Website:** [http://ophthalmology.wustl.edu](http://ophthalmology.wustl.edu)

**Degrees & Requirements**

While the Department of Ophthalmology and Visual Sciences does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

**Research**

**M50 Ophth 900**

**Usha P. Andley, PhD**

1114-C McMillan

Phone: 314-362-7167

Molecular basis of cataract; the function of molecular chaperones in cataract; proteomics, imaging and biochemical studies on cell culture and mouse models for crystallin gene mutations linked with cataract; testing drugs to inhibit cataract.

**Rajendra S. Apte, MD, PhD**

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Innate immunity and immune effector mechanisms in the retina, oxidative stress and cell death, models of developmental angiogenesis and neovascularization, inflammation and photoreceptor survival, macular degeneration.
Steven Bassnett, PhD  
1114 McMillan  
Phone: 314-362-1604  
Eye development, stochastic models of lens growth, stem cell biology, age-related cataract, UV-induced somatic mutation, ocular manifestations of Marfan syndrome, cell death suppression on the optic axis, cell biology of transparent tissues.

Anjali Bhorade, MD  
Phone: 314-362-5343  
Evaluating the effect of glaucoma on visual function in older adults in the home. Understanding the relationship between vision and driving in older adults with glaucoma.

Shiming Chen, PhD  
618 McMillan  
Phone: 314-747-4350  
The molecular mechanisms regulating photoreceptor gene expression and the implications in understanding photoreceptor development and disease. We are focusing on three transcription factors, CRX, NRL and NR2E3, linked to photoreceptor degenerative diseases. Molecular genetics and biochemical approaches are used to identify the regulatory pathways associated with each factor. Mouse models are used to understand why mutations in these factors cause disease and develop therapeutic strategies, including AAV-gene therapy.

Steven M. Couch, MD  
Email (couch@vision.wustl.edu)  
Orbital inflammatory diseases, surgical techniques and novel treatments of periocular/orbital disease.

Susan M. Culican, MD, PhD  
1104 McMillan  
Email (culican@wustl.edu)  
Clinical: development of a low-cost, simple visual function task for screening for macular disorders in the primary care setting. Education: examination of the utility of assessment tools for evaluating resident clinical progression during residency training. Development of new metrics to gauge resident progress.

Philip L. Custer, MD  
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Thomas A. Ferguson, PhD  
1207 McMillan  
Phone: 314-362-3745  
Photoreceptor Neurobiology and Retinal Degeneration. We are a sensory neurobiology lab interested in the function of mammalian rod and cone photoreceptors. In addition, we are interested in the mechanisms of neurodegeneration in the retina and are working on developing pharmacological and gene-therapy tools for preventing photoreceptor cell death.

Humeyra Karacal, MD  
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Treatment of uveitis, prevention of cataracts with anti-oxidants, anti-oxidants in age-related macular degeneration, retinal imaging and analysis using data mining techniques, designing OR equipment to facilitate ophthalmic surgery.

Michael A. Kass, MD  
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Principal Investigator of the Ocular Hypertension Treatment Study (OHTS). Diagnosis, treatment and public health aspects of glaucoma.

Vladimir Kefalov, PhD  
625 McMillan  
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The molecular mechanisms of immune tolerance and how apoptotic cells tolerize the immune response. The role of immune privilege in the pathogenesis of eye diseases such as age-related macular degeneration (AMD). The role of basal autophagy in the cells of the eye by using the cre-loxP system to delete essential autophagy genes from specific cell types in the eye.

Mae Gordon, PhD  
Phone: 314-362-3716  
Ocular hypertension, glaucoma, keratoconus, adenoviral conjunctivitis, randomized clinical trial methodology, patient-reported outcome measures and measurement reliability.

George J. Harocopos, MD  
Email (harocopos@vision.wustl.edu)  
Age-related cataract, ophthalmic pathology.

Andrew Huang, MD, MPH  
106 McMillan  
Phone: 314-362-0403  
Ocular surface stem cell biology, molecular therapy for corneal dystrophies and corneal neovascularization, oxidative stress of corneal endothelium, clinical research on dry eye and ocular surface disease.

Daniel Kerschensteiner, MD  
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To understand the principles that guide the assembly of neural circuits and to decipher the way they process information. We would like to understand the principles that guide the assembly of neural circuits in the retina and to decipher the way they process information and hope to identify features of the retinal circuit architecture that perform particular computations and characterize how they arise during development. We then probe underlying mechanisms of circuit assembly and function through genetically targeted manipulations of specific cells in the retina.

John T. Lind, MD, MS  
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Glaucocma education, resident education, pharmacologic and surgical treatment of glaucoma, ophthalmic microbiology.
Retinoblastoma, eye misalignment (strabismus), retinopathy of prematurity, abnormal tearing, nasolacrimal disorders, cataracts, glaucoma.

**Peter Lukasiewicz, PhD**  
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Neurotransmitters, synapses, retinal function in health and disease, retinal information processing.

**Todd P. Margolis, MD, PhD**  
Email (margolist@vision.wustl.edu)  
1. Cellular and molecular mechanisms that regulate herpes simplex infection neurons.  
2. Inexpensive telemedicine for reducing blindness in underserved populations.

**Josh Morgan, PhD**  
Email (jlmorgan@wustl.edu)  
Synaptic connectivity of visual circuits. Our goal is to understand the structure, development and pathology of synaptic connectivity that gives rise to vision. Our core approach is to reconstruct neural circuits in the retina and visual thalamus using large-scale 3D electron microscopy.

**John R. Pruett Jr., MD, PhD**  
Email (pruettj@wustl.edu)  
We use fcMRI to study the development of large-scale functional brain networks in infants at risk for autism spectrum disorder. We are specifically interested in fcMRI correlates of visual joint attention. Collaborative projects involve fcMRI studies of visual-motor integration.

**Kumar Rao, MD**  
Email (rao@vision.wustl.edu)  

**Nathan Ravi, MD, PhD, MS, FAAO**  
Email (ravi@vision.wustl.edu)  
Directed toward understanding the pathophysiology of presbyopia and developing medical or surgical treatments for this condition.

**Alan Shiels, PhD**  
1128 McMillan  
Phone: 314-362-1637  
Email (shiels@vision.wustl.edu)  
Molecular genetic mechanisms underlying cataract, glaucoma and associated eye disorders: (1) genome-wide linkage analysis and targeted (exome, amplicon) sequencing for discovery of causative or susceptibility genes, and (2) genotype-phenotype and functional expression studies of naturally occurring and gene-targeted mouse models to characterize pathogenic mechanisms.

**Carla J. Siegfried, MD**  
Email (siegfried@vision.wustl.edu)  
My research is focused on ocular oxygen metabolism and the development of open-angle glaucoma. We are studying how the oxygen gradient in the eye is altered in disease states as well as noninvasive methods of measuring corneal oxygen consumption.

**Florentina Soto, PhD**  
Email (sotolucasf@vision.wustl.edu)  
Studies in my laboratory aim to identify the molecular basis of dendrites and axons lamination and synapse formation during development and in the adult retina. In addition, we investigate how these molecules could be involved in the development of retinal pathologies including retinal degeneration.

**Larry Tychsen, MD**  
2S89 Eye Clinic, St. Louis Children's Hospital  
Phone: 314-454-6026  
Principal investigator on NIH-funded studies of visual brain maldevelopment and repair in infant primates, as well as clinical studies of visuomotor abnormalities in cerebral palsy and pediatric refractive surgery.

**Gregory P. Van Stavern, MD**  
Email (vanstaverng@vision.wustl.edu)  
Neuroimaging of the visual pathways, Idiopathic Intracranial Hypertension, evidence-based medicine and clinical decision making; using the visual system as a model to study neurologic disorders.

A further description of research labs can be found on the Vision Core Researchers webpage (http://vrcore.wustl.edu/residentstudentresearchopportunities/RSROHome).

**Faculty**

**Pediatric Ophthalmology Director**  
R. Lawrence Tychsen, MD

**Adult Ophthalmology Clinical Director**  
P. Kumar Rao, MD

**Ophthalmology Research Director**  
Peter Lukasiewicz, PhD

**Ophthalmology Education Director**  
Susan Culican, PhD, MD

**Ophthalmology Director of Translational Research**  
Rajendra Apte, MD, PhD

Visit our website for more information about our faculty (http://ophthalmology.wustl.edu/Faculty) and their appointments.
Adjunct Instructor in Ophthalmology and Visual Sciences  
(secondary appointment)  
OD Illinois College of Optometry 1981  
BA University of Missouri 1976

Navinkumar J Amin, UNKNOWN, MS  
Associate Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)  
UNKNOWN University of Bombay 1960  
MS University of Bombay 1966

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MD University of MO Kansas City 1994  
BA University of MO Kansas City 1994

Usha P Andley, PHD, MS  
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Assistant Professor of Biochemistry and Molecular Biophysics  
PHD Jawaharlal Nehru University 1977  
MS Delhi University 1972  
BS Delhi University 1970

Rajendra Apte, MD, PHD  
Paul A. Cibis Distinguished Professor of Ophthalmology and Visual Sciences (primary appointment)  
Professor of Developmental Biology  
Professor of Medicine  
MD University of Bombay 1993  
PHD University of Texas Southwest 1997

Steven Bassnett, PHD  
Professor of Ophthalmology and Visual Sciences (primary appointment)  
Professor of Cell Biology and Physiology  
BS University of Wales 1982  
PHD University of East Anglia 1987

Paul Douglas Becherer, OD  
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OD School Not Listed 1975  
BA Southern Illinois University 1971

William L Becker, MA, MD  
Assistant Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)  
MA Washington Univ in St. Louis 1987  
MD Washington Univ in St. Louis 1987  
BA Earlham College 1982

Stanley C Becker, PHD, MD, MA  
Assistant Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)  
PHD Washington Univ in St. Louis 1951  
MD University of Chicago 1955  
BA Washington Univ in St. Louis 1948  
MA Washington Univ in St. Louis 1950

Gregg Jonathan Berdy, MD  
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MD Saint Louis University 1983  
BA Duke University 1979

Paul M Bernier, OD  
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)  
OD University of Missouri 1987  
BS Indiana State University 1983

Anjali Maruti Bhorade, MD  
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Associate Professor of Occupational Therapy  
MD University of Chicago 1999

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BS University of Toledo 1963  
MD Washington Univ in St. Louis 1967

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MA Washington Univ in St. Louis 1991  
MD Washington Univ in St. Louis 1992

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MD University of MO Kansas City 1985

James C Bobrow, MD  
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MD Johns Hopkns University Medc 1970  
BA Yale University 1966

George M Bohigian, MD
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
MD Saint Louis University 1965
BA Washington Univ in St. Louis 1961

Bernita Born-Wolf, OD, BN
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OD University of MO St Louis 1987
BN Saint Louis University 1978

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MD Boston University 1992
BA Holy Cross College 1988

Rebekah Arletta Braslow, MD
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BS Stanford University 1981
MD Yale University 1987

Sean Michael Breit, MD
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)
MD Ohio State University 2002

Larry G Brokering, OD
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OD Illinois College of Optometry 1972

Marc Richard Brown, OD
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BA University of Missouri 1974
OD School Not Listed 1980

Nancy M Buchser, MD
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MD University of Miami 2007

Dean B Burgess, MD
Professor Emeritus of Clinical Ophthalmology and Visual Sciences (primary appointment)
MD University of California 1967
BA Occidental College 1963

Carmen F Castellano, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD Illinois College of Optometry 1982
BS Illinois College of Optometry 1980
BA University of MO St Louis 1977

Earl S Changar, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD School Not Listed 1957

Shiming Chen, PHD, MS
Professor of Ophthalmology and Visual Sciences (primary appointment)
Professor of Developmental Biology
PHD State University of New York 1992
BS Beijing University 1981
MS Beijing Medical University 1984

Brian Stewart Clark, PHD
Assistant Professor of Ophthalmology and Visual Sciences (Pending Executive Faculty Approval) (primary appointment)
PHD Medical College of Wisconsin 2013

Bruce H Cohen, MD
Assistant Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
MD Johns Hopkins University 1980
BA Harvard University 1976

Nicholas J Colosi, MD
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MD Saint Louis University 1968
BA La Salle University 1964

Pamela Ann Coslick-Fada, OD
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OD University of Missouri 1987

Steven Michael Couch, MD
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MD University of MO Kansas City 2006

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BA William Jewell College 1987
OD University of MO St Louis 1991

Susan Margaret Culican, MD, PHD
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MD Washington Univ in St. Louis 1998
BA Washington Univ in St. Louis 1990
PHD Washington Univ in St. Louis 1998

Philip L Custer, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
BS Vanderbilt University 1974
MD Vanderbilt University 1978
David L Davidson, OD
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OD School Not Listed 1964

Alicia Beatriz De Maria Leiva, PHD
Instructor in Ophthalmology and Visual Sciences (primary appointment)
PHD Universidad de la Republica 2002

John James Deguire, MD
Instructor in Ophthalmology and Visual Sciences (primary appointment)
MD University of Illinois 1988
BA Washington Univ in St. Louis 1983

Paul E Diehl, OD
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OD Illinois College of Optometry 1959

John Robert Eigenbrodt, OD
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BS Southern Ill Univ Edwardsville 1985
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Lawrence W Ernst, OD
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OD University of Missouri 1990

Raymond F Fada Jr, OD
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OD University of Missouri 1989
BS University of Michigan 1984

Adam Ross Fedyk
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Robert M Feibel, MD
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MD Harvard University 1969
BA Johns Hopkins University 1965

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PHD University of Cincinnati 1982
MS Kent St University 1976
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H

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UNKNOWN University of Missouri 1971
BS University of Missouri 1970

Alexander D Harris, MA, OD
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MA Washington Univ in St. Louis 1972
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OD School Not Listed 1967

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OD University of MO St Louis 1994

Nancy Melberg Holekamp, MD
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MD Johns Hopkins University 1989
BA Wellesley College 1985

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MD University of Illinois Chicago 2009
BA University of Illinois 2004

Jing-Wei Huang, MD
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MD National Taiwan University 1981

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BS School Not Listed 1980

I

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BA Harvard University 1971

J

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BS So Cal College of Optometry 1978
BA University of Missouri 1975
OD So Cal College of Optometry 1980

Sharon Leslie Jick
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)

Daniel Paul Joseph, PHD, MD
Associate Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
PHD University of CA Berkeley 1988
BS Cornell University 1981
MD Wayne State University 1992

K

Krishna Priya Kalyam, MD
Instructor in Ophthalmology and Visual Sciences (primary appointment)
BS Rutgers University 2008
MD Robert Wood Johnson Medical Sc 2012

Stephen A Kamenetzky, MD1, MD

164
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BA Washington Univ in St. Louis 1967
MD1 School Not Listed 1970
MD Washington Univ in St. Louis 1970

**Humeyra Karacal, MD**
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)
MD Hacettepe University 1994

**Michael A Kass, MD, MS**
Bernard Becker Professor of Ophthalmology and Visual Sciences (primary appointment)
Senior Associate Dean for Human Research Protection
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MD Northwestern University 1966
MS Northwestern University Med 1966

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Professor of Neuroscience
PHD Boston University 1999

**Deborah Lynn Kerber, OD**
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OD University of Missouri 1992
BS Southeast Missouri St Univers 1986

**Daniel Kerschensteiner, MD**
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)
Associate Professor of Biomedical Engineering (Courtesy)
Associate Professor of Neuroscience
MD Georg August University 2004

**Sangeeta Khanna**
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)

**William F Kiefer Jr, OD**
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BS Illinois College of Optometry 1973
BA Princeton University 1967
OD Illinois College of Optometry 1975

**Mark Alan Kleindorfer, OD**
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OD Indiana University Bloomington 1979
BS Indiana University Bloomington 1977

**Vivian Marie Kloke, OD**
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BS Mckendree College 1986

OD University of Missouri 1990

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Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
MD Harvard University 1967
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BS Indiana University Bloomington 1970
BA Millikin University 1968
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**L**

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BA Webster University 1980
OD University of MO St Louis 1989

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MD Washington Univ in St Louis 1976
BS University of MO St Louis 1972

**Paul Arthur Lapoint, AA, OD**
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AA Harris Stowe St College 1959
BS School Not Listed 1963
OD School Not Listed 1963

**Steven F Lee, MD**
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)
MD University of Maryland 1987
BS University of Maryland 1983

**Scott W Lewis, OD, BS1**
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OD So Cal College of Optometry 1977
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BS University of Illinois 1968
James Walter Lieber, OD  
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BS Indiana University Indianapolis 1999  
MD Indiana University Indianapolis 2004  
MS Purdue University 2000

Anthony J Lubniewski, MD  
Professor of Ophthalmology and Visual Sciences (primary appointment)  
MD University of Florida 1985  
BS University of Florida 1980

Gregg T Lueder, MD  
Professor of Ophthalmology and Visual Sciences (primary appointment)  
Professor of Pediatrics  
BS Iowa State University 1981  
MD University of Iowa 1985

Peter David Lukasiewicz, PHD  
Janet and Bernard Becker Professor of Ophthalmology (primary appointment)  
Professor of Neuroscience  
BS Brown University 1977  
PHD University of Michigan 1984

Lisa Marie Mackey, OD  
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OD University of Missouri 1993  
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Alan A and Edith L Wolff Distinguished Professor (primary appointment)  
Head of the Department of Ophthalmology and Visual Sciences  
BS Stanford University 1977  
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Assistant Professor of Ophthalmology and Visual Sciences (primary appointment)  
BS1 University of Missouri 1986  
OD University of MO St Louis 1991  
BS University of Missouri 1986

Barry David Milder, MD  
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Raymond I Myers, OD  
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BS University of Notre Dame 1966  
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BA Vanderbilt University 1956  
MD Columbia University 1959

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MD University of California 1982

O
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Adjunct Research Assistant Professor of Ophthalmology and Visual Sciences (primary appointment)
MA Harvard University 1978
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PHD1 Harvard University 1983

P
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BS West Virginia University 1993
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MD1 West Virginia University 1997

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MD University of CA Los Angeles 1982
BA Brandeis University 1975
MA Brandeis University 1975
PHD University of California 1980

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BS1 Emory University 2000
MD Case Western Reserve Univ 2013

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PHD Emory University 2009
MD Emory University 2011
BS Spelman College 2003

Q
Mujtaba A Qazi

Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)

R
Rithwick Rajagopal, MD
Assistant Professor of Ophthalmology and Visual Sciences (primary appointment)
MD New York University 2007

Mark S Rallo, OD
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OD University of Missouri 1990
BS Saint Louis University 1986

Prabakar Kumar Rao, MD
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Professor of Ophthalmology and Visual Sciences (primary appointment)
Professor of Energy, Environmental and Chemical Engineering
MS University of Bombay 1975
PHD Virginia Tech 1980
MD University of Miami 1988
BS University of Bombay 1972

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BS Valparaiso University 1983
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BA University of Michigan 1959

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BA Williams College 1986

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BS Lamar University 1962

S
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Jonathan C Schell, MD  
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)  
MD Saint Louis University 2005  
BS Saint Louis University 2001

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OD Illinois College of Optometry 1957  
BS Illinois College of Optometry 1957

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BA University of Missouri 1971  
OD University of MO St Louis 1984

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MD University of Illinois 1993

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MD Columbia University 1997  
BA Amherst College 1992

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MD University of Michigan 2007

Arsham Sheybani, MD  
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MD Washington Univ in St. Louis 2008

Steven M Shields, MD  
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BS Washington Univ in St. Louis 1981  
MD Washington Univ in St. Louis 1986

Alan Shiels, PHD  
Professor of Ophthalmology and Visual Sciences (primary appointment)  
Professor of Genetics  
PHD University of London 1983  
BS School Not Listed 1979

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MD Saint Louis University 1978  
BA Washington Univ in St. Louis 1974

Carla J Siegfried, MD  
Jacquelyn E and Allan E Kolker M.D. Distinguished Professor of Ophthalmology (primary appointment)  
BA University of MO Kansas City 1989  
MD University of MO Kansas City 1989

Charles D Signorelli, OD  
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)  
BS School Not Listed 1957  
OD School Not Listed 1957

Morton Edward Smith, MD  
Professor Emeritus of Ophthalmology and Visual Sciences (primary appointment)  
Associate Dean Emeritus for Post-Graduate Education  
Lecturer in Ophthalmology and Visual Sciences  
Lecturer in Pathology and Immunology  
MD University of Maryland 1960  
BS University of Maryland 1956

Bradley Thomas Smith, MD  
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)  
MD University of AL Birmingham 2002

Claud Randall Snowden, OD  
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)  
BS Illinois College of Optometry 1972  
OD Illinois College of Optometry 1974

Craig H Sorce, OD  
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)  
OD University of Missouri 1992  
BA Southern Illinois University 1988

Florentina Soto Lucas, PHD  
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)  
PHD University of Alicante 1992

Mark H Spurrier, MD  
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MD Washington Univ in St. Louis 1980  
BA Kansas State University 1976

James F Strieter, OD, MBA  
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)  
BS School Not Listed 1953  
OD School Not Listed 1954
MBA Southern Ill Univ Edwardsville 1988

Brian Patrick Sumner, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD Illinois College of Optometry 1978

Kenneth V Swanson
Instructor in Clinical Ophthalmology and Visual Sciences (primary appointment)

T

Paul M Tesser, MD, PHD
Associate Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BS Mass Inst of Technology (MIT) 1981
MD State Univ of NY Stonybrook 1991
PHD State Univ of NY Stonybrook 1990

Matthew A Thomas, MD
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BS Harvard University 1977
MD Harvard University 1991

Linda Mei-Lin Tsai, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
BA Northwestern University 1990
MD Northwestern University 1995

Robert Lawrence Tychsen, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
John F Hardesty MD Distinguished Professor of Ophthalmology and Visual Sciences
Professor of Neuroscience
Professor of Ophthalmology and Visual Sciences in Pediatrics
BS Georgetown University 1975
MD Georgetown University 1979

V

Gregory Paul Van Stavern, MD
Professor of Ophthalmology and Visual Sciences (primary appointment)
Professor of Neurology
BS La Salle University 1989
MD Pennsylvania State University 1993

Gary Lee Vogel, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD Ohio State University 1977
BA University of Iowa 1970

David Edward Vollman, MD
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)

MD Ohio State University 2006

W

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BS Illinois College of Optometry 1990
OD Illinois College of Optometry 1991
BA Saint Louis University 1987

William Lee Walter, MD
Assistant Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BA De Paul University 1950
MD Ohio State University 1954

Donald E Walter Jr, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
BS University of Houston 1971
OD University of Houston 1972

Stephen R Waltman, MBA, MD
Professor of Clinical Ophthalmology and Visual Sciences (primary appointment)
BS University of Michigan 1977
MD University of Michigan 1982

Richard Harris Wieder, MD
Associate Professor of Ophthalmology and Visual Sciences (primary appointment)
MD University of Illinois 1986
BS University of Illinois 1982

Michael L Wolf, OD
Adjunct Instructor in Ophthalmology and Visual Sciences (primary appointment)
OD University of Missouri 1987
BS University of Missouri 1979

Ming-Fong Agnes Wong, PHD, MD
Adjunct Professor of Ophthalmology and Visual Sciences (primary appointment)
PHD University of Toronto 2001
BA Boston University 1990
MD McGill University 1994

Courses

Curriculum courses for Ophthalmology and Visual Sciences are listed below (p. 170).
First Year

Introduction to clinical ophthalmology begins in the first year with a lecture and practicum (peer exam) on taking an ocular history and performing an ocular exam. Emphasis is on ophthalmoscopy. Lectures and practicum session will be led by Dr. John Lind and Dr. Morton Smith.

Second Year

During the second year, students will receive a refresher lecture and lab on direct ophthalmoscopy as well as a lecture on ophthalmic manifestations of systemic disease and primary ocular diseases.

Third Year

Third-Year Clerkship Opportunities

In the third year, students are given the opportunity to spend four weeks of their surgery rotation on the ophthalmology service. The students work closely with the ophthalmology residents and review the differential diagnosis of the “red eye,” how to interpret an ophthalmologic consult note, and how to handle ocular emergencies. During this rotation, there is again emphasis on the use of the ophthalmoscope. Additional clinical skills introduced to student rotators include the use of the slit lamp and indirect ophthalmoscopy. All third-year students must complete the “Case Studies in Ophthalmology for Medical Students” and attend the periodic “feedback/oral exam” session with Dr. John Lind and/or Dr. Morton Smith.

Third Year/Fourth Year

Ophthalmology Sub-Internship Rotation (“The Sub-Eye”). During the month of June prior to fourth year, students interested in pursuing a career in ophthalmology are encouraged to rotate on this intensive four-week rotation. Students will have personal indirect ophthalmoscopy lenses available for use on the rotation. Formal didactics and workshops will be used to teach students how to perform a detailed ophthalmic history and examination including mastery of advanced slit lamp techniques and indirect fundoscopy. There will be an intense schedule of both live and recorded lectures delivered by ophthalmology faculty members with post-lecture quizzes. Students will be expected to perform daily required reading. Retention and understanding of reading materials will be gauged by frequent quizzes. Students are strongly encouraged to present a case at the department’s Grand Rounds. By the end of the rotation, students will be expected to function at the level of a first-year ophthalmology resident.

Curriculum Courses

M50 Ophth 801 Ophthalmology

This elective is for senior students who plan to apply for a residency in Ophthalmology. In accordance with any sub-internship, medical students will be expected to function at the level of a beginning first-year ophthalmology resident on this rotation. The students will rotate through the resident eye clinic and the subspecialty clinics of the full time faculty of the Washington University Medical School Department of Ophthalmology and Visual Sciences (e.g., neuro-ophthalmology service, cornea/external disease service, etc.). The first day of the rotation will consist of an orientation day in which students will receive extensive didactics and participate in workshops to learn the basics of a complete ophthalmic history and examination. Students may opt to check-out indirect ophthalmoscopy lenses that may be used for the month to facilitate the acquisition of fundoscopy skills. During the rotation, the student's responsibilities range from observation (including observing surgery) to working at a resident level and completing full eye examinations. There will be a rigorous academic curriculum for the rotation including a weekly case presentation, bi-monthly wet lab sessions with a resident, weekly attendance at grand rounds, and a mix of medical student-oriented and resident-oriented conferences. On day one, students will receive a rotating call schedule for the entire month. A medical student is expected to be present at all times to assist the primary call ophthalmology resident during the rotation. By the end of the four-week rotation, the student is expected to be proficient in taking an ocular history and performing a complete eye exam including slit lamp biomicroscopy and indirect ophthalmoscopy.

M50 Ophth 816 Away Rotation in Ophthalmology

This four-week elective is for senior students from medical schools across the United States who are in good standing at their home institution and who are planning to apply for a residency in ophthalmology. The students will rotate through the resident eye clinic and the subspecialty clinics of the full time faculty of the Washington University Medical School Department of Ophthalmology and Visual Sciences (e.g., neuro-ophthalmology service, cornea/external disease service, etc.). In exchange for a refundable deposit, students may opt to check-out indirect ophthalmoscopy lenses that may be used for the month to facilitate the acquisition of fundoscopy skills. During the rotation the student's responsibilities range from observation (including observing surgery) to working at a resident level and completing full eye examinations. Didactics will include weekly case presentation sessions to Dr. John Lind or Dr. Morton Smith, weekly attendance at grand rounds, and a mix of medical student-oriented and resident-oriented conferences. Also, there will be medical student-oriented workshops to learn the basics of the slit lamp and indirect ophthalmoscopy. On day one, students will receive a schedule of conferences that they are expected to attend during the month. By the end of the four-week rotation, the student is expected to be proficient in taking an ocular history and performing a complete eye exam including slit lamp biomicroscopy and indirect ophthalmoscopy. The final grade of the student is determined by the course director with input from the residents, fellows, and faculty members of the particular service(s) through which the student rotated.

M50 Ophth 900 Research Elective - Ophthalmology

Research opportunities may be available. If interested, please contact the Department of Ophthalmology.
Department of Orthopaedic Surgery

Orthopaedic surgery is concerned with the injuries, diseases and conditions of the musculoskeletal system. The WUSM III rotation in Musculoskeletal Surgery & Medicine exposes the student to multiple aspects of orthopaedic surgery; this rotation includes experiences ranging from the care of patients in the emergency department, operating room, and clinical practice in the emergency department, outpatient and inpatient ward.

Website: http://www.ortho.wustl.edu

Degrees & Requirements

While the Department of Orthopaedic Surgery does not offer its own degree, some of the department’s courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

M95 Surgery 900

Various orthopaedic surgery research opportunities are available with the following faculty attendings. If interested, please contact the Education Office at 314-747-2543, email the orthopaedic surgery department (orthsurg@wudosis.wustl.edu), or contact the faculty member directly.

Yousef Abu-Amer, PhD
Robert L. Barrack, MD
Robert Brophy, MD
Jacob M. Buchowski, MD, MS
Ryan Calfee, MD
Aaron Chamberlain, MD
John Clohisy, MD
Matthew Dobbs, MD
Richard H. Gelberman, MD
Charles A. Goldfarb, MD
Eric Gordon, MD
Munish Gupta, MD
Michael Kelly, MD
Sandra Klein, MD
Scott J. Luhmann, MD
Matthew J. Matava, MD
Chris McAndrew, MD
Mark Miller, MD
Jeff Nepple, MD
Regis O’Keefe, MD
Linda Sandell, PhD
Perry Schoenecker, MD
Matt Silva, PhD
Matthew Smith, MD
Lindley B. Wall, MD

Rick Wright, MD

Faculty

Department Chair
Regis O’Keefe, MD, PhD

Visit our website for more information about our faculty (http://www.ortho.wustl.edu/content/Patient-Care/2295/Find-a-Physician/Physician-Directory.aspx) and their appointments.

A

Yousef Abu-Amer, MS, PHD
Professor of Orthopaedic Surgery (primary appointment)
Professor of Cell Biology and Physiology
MS Hebrew University 1987
PHD Hebrew University 1993
BS Hebrew University 1985

Muyibat A Adelani, MD
Assistant Professor of Orthopaedic Surgery (primary appointment)
MD Vanderbilt University 2008

Alexander William Alem, MD
Assistant Professor of Orthopaedic Surgery (primary appointment)
MD Washington Univ in St. Louis 2010
BS Johns Hopkins University 2006

B

Robert L Barrack, MD
Charles F and Joanne Knight Distinguished Professor of Orthopaedic Surgery (primary appointment)
MD Vanderbilt University 1980

Donald R Bassman, MD
Instructor in Clinical Orthopaedic Surgery (primary appointment)
BA Washington Univ in St. Louis 1971
MD Washington Univ in St. Louis 1975

Terra Rupert Blatnik, MD
Assistant Professor of Orthopaedic Surgery (primary appointment)
BS Allegheny College 2003
MD Case Western Reserve Univ 2007

Ljiljana Bogunovic, MD
Assistant Professor of Orthopaedic Surgery (primary appointment)
MD Cornell University 2009

Martin I Boyer, MD, MS
Carol B and Jerome T Loeb Professor of Orthopaedic Surgery (primary appointment)
MD University of Toronto 1988
MS University of Toronto 1993

Keith Happ Bridwell, MD
J Albert Key Distinguished Professor of Orthopaedic Surgery
( primary appointment)
Professor of Neurological Surgery
BA Washington Univ in St. Louis 1973
MD Washington Univ in St. Louis 1977

David Micah Brogan, BE, MS1, MS, MD
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MS1 University of London 2005
MS University College London 2004
MD Washington Univ in St. Louis 2009

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MD Washington Univ in St. Louis 2001
BS Stanford University 1994
MS Stanford University 1995

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MS Yale University 1996

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Assistant Professor of Neurology
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MS Des Moines Universitly 2009

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Assistant Professor of Emergency Medicine in Medicine
MS Columbia University 2016
MD Wright State University 2012
BS Kalamazoo College 2005
MPH Wright State University 2012

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BS Rensselaer Poly Institute 1985

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MD Isfahan U of Medical Sciences 2004

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BA Rice University 2001
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MD Harvard University 1985

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MD Univ of Wisconsin Madison 1968
BS Univ of Wisconsin Madison 1964

Hua Shen, MD, MS, PHD
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MD Capital U of Medical Sciences 1991
MS Chinese Academy of Med Science 1996
PHD University of Konstanz 2002

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PHD University of Rochester 2012
MS University of Rochester 2011

Matthew J Silva, ME, PHD
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ME Cornell University 1984
PHD Mass Inst of Technology (MIT) 1996
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T

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Y

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MS University of California 1985
BA University of California 1983

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Lukas P Zebala, MD
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Associate Professor of Neurological Surgery
BS Northwestern University 1998
MD University of Chicago 2004

Courses

For course information, please visit the Surgery page (p. 265) of this Bulletin.

Department of Otolaryngology

The Department of Otolaryngology-Head & Neck Surgery (http://oto.wustl.edu) at Washington University in St. Louis has a rich, 130-year history of leadership in our field that is built on the foundations of academic medicine: patient care, research, training and service. Our past leaders include luminaries in

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hearing loss in military personnel laid the foundation for the field of audiology. CID also pioneered hearing testing and hearing aids and opened the country's first hearing aid clinic in 1941. In September 2003, a new affiliation transferred CID's graduate degree programs, research programs and adult audiology clinic, along with its building, to Washington University School of Medicine. The CID school continues to operate on the School of Medicine campus as CID — Central Institute for the Deaf.

Today, these programs continue to work together to fulfill a shared mission to serve people with hearing loss.

Website: http://oto.wustl.edu

Degrees & Requirements

While the Department of Otolaryngology does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Otolaryngology Course Requirements

Otolaryngology is presented to students in the first-, second-, third- and fourth-year classes. Physical diagnosis skills are taught in the first year. Clinically oriented lectures and a physical diagnosis workshop are presented to second-year students.

In the third year of the medical curriculum, four-week elective rotations on one of the services at Barnes-Jewish Hospital or St. Louis Children's Hospital are offered. During this period, there is teaching at the bedside, in the operating room and in the clinic, supplemented by daily afternoon lectures, Grand Rounds on Wednesdays, and an introduction to audiology.

Fourth-year students interested in ENT as a specialty may take a two- to four-week elective designed to give them exposure to patient care, both in the outpatient clinic and the operating room and postoperative setting. An additional four-week elective that provides comprehensive ambulatory experience is offered to students headed for primary care.

Research

M55 Oto 900

The type of research will depend upon the current phase of the research program in each laboratory. Students should contact the director of each laboratory to negotiate.

Pablo M Blazquez, PhD
East McDonnell Science Building
4566 Scott Avenue
Phone: 314-362-1013

Role of the vestibulo-cerebellum and its target nuclei in eye movement control and spatial orientation. We used a range of methodologies: single and multiunit recordings, electrical brain stimulation, computational methods, pharmacology and behavioral studies. Our main lines of research are:
1) Signal transformations carried out by the vestibulo-cerebellum during visual and vestibular stimulation. 2) Neuronal computations performed by the anterior and posterior cerebellar vermis for spatial navigation in mice. 3) Role of the cerebellum-brainstem loop in motor learning in the vestibulo-ocular reflex.

Students will be instructed in one or several techniques and are expected to contribute significantly to the development of several lab projects.

Joel A. Goebel, MD, FACS
McMillan, 9th Floor
Phone: 314-362-8205
Clinical research testing of posture and ocular motor control. Projects include measurement of gaze stabilization during head movement, otolith input into dynamic subjective visual vertical measurements, computerized historical data screening for dizziness, and head-mounted vibrotactile balance prosthesis (BalCap). We welcome students to join these projects at any stage.

Judith E.C. Lieu, MD, MSPH
3S35 Children’s Hospital; and McMillan, 9th Floor
Phone: 314-747-8205
Clinical Outcomes Research in Pediatric Otolaryngology. The Clinical Outcomes Research office performs clinical epidemiology and health services research. (Please reference the research elective offered by Dr. Jay Piccirillo in Otolaryngology for more details.) These techniques and methodologies are used to investigate clinical problems seen in pediatric otolaryngology. Projects currently underway include the evaluation of quality of life of young children with hearing loss, evaluation of hearing loss on perception of fatigue in children, use of MRI to investigate effects of hearing loss in children, and characterization of hearing loss in Wolfram syndrome. Potential studies include investigating the phenotypic variation of ear disease in children with immotile cilia syndrome, and evaluating change in quality of life of children who begin using hearing amplification devices. Other projects of the student’s choosing that would utilize these research techniques may also be pursued.

Kevin K. Ohlemiller, PhD
2205 Central Institute for the Deaf
Phone: 314-747-7179
Gene/environment interactions in cochlear injury. We study the interaction of genes and environment that increase cochlear injury due to noise and ototoxic exposure, with an emphasis on how these may yield apparent presbycusis. Because cochlear function and injury is the same in mice and humans, and governed by the same genes, we use mostly mouse models. Methods employed include standard ABR assessment and intra-cochlear recording, quantitative light microscopy, immunohistochemistry, and western blots. We also collaborate to map and perform expression profiling of genes that underlie traits we have discovered. We and our collaborators have identified specific genes and inbred strains of mice that mimic the three major forms of human presbycusis (sensory, neural and strial). Sensory presbycusis appears promoted by alleles and mutations that impair protective factors such as antioxidant enzymes, or that impair ion homeostasis. Neural presbycusis can be modeled by mutations that alter the function of cholinergic receptors. While we are not sure what types of genes and mutations can lead to strial presbycusis, we have discovered four mouse strains that show the key feature of this disease (age-related endocochlear potential reduction), and also show distinct types of strial pathology.

We have shown that some of the same gene alleles and mutations that promote presbycusis also promote cochlear noise injury. Such findings point to an interpretation of sensory presbycusis as principally cumulative injury. We have also published evidence for one or more QTLs that impact the qualitative character of noise injury. Important implications of our findings are (1) that there exists no single “mammalian” archetype of cochlear noise injury, and (2) that injury to the organ of Corti and lateral wall are mechanistically and genetically independent.

Our research is eminently adaptable in difficulty and scale to students’ schedules and other requirements. Students may expect to learn the full range of methods we employ, including physiology, immunohistochemistry, histopathology, and cellular/molecular techniques.

Jay F. Piccirillo, MD
McMillan, 9th Floor
Phone: 314-362-8641
The Clinical Outcomes Research Office of the Division of Research performs basic and applied clinical epidemiology and health services research. Clinical epidemiology is the study of the diagnosis, prognosis, and evaluation of treatment. Health service research is the study of the delivery of health care. The scientific methodology of clinical epidemiology is based on the architecture of clinical research, biostatistics and data processing. Current projects include studying the impact of comorbidities on treatment and outcome for patients with cancer. We also conduct research into the neurobiology, treatment and outcomes for patients with tinnitus. We also use smart-phone technology to capture ecological momentary assessment of tinnitus. Additional projects include exploring neuroplasticity as part of olfactory training for patients with anosmia. Using clinical epidemiology methodology, we can also study a variety of other diseases.

Faculty
Department Head
Craig A. Buchman, MD, FACS
Visit our website for more information about our faculty (http://oto.wustl.edu/About-Us/Faculty-Physicians) and their appointments.
<table>
<thead>
<tr>
<th>Name</th>
<th>Title/Position</th>
<th>Affiliation</th>
<th>Year(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marc Bruce Abrams, DDENT</td>
<td>Instructor in Clinical Otolaryngology (primary appointment)</td>
<td>University of MO Kansas City</td>
<td>1968</td>
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<td></td>
<td></td>
<td>DDENT University of MO Kansas City</td>
<td>1972</td>
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<tr>
<td>Azadeh Afshari, MS, DDENT</td>
<td>Instructor in Clinical Otolaryngology (primary appointment)</td>
<td>Univ of Texas Med Sch Houston</td>
<td>2013</td>
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<tr>
<td></td>
<td></td>
<td>BS West Virginia University</td>
<td>2004</td>
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<tr>
<td></td>
<td></td>
<td>DDENT Univ of Texas Med Sch Houston</td>
<td>2014</td>
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<tr>
<td>Nawal Mona Ahmed</td>
<td>Instructor in Clinical Otolaryngology (DDS) (primary appointment)</td>
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<tr>
<td>Murray Howard Appelbaum, DDENT</td>
<td>Instructor in Clinical Otolaryngology (DMD) (primary appointment)</td>
<td>Washington Univ in St. Louis</td>
<td>1983</td>
</tr>
<tr>
<td>Sean B Bailey, MS, MD</td>
<td>Instructor in Clinical Otolaryngology (primary appointment)</td>
<td>Tulane University</td>
<td>1981</td>
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<td></td>
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<td>MS Tulane University</td>
<td>1988</td>
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<td>MD Tulane University</td>
<td>1987</td>
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<tr>
<td>Jianxin Bao, PHD</td>
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<td>1992</td>
</tr>
<tr>
<td>Perry J Bartels, DDENT</td>
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<td>1986</td>
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<tr>
<td></td>
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<td>DDENT Marquette University</td>
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<tr>
<td>Lynda Cheryl Berkowitz, MS</td>
<td>Instructor in Otolaryngology (primary appointment)</td>
<td>Washington Univ in St. Louis</td>
<td>1983</td>
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<tr>
<td></td>
<td>Instructor in Audiology and Communication Sciences</td>
<td>BS University of Illinois</td>
<td>1981</td>
</tr>
<tr>
<td>Pablo M Blazquez Gamez, PHD</td>
<td>Assistant Professor of Otolaryngology (primary appointment)</td>
<td>University of Seville</td>
<td>1998</td>
</tr>
<tr>
<td>Joseph P Bradley, MD</td>
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<td>University of Kansas Medical</td>
<td>2008</td>
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<td></td>
<td></td>
<td>BS Washington Univ in St. Louis</td>
<td>2003</td>
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<td>Gregory Harris Branham, MD</td>
<td>Professor of Otolaryngology (primary appointment)</td>
<td>University of South Carolina</td>
<td>1983</td>
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<td>BS University of South Carolina</td>
<td>1979</td>
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<tr>
<td>Craig Alan Buchman, MD</td>
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</tbody>
</table>
John Michael Conoyer, MD  
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Lisa S. Davidson, PHD, MS  
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MS Washington Univ in St. Louis 1987

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DDENT Washington Univ in St. Louis 1970  
BA Washington Univ in St. Louis 1966

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Assistant Professor of Clinical Otolaryngology (primary appointment)

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MD University of Michigan 2002  
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MD University of Illinois 1970  
BA Washington Univ in St. Louis 1967

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BA Northwestern University 1979  
MD Univ of Wisconsin Madison 1983

Brian T Faddis, MS, PHD  
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PHD University of California 1994  
BS University of California 1982

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MD School Not Listed 1971  
BA Barnard College 1968

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MS University of Scranton 1981  
BA Barnard College 1971  
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Instructor in Clinical Otolaryngology (primary appointment)

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Associate Professor of Audiology and Communication Sciences
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M ED Smith College 2005
PHD Washington Univ in St. Louis 2009
BA Emory University 1995

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Associate Professor of Otolaryngology (primary appointment)
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Professor of Medicine
Professor of Occupational Therapy

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PHD Russian U of Friendship of Ppl 2002

Jose Pedro Zevallos, MD, MPH
Dr Joseph B Kimbrough Chair for Maxillofacial Surgery and Prosthodontics in the Washington University Department of Otolaryngology (primary appointment)
BS Middlebury College 2000
MD Rutgers University 2005
MPH Univ of Texas Med Sch Houston 2014

Courses

M55 Oto 660B Clinical Topics In Otolaryngology
This course consists of nine introductory lectures on common diseases of the head and neck, including voice disorders, head and neck cancer, hearing loss, management of vertigo, pediatric otolaryngology, salivary gland disorders, sinusitis, otolaryngologic emergencies and facial trauma.
Additionally, there is a case-based roundtable focusing on otolaryngology disorders affecting the geriatric population and the involvement of allied health care disciplines in the evaluation and management of these patients. Each lecture is highlighted by case presentations and treatment options in addition to pathophysiology. This course follows the physical examination practicum given earlier in the academic year.

Credit 9 units.

M55 Oto 801 Otolaryngology
Four-week rotation includes evaluation of ENT problems presented to specialists for diagnosis and treatment. The student participates in the clinic, hospital and operating room. This also includes time on the Pediatric ENT Service, Audiology, Voice Laboratory, and Vestibular Evaluation Laboratory. Option of rotation on the ENT Service at VAMC is available.

M55 Oto 803 Pediatric Otolaryngology
The student will actively participate in the clinical office, inpatient consultations, and surgery with the attending staff at St. Louis Children's Hospital. Care would be taken to provide experience in the common problems one would see in primary care pediatrics or family practice. Participation in sub-speciality/ multidisciplinary clinics such as the Cleft and Craniofacial clinic is encouraged. Opportunity will be provided to learn the fundamentals of audiological evaluation. Students participating in this elective will attend academic conferences in both the pediatric and adult divisions.

M55 Oto 820 Practicum in Adult Clinical Audiology
During this rotation, guidance will be provided in the administration and interpretation of audiometric tests, with an emphasis on defining the severity of auditory dysfunction and identifying sites of pathological processes. Theoretical bases of audiology, anatomy and physiology, and electronics will be reviewed as they relate to auditory assessment. Modification of conventional test paradigms and hearing aid procedures will be covered according to each student’s interests and needs.

M55 Oto 831 Neurotology
Students will actively participate in the physical exam, advanced testing and management of patients with balance dysfunction. Students will attend patient clinic two days a week, and test patients on ENG, rotary chair and computerized platform three days a week. Research participation is welcome with prior arrangements.

M55 Oto 833 Ambulatory Otolaryngology for the Primary Care Physician
This course offers a four-week exposure to ambulatory care of patients with diseases of the head and neck. Eight half-day sessions per week will be offered in attending clinics for general otolaryngology, head and neck cancer, otology and pediatric otolaryngology. Two-half day sessions are reserved for audiology, vestibular lab and voice lab experience. Surgical exposure is available for selected cases as identified by the student and attending physician, but the main goal of this rotation is outpatient diagnosis and management.

M55 Oto 900 Research Elective - Otolaryngology
Research opportunities may be available. If interested, please contact the Department of Otolaryngology.

Department of Pathology & Immunology

The Department of Pathology & Immunology (http://pathology.wustl.edu) is involved in the clinical diagnosis and monitoring of disease, in the teaching of pathology and immunology, and in research on the molecular basis of disease and immunology.

The department is responsible through its divisions for studying the pathogenesis and the biochemical and anatomical basis of diseases. Pathologists do research on disease processes using molecular, genetic and structural analysis. Pathologists have the responsibility for the cytological and anatomical diagnosis of diseases and for developing novel structural and molecular approaches for the analysis of them, particularly cancers and infectious diseases. The divisions of Anatomic and Molecular Pathology (https://pathology.wustl.edu/divisions/amplamp), Immunobiology (https://pathology.wustl.edu/divisions/immunobiology), Laboratory and Genomic Medicine (http://pathology.wustl.edu/divisions/igm) and Neuropathology (http://pathology.wustl.edu/divisions/neuropathology) have faculty involved in teaching, clinical service and research. Prominent areas of research include experimental diabetes, hematology, bone pathophysiology, cancer, and gastrointestinal and vascular pathology.

The department teaches an extensive course in the second year of the curriculum and presents a number of conferences that third- and fourth-year students can attend. The department also offers a number of clerkships. The course director of the second-year Pathology course is Erika C. Crouch, PhD, MD. Students can take clerkships in Autopsy Pathology, Surgical Pathology or Laboratory Medicine, or participate in the research activities of the faculty.

The Division of Immunobiology (https://pathology.wustl.edu/divisions/immunobiology) integrates immunobiology activities in the school. It is responsible for the teaching of immunology in the first year of the curriculum (Brian T. Edelson, MD, PhD, is the course director) and for conducting basic research in immunobiology and in the immunological basis of disease.

Many faculty in the department are involved in graduate teaching and participate in the various programs offered by the Division of Biology and Biomedical Sciences (http://dbbs.wustl.edu/Pages). The department has strong participation in the Immunology graduate program.

Website: https://pathology.wustl.edu

Degrees & Requirements

While the Department of Pathology & Immunology does not offer its own degree, some of the department’s courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found
in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

Paul M. Allen, PhD
BJC Institute of Health, 8th Floor
Phone: 314-362-8758
Research in immunology. The recognition of antigen by T cells. We are investigating how the T cell receptor functions developmentally, biochemically and structurally. We utilize in vivo models to study the role of T cells in alloreactivity/graft rejection and inflammatory bowel disease.

Jacques U. Baenziger, MD, PhD
Kingshighway Building, 2nd Floor, Room 2423
Phone: 314-362-8730
Glycobiology, informational role of carbohydrates in protein targeting and reproductive endocrinology.

Jeffrey I. Gordon, MD
4444 Forest Park, 5th Floor
Phone: 314-362-7243
Genomic and metabolic foundations of symbiotic host-microbial interactions in the human gut; impact on obesity and malnutrition.

Michael McDaniel, PhD
3709 West Building
Phone: 314-362-7435
The focus of this laboratory is to study the function and growth of pancreatic islets in Types 1 and 2 diabetes. Mammalian target of rapamycin (mTOR) is a protein kinase that integrates signals from growth factors and nutrients to regulate DNA and protein synthesis. G protein-coupled receptor agonists, such as GLP-1, have been shown to enhance proinsulin biosynthesis and secretion, and stimulate cellular growth and proliferation. Our objective is to further explore the mechanisms of action of GLP-1 to enhance DNA and protein synthesis via mTOR in rodent and human islets. These studies are of fundamental interest in optimizing mTOR to induce cellular growth and proliferation to: (1) enhance pre- and post-islet transplantation in Type 1 diabetes and (2) prolong b-cell compensation in response to insulin resistance in Type 2 diabetes. b-cell failure in obesity-associated Type 2 diabetes is believed to correlate with the intracellular accumulation of lipids that contribute to defects in insulin secretion and maintenance of b-cell mass. Our studies have identified lipoprotein lipase in b-cells, a key enzyme for catalyzing the hydrolysis of lipoprotein-associated TAG, to produce free fatty acids (FFA) for local cellular uptake. We are also characterizing the effects of enhanced FFA uptake through fatty acid transporters and determining the regulation of lipid droplet synthesis and breakdown by lipid droplet associated proteins. Recent studies suggest that FFA up-regulate mitochondrial uncoupling proteins proposed to dissipate the proton gradient across the mitochondrial inner membrane. The objective of this study is to delineate the link between FFA and b-cell mitochondrial dysfunction in Type 2 diabetes.

Kenneth M. Murphy, MD, PhD
Clinical Sciences Research Building, 7th Floor, Room 7766
Phone: 314-362-2009
Function of dendritic cells in T cell responses and anti-tumor vaccines.

Robert D. Schreiber, PhD
BJC Institute of Health, 8th Floor
Phone: 314-362-8747
Tumor Immunology and Cancer Immunoediting. Research on natural and therapeutically induced responses to tumors and definition of the molecular roles of interferon-gamma and interferon-alpha/beta in these processes.

Carl H. Smith, MD
St. Louis Children’s Hospital
Phone: 314-454-6029
Placental transport and surface membrane structure and function.

Thaddeus S. Stappenbeck, MD, PhD
Clinical Sciences Research Building, North Tower, Room 1020
Phone: 314-362-4214
My lab studies the cause of inflammatory bowel disease, a condition that leads to spontaneous inflammation of the intestine. We study the mechanisms of host gene mutations as well as abnormalities in host-microbial interactions that drive this disease.

Steven Teitelbaum, MD
Barnes-Jewish Hospital
Phone: 314-454-8463
Cellular and molecular mechanisms of bone remodeling with particular emphasis on osteoclast biology as relates to pathogenesis and prevention of diseases, such as osteoporosis. We focus on integrin and cytokine biology utilizing a variety of genetically-manipulated mice.

John Turk, MD, PhD
6609 Wohl
Phone: 314-362-8190
Phospholipase A2 (PLA2) enzymes in regulating insulin secretion from pancreatic islet cells, e.g., a novel iPLA2 that does not require Ca2+ cloned from rat and human islets that is involved in -cell secretion and proliferation. Studies of iPLA2, its post-translational modifications, and its interactions with other proteins involve mice that are iPLA2-deficient globally or in selected tissues, transgenic mice that overexpress iPL2 in -cells, and insulinoma cells with genetically manipulated iPLA2 expression. Mass spectrometric characterization of proteins and complex lipids is an important tool in these studies.

Emil R. Unanue, MD
BJC Institute of Health, 8414
Phone: 314-362-8748
Research in immunobiology/immunopathology. Examination of cellular interactions resulting in immune induction and cellular immunity. These cellular interactions are examined in normal immune responses and in autoimmune diseases. The focus is to identify the proteins responsible for activation of lymphocytes in Type 1 diabetes.

Herbert Virgin, MD, PhD
Clinical Sciences Research Building, Room 8849
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We work on issues at the interface of virology and immunology by analyzing aspects of viral immunity, viral pathogenesis, and viral genetics that contribute to virulence and disease.

Mark A. Watson, MD, PhD
Clinical Sciences Research Building, North Tower, Room 1029
Phone: 314-454-7919
Our laboratory is interested in defining patterns of somatic gene mutation, gene expression, and quantitative tumor clonality that can be used to predict distant site metastases and therapeutic vulnerability in patients with lung and breast cancer. Experimental approaches use histopathological review, and next generation DNA exome and RNA sequencing (NGS) of primary cancer patient tissues, coupled with bioinformatics and statistical modeling to identify candidate biomarker patterns that may be useful for the clinical management of cancer patients.

Faculty

Anatomic and Molecular Pathology Division Head
Steven L. Teitelbaum, MD

Immunobiology Division Head
Gwendalyn Randolph, PhD

Laboratory and Genomic Medicine Division Co-Heads
Charles Eby, MD
Thaddeus Stappenbeck, MD, PhD

Neuropathology Division Head
Robert E. Schmidt, MD, PhD
Visit our website for more information about our faculty (https://pathology.wustl.edu/people) and their appointments.

A

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Professor of Molecular Microbiology
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B

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Dr Robert J Glaser Distinguished University Professor
Professor of Developmental Biology
Professor of Medicine
BA Oberlin College 1969
MD University of Chicago 1973

Nicholas Wayne Griffin, PHD
Assistant Professor of Pathology and Immunology (primary appointment)
PHD Washington Univ in St. Louis 2010

Ann Marie Gronowski, MS, PHD
Professor of Pathology and Immunology (primary appointment)
Professor of Obstetrics and Gynecology
BS University of Illinois 1985
MS Iowa State University 1988
PHD Univ of Wisconsin Madison 1992

Brenda Jean Grossman, MS, MD
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Professor of Medicine
BS Ohio University 1976
MS Saint Louis University 2003
MD Medical College Georgia 1980

Matthew Michael Gubin, PHD
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BS University of MO Columbia 2004
PHD University of MO Columbia 2012

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PHD Washington Univ in St. Louis 2008
MD Washington Univ in St. Louis 2008
BA Princeton University 2000

Scott A Handley, PHD
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PHD Washington Univ in St. Louis 2006
BS Southwest Missouri St Universi 1998

Thomas Joseph Hannan, BA1, DVM
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BA Georgetown University 1989
BA1 Georgetown University 1989
DVM Tufts University 1995

Anjum Hassan, MD1, MD
Associate Professor of Pathology and Immunology (primary appointment)
MD1 School Not Listed 1989
MD Aga Khan University 1989
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MD Fudan University 1993  
PHD Rutgers University 2001

Jonathan W Heusel, MD, PHD  
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MD Washington Univ in St. Louis 1995  
PHD Washington Univ in St. Louis 1995

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BS Lincoln School of Commerce 2007  
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PHD University of Illinois Chicago 2008  
MD University of Illinois Chicago 2008

Kiwook Kim, MS, PHD  
Instructor in Pathology and Immunology (primary appointment)  
MS Handong Global University 2006  
BS Handong Global University 2004  
PHD Weizmann Institute of Science 2011

John M Kissane, MD  
Retiree - Professor of Pathology and Immunology (primary appointment)  
MD Washington Univ in St. Louis 1952  
BA University of Rochester 1948

Eynav Yafit Klechevsky, PHD  
Assistant Professor of Pathology and Immunology (primary appointment)  
PHD Baylor University 2007

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MD Goethe University 1995

Hannah Rachel Krigman, MD  
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MD University of North Carolina 1988  
BA Amherst College 1983

Michael Kyriakos, MD  
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MD Albert Einstein College of Med 1962

Jack H Ladenson, PHD  
Oree M Carroll and Lillian B Ladenson Professor of Clinical Chemistry in Pathology and Immunology (primary appointment)  
Professor of Clinical Chemistry in Medicine  
PHD University of Maryland 1971  
BS Pennsylvania State University 1964

Steven Lee LaRue, MS, MD  
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BS Central Missouri St Universit 1979  
MS Central Missouri St Universit 1980  
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MD National Taiwan University 2000  
PHD Duke University 2008

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BS Amherst College 1997

Cheryl Faye Lichti, D SC, BAS  
Assistant Professor in Pathology and Immunology (primary appointment)  
D SC Duke University 1993  
BAS Hendrix College 1988

Heide Maria Lind, MD  
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MD University of Iowa 1979

Ta-Chiang Liu, PHD, MD  
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PHD Imperial College 2003  
MD National Yang-Ming University 1997

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PHD Oregon Health Science Univers 2010  
MD Peking Union Medical College 2004

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BS Rust College 1995  
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BS2 Rust College 1995
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BS Goucher College 1998
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MD University of Cordoba 1984

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MD University of Virginia 2006
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BA1 University of Virginia 1994

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BS Cornell University 1982

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Sanjay Joshua Swamidass, MD, MA, PHD
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MD University of California 2009
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MS University of Warsaw 1989
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BA Columbia University 1960
MD Washington Univ in St. Louis 1964

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BS Tulane University 2005
PHD Univ Texas Health Sci San Anto 2011
MD Univ Texas Health Sci San Anto 2013

Emil Raphael Unanue, MD
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BS Institute of Secondary Educati 1952
MD Havana University 1960

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PHD University of San Diego 2006

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PHD University of Michigan 2010
Xiaoxiao Wan, PHD  
Instructor in Pathology and Immunology (primary appointment)  
PHD University of MO Columbia 2015

Xiaoli Wang, MD, MS, PHD  
Assistant Professor of Pathology and Immunology (primary appointment)  
MD Third Military Medical Univ 1977  
MS School Not Listed 1989  
PHD University of Arkansas 2001

Mark A Watson, MD, PHD  
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MD Washington Univ in St. Louis 1992  
PHD Washington Univ in St. Louis 1992  
BA University of Pennsylvania 1985

George Randolphe Wettach, MS, MD  
Associate Professor in Pathology and Immunology (primary appointment)  
MS Eastern Virginia Med School 2002  
MD Eastern Virginia Med School 2006  
BS University of CA Berkeley 1995

Frances V White, MS, MD  
Associate Professor of Pathology and Immunology (primary appointment)  
Associate Professor of Pediatrics  
BA Princeton University 1975  
MS University of North Carolina 1978  
MD University of North Carolina 1989

Craig B. Wilen, PHD, AB, MD  
Instructor in Pathology and Immunology (Pending Dean’s Approval) (primary appointment)  
PHD University of Pennsylvania 2011  
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Terry A Woodford-Thomas, PHD, MS  
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PHD Va Polytechnic Inst & State U 1982  
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BS Eastern Illinois University 1975

Melanie Leann Yarbrough, PHD  
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PHD University of Texas Southwest 2009

Guoyan Zhao, MS, PHD  
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PHD Washington Univ in St. Louis 2003

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Associate Professor of Pathology and Immunology (Pending Executive Faculty Approval) (primary appointment)  
PHD Shanghai Medical University 1993  
MD Hubei Medical University 1986  
MS Capital U of Medical Sciences 1989

Bernd Heinrich Zinselmeyer, PHD  
Assistant Professor of Pathology and Immunology (primary appointment)  
PHD University of Strathclyde 2006

Wei Zou, PHD, MA  
Assistant Professor of Pathology and Immunology (primary appointment)  
PHD Hebrew University 2003  
MA Qingdao University 1994

Course listings
Visit online course listings to view offerings for M60 Path (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M60).

M60 Path 523 Immunology
The course consists of lectures, laboratory exercises and clinical correlations. It covers all aspects of the immune response — general properties of the immune system, effector molecules, cells and their function, cellular interactions, vaccines, and immunological diseases. Two laboratory exercises focus on blood typing and allergy. Students will also meet in groups (20-25 students) with clinicians to discuss a variety of clinical cases that relate to the course material.  
Credit 37 units.

M60 Path 665 Pathology
This course is a comprehensive survey of the biology and morphology of human disease through a combination of lectures and laboratory sessions. The year begins with a review of basic disease mechanisms at the cellular and molecular level. Subsequently, the pathogenesis and characteristics of important diseases involving each organ system of the body are presented. During the year, students will become familiar with the methods
of contemporary pathologic analysis. They will also learn how the results of pathologic studies are used in the clinical setting to establish diagnoses, to assess prognosis and response to therapy, and to evaluate the quality of patient care.

Credit 115 units.

M60 Path 702 Laboratory Medicine Clerkship
This elective is designed to teach the student how clinical laboratory assays are used in the diagnosis of disease and to understand the quality assurance tools the laboratory utilizes to assure the reliability of tests. The four-week elective includes rotations through laboratories in clinical chemistry, clinical microbiology, transfusion medicine, molecular diagnostics and hematopathology. During the elective the student will have a daily schedule, which includes didactic sessions with senior staff and house staff. Particularly useful clinical skills to be acquired include: morphology of peripheral blood smears and bone marrow biopsies; interpretation of coagulation tests, biomarkers of cardiac damage and serum protein electrophoresis patterns. Also covered are appropriate use of blood component therapy, and therapeutic apheresis and identification of infectious organisms. Students will attend quality assurance meetings with senior staff, participate in microbiology rounds and present case discussions during this elective. Credit 154 units.

M60 Path 750 Surgical Pathology Clerkship
This elective is designed to familiarize students with the discipline of surgical pathology and to encourage the development of basic skills in gross pathology and histopathological interpretation. The Laboratory of Surgical Pathology at Barnes-Jewish Hospital receives a broad range of medical biopsy material in addition to specimens derived from the busy surgical subspecialty practices. As a result, this elective is beneficial not only for students considering a career in pathology, but also for students planning careers in internal medicine, surgery, obstetrics-gynecology, pediatrics, radiology, radiation oncology and dermatology. Students on this elective will (1) learn how patient specimens are received and processed, (2) acquire skills in the gross examination and microscopic diagnosis of disease through active participation, and (3) learn the role of the pathologist in the preoperative, intraoperative, and postoperative care and management of patients. Students will function as junior house staff managing their own cases with supervision from residents, fellows and attending pathologists. Students may also wish to participate in ongoing research projects within the department as time, and interest, allows. The daily schedule for students begins at 8:00 a.m. with morning conference. In general, the student will be able to complete all gross examination and sign-out activities by 4:30 p.m. Students are welcome to stay beyond 4:30 p.m. to participate in any of the academic or other working activities of the division. Student time distribution: Clinical duties 85%, Conference/Lectures 15%; Major teaching responsibility: Attending staff, residents and fellows; Patients seen/weekly: N/A; On-call/weekend responsibility: None.

M60 Path 807 Dermatopathology
The student will be involved in all activities of the dermatopathology service. These include reviewing discussion and signout of gross and microscopic skin specimens. Signout occurs each day with a team that includes an attending, fellow, and residents from both dermatology and pathology. The medical student will work closely with the residents and fellow to preview cases prior to signout. Dermatology Grand Rounds and dermatopathology lectures are held on Thursday mornings and are mandatory. In addition, dermatopathology slide review conferences are held on Friday mornings and are mandatory. Other learning opportunities include daily Consensus Conference, informal unknown slide sessions, weekly Dermatology Consult Clinicopathologic Conference and monthly Cutaneous Lymphoma Conference and Journal Club. The primary goal of this elective is to acquire basic competence in the diagnosis of skin diseases at the microscopic level. A secondary goal is to acquire understanding of the structure and function of the laboratory at the technical, administrative and medical professional level as it pertains to skin specimens.

M60 Path 812 General Cytopathology
This elective is designed to familiarize students with the discipline of cytopathology and to encourage the development of basic skills. Cytopathology impacts many different areas of patient care and medical practice. The Cytopathology Laboratory at Barnes-Jewish Hospital receives a broad range of medical cytology material involving fine needle aspiration biopsies (FNA), body fluids and Pap tests. As a result, the elective is beneficial for students considering a career in pathology and for students planning careers in internal medicine, surgery, OB-GYN, ENT, and radiology. The focus of the experience can be customized based on the interest of the student. Desk space and a microscope are provided. Students on the elective will (1) learn how patient specimens are received and processed, (2) acquire skills in the microscopic diagnosis of disease through active participation, and (3) learn the role of the cytopathologist in the care and management of patients. Students will have the opportunity to function as junior house staff managing their own cases with supervision from residents, fellows, and attending cytopathologist. There are text books and extensive study sets to permit students to focus on specific areas of interest. The daily schedule for student begins previewing the cytology cases at 8:00 a.m. The student will attend the cytology conference on Wednesday and Thursday. In general, the student will be able to complete sign-out activities by 4:30 p.m.

M60 Path 813 Molecular Pathology
This elective is designed to introduce students to the field of molecular pathology, including established molecular diagnostics and Next Generation Sequencing clinical assays. Students will learn through observation in the laboratory, didactic sessions, resident and fellow presentations, sign out with attending pathologists, and clinical informatics workshops. Students will work with residents/fellows on the rotation and participate as part of the team.

M60 Path 815 OB-GYN Pathology Sub-Internship
The elective stresses the principles of anatomic pathology when applied to operative material in Obstetrics and Gynecology. The sub-intern will examine gynecologic and microscopic specimens in the OB-GYN Pathology Lab and review pertinent literature with a senior pathologist. Ample time will be available for attending regular conferences in OB-GYN and Pathology.
M60 Path 820 Surgical Pathology
This elective is designed to familiarize students with the discipline of surgical pathology and to encourage the development of basic skills in gross pathology and histopathological interpretation. The Laboratory of Surgical Pathology at Barnes-Jewish Hospital receives a broad range of medical biopsy material in addition to specimens derived from the busy surgical subspecialty practices. As a result, this elective is beneficial not only for students considering a career in pathology, but also for students planning careers in internal medicine, surgery, obstetrics-gynecology, pediatrics, radiology, radiation oncology and dermatology. Students on this elective will (1) learn how patient specimens are received and processed, (2) acquire skills in the gross examination and microscopic diagnosis of disease through active participation and (3) learn the role of the pathologist in the preoperative, intraoperative, and postoperative care and management of patients. Students will function as junior house staff managing their own cases with supervision from residents, fellows and attending pathologists. Students may also wish to participate in ongoing research projects within the department as time, and interest, allows. At the end of the rotation, the students are required to do a formal case presentation for the residents, fellows and attending staff. The daily schedule for students begins at 8:00 a.m. with morning conference. In general, the student will be able to complete all gross examination and sign-out activities by 4:30 p.m. Students are welcome to stay beyond 4:30 p.m. to participate in any of the academic or other working activities of the division.

M60 Path 825 Introduction to Neuropathology
The course is structured to give the student a full-time immersion in the specialty of neuropathology, including both neurosurgical and neuropathology-derived material. There are daily didactic sessions that cover the spectrum of neurological diseases, review gross and microscopic neuro-anatomy, discuss approaches to the diagnosis of nervous system disease, and point out the interrelationships of research to clinical problems. Multiple clinical conferences and diagnostic working sessions complement reading, use of a large microscopic divisional study set and project work. Time: 35 to 40 hours per week.

M60 Path 855 Diagnostic Hematopathology
Student electives in diagnostics of diseases of hematopoietic cells aims to foster understanding of acute and chronic leukemias, reactive conditions mimicking malignancies, and lymphomas affecting adults and pediatric populations. This diverse field involves multiple ancillary diagnostic tests such as immunohistochemistry, flow cytometry and genetic testing. This elective will offer medical students an in-depth insight into what goes behind the final pathologic diagnoses in hematologic malignancies before a treatment plan can be executed. This insight is crucial to understand the importance of correct diagnosis (the answer to the usual “What’s taking pathology so long?” comment) and accurate, timely communication of preliminary and final diagnosis to the clinicians. Under general faculty and fellow supervision, the students will be primarily responsible for handling of their own cases such as bone marrow biopsies, simple lymph node biopsies, ordering the required tests, dictating the final reports and communicating with the clinicians. They will also participate in several conferences per week including hematopathology consensus conference, weekly cytogenetic/molecular correlation conferences, journal club and interdepartmental bone marrow transplant and lymphoma conferences.

M60 Path 860 Clinical Laboratory Medicine
This elective is designed to teach the student how clinical laboratory assays are used in the diagnosis of disease and to understand the quality assurance tools the laboratory utilizes to assure the reliability of tests. The four-week elective includes rotations through laboratories in clinical chemistry, clinical microbiology, transfusion medicine and hematopathology. During the elective the student will have a daily schedule, which includes didactic sessions with senior staff and house staff. Particularly useful clinical skills to be acquired include: morphology of peripheral blood smears and bone marrow biopsies; interpretation of coagulation tests, biomarkers of cardiac damage and serum protein electrophoresis patterns; appropriate use of blood component therapy and therapeutic apheresis; and identification of infectious organisms. Students will attend quality assurance meetings with senior staff. They will participate in microbiology rounds and present case discussions during this elective.

M60 Path 900 Research Elective - Pathology
Research opportunities may be available. If interested, please contact the Department of Pathology and Immunology.

Edward Mallinckrodt
Department of Pediatrics

The primary aim of the teaching program of the Department of Pediatrics (http://pediatrics.wustl.edu) is to stimulate interest in developmental biology — in particular, human growth and development — to provide students with a foundation sufficiently comprehensive to have an appreciation of clinical pediatric problems, regardless of their future career choices in medicine.

The major clinical and research facilities are in St. Louis Children's Hospital (http://www.stlouischildrens.org), and the newborn services are at the Women and Infants Center (http://www.stlouischildrens.org/women-and-infants). St. Louis Children's Hospital is a facility with 300 beds that accepts patients through 21 years of age with all types of medical and surgical problems. Hospital admissions average 11,200 annually. Pediatric medical ambulatory activity, including subspecialty and emergency visits, averages about 152,000 visits a year. Nearly 4,000 infants are born annually at the Washington University Medical Center.

Website: http://pediatrics.wustl.edu

Degrees & Requirements

While the Department of Pediatrics does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

Ana Maria Arbelaez, MD
Northwest Tower, 10th Floor
Clinical research in diabetes mellitus. Clinical research studies on hypoglycemia-associated autonomic failure in patients with type 1 diabetes mellitus and on cystic fibrosis related diabetes.

Charles E. Canter, MD
Northwest Tower, Division of Cardiology, 8th Floor
Phone: 314-454-6095
Single-center and multicenter clinical studies and trials in pediatric cardiomyopathy, heart failure, and heart transplantation.

F. Sessions Cole, MD and Jennifer Wambach, MD, MS
Northwest Tower, 8th Floor; and McDonnell Pediatric Research Building, 5th Floor
Phone: 314-454-6148
Using candidate gene sequencing, exome sequencing, whole genome sequencing, and computational prediction and filtering strategies for discovery of deleterious variants in population-based cohorts, case-control cohorts, and trios of affected infant and parents, our laboratory focuses on discovering novel candidate genes associated with neonatal respiratory distress syndrome and understanding the contribution of genetic variation in candidate genes of the pulmonary surfactant metabolic pathway (including surfactant protein B, surfactant protein C, NNX2.1, and ABCA3), to risk of neonatal respiratory distress syndrome.

Vikas Dharnidharka, MD, MPH
Northwest Tower, 10th Floor
Phone: 314-286-1574
Clinical and translational research in childhood kidney disease. Our group is involved in several different types of clinical and translational research, including (a) multicenter clinical intervention trials to improve teen adherence with transplant medications and test new medications in children on dialysis; (b) translational biomarker studies in transplant acute and chronic rejection and genomic studies or post-transplant lymphoproliferative disease; (c) large transplant database epidemiological analyses for associations of immunosuppressive regimens with efficacy and morbidity balance.

Allan Doctor, MD
McDonnell Pediatric Research Building, 5th Floor
Phone: 314-454-2527
Role of erythrocytes in pathologic vascular signaling. We employ several novel experimental platforms to pursue a range of basic, translational, and clinical studies exploring: (1) the role of erythrocytes in context-responsive metabolism of vasoactive effectors in flowing blood; (2) molecular control of antioxidant defense in erythrocytes; (3) the role of acquired injury to normal erythrocytes in the pathophysiology of acute lung injury and multiple organ failure syndrome; and (4) the impact of genetic abnormalities in erythrocytes upon antioxidant defense and vascular signaling (modeled by sickle cell anemia). Query is modeled on many levels from isolated proteins – cell culture – isolated organ – whole mouse – to studies in humans.

Todd Druley, MD, PhD
4444 Forest Park Avenue, Room 6203
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Translational genomic research in pediatric oncology. The Druley lab aims to develop novel genomic and computational methodologies for characterizing the functional impact of rare acquired and germline variation on the etiology and outcomes of various pediatric malignancies.

Jennifer Duncan, MD
McDonnell Pediatric Research Building, 3rd Floor
Phone: 314-747-0802
Understanding the transgenerational impact of maternal nutrition. Our lab uses Drosophila melanogaster as a model system to evaluate the impact of maternal caloric excess on metabolism and mitochondrial function in offspring. We are currently pursuing epigenetic mechanisms, specifically the role of histone modification, for altering gene expression. In addition, we are evaluating the molecular mechanisms underlying triglyceride excess in the offspring and are evaluating tissue-specific mitochondrial function. This elective is for students interested in research in any of these areas.

Stephanie A. Fritz, MD, MSCI
Northwest Tower, Room 10125
Phone: 314-454-4115
Our research team studies the epidemiology, microbial virulence mechanisms, and host defenses against community-associated methicillin-resistant Staphylococcus aureus (CA-MRSA) colonization, transmission and disease. We are investigating the transmission dynamics of CA-MRSA in households and interventions to interrupt the transmission of CA-MRSA and prevent subsequent infections. Our lab also explores the microbial and host genomic determinants, as well as the host immune response to staphylococcal toxins implicated in the pathogenesis of CA-MRSA, in patients across a spectrum of disease states. Our goal is to develop novel approaches for the prevention of CA-MRSA infections.

Carmen Halabi, MD, PhD
McDonnell Pediatric Research Building, 4th Floor, Room 4107
Phone: 314-286-1376
Extracellular matrix in vascular development and disease: The research in the laboratory focuses on vascular biology. Specifically, we study extracellular matrix proteins that make up the elastic fibers of blood vessels. Elastic fibers convey elasticity to blood vessels allowing large arteries to store energy during systole and release it during diastole. Abnormalities in elastic fiber components lead to various complications including hypertension, stiff vessels, and aneurysms. In the laboratory, we utilize mouse models to understand how abnormalities in these proteins lead to disease, which helps us not only learn about the
normal function of these proteins, but also identify potential novel therapeutic targets.

**Robert J. Hayashi, MD**
St. Louis Children's Hospital, Suite 9S  
Phone: 314-454-4118  
Clinical research interests include stem cell transplantation and its complications, including post-transplant lymphoproliferative disease and long-term side effects of therapy.

**Keith A. Hruska, MD**
McDonnell Pediatric Research Building, 5th Floor  
Phone: 314-286-2722  
The research in the laboratory focuses on chronic kidney disease (CKD) and its complications of the chronic kidney disease mineral bone disorder syndrome that involves skeletal frailty, cardiovascular disease, and vascular calcification. The lab has discovered important new pathologic mechanisms of disease leading to vascular calcification through systemic effects of factors involved in renal repair and hyperphosphatemia. Translational studies that continue to develop new therapeutic approaches are being aggressively pursued. New therapies for chronic kidney disease, and its complications, are being studied in clinical trials.

**Paul Hruz, MD, PhD**
McDonnell Pediatric Research Building, 3rd Floor  
Phone: 314-286-2797  
Research interests include structure/function relationships in facilitative glucose transporters, congenital and acquired lipodystrophy syndromes, and insulin resistance associated with HIV protease inhibitor therapy.

**David A. Hunstad, MD**
McDonnell Pediatric Research Building, Room 6106  
Phone: 314-286-2710  
Work in our lab focuses on the interactions of pathogenic bacteria with their hosts. We aim to elucidate the modulation of host immune responses by pathogens and to determine the mechanisms by which these bacteria present specific virulence factors on their surfaces. Currently, we use cultured bladder epithelial cell models and murine models of cystitis to investigate the ability of uropathogenic Escherichia coli to modulate host innate and adaptive immune responses. In addition, we are studying the molecular mechanisms by which selected outer membrane proteins contribute to the virulence of uropathogenic E. coli. Our primary goal is to discover novel targets for interventions that will prevent and better treat bacterial infections of the urinary tract. Along these lines, we are leveraging recent discoveries in UTI pathogenesis to design nanoparticle-based therapies for prevention of acute and recurrent UTI. We have also launched a new translational study of immune responses to UTI in male and female infants, paired with an innovative new mouse model of male UTI that permits first-ever studies of sex differences in these infections.

**S. Celeste Morley, MD, PhD**
McDonnell Pediatric Research Building, Room 6105  
Phone: 314-286-2136  
Our laboratory investigates the molecular mechanisms underlying immune cell signaling and trafficking using mouse models. We hope to identify molecules critical for host defense against infectious organisms such as pneumococcus. Our focus is currently on an actin-binding protein called L-plastin, which is required for normal T and B cell motility.

**Audrey R. Odom, MD, PhD**
McDonnell Pediatric Research Building, Room 6108  
Phone: 314-747-2370  
Antimalarial therapies and diagnostics. Severe malaria due to infection with Plasmodium falciparum kills nearly a million children annually. Our laboratory uses translational approaches to develop new methods to diagnose and treat malaria. Projects are available in several research areas, ranging from clinical studies to molecular parasitology approaches in the lab. We are eager to have students join either our team on campus, where we study parasite metabolism and evaluate new potential therapies, or our team in the field in Malawi, where we are collecting samples for new malaria biomarkers.

**Jose A. Pineda, MD**
Northwest Tower, 10th Floor, Patient-Oriented Research Unit  
Phone: 314-286-1246  
Mechanisms of brain injury in children. Our clinical research efforts focus on investigating the mechanisms and potential new treatments for brain injury, including strategies for implementation of best clinical practices. We utilize high-resolution physiological monitoring, biochemical analysis of clinical samples, and innovative implementation science methodologies.

**Alan L. Schwartz, PhD, MD**
St. Louis Children's Hospital, Suite 3S36  
Phone: 314-454-6005  
Investigative efforts are aimed at understanding: (1) the biology of cell surface receptors, including biochemical and molecular dissection of the mechanisms responsible for receptor-mediated endocytosis of blood coagulation proteins; and (2) the regulation of intracellular protein turnover.

**Shalini Shenoy, MD**
St. Louis Children's Hospital, Suite 9S  
Phone: 314-454-6018  
Investigation of novel reduced intensity transplant strategies for pediatric non-malignant disorders and the immunologic basis of graft versus host disease and graft rejection.

**Gregory A. Storch, MD; Kristine Wylie, PhD; Todd Wylie, BS; Richard S. Buller, PhD**
St. Louis Children's Hospital, Suite 2N52  
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Infectious disease genomics. Our laboratory is interested in applying genomic analysis to a variety of problems in infectious diseases, mostly related to viral infections. Recent studies
include use of next generation sequencing to define the human virome in immunocompromised children, improved methods for detecting viruses using next generation sequencing, use of next generation sequencing for clinical diagnosis, analysis of the human transcriptome response to acute infections, sequencing of the genome of enterovirus D68 and development of a rapid diagnostic test for that virus. Students would have the opportunity to learn genomic techniques, including informatics analysis.

