Pharmacological Sciences

Qun-Yong Zhou, Graduate Program Director/Advisor for the Interdisciplinary Program

Graduate Student Affairs: 949-824-7651 (Program administered by the Department of Pharmacology)

The Department of Pharmacology and Pharmaceutical Sciences join forces to offer an interdisciplinary program leading to the Ph.D. in Pharmacological Sciences with a concentration in Pharmacology or in Pharmaceutical Sciences. For complete program information, see the Interdisciplinary Studies section of the Catalogue.

The Department of Pharmacology also admits students through the following two gateway programs:

**Graduate Gateway Program in Medicinal Chemistry and Pharmacology (MCP).** The one-year graduate MCP Gateway Program is designed to function in concert with selected department programs, including the Ph.D. in Pharmacological Sciences. Upon successful completion of the MCP curriculum at the end of their first year, students choose a faculty advisor who is affiliated with one of the participating departments, and transition into their “home” department to complete the remaining degree requirements. They will receive their Ph.D. from the department of their chosen advisor. Detailed information is available at Department of Pharmacology (http://www.pharmacology.uci.edu) website (http://www.pharmacology.uci.edu).

The Department also participates in the Interdepartmental Neuroscience Gateway Program, described in the School of Biological Sciences section of the Catalogue. Students who select a focus in Neuroscience and a research advisor in the Department begin following the departmental requirements for the Ph.D. at the beginning of their second year and will receive their Ph.D. from the department of their chosen advisor. Detailed information is available at Interdepartmental Neuroscience Gateway Program website (http://www.inp.uci.edu).

**M.S. in Pharmacology**

The online M.S. in Pharmacology is designed to meet the needs of working professionals and traditional students by providing educational access and flexibility in an online format. It is well-suited to meet the goals of individuals who are seeking leadership positions within their organizations in a variety of fields.

The curriculum emphasizes both theoretical and practical applications and an interdisciplinary approach that serves not only as excellent pathways to career advancement, but also provides a solid foundation from which to pursue doctoral study in related fields.

The M.S. in Pharmacology prepares students for careers in academic research institutions, in the biotechnology and pharmaceutical industry, in federal and state agencies, and in private research institutions.

**Admission**

The online M.S. in Pharmacology is targeted to working professionals in the pharmaceutical industry and related fields, and is open to any non-traditional student who can benefit from the flexibility and convenience of online learning. Requirements include:

- A bachelor’s degree from a recognized academic institution with degree standards equivalent to UC
- A minimum cumulative undergraduate GPA of 3.0
- One official transcript
- Some coursework in biology is required, but applicants may be admitted with a variety of undergraduate disciplines, including biology, molecular biology, psychology, and chemistry
- Some research experience is required
- Personal statement
- Three letters of recommendation

Applications must be received by June 1.

**Requirements**

The program consists of 13 required courses (39 units) to be completed sequentially over two years of study (six quarters).

A. Complete the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHARM 270</td>
<td>Applied Pharmacology</td>
</tr>
<tr>
<td>PHARM 271</td>
<td>Principles of Pharmacology</td>
</tr>
<tr>
<td>PHARM 272</td>
<td>Receptors and Drug Targets</td>
</tr>
<tr>
<td>PHARM 274</td>
<td>Research Techniques in Pharmacology</td>
</tr>
<tr>
<td>PHARM 276</td>
<td>Experimental Design and Data Analysis</td>
</tr>
<tr>
<td>PHARM 277</td>
<td>Ethics in Scientific Research</td>
</tr>
</tbody>
</table>
1 Students take PHARM 270 at the beginning of the first year; it is an accelerated five-day in-residence course offered on the UCI campus.

The capstone paper is written while the student is enrolled in PHARM 280. The student, in consultation with their faculty mentor, selects a topic of interest in pharmacology. The final product will be evaluated by the mentor and the course director for acceptability in meeting the capstone requirement. Students submit an application for advancement to candidacy in the fifth quarter of study. The capstone research project and required courses for the fifth and sixth quarters must be completed before the degree will be conferred. The normative time to degree is two years.

