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 (http://bulletin.wustl.edu/medicine/degrees) 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


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.

Stephen L. Johnson, PhD
711 McDonnell Sciences Building
Phone: 314-362-0362
Email: sjohnson@wustl.edu
Growth control and morphogenesis in vertebrate development. Focus on genes and mechanisms affecting proportionate fin growth, fin regeneration and pigment stripe patterning in zebrafish.

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/gial 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: nlims@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.

Faculty

Department Head
Jeffrey D. Milbrandt, MD, PhD

Director, McDonnell Genome Institute
Susan Dutcher, PhD (Interim)

Director, Division of Statistical Genomics
Michael Province, PhD

Director, Genome Technology Access Center
Rich Head, MS

Director, Genome Engineering and iPSC Center
Xiaoxia Cui, PhD

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

A

Ping An, MD
Assistant Professor of Genetics (primary appointment)
MD Shanghai Medical University 1987

B

Ruteja A. Barve, MS, PhD
Instructor in Genetics (primary appointment)
BS University of Pune 1995
MS Washington Univ in St. Louis 2008
PHD Washington Univ in St. Louis 2014

John Rutledge Bermingham Jr, PHD
Associate Professor of Genetics (primary appointment)
BS Yale University 2016
PHD University of Colorado Boulder 2016

Ingrid B Borecki, MS, PHD
Adjunct Professor of Genetics (primary appointment)
MS University of Hawaii 1980
PHD University of Hawaii 1981
BS University of Illinois 1977

William James Buchser, PHD, B MUS
Assistant Professor of Genetics (primary appointment)
PHD University of Miami 2009
B MUS University of Miami 2002

C

Paul F Cliften, PHD, MS
Associate Professor of Genetics (primary appointment)
PHD University of California 1999
BS Utah St University 1992
MS Utah St University 1995

Barak Alon Cohen, PHD
Professor of Genetics (primary appointment)
Alvin Goldfarb Distinguished Professor of Computational Biology
BS Cornell University 1992
PHD Harvard University 1998

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

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

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

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

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

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

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

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

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

Elaine Rene Mardis, PHD
Adjunct Professor of Genetics (primary appointment)
BS University of Oklahoma 1984
PHD University of Oklahoma 1989

James P Mc Carter, PHD, MD
Adjunct Professor of Genetics (primary appointment)
BA Princeton University 1989
PHD Washington Univ in St. Louis 1998
MD 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
BS Univ of Nebraska at Kearney 1974
MD Washington Univ in St. Louis 1978
PHD University of Virginia 1983

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
BS Stanford University 2002
PHD Stanford University 2007

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

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

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

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

**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
BS California Institute Technolo 1972
PHD University of Colorado Boulder 1981
MA University of Colorado Boulder 1975

**W**

**Ting Wang, MS, PHD**
Associate Professor of Genetics (primary appointment)
Associate Professor of Biostatistics
Associate Professor of Computer Science and Engineering
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)
PHD University of Rochester 2006
BA Brigham Young University 2000
MS University of Rochester 2004

**Richard K Wilson, PHD**
Adjunct Professor of Genetics (primary appointment)
PHD University of Oklahoma 1986
BA Miami University 1981

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

**Y**

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

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**Courses**


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**M20 Genetics 900 Research Elective - Genetics**
Research opportunities may be available. If interested, please contact the Department of Genetics.