Anatomy and Cell Biology

Chair
• John F. Engelhardt

Graduate degree: Ph.D. in anatomy and cell biology
Faculty: http://www.medicine.uiowa.edu/dept_primary_apr.aspx?appointment=Anatomy%20and%20Cell%20Biology
Web site: http://www.medicine.uiowa.edu/acb/

The Department of Anatomy and Cell Biology performs three major functions. It teaches human anatomy to students preparing for careers in the health care professions; provides advanced courses, teaching experience, and research training to graduate students preparing for careers in academic research and related scientific fields; and conducts original research on the biological basis of cellular functions and human disease processes.

Preclinical Study

The department contributes to the preclinical education of health care professionals by providing major courses in gross anatomy, cell biology, histology, and neuroscience. The department participates in the Carver College of Medicine’s Medical Scientist Training Program and the Graduate College’s Molecular and Cellular Biology, Immunology, Genetics, and Neuroscience Programs. On occasion, students are directly admitted to a Department of Anatomy and Cell Biology laboratory by arrangement with the laboratory director.

Graduate Program of Study

• Doctor of Philosophy in anatomy and cell biology

Doctor of Philosophy

The Doctor of Philosophy program in anatomy and cell biology requires a minimum of 72 s.h. of graduate credit. Students in the Ph.D. program work toward the doctorate without an intermediate master’s degree program. They complete courses focused in one of three major areas—molecular medicine and gene therapy, developmental and stem cell biology, or cancer biology—in addition to related background and elective courses. Students also teach in lecture and laboratory courses under faculty supervision. The program may be completed in four or five years of intensive, full-time residence.

By the end of their second year of graduate study, anatomy and cell biology students take the comprehensive examination, which assesses their ability to analyze, organize, and apply the information, concepts, and skills acquired during the first two years of study. They define a research problem with their major advisor and formulate a research prospectus.

Subsequent years are devoted primarily to research.

The final Ph.D. examination consists of a public oral defense of the dissertation. The dissertation is based on original research conducted with the guidance of the major advisor and at least four other faculty members on the thesis committee.

Admission

Individuals interested in pursuing a Ph.D. in a laboratory housed in the Department of Anatomy and Cell Biology have two options for admission. The first option is to apply to, and be accepted by, the Medical Scientist Training Program (Carver College of Medicine) or one of the interdisciplinary graduate programs in molecular and cellular biology, immunology, genetics, or neuroscience (Graduate College). These programs accept applicants with a variety of backgrounds in the biological and physical sciences. Each program has specific admission requirements—all include a bachelor’s degree; certain scores on the Graduate Record Examination (GRE) General Test; and for applicants whose first language is not English, specific scores on the Test of English as a Foreign Language (TOEFL). For detailed admission requirements and application information, refer to the section for each program in the Catalog.

The second option is direct admission to a specific laboratory, by arrangement with the laboratory’s director. After such an arrangement has been made, students apply to the Graduate College for admission to the Ph.D. program in the Department of Anatomy and Cell Biology. The department’s graduate admission committee evaluates an applicant’s credentials. Most applicants will have completed a bachelor’s degree with the following undergraduate course work: chemistry through organic chemistry, one semester of biochemistry or the equivalent, one semester of another advanced biology course, mathematics through calculus, one year of physics, and one semester of statistics or the equivalent. Desirable qualifications include an undergraduate major in the biological sciences or chemistry; a master’s degree in the biological sciences, chemistry, or a related area; and scores from a GRE Advanced Test in the applicant’s major area.

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations of the Graduate College.

Financial Support

All students in the Department of Anatomy and Cell Biology receive stipends and tuition support. Sources include training grants from the National Institutes of Health, University of Iowa and departmental fellowships and graduate research assistantships, and individual faculty research grants.

Facilities

The department occupies more than 35,000 square feet in the Bowen Science Building on the University of Iowa health sciences campus. The building houses modern teaching facilities and well-equipped research laboratories. The most modern instrumentation is available, including facilities and equipment for digital microscopic imaging, confocal microscopy, molecular biological techniques, tissue culture, and protein chemistry. Other specialized equipment (e.g., electron microscopes, mass spectrophotometers) is available in other facilities. Through collaborative programs with the Holden Comprehensive Cancer Center and Iowa Cardiovascular Center, faculty and students also have
access to outstanding research facilities throughout the University's health sciences campus.

Courses

**ACB:1199 Human Anatomy and Basic Physiology for Radiation Science**
Integrative systemic study of the structure and function of the human body; body systems defined and described by their constituent organs; body's most basic cellular level, tissue level, and study of organs which comprise various systems; online course with lectures, assignments, and virtual laboratory study. Requirements: high school biology course.

