MOLECULAR AND CELLULAR BIOLOGY

Molecular and Cellular Biology
The Molecular and Cellular Biology Program provides students with comprehensive interdisciplinary training in molecular and cellular biology while reserving sufficient flexibility for students to specialize in their areas of interest. The elements of the core curriculum include courses in molecular genetics and cell structure and function, bioinformatics and genomics, scientific skills and ethics, along with research rotations with individual faculty members. Additional course work is custom-tailored to the individual student's interests and needs. Each program requires 36 units of graduate-level course work, participation in seminar programs, two quarters of supervised teaching experience, written and oral preliminary examinations, supervision by an individual committee of five faculty members, and presentation of a thesis containing the results of publishable original research.

The program also offers access to all of the participating faculty as potential research advisors. Students do three research rotations in the first year and select their advisor from over 90 faculty members in the 20 participating departments in seven colleges. Therefore, the MCB Program lowers interdisciplinary barriers and allows the students to select the advisors that most closely match their interests after they have been on campus for one or more terms.

Graduate Programs

Major

Minor

Dee Denver, Director
Molecular and Cellular Biology
3021 Agricultural and Life Sciences Building
Oregon State University
Corvallis, OR 97331
541-737-3799
Email: denvedee@cgbr.oregonstate.edu and millimag@cgbr.oregonstate.edu
Website: http://www.mcb.oregonstate.edu

Affiliate Faculty
Over ninety faculty members drawn from 20 departments in seven colleges participate in the MCB program.

MOLECULAR AND CELLULAR BIOLOGY
MCB 501. RESEARCH AND SCHOLARSHIP. (1-16 Credits)
PREREQ: Departmental approval required.
This course is repeatable for 99 credits.

MCB 503. THESIS. (1-16 Credits)
PREREQ: Departmental approval required.
This course is repeatable for 999 credits.

MCB 505. READING AND CONFERENCE. (1-16 Credits)
PREREQ: Departmental approval required.
This course is repeatable for 99 credits.

MCB 507. SEMINAR. (1-16 Credits)
PREREQ: Departmental approval required.
This course is repeatable for 99 credits.

MCB 508. WORKSHOP. (1-16 Credits)
This course is repeatable for 99 credits.

MCB 509. PRACTICUM. (1-16 Credits)
PREREQ: Departmental approval required.
This course is repeatable for 99 credits.

MCB 510. INTERNSHIP. (1-16 Credits)
PREREQ: Departmental approval required.
This course is repeatable for 99 credits.

MCB 511. RESEARCH PERSPECTIVES IN MOLECULAR AND CELLULAR BIOLOGY. (3 Credits)
Provides graduate students with an in-depth exposure to faculty members at OSU involved in molecular and cellular biology and their specific fields of research.

MCB 525. TECHNIQUES IN MOLECULAR AND CELLULAR BIOLOGY. (3 Credits)
An intensive laboratory course introducing modern methods for the manipulation of cellular macromolecules. Recombinant DNA technology, protein chemistry, and in situ hybridization methods presented in a format that emphasizes experimental continuity. The course requires two weeks of intensive full-time involvement.

MCB 530. INTRODUCTION TO POPULATION GENETICS. (3 Credits)
Genetic polymorphisms, inbreeding, genetic drift, population subdivision and gene flow, mutation and selection. Emphasis on applied rather than theoretical questions. Offered alternate years.
Recommended: BI 311 and ST 351 and ST 352

MCB 535. GENES AND CHEMICALS IN AGRICULTURE: VALUE AND RISK. (3 Credits)
A multidisciplinary course that examines the scientific, social, political, economic, environmental, and ethical controversies surrounding agricultural and natural resource biotechnologies. Lec/rec. CROSSTICKED as FES 435/FES 535, FES 435H, TOX 435/TOX 535, TOX 435H.
Equivalent to: FES 535, TOX 535
Recommended: One quarter each of biology and chemistry

MCB 541. PLANT TISSUE CULTURE. (4 Credits)
Principles, methods, and applications of plant tissue culture. Laboratory is important part of course. Topics include callus culture, regeneration, somaclonal variation, micropropagation, anther culture, somatic hybridization, and transformation. CROSSTICKED as PBG 441/PBG 541.
Equivalent to: PBG 541
Recommended: (BI 311 and BOT 331) or PBG 430
MCB 554. GENOME ORGANIZATION, STRUCTURE, AND MAINTENANCE. (4 Credits)
How diverse organisms store their individual sets of genetic information (genomes). Evolution of genomes and gene families. Structures of DNA and chromatin. Biochemical and regulatory pathways that protect cellular genomes against environmental and endogenous damage and ensure transmission of faithful copies to progeny. Remodeling of genomes by recombination and transposition. CROSSTLISTED as BOT 554.
Equivalent to: TOX 554
Recommended: BI 311 (or genetics equivalent) and (BB 450 and BB 451 and BB 452) or (BB 490 and BB 491 and BB 492)

MCB 555. GENOME EXPRESSION AND REGULATION. (4 Credits)
Prokaryotic and eukaryotic systems will be used to describe recent advances in understanding transcriptional and posttranscriptional control mechanisms. Topics include: microbial, yeast and mouse model systems; transcriptional control mechanisms; RNA processing, silencing and microRNAs; protein synthesis and posttranslational modification; microarray- and mass spectrometry-based expression genomics.
Recommended: BB 451

MCB 556. CELL AND DEVELOPMENTAL BIOLOGY. (4 Credits)
Examination of molecular and structural elements in eukaryotic cells and their relationship to function and development. Topics include nuclear organization, membranes, organelles, intracellular sorting, cell energetics, cell signaling, cell motility, cell division cycle, and developmental processes of selected model organisms. Critical reading and writing skills will be emphasized.
Recommended: BB 450 and BB 451 (biochemistry) or equivalent; BI 311 (genetics) or equivalent. Recommended: BI 460 (cell biology) or equivalent; MCB 554 and MCB 555.

