

# James S. McDonnell Department of Genetics

The Department of Genetics (<http://genetics.wustl.edu>) is at the forefront of the rapidly developing field known as genomic (or personalized) medicine, in which genetic and epigenetic analysis coupled with clinical information enables treatments to be tailored specifically to the individual patient. The rapid evolution of sequencing technologies, genome engineering, automated cellular imaging and mass spectrometry methods to rapidly perform proteomic and metabolomics studies, coupled with powerful computational tools, is revolutionizing the biological sciences. Investigators in the department are developing new methods of genomic analysis — including technology and software, epigenomics and copy number variation as well as studies of disease pathways using model organisms — to identify and study the genes responsible for human disease and treatment responses.

The department supports a broad program of preclinical and graduate instruction in genetics, with research opportunities that include 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>

## Faculty

### **Jeffrey Milbrandt, MD, PhD** (<http://milbrandt.wustl.edu/>)

James S. McDonnell Professor and Head of Genetics  
Executive Director, McDonnell Genome Institute  
Co-Director Needleman Center for Neurometabolism and Axonal Therapeutics

### **Michael Province, PhD** (<http://genetics.wustl.edu/staff-members/michael-province/>)

Director, Division of Statistical Genomics

### **Rich Head, MS** (<http://genetics.wustl.edu/staff-members/rich-head/>)

Director, Genome Technology Access Center at McDonnell Genome Institute (GTAC@MGI)

### **Xiaoxia Cui, PhD** (<http://genetics.wustl.edu/staff-members/xiaoxia-cui-phd-ms/>)

Director, Genome Engineering and iPSC Center

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

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## A

### **Lucinda L. Antonacci-Fulton, M.S.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Science, Southern Illinois University Edwardsville, 1991  
Master of Science, Southern Illinois University Edwardsville, 1992

## B

### **Ruteja A. Barve, M.S., Ph.D.**

Instructor in Genetics (primary appointment)  
Bachelor of Science, University of Pune, 1995  
Master of Science, Washington University in St Louis, 2008  
Doctor of Philosophy, Washington University in St Louis, 2014

### **John Rutledge Bermingham, Ph.D.**

Associate Professor of Genetics (primary appointment)  
Bachelor of Science, Yale University, 2016  
Doctor of Philosophy, University of Colorado Boulder, 2016

### **Adam J. Bloom, Ph.D.**

Associate Professor of Genetics (primary appointment)  
Assistant Professor of Anesthesiology  
Bachelor of Science, University of California Berkeley, 1997  
Doctor of Philosophy, Washington University in St Louis, 2006

### **Ingrid B Borecki, M.S., Ph.D.**

Adjunct Professor of Genetics  
Champaign, 1977  
Master of Science, University of Hawaii (Duplicate of University of Hawaii at Manoa), 1980  
Doctor of Philosophy, University of Hawaii (Duplicate of University of Hawaii at Manoa), 1981

**William James Buchser, Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Music, University of Miami, 2002  
Doctor of Philosophy, University of Miami, 2009

**Thomas Patrick Burris, Ph.D.**

Adjunct Professor of Genetics  
Doctor of Philosophy, Florida State University, 1993

**C**

**Paul F Cliften, M.S., Ph.D.**

Associate Professor of Genetics (primary appointment)  
Bachelor of Science, Utah State University, 1992  
Master of Science, Utah State University, 1995  
Doctor of Philosophy, University of California, 1999

**Barak Alon Cohen, Ph.D.**

Professor of Genetics (primary appointment)  
Alvin Goldfarb Distinguished Professor of Computational Biology  
Bachelor of Science, Cornell University, 1992  
Doctor of Philosophy, Harvard University, 1998

**Donald Franklin Conrad, M.S., Ph.D.**

Adjunct Associate Professor of Genetics  
Bachelor of Science, Dartmouth College, 1999  
Doctor of Philosophy, University of Chicago, 2007  
Master of Science, Stanford University, 2017

**Seth Daniel Crosby, M.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Science, University of California, 1984  
Doctor of Medicine, University of Texas San Antonio, 1989