**ACB:3109 Human Anatomy Lab for Health Professions**
Regional and systemic approaches to the study of human anatomy, using histological (microscopic) as well as gross (macroscopic) studies. Prerequisites: BIOL:1141. Requirements: ACB:3110 for pre-nursing students.

**ACB:3110 Principles of Human Anatomy**
Gross and microscopic human anatomy; systemic approach to regional anatomy, with emphasis on clinical relevance; optional tutorial sessions. Offered fall and spring semesters. Prerequisites: BIOL:1141 or BIOL:1411. Requirements: pharmacy, pre-nursing, or associated medical sciences major.

**ACB:3113 Human Anatomy Online**
Integrative systemic and regional study of the human body's structure. Prerequisites: BIOL:1141.

**ACB:3122 Independent Study in Anatomy and Cell Biology**
Projects arranged with department faculty members.

**ACB:4156 Scanning Electron Microscopy and X-Ray Microanalysis**
Microscopy methods for research; all aspects of research, from sample preparation to imaging to data analysis; when to use a particular microscopy procedure; theory, operation, and application of scanning electron microscopy, scanning probe microscopy, laser scanning microscopy, X-ray microanalysis. Requirements: a physical science course. Same as CBE:4156, EES:4156.

**ACB:5108 Human Anatomy**
Regional dissection, lectures, demonstrations; areas important to physical therapists, particularly the upper and lower extremities. Offered fall semesters. Requirements: physical therapy and rehabilitation science enrollment.

**ACB:5203 Gross Human Anatomy for Graduate Students**
Regional dissection, lectures, demonstrations, tutorials, discussions, seminars; clinically relevant areas of anatomical radiology, surface anatomy with clinical correlations. Requirements: anatomy and cell biology graduate standing.

**ACB:5205 General Histology for Graduate Students**
Structure and function of cells, tissues and organs studied at light and electron microscopic levels; advanced study of head and neck tissues. Offered spring semesters. Corequisites: MED:8112. Requirements: graduate standing in anatomy and cell biology or Carver College of Medicine graduate program.

**ACB:5206 Graduate Research in Anatomy and Cell Biology**
Individual laboratory research training in anatomical sciences.

**ACB:5218 Microscopy for Biomedical Research**
Basic microscopy methods for research including optics, preparation, and analysis of biomedical specimens; light, fluorescence, confocal, transmitting electron, scanning electron, atomic force microscopes, elemental analysis; immunochemistry and stereology techniques; individualized laboratory instruction. Prerequisites: BIOL:2723. Same as MICR:5218, BIOL:5218.

**ACB:5220 Advanced Microscopy for Biomedical Research**
Technically advanced microscopy and instrumentation for research; individualized laboratory experience with opportunity to explore applications of microscopy methods. Requirements: for ACB:5220 — an introductory microscopy course; for BIOL:5220 — ACB:4156 or ACB:5218 or CBE:4156 or EES:4156 or MICR:5218; for MICR:5220 — an introductory EM course. Same as BIOL:5220, MICR:5220.

**ACB:5224 Graduate Student Seminar**
Current research, literature. Requirements: anatomy and cell biology graduate standing.

**ACB:6000 Human Anatomy for Advanced Practice**
Integrated study of interrelationships between anatomic structure and physiological function in health and disease at various points in the lifespan; mechanisms governing and supporting cellular, organ, and system function; internal milieu; relationship of study to clinical assessment of functional integrity of individual organ systems utilizing pertinent objective and subjective data; implications of pathophysiology for anesthesia and implications of anesthesia for pathophysiology; foundation for clinical practicums and courses in nurse anesthesia. Requirements: admission to anesthesia nursing program. Recommendations: completion of an undergraduate human anatomy and physiology course. Same as NURS:6000.

**ACB:6200 Special Topics in Genetics**
Current research in a selected field of genetics; different topic each year. Companion to a genetics seminar series. Same as GENE:6200.

**ACB:6220 Mechanisms of Cellular Organization**
Current understanding of basic cell biological processes; key experiments that led to guiding insights; mechanisms that cells use for compartmentalization and how those mechanisms are regulated; biogenesis of major organelles (e.g., mitochondria, peroxisomes, nucleus, secretory/endocytic membrane system); functions of cytoskeleton in cell motility, organelle motility, and cell division. Prerequisites: BIOL:3130. Same as MCB:6220, MPB:6220.

ACB:6225 Growth Factor Receptor Signaling 1 s.h.
Mechanisms of signaling by growth factors; cytokines and related molecules that regulate cell proliferation, development, differentiation, and survival; emphasis on molecular mechanisms of signaling, relevance of these signaling processes to various human diseases. Recommendations: BISC:5201 and BISC:5203. Same as MCB:6225, MPB:6225.

