163. Developmental Genetics (3) Lecture—3 hours. Prerequisite: course 121. Current aspects of developmental genetics. Historical background and current genetic approaches to the study of development of higher animals. GE credit: SciEng SE, — W, (W), Natzle, Rose

164. Advanced Eukaryotic Genetics (3) Lecture—3 hours. Prerequisite: course 121. Five basic methods of eukaryotic genetic analysis: mutation, segregation, recombination, complementation, and regulation. Emphasis on the theory and practice of isolating and analyzing mutations, as well as understanding mechanisms underlying both Mendelian and epigenetic inheritance. GE credit: SciEng SE, SL — S, (S) Burgess, Engebrecht

178. Undergraduate Seminar in Molecular Genetics (1) Seminar—1 hour. Prerequisite: upper division standing, completion of Biological Sciences 101, and permission of the instructor. Discussion of current topics in molecular genetics to show advanced applications of basic principles and to highlight professional career opportunities. May be repeated one time for credit when topic differs. (P/NP grading only) GE credit: SciEng OL, SE, — F, W, S, (W, S, J) Cheddin, Natzle, Rodriguez


190C. Undergraduate Research Conference (1) Discussion—1 hour. Prerequisite: upper division standing and consent of instructor; concurrent enrollment in course 193 or 199. Presentation and discussion of research projects carried out by faculty and students. May be repeated for credit. (P/NP grading only) GE credit: SE, — F, W, S, (F, W, S)

191. Introduction to Research (1) Seminar—1 hour. Prerequisite: Biological Sciences 102 (may be taken concurrently) or consent of instructor. Topics in molecular and cellular biology including biochemistry, genetics, and cell biology will be discussed, along with ways undergraduates can participate in research projects. Independent study—9 hours. Prerequisite: 6 units of Biological Sciences 102 or consent of instructor. (P/NP grading only) GE credit: SciEng SE, SL — S, (S) Burgess, Engebrecht

193. Advanced Research (3) Laboratory—6 hours; discussion—1 hour. Prerequisite: upper division standing, completion of an upper division Molecular and Cellular Biology laboratory course and consent of instructor. Research project carried out under the supervision of a faculty sponsor. Discussion and analysis of results and proposed experiments on a weekly basis with faculty sponsor. May include participation in a seminar or research review group. Independent study—3-15 hours. Prerequisite: consent of instructor. Independent study—3-15 hours. Prerequisite: consent of instructor. May be repeated for credit. (P/NP grading only) GE credit: SE, — F, W, S, (F, W, S)

197. Tutoring in Molecular and Cellular Biology (1-2) Tutorial—2-6 hours. Prerequisite: upper division standing, completion of course to be tutored, and consent of instructor. Assisting the instructor in one of the sections’ resident individual or small groups of students in a laboratory, in voluntary discussion groups, or other voluntary course activities. May be repeated for credit. (P/NP grading only) Offered irregularly. GE credit: SE, — F, W, S, (F, W, S)

198. Directed Group Study (1-5) Variable—1-5 hours. Prerequisite: consent of instructor. (P/NP grading only) GE credit: SE, — F, W, S, (F, W, S)

199. Special Study for Advanced Undergraduates (1-5) Independent study—3-15 hours. Prerequisite: consent of instructor. (P/NP grading only) GE credit: SE, — F, W, S, (F, W, S)

248. Seminar in Cell Biology (2) Seminar—2 hours. Prerequisite: consent of instructor. Discussion of current literature on the physical and chemical aspects of organization and function of living systems, topics of current interest in ultrastructure and function of cells. Organizational and functional properties of the molecular and cellular systems of living systems. GE credit: SciEng SE

256. Cell and Molecular Biology of Cancer (2) Lecture—1 hour; term paper. Prerequisite: course in cell or developmental biology (e.g., course 150, 141, 163, or Biological Sciences 104). Analysis of the cellular and molecular levels of the regulation of normal and neoplastic tissue growth; tumor dissemination; identification and characterization of oncogenic agents; characterization of oncoproteins and tumor-suppressor genes.

