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

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

Group Office, Life Sciences Building 5307529092; http://biosci3.ucdavis.edu/GradGroups/MCIP/

Faculty

Seon H. Adams, Ph.D., Research Physiologist (USDA WHINRC)
Paul Allen, Ph.D., Professor (Molecular Biosciences)
Keith Baar, Ph.D., Associate Professor (Neurobiology, Physiology, and Behavior)
Linda Bartsch, Ph.D., Assistant Professor (VWM: Surgical and Radiological Sciences)
Trish J. Berger, Ph.D., Animal Science
Bret Bald, M.D., Ph.D., Professor (Medical Pharmacology)
Sue Bodine, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Lauro Boronin, Ph.D., Assistant Professor (Physiology & Membrane Biology)
Julie Bossuyt, Ph.D., Assistant Professor (Medical Pharmacology)
Robert Brochstein, M.D., Ph.D., Professor (Animal Science)
Earl A. Carstens, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Gretchen Casazza, Ph.D., Assistant Adjunct Professor (Biochemistry)
Ernest S. Chang, Ph.D., Professor (Bodega Marine Laboratory)
Chao-Yin Chen, Ph.D., Assistant Professor (Medical Pharmacology)
Tung-Yu Chen, Ph.D., Associate Professor (Med. Neurology)
Gary N. Cherry, Ph.D., Professor (Bodega Marine Laboratory)
Nipavan Chiamvimonvat, M.D., Professor (Cardiovascular Medicine)
Alan J. Cohen, M.D., Professor (Population Health and Reproduction)
Gino Cortopassi, Ph.D., Professor (Molecular Biosciences)
Carroll E. Cross, M.D., Professor (Internal Medicine, Human Physiology)
Mark S. Curry, Ph.D., Professor (Physiology and Membrane Biology)
Wenbin Deng, Ph.D., Associate Professor (Cell Biology and Human Anatomy)
Elizabeth Drobrow, Ph.D., Associate Adjunct Professor (Medical Neurology)
Michael J. Ferns, Ph.D., Professor (Anesthesiology and Pain Medicine)
Alla F. Fomin, Ph.D., Assistant Professor (Physiology and Membrane Biology)
Charles A. Fuller, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
J. David Farrow, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Darian Genetos, Ph.D., Assistant Professor (VWM: Anatomy, Physiology and Cell Biology)
Aldrin Gomes, Ph.D., Assistant Professor (Neurobiology, Physiology, and Behavior)

Leigh Griffths, Ph.D., Assistant Professor (VM: Medicine and Epidemiology)
Fawaz A. Haj, Ph.D., Associate Professor (Nutrition)
Peter J. Havel, D.V.M., Ph.D., Professor (Molecular Biosciences)
Barbara A. Harwitz, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Andrew T. Ishida, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Lee-Way Jin, Ph.D., Associate Professor (MIND Institute)
James H. Jones, D.V.M., Professor (Surgical and Radiological Sciences)
George A. Kaysen, M.D., Professor (Internal Medicine)
Anne A. Knowlton, M.D., Professor (Cardiovascular Medicine)
Dietmar Kuett, 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 (VM: Anatomy, Physiology and Cell Biology)
Veronica Martinez-Cerdeno, Ph.D., Assistant Professor (Pathology)
Stuart A. Meyers, Ph.D., Professor (VM: Anatomy, Physiology and Cell Biology)
Manuel Navedo, Ph.D., Professor (Medical Pharmacology)
Martha E. O’Donnell, Ph.D., Professor (Physiology and Membrane Biology)
Anita M. Oerlbauer, 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)
Janet F. Roser, Ph.D., Professor (Animal Science)
John C. Rutledge, M.D., Professor (Internal Medicine)
Jon Sack, Ph.D., Assistant Professor (Physiology and Membrane Biology)
Saul Schafer, M.D., Professor (Internal Medicine)
Edward S. Schlegel, Ph.D., Associate Professor (VM: Anatomy, Physiology and Cell Biology)
David Segal, Ph.D., Associate Professor (Genome Center)
Frank Sharp, Ph.D., Professor (Med. Neurology)
Charles L. Stebbins, Ph.D., Professor (Internal Medicine, Physiology and Membrane Biology)
Danielle Stolzenberg, Ph.D., Assistant Professor (Psychology)
Brian C. Trainor, Ph.D., Associate Professor (Psychology)
Catherine Van de Voort, Ph.D., Adjunct Professor (Obstetrics and Gynecology)
Amparo Villablanca, M.D., Professor (Internal Medicine)
Peter C. Wainwright, Ph.D., Professor (Evolutionary Biology)
W. Jeffrey Weidner, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Robert H. Weiss, M.D., Professor (Internal Medicine)
Barry W. Wilson, Ph.D., Professor (Animal Science)
Dennis W. Wilson, Ph.D., Professor (VM: Pathology, Microbiology, and Immunology)
John G. Wingfield, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Vladimir Yarow-Yarovsky, Ph.D., Assistant Professor (Physiology and Membrane Biology)
Clare E. Yellowly, Ph.D., Professor (VM: Anatomy, Physiology and Cell Biology)
Konstantinos Zabalis, Ph.D., Assistant Professor (Pathology)
Jie Zheng, Ph.D., Assistant Professor (Physiology and Membrane Biology)

