Department of Neurobiology and Behavior

Marcelo Wood, Department Chair
Kim Green, Department Vice Chair
2205 McGaugh Hall
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The Department of Neurobiology and Behavior programs provide a broad foundation in neuroscience combined with proficiency in a specific area of research. Faculty members in the Department address questions in neuroscience at the molecular, cellular, systems, and behavioral levels. Research focuses on a range of topics including learning and memory, neurodegenerative disorders, addiction, sensory neurobiology, developmental neurobiology, and neural plasticity.

- Neurobiology and Behavior, Graduate Program
- Neurobiology, B.S.

Faculty

Kevin T. Beier, Ph.D. Harvard University, *Assistant Professor of Physiology and Biophysics; Biomedical Engineering; Neurobiology and Behavior; Pharmaceutical Sciences* (neuroscience, neural circuits, neural plasticity, molecular neuroscience, behavior, technique development, viral-genetic)

Mathew M. Blurton-Jones, Ph.D. University of California, San Diego, *Professor of Neurobiology and Behavior*

Jorge A. Busciglio, Ph.D. Universidad Nacional de Córdoba, *Professor of Neurobiology and Behavior*

Lawrence F. Cahill, Ph.D. University of California, Irvine, *Professor of Neurobiology and Behavior; Psychological Science*

Elizabeth Chrastil, Ph.D. Brown University, *Assistant Professor of Neurobiology and Behavior; Cognitive Sciences*

Susana Cohen-Cory, Ph.D. The Rockefeller University, *Professor of Neurobiology and Behavior*

Karina S. Cramer, Ph.D. California Institute of Technology, *Professor of Neurobiology and Behavior*

Norbert Fortin, Ph.D. Boston University, *Associate Professor of Neurobiology and Behavior*

Christie Fowler, Ph.D. Florida State University, *Associate Professor of Neurobiology and Behavior*

Ron D. Frostig, Ph.D. University of California, Los Angeles, *Professor of Neurobiology and Behavior; Biomedical Engineering*

Christine M. Gall, Ph.D. University of California, Irvine, *Department Chair and Distinguished Professor of Anatomy and Neurobiology; Neurobiology and Behavior*

Sunil P. Gandhi, Ph.D. University of California, San Diego, *Professor of Neurobiology and Behavior*

Kim Green, Ph.D. University of Leeds, *Department Vice Chair and Professor of Neurobiology and Behavior*

John F. Guzowski, Ph.D. University of California, Irvine, *Associate Professor of Neurobiology and Behavior*

Autumn S. Ivy, M.D., Ph.D. University of California, Irvine, *Assistant Professor of Pediatrics; Anatomy and Neurobiology; Neurobiology and Behavior; Neurology; Physiology and Biophysics* (early-life exercise, epigenetics, neurology, learning and memory, developmental disorders)

Claudia H. Kawas, M.D. University of Louisville, *Nichols Term Endowed Chair in Neuroscience and Professor of Neurology; Epidemiology and Biostatistics; Neurobiology and Behavior*

Albert R. La Spada, M.D., Ph.D. University of Pennsylvania, *Associate Dean for Research Development and Distinguished Professor of Biological Chemistry; Neurobiology and Behavior; Neurology; Pathology and Laboratory Medicine*

Frank M. LaFerla, Ph.D. University of Minnesota, *Dean of the School of Biological Sciences and Professor of Neurobiology and Behavior; Neurology*

Thomas E. Lane, Ph.D. University of California, Los Angeles, *Chancellor's Professor of Neurobiology and Behavior*

Michael Leon, Ph.D. University of Chicago, *Professor Emeritus of Neurobiology and Behavior*

Audrey Chen Lew, Ph.D. University of California, Los Angeles, *Assistant Professor of Teaching of Neurobiology and Behavior*

Gyorgy Lur, Ph.D. University of Liverpool, *Assistant Professor of Neurobiology and Behavior*

Stephen V. Mahler, Ph.D. University of Michigan, *Associate Professor of Neurobiology and Behavior*

John F. Marshall, Ph.D. University of Pennsylvania, *Professor Emeritus of Neurobiology and Behavior*

James L. McGaugh, Ph.D. University of California, Berkeley, *Research Professor and Professor Emeritus of Neurobiology and Behavior*