Phillip I. Tarr, MD
McDonnell Pediatric Research Building, Room 6103
Phone: 314-286-2848
Research in pediatric gastroenterology, hepatology and nutrition. Students have opportunities in broadly encompassing research projects. Investigators in the Division have funded and vibrant projects in liver disease (fatty liver disease, acute liver failure, biliary atresia, liver transplants, cystic fibrosis liver disease), inflammatory bowel diseases (Crohn's Disease and ulcerative colitis), infections of the gastrointestinal tract (diarrhea), acute liver failure, Hirschsprung Disease, diarrhea, gut microbiome, aflatoxin injury to the liver and stunting, health services research, necrotizing enterocolitis, antibiotic-resistant pathogens in the human gut, and quality improvement, particularly related to inflammatory bowel disease management. Short- and long-term projects can be arranged around these and other related efforts. The exact nature of the project depends on the time that the student can contribute to the effort, and the availability of any of the Division faculty, who all have established track records as mentors. Interested students should contact any of our faculty, or Dr. Tarr, to discuss the possibilities.

Neil H. White, MD, CDE
St. Louis Children's Hospital, Northwest Tower, 9th Floor
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Our work involves patient-oriented research in the management of diabetes in children. Arrangements can be made for involvement in, or development of, projects aimed at improving outcome or prevention of diabetes mellitus and its complications.

David B. Wilson, MD, PhD
McDonnell Pediatric Research Building, Room 3102
Phone: 314-286-2834
Research is focused on the molecular switches that regulate control genes during early embryonic development and differentiation.

Faculty

Division Chiefs

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Juliane Bubeck Wardenburg, MD, PhD

Visit our website for more information about our faculty (http://pediatrics.wustl.edu/directory) and their appointments.

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Professor of Clinical Pediatrics (primary appointment)  
MD Saint Louis University 1976  
BS University of Illinois 1972  

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Instructor in Clinical Pediatrics (primary appointment)  
PHD University of Florida 1995  

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Instructor in Pediatrics (primary appointment)  
MD Loyola University Chicago 2014  
BA Loyola University Chicago 2001  

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Instructor in Clinical Pediatrics (primary appointment)  
MD Saint Louis University 1987  
BA Dartmouth College 1982  

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Professor of Pediatrics (primary appointment)  
BA Cornell University 1982  
MD University of Cincinnati 1986  

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Professor of Clinical Pediatrics (primary appointment)  
MD University of Missouri 1976  
BA University of Kansas 1972  

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Assistant Professor of Pediatrics (primary appointment)  

MS Saint Louis University 2014  
BS Tulane University 1999  
MD Ohio State University 2003  

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Instructor in Clinical Pediatrics (primary appointment)  
PHD University of Kansas 2010  
MS University of Kansas 2006  
BS Loyola University 2003  

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MD Saint Louis University 1971  
BA Wesleyan University 1967  

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MD Hebrew University-Hadassah Med 2004  
BS Hebrew University-Hadassah Med 2015  

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Associate Professor of Pediatrics (primary appointment)  
MD Saint Louis University 2000  
BA Washington Univ in St. Louis 1993  

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BS University of Missouri Columbl 2003  
MD University of Missouri Columbl 2007  

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BSW Saint Louis University 1998  
MD Saint Louis University 2002  

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Professor of Pediatrics (primary appointment)  
Professor of Cell Biology and Physiology  
Professor of Medicine  
BS Creighton University 1965  
MD Creighton University 1969  

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Associate Professor of Pediatrics (primary appointment)  
Associate Professor of Cell Biology and Physiology  
MD Medical College of Wisconsin 1994  
PHD Medical College of Wisconsin 1993  
BS Marquette University 1987  

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Associate Professor of Pediatrics (primary appointment)  
BA Washington Univ in St. Louis 1990  
MD Baylor University 1994  

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Instructor in Pediatrics (primary appointment)  
PHD Stony Brook University 2017  

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Instructor in Clinical Pediatrics (primary appointment)
Monica L Hulbert, MD
Associate Professor of Pediatrics (primary appointment)
BS Indiana University Bloomington 1996
MD Washington Univ in St. Louis 2000

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Associate Professor of Molecular Microbiology
MD Washington Univ in St. Louis 1995
BA Carleton College 1991

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MD Washington Univ in St. Louis 2014
BS Washington Univ in St. Louis 2014

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BA Univ of Wisconsin Madison 1972
MD University of MO Columbia 1978

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MD Boston University 1972
BA University of Rochester 1968

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BS Washington Univ in St. Louis 2004
MD University of Virginia 2009

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BA Stanford University 1972
MD University of Chicago 1978

Sue E Jagler
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Instructor in Pediatrics (primary appointment)
MD University of Wisconsin 2017

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Associate Professor of Genetics
PHD Washington Univ in St. Louis 1995
BS Stanford University 1987
MD Washington Univ in St. Louis 1995

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MD University of CA San Francisco 2004
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Associate Professor of Molecular Microbiology
MD Duke University 2003
PHD Duke University 2002
BS Duke University 1996

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MD University of Missouri 1981

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BA University of Rochester 1978
MD Johns Hopkins University 1982

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MD Case Western Reserve Univ 1982
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BA Oakwood College 1979
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BS Truman State University 1997
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BS University of MO Columbia 2002
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BS University of Michigan 1999

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BS University of Arizona 2008

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Instructor in Clinical Pediatrics (primary appointment)  
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BA Lawrence University 1989  
B MUS Lawrence University 1989

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BS University of Texas Austin 1998  
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BA Wellesley College 1995  
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BS Saint Louis University 2006  
MD Saint Louis University 2010

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MD University of Chicago 1988  
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BS Rutgers University 2001

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Assistant Professor of Pediatrics (primary appointment)  
MD University of Virginia 1998  
BS University of Virginia 1994

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MD University of Missouri 1969  
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PHD University of Pennsylvania 1977  
MD University of Miami 1984

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MD University of Wisconsin 2006  
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BS University of Liverpool 1994  
PHD University of Surrey 1999

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Instructor in Clinical Pediatrics (primary appointment)  
BS Yale University 1994  
MD Washington Univ in St. Louis 2002

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Assistant Professor of Genetics  
BS Univ of Wisconsin Madison 1997  
PHD Washington Univ in St. Louis 2005  
MD Washington Univ in St. Louis 2005

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BS Government Medical College 2000  
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MS Creighton University 2012  
BS University of Oklahoma 2005  
MD University of Oklahoma 2009

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BS Mass Inst of Technology (MIT) 1977  
MD Washington Univ in St. Louis 1982

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Instructor in Pediatrics (primary appointment)  
BA University of Notre Dame 2007  
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MD University of Kansas 2012

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Instructor in Clinical Pediatrics (primary appointment)  
MD University of Oklahoma 1988  
BA Trinity University 1984

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Professor of Pediatrics (primary appointment)  
MD SMS Medical College 1986  
BS Delhi University 1976  
MBBS Delhi University 1982

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BA Washington Univ in St. Louis 1968  
MD Washington Univ in St. Louis 1972

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Associate Professor of Clinical Pediatrics (primary appointment)  
BA Tufts University 1983  
MD School Not Listed 1993  
M PH Boston University 1992

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Assistant Professor of Clinical Pediatrics (primary appointment)

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Instructor in Clinical Pediatrics (primary appointment)

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Instructor in Clinical Pediatrics (primary appointment)  
BS Marquette University 1993  
MD Saint Louis University 1997

Thomas Casey McKinney, MD  
Professor of Clinical Pediatrics (primary appointment)  
BA Illinois Wesleyan University 1976  
MD Washington Univ in St. Louis 1980

William A McManus, MD  
Assistant Professor of Pediatrics (primary appointment)  
MD Saint Louis University 1986  
BA Carroll College 1980

Christopher Clayton McPherson  
Assistant Professor of Clinical Pediatrics (primary appointment)

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Instructor in Pediatrics (primary appointment)  
Instructor in Medicine  
PHD Emory University 2009

P Aravindaksha Menon  
Instructor in Clinical Pediatrics (primary appointment)

Sarah J. Mermeistein, MD  
Instructor in Pediatrics (primary appointment)  
MD Drexel University 2007  
BA Indiana University Bloomington 2002

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Instructor in Pediatrics (primary appointment)  
BS Washington Univ in St. Louis 2009  
MD University of Illinois Chicago 2013

Mary Shaughnessy Meyer, MD  
Assistant Professor of Clinical Pediatrics (primary appointment)  
MD Saint Louis University 2003  
BA Saint Louis University 1999

Peter Howard Michelson, MD, MS  
Professor of Pediatrics (primary appointment)  
MD Jefferson Medical College 1983  
MS University of Pittsburgh 2007  
BS Bowdoin College 1978

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Instructor in Clinical Pediatrics (primary appointment)  
MD University of Illinois at Chic 2005  
BS Valparaiso University 2001

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Instructor in Clinical Pediatrics (primary appointment)  
MD University of Miami 1982
BS Boston College 1978

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Assistant Professor of Pediatrics (Pending Executive Faculty Approval) (primary appointment)
MD University of Illinois 1978
BS University of Illinois 1974

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Instructor in Pediatrics (primary appointment)
MS University of CA San Diego 2006
MD University of CA Davis 2011
BS University of CA San Diego 2004

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Assistant Professor of Pediatrics (Pending Executive Faculty Approval) (primary appointment)
BA University of Iowa 2002
MD Vanderbilt University 2010
PHD Vanderbilt University 2010

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**Gail Lynn Moolsintong, MD**
Instructor in Clinical Pediatrics (primary appointment)
BS University of MO Columbia 1997
MD University of MO Columbia 2001

**Darlene A. Moore, MD**
Instructor in Clinical Pediatrics (primary appointment)
MD University of Illinois 1978
BS Eastern Illinois University 1974

**Mary R Morgan, MD**
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MD Washington Univ in St. Louis 1990
BA Miami University 1984

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Associate Professor of Pediatrics (primary appointment)
Associate Professor of Pathology and Immunology
PHD Harvard University 2002
MD Harvard University 2002

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Associate Professor of Pediatrics (primary appointment)
Associate Dean for Student Affairs
BS Univ of Wisconsin Madison 1989
PHD Washington Univ in St. Louis 1998
MD Washington Univ in St. Louis 1998

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MD Washington Univ in St. Louis 1992

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Assistant Professor of Pediatrics (primary appointment)
BS Washington Univ in St. Louis 2005
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BS Birmingham Southern College 1974
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BS University of Central Florida 1998
MD University of Miami 2003

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MD Southern Illinois Universtiy S 1997
BA Washington Univ in St. Louis 1993

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Professor of Pediatrics (primary appointment)
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MS University of Cincinnati 2011

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BS University of Illinois 1988

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BS Loyola University 1985  
MD Louisiana St University 1998

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MD Saint Louis University 1996

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Instructor in Pediatrics (primary appointment)  
MD University of Illinois 2013  
BA Washington Univ in St. Louis 2005

Kevin Sullivan O'Bryan, MD  
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MD University of Michigan 2010

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Assistant Professor of Pediatrics (primary appointment)  
BS University of Georgia 2006  
MD Medical College Georgia 2010

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MBA Univ of Massachusetts Amherst 2007  
BA University of Missouri 1977  
MD Saint Louis University 1981

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Instructor in Clinical Pediatrics (primary appointment)  
MBBS University of Lagos 1982

Andrea Cohron Orr  
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BS University of Georgia 2007

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Instructor in Clinical Pediatrics (primary appointment)

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Associate Professor of Pediatrics (primary appointment)  
BS University of MO Columbia 1994  
MD University of MO Columbia 1998

Cynthia M. Ortinau, MD  
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MD University of MO Kansas City 2005

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UNKNOWN University of Cape Town 1982

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MD University of Illinois 1990  
BA University of Michigan 1986

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BS University of Sydney 1990  
PHD University of New South Wales 1996  
BS University of Sydney 1990

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Instructor in Clinical Pediatrics (primary appointment)

Purvi R Patel, MD  
Assistant Professor of Pediatrics (primary appointment)  
MD Baylor University 2000  
BA Rice University 1996

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Associate Professor of Pediatrics (primary appointment)  
Associate Professor of Neurology  
MD Francisco Marroquin University 1993  
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Assistant Professor of Pediatrics (primary appointment)  
BS Oberlin College 1998  
MD Washington Univ in St. Louis 2004  
M PH University North Carolina 2009

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MD University of Rochester 1996  
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BA Brown University 1988  
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MD Medical College Georgia 1984

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BA Washington Univ in St. Louis 1982

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BS Colorado St University 2008

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Courses


M65 Peds 640 Pediatrics: Physicians, Patients & Society
Students are introduced to the unique nature of pediatrics as a subspecialty through a series of clinically oriented lectures and team-based learning sessions focusing on the unique physiology and pathophysiology of pediatric patients. These sessions demonstrate the longitudinal nature of pediatrics by addressing normal and pathologic aspects of human growth and development as well as the unique role of the physician in assessing and managing pediatric patients at all stages of development.
Credit 27 units.

M65 Peds 760 Pediatric Clerkship
This is a 6-week clerkship divided into two 2-week rotations and two 1-week rotations. This course emphasizes pediatric pathophysiology and normal growth and development from birth through adolescence. Two weeks are spent inpatient at St. Louis Children's Hospital in general pediatrics on 10.100 or 11.100. Two weeks are spent in pediatric acute care in one of the following: Acute Care at St. Louis Children's Hospital, Acute Care at Missouri Baptist Medical Center (community hospital) or Acute Care at Progress West Hospital (community hospital). One week is spent on newborn nursery in one of the following: assessment nursery at 6800 Parkview Tower or Missouri Baptist Medical Center nursery (community hospital). One week is spent in outpatient ambulatory clinic in one of the following: St. Louis Children's Hospital subspecialty clinics or Children's Specialty Care Center (CSCC) on Mason Road. Emphasis is on performing a pediatric history and physical examination and developing an appropriate differential diagnosis. Daily rounds with house staff and attending physicians as well as weekly case management conferences and bedside teaching further this emphasis.
Credit 231 units.

M65 Peds 801 General Pediatric Sub-Internship - St Louis Children's Hospital
This is the general pediatric sub-internship. The student will be assigned patients on one of two inpatient pediatric floor teams. They will follow patients from initial evaluation and for continuing care until discharge. Students work directly under the supervision of residents and attending physicians in all the daily activities of the Pediatric Intensive Care Unit at St. Louis Children's Hospital and are on occasional call after hours. Students are introduced to the unique nature of pediatrics as a subspecialty through a series of clinically oriented lectures and team-based learning sessions focusing on the unique physiology and pathophysiology of pediatric patients. These sessions demonstrate the longitudinal nature of pediatrics by addressing normal and pathologic aspects of human growth and development as well as the unique role of the physician in assessing and managing pediatric patients at all stages of development. The rotation is structured to provide students with a clinical experience to allow them to gain exposure to the breadth of lung diseases seen at St. Louis Children's Hospital. The volume of patients on the 7100 Respiratory Unit and number covered by the sub-intern varies. He or she will typically be responsible for the care of two to six patients at any given time. The student will be exposed to children with wide-ranging lung diseases and breathing disorders, such as asthma, cystic fibrosis, bronchopulmonary dysplasia, bronchiolitis, pneumonia, chronic respiratory insufficiency, and congenital lung anomalies during their clinical rotation. The student will also have the opportunity to participate in tests and procedures essential to the practice of pulmonary and allergy medicine, including pulmonary function studies, flexible bronchoscopy, and overnight polysomnography. Sub-interns do not have evening coverage responsibilities, and weekend responsibilities are limited to two days during the four-week block. They are strongly encouraged to attend departmental and divisional conferences.
Credit 231 units.

M65 Peds 811 Pediatric Critical Care Medicine
This elective is designed to familiarize the student with the diagnosis and treatment of critical illness in infants and children. To this end, each student is made responsible for a small number of assigned cases under the direct supervision of pediatric residents, pediatric critical care fellows, and faculty. The teaching activities emphasize the understanding of pathophysiological processes that lead to respiratory, circulatory, and central nervous system dysfunction and their therapy in the developing subject. Students are expected to participate in all the daily activities of the Pediatric Intensive Care Unit at St. Louis Children's Hospital and be on occasional call after hours.

M65 Peds 813 Pediatric Cardiac Catheterization
This elective focuses on the interpretation of hemodynamic and angiographic data acquired in the cardiac catheterization laboratory.

M65 Peds 819 Pediatric Cardiology - Outpatient Service
Students will be exposed to the wide spectrum of cardiac disease seen at an outpatient basis. In addition to general cardiology clinics, several subspecialty clinics are also available, including heart failure/transplant, electrophysiology/inheritable arrhythmias, pulmonary hypertension, Williams' syndrome, Down syndrome, and preventative cardiology clinic. Students will independently evaluate clinic patients referred for a variety of cardiac complaints, such as cardiac murmurs, chest pain, syncope, arrhythmia, as well as a wide variety of congenital cardiac
lesions, and report their findings to the attending. Cardiac auscultation skills will be enhanced through auscultation of cardiac patients in a clinic environment. Students will learn basics of ECG and echocardiogram interpretation by reviewing studies performed during clinic with the attending. Clinics are held at St. Louis Children's Hospital, and the Children's Specialty Care Center in West County. Students also have the option to participate in outreach clinics that occur on a monthly basis (locations include Cape Girardeau, Poplar Bluff, Rolla, Bonne Terre, and Columbia). Depending on interest, students may spend additional time in the echocardiography laboratory for more in-depth exposure to echocardiography. Participation in weekly surgical conference and daily cardiology educational conferences is encouraged.

M65 Peds 826 Genetics and Genomic Medicine
The goal of this senior elective is to facilitate the acquisition of clinical skills and knowledge in genetics and genomic medicine. The student will actively participate in the diagnosis and management of pediatric and adult patients with genetic disease in both the ambulatory and inpatient settings. Emphasis will be placed on application of the science of genetics to the bedside and will include a broad exposure to patients with biochemical, metabolic, structural and complex genetic diseases. Students will have an opportunity to visit clinical laboratories involved with diagnosis of genetic disorders, including the cytogenetics, molecular genetics and biochemical genetics laboratories. Students will be expected to participate in the weekly clinical case conference.

M65 Peds 827 Pediatric Hematology/Oncology Sub-Internship
Students will assume the responsibilities of a pediatric resident on the inpatient Hematology/Oncology service at St. Louis Children's Hospital. Serving in a classic “sub-intern” role, the student will perform evaluations and manage, under the supervision of a senior resident, patients who span the scope of diseases in our discipline. Additional educational activities include: regularly held didactic lectures, participation in our weekly “tumor board” conference, reviewing peripheral smears and bone marrow aspirate specimens obtained from our patients.

M65 Peds 836 Pediatric Rheumatology
Opportunities are available to care for children with a variety of immunologic and rheumatologic disorders. Students will see patients in outpatient clinics and inpatient consultations. An in-depth approach to evaluating disorders of the immunologic system will be provided. Students will participate in evaluation of new patients with a variety of rheumatologic diseases including JRA, SLE, and scleroderma at both SLCH and Shriners Hospital clinics. Students may elect to participate in conferences and seminars.

M65 Peds 838 Pediatric Gastroenterology, Hepatology, and Nutrition
The rotation in Pediatric Gastroenterology, Hepatology, and Nutrition provides broad exposure to specialized and common pediatric gastrointestinal and hepatobiliary problems. Division patients are seen in the outpatient suites and in the hospital. Students evaluate outpatients with common pediatric complaints like abdominal pain, constipation, and poor growth. Additionally, students experience the ongoing outpatient care of patients with liver disease, inflammatory bowel disease, short-gut syndrome, celiac disease, and other rare disorders. The inpatient service provides experience in caring for patients with acute illnesses such as gastrointestinal bleeding, malnutrition, liver failure, complications of inflammatory bowel disease, and pancreatitis as well as seeing patients on the pediatric gastrointestinal consultation service. Students participate in diagnostic and therapeutic endoscopic procedures. At weekly divisional conferences, faculty, fellows, and students review pathology slides from current cases and discuss difficult patient problems and topics of interest.

M65 Peds 839 Antimicrobial Use, Resistance, and Stewardship
In 2013 the CDC estimated that 23,000 Americans die annually from antibiotic-resistant infections, and an additional two million are infected with one of these difficult-to-treat pathogens. The primary driver of this resistance is the use — and, more importantly, the misuse — of antibiotics. In 2015, the White House published the National Action Plan for Combating Antibiotic Resistance Bacteria. This plan calls for improvement in antimicrobial use in human and agriculture medicine, better diagnostics, increased collaboration domestically and internationally, and accelerated development of new antibiotic agents. This fourth-year elective rotation will be focused on educating the student on the current state of domestic and global antibiotic resistance and the mechanisms by which health care systems are addressing this problem. The student will participate in the daily antimicrobial stewardship activities conducted at St. Louis Children's Hospital, attend weekly stewardship and clinical infectious diseases meetings both at the hospital and BJC system level, review antimicrobial use data, and participate in hands-on activities in the microbiology laboratory. At the end of this rotation, the student will be able to: 1. List the antimicrobials and the pathogens they effectively treat, 2. Analyze bacteria for genotypic and phenotypic resistance through standard and rapid microbiologic techniques, 3. Describe the antimicrobial stewardship interventions that can be implemented in the different health care settings, 4. List the social determinants that impact antimicrobial stewardship programs, 5. Explain how the microbiome and resistome are important in our efforts to improve antimicrobial use.

M65 Peds 840 Pediatric Infectious Diseases
This elective is designed to introduce students to the clinical aspects of routine and complex infectious diseases in children ages birth to 18 years. Students will perform ID specialty consultations on both inpatients and outpatients. Regular daily activities will include evaluation of new patients, work rounds on inpatient consults, and teaching rounds with the ID fellow and attending. Students will attend the general pediatric ID clinic and the pediatric HIV clinic, one half-day each per week. Formal teaching includes HIV and ID Core Curriculum sessions, a weekly pediatric ID case conference, a weekly joint clinical conference with the adult ID group, a weekly pediatric ID research conference, and weekly clinical microbiology teaching rounds in the bacteriology and molecular diagnostics labs.

M65 Peds 845 Pediatric Emergency Medicine
The goal of this elective is to provide the senior medical student with a broad introductory clinical experience in pediatric emergency medicine. Functioning as a sub-intern on the Emergency Unit of St. Louis Children's Hospital, the student will have the opportunity to evaluate and manage patients with a wide variety of emergent and urgent medical and surgical problems. Examples include: respiratory distress, abdominal
pain, lacerations, bone injuries, rashes, fever, etc. Students will work either a day shift (7:30 a.m.-3:00 p.m.) or an evening shift (3:00 p.m.-11:00 p.m.) in rotation. Daily teaching conferences are provided by the attending staff. Weekly round will occur to review interesting cases. Also, attending staff and senior pediatric residents provide 24-hour on-site supervision. Each medical student will be asked to prepare a 20-minute presentation on a topic of their choosing.

M65 Peds 846 Child Abuse Pediatrics
The medical student will work with the Child Protection (CPP) team at St. Louis Children's Hospital, which consists of two Child Abuse Pediatrics attending physicians, one Child Abuse Pediatrics fellow, a Pediatric nurse practitioner, a clinic nurse, and three social workers. Pediatric residents also may be rotating with the team at the same time. The student will observe inpatient consults for physical and sexual abuse and outpatient clinic patients for physical and sexual abuse. The student may attend court cases and watch expert witness testimony by the CPP physicians/nurse practitioner. The student may see acute sexual assault cases conducted by the Sexual Assault nurse practitioners. The student will be asked to complete a short project on a topic related to child maltreatment and will present it to the team at the end of the rotation. The student will be given a list of readings/didactic activities to do during the rotation. The student will have daily (45 minute) lectures with one of the child abuse attending physicians on a variety of topics related to child maltreatment and will attend the Child Protection team meeting (one hour) every day. The student can also attend Pediatric Residency noon conference during this rotation.

M65 Peds 849 Pediatric Endocrinology and Diabetes
This elective is designed to include broad clinical experience in pediatric endocrinology and diabetes. The student will have an opportunity to evaluate both patients admitted to St. Louis Children's Hospital and patients referred for consultation in our three outpatient clinics each week. In addition to a divisional conference to review referred patients, several joint conferences with the adult Endocrinology and Diabetes Division (clinical rounds, journal club/research seminar, case conference) are held weekly.

M65 Peds 852 Clinical Pediatric Pulmonary Medicine
This elective provides an excellent opportunity for students to be exposed to the full scope of respiratory diseases and sleep disorders in infants and children. Pediatric referrals will be seen in both an inpatient and outpatient setting. Rotation goals for students include: 1. gain greater insights into the genetics, epidemiology, pathophysiology, and clinical presentations of lung diseases in children, 2. learn the importance of the physical examination using inspection, percussion, and auscultation, 3. understand indications and interpretation of diagnostic tests, such as chest imaging, blood gas measurements, polysomnography, pulmonary function testing, and bronchoscopy with biopsy and lavage, and 4. learn to apply therapeutic interventions to common lung diseases. Unique aspects of this rotation include, a broad exposure to children with asthma, cystic fibrosis, ciliopathies, interstitial lung diseases, chronic lung disease of infancy, congenital lung malformations, and end-stage cardiopulmonary diseases referred for lung transplantation. Weekly didactic sessions, as well as divisional clinical conferences, provide opportunities for the trainee to develop his or her presentation skills.

M65 Peds 861 Newborn Medicine
The goal of this course is to provide students with responsibility for caring for newborn infants, who range from normal to acutely ill to chronically ill, and for their families. The physiology of the transition from fetal to extra-uterine existence, the pathophysiology of specific diseases, and primary accountability of the student for patient management decisions and procedures will be emphasized. In addition, collaboration with nursing staff and other health care providers in decision-making (especially concerning the viability of individual infants), and family management will be regularly required. Students during each rotation will have the option to rotate through the Neonatal Intensive Care Unit at St. Louis Children's Hospital and/or the Neonatal Assessment Center/Labor and Delivery services at Parkview Tower, Barnes-Jewish Hospital. Students assigned to the Labor and Delivery Service will routinely be involved in normal newborn care and delivery room management. The student will be expected to rotate patient responsibilities every fourth night. Expectations during the rotation in the NICU (please check with your attending; schedules will vary): Arrive at 7 a.m. daily. On the first day of your rotation, arrive at the main desk and ask for your fellow to be paged. Examine assigned patients and write daily progress notes, discuss the plan with the supervising resident or fellow on the team. 8:00-8:30 a.m.: Attend NICU teaching rounds, Monday to Thursday. Location: West Conference Room. 8:30 to 8:45 a.m.: Radiology rounds, weekdays. Weekend schedules will vary. 8:45 to 10 a.m.: Patient care rounds, daily (please check expectations for presentations with your attending; duration and expectations will vary). 10:00-10:30 a.m.: Complete Total Parenteral Nutrition prescriptions (with help from fellow or pharmacist). 12 noon: All resident conference in SLCH auditorium. 1:00 -2:00 p.m.: Division conferences (Case Conferences, M and M and core lectures), Wednesdays only. Location: SS28. 4:00 p.m.: Daily sign out rounds. 5:00 p.m.: On-call person stays and shadows the PL1 or PL2 on call. Post-call: Leave at noon, next day. Fridays: No teaching. Patient Care Rounds begin at 7:30 a.m. Grand Rounds at 9:15 a.m. Patient care will take precedence over attendance at conferences. A talk at the 7:45 a.m. conference is expected from students at least once during the rotation.

M65 Peds 875 Pediatric Renal Disease
This course is designed to provide the student with a wide exposure to all aspects of pediatric renal disease and an opportunity to explore a desired aspect of the field in-depth. The student will be an integral part of the Renal Team and as such will see both inpatients and outpatients. Students will have an opportunity to follow the courses of patients with acute renal disease as well as those with more chronic problems and will help to plan the evaluation and therapeutic management of these patients. Discussions and rounds with the attending staff and fellows emphasize the relationship between clinical problems and the pathophysiology of the underlying disease. These informal teaching sessions are supplemented by more formal sessions. These include renal attending rounds, renal research rounds and grand rounds, which are conducted weekly in conjunction with the Renal Division of Barnes-Jewish Hospital. Renal biopsy material is reviewed with the renal pathologists. Attendance at the weekly pediatric grand rounds and pediatric case conferences is encouraged. Opportunities in clinical and translational research projects will be discussed with interested students.
M65 Peds 876 Pediatric Lung Transplantation
St. Louis Children's Hospital has the largest pediatric lung transplantation experience in North America. This unique clinical rotation will enable students to be exposed to the process of transplantation from referral and listing to the actual surgery and post-operative care. Both inpatient and twice weekly outpatient clinics will be available for participation and learning. The use of diagnostic tests, including flexible fiberoptic bronchoscopy with biopsies and bronchoalveolar lavage, histopathology of infection and graft rejection, and the complexities of immunosuppression will all be explored. Weekly multidisciplinary meetings with our team, as well as didactic, psychosocial, and ethical meetings will be available. Our patient referral base is worldwide, and includes infants and children with cystic fibrosis, pulmonary hypertension, complex congenital heart defects, surfactant protein defects and alveolar proteinosis.

M65 Peds 878 Clerkship In Rural Primary Care Pediatrics
The clerkship in rural primary care pediatrics is designed to provide the student with first-hand experience in general pediatric practice in a rural community setting. Students will have the opportunity to see patients in a private office, participate in delivery room resuscitation, evaluate patients in the emergency department, and provide pediatric consultation to family practitioners, obstetricians, and surgeons. The objective of this elective is to provide the student with the experience of serving as a general pediatrician providing comprehensive health services in a rural community. Students assume responsibility for ongoing care of patients and have opportunities to perform procedures. Credit 154 units.

M65 Peds 900 Research Elective-Pediatrics
Research opportunities may be available. If interested, please contact the Department of Pediatrics.

Department of Psychiatry
Instruction in psychiatry is given during the second, third and fourth years of the medical curriculum. Emphasis is on the teaching of psychiatry as a medical discipline, including the biological, social and psychological mechanisms and manifestations of psychiatric illness, as well as psychological reactions to other illnesses. Psychiatric disorders are common and disabling illnesses. An explosion of knowledge resulting from research in neuroscience, genetics and epidemiology is leading to exciting advances in understanding and treating these disorders. Our department is heavily involved in this research, and our didactic curriculum integrates current clinical information with research advances to help students develop the knowledge, skills and attitudes to recognize these illnesses and understand the basic principles of treatment.

William Greenleaf Eliot Division of Child & Adolescent Psychiatry
The Division of Child & Adolescent Psychiatry (http://wuchild.wustl.edu) offers a varied teaching program for medical students, residents in psychiatry, and fellows at St. Louis Children's Hospital and the Child Psychiatry Center. The center provides outpatient services to children with an array of mental disorders. Trainees are assigned to these various services, where they participate in diagnostic evaluations and see patients in treatment, under supervision of a fellow and attending physician.

Website: http://www.psychiatry.wustl.edu

Degrees & Requirements
While the Department of Psychiatry does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research
Note to Students: There are always a number of research projects in the Department of Psychiatry. For additional information contact Dr. Rubin, 314-362-2462.

Andrey Anokhin, PhD
Genetics of the Brain, Behavior and Psychopathology
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This research elective is intended for students interested in cognitive neuroscience, biological psychology, psychophysiology and behavior genetics. Dr. Anokhin's laboratory is investigating relationships between genes, brain and behavior in order to better understand the complex etiology of mental disorders. Our main focus is on "externalizing" the spectrum of psychopathology characterized by deficits in inhibitory self-regulation including ADHD, conduct disorder, and addictive behaviors. We are particularly interested in the intermediate phenotypes, or endophenotypes, mediating genetic risk for addiction such as impulsivity, risk taking, and abnormal affective processing of social-emotional information. In our laboratory-based studies with human volunteers, including twins, we investigate individual differences in brain activity using the recording of brain oscillations (event-related brain potentials, or ERPs) and functional magnetic resonance imaging (fMRI). For example, an ongoing longitudinal study of adolescent twins explores developmental and genetic determinants of brain activity related to reward and punishment processing, inhibitory control of behavior, and risk-taking to identify prospective predictors of substance abuse and associated behavioral problems. Another fMRI study using repeated assessments of the same individuals over time is focused on the identification of stable individual differences in brain activation related to inhibitory control, error monitoring, and reward processing that can be used as reliable phenotypes in genetic analyses. We are now starting a study that will examine twins who are discordant for adolescent marijuana use in order to identify the consequences of drug
abuse for the brain, cognition and emotion, and distinguish them from pre-existing risk factors. Interested students will be able to learn a variety of methods used in these studies, such as the recording and analysis of brain oscillations, event-related neural dynamics, startle response, and autonomic measures, administration of neuropsychological and behavioral tests, and statistical analysis of data. Format of this research elective may include: (1) directed reading; (2) participation in laboratory experiments involving human subjects; (3) analysis of existing data from various research projects; (4) designing and piloting new behavioral experiments. Qualifications: Reliability and responsibility, ability to commit specified amount of time per week and work on schedule which can be negotiated on an individual basis, and good computer skills.

Deanna M. Barch, PhD
Cognitive and Affective Neuroscience of Schizophrenia and Depression
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Phone: 314-747-2160

Students may participate in the conduct of clinical studies of schizophrenia and depression. Involvement in clinical studies can include training and experience in interviewing psychiatric patients, or gaining experience in the techniques of assessing cognitive and emotional function using behavioral and brain imaging methods.

Laura Jean Bierut, MD
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This research elective will focus on analyzing data from high-risk studies of smoking and other addictions. Students will have the opportunity to examine genetic and environmental factors that place some at risk for developing nicotine, alcohol and other substance dependence and protect others from the development of these disorders.

Kevin J. Black, MD
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Email (kevin@wustl.edu)

Students will participate in ongoing studies of brain imaging, movement disorders or neuropsychiatric illnesses. Degree of participation will relate to the student's available research time, skills and interest. Visit our webpage (http://www.nil.wustl.edu/labs/kevin) for examples of past research.

Ginger E. Nicol, MD
Taylor Avenue Building, Suite 121
Phone: 314-362-5154

Clinical research concerning metabolism and the regulations of weight and body composition in persons with mental illness, particularly during exposure to psychotropic medications. Additional projects include 1) participation in the interpretation of results from clinical trials testing the effectiveness of behavioral weight loss in mentally ill individuals; 2) participation in clinical studies testing the effectiveness of psychotropic medications in mentally ill youth and adults; 3) use of administrative data to characterize and examine provider behaviors, including prescribing practices and adherence to standard of care monitoring practices in mentally ill youth and adults; 4) participation in the development and use of mobile health interventions to collect data and to promote health behavior change in mentally ill individuals; and 5) participation in the development, implementation and effectiveness testing of patient safety and quality intervention (PSQI) interventions in mentally ill obese patients in Washington University outpatient psychiatry clinic settings. This elective offers the student a broad exposure to clinical research protocols, including protocols in adults and children. Students will have an opportunity to focus on a particular project of interest.

Rumi Kato Price, PhD, MPE
Central Institute for the Deaf (CID) Building
4560 Clayton Rd.
Phone: 314-286-2283

Medical and graduate students, postdoctoral and clinical fellows will work closely with Dr. Price and her collaborators on ongoing research projects in substance abuse, psychiatric epidemiology, and prevention in the community research context. The current projects include: implementation of a sensor-and smartphone-based technology to monitor and manage post-traumatic stress disorder (PTSD) and anxiety disorder symptoms; and epidemiology and clinical studies of human trafficking in the St. Louis region. We work closely with the Institute for Public Health and collaborate with multidisciplinary researchers as well as community leaders.

Psychiatric and Behavioral Health Sciences Concentration

Rumi Kato Price, PhD, MPE (concentration program director); Arpna Agrawal, PhD; Kathleen B. Bucholz, PhD, MPE; Li-Shiun Chen, MD; Anne Glowinski, MD, MPE; Rick Grucza, PhD, MPE
Taylor Avenue Building (TAB)
660 S. Taylor Ave.
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Courses are held at the Institute for Public Health TAB building. The Psychiatric and Behavioral Sciences Concentration is an integral component of the Master of Population Health Sciences (MPHS). It is accredited in WUSM and taught by psychiatry faculty members. The Concentration provides clinician-researchers, postdoctoral fellows, and advanced medical and other graduate students with strong conceptual and methodological skills required for the design, advanced analysis and interpretation of epidemiological and treatment-effectiveness studies. With an emphasis on a clinical approach to psychiatric and addiction health research, didactic training focuses on
in-depth understanding of disease phenotypes, pathobiology and developmental trajectories; understanding the underlying biological and environmental factors and their interactions; understanding the role of psychiatric epidemiology in disease prevention and intervention; and evaluating psychiatric clinical treatment and management programs of psychopathology. A fellow/student has an option of applying for an MPHS degree program or taking appropriate courses as part of their training or academic program.

Current available courses include:

1. M19 PHS 561 Epidemiology of Psychiatric Disorders across the Lifespan (Course director: A. Glowinski, MD; 3 credits): This course takes an integrated developmental approach to the epidemiology, etiology and evolving nosology of psychiatric disorders.
2. M19 PHS 562 Addictions and Addictive Behaviors (Course director: R. Grucza, PhD; 3 credits): This course provides an overview of the principles of substance-related addictions and the processes and mechanisms that underlie addiction.
3. M19 PHS 5656 Global Burden of Diseases: Methods and Applications (S55 MPH 4003) (Course director: R.K. Price, PhD; 3 credits): This course provides an overview of the current methods for studying the global burden of medical and psychiatric diseases from a multidisciplinary perspective.

Faculty

Department Chair

Charles F. Zorumski, MD

Visit our website for more information about our faculty (http://www.psychiatry.wustl.edu/Faculty) and their appointments.

A

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MD University of Iowa 1991  
BS Oregon St University 1981

**David M Montani, MD**  
Instructor in Clinical Psychiatry (primary appointment)  
BA Harvard University 1991  
MD Washington Univ in St. Louis 1996

**Mary Ann Montgomery, MBA, MD**  
Associate Professor of Clinical Psychiatry (primary appointment)  
BA Vassar College 1967  
MD Northwestern University Med 1973

**Grant William Montgomery**  
Adjunct Instructor in Psychiatry (primary appointment)

**Randi H Mozenter, PHD, MA**  
Instructor in Clinical Medical Psychology in Psychiatry (primary appointment)  
BA Washington Univ in St. Louis 1980  
PHD Washington Univ in St. Louis 1989  
MA Washington Univ in St. Louis 1982

**Emily Hazel Mukherji, MD**  
Instructor in Psychiatry (primary appointment)  
BS Mass Inst of Technology (MIT) 2006  
MD Tufts University 2010

**Rashmi R Nakra, UNKNOWN**  
Associate Professor of Clinical Psychiatry (primary appointment)  
UNKNOWN Lady Hardings 1970

**Elliot C Nelson, MD**  
Professor of Psychiatry (primary appointment)  
BA Johns Hopkins University 1982  
MD University of Illinois 1986

**Ginger E. Nicol, MD**  
Associate Professor of Psychiatry (Child Psychiatry) (primary appointment)  
BA University of Iowa 1998  
MD University of Iowa 2002

**Bruce L Nock, MS, PHD**  
Associate Professor of Neurobiology in Psychiatry (primary appointment)  
Associate Professor of Neuroscience  
MS Bucknell University 1975  
BA Elizabethtown College 1969  
PHD Rutgers University 1981

**Kevin K. Noguchi, MA, PHD**  
Assistant Professor of Psychiatry (primary appointment)  
MA University of CA Los Angeles 1998  
PHD University of CA Los Angeles 2003  
BS University of CA Santa Barbara 1996

**Thomas John Nowotny, MD**  
Assistant Professor of Clinical Psychiatry (primary appointment)  
BS Washington Univ in St. Louis 1980  
MD Washington Univ in St. Louis 1985

**Brendan Joseph O' Connor, MD**  
Assistant Professor of Psychiatry (primary appointment)  
BS Creighton University 2006  
MD Creighton University 2010

**Kalu Onuma**  
Instructor in Clinical Psychiatry (primary appointment)

**Akinkunle Owoso, BS1, MD**  
Assistant Professor of Psychiatry (primary appointment)  
BS1 University of Oklahoma 2003  
MD University of Oklahoma 2007  
BA University of Oklahoma 2003

**Vasileios Panagopoulos**  
Instructor in Clinical Psychiatry (primary appointment)

**Pablo Pastor, PHD, MD**  
Visiting Instructor in Psychiatry (primary appointment)  
PHD University of Barcelona 1992  
MD University of Barcelona 2001
Steven Marc Paul, MS, MD  
Professor of Psychiatry (primary appointment)  
Professor of Neurology  
BS Tulane University 1972  
MS Tulane University 1975  
MD Tulane University 1975  

Michele L. Pergadia, MS, PHD  
Associate Professor of Psychiatry (primary appointment)  
MS Finch Univ of Health Sciences 1997  
BA Washington Univ in St. Louis 1991  
PHD Finch Univ of Health Sciences 2001  

Stephen E Peterson  
Instructor in Clinical Psychiatry (Child) (primary appointment)  

Elizabeth F Pribor, MD  
Associate Professor of Clinical Psychiatry (primary appointment)  
MD Saint Louis University 1985  
BA Emory University 1981  

Rumi Kato Price, MA, PHD, MPE  
Professor of Psychiatry (primary appointment)  
MA University of California 1982  
BA Ochanomizu Univ 1976  
PHD University of California 1988  
MPE Washington Univ in St. Louis 1990  

John R. Pruett Jr, MD, PHD  
Associate Professor of Psychiatry (Child Psychiatry) (primary appointment)  
Associate Professor of Psychological & Brain Sciences  
(Courtesy)  
Associate Professor of Radiology  
BA Princeton University 1990  
MD Washington Univ in St. Louis 2000  
PHD Washington Univ in St. Louis 2000  

R  

John S Rabun, MD  
Instructor in Clinical Psychiatry (primary appointment)  

Tahir Rahman, MD  
Associate Professor of Psychiatry (primary appointment)  
MD University of Kansas Medical 1995  

Alex Taylor Ramsey, PhD, MA  
Assistant Professor of Psychiatry (primary appointment)  
PHD Southern Illinois U Carbondale 2012  
BS University of Evansville 2008  
MA Southern Illinois U Carbondale 2010  

Diane Rankin, MD  
Assistant Professor of Clinical Psychiatry (primary appointment)  
BA University of Colorado Boulder 1962  
MD University of Colorado Boulder 1968  

Radhika Rao, MD  
Instructor in Clinical Psychiatry (primary appointment)  

MD University of South Dakota 2001  

Syed A Raza, MD  
Assistant Professor of Clinical Psychiatry (Child Psychiatry) (primary appointment)  
BS Osmania Medical College 1953  
MD School Not Listed 1959  

Chandrashekar Reddy  
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Angela M. Reiersen, MD, MS PSYC  
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MD University of Southern Calif 1999  
BS University of CA Davis 1994  
MS PSYC Washington Univ in St. Louis 2006  

Daniel B. Reising  
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John P Rice, MA, PHD  
Professor of Mathematics in Psychiatry (primary appointment)  
Professor of Biostatistics  
Professor of Genetics  
MA Washington Univ in St. Louis 1972  
PHD Washington Univ in St. Louis 1975  
BA Cornell University 1969  

Cheryl Richards, PhD, MA  
Associate Professor of Psychiatry (primary appointment)  
Associate Professor of Medicine  
BS Ohio University 1977  
PHD University of Illinois 1987  
MA University of Illinois 1981  

Thomas F Richardson, MD  
Professor of Psychiatry (primary appointment)  
BA Millikin University 1960  
MD Washington Univ in St. Louis 1963  

William M Riedesel II, MD  
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BA University of Rochester 1968  
MD Cornell University 1973  

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MD Washington Univ in St. Louis 1995  
BS University of Dayton 1990  

Cynthia E Rogers, MD  
Assistant Professor of Psychiatry (primary appointment)  
BA Harvard University 1998
MD Washington Univ in St. Louis 2005

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Professor of Psychological & Brain Sciences (courtesy)
Vice Chairman for Education, Department of Psychiatry
MD Washington Univ in St. Louis 1977
MD Washington Univ in St. Louis 1978
BA University of Rochester 1971

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MD University of Iowa 1980
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BA Rutgers University 1971
MD Washington Univ in St. Louis 1975

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BA Rensselaer Polytechnic Instit 1990
PHD Brown University 1995

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MD University of New Mexico 1982
BA Middlebury College 1973

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BS Oberlin College 1994
MS Catholic University America 1999
PHD Palo Alto College 2005

**Norman Sartorius**
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**Jeffrey Frank Scherrer, PHD**
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BA Yale University 1970
MD University of Kentucky 1974
MBA Washington Univ in St. Louis 1988

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**Bryan Norbert Sewing, DOST**
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DOST Kirksville College of Osteopat 1998
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**Paul W Sheffner, MD**
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MD Washington Univ in St. Louis 1974

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PHD Saint Louis University 1992
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MSW Washington Univ in St. Louis 1981

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BS Yale University 1949
MS Yale University 1950

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BA Wabash College 1972
MD Washington Univ in St. Louis 1976

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PHD Washington Univ in St. Louis 2001
RN 1981
BS Washington Univ in St. Louis 1989
RN St Louis Community College 1981
MA Washington Univ in St. Louis 1992

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BA Northwestern University 1986
MD Northwestern University 1991

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BS Saint Louis University 2006
MD University of Utah 2011

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BS School Not Listed 1954
MD School Not Listed 1964
UNKNOWN School Not Listed 1959
Vinod Suri, UNKNOWN
Instructor in Clinical Psychiatry (Child Psychiatry) (Full-Time at Hawthorn Children’s Psychiatric Hospital) (primary appointment)
UNKNOWN Punjab University 1962

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Professor of Psychiatry (primary appointment)
MD University of Belgrade 1978
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BS University of Notre Dame 2001
MD Washington Univ in St. Louis 2009
PHD Washington Univ in St. Louis 2009

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BS Truman State University 1997
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BS Vanderbilt University 1985
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M ED Vanderbilt University 1988

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MD Universidad de San Agustin 2005

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MD School Not Listed 1970

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BA University of Michigan 2004
MA Alliant University 2013
PHD Alliant University 2015

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Instructor in Clinical Psychiatry (primary appointment)

Mary C. Waldron, PHD
Adjunct Assistant Professor of Psychiatry (primary appointment)
PHD University of Virginia 2004

Marysia Weber
Instructor in Clinical Psychiatry (primary appointment)

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Associate Professor of Psychiatry (primary appointment)
BA Point Loma Nazrene College 1980
M ED University of Missouri 1982
PHD University of Missouri 1988

Zila Welner, MD
Associate Professor of Clinical Psychiatry (Child Psychiatry) (primary appointment)
MD School Not Listed 1961

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Adjunct Instructor in Psychiatry (primary appointment)

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Professor of Medicine
Professor of Pediatrics
Professor of Psychological & Brain Sciences
Scott Rudolph University Professor
PHD University of Missouri Columbi 1989

Matthew Stewart Wilson
Instructor in Clinical Psychiatry (primary appointment)

Eric Nicholas Wittrock, DOST
Instructor in Psychiatry (Child) (primary appointment)
DOST Kansas State University 2011

Edwin D Wolfgram, MD
Assistant Professor of Clinical Psychiatry (primary appointment)
MD University of Iowa 1959
BS Iowa State University 1954

Fay Yeh Womer, MD
Associate Professor of Psychiatry (primary appointment)
BS Washington Univ in St. Louis 1999
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David F Wozniak, PHD, MA
Professor of Psychiatry (primary appointment)
Adjunct Associate Professor of Psychological & Brain Sciences
PHD Washington Univ in St. Louis 1984
BA Hobart College 1973
MA Connecticut College 1977

Christopher Wuertz, MD
Assistant Professor of Clinical Psychiatry (primary appointment)
MD University of Illinois 1984

Sean H Yutzy
Adjunct Professor of Psychiatry (primary appointment)
M85 Psych 676A Diseases of the Nervous System: Psychiatry
This course will emphasize the diagnosis of major psychiatric illnesses in adults and children. Psychiatric diseases will be described in terms of epidemiology, clinical presentations, natural history, genetics, differential diagnosis and clinical management. Biological and psychological influences on these diseases will be presented. Interviewing techniques and performance of the mental status exam will be demonstrated by patient interviews. Credit 44 units.

M85 Psych 770 Psychiatry Clerkship
Students spend four weeks on the inpatient psychiatry service of Barnes-Jewish Hospital at either the main campus unit or at the St. Louis Psychiatric Stabilization Center (PSC). Students evaluate and treat patients under the supervision of house staff and an attending physician, attend teaching conferences including small group sessions with WUSM clinical faculty and upper-level psychiatry residents. Exposure to ambulatory treatment settings is also designed into each student’s educational experience. Students are responsible for completing learning exercises and other assignments. Credit 154 units.

M85 Psych 771 Ambulatory Clerkship: Psychiatry for Generalists
Up to two students may elect to pursue their ambulatory medicine selective through the psychiatry department. Students participate in clinical duties depending on assigned locations, which can include the BJH adult psychiatry clinic, a community mental health center, the Washington University child and adolescent psychiatry clinic, and both the adult and child psychiatry consultation services. Students will also submit a written review of a relevant clinical topic of their choice. There are no call obligations at any clinical site. Credit 154 units.

M85 Psych 805 Psychiatry Consult Service
Students spend four weeks on the psychiatry consult service at Barnes-Jewish Hospital. Under the supervision of house staff and attending physicians, students participate in the evaluation and collaborative management of inpatients on medical and surgical units for a broad range of psychiatric and behavioral concerns. They learn about the intersection between psychiatry and other medical specialties and important skills for collaborative patient care. Students attend departmental conferences and other educational sessions, and they also prepare and present a clinical topical review of their choice.

M85 Psych 810 Outpatient Community Psychiatry
This elective will provide the student with a significant outpatient experience in Psychiatry. Students will be paired with a Resident physician and have exposure to two adult clinics and one child clinic over the course of the rotation. Students will observe and assist in the diagnosis and treatment of patients in the clinic setting. Students will also attend scheduled lectures and conferences over the course of the rotation relevant to outpatient Psychiatry. During the elective, the student will learn about the outpatient presentations of psychiatric disorders, a variety of treatment techniques (psychotherapy and psychopharmacology), and general principles of outpatient clinical management.

M85 Psych 836 Clinical Psychiatry - Inpatient Psychiatric Service
This is a senior rotation that provides the students with an opportunity to expand their knowledge of inpatient clinical psychiatry by functioning as interns. Students attend all staffing and teaching conferences given to first-year psychiatry residents, take patients in rotation, and share night call with first-year residents approximately every fifth night. Immediate supervision is provided by the inpatient attending, and additional supervision can be arranged as desired. Teaching emphasis is directed toward psychiatric diagnosis, appropriate use of psychopharmacologic agents, psychotherapeutic intervention, use of community resources and pursuit of the psychiatric scientific literature. The student will write a self-selected clinical topic relevant to treatment and management of psychiatric inpatients.

M85 Psych 840 Child Psychiatry
This elective in child psychiatry utilizes the Child Psychiatry Outpatient Clinic and the consult-liaison service at St. Louis Children’s Hospital. It provides experience in age-appropriate diagnostic and treatment methods in children and adolescents. A paper on a topic of the student’s choosing is required.

M85 Psych 844 Forensic Psychiatry
The medical student will be actively involved in many aspects of forensic psychiatry including civil litigation, workman’s compensation, malpractice, civil commitment, and guardianship. There may be opportunities to be involved in criminal forensic issues. The student will work with several instructors within the Department of Psychiatry but will primarily meet with the Course Director a minimum of two hours per week. They will also work with The BJH Manager of Case Management and The City of St Louis Probate Court. The student will also be assigned readings of landmark cases, textbooks, psychiatric expert opinions, legal filing with the probate court and attend civil hearings. The student will learn relevant criminal statutes regarding competency and civil commitment, causation in civil litigation, the concept of medical malpractice and risk assessment of violence and suicide. There may be the opportunity to witness sexually violent predator evaluations and/or treatment. The student will be required to research and write an opinion on a specific approved topic in forensic psychiatry. The objectives will be measured.
Department of Radiation Oncology

The Department of Radiation Oncology (http://radonc.wustl.edu) was created on July 1, 2001, having been part of the Mallinckrodt Institute of Radiology for many decades. The department has a broad academic program that focuses on excellence in patient care and the development of new treatment paradigms; innovative research in each of the four divisions of clinical, physics, biology and bioinformatics; and teaching for residents in radiation oncology, medical students and allied health personnel. The department is one of the largest, most academically balanced and best equipped in the country, and is responsible for all radiation therapy procedures at Washington University Medical Center. Our faculty have gained international recognition for innovative technological advances in physics and treatment planning, biological research, computer applications and clinical investigation.

Milestones

- Implementation of novel respiratory gating algorithms
- Development of biomarkers of DNA repair capacity of tumors
- Demonstrated the use of proton therapy
- Implementation of first Mevion S250 single-room proton therapy system
- Implementation of real-time MRI guidance for radiation therapy treatment with the ViewRay system. Real-time MRI guidance provides the ability to see tumors move in real-time during a patient's entire treatment. This helps ensure that tumor targets are hit and health tissue is spared.
- Acquisition of high-intensity focused ultrasound (HIFU) with MRI thermometry mapping

The Department of Radiation Oncology currently occupies a large and convenient clinical facility on the lower level of the Center for Advanced Medicine. The downtown clinical facility includes nine treatment rooms, three simulator rooms, and a brachytherapy center with two high dose-rate treatment units. Furthermore, the facility houses the latest Gamma Knife, the ICON unit. We have advanced treatment planning computer systems for 3D conformal and intensity-modulated radiation therapy. We have six linear accelerators with on-board CT imaging capability. The brachytherapy suite includes capability for high dose-rate remote afterloading and for image-guided permanent prostate seed implants. Interstitial and external hyperthermia treatments are also available. In 2013, we implemented a new type of proton treatment facility, using a superconducting synchrocyclotron mounted on a gantry. In addition, we implemented the world's first MRI-guided radiation therapy treatment program in 2014. The department provides radiation therapy treatment at Siteman Cancer Center-South County, Siteman Cancer Center at Barnes-Jewish West County Hospital, and the Children's Hospital of St. Louis.

M85 Psych 855 Introduction to Eating Disorders

Students will learn the basics of assessment, participate in groups that focus on family education, gain experience in interdisciplinary psychiatric team work, attend case discussions with psychiatrists, and participate in treatment planning. Students will be able to describe core symptoms, recommend treatment options, and discuss the medical, nutritional, and psychiatric components of treatment.

M85 Psych 880 Schizophrenia Precursors & Prodromal States

This is an opportunity for trainees to gain experience in the evaluation of children and adolescents who may be at high risk for schizophrenia. The rotation would center around the "First Contact Assessment Service," which evaluates patients who show characteristics suggestive of prodromal schizophrenia (such as new-onset attenuated psychotic symptoms along with recent deterioration in functioning) and/or early life characteristics that may indicate risk for developing schizophrenia later in life (for example, nonspecific social/emotional/behavioral symptoms in a child/adolescent with a strong family history of schizophrenia). Since the full symptoms of schizophrenia are often preceded by a wide range of childhood behavioral and developmental abnormalities, this rotation would also help trainees integrate information regarding the continuity between childhood development and adult psychopathology. Trainee would observe all aspects of First Contact Evaluations (including semi-structured diagnostic interviews and examination of subtle neurological signs), participate in case discussions, and observe follow-up consultations involving patients with psychotic and/or complex neurodevelopmental disorders. Trainee would also be required to write a literature review on a topic relevant to the rotation.

M85 Psych 889 Interventional Psychiatry

Interventional Psychiatry involves the application of ECT (Electroconvulsive Therapy), rTMS (Repetitive Transcranial Magnetic Stimulation) and VNS (Vagus Nerve Stimulation) in the treatment of medication-resistant psychiatric illness. The student will participate in the evaluations of patients referred to the Treatment Resistant Depression Clinic supervised by Dr. Charles Conway. The student will be involved in the neuropsychiatric assessment of patients referred for ECT. In addition, the student will receive training in the application of ECT and in the clinical management of patients receiving inpatient and outpatient ECT. As cases become available, the student will be involved in rTMS and VNS evaluations and treatment. The student will be encouraged to review appropriate literature and make clinically relevant case-oriented presentations. The student will be expected to write a review of a self-selected clinic topic relevant to interventional psychiatry. As advances in the field occur, the rotation may also involve exposure to individuals receiving other modalities of intervention, including deep brain stimulation (DBS) and magnetic seizure therapy (MST).

M85 Psych 900 Research Elective-Psychiatry

Research opportunities may be available. If interested, please contact the Department of Psychiatry.
Hospital, Siteman Cancer Center at Christian Hospital, Siteman Cancer Center at Barnes-Jewish St. Peters Hospital, and Alton Memorial Hospital.

The Physics faculty have research laboratories and offices on the fourth floor of the Clinical Sciences Research Building plus designated areas adjacent to the clinical facility in the Center for Advanced Medicine (CAM) building. The Radiation Biology laboratory and faculty offices are housed at the 4511 Forest Park Building and Wohl Hospital Building.

Website: http://radonc.wustl.edu

Degrees & Requirements

The Department of Radiation Oncology works closely with the Department of Biomedical Engineering to jointly offer a post-PhD Graduate Certificate in Medical Physics. Further information about this program can be found in the Biomedical Engineering (http://bulletin.wustl.edu/grad/engineering/biomedical/#degreerequirements) section of this Bulletin.

While the Department of Radiation Oncology does not offer its own degree, some of the department’s courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

Please visit the Department of Radiation Oncology website (http://radonc.wustl.edu/research) for more information about current research in the department.

Faculty

Department Head
Dennis Hallahan, MD

Clerkship Director
Maria Thomas, MD

Director of Education in Medical Physics
Rao Khan, PhD

Visit our website for more information about our faculty (https://radonc.wustl.edu/faculty) and their appointments.

A

Christopher Abraham, MD, MS
Assistant Professor of Radiation Oncology (Pending Executive Faculty Approval) (primary appointment)
BS Medical College Georgia 2005
MD Saint Louis University 2006
MS Washington Univ in St. Louis 2011

Michael Bernard Altman, PHD
Assistant Professor of Radiation Oncology (primary appointment)
PHD University of Chicago 2010

Anthony John Apicelli III, MD, PHD
Assistant Professor of Radiation Oncology (primary appointment)
MD Washington Univ in St. Louis 2009
PHD Washington Univ in St. Louis 2009
BS Princeton University 1999

Abdelkareem Azab, PHD
Assistant Professor of Radiation Oncology (primary appointment)
PHD Hebrew University 2007

B

Shahed Nicholas Badiyan, MD
Assistant Professor of Radiation Oncology (Pending Executive Faculty Approval) (primary appointment)
MD University of Texas Austin 2009
BS University of Texas Austin 2005

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Instructor in Clinical Radiation Oncology (primary appointment)

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BA Princeton University 2003
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BE Washington Univ in St. Louis 1980
MS Washington Univ in St. Louis 1983
PHS Washington Univ in St. Louis 1990

Jeffrey D Bradley, MD
S. Lee Kling Professor of Radiation Oncology (primary appointment)
BA Drury College 1989
MD University of Arkansas 1993

C

Bin Cai, PHD
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PHD Ohio University 2011

Jochen Cammin, PHD
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PHD University of Bonn 2004

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Distinguished Professor of Radiation Oncology (primary appointment)
Professor of Medicine
Professor of Obstetrics and Gynecology
PHD University of Groningen 2000
BA West Georgia College 1978
MD Emory University 1982

D

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Assistant Professor of Radiation Oncology (primary appointment)
MD University of MO Kansas City 2005

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MS University of NC Charlotte 2011
MS Shahid Beheshti University 2007
PHD University of Pennsylvania 2015
BS University of Tehran 2004
PHD University of NC Charlotte 2013

Venkata Rao Devineni, MD
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PHD SRC Vector 1994

G

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BS University of Puerto Rico 1995
MS Finch Univ of Health Sciences 1997

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BS University of Puerto Rico 1996
MD University of Puerto Rico 2000

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Professor of Radiation Oncology (primary appointment)
PHD Andhra University 1991

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Assistant Professor of Radiation Oncology (primary appointment)
PHD Washington Univ in St. Louis 2008
MS Washington Univ in St. Louis 2004
BS Washington Univ in St. Louis 2002

Perry W Grigsby, MD, MS, MBA
Professor of Radiation Oncology (primary appointment)
Professor of Obstetrics and Gynecology
Professor of Radiology
MD University of Kentucky 1982
MS University of Kentucky 1978
MBA Washington Univ in St. Louis 1990

BS University of Kentucky 1974

Yuxing Gu, PHD
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PHD University of MO St Louis 2014

H

Lannis Hall, M PH, MD
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M PH Saint Louis University 1995
BA University of Michigan 1988
MD Howard University 1992

Dennis E Hallahan, MD
Professor of Radiation Oncology (primary appointment)
Elizabeth H and James S McDonnell III Distinguished Professor of Medicine
Head of the Department of Radiation Oncology
Professor of Biomedical Engineering
Professor of Cell Biology and Physiology
Professor of Molecular Microbiology
Professor of Pathology and Immunology
MD Rush University 1984
BS University of Illinois 1980

Jiayi Huang, MD
Assistant Professor of Radiation Oncology (primary appointment)
MD University of Massachusetts 2007

Geoffrey Douglas Hugo, PHD
Professor of Radiation Oncology (primary appointment)
PHD University of CA Los Angeles 2003

K

James Alexander Kavanaugh, MS
Instructor in Radiation Oncology (primary appointment)
MS Louisiana St University 2011
BS University of Saint Thomas 2008

Rao Fawwad Khan, MD, PHD
Associate Professor of Radiation Oncology (primary appointment)
Associate Professor of Biomedical Engineering
MD Quaid-Azam University 1997
PHD McMaster University 2003

Hyun Kim, MD
Assistant Professor of Radiation Oncology (primary appointment)
MD University of Pittsburgh 2012
BS University of California 2006

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MS Louisiana St University 2012
PHD Univ of Massachusetts Lowell 2016
BS University of Montana Missoula 2009
L

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Professor of Radiation Oncology (primary appointment)
PHD Friedrich-Alexander Universit 2001
BS Huashong University of Science 1992
MS Chinese Academy of Sciences 1995

Hui Li, PHD
Assistant Professor of Radiation Oncology (primary appointment)
BS Huazhong University of Science 1994
PHD Huazhong University of Science 2001

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Professor Emeritus of Radiation Oncology (primary appointment)
PHD University of Chicago 1968
MD National Taiwan University 1960

M

Stephanie Markovina, MD
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MD University of Wisconsin-Madison 2010

Thomas Rolf Mazur, PHD
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PHD University of Texas Austin 2014
BS Union College New York 2007

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Carlos Perez Distinguished Professor of Radiation Oncology (primary appointment)
Vice Chairman of Radiation Oncology
BS Univ of Wisconsin Madison 1982
MBA Washington Univ in St. Louis 2001
MD Univ of Wisconsin Madison 1986

Timothy John Mitchell, PHD, PHD, MS
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BS John Carroll University 2005
PHD University of MO St Louis 2014
PHD Washington Univ in St. Louis 2011
MS Washington Univ in St. Louis 2007

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BS University of Missouri 1972
DDENT University of Missouri 1977
MS University of Missouri 1984

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Vice Chair Medical Physics and Clinical Strategy in Radiation Oncology
MS University of Colorado Boulder 1996
PHD University of MO Columbia 2011
BS Cameron University 1994

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MD University of Miami 1980
BA Princeton University 1969
PHD University of California 1974

P

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BS Case Western Reserve Univ 1997

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ME The Catholic Univ of Korea 2009
PHD University of CA Berkeley 2013
BE Hanyang University Hospital 2007

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MIR clinical facilities are on the second floor of the Institute (general diagnostic radiology); third floor (neuroradiology); fourth floor (gastrointestinal and genitourinary radiology, and ultrasonography); and the fifth floor (MRI). A comprehensive interventional radiology center occupies the eighth floor. Nuclear medicine is on the ninth floor of the Barnes-Jewish Hospital West Pavilion. Orthopedic imaging and musculoskeletal radiology services are on the sixth floor of the Center for
Advanced Medicine. The Breast Health Center, on the fifth floor of the Center for Advanced Medicine, is a multidisciplinary facility that provides a full range of breast imaging services and interventional procedures. In the north wing of St. Louis Children's Hospital is a complete pediatric radiology facility, offering ultrasound, nuclear medicine, CT and MRI and interventional radiology.

The Institute has 102 examination rooms used for diagnostic radiology. Clinical and research equipment includes two PET/CT scanners, 13 CT scanners, two PET scanners, one PET/MR scanner, 15 MR scanners (including an 11.7-Tesla research scanner), 12 high-end ultrasound machines plus seven portable units, nine interventional radiology systems, five digital chest units, 10 computer radiography units, two neurointerventional radiology systems and six mammography units. In addition, as part of the department's community outreach effort, the Institute co-sponsors with the Alvin J. Siteman Cancer Center a mobile mammography van that provides screening services at corporate and public sites in the St. Louis area.

MIR has approximately 200,000 square feet devoted to research, with facilities in the Clinical Sciences Research Building (radiological sciences), in the East Building (electronic radiology), in the Scott Avenue Imaging Center (neurological PET, molecular pharmacology, biomedical MR imaging, optical imaging and cardiovascular imaging), and in the Center for Clinical Imaging Research (a bioimaging facility for basic and translational inpatient and outpatient clinical research).

Administrative, teaching and support functions occupy the sixth floor and the ninth through the 12th floors of the Institute.

Website: https://www.mir.wustl.edu

Degrees & Requirements

While the Department of Radiology does not offer its own degree, some of the department's courses are open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.

Research

Interested students should contact the appropriate individual in each division regarding the types of research projects available.

Tom Conturo, MD, PhD
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Magnetic resonance (MR) imaging is a noninvasive means of providing images of the human body at high spatial resolution and contrast sensitivity. The contrast can be manipulated to depend on different properties of tissue water, enabling the study of a variety of biological processes. In some cases, endogenous or exogenous paramagnetic MR contrast agents are used to alter the MRI contrast by perturbing the tissue water environment. Recently, new MRI hardware has also enabled techniques having high temporal resolution. Using the unique contrast properties of MRI and the higher spatial/temporal resolution, noninvasive techniques can be devised to study neuronal activity, tissue perfusion, water mobility (diffusion), and neuronal fiber pathways in the human brain. The goals of Dr. Conturo's research lab are to develop and apply MR imaging techniques for quantitative imaging of cerebral perfusion, brain function, water diffusion, and neuronal fiber pathways. These techniques utilize the MR signal effects of exogenous bolus-injected contrast agents, endogenous hemoglobin, and microscopic water diffusion. Long-term goals are to apply these methodologies toward imaging and understanding tissue structure, function, and physiology in the brain and other organs in normal and abnormal conditions. The approaches that are used in this laboratory cover a broad range of areas, including MRI physics, MRI pulse sequence development, theoretical derivations, computer simulations, image-processing, computer graphics, custom contrast agent design and synthesis, phantom studies, animal models, human studies, clinical patient studies, and comparison with other imaging modalities.

Farrokh Dehdashti, MD
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Positron emission tomography (PET) is an imaging technique that produces images reflective of biochemical processes of normal and abnormal tissues. PET is complementary to anatomic imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI). The ability of PET to quantify fundamental processes, such as blood flow, oxygen metabolism, glucose metabolism, and receptor density, makes this technique very desirable to both investigators and clinicians. Dr. Dehdashti's research utilizes the conventional PET radiopharmaceutical, F-18 fluorodeoxyglucose (FDG), as well as a variety of unique PET radiopharmaceuticals such as Cu-64-diacetyl-bis(N4-methylthiosemicarbazone) (Cu-64 ATSM), a hypoxic imaging tracer, and 18F-labeled 3-deoxy-3-fluorothymidine (FLT), a proliferative imaging tracer. Below is a partial list of the research projects relating to PET: (1) PET assessment of progesterone receptors in patients with newly diagnosed breast cancer with a new progesterone-receptor imaging tracer, [18F]Fluoro-16,17-[(R)-1'-furyl[m ethylidene]dioxyl]-19-norpregn-4-ene-3,20 dione (FFNP); (2) assessment of cell proliferation with a new tracer, N-4-(6,7-dimethoxy-3,4-dihydroisoquinolin-2(1H)-yl)butyl)-2-[18F]fluorothoxy)-5-methylbenzamide ([18F]3c), also called [18F]ISO-1 by imaging sigma receptors in patients with various solid cancers; (3) PET assessment of tumor hypoxia using 64Cu-ATSM in patients with cervical cancer (the major goal of this project is to predict prognosis); (4) FDG-PET/CT study in cervical cancer to evaluate the change in tumor FDG heterogeneity and SUVmax during chemoradiation and whether these changes are predictive of response to therapy; (5) PET using [18F]FHBG (9-
[4-fluoro-3-hydroxymethyl-butyl]guanine), analog of Penciclovir, an acycloguanosine derivative and antiviral drug, for possible tracking of GvHD in patients who were prior recipients of unrelated allogeneic bone marrow transplant for any hematologic malignancy; (6), FLT-PET/CT to assess tumor cell proliferation in patient must have histologically or cytologically confirmed ER+ stage IV or metastatic invasive breast cancer.

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Cardiovascular Imaging Research. The research in the Cardiovascular Imaging Laboratory is designed to better understand the relationship between myocardial perfusion, intermediary metabolism and mechanical function in both normal and abnormal cardiac states. The research involves the integration of several imaging techniques with diverse strengths such as PET, MRI, CT and echocardiography. The success of the research requires several paths of investigation to be pursued in parallel. For example, in order to image the biologic processes of interest requires continued technical developments for each of the imaging methods listed above. There are ongoing efforts to permit more accurate PET measurements of myocardial substrate metabolism. They include the development of novel tracers of extracted substrates, the development of acquisition schemes to assess endogenous substrate metabolism, and the validation of mathematical approaches to correlate the tracer kinetics with the underlying metabolic processes. These studies are being pursued in small and large animal models and then in humans. Another example includes the current efforts to develop approaches to image the coronary arteries noninvasively by MRI using novel contrast agents and acquisition schemes. In addition, techniques are being developed to permit MR guided interventions on the coronary arteries. This undertaking includes the development of novel guide-wire tracking and catheter tracking schemes using both passive and active approaches. Finally, to permit assessments of myocardial oxygenation and thus, perfusion, techniques are being developed to permit BOLD imaging the myocardium. Another path of the research is to determine how this perfusional-metabolic-functional relation is altered by normal life changes and then determine how disease states alter the relationship. For example, both PET and echocardiography are being used to characterize the age- and gender-related changes on myocardial perfusion, substrate metabolism and function. To study the relationship in disease states, similar studies are being performed in patients with diabetes and obesity. A third path is to determine the mechanisms responsible for these changes in this metabolic-functional relation and identify potential interventions that may reverse or ameliorate them. In this regard, similar imaging studies are being performed to determine the importance of nitric oxide and the PPARα system in defining this metabolic-functional relation.

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Courses

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Visit online course listings to view offerings for M90 Radiol

M90 Radiol 701 General Radiology Clerkship

This four-week introductory radiology elective allows students
to rotate through four of the following radiology services:
Emergency Radiology, Mammography, Pediatrics, Chest,
Abdominal Imaging, Musculoskeletal, Neuroradiology,
Interventional Radiology and Nuclear Medicine. The primary
course objective is to familiarize students with the scope of
diagnostic and interventional radiology including the consulting
role radiologists provide to primary care and specialty providers, risks/benefits and cost effectiveness of radiologic examinations, and guidelines for ordering common studies as well as specific disease entities and their radiologic appearance and work-up. Students spend the majority of the day in the radiology reading rooms with residents, fellows, and faculty for interactive teaching based on daily clinical cases. Students will attend morning case-based conferences and noon didactic conferences with the residents. The students will have an observational role in conferences and in the clinical setting. In the afternoon, students will convene with a radiology resident for an interactive workshop on a scheduled topic in radiology. The day prior to each workshop, students will receive a template PowerPoint form of the following day’s workshop and are expected to spend the afternoon preparing for the next day’s session. Students will be evaluated on their preparedness and participation in the afternoon workshops. On Friday afternoons, students will present an interesting case from the week in PowerPoint format. Two PowerPoint presentations will be submitted at the end of the rotation for grading. An image-based exam will be given in the final week of the elective covering topics presented in the daily student workshops. Reading lists, references and text books will be provided. The first and final days of the elective are mandatory. Grades will be based on daily attendance, faculty workshop participation, end of the rotation exam, and submitted PowerPoint presentations. More than three days absence will require exceptional work for honors. No honors will be awarded if a student is absent for more than five days of the rotation. Credit 154 units.

M90 Radiol 740 Radiation Oncology Clerkship
The four-week clerkship in Radiation Oncology will provide students with the opportunity to participate in the evaluation and management of a broad range of patients referred for consideration of radiation therapy. Clerkship activities will take place at the Barnes-Jewish Hospital/Siteman Cancer Center complex and at our satellite facilities. Students will conduct patient evaluations under the supervision of radiation oncology department residents and faculty. Students will attend many conferences throughout the weeks, with the work day starting between 7:00 a.m. and 7:30 a.m. Students will also have the opportunity to attend the appropriate multidisciplinary clinics, follow-up clinics and multidisciplinary conferences (such as pediatric neuro-oncology, cardiothoracic oncology, lymphoma, GYN tumor conferences, etc.) pertaining to their rotation schedule. Instructional materials are available for students on the rotation. (Students are not expected to purchase any curricular materials for the clerkship.) Student performance will be evaluated by both resident and faculty members who supervise the student over the course of the four-week clerkship. Design credit 1 unit. Credit 154 units.

M90 Radiol 801 General Radiology
This four-week introductory radiology elective allows students to rotate through four of the following radiology services; Emergency Radiology, Mammography, Pediatrics, Chest, Abdominal Imaging, Musculoskeletal, Neuroradiology, Interventional Radiology and Nuclear Medicine. The primary course objective is to familiarize students with the scope of diagnostic and interventional radiology including the consulting role radiologists provide to primary care and specialty providers, risks/benefits and cost effectiveness of radiologic examinations, and guidelines for ordering common studies as well as specific disease entities and their radiologic appearance and work-up. Students spend the majority of the day in the radiology reading rooms with residents, fellows, and faculty for interactive teaching based on daily clinical cases. Students will attend morning case-based conferences and noon didactic conferences with the residents. The students will have an observational role in conferences and in the clinical setting. In the afternoon, students will convene with a radiology resident for an interactive workshop on a scheduled topic in radiology. The day prior to each workshop, students will receive a template PowerPoint form of the following day's workshop and are expected to spend the afternoon preparing for the next day's session. Students will be evaluated on their preparedness and participation in the afternoon workshops. On Friday afternoons, students will present an interesting case from the week in PowerPoint format. Two PowerPoint presentations will be submitted at the end of the rotation for grading. An image-based exam will be given in the final week of the elective covering topics presented in the daily student workshops. Reading lists, references and text books will be provided. The first and final days of the elective are mandatory. Grades will be based on daily attendance, workshop participation, end of the rotation exam, and submitted PowerPoint presentations. More than three days absence will require exceptional work for honors. No honors will be awarded if a student is absent for more than five days of the rotation.

M90 Radiol 802 Advanced Radiology
This course is available only to students who have completed the General Radiology Clerkship Selective (M90 701) or the General Radiology Elective (M90 801). This four-week sub-internship in radiology is intended for students who are interested in pursuing radiology as their intended career choice. Students may tailor their experience to focus on one or more services if desired. This will be considered on a case-by-case basis by the course directors. This elective allows students to rotate through the following radiology services; Emergency Radiology, Mammography, Pediatrics, Chest, Abdominal Imaging, Musculoskeletal, Neuroradiology, Interventional Radiology and Nuclear Medicine. Students spend the majority of the day in the radiology reading rooms with residents, fellows, and faculty for interactive teaching based on daily clinical cases. Students will attend morning case-based conferences and noon didactic conferences with the residents. The students will have an observational role in conferences and in the clinical setting. These returning students will be exempt from the end of rotation exam and attending the daily afternoon teaching sessions if they have previously completed M90 701 or M90 801; however, returning fourth-year students will be required to present weekly presentations with the students in the introductory course. In addition, students may be asked to pursue an educational project during their rotation. Reading lists, references and text books will be provided. The first and final days of the elective are mandatory. Grades are based on daily attendance, faculty feedback, and PowerPoint presentations. No honors will be awarded if a student is absent for more than five days of the rotation.

M90 Radiol 820 Clinical Nuclear Medicine
This four-week elective will be offered to third- and fourth-year medical students. The clinical service in Nuclear Medicine is divided into five subsections: outpatient general Nuclear Medicine, in-patient general Nuclear Medicine, PET, Pediatric, and Cardiac Nuclear Medicine. The recommended schedule will be to spend week 1 and 3 on the North Campus, where the emphasis will be on outpatient general and Pediatric Nuclear Medicine with some time spent in the PET reading room. Week 2 will be split between the inpatient general Nuclear Medicine and Cardiac services. Week 4 schedule will be
determined after a preferences discussion with the student. The primary objective of this rotation is to provide exposure to the full range of clinical nuclear medicine. Under direct supervision of the clinical staff, the student will be able to participate in the planning and interpreting of imaging studies for patients referred to the Division. Opportunity also exists to explore instrumentation techniques, including dedicated computer applications in Nuclear Medicine. In addition to the clinical experience, the student will attend the daily morning conference, held in the Miller Conference Room in 956 West Pavilion, from 8:30-9:30 a.m. From 12-1:00 p.m., the student will be excused to attend the daily department-wide conference. The student is not expected to do any formal presentations but may participate by preparing a case for the Friday follow-up conference. The student will also be excused to attend any conferences within the Department of Radiology, e.g., the 3:00 p.m. medical student didactic lectures, if desired. Students may keep a log of interesting cases to use as a guide for additional reading, or for discussions with the course director or the other staff attendings. A textbook will be provided. The first and final days of the elective are mandatory. No honors will be awarded if a student is absent for more than five days of the rotation.

M90 Radiol 830 Interventional Radiology
This elective is designed to give students in-depth exposure to and experience in all clinical and procedural aspects of interventional radiology including: patient evaluation and consultation, preparation of patients for procedures, performance of a wide range of vascular and non-vascular procedures, post-procedure patient management, and longitudinal patient follow-up. Students will actively participate in interventional procedures. Students will attend the departmental noon conference (daily) and section conferences including didactic lectures, morbidity and mortality conference, and case conferences (three to four times per week).

M90 Radiol 840 Clinical Radiation Oncology
The clinical division offers an elective with emphasis on the evaluation, planning of and administration of radiation therapy in patients with malignant tumors. The students have the opportunity to enhance their knowledge on the natural history, pathological, and biological features of cancer and to sharpen their clinical skills participating in the management of these patients.

M90 Radiol 842 Thoracic Imaging
A four-week elective emphasizing the interactions between cardiothoracic radiologists and the various clinical services, to include thoracic surgery, thoracic oncology, and pulmonary medicine. Learn to read chest radiographs at the viewing console while providing liaison with the clinical teams. This active elective will include the daily chest teaching conference and participation in weekly pulmonary case conference, thoracic surgery, thoracic oncology conferences, as well as the imaging aspects of the clinico-pathological medicine conference. Learn to identify subtle pneumothorax and pneumonia. Learn the limitations of portable chest radiographs. Rotating on cardiac CT and MR service and in the ED service, if interested. The student will be expected to present a single case from what they have seen during the rotation at a 7 a.m. teaching conference.

M90 Radiol 900 Research Elective-Radiology
Research opportunities may be available. If interested, please contact the departments of Radiology or Radiation Oncology.

