

Department of Molecular and Cell Biology

<http://utdallas.edu/nsm/biology/>

Faculty

Professors: Hans Bremer (emeritus), Lee A. Bulla, Santosh R. D’Mello, Rockford K. Draper, Juan E. González, Steven R. Goodman, Donald M. Gray, Betty S. Pace, Lawrence J. Reitzer, C. S. Rupert (emeritus)

Associate Professors: Gail A.M. Breen, John G. Burr, Jeff L. DeJong, Ernest M. Hannig, Stephen D. Levene, Dennis L. Miller, Stephen Spiro,

Assistant Professors: Tianbing Xia

Senior Lecturers: Vincent P. Cirillo, John Moltz, Scott A. Rippel, Ilya Sapoznikov, Joseph Wood

Objectives

The Graduate Program offers training in those aspects of molecular and cell biology that are the bases of modern biological and biomedical sciences.

The Master of Science degree is designed for students who wish to learn the methodology of research in molecular and cell biology and the fundamentals of problem solving in these areas.

The Master of Science degree without thesis is intended for students who wish to acquire a working knowledge of biotechnology, for other students who seek to gain knowledge of modern biology without the intent to seek positions as technical laboratory personnel, and for those students who are seeking additional preparation for admission to professional schools.

The Master of Arts in Teaching degree in Science Education with a specialization in Biology is designed to strengthen the knowledge of high school teachers in fundamental aspects of biology and to bring them up to date on advances in this rapidly developing field. For further information on this program and for course descriptions, see the Science/Mathematics Education section of this catalog.

The Doctor of Philosophy degree with a major in Molecular and Cell Biology is appropriate for students who show a potential for originality in research and is designed to develop a critical and analytical understanding of current developments which will enable them to keep abreast of the rapid advances that are likely to occur in the biological and biomedical fields.

The M.S. and Ph.D. degree plans offer students the opportunity to prepare for academic careers in colleges and universities including medical and dental schools, and for careers

in industrial, hospital, public health, environmental and governmental laboratories and organizations.

Specializations

First-year students will normally complete a body of core courses that emphasize fundamental aspects of biochemistry, biophysics, molecular biology, and cell biology. Students may then proceed to advanced course work in any of these four general areas. Elective courses are open to all qualified students as recommended by their supervising committees. First year students are also encouraged to participate in rotations through research laboratories (required for Ph.D.-track students).

In the second year, research is initiated under the supervision of one or more of the Molecular and Cell Biology faculty. The faculty and their research interests are listed below. Prospective students should recognize that it is possible to do research in closely related areas not mentioned in this list, provided a faculty member is prepared to supervise the work.

Gail A.M. Breen, Isolation and characterization of the genes that code for proteins of the mammalian mitochondrion; mitochondrial biogenesis; eukaryotic gene regulation.

Lee A. Bulla, Molecular basis of biopesticides.

John G. Burr, Eukaryotic growth regulation; mechanism of viral oncogenic transformation.

Santosh D'Mello, Molecular control of neuronal apoptosis

Jeff L. DeJong, Eukaryotic transcription; initiation and activation of RNA polymerase II.

Rockford K. Draper, Membrane traffic; protein toxins; bio-nanotechnology

Juan E. González, Cell-cell interactions, role of exopolysaccharides in nodulation of legumes by rhizobia; molecular genetics of plant-microbe interactions.

Steven R. Goodman, The spectrin membrane skeleton's role in blood and neurologic disorders; sickle cell disease.

Donald M. Gray, Study of nucleic acids and single-strand DNA binding proteins.

Ernest M. Hannig, Control of protein synthesis; genetic and biochemical analysis of translation initiation factors; protein-protein interactions.

Stephen D. Levene, Structure and dynamics of nucleic acids and nucleic acid-protein complexes in solution.

Dennis L. Miller, Structure and organization of mitochondrial DNA; mitochondrial gene expression; RNA editing; mitochondrial biogenesis.

Betty S. Pace, Gene therapy, sickle cell disease.

Lawrence J. Reitzer, Regulation of gene expression and metabolism in prokaryotes.

Stephan Spiro, Regulation of bacterial gene expression by environmental signals; genetic and physiological adaptation to stress.

