Molecular Biosciences

See Veterinary Medicine, School of, on page 539.

Molecular and Cellular Biology

[College of Biological Sciences]
Ted Powers, Ph.D., Professor, Chairperson of the Department
Department Office. 149 Briggs Hall 530-752-3611; http://www.mcb.ucdavis.edu

Faculty

Primary Members
Jawdat Al-Bassam, Ph.D., Assistant Professor
John Albeck, Ph.D., Assistant Professor
Enoch Baldwin, Ph.D., Associate Professor
Seam A. Burger, Ph.D., Associate Professor
Kenneth C. Burris, Ph.D., Professor
Judy Callis, Ph.D., Professor and Vice Chair
Frederic L. Ceddin, Ph.D., Associate Professor
R. Holland Chell, Ph.D., Professor
Bruce W. Draper, Ph.D., Associate Professor
JoAnne Engebrecht, Ph.D., Professor and Vice Chair
Marilynn E. Etzler, Ph.D., Professor
John H. Crowe, Ph.D., Professor Emeritus
Eric E. Conn, Ph.D., Professor Emeritus
Peter B. Armstrong, Ph.D., Professor Emeritus
Roy H. Daji, Ph.D., Distinguished Professor Emeritus
Richard H. Fall, Ph.D., Professor Emeritus
Leslie D. Gottlieb, Ph.D., Professor Emeritus
Carol A. Erickson, Ph.D., Distinguished Professor Emeritus
Robert D. Grey, Ph.D., Professor Emeritus
Distinguished Graduate Mentoring Award
John A. Kiger, Ph.D., Professor Emeritus
Mark G. McNamee, Ph.D., Professor Emeritus
Diana G. Myles, Ph.D., Professor Emeritus
Carl W. Schmid, Ph.D., Professor Emeritus
Irwin H. Segel, Ph.D., Distinguished Professor Emeritus
Chen-Chu Shen, Ph.D., Professor Emeritus
Larry R. Sprechman, Ph.D., Senior Lecturer Emeritus
Lecturers
Benjamin F. Edwards, Ph.D., Lecturer
Kenneth L. Hilt, Ph.D., Lecturer
Judith A. Kjelstrom, Ph.D., Academic Coordinator/Lecturer
Seanna Martin, Ph.D., Lecturer
Larry Z. Morand, Ph.D., Academic Coordinator/Lecturer
Mark F. Sanders, Ph.D., Lecturer Emeritus
Molecular and Cellular Biology offers three major programs: Biochemistry, Molecular Biology, Cell Biology, and Genetics and Genomics.

The Biochemistry and Molecular Biology Major Program

The Biochemistry and Molecular Biology major introduces students to the chemistry of living organisms and the experimental techniques that are used to probe the structures and functions of biologically important molecules. Students who enjoy both chemistry and biology who are comfortable with quantitative approaches to problem solving will find this major a rewarding field of study.

The Program. The biochemistry and molecular biology program begins with the upper division common curriculum that provides an introduction to the principles of biochemistry, genetics, and cell biology. Majors then take a comprehensive and rigorous laboratory course to familiarize them with the most important aspects of biochemical research. Additional upper division courses in biochemistry and molecular biology examine detailed aspects of these subjects. Students are also required to take courses in other biological sciences and a full year of physical chemistry.

Career Alternatives. The biochemistry and molecular biology major provides students the opportunity to work in the chemical, health sciences or veterinary sciences; for students interested in careers in the biotechnological or pharmaceutical industries; or for students interested in careers related to the administrative, legal or commercial aspects of biomedical science.

