

# INDIANA UNIVERSITY

University Graduate School  
2005-2006  
Academic Bulletin

## **Anatomy and Cell Biology<sup>1</sup>**

**School of Medicine**  
**Indianapolis**

**Chairperson**  
Professor David Burr

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anatomy.iupui.edu

## **Graduate Faculty**

### **Professors**

Patrick Walker Bankston, David B. Burr\*, Andrew P. Evan\*, Vincent H. Gattone\*, William C. Hamlett, Janet M. Hock (Dentistry), Virgil D. Hoftiezer\*, Ralph Jersild\* (Emeritus), Carl F. Marfurt\*, James McAteer\*, Brian O'Connor\* (Emeritus), Richard G. Peterson\*, Mark F. Seifert\*, Joel A. Vilensky\*, Zao Cheng Xu\*, Feng C. Zhou\*

### **Associate Professors**

Joseph P. Bidwell\* (Dentistry), James Joseph Brokaw, Kenneth E. Byrd\* (Dentistry), Taihung Duong\*, Eri Hashino\*, Roger C. Hoversland, Bang H. Hwang\*, Michael J. Kubek\*, Nancy J. Mangini\*, Margaret M. Moga, John F. O'Malley, Dale W. Saxon, John Schmedtje\* (Emeritus), Darl Swartz\*, Robert D. Sweazey, James C. Williams\*, Donald Wong\*, Hiroki Yokota

### **Assistant Professor**

Alexander G. Robling, William Truitt (Psychiatry)

### **Adjunct Professors**

Lincoln Ford\*, Alan Mikesky\* (Physical Education), Michael Pritz\* (Neurosurgery), Masahiko Sato\* (Affiliate Graduate Faculty), David Suzuki (Ophthalmology), Charles Young (Affiliate Graduate Faculty)

### **Adjunct Associate Professors**

Robert Bacallao (Medicine), Bonnie Blazer-Yost\* (Biology, Physiology, and Biophysics), Simon Conway\* (Pediatrics), Wei-Hua Lee\* (Pediatrics), Gerald Smith Jr.\* (Medicine)

### **Adjunct Assistant Professors**

Jack Windsor (Dentistry)

### **Graduate Advisor**

James C. Williams\*, Ph.D., Chair of Graduate Studies Committee, 635 Barnhill Drive, MS5035, Indianapolis, IN 46202-5120, (317) 274-7495, williams@anatomy.iupui.edu

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## Degrees Offered

Master of Science and Doctor of Philosophy. The Master of Science as a terminal degree in this field is not encouraged.

## Special Departmental Requirements

(See also general University Graduate School requirements.)

### Admission Requirements

Bachelor's degree, preferably with a background in general, cellular and molecular biology; developmental biology; general and organic chemistry; physics; and calculus. Candidates should have a minimum grade point average of 3.0 (B) overall, and 3.0 in science courses. The Graduate Record Examination General Test is required. It is preferable that graduate study be started in the fall semester. Application for admission to the Master of Science program requires sponsorship by a graduate faculty member. Completed applications should be received before January 15. A personal interview may be requested. Applicants will be notified of departmental action by April 15.

## Master of Science Degree

### Course Requirements

A total of 30 credit hours, including D861, and at least three of the following: D850, D851, D852, or G818.

### Thesis

Normally required; an alternative project may, however, be approved by the student's advisory committee.

### Final Examination

Written. Oral defense of the thesis is also required.

## Doctor of Philosophy Degree

### Course Requirements

A total of 90 credit hours, including D861, and at least three of the following: D850, D851, D852, or G818. An approved course in statistics also is required. A minimum of 32 credit hours must be in courses other than research.

### Minor

A minimum of 12 credit hours of course work other than research in a related program (e.g., biochemistry, biophysics, medical genetics, microbiology, neurobiology, pathology, pharmacology, physiology, toxicology, or life science). For a minor in life science, at least 6 credit hours must be taken in one department. The minor must be approved by the student's advisory committee.

### Other Requirements

Students are required to gain experience in teaching by assisting one semester in one of the departmental courses.

### Grades

Overall B (3.0) average in course work and no less than a B in D850, D851, D852 or G818.

