

# Department of Molecular Biology and Biochemistry

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**Celia Goulding, Department Chair**

**Michael Green, Department Vice Chair**

**Melissa Lodoen, Department Vice Chair**

3205 McGaugh Hall

949-824-4915

<http://mbb.bio.uci.edu/>

The core discipline of Molecular Biology and Biochemistry is the understanding of the molecular mechanisms that underlie all fundamental biological processes. To that end the faculty of the Department of Molecular Biology and Biochemistry represent diverse research interests that include structure and synthesis of proteins and nucleic acids, gene organization and regulation, cell signaling, immunology and host pathogen interactions, biochemical genetics, cell and developmental biology, microbiology and virology.

- Biochemistry and Molecular Biology, B.S.
- Microbiology and Immunology, B.S.

## Graduate Program

The Department offers graduate study in conjunction with the program in Cellular and Molecular Biosciences (CMB) and the Interdepartmental Neuroscience Program (INP). Students admitted into a combined program who select a research advisor in the Department begin following the departmental requirements for the Ph.D. at the beginning of their second year. Participation in an advanced topics seminar series and completion of at least one course per year for three years are expected of all students. Students must advance to candidacy in their third year. The normative time for completion of the Ph.D. is five years, and the maximum time permitted is seven years.

**Graduate Gateway Program in Medicinal Chemistry and Pharmacology (MCP).** The one-year MCP graduate gateway program is designed to function in concert with selected graduate programs, including the Ph.D. in Biological Sciences. Detailed information is available on the Pharmaceutical Sciences website (<http://pharmsci.uci.edu/current-students/graduate-students/>).

## Faculty

Dana W. Aswad, Ph.D. University of California, Berkeley, *Professor Emeritus of Molecular Biology and Biochemistry*

Rachael M. Barry, Ph.D. Princeton University, *Assistant Professor of Teaching of Molecular Biology and Biochemistry*

Hans-Ulrich Bernard, Ph.D. University of Goettingen, *Professor Emeritus of Molecular Biology and Biochemistry; Population Health and Disease Prevention*

Elizabeth Bess, Ph.D. University of Utah, *Assistant Professor of Chemistry; Molecular Biology and Biochemistry (chemical biology)*

Suzanne Bohlson, Ph.D. University of Notre Dame, *Professor of Teaching of Molecular Biology and Biochemistry*

Michael J. Buchmeier, Ph.D. McMaster University, *Professor Emeritus of Medicine; Microbiology and Molecular Genetics; Molecular Biology and Biochemistry*

John Charles Chaput, Ph.D. University of California, Riverside, *Professor of Pharmaceutical Sciences; Chemical and Biomolecular Engineering; Chemistry; Molecular Biology and Biochemistry (chemical and synthetic biology)*

Melanie Cocco, Ph.D. Pennsylvania State University, *Associate Professor of Molecular Biology and Biochemistry; Pharmaceutical Sciences*

Michael G. Cumsky, Ph.D. University of California, Berkeley, *Professor Emeritus of Molecular Biology and Biochemistry*

Hung Y. Fan, Ph.D. Massachusetts Institute of Technology, *Professor Emeritus of Molecular Biology and Biochemistry*

Donald N. Forthal, M.D. University of California, Irvine, *Professor of Medicine; Molecular Biology and Biochemistry; Pathology and Laboratory Medicine*

David A. Fruman, Ph.D. Harvard University, *Professor of Molecular Biology and Biochemistry*

Paul David Gershon, Ph.D. University of Liverpool, *Professor of Molecular Biology and Biochemistry*

Charles Glabe, Ph.D. University of California, Davis, *Professor of Molecular Biology and Biochemistry*

Shane Gonen, Ph.D. University of Washington, *Assistant Professor of Molecular Biology and Biochemistry*

Celia Goulding, Ph.D. King's College London, *Chair and Professor of Molecular Biology and Biochemistry; Pharmaceutical Sciences*