Emeriti Faculty

Irwin Feinberg, M.D., Professor Emeritus
John M. Horowitz, Ph.D., Professor Emeritus

Graduate Study. The Graduate Group in Molecular, Cellular, and Integrative Physiology offers pro-
grams of study and research leading to the M.S. and Ph.D. degrees and participates in joint Ph.D. programs with departments in biology and chemistry. The program provides broad training in the fundamental principles of cellular, molecular, and integrative physiology.

**Graduate Advisers:** Gretchen Casazza, Master Adviser; J. David Furlow, Nipavan Chiamvimonvat, Chao-Yin Chen

**Courses in Molecular, Cellular, and Integrative Physiology (MCP)**
(Formerly courses in Physiological)

**Graduate Courses**

200L. **Animal Cell Culture Laboratory (4)** Discussion—2 hours; laboratory—6 hours. Prerequisite: courses in undergraduate biochemistry, cell biology, or general physiology, or consent of instructor. Techniques of cell culture, with emphasis on cell physiology and the actions of drugs and toxins on cultured somatic cells. Design, performance and interpretation of experiments with animal cells in vitro. —II. (III.) B. Wilson, R. Wu

210A. **Advanced Physiology (4)** Lecture—3 hours; discussion—1 hour. Prerequisite: Physiology Ph.D. program, or consent of instructor. Advanced course covering principles of physiological surveying homeostasis, cellular and selected topics, and neurophysiology. (Same course as Human Physiology 210A.) —I. (III.) Zheng

210B. **Advanced Physiology (6)** Lecture—5 hours; discussion—1 hour. Prerequisite: Physiology 210A, Physiology Ph.D. program, or consent of instructor. Advanced course on general principles of physiology, surveying homeostasis, cellular and selected topics, and neurophysiology. —II. (III.) Stebbins

210C. **Advanced Physiology (5)** Lecture—5 hours. Prerequisite: doctoral student in the Molecular, Integrative and Comparative Physiology Graduate Program 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 reproductive systems. —III. (III.) Navedo, Xiang

210L. **Physiology Laboratory Rotations (5)** Laboratory—15 hours. 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 twice for credit. (S/U grading only.) —I. (II.) Yarow, I. (II.) Lawry

216. **Neurophysiology Literature (3)** Lecture—1 hour; discussion—2 hours. Lectures covering experimental and theoretical methods in studying cell membrane ion channels and the resulting characterization of the physiological functions and structure/function relationships of some of the most important channel types. Discussion of classical and current original papers. —I. (II.)

219. **Muscle Growth and Development (3)** Lecture—2 hours; seminar—1 hour. Prerequisite: Biological Sciences 103, Biological Sciences 104 or Molecular and Cellular Biology 150, or consent of instructor. Integration of growth and development of skeletal muscle, biochemistry, neural control mechanisms, circulatory and nutritional factors. Prenatal and neonatal differentiation of fiber types. Experimental and hereditary myopathies. Offered in alternate years. —III. Bodine, Carlson

220. **General and Comparative Physiology of Reproduction (3)** Lecture—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 110, 110L; Biological Sciences 101, 101L; 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; reproductive cycles; behavioral aspects. —III. 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, conclusions drawn from these results, and their contribution to our understanding will be discussed. —III. (III.) 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 topic differs.

231. **Neuroendocrinology (3)** Lecture—3 hours. Prerequisite: Neurobiology, Physiology, and Behavior 110 or the equivalent course in systemic physiology, Neurobiology, Physiology, and Behavior 130 or the equivalent course in endocrinology. Neural-endocrine interactions; neural regulation of the endocrine system, especially in relation to reproduction; the role of hormones and growth factors in sexual differentiation. —II. (III.)

234. **Current Topics in Neurotoxicology (3)** Lecture—3 hours. Prerequisite: core courses in one of the following graduate programs: Pharmacology and Toxicology, Agricultural and Environmental Chemistry, Biochemistry, Biological Cell, and Developmental Biology, Immunology, Molecular Cellular and Integrative Physiology or Neuroscience. Restricted to upper level undergraduate students must obtain permission from the course coordinator. General principles of neurotoxicology, the cell and molecular mechanisms and health impacts of specific neurotoxins and the contribution of neurotoxic compounds to complex neurodegenerative disorders. —II. (III.)

