

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.

B

Irving Boime, M.S., Ph.D.

Professor of Developmental Biology (primary appointment)
Professor of Reproductive Biology in Obstetrics and Gynecology
Bachelor of Science, Saint Louis College of Pharmacy, 1964
Master of Science, Purdue University, 1966
Doctor of Philosophy, Washington University in St Louis, 1970

Angela N Bowman, Ph.D.

Associate Professor of Developmental Biology (primary appointment)
Bachelor of Arts, University of Pennsylvania, 2006
Doctor of Philosophy, Stanford University, 2012

C

Douglas Floyd Covey, M.A., Ph.D.

Professor of Pharmacology in Developmental Biology (primary appointment)
Professor of Psychiatry
Professor of Anesthesiology
Andrew C and Barbara B Taylor Distinguished Professor of Psychiatry
Bachelor of Science, Loyola College, 1967
Master of Arts, Johns Hopkins University, 1969
Doctor of Philosophy, Johns Hopkins University, 1973

D

Aaron DiAntonio, M.Phil., Ph.D., M.D.

Professor of Developmental Biology (primary appointment)
Alan A and Edith L Wolff Professor of Developmental Biology
Bachelor of Arts, Harvard University, 1988
Master of Philosophy, Cambridge University, 1989
Doctor of Philosophy, Stanford University, 1995
Doctor of Medicine, Stanford University, 1995

Sabine Dietmann, M.S., Ph.D.

Assistant Professor of Developmental Biology (primary appointment)
Assistant Professor of Medicine
Master of Science, Goethe University, 1994
Doctor of Philosophy, Freie Universität Berlin, 1999

G

Geoffrey John Goodhill, Ph.D.

Professor of Developmental Biology (primary appointment)

Professor of Neuroscience
Doctor of Philosophy, University of Sussex, 1992

H

Tracey O Hermanstyne, Ph.D.

Assistant Professor of Developmental Biology (primary appointment)
Lecturer in the College of A&S
Doctor of Philosophy, University of Maryland Baltimore, 2012

Didier Hodzic, Ph.D.

Associate Professor of Developmental Biology (primary appointment)
Assistant Professor of Cell Biology and Physiology
Bachelor of Science, University of Liege, 1991
Doctor of Philosophy, University of Liege, 1998

I

Shin-ichiro Imai, Ph.D., M.D.

Professor of Developmental Biology (primary appointment)
Professor of Medicine
M and T Tanaka Family Distinguished Professorship in Aging Research
Doctor of Medicine, Keio University, 1989
Doctor of Philosophy, Keio University, 1995

J

Aaron N Johnson, Ph.D.

Assistant Professor of Developmental Biology (primary appointment)
Bachelor of Arts, Arizona State University, 1998
Doctor of Philosophy, Arizona State University, 2006

K

Stephen K Kornfeld, Ph.D., M.D.

Professor of Developmental Biology (primary appointment)
Bachelor of Arts, Yale University, 1984
Doctor of Philosophy, Stanford University, 1991
Doctor of Medicine, Stanford University, 1991

Kristen Louise Kroll, Ph.D.

Professor of Developmental Biology (primary appointment)
Adjunct Instructor
Bachelor of Arts, Northwestern University, 1988
Doctor of Philosophy, University of California Berkeley, 1994

L

Yangjian Liu, M.S., Ph.D.

Instructor in Developmental Biology (primary appointment)
Bachelor of Science, Nanjing University, 1998
Master of Science, Chinese Academy of Sciences, 2002
Doctor of Philosophy, John Hopkins University, 2006

M

Helen McNeill, Ph.D.

Professor of Developmental Biology (primary appointment)
Larry J Shapiro and Carol-Ann Uetake-Shapiro Professor
Bachelor of Science, Ramapo College, 1985
Doctor of Philosophy, Stanford University, 1993

Craig Anthony Micchelli, Ph.D.

