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 that lead to human birth defects and disease; they also use this knowledge to create improved future therapies. The department takes a broad view of developmental biology, with research groups studying diverse developmental processes (e.g., early embryogenesis, organogenesis, aging) and applying multidisciplinary approaches that include forward and reverse genetics, epigenetics, molecular and chemical methods, 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 also enable the monitoring of cell behaviors in vivo. We are discovering the 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

Faculty

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

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

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

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

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

Sabine Dietmann, MS, PHD
Assistant Professor of Developmental Biology (primary appointment)
Assistant Professor of Medicine
MS University of Frankfurt 1994
PHD University of Berlin 1999

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

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

Aaron N Johnson, PHD
Assistant Professor of Developmental Biology (primary appointment)
PHD Arizona State University 2006
BA Arizona State University 1998

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

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

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

Helen McNeill, BS1, PHD
Professor of Developmental Biology (primary appointment)
Larry J Shapiro and Carol-Ann Uetake-Shapiro Professor
BS1 Ramapo College 1985
PHD Stanford University 1993

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

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

Samantha A Morris, BS1, PHD
Assistant Professor of Developmental Biology (primary appointment)
Assistant Professor of Genetics
BS1 University of London 2002
PHD Cambridge University 2007

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

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

Debabrata Patra, PHD, MS
Associate Professor of Developmental Biology (primary appointment)
BS University of Bombay 1985
PHD University of Pittsburgh 1993
MS University of Bombay 2006

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

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

Jimann Shin, PHD, MS
Instructor in Developmental Biology (primary appointment)
PHD Vanderbilt University 2007
BS Kyung Pook National University 2002
Research in the Department of Developmental Biology occurs in a highly collegial atmosphere and involves interdisciplinary collaborations between the members of the department as well as among investigators from different departments and centers throughout the School of Medicine, the College of Arts & Sciences, and the McKelvey School of Engineering. Developmental biology faculty have leading roles in several research centers, including the Center of Regenerative Medicine (http://devbio.wustl.edu/REGMED/), the Center for the Investigation of Membrane Excitability Diseases (http://cimed.wustl.edu/), the Center for Cardiovascular Research (https://cardiovascularresearch.wustl.edu/), and the Hope Center (https://hopecenter.wustl.edu/). The department has a rich tradition of mentoring undergraduate, graduate and medical students as well as 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
355 McDonnell Medical Sciences Building
Phone: 314-362-1726
Medicinal chemistry of steroids.

Aaron DiAntonio, MD, PhD
6301 Couch Biomedical Research Building
Phone: 314-362-9925
Neurodevelopment, neurodegeneration, and axon regeneration in Drosophila and mouse.

Shin-ichiro Imai, MD, PhD
362A McDonnell Medical Sciences Building
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
3602 Cancer Research Building
Phone: 314-273-1834
Molecular mechanisms of muscle development and regeneration.

Kerry Kornfeld, MD, PhD
3607 Cancer Research Building
Phone: 314-747-1480

Research Electives

Developmental Biology Research Electives

During the fourth year, opportunities exist for many varieties of advanced clinical or research experiences.
Signal transduction during development; zinc metabolism; aging.

Kristen Kroll, PhD
320 McDonnell Medical 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
305 McDonnell Medical Sciences Building
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 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 Medical Sciences Building
Phone: 314-362-7036
Our lab studies the regulation of stem cell biology in development, homeostasis and disease.

Mayssa Mokalled, PhD
3601 Cancer Research Building
Phone: 314-273-1835
Spinal cord injury, degeneration and regeneration in zebrafish and mouse.

Samantha Morris, PhD
3316 Couch Biomedical Research Building
Phone: 314-747-8618
The focus of this lab is on 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 guides 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
3902 South Building
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 Biomedical Research Building
Phone: 314-747-5520
Interindividual variability in aging and lifespan; developmental origins of longevity and adult health; quantitative microscopy and image analysis of C. elegans.

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
3313 Couch Biomedical Research Building
Phone: 314-362-8768
The Theunissen lab seeks to understand the molecular mechanisms that regulate pluripotent stem cell states and to 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.

Tony Tsai, PhD
333 McDonnell Medical Sciences Building
Phone: 314-362-7054
The Tsai lab is interested in control principles of tissue patterning and morphogenesis during embryo development. We seek to understand how cells integrate biochemical and mechanical inputs to make reliable decisions on what cell types they become, where they migrate, and what structure they collectively build.

Andrew Yoo, PhD
361E McDonnell Medical Sciences Building
Phone: 314-362-1811
Cell fate control by microRNAs; neuronal reprogramming to generate human neurons; chromatin controlling factors and genetic pathways that regulate neurogenesis.
Courses

The Department of Developmental Biology also offers courses through the Graduate School. For a full listing of current courses offered, please visit the Washington University online course listings (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L41&crslvl=5:9).

M04 FYSelect 500C Developmental Biology and Disease
Basic Science. Explores connections between basic research in developmental biology and disease. Students are expected to make a presentation based on current literature in the field and participate in class discussions.
Credit 10 units.

M70 MolBio/Pha 900 Research Elective - Molecular Biology and Pharmacology
Research opportunities may be available. If interested, please contact the department of Developmental Biology.