

Neurosciences

OFFICE: Building #1, School of Medicine,
Mail code 0662
<http://medicine.ucsd.edu/neurosci>

Director, Neurosciences Graduate Program

Anirvan Ghosh, Ph.D., *Biology*

Professors

Henry Abarbanel, Ph.D., *Physics*
Thomas Albright, Ph.D., *Adjunct/Psychology and Neurosciences*
Stephan Anagnostaras, Ph.D.
Ursula Bellugi, Ed.D., *Adjunct/Psychology*
Darwin K. Berg, Ph.D., *Biology-Neurobiology Section*
Karen Britton, M.D., Ph.D., *In-Residence/Psychiatry*
Joan Heller Brown, Ph.D., *Pharmacology*
Theodore H. Bullock, Ph.D., *Emeritus/Neurosciences*
Senyon Choe, Ph.D., *Neurosciences*
Don Cleveland, Ph.D., *Medicine/Neurosciences*
Eric Courchesne, Ph.D., *Neurosciences*
Karen Dobkins, Ph.D., *Psychology*
Mark H. Ellisman, Ph.D., *Neurosciences*
Edmund J. Fantino, Ph.D., *Psychology*
Fred H. Gage, Ph.D., *Adjunct/Neurosciences and Biology*
Douglas R. Galasko, M.D., *In-Residence/Neurosciences*
Mark A. Geyer, Ph.D., *In-Residence/Psychiatry and Adjunct/Neurosciences*
Lawrence S.B. Goldstein, Ph.D., *Cellular and Molecular Medicine*
Philip M. Groves, Ph.D., *Psychiatry and Neuroscience*
Richard H. Haas, M.D., *Neurosciences and Pediatrics*
Richard L. Hauger, M.D., *In-Residence/Psychiatry*
Stephen F. Heinemann, Ph.D., *Adjunct/Neurosciences*
Steven A. Hillyard, Ph.D., *Neurosciences and Adjunct/Psychology*
Vivian Y.H. Hook, Ph.D., *Pharmacology*
Paul A. Insel, M.D., *Pharmacology and Medicine*
Vicente J. Iragui-Madoz, M.D., Ph.D., *Clinical Neurosciences*
Dilip J. Jeste, M.D., *In-Residence and Psychiatry and Adjunct/Neurosciences*
Michael W. Kalichman, Ph.D., *Adjunct/Pathology*
Harvey J. Karten, M.D., *Neurosciences and Psychiatry*

Robert Katzman, M.D., *Emeritus/Neurosciences*
David Kleinfeld, Ph.D., *Physics*
Edward Koo, M.D., *Neurosciences*
George F. Koob, Ph.D., *Adjunct/Psychology and Psychiatry*
William B. Kristan, Ph.D., *Biology and Adjunct/Neurosciences*
Ronald Kuczenski, Ph.D., *In-Residence/Psychiatry and Adjunct/Neurosciences*
Marta Kutas, Ph.D., *Cognitive Science and Adjunct/Neurosciences*
Greg Lemke, Ph.D., *Adjunct/Neurosciences*
Stuart A. Lipton, M.D., Ph.D., *Adjunct/Neurosciences*
John Liu, Ph.D., *Adjunct/Ophthalmology*
Patrick D. Lyden, M.D., *In-Residence/Neurosciences*
Eduardo Macagno, Ph.D., *Biology*
Eliezer Masliah, M.D., *Neurosciences and Pathology*
Pamela Mellon, Ph.D., *Neurosciences and Reproductive Medicine*
Arnold L. Miller, Ph.D., *Neurosciences-Neurobiology Section*
Robert R. Myers, Ph.D., *Anesthesiology and Pathology*
R. Glenn Northcutt, Ph.D., *Neurosciences*
Daniel T. O'Connor, M.D., *In-Residence/Medicine*
Dennis O'Leary, Ph.D., *Adjunct/Neurosciences and Biology*
John Polich, Ph.D., *Adjunct/Neuropharmacology*
Henry C. Powell, M.D., D.Sc., *Pathology*
Morton Printz, Ph.D., *Pharmacology*
Vilayanur S. Ramachandran, M.D., *Psychology*
Barbara Ranscht, Ph.D., *Adjunct/Neurosciences*
Michael G. Rosenfeld, M.D., *Medicine*
Allen F. Ryan, Ph.D., *Surgery and Adjunct/Neurosciences*
David P. Salmon, Ph.D., *In-Residence/Neurosciences*
David S. Segal, Ph.D., *Psychiatry and Adjunct/Neurosciences-Neurobiology Section*
Terrence J. Sejnowski, Ph.D., *Biology-Neurobiology Section and Adjunct/Neurosciences, Cognitive Sciences, Computer Science and Engineering, and Physics*
Martin I. Sereno, Ph.D., *Cognitive Sciences*
Clifford Shults, M.D., *Neurosciences*
Nicholas C. Spitzer, Ph.D., *Biology-Neurobiology Section*
Larry R. Squire, Ph.D., *In-Residence/Psychiatry, Psychology, Neurosciences*
Charles Stevens, M.D./Ph.D., *Adjunct/Pharmacology*
Neal Swerdlow, M.D./Ph.D., *Psychiatry*
David A. Swinney, Ph.D., *Psychology*
Palmer W. Taylor, Ph.D., *Pharmacology*