**Xiaoxia Cui, M.S., Ph.D.**

Associate Professor of Genetics (primary appointment)  
Bachelor of Science, Nanjing University, 2017  
Master of Science, University of Alabama, 2017  
Doctor of Philosophy, University of Texas Austin, 2017

**D**

**Joseph D Dougherty, Ph.D.**

Professor of Genetics (primary appointment)  
Professor of Psychiatry  
Bachelor of Science, Truman State University, 1999  
Doctor of Philosophy, University of California, 2005

**Todd Druley, Ph.D., M.D.**

Associate Professor of Genetics  
Associate Professor of Developmental Biology  
Bachelor of Science, University of Illinois, 1994  
Doctor of Philosophy, University of Illinois Chicago, 2002  
Doctor of Medicine, University of Illinois Chicago, 2002

**Susan K. Dutcher, Ph.D.**

Professor of Genetics (primary appointment)  
Professor of Cell Biology and Physiology  
Bachelor of Arts, Colorado College, 1974  
Doctor of Philosophy, University of Washington, 1980

**F**

**Justin C. Fay, Ph.D.**

Adjunct Associate Professor of Genetics  
Doctor of Philosophy, University of Chicago, 2001

**Robert S. Fulton, M.S.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Arts, Southern Illinois University Edwardsville, 1990  
Master of Science, Southern Illinois University Edwardsville, 1997

**H**

**Richard D Head, M.S.**

Professor of Genetics (primary appointment)  
Professor of Pathology and Immunology  
Master of Science, Southern Illinois University, 1992

**Paul Hime, Ph.D.**

Instructor in Genetics (Pending Dean's Approval) (primary appointment)  
Bachelor of Arts, Washington University in St Louis, 2004  
Doctor of Philosophy, University of Kentucky, 2017

**J**

**Sheng-Chih Jin, M.S., Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Assistant Professor of Pediatrics  
Master of Science, Johns Hopkins University, 2008  
Doctor of Philosophy, Washington University in St Louis, 2014  
Bachelor of Science, National Chiao Tung University, 2019

**L**

**Haluk Lacin, Ph.D.**

Instructor in Genetics (primary appointment)  
Bachelor of Science, Bogazici University, 2003  
Doctor of Philosophy, Washington University in St Louis, 2010

**Heather A Lawson, M.A., Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Arts, University of Wisconsin Milwaukee, 2002  
Master of Arts, Pennsylvania State University, 2004  
Doctor of Philosophy, Pennsylvania State University, 2008

**Daofeng Li, Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Science, China Agriculture University, 2005  
Doctor of Philosophy, China Agriculture University, 2011

**Tina Ann Lindsay, M.A.**

Instructor in Genetics (primary appointment)  
Bachelor of Science, Missouri State University (Formerly Southwest Missouri State), 1993  
Master of Arts, Southern Illinois University, 1996

**M**

**Xianrong Mao, M.S., Ph.D.**

Instructor in Genetics (primary appointment)  
Bachelor of Science, Lanzhou University, 1993  
Master of Science, Chinese Academy of Sciences, 1996  
Doctor of Philosophy, University of Arkansas, 2001

**Brett Burkard Maricque, Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Science, University of Wisconsin Madison, 2010  
Doctor of Philosophy, Washington University in St Louis, 2016

**James P Mc Carter, Ph.D., M.D.**

Adjunct Professor of Genetics  
Bachelor of Arts, Princeton University, 1989  
Doctor of Philosophy, Washington University in St Louis, 1998  
Doctor of Medicine, Washington University in St Louis, 1998

**Jeffrey D Milbrandt, Ph.D., M.D.**

Professor of Genetics (primary appointment)  
Professor of Medicine  
Professor of Neurology  
Professor of Pathology and Immunology  
Head of the Department of Genetics  
Executive Director of the McDonnell Genome Institute  
James S McDonnell Professor of Genetics  
Bachelor of Science, University of Nebraska at Kearney, 1974  
Doctor of Medicine, Washington University in St Louis, 1978  
Doctor of Philosophy, University of Virginia, 1983

**Robi D. Mitra, Ph.D.**

Professor of Genetics (primary appointment)  
Alvin Goldfarb Distinguished Professor of Computational Biology  
Doctor of Philosophy, Massachusetts Institute of Technology, 2000