Faculty

Geoffrey W. Abbott, Ph.D. University of London, Professor of Pharmacology; Physiology and Biophysics

Amal Alachkar, Ph.D. University of Manchester, Associate Adjunct Professor of Pharmacology

James D. Belluzzi, Ph.D. University of Chicago, Adjunct Professor of Pharmacology

Stephen C. Bondy, Ph.D. University of Birmingham, Professor of Medicine; Environmental Health Sciences; Pharmacology; Program in Public Health

Emiliana Borrelli, Ph.D. University of Strasbourg, Professor of Microbiology and Molecular Genetics; Pharmacology

Catherine M. Cahill, Ph.D. Dalhousie University, Acting Associate Professor of Anesthesiology and Perioperative Care; Anesthesiology and Perioperative Care; Pharmacology

A. Richard Chamberlin, Ph.D. University of California, San Diego, Department Chair and Professor of Pharmaceutical Sciences; Chemistry; Pharmacology (chemical biology, organic and synthetic)

Olivier Civelli, Ph.D. Swiss Federal Institute of Technology in Zurich, Department Chair and Eric L. and Lila D. Nelson Chair in Neuropharmacology and Professor of Pharmacology; Developmental and Cell Biology; Pharmaceutical Sciences (novel neuroactive molecules)

Sue P. Duckles, Ph.D. University of California, San Francisco, Professor Emerita of Pharmacology

Frederick J. Ehler, Ph.D. University of California, Irvine, Professor of Pharmacology

Pietro R. Galassetti, Ph.D. Vanderbilt University, Associate Professor of Pediatrics; Pharmacology

Kelvin W. Gee, Ph.D. University of California, Davis, Professor of Pharmacology

Stephen Hanessian, Ph.D. Ohio State University, Director of Medicinal Chemistry and Pharmacology Graduate Program and Professor of Pharmaceutical Sciences; Chemistry; Pharmacology (organic chemistry)

Naoto Hoshi, Ph.D. Kanazawa University, Assistant Professor of Pharmacology; Physiology and Biophysics

Mahtab F. Jafari, Ph.D. University of California, San Francisco, Vice Chair and Professor of Pharmaceutical Sciences; Ecology and Evolutionary Biology; Pharmacology

Diana N. Krause, Ph.D. University of California, Los Angeles, Adjunct Professor of Pharmacology

Arthur D. Lander, Ph.D. University of California, San Francisco, Donald Bren Professor and Professor of Developmental and Cell Biology; Biomedical Engineering; Logic and Philosophy of Science; Pharmacology (systems biology of development, pattern formation, growth control)

Frances L. Leslie, Ph.D. University of Aberdeen, Professor of Pharmacology; Anatomy and Neurobiology

Ellis Levin, M.D. Thomas Jefferson University, Jefferson Medical College, Professor in Residence of Medicine; Biological Chemistry; Pharmacology

John C. Longhurst, Ph.D. University of California, Davis, Susan Samueyi Chair in Integrative Medicine and Professor of Medicine; Pharmacology; Physiology and Biophysics

Shahrdad Lotfipour, Ph.D. University of California, Irvine, Assistant Professor of Pharmacology
Courses

PHARM 210. Chemical Neuroanatomy. 4 Units.
Organization of the nervous system, especially with respect to chemical identity of elements, for students of pharmacology. Major cell types, methods of study, ultrastructure, synaptic organization of functionally defined systems, localization of chemically defined cells and receptors, and brain development.

Restriction: Graduate students only.

PHARM 241. Advanced Topics in Pharmacology. 2 Units.
Application of pharmacological principles in disease therapy. Advanced pharmacological mechanisms and in-depth study of drug action. Discussion of several major drug classes/therapeutic strategies: molecular mechanisms of action, physiological consequences of administration, and clinical use.

PHARM 251. Experimental Pharmacology. 4 Units.
Introduction to the concepts and techniques used in pharmacological science. Molecular biology, quantitative and biochemical pharmacology, fluorescent probes, behavior, genetics, animal handling, anatomical and receptor binding analysis, methods for ion channel study, the absorption, distribution, metabolism and elimination of drugs.

PHARM 254. Introduction to Pharmacology. 4 Units.
Ligand-gated ion channels, G protein-coupled receptors, receptor tyrosine kinases, ligand-regulated transcription factors, their signaling mechanisms, trafficking, macromolecular complexes, and physiological responses.

PHARM 255. Chemical Transmission. 4 Units.
Mechanisms underlying chemical signaling processes in the brain and periphery. Molecular biology, signal transduction, transmitter synthesis and inactivation, pharmacology of integrative function and behavior.

