

# INDIANA UNIVERSITY

University Graduate School  
2006-2007  
Academic Bulletin

## Medical Neurobiology

School of Medicine  
Indianapolis

Program Director  
Professor J. R. Simon\*

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jsimon@iupui.edu

Departmental URL  
www.iupui.edu/~medneuro

## Graduate Faculty

(An asterisk [\*] denotes membership in the University Graduate School faculty with the endorsement to direct doctoral dissertations.)

### Distinguished Professors

M. H. Aprison\* (Emeritus, Biochemistry and Molecular Biology), P. Michael Conneally\* (Emeritus, Medical Genetics, Neurology), Bernardino Ghetti\* (Medical and Molecular Genetics, Neurobiology, Pathology, Psychiatry)

### Chancellor's Professor

Janice C. Froehlich\* (Medicine, Cellular and Integrative Physiology)

### Albert Eugene Sterne Professors

Hugh C. Hendrie\* (Emeritus, Psychiatry), Christopher McDougle\* (Psychiatry)

### Raymond E. Houk Professor of Psychiatry

Anantha Shekhar\* (Neurobiology, Pharmacology and Toxicology)

### Joyce and Iver Small Professor of Psychiatry, Neurobiology, and Medical Genetics

John Nurnberger Jr.\* (Neurobiology, Psychiatry)

### Paul Stark Professor of Pharmacology

Michael Vasko\*

### Robert B. Forney Professor of Pharmacology

James Klaunig\*

### Professors

Joseph DiMicco\* (Pharmacology and Toxicology), Tatiana Foroud\* (Medical and Molecular Genetics),

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Charles Goodlett\* (Psychology), Joseph Hingtgen\* (Emeritus, Clinical Psychology, Neurobiology in Psychiatry), Debomoy Lahiri\* (Psychiatry, Medical and Molecular Genetics), William McBride\* (Biochemistry and Molecular Biology, Neurobiology in Psychiatry), James Murphy\* (Neurobiology, Psychology), Grant Nicol\* (Pharmacology and Toxicology), Sean O'Connor\* (Neurobiology, Psychiatry), Gerry Oxford\* (Stark Neuroscience Research Institute, Pharmacology and Toxicology), Simon Rhodes\* (Cellular and Integrative Physiology), Pharmacology and Toxicology), Jay Simon\* (Psychiatry, Biochemistry and Molecular Biology), David Suzuki\* (Ophthalmology, Anatomy and Cell Biology), Zao C. Xu\* (Anatomy and Cell Biology), Feng Zhou\* (Anatomy and Cell Biology)

### **Associate Professors**

Ellen A.G. Chernoff\* (Biology), Dena Davidson\* (Psychiatry), Nicholas J. Grahame\* (Neurobiology, Psychology), Kathleen Hall (Psychiatry), Eri Hashino\* (Otolaryngology, Anatomy and Cell Biology), David Kareken\* (Neurology, Neuropsychology), Michael Kubek\* (Anatomy and Cell Biology, Neurobiology), Wei-Hua Lee\* (Pediatrics, Anatomy and Cell Biology), Aimee Mayeda\* (Psychiatry), John H. Schild (Biomedical Engineering), Frederick Unverzagt (Psychology), Donald Wong\* (Anatomy and Cell Biology)

### **Assistant Professors**

Nikolai Broustovetski (Pharmacology and Toxicology), R. Andrew Chambers (Psychiatry), Theodore Cummins (Pharmacology and Toxicology), Edward Daly (Neurology), Yansheng Du (Neurology), Cynthia Hingtgen\* (Neurology, Pharmacology and Toxicology), Evan Morris (Biomedical Engineering), Xiaoxi Qiao (Ophthalmology), Leonid Rubchinsky (Mathematical Sciences)

### **Associate Research Professors**

Sandra Morzorati\* (Neurobiology), Richard J. Thielen\* (Neurobiology, Biochemistry and Molecular Biology)

### **Clinical Professor**

Kimberly Quaid\* (Medical and Molecular Genetics, Psychiatry)

### **Graduate Advisor**

Professor J. R. Simon\*, Institute of Psychiatric Research 112, (317) 274-4730

## **Degrees Offered**

Master of Science and Doctor of Philosophy

## **Special Program Requirements**

(See also general University Graduate School requirements.)

### **Admission Requirements**

Bachelor's degree in chemistry, biological sciences, physics, mathematics, engineering, or psychology, which includes courses in general chemistry (8 credit hours), organic chemistry (8 credit hours), physics (4 credit hours), biological sciences (8 credit hours), and mathematics through calculus. Promising students may be accepted even though certain undergraduate prerequisites may be lacking, but they must remove deficiencies during the first year of graduate study. The Graduate Record Examination General Test results must be available before applicants will be considered for admission.

## **Master of Science Degree**

### **Course Requirements**

A total of 30 credit hours, including at least 17 credit hours of approved courses and 3 credit hours of research.

**Thesis**

Required.

**Final Examination**

Comprehensive oral examination.