Michael T. Green, Ph.D. University of Chicago, *Vice Chair and Professor of Molecular Biology and Biochemistry; Chemistry* (chemical, biology, inorganic and organometallic, physical chemistry and chemical physics, theoretical and computational)

Christopher J. Halbrook, Ph.D. Stony Brook University in New York, *Assistant Professor of Molecular Biology and Biochemistry*

Barbara A. Hamkalo, Ph.D. University of Massachusetts, *Professor Emerita of Molecular Biology and Biochemistry*

Allon Hochbaum, Ph.D. University of California, Berkeley, *Associate Professor of Materials Science and Engineering; Chemical and Biomolecular Engineering; Chemistry; Molecular Biology and Biochemistry* (biological materials, protein materials, electronic conductivity in proteins, materials and methods to study microbes and microbial communities)

Yilin Hu, Ph.D. Loma Linda University, *Professor of Molecular Biology and Biochemistry*

Christopher C. Hughes, Ph.D. University of London, *Director of Edwards Lifesciences Center for Advanced Cardiovascular Technology and Professor of Molecular Biology and Biochemistry; Biomedical Engineering* (tissue engineering, growth and patterning of blood vessels)

Matthew Inlay, Ph.D. University of California, San Diego, *Associate Professor of Molecular Biology and Biochemistry*

Anthony A. James, Ph.D. University of California, Irvine, *Distinguished Professor and Donald Bren Professor of Microbiology and Molecular Genetics; Molecular Biology and Biochemistry*

Pavan Kadandale, Ph.D. Rutgers, The State University of New Jersey, *Associate Professor of Teaching of Molecular Biology and Biochemistry*

Mei Kong, Ph.D. McGill University, *Professor of Molecular Biology and Biochemistry*

Young Jik Kwon, Ph.D. University of Southern California, *Professor of Pharmaceutical Sciences; Biomedical Engineering; Chemical and Biomolecular Engineering; Molecular Biology and Biochemistry* (gene therapy, drug delivery, cancer-targeted therapeutics, artificially-induced cellular vesicles, multi-modal therapies)

Chang C. Liu, Ph.D. Scripps Research Institute, *Professor of Biomedical Engineering; Chemistry; Molecular Biology and Biochemistry* (genetic engineering, directed evolution, synthetic biology, chemical biology)

Wendy F. Liu, Ph.D. Johns Hopkins University, *Professor of Biomedical Engineering; Chemical and Biomolecular Engineering; Molecular Biology and Biochemistry; Pharmaceutical Sciences* (biomaterials, microdevices in cardiovascular engineering, cell-cell and cell-micro-environment interactions, cell functions and controls)

Melissa Lodoen, Ph.D. University of California, San Francisco, *Vice Chair and Professor of Molecular Biology and Biochemistry*

Ray Luo, Ph.D. University of Maryland, College Park, *Professor of Molecular Biology and Biochemistry; Biomedical Engineering; Chemical and Biomolecular Engineering; Materials Science and Engineering* (protein structure, noncovalent associations involving proteins)

Andrej Luptak, Ph.D. Yale University, *Department Chair and Professor of Pharmaceutical Sciences; Chemistry; Molecular Biology and Biochemistry* (chemical biology)

Jerry E. Manning, Ph.D. University of Utah, *Professor Emeritus of Molecular Biology and Biochemistry*

Rachel Martin, Ph.D. Yale University, *Professor of Chemistry; Molecular Biology and Biochemistry* (analytical, chemical biology, physical chemistry and chemical physics)

Reginald McNulty, Ph.D. University of California, Irvine, *Assistant Professor of Molecular Biology and Biochemistry; Pharmaceutical Sciences*

Alexander McPherson, Ph.D. Purdue University, *Professor Emeritus of Molecular Biology and Biochemistry*

Benjamin Morehouse, Ph.D. Brandeis University, *Assistant Professor of Molecular Biology and Biochemistry; Pharmaceutical Sciences*

Naomi Morrissette, Ph.D. University of Pennsylvania, *Associate Professor of Molecular Biology and Biochemistry*