Mary Culver Department of Surgery

The formal instruction in surgery begins in the third year with the required, 12-week Integrated Surgical Disciplines Clerkship. During this surgical clerkship, students are assigned to clinical rotations, mostly within the Department of Surgery, with some exposure to other surgical-related disciplines outside the department. The clerkship gives students opportunities to participate in the care of surgical patients, both in- and outpatient; to spend time in the operating rooms; and to attend seminars, teaching conferences and didactic sessions on a regular basis. In the fourth year, students may select sub-internship electives within the Division of General Surgery, which include a variety of general surgical specialties. In addition to the general surgery sub-internships, electives are available in several other surgical subspecialties (e.g., pediatric surgery, transplant surgery, vascular surgery, cardiothoracic surgery, thoracic surgery, urologic surgery, and plastic and reconstructive surgery).

Website: http://www.surgery.wustl.edu

Degrees & Requirements

MPHS Program

Within the Department of Surgery, the Division of Public Health Sciences offers a Master of Population Health Sciences (MPHS) program, which prepares students for clinical research careers by accelerating and deepening their expertise in population health and clinical outcomes research. Students gain a strong foundation and hands-on experience in leading, designing, conducting and moving clinical research findings to applications that will improve patient care and treatment.

In the MD/MPHS program, medical students have an opportunity to add clinical research methods training to their medical school experience. Medical students in the program work on a research project and use that project to complete MPHS course work in 10 months, creating the ideal combination of didactic training and hands-on experience. MPHS program leadership can help students find a research project or lab to work in that would provide a good fit for their goals and interests.

To learn more about the MD/MPHS Program, contact Blanka Hodzic at 314-286-0881 or by email (bhodzic@wustl.edu).

Other Courses

Some of the Department of Surgery’s courses are also open to students in the MD and MSTP (MD/PhD) programs. Further information about the MD and MSTP degrees can be found in the Degrees & Programs Offered (p. 27) section of this Bulletin.
Research Labs
L. Michael Brunt, MD
Barnes-Jewish Hospital, 1160 Northwest Tower
Phone: 314-454-8877
Minimally invasive surgery, including endocrine applications.
Minimum rotation length: four weeks. Under the auspices of the Washington University Institute for Minimally Invasive Surgery (WUIMIS), a number of surgeons are investigating the physiologic consequences of laparoscopic surgery and new applications for procedures and technologies. Dr. Brunt is currently investigating clinical outcomes of various laparoscopic surgical procedures, laparoscopic hiatal hernia surgery and adrenal surgery, and is carrying out education-related research of skills training for senior medical students planning to enter a surgical internship.

Division of Plastic and Reconstructive Surgery
660 S. Euclid, Box 8238
Phone: 314-747-0541
The Division of Plastic Surgery offers many opportunities for research projects on various topics related to plastic surgery. A project will be designed with students prior to their rotation on plastic surgery so that all of the materials and methods will be available at the beginning of the rotation. The basic science laboratories investigate primarily nerve injury and regeneration including nerve transplantation. Students will be encouraged to design and complete their own research study during the elective. Minimum rotation length is six weeks. The research rotation can be conducted in the plastic surgery laboratories under the direction of Drs. Moore, Snyder-Warwick, Wood or Mackinnon.

Ongoing projects include:
1. influence of growth factors and blood flow on nerve regeneration;
2. neural tissue engineering;
3. diagnostic potential of biomarkers to identify nerve injury; and
4. investigation of glial cells at the neuromuscular junction during development, maintenance, aging, and following nerve injury.

Additional clinical and educational research opportunities in various fields of plastic surgery are available with Drs. Fox, Myckatyn, Patel, Tung, and Woo.

These various projects include:
1. in vivo tissue generation and tissue differentiation;
2. the mechanical, structural and biochemical effects of stress on scar tissue maturation;
3. in vivo anatomy of craniofacial deformities;
4. outcome analysis of methods of cleft lip and palate management;
5. breast reconstruction (3D imaging of breasts after cosmetic or reconstructive surgery, interpretation of angiograms of the breast to measure nipple perfusion);
6. use of nerve transfer to improve hand function in patients with cervical spinal cord injury/quadruplegia; and
7. surgical education (specifically web-based multimedia strategies for peripheral nerve surgery education).

The Department of Surgery can utilize Washington University medical students in any of its labs either to receive credit for a class they are currently enrolled in or to add them into the system as a Washington University student employee to be paid for their time worked. Student work may be obtained through the Federal Work-Study program, the Office of Medical Student Research, or through direct communication initiated by the student to faculty they wish to work alongside on specific subjects of interest with the goal of furthering their education. This can be for any year medical student.

Faculty
Clerkship Director
John P. Kirby, MD, MS

Clerkship Associate Director
Eleanor Lynn Powell Drew, MD, AB
Visit our website for more information about our faculty (http://www.surgery.wustl.edu/Faculty) and their appointments.

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BA Princeton University 1984
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MD Saint Louis University 2008
BS Univ of Nebraska at Omaha 2004

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MD Univ of IL -Urbana-Champaign 2004

MS Oregon Health Science Univers 2012
BS Univ of IL -Urbana-Champaign 1996

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MD State Univ of NY Stonybrook 1995
BA New York University 1991

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BA Saint Louis University 1976
MD University of Missouri 1982
MS Saint Louis University 1978

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Professor of Medicine
MD Saint Louis University 1974

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Instructor of Anthropology (Courtesy Affiliation)
PHD Northwestern University 2011
BA Vanderbilt University 1998
M PH Northwestern University 2011

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MD Stanford University 1997
BA Dartmouth College 1992

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MD University of Rome 1999

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MD Aga Khan University 1992

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MD Tohoku University Sendai Miyag 1998
PHD Tohoku University Sendai Miyag 2010

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MA University of Houston 1998
BA Goucher College 1995
PHD University of Houston 1999
M PH University of Texas Houston 2000

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MD University of Michigan 2008
MS Temple University 2012
BS Illinois Institute of Technol 2004

Jeffrey Jim, MS, MD
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MS University of Southern Calif 1999
BS University of Southern Calif 1996
MD University of CA Irvine 2003

Dane P Johnson
Assistant Professor of Surgery (Urologic Surgery) (primary appointment)

K

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MD Ross Univ School of Medicine 2007
MS Columbia University 2003
BS Boston University 2001

Demetrios Katsikas, MD
Instructor in Clinical Surgery (Urological Surgery) (primary appointment)
BS University of Michigan 1985
MD Wayne State University 1989

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Associate Professor of Surgery (Pediatric Surgery) (primary appointment)
Associate Professor of Pediatrics
BS University of Pennsylvania 1985
MD University of Vermont 1990

Adeel Khan, MD
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MD Aga Khan University 2002
BS Bahria University 1997

Andrew M Kim, MS, DDENT
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Instructor in Clinical Otolaryngology
BA California State University 1978
MS Ohio State University 1987

John P. Kirby, MS, MD
Associate Professor of Surgery (General Surgery) (primary appointment)
MS University of Illinois 1999
MD University of Illinois 1993
BS University of Illinois 1988

Saul Klein, MD
Instructor in Clinical Surgery (Urologic Surgery) (primary appointment)
MD Syracuse University 1959

Mary E Klingensmith, MD
Professor of Surgery (General Surgery) (primary appointment)
Mary Culver Distinguished Professor
Vice Chairman for Education, Department of Surgery
MD Duke University 1992
BA Wellesley College 1988

Benjamin D. Kozower, MD
Professor of Surgery (Cardiothoracic Surgery) (primary appointment)
MD University of Rochester 1997
BS University of Rochester 1993

David Paul Krajcovic, MD
Instructor in Clinical Surgery (General Surgery) (primary appointment)
BA Washington Univ in St. Louis 1965
MD Washington Univ in St. Louis 1969

Daniel Kreisel, MD, PHD
Professor of Surgery (Cardiothoracic Surgery) (primary appointment)
Professor of Pathology and Immunology
MD Mount Sinai School of Medicine 1995
PHD University of Pennsylvania 2002

Hing Hung H Lai, MD
Associate Professor of Surgery (Urologic Surgery) (primary appointment)
Associate Professor of Anesthesiology
BS Rice University 1994
MD Cornell University 1999

Constance Wye Leng Lee, MD
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MD University of Virginia 2006
BS University of Virginia 2001

Jerome F Levy
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Ying Lin, MD, PHD
Assistant Professor of Surgery (General Surgery) (primary appointment)
MD Washington Univ in St. Louis 2005
BS Duke University 1997
PHD Washington Univ in St. Louis 2005

Erin Lynn Linnenbringer, BS1, PHD, MS1
Instructor in Surgery (Public Health Sciences) (primary appointment)
BS1 Washington Univ in St. Louis 2000
PHD University of Michigan 2014
MS1 Northwestern University 2003

Ying Liu, PHD, MD
Assistant Professor of Surgery (Public Health Sciences) (primary appointment)
PHD Texas Tech University 2006
MD Southeast U Medical School 1995

Alan M Londe, MD
Instructor in Clinical Surgery (General Surgery) (primary appointment)
MD Washington Univ in St. Louis 1961
BA Washington Univ in St. Louis 1957

Stanley L London, MD
Associate Professor Emeritus of Clinical Surgery (General Surgery) (primary appointment)
MD Washington Univ in St. Louis 1949

Esther Jiaxin Lu, PHD, MS
Assistant Professor of Surgery (Public Health Sciences) (primary appointment)
Assistant Professor of Biostatistics
PHD Medical College of Wisconsin 2007
MS National Univ of Singapore 2002
BS Nankai University 1997

Mark A Ludwig, MD
Instructor in Clinical Surgery (General Surgery) (primary appointment)
BA Emory University 1972
MD University of Chicago 1976

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Associate Professor of Biostatistics
Associate Professor of Medicine
MS1 Duke University 2003
MS Renmin University of China 2001
BS Renmin University of China 1998

PHD Duke University 2006

Susan E Mackinnon, MD
Sydney M., Jr. and Robert H. Shoenberg Professor of Surgery
(Plastic and Reconstructive Surgery) (primary appointment)
Professor of Occupational Therapy
Professor of Otolaryngology
BA Queens College 1971
MD Queen's University 1975

Hersh Maniar, MD
Associate Professor of Surgery (Cardiothoracic Surgery) (primary appointment)
Associate Professor of Medicine
MD University of Illinois 1998
BS University of Michigan 1994

Peter Bruce Manning, MD
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BS Bucknell University 1978
MD University of Michigan 1982

Julie Ann Margenthaler, MD
Professor of Surgery (General Surgery) (primary appointment)
MD Southern Illinois University 1997
BA Boston University 1993

Muhammad Faraz Masood, MD
Assistant Professor of Surgery (Cardiothoracic Surgery) (primary appointment)
MD Dow Medical College Karachi 2001

John E. Mazuski, PHD, MS, MD
Professor of Surgery (General Surgery) (primary appointment)
PHD University of Minnesota 1993
MS Univ of Wisconsin Madison 1975
MD University of CA Los Angeles 1981
BA California State Fresno 1973

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MD University of Missouri 1985

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Spencer J Melby, MD
Associate Professor of Surgery (Cardiothoracic Surgery) (primary appointment)
MD University of Utah 2002
BS Brigham Young University 1997

Bryan F Meyers, MD
Patrick and Joy Williamson Endowed Professor of Surgery
(Cardiothoracic Surgery) (primary appointment)
BA Yale University 1982
MD University of Chicago 1986

Jerry R Meyers, MD
Assistant Professor of Clinical Surgery (General Surgery)
(primary appointment)
MD Washington Univ in St. Louis 1966
BA University of Texas Austin 1962

Kevin Joseph Mitchell, MD
Instructor in Clinical Surgery (General Surgery) (primary appointment)
MD Howard University 1985
BS Howard University 1981

Marc R Moon, MD
John M Shoenberg Professor of Surgery (Cardiothoracic Surgery) (primary appointment)
BS University of Michigan 1983
MD Wayne State University 1988

Amy M. Moore, MD
Associate Professor of Surgery (Plastic and Reconstructive Surgery) (primary appointment)
MD Virginia Comm University 2004

Julian C Mosley, MD
Instructor in Clinical Surgery (General Surgery) (primary appointment)
BS Saint Louis University 2000
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Nabil A Munfakh, MD
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MD University of Michigan 1985
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Gregory P Murphy
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Matthew G Mutch, MD
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MD Washington Univ in St. Louis 1994

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Professor of Surgery (Plastic and Reconstructive Surgery) (primary appointment)
MD Univ of Northern British Colu 1997
BS Univ of Northern British Colu 2003

Neal Neuman, MD
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Thomas E Niesen, MD
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BS Tulane University 1975
MD Tulane University 1979

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DDENT University of Iowa 1983

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Professor of Emergency Medicine in Medicine
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Instructor in Clinical Surgery (General Surgery) (primary appointment)
UNKNOWN University of Pune 1967

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Associate Professor of Surgery (Public Health Sciences) (primary appointment)
PHD Harvard University 2005
MS1 EWHA Womans University 1996
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BS University of South Dakota 1967

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MD University of Missouri 1987
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Professor of Surgery (Cardiothoracic Surgery) (primary appointment)  
Professor of Biomedical Engineering  
Professor of Radiology  
MD University of Oklahoma 1978

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BS University of MO Kansas City 2000  
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Joseph C Bancroft Professor of Surgery (Cardiothoracic Surgery) (primary appointment)  
MD Queen's University 1974

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Instructor in Clinical Surgery (Urologic Surgery) (primary appointment)  
MD School Not Listed 1969  
PHD School Not Listed 1975

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Associate Professor of Surgery (General Surgery) (primary appointment)  
BS Barnard College 2001  
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M PHIL George Washington University 2004

Laurie Jean Punch, MD  
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BS Yale University 1997  
MD University of Connecticut 2002  
BS Yale University 1997

Varun Puri, MD, MS  
Associate Professor of Surgery (Cardiothoracic Surgery) (primary appointment)  
MD Washington Univ in St. Louis 2009  
BS All-India Inst of Medical Sci 1998  
MS Creighton University 2007

Nishant Raj  
Assistant Professor of Surgery (General Surgery) (primary appointment)

Ricardo Rao, MD  
Instructor in Clinical Surgery (General Surgery) (primary appointment)  
MD University of Missouri 1987  
BA University of CA San Diego 1983

Nanette Rahee Reed, MD  
Assistant Professor of Surgery (General Surgery) (primary appointment)  
MD Baylor College of Medicine 2004  
BS University of Notre Dame 2000

Frank O Richards, MD  
Assistant Professor Emeritus of Clinical Surgery (General Surgery) (primary appointment)  
BA Talladega College 1944  
MD Howard University 1947

Shale M Rifkin, MD  
Assistant Professor of Clinical Surgery (General Surgery) (primary appointment)  
MD Washington Univ in St. Louis 1948

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Professor of Surgery (General Surgery) (primary appointment)  
Professor of Radiology  
MD University of Vermont 1984  
BA Colgate University 1979

Jacqueline Mitsouko Saito, MD  
Associate Professor of Surgery (Pediatric Surgery) (primary appointment)  
MD Columbia University 1993  
BS Harvard Radcliff 1989

Arghavan Salles, PHD, MD  
Assistant Professor of Surgery (General Surgery) (primary appointment)  
PHD Stanford University 2014  
BA University of Southern Calif 2002  
MD Stanford University 2006

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Gregorio A. Sicard Distinguished Professor  
Professor of Radiology  
MD Harvard University 1987  
BS Yale University 1983

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Assistant Professor Emeritus of Clinical Surgery (General Surgery) (primary appointment)  
MD Washington Univ in St. Louis 1960  
BA Washington Univ in St. Louis 1956

Douglas J Schuerer, MD  
Professor of Surgery (General Surgery) (primary appointment)  
MD University of Pittsburgh 1995  
BS Allegheny College 1991

Richard B Schuessler, PHD, MS  
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Associate Professor of Biomedical Engineering  
PHD Clemson University 1977  
MS University of Missouri 1974
BS University of Missouri 1973

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BS Kasturba Medical College 1980
PHD Institute of Medical Science 1989

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Assistant Professor of Surgery (General Surgery) (primary appointment)
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MD Temple University 2005
MS1 Temple University 2010

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Assistant Professor of Clinical Surgery (General Surgery) (primary appointment)
MD School Not Listed 2000

Radhika K Smith, MD
Assistant Professor of Surgery (General Surgery) (primary appointment)
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Jason Andrew Snyder, MD
Assistant Professor of Surgery (General Surgery) (primary appointment)
BS Kettering University 2004
MD Marshall University 2008

Alison K Snyder-Warwick, MD
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BA Knox College 2000

MD Washington Univ in St. Louis 2004

Dirk M Spitzer, PHD
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BS School Not Listed 1995
PHD Technische U Braunschweig 1999

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MD Wayne State University 1976
BS Univ of Wisconsin Madison 1972

Daniel Charles Stoeckel
Instructor in Clinical Surgery (primary appointment)

Steven M Strasberg, MD
Pruett Professor of Surgery (General Surgery) (primary appointment)
Associate Professor of Cell Biology and Physiology
MD University of Toronto 1963

Herbert Sunshine, MD
Instructor in Clinical Surgery (Urologic Surgery) (primary appointment)
MD Washington Univ in St. Louis 1954
BA Washington Univ in St. Louis 1950

Siobhan Sutcliffe, MHS, MS, PHD
Associate Professor of Surgery (Public Health Sciences) (primary appointment)
BS Princeton University 1998
MHS Johns Hopkins University 2001
MS Johns Hopkins University 2004
PHD Johns Hopkins University 2005

Marissa Morningstar Tenenbaum, MD
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MD Washington Univ in St. Louis 2002
BS Univ of Wisconsin Madison 1998

Robert W Thompson, MD
Professor of Surgery (General Surgery) (primary appointment)
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Professor of Radiology
BA Hope College 1979
MD University of Michigan 1983

Adetunji Toriola, PHD
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Ralph J Torrence, MD
Assistant Professor of Surgery (Urologic Surgery) (primary appointment)
Erica J Traxel, MD  Assistant Professor of Surgery (Urologic Surgery) (primary appointment)  BS Texas A&M University 1998  MD Beaufort Technical College 2002

Thomas H Tung, MD  Professor of Surgery (Plastic and Reconstructive Surgery) (primary appointment)  BS Duke University 1986  MD University of Maryland 1990

Isaiah Turnbull, MS, MD  Assistant Professor of Surgery (General Surgery) (primary appointment)  MS Washington Univ in St. Louis 2008  BS University of Oregon 1998  MD Washington Univ in St. Louis 2008

Kelly Jean Vallar  Assistant Professor of Surgery (General Surgery) (primary appointment)  

Ramakrishna Venkatesh, MS, MS1, MD  Professor of Surgery (Urologic Surgery) (primary appointment)  MS Bangalore University 1991  MS1 School Not Listed 1991  MD Bangalore University 1988

Jesse Daya Vrecenak, MD  Assistant Professor of Surgery (Pediatric Surgery) (primary appointment)  MD University of Pennsylvania 2007  BS Yale University 2003

Gino J Vricella, MD  Assistant Professor of Surgery (Urologic Surgery) (primary appointment)  MD University of MO Columbia 2006  BS Saint Louis University 2012

Howard S Walker, MD  Instructor in Clinical Surgery (Cardiothoracic Surgery) (primary appointment)  MD Beaufort Technical College 1974  BA Citadel 1971

Brad W. Warner, MD  Jessie L. Ternberg, M.D., PhD. Distinguished Professor of Pediatric Surgery in Surgery (Pediatric Surgery) (primary appointment)  Professor of Pediatrics  MD University of MO Kansas City 1982  BS University of MO Kansas City 1982

Erika Waters, MS PSYC, PHD, M PH  Associate Professor of Surgery (Public Health Sciences) (primary appointment)  MS PSYC Rutgers University 2003  PHD Rutgers University 2006  M PH Johns Hopkns University Medic 2007  BS Arizona State University 1999

Michael D Weiss, MD, BS1  Assistant Professor of Surgery (General Surgery) (primary appointment)  MD Ohio College of Podiatric Medi 1981  BS1 Ohio State University 1977

Jason R Wellen, MD  Associate Professor of Surgery (General Surgery) (primary appointment)  BS Emory University 1998  MD St George's University 2002

Bruce I White, MD  Instructor in Clinical Surgery (Plastic and Reconstructive Surgery) (primary appointment)  MD Washington Univ in St. Louis 1964

Brad C White, MD  Instructor in Clinical Surgery (Urologic Surgery) (primary appointment)  MD Loyola University Chicago 1993  BS Illinois State University 1986

Paul Edward Wise, MD  Professor of Surgery (General Surgery) (primary appointment)  MD John Hopkins University 1996  BS Georgetown University 1992

Brian Wing-Chi Wong, PHD  Assistant Professor of Surgery (General Surgery) (primary appointment)  BS University of British Columbia 2001  PHD University of British Columbia 2011


Yan Yan, MD, MHS, PHD  Professor of Surgery (Public Health Sciences) (primary appointment)  Professor of Biostatistics  MD Nanjing Medical University 1983  MHS Johns Hopkins University 1995  PHD Johns Hopkins University 1998
Courses

M95 Surgery 790 Integrated Surgical Disciplines Clerkship
During the 12-week surgery clerkship, each student is assigned to three separate rotations. Each student is assigned to a required general surgery rotation at Barnes-Jewish Hospital or the John Cochran Veterans Administration Medical Center. In addition, each student selects elective rotations in other general surgical fields, surgical subspecialties and related disciplines of critical care. The student is an active participant in the daily care of patients on each service and attends the service teaching conferences and rounds. For the duration of the 12-week rotation, there are weekly small-group tutorial sessions with faculty members and a biweekly lecture series. Credit 462 units.

M95 Surgery 814 Acting Internship, Trauma Service
The student on this elective will function as a sub-intern on the Trauma and Acute Care Surgical Service within the Section of Acute and Critical Care Surgery. Student involvement in all aspects of clinical surgery is accomplished by student attendance in the outpatient office, preoperative patient evaluation, in-hospital patient management, and postoperative outpatient follow-up after discharge. Practical experience will focus on the initial evaluation and resusculation of traumatized patients and other emergency care patients. The student will also participate in regular rounds, conferences, and in-house call.

M95 Surgery 818 Surgical Night Float & ER Sub-Internship
This sub-internship is specifically designed to give senior medical students an intern-level experience in managing acute on-call problems in surgical patients and in evaluating urgent and emergent problems in the ED. The rotation will be divided into two, two-week segments: one segment in the ED and the second on night float call on the surgical floors. Students will gain experience evaluating and managing the types of acute problems they will encounter as surgical interns as first responders to patients with acute abdominal pain, chest pain, hypotension, mental status changes, and other ER-on-call type problems. They will be assigned to the on-call surgical resident and will have a structured experience in order to maximize development of their diagnostic, management, and case presentation skills in the acute care setting so that they may more smoothly make the transition to a surgical internship.

M95 Surgery 820 Cardiothoracic Surgery
Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41. The senior elective in cardiothoracic surgery is a four-week clinical rotation with two-week blocks divided between adult cardiac, pediatric cardiothoracic, and general thoracic surgery according to the student's preference. Students will participate in morning work rounds, attend the operative procedures of their choice, and attend weekly conferences and teaching rounds. Students will be introduced not only to the surgical procedures but also to the postoperative care of the surgical patients. On the pediatric and adult cardiac services, students will be introduced to the principles of cardiopulmonary bypass, ventricular assist devices, cardiac transplantation, coronary artery bypass surgery (on and off pump), valve repair and replacement, complex aortic surgery, the MAZE procedures and others. On the adult cardiac surgery service, students will function as sub-interns under the direct supervision of a faculty member. On the thoracic surgical rotation, students will have the opportunity of performing bronchoscopy, esophagoscopy, gastroscopy, and participate in surgical resections of lung cancer and esophageal cancer, as well as surgery for emphysema and for benign esophageal conditions. Students will also participate in lung transplantation surgery.

M95 Surgery 830 Plastic and Reconstructive Surgery
The period on Plastic Surgery may either be spent as a clinical clerkship or conducting a research project. The purpose of the clinical clerkship is to familiarize the student with the basic principles of plastic surgery. The student will have successive assignments to each of the attending staff and the ward resident services during the four weeks. This will expose the student to the breadth and depth of plastic surgery. Alternatively, if the student has identified a focus of interest, the student may participate on those services of special interest, such as hand or pediatric plastic surgery. The student will assume an active role on the plastic surgery service and will participate in the total management of a wide variety of surgical problems including congenital anomalies, microvascular surgery, surgery of the upper extremity, peripheral nerve surgery, cosmetic surgery, and general reconstructive plastic surgery. Research projects should be student-motivated, and must be approved prior to scheduling and confirming the research rotation. Student will perform a 10-minute case presentation.

M95 Surgery 832 Plastic Surgery Externship
This course is for visiting medical students only. Flexible start dates for two- to four-week blocks are available. Certain rotation
dates may be limited, depending on the number of students requesting rotations. Students rotate on different Plastic Surgery Services for two weeks each to maximize exposure to all faculty. The student will assume an active role on the plastic surgery service and will participate in the total management of a wide variety of surgical problems including congenital anomalies, microvascular surgery, surgery of the upper extremity, peripheral nerve surgery, cosmetic surgery, and general reconstructive plastic surgery. Participation in conferences is expected. Student will perform a 10-minute case presentation.

M95 Surgery 839B Orthopaedic Sports Medicine
This clinical elective is available for four weeks during which the student participates in orthopaedic conferences, outpatient clinics, surgical cases, and patient rounds on the Sports Medicine service.

M95 Surgery 839A Orthopaedic Sports Medicine
This clinical elective is available for four weeks during which the student participates in orthopaedic conferences, outpatient clinics, surgical cases, and patient rounds on the Sports Medicine service.

M95 Surgery 840A Orthopaedic Surgery-Foot/Ankle
This four-week clinical elective is available to medical students looking to further their knowledge/experience in orthopaedics, specifically foot and ankle surgery. Students will participate in surgical cases, outpatient clinics, inpatient care and weekly didactic sessions/conferences. At the completion of the elective, students should have gained a basic knowledge of foot and ankle problems as well as their operative and nonoperative care.

M95 Surgery 840B Orthopaedic Surgery-Foot/Ankle
This four-week clinical elective is available to medical students looking to further their knowledge/experience in orthopaedics, specifically foot and ankle surgery. Students will participate in surgical cases, outpatient clinics, inpatient care and weekly didactic sessions/conferences. At the completion of the elective, students should have gained a basic knowledge of foot and ankle problems as well as their operative and nonoperative care.

M95 Surgery 842B Orthopaedic Shoulder/Elbow Surgery
Clinical elective available, during which time the student will work with attending surgeons primarily at Barnes-Jewish Hospital. Activities will include participation in the care of hospitalized inpatients, participation in inpatient and outpatient procedures, attendance at designated attending office hours, attendance at designated orthopaedic conferences, and dissection of upper-extremity anatomical specimens.

M95 Surgery 842C Orthopaedic Shoulder/Elbow Surgery
Clinical elective available, during which time the student will work with attending surgeons primarily at Barnes-Jewish Hospital. Activities will include participation in the care of hospitalized inpatients, participation in inpatient and outpatient procedures, attendance at designated attending office hours, attendance at designated orthopaedic conferences, and dissection of upper-extremity anatomical specimens.

M95 Surgery 845B Orthopaedic Hand and Upper Extremity Surgery
Clinical elective available, during which time the student will work with attending surgeons primarily at Barnes-Jewish Hospital, St. Louis Children's Hospital, and Shriners Hospital. The service includes care of adult and pediatric patients with congenital, traumatic, sports (arthroscopy), nerve, and degenerative disease. Activities will include participation in outpatient procedures, attendance at faculty clinic office hours, and attendance at orthopaedic conferences.

M95 Surgery 845C Orthopaedic Hand and Upper Extremity Surgery
Clinical elective available, during which time the student will work with attending surgeon primarily at Barnes-Jewish Hospital. Activities will include participation in the care of hospitalized inpatients, participation in inpatient and outpatient procedures, attendance at designated attending office hours, attendance at designated orthopaedic conferences, and dissection of upper-extremity anatomical specimens.

M95 Surgery 845D Orthopaedic Hand and Upper Extremity Surgery
Clinical elective available, during which time the student will work with attending surgeons primarily at Barnes-Jewish Hospital, St. Louis Children's Hospital, Washington University Orthopedics at Center for Advanced Medicine and South County. The service includes care of adult and pediatric patients with traumatic, sports (arthroscopy), nerve, and degenerative disease. The rotation will cover general hand surgery as well as brachial plexus and peripheral nerve surgery. Activities will include participation in outpatient procedures, attendance at faculty clinic office hours, and attendance at orthopaedic conferences.

M95 Surgery 845E Orthopaedic Hand and Upper Extremity Surgery
Clinical elective available, during which time the student will work with attending surgeons primarily at St Louis Children's Hospital, and Shriners Hospital, Chesterfield, Center for Advanced Medicine and St. Louis Children's Specialty Care Center. The service includes care of adult and pediatric patients with congenital, traumatic, sports (arthroscopy), nerve, and degenerative disease. Activities will include participation in outpatient procedures, attendance at faculty clinic office hours, attendance at orthopaedic conferences, and dissection of upper-extremity anatomical specimens.

M95 Surgery 845F Orthopaedic Hand and Upper Extremity Surgery
Clinical elective available, during which time the student will work with attending surgeons primarily at Barnes-Jewish Hospital, Center for Advanced Medicine and the Chesterfield office. The service includes care of adult and pediatric patients with traumatic, sports (arthroscopy), nerve, and degenerative disease. Activities will include participation in outpatient procedures, attendance at faculty clinic office hours, and attendance at orthopaedic conferences.
procedures, attendance at faculty clinic office hours, and attendance at orthopaedic conferences.

M95 Surgery 846A Orthopaedic Trauma
Clinical elective available for a four-week period, during which time the student will work in orthopaedic trauma at Barnes-Jewish Hospital. The student will work with a team of attendings, residents, PAs, and NPs to provide care for orthopaedic trauma patients. Activities include participation in the care of hospitalized inpatients, inpatient surgical procedures, outpatient office visits and daily conferences.

M95 Surgery 848A Orthopaedic Pediatric Surgery Elective
Clinical elective available for four weeks during which time the student will work with attending surgeon primarily at St. Louis Children's Hospital observing and assisting in outpatient and inpatient care. To be included are activities in the OR, ER, and outpatient clinics. Attendance at and participation in the weekly pediatric orthopaedic conference activities required.

M95 Surgery 848B Orthopaedic Pediatric Surgery Elective
Clinical elective available for four weeks during which time the student will work with attending surgeon primarily at St. Louis Children's Hospital observing and assisting in outpatient and inpatient care. To be included are activities in the OR, ER, and outpatient clinics. Attendance at and participation in the weekly pediatric orthopaedic conference activities required.

M95 Surgery 848C Orthopaedic Pediatric Surgery Elective
Clinical elective available for four weeks during which time the student will work with attending surgeon primarily at St. Louis Children's Hospital observing and assisting in outpatient and inpatient care. To be included are activities in the OR, ER, and outpatient clinics. Attendance at and participation in the weekly pediatric orthopaedic conference activities required.

M95 Surgery 849A Orthopaedic Spine Surgery In Adult Patients
This clinical elective is available for four weeks during which time the student will work with the attending surgeon primarily at Barnes-Jewish Hospital observing and assisting when appropriate in outpatient and inpatient care. To be included are activities in the OR, ER, and outpatient clinics. Attendance at and participation in the weekly orthopaedic conference activities is required. The spine fellow assigned to this service will serve as a primary contributor to the student's education experience on this rotation.

M95 Surgery 849C Orthopaedic Spine Surgery in Adult Patients
This clinical elective is available for four weeks during which the student will work with the attending surgeon primarily at Barnes-Jewish Hospital, Barnes-Jewish West County Hospital, Washington University Orthopaedics - Center for Advanced Medicine observing and assisting when appropriate in outpatient and inpatient care. To be included are activities in the OR, ED, and outpatient clinics. Attendance at and participation in the weekly orthopaedic conference activities is required. The spine fellow assigned to this service will serve as a primary contributor to the student's education experience on this rotation.

M95 Surgery 850 Urology
A four-week clinical clerkship in pediatric and/or adult urology will offer the interested student experience with a spectrum of problems in clinical urology. The student will learn the basic diagnostic procedures and management of surgical and non-surgical aspects of patient care under the supervision of the attending staff and house staff. Clinical conferences are held three days per week.

M95 Surgery 855B Reconstructive/Joint Preservation Surgery
Clinical elective available, during which time the student will work with the attending physician on the Adult Reconstruction and Joint Preservation/Replacement service. This rotation is primarily centered at Barnes-Jewish Hospital and includes care of hospitalized inpatients, participant in inpatient and outpatient procedures, attendance at designated office hours, and attendance at and participation in orthopaedic educational conferences and anatomy sessions.

M95 Surgery 855C Reconstructive/Joint Preservation Surgery
Clinical elective available, during which time the student will work with the attending physician on the Adult Reconstruction and Joint Preservation/Replacement service. This rotation is primarily centered at Barnes-Jewish Hospital and includes care of hospitalized inpatients, participant in inpatient and outpatient procedures, attendance at designated office hours, and attendance at and participation in orthopaedic educational conferences and anatomy sessions.

M95 Surgery 855A Reconstructive/Joint Preservation Surgery
Clinical elective available, during which time the student will work with the attending physician on the Adult Reconstruction and Joint Preservation/Replacement service. This rotation is primarily centered at Barnes-Jewish Hospital and includes care of hospitalized inpatients, participant in inpatient and outpatient procedures, attendance at designated office hours, and attendance at and participation in orthopaedic educational conferences and anatomy sessions.
M95 Surgery 855D Reconstructive/Joint Preservation Surgery
Clinical elective available, during which time the student will work with the attending physician on the Adult Reconstruction and Joint Preservation/Replacement service. This rotation is primarily centered at Barnes-Jewish Hospital and includes care of young patients with hip impingement pathology and older patients with end stage joint arthritis, hospitalized inpatients, participant in inpatient and outpatient procedures, attendance at designated office hours, and attendance at and participation in orthopaedic educational conferences and anatomy sessions.

M95 Surgery 859 Orthopaedic Oncology
Clinical elective available for four weeks, during which time the student will work with the attending physicians on the Musculoskeletal Oncology service. The student will participate in orthopaedic conferences, outpatient clinics, surgical cases and patient rounds.

M95 Surgery 862 Acting Internship, Colon and Rectal Surgery
This sub-internship elective is designed to give students in-depth experience in the clinical management of patients on the Colorectal Surgery Service. Students work closely with the attendings within the Section of Colon and Rectal Surgery, and clinical exposure is focused on a wide range of benign and malignant colorectal diseases. There is exposure to radiation oncology and the specialized areas of nursing related to care of patients with colorectal cancer and inflammatory bowel disease. The course will offer opportunities for students to gain experience in preoperative, intraoperative and postoperative patient management under house staff, fellows, and faculty guidance, as well as ample opportunity to attend and participate in conferences. Notice: If a student desires to work more closely with a specific attending, they must make special arrangements with the faculty member prior to beginning this elective.

M95 Surgery 863 Acting Internship, Surgical Oncology and Endocrine Surgery
This sub-internship elective is designed to give students in-depth experience in the clinical management of patients on the Endocrine and Surgical Oncology Service (Unit II Service). The Unit II Service is a busy upper-gastrointestinal service with a focus on hepatobiliary and pancreatic diseases and their treatment. The course will offer opportunities for students to gain experience in preoperative, intraoperative, and postoperative patient management. Students will serve as clerks and will be responsible for patient management under the guidance of the chief resident and attending surgeons. Clinical exposure is focused on hepatobiliary and pancreatic diseases and their treatment. The course will offer opportunities for students to gain experience in preoperative, intraoperative, and postoperative patient management. There will be opportunity for students to gain experience in preoperative, intraoperative, and postoperative patient management. There will be opportunity for students to evaluate patients, decide on a diagnostic and management strategy and provide care under house staff and faculty guidance, as well as ample opportunity to attend and participate in conferences. Notice: If a student desires to work more closely with a specific attending, they must make special arrangements with the faculty member prior to beginning this elective.

M95 Surgery 864 Ethical Challenges in Surgery and Medicine
This elective will involve exploration of the ethical challenges discussed during didactic conferences and in clinical settings within the Department of Surgery at Washington University in St. Louis School of Medicine. The student will be guided through readings, discussions, and projects by department faculty members with expertise in clinical ethics. The elective will result in a finished manuscript to be submitted for publication with the student as lead author. This elective provides the opportunity to work closely with faculty mentors and should appeal to any student interested in the ethical and humanitarian challenges facing physicians in particular and society in general.

M95 Surgery 871 Acting Internship, Vascular Surgery
This sub-internship elective is designed to give students in-depth experience in the clinical management of patients on the Vascular Surgery Service. The elective will offer opportunities for students to gain experience in preoperative, intraoperative and postoperative management of patients with surgically treated vascular diseases/conditions. Students will serve as clerks and will be responsible for patient management with house staff under the guidance of the fellow and attending surgeons. There will be opportunity for students to evaluate patients, decide on a diagnostic and management strategy, and provide care under house staff and faculty guidance, as well as ample opportunity to attend and participate in conferences. Notice: If a student desires to work more closely with a specific attending, they must make special arrangements with the faculty member prior to beginning this elective.

M95 Surgery 879 Acting Internship, Hepatobiliary-Pancreatic Surgery
This sub-internship elective is designed to give students in-depth experience in the clinical management of patients on the Hepatobiliary-Pancreatic (Unit II) Service. The Unit II Service is a busy upper-gastrointestinal service with a focus on hepatobiliary and pancreatic diseases and their treatment. The course will offer opportunities for students to gain experience in preoperative, intraoperative, and postoperative patient management. Students will serve as clerks and will be responsible for patient management with house staff under the guidance of the fellow, chief resident and attending surgeons. There will be opportunity for students to evaluate patients, decide on a diagnostic and management strategy, and provide care under house staff and faculty guidance, as well as ample opportunity to attend and participate in conferences. Note: If a student desires to work more closely with a specific attending, they must make special arrangements with the faculty member prior to beginning this elective.

M95 Surgery 880 Pediatric Surgery
This sub-internship elective will expose the student to a wide variety of pediatric surgical cases. This includes the preoperative and postoperative care of patients as well as the care of pediatric trauma patients. Daily walking or sit down rounds are made with the resident, nurse practitioner, and attending staff, and participation is expected in the pediatric surgery clinic and the operating room. Weekly conference attendance is mandatory and includes Mortality and Morbidity, Radiology, Pathology, Solid Tumor Board, ED/Trauma, and GI conferences. Students have an opportunity to understand the widely differing anatomy and physiology of patients ranging from newborn infant to teenagers and young adults. The student functions as a team member and assumes level-appropriate responsibilities as determined by senior team members in this highly specialized care field.

M95 Surgery 891 Organ Transplantation
The care of transplant patients requires the integration of multiple diverse medical and surgical disciplines. This elective clerkship in organ transplantation encompasses the preoperative evaluation and management of adult and pediatric recipients of liver, kidney, and pancreas. Students participate in procurement of allografts from cadaveric or living donors, organ preservation, and transplantation. Emphasis is also placed on postoperative
Invasive Surgery and will function as an acting intern. Performance of various surgeons within the Section of Minimally Invasive Surgery group regularly perform the following procedures laparoscopically: cholecystectomy, splenectomy, adrenalectomy, hiatal hernia repair, endoscopic myotomy for achalasia, inguinal hernia repair, ventral hernia repair, complex abdominal wall reconstruction, robotic surgery, and bariatric surgery for morbid obesity. The medical student electing this rotation will participate in the outpatient office and direct patient care, assist and observe in a wide range of laparoscopic procedures and participate in teaching rounds and conferences. This sub-internship elective in minimally invasive surgery is offered by the chief of the Section of Minimally Invasive Surgery in the General Surgery Division. Surgeons in the Minimally Invasive Surgery group regularly perform the following procedures laparoscopically: cholecystectomy, splenectomy, adrenalectomy, hiatal hernia repair, endoscopic myotomy for achalasia, inguinal hernia repair, ventral hernia repair, complex abdominal wall reconstruction, robotic surgery, and bariatric surgery for morbid obesity. The medical student electing this rotation will participate in the outpatient office and direct patient care, assist and observe in a wide range of laparoscopic procedures and participate in teaching rounds and conferences. During this rotation, the student will also have the opportunity to observe and participate in minimally invasive surgical procedures performed by various surgeons within Section of Minimally Invasive Surgery and will function as an acting intern.

M95 Surgery 893 Acting Internship, Minimally Invasive Surgery
This sub-internship elective in minimally invasive surgery is offered by the chief of the Section of Minimally Invasive Surgery in the General Surgery Division. Surgeons in the Minimally Invasive Surgery group regularly perform the following procedures laparoscopically: cholecystectomy, splenectomy, adrenalectomy, hiatal hernia repair, endoscopic myotomy for achalasia, inguinal hernia repair, ventral hernia repair, complex abdominal wall reconstruction, robotic surgery, and bariatric surgery for morbid obesity. The medical student electing this rotation will participate in the outpatient office and direct patient care, assist and observe in a wide range of laparoscopic procedures and participate in teaching rounds and conferences. This sub-internship elective in minimally invasive surgery is offered by the chief of the Section of Minimally Invasive Surgery in the General Surgery Division. Surgeons in the Minimally Invasive Surgery group regularly perform the following procedures laparoscopically: cholecystectomy, splenectomy, adrenalectomy, hiatal hernia repair, endoscopic myotomy for achalasia, inguinal hernia repair, ventral hernia repair, complex abdominal wall reconstruction, robotic surgery, and bariatric surgery for morbid obesity. The medical student electing this rotation will participate in the outpatient office and direct patient care, assist and observe in a wide range of laparoscopic procedures and participate in teaching rounds and conferences. During this rotation, the student will also have the opportunity to observe and participate in minimally invasive surgical procedures performed by various surgeons within Section of Minimally Invasive Surgery and will function as an acting intern.

M95 Surgery 8991 Orthopaedic Surgery Externship (Visiting Students Only)
Flexible scheduling is available for this externship. Students rotate on Orthopaedic Services in four-week blocks. During their rotations, students are assigned to two different services for two weeks each. Students may rotate on a variety of subspecialties including trauma sports medicine, hand and upper extremity, foot and ankle, musculoskeletal oncology, adult reconstructive surgery, pediatric orthopaedics, shoulder and elbow, and spine. For more information about the Orthopaedic Surgery Externship Program (https://www.ortho.wustl.edu/content/Education/2905/Training-Programs/Med-Student-Programs/Externship-Program/Overview.aspx), visit our website.

M95 Surgery 900 Research Opportunities-Surgery
Research opportunities may be available. If interested, please contact the department of Surgery.

Educational Programs

Applied Health Behavior Research
Health Behavior Research is a multidisciplinary field that applies psychology, public health, behavioral medicine, communication science and statistics to promote health and prevent disease. Researchers (1) study the broad range of factors that influence health behaviors and their impact on health outcomes and quality of life; (2) design and test innovative interventions to promote health and reduce disparities; and (3) disseminate evidence-based programs in diverse settings globally. Health Behavior Research is an important component to clinical research involving human participants, because benefits from medical care are dependent on health behaviors such as clear doctor-patient communication, patient adherence, self-management and risk avoidance. Applied Research is research that seeks to solve practical, real-world problems; develops innovative treatments, interventions and methods; and has immediate and practical application of the findings in clinical and community settings. The skills-based graduate programs in Applied Health Behavior Research (AHBR) offered through the Washington University School of Medicine are sponsored by the Clinical Research Training Center (https://crtc.wustl.edu) and the Institute of Clinical and Translational Sciences (http://icts.wustl.edu). The AHBR program provides a strong foundation for graduates to contribute to the development and evaluation of programs and research trials to improve health behaviors, health care quality, health outcomes, and quality of life.

Location
All courses are held on the School of Medicine campus after 4:00 p.m. to accommodate working professionals and full-time students participating in mentored research activities.

Additional Information
Request Information (https://wuctc.az1.qualtrics.com/jfe/form/SV_bCNR92dbkr2wrKh)
Laura Peer, MPH
Program Manager
Phone: 314-454-8956
Email (lpeer@wustl.edu)
Amy McQueen, PhD
Program Director
Phone: 314-286-2016
Email (amcqueen@wustl.edu)
Washington University School of Medicine
Applied Health Behavior Research Program
Clinical Research Training Center (https://crtc.wustl.edu)
660 South Euclid Avenue, CB 8051
St. Louis, MO 63110
Email: ahbr@email.wustl.edu
Website: https://crtc.wustl.edu/programs/degrees/ahbr
Degrees & Requirements

Master of Science in Applied Health Behavior Research

The Master of Science (MS) in Applied Health Behavior Research (AHBR) is a 33-credit, multidisciplinary program that focuses on the applied skills required for the development, management and evaluation of research studies and health behavior programs in academic, clinical, and community settings. Students choose one of two concentrations:

1. Health Education, Program Planning and Evaluation (HEPPE) – designed for individuals who want to develop, manage and evaluate health programs in clinical or community settings; course work focuses on health behavior theory, program planning, program evaluation, health education and program management.

2. Health Behavior Research (HBR) – designed for individuals to develop theoretical knowledge and gain practical research experience in order to pursue careers in a variety of health-related fields and/or manage research studies in clinical settings; course work focuses on health behavior theory, research methodology, analytic methods, and research project management.

- Health Behavior Research, One-Year/Research Intensive Option – for individuals who want to develop theoretical knowledge and gain practical research experience in order to pursue careers in a variety of health-related fields or pursue advanced graduate degrees; designed to be completed in three semesters and includes 9 credit hours of mentored research; provides hands-on training for students interested in health, medical, and psychology-related fields; provides students an opportunity to fulfill specific graduate and medical school core competencies and enhance applications to MD and PhD programs.

Graduate Certificate in Health Behavior Planning and Evaluation

The Graduate Certificate in AHBR is a 15-credit program featuring a curriculum focused on key applied and theoretical concepts in health behavior, as well as the processes needed for managing program development and evaluation activities in clinical and community settings.

Program Requirements

The MS and Certificate programs in AHBR can be pursued on a full-time or part-time basis. Registration is open to anyone with a four-year undergraduate degree from an accredited university or college, in an appropriate field of study. Applications are accepted on a rolling basis, and students may pursue course work at their own pace. The MS does not require a thesis upon completion of the program, and the GRE is not required for admission.

AHBR Required Core Courses

For the Master of Science

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<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tr>
<td>AHBR 508</td>
<td>Project Management in Clinical and Community Settings</td>
<td>3</td>
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<tr>
<td>AHBR 514</td>
<td>Health Behavior Theory</td>
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<td>AHBR 525</td>
<td>Introduction to Biostatistics</td>
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<td>AHBR 560</td>
<td>Survey Methods: Design and Evaluation</td>
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For the Graduate Certificate

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<tr>
<td>AHBR 514</td>
<td>Health Behavior Theory</td>
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<tr>
<td>AHBR 536</td>
<td>Health Education: Methods, Planning, and Evaluation</td>
<td>3</td>
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<tr>
<td>AHBR 582</td>
<td>Evaluation of Health Services Programs</td>
<td>3</td>
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Visit the AHBR Courses webpage (https://crtc.wustl.edu/courses/class-list/ahbr-courses) to view concentration-specific required courses and elective options.

Admissions

In order to be considered for admission, applicants must submit the following:

- AHBR Application Form (https://wucrtc.az1.qualtrics.com/jfe/form/SV_9TVsvUUTmsQKDGZ)
- Application Fee
- Résumé/CV
- Personal Statement
- All College Transcripts
- Three (3) Letters of Recommendation

Contact the program manager (ahbr@email.wustl.edu) for application deadline information.

Academic Policies

Academic policies (https://crtc.wustl.edu/courses/class-list/academic-policies) for the MS and Graduate Certificate programs can be found on the CRTC website.

Research

The graduate programs in Applied Health Behavior Research (AHBR) provide a deeper understanding of the growing fields of health behavior research and behavioral medicine, which conduct and disseminate research findings across a variety
of academic and hospital settings, nonprofit organizations, government agencies, and private industry.

For professionals currently working in health-related fields, the skills-based curriculum provides hands-on methods and resources to enhance knowledge and practical skills needed for career advancement. Courses prepare students for project management, leadership, research design and evaluation, data management and analysis, as well as increase their content expertise in health behavior theory and methods.

For recent graduates planning for their future, the one-year research-intensive master's degree option provides opportunities for students to fulfill specific medical and graduate school core competencies and enhance the competitiveness of their applications, making the program an ideal gap-year option. Through the mentored research experience provided, students develop theoretical knowledge and gain practical experience in order to pursue careers in medicine, allied health, psychology, public health, and other research or health-related fields.

AHBR graduates are prepared to conduct all phases of research — intervention design and implementation, survey development and administration, participant recruitment and tracking, data collection, data management, and data analysis. In academic settings, graduates work for MD or PhD researchers in labs or research centers. In industry, graduates work for health insurance companies, managed care organizations, and corporate wellness programs. For nonprofit and community organizations, graduates may lead the design, implementation, evaluation and dissemination of health and wellness programs, contribute to grant applications and develop partnerships across agencies.

**Faculty**

**Patricia Cavazos-Rehg, PhD**
Associate Professor of Psychiatry
Department: Psychiatry

**Melissa Chapnick, RD, MS, MPH**
Clinical Research Study Assistant II
Department: Obstetrics & Gynecology – Research & Operations, Washington University

**Robert Culverhouse, PhD**
Assistant Professor of Medicine
Department: General Medical Sciences, Washington University

**Michael Elliott, PhD**
Lecturer, AHBR
Department: Biostatistics, School of Public Health, Saint Louis University

**Robert Fitzgerald, PhD**
Research Instructor
Department: Psychiatry (Child)

**Donna Jeffe, PhD**
Professor of Medicine
Department: Internal Medicine
Division: General Medical Sciences

**Shannon Lenz, PhD**
Assistant Professor of Medicine
Department: Psychiatry

**Julia López, PhD, MPH, LCSW**
Research Instructor
Department: Obstetrics & Gynecology

**Amy McQueen, PhD**
Assistant Professor of Medicine
Department: Internal Medicine
Division: General Medical Sciences

**Maria Perez, MA**
Senior Clinical Research Coordinator
Department: Internal Medicine
Division: General Medical Sciences

**Don Rickert, PhD**
Lecturer
Department: Pharmacy Administration, St. Louis College of Pharmacy

**Enbal Shacham, PhD**
Lecturer
Department: Public Health & Social Justice, Saint Louis University

**Amaris Tippey, PhD**
Lecturer, AHBR
Department: Alvin J. Siteman Cancer Center, Barnes-Jewish Hospital

**Courses**


**M88 AHBR 505 Mentored Research**
Students are paired with faculty researchers to obtain hands-on experience and exposure to directed research. (Not offered for Graduate Certificate).
Credit 3 units.

**M88 AHBR 508 Project Management in Clinical and Community Settings**
This course trains students in the day-to-day management of research projects and/or health behavior programs in clinical and community settings, including a review of ethics, data collection and management. Students develop skills for managing and coordinating all aspects of health behavior projects, including recruitment and retention of participants, developing and maintaining various databases for study/program tracking and analysis, writing reports, managing a project team, and using basic statistical tools for project reporting. Successful completion
of this course enables students to better manage health-related studies and programs. Credit 3 units.

**M88 AHBR 512A Counseling Skills for Health Care Professionals**
This course focuses on the counseling skills necessary to promote self-care behaviors in individuals, including techniques for adapting communications style to cultural needs and developmental differences. Methods for incorporating family members and significant others into the counseling process are also included. Credit 3 units.

**M88 AHBR 514 Health Behavior Theory**
This course features analysis and application of behavior theories to health promotion/education planning, implementation, and evaluation in a variety of settings. Primary emphasis is on research related to determinants of health behavior such as personal, family and sociocultural factors that influence health, and lifestyle issues related to behavior change and adherence. Strategies and techniques used by professionals to foster human health are also featured. Credit 3 units.

**M88 AHBR 515 Health Psychology**
This course explores the complex interactions between biological, psychological and social factors as they influence health, health behaviors and coping with illness. In a seminar format, students read, present and discuss empirical literature related to health psychology. Specific class topics include the history and current roles of health psychology as a professional discipline, theoretical models of health and illness prevention with an emphasis on the biopsychosocial model, stress, pain, and the role of biopsychosocial factors in several specific medical illnesses including diabetes, asthma, heart disease and cancer. Developmental issues related to health knowledge and perception, disease management and coping with illness are also discussed. Credit 3 units.

**M88 AHBR 516 Seminar: Communication and Group Dynamics in Health Care**
Theoretical frameworks in the field of communication and practical application of these principles to enhance professional communication in various health care settings. Topics include supportive communication, creative problem solving, effective oral presentation, persuasion, meeting management and group process. Credit 3 units.

**M88 AHBR 520 Introduction to Qualitative Research Methods**
In this course, you will become familiar with types of qualitative research methods (e.g., focus groups, one-on-one interviews, and participant-observation ethnography), appropriate use of these research methods, and approaches to analyzing qualitative data. Credit 1 unit.

**M88 AHBR 523 Introduction to Statistics for the Health Sciences**
This is an introductory course in statistics with a focus on the use of statistical analysis in clinical research. It is taught using SPSS, statistical analysis software commonly used in clinical research. The course teaches basic statistical methods with which clinical researchers will have the facility to execute their own analyses. Same as M17 CLNV 522 Credit 3 units.

**M88 AHBR 524 Foundations of Health Care Research**
This course provides an introduction to the basic scientific concepts and methods of investigation used in health care, social science and behavioral science. Students develop an advanced understanding of all phases and components of the research process. Topics include generating research questions and hypotheses, designing a study, selecting a study sample, measuring variables and constructs, collecting data, and planning data analysis and presentation. Prerequisite: M88-525 Introduction to Biostatistics. Credit 3 units.

**M88 AHBR 525 Introduction to Biostatistics**
This course introduces the basic principles and methods of biostatistics, providing a sound methodological foundation for applications in health care, medicine, public health and epidemiology. Basic statistics, including probability, descriptive statistics, inference for means and proportions, and regression methods are presented. Course work and assignments are designed to provide regular feedback, require repetition of core techniques necessary for mastery of statistical thinking and analysis, challenge students to tackle both straightforward and difficult applications of descriptive and analytic statistics to practical public health problems, and incorporate statistical tools and results into oral and written presentations, emphasizing proper use of language and effective communication. Credit 3 units.

**M88 AHBR 530 Organizational Development and Health Care Services**
Organizational theory as it applies to the management of health care services particularly in a changing environment. Includes planning, implementation and evaluation along with theories of human resources management. Prerequisite: Consult course listings. Credit 3 units.

**M88 AHBR 532 Principles of Management in Health Care**
This course enables students to explore the theoretical framework and practical application of classic management principles so that they can function effectively in a variety of organizational settings in the provision of health care services. Topics include the management process; managerial decision making and planning; negotiation skills; organization design; and leadership. Credit 3 units.

**M88 AHBR 535 Health Disparities: Applications in Clinical Settings**
This course explores how membership in a diverse/special group can impact health and health care, the identification of barriers to research participation, and effective strategies for improving...
recruitment efforts of minority and underserved populations. Exploration of health care services and policies governing these services is also included. Students are encouraged to give critical thought to the question of what it means to deliver culturally competent care. The goal of this course is to understand what it means to create environments (social and otherwise) that help to make individuals and communities healthy. Credit 3 units.

M88 AHBR 536 Health Education: Methods, Planning, and Evaluation
This course provides the basic concepts of learning theory as they relate to health behavior. Students become familiar with teaching/learning processes, teaching methods, community resources, and selection of appropriate evaluation strategies. Focus is on the role played by individual and community behavior as well as environmental and policy factors in preventing chronic and communicable diseases. Students attain the knowledge and skills to plan, develop, implement, monitor and evaluate behavior change programs for improving health status, as well as how to assess the health needs of communities and organizations. Prerequisite: M88-514 Health Behavior Theory. Credit 3 units.

M88 AHBR 540 Community Health Promotion
In this course students explore concepts in health promotion including community assessment, resource identification, intervention strategies and evaluation. State and national interventions for lifestyle change and model school and work site programs are featured Prerequisite: M88-514 Health Behavior Theory. Credit 3 units.

M88 AHBR 541 The Concept and Practice of Wellness
This information-oriented course is designed to educate students about wellness and health via a thorough investigation into factors related to wellness and a personal wellness experience as a wellness provider and a recipient of wellness coaching. These wellness factors include the skills, competencies and practices that enhance health and well-being on physical, mental, emotional and spiritual levels. Using concepts from a variety of disciplines, such as psychology, eastern and western medicine, public health, nutrition, exercise physiology, counseling, occupational therapy and epidemiology, students will examine determinants of health, explore issues related to wellness such as self-empowerment in relation to health promotion and disease prevention, and analyze critical issues that affect health and wellness such as stress and nutrition. The workshop format of this course requires a significant amount of student participation and class projects. Credit 3 units.

M88 AHBR 544 Organizations and Their Role in Health Care
Examines the role of various organizations in health care delivery. The involvement of organizations such as schools and worksites in health care will be reviewed. Opportunities for use of organizational settings for future health programs will be evaluated from the perspectives of consumers, providers and health care planners. Credit 3 units.

M88 AHBR 545 Applied Structural Equation Modeling
The focus of the course is a brief introduction to structural equation modeling (SEM) to familiarize students with the language, logic, and uses of SEM. The curriculum is designed to familiarize students with the language, logic, and uses of SEM. Students gain a strong foundation for understanding, designing, and testing sound measurement models, which can then be combined into more complex structural equation models. The majority of the course covers conceptual aspects and classical SEM applications like confirmatory factor analysis, path analysis, and causal modeling (including tests for mediators and moderators). Time permitting, the course also provides a brief discussion of more complex SEM analyses such as growth curve modeling and latent class analysis. Prerequisite: M88-525 Introduction to Biostatistics. Credit 1 unit.

M88 AHBR 546 Health and Aging
Explores various aspects of health and illness in later life. Uses current literature in the areas of social gerontology, psychology of aging, health promotion, and health behavior to provide a multidisciplinary perspective. Credit 3 units.

M88 AHBR 547 Power and Sample Size
Students learn the theoretical and practical aspects of how to calculate sample size for common study designs under various constraints (time, resources, etc.). An overview of statistical power computations for a variety of experimental and epidemiological study designs is provided. These include single sample designs, two-sample designs, cohort designs, case-control designs and various other experimental designs based on the Analysis of Variance model. The concepts of statistical power, statistical precision, sample size and effect size are also reviewed. Prerequisite: M88-525 Introduction to Biostatistics. Credit 1 unit.

M88 AHBR 548 Applied Data Management
This class is designed as an advanced seminar intended for students in the health and social sciences who plan to engage in applied research and includes a survey of important data management topics and techniques including: data programming and manipulation, data storage and security, data cleaning, relational database theory, and legal and ethical issues of data management. Students develop skills in data programming and manipulation, data storage and security, data cleaning, and relational database theory using software such as SPSS, SAS, Excel and Microsoft Access. Prerequisite: M88-525 Introduction to Biostatistics. Credit 3 units.

M88 AHBR 550 Survey Methods: Design and Evaluation
This applied course focuses on methodological issues regarding the design, implementation, analysis and interpretation of studies and questionnaires in public health research. Essential theoretical concepts are addressed and practical applications are emphasized. Survey design and planning, sampling and data collection procedures are three of the major topic areas covered. Credit 3 units.
M88 AHBR 562 Leadership and Change in Health Care Services

Students engage in the advanced study of leadership, integrating theory, research and application in a diagnostic approach. Leadership skills for managing planned organizational change are developed through group discussions, class exercises, case studies, and the application of organizational approaches to change and innovation. Topics include personal effectiveness, team building, and creating learning environments in organizations.

Credit 3 units.

M88 AHBR 582 Evaluation of Health Services Programs

This course introduces students to the fundamentals of program evaluation methodology, methods of data collection and related measurement reliability and validity. The curriculum features practical applications and illustrations. Topics include the link between program planning and program evaluation; evaluation research designs and their limitations; integrating process and outcome approaches; methods of data collection and utilization of evaluation results. Prerequisite: M88-536 Health Education: Methods, Planning and Evaluation.

Credit 3 units.

M88 AHBR 584 Internship

Provides an opportunity to participate in health promotion through various health promotion agencies. Students work with agency site supervisor for 42 contact hours developing, implementing and evaluating a health promotion project. Also, students meet monthly for 2.5-hour seminars with HCS internship adviser. Students must submit an application (to be obtained in Health Care Services office) and résumé. Approved applicants will be interviewed by agency site supervisor. Deadline for application: one month before registration deadline of intended semester.

Credit 3 units.

M88 AHBR 588 Epidemiology for Clinical Research

The purpose of this course is to provide an understanding of the use of epidemiological concepts and methods in clinical research. Two primary foci are included: 1) common applications of epidemiologic principles and analytic tools in evaluating clinical research questions; and 2) student development of skills to review and interpret the medical literature and utilize publicly available datasets to address clinical research questions.

Credit 3 units.

M88 AHBR 589 Intermediate Methods for Clinical and Outcomes Research

This course focuses on the application of advanced epidemiologic principles and outcomes research as applied to clinical research. Students study the tools used in clinical research, in clinical issues, and in understanding the medical literature concerning these issues, which are crucial for making informed decisions in the care of patients. Critical thinking and scientific/analytic competencies are emphasized throughout the course. Prerequisite: Epidemiology for Clinical Research or M17-513 Designing Outcomes for Clinical Research.

Credit 3 units.

M88 AHBR 590 Designing Clinical Research

Intended for beginning investigators who need to learn how to pose a research question, choose study subjects, make measurements, use questionnaires, use secondary data, understand various research designs including cohort studies, cross sectional studies, case controlled studies, and the evaluation of diagnostic tests, as well as experiments. Course will include basic research statistics, the ethics of research, planning for data management and analysis, and writing and funding a proposal. Each student will prepare a full research protocol suitable for submission to a funding agency or institutional review board on a research question of their choice.

Credit 3 units.

M88 AHBR 594 Oncology Health Education

This course is designed to focus on health education research and practice in cancer prevention and care. The course will review prevention strategies (e.g., smoking cessation, promotion of healthy diet and exercise), strategies for promoting early detection and screening, and treatment strategies (e.g., adherence education, enhancing communication between patient and treatment team, education of family members) and related research with cancer patients, groups at risk for cancer, and families or others impacted by cancer. Based on developments in understanding of genetics of cancer, the course will also review approaches to patients, families, and the public about genetic factors in cancer and to promoting and providing appropriate genetic screening and counseling. Especially owing to the disproportionate burden of cancer among underserved and minority groups, the course will include perspectives of different ethnic groups and socioeconomically disadvantaged groups.

Credit 3 units.

Audiology and Communication Sciences

The Program in Audiology and Communication Sciences (PACS) provides training and graduate programs in the fields of clinical audiology, deaf education, and speech and hearing sciences. PACS is a member of a consortium of programs known as CID at Washington University School of Medicine. The consortium, which also includes hearing research programs and adult audiology clinics, was born out of the pioneering efforts of St. Louis physician Max Goldstein, MD. In 1914, he founded the Central Institute for the Deaf (CID), where doctors and teachers worked together to help people who were deaf or hard of hearing. When the school building opened two years later, its auditory/oral methods for instructing children were groundbreaking.

Washington University and CID first joined forces in 1931, when CID’s established teacher training program became the first deaf education undergraduate program to affiliate with a university. Graduate programs in deaf education, audiology, and speech and hearing sciences soon followed. CID’s research efforts began in the 1930s to study the anatomy and science of hearing. During World War II, CID’s research on hearing loss in military personnel laid the foundation for the field of audiology. CID
also pioneered hearing testing and hearing aid, and opened the country’s first hearing aid clinic in 1941.

In September 2003, a new affiliation transferred CID’s graduate programs, research programs, and adult audiology clinic, along with its building, to Washington University School of Medicine. The graduate programs moved into the new Program in Audiology and Communication Sciences (PACS). Today, PACS offers an undergraduate minor in speech and hearing and three graduate programs.

- Doctor of Audiology (AuD): prepares students as clinical audiologists
- Master of Science in Deaf Education (MSDE): prepares students as teachers of children who are deaf or hard of hearing
- PhD in Speech and Hearing Sciences: prepares students for academic and research careers in speech and hearing sciences

**Additional Information**

Further information, including complete admissions details and full program descriptions, may be obtained by contacting:

Washington University School of Medicine
Program in Audiology and Communication Sciences
660 S. Euclid Ave., CB 8042
St. Louis, MO 63110
Fax: 314-747-0105

**Phone:** 314-747-0104  
**Email:** pacs@wustl.edu  
**Website:** https://pacs.wustl.edu

**Degrees & Requirements**

**Doctor of Audiology (AuD)**

During the first three years, course work is integrated with clinical and research training, with students completing and presenting a Capstone Project in the third year of study. The fourth year is fully dedicated to clinical training. A variety of formative and summative assessments are required during the four-year program to ensure each student’s acquisition of knowledge and mastery of skills. The curriculum covers the scope of practice and includes course work in the basic and applied sciences, as well as prevention, identification, evaluation and treatment of auditory and vestibular disorders. In the first year of study, students complete foundational course work and begin observation and practicum; during years two and three, the time in practicum increases and in courses decreases until the fourth year, when students complete a full-time clinical externship.

The audiology program is accredited by the Council on Academic Accreditation (CAA) of the American Speech-Language-Hearing Association (ASHA). Graduates are eligible for national certification by ASHA.

**Master of Science in Deaf Education (MSDE)**

The Master of Science in Deaf Education (MSDE) program trains teachers of the deaf and hard of hearing, preparing them as professionals with the knowledge and skills to work in a variety of settings with children of all ages. Early identification of hearing loss and advanced hearing technologies have increased the national need for teachers with experience in listening and spoken language, creating opportunities for our graduates across the country. In the first year of study, students complete foundational course work and begin observation and practice teaching; advanced course work and formal practice teaching experiences are completed in the second year.

The deaf education program is accredited by the State of Missouri’s Department of Elementary and Secondary Education (DESE) and the Council on Education of the Deaf (CED). Graduates of the program are eligible for teacher certification in the State of Missouri (Deaf/Hearing Impaired, Birth-Grade 12) and for national certification by CED.

**Doctor of Philosophy (PhD) in Speech and Hearing Sciences**

The PhD program in Speech and Hearing Sciences (http://bulletin.wustl.edu/grad/gsas/sahs) prepares students for academic and research careers in speech and hearing sciences. Established in 1947, the program is dedicated to fostering scientific inquiry in speech and hearing sciences and related disciplines. The program is administered through the Graduate School at Washington University in St. Louis.

**Minor in Speech and Hearing Sciences**

The Minor in Speech and Hearing Sciences (http://bulletin.wustl.edu/undergrad/artsci/speechhearing) is designed for current undergraduate students interested in exploring topics related to human communication. Course work provides an overview of the fields of hearing, deafness, language and speech, with opportunities to explore related topics in more depth. This minor is especially valuable for students in fields such as psychology, education, philosophy-neuroscience-psychology (PNP) and linguistics, but has broad applicability for many fields of study. Course work completed as part of this minor can also be used to fulfill prerequisites for graduate studies in audiology, deaf education and speech-language pathology.

**Research**

The integration of research into the curriculum is a distinctive feature of the PACS graduate programs. All students receive
research training through course work and the completion of an
independent research project. An NIH T-35 grant supports short-
term mentored research opportunities for PACS AuD students
and scholars visiting from other universities who are interested in
pursuing research careers.

The affiliated Department of Otolaryngology’s Harold W. Siebens
Hearing Research Center provides focused research in two
primary areas. The Fay & Carl Simons Center for the Biology
of Hearing and Deafness is a group of investigators within the
department that study the cellular and molecular mechanisms
of auditory signal transduction, sensory cell death, and
regeneration and development. Ongoing and new studies within
this group are adding to our understanding of the molecular and
cellular processes of the development of neural connections,
hearing loss and the potential for future treatments. In the
Center for Childhood Deafness and Adult Aural Rehabilitation,
researchers are achieving a better understanding of how
communication disorders can be measured, treated and
overcome.

Additional areas of research focus within the department include
the study of normal vestibular function and vestibular disorders,
hearing aids, cochlear implants, auditory brainstem implants,
age-related and noise-induced hearing loss, and education of
children who are deaf and hard of hearing.

Faculty
Program Director
William W. Clark, PhD
Professor of Otolaryngology
Professor of Audiology and Communication Sciences

Director of Deaf Education Studies
Heather J. Hayes, PhD
Associate Professor of Otolaryngology
Associate Professor of Audiology and Communication Sciences

Director of Audiology Studies (Interim)
Amanda Ortmann, PhD
Assistant Professor of Otolaryngology
Assistant Professor of Audiology and Communication Sciences

Associate Professor
L. Maureen Valente, PhD
Associate Professor of Otolaryngology
Associate Professor of Audiology and Communication Sciences

Assistant Professors
Brian T. Faddis, PhD
Assistant Professor of Audiology and Communication Sciences
Professor of Otolaryngology

Rosalie M. Uchanski, PhD
Assistant Professor of Audiology and Communication Sciences
Professor of Otolaryngology
Visit our website for a complete list of our participating faculty
(https://pacs.wustl.edu/our-faculty-2) and their appointments.

Christine M Clark, MA
Adjunct Instructor in Audiology and Communication Sciences
(primary appointment)
MA Maryville University 1999
BA Fontbonne College 1979

Roanne Kay Karzon, PhD, M ED, MS
Adjunct Assistant Professor of Audiology and Communication Science (primary appointment)
Adjunct Assistant Professor of Otolaryngology
BA University of Connecticut 1974
PHD Washington Univ in St. Louis 1982
M ED University of Virginia 1976
MS University of Virginia 1976

Barbara A Lanfer, M ED
Adjunct Instructor in Audiology and Communication Sciences
(primary appointment)
BA Fontbonne University 1975
M ED University of MO St Louis 1998

James D. Miller, PHD, MA
Instructor in Audiology and Communication Sciences (primary appointment)
Instructor in Otolaryngology
PHD Indiana University Bloomington 1957
BS Univ of Wisconsin Madison 1951
MA Indiana University Bloomington 1953

Mary Ann Shortal, MS
Adjunct Instructor in Audiology and Communication Sciences
( primary appointment)
MS Washington Univ in St. Louis 1979
BS Washington Univ in St. Louis 1976

Courses
Visit online course listings to view offerings for M89 PACS
M89 PACS 234 Introduction to Speech and Hearing Sciences and Disorders
Introduction to the fields of speech-language pathology, audiology, education of hearing-impaired children, and speech and hearing sciences. Normal speech and hearing processes are discussed, as well as communication disorders. Selected research topics in speech and hearing sciences are presented. Same as L12 Educ 234
Credit 2 units. BU: BA EN: S

M89 PACS 401 Anatomy and Physiology of Speech and Hearing
Introduction to anatomy and physiology of the peripheral hearing system and central nervous system, including functional descriptions of the systems and processes underlying speech and hearing function and dysfunction.
Credit variable, maximum 3 units.

M89 PACS 4011 Behavior Management
Introduction to various behavior management systems effective in both individual and group environments. Behavior interventions, classroom management strategies, environmental controls, psychodynamic techniques, and biophysical interventions are discussed, observed and practiced. Focus is on working with children who are deaf or hard of hearing. Lectures and experience with children. Prerequisite: Permission of department required.
Credit 2 units.

M89 PACS 414 Hearing
Study of the basic auditory phenomena: sensitivity, psychophysical attributes, masking, localization, adaptation and complex auditory perception. Prerequisite: Permission of department required.
Credit 3 units.

M89 PACS 416 Evaluation Techniques for Children Who Are Deaf or Hard of Hearing
A basic introduction to psychometrics with emphasis on the selection, interpretation and evaluation of assessments. Specific techniques for evaluating intellectual, educational, and linguistic abilities and achievement in children who are deaf or hard of hearing, from infancy through adolescence, are discussed and demonstrated. Prerequisite: Permission of department required.
Credit 3 units.

M89 PACS 421 Introduction to Electroacoustics
Introduction to the physics of sound. Topics include production, transmission and reception of sound and factors affecting human communication. Includes discussion, lectures, problems and lab.
Credit 3 units.

M89 PACS 424 Speech and Hearing Sciences
Surveys a broad array of speech and hearing science topics. Focus is on how speech and hearing science research findings can be applied to the practice of deaf education.
Credit 1 unit.

M89 PACS 4301 Sign Language I
Basics of American Sign Language are introduced, including vocabulary, grammatical structure, fingerspelling and cultural information about the deaf community. This is a highly interactive and participatory course.
Credit 2 units.

M89 PACS 4302 Sign Language II
Continues development of American Sign Language with additional vocabulary, emphasis on expressive and receptive abilities, conversational skills, and knowledge of deaf culture. This is a highly interactive and participatory course. Prerequisite: PACS 4301-Sign Language I.
Credit 2 units.

M89 PACS 434 Typical Language Development
Study of typical language development, including the phonologic, morphologic, semantic, syntactic and metalinguistic aspects. Interactions between linguistic and other areas of child development will be discussed. Contrasts will be explored between typical and atypical child development to shed light on language learning processes.
Credit 3 units.

M89 PACS 438 Early Literacy Development of Children Who Are Deaf or Hard of Hearing
Development of early print-recognition, reading and writing of children who are typically hearing and children who are deaf or hard of hearing. Focus is on the years leading up to kindergarten. An overarching theme is the interaction between early language and early literacy development. Evidence-based strategies for differentiated instruction will also be discussed. Permission of department required.
Credit 3 units.

M89 PACS 444 Amplification Systems and Aural Rehabilitation for Children
This course will provide students with a broad understanding of amplification systems and principles and methods of aural rehabilitation as they apply to children who are deaf or hard of hearing. Amplification systems to be covered will include digital hearing aids, cochlear implants and a full range of assistive devices. Aural rehabilitation topics will emphasize patient management and will include communication strategies, conversation styles and speech recognition assessment. Students will be provided with videotapes, live demonstrations and in-class activities. Direct contact with children and technological devices will also be used to support lectures and discussions. Prerequisite: Permission of department required.
Credit 2 units.

M89 PACS 4500 Observation in Deaf Education
Supervised observation of children who are deaf or hard of hearing in educational settings. Prerequisite: Permission of department required.
Credit variable, maximum 6 units.

M89 PACS 4511 Practicum in Deaf Education
Study of typical language development, including the phonologic, morphologic, semantic, syntactic and metalinguistic aspects. Interactions between linguistic and other areas of child development will be discussed. Contrasts will be explored between typical and atypical child development to shed light on language learning processes. Prerequisite: Permission of department required.
M89 PACS 4512 Practicum in Deaf Education
Supervised practicum in education of children who are deaf or hard of hearing. Students will be placed in field experiences (early, mid-level and culminating levels) in a variety of educational settings with a variety of age ranges, using interventions in areas such as language, speech, auditory training, reading, math and other content areas. Prerequisite: Permission of department required. Credit 2 units.

M89 PACS 4515 Language Instruction for Children Who Are Deaf or Hard of Hearing
Principles and methods of developing competence in spoken English in children who are deaf or hard of hearing, birth to grade 12. Includes presentation of differentiated instructional techniques for teaching a diverse population of children who are deaf or hard of hearing English vocabulary, syntax and pragmatics, as well as techniques for auditory training. Evaluations and data-driven lesson planning/IEP/IFSP development will be discussed, as well as the role of families as engaged educational partners in spoken language development. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 4525 Foundations of Literacy Theory and Instruction
Principles and methods of developing reading and writing competence in children who are typically hearing, with an emphasis on the stages of development and appropriate teaching sequences. Based on this foundation, strategies and methods will be presented for making appropriate differentiated learning adaptations and interventions for reading instruction with students who are deaf or hard of hearing who have language and reading deficits. Additional topics include the use of children's literature in instruction, the intersection of language and reading development, content literacy, and general language arts instruction. Prerequisite: Permission of department required. Credit 4 units.

M89 PACS 4526 Literacy Lab: A Focus on Typical and Atypical Learners
Emphasizes observation and some practice planning and teaching reading and writing with students who are typical and atypical learners, including children who are deaf or hard of hearing and who struggle to develop appropriate literacy skills. Observations will focus on areas such as how teachers use differentiated learning strategies for diverse learners, the use of children's literature in instruction, the intersection of language and reading development, instruction in content literacy, and general language arts instruction. Prerequisite: Permission of department required. Credit 2 units.

M89 PACS 454 Mathematics and Content-Area Instruction for Children Who Are Deaf or Hard of Hearing I
Principles and methods of teaching mathematics to students who are typically hearing and those who are deaf or hard of hearing. Strategies for other content-area instruction (science, social studies), use of instructional technology, and strategies for improving content literacy will also be discussed, with an emphasis on techniques for working with children who are deaf or hard of hearing. Students will practice developing and implementing lesson plans that are aligned to state and national standards. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 455 Mathematics and Content-Area Instruction for Children Who Are Deaf or Hard of Hearing II
A continuation of PACS 454. Principles and methods of teaching mathematics to students who are typically hearing and those who are deaf or hard of hearing. Strategies for other content-area instruction (science, social studies), use of instructional technology, and strategies for improving content literacy will also be discussed, with an emphasis on techniques for working with children who are deaf or hard of hearing. Students will practice developing and implementing lesson plans that are aligned to state and national standards. Prerequisites: PACS 454 and permission of department required. Credit 3 units.

M89 PACS 457 Counseling Parents of Children Who Are Deaf or Hard of Hearing
Examines the psychological needs of families who have children who are deaf or hard of hearing. The aim of the course is to help teachers of children who are deaf or hard of hearing interact more effectively with parents and caregivers, using a collaborative model that views families as engaged partners in the educational process. Students will develop a repertoire of interviewing and counseling skills, as well as learn about a wealth of resources to share with families. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 458 Speech for Children Who Are Deaf or Hard of Hearing
Development, improvement and maintenance of speech skills for children who are deaf or hard of hearing through multisensory approaches. Articulation, voice and rhythm patterns are considered. Lectures, demonstrations and practice. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 460 Audiology Staffing
Supervised observation and practicum in audiology. Prerequisite: Permission of department required. Credit 1 unit.

M89 PACS 4611 Practicum in Audiology
Supervised practicum in audiology. Prerequisite: Permission of department required. Credit 1 unit.

M89 PACS 4621 Practicum in Audiology
Supervised practicum in audiology. Prerequisite: Permission of department required. Credit 2 units.

M89 PACS 4631 Practicum in Audiology
Supervised practicum in audiology. Prerequisite: Permission of department required. Credit 2 units.
M89 PACS 4641 Externship in Audiology
Clinical externship in audiology (on campus). Prerequisite: Permission of department required. Credit 9 units.

M89 PACS 4651 Externship in Audiology (Off-Campus)
Clinical externship in audiology (off campus). Prerequisite: Permission of department required. Credit 9 units.

M89 PACS 466 Rehabilitative Audiology
Principles and methods of aural rehabilitation with an emphasis on patient management. Topics include communication strategies and conversation styles, speech recognition assessment and hearing aid service provisions for adults, older persons, children and family members. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 468 Pediatric Audiology
Fundamentals of audiological assessment for infants and children. Behavioral and electrophysiologic procedures, and assessment of auditory processing abilities, are presented. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 470 Business Practices
Issues relating to establishing a private practice including clinical management, small business and accounting practices, models of private practice, referrals and reimbursement, and managed care. Prerequisite: Permission of department required. Credit 2 units.