MCB 557. SCIENTIFIC SKILLS AND ETHICS. (3 Credits)
Offers instruction, guest lectures and case-study based discussions of ethical issues relevant to scientists on topics such as mentoring, best practices of conducting research, research misconduct and compliance, intellectual property, peer review, ethical use of animal and human subjects and managing conflicts of interest. Training in the preparation and presentation of scientific seminars and grant writing.

MCB 563. CANCER AND CHEMOPREVENTION. (2 Credits)
A summary of mechanisms of cancer progression, how cancer is detected, and introduction to chemoprevention using targeted therapy and alternative medicine.
Recommended: BB 451 and BI 314 and BI 460

MCB 575. COMPARATIVE GENOMICS. (4 Credits)
Principles of comparative genomics. Methods for genome assembly and annotation. Genomic approaches for the study of structural change, whole genome duplication, gene family evolution, gene networks, gene regulation and epigenetics. Lab topics include the analysis of next generation sequencing data and conducting comparative genome analyses. Lec/lab. CROSSTLISTED as BOT 575.
Equivalent to: BOT 575
Recommended: Basic working knowledge of cell and molecular biology and genetics. BI 314 and (BI 311 or CSS 430)

MCB 576. INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES. (3 Credits)
Introduction to management of large datasets (e.g., nucleic acids, proteins), computer programming languages, application of basic mathematical functions, and assembly of computational pipelines pertinent to life sciences. CROSSTLISTED as BOT 476/BOT 576.
Equivalent to: BOT 576
Recommended: Cell and molecular biology or genetics and familiarity with text editing software and unix/linux operating system

MCB 599. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.

MCB 601. RESEARCH. (1-16 Credits)
This course is repeatable for 16 credits.

MCB 603. THESIS. (1-16 Credits)
This course is repeatable for 999 credits.

MCB 605. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

MCB 610. INTERNSHIP. (1-9 Credits)
Laboratory rotation.
This course is repeatable for 16 credits.

MCB 620. DNA FINGERPRINTING. (1 Credit)
Principles and methods for producing and analyzing DNA fingerprints. Offered alternate years. CROSSTLISTED as PBG 620.
Equivalent to: PBG 620
Recommended: BI 311 or CSS 430 or CSS 530 or PBG 430 or PBG 530 or HORT 430 or HORT 530

MCB 621. GENETIC MAPPING. (1 Credit)
Principles and methods for constructing genetic maps comprised of molecular and other genetic markers. Offered alternate years. CROSSTLISTED as PBG 621.
Equivalent to: PBG 621
Recommended: BI 311 or CSS 430 or CSS 530 or PBG 430 or PBG 530 or HORT 430 or HORT 530

MCB 622. MAPPING QUANTITATIVE TRAIT LOCI. (1 Credit)
Principles and methods for mapping genes underlying phenotypically complex traits. Offered alternate years. CROSSTLISTED as PBG 622.
Equivalent to: PBG 622
Recommended: CSS 590 or ST 513

MCB 637. MOLECULAR HOST-MICROBE INTERACTIONS. (3 Credits)
Lecture and discussion-based presentation of the molecular bases for interactions between organisms. Addresses bacterial, algal, and fungal symbionts of eukaryotes and considers pathogenesis, commensalism, and mutualism. A focus on the evolution of host-microbe interactions is included.

MCB 651. MOLECULAR BASIS OF PLANT PATHOGENESIS. (3 Credits)
Analysis of current concepts in the physiology, biochemistry, and genetics of host-parasite interactions. Topics covered include specificity, recognition, penetration, toxin production, altered plant metabolism during disease, resistance mechanisms and regulatory aspects of gene expression during host-parasite interactions. Offered alternate years. CROSSTLISTED as BOT 651.
Equivalent to: BOT 651
Recommended: BOT 550
MCB 662. HORMONE ACTION. (3 Credits)
Mechanisms of action of peptide and steroid hormones and related compounds at the cellular level. CROSSLISTED as ANS 662.
Prerequisites: BB 451 with C or better or BB 551 with C or better or BB 492 with C or better or BB 592 with C or better

MCB 671. MOLECULAR TOOLS. (3 Credits)
Intended for personnel with some scientific background who are seeking basic- and advanced-level molecular biology knowledge and who wish to become involved with molecular biology-related and biotechnological research. CROSSLISTED as VMB 671.
Equivalent to: VMB 671

MCB 699. SPECIAL TOPICS. (0-16 Credits)
This course is repeatable for 16 credits.