

Molecular Physiology and Biophysics

Chair

- Kevin P. Campbell

Executive Associate Chair

- W. Scott Moye-Rowley

Faculty: <https://physiology.medicine.uiowa.edu/profile/>

Website: <https://physiology.medicine.uiowa.edu/>

The Department of Molecular Physiology and Biophysics participates in interdisciplinary graduate programs, including the Medical Scientist Training Program, a combined MD/PhD program offered by the Graduate College and the Carver College of Medicine, and it provides instruction in molecular physiology and biophysics for MD, DDS, and other health professions students. The department also conducts a co-op exchange, a vigorous training program that gives undergraduate students the opportunity to develop as independent researchers in preparation for graduate studies.

The department's principal research areas include cell biology, genetics, endocrinology, neuroscience, and membrane physiology and biophysics. The unifying theme is the understanding of signal transduction mechanisms involved in regulating function at the cellular and molecular levels.

Research

Faculty research interests in the Department of Molecular Physiology and Biophysics encompass molecular and cellular endocrinology, cellular and developmental neurophysiology, and membrane structure and function. Within these, there are multiple areas of interest, including hormone receptors, reproductive endocrinology, signal transduction, regulation of gene expression, synaptic transmission, neuronal differentiation, membrane ion channels, regulation of excitability, and cardiovascular electrophysiology and regulation. Experimental models currently being investigated include rodents, yeast, *Drosophila*, and cultured cell lines from a variety of species.

Programs

Graduate Programs of Study

- Master of Science in Molecular Physiology and Biophysics
- Doctor of Philosophy in Molecular Physiology and Biophysics

Students interested in doctoral studies in molecular physiology and biophysics should apply under the umbrella program in Biomedical Science (select molecular physiology and biophysics subprogram). Direct applications to the MS and PhD in molecular physiology and biophysics are not currently being considered.

Facilities

Two floors of the Bowen Science Building are devoted to research and teaching in the Department of Molecular Physiology and Biophysics. Department faculty members also occupy laboratory facilities in the Medical Education Research Facility, Pappajohn Biomedical Discovery Building,

and the Carver Biomedical Research Building. In addition to specialized equipment in faculty research laboratories, the department provides equipment for fluorescence microscopy, isotope analysis, cell culture, and molecular biology. It also has access to the university network and the multimedia education facilities. Additional resources are available at the Hardin Library for the Health Sciences.

Courses

Molecular Physiology and Biophysics Courses

MPB:4199 Research, Independent Study **arr.**

Recommendations: closed to molecular physiology and biophysics graduate students.

MPB:5153 Graduate Physiology **4 s.h.**

Principles of human physiology, organ systems, cell function. Offered fall semesters. Requirements: grades of C- or higher in BIOL:1411 and CHEM:2210 and CHEM:2220, and graduate standing.

MPB:5200 Medical Physiology Online **5 s.h.**

Fundamental principles of cellular membranes, muscle, sensory organs, motor neurological systems, autonomic nervous systems, cardiovascular, pulmonary, renal, gastrointestinal, endocrine, and reproductive systems; interdependence of organ systems to maintain a normal physiological state using clinical correlates as applied to humans; basic physiological principles that establish a solid foundation for future pathophysiological and pharmacological concepts. Recommendations: medical, dental, physician assistant, nurse anesthesia, physical therapy, or graduate standing.

MPB:5201 Advanced Physiology Online **3 s.h.**

Examination of cellular and organ systems of medical physiology; fundamental principles of cellular membranes including muscle, sensory organs, motor neurological systems, autonomic nervous system, cardiovascular, pulmonary, renal, gastrointestinal, endocrine, and reproductive physiology; emphasis on interdependence of organ systems to maintain a normal physiological state (homeostasis) using clinical correlates as applied to humans; basic physiological principles that establish a solid foundation for future pathophysiological and pharmacological concepts.

MPB:5241 Neuromuscular Diseases: Case-Based Seminar **1 s.h.**

MPB:6220 Mechanisms of Cellular Organization **3 s.h.**

Current understanding of basic cell biological processes; key experiments that led to guiding insights; mechanisms that cells use for compartmentalization and how those mechanisms are regulated; biogenesis of major organelles (e.g., mitochondria, peroxisomes, nucleus, secretory/endocytic membrane system); functions of cytoskeleton in cell motility, organelle motility, and cell division. Prerequisites: BMB:3130. Same as ACB:6220, MMED:6220.

MPB:6226 Cell Cycle Control **1 s.h.**

Cell cycle regulation, DNA damage-dependent cell cycle regulation, redox-dependent cell cycle regulation, cellular senescence. Same as ACB:6226, MMED:6226.

MPB:6227 Cell Fate Decisions 1 s.h.

Cellular fate decisions including signal integration, terminal differentiation in development, mechanisms of embryonic stem cell gene regulation/cellular reprogramming, cell death paradigms, and cell death in development and cancer. Same as ACB:6227, MMED:6227.

MPB:6265 Neuroscience Seminar 0-1 s.h.

Research presentations. Same as ACB:6265, BIOL:6265, NSCI:6265, PSY:6265.

MPB:6302 Research Physiology and Biophysics arr.

Requirements: molecular physiology and biophysics graduate standing.

MPB:7402 Thesis arr.

Requirements: molecular physiology and biophysics PhD candidacy.

MPB:8115 Human Physiology for Dental Students 4 s.h.

Principles of human physiology, organ systems, cell function. Offered fall semesters. Requirements: grades of C- or higher in BIOL:1411, CHEM:2210, and CHEM:2220; and DDS enrollment.