Edward L. Nelson, M.D. University of Oregon, *Professor of Medicine; Molecular Biology and Biochemistry*

Dequina Nicholas, Ph.D. Loma Linda University, *Assistant Professor of Molecular Biology and Biochemistry*

Thomas L. Poulos, Ph.D. University of California, San Diego, *Professor Emeritus of Molecular Biology and Biochemistry; Chemistry; Pharmaceutical Sciences* (chemical biology)

Jennifer A. Prescher, Ph.D. University of California, Berkeley, *Professor of Chemistry; Molecular Biology and Biochemistry; Pharmaceutical Sciences* (chemical biology, organic and synthetic)

Olga Razorenova, Ph.D. Institute of Molecular Genetics, *Associate Professor of Molecular Biology and Biochemistry*

Markus W. Ribbe, Ph.D. University of Bayreuth, *UCI Chancellor's Professor of Molecular Biology and Biochemistry; Chemistry* (chemical biology, inorganic and organometallic)

Brian Sato, Ph.D. University of California, San Diego, *Professor of Teaching of Molecular Biology and Biochemistry; Education*

Donald F. Seneear, Ph.D. University of Washington, *Professor Emeritus of Molecular Biology and Biochemistry*

Albert Siryaporn, Ph.D. University of Pennsylvania, *Associate Professor of Physics and Astronomy; Molecular Biology and Biochemistry*

Robert Spitale, Ph.D. University of Rochester, *Professor of Pharmaceutical Sciences; Molecular Biology and Biochemistry* (chemistry, chemical biology, RNA biology)

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

Roberto Tinoco, Ph.D. University of California, San Diego, *Assistant Professor of Molecular Biology and Biochemistry*

Shiou-Chuan (Sheryl) Tsai, Ph.D. University of California, Berkeley, *Professor of Molecular Biology and Biochemistry; Chemistry; Pharmaceutical Sciences*

Luis P. Villarreal, Ph.D. University of California, San Diego, *Professor Emeritus of Molecular Biology and Biochemistry*

Craig Walsh, Ph.D. University of California, Los Angeles, *Associate Dean of Graduate Studies and Professor of Molecular Biology and Biochemistry*

Gregory A. Weiss, Ph.D. Harvard University, *Professor of Chemistry; Molecular Biology and Biochemistry; Pharmaceutical Sciences* (analytical, chemical biology, organic and synthetic, polymer, materials, nanoscience)

Katrine Whiteson, Ph.D. University of Chicago, *Associate Professor of Molecular Biology and Biochemistry*

Travis Wiles, Ph.D. University of Utah, *Assistant Professor of Molecular Biology and Biochemistry*

## Courses

### **MOL BIO 200A. Research in Molecular Biology and Biochemistry. 2-12 Units.**

Individual research with Molecular Biology and Biochemistry faculty.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only.

### **MOL BIO 200B. Research in Molecular Biology and Biochemistry. 2-12 Units.**

Individual research with Molecular Biology and Biochemistry faculty.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only.

### **MOL BIO 200C. Research in Molecular Biology and Biochemistry. 2-12 Units.**

Individual research with Molecular Biology and Biochemistry faculty.

Repeatability: Unlimited as topics vary.

Restriction: Graduate students only.

### **MOL BIO 200R. Research in Developmental & Cell Biology for First-year Students. 2-12 Units.**

Independent research within the laboratories of graduate training faculty in the Department of Molecular Biology and Biochemistry for first-year Ph.D. students.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be taken for credit 3 times.

### **MOL BIO 201A. Seminars in Molecular Biology & Biochemistry. 2 Units.**

Presentation of research from department laboratories or, when pertinent, of other recent developments.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

**MOL BIO 201B. Seminars in Molecular Biology & Biochemistry. 2 Units.**

Presentation of research from department laboratories or, when pertinent, of other recent developments.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

**MOL BIO 201C. Seminars in Molecular Biology & Biochemistry. 2 Units.**

Presentation of research from department laboratories or, when pertinent, of other recent developments.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

**MOL BIO 202A. Tutorial in Molecular Biology and Biochemistry. 2 Units.**

Tutorials in the area of research of a particular professor which relate current research to the literature. May be conducted as journal clubs.

