



COLUMBIA UNIVERSITY

Graduate School of Arts and Sciences Department of Biological Sciences

Program of Study

The department offers training in molecular, cellular, structural, and developmental biology and neurobiology leading to the Ph.D. degree. The graduate program provides each student with a solid background in contemporary biology and an in-depth knowledge of one or more of the above areas. The specific nature and scheduling of courses taken during the first two graduate years are determined by the student's consultation with the graduate student adviser, taking into account the background and specific research interests of the student. During the first year, all students take an intensive core course that provides a solid background in structural biochemistry, cell biology, genetics, neurobiology, and molecular biology.

Beginning in the first year, graduate students attend advanced seminar courses, including the preresearch seminar, which is a forum for faculty-student research discussion. Important components of graduate education include the ability to analyze critically the contemporary research literature and to present such analyses effectively through oral and written presentations. Students acquire training in these skills through participation in advanced-level seminars and journal clubs and presentation and defense of original research proposals during the second year of graduate study.

Beginning in the first year of graduate work, students also engage in research training. To inform incoming students of research opportunities, faculty members discuss ongoing research projects with them in the preresearch seminar held in the autumn term of the first year. All students are strongly encouraged to participate in ongoing research in up to three different laboratories during the first year. The choice of a dissertation sponsor is made after consultation between the student and potential faculty advisers, and intensive research begins following the spring term of the student's first year. Each student is assigned a Ph.D. advisory committee made up of the student's sponsor and 2 other faculty members.

Research Facilities

The Department of Biological Sciences is located in the modern Sherman Fairchild Center for the Life Sciences. The building provides 50,000 square feet of laboratory space for the department's laboratories, as well as extensive shared instrument facilities. The latter include automated DNA synthesis and sequencing; fluorescence and digital microscopy; analytical and preparative biochemistry; FACS analysis and microinjection facilities; and housing and care of research animals, including transgenic mice. A library, designed for ready access to the collections, is housed in the same building. It includes the latest equipment for database searching, an extensive microfilm collection, and audiovisual facilities.

Financial Aid

All accepted students receive generous stipends, complete tuition exemption, and medical insurance. Special fellowships are also available to women and members of minority groups.

Cost of Study

Tuition and fees are paid for all graduate students accepted into the department.

Living and Housing Costs

Most students live in University-owned apartments or dormitories within walking distance of the laboratories. In addition, the campus is easily reached by public transportation from all areas of the city.

Student Group

There are about 90 graduate students and 55 postdoctoral fellows in the department.

Location

New York is the cultural center of the country and offers unrivaled opportunities for attending concerts, operas, plays, and sporting events, for visiting outstanding museums, and for varied, affordable dining. Many excellent beaches, ski slopes, and state and national parks are within reasonable driving distance.

The University

Columbia was established as King's College in 1754 and has grown into one of the major universities of the world. The department is located on the beautiful main campus in Morningside Heights, which combines the advantages of an urban setting and a peaceful "college-town" atmosphere.

Applying

Undergraduate training in one of the natural or physical sciences is required. It is desirable for students to have had at least one year of calculus, as well as courses in organic and physical chemistry, physics, genetics, biochemistry, and cell biology. Any deficiencies may be made up while in graduate school. The Graduate Record Examinations, including the Subject Test in biology, chemistry, or physics, is also required, as is the Test of English as a Foreign Language for international applicants whose native language is not English. Completed applications should be returned by January 1 for admission to the fall semester. Application forms and additional information can be obtained from the World Wide Web site (<http://www.columbia.edu/cu/biology>).

Columbia University is an Equal Opportunity/Affirmative Action institution.