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; shiftwork and sibling disorders. Offered in alternate years. —II. Fuller

255. **Physiology of the Stress Response (2)** Lecture/discussion—2 hours. Prerequisite: graduate student status. Definition of stress, Physiological mechanisms of adaptation to stress. Hormonal control of the systemic stress response; Mechanisms of the cellular stress response; Discussion of current stress in stress physiology and current methods for studying the stress response in animal as well as human defendability. —III. (III.) Kuth, Kvetnik

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, and retinal processing. (Same course as Neuroscience 261A and Neurobiology, Physiology, and Behavior 261A) (S/U grading only) —II. (III.)

261B. **Topics in Vision: Systems, Psychophysics, Computational Models (2)** Lecture/discussion—2 hours. Prerequisite: consent of instructor; course 261A recommended. Functions of the central 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 261C and Neurobiology, Physiology, and Behavior 261B) (S/U grading only) Offered in alternate years.

261C. **Topics in Vision: Clinical Vision Science (2)** Lecture/discussion—2 hours. Prerequisite: courses 261A and 261B, or consent of instructor. Causes and mechanistic basis of blinding disorders. Recent research on aspects of anatomy, biochemistry, electrophysiology, psychophysics, development, and genetics of the visual system. (Same course as Neuroscience 261C and Neurobiology, Physiology, and Behavior 261C) (S/U grading only) Offered irregularly. —III. Werner

275. **Neurohumoral Regulatory Mechanisms of Thermogenesis (3)** Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 104 or the equivalent; Biological Sciences 102 or the equivalent, consent of instructor. Designed for graduate and advanced undergraduate students, this course will examine thermogenic systems in homeotherms (primarily mammals) with respect to regulation (hormonal and central nervous control) and effector mechanisms (basis of heat generation 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.) —I. (II. III)

290C. **Research Conference in Physiology (1)** Seminar—1 hour. 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) —I. (II. III)

291B. **Seminar in Cellular Mechanisms of Adaptation (1)** Seminar—1 hour. Prerequisite: standing in Graduate Group in Physiology or consent of instructor. Currently designed research and general design of experiments in particular research areas. (S/U grading only.) —I. (II. III)

295. **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)

299. **Group Study (1-5)**

299. **Research (1-12)** (S/U grading only)

**Professional Courses**

300A-300B. **Pedagogical Aspects of Physiology in Higher Education (3-3)** Lecture, discussion, or laboratory, or combination. 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 grading and reporting laboratory reports. Course meets teaching requirements for Ph.D. program in Physiology. (S/U grading only) —I. (II. III)

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 of problems in teaching physiology lecture courses. May include analyses of texts and support...
Music

(Office of Letters and Science)

Henry Spiller, Ph.D., Chairperson of the Department
Department Office, 112 Music Building 530.752.5537; Fax 530.752.0983;
http://music.ucdavis.edu

Faculty

Christian Baldini, Ph.D., Associate Professor
Rita Sahai, M.A., Lecturer (Hindustani vocal music)
Michael Seth Orland, A.B., Lecturer (piano)
Scott Macomber, M.M., Lecturer (trumpet)
Ann Lavin, D.M.A., Lecturer (clarinet)
Sam Griffin, D.M.A., Lecturer (Jazz)
Christopher Froh, M.M., Lecturer (percussion)
Daniel Flanagan, M.M., Lecturer (violin)
Thomas Derthick, B.M., Lecturer (double bass)
Bruce Chrisp, M.M., Lecturer (trombone)
Lois Brandwynne, M.A., Lecturer (piano)
Sam Nichols, Ph.D., Lecturer

Emeriti Faculty

Robert S. Bloch, M.A., Professor Emeritus
Wayne Slawson, Ph.D., Professor Emeritus
Robert S. Bloch, M.A., Professor Emeritus
Wayne Slawson, Ph.D., Professor Emeritus

Affiliated Faculty

Phebe Craig, M.M., Lecturer
Sam Nichols, Ph.D., Lecturer

Academic Federation Award for Excellence in Teaching

A.B. Major Requirements:

Preparatory Subject Matter.......................... 27-45
Music 6A, 6B, 6C .................................. 9
Plus Music 2A, 2B, 2C ...................................... 9
And Music 16A, 16B, 16C (0-6)*.................. 9
Music 7A, 7B, 7C ........................................... 9
Plus Music 17A, 17B, 17C (0-6)*................. 9
Music 24A, 24B, 24C .................................. 9
* May be excused by diagnostic examination at the beginning of each quarter.