Tianbing Xia, molecular recognition; RNA structure and RNA-protein interaction; conformational dynamics; femtochemistry

Facilities

Major items of equipment used by the faculty and available for graduate student research include a Leica TCS SP2 AOBS confocal microscope system, ThermoFinnigan LC QDECA XP ion trap mass spectrometer, complete Spectra-Physics femtosecond laser system, Becton Dickson fluorescence activated cell sorter, Veeco MultiMode SPM atomic force microscope, Perkin Elmer DNA chip reader, Molecular Dynamics PhosphoImagers, BioRad real-time polymerase chain reaction instruments, Beckman scintillation counters and Optima ultracentrifuges, and a Jasco J-715 spectropolarimeter. Individual laboratories are well-equipped with instrumentation needed for research in molecular and cell biology, including thermal cyclers, spectrophotometers, chromatography and electrophoresis systems, chemical hoods, and mammalian cell culture facilities.

Other shared biology facilities include environmental chambers, a staffed media kitchen with autoclaves and washing machines, a darkroom with an x-ray film developer, and an electronics workshop. There is a modern research animal housing facility on campus, as well as a GE 500 MHz FT multinuclear magnetic resonance spectrometer.

Admission Requirements

The University's general admission requirements are discussed [here](#).

For full participation in the Graduate Program in Molecular and Cell Biology, the student should have a good background in calculus, general physics, organic chemistry, biochemistry, and general biology, including genetics. Entering students not having this background may be required to take some additional course work in their first year or in the summer immediately preceding entry. A minimum GRE score of 1000 (verbal plus quantitative) is advisable based on our experience with student success in the program.

Degree Requirements

The University's general degree requirements are discussed [here](#).

Upon satisfactory completion of the core courses (and, for Ph.D. candidates, a favorable evaluation following the Spring semester as described below), a Supervising Committee is appointed for each student (except non-thesis M.S. students) based upon mutual agreement between student and faculty. The Supervising Committee, with the Supervising Professor as chairperson, will help the student plan an elective course curriculum and will oversee the student's research and thesis or dissertation.

Master of Science

All students seeking the Master of Science degree in Molecular and Cell Biology must satisfactorily complete a total of at least 36 graduate semester hours which must include the following core courses: BIOL 5410, BIOL 5420, BIOL 5430, and BIOL 5440.

M.S. students intending to submit a thesis must, in addition to the core courses specified above, satisfactorily complete a further 20 hours of Biology courses which includes BIOL 6193, BIOL 8398, and a minimum of 6 credit hours of general electives for which a letter grade is assigned. The remainder of the credit hours usually reflects experimental research but may also be based on literature research as determined by mutual agreement of the student and Supervising Committee. For M.S. (thesis) students, the maximum number of Pass/Fail credits allowed within the 36 credit hour minimum is 13 semester credit hours.

M.S. (non-thesis) students must, in addition to the core courses specified, satisfactorily complete a minimum of four general elective courses in Biology (for which a letter grade is assigned) for a minimum of 9 credit hours, up to 11 semester credit hours of special electives, and/or, with approval of the Graduate Adviser, other graduate courses. For non-thesis M.S. students, the maximum number of Pass/Fail credits allowed within the 36 credit hour minimum is 11 semester credit hours.

A Master of Science Degree in Biotechnology is also offered through the Department of Molecular and Cell Biology see (add hyperlink).

In addition to the the above Master of Science Degrees, a Master of Science in Bioinformatics and Computational Biology (BCBM) is offered jointly by the Departments of Mathematical Sciences and Molecular and Cell Biology. This program combines coursework from the disciplines of biology, computer science, and mathematical Sciences. Faculty from both Mathematical Sciences (MMS) and Molecular and Cell Biology (MCB) participate in the Bioinformatics and Computational Biology program, with the Mathematical Sciences Department serving as the administrative unit. Both departments participate in advising students. See the Department of Mathematical Sciences for more information on this degree program.

Doctor of Philosophy

All Ph.D. students must satisfactorily complete a total of at least 90 credit hours beyond the bachelor's degree. Generally, all core courses are mandatory. In special cases the requirement for a core course can be substituted, but only with the permission of the instructor and the graduate adviser, and usually only after examination. Students must include a minimum of four general elective courses in Biology (for which a letter grade is assigned) for a minimum of 9 credit hours. After core courses BIOL 5410, BIOL 5420, BIOL 5430, BIOL 5440, BIOL 5V50 and BIOL 5V51 [and, in addition, BIOL 6V02 – (The Art of Scientific Presentation) and BIOL 6193] have been completed, students are

evaluated following the Spring semester. The evaluation is based upon performance in the core classes, laboratory rotations, and performance as teaching assistants (if applicable). Students who pass this evaluation must then pass an oral qualifying examination within three semesters to determine the student's aptitude for continuation of dissertation research. A dissertation defense will be conducted after the dissertation has been written. All students are required to submit a minimum of one manuscript for publication in an internationally recognized, peer-reviewed scientific journal. There is no foreign language requirement.