258. Seminar in Development (2) Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms. May be repeated for credit. — W

259. Literature in Developmental Biology (1) Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in developmental biology. May be repeated for credit. (S/U grading only) — F, S, (F, S, F, W, S, J)

263. Biotechnology Fundamentals and Application (2) Lecture—2 hours. Prerequisite: Biological Sciences 101, 102 and Microbiology 102 or consent of instructor. Must be a graduate student in good standing. Fundamentals of molecular biology and chemical engineering involved in recombinant DNA technology. Topics: principles of rate processes of biodiscovery, optimization of bioreactors, and issues related to overexpression and production of recombinant molecules. Participation in student-directed team projects. — W (W) McDonald, Privalsky, Rodriguez, Kjelstrom

282. Biotechnology Internship (7-12) Internship—21-36 hours. Prerequisite: graduate standing and consent of instructor. Open only to students participating in the Designated Emphasis in Biotechnology. Research at a biotechnology company or interdisciplinary cross-college lab for a minimum of 3 months as part of the Designated Emphasis in Biotechnology Program. (S/U grading only) — F, S, (F, W, S, J) Dandekar

290C. Research Conference (1) Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentations and critical discussions of faculty and graduate student research in molecular and cellular biology including biochemistry, genetics, and cell biology. May be repeated for credit. (S/U grading only) — F, W, S, (F, W, S)

291. Current Progress in Molecular and Cellular Biology (1) Seminar—1 hour. Prerequisite: graduate standing or consent of instructor. Seminars presented by guest lecturers on subjects of their own research activities. May be repeated for credit. (Same course as Chemical Engineering 294) — F, W, S, (F, W, S, J) Kjelstrom, McDonald, Rodriguez

295. Literature in Molecular and Cellular Biology (1) Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Critical reading and evaluation of current literature in molecular and cellular biology disciplines. Papers will be presented and discussed in detail. May be repeated for credit. (S/U grading only) — F, W, S, (F, S, W) Baldwin, Fisher, Privalsky,Wilson

298. Group Study (1-5) Variable—1-5 hours. Prerequisite: consent of instructor. (S/U grading only) — F, W, S, (F, W, S)

299. Research (1-12) Independent study — 3-36 hours. (S/U grading only) — F, W, S, (F, W, S)

Professional

390. Methods of Teaching (1) Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Practical experience in the methods and problems of teaching biochemistry/genetics/cell biology. Includes analysis of texts and supporting material, discussion of teaching techniques, preparing for and conducting discussion and laboratory sections, formulating examinations under supervision of instructor. Participating in the teaching program required for Ph.D. May be repeated for credit. (S/U grading only) — F, W, S, (F, W, S)

Molecular, Cellular, and Integrative Physiology (A Graduate Group)

Catherine Vandevoo, Ph.D., Chairperson of the Group

Group Office. 227 Life Sciences Building 530-752-9092; http://mcip.ucdavis.edu

Faculty

Paul Allen, Ph.D., Professor (Molecular Biosciences)
Keith Baar, Ph.D., Associate Professor (Neurobiology, Physiology, and Behavior)
Linda Barter, Ph.D., Associate Professor (VM: Surgical & Radiological Sciences)
Donald M. Bers, Ph.D., Professor (Medical Pharmacology)
Sue Bodine, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Laura Borodinsky, Ph.D., Assistant Professor (Physiology & Membrane Biology)
Julie Brey, Ph.D., Assistant Professor (Medical Pharmacology)
Robert Branson, Ph.D., Professor (VM: Surgical & Radiological Sciences)
C. Titus Brown, Ph.D., Associate Professor (Genome Center)

Fall 2011 and on Revised General Education (GE) AHI: Arts and Humanities; SciEng: Science and Engineering; SocSci: Social Sciences; Div=Domestic Diversity; World Cultures; WC=Writing Experience