Depth Subject Matter................................. 36-40
Choose upper division courses from one of the following tracks:

Track 1: Music Composition ....................... 39
Music 124A, 124B ............................................. 6
Music 121 or 122 ............................................. 4
Music 131 (one year) .................................... 6
Music 195 .................................................... 2
At least 6 units selected from:
Music 140-150 ............................................ 6
Music 101A, 101B .......................................... 8
Music 103 .................................................... 3
At least 6 further units selected from:
Track 2: Music History, Theory, and Ethnomusicology .................. 40
Music 124A, 124B ............................................. 6
Music 121 and/or 122 .................................... 8
Need eight units of seminar courses chosen from above in any combination.
Note: Music 121 and 122 may be repeated for credit.
Music 131, one year .................................. 6
Music 195 .................................................... 2
At least 6 units selected from:
Music 140-150 ............................................ 6
At least 12 further units selected from:

Minor Program Requirements:......................... 32
Music......................................................... 16
Courses chosen from: Music 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150

A student becomes eligible for graduation with honors by meeting the minimum GPA and course requirements established by the College of Letters and Science. To qualify for high or highest honors, students must also complete the Music Department honors program with a GPA of 3.500 or above and write a thesis or submit a portfolio that meets the criteria for high or highest honors. Students apply to participate in the department honors program during the latter part of their junior year. Admission to the program is based on GPA, a thesis proposal, examples of previous writing, and the recommendation of a faculty member who is willing to sponsor the student’s project. Students who anticipate seeking admission to the honors program are urged to complete at least one offering of Music 121 or 122 before the end of their junior year. Interested students are urged to consult with faculty in their field early in their junior year.

Minor Program Requirements:......................... 22
Music......................................................... 16
Courses chosen from: Music 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150

Quarter Offered: I-Fall, II-Winter, III-Spring, IV-Summer; 2015-2016 offering in parentheses.

Pre-Fall 2011 General Education (GE): AH=Arts and Humanities; SE=Science and Engineering; SS=Social Sciences;
AD=American Studies; DD=Domestic Diversity; Div=Dominant Diversity; Wrt=Writing Experience

Fall 2011 and on Revised General Education (GE): AH=Arts and Humanities; SE=Science and Engineering; SS=Social Sciences;
ACGH=American Cultures, DD=Domestic Diversity, OL=Oral Skills, OL=Quantitative, SL=Scientific, VL=Visual, WC=World Cultures, WRT=Writing Experience

Track 3: Music Performance....................... 37
Music 124A, 124B ............................................. 6
Music 121 or 122 ............................................. 4
Music 131 (one year) .................................... 6
Music 195 .................................................... 2
At least 13 units selected from:
Music 131, 140, 150 .................................. 13
At least 6 further units selected from:

Total Units for the Major......................... 64-85
Note: A maximum of 19 units in performance courses (Music 131, 140-150) apply toward the degree; see Unit Credit Guidelines, College of Letters and Science degree requirements section. Faculty of the College of Letters and Science bylaws makes it possible for students to take more than 19 units of performance classes without those additional units counting toward the 225-unit cap on units:

Composition Honors................................ 43.47
Music 101A, 101B ............................................. 6
Music 124A, 124B ............................................. 8
Music 103 .................................................... 3
Music 121 or 122 ............................................. 4
Music 131 (one year) .................................... 6
At least six units selected from:
Music 140-150 ............................................ 6
Two quarters of Music 194H for a total of at least six units resulting in a Senior thesis........................................ 6
At least four further units from:
Music History, Theory, and Ethnomusicology Honors .................. 44
Music 124A, 124B ............................................. 6
Music 121 or 122 ............................................. 8
Music 131 (one year) .................................... 6
At least six units selected from:
Music 140-150 ............................................ 6
Two quarters of Music 194H for a total of at least six units resulting in a Senior thesis........................................ 6
At least 12 further units from:

A student becomes eligible for graduation with honors by meeting the minimum GPA and course requirements established by the College of Letters and Science. To qualify for high or highest honors, students must also complete the Music Department honors program with a GPA of 3.500 or above and write a thesis or submit a portfolio that meets the criteria for high or highest honors. Students apply to participate in the department honors program during the latter part of their junior year. Admission to the program is based on GPA, a thesis proposal, examples of previous writing, and the recommendation of a faculty member who is willing to sponsor the student’s project. Students who anticipate seeking admission to the honors program are urged to complete at least one offering of Music 121 or 122 before the end of their junior year. Interested students are urged to consult with faculty in their field early in their junior year.

Major Advisers: C. Reynolds (A-F), A. Triest (G-J), L. San Martin (N-Z)