M89 PACS 5001 Electrophysiologic Techniques I
Introduces basic concepts in administration and interpretation of physiologic and electrophysiologic measures, with focus on auditory evoked potentials (AEP). Content covers basic instrumentation, parameters and variables affecting the AEP, auditory brainstem response (ABR), middle (MLR) and late (LLR) evoked potentials, auditory steady state response (ASSR) and otoacoustic emissions (OAE). Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 5002 Electrophysiologic Techniques II
Advanced concepts related to the administration and interpretation of physiologic and electrophysiologic measures. Content includes in-depth study of ABR and other auditory evoked potentials, and the clinical application of these for the audiologist. Additional topics include study of electrocochleography (ECochG), P300 auditory responses, and mismatched negativity (MMN). This course will include a thorough study of intraoperative monitoring including neurophysiology and anatomy review, cranial nerve monitoring, spinal cord monitoring, and facial nerve monitoring. Prerequisites: Permission of department required. Credit 2 units.

M89 PACS 502 Pharmacology
Includes basic information related to medications utilized for treating common hearing/balance disorders. Hearing and balance side effects of medications are discussed, as are ototoxic and preventative mechanisms related to pharmacology. Prerequisites: Permission of department required. Credit 1 unit.

M89 PACS 505 Auditory Neuroscience
Development of an in-depth understanding of issues related to auditory neurophysiology from the auditory nerve to the cortex. Prerequisites: Permission of department required. Credit 2 units.

M89 PACS 506 Genetics in Hearing Loss
Study of the genetic causes of hearing loss and balance disorders, and syndromes affecting the auditory and vestibular systems. Prerequisites: Permission of department required. Credit 1 unit.

M89 PACS 507 Vestibular Disorders
Comprehensive course covering the assessment, diagnosis and treatment of vestibular disorders. Prerequisites: Permission of department required. Credit variable, maximum 3 units.

M89 PACS 510 Auditory Perception
Study of how the listener perceives parameters of and differences in acoustical stimuli. Perception of the speech stimulus is also studied in detail, both for listeners who are typically-developing and those who are deaf or hard of hearing. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 511 Hearing Conservation
This course will cover topics related to hearing conservation, including effects of noise on hearing, environmental noise, classroom acoustics, federal regulations, interactions of noise and other agents, and ototoxicity. Additional topics may vary year-to-year. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 517 Counseling for Audiology
Examines the relationship between clinician and patient in audiology. Topics include counseling theory and practices, and principles and methods of effective interviewing and counseling across the lifespan. Prerequisites: Permission of department required. Credit 2 units.

M89 PACS 519 Psychosocial and Educational Foundations of Deafness
Examines psychological, social, educational, legal, historical, and cultural influences related to individuals who are deaf or hard of hearing. Additional topics include IEPs and interprofessional collaboration related to post-high-school transitions. Prerequisite: Permission of department required. Credit 2 units.

M89 PACS 543 Survey of Speech and Language Disorders
Surveys a broad range of speech and language disorders in terms of associated characteristics, assessment techniques and treatment considerations. Prerequisites: Permission of department required.
M89 PACS 544 Clinical Observation and Methods in Speech-Language Pathology
Provides students with an introduction to clinical methods and observation experiences in speech-language pathology. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 551 Research Seminar
A seminar of variable topics related to research in speech and hearing sciences. Each semester/section has its own specific area of focus, which may include an investigation of active areas of research, an overview of outcomes-based research and evidence-based practice for students’ research projects, or thorough analysis and discussion of a specific area of active research. Refer to section description for information on specific topics by section. Prerequisite: Permission of department required. Credit variable, maximum 3 units.

M89 PACS 554 Fundamentals of Early Intervention and Child Development
Course provides information about general and exceptional child development, focusing on ages birth through five years. Course also discusses historical and philosophical tenets of early intervention practice, focusing on a collaborative coaching model, which views families as engaged partners in the child’s education. Other topics include addressing needs of families from a variety of cultural and economic backgrounds, linking families to resources, and federal laws that govern special education services for children with disabilities including transitions in service provisions for children at the age of 3 years. Prerequisites: Permission of department required. Credit 1 unit.

M89 PACS 555 Early Intervention: Serving Children Who Are Deaf or Hard of Hearing, Birth to Age 5
This course provides an overview of an early childhood development of children who are deaf or hard of hearing, birth to age 5, with particular focus on early speech and language development, intervention strategies, assessment techniques, instructional strategies, and aural rehabilitation. Course discusses the philosophical tenets of early intervention practice, which views families as engaged partners in the child’s education, and respects cultural and linguistic diversity. Students will learn about IFSP and IEP development, as well as a variety of resources that can be provided to families. Prerequisite: Permission of department required. Credit 3 units.

M89 PACS 558 Pre-Service Teacher Preparation
This course is designed to help students in the deaf education teacher training program create a teaching portfolio that reflects their own teaching development. Students will demonstrate their ability to reflect on and critique their own teaching practice especially in relation to course planning, instructional strategies, differentiated learning, data-based decision-making, tiered systems for supporting instruction, and classroom management. Professional issues, including developing a résumé and conducting interviews, will also be discussed. Prerequisites: Permission of department required. Credit 2 units.

M89 PACS 5601 Clinical Audiology I
An introduction to the field of clinical audiology. Covers the role of the audiologist in the diagnosis and treatment of hearing disorders; the administration and interpretation of audiologic test results; and amplification systems and assistive devices, such as DM/FM technology. Additional topics may include relevant calibration and instrumentation requirements, audiology as a career, aural rehabilitation, and legal and ethical issues in the field. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 5602 Clinical Audiology II
Covers hearing evaluation and diagnosis in clinical audiology from infancy through adulthood. Topics include auditory processing disorders, functional hearing loss, and other advanced measures. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 565 Hearing Devices in Audiology I
Philosophical issues related to the selection and evaluation of hearing devices, including hearing aids and alternative devices. Means of adjusting hearing devices and measuring their function and benefit are covered. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 5652 Hearing Devices in Audiology II
Advanced issues related to the selection and evaluation of hearing aids. Means of adjusting hearing aids and measuring their function and benefit. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 5653 Hearing Devices in Audiology III
Course covers a variety of topics related to selection, fitting and rehabilitation of cochlear implant patients. Lectures and practical experience in psychophysical testing, programming of the cochlear implant, and auditory training. Prerequisites: Permission of department required. Credit 3 units.

M89 PACS 569 Hearing Disorders
This course covers the nature and causes of hearing disorders, including outer and middle ear, cochlear, retrocochlear and central nervous system. Prerequisites: Permission of department required. Credit 2 units.

M89 PACS 570 Independent Study
Students engage in independent work on the Independent Study, which demonstrates advanced critical thinking and writing skills. Prerequisites: Permission of department required. Credit variable, maximum 6 units.
M89 PACS 5700 Capstone Project
Independent work on the Capstone Project. Prerequisites: Permission of department required.
Credit variable, maximum 6 units.

M89 PACS 5701 Capstone Project Seminar
This weekly, joint meeting is intended to provide extra and preliminary support for initiation of the Capstone Project. Areas will include but are not limited to: journal article critique, scientific writing, overview of research design and methodologies, statistical review, support for graph and table construction, and others. Prerequisites: Permission of department required.
Credit 1 unit.

M89 PACS 574 Statistics and Research Methods
Examines experimental and field research methods as they apply to audiology and communication sciences. Covers such methods as surveys, survey interviews, content analysis, and experimental design. Prerequisites: Permission of department required.
Credit 2 units.

M89 PACS 575 Special Topics
Special topics in speech and hearing sciences, audiology and/or education of the deaf or hard of hearing. Contact the department for more information. Prerequisites: Permission of department required.
Credit variable, maximum 4 units.

M89 PACS 577 Research in Speech and Hearing
Prerequisites: Permission of department required.
Credit variable, maximum 12 units.

M89 PACS 587 Dissertation Research
Prerequisites: Permission of department required.
Credit variable, maximum 12 units.

M89 PACS 885 Master's Nonresident
Prerequisites: Permission of department required.

Biology and Biomedical Sciences
The Division of Biology & Biomedical Sciences at Washington University offers exceptional doctoral education at one of the nation's preeminent biomedical research centers. The Division includes 11 doctoral programs:

- Molecular Genetics and Genomics
- Molecular Microbiology and Microbial Pathogenesis
- Neurosciences
- Plant and Microbial Biosciences
- Biochemistry, Biophysics and Structural Biology
- Computational and Systems Biology
- Developmental, Regenerative and Stem Cell Biology
- Evolution, Ecology and Population Biology
- Human and Statistical Genetics
- Immunology
- Molecular Cell Biology

A collaborative, interdisciplinary approach to research and education is a hallmark of Washington University and the Division. As a universitywide consortium, the Division transcends departmental lines and removes traditional boundaries of scientific fields. Faculty and graduate students regularly cross disciplines, devising novel questions and approaches that might otherwise go unexplored. The Division currently consists of 670 graduate students and over 500 faculty members from 37 departments.

Washington University in St. Louis provides unique opportunities in translating basic science to practical application. The university's BioMed 21 initiative provides $300 million to support research that bridges the gap from bench to bedside; the project included construction of a 215,000 square-foot building dedicated to such research. In addition, the Division's associations with internationally prominent local institutions provide exciting opportunities: Students in the biomedical sciences enrich their work with the clinical perspective of our outstanding medical school; students in plant, population, evolutionary, and ecological sciences benefit from our close affiliation with the internationally renowned Missouri Botanical Garden (http://www.missouribotanicalgarden.org) and the Danforth Plant Science Center (http://www.danforthcenter.org/default.asp).

To help prepare graduates for a career in academia, government, industry or another field of their choice, educational opportunities are offered for skills development and career exploration. Through our Career Talks program, professionals from a variety of fields, such as biotech start-ups and patent law, provide presentations and Q & A sessions to students throughout the year. In addition, through partnerships with groups such as the Teaching Center, the BALSA Group and ProSPER, students have additional opportunities to develop experiences relevant to future career goals.

Admissions Information
Please visit the Admissions (p. 26) section of the Bulletin for more information.

Additional Information
Further information, including full program descriptions, may be obtained by contacting:

Mailing address:
Division of Biology & Biomedical Science
Washington University in St. Louis
660 S. Euclid Ave., CB 8226
St. Louis, MO 63110
Degrees & Requirements

PhD Degrees

Each program has its own steering committee, which provides students with guidance, addresses their needs, and monitors their progress. The committee also helps each student customize the course of study to match their individual needs. Each of the 11 programs establishes its own degree requirements.

Across all the programs, the course of study consists of five distinct parts:

Courses

This generally requires two to five semesters and usually consists of four to nine courses in areas fundamental to the student's program. Students are expected to maintain a B average in graduate courses.

Laboratory Rotations

Selecting a thesis adviser is the most important decision a student makes in graduate school. To help each student make an informed, thoughtful choice, the Division builds in flexibility to explore options. Students usually participate in three lab rotations during their first year. Additional rotations can be arranged, and rotation lengths are flexible. Students usually begin their thesis research by the end of their first year.

Qualifying Examination

After required courses are completed, each student takes a preliminary, or qualifying, examination to assess mastery of the field and the ability to integrate information across fields. Upon successful completion of the qualifying exam, the student concentrates on thesis research.

Thesis Research

Thesis research begins once the student has chosen a laboratory in which to work. With their mentor — the laboratory’s principal investigator — the student devises a thesis project and chooses an advisory committee. Typically between the end of their second year and middle of their third year, students present their thesis proposals to the thesis committee. Upon successful approval of the thesis proposal, the student officially becomes a doctoral candidate. For the rest of the student's program of study, the thesis committee monitors progress and meets at least once a year to provide analysis and advice. It also serves as the thesis defense committee when the thesis is ready for presentation. Most students complete and defend their dissertations by the end of their sixth year.

Scientific Scholarship

Keeping abreast of scientific developments is critical for faculty and students alike. The Division offers many ways to stay current. More than 15 weekly biology seminars provide excellent opportunities to meet outstanding scientists from outside Washington University. Several annual symposia bring internationally recognized speakers to campus. Journal clubs meet weekly for students, postdoctoral fellows, and faculty to present and discuss current scientific literature. A number of Special Emphasis Pathways (http://dbbs.wustl.edu/curstudents/SpecialEmphasisPathways/Pages/SpecialEmphasisPathways.aspx) allow students to enhance their PhD program. Program retreats allow for informal interaction among students and faculty. The Division also provides funds for each student to defray the costs of attending a national scientific meeting.

Research

Biochemistry, Biophysics and Structural Biology (http://dbbs.wustl.edu/divprograms/biophysics/Pages/BBSB.aspx)

Areas of study: DNA repair, replication and recombination, allostery and enzymology, molecular signaling, cell cycle regulation, biochemistry of host-pathogen interactions, mechanisms of microbial immune invasion, mechanisms of neural degeneration, nucleic acid-protein interactions, nanotechnology and chemical biology, cellular transport and trafficking, computational biophysics.

Visit our website for information about our Biochemistry, Biophysics and Structural Biology faculty (http://dbbs.wustl.edu/divprograms/biophysics/Pages/Faculty.aspx).

Computational and Systems Biology (http://dbbs.wustl.edu/programs/CompBio)

Areas of study: systems biology, genomics, sequence analysis, regulatory networks, synthetic biology, metagenomics, metabolomics, proteomics, epigenomics, transcriptomics, lipidomics, single cell dynamics, high-throughput technology development, applied math and mathematical models of biological processes, computational biology, comparative genomics, personalized medicine, genome engineering, machine
learning, big data science, next generation sequencing and its applications, bioinformatics.
Visit our website for information about our Computational and Systems Biology faculty (http://dbbs.wustl.edu/divprograms/compbio/Pages/Faculty.aspx).

**Developmental, Regenerative and Stem Cell Biology** (http://dbbs.wustl.edu/programs/DevBio)

*Areas of study:* development, stem cell biology, regenerative biology, cell biology, genetics, cell signaling, the biology of cancer, epigenetics, circadian rhythms, systems biology.
Visit our website for information about our Developmental, Regenerative and Stem Cell Biology faculty (http://dbbs.wustl.edu/divprograms/devbio/Pages/Faculty.aspx).

**Evolution, Ecology and Population Biology** (http://dbbs.wustl.edu/programs/eepb)

*Areas of study:* population ecology, community ecology, plant and animal evolution, microbial evolution, evolution of behavior, phylogenetics, systematics, theoretical and experimental population genetics.
Visit our website for information about our Evolution, Ecology and Population Biology faculty (http://dbbs.wustl.edu/divprograms/eepb/Pages/Faculty.aspx).

**Human and Statistical Genetics** (http://dbbs.wustl.edu/programs/hsg)

*Areas of study:* human genetics, statistical genetics, functional genomics, molecular genetics, Mendelian disease, complex disease, human disease models, systems biology.
Visit our website for information about our Human and Statistical Genetics faculty (http://dbbs.wustl.edu/divprograms/hsg/Pages/Faculty.aspx).

**Immunology** (http://dbbs.wustl.edu/programs/immunology)

*Areas of Study:* cellular immunology, molecular immunology, lineage development, autoimmunity, cancer immunotherapy, transcription factors, epigenomics, mucosal immunity, innate immunity, bacterial, viral, and parasite immunity, immune evasion, antigen processing and presentation, dendritic cells, T cell signaling, antigen receptor diversification.
Visit our website for information about our Immunology faculty (http://dbbs.wustl.edu/divprograms/immunology/Pages/Faculty.aspx).

**Molecular Cell Biology** (http://dbbs.wustl.edu/programs/cellbio)

*Areas of study:* cell adhesion, protein trafficking and organelle biogenesis, cell cycle, receptors, signal transduction, gene expression, metabolism, cytoskeleton and motility, membrane excitability, molecular basis of diseases.
Visit our website for information about our Molecular Cell Biology faculty (http://dbbs.wustl.edu/divprograms/cellbio/Pages/Faculty.aspx).

**Molecular Genetics and Genomics** (http://dbbs.wustl.edu/programs/mgg)

*Areas of study:* genetics, genetic basis of disease, genomics, epigenetics, genetic engineering, genome editing, model organism genetics, development, cell biology, molecular biology, complex traits, bioinformatics, systems biology.
Visit our website for information about our Molecular Genetics and Genomics faculty (http://dbbs.wustl.edu/divprograms/genetics/Pages/Faculty.aspx).

**Molecular Microbiology and Microbial Pathogenesis** (http://dbbs.wustl.edu/programs/micro)

*Areas of study:* Host-pathogen interactions, cellular microbiology, molecular microbiology, microbial pathogenesis, pathogen discovery, emerging infectious diseases, microbial physiology and biochemistry, comparative genomics, gene expression and regulation, microbiome and host interactions, virology, bacteriology, mycology, parasitology.
Visit our website for information about our Molecular Microbiology and Microbial Pathogenesis faculty (http://dbbs.wustl.edu/divprograms/micro/Pages/Faculty.aspx).

**Neurosciences** (http://dbbs.wustl.edu/programs/neuro)

*Areas of study:* neurobiology, neurology, functional imaging, behavior, cognition, computational neuroscience, electrophysiology, sensory systems, motor systems, neuroglia, neuronal development, learning, memory, language, synaptic plasticity, mind, consciousness, neurodegeneration, diseases of the nervous system, neuronal injury, clinical neuroscience, motor control, biological rhythms, connectivity mapping.
Visit our website for information about our Neurosciences faculty (http://dbbs.wustl.edu/divprograms/neuro/Pages/Faculty.aspx).
Plant and Microbial Biosciences (http://dbbs.wustl.edu/programs/plantbio)

Areas of study: cell biology; development; physiology; signaling, development, metabolic regulation, photosynthesis, bioenergy, protein structure-function, synthetic biology, biogeochemistry, environmental microbiology, ecology, population genetics and molecular evolution.

Visit our website for information about our Plant and Microbial Biosciences faculty (http://dbbs.wustl.edu/divprograms/PlantMicroBioSci/Pages/Faculty.aspx).

Faculty

For a list of divisions and their areas of study, including more information about program faculty members, please refer to the Research (p. 282) section of this page.

Courses

For a full listing of courses offered through the Department of Biology and Biomedical Sciences, please visit the university online course catalog (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L41&crslvl=5:9).

Biomedical Engineering

Modern biomedical engineers face a far different world than those trained even two decades ago.

Explosive advances in our ability to probe and understand molecular and cellular processes and their interconnections now make it imperative that the powers of engineering be brought to bear at ever smaller, as well as at systemwide, levels. This will not only produce new discoveries at the most fundamental levels but also accelerate the translation of these discoveries into practical applications.

Our vision is that future leaders and lasting impact will arise from successfully integrating engineering concepts and approaches across molecular to whole-body levels. Moreover, those also trained to integrate the analytical, modeling and systems approaches of engineering to the complex and, sometimes overwhelming, descriptive details of biology will be uniquely positioned to address new and exciting opportunities. We are committed to educating and training the next generation of biomedical engineers with this vision in mind.

At Washington University, world-class biological, engineering and medical research — along with top-notch, state-of-the-art health care — are closely intertwined. For more than 50 years, collaborations between the School of Medicine and the School of Engineering & Applied Science have led to major advances in many areas including: positron emission tomography, medical applications of ultrasound, application of computers to hearing research, and development of heart valve flow simulators. Since the establishment of the Department of Biomedical Engineering in 1997, this atmosphere of collaboration and collegiality between the two schools has been further strengthened and expanded, leading to an exceptional degree of synergy that is one of our hallmarks. All of our core faculty have been hired since 1997 and comprise a young, dynamic and still-expanding group.

The core faculty, together with over 70 affiliated faculty from other departments form a network of mentors dedicated to training the next generation of biomedical engineers. Our goal is to educate students in an interdisciplinary manner so that they can effectively collaborate with physicians, biologists and other life scientists to build their careers. Students can elect to perform their research with any member of the network.

The commitment and diverse talent of these faculty provide a vast array of choices to enable students to refine their unique quantitative and analytical engineering skills and apply them to relevant biomedical problems. As a result, our graduates are well-equipped to work in multidisciplinary teams tackling cutting-edge and high-impact problems of modern biomedical engineering.

Admissions Information

Please visit the Biomedical Engineering website (https://bme.wustl.edu/Pages/default.aspx) for admissions information.

Contact Information

Email: bme@seas.wustl.edu
Website: https://bme.wustl.edu/graduate

Degrees & Requirements

For more information about our graduate degrees, please visit the Biomedical Engineering (http://bulletin.wustl.edu/grad/engineering/biomedical) pages of the School of Engineering & Applied Science Graduate Programs Bulletin.

Research

Areas of Research

Health care problems posed by complex diseases present the most daunting challenges for modern society. These diseases include cancer, injuries to physiological systems, and disorders associated with embryonic development, aging and the adaptive immune system.

Our vision is that advances in the diagnosis and treatment of complex diseases will require integrative and multiscale engineering approaches to biology and biomedical sciences. The BME department faculty will produce advances in basic science, enabling technologies and multiscale systems science approaches that will provide a more holistic understanding of the spatiotemporal responses of biomolecular and cellular networks that give rise to the onset and progression of such diseases and the propagation of injuries.
This will involve an integrative approach with a synergistic focus on development, regeneration and degeneration of cells and tissues, and will be leveraged to transform the development of novel biomaterials, drugs and biomedical devices for diagnosis and treatment.

**Biomedical & Biological Imaging (BBI)**

This program seeks to bring the most innovative technology — whether it be next-generation hardware, multiple modalities, advanced image reconstruction or signal-processing methods, new contrast agents or novel applications — to bear on important basic science and clinical issues. Our goal is to develop new technologies to complement the already strong research and clinical imaging activities in our community.

**Cancer Technologies (CT)**

Cancer Technologies seeks to enhance our understanding and treatment options for cancer using the latest methods and approaches in engineering. The broad goals of Cancer Technologies are to apply the latest engineering methods and techniques (imaging, microfluidics, optogenetics) to enhance understanding and therapy for cancer. Faculty working in this area seek to understand how cancer metastasizes by examining how cells migrate through tissue, enter the circulation, and exit at distant sites (lung, brain, liver, bone). In addition, faculty seek to develop novel imaging methods (ultrasound, photoacoustic) that can detect cancer at earlier stages, as well as provide information on the functional or metabolic state of the cancer.

**Cardiovascular Engineering (CVE)**

Cardiovascular disease is the number one cause of death and disability in the developed countries. Cardiovascular Engineering encompasses a multidisciplinary effort to improve our understanding of cardiovascular disease and develop better therapies. This program seeks to develop new methods to study, diagnose and treat cardiovascular diseases. Examples include understanding how molecules control the heartbeat, imaging the electrical potential at the surface of the heart, engineering cardiac tissues, and creating mathematical models to connect heart function to its nanoscale molecular foundation.

**Molecular & Cellular Systems Engineering (MCSE)**

The molecular and cellular networks that compose cells and tissues fundamentally determine the emergent properties that shape the physiology of healthy organs and pathological tissues that cause diseases, like neurodegeneration and cancer. Their complexity requires novel and integrated approaches that span scales, ideas and techniques. Pushing the boundary of knowledge in the direction of understanding molecular, cellular, and tissue systems will allow us to gain the insight required to build better therapies. This program seeks to develop innovative approaches for treating disease by manipulating molecules, cells or systems. For example, diseases associated with misfolded proteins, such as Alzheimer’s and Huntington’s, could be treated by understanding and eventually modifying how proteins fold into their complex three-dimensional, functional configurations. Better understanding of most biological processes is likely to depend upon systemwide approaches at all levels.

**Neural Engineering (NE)**

Neural Engineering research involves fundamental and applied studies related to neurons, neural systems, behavior and neurological disease. This program involves fundamental and applied studies related to neurons, neural systems, behavior and neurological disease encompassing a spectrum of activities, including mathematical modeling; exploring novel approaches to sensory (vision, hearing, smell and touch) and motor processing; exploring fundamentals of neural plasticity; and designing neuroprosthetics. The approaches involve information processing at the molecular, cellular, systems and behavioral levels.

**Orthopedic Engineering (OE)**

Orthopedic Engineering combines principles of tissue engineering, cell biology and biomechanics to generate new knowledge of bone and soft tissue biology and develop novel therapies to treat musculoskeletal disease. This program seeks to understand the mechanical and material properties of bone and soft tissues (muscle, cartilage) and to exploit biomaterial and cellular processes to mediate injury responses and promote regeneration. Computational models play a significant role in the design of and development of new experimental methods and protocols.

**Regenerative Engineering in Medicine (REM)**

Regenerative Engineering in Medicine combines cell and molecular biology, cell biophysics and engineering methods to understand and control the organization and function of tissues. This program seeks to determine the fundamental principles regulating growth and remodeling in natural and engineered tissues. The result will be a better understanding of normal growth processes and the responses of cells, tissues and organisms to disease and trauma. This knowledge will be applied to the development of materials that promote healing and the regeneration of functional tissues.

**Faculty**

**Chair**

Lori A. Setton (https://engineering.wustl.edu/Profiles/Pages/Lori-Setton.aspx)

Lucy and Stanley Lopata Distinguished Professor of Biomedical Engineering

PhD, Columbia University

Biomaterials for local drug delivery; tissue regenerations specific to the knee joints and spine

Lucy and Stanley Lopata Distinguished Professor of Biomedical Engineering

PhD, Columbia University

Biomaterials for local drug delivery; tissue regenerations specific to the knee joints and spine
Endowed Professors

Rohit V. Pappu  
PhD, Tufts University  
Macromolecular self assembly and function; computational biophysics

Edwin H. Murty Professor of Engineering

Yoram Rudy  
Fred Saigh Distinguished Professor of Engineering  
Cardiac electrophysiology; modeling of the cardiac system

Frank Yin  
Stephen F. and Camilla T. Brauer Distinguished Professor of Biomedical Engineering  
Tissue and cell biomechanics; hemodynamics

Professors

Mark Anastasio  
PhD, University of Chicago  
Imaging sciences; phase-contrast; x-ray imaging

Jianmin Cui  
PhD, State University of New York–Stony Brook  
Ion channels; channel structure-function relationship; biophysics

Daniel Moran  
PhD, Arizona State University  
Motor control; neural engineering; neuroprosthetics; movement biomechanics

Quing Zhu  
PhD, University of Pennsylvania  
Biophotonics and multimodality ultrasound and optical imaging

Associate Professors

Dennis L. Barbour  
MD, PhD, Johns Hopkins University  
Auditory physiology; sensory cortex neurocircuitry; novel perceptual diagnosticians and therapeutics

Vitaly Klyachko  
PhD, University of Wisconsin-Madison  
Synaptic function and plasticity; neural circuits; information analysis; neurological disorders

Baranidharan Raman  
PhD, Texas A&M University  
Computational and systems neuroscience; neuromorphic engineering; pattern recognition; sensor-based machine olfaction

Jin-Yu Shao  
PhD, Duke University  
Cell mechanics; receptor and ligand interactions; molecular biomechanics

Kurt A. Thoroughman  
PhD, Johns Hopkins University  
Human motor control and motor learning; neural computation

Assistant Professors

Hong Chen  
PhD, University of Washington  
Physical acoustics; therapeutic ultrasound and ultrasound imaging

Nate Huebsch  
PhD, Harvard University  
Cell-material Interactions, iPSC-based tissue modeling to study cardiac development and disease

Abhinav Kumar Jha  
PhD, University of Arizona  
Development of computational-imaging solutions for diagnosing and treating diseases

Kristen Naegle  
PhD, Massachusetts Institute of Technology  
Computational systems biology with emphasis on cellular networks involved in cancer and diabetes

Jon Silva  
PhD, Washington University  
Ion channel biophysics

Michael D. Vahey  
PhD, Massachusetts Institute of Technology  
Biophysical mechanisms of infectious disease; fluorescence microscopy; microfluidics

Senior Professor

Larry Taber  
PhD, Stanford University  
Mechanics of growth and development; cardiac mechanics
Courses

Below are all BME graduate-level courses. Visit online course listings to view semester offerings for E62 BME (https://courses.wustl.edu/CourseInfo.aspx?sch=E&dept=E62&crslvl=5:8).

E62 BME 501C BME Doctoral Seminar Series
This is a 1-unit credit option for BME students who attend regularly scheduled BME seminars (or approved substitute seminars). A satisfactory grade is obtained by submission of a two-page peer-reviewed paper written by one of the regularly scheduled BME seminar speakers whose seminar the student attended. Papers are to be submitted to the graduate student administrator for review by the director of doctoral studies. Prerequisites: Students must be current BME students in their second year and beyond in order to register. Credit 1 unit.

E62 BME 506 Seminar in Imaging Science and Engineering
This seminar course consists of a series of tutorial lectures on Imaging Science and Engineering with emphasis on applications of imaging technology. Students are exposed to a variety of imaging applications that vary depending on the semester, but may include multispectral remote sensing, astronomical imaging, microscopic imaging, ultrasound imaging, and tomographic imaging. Guest lecturers come from several parts of the university. This course is required of all students in the Imaging Science and Engineering program; the only requirement is attendance. This course is graded pass/fail. Prerequisite: admission to Imaging Science and Engineering program. Same as E35 ESE 596 Credit 1 unit.

E62 BME 507 Radiological Physics and Dosimetry
This class is designed to construct a theoretical foundation for ionizing radiation dose calculations and measurements in a medical context and prepare graduate students for proper scientific presentations in the field of x-ray imaging and radiation therapy. Specifically, a student completing this course will be able to do the following: 1. Understand and apply key concepts specific to energy deposition for both ionizing photon interactions and transport in matter and for energetic charged particle interactions and transport in matter. Radiation sources include radioactivitity, x-ray tubes, and linear accelerators. 2. Understand the theoretical details of ion-chamber based dosimetry and of both cavity-theory based (TG-21) and Monte-Carlo based (TG-51) clinical protocols. 3. Perform and present real-world style research projects as a group, and present these projects in a typical professional scientific format and style. 4. Achieve an understanding of the history and potential future developments in ionizing radiation detection and dosimetry. Prerequisites: BS in physics or engineering and instructor approval. Credit 3 units.

E62 BME 5071 Radiobiology
Effects of ionizing radiations on living cells and organisms, including physical, chemical, and physiological bases of radiation cytotoxicity, mutagenicity and carcinogenesis. Textbook: Radiobiology for the Radiologist. Eric Hall and Amato Giaccia. Two lectures per week. Prerequisites: graduate student standing and one year each of biology, physics and organic chemistry, or approval of instructor. Credit 2 units.

E62 BME 5072 Radiation Therapy Physics
Ionizing radiation use in radiation therapy to cause controlled biological effects in cancer patients. Physics of the interaction of the various radiation modalities with body-equivalent materials, and physical aspects of clinical applications. Lecture and lab. Prerequisites: graduate student standing or permission of instructor. Credit 3 units.

E62 BME 5073 Radiation Protection and Safety
This course will introduce concepts of radiation protection and safety. The focus will be on how to protect humans and environment from ionizing radiation. Special emphasis will be on radiological protection in clinics. Prerequisite: graduate student standing or permission of instructor. Credit 2 units.

E62 BME 523 Biomaterials Science
An understanding of the interactions between biological systems and artificial materials is of vital importance in the design of medical devices. This course will introduce the principles of biomaterials science, unifying knowledge from the fields of biology, materials science, surface science, and colloid science. The course will be taught from the primary scientific literature, focusing on the study of protein/surface interactions and hydrogel materials. Credit 3 units. EN: TU

E62 BME 524 Tissue Engineering
This course integrates the principles and methods of engineering and life sciences toward the fundamental understanding of normal and pathological mammalian tissues especially as they relate to the development of biological substitutes to restore or improve tissue function. Current concepts and strategies including drug delivery, tissue and cell transplantation, and in vivo tissue regeneration will be introduced as well as their respective clinical applications. Prerequisites: BME 366; or MEMS 3410, Biol 2960 and 2970; or permission of the instructor. Credit 3 units. EN: TU

E62 BME 527 Design of Artificial Organs
Medical devices that replace the function of one of the major organs in the body must usually interface with flowing blood. Examples include total artificial hearts, left ventricular assist devices, membrane oxygenators, hemodialysis systems and encapsulated endocrine cells. The design of these devices relies on integration of knowledge from a variety of fields, in particular computational fluid dynamics and blood rheology. We study the process by which a concept for a device eventually leads to a functioning, blood-contacting medical device, with most of the focus on the design of left ventricular assist devices. Students...
learn to use CAD to design blood pumping devices, test their designs via computational fluid dynamics, and 3D print and test their pumps with water. Prerequisite: BME 366 or equivalent course in Transport Phenomena (including momentum and mass transfer).

Credit 3 units. EN: TU

E62 BME 528 Translational Regenerative Medicine
This course provides students with an opportunity to connect basic research with applications in translation for several tissues/disease models. Course sessions will alternate between literature on basic mechanisms of development/stem cell biology and applications led by researchers or clinicians working in each area. Areas of focus will include cardiovascular development/developmental heart disease and arrhythmia, lung, endocrinology/diabetes, gut/intestinal disorders, musculoskeletal, neural (peripheral and brain), liver, hematology and eye. Emphasis on how discovery can be translated will be a major focus of the course. Students will be expected to review and present on primary literature in the field. Graduate standing is required. Prerequisites: graduate standing Engineering or DBBS.

Credit 3 units.

E62 BME 530A Molecular Cell Biology for Engineers
This course is designed for upper-level undergraduates and first-year graduate students with a background in engineering. This course covers the biology of cells of higher organisms: protein structure and function; cellular membranes and organelles; cell growth and oncogenic transformation; cellular transport, receptors and cell signaling; the cytoskeleton, the extracellular matrix and cell movement. Emphasis is placed on examples relevant to biomedical engineering. The course includes two lectures per week and one discussion section. In the discussion section, the emphasis is on experimental techniques used in cell biology and the critical analysis for primary literature. Note this course does not count for engineering topics credits and is meant to fulfill a life science requirement for engineering or physical sciences graduate students. Prerequisites: Biol 2960 and 2970 or graduate standing.

Credit 4 units.

E62 BME 533 Biomedical Signal Processing
Course designed for graduate students with little or no background in signal processing. Continuous-time and discrete-time application of signal processing tools to a variety of biomedical problems. Course topics include review of linear signals and systems theory, frequency transforms, sampling theorem, basis functions, linear filtering, feature extraction, parameter estimation and biological system modeling. Special emphasis will be placed on signal transduction and data acquisition. Additional topics include noise analysis of real-world biosignals, biological system identification, stochastic/chaotic/fractal/nonlinear processes in biological systems. Concepts learned in class will be applied using software tools to 1D biomedical signals such as biological rhythms, chemical concentrations, blood pressure, speech, EMG, ECG, EEG. Prerequisites: graduate standing or consent of instructor.

Credit 3 units. EN: TU

E62 BME 537 Computational Molecular Biology
This course is a survey of algorithms and mathematical methods in biological sequence analysis (with a strong emphasis on probabilistic methods) and systems biology. Sequence analysis topics include introduction to probability, probabilistic inference in missing data problems, hidden Markov models (HMMs), profile HMMs, sequence alignment, and identification of transcription-factor binding sites. Systems biology topics include discovery of gene regulatory networks, quantitative modeling of gene regulatory networks, synthetic biology, and (in some years) quantitative modeling of metabolism. Prerequisite: CSE 131. Same as E81 CSE 587A

Credit 3 units.

E62 BME 538 Cell Signal Transduction
This class covers the elements of cell signal transduction important to human development, homeostasis and disease. Lectures are combined with primary literature review to cover canonical signaling and current topics within the field. Spatial, time and dose-dependent aspects of signaling are of particular focus. Topics include: G protein-coupled receptors, receptor tyrosine kinases, adhesion signaling, the MAPK cascade, lipid signaling, the DNA damage response, and autocrine, paracrine and juxtacrine signaling. Prerequisites: BME 530A or BME 5068.

Credit 3 units.

E62 BME 550 Numerical Methods for Computational Modeling in Biomedicine
Advanced computational methods are required for the creation of biological models. Students will be introduced to the process of model development from beginning to end, which includes model formulation, how to solve and parameterize equations, and how to evaluate model success. To illustrate the potential of these methods, participants will systematically build a model to simulate a "real-life" biological system that is applicable to their research or interest. A mechanistic appreciation of the methods will be gained by programming the methods in a low-level language (C++) in a Linux environment. While extensive programming knowledge is not required, participants are likely to find that some programming background will be helpful. Students enrolled in the 550 graduate class will be required to complete a final project that incorporates the methods taught in class. Prerequisites: introductory programming course similar to E81 CSE 131.

Same as E62 BME 450

Credit 3 units. EN: TU

E62 BME 5565 Mechanobiology of Cells and Matrices
At the interface of the cell and the extracellular matrix, mechanical forces regulate key cellular and molecular events that profoundly affect aspects of human health and disease. This course offers a detailed review of biomechanical inputs that drive cell behavior in physically diverse matrices. In particular, cytoskeletal force-generation machineries, mechanical roles of cell-cell and cell-matrix adhesions, and regulation of matrix deformations are discussed. Also covered are key methods for mechanical measurements and mathematical modeling of cellular response. Implications of matrix-dependent cell motility in cancer metastasis and embryonic development are discussed. Prerequisite: graduate standing or permission of the instructor.

Same as E37 MEMS 5565

Credit 3 units. EN: TU

E62 BME 559 Intermediate Biomechanics
This course covers several of the fundamental theories of solid mechanics that are needed to solve problems in biomechanics. The theories of nonlinear elasticity, viscoelasticity and poroelasticity are applied to a large range of biological tissues including bone, articular cartilage, blood vessels, the heart,
skeletal muscle, and red blood cells. Other topics include muscle
activation, the biomechanics of development and functional
adaptation, and the mechanics of hearing. Prerequisites: BME
240 and ESE 318 and ESE 319 or equivalent, or permission of
instructor.
Credit 3 units. EN: TU

E62 BME 5610 Protein Structures and Dynamics
This course covers the concepts and methods involved
in the analysis of protein structure, stability, folding and
misfolding. Topics include protein structural elements, amyloid
structure, intra- and intermolecular forces, folding pathways
and intermediates, phi-value analysis, kinetics of protein folding
and of amyloid formation, and their application to problems of
bioengineering and biophysics. Two-thirds of the course will
consist of lectures; the other third will be student seminars, in
which each student presents a paper from primary literature
and its concept and methodology that is discussed in detail.
Prerequisites: BME 320B Bioengineering Thermodynamics or
equivalent.
Same as E62 BME 461
Credit 3 units. EN: TU

E62 BME 562 Mechanics of Growth and Development
This course applies the fundamental principles of solid
mechanics to problems involving growth, remodeling and
morphogenesis of cells, tissues and organs. Introduction to
developmental biology, nonlinear elasticity, viscoelasticity
and active contraction. Particular topics include cellular
morphogenetic mechanisms, growth and development of the
cardiovascular system, and adaptive remodeling of bone.
Prerequisites: BME 240 or MEMS 241 or equivalent.
Credit 3 units. EN: TU

E62 BME 564 Orthopaedic Biomechanics — Cartilage/
Tendon
Basic and advanced viscoelasticity and finite strain analysis
applied to the musculoskeletal system, with a primary focus on
soft orthopaedic tissues (cartilage, tendon and ligament). Topics
include: mechanical properties of cartilage, tendon and ligament;
applied viscoelasticity theory for cartilage, tendon and ligament;
cartilage, tendon and ligament biology; tendon and ligament
wound healing; osteoarthritis. This class is geared to graduate
students and upper-level undergraduates familiar with statics
and mechanics of deformable bodies. Prerequisite: BME 240
or equivalent. Note: BME 590Z (BME 463/563) Orthopaedic
Biomechanics — Bones and Joints is not a prerequisite.
Same as E37 MEMS 5564
Credit 3 units. EN: TU

E62 BME 565 Biosolid Mechanics
Introduction to the mechanical behaviors of biological tissues
of musculoskeletal, cardiac and vascular systems. Topics to be
covered include static force analysis and nonlinear optimization
theory; linearly elastic models for stress-strain analysis and
solutions to relevant problems in bioelasticity; models of active
structures (e.g., muscles); strain energy methods and nonlinear
tissue behaviors; and introductory theory for finite element
analysis. Emphasis will be placed on modeling stress-strain
relations with relevance to biological tissues. Prerequisites: BME
240 or equivalent and ESE 318 and ESE 319.
Same as E62 BME 465
Credit 3 units. EN: TU

E62 BME 5702 Application of Advanced Engineering Skills
for Biomedical Innovators
Students will work in small teams to apply core engineering
skills covered in BME 5701 such as FEM, CAD, microcontroller
programming, circuit design, data informatics, and app
development to particular clinical needs or processes chosen by
the instructing staff. Prerequisites: BME 5701 or permission of
instructor.
Credit 3 units.

E62 BME 5711 Ideation of Biomedical Problems and
Solutions
This course is part one of the year-long master's design
sequence for the BME Master of Engineering. The course will
begin with a boot camp primer of HIPAA certification, clinical
etiquette, medical law, and intellectual property law. This
will be followed by a rotation period of guided shadowing of
clinicians. Following each rotation, students will review and
present their findings, with a view toward problem solving and
project generation. Three-fourths of the way through the course,
students will form into teams, choose a master's project, and
begin intensive study of their chosen problem or process. The
final weeks of the course will focus on problem scope and
definition, identification of creative alternatives, and consultation
with experts in the field. Prerequisite: acceptance into the Master
of Engineering program.
Credit 3 units.

E62 BME 5712 Implementation of Biomedical Solutions
This course is part two of the year-long master's design
sequence for the BME Master of Engineering. Students will
work in small groups to begin to design a solution to the
problem identified in BME 5711. Options and alternatives will
be evaluated and a best-choice solution will be chosen, based
on an in-depth study of constraints upon the problem, including
engineering materials, economic, safety, social, manufacturing,
ethical, sustainability, and other requirements. Core skills such as
FEM, CAD, circuit design, microcontroller programming, and 3-D
printing will be applied to create first an alpha mockup for
proof of concept, followed by a full working prototype by the
end of the semester. Prerequisites: BME 5711 or permission of
instructor.
Credit 3 units.

E62 BME 5713 Translation of Biomedical Solutions to
Products
This course is the third and final part of the year-long master's
design course sequence. Through a repeated sequence of
iteration, fabrication and verification, design teams will refine and
optimize their master's design project, bringing it to completion.
Prerequisites: BME 5712 or permission of instructor.
Credit 4 units.

E62 BME 572 Biological Neural Computation
This course considers the computations performed by the
biological nervous system with a particular focus on neural
circuits and population-level encoding/decoding. Topics include
Hodgkin-Huxley equations; phase-plane analysis; reduction of
Hodgkin-Huxley equations; models of neural circuits; plasticity
and learning; and pattern recognition and machine learning
algorithms for analyzing neural data. Note: Graduate students
in psychology or neuroscience who are in the Cognitive,
Computational and Systems Neuroscience curriculum pathway may register in Biol 5657 for 3 credits. For non-BME majors, conceptual understanding, and selection/application of right neural data analysis technique are stressed. Hence homework assignments/examinations for the two sections are different, however all students are required to participate in a semester-long independent project as part of the course. Prerequisites: calculus, differential equations, basic probability and linear algebra. Undergraduates need permission of the instructor. Biol 5657 prerequisites: permission from the instructor. Credit 3 units. EN: TU

E62 BME 5722 Feasibility Evaluation of Biomedical Products
This is the second course of the Master of Engineering - Biomedical Innovation sequence in product development. Students will practice the steps in biomedical product development, including medical need validation, brainstorming initial solutions, market analysis, solution evaluation, regulatory, patent, and intellectual property concerns, manufacturability, risk assessment and mitigation, and global considerations. The course will focus on applying product development techniques to several real unmet medical needs; students will thus perform analysis and create reports and presentations for several different product solutions. Peer and faculty evaluations will provide feedback to improve individual technique. Local biomedical entrepreneurs will also visit to share their expertise and experiences. Prerequisite: admission to the Master of Engineering program. Credit 2 units.

E62 BME 5723 Realization of Biomedical Products in the Marketplace
This course is the third in the MEng-BMI Biomedical Product Development sequence, focusing on the final stages of analysis to bring forth a leading solution concept. Solution concepts are screened for killer risks in the areas of intellectual property, regulatory, reimbursement, business models, and technical feasibility to identify viable concepts. From there, manufacturability and product specifications are evaluated against user and design requirements to select a concept that offers the highest value with lowest risk. Throughout the course, students will practice effective communication of risk factors through pitch presentations and executive summary reports. In addition, specialists from the St. Louis entrepreneurial community will share their experiences as guest speakers. Prerequisites: BME 5722; MEng-BMI candidates only. Credit 1 unit.

E62 BME 5731 Business Foundations for Biomedical Innovators
For medical innovators, a successful translation from product to market will require careful strategy and an understanding of the steps needed to form and fund a biotech business, either as a new startup or as an extension of the product line of an existing company. This course will provide a first look at the steps in this process, including intellectual property concerns, R&D, clinical strategy, regulatory issues, quality management, reimbursement, marketing strategy, sales and distribution, operating plans, and approaches to funding. Prerequisites: MEng program. Credit 2 units.

E62 BME 5732 Entrepreneurship for Biomedical Innovators
This course will apply the concepts covered in BME 5731 in an interactive process that will provide practical experience. Topics of intellectual property, R&D, clinical strategy, regulatory issues, quality management, reimbursement, marketing strategy, sales and distribution, operating plans, and approaches to funding will be covered. Along with practical exercises, access to specialists and experts in these topics from the St. Louis entrepreneurial community will be provided as an integral part of the course. Prerequisites: BME 5731; MEng-BMI candidates only. Credit 2 units.

E62 BME 574 Quantitative Bioelectricity and Cardiac Excitation
Action potential generation, action potential propagation, source-field relationships in homogeneous and inhomogeneous media, models of cardiac excitation and arrhythmia, quantitative electrocardiography. Prerequisites: differential equations, Laplace transform, electromagnetic field theory (undergraduate level). Credit 3 units. EN: TU

E62 BME 575 Molecular Basis of Bioelectrical Excitation
Ion channels are the molecular basis of membrane excitability in all cell types, including neuronal, heart and muscle cells. This course presents the structure and the mechanism of function of ion channels at the molecular level. It introduces the basic principles and methods in the ion channel study as well as the structure-function relation of various types of channels. Exemplary channels that have been best studied are discussed to illustrate the current understanding. Prerequisites: knowledge of differential equations, electrical circuits and chemical kinetics. Credit 3 units. EN: TU

E62 BME 5771 Biomedical Product Development
Advances in science and technology have opened the health care field to innovation now more than any other time in history. Engineers and inventors can make real and rapid improvements to patient treatments, length of hospital stay, procedure time, cost containment, and accessibility to treatment. However, a successful transition from idea to implementation requires careful market analysis and strategy planning. This course will address the steps in this process, including personal and team strength assessment, medical need validation, brainstorming initial solutions, market analysis, solution evaluation, regulatory, patent and intellectual property concerns, manufacturability, risk assessment and mitigation, and global considerations. Students will be expected to review resource material prior to coming to class in order to facilitate active class discussion and team-based application of the material during class; regular attendance will be key to course success. The course will focus on applying product development techniques to several real unmet medical needs; students will thus perform analysis and create reports and presentations for several different product solutions. Peer and faculty evaluations will provide feedback to improve individual technique. In addition, throughout the semester, local biomedical entrepreneurs will visit to share their expertise and experiences. Prerequisites: graduate or professional student standing or permission of the instructor. Credit 3 units.

E62 BME 5772 Biomedical Business Development
For medical innovators, a successful translation from product to market will require careful strategy and an understanding of the steps needed to form and fund a biotech business, either as a new startup or as an extension of the product line of an existing company. This course will address the steps in this
E62 BME 5799 Independent Study for Candidates in the Master of Engineering Program

Independent investigation on a topic of special interest. The student and mentor must justify the requested number of units. The MEng program director must approve the requested number of units.
Credit variable, maximum 6 units.

E62 BME 5820 Fundamentals and Applications of Modern Optical Imaging

Analysis, design and application of modern optical imaging systems with emphasis on biological imaging. First part of course will focus on the physical principles underlying the operation of imaging systems and their mathematical models. Topics include ray optics (speed of light, refractive index, laws of reflection and refraction, plane surfaces, mirrors, lenses, aberrations), wave optics (amplitude and intensity, frequency and wavelength, superposition and interference, interferometry), Fourier optics (space-invariant linear systems, Huygens-Fresnel principle, angular spectrum, Fresnel diffraction, Fraunhofer diffraction, frequency analysis of imaging systems), and light-matter interaction (absorption, scattering, dispersion, fluorescence). Second part of course will compare modern quantitative imaging technologies including, but not limited to, digital holography, computational imaging, and super-resolution microscopy. Students will evaluate and critique recent optical imaging literature. Prerequisites: ESE 318 and ESE 319 or their equivalents; ESE 330 or Physics 421 or equivalent.
Same as ESE 582
Credit 3 units. EN: TU

E62 BME 589 Biological Imaging Technology

This class develops a fundamental understanding of the physics and mathematical methods that underlie biological imaging and critically examine case studies of seminal biological imaging technology literature. The physics section examines how electromagnetic and acoustic waves interact with tissues and cells, how waves can be used to image the biological structure and function, image formation methods and diffraction limited imaging. The math section examines image decomposition using basis functions (e.g., Fourier transforms), synthesis of measurement data, image analysis for feature extraction, reduction of multidimensional imaging datasets, multivariate regression and statistical image analysis. Original literature on electron, confocal and two photon microscopy, ultrasound, computed tomography, functional and structural magnetic resonance imaging and other emerging imaging technology are critiqued.
Same as E35 ESE 589
Credit 3 units. EN: TU

E62 BME 5902 Cellular Neurophysiology

This course examines the biophysical concepts of synaptic function with the focus on the mechanisms of neural signal processing at synapses and elementary circuits. The course combines lectures and discussion sessions of primary research papers. Topics include synaptic and dendritic structure, electrical properties of axons and dendrites, synaptic transmission, rapid and long-term forms of synaptic plasticity, information analysis by synapses and basic neuronal circuits, principles of information coding, mechanisms of learning and memory, function of synapses in sensory systems, models of synaptic disease states such as Parkinson and Alzheimer's diseases. Additionally, a set of lectures is devoted to modern electrophysiological and imaging techniques, and modeling approaches to study synapses and neural circuits. Prerequisite: senior or graduate standing.
Credit 3 units. EN: TU

E62 BME 5903 Physical Methods for Biomedical Scientists

The course will introduce the spectrum of biophysical techniques used in biomedical sciences with a focus on advanced fluorescence spectroscopy. The first half of the course (January to spring break) will introduce the concepts behind techniques such as: dynamic light scattering, SPR, analytical ultracentrifugation size-exclusion and affinity chromatography, atomic force microscopy, fluorescence spectroscopy, FRET, FTIR, circular dichroism, fluorescence correlation spectroscopy, sub-diffraction microscopy. The second half of the course will be held as six 3 h block lab classes (Fridays 10 a.m.-1 p.m.) in which the students will use these techniques in experiments on protein folding, protein stability and amyloid formation. Prior attendance of BME 461 Protein Structure and Dynamics is encouraged. Because of limited room in the experimental lab, attendance will be limited to nine students. Prerequisite: senior or graduate standing.
Same as E62 BME 4903
Credit 3 units. EN: TU

E62 BME 591 Biomedical Optics I: Principles

This course examines the biophysical concepts of synaptic function with the focus on the mechanisms of neural signal processing at synapses and elementary circuits. The course combines lectures and discussion sessions of primary research papers. Topics include synaptic and dendritic structure, electrical properties of axons and dendrites, synaptic transmission, rapid and long-term forms of synaptic plasticity, information analysis by synapses and basic neuronal circuits, principles of information coding, mechanisms of learning and memory, function of synapses in sensory systems, models of synaptic disease states such as Parkinson and Alzheimer's diseases. Additionally, a set of lectures is devoted to modern electrophysiological and imaging techniques, and modeling approaches to study synapses and neural circuits. Prerequisite: senior or graduate standing.
Credit 3 units. EN: TU

E62 BME 5911 Cardiovascular Biophysics Journal Club

This journal club is intended for beginning graduate students, advanced undergraduates and MSTP students with a background in the quantitative sciences (engineering, physics, math, chemistry, etc.). The subjects covered are inherently multidisciplinary. We review landmark and recent publications in quantitative cardiovascular physiology, mathematical modeling of physiologic systems and related topics such as chaos theory and nonlinear dynamics of biological systems. Familiarity with calculus, differential equations and basic engineering/thermodynamic principles is assumed. Knowledge of anatomy/physiology is optional.
Credit 1 unit.
E62 BME 5913 Molecular Systems Biology: Computation & Measurements for Understanding Cell Physiology and Disease
Systems-level measurements of molecules in cells and tissues harbor the promise to identify the ways in which tissues develop, maintain, age, and become diseased. This class will introduce the systems-level measurement techniques for capturing molecular information and the mathematical and computational methods for harnessing the information from these measurements to improve our understanding of cell physiology and disease. This is a practical class, which involves implementation of the concepts in MATLAB and will be applied to existing, real data from published journal articles. Molecular topics will include: gene expression, microRNA, proteins, post-translational modifications, drugs, and splicing. Computational/ mathematical topics covered will include: statistical inference, dimensionality reduction techniques, unsupervised and supervised machine learning, and graph-based techniques.
Prerequisites: A working knowledge of molecular biology, linear algebra, and statistics is required.
Credit 3 units. EN: TU

E62 BME 593 Computational Methods for Inverse Problems
Inverse problems are ubiquitous in science and engineering, and form the basis for modern imaging methods. This course will introduce students to the mathematical formulation of inverse problems and modern computational methods employed to solve them. Specific topics covered will include regularization theory, compressive sampling, and a survey of relevant numerical optimization methods. The application of these methods to tomographic imaging problems will be addressed in detail.
Prerequisites: ESE 318, 319, 326, 351.
Same as E62 BME 493
Credit 3 units. EN: TU

E62 BME 594 Ultrasound Imaging
Introduce basic principles of ultrasound imaging, diagnostic ultrasound imaging system, clinical applications, and emerging technologies in industry. Prerequisite: ESE 351.
Same as E62 BME 494
Credit 3 units. EN: TU

E62 BME 595 Drug Delivery Systems: Principles and Applications
Drug delivery is a promising approach for transporting pharmaceutical treatments in the body to safely achieve the desired therapeutic effect, while reducing the undesired side effects. This course will introduce students to the fundamental concepts of drug pharmacokinetics and dynamics, the biological and physiochemical principles drug delivery systems are based on, and the advantages of such delivery systems. Additionally, we will introduce the design and development of advanced drug delivery platforms such as nano-carriers, cell/gene delivery systems, drug-polymer conjugates and their relevant clinical applications. Finally, we will be having guest speakers from the industry, the university, as well as the office of technology management for Interdisciplinary Innovation & Entrepreneurship.
Credit 3 units.

E62 BME 599 Master’s Research
Credit variable, maximum 6 units.

E62 BME 600 Doctoral Research
Credit variable, maximum 12 units.

E62 BME 601 Research Rotation for BME Doctoral Students

E62 BME 601C Research Rotation for BME Doctoral Students
Credit 3 units.

E62 BME 602 Teaching Assistantship - Basic
This is a pass/fail course for the fulfillment of the basic teaching requirement which is required for the PhD degree. A form obtained from the BME department must be submitted to the instructor at the end of the semester for approval in order to receive a grade.

E62 BME 603 Teaching Assistantship - Advanced
This is a pass/fail course for the fulfillment of the advanced teaching requirement which is required for the PhD degree. A form obtained from the BME department must be submitted to their thesis mentor upon completion of requirements for approval in order to receive a grade.

E62 BME 883 Master’s Continuing Student Status

Biostatistics
The Division of Biostatistics engages in research, biostatistical consultation and training activities. Interested students may pursue intensive studies through the Master of Science in Biostatistics (MSIBS), a Master of Science in Genetic Epidemiology (GEMS) (for postdocs only), a Certificate in Genetic Epidemiology, or individual courses offered by the Division. Research activities include several independent lines of research as well as numerous collaborative projects with various departments of the medical school. Biostatistical consultation represents an important activity of the Division, providing expertise in both theoretical and applied areas. The Division participates actively in postdoctoral training through a T32 postdoctoral training grant in genetic epidemiology.

The Division provides consultation through the Washington University Institute of Clinical and Translational Sciences (ICTS), the Washington University Intellectual & Developmental Disabilities Research Center, and the Biostatistics Consulting Service in a wide range of areas including the statistical design of experiments and clinical trials, protocol development, database management, analysis of data and interpretation of results. Some of the areas of special strength and expertise include cardiovascular biostatistics, computing and statistical packages. The Division is well-equipped to provide assistance at the stage of preparing grant applications, including careful discussions of study design, sample size calculations, randomization schemes, computer resources and data analysis.

One of the Division's specialties is statistical genetics/genetic epidemiology. We host and participate in a postdoctoral T32
training grant in this area. Statistical genetics is the scientific discipline that deals with an analysis of the familial distribution of traits, with a view to understanding any possible genetic basis. However, one cannot study genes except as they are expressed in people living in certain environments, and one cannot study environmental factors except as they affect people who have certain genotypes. Statistical genetics is a unique interdisciplinary field that seeks to understand both the genetic and environmental factors and how they interact to produce various diseases and traits in humans. These studies are carried out in relatively large samples of participants in relevant populations, thus, the population history and dynamics often come into play. Population dynamics alter the frequency and distribution of both genetic and environmental factors and, thus, their net effect on the phenotype of interest. Some population characteristics also can be exploited for the purposes of gene discovery and mapping because the history has affected the genomic structure in a way that specific genotypes associated with disease can be identified.

Human diseases have been the focal point of these studies, and recent efforts are directed toward complex disorders such as coronary heart disease, hypertension, diabetes, obesity, cancer, atopy and allergies, and neurological and psychiatric disorders, to name a few. It is commonly thought that an understanding of the genetic underpinnings of such disorders will revolutionize medicine in the 21st century, enabling better preventive measures, diagnosis, prognosis and novel treatments. Given progress in the Human Genome Project, in computing power and in the creation of powerful statistical methods of analysis, we are poised to shepherd this revolution. It is an exciting time in science, and opportunities for careers in statistical genetics/genetic epidemiology abound.

**NIH-Sponsored Training Programs**

The PRIDE Summer Institute in Cardiovascular Genetics and Epidemiology (CGE) with a focus on cardiovascular and other heart, lung, blood and sleep disorders: An all-expense-paid summer institute continues in the summer of 2018 with funding from the NHLBI. The goal is to mentor junior faculty in underrepresented minorities and/or faculty with disabilities into independent research careers in biomedical sciences. For further information, visit the PRIDE-CGE website (https://biostatistics.wustl.edu/education/pridecge) or email the program administrator (biostat-pride-cge@email.wustl.edu).

The Division holds a postdoctoral T32 training grant in cardiovascular genetic epidemiology from the NIH. This training grant is available to PhDs and MDs with a background in quantitative sciences, cardiovascular sciences or experience in statistical genetics and genetic epidemiology. Candidates must be U.S. citizens or permanent residents to be eligible. For more information visit our Research Training (https://biostatistics.wustl.edu/education/post-doctoral-research-training-in-genetic-epidemiology) webpage, contact the program administrator at 314-362-3697, or send an email (post-doc-search@wubios.wustl.edu).

For more information regarding our Genetic Epidemiology training programs, including the Master of Science in Genetic Epidemiology (GEMS) or certificate, please visit the Genetic Epidemiology (p. 303) page of this Bulletin.

**Academic Calendar**

The MSIBS program begins approximately July 1 each year with preparatory workshops, followed by intensive summer semester courses. For the fall and spring courses, the MSIBS program follows the calendar of the College of Arts & Sciences. The current MSIBS calendar can be found on the Division of Biostatistics website (https://biostatistics.wustl.edu).

**Location**

The program is located in the Division of Biostatistics on the fifth floor of the Bernard Becker Medical Library (660 S. Euclid Ave.), Rooms 500-508.

**Additional Information**

**MSIBS Program**

Division of Biostatistics
660 S. Euclid Ave., CB 8067
St. Louis, MO 63110-1093

Phone: 314-362-1384
Email: biostat-msibs@email.wustl.edu
Website: https://biostatistics.wustl.edu

**Degrees & Requirements**

**Graduate Studies**

The Division of Biostatistics sponsors a Master of Science in Biostatistics (MSIBS), a Master of Science in Genetic Epidemiology (GEMS; for postdoctoral students only), and a Certificate in Genetic Epidemiology. The Division sponsored the GEMS program from 2002-12. In 2012 the GEMS program was streamlined as a postdoctoral degree program in addition to integrating some of the curriculum into the MSIBS program. Master’s students who wish to have the GEMS type of training should look into the Statistical Genetic pathway of the MSIBS program.

**Master of Science in Biostatistics (MSIBS)**

This 18-month, 42-credit-hour program offers excellent training in biostatistics and statistical genetics for students who earned undergraduate or higher degrees with majors in mathematics, statistics, computer science, biomedical engineering or other related major. It prepares graduates for rewarding employment in academia and industry and for further graduate studies. Students
will choose between a traditional Biostatistics or Statistical Genetics pathway. An internship is a required component of the program, and students have the option to do a thesis project or enroll in approved elective courses. Students also have the opportunity to enhance their research and statistical training through a paid research assistant position.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>Summer Year 1</td>
<td></td>
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<tr>
<td>MSB 506</td>
<td>Introduction to R for Data Science</td>
<td>2</td>
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<tr>
<td>MSB 515</td>
<td>Fundamentals of Genetic Epidemiology</td>
<td>3</td>
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<tr>
<td>MSB 550</td>
<td>Introduction to Bioinformatics</td>
<td>3</td>
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<tr>
<td>MSB 503</td>
<td>Statistical Computing with SAS</td>
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<td>Fall Year 1</td>
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<tr>
<td>MSB 560</td>
<td>Biostatistics I</td>
<td>3</td>
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<tr>
<td>MSB 570</td>
<td>Biostatistics II</td>
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<tr>
<td>Elective (Select from an approved list)*</td>
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<tr>
<td>Spring Year 2</td>
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<tr>
<td>MSB 617</td>
<td>Study Design and Clinical Trials</td>
<td>3</td>
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<tr>
<td>MSB 512</td>
<td>Ethics in Biostatistics</td>
<td>2</td>
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<tr>
<td>Summer Year 2</td>
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<tr>
<td>MSB 630</td>
<td>Internship (3 or 6 credit hours. If 3 credit hours, student will enroll in an approved elective to replace the credit hours.)</td>
<td>3 or 6</td>
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<tr>
<td>Fall Year 2</td>
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<tr>
<td>MSB 600</td>
<td>Mentored Research (Student will enroll in Mentored Research course or 6 credit hours of electives.)</td>
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* For a list of approved electives (https://biostatistics.wustl.edu/education/master-of-science-in-biostatistics-msibs/curriculum-and-degree-requirements) please visit our website.

**Plus specific courses for each pathway:**

**Biostatistics**

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<td>PHS 501</td>
<td>Introduction to Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>MSB 618</td>
<td>Survival Analysis</td>
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**Statistical Genetics**

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<tr>
<td>MSB 5483</td>
<td>Human Genetic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>MSB 621</td>
<td>Computational Statistical Genetics</td>
<td>3</td>
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**Research**

Research activities of the division span a wide range of topics dealing with a number of disease areas and provide research opportunities at both theoretical and applied levels. Several research projects involve close interaction and collaboration with a number of research groups at the Washington University Medical Center. Independent research programs of the division deal with genetic epidemiology of cardiovascular and metabolic diseases, bioinformatics and statistical issues in imaging sciences and Alzheimer’s disease. A number of theoretical and applied problems are addressed, including nature-nurture resolution and identification of the genetic basis of risk factor domains such as lipids, obesity, blood pressure and hypertension, and insulin resistance and diabetes; exploration of gene-gene and gene-environment interactions; and multivariate associations among multiple risk factors.

Current and recent collaborative research projects include: a coordinating center for a multicenter study to assess the genetic basis of response to exercise training (HERITAGE); a coordinating center for a multicenter study on the effectiveness of a weight loss treatment implemented in primary care; a coordinating center for a multicenter NETWORK study on the genetics of hypertension (HyperGEN), and the Family Blood Pressure Program (FBPP); coordinating centers for a multicenter study to assess the genetic basis of response to intervention through incorporation of gene-environment interactions (Gensalt); the coordinating center for the PRIDE program with the goal of mentoring junior faculty in underrepresented minorities and/or faculty with disabilities into independent research careers in biomedical sciences; the coordinating center for the Data Analysis and Coordinating Center (DACC), which tracks the education and careers of people who have participated in the NHGRI Diversity Action Plan (DAP) and NHGRI T32s that concentrate on genomics and genetics; important collaborative studies through support roles as biostatistics cores on the Washington University Institute of Clinical and Translational Sciences, the Alzheimer’s Disease Research Center, the Adult Children’s Study, Healthy Aging and Senile Dementia (HASD), the Dominantly Inherited Alzheimer Network (DIAN), the Alvin J. Siteman Cancer Center, the Silent Infarct Transfusion Study, the Optimization of Chemotherapy for Control and Elimination of Onchocerciasis, the Washington University Spotrias Center, the Washington University Intellectual & Developmental Disabilities Research Center and Childhood Obesity Treatment.

We also have a significant role on studies that focus on lung transplants, asthma, COPD, pediatric heart and ischemic heart disease and on several epidemiological research projects developing methods for increasing public awareness and utilization of measures that are known to decrease the likelihood of developing heart disease and for encouraging behaviors that will improve prognosis following a heart attack.

**Academic Policies**

Academic policies for the MSIBS program can be found in the MSIBS Student Handbook.
Faculty

Division Director
Dr. Dabeeru Rao, PhD
Visit our website for more information about our faculty (https://biostatistics.wustl.edu/faculty-staff) and their appointments.

A
Amber Salter Albright, M PH, BS1, PHD
Assistant Professor of Biostatistics (primary appointment)
Assistant Professor of Neurology
M PH University of North Texas Heal 2005
BS1 University of Texas Austin 2002
PHD University of Alabama-Birmingham 2015

C
Ling Chen, PHD, MS, MPH
Assistant Professor of Biostatistics (primary appointment)
Assistant Professor of Medicine
PHD University of MO Columbia 2009
BS Beijing Medical University 1996
MS Beijing Medical University 1998
MPH University South Carolina 2003

G
Charles William Goss, PHD, MS
Instructor in Biostatistics (primary appointment)
BS University of Michigan 2003
PHD Ohio State University 2014
MS Florida International 2018
BA University of Michigan 2018

Chi Gu, MS, PHD
Associate Professor of Biostatistics (primary appointment)
Associate Professor of Genetics
MS Nanjing Medical University 1985
BS Nanjing Medical University 1982
PHD Washington Univ in St. Louis 1992

L
Lei Liu, BS1, PHD, MS1, MS2
Professor of Biostatistics (primary appointment)
BS1 ZHEJIANG UNIVERSITY 1994
PHD University of Michigan 2017
MS1 ZHEJIANG UNIVERSITY 1997
MS2 Virginia Tech 1998

M
J. Philip Miller
Professor of Biostatistics (primary appointment)
Professor of Medicine
Tenure Held At-Large in the Medical School
BA Washington Univ in St. Louis 1965

R
Dabeeru C Rao, MS, PHD
Professor of Biostatistics (primary appointment)
Director of the Division of Biostatistics
Professor of Biostatistics in Genetics
Professor of Biostatistics in Psychiatry
Professor of Mathematics
Tenure Held At-Large in the Medical School
MS Indian Statistical Institute 1968
BS Indian Statistical Institute 1967
PHD Indian Statistical Institute 1971

Treva Kay Rice, PHD, MA
Professor of Biostatistics (primary appointment)
Professor of Psychiatry
PHD University of Colorado Boulder 1987
BS University of Texas Arlington 1981
MA University of Colorado Boulder 1984

S
Kenneth B Schechtman, MS, PHD, MA
Professor of Biostatistics (primary appointment)
Professor of Medicine
Tenure Held At-Large in the Medical School
MS Purdue University 1971
BS City University of New York 1967
PHD Washington Univ in St. Louis 1978
MA Washington Univ in St. Louis 1978

Yun Ju Sung, PHD
Associate Professor of Biostatistics (primary appointment)
Associate Professor of Psychiatry
PHD University of Minnesota 2003

W
Guoqiao Wang, MS, MA, PHD
Assistant Professor of Biostatistics (primary appointment)
Assistant Professor of Neurology
MS Yunnan University 2007
MA University of Alabama-Tuscaloos 2010
PHD University of Alabama-Birmingham 2014

X
Chengjie Xiong, PHD, MS
Professor of Biostatistics (primary appointment)
Professor of Mathematics
Professor of Neurology
PHD Kansas State University 1997
BS Xinjiang University 1983
MS Peking University 1989

Courses
M21 MSB 503 Statistical Computing with SAS
Intensive hands-on summer training in SAS (Statistical Analysis System) during seven full weekdays. Students will learn how to use SAS for handling, managing, and analyzing data. Instruction is provided in the use of SAS programming language, procedures, macros, and SAS SQL. The course will include exercises using existing programs written by SAS experts. Contact the program managers (biostat-msibs@email.wustl.edu) for details, to register, or to obtain permission of the course director.
Credit 2 units.

M21 MSB 506 Introduction to R for Data Science
This is an introduction to the R Statistical Environment for new users. R is “a freely available language and environment for statistical computing and graphics which provides a wide variety of statistical and graphical techniques: linear and nonlinear modeling, statistical tests, time series analysis, classification, clustering, etc.” The goal is to give students a set of tools to perform statistical analysis in medicine, biology, or epidemiology. At the conclusion of this primer, students will: be able to manipulate and analyze data, write basic models, understand the R environment for using packages, and create standard or customized graphics. This primer assumes some knowledge of basic statistics as taught in a first-semester undergraduate or graduate sequence. Topics should include: probability, cross-tabulation, basic statistical summaries, and linear regression in either scalar or matrix form. Contact the program manager (biostat-msibs@email.wustl.edu) for details, to register, or to obtain permission from the course director.
Credit 2 units.

M21 MSB 512 Ethics in Biostatistics
This course prepares biostatisticians to analyze and address ethical and professional issues in the practice of biostatistics across the range of professional roles and responsibilities of a biostatistician. The primary goals are for biostatisticians to recognize complex situational dynamics and ethical issues in their work and to develop professional and ethical problem-solving skills. The course specifically examines ethical challenges related to research design, data collection, data management, ownership, security, and sharing, data analysis and interpretation, and data reporting and provides practical guidance on these issues. The course also examines fundamentals of the broader research environment in which biostatisticians work, including principles of ethics in human subjects and animal research, regulatory and compliance issues in biomedical research, publication and authorship, and collaboration in science. By the conclusion of the course, participants will understand the ethical and regulatory context of biomedical research; identify ethical issues, including situational dynamics that serve to foster or hinder research integrity, in the design and conduct of research and the management, analysis and reporting of data; and utilize strategies that facilitate ethical problem-solving and professionalism. Contact the program manager for details, to register, or to obtain permission of the course director (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384).
Credit 2 units.

M21 MSB 515 Fundamentals of Genetic Epidemiology
Intensive two-week summer course. Lectures cover causes of phenotypic variation, familial resemblance and heritability, Hardy-Weinberg Equilibrium, ascertainment, study designs and basic concepts in genetic segregation, linkage and association. The computer laboratory portion is designed as hands-on practice of fundamental concepts. Students will gain practical experience with various genetics computer programs (e.g., SOLAR, MERLIN, QTDT, and PLINK). Auditors will not have access to the computer lab sessions. Prerequisite: R Primer. Contact the program manager (biostat-msibs@email.wustl.edu) for details, to register, or to obtain permission from the course director.
Credit 3 units.

M21 MSB 5483 Human Genetic Analysis
Basic Genetic Concepts: meiosis, inheritance, Hardy-Weinberg equilibrium, linkage, segregation analysis; Linkage Analysis: definition, crossing over, map functions, phase, LOD scores, penetrance, phenocopies, liability classes, multipoint analysis, nonparametric analysis (sibpairs and pedigrees), quantitative trait analysis, determination of power for Mendelian and complex trait analysis; Linkage Disequilibrium Analyses; allelic association (case control designs and family bases studies), QQ and Manhattan plots, whole genome association analysis; population stratification; Quantitative Trait Analysis: measured genotypes and variance components. Hands-on computer lab experience doing parametric linkage analysis with the program LINKAGE, model free linkage analyses with GeneHunter and Merlin, power computations with SLINK, quantitative trait analyses with SOLAR, LD computations with Haploview and WGAViewer, and family-based and case-control association analyses with PLINK and SAS. The methods and exercises are coordinated with the lectures, and students are expected to understand underlying assumptions and limitations and the basic calculations performed by these computer programs. Auditors will not have access to the computer lab sessions. Prerequisite: M21-515 Fundamentals of Genetic Epidemiology. For details, to register, and to receive the required permission of the course director, contact the MSIBS program manager (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384).
Same as L41 Biol 5483
Credit 3 units.

M21 MSB 550 Introduction to Bioinformatics
Provide a broad exposure to the basic concepts, methodology and application of bioinformatics to solve biological problems. Specifically, the students will learn the basics of online genomic/ protein databases and database mining tools, and acquire understanding of mathematical algorithms in genome sequence analysis (alignment analysis, gene finding/predicting), gene expression microarray (genechip) analysis, and of the impact of recent developments in the protein microarray technology. Prerequisite: R Primer. Contact the program manager (biostat-msibs@email.wustl.edu) for details, to register, or to obtain permission from the course director.
Credit 3 units.

M21 MSB 560 Biostatistics I
This course is designed for students who want to develop a working knowledge of basic methods in biostatistics. The course is focused on biostatistical and epidemiological concepts and on practical hints and hands-on approaches to data analysis rather than on details of the theoretical methods. We will cover basic concepts in hypothesis testing, will introduce students to several of the most widely used probability distributions, and will discuss classical statistical methods that include t-tests, chi-square tests, regression analysis, and analysis of variance. Both in-class
examples and homework assignments will involve extensive use of SAS. Prerequisite: M21-503, Statistical Computing with SAS®, or student must have good practical experience with SAS®. Participants are strongly encouraged to participate in the “Computing/Unix” and “Statistics” workshops offered free of charge prior to this course. For details, to register, and/or to obtain the required permission of the course director, contact the program manager (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384).
Credit 3 units.

M21 MSB 570 Biostatistics II
This course is designed for students who have taken Biostatistics I or the equivalent and who want to extend their knowledge of biostatistical applications to more modern and more advanced methods. Biostatistical methods to be discussed include logistic and Poisson regression, survival analysis, Cox regression analysis, and several methods for analyzing longitudinal data. Students will be introduced to modern topics that include statistical genetics and bioinformatics. The course will also discuss clinical trial design, the practicalities of sample size and power computation and meta analysis, and will ask students to read journal articles with a view toward encouraging a critical reading of the medical literature. Both in-class examples and homework assignments will involve extensive use of SAS. Prerequisite: M21-560, Biostatistics I or its equivalent as judged by the course directors. For details, to register, and/or to obtain the required permission of the course director, contact the program manager (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384).
Credit 3 units.

M21 MSB 600 Mentored Research
Student undertakes supervised research in a mentor's lab. The goal is to acquire important research skills as well as good writing and presentation skills. The student finds a mentor who is willing to work with them, and they together identify a research topic. A written thesis based on the research, prepared in the format of an actual scientific publication, must be submitted and presented to a select audience. The course directors will organize a few meetings throughout to facilitate the whole process. The course directors will determine the grade (pass/fail) in consultation with the mentors. Permission of the course directors is required.
Credit variable, maximum 6 units.

M21 MSB 617 Study Design and Clinical Trials
The course will focus on statistical and epidemiological concepts of study design and clinical trials. Topics include: different phases of clinical trials, various types of medical studies (observational studies, retrospective studies, adaptive designs, and comparative effectiveness research), and power analysis. Study management and ethical issues are also addressed. Students will be expected to do homework and practice power analysis during lab sessions. Prerequisites: M21-560 Biostatistics I and M21-570 Biostatistics II. Permission of the course director required. For details, to register, and to receive the required permission of the course director, contact the program manager (biostat-msibs@email.wustl.edu).
Credit 3 units.

M21 MSB 618 Survival Analysis
This course will cover the basic applied and theoretical aspects of models to analyze time-to-event data. Basic concepts will be introduced including the hazard function, survival function, right censoring, and the Cox-proportional hazards (PH) model with fixed and time dependent covariates. Additional topics will include regression diagnostics for survival models, the stratified PH model, additive hazards regression models and multivariate survival models. Permission of the course director required. Prerequisites: M21-560 Biostatistics I and M21-570 Biostatistics II. For details, to register, and to receive permission from the course director, contact the program manager (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384).
Credit 3 units.

M21 MSB 621 Computational Statistical Genetics
This course is designed to give the students computational experience with the latest statistical genetics methods and concepts, so that they will be able to computationally implement the method(s)/model(s) developed as part of their thesis. Concentrating on the role of genomics and SAS computing, it deals with creating efficient new bioinformatic tools to interface with some of the latest, most important genetic epidemiological analysis software, as well as how to derive, design and implement new statistical genetics models. The course also includes didactic instruction on haplotype estimation and modeling of relationship to phenotype, LD mapping, DNA pooling analysis, techniques in pharmacogenomics (with an emphasis on possible genomic role in drug response heterogeneity), and epistasis (GxG) and GxX interactions; data mining methods, including clustering, recursive partitioning, boosting, and random forests; and fundamentals of meta-analysis, importance sampling, permutation tests and empirical p-values, as well as the design of monte-carlo simulation experiments. Prerequisite: permission of the instructor. Contact the program manager for the required permission of the course director (by email (biostat-msibs@email.wustl.edu) or phone: 314-362-1384).
Credit 3 units.

M21 MSB 630 Internship
The primary goal of the Internship program is for all students to acquire critical professional experience so that they will be well prepared to enter the job market upon graduation. This provides an opportunity for students to develop contacts, build marketable skills, and perceive likes and dislikes in the chosen field. Students will have an opportunity to work with experienced mentors (PIs) on a range of projects that may include data management, data analysis, study design, protocol development, among other things. Students may have opportunities to contribute to and participate in the preparation of publishable quality manuscripts. As part of the Internship requirements, each student will submit a one-page Abstract of the work performed as part of the internship and will give a 5-minute presentation of the Internship experience. Internship presentations will be scheduled in late summer. The grade (pass/fail) for each student will be determined in consultation with the mentor. The internship is offered during the student's second summer. In extremely unusual circumstances and when the students' prior training justifies it, students can petition the internship committee to complete the internship during the spring or second fall semester. Approval of the committee is required.
Credit variable, maximum 6 units.
Clinical Investigation

The Master of Science in Clinical Investigation (MSCI) and Certificate in Clinical Investigation (CI) are programs for young investigators committed to pursuing academic careers in clinical research. The unique MSCI degree combines didactic course work with mentored research and career development opportunities and provides students with the knowledge and tools to excel in the areas of clinical investigation most relevant to their careers. The CI certificate is made up of the core MSCI didactic course work in study design, research implementation, statistical approaches, responsible conduct of research, scientific communication and literature critique, leadership and community engagement. Clinical investigation programs offered through the Washington University School of Medicine are sponsored by the Clinical Research Training Center (https://crtc.wustl.edu) and the Institute of Clinical and Translational Sciences (http://icts.wustl.edu).

Students in the 33-credit MSCI program:

• Engage in high-quality didactic courses (refer to the MSCI course list (https://crtc.wustl.edu/courses/class-list/msci-courses)) with mentored research and a weekly multidisciplinary seminar to meet the needs of clinicians seeking training in clinical research.

• Gain knowledge in the core competencies of clinical research and investigation such as study design, research implementation, statistical approaches, responsible conduct of research, community engagement, scientific communication and literature critique, and leadership.