B.S. Major Requirements:

Preparatory Subject Matter .......................... 55-65

Biological Sciences 2A-2B-2C .......................... 14
Chemistry 2A-2B-2C .......................... 15
Mathematics 17A-17B-17C or 21A-21B-21C (21C recommended) .......................... 8-12
Physics 7A-7B-7C .......................... 12
Biology 8A-8B or 118A-118B .......................... 11BC

Depth Subject Matter .......................... 45-51

Biological Sciences 101, 102, 103, 104 ........................................ 13
Statistics 100 or 130A-130B .......................... 4-8
Mathematical and Cellular Biology 140L ........................................ 5
Two courses from: Molecular and Cellular Biology 143, 144, or 145 ........................................ 6
Molecular and Cellular Biology 121 ........................................ 3
Molecular and Cellular Biology 150; or 163 and 164 ........................................ 4-6
Select at least 10 additional units from the following:

Chemistry 107A, 107B
Evolution and Ecology 100, 150
Microbiology 101, 102, 150, 170
Molecular and Cellular Biology 20L, 123, 124, 125, 138, 143, 144, 145, 150, 158, 160, 162, 163, 164, 178, 182, 191
Neurobiology, Physiology, and Behavior 100, 101, 102, 112, 160, 161
Pathology, Microbiology, and Immunology 126, 126L, 128
Plant Biology 111, 111D, 113, 113D, 152

Statistics 100 or 130A-130B .......................... 4-8
Molecular and Cellular Biology 120L, 121, 123, 124, 125, 138, 143, 144, 145, 150, 158, 160, 162, 163, 164, 178, 182, 191

Restrictive Electives .......................... 6
Six units of upper division courses in biological sciences or chemistry relevant to the student’s interest chosen in consultation with the adviser. Students are encouraged to obtain additional laboratory experience; however, no more than three units of 192, 193 or 199 research may be counted toward restricted elective units.

Total Units for the Major .......................... 106-115

Master Adviser. C.S. Gasser

Advising. Biology Academic Success Center (BASC); 1023 Sciences Laboratory Building; 530-752-0410; http://www.biosci.ucdavis.edu/BASC.

Graduate Study. See Biochemistry, Molecular, Cellular, and Developmental Biology, on page 177.
Courses in Molecular and Cellular Biology (MCB)

Lower Division

10. Introduction to Human Heredity (4)
Lecture—3 hours; discussion—1 hour. Topics in human heredity and human gene structure and function, including the genetic basis of human development, causes of defects, mental retardation, genetic diseases, sexual determination, development, and behavior. GE credit: SciEng | QL, SE, SL—III. (II, III) Engebretson, Kannal

99. Special Study (1-5)
Independent study—3-15 hours. Prerequisite: consent of instructor. (P/NP grading only.) GE credit: SE.

Upper Division

120L. Molecular Biology and Biochemistry Laboratory (6)
Laboratory—10 hours; lecture—2 hours; laboratory/discussion—1 hour. Prerequisite: Biological Sciences 103 (may be taken concurrently). Restricted enrollment. Introduction to laboratory methods and procedures employed in studying molecular biology and biochemical processes. Designed for students who need exposure to the use of molecular biology and biochemical techniques as research and analytical tools. GE credit: SciEng | QL, SE, SL, VE—II, III, IV. (I, II, III) Huffman, Powers

121. Advanced Structures in Molecular Biology (3)
Lecture—3 hours. Prerequisite: Biological Sciences 101 and 102 or 105 or Animal Biology 102 (may be taken concurrently; prior completion recommended). Structure, expression, and regulation of eukaryotic genes. Chromosome structure and replication; gene structure, transcription, and RNA processing; protein synthesis and translation control; development, immune system, and oncogenes. Not open for credit to students who have completed Molecular and Cellular Biology 161. GE credit: SciEng | QL, SE, SL—II, III, IV. (I, II, III) Burgess, Gasser, Harper, Powers

123. Behavior and Analysis of Enzyme and Receptor Systems (3)
Lecture—3 hours. Prerequisite: Biological Sciences 103. Introduction to the principles of enzyme kinetics and receptor-ligand interactions with emphasis on metabolic regulation and data analysis. Topics include simultaneous equilibria, chemical and steady-state kinetics, allosteric enzymes, multireg- tant systems, enzyme assays, membrane transport and computer-assisted simulations and analyses. GE credit: SciEng | QL, SE, SL—II, III, IV. (I, II, III) Burgess, Gasser

