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 Ho, Organismal Biology & Anatomy
• David Kovar, Molecular Genetics & Cell Biology
• Bruce Lahn, Human Genetics
• Victoria Prince, Organismal Biology & Anatomy
• Clifton Ragsdale, Neurobiology
• 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
• Kay Macleod, Ben May Department for Cancer Research
• Jocelyn Malamy, Molecular Genetics & Cell Biology
• Ivan Moskowitz, Pediatrics
• Ed Munro, Molecular Genetics & Cell Biology
• Urs Schmidt-Ott, Organismal Biology & Anatomy

Assistant Professors
• Jill de Jong, Pediatrics
• Ellie Heckscher, Molecular Genetics & Cell Biology
• Paschalis Kratsios, Neurobiology
• Vincent Lynch, Human Genetics
• Donald VanderGriend, Medicine
• Xiaoyang Wu, Ben May Department for Cancer Research

Emeritus Faculty
• Martin Gross, Pathology
• Robert Haselkorn, Molecular Genetics & Cell Biology
• 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 three different laboratories before beginning their dissertation research. These rotations are performed during the first academic year, one each quarter. Rotations can also be performed 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.

At the end of June, students take the Preliminary Examination as a first step towards candidacy for the Ph.D. The exam consists of the preparation of a written research proposal in the field of developmental biology and an oral defense of that proposal.

**Second year**

Coursework will continue during the second year as needed to fulfill the requirements. Students choose research advisors by July 1 of the Summer Quarter after the first year, and begin developing a research project. By early Autumn Quarter, each student assembles a thesis committee. 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 Autumn 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 year and a half, the evaluation is based on the student’s performance in courses, laboratory rotations, the preliminary examination, 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.

**Requirements for the Ph.D. Degree**

A Ph.D. candidate must fulfill certain formal course work requirements, pass the preliminary and qualifying examinations, 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.

**DVBI 33850. Evolution and Development. 100 Units.**
The course examines the evolution of animal development. Special attention is given to the development of invertebrate phyla from sponges to lower chordates. References to vertebrate body plans are included. Original research papers will be assigned to introduce current debates. Students will be asked to contribute an oral presentation on a selected research topic that fits the broader goal of the course.

Instructor(s): U. Schmidt-Ott Terms Offered: Autumn
Prerequisite(s): Advanced undergraduates may enroll with the consent of the instructor.
Equivalent Course(s): BIOS 22306,EVOL 33850,ORGB 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 including embryology, genetics, and molecular genetics.
Instructor(s): V. Prince, C. Ragsdale. Terms Offered: Spring
Prerequisite(s): For College students: Three quarters of a Biological Sciences Fundamentals sequence.
Equivalent Course(s): MGCB 35600, ORGB 33600, BIOS 21356

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: Three quarters of a Biological Sciences Fundamentals sequence.
Equivalent Course(s): ECEV 32900, MGCB 36100, BIOS 23299

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: Three quarters of a Biological Sciences Fundamentals sequence including BIOS 20189, BIOS 20190, or BIOS 20235.
Equivalent Course(s): MGCB 36400, BIOS 21237

DVBI 32000. Quantitative Analysis of Biological Dynamics. 100 Units.
This course covers quantitative approaches to understanding biological organization and dynamics at molecular, sub-cellular and cellular levels. A key emphasis is on the use of simple mathematical models to gain insights into complex biological dynamics. We also will cover modern approaches to quantitative imaging and image analysis, and methods for comparing models to experimental data. A series of weekly computer labs will introduce students to scientific programming using Matlab and exercise basic concepts covered in the lectures.
Instructor(s): E. Munro; M. 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, D. Bishop Terms Offered: Winter
Equivalent Course(s): BCMB 31200, MGCB 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. Enrollment requires the equivalent of an undergraduate molecular biology course or consent from the instructors.
Instructor(s): J. Staley, A. Ruthenburg Terms Offered: Spring
Equivalent Course(s): BCMB 31300, MGCB 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): D. Bishop, E. Ferguson, J. Malamy, I. Moskowitz 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
Prerequisite(s): For undergraduates: Three quarters of a Biological Sciences Fundamentals sequence.
Equivalent Course(s): BIOS 21238, MGCB 31700
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

- Times was used instead of Trajan.
- Times was used instead of Palatino.

The editor may contact Leepfrog for a draft with the correct fonts in place.