### Qualifying Examination

Written and oral, designed to assess the student's preparedness to carry out a research program.

## Final Examination

Oral defense of dissertation. Further details of departmental policies will be made available to the student on request and at the time of enrollment.

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## Courses

The courses below are offered every year unless otherwise indicated. "Even" or "odd" refers to the calendar year in which the academic year ends (e.g., 1998-99 is an "odd" year).

### General

**D501 Functionally-Oriented Human Gross Anatomy (5 cr.)** P: K101 Concepts of Biology I or K103 Concepts of Biology II, or K331 Embryology, or equivalent. Consent of instructor. Introduction to the concepts, terminology, and basic structure of the human body. Prosection of the body will use a regional approach. Emphasis on providing fundamental knowledge of the structure/function of major organ systems, peripheral nervous system, and vascular supply to the trunk, head and neck, limbs, and back.

**D502 Basic Histology (4 cr.)** P: K103 or K324. Lecture and laboratory instruction on the microscopic structure of the basic tissues and organs of the body. Previous exposure to gross anatomy principles and dissection encouraged.

**D526 Methods in Cell and Neurobiology (4 cr.)** Didactic and laboratory instruction in contemporary methods used in modern cell biology and neurobiology research. Methods range from cellular to molecular. Each method is taught by a faculty member with expertise and experience in that area.

**D527 Graduate Neuroanatomy (3 cr.)** P: any undergraduate biology or anatomy course, or approval of the course director. A neuroanatomy/neurobiology course that introduces the student to terminology, pathways, organization, and concepts of the human nervous system. It is designed for those seeking a Doctoral or terminal Master of Science degree in a department other than Anatomy, or for students in interdisciplinary programs such as Psychology, Medical and Biological Engineering and the Medical Neurobiology Program.

**D533 Neural Substrate for Sensory-Motor Control (3cr.)** This is an advanced graduate course that will build upon the neuroanatomic foundation established in ANAT D527. The goal is to give functional meaning to the neural systems involved with acquiring behaviorally relevant information and transforming this information into signals that guide behavior. The emphasis will be on neuronal signal processing.

**D850 Gross Anatomy (8 cr.)** A survey course of human anatomy, including a complete dissection.

**D851 Histology (4 cr.)** A complete survey of the microscopic structure of the tissues and organs of the body.

**D852 Neuroscience and Clinical Neurology (5 cr.)** P: gross anatomy or instructor approval. A multidisciplinary course integrating basic neuroscience with clinical neurology in understanding the human nervous system and neurological disorders. Includes the neurologic exam in presentations of neurologic patients, neuroradiologic imaging and histologic atlas cross-sections in studying internal organization and vasculature of the brain and spinal cord.

**D853 Human Developmental Anatomy (4 cr.)** P: D850, D851 and D852. A correlative study of prenatal and neonatal form and function. Odd years.

**D856 Advanced Histology (1-5 cr.)** In-depth consideration of selected topics on the microscopic anatomy of cells, tissues, and organs.

**D860 Research (1-10 cr.)**

**D861 Seminar (1 cr.)** Required yearly for all graduate students in residence. Literature and research reports and discussions by faculty, students, and invited distinguished visitors.

**D862 Anatomical Techniques (2 cr.)** Introduction to techniques in anatomical research and in preparation of teaching materials.

**D863 Peripheral Nervous System (2-3 cr.)** Anatomical and functional consideration of sensory, motor, and autonomic portions of the peripheral nervous system, with emphasis on neurotransmission and its regulation, physiology of receptors, neuromuscular junction, peripheral axons and their central regulation, myelination, and axonal transport.

**D864 Advanced Gross Anatomy (cr. arr.)** P: D850. Functional, clinical, and developmental gross morphology of specific regions of the human body; special topics may vary.

**D865 Developmental Neuroanatomy (3 cr.)** Basic principles and problems relating to prenatal and postnatal development and aging of the central nervous system.

**D866 Electron Microscopy with Laboratory (2 cr.)** P: D851 or equivalent, and consent of instructor. Introduction to electron microscopy, including lectures and laboratory. The application of techniques, biological specimen preparation (rationale and practical aspects), instrument operation, and image processing for both scanning and transmission electron microscopy are included. Special techniques and their application will be discussed.

