

Cell and Molecular Biology

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Professors

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Leonard B. Thien, Ph.D., California, Los Angeles

Associate Professors

Carol Burdsal, Ph.D., Duke

YiPing Chen, Ph.D., Iowa

David Hurley, Ph.D., Pennsylvania State

David A. Mullin, Ph.D., Texas, Austin

Assistant Professors

Andrei B. Belousov, Ph.D., Moscow State, Russia

Fiona Inglis, Ph.D., University of Glasgow

Liang Ma, Ph.D., Southern California

Bret Smith, Ph.D., Tennessee Medical Center

The curriculum in the cell and molecular biology department is designed for students with interests in the cellular and molecular basis of life and the application of molecular techniques to medical, technological, and environmental issues.

MAJOR

Students majoring in cell and molecular biology must complete a minimum of ten courses in the biology component, totaling at least 22 credits, 16 credits in chemistry (one year of both general chemistry with laboratories 107/117, 108/118 or H109/H111, H110/ H112 and organic chemistry with laboratories 241/243, 242/244, or H245/H247, H246/H248), six credits in mathematics (see B.S. math requirements), and eight credits of physics with laboratories 121, 122 or 131, 132. Students intending to pursue graduate study are advised to take one year of calculus to satisfy their math requirement.

To fulfill the biology component, all students must complete Cell and Molecular Biology 101 General Biology (lecture only). Students with AP scores of 4 or 5 are awarded three units of credit for 101 and one unit of credit for 211. In addition to 101, all students must complete 205, 301, 311, and either 401 or Chemistry 302 or 383. Students must also complete either 302 or 312, and one course from 331, 332, 416, 478.

An additional three elective courses are required, with at least two of the three being laboratory oriented. One course involving independent laboratory research, either H491, H492, 495, 496, H499 or H500 may be used as a laboratory oriented course in the electives requirement. Students may use approved courses from other departments to fill the elective component. A list of courses which fulfill this requirement is available from the cell and molecular biology department.

MINOR

Students wishing to minor in cell and molecular biology must complete Cell and Molecular Biology 101, 205, 301, and 311; two additional electives in biology; and 16 credits in chemistry (one year of

both general and organic chemistry and their respective laboratories). Because of the interdisciplinary nature of the biological chemistry major, students in that program may not minor in cell and molecular biology.

HONORS COURSES

CELL H205 Genetics (3)

Ms. Bennett. Prerequisite: approval of department. Special course for superior students covering the material listed for 205 plus readings and discussion of recent discoveries.

CELL H416 Developmental Biology (3)

Ms. Burdsal, Mr. Chen. Prerequisite: approval of department. Special course for superior students covering the material listed for 416 plus readings and discussion of recent discoveries.

CELL H491, H492 Independent Studies (1-3, 1-3)

Staff. Laboratory or library research under direction of a faculty member.

CELL H499-H500 Honors Thesis (3, 4)

Staff. For especially qualified juniors and seniors with approval of department and the Honors Committee.

INTRODUCTORY LEVEL COURSES

CELL 101 General Biology (3)

Ms. Bennett. A study of the phenomena fundamental to all living systems: cellular biology, physiology, genetics, and development. Required of all cell and molecular biology majors.

CELL 103 Heredity and Society (3)

Staff. The nature, scope, and implication of the recent accomplishments in the field of genetics. A consideration of human birth defects, hereditary diseases, and the potential of the human species to manipulate its own genes (genetic engineering). Meets the college non-laboratory science requirement. Satisfies the college laboratory science requirement with completion of CELL 106. Does not count toward the requirements for a major or minor in cell and molecular biology.

CELL 106 Heredity and Society Laboratory (1)

Staff. Prerequisite or corequisite: CELL 103. Laboratory and computer exercises to reinforce concepts discussed in Heredity and Society lecture. Students will learn basic laboratory skills, including microscopy and molecular biological techniques. In addition, they will make use of computer programs and internet activities on the world wide web. Satisfies the college laboratory course requirement with completion of CELL 103. Does not count toward the requirements for the major or minor in cell and molecular biology.