124. Macromolecular Structure and Function (4)
Lecture—4 hours. Prerequisite: Biological Sciences 103, Chemistry 18C. An in-depth investigation into protein and nucleic acid structure and thermodynamics and how these properties influence their biological functions. Key examples of important functional classes of these molecules will be examined. Not open for credit to students who have completed course 122 or Chemistry 108. GE credit: SciEng | SE—II, II, II, IV. (I, II) Baldwin

126. Plant Biochemistry (3)
Lecture—3 hours. Prerequisite: Biological Sciences 103 or 105. The biochemistry of important plant processes and metabolic pathways. Discussion of methods used to understand plant processes, including use of transgenic plants. (Same course as Plant Biology 126.) GE credit: SciEng | SE, SL—II. (II) Callis, Tien

138. Undergraduate Seminar in Biochemistry (1)
Seminar—1 hour. Prerequisite: Biological Sciences 103. Discussion of the historical developments of modern biochemistry or current major research problems. May be repeated two times for credit when topic differs. (P/NP grading only.) GE credit: OL, SE—II, III. (II, III) Callis, Gasser, Nunnari

140L. Cell Biology Laboratory (5)
Lecture—2 hours; laboratory-discussion—6 hours; discussion—1 hour. Prerequisite: Biological Sciences 104 (may be taken concurrently). Exercises illustrating the principles of cell biology with emphasis on light microscopy. GE credit: SciEng | QL, SE, SL, VL—II, III. (I, II) Kaplan

142. Advanced Cell Biology: Contractile and Motile Systems (4)
Lecture—3 hours; term paper. Prerequisite: Biological Sciences 102, 104 (may be taken concurrently). Mathematics 168. Advanced cell biology with emphasis on molecular, biophysical and cellular properties of contractile and motile systems. GE credit: SciEng | SE

143. Cell and Molecular Biophysics (3)
Lecture—3 hours. Prerequisite: Biological Sciences 101, 102, 103, 104. Physical chemical principles by which molecules form living, moving, reproducing cells. Physical nature of cytoplasm; molecular structure and bonding in the subcellular assemblies and protein machines. Physical techniques and modeling of cytoskeletal polymer-motor dynamics and function during intracellular transport, mitosis and motility. GE credit: SciEng | QL, SE—II, III. (III) Al-Bassam

144. Mechanisms of Cell Division (3)
Lecture—3 hours. Prerequisite: Biological Sciences 101, 102, 104. The molecules and mechanisms that allow eukaryotic cells to coordinate cell growth, DNA replication, segregation of chromosomes and cell division. GE credit: SciEng | SE, WE—II, III. (II) McNally

145. Assembly and Function of Cell Signaling Machinery (3)
Lecture—3 hours. Prerequisite: Biological Sciences 101, 102, 104. Molecular basis of cell signaling, including positioning of cellular machinery, components of various signaling pathways, and downstream effects of signaling on cell adhesion, cell differentiation, and programmed cell death. GE credit: SciEng | SE—II, III. (III) Erickson

148. Undergraduate Seminar in Cell Biology (2)
Seminar—2 hours. Prerequisite: upper division standing in the biological sciences or a related discipline. Student reports on current topics in cell biology with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included. May be repeated for credit. (P/NP grading only.) GE credit: OL, SE

150. Developmental Biology (4)
Lecture—4 hours. Prerequisite: Biological Sciences 101. Analysis of the mechanistic basis for animal development with a focus on experimental evidence and the relevant fundamental experimental strategies. Fertilization and early development, morphogenesis and patterning, cell differentiation, regulation of cell proliferation and tissue growth. GE credit: SciEng | SE, SL—II, II, II. (I, II) Armstrong, Draper, Edwards, Natzle

