

Cellular and Molecular Biology

Program and Application Information

Department Phone:	(701) 231-6456
Department Email:	madonna.fitzgerald@ndsu.edu
Department Web Site:	www.ndsu.edu/cellularmolecularbiology/
Application Deadline:	February 15 is the deadline for applicants seeking consideration of financial assistance (fellowship, assistantships) for fall semester and July 1 for spring semester.
Degrees Offered:	Ph.D.
Test Requirement:	GRE
English Proficiency Requirements:	TOEFL iBT 71; IELTS 6

Program Description

The CMB Program offers interdisciplinary research education and training opportunities that lead to a Ph.D. In this setting, students learn to integrate across concepts and to use multiple approaches to study contemporary biological problems. Students have access to state-of-the-art facilities and equipment in faculty laboratories and core facilities around campus. The CMB program prepares students for careers in academia and private industry. All graduates of the program have obtained permanent positions in their field or are engaged in postdoctoral training.

The CMB degree requirements include a series of required CMB core courses; additional elective courses; written and oral preliminary examinations; a doctoral dissertation based on independent, original research in the area of cellular and molecular biology under the direction of a CMB faculty member; and an oral defense of the dissertation.

CMB faculty members are recognized and respected nationally and internationally for contributions to their fields of study. They are drawn from 10 academic departments, including Animal Sciences, Chemistry and Molecular Biology, Biological Sciences, Cereal and Food Sciences, Entomology, Health, Nutrition, and Exercise Sciences, Pharmaceutical Sciences, Plant Pathology, Plant Sciences, and Veterinary and Microbiological Sciences. With the interdisciplinary nature of the program, you can look forward to working closely with not just one but many faculty members at NDSU.

Students may engage in basic and applied aspects of cellular and molecular biology research in various systems, including animals, plants, and microorganisms. Examples of current research by CMB faculty include the following:

- Adaptation to environmental stress
- Assistive reproductive technology
- Apoptosis
- Cancer
- Cell-cell communication
- Cell cycle regulation
- Cell metabolism
- Cytogenetics
- Drug action and metabolism
- Enzymology and metabolic regulation
- Extracellular matrix
- Gene regulation and expression
- Hormone biosynthesis, metabolism, and evolution
- Immunology
- Molecular pathogenesis
- Protein structure and function
- Signal transduction
- Stem cells and developmental processes

Admissions Requirements

The Cellular and Molecular Biology Ph.D. program is open to qualified graduates of universities and colleges of recognized standing. If possible, applicants should identify at least one cellular and molecular biology faculty member with whom they wish to study.

The following undergraduate courses have been identified as required for graduate work in the CMB program:

Biology: One year of general biology with laboratory and one course in genetics are required. Cellular biology or cellular physiology, animal or plant physiology, and microbiology are recommended.

Chemistry: One year of general chemistry with laboratory and two sequential terms of organic chemistry with laboratory are required. Biochemistry is recommended.

Mathematics: Two terms of life sciences calculus are required.

Physics: Two sequential terms of general physics with laboratories (above the concept level) are required.

In addition, introductory courses in computer science, statistics, and technical writing are recommended. Deficiencies in required courses may be made up within the first year of resident study without graduate credit.

Financial Assistance

Financial support, if required, is usually provided by the department in which the student will carry out research. In reviewing each application, the Steering Committee will contact the faculty member(s) identified by the applicant to determine if financial support is available. Students seeking financial support also can contact either the CMB faculty member(s) with whom they wish to study or the chair of the CMB Steering Committee.

Program Administration

This interdisciplinary graduate program is administered by the CMB Steering Committee. The committee is composed of five CMB faculty members representing five different academic departments. Steering Committee members, who serve overlapping three-year terms, are elected at a yearly meeting of the CMB faculty.

The duties of the Steering Committee include:

1. review of each CMB student's plan of study, proposed research topic, and general progress;
2. review of applications for membership in the CMB faculty; and
3. implementation of the CMB program by established procedures.