Pre-Fall 2011 General Education (GE): Arthum=Arts and Humanities; SciEng=Science and Engineering; SocSci=Social Sciences; Div=Domestic Diversity; WC=Writing Experience Quarter Offered: F=Fall, W=Winter, S=Spring, SU=Summer; 2017-2018 offering in parentheses
Rebecca Calisi Rodriguez, Ph.D., Assistant Professor
(Neurobiology, Physiology, and Behavior)
Christopher C. Colbert, Ph.D., Professor
(Animal Science)
Earl E. Carstens, Ph.D., Professor
(Animal Science)
Luis Carvalho-Carmona, Ph.D., Assistant Professor
(Biochemistry and Molecular Medicine)
Gretchen Casazza, Ph.D., Research Director
(JUCD Sports Medicine)
Chao-Yin Chen, Ph.D., Associate Professor
(Molecular Biosciences)
Carroll E. Cross, M.D., Professor
(International Medicine, Human Physiology)
FitzRoy E. Curry, Ph.D., Professor
(Physiology and Membrane Biology)
Wendy Deng, Ph.D., Assistant Professor
(Biochemistry and Molecular Medicine)
Michael J. Ferns, Ph.D., Professor
(Anesthesiology and Pain Medicine)
Alan F. Fomina, Ph.D., Associate Professor
(Biochemistry and Molecular Medicine)
Charles A. Fuller, Ph.D., Professor
(Neurobiology, Physiology, and Behavior)
J. David Furlow, Ph.D., Professor
(Neurobiology, Physiology, and Behavior)
Melanie Greare, Ph.D., Assistant Adj. Professor
(VM Anatomy, Physiology and Cell Biology)
Damin Gresta, Ph.D., Assistant Professor
(VM Anatomy, Physiology and Cell Biology)
Aldrin Gomes, Ph.D., Associate Professor
(Physiology, Physiology, and Behavior)
Eleanor Grandi, Ph.D., Assistant Professor
(Medical Pharmacology)
Leigh Griffiths, Ph.D., Assistant Professor
(VM Medicine and Epidemiology)
Fawaz Haj, Ph.D., Integrative Physician
(Population Biology and Evolutionary Ecology)
Peter J. Havel, D.V.M., Ph.D., Professor
(Molecular Biosciences)
Barbara A. Horwitz, Ph.D., Professor
(Neurobiology, Physiology, and Behavior)
Mark Huisng, Ph.D., Assistant Professor
(Neurobiology, Physiology, and Behavior)
Andrew T. Ishida, Ph.D., Professor
(Physiology, Physiology, and Behavior)
Lee-Way Jin, Ph.D., Associate Professor
(MIND Institute)
James H. Jones, D.V.M., Ph.D., Professor
(Surgical and Radiological Sciences)
Paul Knoepfler, Ph.D., Associate Professor
(Animal Science)
Anne A. Knowlton, M.D., Professor
(Cardiovascular Medicine)
Dietmar Kuehl, Ph.D., Professor
(Animal Science)
Pamela Lein, Ph.D., Professor
(Molecular Biosciences)
Yu-Fung Lin, Ph.D., Associate Professor
(Physiology and Membrane Biology)
K.C. Kent Lloyd, D.V.M., Ph.D., Professor
(WM Anatomy, Physiology and Cell Biology)
Veronica Martinez-Cerdeño, Ph.D., Assistant Professor
(Pathology)
Stuart A. Meyers, Ph.D., Professor
(WM Anatomy, Physiology and Cell Biology)
William Murphy, Ph.D., Professor (Dermatology)
Manuel Navedo, Ph.D., Associate Professor
(Medical Pharmacology)
Martha E. O'Donnell, M.D., Professor
(Physiology and Membrane Biology)
Anita M. Oberbauer, Ph.D., Professor
(Animal Science)
John A. Payne, Ph.D., Professor
(Physiology and Membrane Biology)
Isaac N. Pessah, Ph.D., Professor
(Molecular Biosciences)
Helen E. Raybould, Ph.D., Professor
(Anatomy, Physiology and Cell Biology)
David Richard, M.D., Professor
(Medical Neurology)
Michael Rogawski, M.D./Ph.D., Professor
(Medical Neurology)
John C. Ruff, M.D., Professor
(International Medicine)
Karen Ryan, Ph.D., Assistant Professor
(Neurobiology, Physiology and Behavior)
Jan Sack, Ph.D., Assistant Professor
(Physiology and Membrane Biology)
Luís Santana, Ph.D., Professor
(Physiology and Membrane Biology)
Saul Schoener, M.D., Professor (Internal Medicine)
Edward S. Schelegle, Ph.D., Associate Research Physiologist (VM: Anatomy, Physiology and Cell Biology)
David Segal, Ph.D., Professor (Genome Center)
Frank Sharp, Ph.D., Professor (Med. Neurology)
Charles L. Stebbins, Ph.D., Professor
(International Medicine, Physiology and Membrane Biology)
Danielle Stolzberg, Ph.D., Assistant Professor
(Psychology)
Lin Tian, Ph.D., Assistant Professor
(Biochemistry and Molecular Medicine)
Catherine VandeVoort, Ph.D., Adjunct Professor
(Obstetrics and Gynecology)
Omar Villalobos, M.D., Assistant Professor
(International Medicine)
Peter C. Wainwright, Ph.D., Professor
(Evolution and Ecology)
Vladimir Yarov-Yarovoy, Ph.D., Associate Professor
(Physiology and Membrane Biology)
Katherine VandeVoort, Ph.D., Adjunct Professor
(Obstetrics and Gynecology)
Lin Tian, Ph.D., Assistant Professor
(OB/GYN)
Karen Zito, Ph.D., Associate Professor
(Physiology, Physiology, and Behavior)
Emeriti Faculty
John M. Horowiz, Ph.D., Professor Emeritus
Graduate Study. The Graduate Group in Molecular, Cellular, and Integrative Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees and participation in the Ph.D./D.V.M. programs. The programs emphasize broad training in the fundamental principles of cellular, molecular, and integrative physiology. Graduate Adviser. Chao-Yin Chen Master Advisers. Gretchen Casazza, Nipavan Chiamvimonvat, Eleonora Grandi
Courses in Molecular, Cellular, and Integrative Physiology (MCP)
(Formerly courses in Physiology and the actions of drugs and toxicants on cell cultures) Design, performance and interpretation of experiments with animal cells in vitro.