• May pursue one of three concentrations: Translational Medicine, Genetics/Genomics, or Clinical Investigation (https://crtc.wustl.edu/msci-concentrations). Each concentration provides focused training that is tailored specifically to a student's interest within clinical and translational research.

• Attend a weekly, multidisciplinary seminar in order to learn about alternative research designs and methods through the discussion and presentation of peers' research and obtain key feedback from senior faculty and peers with expertise in their field.

• Attend monthly career development sessions to learn best practices in areas critical to success in clinical research including: grant writing, data management, intellectual property management, budgeting, ethics and other areas.

• Complete a thesis requirement (https://crtc.wustl.edu/thesis-requirement) consisting of a manuscript of original clinical research submitted for publication.

• Participate in a formal, structured mentorship program that offers an opportunity to work alongside faculty renowned for their innovative clinical research and teaching experience.

Location

Core courses are held on the School of Medicine campus after 4:00 p.m. to accommodate working professionals and full-time students participating in mentored research activities.

Additional Information

Suzie Fragale
Program Coordinator – Curriculum and Evaluation
Phone: 314-747-8936
Email (fragale@wustl.edu)

David Warren, MD, MPH
Program Director
Email (dwarren@wustl.edu)

Washington University School of Medicine
Master of Science in Clinical Investigation Program
Clinical Research Training Center
660 South Euclid Avenue, CB 8051
St. Louis, MO 63110

Email: crtmsci@email.wustl.edu
Website: https://crtc.wustl.edu

Degrees & Requirements

Master of Science in Clinical Investigation

Program Requirements

Didactic Course Work

All Master of Science in Clinical Investigation (MSCI) scholars must complete 33 credit hours of didactic course work, including 16 core credits, 4 credits of MTPCI Research Seminar, at least 6 credits of electives, and variable credits of mentored independent research. For additional information about the specific courses required for each of the concentrations, please visit the MSCI Concentrations (https://crtc.wustl.edu/msci-concentrations) webpage. Core courses include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>CLNV 513</td>
<td>Designing Outcomes and Clinical Research</td>
<td>3</td>
</tr>
<tr>
<td>or CLNV 588</td>
<td>Epidemiology for Clinical Research</td>
<td></td>
</tr>
<tr>
<td>CLNV 510</td>
<td>Ethical and Legal Issues in Clinical Research</td>
<td>2</td>
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<tr>
<td>CLNV 522</td>
<td>Introduction to Statistics for Clinical Research</td>
<td>3</td>
</tr>
<tr>
<td>M17 CLNV 590</td>
<td>Intermediate Methods for Clinical and Outcomes Research</td>
<td>3</td>
</tr>
<tr>
<td>CLNV 524</td>
<td>Intermediate Statistics for the Health Sciences</td>
<td>3</td>
</tr>
<tr>
<td>CLNV 528</td>
<td>Grantsmanship</td>
<td>2</td>
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Scholars will form a thesis committee consisting of three faculty members and will meet with them at least twice per year. The thesis committee should include the scholar's primary mentor, the MSCI program director, and a third faculty member in a closely related research field. The committee meetings will consist of reviewing the scholar's plan for completing and publishing a research project and manuscript. Scholars will return signed Mentorship Committee forms to the Clinical Research Training Center (CRTC) by December 1 and May 1. The final approval meeting will consist of a formal 15-minute presentation of the research followed by the committee's discussion of the manuscript. Visit the Thesis Requirement (https://crtc.wustl.edu/thesis-requirement) webpage for more detail. The thesis must be based on original human research conducted during the period of pursuit of the degree. An alternate entrepreneurial thesis option (https://crtc.wustl.edu/programs/degrees/msci/msci-entrepreneurial-thesis-option) is also available.

CRTC Seminar

Scholars are required to attend the weekly CRTC Seminar (currently held on Tuesday afternoons) during the fall and spring semesters (mid-August through May). During their first and second years of the program, scholars are required to present research-in-progress once each year. Feedback will be provided by the directors, mentors and peers in attendance. The second week of each month will be dedicated to career development topics. During these seminars, speakers will be invited from outside the MSCI program to present.

Mentors

Developing a successful clinical and translational research career requires strong relationships with mentors and a research team. Each scholar must have a program-approved primary research mentor. This mentor will be the scholar's main source of research supervision and career development. It is expected that scholars will meet weekly with their mentor and that the mentor will be available for consultation and support concerning the scholar's current projects and future progress. The mentor is expected to provide formal feedback to the scholar at least semiannually. In addition to the scholar's research mentor, the MSCI program director will serve as a mentor to the scholar to further assist in each scholar's career development during the program.

Responsible Conduct of Research (RCR)

Scholars are required to complete the Ethical and Legal Issues in Clinical Research (CLNV 510) course during their time in the program as part of their training in the Responsible Conduct of Research.

Institutional Review Board (IRB) Approvals

Scholars are required to obtain IRB approval for all research conducted as part of their MSCI degree and to provide documentation of current IRB approvals for their research project(s) to the MSCI program.

Individual Development Plans

MSCI scholars must develop an Individual Development Plan in consultation with their mentors and must submit the plan by July 1 each year. The plan should include individual development goals for the next 1-5 years, career objectives for each goal, research activities/projects that will assist the scholar in meeting the objectives, and an overview of the courses, workshops and other educational/training activities that the scholar plans to pursue. For each objective, the scholar should indicate what individual products (degrees, publications, presentations, grants, etc.) are expected. A timeline should be constructed to display the individual objectives, educational activities, research activities and products.

Career Development Retreat

All MSCI scholars are required to attend the annual retreat hosted by the CRTC. During the late-afternoon event, speakers will highlight topics of relevance to scholars' career development and research.

Research Training Symposium and Poster Session

In October of each year, the Washington University School of Medicine hosts a schoolwide, half-day Research Training Symposium and Poster session. All MSCI scholars are strongly encouraged to submit an abstract and present a poster at the symposium each year of their appointments. Scholars are given the option to have their research considered for an oral presentation.

Program Evaluation

Scholars are required to complete required program evaluations twice per year. These evaluations are administered online and are mandatory for all scholars. Scholars are also required to complete an exit interview one month prior to completing their degree.

Eligibility

Level of Education

MSCI candidates must either be enrolled in a pre- or postdoctoral mentored research program at Washington University School of Medicine or hold a postdoctoral appointment in health science at Washington University or one of the Institute of Clinical and Translational Sciences (ICTS) affiliates.

Citizenship

Eligible applicants must be citizens or noncitizen nationals of the United States, or have been lawfully admitted to the United States for permanent residence and have in their possession an
Alien Registration Receipt Card (I-151 or I-551) or other legal verification of admission for permanent residence. Individuals on temporary or student visas are eligible provided that they hold a valid U.S. visa and a postdoctoral appointment at Washington University or one of the ICTS affiliates. The MSCI program is unable to sponsor visas. Typically, students who desire to enter the program obtain a visa sponsored through their research department.

Research Project
All applicants must be conducting clinical and translational research. Clinical research is defined as patient-oriented research, that is, research conducted with human subjects or on material of human origin such as tissues, specimens and cognitive phenomena, for which an investigator or colleague directly interacts with human subjects.

Mentor
Applicants must have an established relationship with a senior faculty member prior to beginning the MSCI program. Applicants should look for mentors that match their research interests. They should contact each mentor they are interested in working with directly, stating their interest in the mentor's research and the applicant's desire to work with them. Suggested mentors (https://crtc.wustl.edu/people) can be found on our website. If applicants are having problems finding a mentor, they should contact us.

Graduate Certificate in Clinical Investigation
The Graduate Certificate in Clinical Investigation (CI) (https://crtc.wustl.edu/programs/certificates/ci) is a 16-credit certificate program for young investigators committed to pursuing academic careers in clinical research.

- Students will gain knowledge in the core competencies of clinical research and investigation such as study design, research implementation, statistical approaches, responsible conduct of research, scientific communication and literature critique, leadership and community engagement.
- On average, scholars complete the certificate requirements within one to two years. All course work must be successfully completed within five years from the start of the first course. Credits cannot be transferred into the CI program.
- The evening course format allows for full- or part-time enrollment that can accommodate clinical schedules at any point in a career.
- Three different tracks have been developed for the certificate: Clinical Investigation, Translational Medicine, Genetics/Genomics.

Academic Policies
Academic policies (https://crtc.wustl.edu/courses/class-list/academic-policies) for the MSCI and graduate certificate programs can be found on the Clinical Research Training Center website.

Research
While in the program, scholars conduct their own clinical research projects. The research project must receive IRB approval and needs to involve either patients, human tissue, human cell lines, or clinical data. The resulting thesis manuscript cannot be a review article, case report, or case series. Multidisciplinary mentors and leaders guide research projects and encourage career development activities. Research in progress is presented at multidisciplinary seminar sessions where peer and mentor feedback is received. Program graduates have published over 740 peer-reviewed manuscripts, secured over 100 federal, state, and privately sponsored grants, and presented at over 1,000 conferences, symposia and meetings locally, nationally and internationally.

Faculty
Patricia Cavazos-Rehg, PhD
Associate Professor
Department: Psychiatry
Karen L. Dodson, MBA
Manager, Professional Development
Department: Office of the Associate Dean of Faculty Affairs
Brian F. Gage, MD, MSc
Professor of Medicine
Department: Internal Medicine
Division: General Medical Sciences
Jane Garbutt, MB, ChB
Professor of Medicine
Department: Internal Medicine & Pediatrics
Division: General Medical Sciences
Ramaswamy Govindan, MD
Professor of Medicine
Department: Internal Medicine
Division: Oncology
Dorina Kallogjeri, MD, MPH
Research Statistician
Department: Otolaryngology
Albert Lai, PhD
Assistant Professor
Department: General Medical Sciences
Division: Institute for Informatics
Jessica Mozersky, PhD, MBE
Assistant Professor in Medicine
Department: Internal Medicine
Courses


M17 CLNV 503 PICRT Mentored Independent Research
Trainees earn Predoctoral Interdisciplinary Clinical Research Training Mentored Independent Research credits for conducting clinical research, completing a report, and developing and presenting a poster describing their work. They are also expected to attend a half-day research symposium in the fall with other clinical investigators. Mentored Independent Research will be presented each semester to an advisory committee that includes the scholar's departmental mentors as well as Clinical Research Training Center program faculty. The research presented will be in the form of a research paper submitted for publication in a peer-reviewed journal. Under some circumstances, a grant application submitted for review will be acceptable in place of the research paper. PICRT Mentored Independent Research will provide scholars with the practical application of skills learned in the Clinical Research Training Program didactic course work and seminars. Open to CRTC Predoctoral Program scholars only.
Credit variable, maximum 6 units.

M17 CLNV 510 Ethical and Legal Issues in Clinical Research
This course prepares clinical researchers to critically evaluate ethical and regulatory issues in clinical research. The principal goal of this course is to prepare clinical researchers to identify ethical issues in clinical research and the situational factors that give rise to them, to identify ethics and compliance resources, and to foster ethical problem-solving skills. The course aims to deliver practical guidance for investigators through discussion of critical areas of clinical research ethics. An additional aim of the course is to enable participants to recognize the different ways in which research participants may be vulnerable and the ethical issues raised by including and excluding vulnerable participants. By the end of the course, participants will understand the regulatory framework that governs human subjects research and the distinction between compliance and ethics; be able to identify major ethical concerns in the conduct of clinical research, including situational factors that may give rise to ethical concerns; and be able to apply an ethical problem-solving model in clinical research. Please contact the MSCI Program for permission to enroll in this course.
Credit 2 units.

M17 CLNV 5110 MTPCI Mentored Independent Research
Scholars earn Mentored Independent Research credits for conducting clinical research, completing a report, and developing and presenting a poster describing their work. They are also expected to attend a half-day research symposium in the fall with other clinical investigators. Mentored Independent Research will be presented each semester to an advisory committee that includes the scholar's departmental mentors as well as Clinical Research Training Center program faculty. The research presented will be in the form of a research paper submitted for publication in a peer-reviewed journal. Under some circumstances, a grant application submitted for review will be acceptable in place of the research paper. MTPCI Mentored Independent Research will provide scholars with the practical application of skills learned in the Clinical Research Training Program didactic course work and seminars. Open to CRTC Postdoctoral Program scholars only.
Credit variable, maximum 4 units.

M17 CLNV 513 Designing Outcomes and Clinical Research
This course covers how to select a clinical research question, outline a research protocol, and execute a clinical study. Topics include: subject selection, observational and experimental study designs, sample size estimation, clinical measurement, bias and confounding, and data management. The course is designed for health care professionals who wish to conduct patient-oriented clinical research. Students incorporate research design concepts into their own research proposal. The course consists of lectures, weekly problem sets, weekly reading assignments, outlining a research protocol, and a final exam.
Credit 3 units.

M17 CLNV 5140 MTPCI Research Seminar
Weekly seminar series are required for Postdoctoral Program and Career Development Program scholars for four semesters, one credit per semester. An important learning experience in research is the presentation and critical discussion of research ideas and projects at various points in their evolution. Seminars will alternate discussion of work in progress with critical reading of current clinical research in order to practice and enhance analysis and communication skills. Each scholar will formally present their own research in progress twice per year for feedback by peers and faculty from multiple disciplines. In addition to presenting their own work in oral and written form for peer and faculty evaluation, scholars will formally review the written proposals of their peers in a way that emulates the duties of a member of an NIH study section. This formal
M17 CLNV 515 PIRTT Research Seminar
Pre/Postdoctoral Interdisciplinary Research Training in Translation (PIRRTT) Seminar. Two semesters of this course are required for the TL1 Scholars. This course alternates faculty presentations, research-in-progress discussions, and reading and journal discussions. CRTC scholars only.
Credit 1 unit.

M17 CLNV 518 Drug and Device Development
This course will provide an overview of the commercial development pathways for both pharmaceuticals and medical devices, from inception to market. Through lectures and discussions, students will gain an appreciation for the role clinical study programs play in the broader scope of product development. Class topics will include preclinical, clinical, regulatory, and marketing factors which influence discovery and development of new medical products.
Same as U80 CRM 518
Credit 3 units.

M17 CLNV 522 Introduction to Statistics for Clinical Research
This is an introductory course in statistics with a focus on the use of statistical analysis in clinical research. It is taught using SPSS, statistical analysis software commonly used in clinical research. The course teaches basic statistical methods with which clinical researchers will have the facility to execute their own analyses.
Credit 3 units.

M17 CLNV 524 Intermediate Statistics for the Health Sciences
This course builds upon Introduction to Statistics for Clinical Research (M17-522) and will focus on SPSS, Cox proportional hazards, generalized linear models, multiple linear models, ANOVA, repeated measures, regression, applied modeling, 2X2, ROC curves, checking assumptions and regression diagnostics. Completion of this course will enable clinical investigators to work independently with their own data and run their own analyses. Content will include data sets with applied exercises, interpreting output, lab assignments, and a midterm and final exam. Course director is Mark Walker, PhD, and instructor is Brian Waterman, MPH. Prerequisite: M17-522.
Credit 3 units.

M17 CLNV 528 Grantsmanship
Scholars create a focused research plan that incorporates well-formulated hypotheses, rationales, specific objectives and long-range research goals; organize and present a sound research plan that accurately reflects the ideas and directions of the proposed research activities; develop and justify a budget for the proposed research activities; avoid many common grant-writing mistakes; discuss the peer review process in grant evaluation and formulate a grant proposal that is maximally compatible with that process. Students enrolled in this course should identify a grant to actively work on during the semester.
Credit 2 units.

M17 CLNV 529 Scientific Writing and Publishing
The objective of this course is to teach the proper techniques of writing and publishing a biomedical manuscript. Writing a working title and structured abstract as well as hand drawing of figures and tables is covered. Publishing strategies are also discussed.
Credit 2 units.

M17 CLNV 5302 Introduction to Biomedical Informatics I: Foundations
This survey course provides an overview of the theories and methods that comprise the field of biomedical informatics. Topics to be covered include: 1) information architecture as applied to the biomedical computing domain; 2) data and interoperability standards; 3) biological, clinical, and population health relevant data analytics; 4) health care information systems; 5) human factors and cognitive science; 6) evaluation of biomedical computing applications; and 7) ethical, legal, and social implications of technology solutions as applied to the field of biomedicine. The course will consist of both didactic lectures as well as experiential learning opportunities including "hands on" laboratory sessions and journal club style discussion. The course will culminate with a capstone project requiring the in-depth examination, critique and presentation of a student-selected topic related to the broad field of biomedical informatics. Biomedical Informatics I is designed primarily for individuals with a background in the health and/or life sciences and who have completed a course in introductory statistics (e.g., Math 1011). No assumptions are made about computer science or clinical background; however, some experience with computers and a high-level familiarity with health care will be useful. This course does not require any programming knowledge, and it will not teach students how to program.
Credit 3 units.

M17 CLNV 5303 Introduction to Biomedical Informatics II: Methods
This course introduces students to the methods needed in order to apply the foundational theories covered in Biomedical Informatics I. The course will cover a broad spectrum of such methods including both computational and quantitative science techniques that can be employed in the design, conduct, and analysis of basic science, clinical, and translational research programs. This course is intended to enable individuals to critically select such methods and evaluate their results as part of both the design of new project as well as the review of results available in the public domain (e.g., literature, public data sets, etc.). Core concepts to be reviewed during this course include: basic computational skills, data modeling and integration, formal knowledge representation, in silico hypothesis generation, quantitative data analysis principles, and critical thinking skills surrounding the ability to ask and answer questions about complex and heterogeneous biomedical data. Prerequisite: M17-5302 or instructor permission.
Credit 3 units.

M17 CLNV 532 Genomics in Medicine I
This course introduces principles of genomics in medicine as they apply to clinical research and provides a practical background in molecular biology and genetics. Students
will be provided with an introduction to genomic research and applications of genomic technologies in the research environment and an understanding of the clinical application of genetic/genomic knowledge. Critical thinking and scientific/analytic competencies are emphasized through weekly lectures by renowned faculty. Reflection papers are required. Prior clinical research experience is helpful but not required. Course options include face-to-face, hybrid and online. Credit 1 unit.

M17 CLNV 533 Genomics in Medicine II
This course introduces principles of genomics in medicine as they apply to clinical research and provides a practical background in molecular biology and genetics. Students will be provided with an introduction to genomic research and applications of genomic technologies in the research environment and an understanding of the clinical application of genetic/genomic knowledge. Critical thinking and scientific/analytic competencies are emphasized through weekly lectures by renowned faculty. Reflection papers are required. Students may enroll in this course even if they have not taken Genomics in Medicine I (M17-532). Prior clinical research experience is helpful but not required. Course options include face-to-face, hybrid and online. Credit 1 unit.

M17 CLNV 588 Epidemiology for Clinical Research
The purpose of this course is to provide an understanding of the use of epidemiological concepts and methods in clinical research. Two primary foci are included: 1) common applications of epidemiologic principles and analytic tools in evaluating clinical research questions; and 2) student development of skills to review and interpret the medical literature and utilize publicly available datasets to address clinical research questions. Same as M88 AHBR 588
Credit 3 units.

M17 CLNV 589 Intermediate Methods for Clinical and Outcomes Research
This course focuses on the application of advanced epidemiologic principles and outcomes research as applied to clinical research. Students study the tools used in clinical research, in clinical issues, and in understanding the medical literature concerning these issues, which are crucial for making informed decisions in the care of patients. Critical thinking and scientific/analytic competencies are emphasized throughout the course. Prerequisite: Epidemiology for Clinical Research or M17-513 Designing Outcomes and Clinical Research. Credit 3 units.

Genetic Epidemiology
Division of Biostatistics
The Division of Biostatistics offers two training programs in Genetic Epidemiology, a postdoctoral master’s degree (GEMS) and a certificate program. These programs provide a multidisciplinary educational opportunity for people who want to work at the dynamic nexus of genetics and medicine. There are growing needs for scientists with this training both in academia and industry. With the wealth of data from the Human Genome Project and the availability of powerful new computational approaches, abundant opportunities are now available to explore and characterize the interplay between genes and the environment that affect the biological processes that underlie disease.

NIH-Sponsored Training Programs
The PRIDE Summer Institute in Cardiovascular Genetics and Epidemiology (CGE) with a focus on cardiovascular and other heart, lung, blood and sleep disorders: An all-expense-paid summer institute continues in the summer of 2018 with funding from the NHLBI. The goal is to mentor junior faculty in underrepresented minorities and/or faculty with disabilities into independent research careers in biomedical sciences. For further information, visit the PRIDE-CGE website (https://biostatistics.wustl.edu/education/pridecge) or email the program administrator (biostat-pride-cge@email.wustl.edu).

The Division holds a postdoctoral T32 training grant in cardiovascular genetic epidemiology from the NIH. This training grant is available to PhDs and MDs with a background in quantitative sciences, cardiovascular sciences or experience in statistical genetics and genetic epidemiology. Candidates must be U.S. citizens or permanent residents to be eligible. For more information visit our Research Training (https://biostatistics.wustl.edu/education/post-doctoral-research-training-in-genetic-epidemiology) webpage, contact the program administrator at 314-362-3697, or send an email (post-doc-search@wubios.wustl.edu).

For more information regarding our Genetic Epidemiology training programs, including the Master of Science in Genetic Epidemiology (GEMS) or certificate, please visit the Degrees & Requirements (p. 304) section of this page.

The Division of Biostatistics includes world-renowned scientific leaders in their respective areas. D.C. Rao, PhD, director of the Division of Biostatistics and the program director, is one of the founding fathers of the field.

Academic Calendar
Training programs begin approximately July 1 each year with preparatory workshops, followed by intensive summer semester courses. For the fall courses, the programs follow the calendar of the College of Arts & Sciences.

Prospective Students
Those interested in applying for a training program or to learn more information may contact the program manager (biostat-msibs@email.wustl.edu).

Location
The program is located in the Division of Biostatistics on the fifth floor of the Bernard Becker Medical Library (660 S. Euclid Ave.), Rooms 500-508.
Degrees & Requirements

Since genetic epidemiology is a multidisciplinary field, we expect applicants to come from a variety of backgrounds, but primarily those who have earned a terminal degree such as physician scientists and other clinical investigators, particularly postdoctoral fellows and people with terminal degrees in other (related) disciplines who seek to gain expertise in genetic epidemiology. All prospective students must provide evidence of basic skills in genetics, mathematics and computer programming through course work, documented experience or by passing a proficiency exam.

Master of Science in Genetic Epidemiology

An option for those who have completed a doctoral degree (PhD, MD, or equivalent) is to pursue a postdoctoral Master of Science in Genetic Epidemiology (GEMS) degree. The 30-credit-hour program can be pursued either full time or part time but must be completed within three years.

The GEMS program for postdoctoral students has eight core courses, listed below, as well as 6 credits of approved electives:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>MSB 503</td>
<td>Statistical Computing with SAS (summer)</td>
<td>2</td>
</tr>
<tr>
<td>MSB 506</td>
<td>Introduction to R for Data Science (summer)</td>
<td>2</td>
</tr>
<tr>
<td>MSB 515</td>
<td>Fundamentals of Genetic Epidemiology (summer)</td>
<td>3</td>
</tr>
<tr>
<td>MSB 550</td>
<td>Introduction to Bioinformatics (summer)</td>
<td>3</td>
</tr>
<tr>
<td>MSB 560</td>
<td>Biostatistics I (fall)</td>
<td>3</td>
</tr>
<tr>
<td>MSB 570</td>
<td>Biostatistics II (fall)</td>
<td>3</td>
</tr>
<tr>
<td>MSB 5483</td>
<td>Human Genetic Analysis (fall)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Units 30

Certificate in Genetic Epidemiology

The 19-credit-hour certificate program is designed to prepare students to work at the interface of genetics, biostatistics, epidemiology and computing. The Certificate in Genetic Epidemiology is earned after successful completion (with a minimum of a B average) of seven core courses plus labs that are normally offered to master’s candidates in Biostatistics. To earn the certificate, these courses may be taken over one or two consecutive years:

<table>
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</tr>
<tr>
<td>MSB 5483</td>
<td>Human Genetic Analysis (fall)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Units 19

Research

Research activities of the division span a wide range of topics dealing with a number of disease areas and provide research opportunities at both theoretical and applied levels. Several research projects involve close interaction and collaboration with a number of research groups at the Washington University Medical Center. Independent research programs of the division deal with genetic epidemiology of cardiovascular and metabolic diseases, bioinformatics and statistical issues in imaging sciences and Alzheimer’s disease. A number of theoretical and applied problems are addressed, including nature-nurture resolution and identification of the genetic basis of risk factor domains such as lipids, obesity, blood pressure and hypertension, and insulin resistance and diabetes; exploration of gene–gene and gene–environment interactions; and multivariate associations among multiple risk factors.

Current and recent collaborative research projects include: a coordinating center for a multicenter study to assess the genetic basis of response to exercise training (HERITAGE); a coordinating center for a multicenter study on the effectiveness of a weight loss treatment implemented in primary care; a coordinating center for a multicenter NETWORK study on the genetics of hypertension (HyperGEN), and the Family Blood Pressure Program (FBPP); coordinating centers for a multicenter study to assess the genetic basis of response to intervention through incorporation of gene–environment interactions.
(Gensalt); the coordinating center for the PRIDE program with the goal of mentoring junior faculty in underrepresented minorities and/or faculty with disabilities into independent research careers in biomedical sciences; the coordinating center for the Data Analysis and Coordinating Center (DACC), which tracks the education and careers of people who have participated in the NHGRI Diversity Action Plan (DAP) and NHGRI T32s that concentrate on genomics and genetics; important collaborative studies through support roles as biostatistics cores on the Washington University Institute of Clinical and Translational Sciences, the Alzheimer's Disease Research Center, the Adult Children's Study, Healthy Aging and Senile Dementia (HASN), the Dominantly Inherited Alzheimer Network (DIAN), the Alvin J. Siteman Cancer Center, the Silent Infarct Transfusion Study, the Optimization of Chemotherapy for Control and Elimination of Onchocerciasis, the Washington University Women's Health Research Center, the Washington University Intellectual & Developmental Disabilities Research Center and Obesity Treatment.

We also have a significant role on studies that focus on lung transplants, asthma, COPD, pediatric heart and ischemic heart disease and on several epidemiological research projects developing methods for increasing public awareness and utilization of measures that are known to decrease the likelihood of developing heart disease and for encouraging behaviors that will improve prognosis following a heart attack.

**Faculty**

**Division Director**

Dr. Dabeeru Rao, PhD

Visit our website for more information about our faculty (https://biostatistics.wustl.edu/faculty-staff) and their appointments.

**A**

Amber Salter Albright, M PH, BS1, PHD

Assistant Professor of Biostatistics (primary appointment)

Assistant Professor of Neurology

M PH University of North Texas Heal 2005

BS1 University of Texas Austin 2002

PHD University of Alabama-Birmingham 2015

**C**

Ling Chen, PHD, MS, MPH

Assistant Professor of Biostatistics (primary appointment)

Assistant Professor of Medicine

PHD University of MO Columbia 2009

BS Beijing Medical University 1996

MS Beijing Medical University 1998

MPH University South Carolina 2003

**G**

Charles William Goss, PHD, MS

Instructor in Biostatistics (primary appointment)

BS University of Michigan 2003

PHD Ohio State University 2014

MS Florida State University 2018

BA University of Michigan 2018

Chi Gu, MS, PHD

Associate Professor of Biostatistics (primary appointment)

Associate Professor of Genetics

MS Nanjing Medical University 1985

BS Nanjing Medical University 1982

PHD Washington Univ in St. Louis 1992

**L**

Lei Liu, BS1, PHD, MS1, MS2

Professor of Biostatistics (primary appointment)

Professor of Medicine

Tenure Held At-Large in the Medical School

BA Washington Univ in St. Louis 1965

**M**

J. Philip Miller

Professor of Biostatistics (primary appointment)

Professor of Medicine

Tenure Held At-Large in the Medical School

BA Washington Univ in St. Louis 1965

Dabeeru C Rao, MS, PHD

Professor of Biostatistics (primary appointment)

Director of the Division of Biostatistics

Professor of Biostatistics in Genetics

Professor of Biostatistics in Psychiatry

Professor of Mathematics

Tenure Held At-Large in the Medical School

MS Indian Statistical Institute 1968

BS Indian Statistical Institute 1967

PHD Indian Statistical Institute 1971

Treva Kay Rice, PHD, MA

Professor of Biostatistics (primary appointment)

Professor of Psychiatry

PHD University of Colorado Boulder 1987

BS University of Texas Arlington 1981

MA University of Colorado Boulder 1984

Kenneth B Schechtman, MS, PHD, MA

Professor of Biostatistics (primary appointment)

Professor of Medicine

Tenure Held At-Large in the Medical School

MS Purdue University 1971

BS City University of New York 1967

PHD Washington Univ in St. Louis 1978
MA Washington Univ in St. Louis 1978
Yun Ju Sung, PHD
Associate Professor of Biostatistics (primary appointment)
Associate Professor of Psychiatry
PHD University of Minnesota 2003

W
Guoqiao Wang, MS, MA, PHD
Assistant Professor of Biostatistics (primary appointment)
Assistant Professor of Neurology
MS Yunnan University 2007
MA University of Alabama-Tuscaloosa 2010
PHD University of Alabama-Birmingham 2014

X
Chengjie Xiong, PHD, MS
Professor of Biostatistics (primary appointment)
Professor of Mathematics
Professor of Neurology
PHD Kansas State University 1997
BS Xinjiang University 1983
MS Peking University 1989

Courses
For course information, please visit the Biostatistics page (p. 295) of this Bulletin.

Interdisciplinary Opportunities
Washington University School of Medicine excels in applying a multidisciplinary approach to all its endeavors, allowing faculty to easily cross administrative boundaries to address the health industry's biggest challenges. To achieve this goal, the medical school provides a limited number of interdisciplinary courses.

Interdisciplinary experiences can additionally be found in many of our joint programs of study.

For more information about joint degrees offered through the medical school, please visit the Joint section of the Degrees & Programs Offered (p. 28) page.

Courses
Visit online course listings to view offerings for M80 InterDis (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M80).

M80 InterDis 501 Clinical Epidemiology and Biostatistics
This course will be presented in the first year by clinicians and will emphasize important principles of applying biostatistics and epidemiology rules to the study of human diseases. Practical applications of statistical tools in biomedical and clinical settings will be discussed along with other subjects such as clinical study design. This course will consist of formal lectures followed by a discussion session in which students will meet in small groups to discuss pertinent papers with particular emphasis on methodologies. Credit 28 units.

M80 InterDis 601 Clinical Epidemiology and Biostatistics
This course will be presented in the first year by clinicians and will emphasize important principles of applying biostatistics and epidemiology rules to the study of human diseases. Practical applications of statistical tools in biomedical and clinical settings will be discussed along with other subjects such as clinical study design. This course will consist of formal lectures followed by a discussion session in which students will meet in small groups to discuss pertinent papers with particular emphasis on methodologies. Credit 17 units.

M80 InterDis 807 Physical Medicine and Rehabilitation
The elective is designed to provide the student with a broad introduction to the field of physical medicine and rehabilitation. Major objective of this clinical elective is to achieve greater knowledge of the neurological and musculoskeletal diseases and their treatment, and gain understanding of basic principles of rehabilitation. The student will learn the clinical and rehabilitative care of patients with strokes, traumatic brain injury, spinal cord trauma and diseases, and limb amputations. Student will gain clinical skills in evaluating management of functional impairments. Students will be expected to participate in daily rounds on inpatient rehabilitation units with the clinical care team, follow 3-5 patients, attend multidisciplinary team conferences and family meetings, attend outpatient rehabilitation clinics in spinal cord, stroke, traumatic brain injury, and amputee. Teaching and supervision is provided by the psychiatry and neurology faculty of the Division of Rehabilitation. Rehabilitation and neurology residents are involved in student teaching as well. Students are required to participate in didactic teaching conferences within the PM&R residency. This rotation can be streamlined to meet areas of emphasis desired by individual students.

M80 InterDis 809 Ambulatory Care - Jacqueline Maritz Lung Center
The Jacqueline Maritz Lung Center houses the ambulatory care activities of the Divisions of Pulmonary Medicine, Thoracic Surgery, and Allergy/Immunology, as well as the pulmonary function laboratory. The student will rotate through: 1. both general pulmonary and subspecialty clinics in Pulmonary Medicine (cystic fibrosis, transplantation, emphysema, etc.), 2. the Thoracic Surgery clinic, and 3. the Allergy/Immunology clinic. Students will also interpret pulmonary function tests. Chest imaging is also emphasized in the evaluation process. The rotation can be streamlined to meet areas of emphasis desired by individual students.

M80 InterDis 827 Introduction to Global Health
This is a cross-disciplinary "crash course" in global health for students considering a career in global health and should be particularly useful for those students planning to complete international electives before graduation or during residency. This course consists of a mix of lectures, workshops, discussions, debates, laboratory sessions, clinics, and simulation labs for two weeks. Topics will include significant coverage of high-burden infectious and tropical diseases (primarily case-based) in addition to discussion of emerging and neglected global health
topics including mental health, non-communicable diseases, radiology, and maternal health. Active participation in all activities and discussions is expected in order to obtain credit for this course. The course is team taught by faculty from around the medical school with extensive experience in global health and will include opportunities to network with faculty and residents actively engaged in clinical, research, policy, and implementation work around the world. This course has been run for two years previously for residents only and now is being opened up to senior medical students as well. No specific clinical requirements or call is required. Attendance and active participation for each session throughout the two weeks is required and students should not schedule residency interviews or other time off during this block.

M80 InterDis 829 Biomedical Innovation and Entrepreneurship

The four-week course will be offered once during the year: Weeks 25 through 28. Course Description: This four-week course will serve as both a primer course for students interested in medical technology and biotechnology development, as well as a hands-on opportunity for them to work directly with teams engaged in clinical problem solving and product development. Students will learn the basics of developing a business plan, market analysis, clinical needs assessment, and project design. Students will split their time between working with an IDEA Labs team, performing independent research, and completing educational modules. During the portion of the year this course is offered, IDEA Labs teams are beginning to develop solutions to clinical problems. During this process the teams need to reach out to the clinical community, which are faculty/staff intensive. By the end of this four-week course, students should be able to demonstrate improved cognitive and clinical skills needed to enter the internship year of graduate medical training. The target group for this course is primarily students entering clinical residency training positions. As outlined in the course objectives, topics to be covered include: acute clinical problems commonly faced on the inpatient service or emergency room, review of key diagnostic testing, basic procedural skills, and patient and family communications regarding informed consent and end-of-life issues. Course work will be divided between self-study, didactic and small group discussions, and hands-on skills practice and simulation. Parts of the course will be tailored to individuals entering internal medicine, pediatrics, and surgical disciplines. Students will be assessed by performance on simulation exercises and a written exam. By the end of this course, the student will be able to: 1. respond to common acute patient problems as tested with simulation by rapidly assessing the patient, requesting relevant information from the patient, medical record, and nursing staff, generate a differential diagnosis and order appropriate diagnostic testing and initial treatment for the problem, 2. demonstrate competence in a set of designated technical skills commonly needed in residency including basic suturing, chest tubes, central line, thoracentesis, and IV placement, 3. demonstrate the ability to interpret diagnostic tests, such as chest x-ray and EKG, commonly used for initial evaluation of acute medical problems, and 4. demonstrate and discuss the key elements of obtaining informed consent, dealing with difficult patient and family situations, end-of-life issues, and pain management.

M80 InterDis 849 Fourth-Year Capstone Course

The Fourth-Year Capstone Course is highly structured and is schedule-sensitive. In order to provide students with the absolute best experience possible, students are required to attend all sessions. In general, the morning sessions will start at 8:00 a.m. and run until approximately 12 noon. Afternoon sessions will generally run from 1:00 p.m. until about 5:00 p.m. The afternoons are hands-on activities which are faculty/staff intensive. By the end of this four-week course, students should be able to demonstrate improved cognitive and clinical skills needed to enter the internship year of graduate medical training. The target group for this course is primarily students entering clinical residency training positions. As outlined in the course objectives, topics to be covered include: acute clinical problems commonly faced on the inpatient service or emergency room, review of key diagnostic testing, basic procedural skills, and patient and family communications regarding informed consent and end-of-life issues. Course work will be divided between self-study, didactic and small group discussions, and hands-on skills practice and simulation. Parts of the course will be tailored to individuals entering internal medicine, pediatrics, and surgical disciplines. Students will be assessed by performance on simulation exercises and a written exam. By the end of this course, the student will be able to: 1. respond to common acute patient problems as tested with simulation by rapidly assessing the patient, requesting relevant information from the patient, medical record, and nursing staff, generate a differential diagnosis and order appropriate diagnostic testing and initial treatment for the problem, 2. demonstrate competence in a set of designated technical skills commonly needed in residency including basic suturing, chest tubes, central line, thoracentesis, and IV placement, 3. demonstrate the ability to interpret diagnostic tests, such as chest x-ray and EKG, commonly used for initial evaluation of acute medical problems, and 4. demonstrate and discuss the key elements of obtaining informed consent, dealing with difficult patient and family situations, end-of-life issues, and pain management.

M80 InterDis 851 The Business of Medicine

This two-week, interactive course is designed to enhance medical student awareness of the health care industry by exploring the market forces, business structures, and health policy that impact physicians and their patients. From clinical practice management issues all the way up to “big picture” views of health care, the course modules are intended to prepare students for the challenges they will face in their own practices as well as for leadership roles in improving patient care on a large scale. The course will be a blend of case-method sessions, targeted mini-lectures, expert panels, and field trips, all designed to invite student participation and engagement with representatives from a broad spectrum of the health care industry. Course subscriptions will be limited to 20 students, creating an opportunity for direct, personal interaction with guest speakers, faculty, and each other. Credit 77 units.
M80 InterDis 899T Teaching Elective
Teaching support for second-year courses.

Medicine Postgraduate Residency/Fellowship
Postgraduate residency training is essential preparation for the practice of medicine. Most School of Medicine graduates serve three or more years of residency training, and many will gain additional experience as postdoctoral fellows.

To aid students in obtaining desirable residency appointments, an active counseling program is maintained through the School of Medicine’s Career Counseling office. Students in their preclinical years can participate in Career Counseling events, such as career talks hosted by individual specialties, and are provided resources for choosing their specialty. Students are encouraged to look at their own interests, attributes, lifestyle and other priorities and, with this information, begin to make decisions about the specialty best suited for them. In addition, students are encouraged to meet with clinical advisers and faculty members from a variety of specialty divisions at Washington University to learn more about the fields in which they are interested. The Career Counseling office maintains a website where students can find information regarding 20 residency specialties (https://residency.wustl.edu/choosing-a-specialty).

Throughout their final year in medical school, students are invited to interact closely with the Career Counseling office through individual meetings and instruction on how to plan for the residency application and interviewing process. The number of U.S. seniors applying in the National Residency Matching Program (NRMP) Match each year has been steadily increasing. The match process continues to be competitive, and students must make their choices with considerable care.

The School of Medicine maintains an active interest in its graduates and is pleased to assist them in subsequent years as they seek more advanced training or staff appointments in the communities in which they settle.

Postdoctoral Training
Those departments that offer postdoctoral fellowships individualize such educational activity up to a maximum of 36 months of academic time. Such fellowships lead integrally to certification by the appropriate specialty and/or subspecialty boards of the American Medical Association.

Endowed Scholarships & Fellowships
Please visit the Medical Alumni & Development Programs webpage for Endowed Scholarships & Fellowships (https://medicalalumni.wustl.edu/give/scholarships/endowed-scholarships).

Continuing Medical Education
The study of medicine is a lifelong process with continuing medical education being an integral component of the continuum. The School of Medicine has supported this learning endeavor through the operation of the Continuing Medical Education (CME) program, which has been fully accredited since 1973. In 2016, the program achieved accreditation by the Joint Accreditation for Interprofessional Continuing Education to provide credit not only for medicine, but for pharmacy and nursing continuing education activities as well. The program’s mission is to collaborate with teams of health care professionals and/or individual members of the health care team to provide opportunities for educational renewal and advancement in order to facilitate lifelong learning, maintenance of professional competencies, and enhancement of knowledge and skills to improve performance, clinical care and patient outcomes.

Pursuant to this mission, the objectives of the CME program include the following:

- Enable the acquisition of new knowledge and skills for the delivery of quality patient care
- Translate the results of research to clinical diagnosis and treatment for health care practitioners
- Apply educational approaches in support of continuous quality improvement and patient safety in health care delivery
- Integrate clinical outcome measures into the educational process
- Assist with adaptation to changing health care delivery environments
- Support faculty development as postgraduate medical educators and leaders
- Evaluate and refine educational activities
- Support health care professionals in meeting state and specialty recertification and relicensure requirements

Each year the CME department awards credit for more than 160 symposia and more than 180 recurring academic rounds and conferences as well as videos, monographs, and self-directed learning. About 9,000 registrants participate in these activities annually and receive more than 110,000 hours of instruction. CME Online (https://wustlcme.highmarkscce.com) provides educational programs via the internet. Since starting in 2000, the CME online program has grown to include more than 250 hours of available CME credit.

Graduate Medical Education
Washington University School of Medicine has a number of Graduate Medical Education (https://gme.wustl.edu) opportunities.
Occupational Therapy

The Program in Occupational Therapy offers several professional degrees as well as a joint degree with the George Warren Brown School of Social Work. Students interested in entering the field of occupational therapy may do so with a master's or doctoral degree. It is possible to enroll in either program and apply to transfer to the other later, as both the master's and the doctoral programs share the same curriculum for the first year of study. Students may also decide to apply to both programs if they like. Typically, the doctoral program attracts students who have further interest in research and leadership in the field.

The Program in Occupational Therapy prepares students for professional practice and, through its research, generates knowledge to address the issues facing individuals with disabilities, chronic diseases and developmental disabilities. Students are prepared as generalists but, in addition, can concentrate their studies for work in pediatrics, aging, rehabilitation, work and industry or social participation. The curriculum focuses on the dynamic interaction of the biological and psychological, environmental and occupational factors that enable persons to fulfill roles and lead meaningful and productive lives. Students interact with leading physicians and scientists whose practice and science is contributing to better methods of treatment of persons with disabilities. In addition, students are linked with community agencies and leaders that are providing services to individuals with disabling conditions.

Undergraduate students in pre-medical, psychology, biology or anthropology will find that the program offers a means of applying their knowledge in a professional field.

The Program in Occupational Therapy is accredited by the Accreditation Council for Occupational Therapy Education (ACOTE) of the American Occupational Therapy Association (AOTA), located at 4720 Montgomery Lane, Suite 200, Bethesda, MD 20814-3449. ACOTE's telephone number, c/o AOTA, is 301-652-AOTA. For more information, visit the ACOTE Accreditation webpage.

Additional Information

Complete admissions information can be found under the Admissions (p. 26) section of this Bulletin. A full description of degrees in Occupational Therapy can be found in the Degrees & Requirements (p. 309) section of this page.

Email: wuotinfo@wustl.edu
Website: http://www.ot.wustl.edu

Degrees & Requirements

Applicants must hold a bachelor's degree or be a participant in an approved 3-2 program and have completed prerequisite courses from an accredited college or university. The Program in Occupational Therapy is accredited by the Accreditation Council for Occupational Therapy Education of the American Occupational Therapy Association.

Master of Science in Occupational Therapy (MSOT)

The MSOT is a two-and-a-half-year program that prepares students to become practitioners in any practice area. A minimum of a master's degree is required for entry into the profession of occupational therapy.

The MSOT degree prepares generalist clinicians with the knowledge and skills to work as direct care providers, consultants, educators, managers and advocates for clients. The MSOT program also includes the option for students to study with experienced community clinicians, community agency administrators or faculty scientists. Students have exposure to participation, public health, aging, work and industry, children and youth, mental health and neurorehabilitation. An experiential portion of the curriculum — six months of full-time fieldwork supervised by experienced clinicians — follows the normal two years of academic course work. The MSOT is a 28-month, full-time degree program.

Clinical Doctorate of Occupational Therapy (OTD)

The OTD is a three-and-a-half-year program for students who want to assume a leadership position in practice, management, teaching and/or clinical research. In addition to course work, and six months of full-time fieldwork supervised by experienced clinicians, students also complete a 16-week doctoral experiential component to prepare for a selected area of practice.

Students will focus on a specialty area and receive mentored apprenticeship. Students will graduate with an OTD, a professional clinical doctorate degree. Students who choose the OTD may choose from multiple concentrations in productive aging, work and industry, social participation and the environment, children and youth, neurorehabilitation and rehabilitation science. OTD graduates are building exciting careers in teaching, research, consultation, clinical services, and management and policy in their chosen area of expertise. The Clinical Doctorate of Occupational Therapy (OTD) is a 40-month, full-time degree program.

Graduates of either degree program will be eligible to sit for the NBCOT examination to become a practicing occupational therapist. The exam is administered by the National Board for Certification in Occupational Therapy (NBCOT), located at 12 South Summit Avenue, Suite 100, Gaithersburg, MD 20877. NBCOT’s phone number is 301-990-7979. For more information, visit the NBCOT website (https://www.nbcot.org). Consult our Program in Occupational Therapy website for more information.
about our NBCOT Exam Results (http://www.ot.wustl.edu/education/nbcot-408).

A felony conviction may affect a graduate's ability to sit for the NBCOT certification exam or attain state licensure.

Research
Faculty in the Program in Occupational Therapy at Washington University are involved in research that is changing the way occupational therapy is practiced. In collaboration with colleagues in the School of Medicine, public health, social work and community agencies, they are involved in projects that encompass many of the challenges facing society. By providing evidence through scientific research, they are validating the profession as an important partner in the health care team. By acting as innovators, they are developing new and better ways to provide care.

To find more information about research activities in the Program of Occupational Therapy, please visit the Research (http://www.ot.wustl.edu/research-105) page of our website.

Faculty
Elias Michael Executive Director
Carolyn M. Baum, PhD, OTR, FAOTA
Director, Division of Professional Education
Steve Taft, PhD, OTR/L, FNAP, FAOTA
Director, Clinical Operations
Patricia Nellis, OTD, OTR/L
Director, Business Operations
Bill Bauer
Assistant Director, Entry-Level Professional Programs
Stacy Smallfield, DrOT, OTR/L, BCG, FAOTA
Assistant Director, Educational Evaluation and Quality
Vicki Kaskutas, OTD, OTR/L, FAOTA

Visit our website for more information about our faculty (https://www.ot.wustl.edu/about/our-people-117?typeId=2) and their appointments.

A
Regina A. Abel, PhD
Instructor in Occupational Therapy (primary appointment)
Instructor in Medicine
BS Southwest Missouri St Universi 1992

B
Parul Bakhshi, PhD
Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Surgery (Public Health Sciences)
PHD University Rene’ Descartes 2003

Peggy Barco, MED
Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Medicine
MED Washington Univ in St. Louis 1987

M. Carolyn Baum, PHD, MA
Professor of Occupational Therapy (primary appointment)
Elias Michael Executive Director of the Program in Occupational Therapy
Professor of Neurology (Occupational Therapy)
Professor of Social Work (Courtesy)
PHD Washington Univ in St. Louis 1993
MA Webster University 1979
BS University of Kansas 1966

Christine R. Berg, MS, BSOT, PHD
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Neurology
MS Boston University 1980
BSOT Tufts University 1976
PHD Washington Univ in St. Louis 1999

D
Jeanenne M Dallas, MA
Instructor in Occupational Therapy (primary appointment)
Instructor in Neurology
BS University of Central Arkansas 1979
MA Webster University 1993

Jessica L Dashner, MS
Instructor in Occupational Therapy (primary appointment)
Instructor in Neurology
MS Washington Univ in St. Louis 2002
BS McKendree College 2000

E
Dorothy F Edwards, PHD
Adjunct Associate Professor of Neurology
Adjunct Associate Professor of Occupational Therapy
BA Loyola University 1972
PHD Washington Univ in St. Louis 1980

H
Linda Ann Hunt
Adjunct Associate Professor of Neurology
Adjunct Associate Professor of Occupational Therapy
K

Victoria Kaskutas, MHS, OTD
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Medicine
BS University of Illinois 1980
OTD Washington Univ in St. Louis 2009

Allison A King, MD
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Education (Courtesy)
Associate Professor of Medicine
Associate Professor of Pediatrics
Associate Professor of Surgery (General Surgery)
BS Washington Univ in St. Louis 1992
MD University of MO Columbia 1996

Kathleen Marie Kniepmann, DED, M PH
Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Neurology
DED Harvard University 1980
BS Washington Univ in St. Louis 1974
M PH Harvard University 1981
BA Washington Univ in St. Louis 1974

L

Huiping C Lieser, PHD, MA
Instructor in Occupational Therapy (primary appointment)
PHD Kansas State University 2001
MA Kansas State University 1994

M

Lauren Elizabeth Milton, BS1, PHD
Instructor in Occupational Therapy (Pending Dean's Approval) (primary appointment)
BS1 Saint Louis University 2001
PHD Washington Univ in St. Louis 2008

Marian A Minor, PHD, M PH
Associate Professor of Occupational Therapy (primary appointment)
PHD University of Missouri 1989
BS University of Kansas 1965
M PH University of Missouri 1979

Kerri A Morgan, PHD, MS
Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Neurology
BA Texas Christian University 1996
PHD Washington Univ in St. Louis 2015
MS Washington Univ in St. Louis 1998

P

Monica S Perlmutter, OTD, BSOT, MA
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Ophthalmology and Visual Sciences
OTD Washington Univ in St. Louis 2012
BSOT University of MO Columbia 1981
MA Washington Univ in St. Louis 1989

Benjamin Allen Philip, PHD
Instructor in Occupational Therapy (primary appointment)
Instructor in Neurology
Instructor in Surgery (Plastic and Reconstructive Surgery)
PHD Brown University 2009

Roberta G Pineda, PHS, MHS
Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Pediatrics
PHS University of Florida 2006
MHS University of Florida 1994

S

Stacy Lynn Smallfield, MD, MS
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Medicine
MD Nova Southeastern University 2007
MS Washington Univ in St. Louis 1996
BS Gustavus Adolphus College 1995

Susan L Stark, MS, PHD
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Neurology
Associate Professor of Social Work
MS Washington Univ in St. Louis 1989
BS Alma College 1988
PHD University of MO Columbia 1998

T

Steven D Taff, PHD, MS
Associate Professor of Occupational Therapy (primary appointment)
Associate Professor of Medicine
PHD University of MO St Louis 2005
BS MO State U (formerly SW MO St) 1989
MS Washington Univ in St. Louis 1997

V

Erin Foster Voegl, OTD
Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Neurology
Assistant Professor of Psychiatry
BS Washington Univ in St. Louis 2003
OTD Washington Univ in St. Louis 2005

W

Timothy J Wolf, OTD
Adjunct Assistant Professor of Occupational Therapy (primary appointment)
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Assistant Professor of Occupational Therapy (primary appointment)
Assistant Professor of Neurology
PHD Univ of IL-Urbana-Champaign 2012

Courses

Visit online course listings to view offerings for M01 OT (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M01).

M01 OT 4851 Community Service Assistantship
Promotes disability awareness through service learning. Students will participate in service to community agencies to interact with people who have disabilities or who are at risk for disability. The experience is designed to provide an ecological perspective on the occupational performance of people with disabilities, and the role of agencies in promoting health and quality of life. Students will learn the roles, functions, and funding sources for the community agency where they do service. Graduate students taking this course will identify needs or new roles for occupational therapists in the community. Permission of faculty adviser required.
Credit 1 unit.

M01 OT 5023 Theory and Foundations for Occupational Therapy Practice
Students explore the knowledge, skills and attitudes of the professional occupational therapist through the study of occupation, participation and well-being, some of the core concepts of the profession. The course acquaints students with the profession’s history, current health issues and emerging areas of practice. Students explore the relationship between occupation, development, culture and health at the person, organization and population levels. Students are introduced to the Occupational Therapy Practice Framework and the International Classification of Function. The theoretical foundation of practice is emphasized. Credit 3 units.

M01 OT 5093 Management in a Changing Practice Environment
This course applies management and organizational principles to occupational therapy services in current and potential practice environments, and entrepreneurial opportunities. Through discussions with business professionals, and case studies, this course highlights organizational, managerial, marketing, financial, regulatory, and funding influences on the development, delivery and evaluation of OT practice. Business plans are developed through case studies. Fieldtrips and interactions with managers and corporate leaders allow students the opportunity for experiential learning.
Credit 3 units.

M01 OT 5120 Contemporary Issues in OT Practice I
This first in a series of three seminar courses provides students with the opportunity to explore current, emerging, and future trends in OT practice. Students will use the most recent research and policy information to critically examine and discuss potential developments in OT practice, including new areas of practice such as habilitation and telemedicine, effects of legislation and novel technologies, and a focus on community and population health, participation, and well-being.
Credit 1 unit.

M01 OT 5125 Contemporary Issues in OT Practice II
This second of a series of three seminar courses provides students with the opportunity to explore current, emerging, and future trends in OT practice. Students will utilize the most recent research and policy information to critically examine and discuss potential developments in OT practice, including new areas of practice such as habilitation and telemedicine, effects of legislation and novel technologies, and a focus on community and population health, participation, and well-being.
Credit 1 unit.

M01 OT 5163 Environmental Factors Facilitating Performance and Participation I
In this first of a two-course sequence, students gain in-depth understanding of the psychological, social, political, physical, and cultural elements of the environment that influence occupational performance, participation, and health. Disability and chronic health conditions as consequences of environmental barriers and the relationship between the person and environments, as both change across the life span, will be discussed. Assessment and intervention strategies that promote health and maximize participation in daily activities will be examined in home, school, workplace, and other community settings. Students are provided with opportunities to practice and demonstrate skills acquired through community-based experiences including a group community consultation project.
Credit 3 units.

M01 OT 5220 Supporting Participation with Technology and Environmental Interventions
This course introduces technology and environment-related interventions to preserve, augment or improve social, emotional, physical and academic well-being. Intervention strategies that promote health and maximize participation in daily activities for people with chronic conditions and disabilities will be examined in home, school, workplace, and community settings. The tools and interventions will include descriptions of special equipment (e.g., self-care tools and compensatory techniques), assistive technology devices (i.e., computer access, mobility devices, augmentative communication systems, environmental control units, vehicle adaptations and recreational equipment), and environmental adaptations and modifications (i.e., universal design, home and work modifications). Lectures will focus on the ethical, legislative, funding, assessment and psychosocial issues. Labs will provide an opportunity for hands-on learning experiences with a broad range of tools in context-specific personal, community and organizational settings.
Credit 3 units.
M01 OT 5225 Fundamentals of Health Care and Professional Practice
This course prepares students to manage the changing paradigms of practice that will be encountered over their career. Understanding the current continuum of care settings, professional team roles, and health policy sets the foundation for this course. Professional behavior and ethics will be introduced. Preparation of leadership skills and an entrepreneurial approach to practice will be introduced. Partnering with community agencies to meet the unmet needs of those we serve and to open up new potential markets will be explored.
Credit 3 units.

M01 OT 5285 Promoting Population Health through Community Partnerships
This course offers a service learning experience through partnership with local community agencies to enhance population health. Mentored teams collaborate with personnel in community non-profit agencies. Students provide a capacity-building service through a needs assessment and a written program plan with an evaluation component. The intent is to enhance sustainability of the organizations' programs. The target population served by the organization benefits from expansion and/or enhancement of services. Examples of programs include: parent education, youth skill development, worker health advocacy, neighborhood/residential services, and employee/volunteer programs.
Credit 3 units.

M01 OT 5315 Toolbox to Support Professional Practice
This course serves as an introduction to the essential skills required of therapists in contemporary clinical practice. Students will be introduced to resources supporting professional practice and will learn and apply a variety of skills including transfers, documentation, goal-writing, common precautions, monitoring of vital signs, chart reading, orientation to acute care environments, activity analysis, and searching relevant literature to facilitate evidence-based practice.
Credit 3 units.

M01 OT 5380 Health Promotion, Participation and Wellness for Persons with Chronic Disease
The impact of chronic disease on daily participation affects health-related quality of life and well-being. Students will study health promotion and preventive individual and group models of service delivery for community-dwelling people. Using Healthy People 2020 topic areas, students will explore theory-driven, evidence-based health education solutions for consumers with chronic conditions to strengthen their community participation. Students will discover therapeutic interventions to empower people to self-manage their conditions and connect with community resources for health promotion, prevention and wellness.
Credit 2 units.

M01 OT 5452 Fundamentals of Evidence-Based Practice
Through critical reading and analysis of professional scientific literature, students build a foundation for life-long learning and evidence-based clinical practice. Students will be introduced to measurement principles, learn qualitative and quantitative analysis, and apply concepts learned to designing single case studies for clients served. Evaluation is at the core of evidence-based practice: Interactions with clients are dependent on the ability to measure therapeutic effect.
Credit 2 units.

M01 OT 5610 Fieldwork I
This is the first course in a series that emphasizes the growth of the student as a professional. Students will build on the electronic professional portfolio developed in the fall semester and participate in self-directed learning experiences to enhance personal growth and professional competence. An intensive one-week, 40-hour, supervised fieldwork experience in a clinical or community setting allows the student to practice the skills learned in the classroom.
Credit 1 unit.

M01 OT 5615 Fieldwork I
This is the second course in a series that emphasizes the growth of the student as a professional. Students will continue to build on their electronic professional portfolio and participate in self-directed learning experiences to enhance personal growth and professional competence. An intensive one-week, 40-hour, supervised fieldwork experience in a clinical or community setting allows the student to practice the skills learned in the classroom.
Credit 1 unit.

M01 OT 5620 Preparation for Professional Practice
This course emphasizes the growth of the student as a professional. Topics include the preparation for national certification and state requirements for credentialing, standards of practice, ethical behaviors and continuing competence. Students will prepare a personal marketing package and participate in self-directed learning experiences. Preparation for the students' fieldwork Level II and Apprenticeships will be emphasized in this course. Topics include the FWII evaluation process, completing FWII prerequisites, communicating with FW Educators and other professionals.
Credit 1 unit.

M01 OT 5630 Fundamentals of Professional Communication
The ability to communicate and work with individuals and groups are essential skills for an occupational therapist. Effective practitioners employ therapeutic use of self, activity analysis, behavioral management, and group leadership skills to effect change in those served. Concepts of self-management and basic tenets of learning theories will be explored and applied to various populations served. Occupational therapists must be able to meet the psychosocial needs of all clients across the continuum of care.
Credit 3 units.

M01 OT 5762 Body Structures Supporting Daily Function I
In this second of a two-course-sequence, students engage in the study of the contribution of the structure, function, and development of body systems that support daily activity. This semester emphasizes anatomical systems and neuromusculoskeletal substrates for activity, joint integrity, strength and cardiopulmonary function.
Credit 2 units.

M01 OT 5770 Fundamentals of Assessment I
The course runs concurrently with Body Structures Supporting Daily Function and Neuroscience Principles of Performance. In
In this first of a two-course sequence, students apply anatomical and kinesiological principles to occupational performance through assessment of anatomical structures and physiological health. Students learn how to identify sensory, cognitive, perceptual, and emotional performance capacities of individuals by focusing on neuroanatomical and neuro-physiological substrates of sensory, motor, arousal, cognitive, motivational and emotional systems. The students connect the neuroscience of the physiological, neurobehavioral, cognitive and psychological systems to the motor, process and communication performance skills and performance patterns that support occupational performance. Additionally, selected chronic diseases, disorders and conditions will be introduced. Etiology, pathology, clinical course, prognosis and medical management will inform the evaluation process as it impacts occupational performance. Students will build clinical reasoning for core OT practice skills including assessment of person, occupation and environment factors, activity analysis and activity gradation, observation, administering and interpreting assessments, building measurement models, and documenting the evaluation process. Evidence based practice is emphasized through exploration of the scientific and medical literature. Students will apply measurement principles and skills in selection, administration and interpretation of assessments through case studies, laboratory and fieldwork or in-context experiences.

Credit 3 units.

M01 OT 5782 Neuroscience Principles of Performance I
In this first of a two-course sequence, students learn how the brain and nervous system support the sensory, perceptual, cognitive, emotional, and physiological capacity of individuals as they perform activities of daily life. Emphasis is placed on sensory processing, motor processing, cognitive performance, learning and memory, and communication. Students will also learn about specific neurological conditions commonly encountered in clinical practice.

Credit 3 units.

M01 OT 580 Medical Spanish and Hispanic Culture: Increasing Participation and Performance in Minority Population
This course will teach students basic vocabulary and communication skills in Spanish. It will also focus on developing an understanding and appreciation for the culture of the many different Spanish-speaking countries. We will discuss the availability and use of assessments available in Spanish and how to perform a client-centered evaluation in Spanish. Students will demonstrate oral and written skills in Spanish and knowledge of the sociocultural and socioeconomic factors influencing participation. Prerequisite: basic level of Spanish (high school Spanish) or a language assessment with the instructor.

Credit 3 units.

M01 OT 5801 Case Based Learning I
In this first course of a two-semester sequence, students are engaged in a learning experience that includes divergent case method, inquiry learning, and problem-based learning. Using a self-directed learning process, clinical reasoning and group process skills, students explore practice problems and apply specific occupational therapy evaluations and intervention techniques for persons of all ages and disability categories. The context of cases are integrated with material covered concurrently in the Interventions courses and focus on direct clinical treatment interventions.

Credit 2 units.

M01 OT 5802 Case Based Learning II
In this second of a two-course sequence, students are engaged in a learning process that includes divergent case method, inquiry learning, self-directed learning, problem-based learning, clinical reasoning and group process skills. Students explore practice problems, and apply specific occupational therapy evaluations and intervention techniques for persons of all ages and disability categories within the context of cases integrated with material covered concurrently in the Interventions courses. The focus is on direct clinical treatment interventions. This is a small seminar class with 8-9 students and a faculty mentor.

Credit 2 units.

M01 OT 5825 Interventions Supporting Recovery and Participation of Individuals with Sensorimotor Challenges
Sensorimotor deficits and delays impact daily life and participation. Throughout this course, students will explore how to utilize assessment results to implement theory-driven evidence-based treatment plans to improve occupational performance and participation in daily life. Lifespan and practice setting issues from birth to older adults will be addressed in relation to sensory and motor deficits and delays. Students will utilize a variety of hands-on, case-based, and self-directed learning activities to develop clinical skills.

Credit 3 units.

M01 OT 5835 Interventions Supporting Recovery and Participation of Individuals with Cognitive and Learning Challenges
TBA
Credit 3 units.

M01 OT 5845 Interventions Supporting Recovery and Participation of Individuals with Psychosocial Challenges
This 3-credit course is designed to provide the foundation skills for evidence-based intervention for individuals with mental health and psychosocial challenges across the lifespan. Students will explore policies, theories, medical and pharmacological treatments and OT intervention approaches and therapeutic techniques for individuals with mental illness diagnoses. The course will focus on supporting recovery and performance to increase participation. Course material will address factors across the continuum of individual through population intervention approaches. Lectures, case studies, lab experiences, and experiences in the community will provide the foundation for the learning experiences. Related skills in documentation, goal setting, reimbursement and ethical issues which may arise will be incorporated into classroom discussions and assignments.

Credit 3 units.

M01 OT 593A Fieldwork II
Provides fieldwork experiences under the supervision of an occupational therapist. Students’ participation includes in-depth experience in delivering occupational therapy services to clients including evaluation, treatment and intervention. Students have the opportunity to practice in a variety of clinical or community based settings. During the fieldwork process, students are expected to assume increasing responsibilities related to patient or client care. The fieldwork experience is designed to promote
M01 OT 593B Fieldwork II
Provides fieldwork experiences under the supervision of an occupational therapist. Students' participation includes in-depth experience in delivering occupational therapy services to clients including evaluation, treatment and intervention. Students have the opportunity to practice in a variety of clinical or community based settings. During the fieldwork process, students are expected to assume increasing responsibilities related to patient or client care. The fieldwork experience is designed to promote clinical reasoning, professionalism and competency. Duration is 12 weeks per course section. Credit 6 units.

M01 OT 595 Independent Study
Active participation in research activities with program faculty. A written plan of study agreed upon by faculty and student. Permission of faculty adviser required. Credit variable, maximum 6 units.

M01 OT 596 Fieldwork II - Elective
Optional fieldwork after graduation. Permission required to register. Credit variable, maximum 6 units.

M01 OT 601 Applied Clinical Research I
This is the first of a four-course sequence offering the students opportunities to: 1) perform a systematic investigation, 2) develop a research project, and 3) perform testing and evaluation. The class is designed to develop or contribute to generalizable knowledge of occupational therapy or occupational performance. Activities that meet this definition include ongoing work in the laboratories of the faculty, controlled clinical trials, pilot studies to determine feasibility of future studies, demonstrations and community programs that may lead to new services or policy demonstrations. In the sequence, the student will work on their research project. The project will include collecting, processing, and analyzing data. The student will also begin to write about their work. Students may observe practitioners who work with the population related to their research projects. Credit 3 units.

M01 OT 603 Applied Clinical Research III
The third of a four-course sequence offering the students opportunities to: 1) perform a systematic investigation, 2) develop a research project, and 3) perform testing and evaluation. The class is designed to develop or contribute to generalizable knowledge of occupational therapy or occupational performance. Activities that meet this definition include ongoing work in the laboratories of the faculty, controlled clinical trials, pilot studies to determine feasibility of future studies, demonstrations and community programs that may lead to new services or policy demonstrations. In the sequence, the student will work on their research project. The project will include collecting, processing, and analyzing data. The student will also begin to write about their work. Students may observe practitioners who work with the population related to their research projects. Credit 3 units.

M01 OT 605 Applied Clinical Practice I
This is the first of a four-course sequence offering students opportunities to: 1) enhance clinical skills, 2) support evidence based practice, 3) provide leadership opportunities, and 4) allow specialization in an area of clinical practice. The opportunities will present themselves by associating with clinics or other OT related facilities in the greater St. Louis area. The course is self-directed learning experience under the guidance of an OT clinical faculty member and a community practitioner. The student will be guided by a clinical mentor and work on a clinical project related to the needs of the facility. A final report and presentation will be made and the end of the sequence. Credit 3 units.

M01 OT 607 Applied Clinical Practice III
The third of a four-course sequence offering students opportunities to: 1) enhance clinical skills, 2) support evidence based practice, 3) provide leadership opportunities, and 4) allow specialization in an area of clinical practice. Students will have an opportunity to develop occupation-based programs for clinics or other community agencies in the St. Louis region. The course is a collaborative self-directed service learning experience under the guidance of an OT faculty member and a community partner. The student will be guided by the needs of the agency in helping to build the agency's capacity. Credit 3 units.

M01 OT 630 Seminar in Proposal Development and Applied Clinical Research
This is the third course in the clinical research series. Students continue to learn specific research methodologies, gain skills in the use of standardized measurement tools, conduct behavioral analysis, enter data in an established data base and conduct statistical analysis. The student learns the research process in a mentored seminar format. At the end of this course, students present their research findings to a community of students, faculty, area clinicians, and other members of the general public who attend this day-long conference of student presentations. Students may choose to study in faculty research laboratories related to productive aging, pediatrics, work and industry, or participation. Credit 3 units.

M01 OT 660 Biopsychosocial Factors Influencing Performance
The course will provide an in-depth understanding of the biomedical research literature pertaining to factors that influence performance. The course focuses on psychological, physiological, sensory, perceptual, motor, cognitive processes as well as subjective and objective assessments of the environment for home, work and community contexts that contribute to performance and performance changes with rehabilitation. The course will be team taught with a combination of lecture and seminar formats to lay the foundational principles of performance and to discuss how the capacity to perform supports participation. Credit 3 units.

M01 OT 670 Environment Factors and Participation
The course will provide an in-depth understanding of person-environment interactions and the link between biomedical factors and community participation. The course focuses on the
physical, technology and policy aspects of the environment that impact participation of persons with or at risk for chronic illness or disability. The course will be team taught with a combination of lecture and seminar formats.
Credit 3 units.

M01 OT 680 Measurement Theory and Development
The course will provide a broad framework and specific knowledge for assessment in areas of rehabilitation and participation. The course focuses on psychological, physiological, sensory, perceptual, motor, cognitive processes as well as subjective and objective assessments of the environment for home, work and community contexts. The course will be team taught with a combination of lecture and discussion formats.
Credit 3 units.

M01 OT 690 Rehabilitation Neuroscience
The role of experience in shaping brain functions is a central question in psychology and neuroscience. The prevailing view is that the functional organization of the mature brain is dynamic — changing in response either to increases or decreases in stimulation. However, this has not always been the accepted perspective. Even now, many fundamental questions remain, and the answers should directly impact the way that we approach learning and the rehabilitation (re-learning) in the future. Just what are the limits on plasticity in the adult brain? How should environments be structured to exploit this capacity effectively? Is all reorganization behaviorally relevant? What factors contribute to adaptive, as opposed to maladaptive, changes? Together, we will consider historical perspectives on, and what is presently known about, these and related questions.
Credit 3 units.

M01 OT 710 Lab Practicum
Laboratory practicum is designed to permit the student to learn the basic processes of their selected laboratory. The practicum will involve ongoing research projects and can be both laboratory and clinical in nature.
Credit 2 units.

M01 OT 720 Teaching Practicum I
The teaching practicum provides an opportunity to engage in a focused and supervised classroom teaching experience. The student's teaching should be in a content area relevant to the student's area of interest.
Credit 1 unit.

M01 OT 721 Teaching Practicum II
The teaching practicum provides a continued opportunity to engage in a focused and supervised classroom teaching experience. The student's teaching should be in a content area relevant to the student's area of interest.
Credit 1 unit.

M01 OT 750A Directed Practice Research: Productive Aging
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in productive aging. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 750B Directed Practice Research: Social Participation
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in social participation. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 750C Directed Practice Research: Pediatrics
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in pediatrics. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 750D Directed Practice Research: Social Participation
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in social participation. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 750E Directed Practice Research: Pediatrics
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in pediatrics. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 750F Directed Practice Research: Rehabilitation
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in rehabilitation. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 750W Directed Practice Research: Work & Industry
This is the first course in a series of three courses designed as an applied clinical experience or clinical research project under the guidance of a graduate faculty mentor. The focus of the project will be in Work & Industry. The project, over the course of three semesters, will result in a scholarly paper.
Students enter this course after they have completed OT 630, the Proposal Seminar course.
Credit 3 units.

M01 OT 751A Directed Practice / Research Aging I
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member.
Credit variable, maximum 6 units.

M01 OT 751B Directed Practice / Research Disability I
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member.
Credit variable, maximum 6 units.

M01 OT 751C Directed Practice / Research Pediatrics I
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member.

Credit variable, maximum 6 units.

M01 OT 751R Directed Practice/Research - Rehab
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member.
Credit variable, maximum 6 units.

M01 OT 751W Directed Practice / Research Work I
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member.
Credit variable, maximum 6 units.

M01 OT 752A Directed Practice / Research Aging II
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member. Prerequisite: OT 751A.
Credit variable, maximum 6 units.

M01 OT 752D Directed Practice / Research Disability II
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member. Prerequisite: OT 751D.
Credit variable, maximum 6 units.

M01 OT 752P Directed Practice / Research Pediatrics II
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member. Prerequisite: OT 751P.
Credit variable, maximum 6 units.

M01 OT 752R Directed Practice Research III: Rehab
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member. Prerequisite: OT 751R.
Credit variable, maximum 6 units.

M01 OT 752W Directed Practice / Research Work II
Student will engage in applied clinical research under the guidance of a graduate faculty member. Topics will be in the area of specialization chosen by the student in consultation with the faculty member. Prerequisite: OT 751W.
Credit variable, maximum 6 units.

M01 OT 760A OT Practice Seminar I
The seminar will focus on World Health Organizations Model of function and health. Student will engage in critical reading and discussion of the application of the model to their area of specialization. Prerequisite: OT 760A.
Credit 3 units.

M01 OT 760B OT Practice Seminar II
The seminar will focus on World Health Organizations Model of function and health. Student will engage in critical reading, and discussion of the application of the model to their area of specialization. Prerequisite: OT 760A.
Credit 3 units.

M01 OT 762 Seminar in Education Strategies
This course offers an opportunity for students to reflect on and examine concurrent occupational therapy teaching assistantship experiences. Attention will be given to learning theories underlying practice, teaching tools and strategies, and situated and distributed learning. Activities will include critical reading, peer supervision, and self-assessment.
Credit 3 units.

M01 OT 770 Research Seminar
Regular meeting where research is presented and discussed. Presentations will be made by Washington University faculty, faculty outside the university, and students.
Credit 1 unit.

M01 OT 780 Research Practicum
The mentored research credit units will be used to develop the research skills of the student. The student will work with the mentor's guidance to conduct research that adds value to the laboratory and gains experience for the student. The mentored independent studies should lead to refereed publications and may contribute to the dissertation research.
Credit variable, maximum 6 units.

M01 OT 793C Doctoral Experiential Component
Provides a customized field experience specific to the doctoral pursuit of the student. Students may participate in research, policy, clinical practice, advocacy, teaching, etc. Students are expected to achieve specific goals established by the student, their doctoral chair, and the site mentor. Duration is 16 weeks.
Credit 6 units.

M01 OT 793D Doctoral Experiential Component
Provides a customized field experience specific to the doctoral pursuit of the student. Students may participate in research, policy, clinical practice, advocacy, teaching, etc. Students are expected to achieve specific goals established by the student, their doctoral chair, and the site mentor. Duration is 16 weeks.
Credit variable, maximum 6 units.

Physical Therapy
Physical therapy is the science of human movement applied to rehabilitation, injury, fitness, injury prevention and overall health. Practicing in a variety of settings, physical therapists diagnose and treat movement dysfunction in patients with skill, competence and compassion. The Program in Physical Therapy is committed to providing students with excellent scientific and clinical education in an environment that strives to continually lead the industry in practice, research, innovation and advocacy of movement health.

The Program in Physical Therapy at the School of Medicine offers two formal curricula that collectively foster opportunities for lifelong learning and comprehensive career development.
The Human Movement System Approach

The Program in Physical Therapy has pioneered a unique, movement-based approach to physical therapy. The human movement system is at the core of our approach to physical therapy education, research and patient care.

At the core of our approach to physical therapy is the human movement system, which consists of physiological organ systems that interact to produce and support movement of the body and its parts. Movement science is the study of the movement system, and we believe physical therapists are the world's movement system experts.

Our program has pioneered the development of movement-focused physical therapy education, research and treatment (https://outlook.wustl.edu/movement-redefined). The human movement system continues to be our foundation for treating patients, conducting research, and training the next generation of leaders in physical therapy. Our vision is aligned with the vision of the American Physical Therapy Association (APTA) (http://www.apta.org), which is to "transform society by optimizing movement to improve the human experience."

Additional Information

Further information, including complete admissions instructions and program descriptions, may be obtained by direct correspondence with the Program in Physical Therapy:

Program in Physical Therapy
Washington University School of Medicine
4444 Forest Park Avenue, CB 8502
St. Louis, MO 63108-2212
Fax: 314-286-1410

Email: ptadmissions@wustl.edu
Website: https://pt.wustl.edu

Degrees & Requirements

Professional Doctor of Physical Therapy (DPT)

The professional curriculum is an intensive three-year experience leading to the Doctor of Physical Therapy degree. The principle focus of this professional training is to develop scientific and clinical expertise in the diagnosis and treatment of movement-related conditions. By integrating biomedical and physical sciences and clinical education with behavioral and social sciences, the DPT curriculum (PDF) (http://bulletin.wustl.edu/medicine/departments/physical-therapy/DPT_Curriculum_2016.pdf) provides students with the scientific expertise, critical thinking skills and interpersonal communication necessary for effective clinical practice, comprehensive treatment design, patient advocacy, patient education and health promotion.

Applicants for admission must have 1) completed a bachelor’s degree at an accredited institution, and 2) prerequisite courses in biology, chemistry, physics, anatomy, physiology, psychology and statistics, and 3) a minimum science, math/science, and core prerequisites GPA of 3.0, and 4) completed the Graduate Record Examination.


DPT Curriculum

Year One, Fall

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>PhysTher 601</td>
<td>Diagnosis and Evidence Analysis in PT Practice I</td>
<td>2</td>
</tr>
<tr>
<td>PhysTher 602</td>
<td>Professional Issues and Skills I</td>
<td>3</td>
</tr>
<tr>
<td>PhysTher 603</td>
<td>Essential Clinical Skills I</td>
<td>4</td>
</tr>
<tr>
<td>PhysTher 604</td>
<td>Cells, Systems and Disease I</td>
<td>4</td>
</tr>
<tr>
<td>PhysTher 605</td>
<td>Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>PhysTher 606</td>
<td>Kinesiology I</td>
<td>3</td>
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Early Clinical Experience

Year One, Spring

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>PhysTher 610</td>
<td>Cells, Systems and Disease II</td>
<td>4</td>
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<tr>
<td>PhysTher 611</td>
<td>Human Anatomy</td>
<td>5</td>
</tr>
<tr>
<td>PhysTher 612</td>
<td>Diagnosis and Evidence Analysis in PT Practice II</td>
<td>2</td>
</tr>
<tr>
<td>PhysTher 613</td>
<td>Kinesiology II</td>
<td>5</td>
</tr>
<tr>
<td>PhysTher 614</td>
<td>Diagnosis and Management of Musculoskeletal Conditions in PT I</td>
<td>3</td>
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<tr>
<td>PhysTher 615</td>
<td>Professional Issues and Skills Development II</td>
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</table>

Early Clinical Experience

Year One, Summer

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhysTher 691/ PhysTher 691A</td>
<td>Clinical Experience I</td>
<td>4</td>
</tr>
</tbody>
</table>

(8-week, full-time internship)

Year Two, Fall
PhysTher 621  Exercise Physiology  3
PhysTher 622  Diagnosis and Management of Cardiopulmonary Conditions in PT  3
PhysTher 623  Orthopaedic Medicine  2
PhysTher 624  Diagnosis and Management of Musculoskeletal Conditions in PT II  3
PhysTher 625  Neurology Medicine  2
PhysTher 627  Essential Clinical Skills II  3
PhysTher 628  Case Integration Lab I  1
PhysTher 629  Diagnosis and Management of Neuromuscular Conditions in PT I  2

<table>
<thead>
<tr>
<th>Year Two, Winter</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
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<tr>
<td>PhysTher 692/</td>
</tr>
<tr>
<td>PhysTher 692A</td>
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<table>
<thead>
<tr>
<th>Year Two, Spring</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
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<tr>
<td>PhysTher 626</td>
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<tr>
<td>PhysTher 635</td>
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<tr>
<td>PhysTher 636</td>
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<tr>
<td>PhysTher 638</td>
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<tr>
<td>PhysTher 642</td>
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<tr>
<td>PhysTher 643</td>
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<table>
<thead>
<tr>
<th>Year Three, Summer</th>
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<tbody>
<tr>
<td>Code</td>
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<td>PhysTher 693/</td>
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<td>PhysTher 693A</td>
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<td>PhysTher 694/</td>
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<td>PhysTher 694A</td>
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<tr>
<th>Year Three, Spring</th>
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</thead>
<tbody>
<tr>
<td>Code</td>
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<tr>
<td>PhysTher 650</td>
</tr>
</tbody>
</table>

PhysTher 651  Organizational and Management Issues  3
PhysTher 652  Alternative Settings and Practice Environments  3
PhysTher 653  Health Fitness and Prevention  3
PhysTher 654  Case Integration Lab III  3
PhysTher 655  Professional Issues and Skill Development IV  4

Focused Clinical Study (30 hours)

**Doctor of Philosophy (PhD) in Movement Science**

The focus of the interdisciplinary doctoral program in movement science is to prepare future researchers and faculty members who can enhance the profession of physical therapy. Admission to this curriculum requires acceptable scores on the Graduate Record Examination, excellence in previous academic work, and demonstrated beginning abilities in posing questions of importance to the study of movement.

