MOLECULAR AND CELLULAR PHYSIOLOGY

Courses offered by the Department of Molecular and Cellular Physiology are listed under the subject code MCP on the [Stanford Bulletin's ExploreCourses web site](http://explorecourses.stanford.edu/CourseSearch/search/?view=catalog&catalog=&page=0&q=MCP&filter-catalognumber-MCP=on). The program offers a course of study leading to the Doctor of Philosophy in Molecular and Cellular Physiology. Candidates for Ph.D. degrees at Stanford must satisfactorily complete a program of study that includes 135 units of graduate course work and research. Study toward the Ph.D. is expected to occupy five years, including summers. The MCP course requirements for the program are as follows:

- MCP 221 Advanced Cell Biology
- MCP 207 MCP Bootcamp
- MCP 208 MCP Journal Club and Professional Development Series
- MCP 256 How Cells Work: Energetics, Compartments, and Coupling in Cell Biology
- BIOS 200 Foundations in Experimental Biology
- MED 255 The Responsible Conduct of Research, if funded on NSF or NIH training grants
- Advanced graduate courses or mini-courses for a minimum of 6 units total. These courses do not need to be MCP courses but must be in relevant scientific topic and approved by the Director of Graduate Studies.
- Two of the following courses:
  - BIOC 241 Biological Macromolecules
  - GENE 205 Advanced Genetics
  - NBIO 206 The Nervous System
  - BIO 230

Students are also required to participate in the Molecular and Cellular Physiology Seminar Series and attend the department scientific meeting. Courses taken to meet program requirements must be taken for a letter grade and students must earn a minimum grade of at least a 'B' in every individual required course. Students must also maintain a minimum GPA of 3.0 by University policy. Failure to maintain the required grades and grade point average is taken as evidence of unsatisfactory progress in the program.

Students should complete their required courses within the first two years of study. Exceptions may be made in cases where it was impossible to schedule courses because they were not offered within a student's first two years. Students may petition the MCP graduate committee for variances in the specific courses required, and such petitions may be granted in special circumstances, in cases where a student's progress is otherwise exemplary.

Qualifying Examination

All students in the program must pass a qualifying examination to advance to candidacy for the Ph.D. It is expected that students take the qualifying examination by the end of the Autumn Quarter in the second year of study. Failure to take the qualifying exam by the end of Autumn Quarter of the second year of study is taken as evidence of unsatisfactory progress in the program. In any case where a student thinks they need additional time to schedule and take their exam, a request must be submitted in writing to the Director of Graduate Studies.
Graduate Advising Expectations

The Department of Molecular and Cellular Physiology is committed to providing academic advising in support of graduate student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both the adviser and the advisee. As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Both the adviser and the advisee are expected to maintain professionalism and integrity.

Faculty advisers guide students in key areas such as selecting courses, designing and conducting research, developing of teaching pedagogy, navigating policies and degree requirements, and exploring academic opportunities and professional pathways.

Graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

For a statement of University policy on graduate advising, see the "Graduate Advising (http://exploredegrees.stanford.edu/graduatedegrees/)" section of this bulletin.

Emeriti (Professors): W. James Nelson, Stephen J. Smith, Richard W. Tsien
Chair: Miriam B. Goodman
Associate Professors: V. Daniel Madison, Merritt C. Maduke
Assistant Professors: Liang Feng, Lucy E. O’Brien
Joint Professors: Steve Chu, William Weis
Courtesy Professors: John Huguenard, Anthony J. Ricci, Ron Dror

Courses

MCP 156. How Cells Work: Energetics, Compartments, and Coupling in Cell Biology. 4 Units.
Open to graduate and medical students, and advanced undergraduates. Dynamic aspects of cell behavior and function, including cellular energetics, homeostasis, heterogeneity of membranes, structure and function of organelles, solute and water transport, signaling and motility. Emphasis is on the principles of how coupling of molecular processes gives rise to essential functions at the cellular level. Mathematical models of cell function. Student presentations. Same as: MCP 256

MCP 199. Undergraduate Research. 1-18 Unit.
Students undertake investigations sponsored by individual faculty members. Prerequisite: consent of instructor.