PHARM 256. Experimental Design for Pharmacologists. 1 Unit.
Population and sample statistics, hypothesis testing, analysis of variance, nonparametric statistics, experimental design, power, and the use of statistical computer software.

Prerequisite: PHARM 251

PHARM 257. Ethics in Research. 1 Unit.
Ethical conduct in research including data handling, authorship, conflict of interest, animal rights, handling of misconduct.

Prerequisite: PHARM 299

Repeatability: May be taken for credit 2 times.

PHARM 270. Applied Pharmacology . 3 Units.
One week (five days, 40 hours) in-residence course offered on the UCI campus. Introduction to pharmacological techniques and current research problems; includes laboratory demonstrations and research seminars.

Restriction: Pharmacology Majors only.

PHARM 271. Principles of Pharmacology . 3 Units.
Principles of pharmacology: pharmacodynamics, pharmacokinetics, pharmacogenetics, drug interactions, and toxicity.

Restriction: Pharmacology Majors only.
PHARM 272. Receptors and Drug Targets. 3 Units.
Molecular basis of drug-receptor interaction. Receptor properties including gene and protein structure, signaling mechanisms, trafficking and physiological effects: G-protein linked receptors, ligand-gated ion channels, receptor tyrosine kinases, nuclear receptors, and ligand regulated transcription factors.

Restriction: Pharmacology Majors only.

PHARM 274. Research Techniques in Pharmacology. 3 Units.
Experimental techniques and model systems used in pharmacological research. Receptor analysis, bioassay, molecular biology, in vitro pharmacology, biochemical pharmacology, imaging, electrophysiology, in vivo pharmacology, disease models.

Restriction: Pharmacology Majors only.

PHARM 276. Experimental Design and Data Analysis. 3 Units.
Experimental design, data analysis and interpretation. Population and sample statistics, hypothesis testing, analysis of variance, nonparametric statistics, and power calculations.

Restriction: Pharmacology Majors only.

PHARM 277. Ethics in Scientific Research. 3 Units.
Ethical conduct in research including data handling, authorship, conflict of interest, animal rights, and handling of misconduct.

Restriction: Pharmacology Majors only.

PHARM 278. Concepts in Drug Discovery. 3 Units.
Critical steps involved in discovery and optimization of a new drug. Target selection, relationship of molecular structure to pharmacological activities, screening methods, strategies to identify lead compounds, and preclinical characterization necessary for development of the drug for clinical trials.

Restriction: Pharmacology Majors only.

PHARM 279. Special Topics in Pharmacology. 3 Units.
Topics of current interest in pharmacology; discussion of recent research publications.

Restriction: Pharmacology Majors only.

PHARM 280. Master’s Project in Pharmacology. 3 Units.
Capstone research paper on topic of interest in pharmacology.

Restriction: Pharmacology Majors only.

PHARM 281. Neuropharmacology. 3 Units.
Autonomic and central nervous system pharmacology, including major drug classes and therapeutic uses. Mechanisms underlying chemical signaling processes in the brain and peripheral nervous system, including neurotransmitter synthesis, inactivation, and receptor action.

Restriction: Pharmacology Majors only.

PHARM 282. Behavioral Pharmacology. 3 Units.

Restriction: Pharmacology Majors only.

PHARM 283. Cardiovascular Pharmacology. 3 Units.
Basic understanding of drugs used in the prevention and treatment of cardiovascular disease. Mechanisms of action, clinical and adverse effects.

Restriction: Pharmacology Majors only.

PHARM 284. Endocrine, Respiratory, and Gastrointestinal Pharmacology. 3 Units.
Basic understanding of drugs used in endocrine, respiratory, and gastrointestinal conditions, including hormone replacement, contraceptives, and drugs for diabetes, asthma, obesity, ulcer, and gastric reflux. Mechanisms of drug action, clinical and adverse effects.

Restriction: Pharmacology Majors only.

PHARM 288. Seminar. 2 Units.
Presentation and discussion of current problems and methods in teaching and research in pharmacology, toxicology, and therapeutics.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.
PHARM 299. Research. 1-12 Units.
Independent research with Pharmacology and Toxicology faculty.

Repeatability: May be repeated for credit unlimited times.

Restriction: Graduate students only.