The faculty members of the Program in Physical Therapy are committed to being leaders in discovering and transmitting new knowledge related to movement dysfunction, preparing clinicians to assume multiple roles in a complex health care environment, and fulfilling the service mission to society through active participation in humanistic, scientifically based patient care. Students in all curricula are expected to participate actively in an environment that values integrity, initiative, creativity and the strong belief that physical therapy intervention promotes health. In these ways, all individuals associated with the Program in Physical Therapy may achieve their highest professional and personal potential.

Visit our website or more information regarding application and admissions ([https://pt.wustl.edu/education/phd-in-movement-science/application-admissions](https://pt.wustl.edu/education/phd-in-movement-science/application-admissions)).

For more information about the PhD in Movement Science ([http://bulletin.wustl.edu/grad/gsas/movesci](http://bulletin.wustl.edu/grad/gsas/movesci)), please visit the Graduate School Bulletin.

**Research**

The mission of the Research Division is to understand how the movement system ([https://pt.wustl.edu/about-us](https://pt.wustl.edu/about-us)) is affected by disease, injury, lifestyle, development and aging, and to understand how movement can be used to promote health by enhancing physical function, activity and participation across the lifespan.

Our interdisciplinary scientific endeavors include mechanistic and translational investigations at all levels of organization from the cell to society. Our research ([https://pt.wustl.edu/research/our-research-areas](https://pt.wustl.edu/research/our-research-areas)) is supported by millions of dollars in federal, private foundation, and university funding. We pursue knowledge in a collaborative work environment within the

Our doctoral and postdoctoral Research Training Programs (https://pt.wustl.edu/research/research-training-programs) prepare students for careers at the forefront of physical therapy and movement science research.

### Our Research Areas

<table>
<thead>
<tr>
<th>Research Area</th>
<th>Faculty Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot &amp; Ankle Injury &amp; Recovery</td>
<td>Mary K. Hastings, PT, DPT, MSCI, ATC</td>
</tr>
<tr>
<td>Hardware &amp; Software Design for Rehabilitation Research</td>
<td>Joseph W. Klaesner, PhD</td>
</tr>
<tr>
<td>Integrative Muscle Physiology</td>
<td>Gretchen A. Meyer, PhD</td>
</tr>
<tr>
<td>Metabolism &amp; Organ Function in Metabolic Disease</td>
<td>W. Todd Cade, PT, PhD</td>
</tr>
<tr>
<td>Movement &amp; Musculoskeletal Problems in Diabetes</td>
<td>Michael J. Mueller, PT, PhD, FAPTA</td>
</tr>
<tr>
<td>Movement &amp; Neurodegenerative Disease</td>
<td>Gammon M. Earhart, PT, PhD, FAPTA</td>
</tr>
<tr>
<td>Movement &amp; Neurodegenerative Disease</td>
<td>Ryan P. Duncan, PT, DPT</td>
</tr>
<tr>
<td>Nutrition &amp; Exercise</td>
<td>Diana C. Parra Perez, MPH, PhD</td>
</tr>
<tr>
<td>Physical Activity &amp; Fitness</td>
<td>B. Ruth Clark, PT, PhD</td>
</tr>
<tr>
<td>Physical Activity &amp; Fitness</td>
<td>Susan B. Racette, PhD</td>
</tr>
<tr>
<td>Prevention, Rehabilitation &amp; Maintenance in Musculoskeletal Conditions</td>
<td>Linda Van Dillen, PT, PhD, FAPTA</td>
</tr>
<tr>
<td>Rehabilitation Research for Orthopaedic Conditions</td>
<td>Marcie Harris-Hayes, PT, DPT, MSCI</td>
</tr>
<tr>
<td>Stroke Recovery &amp; Rehabilitation Accelerometry</td>
<td>Catherine Lang, PT, PhD</td>
</tr>
<tr>
<td>Stroke Recovery &amp; Rehabilitation Accelerometry</td>
<td>Margheureta D. Bland, PT, DPT, NCS</td>
</tr>
<tr>
<td>Whole Body &amp; Joint-Level Orthopaedic Biomechanics</td>
<td>Michael D. Harris, PhD</td>
</tr>
<tr>
<td>Biological sample processing equipment</td>
<td>Motion capture equipment</td>
</tr>
<tr>
<td>Cell culture suite</td>
<td>Muscle physiology testing equipment</td>
</tr>
<tr>
<td>Dynamometers</td>
<td>Oscilloscopes</td>
</tr>
<tr>
<td>Electromyography</td>
<td>Rotating treadmill</td>
</tr>
<tr>
<td>Eye tracking</td>
<td>Simulated spaces for functional activities</td>
</tr>
<tr>
<td>Force platforms</td>
<td>Split-belt treadmill</td>
</tr>
<tr>
<td>Function generators</td>
<td>Treadmills</td>
</tr>
<tr>
<td>GAITRite instrumented walkway</td>
<td>Wheel mill system</td>
</tr>
</tbody>
</table>

### Research Training Programs

We offer physical therapy research training programs designed to prepare students at the doctoral and postdoctoral levels for careers in groundbreaking physical therapy research.

**PhD in Movement Science**

Under the Movement Science Program, students work on the research topics that interest them while completing course work that prepares them for their research careers. The Movement Science Program encourages collaboration with other departments within the School of Medicine.

Visit our website for more information about our Movement Science Program (https://pt.wustl.edu/education/phd-in-movement-science).

**Postdoctoral Fellowship in Movement Science**

Our Postdoctoral Fellowship in Movement Science offers an opportunity to develop and complete research projects related to movement science and rehabilitation. Fellows are encouraged to collaborate with other faculty and programs in the School of Medicine.

Visit our website for more information about our Postdoctoral Fellowship (https://pt.wustl.edu/education/postdoctoral-fellowship-in-movement-science).

### Faculty

**Division Director of Education**

Jennifer Stith, PT, PhD, LCSW

**Division Director of Research**

Linda Van Dillen, PT, PhD, FAPT

**Division Director of Clinical Practice**

Beth Crowder, PT, DPT, NCS, MPPA

Visit our website for more information about our faculty (https://pt.wustl.edu/faculty-staff/faculty) and their appointments.
Steven B Ambler, M PH, DPT, PHD
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Orthopaedic Surgery
M PH University of South Florida 2014
BS University of Illinois 2002
DPT Washington Univ in St. Louis 2005
PHD University of South Florida 2016

Amy J Bastian, PHD
Adjunct Assistant Professor of Physical Therapy (primary appointment)
PHD Washington Univ in St. Louis 1995
BS University of Oklahoma 1990

Marghuretta Dakota Bland, DPT, MS
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Neurology
Associate Professor of Occupational Therapy
DPT Washington Univ in St. Louis 2008
BS Canisius College 2004
MS Washington Univ in St. Louis 2008

Marybeth Brown, MA, PHD
Adjunct Associate Professor of Physical Therapy (primary appointment)
BS Russell Sage College 1967
MA University of Southern Calif 1974
PHD University of Southern Calif 1984

Tamara Lavon Burlis, MHS, DPT
Professor of Physical Therapy (primary appointment)
Assistant Director of Professional Curriculum in Physical Therapy
Associate Director for Clinical Education in Physical Therapy
Professor of Medicine
MHS Washington Univ in St. Louis 1993
DPT Washington Univ in St. Louis 2003
BA Wartburg College 1988
BS Washington Univ in St. Louis 1988

William Todd Cade, PHD, MS
Professor of Physical Therapy (primary appointment)
Associate Director of Postdoctoral Fellowships in Physical Therapy
Professor of Medicine
PHD University of Maryland 2002
BS University of Maryland 1991
MS University of Miami 1994

Cheryl Ann Caldwell, MHS, DPT
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Orthopaedic Surgery
BS University of Colorado Boulder 1976

MHS Washington Univ in St. Louis 1988
DPT Washington Univ in St. Louis 2002

Billie Ruth Clark, PHD
Professor of Physical Therapy (primary appointment)
Professor of Neurology
PHD Saint Louis University 1988
BS Saint Louis University 1974

Suzanne Marie Cornbleet, MA, DPT
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Orthopaedic Surgery
MA Washington Univ in St. Louis 1987
DPT Washington Univ in St. Louis 2003
BS University of Colorado Boulder 1975

Beth Elaine Crowner, BS PT, MS, M PP, DPT
Professor of Physical Therapy (primary appointment)
Division Director of Clinical Practice in Physical Therapy
Professor of Neurology
BS PT Washington Univ in St. Louis 1989
MS Washington Univ in St. Louis 1989
M PP University of MO St Louis 1997
DPT Washington Univ in St. Louis 2007

Sylvia Lin Czuppon, MS, DPT
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Orthopaedic Surgery
MS Washington Univ in St. Louis 2002
DPT Washington Univ in St. Louis 2011
BA Washington Univ in St. Louis 2000

Ryan Michael DeGeeter, DPT
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Orthopaedic Surgery
BS Ball State University 2007
DPT Washington Univ in St. Louis 2010

Ryan Patrick Duncan, MS, DPT
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Neurology
BS Maryville University 2007
MS Maryville University 2008
DPT Washington Univ in St. Louis 2012

Gammon Marie Earhart, MS, PHD
Professor of Physical Therapy (primary appointment)
Executive Director of the Program in Physical Therapy
Professor of Neurology
Professor of Neuroscience
MS Beaver College 1996
PHD Washington Univ in St. Louis 2000
BS Beaver College 1994
Michael Dennison Harris, PHD
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Mechanical Engineering and Materials Science (Title of Standing)
Assistant Professor of Orthopaedic Surgery
BS University of Utah 2007
PHD University of Utah 2013

Mary Kent Hastings, MS, DPT
Professor of Physical Therapy (primary appointment)
Professor of Orthopaedic Surgery
BS University of Illinois 1990
MS Washington Univ in St. Louis 1993
DPT Washington Univ in St. Louis 2002

Marcie Harris Hayes, MS, DPT
Professor of Physical Therapy (primary appointment)
Professor of Orthopaedic Surgery
MS Northwestern University 1996
BS Southwest Missouri St Universi 1994
DPT Washington Univ in St. Louis 2003

Carey Lane Holleran, PHD, MS
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Neurology
PHD University of Indianapolis 2014
BS Duquesne University 2003
MS Duquesne University 2004

Gregory William Holtzman, MS, DPT
Associate Professor of Physical Therapy (primary appointment)
Associate Director of Clinical Practice in Physical Therapy
Associate Professor of Orthopaedic Surgery
BA Emory University 1995
MS Washington Univ in St. Louis 2001
DPT Washington Univ in St. Louis 2007

Renee A. Ivens, MHS, DPT
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Orthopaedic Surgery
MHS Washington Univ in St. Louis 1996
DPT Washington Univ in St. Louis 2006
BS Maryville University 1984

Lynnette C Khoo-Summers, MS, DPT
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Associate Professor of Orthopaedic Surgery
MS Washington Univ in St. Louis 1998
BA Colorado St University 1990
DPT Washington Univ in St. Louis 2008

Joseph W. Klaesner, BS1, PHD, MS
Professor of Physical Therapy (primary appointment)
Professor of Radiology
BS1 Marquette University 1987
BS Marquette University 1987
PHD Vanderbilt University 1995
MS Vanderbilt University 1993

Catherine Eckels Lang, MS, PHD
Professor of Physical Therapy (primary appointment)
Associate Director of Movement Science PhD Program in Physical Therapy
Professor of Neurology
Professor of Occupational Therapy
MS University of Vermont 1997
BS University of Vermont 1993
PHD Washington Univ in St. Louis 2001

Vanessa Mae Lanier, DPT
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Orthopaedic Surgery
BS Washington Univ in St. Louis 2007
DPT Washington Univ in St. Louis 2012

Mary Kate McDonnell, MHS, DPT
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Associate Director of Residencies and Fellowships in Physical Therapy
Associate Professor of Orthopaedic Surgery
MHS Washington Univ in St. Louis 1985
BS Saint Louis University 1981
DPT Washington Univ in St. Louis 2003

Patricia Navarro McGee, DPT
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Assistant Professor of Orthopaedic Surgery
DPT Washington Univ in St. Louis 2004
BA Washington Univ in St. Louis 2001
BA Washington Univ in St. Louis 2001

Gretchen Ann Meyer, MS, PHD
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Assistant Professor of Orthopaedic Surgery
Assistant Professor of Neurology
Assistant Professor of Orthopaedic Surgery
MS Washington Univ in St. Louis 2004
PHD University of CA San Diego 2011
BS Washington Univ in St. Louis 2004

Jennifer Alaine Miller-Katsafanas, DPT, BBA, DPT
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Obstetrics and Gynecology
BA University of MO St Louis 1996
DPT Washington Univ in St. Louis 2012
BA University of MO St Louis 1996
BBA University of MO St Louis 1996
DPT Washington Univ in St. Louis 2012
Michael Jeffrey Mueller, MHS, PHD
Professor of Physical Therapy (primary appointment)
Professor of Radiology
BS Washington Univ in St. Louis 1979
MHS Washington Univ in St. Louis 1984
PHD Washington Univ in St. Louis 1992

Barbara Jean Norton, MHS, PHD
Professor of Physical Therapy (primary appointment)
Associate Director for Education Technology in Physical Therapy
Professor of Neurology
MHS Washington Univ in St. Louis 1985
PHD Washington Univ in St. Louis 1996
BS Washington Univ in St. Louis 1966

Diana C. Parra Perez, MS, PHD
Assistant Professor of Physical Therapy (primary appointment)
Assistant Professor of Surgery (Prevention and Control)
MS Saint Louis University 2008
PHD Washington Univ in St. Louis 2013
BA Universidad del Rosario 2001

Susan B. Racette, PHD
Professor of Physical Therapy (primary appointment)
Professor of Medicine
BS Bucknell University 1988
PHD University of Chicago 1994

Shirley Ann Sahrmann, MA, PHD
Professor Emeritus of Physical Therapy (primary appointment)
MA Washington Univ in St. Louis 1971
PHD Washington Univ in St. Louis 1973
BS Washington Univ in St. Louis 1958

Nancy Bloom Smith, MS, DPT
Professor of Physical Therapy (primary appointment)
Professor of Orthopaedic Surgery
BA University of Virginia 1976
MS Washington Univ in St. Louis 1979
BS Washington Univ in St. Louis 1984
DPT Washington Univ in St. Louis 2002

Theresa M Spitznagle, MHS, DPT
Professor of Physical Therapy (primary appointment)
Professor of Obstetrics and Gynecology
BS Marquette University 1986
MHS Washington Univ in St. Louis 1994
DPT Washington Univ in St. Louis 2006

Jennifer S Stith, MS, PHD, MSW
Professor of Physical Therapy (primary appointment)
Division Director for Education in Physical Therapy

Professor of Neurology
MS University of Southern Calif 1979
PHD Washington Univ in St. Louis 1994
BS University of California 1976
MSW Washington Univ in St. Louis 2006

Stacy Lynne Tylka, DPT, MS
Associate Professor of Physical Therapy (primary appointment)
Associate Professor of Obstetrics and Gynecology
Associate Professor of Orthopaedic Surgery
DPT Washington Univ in St. Louis 2009
BS Saint Louis University 2000
MS Saint Louis University 2002

Linda R Van Dillen, PHD, MS
Professor of Physical Therapy (primary appointment)
Division Director of Research in Physical Therapy
Professor of Orthopaedic Surgery
DPT Washington Univ in St. Louis 1994
BS University of Missouri 1979
MS Washington Univ in St. Louis 1985

Courses
Visit online course listings to view semester offerings for M02 PhysTher (https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M02).

M02 PhysTher 5001 Independent Study
Independent research work under supervision of a faculty member in the Program in Physical Therapy. Prerequisite: junior or senior standing and permission of faculty. Petition forms are available from Dr. Clark. Credit variable, maximum 6 units.

M02 PhysTher 601 Diagnosis and Evidence Analysis in PT Practice I
Includes processes required for effective clinical decision-making such as the use of disablement models, decision trees, diagnostic classification systems, patient interviewing and outcome measures. An introduction to basic research methods and systematic review of the literature. Patient cases will be used to practice clinical decision-making skills. Credit 2 units.

M02 PhysTher 602 Professional Issues and Skills 1
An introduction to the profession of physical therapy, the APTA, professional behavior and clinical activities such as documentation and quality improvement. Includes ethics, legal issues and policies that guide professional behavior. Students will learn and practice using principles of patient teaching, negotiation and team building. Students will spend 80 hours at clinical sites. Credit 3 units.
M02 PhysTher 603 Essential Clinical Skills I
Beginning skills for patient management include using systems screening and reliable assessment of impairments including visual appraisal, vital signs, sensation, reflexes, pain, range of motion, muscle strength and infection control. Skill and safety in positioning, draping and managing equipment during patient care activities such as walking and transfers will be developed. Credit 4 units.

M02 PhysTher 604 Cells, Systems and Disease I
The first of a two-semester course, this course focuses on advanced human physiology and pathological mechanisms of disease. Course content emphasizes cellular and organ system physiology, pathological mechanisms of disease, and medical management of pathological conditions. Physicians will discuss medical diagnosis, clinical signs and symptoms, and management of selected diseases. Students will be introduced to pharmacology and to the relevance of clinical laboratory values. Patient case studies will be used to integrate information. Credit 3 units.

M02 PhysTher 605 Neuroscience
Focuses on the study of structures, organization and function of the nervous and muscular systems. Emphasis is on the sensory and motor systems involved in motor control and on basic knowledge required for clinical practice. Credit 3 units.

M02 PhysTher 606 Kinesiology I
An introduction to the analysis of normal human movement activities through the application of mechanical concepts including displacement, velocity, acceleration, force and torque. Emphasizes kinematic and kinetic concepts relevant to human movement and study of the structures involved in movement. Credit 3 units.

M02 PhysTher 610 Cells, Systems and Disease II
A continuation of the first semester. Open only to individuals enrolled in the Physical Therapy program. Credit 4 units.

M02 PhysTher 611 Human Anatomy
Emphasis is on: 1) Musculoskeletal, neural and vascular systems of the extremities, head, neck and trunk; and 2) anatomical features relevant to current physical therapy practice. Lectures are complemented by student-performed dissection of human cadavers, instructor-prepared prosections and computer-assisted instruction. Open only to individuals enrolled in the Physical Therapy program. Credit 5 units.

M02 PhysTher 612 Diagnosis and Evidence Analysis in PT Practice II
Continuation of research methods from the first semester, including use of statistics and outcome measures. Students will complete a reliability project and write a paper based on the literature. Cases will permit further practice using decision trees and assigning diagnoses of basic movement-related conditions. Open only to individuals enrolled in the Physical Therapy program. Credit 2 units.

M02 PhysTher 613 Kinesiology II
Emphasizes principles of maturation and motor learning relative to the application of biomechanical principles to the analysis of human movement. Standardized methods of characterizing movement by observation and with the use of technology will be addressed. Topics include developmental, anatomical, electromyographical and physiological elements of kinesiology with regard to individual joints and common functional activities such as gait and transitional movements. Credit 5 units.

M02 PhysTher 614 Diagnosis and Management of Musculoskeletal Conditions in PT
Students will learn postural assessment and application of Movement Systems Balance. Analysis of functional activities, the essential components and compensatory strategies, will prepare the student to begin to plan interventions for individuals with musculoskeletal problems. Skill in providing interventions of manual exercise, fitness training and functional mobility training will be developed. Cases will provide use of diagnostic systems relevant to musculoskeletal conditions. Credit 3 units.

M02 PhysTher 615 Professional Issues and Skills Development II
Students will be assigned to part-time clinical experiences for 45 hours to allow practice of acquired skills in patient care, documentation and communication. Credit 0.5 units.

M02 PhysTher 621 Exercise Physiology
A study of the responses of various physiological systems to exercise. Includes application and integration of these systems to various diseases and to human performance. Content will be coordinated with Diagnosis and Management of Cardiopulmonary Conditions in Physical Therapy. Open only to individuals enrolled in the Physical Therapy program. Credit 3 units.

M02 PhysTher 622 Diagnosis and Management of Cardiopulmonary Conditions in PT
Students will learn to assess, diagnose and treat movement-related cardiopulmonary conditions. Treatment techniques will include exercise and conditioning, breathing techniques, postural drainage and percussion. Interpretation of laboratory tests and pharmacology will prepare students to work with patients safely. Case studies will prepare students for general practice. Open only to individuals enrolled in the Physical Therapy program. Credit 3 units.

M02 PhysTher 623 Orthopaedic Medicine
Physician lectures will provide students with information on surgical and non-surgical procedures and postoperative management of patients with orthopaedic conditions. Physicians will discuss medical diagnosis, clinical signs and symptoms, and management of selected conditions to prepare the student to use this information in Diagnosis and Management of Musculoskeletal Conditions in PT II - III. Open only to individuals enrolled in the Physical Therapy program. Credit 2 units.
M02 PhysTher 624 Diagnosis and Management of Musculoskeletal Conditions in PT II
Students will acquire the skills needed to manage and prevent movement-related musculoskeletal problems of the spine and lower quarter. Acute and post-acute care will be addressed. Integration of information from previous and concurrent courses will be stressed with emphasis on screening, examination, analysis of findings, diagnosis, design and implementation of intervention programs for patients with increasingly complex problems. Functional activities across the life span will also be addressed. Open only to individuals enrolled in the Physical Therapy program.
Credit 3 units.

M02 PhysTher 625 Neurology Medicine
Physician lectures will provide students with information on the medical management of patients with neurological conditions. Physicians will discuss medical diagnosis, clinical signs and symptoms, and management of selected conditions to prepare the student to use this information in Diagnosis and Management of Neuromuscular Conditions in PT. Open only to individuals enrolled in the Physical Therapy program.
Credit 2 units.

M02 PhysTher 626 Moderators of Health, Wellness and Rehabilitation
Designed to explore individual attitudes toward health, illness, disability and death. Emphasizes the effect of these attitudes on individual goals, motivation, expectations, interpersonal relationships and exercise adherence. Investigates individual health attitudes, personal values, family interaction, stress management and concepts of wellness. Age-related issues will be addressed. Open only to individuals enrolled in the Physical Therapy program.
Credit 3 units.

M02 PhysTher 627 Essential Clinical Skills II
Skill in providing interventions including massage and mobilization and the application of thermal, mechanical, hydro and electrotherapeutic modalities will be developed. Students will learn the basic indications for and prescription of adaptive equipment and wheelchairs. Open only to individuals enrolled in the Physical Therapy program.
Credit 3 units.

M02 PhysTher 628 Case Integration Lab I
Paper, video and live patient cases provided by faculty and students will be completed to provide practice in managing patients with varying movement-related diagnoses of the cardiopulmonary and musculoskeletal systems. Open only to individuals enrolled in the Physical Therapy program.
Credit 1 unit.

M02 PhysTher 629 Diagnosis and Management of Neuromuscular Conditions in PT I
Students will acquire the skills to examine patients with neuromuscular disorders. Emphasis will be on screening, selecting tests and measures, examination, determining impairments and functional loss, and making a movement system diagnosis. Students will practice examining both adult and pediatric patients. Content related to motor control and motor learning will be integrated into the course. Course content will be integrated with the concurrent Neurology Medicine course. Open only to individuals enrolled in the Physical Therapy program.
Credit 4 units.

M02 PhysTher 635 Professional Issues and Skill Development III
Focuses on clinical application of compliance and motivation principles. Peer teaching, communication, consultation skills, leadership skills, lobbying legislation, documentation and negotiation in the clinic will be practiced. Students will practice decision making, supervision and delegation. Students will prepare resumes and begin career planning.
Credit 3 units.

M02 PhysTher 636 Diagnosis and Management of General Medical Conditions in PT
Students will acquire the skills needed to manage movement-related problems in patients with diabetes, burns, arthritis, wounds, amputation and prosthetics, obesity, oncological problems, incontinence, pain, genetic conditions, osteoporosis, malnutrition, transplants and neonatology. Integration of information from previous and concurrent courses will be stressed with emphasis on screening, examination, analysis of findings, diagnosis, design and implementation of intervention programs for patients with increasingly complex problems. Functional activities across the life span will be addressed.
Credit 3 units.

M02 PhysTher 637 Diagnosis and Management of Musculoskeletal Conditions in PT III
Students will acquire the skills needed to manage and prevent movement-related musculoskeletal problems of the spine, neck, elbow, wrist and hand, ankle and foot. Integration of information from previous and concurrent courses will be stressed with emphasis on screening, examination, analysis of findings, diagnosis, design and implementation of intervention programs for acute and post-acute patients with increasingly complex problems. Functional activities across the life span will be addressed.
Credit 3 units.

M02 PhysTher 638 Case Integration Lab II
Students will use paper, computer, video and live patients to integrate information learned across the curriculum. Students will orally present cases they managed during Clinical Experience II. Credit 1 unit.

M02 PhysTher 643 Diagnosis and Management of Neuromuscular Conditions in PT II
Students will build on their skills for examining patients with neuromuscular disorders and diagnosing movement system dysfunction. Additional skills acquired will be designing and implementing intervention plans to address impairments and functional loss in patients of all ages. To aid in selecting appropriate interventions, students will consider patient prognosis. Students will learn to prescribe wheelchairs and orthotics, fabricate splints, apply kinesiotape, and use a variety of medical equipment. Motor control and motor learning principles will be integrated into the course. Open only to individuals enrolled in the Physical Therapy program.
Credit 4 units.
M02 PhysTher 650 Diagnosis and Evidence Analysis in PT Practice III
Students will prepare written case reports based on patients seen during their clinical experiences. Students will defend use of diagnostic classifications and integrate the literature to support their case. Students will practice selecting appropriate outcome measures, designing clinical research questions, and use data to make decisions about individual and group treatment. Credit 3 units.

M02 PhysTher 651 Organizational and Management Issues
Dynamics of organizations and departments will be discussed using case examples. Focuses on the knowledge and skills needed by physical therapists early in their careers. Principles of administration and management that enable the physical therapist to supervise supportive personnel, to understand fiscal issues including reimbursement, and to recommend staffing schedules and patterns will be addressed. Students will learn marketing and public relations strategies. Credit 3 units.

M02 PhysTher 652 Alternative Settings and Practice Environments
Physical therapy practice in work and community settings will be addressed with an emphasis on ergonomics and group treatment. Special PT tests and the interpretation of other tests will be integrated into cases. Students will be introduced to care for the patient with vestibular problems, care in the ER, and an update in genetics/genomics. Alternative medicine and alternative PT practice will be studied. Students will explore recreational options for disabled populations. Credit 3 units.

M02 PhysTher 653 Health Fitness and Prevention
Emphasis will be on critiquing and designing fitness and wellness programs for well and special populations. Programs will focus on those for employee fitness, diabetes, arthritis, obesity and the elderly. Students will participate in and evaluate group treatments and recreational exercise. Use of exercise equipment will be addressed. Credit 3 units.

M02 PhysTher 654 Case Integration Lab III
A variety of teaching methods, including rounds format, assessment centers and student presentations will enable students to integrate information from across the curriculum to complete complex case studies. Emphasis will be on pharmacology, other tests, moderators, establishing time frames and setting priorities for care. Age-related issues will be addressed. Credit 3 units.

M02 PhysTher 655 Professional Issues and Skill Development IV
Focus will be on the professional skills students need to function in entry-level practice in a variety of settings. Students will study licensure, and will participate in lobbying and a mock House of Delegates. Skills in serving as an expert witness, a leader, a peer instructor and in clinical instruction will be developed. Students will be expected to participate in a service project and activities of the American Physical Therapy Association. Cultural and race issues will be actively explored. Credit 4 units.

M02 PhysTher 691 Clinical Experience I
An eight-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes development of professional behaviors. Credit 4 units.

M02 PhysTher 691A Clinical Experience I
An eight-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes development of professional behaviors. Credit 4 units.

M02 PhysTher 692 Clinical Experience II
An eight-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes development of professional behaviors. Credit 4 units.

M02 PhysTher 692A Clinical Experience II
An eight-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes development of professional behaviors. Credit 4 units.

M02 PhysTher 693 Clinical Experience III
A 10-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes the development of professional behaviors. Credit 5 units.

M02 PhysTher 693A Clinical Experience III
A 10-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes the development of professional behaviors. Open only to individuals enrolled in the Physical Therapy program. Off-campus. Credit 5 units.

M02 PhysTher 694 Clinical Experience IV
A 12-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes the development of professional behaviors. Credit 6 units.

M02 PhysTher 694A Clinical Experience IV
A 12-week, full-time clinical experience supervised by clinical faculty. Allows the student to practice evaluation and treatment skills acquired in the classroom and laboratory. Also emphasizes the development of professional behaviors. Open only to
individuals enrolled in the Physical Therapy program. Off-campus.
Credit 6 units.

Population Health Sciences
The Master of Population Health Sciences (MPHS), offered by the School of Medicine, is a 10-month degree program for clinicians, clinical doctorates, medical students and health sciences students seeking training in clinical research methods. The curriculum emphasizes the role of epidemiology and biostatistics in approaching clinical effectiveness and outcomes research for all medical specialties. The MPHS does not require a research thesis upon completion of the program. Instead, the program innovatively uses applied course work to focus on the long-term mastery of skills. Using topics relevant to their careers and interests, MPHS students practice the art of developing research study protocols, performing systematic reviews, designing epidemiologic studies and much more. Many students go on to produce award-winning research using their applied course work and skills learned in the program. MPHS students deepen their learning by choosing one of four concentrations: Clinical Epidemiology, Health Services, Quantitative Methods, or Psychiatric and Behavioral Health Sciences.

Contact: Blanka Hodzic, Program Coordinator
Email: bhodzic@wustl.edu
Website: http://www.mphs.wustl.edu

Degrees & Requirements
MD/MPHS
The MD/MPHS provides medical students with an opportunity to supplement their clinical training and course work with a quantitative approach to population health science research. Students develop core skills in epidemiology and biostatistics, which can be applied to research in any clinical field, from primary to specialty care. The program is intended for medical students who plan to incorporate clinical or population health research into their clinical careers, including clinical effectiveness and outcomes research. The program is not restricted to Washington University medical students; students from other medical schools are encouraged to apply. The program combines the traditional medical school curriculum with one additional year of full-time study for the MPHS degree. This added year is typically taken after the second or third year of medical school.

Requirements
Program Format
The MPHS program is a full-time, 10-month format. A minimum of 12 credit hours is required for full-time student status, and the maximum course load is 18 credit hours per semester. Part-time study options are available.

Core MPHS Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHS 510</td>
<td>Introduction to SAS for Clinical Research ¹</td>
<td>1</td>
</tr>
<tr>
<td>PHS 501</td>
<td>Introduction to Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>PHS 502</td>
<td>Intermediate Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>PHS 600</td>
<td>Applied Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>PHS 511</td>
<td>Introductory Biostatistics for Clinical Research</td>
<td>3</td>
</tr>
<tr>
<td>PHS 512</td>
<td>Intermediate Biostatistics for Clinical Research</td>
<td>3</td>
</tr>
<tr>
<td>PHS 505</td>
<td>Ethics in Population and Clinical Health</td>
<td>1</td>
</tr>
<tr>
<td>PHS 500</td>
<td>Current Topics in Public Health (medical students only)</td>
<td>1</td>
</tr>
</tbody>
</table>

¹ Students with previous SAS experience may opt out of this required class by taking the final exam on Friday, July 20, 2018 from 9-11 a.m. in the Taylor Avenue Building (exact room TBD). Students who receive a 90 percent or higher on the exam will be exempt from taking the course.

Information on elective courses is available on our MPHS website (http://www.mphs.wustl.edu).

Research
Research Projects & Assignments
The MPHS program uses applied course work, which means students use their own research projects and interests for class discussions and assignments. This format helps our students apply and master research concepts quickly and maximizes research productivity during their time in the program.

For example, students will write and design research protocols, systematic reviews and meta-analysis, grant proposals, and more. Additionally, our instructors select case studies, prioritize reading lists, and shape class discussions from current, in-the-news clinical outcomes research and population health topics.

Students are not required to complete a research project for graduation. The focus in the MPHS program is on the practice and mastery of clinical research skill sets for long-term benefit.

Students are encouraged to have a primary mentor connected to their research while in the MPHS program. If needed, our program leadership can help students find a research project or mentor.
Faculty

Director

Graham Colditz, MD, DrPH (http://publichealthsciences.wustl.edu/en/About-Us/Division-Chief)

Co-Deputy Director

Yikyung Park, ScD (http://publichealthsciences.wustl.edu/en/Faculty/ParkYikyung)

Courses


M19 PHS 500 Current Topics in Public Health

Students will review public health research, interventions and problems making headlines in print and television media. Discussion of how the problem is presented and evaluated will take place, and students will discuss alternate approaches. Course activities: brief presentations, short written assignments, class participation. Course note: required for medical students. Credit 1 unit.

M19 PHS 501 Introduction to Epidemiology

This course introduces the basic principles and methods of epidemiology, with an emphasis on critical thinking, analytic skills, and application to clinical practice. Topics include outcome measures, methods of adjustment, surveillance, quantitative study designs, and sources of data. Designed for those with a clinical background, the course will provide tools for critically evaluating the literature and skills to practice evidence-based medicine. Course activities: lectures, midterm and final exams, class participation, problem sets and papers. Course note: M19-501 required prerequisite. Credit 3 units.

M19 PHS 505 Ethics in Population and Clinical Health

This course will expose population and clinical health researchers to the various ethical issues and situations encountered in their research and clinical duties, with a focus on research-related issues and solutions. It will also familiarize them with available ethics and compliance resources. Case studies and scenario presentations will facilitate discussion on topics such as informed consent, rights to health, personal responsibility for health, allegations of misconduct, research with communities, data objectivity and presentation, publications, collaborators’ rights and responsibilities, intellectual property, and student-mentor relationships. Credit 1 unit.

M19 PHS 510 Introduction to SAS for Clinical Research

This introductory course in biostatistics is designed for medical students, clinicians and health researchers with basic SAS programming skills. Students will learn how to operate SAS, import external data, create SAS data sets, create, format and manipulate variables, and export data and results. Upon completion of this course, students will have obtained a basic understanding of the SAS environment. Credit 1 unit.

M19 PHS 511 Introductory Biostatistics for Clinical Research

This course introduces students to basic statistical concepts including hypothesis testing, probability distributions and relevant basic statistical methods. Through in-class and homework assignments, students will learn to apply statistical concepts to the medical context. Upon completion of the course, students will be able to summarize quantitative data and carry out and interpret simple data description and analyses using the SAS program. Prerequisite for the course is knowledge in SAS. Credit 3 units.

M19 PHS 512 Intermediate Biostatistics for Clinical Research

This intermediate course is designed for medical students, clinicians and health researchers. The course will introduce students to basic statistical concepts as applied to clinical and population-based data sets, including linear and logistic regression analyses, and survival analyses. Through applied course work, students will learn how to analyze and interpret clinical research data. Upon completion of the course, students will be able to perform statistical data analyses for regression models with continuous, categorical, and survival outcomes using the SAS program, and will be able to use these models to address their research questions. Prerequisite for
the course is an introductory course in biostatistics and SAS knowledge.
Credit 3 units.

M19 PHS 5252 Comparative Effectiveness Research
This course will provide a comprehensive introduction to comparative effectiveness research. Topics include an overview of comparative effectiveness research, stakeholder engagement in comparative effectiveness research, designing comparative effectiveness research methodological challenges in doing comparative effectiveness research, and recent developments in PCORI and federal policy. Students will be expected to review and evaluate comparative effectiveness studies as well as actively participate in class discussions. Course note: M19-501 and M21-560 are required prerequisites; SAS software required. If student is not in the MPH program, they must contact the program regarding registration.
Credit 2 units.

M19 PHS 5254 Using Administrative Data for Health Services Research
The objective of this advanced graduate course is to prepare highly motivated students to perform health services research using administrative data. Lectures will provide tutorials on national administrative databases, review journal articles using these databases, instruction in SAS programming and application of health services research methods using administrative databases. Strengths and limitations of large databases that are commonly used for research will be considered, and special attention will be devoted to large federal databases that are readily available to new investigators. Students will learn how to obtain, link and analyze large databases, understand the key issues related to data security and confidentiality, and become knowledgeable about key methodologic issues in observational studies using administrative data. Students will evaluate published studies based on large administrative databases, develop a health services research proposal and complete a short research project that uses administrative data.
Credit 3 units.

M19 PHS 5256 Patient Safety, Quality Management, and Quality Improvement
This course introduces principles of patient safety, quality measurement and quality improvement. Classes are designed to provide students with hands-on skills in systems thinking and in preventing, learning from, and dealing with medical error and adverse events. Students will also learn fundamentals in approaches to evaluating quality, including quantitative methods in measure development. We will discuss various approaches and challenges to knowledge translation and effective change management in improving quality. Students will be encouraged to use their real-world experiences in problem solving around patient safety concerns, to develop and evaluate quality measures in their respective fields and to develop a quality improvement project in their area of interest as part of the course. If student is not in the MPH program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 527 Development, Validation and Application of Risk Prediction Models
This course will present an introduction to the methods of predictive modeling, with applications to both genetic and clinical data. Basic concepts and philosophy of supervised and unsupervised data mining as well as appropriate applications will be discussed. Topics covered will include multiple comparisons adjustment, cluster analysis, self-organizing maps, principal component analysis, and predictive model building through logistic regression, classification and regression trees (CART), multivariate adaptive splines (MARS), neural networks, random forests, and bagging and boosting. Approaches to validation will be discussed, and strategies for estimation of added value with expanded variable lists will be a key focus of this applied quantitative methods course. Course note: Biostatistics I and II (M21-560 and M21-570) are required prerequisites. If student is not in the MPH program, they must contact the program regarding registration.
Credit 2 units.

M19 PHS 530 Multilevel models in Quantitative Research
This course covers statistical model development with explicitly defined hierarchies. Such multilevel specifications allow researchers to account for different structures in the data and provide for the modeling of variation between defined groups. The course begins with simple nested linear models and proceeds on to non-nested models, multilevel models with dichotomous outcomes, and multilevel generalized linear models. In each case, a Bayesian perspective on inference and computation is featured. The focus on the course will be practical steps for specifying, fitting and checking multilevel models with much time spent on the details of computation in the R and Bugs environments. Prerequisites: Math 2200, Math 3200, Poli Sci 581, or equivalent.
Same as L32 Pol Sci 584
Credit 3 units.

M19 PHS 532 Applied Qualitative Methods for Health Research
This course will introduce students to the most commonly used qualitative methods for medical-related research. It will provide a foundation in the application of qualitative methods to medical and health research. Topics addressed will include uses of qualitative data, designing studies, sampling strategies, collecting data, and qualitative analysis. A variety of methods will be discussed, with an emphasis on using focus groups and various interviewing techniques. Students will learn the best practices in qualitative research and how to critically evaluate qualitative studies and articles. Upon completion of the course, students will be able to plan, conduct and analyze a qualitative study. If student is not in the MPH program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 540 Decision Analysis for Clinical Investigation and Economic Evaluation
In this course, we will introduce students to the methods and applications of decision analysis and cost-effectiveness analysis in health care technology assessment, medical decision making, and health resource allocation. At the conclusion of the class, the student will have an understanding of the theoretical basis for economic evaluation and decision analysis, its application, and hands-on experience in the application of the methods. Among the topics covered are the development of a research
M19 PHS 550 Randomized Controlled Trials
This course provides a comprehensive introduction to randomized controlled clinical trials. Topics include types of clinical trials research (efficacy and effectiveness trials), study design, treatment allocation, randomization and stratification, quality control, analysis, sample size requirements, patient consent, data safety and monitoring plans, reporting standards, and interpretation of results. Course activities: lectures, manuscript critiques, class project, paper. Course note: Students are strongly encouraged to have taken or be concurrently enrolled in M21-560. If student is not in the MPHS program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 551 Systematic Reviews and Meta-Analysis
Introduction to the use of meta-analysis and related methods used to synthesize and evaluate epidemiological and clinical research in public health and clinical medicine. Concepts introduced and illustrated through case studies of public health and medical issues. Course activities: lectures, class discussion, group project, paper. Stata IC required. Course note: M21-570 required prerequisite. If student is not in the MPHS program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 560 Principles of Shared Decision Making and Health Literacy in the Clinical Setting
This course will provide a comprehensive introduction to principles of shared decision making and health literacy and their implications for clinical communication. Topics may include basic and applied research on shared decision making, principles of designing and evaluating patient decision aids, principles of health literacy, research on relationship between health literacy, numeracy, and health outcomes, best practices for communication with low-numerate and low-literate individuals, best practices (and controversies) in communicating probabilities and their associated uncertainty about screening and treatment outcomes, and best practices for designing and evaluating written information for clinical populations (such as intake forms, brochures, and informed consent documents). Course activities: lectures, manuscript critiques, class project, paper. If student is not in the MPHS program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 561 Epidemiology of Psychiatric Disorders across the Lifespan
This course takes an integrated developmental approach to the epidemiology, etiology and evolving nosology of psychiatric disorders. Part I will lay the conceptual groundwork to understand and conduct research on psychiatric disorders and their risk factors in the general population. Part II will cover disorders that are traditionally considered under the purview of child psychiatry but that have developmental consequences for adulthood. Part III will cover psychiatric disorders unique in adulthood as well as those that often emerge in adolescence or earlier. Part IV will be devoted to special and contemporary topics in psychiatric and developmental epidemiology.

Discussion and instruction in the use of relevant data sets will be integrated into all sections. By the end of the course, students will be expected to design and conduct basic analyses of existing psychiatric epidemiologic data. Course activities: lectures, class discussion, analytical project, presentation, complete a literature review paper. If student is not in the MPHS program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 562 Addictions and Addictive Behaviors
This course provides an overview of the principles of substance-related addictions and the processes and mechanisms that underlie addiction. Students will be introduced to the epidemiology and developmental course of addiction, risk and protective influences that act on the course of addiction and its adverse health consequences. Both genetic and environmental underpinnings will be discussed. The impact of policy and economics will be highlighted. Emphasis will be placed on addictive behaviors, effective interventions, and treatment modalities. Students will be expected to participate in class discussions, complete written assignments (review paper format) and present one of their written assignments via in-class presentation. Course activities: lectures, class discussion, review paper presentation, three short papers. Course note: a required course for the Psychiatric and Behavioral Health Sciences Concentration. Prerequisite: M21-560 Biostatistics I or course director approval. If student is not in the MPHS program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 563 Introduction to Dissemination and Implementation Science
This course provides an introduction to dissemination and implementation (D&I) science (i.e., translational research in health). Topics include the importance and language of D&I science; designs, methods, and measures; differences and similarities across clinical, public health, and policy settings; selected tools for D&I research and practice; and future issues. Credit 1 unit.

M19 PHS 5656 Global Burden of Diseases: Methods and Applications
This 3-credit transdisciplinary course provides an overview of quantitative and qualitative methods used in the field of global health, as well as their applications for studying the global burden of diseases. Topics covered include infectious diseases, noncommunicable chronic medical illness and behavioral disorders. At the end of this course, students will have learned basic methods used in global health research and major trends in the global burden of diseases. Students will be able to apply the knowledge of measurements to forecast the future of the global burden of specific diseases and to develop needed policy recommendations. Students will also be able to address prevention and intervention strategies targeted to specific nations or regions, while drawing on perspectives and approaches from a range of disciplines. Students will learn sociocultural and economic factors that affect global and regional distributions of major disease categories and how they are linked to issues of global trade and political economy. The transdisciplinary knowledge and hands-on skills learned from this course will assist students with an interest in international research, and the acquisition of practical skills will benefit their pursuit of health professions. This includes cultural competency training as it applies to medicine and public health. This course
is open to postgraduate scholars and fellows and graduate and advanced undergraduate students.
Credit 3 units. A&S IQ: SSC EN: S

M19 PHS 570 Communicating Research Findings to the Media and Lay Audiences
A critical step in the dissemination of population-level clinical research is communicating research findings and key messages to the media and lay audiences. With conflicting messages coming from advocacy groups and others, the burden falls on the clinician-researcher to distill complex information, dispel misinformation, and tell a compelling story that resonates with the audience. The course will equip students with the skills, technique, experience and confidence needed to give successful, engaging media interviews and presentations related to the publication of research and expertise-specific topics. Through critique, tape and review exercises, class discussion, and guest speakers, students will learn about the facets that make an interview or presentation successful, including nonverbal communication and delivery skills (body language and vocal interpretation), content and messaging, and navigating interactions with the media. The instructor will evaluate each student’s skill set and create a working skills inventory on which the student will build throughout the course in a series of on-camera experiences.
Credit 1 unit.

M19 PHS 600 Applied Epidemiology
The final course in the epidemiologic methods course sequence, this course provides students the opportunity to apply the methods and principles learned previously to a specific research problem of their own choosing. This course is designed to provide students with an understanding of the processes involved in applying their training to the design and conduct of research. Students will prepare a research grant application in the format expected for a National Institutes of Health R03/ R21 grant application. Students will also learn how other organizations differ in their grant application process, with particular attention to AHRQ. The course offers students the opportunity to critically evaluate scientific research proposals for scientific merit. Course activities: lectures, class discussion, presentation and review of an individual grant. If student is not in the MPH program, they must contact the program regarding registration.
Credit 3 units.

M19 PHS 610 Multilevel and Longitudinal Data Analyses for Clinical Research
The course is designed for medical students, clinicians and health researchers. The course is an extension of Intermediate Biostatistics (M19-512, instructor Yan Yan). The topics include basic statistical concepts and methods for various types of clinical data (continuous, categorical, count, and time-to-event outcome data) in multilevel and longitudinal settings. Through lectures, SAS labs, and homework assignments, students will understand the basic statistical concepts and methods for the four types of clinical outcome data in multilevel and longitudinal settings, will be able to address clinical research questions using these concepts and methods, will be able to perform basic data analyses on these types of data with SAS software, and will be able to interpret the results in the context of clinical research.
Credit 3 units.

Public Health
The purpose of this joint degree is to train physicians in the knowledge and skills needed to recognize, analyze and solve the key problems affecting the health of our community and society. The Master of Public Health (MPH) degree offered through the Brown School is unique in that it prepares students to apply public health sciences and transdisciplinary approaches to problem solving for improving population health, especially in vulnerable communities. Courses involve learning systematic approaches to implement and sustain public health discoveries regionally, nationally and internationally. Both the Brown School and the School of Medicine are top-ranked academic centers making this joint degree an outstanding opportunity.

Additional Information
For more information about the MD/MPH program, please contact Angela Hobson, PhD, assistant dean for public health, by email (hobsona@wustl.edu) or phone (314-935-2760); or email Brown School admissions (brownadmissions@wustl.edu).

Degrees & Requirements
MD/MPH
Applicants should be in the third year of their medical school program. Prior to entering the MPH program, students should have taken courses (up to 11 credit hours) that count toward their MPH degree.

The MD/MPH provides medical students with an opportunity to supplement their clinical training with courses and experiences designed to create transdisciplinary competencies on how to improve population health. Students learn the basics of public health from the foundations courses. MD/MPH students also can choose from a wide variety of Transdisciplinary Problem Solving Courses (two are required), and they will participate in small-group public health discussions in Public Health Seminar. The faculty and staff at the Brown School will help guide students to relevant practicum experiences. When course work and practicum are completed, MD/MPH students also have an opportunity to apply for the Master’s Research Fellows program, allowing them to work on research projects during their MPH program.

Requirements
Program format
Medical students will spend their fourth year in the MPH program. The MD/MPH curriculum comprises three full-time semesters of course work, (summer, fall, spring) at the Brown School, followed by the MPH Practicum and Culminating Experience. Students will meet the 52 required credit hours with
the 11 credits earned in the MD program, 40 credits at the Brown School, and 1 credit in either program.

### Core MPH courses

- Cross-cutting Themes in Public Health
- Epidemiology
- Biostatistics
- Environmental Health
- Health Policy and Administration
- Health Behavior and Health Promotion

### Research

Please visit the Brown School MPH website for more information about our public health research (https://brownschool.wustl.edu/Academics/Master-of-Public-Health/Curriculum).

### Faculty

**Associate Dean for Public Health**

Matthew W. Kreuter (https://brownschool.wustl.edu/faculty-and-research/pages/matthew-kreuter.aspx)

Kahn Family Professor of Public Health
Senior Scientist, Health Communication Research Laboratory
PhD, University of North Carolina at Chapel Hill
MPH, University of North Carolina at Chapel Hill

**Assistant Dean for Public Health**

Angela Hobson (https://brownschool.wustl.edu/faculty-and-research/pages/angela-hobson.aspx)

Senior Lecturer
PhD, Saint Louis University

### Courses

The Department of Public Health offers courses through the Graduate School. Visit the university online course listings for semester offerings for S55 MPH (https://courses.wustl.edu/CourseInfo.aspx?sch=S&dept=S55&crslvl=5:9).

### Financial Information for the School of Medicine

This section presents financial information for the programs and degrees offered by the School of Medicine. Refer to the sections below for more financial information about individual programs.

- MD (p. 332)
- Health Professions (p. 347)
- Joint (p. 349)

### Medical Students

#### Financial Assistance

The ability to finance a medical education at Washington University does not influence the student selection process. As all students accepted for admission have proven scholastic ability, financial assistance is awarded to qualifying U.S. citizens and permanent residents solely on the basis of documented financial need which cannot be met by student and family resources. Students who consider themselves financially independent of their parents must arrange for loans to replace the amount of support parents are analyzed to have the potential to contribute. The School of Medicine's Office of Financial Aid (Campus Box 8059) will assist students in making these arrangements.

In responding to the Admissions Committee's offer of admission, an accepted student will be directed to the student financial aid portal, Net Partner (https://netpartnerstudent.wustl.edu), to indicate what type of aid they are applying for. The Financial Aid Office acknowledges the student's intent and provides instructions for completing the Free Application for Federal Student Aid (FAFSA). Everyone applying for financial aid must complete a FAFSA and designate Washington University School of Medicine, School Code #G24620, as a recipient.

Medical school financial aid application documents and detailed instructions are made available after January 1.

The financial aid application materials solicit information about the applicant and parents, including a detailed description of resources and liabilities. If an applicant's parents are separated or divorced, the financial information is required from both biological parents, excluding income and assets of their spouse, if remarried. If the applicant is married, similar information is required of the spouse. The school expects the applicant to complete and submit the financial aid documents within two weeks from the date the applicant receives them. Official copies of both biological parents' individual U.S. income tax returns and the applicant's official IRS transcripts complete the data required for financial aid consideration.

While "permanent residents" of the United States are eligible for most federal financial aid programs, need-based financial aid from Washington University is only awarded if the applicant and both biological parents can provide official, audited documents with the same detailed information as provided on a U.S. income tax return. All information is held in strict confidence.

Financial aid awards are credited toward payment of tuition and fees. If there is an excess of funds on a student's account after tuition and other charges, the Registrar's Office will issue a refund check. The loan portion of an award will be funded through the resources of the School of Medicine or through the Federal Direct Loan program. Financial aid awards are made for a given academic year. Students may reapply for financial assistance in succeeding years if they remain in good academic standing.
Standards for Satisfactory Academic Progress for Financial Aid Eligibility

When a student is enrolled in the curriculum of the MD program, the following policy applies regarding standards for Satisfactory Academic Performance (SAP).

Federal law and regulations require that all students receiving financial assistance from Federal Title IV funds maintain Satisfactory Academic Progress (SAP). This policy presents the standards adopted by the Washington University School of Medicine and applies to all MD students.

Annually, at the end of each spring term, the School of Medicine at Washington University in St. Louis evaluates SAP. If a student is not maintaining progress, they will be notified by the Committee on Academic and Professional Evaluation of Students (CAPES) and the director of financial aid and will be ineligible, or "suspended," for federal aid for future terms unless they appeal their status and it is approved by CAPES and the director of financial aid.

In order to be compliant in maintaining SAP, and thus eligible for financial aid, students must be satisfactorily progressing toward their academic objectives. Federal regulations require the following measurements for determining SAP: time frame and quantitative/qualitative requirements.

Time frame requirement:
The maximum time frame of full-time enrollment for completion of each program is as follows:

- Four-year MD program: 6 years
- Five-year MD program: 7.5 years
- MA/MD program: 7.5 years (or 9 years if a 2-year MA is pursued)

Periods of non-enrollment are not counted in the measurement of satisfactory academic progress but all periods of attendance, regardless of whether or not the student received Title IV aid, are counted.

This policy is applied in the context of each individual student's enrollment status in order to accommodate the student who does not enroll on a full-time basis. For example, if a student enrolls in a four-year program, the full-time student would meet the 150 percent maximum rule (as per Title IV guidelines) after six years of full-time enrollment, and the half-time student is expected to complete in 12 years. If a student vacillates between full-time and half-time enrollment, that student would have a maximum time frame between six and 12 years, and the maximum time frame for that student would be continuously adjusted.

If a student reaches a point where they cannot complete their program within the 150 percent maximum, the student becomes ineligible for aid.

Quantitative/qualitative requirement:

Academic requirements for the MD degree include the satisfactory completion of the curriculum designated by the faculty. The progress of each student working toward an MD degree is monitored carefully by the Committee on Academic and Professional Evaluation of Students (CAPES). Refer to the Assessing Academic Achievement (p. 360) section of this Bulletin for more information.

A student failing to meet the standards of satisfactory progress as determined by CAPES shall be placed on financial aid suspension. The student will be eligible for aid when they achieve SAP, or the student may appeal. Students who choose to appeal must state the reasons for failing to meet SAP (e.g., injury/illness of the student, death in the family or other special circumstance) and what has changed in the student's situation so that they can now make SAP. If the student successfully appeals, the student will be placed on financial aid probation and may receive financial assistance for one semester. At the conclusion of this period, the student must have achieved compliance with each standard or be progressing per their individual academic plan to receive additional aid. A student who does not achieve compliance with each standard or the conclusion of the probationary period is suspended from financial aid eligibility.

The Office of Student Financial Aid must notify a student of probationary status and/or suspension.

The director of Student Financial Aid shall have primary responsibility for enforcement of this policy. The Office of Student Financial Aid shall ascertain at the time of each disbursement of funds and prior to certification of a financial aid application that the student is in compliance with the policy.

Cost of Education

For the first-year class matriculant, tuition and estimated expenses for the 2018-19 academic year are listed below.

Students who enter in 2018 will benefit from a tuition stabilization
plan, which provides that their annual tuition of $65,044 will be constant for up to five consecutive years. The stabilized rate will expire five academic years after matriculation. Therefore, students whose medical education is interrupted for any reason for more than one year will be charged the rate of the class they rejoin. Appeals of this policy should be submitted in writing to the medical school registrar. The items listed below provide an estimate of the expenses for a single student in the 39-week first-year class. The total of these figures suggests a basic minimum budget of approximately $85,661. Allowances for entertainment, travel, clothing and other miscellaneous items must be added to this estimate.

**Tuition** (includes Student Health Services and Microscope Lending Plan): $65,044  
**Books, supplies:** $700  
**Medical Instruments:** $740  
**Housing and food:** $14,251  
**Miscellaneous:** $2,534  
**Travel and personal:** $2,392

**Policy for International Students**

The admission decision at Washington University School of Medicine is based on academic and personal merit and not on the ability of the student to pay the costs of education. However, individuals who are not citizens of the United States of America or who do not hold U.S. Permanent Resident Visa status, including DACA students, are not eligible for financial aid due to regulations covering many programs used by the school to fund financial assistance. Therefore, in order for the school to complete the required documents which are necessary for issuance of a visa, the student must document, by a date and in a manner designated by the school, that the necessary amount of funds, as established by the school, is available to pay the costs of education (tuition and living expenses) for the anticipated period of enrollment, normally four years. Documentation of the required amount of financial resources may be by a letter of credit or by deposit of funds in an escrow account with a bank designated by the school.

Refer to the Research section (p. 19) of this Bulletin for more information about Student Research Fellowships.

**Awards and Prizes**

At two annual events, Washington University School of Medicine publicly recognizes and rewards outstanding scholarship, research accomplishments and community service of individual students. In December, the Student Awards Luncheon acknowledges academic excellence earned during the first three years of study. As part of the festive commencement activities in May, graduates are recognized for meritorious research and clinical achievements accomplished during their medical school careers.

**Morris Alex, MD Prize.** Awarded each year to the medical student who is outstanding among their peers in the second-year Practice of Medicine course. The November 2016 recipient: Julia Berg.

**Alpha Omega Alpha Book Prize.** Awarded to a member of the graduating class who has performed outstandingly for the entire medical course. The May 2017 recipient: Andrew Daniel Linkugel.

**American Academy of Neurology Medical Student Prize for Excellence in Neurology.** Awarded to a member of the graduating class for excellence in clinical neurology and outstanding personal qualities of integrity, compassion and leadership. The May 2017 recipient: Stephen Ernest Fuest.

**American College of Physicians Michael M. Karl, MD Book Award.** Presented annually to a member of the graduating class committed to a career in internal medicine, in recognition of highest achievement in the field of internal medicine. The May 2017 recipient: Stephen Ernest Fuest.

**American College of Physicians Award for Excellence in Physical Diagnosis.** Given to a student annually for outstanding performance in the second-year Practice of Medicine course. The November 2016 recipient: Jay Bowman-Kirigin.

**American College of Physicians Clerkship Award.** Established in 1992 to be awarded to a student completing the third year of study with meritorious achievement in the Internal Medicine Clinical Clerkship. The November 2016 recipient: Ethan Tobias.

**American Medical Women's Association Glasgow-Rubin Memorial Award.** Presented to the woman graduating first in her class.


**The Ruth Bebermeyer Award.** Established in 2001 by the WUMCAA executive council to honor Ruth Bebermeyer for her many years of dedicated service to WUMCAA (1990-2000) and to the students of the School of Medicine. The award is given to "a student who has shown extraordinary kindness and sensitivity to the needs of others," whether those others be fellow students, patients or just people in general. The November 2016 recipient: Lyndsey Cole.

**Alexander Berg Prize.** Awarded to the student presenting the best results in research in molecular microbiology. The May 2017 recipient: Joseph Planer.

**The James and Philip Brasington Memorial Prize.** Awarded to a medical school student who has demonstrated excellent preclinical and clinical academic performance in psychiatry and
who has the potential to make significant contributions to the field. The May 2017 recipient: Giuseppe Salvatore D’Amelio IV.

**Jacques J. Bronfenbrenner Award.** Provided by Dr. Bronfenbrenner’s students in memory of his inspiration as a teacher and a scientist, and awarded to the member of the graduating class who, as judged by the Department of Medicine, has done the most outstanding work in infectious diseases or related fields. The May 2017 recipient: James Zou.

**Dr. Richard S. Brookings and Robert Carter Medical School Prizes.** Provided through a bequest of Robert S. Brookings to recognize academic and personal achievements, including but not limited to exemplary academic performance, leadership, community service and research.


**Dr. Harvey Butcher Prize in Surgery.** Awarded annually in memory of Dr. Harvey Butcher to the members of the graduating class who, as judged by the Department of Surgery, show the greatest promise for general surgery. The May 2017 recipient: Katherine Marie Holzem.

**Kehar S. Chouke and George Gill Prize in Anatomy.** Awarded annually to a first-year medical student who has demonstrated superior scholarship in Human Anatomy. The November 2016 recipient: Nirbhay Jain.

**Class of 2001 Award.** Established by the Class of 2001 as its gift to the medical school. Awards are to be given to third-year medical students in recognition of outstanding performance in the areas of community service and student group activities in the first two years of medical school. The November 2016 recipients: Mindy Guo and Rubabin Tooba.

**Class of 2003 Award.** Dedicated to the memory of three classmates who died in a car accident, and awarded to a first-year student recognized by peers as being selfless, exceptionally kind to others and dedicated to the highest standards in medicine, traits for which these classmates will be remembered. The November 2016 recipients: Gabriela Abrishamian-Garcia and Juan Deliz Gonzalez.

**F. Sessions Cole Award in Pediatrics.** The inaugural Cole award is presented to a senior medical student entering the field of pediatrics who exhibits honest and thoughtful patient care, who gives generously with their time, and who welcomes emerging technology. A masterful clinician who continually advocates for our smallest patients. The May 2017 recipient: Ashley Denise Osborne.

**Carl F. and Gerty T. Cori Prize in Biochemistry.** Awarded at the end of the first year to the class member who has demonstrated superior scholarship in biochemistry. The November 2016 recipient: William Padovano.

**Edmund V. Cowdry Prize in Histology.** Established in 1969 to honor Dr. Cowdry; awarded to a medical student in the first-year class who has performed meritoriously in microscopic anatomy. The November 2016 recipient: William Padovano.

**Antoinette Frances Dames Award in Cell Biology and Physiology.** Awarded annually to members of the first-year class who have demonstrated superior scholarship in these fields. The November 2016 recipient: Nirbhay Jain.

**Elisabeth L. Demonchaux Prize in Pediatrics.** Established in 1985, the prize is awarded annually to a graduating student who has done outstanding work in pediatrics. The May 2017 recipient: Lucy Bell Bollinger.

**Steven Dresler Prize.** Awarded to a graduating student who has demonstrated a commitment to promoting social good, civil rights and civil liberties through social action and volunteerism. The November 2016 recipient: Jorge Zarate Rodriguez.

**Dr. William Ellis Award.** Established in 1990 by Dr. Ellis and awarded to a senior student in recognition of meritorious research in ophthalmology. The May 2017 recipient: Jennifer Marie Enright.

**The Endocrine Society Medical Student Achievement Award.** Recognizing a graduating medical student who has shown special achievement and interest in the general field of endocrinology. The May 2017 recipient: Abraham Segura.

**The Family Health Foundation of Missouri Scholarship Award.** Awarded to the top graduating student entering the specialty of family medicine.

**George F. Gill Prize in Pediatrics.** Awarded to a member of the graduating class who has demonstrated superior scholarship in pediatrics. The May 2017 recipient: Ellen Merrick Schill.

**Alfred Goldman Book Prize in Diseases of the Chest.** Created in 1972 as an annual award to be given to a student selected by the faculty for outstanding clinical work or research in diseases of the chest or pulmonary physiology. The May 2017 recipient: Janice S. Kim.

**Max and Evelyn Grand Prize.** Established in 1985 by Dr. M. Gilbert Grand, the prize is awarded annually to a member of the graduating class for excellence in ophthalmic research or clinical ophthalmology. The May 2017 recipient: Jennifer Marie Enright.

**Peter Halstead Hudgens Award.** Established by Dr. Richard W. Hudgens in memory of his son, this award recognizes a graduating student for excellence in research and clinical psychiatry. The May 2017 recipient: Timothy Otto Laumann.

**R.R. Hannas Award for Excellence in Emergency Medicine.** Offered annually by the Missouri Chapter of the American College of Emergency Physicians for exceptional...
performance in emergency medicine. The May 2016 recipient: Daniel Seth Greenstein.

**Nathan Edward Hellman, MD, PhD, Memorial Award.** Recognizes a second-year student selected through a vote of fellow classmates. The recipient is distinguished as a student with a strong track record of accomplishments and an interest in academic medicine, and whose humanism, collegiality, humor and compassion are an inspiration to members of the class. The November 2016 recipient: Kalyan Tripathy.

**Herrmann Prize.** Created by Dr. Paul Herrmann (MD ’61) and his wife, Susan, to recognize a student who is considered a thoughtful and sensitive communicator in the clinical arena and whose listening and communication skills every patient hopes their physician will possess. The November 2016 recipient: Daniel Weisel.

**Dr. John Esben Kirk Scholastic Award.** Established in 1975 and awarded to a graduating student of high scholastic standing. The May 2017 recipient: Miriam Rose Ben Abdallah.

**Rosalind Kornfeld Student Leadership Award.** Presented to a woman or women in the graduating class who have or have demonstrated outstanding leadership in service to or advancement of women in the community. The May 2017 recipient: Miriam Rose Ben Abdallah.

**Louis and Dorothy Kovitz Senior Prize in Surgery.** Senior award in surgery recognizing members of the graduating class who have shown the most outstanding ability, zeal and interest in surgical problems. The May 2017 recipient: Martha Morris Orms McGilvray.

**Wallace Leibner Award.** Established in 1988 in memory of Dr. Leibner, the award is given to the member of the graduating class who has not only demonstrated excellence in diagnosis and therapeutics, but also an understanding of human nature and needs, and an active nurturing of both patient and family. The May 2017 recipient: Lyndsey Dyan Cole.

**Irwin Levy Prize in Neurology and Neurological Surgery.** Established in 1980 by friends of Dr. Levy as a tribute to his commitment to clinical teaching. Provides a prize for the student who presents the best performance in the neurology and neurological surgery clerkships. The November 2016 recipient: Taylor Elizabeth Geisman, Kenneth Dewey Macneal, Debra Vakkalagadda.

**Howard A. McCordock Book Prize in Pathology.** Awarded annually to a student who has done the most outstanding clinical or basic research work in the field of cardiovascular disease. The May 2017 recipient: Stephen Ernest Fuest.

**Edward Massie Prize for Excellence in Cardiology.** Awarded to the member of the graduating class, selected by the director of the Division of Cardiovascular Disease in the Department of Medicine, who has done the most outstanding clinical or basic research work in the field of cardiovascular disease. The May 2017 recipient: Stephen Ernest Fuest.

**McGraw-Hill/Lange Medical Student Book Award.** Awarded annually to medical students for high scholastic standing. The November 2016 recipients: Elizabeth Daniels and Andrew Linkugel.

**Medical Center Alumni Scholarship Fund Prize.** Given annually to students who have shown excellence in their work during the preceding year. The November 2016 recipient: Derek Schloemann.

**Medical Fund Society Prize in Medicine.** One prize awarded annually to a graduating student who has excelled in the study of internal medicine. The May 2017 recipient: Chetan Venkata Vakkalagadda.

**Medical Fund Society Prize in Surgery.** One prize awarded annually to a graduating student who has excelled in the study of surgery. The May 2017 recipient: Andrew Daniel Linkugel.

**Merck Academic Excellence Award.** Given to three graduating medical students for scholastic achievement in medical studies. The May 2017 recipients: Nicole Suzanne Benzoni, Nehal Mahesh Mehta, Brandon Louis Rogalski.

**Missouri State Medical Association Award.** Presented annually to honor School of Medicine graduates for outstanding achievement in the study of medicine. The May 2017 recipients: Taylor Elizabeth Geisman, Kenneth Dewey Macneal, Debra Wendy Yen.

**The Missouri State Medical Association Student Scholarships.** Awarded annually to first-year medical students who graduated from Missouri high schools in recognition of their high undergraduate academic achievement. The November 2016 recipients: Miriam Ben Abdallah, Kevin Cross, Brian Cusworth, Elizabeth Graesser, Harleen Grewal, Seth Howdeshell, Daniel Weisel, and Maeve Woeltje.

**Dr. Helen E. Nash Academic Achievement Award.** Given annually to a student who has exhibited to an unusual degree the qualities of industry, perseverance, determination and enthusiasm. The prize is given in honor of Dr. Helen Nash, a pediatrician noted in the St. Louis community for her commitment to excellence, tireless advocacy on behalf of children and endless enthusiasm for the field of medicine. The November 2016 recipient: Lindsay Burton.

**The Dr. Philip Needleman Pharmacology Prize.** Established by his family in 1989 to honor Dr. Needleman, who was chairman of the Department of Pharmacology from 1976-89. This annual award is given to a member of the graduating class for outstanding research in pharmacology. The May 2017 Recipient: Joseph Planer.

**The Doctor James L. O’Leary Neuroscience Prize.** Awarded annually to a student who demonstrates the best
accomplishment in the Neuroscience course. The November 2016 recipient: Elizabeth Graesser and Nirbhay Jain.

The Roy R. Peterson Prize in Anatomy. Awarded for outstanding performance in the Human Anatomy course in recognition of Dr. Peterson's many contributions as a teacher in the School of Medicine. The November 2016 recipient: Alex Hanson.

The Richard and Mildred Poletsky Education Fund. Established in 1995 by the family of Mr. Richard Poletsky, an alumnus of Washington University. A prize is awarded annually to a professional student in the health sciences whose interest is in research on dementia and care of demented patients.

The Dr. Frank O. Richards Medical Student Scholarship Prizes. Provided by African-American alumni and friends of Washington University School of Medicine. The prizes embrace diversity efforts and are awarded in recognition of achievements in the first and second year of the curriculum. The November 2016 recipients: Elaine Otchere and Jorge Zarate Rodriguez.

Dr. Philip Rosenblatt Award in Pathology. Given to a senior medical student for distinguished performance during an elective in pathology or laboratory medicine. The May 2017 recipient: Lily Yili Zhang.

Dr. William A. Rubenstein Award in Medicine. Awarded to a fourth-year student who shows a serious interest in pursuing a career in internal medicine and who demonstrates the exceptional qualities of a gifted physician, including compassion, caring, and the pursuit of scientific knowledge. The November 2016 recipient: Taylor Geisman.

St. Louis Pediatric Society Senior Prize. Presented to the senior student showing the greatest promise in clinical pediatrics. The May 2017 recipient: Amanda Hart Reis.

David F. Silbert Outstanding Teaching Assistant Award. Established in memory of Dr. David Silbert, it is awarded to a teaching assistant in a medical school course in recognition of a commitment to teaching. The November 2016 recipient: Lindsey Steinberg.

John R. Smith Memorial Fund Award. Created in 1982, it is awarded to a medical student who has done meritorious clinical and/or research work in the Division of Cardiovascular Disease within the Department of Medicine. The May 2017 recipient: Michael Joseph Madigan Jr.

Dr. Margaret G. Smith Award. Given to a woman medical student for outstanding achievement in the first two years of medical school. The November 2016 recipient: Cynthia Wang.

Society for Academic Emergency Medicine Excellence in Emergency Medicine Award. Based on demonstrated excellence in the specialty of emergency medicine, it is awarded to a senior medical student at Commencement. The May 2017 recipient: James Thomas VandenBerg.

Samuel D. Soule Award in Obstetrics and Gynecology. Presented to a member of the fourth-year class for meritorious achievement in either basic or clinical investigation in obstetrics and gynecology. The May 2017 recipient: Allison Page Schelble.

Jessie L. Ternberg Award. Presented to a woman graduating from the School of Medicine who best exemplifies Dr. Ternberg’s indomitable spirit of determination, perseverance and dedication to her patients. The November 2016 recipient: Jessica Holttum.

Washington University Internal Medicine Club Research Award. Awarded to the member of the graduating class who has done the most significant research in any area of internal medicine. The May 2017 recipient: Andrew Philip Jallouk.

Washington University Summer Research Prize. The award recognizes students for meritorious research in the Summer Research Fellowship Program at Washington University School of Medicine. The November 2016 recipients: Daniel Friedman and Nakul Shah.

Samson F. Wennerman Prize in Surgery. Donated by his wife, Zelda E. Wennerman, and awarded annually to the fourth-year student who has demonstrated promise in the field of surgery. The May 2017 recipient: Arith Philip Jallouk.

Doris P. and Harry I. Wexler Fund. Established in 1998 by a bequest from Mrs. Wexler, the prize is awarded annually for research in multiple sclerosis and in alternate years research in eye disease. The May 2014 recipient: Cynthia Lee Montana.

The Park J. White, MD Prize. Created in 1992 in honor of the centennial of the birth of Dr. White, who was a distinguished pediatrician, social activist and pioneer teacher of medical ethics. He introduced the first course on medical ethics to students in 1927. The prize is awarded to students for outstanding performance in the ethics elective offered by the Program for the Humanities in Medicine. The May 2017 recipient: Daphne Ying Xiao.

Hugh M. Wilson Award in Radiology. Given annually to a graduating medical student in recognition of outstanding work in radiology-related subjects, either clinical or basic science. The May 2017 recipient: Matthew Frederick Glasser.

The Wynder Prize in Preventive Medicine. An annual prize established in 1994 and awarded to senior medical students who have done the best research in preventive medicine. The May 2017 recipient Anita Nandkumar Chary and Austin James Wesevich.

James Henry Yalem Prize in Dermatology. Established by Charles Yalem in memory of his son and awarded annually to members of the fourth-year class for outstanding work in dermatology. The May 2017 recipient: Amy Zheng Xu.
Registration, Payments, and Withdrawal & Refunds Policy

The university billing system provides a central financial account against which most student expenses incurred at the university will be posted, including but not limited to tuition, housing charges, parking and library fines. This policy, when referring to tuition and other charges, includes any and all charges posted to this account.

All payments of tuition and other university charges are due and payable on the dates specified in the published calendars of the programs in the School of Medicine. Failure of a student to register when required, and pay tuition and other charges incurred on or before the date specified in the published calendar, may result in a late fee of $50 to be added to the amount due. The late fee may be imposed seven days after the due date if full payment has not been received. Tuition and other charges are usually payable twice a year, at the start of the academic year, and again at the middle of the academic year, as listed on the schedule on the academic calendar.

In addition to the $50 late fee, any payment due from the student and not paid by the specified date will accrue interest at the current market rate in effect on the first business day of the month in which the payment is due. This fee will be imposed on any accounts not paid in full within 30 days of the due date. Any amount not paid when due (plus accrued interest thereon) must be paid in full within three months of the due date to avoid potential suspension from classes, unless a deferred payment is approved by the registrar due to extenuating circumstances.

If a student fails to make payments within three months of the original due date, the school will not release the student's academic record, grade reports or transcript, pending settlement of the unpaid account. A student who has not satisfied all of their delinquent financial obligations to Washington University (tuition, university housing, parking, etc.) one month before the end of the academic year will not be allowed to progress to the next academic year, nor can they be issued a diploma.

Federal financial aid funds for the next academic year cannot be disbursed until all prior year balances are paid in full.

Students who rely on financial aid funds to meet their obligations should submit their applications for processing according to application deadlines published by the Office of Financial Aid.

Deadlines allow for receipt of financial aid funds by payment due dates if applications are filed by the deadline. The Office of Student Financial Aid will assist students with loan applications and financial planning upon request.

A student who withdraws or takes a leave of absence from the school will receive a pro rata refund of tuition and appropriate fees. The refund will be based on the ratio of the class days enrolled (from the first day of classes to the termination date) to the total number of class days in the term for which tuition and fees were paid. It is understood that the date on which a student formally notifies the Registrar's Office in writing of the decision to withdraw or take a leave of absence from the School of Medicine shall be regarded as the termination date, with no retroactive clause to be accepted. A prospective date will be accepted, however. If tuition and fees were paid entirely or in part by financial aid from the school, the refund will be applied first to the total repayment of the accounts from which financial aid was drawn, with any remaining refund balance given to the student. Financial aid received in excess of the costs of tuition and fees must be refunded by the student to the school on the same pro rata basis as calculated for the tuition refund outlined above — per "Return of Title IV" federal guidelines. Any questions about these policies may be directed to either the Office of the Registrar or Financial Aid.

Merit-Based Scholarships

In 1978, the School of Medicine established a scholarship program that based selection on merit rather than financial need. As one of the first merit scholarship programs for medical students, the Distinguished Student Scholarship Program has recognized and rewarded academic excellence and personal achievement for 33 years. And, to honor outstanding alumni of Washington University, the Medical Center Alumni Association created in 1989 the Distinguished Alumni Scholarship Program. In 1998, the Barnes-Jewish Hospital Medical Staff Association committed to funding one full-tuition, four-year scholarship to a student in each entering class. Beginning with the 2002-2003 academic year, one additional "named" scholarship was made available through the generosity of a donor.

Most merit-based scholarships are awarded to students in the first-year class and are subject to annual renewal. Recipients of these scholarships are expected to maintain academic excellence. If a scholarship is not renewed, the student may file for financial aid from the school. For scholarship recipients who document financial need above the full-tuition scholarship, additional funds are available to provide support up to the total cost of education. Scholarship recipients may not concurrently participate in the school's Medical Scientist Training Program, the Armed Forces Health Professions Scholarship Program, or the National Health Service Corps Scholarship Program.

Now known collectively as the Distinguished Scholars Program, its aim is to attract and enroll the most outstanding students in the School of Medicine, thus enriching the scholarly environment and broadening the scope of learning for all students. Scholarship recipients are selected on intelligence, character, personal accomplishments and goals, motivation for medicine, aptitude for science, leadership potential, communication skills and diversity of life experience. Scholarships awarded under this program include the Barnes-Jewish Hospital Scholars, Danforth Scholars in Medicine, Distinguished Alumni Scholars (DAS), Distinguished Faculty Scholars (DFS), and Distinguished Student Scholars (DSS).
Barnes-Jewish Hospital Medical Staff Association Scholarship

One full-tuition, four-year scholarship will be awarded to a student in each entering class beginning in 1999. Selection of the Barnes-Jewish Hospital Medical Staff Association Scholar is the same as for the Distinguished Student Scholarship.

Danforth Scholars in Medicine

Named in honor of William H. and Elizabeth Gray Danforth, the chancellor and first lady of the university from 1971 to 1995, the Danforth Scholars Program is a tribute to their legacy of exemplary leadership and service.

Distinguished Alumni Scholarships

Up to four full-tuition scholarships are awarded annually to members of the entering first-year class. The application procedure and selection process are the same as for the Distinguished Student Scholarships. Since 1989, Distinguished Alumni Scholarships have been named in honor of:

Leonard Bacharier, MD
Thomas Bailey, MD
Thomas Baranski, MD, PhD
Walter F. Benoist, MD
Leonard Berg, MD
Grace E. Bergner, MD
Laura Bierut, MD
Ellen F. Binder, MD
Stanley J. Birge, MD
Eugene M. Bricker, MD
Keith H. Bridwell, MD
Angela Brown, MD
Elmer B. Brown, MD
J. William Campbell, MD
David B. Clifford, MD
C. Robert Cloninger, MD
Jennifer W. Cole, MD
John N. Constantino, MD
Justin J. Cordonnier, MD
Michael Crowder, MD, PhD
Carlos Daughaday, MD
John D. Davidson, MD
Louis P. Dehner, MD
Brian Dieckgraefe, MD, PhD
Bradley Evanoff, MD, MPH
Ronald G. Evens, MD
Lewis C. Fischbein, MD
I.J. Flance, MD
James W. Fleshman, MD
James Forsen Jr., MD
Bernard T. Garfinkel, MD
Deborah J. Gersell, MD
Jerome J. Gilden, MD
Harvey S. Glazer, MD
David Goldring, MD
Sidney Goldring, MD
Samuel B. Guze, MD
Paul O. Hagemann, MD
Marc R. Hammerman, MD
Alexis F. Hartmann, MD
Alexis F. Hartmann Jr., MD
John C. Herweg, MD
Scott G. Hickman, MD
Richard W. Hudgens, MD
David Hunstad, MD
Robert S. Karsh, MD
John M. Kissane, MD
Ira J. Kodner, MD
Allan E. Kolker, MD
Stuart A. Kornfeld, MD
Lawrence M. Kotner Jr., MD
Nicholas T. Kouchoukos, MD
William M. Landau, MD
Timothy J. Ley, MD
Virgil Loeb, MD
Maurice Lonsway, MD
Robert H. Lund, MD
Alan P. Lyss, MD
Philip W. Majerus, MD
Mark J. Manary, MD
Paul R. Manske, MD
Gerald Medoff, MD
Paul A. Mennes, MD
J. Neil Middelkamp, MD
Benjamin Milder, MD
Barbara S. Monsees, MD
Carl V. Moore, MD
George E. Murphy, MD
David G. Mutch, MD
D. Michael Nelson, MD, PhD
Robert C. Packman, MD
Charles W. Parker, MD
Mary L. Parker, MD
Alan L. Pearlman, MD
M. Alan Permutt, MD
Frederick D. Peterson, MD
Gordon W. Philpott, MD
Gary A. Ratkin, MD
Edward H. Reinhard, MD
Fred C. Reynolds, MD
William J. Ross, MD
Will R. Ross, MD, MPH
Joseph F. Ruwitch Jr., MD
Llewellyn Sale Jr., MD
George Sato, MD
Bradley Schlaggar, MD, PhD
Mark E. Frisse, MD
Gustav Schonfeld, MD
Clay F. Semenkovich, MD
Distinguished Faculty Scholars

The Distinguished Faculty Scholar Program provides merit-based scholarships (up to full-tuition for four years) to students who demonstrate their commitment to bringing diverse people together and to enhancing service to disadvantaged groups.

