

MOLECULAR BIOLOGY & INTERDISCIPLINARY LIFE SCIENCES

Graduate Program Information

Students of the molecular life sciences seek to reduce complex biological processes to a set of understandable molecular or chemical structure and function relationships. Integration of this knowledge into the context of complex living tissues interacting with the environment is the ultimate goal. This requires that the expertise from many diverse traditional disciplines be directed along converging experimental lines. The Ph.D. program in Molecular Biology & Interdisciplinary Life Sciences (MOLB-ILS) is designed to facilitate an interdisciplinary approach to graduate research, utilizing both traditional techniques and the latest advances in biotechnology, including the extraordinary power of recombinant DNA methodology. Participants in this program will take core courses in biochemistry, molecular biology and cell biology. Subsequent course work will be tailored for the individual student, depending upon his or her research emphasis. Participation in regular seminar programs will be expected to provide students with the widest possible scientific background. Financial aid, in the form of a limited number of MB teaching and research assistantships, is available on a competitive basis. Research Assistantships may also be available from individual faculty within the Molecular Biology & Interdisciplinary Life Sciences Graduate Program.

Only the most competitive students are admitted with assistantship support.

The MOLB-ILS program offers curricula leading to the M.S. and Ph.D. degrees in the areas of biochemistry, molecular genetics, molecular biology, cell biology, bioinformatics, and microbiology. Admission to the MOLB-ILS Program without deficiency is based on an undergraduate program essentially equivalent to that pursued by an undergraduate major in chemistry, biology, agronomy, horticulture, biochemistry, or microbiology at this university. An entering student is required to complete the Graduate Record Examination (General Aptitude). Undergraduate deficiency courses must be passed with a minimum grade of B.

Applicants are strongly encouraged to contact at least three individual program faculty before applying to identify a prospective advisor and laboratory in which to pursue graduate research. Previous course records and GPA standings (typically minimum of 3.3/4.0), GRE scores (typically minimum of 300 combined verbal and quantitative), TOEFL scores of foreign applicants (typically minimum of 550 on the paper-based or 213 on the computer-based), a letter of interest from the applicant that identified faculty laboratories of interest, and three letters of reference regarding research performance or potential are weighted heavily during the selection process.

Students with a B.S. degree in one of the disciplines listed above can expect to earn the MS degree in about 30 credits, including at least 6 credits of thesis research. The Ph.D. degree can be earned in about 30 to 40 credits of formal course work, plus additional thesis research credits, for a minimum total of 75 credits beyond the B.S. because research is central in both the M.S. and Ph.D. curricula, early selection of a research advisor is required.

Ph.D. degree candidates will successfully complete a written and oral qualifying examination based on their proposed research and the subject matter in the core courses (below) at the end of the first year of study. Also at this time, the master's or doctoral committee is organized to assist in planning a program appropriate to the background and goals of the

student. Ph.D. candidates will subsequently complete a comprehensive written examination and oral examination approximately at the end of the second year of study. A final, formal presentation and oral defense of the original research documented in the M.S. or Ph.D. thesis completes the degree requirements.

Master Degree(s)

- Molecular Biology - Master of Science (<https://catalogs.nmsu.edu/nmsu/graduate-school/molecular-biology-master-science/>)

Doctoral Degree(s)

- Molecular Biology - Doctor of Philosophy (<https://catalogs.nmsu.edu/nmsu/graduate-school/molecular-biology-doctor-philosophy/>)

Minors

- Bioinformatics (with Computer Science) - Graduate Minor (<https://catalogs.nmsu.edu/nmsu/graduate-school/bioinformatics-computer-science-graduate-minor/>)
- Molecular Biology - Graduate Minor (<https://catalogs.nmsu.edu/nmsu/graduate-school/molecular-biology-graduate-minor/>)
- Molecular Biology- Undergraduate Minor (<https://catalogs.nmsu.edu/nmsu/arts-sciences/molecular-biology/molecular-biol-undergraduate-minor/>)

A. Ashley, Ph.D. (Colorado State University)– Department of Chemistry and Biochemistry– cellular response to DNA replication stress and damage; maintenance of genomic integrity in eukaryotes; R. Ashley, Ph.D. (Colorado State University)– Department of Animal and Range Sciences– progesterone's actions mediated by membrane receptors, and chemokines' effects in early pregnancy and breast cancer; D. Bailey, Ph.D., (Cornell)– Department of Biology; S. Belteton, Ph.D. (Purdue University) - Dept of Botany and Plant Pathology - Plant tissue morphogenesis; R. Chinnasamy, Ph.D. (National Chemical Laboratory-Pune, India)– Department of Chemistry and Biochemistry; A. Corcoran, Ph.D. (University of California Los Angeles)– Molecular Biology Program; C. Cramer, Ph.D. (North Carolina State University) – onion breeding and horticulture; R. Creamer, Ph.D., (University of California-Davis)– Department of Entomology Plant and Weed Science– plant virology, fungal endophytes; J. Curtiss, Ph.D. (University of Colorado-Boulder)– Department of Biology– molecular genetics of eye development; S. Fuentes-Soriano, Ph.D. (University of Missouri-Saint Louis)– Department of Animal and Range Science–; I. Guzman, Ph.D. (New Mexico State University)– Department of Plant and Environmental Sciences; K. A. Hanley, Ph.D. (University of California San Diego)– Department of Biology– emerging vector-borne viruses; I. Hansen, Ph.D. (University of Wurzburg, Germany)– Department of Biology– molecular vector biology; S. Hanson (Wisconsin)– Department of Entomology Plant and Weed Science– viral plant pathogens; J. Hernandez Gifford, Ph.D. (Washington State University)– Department of Animal and Range Sciences– reproductive physiology; O. Holguin, Ph.D. (New Mexico State University)– Department of Plant and Environmental Sciences– biochemistry including etabolomics and proteomics with a focus on chemical analysis technique; J. Houston, Ph.D. (Texas A&M University)– Department of Chemical & Materials Engineering– biomedical engineering, flow cytometry, fluorescence dynamics, biophotonics, and instrumentation development; K. Houston, Ph.D. (University of Texas)– Department of Chemistry and Biochemistry– hormonal carcinogenesis; E. Indriolo, Ph.D. (Purdue University) – Department of Biology – plant signaling, molecular biology; M. L. Kahn, Ph.D. (Stanford University) - Biophysics Program – Bacteriophage DNA Replication; G. Lopez-