158. Undergraduate Seminar in Developmental Biology (2)
Seminar—2 hours. Prerequisite: upper division standing in the biological sciences or a related discipline. Student reports on current topics in cell biology with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate
160L. Principles of Genetics Laboratory (5) Laboratory—6 hours; lecture—2 hours, discussion/ laboratory—1 hour. Prerequisite: Biological Sciences 101. Laboratory work in basic and molecular genetics including mapping, isolation, and characterization of mutants in eukaryotic model systems, reverse genetics, gel electrophoresis, recombinant DNA techniques, and PCR. Not open for credit to students who have completed Genetics 100L. GE credit: SciEng | QL, SE, VL, WE.—I, II, III. (I, II, III.) Engebret, Kiger, Natzle, Rose, Sanders, Sundaresan

162. Human Genetics and Genomics (3) Lecture—3 hours. Prerequisite: course 121 or equivalent. Human molecular genetic variation, molecular basis of metabolic disorders, chromosome aberrations and consequences, analysis of the human genome, and computational techniques of genetic & genomic analyses. GE credit: SciEng | QL, SE, SL.—I. (I.) Chedin

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.—II. (II.) Natzle, Rose


178. Undergraduate Seminar in Molecular Genet e (1) Seminar—1 hour. Prerequisite: upper division standing, completion of Biological Sciences 101, and completion or concurrent enrollment in course 121. 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 topics differ. [P/NP grading only.] GE credit: SciEng | QL, SE, SL.—I, II, III. (I, II, III.) Chedin, Engebret, Rodriguez

182. Principles of Genomics (3) Lecture—3 hours. Prerequisite: Biological Sciences 101. Fundamentals of genomics, including structural genomics, bioinformatics, genetics, and bioinformatics, focusing on the impact of these disciplines on research in the biological sciences. Social impacts of genomic research. GE credit: SciEng | SE.—II. (II.) Burns, Klotz

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 current research by faculty and students. May be repeated for credit. [P/NP grading only.] GE credit: SE.—I, II, III. (I, II, III.)

191. Introduction to Research (1) Seminar—1 hour. Prerequisite: Biological Sciences 102 or permission of instructor. Overview of research projects. May be repeated. [P/NP grading only.] GE credit: SE.—I, II, III. (I, II, III.)

192. Internship (1-12) Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Technical and/or practical experience on and off campus, supervised by a member of the Section of Molecular and Cellular Biology faculty. [P/NP grading only.] GE credit: SE.

193. Advanced Research (3) Laboratory—6 hours; discussion—1 hour. Prerequisite: upper division standing, completion of an upper division Molecular & 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 an individual basis with faculty sponsor. May include presentation of a seminar to a research group. May be repeated for credit. [P/NP grading only.] GE credit: SE.—I, II, III. (I, II, III.)

194H. Research Project (4) Independent study—9 hours. Prerequisite: 6 units of course 193 and/or 199 with faculty director; senior standing; GPA of at least 3.250; consent of Section. Portray research. Continuation of an intensive, individual laboratory research project in biochemistry, genetics, or cell biology culminating with the presentation of the work in a written thesis and in a seminar. [P/NP grading only.] GE credit: OL, SE, WE.

197T. Tutorial in Molecular and Cellular Biology (1-5) Tutorial—2-6 hours. Prerequisite: upper division standing, completion of course to be tutored, and consent of instructor. May be repeated for credit. (P/NP grading only.) GE credit: SciEng | SE, QL, WE, SL.—I. (I.) Chedin

197U. Tutorial in Molecular and Cellular Biology (1-5) Tutorial—2-6 hours. Prerequisite: upper division standing, completion of course to be tutored, and consent of instructor. May be repeated for credit. (P/NP grading only.) GE credit: SciEng | SE, QL, WE, SL.—I. (I.) Chedin

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

199. Special Study for Advanced Undergraduates Lecture—3 hours. Independent study—3-15 hours. Prerequisite: consent of instructor. [P/NP grading only.] GE credit: SE.

