

Biology Focus Areas: Molecular and Cell Sciences

Modern research at the cellular and molecular level now uses the principles of chemistry, physics and computer science to answer fundamental questions of biological importance. Microbiology has broadened from the study of free living prokaryotic and eukaryotic cells to include studies of cells of multicellular eukaryotic organisms becoming part of the more inclusive discipline of Cell Biology. As our understanding of molecular cell function has expanded, it has been possible to apply our knowledge to finding practical solutions to agricultural and biomedical problems, giving rise to the new discipline of Biotechnology. The disciplines of biochemistry, biotechnology, genetics, cell biology, microbiology and molecular biology have become so interrelated that disciplinary lines have disappeared. For students to succeed in postgraduate programs and the workplace, they must be trained to transparently move from one discipline to another. The blurring of disciplinary lines makes interdisciplinary training mandatory, as it is impossible to teach a course in cell biology, microbiology, molecular biology or genetics without including a substantial amount of material from what has been traditionally called biochemistry.

With these concepts in mind, all of the faculty of the Department of Microbiology and Molecular Cell Sciences are committed to providing cutting edge educational programs in the areas of **Biochemistry, Cell and Molecular Biology and Biotechnology.**

✍✍ **Biochemical education** provides students with the intellectual foundations and experimental tools needed to study and understand the chemical interactions between cellular constituents (protein-protein, protein-nucleic acid, protein-lipid etc) and between cellular constituents and small molecules (environmental components or cellular metabolites) which have significant effects on cell functions. The distinguishing characteristic of this focus area is that experimental work relies on experimental manipulation in test tubes of partially purified or purified cellular constituents and chemical compounds.

✍✍ **Cell and Molecular Biology education** provides students with the intellectual foundations and experimental tools needed to study how microbes and cells of higher organisms function. What distinguishes this focus area from the biochemistry focus area is not the basic question being asked but reliance on experimental manipulation of living cells.

✍✍ **Biotechnology education** is aimed at fulfilling the urban university mission of workforce development. Hands on laboratories and research will provide graduates (BS, MS, PhD) with the intellectual resources and technical skills needed by the emerging Memphis biotechnology commercial sector. Involvement at the K-12 level with teacher training and student mentoring are aimed at increasing the number of students considering careers in the biotechnology industry and at providing students with the knowledge base needed to succeed as science majors at the baccalaureate level.

The Department of Microbiology and Molecular Cell Sciences has developed the following interdisciplinary research focuses which apply the disciplines of Biochemistry, Cell Biology, Microbiology and Molecular Biology to important questions in:

✍✍**Genomics:** Dr. T. Sutter, Dr. C. Sutter Dr. C. Lessman, Dr. K. Gartner, Dr. A. Sorin

✍✍**Protein Trafficking:** Dr. S. Schwartzbach, Dr. C. Estrano, Dr. T-Y. Wong,

✍✍**Cell Signaling:** Dr. K. Gartner, Dr. J. Cole, Dr. C. Sutter, Dr. C. Lessman, Dr. C. Vance, Dr. T-Y. Wong, Dr. B. Taller, Dr. C. Estrano, Dr. L. Coons, Dr. D. Ourth, Dr. S. Stevens

✍✍**Toxicology and Carcinogenesis:** Dr. T. Sutter, Dr. K-T. Chung, Dr. C. Vance