Martinez, Ph.D. (Ohio State University)– Department of Biology– short and long-term effects that single and repeated bouts of environmental stress can have on animals; D.N. Lozada, Ph.D. (University of Arkansas)– Department of Plant and Environmental Sciences; S. Lusetti, Ph.D. (University of Wisconsin-Madison)–Department of Chemistry and Biochemistry– DNA replication, recombination and repair; B. A. Lyons, Ph.D. (Cornell University)– Department of Chemistry and Biochemistry– structure and function relationships in breast and liver cancer cell signaling pathways; B.G. Milligan, Ph.D. (University of California-Davis)– Department of Biology– plant evolutionary biology; N. Pietrasiak, Ph.D. (University of California-Riverside– Department of Plant and Environmental Sciences– cyanobacterial phylogenetics, molecular ecology of terrestrial algae, biocrusts; J. Randall, Ph.D., Program Director (New Mexico State University)– Department of Entomology Plant and Weed Science– molecular plant physiology, genetics, and plant/microbe interactions; I. Ray, Ph.D. (Wisconsin-Madison)– Department of Plant and Environmental Sciences– plant genetic engineering, primary and secondary metabolism, stress, legumes; L. Rodriguez-Urbe, Ph.D. (New Mexico State University)– Department of Plant and Environmental Sciences; A. Romero-Olivares, Ph.D. (University of California Irvine)- Department of Biology- impacts to our ecosystems; E. E. Serrano, Ph.D. (Stanford)– Department of Biology– neuroscience, genetics, science and ethics; C. B. Shuster, Ph.D., (Tufts University)– Department of Biology– regulation of mitosis and cytokinesis, role of the cytoskeleton during early development; G. Smith, Ph.D. (North Carolina State)– Department of Biology-environmental gene probes, microbial biodegradation; J. Song, Ph.D. (Washington)– statistical computing, systems biology, bioinformatics, computer vision; P. Trainor, Ph.D. (University of Louisville)– Department of Economics, Applied Statistics and International Business; J. Xu, Ph.D. (Second Military Medical University, China)– Department of Biology– functional genomics and population genetics of mosquito-malaria interactions; E. Yukl (Oregon Health and Science University) - Department of Chemistry and Biochemistry– structural biology and bioinorganic chemistry; J. Zhang, Ph.D. (University of Arkansas)– Department of Plant and Environmental Sciences– cotton genetics, genomics and molecular biology

Molecular Biology Courses

MOLB 448. Special Research Problems

1-3 Credits

Individual investigation, theoretical or experimental, under the supervision of a molecular biology faculty member. May be repeated for a maximum of 6 credits.

Prerequisite: consent of instructor.

MOLB 520. Molecular Cell Biology

3 Credits (3)

Same as BIOL 520.

MOLB 542. Biochemistry I

3 Credits (3)

Same as BCHE 542. B or better required.

MOLB 545. Molecular and Biochemical Genetics

3 Credits (3)

Same as BCHE 545 and BIOL 545.

MOLB 546. Biochemistry II

3 Credits (3)

Same as BCHE 546.

MOLB 550. Topics in Molecular Biology

1-3 Credits

Selected topics of current interest in field of molecular biology for master's level students. May be repeated up to 12 credits.

Learning Outcomes

1. Learning goals are dependent upon topic and instructor.

MOLB 590. Discussions in Molecular Biology

1 Credit (1)

Oral presentations of ongoing research and/or research proposal for the masters thesis. Must be repeated twice for masters and a minimum of three times for doctoral students. May be repeated up to 4 credits.

Learning Outcomes

1. To expose students to the fundamentals of speaking, including organization, and listening.
2. To understand and gain practice oral presentations.
3. Encourage critical thinking and discussion of scientific material during presentations.

MOLB 597. Laboratory Rotations/Research Discussions

1-3 Credits

All entering students are required to take at least one credit, during their first semester, in which they will circulate through at least three different labs working on assigned problems and discussing research programs. May be repeated for a maximum of 4 credits. Graded S/U.

MOLB 598. Special Research Programs

1-3 Credits

Individual investigation, experimental or theoretical, under the supervision of a molecular biology faculty member. Course may be repeated up to a total of 6 credits with committee approval.

MOLB 599. Master's Thesis

1-15 Credits (1-15)

Experimental and scholarly research leading to the preparation of a master's thesis.

MOLB 600. Molecular Biology Research

1-15 Credits

Laboratory research efforts prior to successful completion of doctoral comprehensive exam.

MOLB 650. Advanced Topics in Molecular Biology

1-3 Credits

Discussions and lectures on topics of current interest in molecular biology for doctoral students.

MOLB 698. Advanced Research Projects

1-9 Credits

Individualized special research assignments for doctoral-level students. Up to 9 credits, with approval of committee. Graded S/U.

MOLB 700. Doctoral Dissertation Research

1-15 Credits

Research for doctoral students after completing comprehensive exams.

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Facebook: <https://www.facebook.com/nmsumolbio> (<https://www.facebook.com/nmsumolbio/>)