Graduate

200L. Animal Cell Culture Laboratory (4)
Discussion—2 hours; laboratory—6 hours. Prerequisites: courses in undergraduate biology, chemistry, cell biology, or general physiology, or consent of instructor. Techniques of cell culture, with emphases on cell physiology and the actions of drugs and toxicants on cultured somatic cells. Design, performance and interpretation of experiments with animal cells in vitro. —W (W) Ross, Pablo

210A. Advanced Physiology (4)
Lecture—3 hours; discussion—1 hour. Prerequisites: Physiology Ph.D. program, or consent of instructor. Advanced course in general principles of physiology, surveying homeostasis, cellular and selected topics, and neurophysiology. (Same course as Human Physiology 210A.) —F (F) Zheng

210B. Advanced Physiology (6)
Lecture—5 hours; discussion—1 hour. Prerequisites: Physiology 210A, Physiology Ph.D. program, or consent of instructor. Advanced course in general principles of physiology, surveying homeostasis, cellular and selected topics, and neurophysiology. —W (W) Ross, Pablo

210C. Advanced Physiology (5)
Lecture—5 hours. Prerequisite: doctoral student in the Molecular, Integrative and Comparative Physiology Graduate Group, or consent of instructor. Graduate level instruction in the general principles of physiology and the neural and humoral control of the cardiovascular, renal, respiratory, gastrointestinal, sensory, muscular, and skeletal and reproductive systems. —S (S) Navedo, Xiang

210L. Physiology Laboratory Rotations (5)
Laboratory—15 hours. Restricted to Molecular, Cellular and Integrative Physiology (MCIP) graduate students. One mandatory rotation and up to two voluntary rotations. Students learn techniques and perform experiments related to particular research problems. At the end of the rotations students give a short talk and hand in a research paper. May be repeated two times for credit. (S/U grading only.) —F, W (F, W) Sack, Yao-Yuan Wang