Bruce L. McNaughton, Ph.D. Carleton University, *UCI Distinguished Professor of Neurobiology and Behavior*

Raju Metherate, Ph.D. McGill University, *Associate Dean and Professor of Neurobiology and Behavior*

John Middlebrooks, Ph.D. University of California, San Francisco, *Professor of Otolaryngology; Biomedical Engineering; Cognitive Sciences; Neurobiology and Behavior*

Andrea C. Nicholas, Ph.D. University of Chicago, *Associate Professor of Teaching of Neurobiology and Behavior*

Sean B. Ostlund, Ph.D. University of California, Los Angeles, *Associate Professor of Anesthesiology and Perioperative Care; Neurobiology and Behavior*

Eitan Schechtman-Drayman, Ph.D. Hebrew University of Jerusalem, *Assistant Professor of Neurobiology and Behavior*

Craig Stark, Ph.D. Carnegie Mellon University, *James L. McGaugh Chair in the Neurobiology of Learning and Memory and Professor of Neurobiology and Behavior; Cognitive Sciences*

Oswald Steward, Ph.D. University of California, Irvine, *Director, Reeve-Irvine Research Center and Reeve-Irvine Endowed Chair in Spinal Cord Injury Research and Distinguished Professor of Anatomy and Neurobiology; Neurobiology and Behavior*

Georg F. Striedter, Ph.D. University of California, San Diego, *Professor of Neurobiology and Behavior*

Katumi Sumikawa, Ph.D. Imperial College London, *Professor of Neurobiology and Behavior*

Vivek Swarup, Ph.D. University of Laval, *Assistant Professor of Neurobiology and Behavior*

Andrea Tenner, Ph.D. University of California, San Diego, *Professor of Molecular Biology and Biochemistry; Neurobiology and Behavior; Pathology and Laboratory Medicine*

Leslie M. Thompson, Ph.D. University of California, Irvine, *Chancellor's Professor and Donald Bren Professor of Psychiatry and Human Behavior; Biological Chemistry; Neurobiology and Behavior*

Marcelo A. Wood, Ph.D. Princeton University, *UCI Chancellor's Fellow and Department Chair and Professor of Neurobiology and Behavior*

Michael Yassa, Ph.D. University of California, Irvine, *UCI Chancellor's Fellow, and Associate Dean of Diversity, Equity, and Inclusion and Director of the Center for the Neurobiology of Learning and Memory and Professor of Neurobiology and Behavior; Psychological Science*

Courses

NEURBIO 200A. Research in Neurobiology and Behavior. 2-12 Units.
Individual research with Neurobiology and Behavior faculty.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 200B. Research in Neurobiology and Behavior. 2-12 Units.
Individual research with Neurobiology and Behavior faculty.

Prerequisite: NEURBIO 200A. NEURBIO 200A with a grade of B- or better

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 200C. Research in Neurobiology and Behavior. 2-12 Units.
Individual research with Neurobiology and Behavior faculty.

Prerequisite: NEURBIO 200B. NEURBIO 200B with a grade of B- or better

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 201A. Research in Neurobiology and Behavior. 2-12 Units.
Individual research with Neurobiology and Behavior faculty.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 201B. Research in Neurobiology and Behavior. 2-12 Units.
Individual research with Neurobiology and Behavior faculty.

Prerequisite: NEURBIO 201A. NEURBIO 201A with a grade of B- or better

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 201C. Research in Neurobiology and Behavior. 2-12 Units.
Individual research with Neurobiology and Behavior faculty.

Prerequisite: NEURBIO 201B. NEURBIO 201B with a grade of B- or better

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 202A. Foundations of Neuroscience. 2 Units.
Intended to expose students to critical reading and analysis of the primary neuroscience literature. Instructors from departments associated with the Interdepartmental Neuroscience Program participate and discuss topics of current interest.

Grading Option: Satisfactory/unsatisfactory only.

NEURBIO 202B. Foundations of Neuroscience. 2 Units.
Intended to expose students to critical reading and analysis of the primary neuroscience literature. Instructors from departments associated with the Interdepartmental Neuroscience Program participate and discuss topics of current interest.