Repeatability: Unlimited as topics vary.

**MOL BIO 202B. Tutorial in Molecular Biology and Biochemistry. 2 Units.**

Tutorials in the area of research of a particular professor which relate current research to the literature. May be conducted as journal clubs.

Repeatability: Unlimited as topics vary.

**MOL BIO 202C. Tutorial in Molecular Biology and Biochemistry. 2 Units.**

Tutorials in the area of research of a particular professor which relate current research to the literature. May be conducted as journal clubs.

Repeatability: Unlimited as topics vary.

**MOL BIO 203. Nucleic Acid Structure and Function. 4 Units.**

Structure and chemistry of nucleic acids. Relationship between these properties and the mechanisms of fundamental processes such as replication and repair, RNA-mediated catalysis, formation and regulation of higher order chromatin structure and recombination.

Prerequisite: BIO SCI 98 and BIO SCI 99 and CHEM 51A and CHEM 51B and CHEM 51C

**MOL BIO 204. Protein Structure and Function. 4 Units.**

The structure and properties of proteins, enzymes, and their kinetic properties.

Prerequisite: BIO SCI 98 and BIO SCI 99 and CHEM 51C

**MOL BIO 205. Molecular Virology. 4 Units.**

Primary research data on the major DNA and RNA viruses emphasizing strategies of regulation of gene expression. Utilization of viruses as molecular biological tools. Graduate-level knowledge of the biochemistry and molecular biology of macromolecules is required.

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

Restriction: Graduate students only.

**MOL BIO 211. Structural Biology. 4 Units.**

Basic principles of magnetic resonance, Xray crystallography, and CryoEM toward the determination of high-resolution biomolecular structures.

Prerequisite: MATH 2B

Restriction: Graduate students only.

Concurrent with BIO SCI M133.

**MOL BIO 214. Literature in Protein Structure and Function. 2 Units.**

Exploration and critical analysis of recent primary scientific literature in structure and properties of proteins, enzymes, and their kinetic properties.

Corequisite: MOL BIO 204

Grading Option: Satisfactory/unsatisfactory only.

**MOL BIO 215B. Integrative Immunology II. 4 Units.**

Lectures and student presentations of primary literature. Focuses on advanced topics and cutting edge technologies in modern immunology. Combination of didactic lectures and student-led journal article discussion.

Prerequisite: PHYSIO 215. PHYSIO 215 with a grade of B+ or better

Same as M&MG 215B, PHYSIO 215B.

Restriction: Graduate students only.

**MOL BIO 217A. Principles of Cancer Biology I. 4 Units.**

Oncogenes and tumor suppressor genes are studied from molecular viewpoints. Also studies their role in cancer; viral carcinogenesis. Designed for graduate students interested in cancer research. Format includes lectures and student-led discussions.

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

Restriction: Graduate students only.

**MOL BIO 217B. Principles of Cancer Biology II. 4 Units.**

Topics include cancer cell growth and metastasis, chemical carcinogenesis, and cancer genetics and epidemiology. Designed for graduate students interested in cancer research. Format includes lectures and student-led discussions.

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

Restriction: Graduate students only.

**MOL BIO 218. Clinical Cancer. 3 Units.**

Designed to acquaint students in basic life science with clinical cancer.

Restriction: Graduate students only.

**MOL BIO 220. Structure & Synthesis of Biological Macromolecules Journal Club. 2 Units.**

Advanced topics in macromolecular structure and synthesis as related to biological problems.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.

**MOL BIO 221. Advanced Topics in Immunology. 4 Units.**

Literature-based, interactive discussions focused on review of seminal historic and recent immunology literature. Student responsibilities include reading, critical evaluation, and discussion of manuscripts.