Robert D. Terry, M.D., *Emeritus/Neurosciences and Pathology*
Leon J. Thal, M.D., *Chair, Neurosciences*
Doris A. Trauner, M.D., *Neurosciences and Pediatrics*
Roger Tsien, Ph.D., *Pharmacology and Chemistry & Biochemistry*
Wylie Vale, Ph.D., *Adjunct/Biology and Medicine*
Ajit Varki, M.D., *Medicine*
Matthew B. Weinger, M.D., *Anesthesiology*
Tony Yaksh, Ph.D., *Anesthesiology and Pharmacology*
Samuel S.C. Yen, M.D., *Emeritus/Reproductive Medicine*
Justin Zivin, M.D./Ph.D., *Neurosciences*
Charles Zuker, Ph.D., *Biology-Neurobiology Section and Neurosciences*

Associate Professors

Nigel Calcutt, Ph.D., *Pathology*
Donna Gruol, Ph.D., *Adjunct/Neurosciences*
John Kelsoe, M.D., *Psychiatry*
Christopher Kintner, Ph.D., *Adjunct/Biology*
Paul Martin, Ph.D., *Neurosciences*
Jaime Pineda, Ph.D., *Cognitive Sciences*
David H. Rapaport, Ph.D., *Surgery*
William R. Schafer, Ph.D., *Biological Sciences/Neurobiology*
Linda Sorkin, Ph.D., *Anesthesiology*
Evelyn Tecoma, M.D./Ph.D., *Clinical/Neurosciences*
John Thomas, Ph.D., *Adjunct/Neurosciences and Biology*
Eric Turner, M.D./Ph.D., *In-Residence/Psychiatry*
Mark Tuszynski, M.D./Ph.D., *Neurosciences*
Friedbert Weiss, Ph.D., *Adjunct/Psychiatry*
Mark C. Whitehead, Ph.D., *Surgery*
David Williams, Ph.D., *Adjunct/Pharmacology and Neurosciences*

Assistant Professors

Carolee Barlow, M.D., Ph.D., *Adjunct/Biology*
Lisa M. Boulanger, Ph.D., *Adjunct/Neurosciences*
Geoffrey Boynton, Ph.D., *Adjunct/Neurosciences*
Edward M. Callaway, Ph.D., *Adjunct/Neurosciences and Biology*
Andrea Chiba, Ph.D., *Cognitive Science*
E. J. Chichilnisky, Ph.D., *Adjunct/Neurosciences*
Robert Clark, Ph.D., *IR/Psychiatry*
Virginia de Sa, Ph.D., *Psychology*
Sascha du Lac, Ph.D., *Adjunct/Neurosciences*
Dan Feldman, Ph.D., *Biology-Neurobiology Section*
Marla Feller, Ph.D., *Biology-Neurobiology Section*
Joseph G. Gleeson, M.D., *Neurosciences*
James Goodson, Ph.D., *Psychology*

Bruce A. Hamilton, Ph.D., *Medicine*
 Jeffrey S. Isaacson, Ph.D., *Neurosciences*
 S. V. Penelope Jones, Ph.D., *Psychology*
 Rich Krauzlis, Ph.D., *Adjunct/Neurosciences*
 Kuo-Fen Lee, Ph.D., *Adjunct/Biology*
 Athina Markou, Ph.D., *Adjunct/Psychiatry*
 Mark Mayford, Ph.D., *Adjunct/Neurosciences*
 Sharon L. Nichols, Ph.D., *Adjunct/Neurosciences*
 Ardem Patapoutian, Ph.D., *Cell Biology*
 Martin Paulus, M.D., *Psychiatry*
 Samuel L. Pfaff, Ph.D., *Adjunct/Biology*
 Massimo Scanziani, Ph.D., *Biology*
 Gery Schulteis, Ph.D., *Adjunct/Anesthesiology*
 Gabriel A. Silva, Ph.D., *Bioengineering*
 Paul Slesinger, Ph.D., *Adjunct/Neurosciences*
 Lisa Stefanacci, Ph.D., *Adjunct/Psychiatry*
 Lisa Stowers, Ph.D.
 Michael A. Taffe, Ph.D., *Neuropharmacology*
 Anthony Wynshaw-Boris, M.D./Ph.D., *Pediatrics
 and Medicine*

