Committee on Development, Regeneration, and Stem Cell Biology

Chair
- Ilaria Rebay

Professors
- John Cunningham, Pediatrics
- Glyn Dawson, Pediatrics
- Wei Du, Ben May Department for Cancer Research
- Richard Fehon, Molecular Genetics & Cell Biology
- Edwin Ferguson, Molecular Genetics & Cell Biology
- Yoav Gilad, Human Genetics
- Michael Glotzer, Molecular Genetics & Cell Biology
- William Green, Neurobiology
- Elizabeth Grove, Neurobiology
- Robert Haselkorn, Molecular Genetics & Cell Biology
- Robert Ho, Organismal Biology & Anatomy
- Bruce Lahn, Human Genetics
- Victoria Prince, Organismal Biology & Anatomy
- Ilaria Rebay, Ben May Department for Cancer Research
- Marsha Rosner, Ben May Department for Cancer Research
- Nancy Schwartz, Pediatrics
- Neil Shubin, Organismal Biology & Anatomy
- Kevin White, Human Genetics

Associate Professors
- Sally Horne-Badovinac, Molecular Genetics & Cell Biology
- Akira Imamoto, Ben May Department for Cancer Research
- Barbara Kee, Pathology
- David Kovar, Molecular Genetics & Cell Biology
- Kay Macleod, Ben May Department for Cancer Research
- Jocelyn Malamy, Molecular Genetics & Cell Biology
- Ivan Moskowitz, Pediatrics
- Clifton Ragsdale, Neurobiology
- Urs Schmidt-Ott, Organismal Biology & Anatomy

Assistant Professors
Committee on Development, Regeneration, and Stem Cell Biology

- Jill de Jong, Pediatrics
- Vincent Lynch, Human Genetics
- Ed Munro, Molecular Genetics & Cell Biology
- Donald VanderGriend, Medicine
- Xiaoyang Wu, Ben May Department for Cancer Research

Emeritus Faculty
- Martin Gross, Pathology
- Anthony Mahowald, Molecular Genetics & Cell Biology
- Manfred Ruddat, Ecology & Evolution

Program of Study

First Year

The first year of graduate study is spent in coursework, independent reading, and exploratory research. Three courses constitute a full schedule for each quarter of the first year; the schedule typically includes three lecture courses or two lecture courses and a research rotation. Students are required to undertake laboratory rotations in at least two different laboratories before beginning their dissertation research. Three rotations are encouraged. These rotations can be performed during the first academic year or during Summer Quarter.

Seminars given by invited speakers are regularly offered and students are strongly urged to attend. A separate series of meetings is presented in the Autumn and Winter quarters by faculty to introduce students to their research. Before beginning their second year, students complete Part I of the candidacy examinations: over a period of several weeks, students prepare an original research proposal based upon data in the current literature; the written proposal is then presented orally before an examining committee of faculty.

Second year

While coursework can continue during the second year, students spend much of their time developing a research project. Students have generally chosen research advisors by the beginning of the second year. By the end of Winter Quarter of the second year, each student’s doctoral committee is named. The student then prepares a written proposal for dissertation research and defends this proposal before the doctoral committee. This defense constitutes Part II of the candidacy examination. This examination must be completed by the end of Spring Quarter of the second academic year.

Advanced years

After the qualifying exam, the student works full time on thesis research, although the faculty urges students to continue to take advantage of the advanced courses and seminars that are offered. Finally, each graduating student writes a dissertation describing his or her research, presents the work in a public seminar, and defends it before their doctoral committee.

Evaluation
Throughout their term as graduate students, students are expected to have frequent informal conversations with professors in their courses, their research advisor, and members of their doctoral committees. In this way, students can obtain frequent appraisals of their progress and constructive advice.

Formal evaluation of each student’s progress continues every academic year. In the first and second years, the evaluation is based on the student’s performance in courses, laboratory rotations and the qualifying examination. In later years, the research advisor and doctoral committee oversee the student’s dissertation research progress; a report is submitted after the yearly meeting that becomes part of the student’s permanent file. If there are any deficiencies in performance, the student will receive a letter describing those deficiencies and making suggestions about how to remedy them.

Admissions

For information about applying to our graduate program, please visit our website at http://molbio.bsd.uchicago.edu/index.php.

Requirements for the Ph.D. Degree

A Ph.D. candidate must fulfill certain formal course work requirements, pass the qualifying examination, and present a satisfactory dissertation describing the results of original research.

The committee expects a knowledge of and proficiency in contemporary developmental biology as well as auxiliary fields of molecular biology, cell biology, and genetics. This requirement will normally be met by fulfilling the formal course work listed below. However, courses taken at other institutions, in other departments, or as part of the medical school curriculum may substitute for required committee courses with the approval of the curriculum committee.

Formal Course Work

The Biological Sciences Division requirement of nine graded course units may be met by registering for a combination of formal courses and up to two graded laboratory rotations. During the first year of graduate work students ordinarily complete one course in molecular biology, one in cell biology, one in genetics, and three courses in developmental biology.

Developmental Biology Courses

DVBI 33850. Evolution and Development. 100 Units.

The course will provide a developmental perspective on animal body plans in phylogenetic context. The course will start with a few lectures, accompanied by reading assignments. Students will be required to present a selected research topic that fits the broader goal of the course and will be asked to submit a referenced written version of it after their oral presentation. Grading will be based on their presentation (oral and written) as well as their contributions to class discussions.