Correspondence and Information

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THE FACULTY AND THEIR RESEARCH

- Amer A. Beg, Associate Professor; Ph.D., North Carolina, 1993. Regulation of cell death and immune function by NF- κ B transcription factors.
- Walter J. Bock, Professor; Ph.D., Harvard, 1959. General evolutionary theory; evolutionary and functional morphology; morphology and classification of birds; history and philosophy of evolutionary biology.
- Ronald Breslow, Adjunct Professor; Ph.D., Harvard, 1956. Aromaticity and antiaromaticity; biochemical model systems; biomimetic synthetic methods; small ring compounds; organic reaction mechanisms; organic electrochemistry.
- J. Chloë Bulinski, Professor; Ph.D., Wisconsin, 1980. Microtubule dynamics and function during the cell cycle and cell differentiation.
- Harmen Bussemaker, Assistant Professor; Ph.D., Utrecht (Netherlands), 1995. Bioinformatics research aimed at understanding how regulatory proteins control chromatin structure and gene expression, using a combined analysis of complete genome sequences and DNA microarray or SAGE data.
- Martin Chalfe, Professor; Ph.D., Harvard, 1976. Developmental genetics of identified nerve cells in *Caenorhabditis elegans*; genetic analysis of cell differentiation, mechanosensory transduction, synapse specification, and aging.
- Lawrence A. Chasin, Professor; Ph.D., MIT, 1967. Molecular genetics of pre-mRNA processing; molecular recognition of RNA splice sites in long transcripts.
- James W. Erickson, Assistant Professor; Ph.D., Wisconsin–Madison, 1989. Genetic analysis of sex determination in *Drosophila*; developmental role of yolk nuclei; mechanisms of transcriptional activation in early embryogenesis.
- Julio Fernandez, Professor; Ph.D., Berkeley, 1982. Study of the cellular events that lead to the release of histamine or catecholamine-containing secretory granules from single, isolated mast cells or chromaffin cells; analysis of single protein elasticity by Atomic Force Microscopy (AFM).
- Stuart Firestein, Associate Professor; Ph.D., Berkeley, 1988. Cellular and molecular physiology of transduction; coding and neuronal regeneration in the vertebrate olfactory system.
- John F. Hunt, Assistant Professor; Ph.D., Yale, 1993. Structural genomics and biophysical studies of the molecular mechanism of transmembrane transport.
- Daniel D. Kalderon, Associate Professor; Ph.D., London, 1984. Molecular mechanisms of cellular interactions mediated by cAMP-dependent protein kinase (PKA) in *Drosophila*; roles of PKA in hedgehog signaling and in generating anterior/posterior polarity in oocytes.
- Darcy B. Kelley, Professor; Ph.D., Rockefeller, 1975. Sexual differentiation of the nervous system; molecular analyses of androgen-regulated development in neurons and muscle; neuroethology of vocal communication; evolution of the nuclear receptor family.
- James L. Manley, Professor; Ph.D., SUNY at Stony Brook, 1976. Regulation of mRNA synthesis in animal cells; biochemical and genetic analysis of mechanisms and control of mRNA transcription, splicing, and polyadenylation; developmental control of gene expression.
- Ann McDermott, Adjunct Associate Professor; Ph.D., Berkeley, 1987. Solid-state NMR of enzyme active sites and model systems.
- Audrey Minden, Assistant Professor; Ph.D., Illinois, 1992. Signal transduction pathways in mammalian cells; regulation of cellular proliferation and differentiation; functions of small G proteins in cell signaling.
- James Mohler, Adjunct Professor; Ph.D., MIT, 1982. Genetic control of pattern formation during *Drosophila* development.
- Robert E. Pollack, Professor; Ph.D., Brandeis, 1966. Critical analysis of issues involving molecular biology and religion.
- Carol L. Prives, Professor; Ph.D., McGill, 1968. Structure and function of the p53 tumor suppressor protein and p53 family members; studies on cell cycle and apoptosis; stress activated signalling and control of proteolysis.