**D868 Histology of Immune System: Lecture (2 cr.)** P: D851. Current information on cells, tissues, and organs that participate in cellular and humoral immune reactions. Cytochemical methods for elucidating these reactions. Attention given to cellular aspects of immune mechanisms in cancer and organ transplantations.

**D869 Histology of Immune System: Laboratory (cr. arr.)** P: D868 or concurrent. Enrollment limited. The fluorescent antibody technique, enzyme-labeled antibody technique, electron microscopic immunocytochemistry, the isolation and observation of lymphocytes, and cytochemistry of marrow smears.

**D870 Tissue Culture: Lecture (2 cr.)** P: D871 concurrently. Study of living edu cells and tissues maintained in an artificial environment with emphasis on growth, differentiation, and their response to various factors.

**D871 Tissue Culture: Laboratory (2 cr.)** P: D870 concurrently. Application of laboratory techniques used in preparation of in vitro cultures, and their use in biomedical research.

**D875 Topics in Advanced Neuroanatomy (2-5 cr.)** Examination of the anatomy and related physiology and neurochemistry of selected brain areas. Topics will include regional structures (in spinal cord, brain stem, diencephalon, or telencephalon) or specific neurological systems (sensory, motor, or autonomic-visceral). Area of study to be arranged with instructor.

**D876 Neurotransmitter and Neuroendocrine Cytology and Anatomy (3 cr.)** Detailed examination of the cytology and connections, chemical and physiological regulatory mechanisms, interactions, and functions of neurotransmitter or neurohormonal cells, including central neurons utilizing dopamine, norepinephrine, epinephrine, serotonin, acetylcholine, amino acid transmitters, substance P, and endorphins. Regulation and function of neuroendocrine transducers related to anterior and posterior pituitary, adrenal medulla, pineal.

**D888 Developmental and Molecular Neurobiology.** This is an in-depth course in neurobiology designed to help students understand the molecular and cellular mechanisms that underlie the development, normal and abnormal functions of the nervous system. Special emphasis will be placed on both experimental and theoretical approaches that led to our current knowledge of the nervous system.

## Graduate

**G595 Current Topics in Cell Structure and Function (3 cr.)** P: D851 or F705 or B817 or consent of instructor. An advanced course in cell biology designed to evaluate contemporary issues in cell structure and function. Background lectures are complemented by discussion of primary research articles. Emphasis is on developing a critical approach to the cell biology literature by evaluating the effectiveness and limitations of various experimental strategies.

**G801 Experimental Approaches to Cell Structure and Function (3 cr.)** The overall objective of this graduate course in cell biology is to present, in an experimental context, information integrating cell structure with cell function. The focus is on topics in which new information on cell structure has enhanced or reformulated our understanding of cell function.

**G811 Seminars in Aging Research (1 cr.)** P: None. Required one time (2 semesters) for all students who plan to minor in aging. Students are required to select 10 seminars during the year from an approved list, or with approval of the seminar coordinator. Seminars involve research reports and discussion by faculty, students, and invited distinguished scholars.

**G812 Fundamental Concepts in Aging (3 cr.)** P: None. A survey course covering various processes and diseases of aging. The course includes sections on demography and epidemiology; physiology, molecular biology, and pharmacology of aging; specific clinical disease entities commonly associated with aging; neurodegeneration, memory, and cognition; depression, the pathophysiology of pain, nutrition, physical function, ethics, and psychosocial issues.

**G819 Basic Bone Biology (2 cr.)** P: One semester of introductory biology. An introduction to basic bone biology, including bone morphology, composition, and physiology; cell biology of bone cells; measurement techniques; adaptation to the mechanical and metabolic environments; regulatory factors and mineral homeostasis; and growth and development.

**G818 Integrative Cell Biology (3 cr.)** This course provides broad understanding of ways in which cells are organized and integrated into tissues. Emphasis is on the function of cells in neural/neuroendocrine system, cardiopulmonary, renal, and immune systems in the cytomechanics. Modern approaches to the study of tissue function by analysis of cellular regulation will be emphasized.

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<sup>1</sup> See also "Anatomy" in the Medical Sciences bulletin, Bloomington.