CELL 123 Biology of the Nervous System (3)

Staff. Basic concepts in neuroscience, including discussion of the components of the nervous system, the ways nerves communicate with each other, mechanisms of drug action, the ways that an organism responds to its internal and external environment, and discussion of neurological and behavioral disorders. Meets the college non-laboratory science requirement. Does not count towards the requirements for a major or minor in cell and molecular biology or neuroscience. Credit may not be received for both CELL 123 and PSYC 367.

CELL 210 Biology of Human Reproduction (3)

Ms. Bennett. The anatomy and physiology of male and female reproductive systems, and the diseases relating to each. A consideration of relevant aspects of gynecology, obstetrics and urology. Meets the college non laboratory science requirement. Does not count toward the requirements for a major or minor in cell and molecular biology.

COURSES FOR INTERMEDIATE AND ADVANCED UNDERGRADUATES**CELL 205 Genetics (3)**

Ms. Bennett. Prerequisite: CELL 101. The principles of genetic analysis and the nature of the gene. Discussion of the chromosomal and molecular basis of transmission, replication, mutation, and expression of heritable characteristics.

CELL 211 General Biology Laboratory (1)

Staff. Prerequisite: CELL 101. Laboratory exercises emphasizing concepts in cell, molecular, and developmental biology. Designed for majors in the biological sciences.

CELL 222 Exploring Careers in Medicine (1)

Staff. Prerequisites: CELL 101 and approval of instructor. This course will examine different careers in medicine, the distribution of hours spent in practice each week, and some of the disease processes and treatments seen by physicians. It will be taught from a practical, clinical point of view and is intended to help students identify their areas of interest in medicine or medical research. Must be taken S/U.

CELL 301 Cell Biology (3)

Staff. Prerequisites: CELL 205 and 311. Fundamental properties of eukaryotic cells and the physiology of cellular components. Emphasis on modern biological approaches and the interaction between cells and their environment.

CELL 302 Cell Biology Laboratory (1)

Staff. Prerequisite or corequisite: CELL 301. Growth and differentiation of mammalian cells in vitro and in vivo. Basic laboratory skills in cell culture, gene transfer, and immunochemistry.

CELL 305 Drugs and Their Actions (3)

Ms. Beckman. Prerequisites: four credits of biology and eight credits of organic chemistry, or equivalent, or approval of instructor. Basic principles of pharmacology and selected topics of special interest, such as drugs of socioeconomic importance and socially abused drugs. Same as CHEM 305 and GPHR 605.

CELL 311 Molecular Biology (3)

Mr. Mullin, Mr. Thien. Prerequisite: CELL 205. Introduction to theory and applications of molecular biology.

CELL 312 Molecular Biology Laboratory (1)

Staff. Prerequisite or corequisite: CELL 311. Laboratory experience in modern molecular biology techniques.

CELL 321 Cellular Physiology (3)

Mr. Belousov. Prerequisite: CELL 101. A survey of vertebrate anatomy and physiology emphasizing the cellular and molecular basis of organ function. This course emphasizes modern experimental approaches for exploring physiological function of a variety of organ systems.

CELL 331 Cellular Neuroscience (3)

Mr. Tasker. Prerequisite: CELL 101. Introduction to the basic principles of the neurosciences, including cellular and molecular neurobiology, neuroanatomy and neurophysiology of simple invertebrate and vertebrate systems, neural development, neuropharmacology and synaptic organization of higher neural systems.

CELL 332 Systems Neuroscience (3)

Mr. Smith. Prerequisite: CELL 101 or approval of instructor. The subject of this course is the human nervous system, its anatomy, connectivity and function. Discusses the normal structure of the nervous system and the relationship of that structure to physiological function. The course is taught from a practical, clinical point of view and is intended to prepare students for further study in the neurosciences.