Associate Professor of Developmental Biology (primary appointment)
Bachelor of Science, University of Wisconsin Madison, 1993
Doctor of Philosophy, University of Wisconsin Madison, 1999

Mayssa Mokalled, M.S., Ph.D.

Assistant Professor of Developmental Biology (primary appointment)
Bachelor of Science, American University of Beirut, 2003
Master of Science, American University of Beirut, 2005
Doctor of Philosophy, University of Dallas, 2010

Samantha A Morris, Ph.D.

Associate Professor of Developmental Biology (primary appointment)
Associate Professor of Genetics
Bachelor of Science, University of London, 2002
Doctor of Philosophy, Cambridge University, 2007

N

Philip Needleman, M.S., Ph.D.

Adjunct Professor of Molecular Biology and Pharmacology
Bachelor of Science, School Not Listed, 1960
Master of Science, School Not Listed, 1962
College Park), 1964

O

David M Ornitz, Ph.D., M.D.

Professor of Developmental Biology (primary appointment)
Alumni Endowed Professor of Developmental Biology
Bachelor of Science, University of California Davis, 1981
Doctor of Philosophy, University of Washington, 1987
Doctor of Medicine, University of Washington, 1988

P

Debabrata Patra, M.S., Ph.D.

Associate Professor of Developmental Biology (primary appointment)
Bachelor of Science, University of Bombay, 1985
Doctor of Philosophy, University of Pittsburgh, 1993
Master of Science, University of Bombay, 2005

R

John K. Russell

Professor Emeritus of Developmental Biology

John Hall Russell, Ph.D.

Professor Emeritus of Developmental Biology
Bachelor of Science, Juniata College, 1968
Doctor of Philosophy, Washington University in St Louis, 1974

S

Diane S Sepich, Ph.D.

Assistant Professor of Developmental Biology (primary appointment)

Bachelor of Science, University of San Diego, 1981

Doctor of Philosophy, University of Oregon, 1994

Jimann Shin, M.S., Ph.D.

Instructor in Developmental Biology (primary appointment)

Bachelor of Science, Kyung Pook National University, 2002

Master of Science, Kyung Pook National University, 2004

Doctor of Philosophy, Vanderbilt University, 2007

Lilianna Solnica-Krezel, M.S., Ph.D.

Professor of Developmental Biology (primary appointment)

Head of the Department of Developmental Biology

Alan A and Edith L Wolff Professor of Developmental Biology

Master of Science, Medical University of Warsaw, 1985

Doctor of Philosophy, University of Wisconsin Madison, 1991

T

Thorold W Theunissen, M.A., Ph.D.

Assistant Professor of Developmental Biology (primary appointment)

Bachelor of Arts, Harvard, 2007

Master of Arts, Cambridge University, 2008

Doctor of Philosophy, Cambridge University, 2011

Yu-Chen Tony Tsai, Ph.D.

Assistant Professor of Developmental Biology (primary appointment)

Doctor of Philosophy, Stanford University, 2013

W

Spencer Gaffney Willet, Ph.D.

Instructor in Developmental Biology (primary appointment)

Bachelor of Science, University of Tennessee, 2007

Doctor of Philosophy, Vanderbilt University, 2014

Y

Yongjun Yin, Ph.D.

Instructor in Developmental Biology (primary appointment)

Doctor of Philosophy, Hebrew University, 2004

Andrew Seungjo Yoo, M.S., Ph.D.

Professor of Developmental Biology (primary appointment)

Bachelor of Science, McGill University, 1995

Master of Science, University of British Columbia, 1997

Doctor of Philosophy, Columbia University, 2005

Z

Bo Zhang, Ph.D.

Associate Professor of Developmental Biology (primary appointment)

Bachelor of Science, Inner Mongolia University, 2004

Doctor of Philosophy, Chinese Academy of Sciences, 2011

Research Electives

Developmental Biology Research Electives

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

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 (<https://regenerativemedicine.wustl.edu/>), the Center for the Investigation of Membrane Excitability Diseases (<https://sites.wustl.edu/cimed/>), 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

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 College of Arts & Sciences. 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.