**Shamim Ara Mollah, Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Doctor of Philosophy, University of California San Diego, 2019

**P**

**Zachary Scott Pincus, Ph.D.**

Voluntary Research Assistant Professor of Genetics  
Bachelor of Science, Stanford University, 2002  
Doctor of Philosophy, Stanford University, 2007

**Michael A Province, M.A., Ph.D.**

Professor of Genetics (primary appointment)  
Professor of Biostatistics  
Bachelor of Arts, University of Dallas, 1973  
Master of Arts, Washington University in St Louis, 1979  
Doctor of Philosophy, Washington University in St Louis, 1987

**S**

**Nancy L. Saccone, M.S., Ph.D.**

Associate Professor of Genetics (primary appointment)  
Associate Professor of Biostatistics  
Bachelor of Arts, University of California, 1988  
Master of Science, Brown University, 1990

Doctor of Philosophy, Brown University, 1993

**Yo Sasaki, M.S., Ph.D.**

Professor of Genetics (primary appointment)  
Bachelor of Science, Tokyo University of Agriculture & Technology, 1991  
Master of Science, Tokyo University of Agriculture & Technology, 1994  
Doctor of Philosophy, Gunma University, Med School, 1997

**Tim B Schedl, Ph.D.**

Professor of Genetics (primary appointment)  
Bachelor of Arts, Lawrence University, 1977  
Doctor of Philosophy, University of Wisconsin Madison, 1984

**Cherilynn Maria Reynolds Shadding, Ph.D.**

Adjunct Assistant Professor of Genetics  
Doctor of Philosophy, Meharry Medical College, 2002

**James B Skeath, Ph.D.**

Professor of Genetics (primary appointment)  
Bachelor of Arts, Haverford College, 1988  
Doctor of Philosophy, University of Wisconsin Madison, 1993

**Gary D Stormo, M.A., Ph.D.**

Professor of Genetics (primary appointment)  
Professor of Biomedical Engineering  
Professor of Computer Science  
Joseph Erlanger Professor  
Bachelor of Science, California Institute Technology, 1972  
Master of Arts, University of Colorado Boulder, 1975  
Doctor of Philosophy, University of Colorado Boulder, 1981

**T**

**Tychele Naomi Turner, Ph.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Science, Michigan State University, 2008  
Doctor of Philosophy, Johns Hopkins University Medical, 2014

**W**

**Ting Wang, M.S., Ph.D.**

Professor of Genetics (primary appointment)  
Professor of Computer Science and Engineering  
Professor of Biostatistics  
Sanford and Karen Loewentheil Distinguished Professor of Medicine  
Master of Science, Washington University in St Louis, 2001  
Doctor of Philosophy, Washington University in St Louis, 2006

**Michael Aaron White, M.S., Ph.D.**

Associate Professor of Genetics (primary appointment)  
Bachelor of Arts, Brigham Young University, 2000  
Master of Science, University of Rochester, 2004  
Doctor of Philosophy, University of Rochester, 2006

**Mary Kaye Wojczynski, M.P.H., Ph.D.**

Associate Professor of Genetics (primary appointment)  
Stevens Point, 1995

Master of Public Health, Emory University, 1999  
Doctor of Philosophy, University North Carolina, 2006

## Y

### **Jinsheng Yu, M.S., Ph.D., M.D.**

Assistant Professor of Genetics (primary appointment)  
Bachelor of Science, Tongji University, 1984  
Master of Science, Tongji University, 1995  
Doctor of Philosophy, Tongji University, 1998  
Doctor of Medicine, Tongji University, 1998

## Z

### **Xiaoyu Zhuo, Ph.D.**

Instructor in Genetics (primary appointment)  
Doctor of Philosophy, University of Utah, 2016

## Research Electives

### Genetics Research Electives

During the fourth year, opportunities exist for many varieties of advanced clinical or research experiences.

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### **Barak Cohen, PhD**

Couch Biomedical Research Building, Room 4308  
Phone: 314-362-3674  
cohen@wustl.edu

Functional genomics in yeast; gene regulatory networks, complex trait genetics, and synthetic biology studies of cis-regulation.