**Doctor of Philosophy Degree****Course Requirements**

A total of 90 credit hours, including dissertation. A minimum of 36 credit hours must be in course work, the remainder in research.

**Minor**

Twelve (12) credit hours must be taken in one of the basic sciences associated with the Medical Neurobiology Program: anatomy, biochemistry, biology, medical genetics, microbiology and immunology, pathology, pharmacology, physiology and biophysics, and psychology.

**Qualifying Examination**

Written and oral, followed by presentation of a research proposal.

**Final Examination**

Oral defense of dissertation.

Core courses include N800, N801, N802, N611, N612, N613, N614, N615, N616, N617, P615, D527,. Additional appropriate courses in the Departments of Anatomy, Biochemistry, Biology, Medical Genetics, Microbiology and Immunology, Pathology, Pharmacology and Toxicology, Physiology and Biophysics, and Psychology will be accepted for credit toward the major with prior approval of the student's advisor.

**Courses**

**N800 Research in Medical Neurobiology (cr. arr.)** P: Consent of instructor with whom research is being done. Supervised literature and laboratory research in selected area(s) of medical neurobiology.

**N801 Seminar: Topics in Medical Neurobiology (1 cr.)** Required of all graduate students in program. Recent topics in medical neurobiology covered by literature and research reports and discussions by faculty, graduate students, and invited guest lecturers.

**N802 Techniques of Effective Grant Writing (3 cr.)** The grantsmanship course is designed to teach graduate students how to write an NIH application and to provide information on the review process. Students will complete an NIH R03 application by the end of the semester. All students will participate in a mock IRG-style review of each application at the end of the course.

**N611 Fundamental Neuroscience—Introduction to Cell and Molecular Biology (1 cr.)** A lecture/discussion course to introduce the student to general principles of cell and molecular biology and to provide an overview of general anatomy, electrical properties of neurons, and synaptic transmission. This course is designed as a primer for subsequent courses in the series (N612 through N617).

**N612 Fundamental Neuroscience—Neurotransmitter Dynamics & Synaptic Plasticity (2 cr.)** P: Consent of Instructor. A lecture/discussion course to explore the fundamental mechanisms involved in transmitter synthesis, release, storage, reuptake and general metabolism. Molecular mechanisms of synaptic plasticity as well as facilitation and depression of synaptic strength will also be explored.

**N613 Fundamental Neuroscience—Electrical Signaling & Ion Channel Biology (2 cr.)** P: Consent of Instructor. A lecture/discussion to explore the electrical properties of neurons, including various ion channels, ion channel pharmacology, and the generation, shape and conduction of action potentials.

**N614 Fundamental Neuroscience—Special Senses & Integrative Neurophysiology (2 cr.) P:**

Consent of Instructor. A lecture/discussion course to explore fundamental concepts and mechanisms related to various sensory receptors (photo receptors, hair cells), spinal reflex circuits, central pattern generators, and the visual system as complex integrative model.

**N615 Fundamental Neuroscience—Neuropharmacology of Synaptic Transmission (2 cr.) P:**

Consent of Instructor. A lecture/discussion course to explore the pharmacology of synaptic transmission with emphasis on transmitter receptors and basic pharmacologic principles including potency, efficiency, drug-protein interactions, ternary models for receptor activation, etc.

**N616 Fundamental Neuroscience—Developmental Biology of Neuroscience (2 cr.) P:**

Consent of Instructor. A lecture/discussion course to explore concepts in basic neuroembryology including examination of molecular cues for axial patterning, axonal pathfinding and growth, developmental regulation of gene transcription, neural stem cells and glia; cell precursors, and regionalization of nervous system function.

**N617 Fundamental Neuroscience—Intracellular Signal Transduction in Neurons (2 cr.) P:**

Consent of Instructor. A lecture/discussion course to explore the fundamentals of signal transduction with emphasis on G-protein signaling mechanisms, post-translational modifications of neural proteins, growth factor, integrin and calcium signaling pathways, and lipid signaling in neurons.

**Anatomy**

**D527 Neuroanatomy (3 cr.)**

**D863 Peripheral Nervous System (2-3 cr.)**

**D875 Topics in Advanced Neuroanatomy (2-5 cr.)**

**D876 Neurotransmitter and Neuroendocrine Cytology and Anatomy (3 cr.)**

**Biochemistry**

**B500 Introductory Biochemistry (3 cr.)**

**B835 Neurochemistry (3 cr.)**

**B836 Advanced Topics in Neurochemistry (2 cr.)**

**Graduate**

**G865 Fundamental Molecular Biology (3 cr.) P:** B800 or equivalent. Principles of molecular structure, function, and biosynthesis; core information regarding prokaryotic and eukaryotic gene continuity and metabolic coordination; introduction to multicellular systems and problems.

**Pharmacology and Toxicology**

**F602 Pharmacology: Lecture (5 cr.)**

**F804 Introduction to Pharmacology I (3 cr.)**

**F810 Pharmacology of Autonomic Cardiovascular Control: Central and Peripheral Mechanisms (3 cr.)**

**Physiology and Biophysics**

**F613 Mammalian Physiology Lecture (5 cr.)**