Prerequisite: M&MG 215. M&MG 215 with a grade of B- or better

Restriction: Graduate students only.

**MOL BIO 221L. Advanced Immunology Laboratory. 4 Units.**

An advanced course in immunology for graduate students enrolled in the Biotechnology master's program. Emphasis is placed on learning modern techniques in immunology such as ELISAs, western blotting, immunofluorescent staining assays.

Restriction: Graduate students only.

Concurrent with BIO SCI M121L.

**MOL BIO 223. Introduction to Computational Biology. 4 Units.**

The use of theories and methods based on computer science, mathematics, and physics in molecular biology and biochemistry. Basics in biomolecular modeling. Analysis of sequence and structural data of biomolecules. Analysis of biomolecular functions.

Same as BME 232.

Restriction: Graduate students only.

Concurrent with BIO SCI M123 and COMPSCI 183 and BME 132.

**MOL BIO 227. Immunology Journal Club. 2 Units.**

Advanced topics in immunology as related to an understanding of human disease.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be taken for credit 15 times.

Restriction: Graduate students only.

**MOL BIO 229. Research-in-Progress Seminars. 1 Unit.**

Two half-hour presentations by graduate students and postdoctorals to the department on their current research projects.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be taken for credit 15 times.

Restriction: Graduate students only.

**MOL BIO 235. Literature in Chemical and Structural Biology. 1 Unit.**

Exploration and critical analysis of recent primary scientific literature in chemical and structural biology.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

**MOL BIO 243. Topics in Stem Cells. 2-4 Units.**

Presentation by participating faculty or guest lecturer that is open to the science community, followed by discussion of the lecture topic or a related topic. Students are responsible for presentations and readings.

**MOL BIO 248. Metallobiochemistry . 4 Units.**

A review of the biochemistry of metallic elements emphasizing: methods for studying metals in biological systems; the chemical basis for nature's exploitation of specific elements; structures of active sites; mechanisms; solid-state structures and devices; metals in medicine.

Prerequisite or corequisite: CHEM 131C or CHEM 132C

Same as CHEM 218.

**MOL BIO 250. Advanced Topics in Biotechnology - Nucleic Acids. 2 Units.**

Supplements laboratory curriculum with scientific background behind experimental methods. Format consists of lectures and the presentation and analysis of relevant papers from the scientific literature.

Corequisite: MOL BIO 250L

Restriction: Graduate students only. Biotechnology Majors only.

**MOL BIO 250L. Biotechnology Laboratory - Nucleic Acids. 8 Units.**

Nucleic acid techniques and recombinant DNA technology. Extraction and purification of nucleic acids, cloning and subcloning, PCR, site-directed mutagenesis, nucleic acid hybridization, additional associated procedures. Students must demonstrate accurate documentation of data (laboratory notebook) detailing experience and results.

Corequisite: MOL BIO 250

Restriction: Graduate students only. Biotechnology Majors only.

**MOL BIO 251. Advanced Topics in Biotechnology - Protein Purification and Characterization. 2 Units.**

Supplements laboratory curriculum with scientific background behind experimental methods. Format consists of lectures and the presentation and analysis of relevant papers from the scientific literature.

Corequisite: MOL BIO 251L

Prerequisite: MOL BIO 250L and MOL BIO 250. MOL BIO 250L with a grade of B- or better. MOL BIO 250 with a grade of B- or better

Restriction: Graduate students only. Biotechnology Majors only.

**MOL BIO 251L. Biotechnology Laboratory - Protein Purification and Characterization. 8 Units.**

Major techniques of handling proteins and antibodies. Protein engineering, expression and large-scale purification of recombinant proteins from bacteria, HPLC, antibody purification, western blotting, additional associated procedures. Students must demonstrate accurate documentation of data (laboratory notebook) detailing experience and results.

Corequisite: MOL BIO 251

Prerequisite: MOL BIO 250L and MOL BIO 250. MOL BIO 250L with a grade of B- or better. MOL BIO 250 with a grade of B- or better

Restriction: Graduate students only. Biotechnology Majors only.