These awards are for students who have:

- Been recognized as scholars from groups that are historically underrepresented in medicine;
- Challenged themselves and excelled academically;
- Demonstrated leadership;
- Engaged in or shown a commitment to community service;
- Demonstrated their commitment to bringing diverse people together (for example, by having been involved in diversity initiatives in their schools or communities); and,
- Demonstrated a commitment to serving historically underprivileged populations, and/or demonstrated achievement and determination in the face of personal challenges.

Distinguished Student Scholarships

Distinguished Student Scholarships are awarded annually (up to full-tuition for four years) to selected members of the entering first-year class based on meritorious academic and personal accomplishments. Final selection of scholarship recipients is made by a committee of the faculty based on demonstrated superior intellectual achievement as well as an assessment of the applicant's character, attitude, motivation and maturity.

Scholarship Funds

Grace Bergner Abrams Scholarship. Established in 1995 through the bequest of Dr. Grace Bergner Abrams, MD '43. Friends and patients also contributed to this endowed scholarship.

Helen M. Aff-Drum Scholarship Fund. Established in 1988 to provide scholarship support to financially deserving medical students.

Anderson Student Scholarship. Established through bequest in 2001 by Rolf L. Anderson, MD '62.

Franz and Harriet I. Arzt Student Loan. Established by the estate of Dr. and Mrs. Franz Arzt in 2013.

Isak and Breine Ascher Scholarship Fund. The late Dr. Eduard Ascher, MD '42, established this scholarship through a trust to memorialize his parents, who were lost in the Holocaust during World War II. He chose Washington University School of Medicine because of their willingness to "give a chance" to an Austrian refugee.

Arthur I. Auer, MD 1956 and Marian D. Auer, NU 1955 Scholarship. Established in 2012 by Dr. and Mrs. Auer to provide scholarship assistance to worthy students.

Dr. William Monroe Baker Fund. Established in 1988 under the will of Miss Lola Braxton in memory of Dr. Baker to provide scholarship assistance to worthy students.

Barnes-Jewish Hospital Medical Staff Association Scholarship. Established in 1998 by the Barnes-Jewish Hospital Medical Staff Association to provide financial assistance to students based on academic excellence.

Floyd A. and Rita Sue Barnett Scholarship. Established in 1994 from a trust agreement (1989) of Floyd and Rita Sue Barnett for scholarships for students who are academically well-qualified and financially deserving.

Dr. Frederick Barry Scholarship. Established in 2009 through the estate of Dr. Frederick Barry for medical student education.

The Dr. Joseph A. and Helene H. Bauer Scholarship. Created in 1987 by Dr. and Mrs. Joseph A. Bauer to provide scholarship support to academically well-qualified and financially deserving medical students.

Edward Baumhardt Scholarship. Established in 2014 through the estate Dr. Edward Earl Baumhardt.

William L. Becker, MD Scholarships. Established in 2012 by Dr. William Becker, MD '87 and awarded based on financial need.
Albert G. Blanke Jr. Endowed Scholarship. Established by a generous gift in 1982, the fund provides scholarship assistance for deserving students in the School of Medicine.

Dr. John A. Bowers Scholarship Fund. Established through the estate of Dr. and Mrs. John Bowers. The scholarship is awarded based on need.

Warren Bowersox, MD Scholarship Fund. Established in 2005 by Mrs. Warren Bowersox in memory of her husband, who was a member of the MD class of 1943, to support scholarships.

Isabel Valle Brookings Scholarship. Established in 1957 by Isabel Valle Brookings (Mrs. Robert S.) for scholarships and loans in the School of Medicine.

The Seymour Brown, MD and Rose Tropp Brown Scholarship. Established by the estate of Dr. Seymour and Mrs. Rose Tropp Brown.

Jane Stewart and Robert S. Brua, MD Scholarship Fund. Established in 1996 through the generosity of Dr. Brua.

The Bruce Family Scholarship. Established in 2012 by Robert and Suzanne Bruce to commemorate three generations of physicians: Helen L. Bruce, MD; her son, Robert M. Bruce, MD; and her grandson, Carl T. Bruce, Washington University School of Medicine, Class of 2015.

Robert W. Butcher, MD Scholarship. Established in 2012 by an anonymous donor.

Ruth Elizabeth Calkins Scholarship Fund. Established by Dr. Delevan Calkins in honor of his granddaughter.

Dr. Richard Brookings and Mr. Robert Carter Medical School Scholarship. Established through a bequest of Robert S. Brookings.

Gilbert L. Chamberlain, MD Scholarship Fund. Created in 1971 by Dr. Gilbert L. Chamberlain to be used to aid worthy students in acquiring their medical education.

Cecil M. Charles – Nu Sigma Nu Medical Student Scholarship Fund. Established by the Nu Sigma Nu Medical Fraternity in memory of Dr. Charles.

Tien Hsin Cheng, MD Endowed Scholarship in Medicine. Established in 2007 by Dr. Tien Hsin Cheng, MD ’76, for deserving medical students with financial need.

Dr. Kehar Singh Chouke Loan. Established by the estate of Dr. Kehar Singh Chouke.

Class of 1945 Scholarship. Established by the alumni from the Class of 1945 in honor of their 45th reunion.

Class of 1954 Scholarship in Memory of Dan Nathans. Established in 2000 by the alumni from the Class of 1954 in memory of their classmate, Daniel Nathans, who was awarded the Nobel Prize in Medicine in 1978. Members of the Nathans family also contributed to the establishment of the fund.

Class of 1956 Scholarship. Established in 1996 by members of the Class of 1956 in honor of their 40th reunion.

Class of 1959 50th Reunion Scholarship. Established in 2008 by members of the Class of 1959 in honor of their 50th reunion.

Class of 1960 Scholarship. Established in 2010 by the members of the Class of 1960 in honor of their 50th reunion.


Class of 1964 Scholarship. Established in 1993 by the alumni from the Class of 1964 to support scholarships.

Class of 1968 Scholarship. Established in 1998 by the alumni from the Class of 1968 in honor of their 30th reunion to support student scholarships.


Class of 1971 Scholarship. Established in 1999 by members of the Class of 1971 in honor of their 25th reunion.

Class of 1972 Scholarship. Established in 1999 by members of the Class of 1972 in honor of their 25th reunion.


Class of 1974 Scholarship in Honor of Dr. Jonathan Mann. Established in 2002 by members of the Class of 1974 for their 25th reunion and to honor the memory of their classmate, Dr. Jonathan Mann, a pioneering AIDS researcher, who died in the Swissair Flight 111 accident in 1998.

Class of 1975 Scholarship. Established in 2000 by members of the Class of 1975 in honor of their 25th reunion.


Class of 1977 Scholarship. Established in 2002 by members of the Class of 1977 in honor of their 25th reunion.


Class of 1979 Scholarship. Established in 2003 by members of the Class of 1979 in honor of their 25th reunion.


Class of 1982 Scholarship. Established in 2006 by members of the Class of 1982 in honor of their 25th reunion.

Class of 1984 Scholarship. Established in 2008 by members of the Class of 1984 in honor of their 25th reunion.

Class of 1985 Scholarship. Established in 2016 by members of the Class of 1985.

Class of 1986 Scholarship. Established in 2011 by members of the Class of 1986 in honor of their 25th reunion.

Grace Strong Coburn Scholarship. Created in 1962 through the bequest of Mrs. Grace Strong Coburn for scholarships in the School of Medicine.

Jack W. Cole, MD Scholarship Fund. Established in 2002 by Mrs. Ruth Kraft Cole, in memory of her late husband, a 1944 graduate of WUSM, and to recognize Dr. Cole's deep appreciation for the education he received. Preference will be given to a student pursuing a career in academic medicine.

T. Griswold Comstock Scholarships. Established under the will of Marilla E. Comstock for students who would otherwise be unable to obtain a medical education.

Robert Emmet Connor Family Scholarship Fund. Established in 2010 by Dr. Robert Connor in appreciation for the medical education he received at Washington University.

Clark and Mildred Cox Scholarship for Women. Established in 1998 with a donation from the Clark Cox Trust.

Arpad Csapo, MD Memorial Scholarship Fund. Established in 1982 by Elise Csapo in memory of her husband, and by his friends and colleagues to provide assistance for students who have shown promise in fields relating to reproductive medicine.

William H. and Elizabeth Gray Danforth Scholars Program. Established in 1998 in honor of Chancellor Danforth's retirement. The Scholarship recipients must demonstrate outstanding academic promise and a record of community service that reflects Dr. Danforth's values and actions.

Harriet Arey and John D. Davidson Scholarship. Established in 2000 by Harriet Arey and John D. Davidson for scholarships in the School of Medicine.

Davie Family Endowed Scholarship. Established by Joseph Davie, MD ’68, and his family to support scholarships for deserving medical students.

Paul H. and Ruth K. DeBruine Endowed Scholarship. Established in 1994 by Dr. and Mrs. Paul DeBruine in honor of his 35th medical school reunion to provide scholarship support to academically well-qualified and financially deserving medical students.

The Melvin DeHovitz Scholarship. Established by the estate of Mr. DeHovitz in honor of his mother, Jeanette DeHovitz.

Distinguished Alumni Scholarship. These scholarships are made available by generous donations from our alumni. The Washington University Medical Center Alumni Association Executive Council names the scholarships for alumni each year to honor their outstanding contributions and leadership.

Distinguished Faculty Scholarship. These scholarships are for students who have challenged themselves and excelled academically, demonstrated leadership, engaged in or shown a commitment to community service, demonstrated their commitment to bringing diverse people together, and enhanced service to disadvantaged groups. In addition, it links each of the scholarship recipients with a faculty mentor who has contributed to the diversity of the medical school.

Distinguished Student Scholarship. These scholarships are awarded to students who are selected primarily on the basis of merit (demonstrated superior intellectual and personal achievements, and an assessment of the applicant's character, attitude, motivation and maturity).

Dr. Charles Drabkin Scholarship. Created in 1964 to provide financial assistance to medical students.


Eichner-Dominguez Family Scholarship. Established in 2005 by Lora Eichner, MD ’93, to make it easier for students to attend medical school.

Dr. Howard Eisen and Dr. Judith Wolf Scholarship. Established in 2013 by Dr. Howard Eisen and Dr. Judith Wolf, who both completed their residencies at Washington University School of Medicine. Provides support to medical students based on need or merit.

Dr. and Mrs. Max Elliott Scholarship. Established in 2000 by Dr. Elliott, MD ’64, to assist medical students.

Robert B. Fickel, DDS Scholarship Fund. Established by a 1941 graduate of Washington University School of Dental Medicine.

Carl Fisch Scholarship Fund. Created in memory of Dr. Fisch by his daughter, Marguerite F. Blackmer. Provides support to students who demonstrate financial need.

Flance Medical Scientist Traineeship. Instituted in memory of faculty member and alumnus I. Jerome Flance, MD ’35 by the Harry Edison Foundation for support of a student in the Medical Scientist Training Program.

Ann Randolph Flipse, MD Scholarship in Medicine. Established in 2007 by Dr. Ann Randolph Flipse to support deserving medical students with a preference for students whose undergraduate degree was in English, history, philosophy, music, arts or a graduate degree in the humanities.


Helen H. Glaser Scholarship for Women Medical Students. Established in 1999 by Robert J. Glaser, MD, emeritus trustee of the Washington University Medical Center Alumni Association Executive Council.
and former faculty member, in memory of his wife, Helen H. Glaser, MD ‘47.

**Anne T. and Carl Goetsch Scholarship.** This fund was established in 2003 through the bequest of Dr. Anne T. Goetsch, MD ‘41, HS ’44, and Dr. Carl Goetsch, HS ’43, to support medical students.

**Norman M. and Eleanor H. Gross Scholarship Fund.** Established in 2004 by Dr. and Mrs. Gross to provide financial assistance to qualified medical students.

**Jackson Johnson Scholarship.** Established in 1970 under the will of Miss Isabel Bailey Harvielle Harvielle-Bailey Scholarship for Medicine or Surgery. Established in 2008.

**Paul H. and Lila L. Gutman Scholarship Fund.** Established in 1976 to provide financial assistance to qualified medical students.

**Donald R. and Mary N. Harkness Family Scholarship.** Established in 2009 by the Estate of Dr. Raymond F. Holden Jr., and Mrs. Ronnie Kaiser in appreciation of the financial aid Dr. Kaiser received as a student and to provide support for medical students.

**George D. Kettelkamp Scholarship.** Established in 1969 by Mrs. Kettelkamp in memory of her husband, an alumnus of the School of Medicine.

**M. Kenton King, MD Scholarship.** Created by the Executive Faculty to honor Dr. King at the time of his retirement in 1989 as dean of the School of Medicine after having served in that position for 25 years.

**Saulo Klahr Endowed Scholarship.** Established in 2010 by Mrs. M. Carol Klahr in memory of her husband, Dr. Saulo Klahr, a WUSM professor of kidney disease for 46 years, to provide scholarship support to medical students.

**Ira J. Kodner Scholarship.** Established in 2014 to honor Dr. Ira Kodner, MD, professor emeritus of surgery.

**Albert F. Koetter, MD Scholarship Fund.** Established in 1980 for medical student scholarships, the Medical Century Club Scholarship Endowment. Following the foundation’s generous gift in 1980 for medical student scholarships, the Medical Century Club accepted the challenge to raise new scholarship funds to match an additional gift from the foundation.

**Jay and Ronnie Kaiser Endowed Scholarship.** Established in 1983 as a memorial to Lorraine from her classmates, friends and family to assist deserving medical students in the funding of their medical expenses.

**Henry J. Kaiser Family Foundation – Medical Century Club Scholarship Endowment.** Following the foundation’s generous gift in 1980 for medical student scholarships, the Medical Century Club accepted the challenge to raise new scholarship funds to match an additional gift from the foundation.

**Jay and Ronnie Kaiser Endowed Scholarship.** Established in 2004 by Dr. Jay Kaiser, MD ’72, and Mrs. Ronnie Kaiser in appreciation of the financial aid Dr. Kaiser received as a student and to provide support for medical students.

**Dr. Donald J. Horsh Scholarship.** Established in 1985 to honor Dr. Donald J. Horsh, former associate professor and deputy director for the Health Administration Program. Provides support to medical students.

**Dr. and Mrs. Charles Y. (Yueh-Gin Gung) Hu Scholarship.** Established in 2002 to provide a scholarship to medical students.

**Dr. Grace Huse Memorial Fund.** Provides scholarship awards for deserving Washington University medical students.

**Justan Icks Scholarship.** Established in 2008 by anonymous donor to support students with high academic achievement.

**Maude L. Lindsey Memorial Scholarships.** Created in 1976 to assist students in the School of Medicine.
John R. Lionberger Jr. Medical Scholarship Endowment Fund. Created in 1982 by Dr. John R. Lionberger to be used to aid worthy students in acquiring their medical education.

E.A. Marquard Memorial Student Scholarship. Established in 1994 from the E. Alfred Marquard Memorial Student Loan Fund to provide scholarships for deserving medical students.

Alma Mavis Scholarship. Created in 1988 under the will of Alma Mavis to assist students intending to practice family medicine.

Eliza McMillan Scholarship. Provides assistance to young women in any of several schools of the university to secure an education.

Medical Alumni Scholarship Fund. Awarded on the basis of academic achievement and financial need.

Edith and Martin Meltzer Scholarship. Established in 2004 by the Meltzer Family Foundation to honor Dr. Gerald Meltzer’s (MD ’63) parents, who established the foundation.

Dr. Charles Miller Jr. and Florence Noland Miller Scholarship. Established in 2014 to support medical students.

Roy B. and Viola R. Miller Memorial Fund. Created in 1963 through the bequest of Roy B. Miller to provide scholarships for medical students.

The Warren S. and Dorothy J. Miller Scholarship Fund. Established in 1982 through the bequest of Dorothy J. Miller to provide scholarships for any students engaged in studies leading to the degree of Doctor of Medicine.

Joseph J. and Ernesta G. Mira Scholarship Fund. Established in 1988 by Dr. and Mrs. Mira to provide assistance to students from the Alton, Illinois, area. Available to others when there are no students from the Alton/Madison County area.

George and Elizabeth Ann Neilson Scholarship. Established by the estate of George and Elizabeth Neilson.

David and Janine Nelson Scholarship in Medicine. Established in 2011 by Dr. David Nelson, a 1963 graduate of Washington University School of Medicine, and his wife, Janine.

Nancy S. Newlin, MD and Henry H. Newlin, JD Scholarship Fund. Established by Dr. Newlin and her late husband.

Norland Endowed Scholarship. Established in 2015 by Dr. Charles C. Norland, a 1959 graduate of Washington University School of Medicine, and Mrs. Dorothy Norland.

Mr. and Mrs. Spencer T. Olin Fellowships for Women. Provides for annual financial support to female graduates of an undergraduate institution in the United States in any of several disciplines. Application deadline is February 1.

Spencer T. and Ann W. Olin Medical Fellowships. Created in an effort to help fill the continuing shortage of physicians who pursue careers in biomedical research, the awards are primarily for students in the Medical Scientist Training Program.

Dr. Roy W. Osterkamp Memorial Scholarship Fund. Established in 2003 by Mrs. Linda Osterkamp Desloge and Mrs. Lila Osterkamp Haberberger, in memory of their father, Dr. Roy W. Osterkamp, DE ’36. Preference will be given to a student pursuing a career in a medical field related to dental medicine, such as maxillo-facial surgery. If no student shares this interest, it will be awarded based on need.

F. Thomas Ott (MD ’65) and Mary Miller Ott (MSN ’68) Scholarship. Established in 2010 by Dr. F. Thomas and Mrs. Mary Miller Ott to provide scholarship support to medical students.

Dr. Sidney F. (Class of ’29) and Dora K. Pakula Scholarship. Established in 2001 by Dr. and Mrs. Lawrence C. Pakula in memory of Dr. Pakula’s parents to support student scholarships.

Mary Langston Parker Scholarship. Established in 2014 by The Parker Family to honor Dr. Mary Langston Parker, MD ’53, professor emerita of preventive medicine and past director of Student Health Services.

William B. Parker Scholarship. Established in 1976 by the School of Medicine in honor of William B. Parker’s 51 years of service.

The Robert W. and Elise Hampton Parsons Scholarship Fund. Established in 2014 by Dr. Robert W. Parsons, MD ’54, to support medical students.

William A. Peck, MD Scholars in Medicine. Established in 2002 to recognize Dr. Peck’s 14 years of service to the Medical Center and Washington University community. University trustees, faculty, staff, alumni and friends honored Dr. Peck with gifts to this scholarship.

Peterson Group Scholarship. Established in 2014 by Peterson Group to provide financial support to medical students.

Philpott Family Scholarship. Established in 1995 by the Philpott family to provide support for medical students with financial need and excellent academic achievement.

Pi Beta Phi – Charles Ruggieri Scholarship Fund. Established in 1985 by the Washington University alumni of the Pi Beta Phi medical fraternity to honor Charles Ruggieri and to assist deserving medical students enrolled in Washington University School of Medicine with the funding of their medical education.

The Virginia Keck, George M. (MD ’32) and George K. (MD ’64) Powell Medical Student Scholarship Fund. Established in 1984 by Mrs. George M. Powell in grateful appreciation for the medical education provided to her husband and son by Washington University School of Medicine, which so positively affected the lives of the Powell families.

Henry and Louise Reller Scholarship. To be given to medical students in the name of the parents of Louise Reller.
Gennaro Resta Scholarship. Established in 2014 by Dr. Regina M. Resta (Class of 1985) and Dr. Michael A. Kolodziej (Class of 1984) to honor Dr. Resta's father.

Lyman K. Richardson, MD Scholarship Fund. Established in 1993 by Mrs. Ellen Richardson to provide scholarship support to medical students.

John E. Rittmann Scholarship. Established in 2015 by Dr. John E. Rittman, a 1962 graduate of Washington University School of Medicine.

Samuel Jennings Roberts Scholarship Fund. Created to provide scholarships for any students engaged in study leading to the degree of Doctor of Medicine.

Robert Allen Roblee Scholarship Fund. Established in 1948 through a gift of Mrs. Joseph H. Roblee for students in the School of Medicine.

Thomas W. and Elizabeth J. Rucker Scholarship Fund. Created in 1956 through the bequest of Eugenia I. Rucker, in memory of her mother and father.

J. Max Rukes Scholarship Fund. Established in 1987, the fund provides scholarship support to deserving medical school students, with a preference for those who are interested in endocrinology.


Robert G. and Maxine W. Scheibe Scholarship. Established in 1999 by Robert G. Scheibe, a 1960 Washington University graduate who also received his medical degree here in 1964 and his wife, Maxine, who is a 1966 graduate of the Washington University School of Nursing.

William H. and Ella M. Schewe Scholarship. Established to provide financial assistance to worthy students in the medical school.

Dr. David Schlessinger Endowed Scholarship. Created in 2006 by Dr. Dan Longo in honor of his mentor, Dr. Schlessinger, who was a professor of molecular microbiology, professor of genetics and professor of microbiology at Washington University School of Medicine.

Dr. Gustav and Mrs. Miriam Schonfeld Scholarship. Established in 2010 by Dr. Gustav and Mrs. Miriam Schonfeld to support medical students. Dr. Schonfeld, MD ‘60, was past chair of the Department of Internal Medicine and physician-in-chief at Barnes-Jewish Hospital.

Edna Schrick, MD Scholarship Fund. Established in 1992 by Dr. Schrick to provide scholarship support.

Mordecai E. Schwartz Endowed Scholarship. Established in 2006 by Dr. Mary R. Schwartz, Dr. David Cech and Alexander I. Schwartz in memory of their father, who was committed to the training of future physicians.

Edward L. Schweich Scholarship. Established in 2010 by Mr. and Mrs. Henry L. Schweich, in memory of Edward L. Schweich, for medical student scholarship support.

Senior Merit Scholarship. Established by an anonymous alumnus of the School of Medicine, it provides a scholarship to a senior student who has earned a distinguished record of academic and personal achievements during the first three years in the medical school.

Charlie W. Shaeffer Jr. Endowed Scholarship Fund. Established in 2008 by Charlie Shaeffer (MD ’64) and his wife, Claire, for medical students, based on academic merit and/or financial need.

Dr. John B. Shapleigh Scholarship Fund. Established in 1926 through the bequest of Dr. John B. Shapleigh and supplemented by contributions from Mrs. Shapleigh and Miss Margaret Shapleigh.

Alexander Balridge Shaw Scholarship Fund. Created in 1958 through the bequest of Roy A. Shaw in memory of his father, Dr. Alexander Balridge Shaw.

William T. Shearer and Lynn Des Prez Diversity Scholarship. Created by William T. Shearer, MD ’70, and his wife, Lynn Des Prez. Scholarships are awarded with a preference for under-represented students.

Dr. Edward Hiroshi Shigeoka Scholarship Fund. Created in 1988 by Dorothy F. Shigeoka in memory of her husband, Dr. Edward Hiroshi Shigeoka, to help disadvantaged and deserving students pursue their careers in medicine.

Ernie Simms Scholarship Fund. Founded in 1984 by friends, colleagues and former students of Professor Simms in recognition of his contributions to scholarly research and teaching in the Department of Microbiology and Immunology.

Dr. and Mrs. Vergil N. Slee Endowed Scholarship Fund. Established in 2012 through a bequest from 1941 graduate of the School of Medicine, Dr. Vergil N. Slee, and his wife.

Stanley B. Smith, MD Scholarship. Established in 2001 in memory of Samuel and Dora Smith, Dr. Smith’s parents, to support student scholarships.

Dr. Dwight H. Stone Scholarship. Established by Mr. Dwayne Stone in honor of his brother, Dr. Dwight H. Stone, a 1959 graduate of the School of Medicine.

Beulah B. Strickling Scholarship Fund. Established in 1960 with a bequest from Mrs. Beulah B. Strickling.

Marleah Hammond Strominger Scholarship. Established in 1971 by Donald Strominger, MD, and supported by family and friends of Marleah Hammond Strominger. The recipient shall be a motivated student with need for financial assistance.

Mary and Ernst Stuehrk Scholarship Fund. Established in 1987 to assist medical students with documented financial need.
Edwin H. and Virginia M. Terrill Scholarship Fund. Established in 1964 with the bequest of Dr. Edwin H. Terrill, an alumnus.


Mildred Trotter Scholarship Fund. For students with documented financial need, the fund was established in 1979 by Dr. and Mrs. Paul Guttman, and supplemented by former students of Dr. Trotter, as a tribute to her many years of teaching in the Department of Anatomy.

Hiromu Tsuchiya Scholarship Fund. Created to provide scholarships in the School of Medicine.

Tuholske-Jonas-Tuholske Medical Scholarship Fund. Established in 1974 by Rose T. Jonas in memory of her father, husband and brother. The recipient shall be a senior student preparing to enter the field of surgery, obstetrics and gynecology, or internal medicine.

Cornelia Van Prooyen, MD Scholarship Fund. Established in 1987, the fund provides scholarship support and other financial assistance to female medical students.

George S. and Aspasia N. Vellios Scholarship. Established by Frank Vellios, MD '46, in honor of his parents. Scholarships are awarded to deserving medical students with financial need.

Louis H. Waltke and Marie Waltke Memorial Fund for Medical Education. Created in 1984 to provide scholarships and fellowships at the School of Medicine.

Dr. Robert A. Weiss Scholarship. Established by Dr. and Mrs. Robert Weiss.

George and Irene Wolf Medical Scholarship Fund. Established by the donors to benefit students in the School of Medicine.

Pamela F. Gallin Yablon, MD Scholarship. Established in 2008 by Dr. Pamela F. Gallin Yablon and Mr. Leonard H. Yablon to support medical students.

Dr. Mitchell and Elaine Yanow Scholarship Fund. Established in 2002 by the children of Dr. and Mrs. Yanow to honor the memory of their parents and to provide support for deserving medical students.

George Zografakis Memorial Scholarship Fund. Created by the family and friends of Dr. Zografakis, a distinguished faculty member in the Department of Surgery.

Loan Funds

Auer-Rosenfeld Memorial Loan Fund. Established by Mrs. Elizabeth Auer to be used for educational loans to students.

Dr. John C. Boetto Loan Fund. Established in 1993 by a bequest from Mrs. Josephine D. Boetto as a memorial to her son to provide loans for deserving medical students.

Otto W. Brandhorst Loan Fund. Created in 1985 by the estate of Fern Crawford. This fund supports loans to students in the School of Medicine.

Dr. Harold A. Budke Loan. Established in 1998 to provide financial assistance to needy and deserving medical students.

Harold A. Budke, MD, Loan Fund II. Established in 2001 with a bequest from the estate of Etta Elise Wedemeyer to provide loans to needy and deserving female students who will practice family medicine, internal medicine or obstetrics-gynecology medicine.

Class of 1947 Loan Fund. Established in 1996 by members of the class of 1947 in honor of their 50th reunion.

Jess K. Goldberg Memorial Loan Fund by Ophelia H. Kooden and Violet G. Sachs. Created in 1970 to provide zero-interest loans for medical students in memory of the donors’ brother who passed away while attending medical school.

Health Professions Student Loan Fund. Established by federal legislation for medical students with a demonstrated financial need. Loans are available for long terms at favorable rates.

William Randolph Hearst Medical Scholars Loan Fund. In 1989, the Hearst Foundation provided funding for a new and innovative loan program which provides interest-free loans to students in their last year of study.

Ursula Hecker Loan Fund. Established in 1967 by a bequest from Ursula Lee Hecker for the use and benefit of worthy, deserving and needy medical students.


Horncrest Foundation — School of Medicine Loan Fund. In 1982, the trustees of the Horncrest Foundation approved a proposal on behalf of the School of Medicine to match up to a generous annual cap for five-year loan funds solicited by the school. The campaign was extremely successful and now provides loan funds to students with documented financial need.

W.K. Kellogg Foundation Loan Fund. Provides financial assistance to medical students in need of such aid.

Gustel and Edith H. Kiewitt Scholarship Loan Fund. Provides loan funds for medical students.

Medical Scholars Loan Program. Established in 1985 by members of the William Greenleaf Eliot Society, this fund provides an interest-free source of long-term student loans. Annual contributions from alumni and friends support this perpetual and growing resource upon which current and future medical students will draw.
George W. Merck Memorial Loan Fund. Established in 1959 by The Merck Company Foundation, the original purpose of the loan was modified in 1983 to provide loans to graduating students which would help bridge the transition from student to resident physician.


Dr. Lloyd L. Penn and Goldie H. Penn Student Loan. Dr. Penn, MD '33, established the fund in 1977 to aid well-qualified and deserving students.

Perkins Student Loan. A federal program (formerly National Direct Student Loan) to provide loans to students with financial need. Permits repayment over an extended period at a favorable interest rate.

Dr. William C. and Elva Pratt Loan Fund. Established in 1982 for medical students with demonstrated financial need.

G.H. Reinhardt Memorial Scholarship Loan Fund. Established in 1947 through the bequest of G.H. Reinhardt.

Aline Rixman Loan Fund. Created in 1940 by William Rixman in memory of his wife, the fund is used to alleviate unexpected financial emergencies of medical students.

James L. and Dorothy Rouner Loan Fund. Established in 1997 by Dr. James and Mrs. Dorothy Rouner to be used for medical students pursuing a career in primary care–general internal medicine.

Caroline O. Schlesinger Loan Fund. Established in 1969 to provide financial support for medical students.

School of Medicine Student Loan Fund. Established to make loans to students with documented financial needs.

Washington University Medical Center Alumni Association Loan Fund. Provides emergency loans to medical students.

The Alan A. and Edith L. Wolff Loan Fund. Established in 1993 by Mrs. Edith L. Wolff to provide loans to students with demonstrated financial need who are in their final year of study for the Doctor of Medicine degree.

Health Professions

The following policy applies to students pursuing graduate/professional training in Applied Health Behavior Research (p. 348); Audiology and Communication Sciences (p. 348); Biology and Biomedical Sciences (p. 348); Biomedical Engineering (p. 348); Biostatistics (p. 348); Clinical Investigation (p. 348); Doctor of Philosophy (p. 348); Genetic Epidemiology (p. 348); Occupational Therapy (p. 348); Physical Therapy (p. 349); Population Health Sciences (p. 349); Public Health (p. 349).

General Information

Registration, Payments, and Withdrawal & Refunds Policy

The university billing system provides a central financial account against which most student expenses incurred at the university will be posted, including but not limited to tuition, housing charges, parking and library fines. This policy, when referring to tuition and other charges, includes any and all charges posted to this account.

All payments of tuition and other university charges are due and payable on the dates specified in the published calendars of the programs in the School of Medicine. Failure of a student to register when required, and pay tuition and other charges incurred on or before the date specified in the published calendar, may result in a late fee of $50 to be added to the amount due. The late fee may be imposed seven days after the due date if full payment has not been received. Tuition and other charges are usually payable twice a year, at the start of the academic year, and again at the middle of the academic year, as listed on the schedule on the academic calendar.

In addition to the $50 late fee, any payment due from the student and not paid by the specified date will accrue interest at the current market rate in effect on the first business day of the month in which the payment is due. This fee will be imposed on any accounts not paid in full within 30 days of the due date. Any amount not paid when due (plus accrued interest thereon) must be paid in full within three months of the due date to avoid potential suspension from classes, unless a deferred payment is approved by the registrar due to extenuating circumstances.

If a student fails to make payments within three months of the original due date, the school will not release the student's academic record, grade reports or transcript, pending settlement of the unpaid account. A student who has not satisfied all of their delinquent financial obligations to Washington University (tuition, university housing, parking, etc.) one month before the end of the academic year will not be allowed to progress to the next academic year, nor can they be issued a diploma.

Federal financial aid funds for the next academic year cannot be disbursed until all prior year balances are paid in full.

Students who rely on financial aid funds to meet their obligations should submit their applications for processing according to application deadlines published by the Office of Financial Aid. Deadlines allow for receipt of financial aid funds by payment due dates if applications are filed by the deadline. The Office of Student Financial Aid will assist students with loan applications and financial planning upon request.

A student who withdraws or takes a leave of absence from the school will receive a pro rata refund of tuition and appropriate fees. The refund will be based on the ratio of the class days enrolled (from the first day of classes to the termination date).
to the total number of class days in the term for which tuition and fees were paid. It is understood that the date on which a student formally notifies the Registrar's Office in writing of the decision to withdraw or take a leave of absence from the School of Medicine shall be regarded as the termination date, with no retroactive clause to be accepted. A prospective date will be accepted, however. If tuition and fees were paid entirely or in part by financial aid from the school, the refund will be applied first to the total repayment of the accounts from which financial aid was drawn, with any remaining refund balance given to the student. Financial aid received in excess of the costs of tuition and fees must be refunded by the student to the school on the same pro rata basis as calculated for the tuition refund outlined above — per “Return of Title IV” federal guidelines. Any questions about these policies may be directed to either the Office of the Registrar or Financial Aid.

Standards for Satisfactory Academic Progress for Financial Aid Eligibility

**Note** (for non-MD students): Students enrolled in other School of Medicine degree programs should refer to the policies of their primary program (Applied Health Behavior Research (https://crtc.wustl.edu/programs/degrees/ahbr), Audiology and Communication Sciences (https://pacs.wustl.edu), Biostatistics (https://biostatistics.wustl.edu), Clinical Investigation (https://crtc.wustl.edu/programs), Genetic Epidemiology (https://biostatistics.wustl.edu/education), Occupational Therapy (http://www.ot.wustl.edu), Physical Therapy (https://pt.wustl.edu), and Population Health Sciences (http://www.mphs.wustl.edu)).

Program Information

**Applied Health Behavior**

The Applied Health Behavior programs follow the standard tuition rate for graduate programs offered through the School of Medicine, which increases incrementally each year. Additional information may be obtained by contacting the Applied Health Behavior program manager (ahbr@email.wustl.edu).

**Audiology and Communication Sciences**

For more information about the Audiology and Communication Sciences program, including tuition and fees, please visit the Audiology and Communication Sciences (https://pacs.wustl.edu/admissions/tuition-and-financial-aid) website.

**Biological and Biomedical Sciences**

Students admitted to the Division of Biology & Biomedical Sciences (DBBS) graduate programs are guaranteed full stipend and tuition support contingent upon satisfactory performance. The stipend for the 2018-19 academic year is $30,500. In addition, health coverage, disability, and life insurance are also provided. Please visit the DBBS website (http://dbbs.wustl.edu/ Pages) for additional information.

**Biomedical Engineering**

For more information about the Biomedical Engineering (http://bulletin.wustl.edu/grad/engineering/biomedical) program, including tuition and fees, please visit the Engineering & Applied Science Bulletin.

**Biostatistics**

For tuition information, please visit our Biostatistics website (https://biostatistics.wustl.edu/education/master-of-science-in-biostatistics-msibs/tuition-and-financial-aid), contact the program manager at 314-362-1384, send an email (biostats-msibs@email.wustl.edu), or write to:

**MSIBS Program**

Division of Biostatistics
CB 8067
660 S. Euclid Ave.
St. Louis, MO 63110-1093
Fax: 314-362-2693

**Clinical Investigation**

MSCI programs follow the standard tuition rate for graduate programs offered through the School of Medicine, which increases incrementally each year. MSCI courses are eligible for the Washington University Human Resources Tuition Assistance Program for qualifying staff and faculty. Visit the Clinical Research Training Center (https://crtc.wustl.edu/courses/class-list/tuition) website for additional tuition information.

**Doctor of Philosophy**

For more information about the Doctor of Philosophy program, including tuition and fees, please visit the Graduate School website (http://graduateschool.wustl.edu).

**Genetic Epidemiology**

For tuition information, please visit our website (https://biostatistics.wustl.edu/education), contact the program manager at 314-362-1384, send an email (biostats-msibs@email.wustl.edu), or write to:

**MSIBS Program**

Division of Biostatistics
CB 8067
660 S. Euclid Ave.
St. Louis, MO 63110-1093
Fax: 314-362-2693

**Occupational Therapy**

Tuition and fieldwork fees (MSOT, full-time) per semester: $15,692 for first five semesters, $7,845 per semester for last two semesters while on fieldwork.

Tuition and fieldwork fees (OTD, full-time): $15,692 per semester first four semesters, $16,199 per semester last three academic semesters, and $7,845 for each semester student is on clinical fieldwork or the doctoral experiential component.
Part-time tuition: $1,265 per credit

Physical Therapy
Professional DPT curriculum: $19,193 per semester
Doctoral curriculum: $27,825 per semester

Population Health Sciences
For more information about the Population Health Sciences program (http://mphs.wustl.edu), including tuition and fees, please visit the Population Health Sciences website (http://mphs.wustl.edu/Admissions/Tuition).

Public Health
For more information about the Public Health program, including tuition and fees, please visit the Graduate School website (http://graduateschool.wustl.edu).

Joint
The following policy applies to students pursuing graduate/professional training in the following joint programs: MD/PhD (p. 349), MD/MSCI (p. 349), MD/MPHS (p. 350), MD/MPH (p. 350), MD/MA (p. 350).

General Information
Registration, Payments, and Withdrawal & Refunds Policy
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All payments of tuition and other university charges are due and payable on the dates specified in the published calendars of the programs in the School of Medicine. Failure of a student to register when required, and pay tuition and other charges incurred on or before the date specified in the published calendar, may result in a late fee of $50 to be added to the amount due. The late fee may be imposed seven days after the due date if full payment has not been received. Tuition and other charges are usually payable twice a year, at the start of the academic year, and again at the middle of the academic year, as listed on the schedule on the academic calendar.

In addition to the $50 late fee, any payment due from the student and not paid by the specified date will accrue interest at the current market rate in effect on the first business day of the month in which the payment is due. This fee may be imposed on any accounts not paid in full within 30 days of the due date. Any amount not paid when due (plus accrued interest thereon) must be paid in full within three months of the due date to avoid potential suspension from classes, unless a deferred payment is approved by the registrar due to extenuating circumstances.

If a student fails to make payments within three months of the original due date, the school will not release the student's academic record, grade reports or transcript, pending settlement of the unpaid account. A student who has not satisfied all of their delinquent financial obligations to Washington University (tuition, university housing, parking, etc.) one month before the end of the academic year will not be allowed to progress to the next academic year, nor can they be issued a diploma.

Federal financial aid funds for the next academic year cannot be disbursed until all prior year balances are paid in full.

Students who rely on financial aid funds to meet their obligations should submit their applications for processing according to application deadlines published by the Office of Financial Aid. Deadlines allow for receipt of financial aid funds by payment due dates if applications are filed by the deadline. The Office of Student Financial Aid will assist students with loan applications and financial planning upon request.

A student who withdraws or takes a leave of absence from the school will receive a pro rata refund of tuition and appropriate fees. The refund will be based on the ratio of the class days enrolled (from the first day of classes to the termination date) to the total number of class days in the term for which tuition and fees were paid. It is understood that the date on which a student formally notifies the Registrar's Office in writing of the decision to withdraw or take a leave of absence from the School of Medicine shall be regarded as the termination date, with no retroactive clause to be accepted. A prospective date will be accepted, however. If tuition and fees were paid entirely or in part by financial aid from the school, the refund will be applied first to the total repayment of the accounts from which financial aid was drawn, with any remaining refund balance given to the student. Financial aid received in excess of the costs of tuition and fees must be refunded by the student to the school on the same pro rata basis as calculated for the tuition refund outlined above — per “Return of Title IV” federal guidelines. Any questions about these policies may be directed to either the Office of the Registrar or Financial Aid.

Program Information
Doctor of Medicine and Doctor of Philosophy: MD/PhD (MSTP)
All MSTP students in the program receive financial support in the form of stipends (currently $30,500 per year), health coverage, disability and life insurance, and full tuition remission for both the MD and PhD phases of training. Please visit the MSTP website (http://mstp.wustl.edu/Pages) for additional information.

Doctor of Medicine and Master of Science in Clinical Investigation: MD/MSCI
MSCI programs follow the standard tuition rate for graduate programs offered through the School of Medicine, which increases incrementally each year. MSCI courses are eligible
for the Washington University Human Resources Tuition Assistance Program for qualifying staff and faculty. Visit the Clinical Research Training Center (https://crtc.wustl.edu/courses/class-list/tuition) website for additional tuition information.

For information about tuition for the Medicine program, please visit the MD section (p. 332) of this page.

**Doctor of Medicine and Master of Population Health Sciences: MD/MPHS**

For more information about the Population Health Sciences program (http://mphs.wustl.edu/Academics/MD-MPHS), including tuition and fees, please visit the Master of Population Health Sciences website.

For information about tuition for the Medicine program, please visit the MD section (p. 332) of this page.

**Doctor of Medicine and Master of Public Health: MD/MPH**

For more information about the MD/MPH program (http://bulletin.wustl.edu/brownschool/financial), including tuition and fees, please visit the Brown School Bulletin.

For information about tuition for the Medicine program, please visit the MD section (p. 332) of this page.

**Doctor of Medicine and Master of Arts: MD/MA**

Fellowship stipends and other support are available through the Howard Hughes Medical Institute (basic science research), National Institute of Diabetes and Digestive and Kidney Diseases (GI, hepatology, endocrinology, nutrition, nephrology and hematology research), and the Clinical Research Training Center – Predoctoral Program (clinical research). Students unable to qualify for one of these awards may also apply for institutional funding. Funding amounts may vary, and some of these sources have deadlines in early January. Please contact the MD/MA program administrator at 314-362-7190 or visit the MD/MA webpage (http://mamd.wustl.edu) for details.

For information about tuition for the Medicine program, please visit the MD section (p. 332) of this page.

**People of the School of Medicine**

**Faculty & Staff**

**Staff**

For staff contact information, please visit the Washington University online directory (http://wustl.edu/directory).

Note: For access to online directories for Washington University, Washington University Physicians and BJC HealthCare, please visit the Washington University School of Medicine’s online directories (http://medicine.wustl.edu/directory).

**Faculty**

The All Faculty List of the online Bulletin is drawn from the Washington University Human Resources Management System (HRMS) and provides academic appointments and education details. To update or change a faculty member’s Bulletin listing, please contact the HRMS representative for the department, division or program.

**Students**

For student contact information, please visit the Washington University online directory (http://wustl.edu/directory).

**Faculty Committees**

**Committees and Committee Members**

This section of the Bulletin presents faculty committees, which govern various aspects of School of Medicine activities related to research, patient care and education. Their purpose is to help ensure that the school’s activities are carried out in compliance with university policies as well as state and federal law.

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**Voting Members**

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*Chairman, Executive Faculty*

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Azad Bonni
Craig A. Buchman
John A. Cooper
Ralph G. Dacey Jr.
Timothy J. Eberlein
Charles S. Eby (*interim*)
Alex S. Evers
Victoria J. Fraser
Dennis E. Hallahan
David M. Holtzman
George A. Macones
Todd P. Margolis
Jeffrey D. Milbrandt
Regis J. O'Keefe
David W. Piston
Lilianna Solnica-Krezel
Richard L. Wahl
Charles F. Zorumski

Richard L. Wahl
*Chair, Executive Committee of the Faculty Council*

Paul Bridgman
*Chair, Executive Committee of the Faculty Council*
Dayna Early
Vice Chair, Executive Committee of the Faculty Council
Jennifer A. Dunn
Voluntary Faculty Representative

Attending, Ex Officio
Mark S. Wrighton
Chancellor
Holden Thorp
Provost

Faculty Council
The Faculty Council consists of all full-time members of the faculty with the rank of professor, associate professor, assistant professor and those instructors who have been on the faculty for at least three years.

Executive Committee of the Faculty Council (ECFC)
Paul Bridgman
Chair
Dayna Early
Vice Chair
For a full list of committee members, please visit the Executive Committee of the Faculty Council website (https://ecfc.wustl.edu).

Institutional Animal Care and Use Committee
Brian Finck
Chair
Please visit the Institutional Animal Care and Use Committee (http://research.wustl.edu/Offices_Committees/ASC/Pages/default.aspx) website for information.

Committee on the Academic and Professional Evaluation of Students
Linda J. Pike, PhD
Chair
Kari Allen, MD
Paul Bridgman, PhD
Steven Cheng, MD
Erika C. Crouch, MD, PhD
Dehra Harris, MD
Simon Haroutounian, MD
Henry Huang, PhD
Nigar Kirmani, MD
Robert W. Mercer, PhD
Casey Pruitt, MD
Deborah Rubin, MD

Ex Officio
Eva Aagaard, MD
Tom De Fer, MD
Michael Donlan, PhD
Lisa M. Moscoso, MD, PhD
Valerie Ratts, MD
Will R. Ross, MD, MPH
Karen Winters, MD

Committee on Admissions
Valerie S. Ratts
Chair
For a full list of committee members, please visit the Medical Student Admissions website (https://mdadmissions.wustl.edu/how-to-apply/selection-process/admissions-committee-bios).

Committee on Fellowships and Awards
Jeffrey Miner
Chair
Sharon Cresci
Fanxin Long

Committee on Student Financial Aid
Bridget O'Neal
Chair
Valerie S. Ratts

Conflicts of Interest Review Committee
Robert Gropler, MD
Chair
For a full list of committee members, please visit the Office of the Vice Chancellor for Research website (http://research.wustl.edu/ComplianceAreas/COI/Committees/Pages/default.aspx).

Human Research Protection Office (HRPO)
Washington University Institutional Review Boards (IRB)
Jonathan Green, MD, MBA
Associate Dean for Human Studies; Executive Chair of the IRB, Washington University School of Medicine

Human Research Protection Office (HRPO)
Martha Jones, MA, CIP
Executive Director
For more information, please visit the Human Research Protection Office website (https://hrpo.wustl.edu).
Human Research Quality Assurance/Quality Improvement Committee
Edward M. Geltman
Chair
For a full list of committee members, please visit the Human Research Quality Assurance Program webpage (http://research.wustl.edu/Offices_Committees/hrqaqi/monitoring/Pages/committee.aspx).

Institutional Biological and Chemical Safety Committee
Michael Caparon, PhD
Co-Chair
Henry Huang, PhD
Co-Chair
Neil Anderson, MD
Michael Diamond, MD, PhD
Scott Handley, PhD
Barbara Joy Snider, MD, PhD

Ex officio
Bruce Backus, MS, PE
Kenneth Boschert, DVM
Susan Cook, PhD, CBSP
Brian Dieckgraefe, MD, PhD

Alternates
Chad B. Faulkner, DVM, PhD
Teresa Simmons

Public Members
Mary Burke
Robert Koehler
Paul Mercurio

MD/MA Program Committee
Deborah C. Rubin
Chair
For a full list of committee members, please visit the Division of Biology and Biomedical Sciences website (http://dbbs.wustl.edu/divprograms/mamd/Pages/MAMDCcommittee.aspx).

Medical School Faculty Rights Committee
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Dayna S. Early, MD (2018)
Co-Chair
Mauricio Lisker-Melman, MD (2019-R)
Lawrence B. Salkoff, PhD (2019-R)

Carla J. Weinheimer, MS (2019-R)
Ann M. Gronowski, PhD (2020-A)
Katherine M. Jones, MD (2020-A)
Steven J. Mennerick, PhD (2020-A)

Medical Scientist Training Program Committee
Wayne M. Yokoyama
Program Director
Audrey R. Odom John
Associate Director
Daniel S. Ory
Associate Director
For a full list of committee members, please visit the Medical Scientist Training Program website (http://mstp.wustl.edu/about%m20mstp/Pages/Administration.aspx).

Radiation Safety Committee
Barry A. Siegel, MD
Chair
Buck E. Rogers, PhD
Vice Chair
Maxwell Amurao, PhD
Radiation Safety Officer and Executive Secretary
For a full list of committee members, please visit the Department of Radiation Safety website (https://radsafety.wustl.edu/An1Pages/An1-Committees.htm).

Radioactive Drug Research Committee
Barry A. Siegel, MD
Chair
Delphine Chen, MD
Vice Chair
For a full list of committee members, please visit the Department of Radiation Safety website (https://radsafety.wustl.edu/An1Pages/An1-Committees.htm).

Alvin J. Siteman Cancer Center Protocol Review and Monitoring Committee
Co-Chairs
Perry Grigsby
Brad Kahl
Joel Picus
Julie Margenthaler
Behavioral Science Subcommittee
Bettina Drake
Chair

For a full list of committee members, please visit the Siteman Cancer Center website (https://siteman.wustl.edu/about/committees).

Alvin J. Siteman Cancer Center Quality Assurance and Safety Monitoring Committees
Nancy L. Bartlett
Chair

For a full list of committee members, please visit the Siteman Cancer Center website (https://siteman.wustl.edu/about/committees).

Leadership

Board of Trustees
Please visit the Board of Trustees website for the list of current trustees (http://boardoftrustees.wustl.edu/Pages/current-trustees.aspx) and other information concerning the board.

Emeritus Trustees
Please visit the Board of Trustees website for the list of emeritus trustees (http://boardoftrustees.wustl.edu/Pages/emeritus-trustees.aspx) and other information concerning the board.

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Assistant Dean for Academic Affairs and Registrar

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Assistant Dean and Director of Financial Aid

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Assistant Dean for Student Diversity and Engagement

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Assistant Dean of Special Programs

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Assistant Dean for Clinical Research and Administrative Director of Center for Clinical Studies

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Director of the Student and Occupational Health Services — Medical Campus

Stephanie Breisford
Assistant Registrar

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Gautam Adusumilli  
Representative to the Graduate Professional Council (GPC Rep)  
Neel Raval  

Policies of the School of Medicine

This section presents information about general policies of the School of Medicine and specific policies related to individual programs. Refer to the MD (p. 356), Health Professions (p. 356), or Joint (p. 356) sections of this page for more information about individual policies for the programs listed below:

- Applied Health Behavior Research  
- Audiology and Communication Sciences  
- Biology and Biomedical Sciences  
- Biomedical Engineering  
- Biostatistics  
- Clinical Investigation  
- Doctor of Philosophy  
- Genetic Epidemiology  
- MD Program  
- Occupational Therapy  
- Physical Therapy  
- Population Health Sciences  
- Public Health  

University

Washington University Policies

The information provided here is intended to assist university students, faculty and staff in locating university policies related to the educational mission. These policies, procedures and guidelines exist to assist Washington University students, faculty and administrators in doing the business of Washington University in St. Louis in ways that are effective, consistent and compliant and to provide a safe, effective and supportive environment in which to learn, teach and work.

Some universitywide policies are available on the University Policies (p. 8) page of this Bulletin. A more complete list is available on the Washington University website (https://wustl.edu/about/compliance-policies).
School of Medicine

Washington University School of Medicine Policies

Washington University School of Medicine is committed to providing a safe, professional and supportive environment in which to learn. The policies organized here pertain to professionalism, appropriate conduct and student rights. They exist to protect students and employees as they conduct their daily responsibilities.

- Bloodborne Pathogens Policy (p. )
- Duty Hour Policy (p. 379)
- Liability Insurance (p. 385)
- Needle Stick/Human Blood and Body Fluid Exposure Policy (p. 379)
- Pharmaceutical and Medical Device Industry Policy (p. 379)
- Professionalism & Conduct (p. 378)
- Student Records and Transcripts (https://registrar.med.wustl.edu)
- Students with Disabilities Policy (p. 380)
- Tobacco-Free Policy (https://wustl.edu/about/compliance-policies/university-space-facilities/tobacco-free-policy)

MD

The information provided here is intended to assist university students, faculty and staff in locating university policies related to the educational mission. These policies, procedures and guidelines exist to assist Washington University students, faculty and administrators in doing the business of Washington University in St. Louis in ways that are effective, consistent and compliant for purposes of providing a safe, effective and supportive environment in which to learn, teach and work.

Please visit the appropriate sections of this Bulletin for more information.

MD Program Policies

- Absences & Leaves (p. 357)
- Academic Assistance (p. 360)
- CAPES - Assessing Academic Achievement & Professionalism (p. 360)
- Evaluation and Grades (p. 370)
- Professionalism (p. 372)
- Other Policies (p. 378)

Health Professions

For information regarding policies of the following degrees and programs, please visit these sites:

- Applied Health Behavior Research (https://crtc.wustl.edu/programs/degrees/ahbr)
- Audiology and Communication Sciences (https://pacs.wustl.edu/programs)
- Biology and Biomedical Sciences (http://dbbs.wustl.edu/cursosstudents/DBBSSStudentPolicies/Pages/DBBSSStudentPolicies.aspx)
- Biomedical Engineering (https://bme.wustl.edu/graduate/phd/Pages/default.aspx)
- Biostatistics (https://biostatistics.wustl.edu)
- Clinical Investigation (https://crtc.wustl.edu/programs/degrees/msci)
- Doctor of Philosophy (http://graduateschool.wustl.edu/policies-procedures)
- Genetic Epidemiology (http://bulletin.wustl.edu/medicine/departments/genetic-epidemiology)
- Occupational Therapy (https://www.ot.wustl.edu/about/resources-118)
- Physical Therapy (https://pt.wustl.edu/student-resources)
- Population Health Sciences (http://mphs.wustl.edu)
- Public Health (http://bulletin.wustl.edu/brownschool/policies)

Joint

The School of Medicine hosts a number of joint programs including the following:

- Doctor of Medicine (p. 356) (five-year program)
- Doctor of Medicine and Master of Arts
- Doctor of Medicine and Master of Science in Clinical Investigation (https://crtc.wustl.edu/courses/class-list/academic-policies)
- Doctor of Medicine and Master of Population Health Sciences (http://mphs.wustl.edu)
- Doctor of Medicine and Master of Public Health (http://bulletin.wustl.edu/brownschool/policies)
- Doctor of Medicine and Doctor of Philosophy (MSTP (http://dbbs.wustl.edu/cursosstudents/DBBSSStudentPolicies/Pages/DBBSSStudentPolicies.aspx))

For policies relating to any joint program, please visit the MD section (p. 356) of this page or individual websites for the respective program areas.
MD: Absences & Leaves

Leave of Absence (LOA) Policy

Return of students from involuntary leave of absence requires clearance of both the director of Student Health Services and the associate dean for student affairs.

I. Voluntary LOA: A student may request a leave of absence for academic or personal reasons by submitting a statement in writing to the Office of Student Affairs. Such a statement should include an indication of the beginning and anticipated ending dates and a brief statement of the reason (academic or personal). Requests for leaves of absence must be approved by the associate dean for student affairs. Leaves of absence shall be granted for no more than one year, but in unusual cases may be renewed by the Committee on the Academic and Professional Evaluation of Students (CAPES) for additional time after discussion with the associate dean for student affairs. Students requiring a personal leave of absence for medical reasons must submit a supporting letter from the director of Student Health Services. A written statement of medical clearance will be required before the student may return from such a leave.

II. Involuntary LOA: If there is a reasonable basis for believing that the continued presence of the student on campus or in clinical rotations poses a substantial threat to the student, to patients, or to the rights of others to engage in their normal university functions and activities, the following procedures apply:

A. The chancellor or his designate may impose an involuntary leave of absence when there is evidence that a student has committed an offense under these rules or the University’s Judicial Code, and when there is evidence that the continued presence of the student on the university campus or as a participant in a clinical rotation poses a substantial threat to themselves, to patients, or to the rights of others to continue their normal university function and activities.

B. Imposition of the involuntary leave of absence may result in denial of access to the campus, prohibition of class attendance and/or prohibition of participation in clinical rotations.

C. If an involuntary leave of absence is imposed, the suspending authority shall prepare a written notice of the imposition and shall have the notice mailed certified or personally presented to the student. The written notice shall include a brief statement of the reasons therefore and a brief statement of the procedures provided for resolving cases of involuntary leave of absence under these rules.

D. The student shall be given an opportunity to appear personally before the suspending authority within five (5) business days from the date of service of the notice of imposition of the involuntary leave of absence. If the student asks to appear personally before the suspending authority, only the following issues shall be considered:

1. Whether the suspending authority’s information concerning the student’s conduct is reliable; and

2. Whether under all the circumstances, there is a reasonable basis for believing that the continued presence of the student on campus or in clinical rotations poses a substantial threat to the student, to patients, or to the rights of others to engage in their normal university functions and activities.

E. Within one week of the date of imposition of the involuntary leave of absence, the suspending authority shall either file a statement of charges against the student with the University Judicial Board, and shall have the statement or charges served, by mail or personal service, upon the student and the dean of the school or college or director of the program in which the student is enrolled, or initiate proceedings under these rules to convene a Disciplinary Committee.

F. A temporary suspension shall end:

1. when rescinded by the suspending authority, or

2. upon the failure of the suspending authority to promptly file a statement of charges with the University Judicial Board or a Disciplinary Committee, or

3. when the case is heard and decided by the University Judicial Board or the Disciplinary Committee.

Return of students from involuntary leave of absence requires clearance of both the director of Student Health Services and the associate dean for student affairs.

III. LOA Impact on Financial Aid: Students receiving financial aid should be advised that at the end of sixty (60) days or more leave of absence, the grace period for loan repayment during a leave of absence may be exhausted. In such cases there will be an obligation for the student to start payments. According to the federal rules under which loans are made, the use of a grace period during a leave of absence will generally mean that the schedule for loan repayment may be changed. Students who are receiving financial assistance should consult with the Financial Aid Office to determine the implications of a leave of absence for their financial aid.

IV. LOA Impact on Tuition: A student returning from a leave of absence of one year duration or less will maintain the same tuition rate. Students returning after more than one year leave of absence will assume the tuition rate of the class they are rejoining. Appeals of this policy should be submitted in writing to the registrar. Please refer to the Financial Information (p. 332) section on Registration, Payments, and Withdrawal & Refunds Policy and the effect...
Absence Policy for MD Students on Clinical Clerkships

The profession of medicine requires the utmost commitment of time and energy to patient care and research activities. While the development of this commitment begins in the preclinical years, it is further practiced and developed during the clinical clerkship year.

The clinical clerkship year at Washington University School of Medicine (WUSM) comprises 48 weeks of required core clinical experiences. All students on the clinical clerkships have a scheduled two-week winter recess break, a three-day spring break and a two-week break between the end of the third-year clinical clerkships and the start of fourth-year elective rotations (plus free time prior to graduation for MSTP students). During every clinical clerkship, each student is expected to participate fully in all activities of the clerkship up until the designated end time of the clerkship or the start time of a holiday break. This regularly requires participation beyond formal weekday hours to include evening and nighttime call and clinical responsibilities on weekends.

If a student is ill or has a personal emergency, they should notify the clerkship course director’s office and the resident supervising their clinical team the morning of the absence. If the absence extends beyond two consecutive days, the student should also notify the Office of Student Affairs.

It is recognized that a student may, on a very occasional basis, desire to be excused from clinical activities for professional or significant personal events. For the third year, the Clinical Curriculum Committee agreed upon the following guidelines regarding the maximum number of days of excused absences (including illness) from clerkships: Please refer to the chart below (p. 359) (Allowable Absences for Third- and Fourth-Year Students) for specifics. Students must recognize that clerkship teaching, learning and evaluation are dependent on the student’s presence and participation in every aspect of the clerkship. While students will not be graded down only because of an excused absence, time spent away from the clerkship may decrease learning and impede effective evaluation; students are encouraged to make up missed work on rotations in which this can result in meaningful learning and should discuss this option with the clerkship director. It is the responsibility of the student to directly contact the clinical clerkship course director in writing (by letter or email) to obtain permission for any planned absences well in advance.

At the discretion of the course director, any student who misses portions of the clinical clerkship experiences due to planned and/or unplanned absences that exceed the maximum time may be required to utilize winter recess, spring break or free time at the end of the third-year clinical clerkships to complete the 48 weeks of mandatory clinical clerkships.

Absence Policy for MSTP Students on Clinical Clerkships

MSTP students are allowed to miss up to three days of any four-week clerkship, five days of any six-week clerkship (not to exceed two days per two-week rotation) and up to nine days of any 12-week clerkship for any reason including interviews. This is a substantially more flexible policy than we have toward the MD students, in which we limit the number of days off to three in a four-week or six-week period, and five in a 12-week period. We recognize that for some MSTP students entering competitive specialties with limited interview dates it may be necessary for them to plan far enough ahead in their training to schedule a month for either a very light elective or a free month to allow appropriate flexibility for interviews. The committee also agreed that the MSTP students should be encouraged to:

1. Talk with Dr. Kathryn Diemer early for assistance in residency planning;
2. Seriously consider coming out of lab a month earlier to allow flexibility for interviewing; and
3. Delay graduation by one year to increase flexibility.

We believe this policy strikes an appropriate balance between increased flexibility for the MSTP students and assuring a meaningful educational experience on the core clerkships.

Absence Policy for MD Students in the Fourth Year

The profession of medicine requires the utmost commitment of time and energy to patient care and research activities. While the development of this commitment begins in the preclinical years, it is further practiced and developed during the clinical years.

The fourth year at Washington University School of Medicine encompasses a 44-week time block and requires students take a minimum of 36 weeks of credit (32 weeks of electives plus the required four-week Capstone experience). All students have a scheduled two-week winter recess and a three-day spring break during the academic year. During each elective, each student is expected to participate fully in all activities of the elective up until the designated end time of the elective or the start time of a holiday break. This could require participation
beyond formal weekday hours to include evening and nighttime call and clinical responsibilities on weekends.

If a student is ill or has a personal emergency, they should notify the elective course director's office and the resident supervising their clinical team the morning of the absence. If the absence extends beyond two consecutive days, the student should also notify the Office of Student Affairs.

It is recognized that a student may, on a very occasional basis, desire to be excused from clinical activities for professional absences or significant personal events. For the fourth year, the Clinical Curriculum Committee agreed upon the following guidelines regarding the maximum number of days of excused absences (including illness) from electives.

The elective year generally follows the clinical clerkship absence policy. During interview season, students will be allowed to miss up to five days in a four-week rotation; any additional days off would require approval by the associate dean for medical student education and the elective course director. Please refer to the chart below (p. 359) (Allowable Absences for Third- and Fourth-Year Students) for specifics. Students must recognize that elective teaching, learning and evaluation are dependent on the student's presence and participation in every aspect of the elective. While students will not be graded down because of an excused absence alone, time spent away from the elective may decrease learning and impede effective evaluation. Because of these meaningful learning experiences, students are encouraged to make up missed work on rotations and should discuss this option with the course director. It is the responsibility of the student to directly contact the course director in writing (by letter or email) to obtain permission for any planned absences well in advance of the planned absence.

At the discretion of the course director, any student who misses portions of the elective experience due to planned and/or unplanned absences that exceed the maximum time may be required to utilize winter recess, spring break or free time to complete the elective.

The required fourth-year Capstone course has a separate absence policy. Please refer to the course syllabus for details.

### Absence Policy - Clinical Rotations

#### Allowable Absences for Third- and Fourth-Year Students

<table>
<thead>
<tr>
<th>2-week elective</th>
<th>4-week elective</th>
<th>4-week clerkship</th>
<th>6-week clerkship</th>
<th>12-week clerkship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>3 days</td>
<td>3 days</td>
<td>3 days (1 day max per 2-week rotation)</td>
<td>5 days</td>
</tr>
</tbody>
</table>

#### Maximum Allowable Absences for Special Cases: MSTP Students and Fourth-Year Interviewing

<table>
<thead>
<tr>
<th>2-week elective</th>
<th>4-week elective</th>
<th>6-week clerkship</th>
<th>12-week clerkship</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A*</td>
<td>5 days</td>
<td>5 days (2 days max per 2-week rotation)</td>
<td></td>
</tr>
<tr>
<td>3 days</td>
<td>3 days</td>
<td>9 days</td>
<td></td>
</tr>
</tbody>
</table>

* Students not advised to enroll during interview season

### Policy on Student Status and Benefits During Research Years or Leave of Absence

#### MD/PhD

Student status is maintained while in the research phase of the MD/PhD programs. During research years, students are registered in either the graduate school or under the program granting the master's degree. Both student health and disability coverage are provided by the Division of Biology and Biomedical Sciences.

#### Master's/MD

Student status is maintained while in the research phase of the MD/MA, MSCI, and MPHS programs. Both student health and disability coverage are provided.

#### Five-Year MD Program

#### Research Year at WUSM

Student status is maintained throughout the approved research year. In exceptional circumstances, a second research year may be permitted. The student may receive a stipend, but may not be considered an employee of the university. Students are registered in the School of Medicine. Both disability and student health coverage are required and are payable by the student. Outside funding often covers such fees.

#### Approved Research Year Away

Student status is maintained throughout the approved research year. Students are registered in the School of Medicine. Both disability and student health coverage are optional with proof of like coverage. The cost of either elected coverage is payable by the student. Outside funding often allows these costs.

#### Leave of Absence

#### Leave of Absence Year at WUSM

Student status is not maintained during the leave of absence though benefits of student health coverage and disability insurance are optional throughout an approved leave. Costs are payable by the MD program students. MD/MA and MD/PhD
students may request support for these costs from the Division of Biology and Biomedical Sciences if funds are available. The Office of Financial Aid should be consulted for information regarding loan repayment and grace periods when on a leave of absence.

**Leave of Absence Year Away**

Student status is not maintained during the leave of absence away from Washington University School of Medicine. Both disability and student health coverage are optional with proof of like coverage. The cost of either elected coverage is payable by the student.

**MD: Academic Assistance**

**Tutorial Assistance Program**

Students experiencing difficulty in any course may request tutorial assistance. Such requests should initially be directed toward the course directors and thereafter to the associate dean for student affairs. Students who are repeating courses will be offered the opportunity for tutorial assistance. The Committee on the Academic and Professional Evaluation of Students (CAPES) may also require it. There is no charge to the student for tutorial assistance.

**MD: CAPES - Assessing Academic Achievement & Professionalism**

The policies and procedures listed below are adopted by the faculty and administration of the School of Medicine concerning review of student academic performance and professional integrity.

Overall academic and professional evaluation of students at the Washington University School of Medicine (WUSM) will be made by the Committee on the Academic and Professional Evaluation of Students (CAPES). The Committee on the Academic and Professional Evaluation of Students operates under the Rules Governing Review of Student Performance. Please visit the CAPES (p. 360) section below for more information.

**Rules Governing Review of Student Performance**

**Preface**

This document describes procedures adopted by the faculty and administration of the School of Medicine concerning review of student academic performance and professional integrity. Students are encouraged to read this information for a thorough understanding of the contents. Any questions arising from the procedures laid out herein should be directed to the Office of Student Affairs or the Office of the Registrar.

Major revisions to this document will be approved by the Academic Affairs Committee.

Questions about this document may be directed to:

- Lisa Moscoso, MD, PhD
  - Associate Dean for Student Affairs
- Michael Donlan, PhD
  - Assistant Dean for Academic Affairs, Registrar

*Updated 1/25/2018*

**CAPES - Committee on the Academic and Professional Evaluation of Students**

**Purpose and Jurisdiction**

Students at the Washington University School of Medicine must demonstrate the ability to synthesize and apply knowledge and the capability of becoming a safe and effective physician. In addition, they must demonstrate the principles of professionalism including sound judgment, honesty, integrity, responsibility, a sensitivity and compassion for individual needs, and compliance with applicable laws, policies and regulations.

Serious or repeated academic failures or breaches of these principles in professionalism will be referred to the Committee on the Academic and Professional Evaluation of Students (CAPES) for review. Throughout the enrollment of a student, it is within the jurisdiction of the CAPES to terminate the enrollment of a student who has demonstrated serious academic failure or a breach of professionalism. The deliberations of the CAPES are generally positive in approach and are committed to the ultimate aim of assisting students to successfully complete the courses of study required by the school. The principle that careful selection of students will minimize attrition from the school is strongly endorsed by the CAPES.

The text contained herein outlines rules governing the review of student performance. For further information, refer to the Guiding Principles of Professionalism (p. 372) in the Policies section of this *Bulletin*.

**Responsibility of the Committee**

The ultimate responsibility of the Committee on the Academic and Professional Evaluation of Students (CAPES) is to assess whether each student meets the academic and ethical standards necessary to enter the profession of medicine. To accomplish this mission, CAPES undertakes the following tasks:

- **Student Advancement:** The CAPES annually recommends promotion of students who have successfully completed all requirements of the current academic year to the studies of the subsequent year.
- **Degree Recommendations:** The CAPES recommends to the Executive Faculty those students who have successfully completed all prescribed requirements of the school and are qualified to receive the Doctor of Medicine degree.
• Academic Remediation Reviews: When a student is in need of academic support services, the CAPES will recommend student status and remediation measures, which may include entry of a student into an Individualized Study Program.

• Disciplinary Action: The CAPES will review cases requiring disciplinary action due to unprofessional behavior or a breach of integrity.

Students for Whom the Rules Apply

• All students engaged in preclinical and clinical education requirements for the MD degree

• Students in all years of the Five-Year MD program

• All students in joint and dual degree programs including but not limited to MD/MPH, MD/MSCI, MA/MD and MD/PhD (MSTP) programs taking preclinical or clinical portions of their MD education

Joint or Dual Degree Students:
When a student enrolled in a joint or dual degree program is found in violation of the other program's academic or professional integrity policy or is found to have committed any disciplinary violations, including violations of the University Student Conduct Code, such matters may be brought to the attention of the CAPES for review and further action. Notwithstanding decisions made by the other schools or programs, the CAPES reserves the right to take further action when a student is found in violation of such policies. If a student enrolled in a joint or dual degree program is not meeting academic performance expectations of the other program or school such that the student's status in that program or school may be impacted, the CAPES reserves the right to determine whether any action should be taken with respect to the student's status at WUSM.

CAPES Membership

• Appointed and ex officio membership: Twelve voting faculty members of the CAPES are appointed for a four-year term by the dean of the School of Medicine following nomination by the department heads and/or associate deans. Faculty members may be reappointed to serve on the CAPES. Membership will include both clinical and preclinical department faculty. In addition, the CAPES membership will include, in ex officio capacity, the registrar (nonvoting) and the associate dean for student affairs (nonvoting). The senior associate dean, the associate deans for medical education, admissions and diversity programs, and the director of Student Health Services may attend the CAPES meetings as nonvoting participants.

• Chair: A faculty member will be appointed by the dean from within the CAPES committee to serve as chair. The term of the chair will be four years and may be reappointed.

• Guests:

1. When the committee is addressing issues related to academic performance, a course director who is not a member of the CAPES but who submitted a Fail/Incomplete grade for a student who is to be discussed at the meeting will be present at the meeting to provide information regarding the student's performance. A course director may send a designated representative or may submit information in writing. In the event that a course director or designated representative is not present or sufficient information has not been forwarded, final action for the student will be deferred until adequate information is available.

2. Similarly, when the committee is addressing issues of professionalism, the individual filing the professionalism concern form will be present for the meeting or in some instances may be allowed to submit information in writing.

3. Any faculty, administrator or staff may be invited at the discretion of the chair.

Meeting Frequency and Quorum

The CAPES meetings must occur in a timely manner after final examinations or re-examinations, as soon as practical after grades are submitted to the registrar. Generally grades will be submitted to the registrar within 10 days of completion of an examination. A meeting of the CAPES may also be convened at any time such that timely review of a matter is deemed necessary.

Seven voting members must be present to consider academic or disciplinary actions.

Grades

Grade Scales: Courses in the first- and second-year curriculum are evaluated on a pass/fail basis. Third- and fourth-year courses use a graded scale. Specific grades for each grade level are detailed in the Evaluation and Grades (p. 370) section of this Bulletin.

Grade Submission

Final grades will be submitted online within 10 business days of the final examination or final class meeting for the first two years. For the third and fourth years, grades are due within four weeks of the receipt of standardized examination scores or the last day of the rotation if no examination was given.

Grade Appeals

Students may appeal a grade with the course director by filing a grade appeal request form (https://registrar.med.wustl.edu/resources/#Forms). Grade appeals must be filed within 10 business days after the grade has been posted.

If reasons beyond the student's control delay the appeal past the July 15 deadline, the registrar must be notified so that the final transcripts, grade distributions and class rankings for the
Individual Study Program

Students who have difficulty handling the normal academic course load will enter an Individual Study Program (ISP) requiring five years to complete rather than four years. The intent of an ISP is to optimize the prospect that the student will successfully complete the curriculum. An ISP may be requested by the student or recommended or required by the committee.

1. ISP: Scope and Sequence
   The content and sequence of courses will be determined by the associate dean for student affairs with the input from the student, relevant course directors and the CAPES. The plan for execution of an ISP will be recorded in the student's file in the Registrar's Office and a copy will be provided to the student.

2. ISP: Examination Schedules
   Unless extenuating circumstances exist, ISP students are required to take the examinations for a particular course in their usual temporal relationship to the course work. Requests for exceptions should be recorded in the student's file in the Office of the Associate Dean for Student Affairs. Approval of such requests is considered according to the Washington University School of Medicine guidelines for exam administration (p. 370) found in the Policies section of this Bulletin.

3. ISP: Single Fail or Incomplete Grade
   In the event that a single Fail or Incomplete grade is recorded for a student after entry into an ISP, the CAPES will again review the student's record. Consequences may include remediation, repeat of the course or dismissal from the school.

4. ISP: Grounds for Dismissal
   Students on an ISP who have not successfully completed and received a grade of Pass or above in all required courses of the first- and second-year curricula by the start of the second six-week period in the year of the clinical clerkship may be dismissed from the school.

Accommodations

It is the responsibility of students to alert the CAPES regarding personal concerns, health problems, or any other factors that may be adversely affecting their academic performance, and to bring such matters to the attention of the director of Student Health Services or the associate dean for student affairs for possible accommodations (p. 380).

Indications for Review of Academic Performance

"Indications for Review of Academic Performance" refers to the guidelines used at the school in the event a student either fails exams or a course or fails to complete a course in the requisite time. In general, the school guidelines for the "Indications for Review of Academic Performance" are as follows:

Tutoring

Students experiencing difficulty in any course may request tutorial assistance. Such requests should be initially directed toward the course director and thereafter to the associate dean for student affairs. Students who are repeating courses will be offered tutorial assistance, and the CAPES may also require it. There is no charge to the student for tutorial assistance.

Academic Support and Accommodations

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School of Medicine (07/06/18)
Exam Failure
Exam failures can warrant meeting with the associate dean for student affairs (ADSA) and/or lead to referral to the CAPES. Consult the conditions below for further details relevant to each student-year level.

Single Course Failure – Meeting with the ADSA
In the event of any initial failure of a course the student will meet with the associate dean for student affairs (ADSA) to formulate a remediation plan in coordination with the course director.

Multiple Course Failures – Referral to the CAPES
Two or more courses in one year
• If either a failing or incomplete grade in two or more courses occurs in a single year, the student’s academic performance will be referred to the CAPES for review and determination of a course of action.

Three courses (cumulatively across multiple years)
• If either a failing or incomplete grade in three courses occurs across multiple years, the student’s academic performance will be referred to the CAPES for review and determination of a course of action.

Individualized Study Program (ISP)
Refer to the ISP section (p. 362) within this CAPES policy for full details on guidelines pertaining to the review of students engaged in an ISP.

Time Constraints
Three-year rule:
No student may take more than three years to complete the course work required for the first two years of study. Time periods included in an approved leave of absence are not counted in these three years.

Two-year rule:
In the absence of extenuating circumstances or an approved leave of absence, no student may take more than two academic years to complete the course work required in any individual curricular year. Time periods included in an approved leave of absence are not counted in these two years.

Maximum Attempts at Passing a Course
Students have a maximum number of three attempts to pass any individual course during enrollment in the school.

Joint or Dual Degree Program Students
If a medical student enrolled in a joint or dual degree program is not making satisfactory academic progress or is not meeting academic performance expectations of the other program or school such that the student’s status in that school or program may be impacted, the CAPES reserves the right to determine whether any action should be taken with respect to the student’s status within the School of Medicine. Further details pertaining to joint or dual degree program students are listed in the section describing students for whom the rules governing student performance apply.

Note: Specific conditions warranting review of academic performance are detailed below for each student-year level. Conditions for review of student performance due to professionalism issues are found in the policy section regarding professionalism.

First-Year Students – Indications for Review of Academic Performance
All first-year courses must be completed before the start of the second-year curriculum. Failure to meet this requirement typically means one of the following conditions has occurred:

Failure of a Single Exam (for First-Year Medical Students)
Failure of a single exam is not an immediate indication for review of academic performance by the CAPES. However, failure of a single exam that comprises a significant portion of the final grade (typically 20 percent or more) must be reported by the course director to the associate dean for student affairs (ADSA). The course director may allow one attempt at remediation of the exam at a time the course director prescribes. The scheduling of the remedial exam will be agreed upon by the course director and the student, but it should generally not extend beyond 30 days after the end of the course. Days of recess for winter and spring break will not be counted in the 30 days. A grade of “E” (i.e., temporary grade signifying the pending make-up of a failed exam) will be submitted by the course director if the remedial exam is not accomplished within the course dates. This grade will stand on the academic record until it is replaced with a valid final grade of Pass or Fail. Grades of “E” that are not resolved within 30 days will be replaced with a grade of Fail (F). In rare circumstances, the ADSA may approve an extension of this deadline. If the student successfully remediates the exam, and has otherwise passed the course, a Pass (P) will be recorded by the registrar. A student may remediate only one examination in any course.

Failure of Two or More Exams
The ADSA may request that the CAPES reviews performance of a student who has failed two or more examinations. In such cases, the CAPES will recommend a course of action.

Failure of a Course
If a student receives a Fail/Incomplete grade in a single first-year course, the ADSA will meet with the student to formulate
a remediation plan in coordination with the course director. The remediation plan may include the following options:

- Take a re-examination as approved by the course director.
- Enroll in and successfully complete, at the level designated by the course director, a summer course at a different institution, such a course being completed and passed by the beginning of the second year.

If a student fails to successfully complete an approved summer course or fails the re-examination taken to remediate a failed course, they will be referred to the CAPES for review and recommended course of action. The CAPES may require the student to enter an ISP or be dismissed from the school. The CAPES may permit a second re-examination. If the second re-examination is failed, the student will be dismissed from the school.

### Failure of Two or More Courses

A student for whom the registrar has recorded a Fail/Incomplete grade in two or more courses during the first year will be referred to the CAPES for determination of a course of action. The committee may decide to permit the student to take re-examinations, if a re-examination has not already been taken. Such re-examinations will generally occur during the inter-academic year break. If a re-examination is failed the student may be required to enter an ISP or be dismissed from the school.

### Second-Year Students – Indications for Review of Academic Performance

Students in their second year will be referred to either the associate dean for student affairs (ADSA) or the CAPES for review and resolution of a recommended course of action when any one of the following conditions has occurred:

#### Conditions for Meeting with the ADSA for Second-Year Students

Failure of a single interval exam within a year-long course or failure of one block-long course (for Second-Year Students):

- An initial failure of a single exam does not signal an automatic referral to the CAPES.
- A second-year student who receives a final grade of Fail or Incomplete in a single interval exam in a year-long course will first meet with the ADSA.
- A second-year student receiving a failing/incomplete grade in one block-long course must first meet with the associate dean for student affairs (ADSA).

#### Re-examination Scheduling and Resolution

- Re-examinations for year-long courses will generally be offered during the inter-academic year break, prior to entry into the third year.

- Re-examinations for individual block-long courses will generally be offered at a time determined by the course director and the ADSA. All such re-exams must be offered to students and completed prior to the start of the next academic year.
- Students failing the re-examination of a single block-long course (or failing a re-examination of a single year-long course) will be referred to the CAPES to determine a course of action. If the examination is failed for a third time, enrollment will be terminated.