Prerequisite: NEURBIO 202A. NEURBIO 202A with a grade of B- or better

Grading Option: Satisfactory/unsatisfactory only.

NEURBIO 206. Molecular Neuroscience. 5 Units.
Surveys molecular and cellular mechanisms involved in neuronal function, including control of gene expression, post-transcriptional and post-translational processing, RNA and protein targeting, cell death mechanisms, and molecular genetic basis of neurological disorders. Overview of the molecular aspects of developmental neurobiology.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 207. Cellular Neuroscience. 5 Units.
Neurophysiological and neurochemical mechanisms of electrical and chemical signaling in neurons. Topics include generation of resting- and action-potentials, voltage- and ligand-gated ion channels, second messenger systems, and synaptic transmission and integration.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 207L. Cellular Neuroscience Laboratory. 2 Units.
Intensive hands-on laboratory experience of contemporary techniques for studying ion channels and synaptic function. Experiments include microelectrode recording, patch clamp, quantal analysis of synaptic transmission, heterologous expression of genes for channels and receptors, brain slice, and fluorescence calcium imaging.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 208. Systems Neuroscience. 5 Units.
Study of the mammalian nervous system at the systems level. Anatomy and physiology of sensory, motor, and integrative functions.

Repeatability: May be taken for credit 2 times.

Same as ANATOMY 210A.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 209. Behavioral Neuroscience. 5 Units.
Overview of fundamental conceptual and experimental issues in the neurobiology of learning and memory. The approach is a cross-level integration of research in molecular-genetic, cellular, circuit, systems, and behavioral analyses.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 217. Foundations in Neuroimmunology II. 4 Units.
The immune system supports normal brain development as well as controls central nervous system (CNS) infection, and neurodegenerative and neurological diseases. Assesses how the immune system contributes to both host defense and disease.

Prerequisite: Undergraduate- or graduate-level immunology experience is required.

Restriction: Graduate students only.

Concurrent with BIO SCI N127.

NEURBIO 220. Neural Coding, Computation, and Dynamics. 4 Units.
Theoretical principles and biological mechanisms underlying how brains acquire, assimilate, store, and retrieve information, compute adaptive responses to external inputs, and how knowledge is extracted from experience to generate an internal model of the world.

Prerequisite: At least one upper-division course in the field of Neuroscience or one upper-division course in Cognitive Science or Machine Learning.

Concurrent with BIO SCI N174.

NEURBIO 227. Bioinformatics and Systems Biology. 4 Units.
Students learn the fundamentals of bioinformatics, genomic approaches, and Linux and R program in order to analyze RNA-sequencing data.

Overlaps with ECO EVO 282, ECO EVO 283.

Restriction: Graduate students only.

NEURBIO 228. Psychophysiological Methods in Clinical Research . 4 Units.
Introduces the principal signals of psychophysiology and outlines how measures calculated from these signals can be applied in clinical research and practice.

Prerequisite: One graduate or undergraduate course in statistics.

Restriction: Graduate students only.

NEURBIO 230. Epigenetics in Health and Disease . 4 Units.
Focuses on the role of chromatin/nuclear structure organization (histone and DNA modification, chromatin remodeling, higher order chromatin structure and nuclear organization) on gene regulation, DNA replication and repair, relevant to development, metabolism, learning and memory, and human disease.

Prerequisite: MOL BIO 203 or MOL BIO 204 or NEURBIO 206. MOL BIO 203 with a grade of B- or better. MOL BIO 204 with a grade of B- or better. NEURBIO 206 with a grade of B- or better

Same as BIOCHEM 225.

Restriction: Graduate students only.

NEURBIO 231. Clinical and Epidemiological Aspects of Neurodegenerative Diseases. 4 Units.
Clinical and epidemiological aspects of neurodegenerative disorders causing dementia will be reviewed, including AD, PD, FTD, HD and cerebrovascular disease. Seminar format will include student presentations and group discussion.

Restriction: Graduate students only.

NEURBIO 232. Regenerative Neurobiology. 4 Units.
Surveys the latest research on regenerative neurobiology. Both basic stem cell discoveries and their potential clinical application to brain disorders will be examined.

NEURBIO 233. Neurobiology of Drug Addiction. 4 Units.
Provides a comprehensive overview of topics in the addiction field, including drug pharmacology, models/approaches to investigate addiction, brain circuits, genetics, epigenetics, and the cellular and molecular biology of drug addiction.