CELL 389 Service Learning (1)

Staff. Prerequisite: departmental approval. Students complete a service activity in the community in conjunction with the content of a three-credit corequisite course.

CELL 401 Cellular Biochemistry (3)

Mr. Hurley. Prerequisites: CELL 205 and 301. Structure and function of biological molecules, energetics, metabolism, synthesis of macromolecules and assembly of structures.

CELL 410 Molecular Mechanisms of Reproduction (3)

Mr. Ma. Prerequisite: CELL 311 or approval of instructor. This course contains lectures covering the human and the mouse reproductive tract development and the adult reproductive process. It contains both an overview of the reproductive physiology and detailed molecular mechanisms pertaining to the reproductive processes.

CELL 411 Cells and Tissues (4)

Staff. Prerequisite: CELL 301 or approval of instructor. Emphasis on modern techniques and their applications to research on cell and tissue structure, physiology, and biochemistry. Lectures and laboratory.

CELL 413 Embryology (4)

Mr. Muneoka. Prerequisite: CELL 301 or approval of instructor. Anatomical study of developmental processes in humans. Lecture and online laboratory.

CELL 416 Developmental Biology (3)

Ms. Burdsal, Mr. Chen. Prerequisite: CELL 205 or approval of instructor. The origin and development of form and patterns in organisms. Recent investigations and research methodology on the processes of growth and differentiation are stressed.

CELL 417 Developmental Biology Laboratory (1)

Staff. Prerequisite or corequisite: CELL 416. The role and patterns of gene expression and cell interactions involved in the formation and function of tissues and organisms are investigated.

CELL 422 Microbiology (3)

Mr. Mullin. Prerequisite: CELL 301. Taxonomy, physiology, genetics and ecology of microorganisms. This course will cover the role of microbes in medicine and industry, and as model systems for research.

CELL 423 Microbiology Laboratory (1)

Staff. Prerequisite or corequisite: CELL 422. Laboratory studies of microbial taxonomy, physiology, biochemistry, and genetics.

CELL 427 Seminar in Molecular Biology (2)

Mr. Mullin. Prerequisite: approval of instructor. Selected current topics in molecular biology literature will be critically analyzed.

CELL 434 Neurobiology of Disease (3)

Mr. Belousov. Prerequisite: CELL 331. Advanced course on the higher neural functions of the nervous system and neurological diseases resulting from disruption of these functions. An emphasis is placed on the physiology of the nervous system and neural dysfunction caused by inherited and acquired diseases. Topics range from motor control and neuromuscular diseases to high cognitive function and dementia.

CELL 435 Developmental Neurobiology (3)

Ms. Inglis. Prerequisite: CELL 331 or CELL 416 or approval of instructor. A broad overview of the different stages of neural development. Examination of the molecular aspects of developmental neurobiology, with reference to some important signaling pathways involved in neural growth and specification. Particular attention will be given to those active research fields, such as growth cone guidance and collapse and activity-dependent development, and applications of these to injury and disease.

CELL 441 Molecular Basis of Human Genetic Disease (3)

Mr. Hurley. Prerequisite: CELL 401. Analysis and understanding of the emerging knowledge of human diseases in terms of their causative genetic and molecular mechanisms. Using this information, students develop the ability to critically review the current scientific literature on the subject of

molecular medicine, with an attempt to predict some of the future paths along with molecular medicine will evolve in the post-genomic years.

CELL 456, 457 Internship Studies (3, 3)

Staff. Prerequisites: approval of instructor and department. An experiential learning process coupled with pertinent academic course work. Open only to juniors and seniors in good standing. Registration is completed in the academic department sponsoring the internship. (Note: A maximum of six credits may be earned in one or two courses.)

CELL 466 Special Topics in Cell and Molecular Biology (1-3)

Staff. Courses offered by visiting professors or permanent faculty primarily for undergraduates. For description, consult department.