### Deferral of Clinical Rotation Start Date

The CAPES may allow the student to defer beginning the clinical rotations so that re-examinations may be taken up to six weeks after the beginning of the usual cycle of clinical clerkships. Such extra time used for study and preparation will ordinarily mean that the student will not have the usual unscheduled time in the elective year.

**Note:** No student is permitted to begin Clinical Rotations of the Third Year until all first- and second-year courses have been successfully completed.

### If Re-examinations Are Not Allowed

- **ISP:** In the event that the CAPES decides to not permit re-examination, an ISP may be recommended.
- **Dismissal/Termination:** The CAPES has the option to recommend any such student be dismissed.

### Conditions for Referral to the CAPES for Second-Year Students

Second-year students will be referred to the CAPES for review and resolution under any of the following categories:

1. Failure of an interval exam in one year-long course and one block-long course
2. Failure of two interval exams in year-long courses
3. Failure or Incomplete recorded in any re-examination
4. Failure or Incomplete grade in one year-long course
5. Failure or Incomplete grades in two or more block-long courses

### Remediation for Second-Year Students Reviewed by the CAPES

#### Re-examinations allowed:

The committee may permit the student to take re-examinations in the courses for which a Fail or Incomplete has been recorded (provided that a re-examination has not already been taken for a given course). Such re-exams will generally occur during the inter-academic year break. **Note:** In the event that a Fail/Incomplete grade is recorded after a re-examination, the CAPES may require that a student enter an ISP or that enrollment in the School of Medicine be terminated. The CAPES may decide that a second re-examination may be offered.
Cumulative Academic Review (at End of Second Year)

Prior to promotion to the clerkship year, the CAPES will review the cumulative academic record of each student brought forth by the associate dean for student affairs (ADSA) to determine whether the student's academic performance justifies advancement to the clinical phase of the medical education without warning. Typically, multiple remediated examinations and/or failing grades during the first two years of the curriculum will raise concerns about the student's knowledge and readiness to participate in clinical care of patients.

Students with overall records indicating globally poor performance may have one of the following actions taken upon them with written notification:

- Required to repeat specific preclinical course work
- Advancement to Clinical Year with Academic Warning, with a required meeting with the ADSA in order to –
  - Review and pursue available resources for academic intervention
  - Review and plan an effective clerkship schedule to consider schedule changes helping to facilitate successful clinical experiences
  - Recommend students seek tutorial assistance through each clerkship director and address any additional or unique circumstances
- Probation – Contingencies for continued enrollment on probationary status and for return to good standing will be specified by the CAPES.
- Dismissal – Globally poor performance may be deemed grounds for dismissal by the CAPES. In addition, a third-year student who is advanced with academic warning and then fails any component of a clinical clerkship may be dismissed from the school.

Indications for Review of Academic Performance for Third and Subsequent Years

Failure of any core clinical rotation without successful remediation will prevent proper advancement toward the student's degree and may result in significant consequences for career planning. For these reasons, the following list itemizes the conditions under which the CAPES committee will convene.

Failure of One Course Required for Third or Subsequent Years

The ADSA will meet with any student for whom a single Fail/Incomplete/E grade has been recorded for a course beyond the second year of the MD curriculum. Discussion will include the requirements stipulated by the relevant course director in order to remediate the academic encumbrance. Options will generally include a re-examination or the repeating of all or a portion of the course. If a single failing grade for a clerkship course or elective has been recorded, the student may be referred to the CAPES for review and course of action. If a Fail grade has been entered following the prescribed remediation, the student will always be referred to the CAPES to determine a course of action. When such a student is referred to the CAPES, the committee may permit a re-examination or retaking/repeating of all or any portion of the course. If the course is failed a third time, the student will be dismissed from school.

Failure of any Component of a Clerkship while on Academic Warning

A student who advances to the clinical years under academic warning, and who fails any component of a clerkship will be referred to the CAPES for action including possible dismissal from the school.

If Poor Academic Performance is Reported for Two or More Courses

The ADSA may request that the CAPES review performance of a student who has been reported as having demonstrated poor academic performance in two or more courses at interval evaluations conducted throughout the courses. In such instances, the CAPES may determine a course of action.

Failure of Two or More NBME Subject/Shelf Examinations

Any student who fails to achieve a passing grade on any two or more NBME subject/shelf examinations conducted as part of any clerkship evaluation will be referred to the CAPES for review and course of action. Note: A passing grade for any subject/shelf examination is defined as any score greater than or equal to the 10th percentile as reported by the NBME.

Recording of Failed Grades, Remediation, Re-examinations, Repercussions, or Dismissal (for Students in their Third Year and Beyond)

A student who fails any clinical component of a clerkship or elective will have a Fail grade recorded on the permanent academic record. At the discretion of the course director or the CAPES, the student must repeat either the portion failed or the entire clerkship or elective in order to remove the academic degree encumbrance. The failing grade will, however, remain visible on the permanent academic record. Any new passing grade for any such remediated course will display on the transcript; thus, both the original failing grade and the newly recorded grade for the course will be visible on the permanent academic record.

In addition, a failing grade for clinical clerkships will be officially recorded onto the permanent academic record whenever a student fails the subject/shelf examination for the second time. A
failing grade is defined as a score of less than the 10th percentile as reported by the NBME.

For students referred to the CAPES for failed/incomplete grades, the committee may endorse or amend the remediation recommendations of the corresponding course director(s). In the event a student fails a course remediation defined by the course director and approved by the CAPES, the CAPES may require that the clerkship rotation be repeated or that enrollment of the student in the school be terminated. Students will generally be permitted three attempts to achieve a passing grade in any clerkship course. If three failing NBME subject examination grades or final clerkship grades have been submitted for a course, the student will be dismissed from the school.

Procedures Concerning Review of Academic Performance

A. Convening a Meeting

Actions for Academic Review of students shall be referred to the CAPES for consideration by way of the associate dean for student affairs (ADSA) or registrar. The ADSA will convene a meeting of the CAPES, notifying the student in writing regarding the reason for the review and the date, time, and place of the meeting. A meeting of the CAPES may be convened at any time when a timely review of an issue is deemed necessary.

B. Attendees

The associate dean for student affairs, the registrar, and the course director(s) or their designated representatives shall present the matter to the CAPES in a closed and confidential CAPES meeting.

C. Student Responsibility

All students will be asked to be available to appear before the committee to provide additional information relevant to the concern. If the student fails to be available to appear at the meeting, the committee may postpone the meeting or may conduct the meeting and impose sanctions without the student present. Failure of a student to appear or provide information requested by the CAPES may result in the committee's filing a professionalism concern form. Meetings may be rescheduled at the discretion of the CAPES chair.

It is the responsibility of the student to alert the CAPES of any extenuating circumstances or contributing factors that should be considered regarding the student's status. The student shall be permitted, upon request in advance of the CAPES meeting, to appear before the CAPES on their own behalf. At the student's request, they may be accompanied by a member of the faculty, staff or fellow student of the school.

D. Student Record Considered

A student's entire academic and professionalism record will be considered in deliberations regarding student status.

E. Meeting Minutes

A record of the CAPES meeting shall be preserved and will be available for review by the School of Medicine's Appeals Committee, as necessary.

F. Outcomes Possible

Actions taken by the CAPES may include but are not limited to dismissal, suspension, probation, defined penalty, advancement with academic warning, remediation, and/or additional oversight. The CAPES may also rule that the MSPE/Dean's Letter should include a citation regarding the matter. The CAPES decision shall be made by simple majority unless the vote is for dismissal which requires a three-fourths majority.

G. Notifying Students of Final Committee Decisions

The associate dean for student affairs will inform the student verbally of the decision of the CAPES. The registrar will inform the student in writing within 10 business days.

Indications for Review of Professional Integrity

Matters involving a possible breach of professional integrity shall be brought to the attention of the associate dean for student affairs. The individual(s) raising the questions of possible misconduct shall present a Professionalism Concern Form (https://registrar.med.wustl.edu/resources/#Forms) providing detailed written information as necessary. Individuals submitting such forms are reminded of the need for complete confidentiality regarding all matters of conduct.

Behaviors inappropriate to the medical profession shall include but are not limited to:

- cheating or unauthorized use of materials during examinations
- abuse
- misrepresentations
- other seriously improper conduct in relation to patients or colleagues
- breach of confidentiality and trust
- misconduct in violation of university policies
- violation of the University Student Conduct Code
- illegalsities
- substance abuse
- failure of judgment including that related to noncompliance in the treatment of any personal medical condition
- misrepresentation or failure in personal actions or meeting obligations
- any combination of the above items, and others which might raise serious unresolved doubts about the integrity of the student with regards to entering the practice of medicine
For more information, consult the Guiding Principles of Professionalism (p. 372) under the Policies section of this Bulletin.

**Procedures Concerning Review of Professional Integrity**

At the discretion of the associate dean for student affairs, in cases of serious or repeated breaches of professional integrity, the associate dean for student affairs will convene a meeting with the associate dean for admissions, the associate dean for medical student education, the senior associate dean for medical education to review the complaint(s) and to decide whether further action is necessary.

If further inquiry is deemed necessary, the associate dean for student affairs and either the associate dean for medical student education, the associate dean for admissions, or the senior associate dean for medical education will discuss the complaint with the student. If the two associate deans deem that further action is warranted, the following procedure will occur:

**A. Convening of Meeting**

The associate dean for student affairs will convene a meeting of the CAPES. Whenever possible, the CAPES shall convene within two weeks after the initial meeting between the student and the associate dean for student affairs. If the person bringing the complaint is a member of the CAPES, they will not vote but may participate in the discussion. If the person bringing the complaint is not a member of the CAPES, they will be asked to present the complaint and will then be excused. The CAPES chairperson will oversee the procedures of the meeting. The registrar will record the minutes.

**B. Gathering of Pertinent Information and Meeting Attendees**

Prior to the meeting, the associate dean for student affairs will forward information concerning the matter to the committee. In addition the associate dean for student affairs will inform the student in writing regarding the time, date and place of the meeting. A copy of the complaint will be provided to the student. The notification shall state that the proceedings are confidential. The student may bring a faculty member, staff member or fellow student for guidance and support. If this person is not a fact witness to the complaint, they may not address the committee.

**C. Student Responsibility**

Any student to be considered at a CAPES meeting will be asked to be available to appear before the committee to provide additional information relevant to the concern. If the student fails to be available for the meeting, the committee may postpone the meeting or may conduct the meeting and impose sanctions without the student present. Failure of a student to appear or provide information requested by the CAPES may result in the committee's drawing adverse conclusions. Meetings may be rescheduled at the discretion of the CAPES chair.

**D. Student Record and Pertinent Documentation/Materials**

The CAPES will consider evidence which tends to prove or disprove the alleged conduct. If the CAPES finds that the student engaged in misconduct, it may consider additional evidence of prior conduct, evidence as to the charged student's character, the student's entire academic and disciplinary record, or any other evidence which would assist the CAPES in determining appropriate action. The chair of the CAPES will rule on whether or not evidence or testimony will be considered. The CAPES has neither the advantages nor limitations inherent in a court of law. During the meeting the student will have access to the written evidence presented and may present evidence and fact witnesses on their own behalf. The student should be prepared to discuss the circumstances of the complaint after which the CAPES will excuse the student from the room.

**E. Objective Approach By Committee**

The purpose of the CAPES meeting is to provide fair and prompt review of the inquiry. The committee is not positioned in an adversarial role against the student, but simply serves to review the evidence as presented and determine a decision regarding disciplinary action if necessary. The decision as to whether the student committed the alleged act will be made solely on the basis of evidence and testimony presented at the meeting. Innocence of the student will be presumed. A CAPES member must find in favor of the student unless the member is persuaded that it is more likely than not that the student engaged in the alleged misconduct.

**F. Outcomes Possible**

Actions taken by the CAPES may include but are not limited to dismissal, suspension, probation, defined penalty, fine and restitution, advancement with academic warning, remediation and/or additional oversight. Contingencies for continued enrollment on probationary status and for return to good standing will be specified by the CAPES in each individual case. The CAPES may also rule that the MSPE/Dean's Letter should include a citation regarding the matter. The CAPES decision shall be made by simple majority unless the vote is for dismissal which requires a three-fourths majority.

**G. Notifying Student of Committee Decisions**

The associate dean for student affairs will inform the student verbally of the decision of the CAPES. The registrar will inform the student in writing within 10 business days.
H. Meeting Minutes and Confidentiality
The record of such proceedings will be held confidentially with access restricted to committee members, the student involved and relevant members of the administration.

I. Disclaimers
• The university does not tolerate retaliation against individuals who bring forward complaints or who participate in the CAPES process.
• Unless determined by the associate dean for student affairs that extraordinary circumstances exist, the student will be permitted to continue in the usual academic activities during CAPES proceedings. However, if there is a reasonable basis for believing that the continued presence of the student on campus or in clinical rotations poses a substantial threat to the student, to patients, or to the rights of others to engage in their normal university functions and activities, the procedure outlined under the school’s Leave of Absence Policy (p. 357) will apply.

J. Both Academic Performance and Professionalism Concerns Exist
Should a student be referred to the CAPES for an issue involving both academic performance and professionalism concerns, the procedures for Professionalism Concerns will be followed.

Appeals Process
The School of Medicine has the right and responsibility to assure that each student, during the time of enrollment, demonstrates levels of academic achievement and ethical stature appropriate to the practice of medicine. The school must also ensure provision of fairness in discharging those rights and responsibilities. As such, an appeals process is in place as outlined below:

A. Request for an Appeal
Within 14 working days of the date on which an academic or disciplinary decision is rendered by the CAPES, the student may request in writing to the registrar, that the School of Medicine’s Appeals Committee review the record of the CAPES decision to determine that the appropriate CAPES procedures were followed or that the Appeals Committee requests that the CAPES consider additional, new relevant information which was not previously presented to the CAPES for good cause. The letter to the registrar should include the basis for appeal as well as any new relevant information and an explanation as to why it was not timely presented to the CAPES.

B. Establishing an Appeals Committee
An Appeals Committee, composed of faculty members appointed by the dean of the School of Medicine, shall be created to review appeal of decisions by the CAPES. Members of the CAPES may not be appointed to the Appeals Committee. A quorum of this committee shall consist of five members.

C. Review by the Appeals Committee
The Appeals Committee shall review the record of the CAPES decision solely to determine whether the pertinent CAPES procedures were followed and whether all relevant information was considered by the CAPES. If the appeal is based on a contention that all relevant information was not presented to the CAPES, the written appeal must provide the Appeals Committee with adequate reason why the student did not present this information at the CAPES meeting in question. In all cases, the Appeals Committee shall not substitute its judgment of the facts or its opinions of the merit of the matter for those of the CAPES.

D. Appeals Committee Decision Types
1. Remand the case to the CAPES
   The Appeals Committee may decide to remand the matter to the CAPES for reconsideration with its explanation for the remand. If the matter is remanded to the CAPES, all documents, minutes of the Appeals Committee meeting, and information submitted by or for the student in support of the appeal will be made available to the CAPES.
2. Denial
   The Appeals Committee may decide to deny the appeal.

E. Decision Notification to the Student
The Appeals Committee shall provide its decision in writing to the student, the dean of the School of Medicine, the associate dean for student affairs and the registrar. The associate dean for student affairs shall determine whether the student may continue their curriculum pending the Appeals Committee review of a CAPES decision.

F. Student Appeal to the Dean
Within 10 business days of the date of an Appeals Committee decision, the student may request in writing that the dean of the School of Medicine review the decision of the Appeals Committee. The decision of the dean of the School of Medicine shall be final.

Glossary
The following definitions are applied when the indicated terms are used in relation to the foregoing rules concerning review of academic performance and professional integrity:

Academic Warning, Advancement with
A supervised status that may be imposed if a student’s cumulative academic review indicates that special oversight is warranted. Refer to the sections on Cumulative Academic Review and Academic Warning for additional information.

Action, Disciplinary
An action, including counseling and penalties, taken by the School of Medicine, after consideration of the disciplinary problem.

**Administrative Withdrawal**
Termination of a student's enrollment from or eligibility to return to the School of Medicine by the university where the student has:

A. failed to register and has not sought a leave of absence; or
B. not returned from an approved leave of absence within the designated period of time and where an extension of the leave of absence has not been timely requested and approved by the CAPES.

**Dismissal, Academic**
Involuntary separation of a student from the School of Medicine because they have not met the academic requirements.

**Dismissal, Disciplinary**
Involuntary separation of a student from the School of Medicine as a result of action taken because of misconduct.

**Good Standing**
As a record or transcript notation, it signifies that the student is eligible to continue, to return, or to transfer elsewhere. It implies good academic standing as well as good citizenship and replaces such terms previously used as honorable dismissal, honorable withdrawal, withdrawn, voluntary withdrawal, eligible to return and clear record.

**Grade, Incomplete**
Indicates there is still a possibility of credit after further work. Used when the instructor is not prepared to give a final mark for the term in view either of sickness of the student or some justifiable delay in the completion of certain work. It is accompanied by a note that explains the circumstances and indicates how and when the incomplete may be resolved. A definitive mark for the term is recorded on the official transcript when the work is completed and the incomplete grade is removed. In case the work is not completed within the time allowed, the recorded grade will be changed to fail.

**Permanent Academic Record**
The all-inclusive abstract of academic achievement. This is also commonly referred to as the official educational record or official transcript.

**Probation**
Probation status may be for academic and for disciplinary reasons. Academic probation is the result of unsatisfactory scholarship. It is not a penalty but a warning and provides an opportunity to improve. Usually the student is required to make regular specified improvement in his record in order to avoid dismissal.

Disciplinary probation is the middle status between good standing and suspension or dismissal. The student remains enrolled but under stated conditions according to school policies. Disciplinary probation covers a stated trial period during which it is determined whether the student is returned to good standing having met the stated requirements or dismissed from enrollment at the end of the period for failure to meet the stated requirements.

**Professionalism Concern Form**
A form completed by a member of the university community to communicate an instance of unprofessional behavior to the associate dean for student affairs. Serious or repeated instances of unprofessional behavior may be referred to the CAPES by the associate dean for student affairs.

**Suspension**
Suspension is an involuntary separation of the student from the school but it differs from dismissal from enrollment in that it implies and states a time limit when return will be possible. Thus, suspension may extend for a specified time, until a specified date or until a stated condition is met.

**Withdrawal**
A release from enrollment. A student may request that they be allowed to withdraw from enrollment. Such requests are directed to the registrar or the associate dean for student affairs. When a student has requested withdrawal status, the school, by action of the CAPES, will determine whether the withdrawal will be annotated with good standing or not in good standing in the official academic record. Such annotations may be accompanied by explanations in the official educational record.

**Appendices**

**Evaluations and Grades**
Please visit the Evaluation and Grades (p. 370) section of this Bulletin for more information.

**Grade Appeal Form**
Please visit the Office of the Registrar (https://registrar.med.wustl.edu/resources/#Forms) website for more information.

**Professionalism Concern Form**
Please visit the Office of the Registrar (https://registrar.med.wustl.edu/resources/#Forms) website for more information.
MD: Evaluation and Grades

More information about assessing student performance and integrity can be found in the Assessing Academic Achievement and Professionalism (p. 360) section of this Bulletin.

Following are general guidelines for exams administered in the undergraduate medical curriculum. Additional requirements may be posed by the individual course director.

Exam Expectations for Students

- Students are required to take all examinations at the originally specified time. A student may be excused from this rule for extenuating circumstances at the discretion of the associate dean for student affairs (ADSA). Sudden personal illness is the most common example of an extenuating circumstance. Doctor appointments of a routine nature or vacation time are not considered to be extenuating circumstances for which students can be exempted from the regularly scheduled exam date. Such occasions will be promptly reported to the associate dean for student affairs. In the event of inability to attend a scheduled examination due to sudden illness, the student is required to inform the ADSA, but should also notify the course director and contact Student Health Services.
- Students are expected to be punctual and should be assembled in the designated exam area before the official start time of the exam. Tardiness will not be excused except in extenuating circumstances. For purposes of the exam, “tardiness” will be defined by the course director or exam proctor.
- Students must not share study materials, exchange information, collaborate or communicate with others during the exam.
- Place all personal items in designated area. (Cell phones must be turned off and pagers set on pulse.)
- Hand registration card, laminated sheet and pen to the proctor prior to leaving the room.

Exam Expectations for Faculty

- Exams should be proctored by the course director or a designee appointed by the course director comfortable with proctoring and exam administration guidelines. NBME subject exams are proctored by or coordinated by the Office of Student Affairs.
- Administration should be fair to all students.
- If the faculty member answers a substantive question or clarifies an issue, the same should be communicated to all students, including those in separate rooms or at different times.
- Reasonable adjustments should be offered to students who require special accommodations, including a separate testing room or additional time. Course directors are notified of these students through the associate dean for student affairs.
- If a student behaves inappropriately, the course director should notify the associate dean for student affairs immediately (refer to examples in the Cheating section below (p. 370) regarding inappropriate behaviors).
- All requirements of students should be communicated to all students prior to the start of the exam.

Special Accommodations

Any student needing accommodations for exams should review the school’s Students with Disability Policy (p. 380) in advance of exams. Students needing accommodations should meet with the associate dean for student affairs in advance of exams to discuss their request. The associate dean for student affairs will inform course directors of approved exam accommodations.

Cheating

The following examples are intended to be representative of behaviors that constitute cheating in the context of an exam. This is not intended to be an all-inclusive list.

- Looking at or copying from another student’s test.
- Collaborating with another student during the test without authorization.
- Using lecture notes or textbooks during an exam without authorization.
- Possessing crib notes during an exam.
- Using signals/signs to obtain answers from others.
- Utilizing a calculator, cell/smart phone, smart watch, computer, or any other device or learning aid without authorization. This includes storing, receiving, and/or accessing course matter stored on such devices.
- Obtaining assistance in answering questions on a take-home exam without authorization.
- Obtaining advance copies of exams or quizzes by any means.
- Having someone else take an exam in your place.
- Feigning illness or submitting misleading statements to avoid taking an exam at the scheduled time.
- Changing an answer on a graded test and claiming the question response was incorrectly marked wrong.

United States Medical Licensing Exam (USMLE)

Students who matriculated prior to 2014 and who anticipate practicing clinical medicine are required to take the USMLE Step 1 and 2 examinations. Beginning with the class matriculating in 2014, all students are required to take the USMLE Step 1, Step 2 CK and Step 2 CS prior to graduation.
The USMLE is designed to "assess a physician's ability to apply knowledge, concepts, and principles, and to demonstrate fundamental patient-centered skills, that are important in health and disease and that constitute the basis of safe and effective patient care." The USMLE represents a single uniform examination for medical licensure in the United States, and as such, is a minimum requirement for obtaining a medical license.

The USMLE consists of four separate examinations. "Step 1 assesses whether you understand and can apply important concepts of the sciences basic to the practice of medicine, with special emphasis on principles and mechanisms underlying health, disease, and modes of therapy. Step 1 ensures mastery of not only the sciences that provide a foundation for the safe and competent practice of medicine in the present, but also the scientific principles required for maintenance of competence through lifelong learning." Step 1 is taken after completing the second year at Washington University School of Medicine (WUSM).

Step 2 consists of two separate examinations, Step 2 CK (Clinical Knowledge) and Step 2 CS (Clinical Skills), which are taken at different times. "Step 2 assesses whether you can apply medical knowledge, skills, and understanding of clinical science essential for the provision of patient care under supervision and includes emphasis on health promotion and disease prevention. Step 2 ensures that due attention is devoted to principles of clinical sciences and basic patient-centered skills that provide the foundation for the safe and competent practice of medicine." Step 2 exams are taken after completing the third year but prior to graduation from WUSM.

"Step 3 assesses whether you can apply medical knowledge and understanding of biomedical and clinical science essential for the unsupervised practice of medicine, with emphasis on patient management in ambulatory settings. Step 3 provides a final assessment of physicians assuming independent responsibility for delivering general medical care." Step 3 is taken following graduation and during internship/residency training.

Further information can be obtained from the USMLE (http://www.usmle.org) Bulletin of Information published by the National Board of Medical Examiners, and is available, along with application forms and information, on their website.

**Preclerkship Narrative Assessment Policy**

**Narrative Evaluation Background**

Narrative assessment can be used as a tool to provide meaningful insights about the knowledge, clinical competence, and professional development of our students. As such, clinical clerkships and upper-level electives include formative and summative narrative evaluations. Through the preclerkship narrative assessment policy we aim to systematically provide students in the preclinical phase of the curriculum with feedback on their performance on the following Competency-Based Learning Objectives (CBLOs):

- Interpersonal and Communication Skills 3 (ICS-3) – Communicate effectively with members, including both physician and non-physician professionals, of the health care team
- Professionalism 1 (PROF-1) – Maintain a professionally appropriate demeanor, exhibit high standards of professional integrity, and demonstrate an awareness of potential conflicts of interest
- Professionalism 4 (PROF-4) – Work collaboratively and effectively in interprofessional teams
- Practice-Based Learning and Improvement 1 (PBLI-1) – Demonstrate the skills needed for lifelong learning including the ability to identify and address personal strengths and weaknesses to incorporate formative feedback, and to self-assess knowledge and performance to develop a self-improvement plan
- Practice-Based Learning and Improvement 3 (PBLI-3) – Participate in the education of peers and other members of the health care team

**Narrative Assessment Criteria (Preclinical)**

Narrative assessment must be provided in preclinical courses in which students work in small groups of 12 or less for at least three separate mandatory sessions. For activities in which a given instructor supervises more than one small group, they will provide narrative feedback when they can observe each individual small group for a minimum of 30 minutes (taken together, across all small group sessions).

Narrative assessment can be provided in preclinical courses that do not meet these criteria, provided the instructor demonstrates that the nature of the interaction allows for meaningful feedback regarding the indicated CBLOs.

**Grading System**

**I. First and Second Year**

Courses in the first-year and second-year curriculum are evaluated on a Pass (P) or Fail (F) basis. For purposes of the final official grade records of the School of Medicine, grades used for the first year and second year are:

- P = Pass, indicating satisfactory performance
- F = Fail; any grade of F remains on the student's academic record. When the course is repeated or remediated the new grade will appear as a separate entry in addition to the failing grade.
- L = Successful audit
- NG = Course credit earned, students not graded
• W = Withdrawal from a course
• Z = Unsuccessful audit

Valid temporary grades include:
• E = Temporary grade, makeup of failed exam pending.
• I = Incomplete, temporary grade pending completion of course requirements, replaced with an F if not removed within one year. In rare instances, the Committee on the Academic and Professional Evaluation of Students (CAPES) may grant an extension. Incomplete indicates that, because of a delay excused by the course director, the student has not completed the requirements to pass a course.

II. Subsequent Years

For purposes of the final official grade records of the School of Medicine, the following grades are used for subsequent years:
• H = Honors, reflecting a truly outstanding performance
• HP = High Pass, awarded for excellent/very good work
• P = Pass, indicating satisfactory performance
• F = Fail; any grade of F remains on the student's academic record. In clinical clerkships that have a subject examination, students must score at or above the 10th percentile of the national pool of students taking the examination to pass the clerkship. If a student fails a shelf examination for the second time in a third-year clerkship, an F is recorded on the permanent record.

When the course is repeated or remediated the new grade will appear as a separate entry in addition to the failing grade.
• Cr/NCr = Credit/No Credit for select second- and fourth-year courses
• L = Successful audit
• NG = Course credit earned, students not graded
• W = Withdrawal from a course
• Z = Unsuccessful audit

Valid temporary grades include:
• E = Temporary grade, makeup of failed exam pending. In clinical clerkships that have a subject examination, students must score at or above the 10th percentile of the national pool of students taking the examination to pass the clerkship. If a student fails the subject examination once, the grade of E will be recorded. Upon successfully retaking the subject examination, the new grade will replace the grade of E on the permanent academic record. If the shelf examination is failed a second time, the grade of F is recorded on the permanent academic record.
• I = Incomplete, temporary grade pending completion of course requirements, replaced with an F if not removed within one year. In rare instances, the CAPES may grant an extension. Incomplete indicates that, because of a delay excused by the course director, the student has not completed the requirements to pass a course.

Grade Notifications and Reporting

Departments are asked to report final grades for first- and second-year preclinical courses within 10 business days after the end of the course; and final grades for third- and fourth-year clerkship and elective courses are to be reported by the end of the fourth week after the course ends. Notifications of grade due-dates are communicated to course directors and monitored by the registrar staff. Email notifications are also sent automatically to students via the online course scheduling system (OASIS) within 24 hours of final grades being submitted. Once recorded, final grades are available for student viewing both in OASIS and in the university’s web-based student information system, WebSTAC. Final grades are not available on official transcripts until the end of the academic year.

Grade Point Average, Class Ranking, and Grade Distributions

For more information about Grade Point Average, Class Ranking, and Grade Distributions, please visit the Assessing Academic Achievement & Professionalism (p. 360) section of this Bulletin.

Grade Appeals

For more information about Grade Appeals, please visit the Assessing Academic Achievement & Professionalism (p. 360) section of this Bulletin.

Remediation

For more information about Remediation, please visit the Assessing Academic Achievement & Professionalism (p. 360) section of this Bulletin.

MD: Professionalism

Preamble

Medicine is one of the oldest of the learned professions. A professional is one who is in command of a specialized body of knowledge and skills, and is given specific rights not typically allowed to the public. Along with those rights, the professional has specific responsibilities or duties not generally expected of the public.

The singularity of medicine is that it deals with human health. Patients are potentially at their most vulnerable when establishing a relationship with a physician. That the patient's relationship with their physician involves a dependency that encompasses life and death adds further to the uniqueness of this relationship.

The label of professional is not a right but must be earned. The special contract physicians have with society has
professionalism as its foundation. Professionalism consists of fundamentally important qualities including altruism, compassion and empathy, respect for patients and health care workers, commitment to ongoing excellence, honesty, trustworthiness, integrity, accountability, recognition of limits, collaboration, and duty to society.

Professional development is an ongoing process at all levels of training and practice. The purpose of this document is to outline those elements of professionalism expected of our medical students. It is not meant to be all-encompassing, providing exact guidelines for all possible situations. While this document was developed with medical students in mind, it is generally applicable to all medical professionals.

The goal of the Washington University Medical Center is to provide patient care, medical education, and biomedical research of the highest quality. Accomplishing this goal depends in part, also, on an atmosphere of mutual respect and collegiality among all those who work and study here. This document focuses on the special issues presented by the teacher/learner relationship, as well, and applies to all years of the medical school curriculum.

Guiding Principles of Professionalism

Professional responsibility

1. Students have a responsibility to actively participate in their education and to work to improve the educational environment for future students.
2. Students should have a willingness to pursue lifelong, self-directed learning, which is an essential attribute of any professional.
3. Students should act responsibly in their personal and academic lives with regard to meeting deadlines, financial obligations and other comparable responsibilities.
4. Preparation for class and during clinical rotations sets a good example for peers, maximizes every student’s learning opportunity, and demonstrates respect for the teachers and peers.
   a. Respecting one’s peers in a classroom or in the hospital setting includes behaviors such as arriving on time, exhibiting respectful body language, listening attentively, turning off cell phones and allowing all present to engage in discussion.
5. Students should report to the appropriate supervisor potentially serious errors that others have committed.
6. Students should contribute to their community.
   a. Students are encouraged to participate in the first- and second-year teaching groups.
   b. These provide a service to the larger St. Louis community, while teaching students how to communicate with people of diverse backgrounds.
   c. Students are encouraged to serve at the Saturday Neighborhood Health Clinic and other community service and teaching activities.
7. Students should be aware of the larger social and economic context in which disease occurs, and take advantage of opportunities to deepen their knowledge about this topic.

Competence and self-improvement

1. In order to function at the expected level, students should attend to their own physical and emotional health.
   a. The experience of being a medical student can be physically and emotionally challenging. Students need to be able to identify when they are overwhelmed to the point where they may not be able to function appropriately. Students are encouraged to seek educational assistance and/or the emotional support of others in these instances.
2. Recognizing and admitting errors in patient care are key to being a good physician.
   a. Students should view mistakes as part of learning. Assuming responsibility for mistakes is critical for professional development.
   b. Developing productive strategies for dealing with mistakes and non-confrontational ways of correcting them is essential.
3. Feedback, advice and criticism from residents, fellows and faculty fosters personal and professional development, and should be taken in the context of mentoring.
   a. Students should assume that opinions of their faculty/residents/fellows that may seem unclear are usually solidly founded, and accept feedback regarding their performance openly and maturely from individuals more experienced than they.
   b. Students should provide suggestions and examples for improving the mentoring environment by forthrightly evaluating their instructors.
4. Students should identify and correct errors in patient care as soon as possible or notify those who can correct it.
5. Students should balance personal and professional interests.
   a. Students should not over-commit.
   b. Students should communicate schedule conflicts to course directors, lecturers, and/or house staff.

Respect for others and professional relationships

1. Students should conduct themselves with manners and consideration of all others, and be respectful of others’ time.
2. While individual effort is important in developing a medical knowledge base, much of what students learn in medical school will depend on a collaborative effort with their peers.
   a. From the first day of medical school, students should encourage each other and collaborate with their peers
when appropriate in the learning environments of lectures, small group discussions, and lab sessions. In doing so, they are laying the foundation for the truly collaborative nature of medicine.

b. During the clinical years, students should understand that their peers are a valuable resource. Likewise, a student should assist peers in patient care responsibilities.

c. In all cases, students should respect the work and learning opportunities of their classmates and they should share educational opportunities with their peers. Professional behaviors include listening to other’s presentations, and encouraging others’ opportunities to present, ask/answer questions, admit patients, participate in surgical cases/procedures, or perform duties.

3. Respect for the ethnic and cultural diversity of classmates provides for a more nurturing environment for all.
   a. Students should be aware that their classmates come from a wide variety of religious and ethnic backgrounds and that they will have differing lifestyles and viewpoints. This diversity is an important resource in our community, contributing to the personal and professional growth of all.
   b. Students should be sensitive to the importance of these issues and should seek opportunities to enhance appreciation of multiple cultures through dialog, educational opportunities, etc.

4. Students should be supportive of peers during difficult times in their personal and professional lives.
   a. Students must appreciate that their peers may have issues in their personal or professional lives (e.g., family, medical, academic, or administrative problems) that may affect their interactions with others. In these circumstances, students should make every attempt to be sympathetic and to offer their support to those students.

5. Participation and teamwork enhances the educational experience.
   a. The learning process is a partnership between students and faculty. Students should actively participate in this partnership by providing feedback to professors by way of evaluations and surveys.
   b. Contributing to the overall functioning of the team maximizes both learning and patient care in the clinical setting.

6. Understanding the appropriate venues for feedback to house staff/fellows/faculty is critical to successfully resolving conflicts. Students should be aware of the hierarchy of the team, and appropriate mechanisms for handling disagreement with faculty/residents/fellows. Conflicts can be translated into productive outcomes if handled appropriately. For additional helpful information, reference the university Code of Conduct (https://universitycompliance.wustl.edu/code-of-conduct).

7. Maintaining a professional relationship with teachers (including faculty/residents/fellows and TAs) is important, especially during times when these teachers are in a position to grade or evaluate the student.
   a. Students should avoid behaviors that could potentially be construed as attempting to influence the faculty, for example running personal errands.
   b. The university has specific codes and regulations regarding romantic relationships between a student and a teacher, including faculty/resident/fellows outlined in the Consensual Relationships Policy (https://hr.wustl.edu/items/consensual-relationships). Students engaged in such relationships should review these codes and avoid any situation that can cause potential conflict of interest in the academic setting.

8. Patients should be treated as individuals in the context of their family, culture and community. Personal bias should be subordinated when possible to further the therapeutic relationship.
   a. Use of offensive language or gestures is unacceptable.
   b. At times, some religious beliefs will require the use of alternative care approaches.
   c. Students, like practicing physicians, should not refuse to participate in the care of a patient with a communicable disease unless this represents a meaningful threat to the student's own health. In contrast, a student who is verbally or physically threatened by a patient may ask to be excused from care of that patient.

9. Students should treat hospital staff with appreciation and respect as they are vital members of the health care team.

**Honesty and integrity**

1. Student work should be original.
   a. Only authorized resources should be used during examinations, quizzes or graded course work. WUSM has a zero tolerance policy for plagiarism (https://studentconduct.wustl.edu/academic-integrity).
   b. When students are aware that a classmate has submitted work that is not their own (cheated), they should discuss this situation with the course director and/or the associate dean for student affairs.

2. Students must respect patients’ rights and maintain confidentiality, in accordance with HIPAA guidelines.
   a. Students should be ever aware that patients are ill and have the right to refuse care, particularly when poorly provided.
   b. Patient information should only be discussed with appropriate people at appropriate times.
   c. Patient records should not be photocopied carelessly or removed from appropriate areas.
The education of a student.

A mentor, student, nurse or other person charged with supervising be defined as an attending physician, fellow, resident, research assigned during a course or clinical rotation. A teacher may also member of the School of Medicine faculty to whom a student is as any person subject to School of Medicine policies, such as a respect. For purposes of this policy, a teacher shall be defined students can trust their teachers to treat them fairly and with Effective learning is possible only in an environment where

The Teacher and Learner Relationship

Relationships and Policy against Conduct in Teacher/Learner Guidelines for Professional

School of Medicine (07/06/18)

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9. Students should respect the laws of federal, state and local governments in both professional and private life.

Guidelines for Professional Conduct in Teacher/Learner Relationships and Policy against Medical Student Mistreatment

The Teacher and Learner Relationship

Effective learning is possible only in an environment where students can trust their teachers to treat them fairly and with respect. For purposes of this policy, a teacher shall be defined as any person subject to School of Medicine policies, such as a member of the School of Medicine faculty to whom a student is assigned during a course or clinical rotation. A teacher may also be defined as an attending physician, fellow, resident, research mentor, student, nurse or other person charged with supervising the education of a student.

One manner in which the teacher/learner relationship is unique is that students may be vulnerable, depending on many of their teachers for evaluations and recommendations. In addition, medical education includes mastering not just pathophysiology but also the essentials of professional behavior, as set forth in our Guiding Principles of Professionalism (p. 373).

We also recognize that students learn professional behavior primarily by observing the actions of their teachers as role models. Unprofessional, offensive, disrespectful or abusive behavior by teachers is antithetical to standards of professional conduct that medical students are expected to master. These behaviors by teachers may also be self-perpetuating, as students come to believe that such behavior is appropriate when they assume the role of teacher. As we strive to create an environment of mutual respect, all faculty, staff and students are expected to abide by the Abusive Conduct Policy (http://hr.med.wustl.edu/Policies/Pages/AbusiveConduct.aspx).

Behaving in ways that embody the ideal student-teacher relationship fosters respectful behavior, minimizes the likelihood of student mistreatment, and optimizes the educational experience for students. The following practices are examples of ways in which teachers and learners can encourage a positive learning environment conducive to the exchange of ideas among all who participate in the learning process:

1. Teachers
   a. Be prepared and on time.
   b. Provide learners with the most current materials.
   c. Treat students fairly, respectfully, and without bias related to their race, color, age, religion, sex, sexual orientation, gender identity or expression, national origin, veteran status, disability or genetic information.
   d. Give students timely, constructive and accurate feedback.
   e. Distinguish between the Socratic method, where insightful questions are a stimulus to learning and discovery, and over-aggressive questioning, where detailed questions are repeatedly presented with the endpoint of embarrassment or humiliation of the student.

2. Learners
   a. Treat teachers, peers, patients and members of the health care team fairly, respectfully, and without bias related to their race, color, age, religion, sex, sexual orientation, gender identity or expression, national origin, veteran status, disability or genetic information.
   b. Respect patients' privacy. Under no circumstances should you discuss a patient online or post online a patient's photo, even if the patient gives you permission.
   c. Be conscientious with your electronic presence. Voicemail, email and other electronic communications (for example, blogs, social media sites, smart phone apps, photographs and any published writing) should
be thoughtfully composed. Treat all individuals in the learning environment with respect and understanding.

d. You have the right to free speech; however, in order to foster a community of professionalism, you and your peers are encouraged to approach one another professionally and to abide by the Washington University Code of Conduct.

e. Treat fellow students as colleagues, not competitors.

f. Take responsibility for maximizing your educational experience by addressing conflicts and discomforts which may impede your learning.

g. Be an enthusiastic learner.

h. Be trustworthy and honest.

i. Be prepared and punctual.

j. Know your limitations and ask for help when needed.

k. Put the patient's welfare first and ahead of your educational needs.

l. Know and understand your patients' medical history, diagnoses, treatment and status.

m. Take the initiative to educate yourself about your patients' illness.

n. Be compassionate.

**Student Mistreatment**

The School of Medicine prohibits behavior that is abusive or which mistreats students or others in the learning environment. We take issues of mistreatment seriously and aspire to a culture of zero tolerance for instances of abuse, mistreatment and disrespect. Washington University School of Medicine (WUSM) is committed to maintaining an environment free from discrimination, harassment of any type, and abuses of authority. The Association of American Medical Colleges (AAMC) has defined Mistreatment in previous Graduation Questionnaires as follows: Mistreatment arises when behavior shows disrespect for the dignity of others and unreasonably interferes with the learning process. It can take the form of physical punishment, sexual harassment, psychological cruelty, and discrimination based on race, religion, ethnicity, sex, age or sexual orientation. The behaviors listed below are provided as examples of mistreatment and offensive behavior by the AAMC. However, we recognize that there are nuances to interpersonal interactions. Students who feel they may have been subjected to mistreatment are encouraged to follow the procedures outlined in the Steps for Reporting Student Mistreatment section of this policy. The goal of this process is to provide the best learning environment possible.

**Examples of Potential Mistreatment**

- Public humiliation
- Threats of physical harm
- Physical harm (e.g., being hit, slapped, kicked)

- Requirements to perform personal services (e.g., shopping, babysitting)
- Offensive sexist remarks/names
- Denial of opportunities for training or rewards based solely on gender, race, sexual orientation or ethnicity
- Lower evaluations or grades because of gender, race, sexual orientation or ethnicity rather than performance
- Unwanted sexual advances
- Being asked to exchange sexual favors for grades or other rewards
- Racially or ethnically offensive remarks/names
- Offensive remarks/names related to sexual orientation

**Steps for Reporting Student Mistreatment**

The university takes allegations of student mistreatment by faculty, residents, staff or other students very seriously and strongly encourages its faculty, staff and students who are witness to such conduct to report it immediately, without fear of retaliation, to any of the following three deans: the senior associate dean for education, the associate dean for student affairs, or the associate dean for medical student education. These individuals will offer guidance and support — described below — to the student and discuss informal and formal options to resolve the matter. For more information, please visit the Office of Medical Student Affairs (p. 381) in this Bulletin.

Students may also consult with the medical student ombudsperson as a confidential resource. The medical student ombudsperson can provide guidance as well as mediation, directly or indirectly, between the student and the offender.

Students may also choose to report student mistreatment via a link on the Canvas learning management system student commons homepage or via the Oasis curriculum management system. The end-of-clerkship and elective surveys have questions regarding mistreatment where incidents can be reported in real time. These reports are confidential. The Office of Medical Student Affairs will receive all reports and will follow up with the reporting individual, if identified, to offer guidance, support and options for resolution to the student. If sufficient information is provided, the report will be passed on to the clerkship director and department chair after student evaluations are finalized for the course or clerkship in which the event occurred. Reports will be reviewed quarterly by a Learning Climate Committee. This committee will be chaired by the associate dean of student affairs and will consist of a medical student, advisory dean or deans, the director of GME (or designee), a hospital staff member, and the medical student ombudsperson. Aggregate reports will generally be forwarded to department chairs quarterly for monitoring purposes.
Confidentiality and Anonymous Reporting

The university will strive to protect, to the greatest extent possible, the confidentiality of persons reporting mistreatment and of those accused of mistreatment. Because the university may have certain legal obligations (e.g., in response to allegations of sexual harassment), the university cannot guarantee complete confidentiality where it would conflict with the university's obligation to investigate meaningfully or, where warranted, take corrective action. Even when some disclosure of the university's information or sources is necessary, it will be limited to the extent possible. The university will keep confidential all records of complaints, responses and investigations, to the extent permitted by law.

If the student is not comfortable reporting to one of the individuals identified above, the student may choose an intermediary who can then directly communicate the incident with these individuals while maintaining anonymity. Students may also submit anonymous reports via the Oasis curriculum management system in real time or when filling out course evaluations. Anonymous reports will be shared with the clerkship director and department chair.

If a student insists on confidentiality or anonymity, the university may be limited in its ability to respond and take action with respect to the report.

Bias Report and Support System (BRSS)

In addition, Washington University developed a system through which students, faculty, staff and community members who have experienced or witnessed what they perceive as incidents of bias, prejudice or discrimination involving a student can report their experiences to the university's Bias Report and Support System (BRSS) (https://diversityinclusion.wustl.edu/brss) team. If, for any reason, students want to provide identifying information when filing a report, they have the option to fill out the BRSS form (https://diversity.wustl.edu/students/mosaic/bias-report-support-system/bias-report-form) anonymously online by selecting the "For Information Only" option. Please note that a brief description of the incident will be included in the quarterly summary report. If an individual submitting a report selects the "For Support and Referral" option, a member of the BRSS team will meet with the individual and refer that person to the appropriate university policy and administrator. Note that these non-anonymous BRSS reports on the WUSM campus are sent to the assistant provost, who assists WUSM students in navigating their programs and connects them with the relevant policies and contacts within those programs.

Informal and Formal Options for Possible Resolution

Informal Options

If you feel comfortable dealing with the situation without assistance, you can communicate either orally or in writing with the person whose behavior is offensive. The most useful communication will have three parts:

1. A factual description of the incident(s) including date, time, place and specific action.
2. A description of the writer's feelings, including any consequences of the incident.
3. A request that the conduct cease.

Frequently, such a communication will cause the offensive behavior to stop, particularly when the person may not be aware that the conduct is offensive.

If you would like to proceed informally, but with the assistance of someone else, you may:

1. Ask the person's supervisor (e.g., department chair, dean, director, housing office representative, academic adviser, or a trained WUSM faculty member) to speak to the person whose behavior was offensive. The purpose of such conversations is the cessation of offensive behavior. You should note that these individuals may be obligated to report the incident or conduct you disclose to the university for further investigation and action.

2. Consult with one of the advisers listed in Additional Resources who are specifically charged with responding to mistreatment inquiries and complaints. These individuals are thoroughly familiar with WUSM's mistreatment policy and are available to consult with victims, those accused of engaging in mistreatment, witnesses and supervisors of parties to a complaint. They can provide information about informal actions that might remedy the situation and discuss university policies and procedures for resolving complaints.

3. Ask the adviser to mediate or arrange for mediation. Mediation is discussion and negotiation, with the help of a third party, and is designed to permit the parties to reach a mutually agreeable resolution of a dispute. If a person complaining of mistreatment seeks mediation, the person accused of mistreatment agrees, and the adviser concludes that the mediation would be consistent with the university’s legal obligations in responding to and preventing discrimination or discriminatory harassment, then the adviser may mediate or arrange for mediation.

Formal Options

Should informal resolution be unsuccessful or inappropriate under the particular circumstances alleged, the student will be referred to the applicable university policies and procedures for filing a formal complaint. The university will initiate an investigation into the allegations under the appropriate policy and take disciplinary action as contemplated by the applicable procedures. For example, if a student asserts that a faculty member has engaged in mistreatment in the form of sexual harassment, the university’s Sexual Harassment Policy would be followed.
Education

The School of Medicine will provide ongoing education to promote a respectful and positive learning environment. The purpose of this education will be to provide definitions and standards for an optimal learning environment, to inform students and educators of policies and processes for reporting offensive behavior and learner mistreatment. This educational information will be provided by the Learning Climate Committee. The policy will be posted in the Bulletin, clerkship and course director handbooks and will be reviewed with students at orientations. In addition, educational sessions may be provided at departmental and division meetings, resident sessions, staff meetings and curriculum committee meetings.

Additional Resources

For a list of Medical Student Advisers, please visit the Office of Medical Student Affairs (p. 381) page in this Bulletin.

Related Policies

Washington University Discrimination and Harassment Policy (http://hr.wustl.edu/policies/Pages/DiscriminationAndHarassment.aspx)

Washington University Sexual Assault Policy (https://wustl.edu/about/compliance-policies/governance/usab-procedures-complaints-sexual-assault-filed-students)

Washington University Abusive Conduct Policy (https://hr.wustl.edu/items/abusive-conduct-policy)

Washington University Diversity Bias Report Form (http://diversity.wustl.edu/students/mosaic/bias-report-support-system/bias-report-form)

Assessing Academic Achievement & Professionalism (MD Program) (p. 360)

MD: Other Policies

Full information about the Student Constitution and Bylaws can be found in Canvas (https://md.wustl.edu/academics/learning-management-technology-canvas).

Additional School of Medicine Policies can be found under the School of Medicine: Other Policies (p. 378) section of this Bulletin.

School of Medicine: Professionalism & Conduct

Research Integrity Policy

Allegations of breach of the Research Integrity Policy are the primary responsibility of the Research Integrity Committee of the School of Medicine. Complaints regarding students enrolled for the MD degree will be directed promptly to that committee. The Research Integrity Committee will promptly investigate the charges and report its conclusions and recommendations to the dean, who will refer the issue to the Committee on the Academic and Professional Evaluation of Students (CAPES) as a breach of professional integrity if further action is warranted.

For further information, visit the Research Integrity Policy (https://research.wustl.edu/washington-university-research-integrity-policy) posted on the Washington University website.

Policy Against Abusive Conduct

Please visit the Human Resources website for the Policy Against Abusive Conduct (http://hr.med.wustl.edu/Policies/Pages/AbusiveConduct.aspx).

Social Media Policy

Students accepted to Washington University School of Medicine (WUSM) and current Washington University School of Medicine students should be vigilant in using social networking (Facebook, Twitter, blogging, etc.). The profession of medicine requires the highest standards of conduct because of the level of trust patients place in medical professionals. When students are admitted to WUSM, enrollment remains contingent on their demonstration of this high standard of conduct, through sound judgment, accountability and integrity. Written, voice, email and other electronic communications, including those in blogs, social media sites, and smart phone apps, as well as in published writing, should be thoughtful and treat all individuals in the learning environment with mutual respect and understanding. Posting items that represent unprofessional behavior, releasing patient health information or other HIPAA violations, or violating Washington University in St. Louis policies on social networking sites will result in disciplinary action by the medical school.

The following two Washington University policies are incorporated into this policy and apply to accepted and current students:

- Washington University Social Media Policy (https://wustl.edu/about/compliance-policies/media-policies/social-media-policy)
- WUSM Social Media Guidelines (https://medicine.wustl.edu/brand/social-media)

School of Medicine: Other Policies

Policies Related to Student Health and Safety

Bloodborne Pathogens Policy

In 1992, the Executive Faculty of the School of Medicine formally adopted a Medical Campus policy on Human Immunodeficiency Virus (HIV) and Hepatitis B Virus (HBV) infections. This policy was updated in 2001 to include Hepatitis C Virus (HCV) infections. The purpose of the policy is to provide guidelines to
prevent or reduce the transmission of these infectious agents between patients and health care workers (HCWs). It is an ethical and moral obligation for the student/employees to report bloodborne pathogens (BBP) infections.

The policy deals with 1) the university’s responsibilities to infected patients (including obligation to treat, confidentiality and appropriate serologic testing), 2) appropriate health and safety precautions and procedures for faculty, students and staff (including compliance with CDC guidelines, blood and body fluid precautions and handling of needles or sharp instruments), and 3) the university’s responsibilities to faculty, staff or students who are infected with HIV, HBV or HCV infection — including admission to medical school, participation in clinical rotations, serologic testing confidentiality and medical treatment.

The policy makes a distinction between Category I activities — those involving no risk of transmission from infected HCWs to patients, such as routine history/physical examinations, minor surface suturing, elective phlebotomy; and Category II — procedures for which bloodborne virus transmission is theoretically possible but unlikely, such as minor local procedures, central venous lines, other specialty procedures; and Category III — procedures for which there is definite risk of bloodborne virus transmission, such as general surgery, CT surgery, neurosurgery, etc., and non-elective procedures performed in the Emergency Department.

In 2012 a committee was formed including representation from Administration, Legal – Risk Management, Infectious Disease, Occupational Health, and the director of Student Health Services (SHS). The SHS director meets with the infected student and discusses the need for restricted activities and proper follow-up.

**Needle Stick/Human Blood and Body Fluid Exposure Policy**

All exposures to human blood and body fluids will be reported immediately to the Health Service. The Health Service maintains a 24-hour reporting system. During working hours, 8 a.m.-4 p.m., the office can be reached at 314-362-3523 or 314-362-3528. After hours the Health Service can be contacted through a digital beeper at 314-871-2966.

**Needle Stick Procedure**

Cleanse wound immediately with soap and water. If a mucous membrane has been exposed, rinse with copious amounts of water.

1. Identify the source of exposure.
2. Call the Health Service for further instructions. Source patient will be evaluated for HIV, Hepatitis B and Hepatitis C. The responsibility of acquiring patient consent for testing will be the responsibility of the physician in charge of the case. The employee will notify the physician. All source patient charges will be the responsibility of the Health Service.
4. Employees and students will report to the Health Service for follow-up. Individuals will be evaluated for:
   a. HIV or Serum Sample Save
   b. Hepatitis B Vaccination
   c. HbsAB (+test in past eliminates further testing)
   d. HCV
   e. Td
   f. PEP Prophylaxis

**Human Blood and Body Fluid Exposures Procedure**

1. Clean area with soap and water.
2. Call Employee Health (314-362-3528) or Student Health (314-362-3523) or after hours call the digital beeper (314-871-2966).
3. Keep source or patient available for HIV, HbsAg, and HCV testing.
4. Follow the instruction given by the Health Service. Complete an incident report.

**Always wear Personal Protective Equipment (PPE)!**

**Pharmaceutical and Medical Device Industry Policy**

For the Pharmaceutical and Medical Device Industry Policy (https://fpp.wustl.edu/policies/policy-on-conflicts-of-interest-in-clinical-care), please visit the Faculty Practice Plan website.

* This policy applies to fourth-year students as well.

**Policies Related to Procedures**

**Duty Hour Policy**

Clerkship directors and directors of other clinical rotations are responsible for monitoring and ensuring that duty hours are adjusted as necessary. Duty hours are defined as all clinical and academic activities related to medical student education including patient care (both inpatient and outpatient), administrative duties (completion of paperwork, dictation of charts, etc.), the provision for transfer of patient care (check-in, check-out, etc.), time spent in-house while on call, and scheduled academic activities (i.e., required academic conferences). Time spent reading, doing write ups, etc., after leaving the hospital (or after having been told student can leave) does not count toward duty hours. Student duty hours are set taking into account the effects of fatigue and sleep deprivation on learning and patient care.

- Students must not be scheduled for more than 80 clinical duty hours during a seven-day week, averaged over a four-week period.
- Students must have a minimum average of four 24-hour periods off over four weeks. Note: Official school breaks and
holidays should not be counted toward this minimum time-off requirement.

- Students must not be on overnight call more frequently than every third night.
- Students cannot be on call for more than 24 successive hours, with an added period of up to four hours for continuity, educational debriefing, and didactic activities. No new patients should be assigned to students after the 24-hour call limit.
- All third- and fourth-year students will have all official Washington University holidays off, regardless of whether the student's team is on-call or post-call the day of the holiday. On the work day directly preceding the holiday, students will be dismissed by 5 p.m., and will not be assigned call duties, or regular clinical duties, until the day following the holiday at the time set forth by the clerkship director, chief resident, or fourth-year elective course director.
- Students are strongly encouraged to discuss issues pertaining to days off with the resident at the beginning of the clerkship, or fourth-year elective, and to contact the respective clerkship director, elective course director, or resident, in writing (by letter or email) to obtain permission for any planned absences well in advance of the planned absence.
- Individual clerkship directors and directors of clinical rotations may choose to implement duty hour guidelines that are more restrictive than the above. However, duty hours may not exceed the above regulations.
- If student encounters a duty hour violation, they should discuss it first with the clerkship director or elective course director. If the issue is not resolved to satisfaction, they may approach deans Michael Awad, Lisa Moscoso, or Alison Whelan.

Policies Related to Student Rights

Students with Disabilities Policy

It is the goal of Washington University to assist students with disabilities in removing the barriers their disabilities may pose and provide support in facing the challenge of pursuing an education at Washington University.

Washington University recognizes and accepts its professional, legal and moral responsibility to avoid discrimination in the acceptance and education of qualified students with disabilities and to provide reasonable accommodations to such students consistent with the principles embodied in the law. These guidelines apply to students seeking admittance as well as to those who become disabled while they are enrolled.

Washington University makes every effort to insure that all qualified applicants and students can participate in and take full advantage of all programs and opportunities offered within the university. Washington University encourages and gives full consideration to all applicants for admission. Washington University does not discriminate in access to its programs and activities on the basis of age, sex, sexual orientation, race, disability, religion, color or national origin.

All students in educational programs at the School of Medicine, those seeking admittance, as well as those who become disabled while they are enrolled, must possess those intellectual, ethical, physical, and emotional capabilities required to undertake the full curriculum and to achieve the levels of competence required by the faculty and the profession.

In this regard, we will be guided by the principles outlined below.

A. Responsibilities of the Student

1. Disclosure of disability

   It is the responsibility of a student who has a disability to disclose it and request accommodation from the dean for student affairs or program director. The school encourages students with disabilities to identify themselves as early as possible in order to optimize the mobilization of resources and available accommodations.

2. Diagnosis of disability

   Students who are in academic difficulty that might be a consequence of a disability are encouraged to avail themselves of diagnostic services that may lead to accommodations. Furthermore, such students are encouraged to explore with the administration of their academic unit the possibility of a disability if the inquiry is relevant to educational performance and there is evidence of educational performance problems.

3. Documentation of disability and request for accommodation

   The disability, its functional impact and requested accommodation(s) must be documented. If the student discloses a disability and requests accommodation, the school requires documentation of the disability from a qualified professional. The student is financially responsible, unless there are extraordinary and compelling circumstances, for the costs related to the documentation by an appropriately educated and trained professional. The information provided by the professional must be factual, objective and technically valid, and must establish clearly that the disability substantially limits one or more of the student's major life activities. The professional(s) who evaluate the student should identify options for management of the disability. Based on this information, the affected student then should request in writing the accommodations which they request be made. The dean for student affairs or program director and the student should work together to arrive at reasonable accommodations. The school may also require a second expert opinion for which the school may be financially responsible under extraordinary and compelling circumstances. The school reserves the right to request as much detailed information from the student and/or the
There shall exist a standing Disabilities Oversight Committee composed of members designated by the dean of the School of Medicine. The committee shall have the following responsibilities: periodic review of requests for accommodations and accommodations granted, provide recommendations regarding accommodations for disabilities, and serve as requested on disability appeals committee. This group serves as a resource regarding issues of significance to the institution and to students with disabilities.

C. Appeals

A student with a disability who believes that a request for accommodation has been improperly denied or who perceives that they have been discriminated against on the basis of a disability should direct their appeal to the dean of the School of Medicine. As needed, the dean of the School of Medicine may assemble an advisory group to review appeals and make recommendations. This group may include, but may not be limited to, the following: the chair of the committee that oversees academic evaluation and advancement of students for the particular academic unit, students, and/or representatives of the Disabilities Oversight Committee.

Resources

The School of Medicine is fully dedicated to providing an outstanding learning environment in which students are supported in meeting their individual professional goals. Services include:

- Advising and Career Counseling (p. 381)
- Diversity Programs (p. 382)
- Housing (p. 382)
- Office of Education (p. 383)
- Office of Medical Student Education (p. 383)
- Office of Student Financial Planning (p. 383)
- Parking and Transportation (p. 383)
- Protective Services (p. 384)
- Registrar (p. 384)
- Risk Management (p. 385)
- Student Health (p. 385)

Advising and Career Counseling

Student advising occurs within two broad programs: Pre-clinical Advising and Career Counseling.

Pre-clinical Advising

First-year students are assigned to academic societies upon matriculation. Each academic society has an advisory dean. This advisory dean meets with all first- and second-year students individually in the first and second year. In addition, advisory deans will meet with their students in small groups several times
Career Counseling

In addition to the advising programs described, students seek informal advising from faculty with whom they have had contact, either through classroom work, research or clinical clerkships. Students also have faculty contact through membership in the academic societies. Many of the specialty-specific student interest groups and other student-run programs provide opportunities for clinical shadowing and informal advising as well.

The assistant dean for Career Counseling is available to medical students at any point in their school career to provide individual counseling in planning for choosing a specialty, as well as for the residency application and match process. At the beginning of their final year of medical school, students are required to meet with the assistant dean for Career Counseling in preparation for writing their Medical Student Performance Evaluation (MSPE or Dean's Letter). At this meeting and throughout their final year, the assistant dean is available to discuss the student's long-term educational and career goals, help choose residency programs that meet these goals, review their residency application, and support construction of their program rank order list for the match.

Students also have the opportunity to select a career adviser from a list of faculty in the field in which the student plans to seek a residency position. The career advisers have responsibility for reviewing the student's choice for fourth-year electives and making appropriate recommendations for the structure and content of the elective year. For more information visit the Career Counseling Office (https://residency.wustl.edu) website.

List of Advisers

Tessa Madden, MD, MPH (http://bircwh.im.wustl.edu/tessa-madden-m-d-m-p-h)

Evan Schwarz, MD (http://emed.wustl.edu/schwarz_evan/Biography.aspx)

Yumi Turmelle, MD, MPH (http://pediatrics.wustl.edu/Faculty/turmelle_y)

Kathy Diemer, MD, Assistant Dean for Career Counseling (https://residency.wustl.edu)

Eva Aagaard, MD, Senior Associate Dean for Education (https://medicine.wustl.edu/news/school-medicine-names-new-leader-medical-education)

Office of Diversity Programs

The mission of the Office of Diversity Programs is to enhance the educational environment through the recruitment of a culturally diverse academic workforce, while preparing a diverse student body to become leaders in a vibrant, global society. By enhancing the diversity of the medical workforce, and improving culturally competent or cross-cultural communication and practice, we can more effectively reduce health inequities.

Our office provides first-year students with an overview of health care and public health in St. Louis through the Washington University Medical Plunge or WUMP. In addition, we facilitate opportunities for students to volunteer in clinics in underserved neighborhoods and engage in service in the community, further enhancing their understanding of culturally sensitive health care. We sponsor and promote a number of community service outreach programs throughout the educational pipeline to introduce students from underrepresented and economically disadvantaged groups to careers in science and medicine. We believe that this pipeline approach is the most successful way to develop students who will assume leadership roles in medicine and public health on a local, national and international level.

For more information on diversity at the School of Medicine, please visit the Office of Diversity Programs website (http://medschooldiversity.wustl.edu).

Housing

Those who are associated with Washington University School of Medicine can find apartments, houses, condos, lofts, and short-term housing that range in price from $700 to $2,200 per month within the immediate area. Apartment Referral Services, located on North Campus, maintains listings of housing appropriate for students, faculty and staff. For information, contact Apartment Referral Services (http://ars.wustl.edu) at CB 1016, 700 Rosedale Ave., St. Louis, MO 63112, or by phone: 314-935-5092 or email (ars@wustl.edu). Visit both Quadrangle Housing (https://quadrangle.wustl.edu) and Parallel Properties (http://rentparallel.com) for more information about Washington University-owned housing options.
• Studio and one-bedroom for $742-1350
• Two-bedrooms for $1268-1863
• Pet policy: Pets are accepted at Bldg. #718

Amenities: 24-hour fitness room, great hall, ping pong, billiards, game room, library, music room, media room, interior and exterior bike storage, study lounge, conference room, outdoor courtyards, 4th floor outdoor terrace. Common kitchens are available for resident events and/or dinner parties.

Parking (monthly): Surface parking available through WUSM Transportation
Walking: On-campus

Coming August 2018, experience vibrant apartment living at The Core Apartment Residences on the Washington University in St. Louis Medical Campus. The Core is comprised of two buildings with 160 apartments consisting of studios, one-bedrooms and two-bedrooms. Each apartment is designed and constructed with displays that reflect the unique living needs of our residents — including a full bath and kitchen, and a washer and dryer. Rents are “all in” with pricing that includes furniture, internet, cable and utilities!

For more information, visit the Core Apartment Residences website (https://www.rentcafe.com/apartments/mo/st.-louis/the-core-apartment-residences).

For short term options and additional details, please contact the leasing adviser at 314-362-3230 or by email (olinresidence@wusm.wustl.edu).

Office of Education

The mission of Washington University School of Medicine (https://medicine.wustl.edu/about/mission) is to lead in advancing human health through the best clinical care, innovative research, and the education of tomorrow’s leaders in biomedicine in a culture that supports diversity, inclusion, critical thinking and creativity.

The Office of Education (https://education.med.wustl.edu) supports the medical school’s teaching mission.

We represent and advocate for medical education while supporting leadership and programmatic development in education, educational scholarship and administration.

Our Role and Services

We support medical education at every level, from undergraduate through professional, in the following key areas:

• Educational resources: The Office of Education serves as the umbrella office for major teaching resources that are shared across medical education programs.
• Consulting resources: The office also includes a number of experts who serve as shared resources for the education programs throughout the school. This group includes individuals with expertise in project management, curriculum development and assessment, educational outcomes, education research and faculty development.
• Education scholarship (https://education.med.wustl.edu/research-scholarship): Faculty throughout the school have indicated growing interest for a career as a clinician educator. Such educators are typically junior faculty with creative ideas for curricular innovation but without expertise for the relevant scholarship.

Office of Medical Student Education

The Office of Medical Student Education (https://md.wustl.edu/contact/medical-student-education) (OMSE) oversees the curriculum for the MD program at Washington University School of Medicine.

Our mission is to cultivate the best environment in which medical education and instruction can flourish. To achieve this, our office:

• Provides support to enhance the administrative, technical, and professional expertise of faculty and staff.
• Provides the necessary resources to create a collaborative and amiable environment that allows students and faculty to excel in teaching and learning.
• Monitors local and national environments to inform continuous development.
• Continuously searches for new ways to strengthen and expand faculty and curriculum development programs and implement innovative teaching initiatives.

Office of Student Financial Planning

The Office of Student Financial Planning is dedicated to providing personalized assistance regarding the unique financial needs of students at the School of Medicine.

Students of programs contained within the School of Medicine can apply for financial aid through our office and see if they qualify, or are eligible, for federal loans and/or institutional aid.

The Office of Student Financial Planning’s staff meets with students one-on-one to discuss aid eligibility, loan repayment and budgeting.

For information about how to apply for aid and about the cost of attendance for individual programs, please visit the Office of Student Financial Planning website (http://finaid.med.wustl.edu).

Parking and Transportation

Transportation Services (http://facilities.med.wustl.edu/parking-transportation) offers campus parking passes, free passes for MetroLink and MetroBus, and access to shared car-sharing services.
Hourly, daily and permit parking is available in the 2300-space Clayton Garage (corner of Clayton and Taylor avenues). To obtain permit parking in the Duncan-Central Garage, you should contact 314-362-3100 and ask to be added to the waiting list. Parking in patient or visitor spaces by faculty, staff or students is strictly prohibited at all times. Parkers must establish parking with the Transportation Department to park in the garages or lots during business hours Monday through Friday, 7 a.m. to 4 p.m. unless paying the hourly Clayton Garage rate.

Additional information, maps and fees are available on the Parking & Transportation pages of the Operations & Facilities Management Department website. Requests for parking information can be directed to the Facilities Integrated Service Center (FISC) on the first floor of Olin Hall.

For those who occasionally drive to the medical school, a Prepaid Debit Pass can be purchased for the Clayton Garage. The debit pass can be purchased in the Clayton Garage on your first entry. Take a ticket and, when exiting, you can purchase a debit pass from the attendant for $10.00. Debit passes can be recharged in the self-service kiosk in the first floor northwest elevator lobby.

Shuttle service is available for transportation from one site to another within the Medical Campus in accordance with specific shuttle schedules. If additional information, maps or shuttle schedules are needed, please visit the Facilities website (http://facilities.med.wustl.edu/parking-transportation).

Students living in the Central West End or Skinker/DeBaliviere neighborhood can ride the dedicated shuttle service during the evening hours. Details can be found on the Shuttles & Maps webpage (https://facilities.med.wustl.edu/parking-transportation/shuttles-maps). Registered full-time students of Washington University, Washington University School of Medicine, or benefits-eligible employees of the same, can register for a Metro Transit Universal Pass (U-Pass (https://parking.wustl.edu/items/metro-transit)) online. There is no charge for the U-Pass.

For those needing a car to run an errand or for overnight, we have a car-sharing program, CarShare (https://parking.wustl.edu/items/enterprise-carshare). Simply apply for membership (https://www.enterprise-carshare.com/us/en/programs/university/washu.html) and within three to five business days after membership approval, a personal smartcard will be issued. Reservations can then be made online.

Protective Services

The School of Medicine is fully dedicated to providing an outstanding learning environment in which students are supported in meeting their individual professional goals. Services include Protective Services (http://facilities.med.wustl.edu/security), which protects the Washington University School of Medicine campus and certain off-campus properties.

Uniformed Protective Services Officers are on duty 24 hours a day, seven days a week to provide for personal safety, reduce the opportunity for crime, apprehend law violators, provide crime prevention and awareness training, and assist in enforcement of university rules and regulations. Armed Response Officers and unarmed Public Safety Officers are radio-dispatched. They respond immediately to telephone calls made to 314-362-4357. Officers patrol the campus on foot, on bicycles, and in marked mobile units. Contract Agency guards staff a few fixed posts to supplement the in-house officers.

The medical school access control program makes the campus accessible after hours and on weekends. Faculty, staff and students are issued a photo identification badge that identifies the wearer as a member of the medical school community.

The badge has a magnetic strip and proximity chip that activates the computerized door lock entrances to the school's buildings. These entrances have two-way intercoms for direct communication with Protective Services Communications Officers, as do direct-ring telephones located outside select campus buildings and “Code Blue” emergency telephones on surface parking lots and in the garages.

Each year, Protective Services publishes a summary of statistical information concerning campus crime, as required by federal law, on the School of Medicine Operations & Facilities Management website, on our Crime Statistics webpage (https://facilities.med.wustl.edu/security/alerts-statistics-sex-crimes-harassment-general-security-tips/crime-statistics). A daily crime log, information on crime prevention tips, and the many services and programs provided by Protective Services also appear on the web. For a printed copy of the annual security report, contact Washington University School of Medicine, Protective Services Department, CB 8207, 660 S. Euclid Ave., St. Louis, MO 63110, or call 314-362-0460. A Safety & Security report (http://police.wustl.edu/clerylogsandreports/Pages/default.aspx) is also available online.

Office of the Registrar

Student Academic Records and FERPA

- A copy of the university policies regarding educational records and the release of student record information (p. 13) may be obtained on the University Policies page of this Bulletin.

Transcripts, Licensure, and Grades

- For more information, please visit the Office of the Medical School Registrar (https://registrar.med.wustl.edu) website.

Registration, Tuition Refunds, and Billing

- Information about tuition (p. 332) is available under the Financial Information section of the Bulletin. For
questions about billing and tuition refunds (https://registrar.med.wustl.edu/registration-and-tuition), please visit the Office of the Medical School Registrar website.

**Academic Calendars**

- Academic calendars (https://registrar.med.wustl.edu/calendars) for MD and Health Profession programs are available on the Office of the Medical School Registrar website.

**Risk Management Office**

**Liability Insurance**

Washington University provides general liability insurance for all students or practicums while participating in required clinical experiences. In addition, Washington University voluntarily provides a defense and indemnification benefit for matriculated students who are candidates for the MD degree at Washington University School of Medicine (WUSM).

The benefit is provided to WUSM students for defense and indemnification of claims arising out of activities which are part of academic programs and only while a student is acting in their capacity as a medical student enrolled in the undergraduate medical program at the School of Medicine. This policy is subject to terms, conditions, limitations and exclusions, and each request for defense/indemnification will be decided on a case-by-case basis at the sole discretion of the university.

Defense/indemnification will not be provided for any criminal acts, acts committed while under the influence, acts in violation of law, or where the injury or damage resulted from intentional malicious conduct or wrongdoing, or in the event that the action or proceeding is brought by or on behalf of Washington University. This indemnification does not cover any liability which is insured elsewhere, but it may be in excess of any amount payable under any other such insurance.

**Reporting An Incident**

Any incident, either actual or alleged, involving patient injury which could lead to a claim, of which you have knowledge, must be reported immediately to the Risk Management Office of the School of Medicine.

**Student Health Services**

Student Health Services (http://wusmhealth.wustl.edu) provides quality medical care, including preventive services, for all students and their covered family members.

**Director:** Karen S. Winters, MD

**Information/Appointments:** 314-362-3523

**Billing/Benefits:** 314-362-2346

For a complete description of benefits, please visit the Student Health Services (http://wusmhealth.wustl.edu) website.

Student Health Services provides a complete service for full-time students registered in the Washington University School of Medicine (WUSM). WUSM Student Health Services provides preventative and therapeutic health benefits through a mandatory self-funded program of services available to all full-time medical degree-seeking students and their eligible dependents. The goal of Student Health Services is to deliver efficient, accessible, high-quality essential medical care in order to prevent and treat health problems that may interfere with a student’s education and professional goals while attending WUSM.

Student Health Services is under the direction of Karen S. Winters, MD. Benefits provided through this service include: ambulatory patient services, emergency services, ambulance services, hospitalization, maternity and newborn care, on- and off-campus mental health, including behavioral health treatment, prescription drugs, allergy services, physical therapy services, dermatology services, rehabilitative and habilitative services and devices, laboratory service, x-rays, preventive and wellness services, and chronic disease management, vision and dental care, and pediatric services. Students also receive disability and life insurance. Most medical care will be provided at no cost, except for applicable deductibles or co-pays.

Student Health Services is a multidisciplinary facility conveniently located on campus and dedicated to providing quality health care to WUSM students and their covered family members. The well-qualified staff consists of physicians, nurses, psychologists, and other medical support personnel. Student Health Services offers easy access to medical and psychiatric care so that physical and emotional problems will not interfere with university life.

The Office of Health Services is open Monday through Friday from 8:00 a.m. to 4:00 p.m. Student Health Services is closed on Saturdays, Sundays, and university holidays. Services are available by appointment at 4525 Scott Ave., Suite 3420. Health Services offers an after-hour phone service monitored by Dr. Winters. Students may call 314-362-3526 after hours for non-urgent care.

There are no lifetime or annual limits on Essential Health Benefits that the Student or Covered Dependent may claim from Student Health Services. However, covered services that are Non-Essential Health Benefits are subject to a $2,000,000 per person annual benefit limit on all benefits covered by Student Health Services. Once students have reached the annual benefit limit, they will be responsible for 100 percent of all Non-Essential Health Benefits. The responsibility of Student Health Services for hospitalization and emergency care will end 30 days after an individual ceases to be an officially enrolled student.

Health Services pre-screens every incoming student prior to their arrival at the school to ensure all federal requirements have been met regarding communicable diseases. Entering students are required to have a medical examination and two-step tuberculosis testing or Interferon-Gamma Release
forms for the student to complete. However, students will be officially covered by WUSM Student Health Services. There are no enrollment deadlines.

In addition to the benefit provided by Student Health Services, students are provided with a prepaid dental plan through Assurant, now Sun Life Financial. All full-time students are eligible for dependents, will be covered by a prepaid dental plan through participating general dentists in Sun Life Financial network before October 1 of the academic year. Students can use their benefits for family members as well for the yearly premium; consult the Student Health Benefit office for details.

**Dental Care**

Benefits provided by Student Health Services for injury to a sound natural tooth only. Coverage for injury to a sound natural tooth is 100 percent of the first $300 of expenses, and 80 percent of the balance, not to exceed $1,000 as a result of any one accident. Student Health Services will provide a list of private dentists upon request.

Assays within three months starting school (matriculation) and to provide documentation of two MMR vaccines or two doses of Measles vaccine, two doses of Mumps vaccine and one dose of Rubella vaccine or Serologic proof of immunity for Measles, Mumps and Rubella, documentation of two doses of Varicella vaccine or copy of lab result of a positive Varicella IgG antibody, documentation of two doses of the Hepatitis B vaccine and positive Quantitative Hepatitis B Surface antibody, and tetanus-diphtheria (Tdap; at least one dose required since 2005). Health Services tracks all immunizations during and prior to enrollment. Statements of Health for internships and practicums are provided.

**Spouses, Dependents**

Students may enroll their eligible dependents in Student Health Services by paying an additional Student Health Services access fee. Students may enroll dependents into this program only at the following times: at the time the student enrolls in WUSM (at student matriculation), or within thirty-one (31) days of a Qualifying Event. If a student elects to enroll their eligible dependents at matriculation, coverage for dependents will become effective on the same date the covered student's benefits become effective, provided enrollment for the dependents occurs on or before the deadline. No enrollment for dependents is allowed after the deadline unless a Qualifying Event occurs. Dependent coverage terminates when the student's coverage terminates or when the dependent no longer meets the definition of a Dependent as described above, if earlier.

All eligible full-time students registered in the medical and allied professional schools of the Medical Campus, and their enrolled dependents, will be covered by a prepaid dental plan through Assurant, now Sun Life Financial. All full-time students are covered automatically, with the coverage premium paid for by WUSM Student Health Services. There are no enrollment forms for the student to complete. However, students will not officially have coverage until a participating dentist is selected. To select a participating dentist, the student may call Sun Life Customer Service at 800-380-6347 or visit the Sun Life website (https://www.slfserviceresources.com). Students must select a participating general dentist in Sun Life Financial network before they can use their benefits. This plan is available to a student's family members as well for the yearly premium; consult the Student Health Benefit office for details.

**Counseling Services**

Students at the medical school may have concerns over poor concentration, ineffective study habits, anxiety over their performance, low self-esteem, relationships, grief or depression. The psychiatry and clinical psychology staff members are available to help students cope with these concerns. Initial evaluations are made at Student Health Services. Subsequent care may be at the Medical Campus or a designated physician's office. Call 314-362-2404 for more information. All records are confidential and may not be reviewed by anyone without the student's written consent.

In addition, Student Health Services provides a Student Assistance Program (SAP) for all enrolled students and their immediate family members. This prepaid benefit is offered as a way to help our students resolve issues that may have an impact upon their personal lives and their school performance.

The SAP provides confidential, professional assistance to full-time enrolled students and their family members to help resolve problems that are affecting their personal life or school performance. The program is managed by ENI, a nationally known professional consulting firm specializing in SAP services. Students can contact ENI 24 hours a day, seven days a week to arrange a confidential appointment with an SAP specialist. SAP specialists have professional training and expertise in a wide range of issues such as academic problems, eating disorders, credit problems, adjusting to school, marriage and family problems, alcohol and drug abuse, emotional and psychological concerns, financial difficulties, stress and much more.

An SAP can be reached by calling 800-327-2255 and selecting prompt #3.

**Disability Insurance**

All students are covered by group disability insurance. A student who is completely disabled for six consecutive months is eligible to receive $500 per month benefit. Coverage increases to $1,500 per month in the third year. Individual disability policies are issued to fourth-year students, increasing the total monthly benefit to $2,000. Individual policies are portable, guaranteed issue and can be increased after graduation up to a maximum $4,700 per month benefit. Call 314-362-2346 for more information.

**Life Insurance**

All eligible full-time students registered in the Washington University medical school and allied professional schools are covered automatically, premium paid for by WUSM Student Health Services. An enrollment form listing the student's beneficiaries is required to complete enrollment. In brief, the term life insurance plan and AD&D plan for medical students and affiliated programs provided by Standard Insurance Company is as follows: term life plan provides $10,000 of term...
life insurance and the AD&D plan $10,000 of accidental death and dismemberment protection. A detailed description of the plan is available at Student Health Services.
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