215. Electrophysiology Techniques and Applications
Lecture—1.5 hours. Discussion—1.5 hours. Broad scope of topics in electrophysiology techniques and applications. (Same course as Pharmacology and Toxicology 215.) (S/U grading only.) —S (S) Chen

216. Neurophysiology Laboratory (3)
Lecture—1 hour; discussion—2 hours. Lectures covering experimental and theoretical methods in studying cell membrane ionic channels and the role of cell signaling for the characterization of the physiological functions and structure/function relationships of some of the most important channel types. Discussion of classical and current original papers. Offered in alternate years. —S. Bodine, Carlsen

220. General and Comparative Physiology of Reproduction
Lecture—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 110, 1101; Biological Sciences 103, 103 B. Basic phenomena of sexual and asexual reproduction and comparisons of processes in a wide variety of animals; gamete formation, structure, and metabolism; fertilization; neuroendocrine mechanisms in mammalian reproduction and reproductive cycles; behavioral aspects. —S (S) Adams, Berger, Conley

222. Mammalian Gametogenesis and Fertilization (3)
Lecture/discussion—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 121 or the equivalent. Course will emphasize our current understanding of events in mammalian gametogenesis and the fertilization process. Published results, and conclusions drawn from these results, and their contribution to our understanding will be discussed. —S (S) Berger

230. Advanced Endocrinology (2)
Lecture—2 hours. Prerequisite: Neurobiology, Physiology, and Behavior 130 or the equivalent, and graduate standing. Focus on timely topic of endocrine research. Critical review of current literature and discussion of future research strategies in the area. May be repeated for credit when topics differ.

231. Neuroendocrinology (3)
Lecture—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 130 or the equivalent course in system physiology, Neurobiology, Physiology, and Behavior 130 or the equivalent course in endocrinol-
ogy. Neural-endocrine interactions; neural regulation of the endocrine system, especially in relation to reproduction; the role of hormones and growth factors in sexual differentiation of the brain.

234. Current Topics in Neurotoxicology (3)
Lecture—2 hours; lecture/discussion—1 hour. Prerequisite: Neurobiology, Physiology, and Behavior 110 or the equivalent. General principles of neurotoxicology, the role of specific neurotoxins and the contribution of neurotoxic compounds to complex neurodevelopmental disorders and neurodegenerative diseases. [Same course as Environmental Toxicology 234 and Molecular Sciences 234.] Offered in alternate years. —W. Lein

242. Biological Rhythms (3)
Lecture—2 hours; lecture/discussion—1 hour. Prerequisite: Neurobiology, Physiology, and Behavior 110 or the equivalent. General aspects and basic mechanisms of biological rhythms, the importance of rhythm desynchronization in areas of pharmacology and space medicine; telemetry; mathematical methods, chronometry; daily, reproductive, and annual periods; shift-work, jet lag and sleep disorders. Offered in alternate years. —(F) Fuller

255. Physiology of the Stress Response (2)
Lecture/discussion—2 hours. Prerequisite: graduate student status. General aspects of the Stress-Physiological mechanisms of adaptation to stress; Hormonal control of the systemic stress response; Mechanisms of the cellular stress response. Discussion of current trends in stress physiology and current methods for studying the stress response. [Same course as Animal Biology 255.] —S. (S.) Kueitz

261A. Topics in Vision: Eyes and Retinal Mechanisms (2)
Lecture/discussion—2 hours. Prerequisite: graduate standing, Neurobiology, Physiology, and Behavior 100 or 112 or the equivalent. Structure and function of the visual system, with emphasis on the eye and retina, including optics, anatomy, transduction, retinal synapses, adaptation, and parallel processing. [Same course as Neuroscience 261A and Neurobiology, Physiology, and Behavior 261A.] —F, W, S. (F, W, S.)