Graduate

210. Molecular Genetics and Genomics (3) Lecture/discussion—3 hours. Prerequisite: Biological Sciences 101 and Molecular & Cellular Biology 121, or equivalent. Pass One restricted to graduate students. Emphasizes molecular genetic and genomic approaches to address fundamental biological questions. Introduces and emphasizes the strengths of prokaryotic and eukaryotic model systems and serves as building block for the MBDCB core courses, which use model systems to develop their themes. May be repeated one time for credit. —I. (I.) Engebret

211. Macromolecular Structure and Interactions (3) Lecture—3 hours. Prerequisite: Biological Sciences 102, or the equivalent, or consent of instructor. Pass One restricted to graduate students. Conceptual and quantitative basis for macromolecular structure-function-relationship. Investigation of the paradigm form follows function. Review of key elements of protein, nucleic acid, and lipid organization in specific macromolecular associations by analyzing chemical structure and physical-chemical behavior. No credit for students who have taken course 221A. —I. (I.) Bologan, Segal, Wilson

212. Cell Biology (3) Lecture—3 hours. Prerequisite: Biological Sciences 104, or equivalent, or consent of instructor. Pass One restricted to graduate students. Analysis of basic processes of metabolism, differentiation, division, and transport. Study of the integration and regulation of cell behavior in response to changes in cellular environment. No credit for students that have taken course 121L. —I. (I.) Voss

213. Developmental Biology (3) Lecture—3 hours. Prerequisite: undergraduate biology course or consent of instructor. Pass One restricted to graduate students. Fundamental principles in embryonic development that guide application of modern cellular and genetic approaches to understand developmental mechanisms. Emphasis on experimental approaches used to critically address scientific questions. —II. (II.) Erickson

214. Molecular Biology (3) Lecture—3 hours. Prerequisite: course 211, or equivalent, or consent of instructor. Pass One restricted to graduate students. Emphasis on the central dogma of molecular biology (DNA-RNA-protein). No credit for students that have taken course 221C. —III. (III.) Heyer

215. Graduate Reading Course (2) Discussion—10 hours. Prerequisite: graduate standing or consent of instructor. Pass One restricted to graduate students. Development of critical reading skills through study of major paradigm advances in specialized fields of biochemistry, molecular, cell, and developmental biology. Emphasis on active learning and student participation. Presentation and analysis of literature and major advances in field of study. May be repeated two times for credit if topic differs. —III. (III.) Kaplan

220L. Advanced Biochemistry Laboratory Research (5) Laboratory—15 hours. Prerequisite: course 210 and 211 (may be taken concurrently) and 120L or the equivalent. Two five-week assignments in MBDCB research laboratories. Individual research problems with emphasis on methodology, experimental design, and oral communication of results. May be repeated two times for credit.—I, II, III. (I, II, III.) Nunnari, Starr

241. Membrane Biophysics Laboratory Rotations (5) Lecture—3 hours. Prerequisite: Biological Sciences 102, 103, or consent of instructor. Advanced topics on membrane biophysics and biophysics. Relationship of the unique properties of biomembranes to their roles in cell biology and physiology. (Same course as Biophysics 241.)—III. (III.) Longo, Voss

248. Seminar in Cell Biology (2) Seminar—2 hours. Prerequisite: consent of instructor. Discussion of recent literature on the physiological 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 levels of biological systems. May be repeated for credit.—I.

251. Molecular Mechanisms in Early Development (3) Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; introductory background in developmental biology and/or cell biology recommended. Analysis of the early events of development including germ cell and other stem cells, gametogenesis, meiosis, imprinting, differentiation of normally engineered organisms, egg activation and establishment of embryonic polarity with focus on cellular events including gene regulation and cell signaling. Offered in alternate years.—III. (III.) Natzle, Rose

255. Molecular Mechanisms in Pattern Formation and Development (3) Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; introductory background in developmental biology and/or genetics recommended. Genetic and molecular analysis of mechanisms that control animal development after fertilization. Establishment of embryonic axes, cell fate and embryonic pattern formation, molecular and developmental biology. Emphasis on active learning and student participation. Presentation and analysis of literature and major advances in field of study. May be repeated two times for credit if topic differs. —III. (III.) Kaplan