The Graduate Program

The group in neurosciences accepts candidates for the Ph.D. degree who have undergraduate majors in such disciplines as biology, chemistry, engineering, microbiology, mathematics, physics, psychology, and zoology. A desire and competence to understand how the nervous system functions is more important than previous background and training.

Doctoral Degree Program

Students in this program receive guidance and instruction from a campuswide group of faculty interested in nervous system mechanisms. Each student, in consultation with an advisory committee, selects courses relevant to his or her research interests and goals. The selection will include formal courses listed in this catalog and informal seminars offered by the department. A regular schedule of rotation through the laboratories of faculty members is a feature of the first year; the student is exposed in this way to the various approaches, techniques, and disciplines represented on the campus.

Course Work

By the time of the minor proposition (see below), students are expected to demonstrate competence in the basics of neuroscience by taking five quarters of mandatory course work—

three quarters of Basic Neuroscience (Neurosci. 200 A-B-C), and one quarter each of Neuroanatomy Lab (Neurosci. 257) and Statistical Methods and Experimental Design (Neurosci. 225). In addition, students choose among various core elective courses, such as Molecular and Cellular Neuroendocrinology (Neurosci. 222), Neuropsychopharmacology (Neurosci. 277), Molecular and Cellular Neurobiology (Neurosci. 268), Developmental Neuroscience (Neurosci. 263) and approved courses from other graduate departments. Students are also permitted to substitute previous courses that are similar to the Neurosciences core courses. Such a substitution would require approval of the graduate adviser in consultation with the Core Curriculum Committee and course instructor(s).

Minor Proposition

The purpose of this examination is to test the student's ability to choose a problem in the neurosciences and propose an experimental approach to its solution. The problem should be broad, requiring experimental approaches from more than one discipline. The problem should be outside the area of the student's anticipated dissertation research. Students will be required to demonstrate a working knowledge of the disciplines involved in the minor proposition.

Oral defense of the minor proposition will be required at the end of the spring quarter of the second year of study. Exemptions may be granted to entering students already holding a master's degree.

Dissertation

During the second year, students are expected to propose and initiate work on a dissertation problem under the guidance of a faculty preceptor. The neurosciences group at UCSD currently conducts animal research and clinical studies in the fields of neuroanatomy, neurochemistry, neuropharmacology, neurophysiology, comparative neurology, physiology of excitable membranes, synaptic transmission, neuronal integration and coding, nervous system tissue culture, neuroimmunology, brain function, sensory physiology, motor mechanism, and systems analysis as applied to neurological problems.

Qualifying Examination

This examination, a university requirement, focuses on the proposed research that the student will undertake for his or her dissertation. This

examination is conducted by the approved doctoral committee.

Dissertation Examination

The required formalities listed in the *Instruction for Preparation and Submission of Doctoral Dissertations* issued by the Office of Graduate Studies and Research to students should be followed closely. The final examination includes both a public presentation followed by a closed defense of the dissertation with members of the Committee.

Teaching

Students are required to teach and to develop their talents as teachers. To this end, opportunities to lecture and to assist in laboratory exercises and demonstrations are provided.

Ph.D. Time Limit Policies

Students must advance to candidacy by the end of four years. Total university support cannot exceed six years. Total registered time at UCSD cannot exceed seven years.