MCP 207. MCP Bootcamp. 1-3 Unit.
Hands-on, week-long immersion in methods and concepts related to the physiology of cell signaling. Required of all first-year MCP students; other PhD students may enroll with consent of instructor.
MCP 208. MCP Journal Club and Professional Development Series. 1-2 Unit.
This class will entail discussion of current research in Molecular and Cellular Physiology (Journal Club) and sessions devoted to career development. Enrolled learners will gain experience in designing and delivering professional oral presentations and writing accessible lay summaries of primary research. They will also receive guidance in how to give and receive critiques following a rubric. Learners will choose research papers following a theme to be determined collaboratively. Career and professional development class sessions will provide information on a variety of topics related to career development and strategies for navigating the research environment in productive and healthy ways (see below). The class will meet 8 times per quarter, with 4 Journal Club and 4 Professional Development sessions per quarter. Journal Club sessions will consist of one member of the class giving an oral presentation on the topic of a current relevant research paper, followed by critique and discussion. Learners will prepare written critiques of these talks. The Professional Development session will consist of a series of lectures, discussions, or workshops designed to foster a better understanding of the practices and processes that are critical for navigating paths toward a research career, but which are not generally covered in a classroom setting. These sessions might include such topics as mentor/mentee relationships, authorship, navigating peer review, issues of diversity and respectful workplace, wellness, experiences Stanford alumni in their own career paths, and other topics, including those suggested by class participants. The class will be graded on participation and on the writing assignments, including critiques and lay summaries. The course will be required for MCP graduate students in their first 3 years of study, and open to all predoctoral graduate students. The broader membership of the MCP scientific community will be encouraged to participate including postdocs (with permission of the course director).

MCP 221. Advanced Cell Biology. 4 Units.
For Ph.D. students. Taught from the current literature on cell structure, function, and dynamics. Topics include complex cell phenomena such as cell division, apoptosis, signaling, compartmentalization, transport and trafficking, motility and adhesion, and differentiation. Weekly reading of current papers from the primary literature. Advanced undergraduates may participate with the permission of the Course Director.
Same as: BIO 214, BIOC 224

MCP 222. Imaging: Biological Light Microscopy. 3 Units.
This intensive laboratory and discussion course will provide participants with the theoretical and practical knowledge to utilize emerging imaging technologies based on light microscopy. Topics include microscope optics, resolution limits, Kühler illumination, confocal fluorescence, two-photon, TIRF, FRET, photobleaching, super-resolution (SIM, STED, STORM/PALM), tissue clearing/CLARITY/light-sheet microscopy, and live-cell imaging. Applications include using fluorescent probes to analyze subcellular localization and live cell-translocation dynamics. We will be using a flipped classroom for the course in that students will watch iBiology lectures before class, and class time will be used for engaging in extensive discussion. Lab portion involves extensive in-class use of microscopes in the CSIF and NMS core microscopy facilities.
Same as: BIO 152

MCP 256. How Cells Work: Energetics, Compartments, and Coupling in Cell Biology. 4 Units.
Open to graduate and medical students, and advanced undergraduates. Dynamic aspects of cell behavior and function, including cellular energetics, homeostasis, heterogeneity of membranes, structure and function of organelles, solute and water transport, signaling and motility. Emphasis is on the principles of how coupling of molecular processes gives rise to essential functions at the cellular level. Mathematical models of cell function. Student presentations.
Same as: MCP 156

MCP 299. Directed Reading in Molecular and Cellular Physiology. 1-18 Unit.
Prerequisite: consent of instructor.

MCP 370. Medical Scholars Research. 4-18 Units.
Provides an opportunity for student and faculty interaction, as well as academic credit and financial support, to medical students who undertake original research. Enrollment is limited to students with approved projects.

MCP 399. Graduate Research. 1-18 Unit.
Students undertake investigations sponsored by individual faculty members. Research fields include endocrinology, neuroendocrinology, and topics in molecular and cellular physiology. Prerequisite: consent of instructor. (Staff).

MCP 801. TGR Project. 0 Units.

MCP 802. TGR Dissertation. 0 Units.