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### **Joseph Dougherty, PhD**

Couch Biomedical Research Building, Room 6316  
Phone: 314-286-0752  
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 disorders, particularly those that mimic genetic variations that we have identified in human patient populations, with the goal of trying to understand the cellular and molecular underpinnings of these disorders.

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### **Susan K. Dutcher, PhD**

Couch Biomedical Research Building, Room 5301  
Phone: 314-362-2765  
dutcher@wustl.edu

Studies of the role of centrioles and basal bodies in ciliary signaling, assembly, and motility using molecular genetics and computational and biochemical approaches.

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### **Sheng Chih (Peter) Jin, PhD**

Couch Biomedical Research Building, Room 5206  
jin810@wustl.edu  
Phone: 314-273-2710

We use human genetic, genomic, and bioinformatic approaches to identify mutations underlying human diseases and their molecular mechanisms.

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### **Tristan (Qingyun) Li, PhD**

McDonnell Medical Sciences Building, 8th Floor  
Phone: 314-273-1422  
qingyunli@wustl.edu

Our lab is broadly interested in neuroimmunology, with a focus on microglial biology. We combine cutting-edge, single-cell genomic technologies with in vitro and in vivo genetic, molecular, and cellular tools to investigate microglial functions in the establishment of the nervous system as well as how changes in these functions contribute to neurological diseases.

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### **Jeffrey Milbrandt, MD, PhD**

Couch Biomedical Research Building, Room 6306  
Phone: 314-362-4651  
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 the axonal/glia 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, particularly motor neuron diseases like ALS and peripheral neuropathy.

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### **Rob Mitra, PhD**

Couch Biomedical Research Building, Room 4301  
Phone: 314-362-2751  
rmitra@wustl.edu

Our focus is on 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; and (3) developing novel technologies to more efficiently achieve the first two aims.

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**Samantha Morris, PhD**

Couch Biomedical Research Building, Room 3316  
Phone: 314-747-8618  
s.morris@wustl.edu

This lab strives to engineer cell fate to generate clinically valuable cell populations via 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 with cell and developmental biology approaches.

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**Michael A. Province, PhD**

Farrell Learning and Teaching Center (FLTC), 6th floor, Suite 605  
Phone: 314-362-3616  
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.

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**Nancy L. Saccone, PhD**

Farrell Learning and Teaching Center (FLTC), 6th floor, Suite 606  
Phone: 314-747-3263  
nlism@wustl.edu (nlisms@wustl.edu)

Statistical genetics and psychiatric genetics; development and application of analysis methods for studying the genetics of human disease and complex traits.

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**Tim Schedl, PhD**

Couch Biomedical Research Building, Room 5305  
Phone: 314-362-6162  
ts@wustl.edu

Our lab studies 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.

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**James Skeath, PhD**

Couch Biomedical Research Building, Room 6315  
Phone: 314-362-0535  
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 central nervous system.

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**Gary D. Stormo, PhD**

Couch Biomedical Research Building, Room 4208  
Phone: 314-747-5534  
stormo@wustl.edu

Computational biology of protein-DNA interactions, RNA folding, gene and promoter finding; biochemical analysis of DNA-protein interactions and gene regulation.

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**Tychele Turner, PhD**

Couch Biomedical Research Building, Room 5302  
Phone: 314-273-8517  
tychele@wustl.edu

The focus of the Turner laboratory is the discovery and characterization of genetic etiological factors involved in neurodevelopmental disorders. We utilize both computational and experimental approaches to explore this genetic architecture.

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**Ting Wang, PhD**

Couch Biomedical Research Building, Room 5211  
Phone: 314-286-0865  
twang@wustl.edu

Our lab uses genomics and epigenomics approaches to investigate how epigenetic factors determine cell fate. We study cell fate in normal development, differentiation, and regeneration; cell fate in tumorigenesis and epigenetic therapy; and cell fate in evolution.

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## Courses

Visit online course listings to view offerings for M20 Genetics (<https://courses.wustl.edu/CourseInfo.aspx?sch=M&dept=M20>).

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**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 at which genomic and epigenomic tools are being developed is unprecedented. 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 life-long 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 to 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, and so) 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, healthcare 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.

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**M20 Genetics 899 Special Study Genetics**

Special study opportunities are available in the Department of Genetics. If interested, please contact the department for further information.

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