256. Cell and Molecular Biology of Cancer (2) Lecture—1 hour; term paper. Prerequisite: course in cell or developmental biology [e., course 150, 141, 142, or Biological Sciences 210L]. Restriction to students that have completed a course in molecular and cellular levels of the regulation of normal and neoplastic tissue growth; tumor dissemination; identification and characterization of oncogenic agents; characterization of oncogenes and tumor-suppressor genes. —I. (I.)
Molecular, Cellular, and Integrative Physiology (A Graduate Group)

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


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 Bartkey, Ph.D., Associate Professor (WM. Surgical and Radiological Sciences)
Trish J. Berger, Ph.D., Professor (Animal Science)
Brenda Gold, Ph.D., Professor (Medical Pharmacology)
Sue Bodine, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Lauro Borroto-Escuela, Ph.D., Assistant Professor (Physiology & Membrane Biology)
Julie Bosuys, Ph.D., Assistant Professor (Medical Pharmacology)
Robert Brodhun, Ph.D., Associate Professor (Neurobiology, Physiology, and Behavior)
Earl J. Carstens, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Gretchen Casazza, Ph.D., Assistant Adjunct Professor (Mesocricetus auratus)
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 C. Chen, Ph.D., Professor (Bodega Marine Laboratory)
Nipavan Chiamvimonvat, M.D., Professor (Cardiovascular Medicine)
Alan J. Corrales, Ph.D., Assistant Professor (Population Health and Reproduction)
Gino Cartopassi, Ph.D., Professor (Molecular Biosciences)
Carroll E. Cross, M.D., Professor (Internal Medicine, Human Physiology)
Fitz-Roy Curry, Ph.D., Professor (Physiology and Membrane Biology)
Weimin Deng, Ph.D., Associate Professor (Cell Biology and Human Anatomy)
Elizabeth Dibrows, Ph.D., Associate Adjunct Professor (Medical Neurology)
Michael J. Ferns, Ph.D., Professor (Anesthesiology and Pain Medicine)
Alfa F. Fominia, Ph.D., Assistant Professor (Physiology and Membrane Biology)
Charles A. Fuller, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
J. David Furlow, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Damián Genetos, Ph.D., Assistant Professor (WM Anatomy, Physiology and Cell Biology)
Aldrin Gomes, Ph.D., Assistant Professor (Neurobiology, Physiology, and Behavior)

Leigh Griffiths, Ph.D., Assistant Professor (VM. Medicine and Epidemiology)
Fawaz Haji, Ph.D., Associate Professor (Nutrition)
Peter J. Havel, D.V.M., Ph.D., Professor (Molecular Biosciences)
Barbara A. Horvitz, 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., Ph.D., Professor (Surgical and Radiological Sciences)
George A. Kaysen, M.D., Professor (Internal Medicine)
Anne A. Knowlton, M.D., Professor (Cardiovascular Medicine)
Dietmar Kuziel, 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 (WM. Anatomy, Physiology and Cell Biology)
Manuel Navedo, Ph.D., Assistant Professor (Medical Pharmacology)
Martha E. O’Donnell, Ph.D., Associate Professor (Physiology and Membrane Biology)
Anita M. Obrerber, Ph.D., Professor (Animal Science)
John A. Payne, Ph.D., Professor (Physiology and Membrane Biology)
Isaac N. Pesah, 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 Schaefer, M.D., Professor (Internal Medicine)
Edward S. Schellekens, Ph.D., Associate Professor (WM. 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 Stelzenberg, Ph.D., Assistant Professor (Psychology)
Brian C. Trainor, Ph.D., Associate Professor (Psychology)
Catherine VandeVoort, Ph.D., Adjunct Professor (Obstetrics and Gynecology)
Amparo Villalobos, Ph.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 (WM. Pathology, Microbiology, and Immunology)
John A. Wingfield, Ph.D., Professor (Neurobiology, Physiology, and Behavior)
Vladimir Yarov-Yavorov, Ph.D., Assistant Professor (Physiology and Membrane Biology)
Clare E. Yellowley, Ph.D., Professor (WM. Anatomy, Physiology and Cell Biology)
Konstantinos Zarpalis, Ph.D., Assistant Professor (Pathology)
Jie Zheng, Ph.D., Associate 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-