**MOL BIO 252L. Biotechnology Management Laboratory. 8 Units.**

Overview of current methods in biotechnology, designed specifically for biotechnology graduate students. Organized into four distinct sections (nucleic acids, proteins, virology, and immunology). Students must demonstrate accurate documentation of data (laboratory notebooks) detailing experience and results.

Restriction: Graduate students only. Biotechnology Majors only.

**MOL BIO 253. Biotech Management . 5 Units.**

Taught jointly by Bio Sci and Merage School faculty, the course addresses fundamental aspects within, and associated with, the biotechnology industry. Curriculum is focused largely on management issues, including finance, product development, pharmaceuticals, project management, regulatory affairs, and ethics.

Same as MGMTMBA 293.

Restriction: Graduate students only. Biotechnology Majors only.

**MOL BIO 268. Seminar in Systems Microbiology Research. 1 Unit.**

A research and journal club seminar that covers topics on bacteria and phage using approaches and principles from biology, engineering, and physics.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

Same as PHYSICS 268, ENGRMSE 267.

Restriction: Upper-division students only. Graduate students only.

**MOL BIO 270. Science Communication Skills. 2 Units.**

Development of effective communication skills, oral and written presentations. Topics range from the art of creating keynote slides to strategically crafting a personal story, culminating in a live presentation to an invited audience.

**MOL BIO 280. Advanced Topics in Biochemistry and Molecular Biology. 4 Units.**

Selected topics in specified areas of concentration, e.g., nucleic acids, protein biochemistry, genetic expression, biochemical genetics. Specific topics announced in advance.

Restriction: Graduate students only.

**MOL BIO 291. Graduate School Fundamentals. 2 Units.**

Lectures and discussions providing basic skills needed for success in Ph.D. graduate studies. Topics include formulating a hypothesis, experimental design, literature review, grant writing, oral communication, biostatistics, time management, and professional development.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only. Cellular and Molecular Biosci Majors only.

**MOL BIO 292A. Scientific Communication. 2 Units.**

Small group meetings for graduate students to practice scientific writing, debate, and presentation skills.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

**MOL BIO 292B. Scientific Communication. 2 Units.**

Small group meetings for graduate students to practice scientific writing, debate, and presentation skills.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.



**MOL BIO 292C. Scientific Communication. 2 Units.**

Small group meetings for graduate students to practice scientific writing, debate, and presentation skills.

Grading Option: Satisfactory/unsatisfactory only.

Repeatability: May be repeated for credit unlimited times.

**MOL BIO 293A. Cancer Biology Journal Club. 1 Unit.**

Focuses on molecular mechanisms that underlie the development and progression of cancers. Covers a variety of cancer-related research areas, such as cell cycle control, apoptosis, DNA repair, metastasis, angiogenesis, and others.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only.

**MOL BIO 293B. Cancer Biology Journal Club. 1 Unit.**

Focuses on molecular mechanisms that underlie the development and progression of cancers. Covers a variety of cancer-related research areas, such as cell cycle control, apoptosis, DNA repair, metastasis, angiogenesis, and others.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only.

**MOL BIO 293C. Cancer Biology Journal Club. 1 Unit.**

Focuses on molecular mechanisms that underlie the development and progression of cancers. Covers a variety of cancer-related research areas, such as cell cycle control, apoptosis, DNA repair, metastasis, angiogenesis, and others.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only.

**MOL BIO 295. Biomedical Research Methods. 2 Units.**

Lectures and interactive discussions of research methods in modern biomedical science. Each week will focus on a different class of techniques, including molecular, biochemical, immunological, genomic, bioinformatics, microscopy, cancer biology, genome editing. One hour per week, grading based on attendance.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only. Cellular and Molecular Biosci Majors only.

**MOL BIO 399. University Teaching. 4 Units.**

Limited to Teaching Assistants.

Grading Option: Satisfactory/unsatisfactory only.

Restriction: Graduate students only.