Restriction: Graduate students only.

Concurrent with BIO SCI N121.

NEURBIO 236. Cortex: Structure, Function, and Plasticity. 4 Units.
Structured to include lectures and presentation of papers about cortex with emphasis on sensory-motor cortex. Both historical and current perspectives on cortical structure-function relationship will be critically evaluated.

NEURBIO 237. Neurobiology of Aging and Alzheimer's Disease. 4 Units.
Outlines changes occurring in aging and Alzheimer’s disease, and clinical manifestations of those changes. Emphasis on genetic and lifestyle risk factors, molecular mechanisms that are basis for detrimental and protective responses, diagnosis, and developing therapies for aging and Alzheimer's disease.

Prerequisite: NEURBIO 209. NEURBIO 209 with a grade of B- or better

NEURBIO 239. Functional Imaging of the Nervous System. 4 Units.
Overview of technical and applied aspects of imaging techniques available for studying the nervous system. The areas emphasized are cellular and subcellular imaging of neural function, systems-level imaging of brain function, and imaging of the human brain.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 240. Advanced Analysis of Learning and Memory. 4 Units.
Advanced analysis of contemporary research concerning the nature and neurobiological bases of learning and memory. Special emphasis is given to time-dependent processes involved in memory storage.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 247. Programming for Neuroscience Research . 4 Units.
A neuroscience-specific introduction to programming and data analysis using either MATLAB or Scientific PYTHON. Students will learn general programming skills and effective use of programming for data management, statistical analysis, and image analysis.

Overlaps with PSYCH 205A.

NEURBIO 248. Topics in Neurobiology and Behavior. 4 Units.
Studies in selected areas of Neurobiology and Behavior. Topics addressed vary each quarter.

Repeatability: May be taken for credit 3 times.

NEURBIO 249. Electronics for Biologists. 4 Units.
Basic principles of electricity; properties and use of discrete components and integrated circuits; circuit analysis and design. Intended for advanced students in the life sciences.

Same as PHYSIO 205.

NEURBIO 254. Molecular Neurobiology. 4 Units.
The application of genetic and recombinant DNA technology to neurobiology. Topics include the study of neuronal proteins which play important roles in the formation of synapses and synaptic transmission.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 255. Perspectives in Neuroscience: Past, Present, and Future. 4 Units.
An overview of the conceptual and technical foundations of contemporary neuroscience from ancient times to the present. The subjects include synapses, neurons, brain organization, sensory, motor and regulatory systems, learning and memory, human brain function and dysfunction.

Repeatability: May be taken for credit 2 times.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

Concurrent with BIO SCI N119.

NEURBIO 257. Statistics for Neurobiologists. 4 Units.
Introduction to common methods for statistical analysis used in neurobiology. Topics covered include t-tests, ANOVAs, correlations and regressions, general linear model, power analysis, and non-parametric tests.

Restriction: Graduate students only.

NEURBIO 260. Auditory Neuroscience. 4 Units.
Multidisciplinary overview of brain mechanisms of hearing. Emphasizes breadth of auditory function and research: single neurons to psychoacoustics, the chochlea to the cortex, and basic science to clinic.

Concurrent with BIO SCI N147.

NEURBIO 290. Colloquium in Neurobiology and Behavior. 1.3 Unit.
Presentation of contemporary research problems in neurobiology and behavior and related areas by invited speakers.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 291. Neuroscience Journal Club. 1-3 Units.
Covers emerging topics in addiction neuroscience research in a journal club format. Students discuss recent articles and may present an article of their choosing. Students gain skills in critical thinking and scientific communication.

Repeatability: May be taken for credit 6 times as topics vary.

NEURBIO 292. Scientific Proposals for Neuroscience Trainees. 4 Units.
Students learn how to effectively communicate scientific ideas and results. Activities include learning how to effectively write a scientific proposal, how to perform a coherent, persuasive slide presentation, and how to give meaningful, constructive review critiques.

Restriction: Graduate students only. Neurobiology and Behavior Majors only.

NEURBIO 399. University Teaching. 1-4 Units.
Limited to Teaching Assistants.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.