By the end of the first academic year, the student will select an academic adviser from among the CMB faculty and arrange for the appointment of a Graduate Advisory Committee. This committee will consist of at least four members of the graduate faculty. This includes the student's major adviser, at least one additional CMB faculty member, and an appointee of the Graduate School. One committee member must be from outside the student's academic college.

The Plan of Study will be prepared by the student, in consultation with the major adviser, by the end of the first year in residence. The plan shall be approved by the student's Graduate Advisory Committee, the CMB Program Director, the department chair, the academic dean, and the Graduate School dean. The Plan of Study must be filed in the Graduate School prior to scheduling the comprehensive written examination.

The Graduate School requires the Plan of Study for the Ph.D. degree to include not less than 90 semester graduate credits. Of this total, not less than 27 credits must be in courses other than seminar or research credits. Of the 27 course credits, 15 must be at the 700-789 level. The CMB program requires students to complete a series of 7 courses totaling 21-23 semester credits in 4 core areas. The student will complete additional elective courses to fulfill the Graduate School requirement of 27 semester credits in academic courses. An overall GPA of 3.0 or better must be maintained.

Courses Offered

Biochemistry and Molecular Biology

BIOC 701	Comprehensive Biochemistry I (required)	4
BIOC 702	Comprehensive Biochemistry II (required)	4
BIOC 673	Methods of Biochemical Research (required)	3

Cellular Biology

ZOO 820	Advanced Cell Biology	3
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Molecular Biology

BIOC 674	Methods of Recombinant DNA Technology (required)	3
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Select one of the following:

BIOC 719	Molecular Biology of Gene Expression and Regulation	
MICR 783	Advanced Bacterial Genetics and Phage	
PLSC 731	Plant Molecular Genetics	

Technique Courses

Select one of the following:

MICR 645	Animal Cell Culture Techniques
PLSC 684	Plant Tissue Culture and Biotechnology

The core courses will normally be completed by the end of the second year in residence. These courses must be completed before the student takes the preliminary written examinations, whereas the elective courses may be taken at any time during the program prior to defense of the dissertation. The elective courses will normally be classes offered by the department in which the student is doing research or other departments participating in the CMB program. Each student is expected to attend all CMB seminars and present at least one seminar per year throughout the program.

Examination

Written Preliminary Examination covers the first three core areas (biochemistry and molecular biology, cellular biology, and molecular biology) and is normally taken at the end of the second year in residence. The written preliminary examination must be passed before the comprehensive oral examination can be scheduled.

Comprehensive Oral Examination shall be taken no later than the end of the third year in residence. This examination will be based on a non-dissertation research topic that will be submitted in the format of a National Institutes of Health or National Science Foundation postdoctoral fellowship research proposal. After successful completion of the comprehensive oral examination, the student will be formally admitted to candidacy for the Doctor of Philosophy degree. At least one academic semester, and preferably two semesters, shall elapse between the preliminary oral examination and the oral defense of the research-based dissertation.

Dissertation Research

A short proposal describing research suitable for preparation of a dissertation in Cellular and Molecular Biology shall be prepared and submitted to the student's Graduate Advisory Committee and the CMB Steering Committee for review and approval. The dissertation must show originality and demonstrate the student's capacity for independent research. It must embody results of research that constitutes a definitive contribution to knowledge.

In addition to the defense of the dissertation in the final oral examination, the candidate will present a final public seminar based on the dissertation research.

Teresa Bergholz, Ph.D.

Michigan State University, 2007
Field: Functional Genomics of Foodborne Pathogens
Department: Chemistry and Biochemistry

Eugene S. Berry, Ph.D.

Northeastern University, 1983
Field: Animal Virology (ss+) RNA Viruses), Genetic Variation, Mechanisms of Pathogenesis and Virulence
Department: Veterinary and Microbiological Sciences

Julia Bowsher, Ph.D.

Duke University, 2007
Field: Evolutionary Developmental Biology; Molecular Basis of Pattern Formation
Department: Biological Sciences

Chris Colbert, Ph.D.