COURSES

UNDERGRADUATE

199. Independent Research (2 or 4)

Laboratory research under the supervision of individual members of the faculty of the neurosciences department in one or a combination of neurosciences disciplines, e.g., neuroanatomy, neurophysiology, neurochemistry, neuropharmacology. (P/NP grades only.)
Prerequisite: consent of department chair. (F,W,S)

GRADUATE

200A-B-C. Basic Neuroscience (4-4-4)

These courses are designed for graduate students in the neurosciences and other departments that are part of the interdisciplinary program (i.e., Biology, Cog. Sci.). These courses have been designed to cover as much basic neuroscience as possible in *three quarters of study*. It will combine two three-hour meetings each week with a 1.5 hour lecture and a 1.5 hour discussion of papers. These will be required courses for all first-year neurosciences graduate students. Biology will cross-list courses under Biology headings, making it a requirement of first year Biology graduate students.
Prerequisite: graduate student or consent of instructor. (F,W,S)

221. Advanced Topics in Neurosciences (2)

Specialized advanced topic areas in neurosciences will be addressed in an interactive seminar course format. A different specific topic will be considered each quarter as announced in advance. Students will each present an aspect of the topic area and participate in discussions.
Prerequisite: graduate student or consent of instructor. (F,W,S)

222. Molecular and Cellular Neuroendocrinology (4)

This course will examine the role of the CNS in controlling reproductive functions, stress, growth and behavior, with emphasis on the cellular and molecular mechanisms of neuroendocrine function. The lectures will be given by experts on each of the topic subjects. Lectures will include a basic introduction on the topic followed by a description of the current research in the area.

225. Statistical Methods and Experimental Design (2)

This course is designed for graduate students in the neurosciences, but will address issues of statistical methods and experiment design for investigators working in any field of biological research. The course will combine lectures, discussion, and practical examples drawn from the experience of the participant. *Prerequisite: graduate student in the neuroscience graduate program or consent of the instructor.* (F)

233. Comparative Vertebrate Neurobiology (4)

Survey of the organization and evolution of vertebrate nervous systems. *Prerequisite: consent of instructor.* (S/U grades only.) (W)

234. Molecular and Cellular Neurochemistry (4)

Topics include membrane and nerve function in nervous system, structure and function of receptors for neurotransmitters, role of cAMP as a second messenger in the nervous system, synthesis and processing of neuropeptides.

235. Neurobiology of the Chemical Senses (1)

This lecture and seminar course surveys the neuroanatomy and neurophysiology of the central and peripheral taste and olfactory systems. Plasticity of the mature and developing chemosensory systems will also be covered. Behavioral studies of sensory function will be related to psychophysical studies in humans, including those directed at evaluating clinical chemosensory disorders. Students are expected to discuss readings of journal articles. (S)

241. Ethics and Survival Skills in Academia (2-4)

This course will cover "ethical" issues in academia, including dishonesty, plagiarism, attribution, sexual misconduct, etc. We will also discuss "survival" issues, including job hunting, grant preparation, journal reviews, writing letters of recommendation, mentoring, etc. (W)

243. Physiological Basis of Human Information (2)

Psychological processes including attention, perception, and memory will be studied in connection with event-related potentials of the human brain. The interrelations among psychological and physiological events will be explored in order to arrive at unified concepts of human information processing. *Prerequisites: Neurosci. 238 or Psych. 231, and consent of instructor.* (S/U grades only.) (F)

251. Scientific Communication (2)

(Same as SIO 292) Forms of scientific communication, practical exercise in scientific writing and short oral communication, and in criticism and editing, preparation of illustrations, preparation of proposals; scientific societies and the history of scientific communication. Examples from any field of science, most commonly biology, marine biology, ecology, and neuroscience. *Prerequisite: graduate status in science.* (S/U grades only.) (S)

253. Clinical Neuroanatomy (1)

Review of neuroanatomy, with emphasis on clinical correlations. Pertinent physiological, chemical, and clinical information will be included and functional organization

will be stressed. It is essential that students be familiar with neuroanatomical nomenclature. *Prerequisite: medical student, graduate student, intern, resident, or consent of instructor.* (S/U grades only.)

256. Mammalian Neuroanatomy (4)

Lectures presenting the basic features of the anatomy of the mammalian nervous system. This will include consideration of cellular components, development, topographic anatomy, and a detailed presentation of the organization of functional systems. *Prerequisite: graduate status or consent of instructor.* (S/U grades only.) (F) (not offered in 2000–2001)

257. Mammalian Neuroanatomy Laboratory (4)

Neuroanatomy laboratory course taught in conjunction with Mammalian Neuroanatomy (256). Laboratories deal with gross and microscopic neuroanatomy of brain systems. Sessions include microscopic analysis of histological sections and observations and dissections of human brain material. *Prerequisite: Neuroanatomy 256 or concurrent enrollment.* (S/U grades permitted.) (W)

259. Workshop in Electron Microscopy (4)

This course is to introduce graduate students in the neurosciences to research methods used in electron microscopy (EM) through one hour of formal lecture, one hour of seminar, three hours of demonstration, and three hours of supervised laboratory work per week. Students will become familiar with sectioning EM, scanning EM, and freeze-fracture EM. *Prerequisites: graduate-student standing in neurosciences doctoral program and consent of instructor.* Enrollment limited. (S/U grades only.) (S)