ACB:6226 Cell Cycle Control 1 s.h.
Cell cycle regulation, DNA damage-dependent cell cycle regulation, redox-dependent cell cycle regulation, cellular senescence. Recommendations: BISC:5201 and BISC:5203. Same as MCB:6226, MPB:6226.

ACB:6227 Cell Fate Decisions 1 s.h.

ACB:6237 Critical Thinking in Biochemistry and Molecular Biology 1 s.h.
How nucleic acids, proteins, lipids, and carbohydrates interact to influence the function of cells and tissues; how molecules drive signaling pathways and cellular processes essential for biological functions; based on research publications.

ACB:6238 Critical Thinking in Genetics 1 s.h.
Current topics in molecular and classical genetics; emphasis on genetic underpinnings of disease; based on primary research publications.

ACB:6239 Critical Thinking in Cell Biology 1 s.h.
Understanding subcellular organization and intercellular communication; emphasis on critical thinking and primary research publications.

ACB:6248 Critical Thinking in Development 1 s.h.
Current topics in molecular basis of vertebrate development; based on primary research publications.

ACB:6249 Critical Thinking in Cellular Physiology 1 s.h.
Control of physiological systems at the cellular level; emphasis on regulation by molecular signaling pathways; literature-based.

ACB:6252 Functional Neuroanatomy arr.
Basic principles of neuroanatomy and neurophysiology; emphasis on human central nervous system; laboratory emphasis on anatomical study of spinal cord and brain. Offered spring semesters. Requirements: physical therapy and rehabilitation science enrollment or graduate standing.

ACB:6265 Neuroscience Seminar 0-1 s.h.
Research presentations. Offered fall and spring semesters. Same as PSY:6265, MPB:6265, NSCI:6265, BIOL:6265.

ACB:7227 Anatomic Study for Teaching 2-3 s.h.
Experience completing a detailed dissection of a region of the human body; opportunity to create models depicting anatomical concepts. Requirements: enrollment in teaching certificate program.

ACB:8101 Medical Gross Human Anatomy 5 s.h.
Complete dissection of the body with regional emphasis stressing relationships to the living system; clinically relevant areas of radiologic imaging, surface anatomy, embryology, and clinical correlations; anatomical knowledge through lectures, small group work, independent activities. Offered fall semesters. Requirements: M.D. enrollment.

ACB:8114 Medical Neuroscience 4 s.h.
Basic principles of neurophysiology, neuroanatomy, emphasis on human central nervous system; laboratory emphasis on anatomical study of spinal cord, brain. Offered spring semesters. Requirements: physical therapy and rehabilitation science or M.D. enrollment, or graduate standing.

ACB:8120 Human Gross Anatomy for Dental Students 6 s.h.
Exploration of gross anatomy of human body including thorax, abdomen, upper limb; extensive focus on head, neck, and neuroanatomy; regional and systemic approaches; course sequence and assessment blended with general histology for dental students; cadaveric dissections closely follow lecture sequence; emphasis on correlations to dental practice. Offered spring semesters. Requirements: D.D.S. enrollment.

ACB:8121 General Histology for Dental Students 4 s.h.
Microscopic study of cells, fundamental tissues, organ systems; emphasis on tooth-related structures. Offered spring semesters. Requirements: D.D.S. enrollment or anatomy and cell biology graduate standing.

ACB:8201 Gross Human Anatomy for Physician Assistant Students 6 s.h.
Focused regional dissection with clinical integration through lectures, demonstrations, and tutorials; neuroanatomy, radiology. Offered summer sessions. Requirements: physician assistant studies and services or M.D. enrollment.

ACB:8250 Integrated Gross Human Anatomy, General and Oral Histology for Dental Students (GRISTO) 10 s.h.
Integrated study of morphology of human body at microscopic and macroscopic levels; covers breadth and depth of traditional professional-level anatomy and histology courses; focus on structures of head and neck, oral cavity, and in-depth study of nervous system; combination of traditional lectures, cadaver laboratory dissection, virtual histology laboratories, and supported self-regulated learning strategies. Requirements: D.D.S. program enrollment.

**ACB:8401 Advanced Human Anatomy**

Regional dissection of the body with emphasis on systems relevant to student's specialty interests; discussion, reading, clinically relevant imaging, embryology. Offered spring semesters. Requirements: fourth-year M.D. enrollment or graduate standing.

**ACB:8402 Teaching Elective in Regional Anatomy**

Expand knowledge and experience in medical education; investigate educational pedagogy in a laboratory setting coupled with self-directed learning of anatomical content relevant to professional development; prepare, design, and implement four teaching interactions with M1/D1/PA1 students; design a classroom exercise (e.g., interactive lecture, learning activity, computer-based study module) that helps bridge the basic science content with clinical procedure. Requirements: M.D. standing and enrollment in teaching track distinction.