261B. Topics in Vision: Systems, Psychophysics, Computational Models (2)
Lecture/discussion—2 hours. Prerequisite: consent of instructor; course 261A recommended. Functions of the visual pathways and their underlying mechanisms. Recent research on aspects of anatomy, biochemistry, electrophysiology, psychophysics, development, and genetics of the visual system. [Same course as Neuroscience 261B and Neurobiology, Physiology, and Behavior 261B.] —F, W, S. (F, W, S.)

261C. Topics in Vision: Clinical Vision Science (2)
Lecture/discussion—2 hours. Prerequisite: courses 261A and 261B, or consent of instructor. Causes and mechanistic bases of major blinding diseases. Recent research on aspects of anatomy, biochemistry, electrophysiology, psychophysics, development, and genetics of the visual system related to disease. [Same course as Neuroscience 261C and Neurobiology, Physiology, and Behavior 261C.] —F, W, S. (F, W, S.) Offered in alternate years. —W. Britten

275. Neurohumoral Regulatory Mechanisms of Thermogenesis (3)
Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 104 or the equivalent; Biological Sciences 114A or the equivalent; consent of instructor. Designed for graduate and advanced undergraduate students, this course will examine thermogenic processes in homeotherms [primarily mammals] with respect to regulation (hormonal and central nervous control) and effector mechanisms (basis of heat production at the target cell).

290. Seminar (1)
Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. [(S/U grading only)]—F, W, S. (F, W, S.)

290C. Research Conference in Physiology (1)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentation and discussion of faculty and graduate student research in physiology. May be repeated for credit. [(S/U grading only)]—F, W, S. (F, W, S.)

291B. Seminar in Cellular Mechanisms of Adaptation (1)
Seminar—2 hours. Prerequisite: graduate standing and consent of instructor. Current research in physiology. Overall design of experiments and particular research areas. [(S/U grading only)]—F. (F.) Chen, Grandi

293. Current Progress in Physiology (1)
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their current research activities. May be repeated for credit. [(S/U grading only)]

298. Group Study (1-5)
Seminar—1 hour. Prerequisite: graduate standing. May be repeated for credit. [(S/U grading only)]

299. Research (1-12)
Seminar—1 hour. Prerequisite: graduate standing. May be repeated for credit. [(S/U grading only)]

Professional

300A. Pedagogical Aspects of Physiology in Higher Education (3)
Lecture; discussion; laboratory. Prerequisite: meet qualifications for teaching assistant in physiology. Participation as a teaching assistant for one quarter in a designated physiology course. Instruction in methods of leading discussion groups, leading laboratory sections, writing and grading quizzes, operation and use of laboratory equipment, and reading and grading laboratory reports. Course meets teaching requirements for Ph.D. program in Physiology. [(S/U grading only)]—F, W, S. (F, W, S.)

300B. Pedagogical Aspects of Physiology in Higher Education (3)
Lecture; discussion; laboratory. Prerequisite: meet qualifications for teaching assistant in physiology. Participation as a teaching assistant for one quarter in a designated physiology course. Instruction in methods of leading discussion groups, leading laboratory sections, writing and grading quizzes, operation and use of laboratory equipment, and reading and grading laboratory reports. Course meets teaching requirements for Ph.D. program in Physiology. [(S/U grading only)]—F, W, S. (F, W, S.)

390. The Teaching of Physiology (1)
Discussion—1 hour. Prerequisite: Teaching Assistant assignment to a physiology lecture course and consent of instructor. Practical experience in methods and problems of teaching physiology lecture courses. May include analyses of texts and supporting material, discussion of teaching techniques, preparation for and conducting discussion sessions, and formulation of topics and questions for examinations under supervision of instructor. May be repeated for credit. [(S/U grading only)]—F, W, S. (F, W, S.)

The Major Program

The Bachelor of Arts degree in music provides both a broad liberal arts education and the skills necessary to explore music through its history, composition, theory, and performance. Students majoring in music may choose from three tracks in the major: (1) composition, (2) music history, theory, and ethnomusicology, or (3) performance. After a common core of courses in the lower division, students pursue...