263. Developmental Neurobiology (3)

(Same as Biology 258.) Cellular and developmental aspects of the nervous system. Methods of investigation and culture approaches. Basic neuroembryology and selected examples of regional developments. Neuroglial cells and neuron-glia interactions. Extrinsic controls of survival growth and maturation of neural cells. Neurite growth and synapse formation. Potential for plasticity and regeneration in the nervous system. *Prerequisite: graduate students or consent of instructor.* (S)

264. Behavioral Neuroscience (5)

The course is to cover different areas of behavioral biology, such as ethology, behavioral biology, learning and memory, perception psychophysics. Some outside reading will be required. *Prerequisite: medical student, graduate student, or consent of instructor.* (W)

268. Molecular and Cellular Neurobiology (4)

This course focuses on cellular anatomy of the nervous system at the molecular level. The lectures will communicate current molecular genetic and cell biological approaches used to study the specialized structures and cell types of nervous tissue. Topics will include cell organelles; chromatin structure/function; gene expression/regulation; cytoskeleton and membrane interactions; signal transduction/receptors, channels and pumps; cellular junctions/synapses; node of Ranvier; and neuroplasmic transport. *Prerequisites: neurochemistry, neuroanatomy, biochemistry.* (F)

269. Electroencephalography and Clinical Neurophysiology (1)

Using the Journal of Electroencephalography and Clinical Neurophysiology as a core text, subjects chosen from the journal will be discussed and critically evaluated by the participants, and the literature pertinent to each topic reviewed. *Prerequisites: Neurosci. 238, Basic Neurology (205), neurology resident, or consent of instructor.* (F,W,S)

274. Neurobiology of Cognitive Developmental Disorders (2)

Neurobiological foundation of developmental disorders in information processing including infantile autism, developmental dysphasia, attention deficit disorder, and childhood schizophrenia. Neurophysiological, neuroanatomical, and psychological evidence will be explored. *Prerequisite: undergraduate or graduate course in neurobiology.* (S/U grades permitted.)

276. Neuroscience Research Rounds (2)

Neurosciences group faculty members and graduate students will present and discuss ongoing research. Attendance will be mandatory for first- and second-year graduate students. Faculty, advanced graduate students, medical students, postdoctoral trainees, and other interested parties are encouraged to attend. (F,W,S)

277. Neuropsychopharmacology (4)

An examination of the molecular and biochemical bases of drug and transmitter action. The course is devoted to receptor mechanisms, neuropharmacology, and drug action on excitable tissues. (S)

296. Neurosciences Research Rotation (1-12)

Independent study. (S/U grades only.) (F,W,S)

298. Neurosciences Independent Study Project (ISP) (1-12)

Prerequisite: approved ISP proposal. (F,W,S)

299. Neurosciences Research (1-12)

Independent study. (S/U grades only.) (F,W,S)

401. Neurology General Clinical Selective Clerkship (7)

Provides opportunities for practical application of neurological skills to the understanding and treatment of a variety of clinical disorders of the nervous system. *Prerequisite: successful completion of first two years of medical school.* (F,W,S)

426. Subintern Pediatric Neurology (7)

Subinterns are responsible for the primary care of hospitalized pediatric neurology patients under the direct resident and attending physician supervision. They will perform procedures such as lumbar puncture and participate in night call, daily teaching round, neurology Grand Rounds, and Journal Clubs. *Prerequisite: Neurology 401 or consent of instructor.* (F,W,S)

427. Neurology Outpatient Clerkship (7)

The student will rotate through the general and subspecialty (stroke, epilepsy, headache, nerve, and muscle) neurology clinics based at UCSD Medical Center. Lectures and clinical conferences will be attended as well. *Prerequisite: Neurosciences 401 or equivalent.* (F,W,S)

496. Clinical Independent Study (1-12)

Independent clinical study for medical students (S/U grades only.) (F,W,S)

500. Apprenticeship Teaching (1-4)

Participation in the department teaching program is required of all students working toward a Ph.D. degree. In general, students are not expected to teach in the first year, but are required to serve as teaching assistants or tutors for one quarter at any time during their subsequent years of training. The amount of teaching required is equivalent to the duties expected of a 50 percent assistant for one quarter. *Prerequisite: neurosciences graduate students.* (S/U grades only.) (F,W,S)