CELL 471 The Molecular Biology of Cancer (3)

Ms. Burdsal. Prerequisite: CELL 301. The complex multistep process which transforms a normal cell into a cancer cell, carcinogenesis, will be examined with emphasis on current molecular insights.

CELL 478 Developmental Genetics (3)

Mr. Chen. Prerequisite: CELL 416 or approval of instructor. The genetic control of developmental processes.

CELL 488 Writing Practicum (1)

Staff. Prerequisite: successful completion of the First-Year Writing Requirement. Corequisite: three-credit departmental course. Fulfills the college intensive-writing requirement.

CELL 495, 496 Special Projects in Cell and Molecular Biology (1-3, 1-3)

Staff. Individual studies in a selected field. Open to qualified students with approval of instructor and advisor.

COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

CELL 600 Biomedical Ethics (3)

Ms. Bennett. Prerequisite: Cell 101 or approval of instructor. An interdisciplinary course that examines the moral principles that apply to biology and medicine. Ethical principles will be analyzed in relation to such topical issues as informed consent, abortion, death and dying, allocation of scarce resources, personhood, AIDS, risk, human experimentation, and public policy. Case studies and class discussion will complement lectures and video presentations.

CELL 601 Cellular Biochemistry (3)

See CELL 401 for course description. Additional term paper required.

CELL 608 Advanced Developmental and Cell Biology II (3)

Ms. Burdsal, Mr. Chen, Mr. Ma, Mr. Muneoka. Prerequisite: approval of instructor. Lectures, readings, and discussion of the literature in the fields of cellular, developmental, and molecular biology.

CELL 610 Molecular Mechanisms of Reproduction (3)

See CELL 410 for description. Additional term paper required.

CELL 611 Cells and Tissues (3)

See CELL 411 for course description. Additional term paper required.

CELL 613 Embryology (3)

See CELL 413 for course description. Additional term paper required.

CELL 616 Developmental Biology (3)

See CELL 416 for course description. Additional term paper required.

CELL 621 Cellular Physiology (3)

See CELL 321 for course description. Additional term paper required.

CELL 622 Microbiology (3)

See CELL 422 for course description. Additional term paper required.

CELL 631 Cellular Neuroscience (3)

See CELL 331 for course description. Additional term paper required.

CELL 632 Systems Neuroscience (3)

See CELL 332 for course description. Additional term paper required.

CELL 633 Cellular Gene Regulation and Expression (3)

Mr. Hurley. Prerequisite: CELL 311. A critical evaluation of recent literature on the topic of eukaryotic gene regulation. Embryonic development, tissue differentiation, response to environmental factors, and the flow of information through the eukaryotic cell will include subjects to be discussed via current publications on each topic.

CELL 634 Neurobiology of Disease (3)

See CELL 434 for course description. Additional term paper required.

CELL 635 Developmental Neurobiology (3)

See CELL 435 for course description. Additional term paper required.

CELL 641 Molecular Basis of Human Genetic Disease (3)

See CELL 441 for course description. Additional term paper required.

CELL 663 Cellular Neurophysiology (3)

Mr. Smith. Prerequisite: CELL 331 or approval of instructor. Survey of current topics and techniques in the physiology of neurons and neuronal circuits, concentrating primarily on electrophysiological studies.

CELL 666 Special Topics in Cell and Molecular Biology (1-3)

Staff. Courses offered by visiting professors or permanent faculty. For description, consult department.

CELL 671 The Molecular Biology of Cancer (3)

See CELL 471 for course description. Additional term paper required.

CELL 678 Developmental Genetics (3)

See CELL 478 for course description. Additional term paper required.

CELL 684 Current Topics in Developmental Biology (2)

Mr. Burdsal, Mr. Chen, Ms. Inglis, Mr. Ma, Mr. Muneoka. Prerequisite: approval of instructor. Reports and discussions of current literature on developmental processes.