Instructor(s): U. Schmidt-Ott
Terms Offered: Autumn
Prerequisite(s): Advanced undergraduates may enroll with the consent of the instructor.
Equivalent Course(s): ORGB 33850, BIOS 22306, EVOL 33850
DVBI 35600. Vertebrate Development. 100 Units.
This advanced-level course combines lectures, student presentations, and discussion sessions. It covers major topics on the developmental biology of embryos (e.g. formation of the germ line, gastrulation, segmentation, nervous system development, limb patterning, organogenesis). We make extensive use of the primary literature and emphasize experimental approaches (e.g. classical embryology, genetics, molecular genetics).
Instructor(s): V. Prince, C. Ragsdale. Terms Offered: Spring
Prerequisite(s): For College students: Completion of the first three quarters of a Biological Sciences Fundamentals Sequence
Equivalent Course(s): BIOS 21356, MGCB 35600

DVBI 36100. Plant Development and Molecular Genetics. 100 Units.
Genetic approaches to central problems in plant development will be discussed. Emphasis will be placed on embryonic pattern formation, meristem structure and function, reproduction, and the role of hormones and environmental signals in development. Lectures will be drawn from the current literature; experimental approaches (genetic, cell biological, biochemical) used to discern developmental mechanisms will be emphasized. Graduate students will present a research proposal in oral and written form; undergraduate students will present and analyze data from the primary literature, and will be responsible for a final paper.
Instructor(s): J. Greenberg Terms Offered: Spring
Prerequisite(s): For undergraduates only: Completion of the general education requirement in the biological sciences
Equivalent Course(s): BIOS 23299, ECEV 32900, MGCB 36100

DVBI 36200. Stem Cells and Regeneration. 100 Units.
The course will focus on the basic biology of stem cells and regeneration, highlighting biomedically relevant findings that have the potential to translate to the clinic. We will cover embryonic and induced pluripotent stem cells, as well as adult stem cells from a variety of systems, both invertebrate and vertebrates.
Instructor(s): E. Ferguson, V. Prince, J. Cunningham, J. De Jong, X. Wu Terms Offered: Autumn
Prerequisite(s): For undergraduates only: completion of a biological sciences fundamentals sequence
Equivalent Course(s): BIOS 21416

DVBI 36400. Developmental Mechanisms. 100 Units.
This course provides an overview of the fundamental questions of developmental biology, with particular emphasis on the genetic, molecular and cell biological experiments that have been employed to reach mechanistic answers to these questions. Topics covered will include formation of the primary body axes, the role of local signaling interactions in regulating cell fate and proliferation, the cellular basis of morphogenesis, and stem cells.
Instructor(s): E. Ferguson, R. Fehon Terms Offered: Winter
Prerequisite(s): For undergraduates only: BIOS 20189, BIPS 20190, or BIOS 20235 or equivalent.
Equivalent Course(s): BIOS 21237, MGCB 36400
DVBI 32000. Quantitative Analysis of Biological Dynamics. 100 Units.
The basic focus of the course will be quantitative approaches to understanding
organization and dynamics at the molecular, subcellular and cellular levels, and will
rest on three pillars - modern imaging and image analysis, quantitative analysis and
presentation of data, mathematical modeling and computer simulations.
Instructor(s): Edwin Munro; Michael Rust Terms Offered: Spring
Equivalent Course(s): MGCB 32000

DISTRIBUTION COURSES

DVBI 31200. Molecular Biology-I. 100 Units.
Nucleic acid structure and DNA topology; methodology; nucleic-acid protein
interactions; mechanisms and regulation of transcription in eubacteria, and of
replication in eubacteria and eukaryotes; mechanisms of genome and plasmid
segregation in eubacteria.
Instructor(s): L. Rothman-Denes Terms Offered: Winter
Equivalent Course(s): MGCB 31200, BCMB 31200

DVBI 31300. Molecular Biology-II. 100 Units.
The content of this course covers the mechanisms and regulation of eukaryotic
gene expression at the transcriptional and post-transcriptional levels. Our goal is
to explore research frontiers and evolving methodologies. Rather than focusing
on the elemental aspects of a topic, the lectures and discussions highlight the most
significant recent developments, their implications and future directions.
Instructor(s): J. Staley, A. Ruthenburg Terms Offered: Spring
Equivalent Course(s): MGCB 31300, BCMB 31300

DVBI 31400. Genetic Analysis of Model Organisms. 100 Units.
Fundamental principles of genetics discussed in the context of current approaches
to mapping and functional characterization of genes. The relative strengths and
weaknesses of leading model organisms are emphasized via problem-solving and
critical reading of original literature.
Instructor(s): A. Palmer, D. Bishop, E. Ferguson, J. Malamy Terms Offered: Autumn
Equivalent Course(s): BCMB 31400, HGEN 31400, MGCB 31400

DVBI 31600. Cell Biology I. 100 Units.
Eukaryotic protein traffic and related topics, including molecular motors and
cytoskeletal dynamics, organelle architecture and biogenesis, protein translocation
and sorting, compartmentalization in the secretory pathway, endocytosis and
exocytosis, and mechanisms and regulation of membrane fusion.
Instructor(s): A. Turkewitz, B. Glick Terms Offered: Autumn
Equivalent Course(s): BCMB 31600, MGCB 31600
DVBI 31700. Cell Biology II. 100 Units.
This course covers the mechanisms with which cells execute fundamental behaviors. Topics include signal transduction, cell cycle progression, cell growth, cell death, cancer biology, cytoskeletal polymers and motors, cell motility, cytoskeletal diseases, and cell polarity. Each lecture will conclude with a dissection of primary literature with input from the students. Students will write and present a short research proposal, providing excellent preparation for preliminary exams.
Instructor(s): M. Glotzer, D. Kovar Terms Offered: Winter
Equivalent Course(s): BIOS 21238, MGCB 31700