- Ron Prywes, Associate Professor; Ph.D., MIT, 1984. Normal and cancerous mechanisms of regulation of cellular proliferation and gene expression; signal transduction and activation of transcription factors; activation of transcription by the ER stress/unfolded protein response.
- Michael P. Sheetz, Professor; Ph.D., Caltech, 1972. Motility studies of cells and microtubule motor proteins, with an emphasis on the force-dependent interactions relevant to transformed cells and neuron pathfinding, using laser tweezers.
- Liang Tong, Associate Professor; Ph.D., Berkeley, 1989. Structural biology of signal transduction molecules.
- Alexander A. Tzagoloff, Alan H. Kempner Professor of Biological Sciences; Ph.D., Columbia, 1962. Energy-coupling mechanisms; structure of membrane enzymes; biogenesis of mitochondria; genetics of mitochondria in yeast.
- Lili Yamasaki, Assistant Professor; Ph.D., Texas Health Science Center at San Antonio, 1991. Role of E2F/DP transcription factors in growth control by the retinoblastoma tumor suppressor protein (pRB) in vivo.
- Jian Yang, Assistant Professor; Ph.D., Washington (Seattle), 1991. Structure and function of ion channels; molecular mechanisms of ion channel regulation and localization.
- Rafael Yuste, Assistant Professor; M.D., Madrid, 1987; Ph.D., Rockefeller, 1992. Dendritic integration and cortical microcircuitry.
- Geoffrey L. Zubay, Professor; Ph.D., Harvard, 1957. Prebiotic reactions leading to the origins of life.
- Additional Faculty Sponsors for Ph.D. Research**
- Richard Axel, Biochemistry. Central and peripheral organization of the olfactory system.
- Kathryn Calame, Microbiology/Immunology. Lymphocyte gene regulation.
- Marian Carlson, Genetics/Development. Regulation of gene expression in yeast; mechanisms of transcriptional control.
- Virginia Cornish, Chemistry. Development of in vivo selection strategies for evolving proteins with novel catalytic properties.
- Frank Costantini, Genetics/Development. Molecular genetics of mammalian development.
- Jean Gautier, Genetics/Development. Cell cycle and cell death during early development.
- Steve Goff, Biochemistry. Retroviral replication.
- Lloyd Greene, Pathology. Mechanisms of neuronal differentiation and degeneration and their regulation by external growth factors.
- Iva Greenwald, Biochemistry. Development and cell-cell interactions.
- René Hen, Neurobiology and Behavior. Serotonin receptors and behavior.
- Wayne Hendrickson, Biochemistry. Macromolecular structure; X-ray crystallography.
- David Hirsh, Biochemistry. Molecular genetics of development.
- Barry Honig, Biochemistry. Theory of biomolecular structure and function.
- Tom Jessell, Biochemistry. Molecular mechanisms of neural differentiation.
- Eric Kandel, Physiology. Cell and molecular mechanisms of associative and nonassociative learning.
- Arthur Karlin, Biochemistry. Molecular mechanisms of receptor function.
- Richard Mann, Biochemistry. Transcriptional control.
- Carol Mason, Pathology. Cellular and molecular mechanisms of associative and nonassociative learning.
- Ann McDermott, Chemistry. Solid-state NMR studies of enzyme mechanism and membrane protein structure.
- Aaron Mitchell, Microbiology. Regulatory pathways that govern cellular differentiation in the two yeasts: *Saccharomyces cerevisiae* and *Candida albicans*.
- Art Palmer, Biochemistry. Biomolecular dynamics, structure, and function; NMR spectroscopy.
- Virginia Papaioannou, Genetics/Development. Genetic control of mammalian development in the peri-implantation period.
- Anna Marie Pyle, Biochemistry. RNA structure and function.
- Rodney Rothstein, Genetics/Development. Yeast genetics; mechanisms of genetic recombination; control of genome stability; functional genomics.
- Chris Schindler, Microbiology/Medicine. JAK-STAT signaling and immune response.
- Steve Siegelbaum, Pharmacology. Molecular studies of ion channel structure and function; synaptic transmission and plasticity in the mammalian brain.
- Gary Struhl, Genetics/Development. Developmental genetics.
- Dimitrios Thanos, Biochemistry. Regulation of gene expression.