Purdue University, 2000
Field: Structure Biology with a Focus on the Biochemistry of Proteins Involved in Iron Import and Utilization
Department: Chemistry and Biochemistry

Glenn Dorsam, Ph.D.

Virginia Commonwealth University, 1998
Field: Epigenetic Regulation
Department: Chemistry and Biochemistry

Nathan Fisher, Ph.D.

University of Michigan, 2006
Field: Ecology and Evolution of Non-Commensal Bacterial Pathogens
Department: Veterinary and Microbiological Sciences

Anna T. Grazul-Bilska, Ph.D.

University of Agriculture and Technology, 1983
Field: Animal Embryology and Reproductive Physiology & Endocrinology, Assisted Reproduction Technology
Department: Animal and Range Sciences

Kendra Greenlee, Ph.D.

Arizona State University, 2004
Field: Developmental Physiology and Immunology
Department: Biological Sciences

Tim Greives, Ph.D.

Indiana University, 2009
Field: Endocrine Regulation of Seasonality, Reproductive Neuroendocrinology, Hormones and Behavior
Department: Biological Sciences

Bin Guo, Ph.D.

State University of New York at Buffalo, 1999
Field: Cancer Cell Biology, Apoptosis, Molecular Pharmacology
Department: Pharmaceutical Sciences

Lauren Hanna, Ph.D.

Texas A&M University, 2013
Field: Quantitative Genetics, Animal Breeding, Whole System Approaches to Genomic Associations of Quantitative Traits
Department: Animal Sciences

Stuart Haring, Ph.D.

University of Iowa, 2004
Field: DNA Metabolism and Cell Cycle Regulation
Department: Chemistry and Biochemistry

Britt Heidinger, Ph.D.

Indiana University, 2007
Field: Physiological Ecology
Department: Biological Sciences

Yagna Jarajapu, Ph.D.

Glasgow Caledonian University, 2002
Field: Bone Marrow Dysfunction and Vascular Repair in Diabetes, ACE2/Angiotensin-(1-7)/Mas receptor Pathway in Bone Marrow Cells, Regulation of Bone Marrow Mobilization by Leptin
Department: Pharmaceutical Sciences

Estelle Leclerc, Ph.D.

University of Paris XI, 1994
Field: Melanoma, Pancreatic Cancer; Monoclonal Antibodies as Diagnostic and Therapeutic Agents; Mechanism of RAGE Signaling
Department: Pharmaceutical Sciences

Phillip E. McClean, Ph.D.

Colorado State University, 1982
Field: Plant Molecular Genetics
Department: Plant Sciences

Stephen O'Rourke, Ph.D.

University of Wisconsin, 1995
Field: Vascular Pharmacology/physiology, Regulation of Vasomotor Tone, Smooth Muscle-Endothelial Cell Interactions
Department: Pharmaceutical Sciences

Birgit Pruess, Ph.D.

Ruhr-Universität Bochum, 1991
Field: Bacterial Physiology and Global Gene Expression
Department: Veterinary and Microbiological Sciences

Steven Qian, Ph.D.

University of Iowa, 1999
Field: Free Radical Metabolism
Department: Pharmaceutical Sciences

Sheela Ramamoorthy, Ph.D.

Virginia Tech, 2006
Field: Virology, Immunology, and Vaccinology
Department: Veterinary and Microbiological Sciences

Dale A. Redmer, Ph.D.

University of Missouri - Columbia, 1983

Field: Animal Physiology, Reproductive Physiology, Fetal Growth, Placental Function, Ovarian Function, Vascular Growth

Department: Animal Sciences

Katie Reindl, Ph.D.

North Dakota State University, 2006

Field: Cancer Cell Biology, Cell Migration and Metastasis, Cell Cycle Control, Extracellular Matrix Interactions

Department: Biological Sciences

Lawrence P. Reynolds, Ph.D.

Iowa State University, 1983

Field: Factors Influencing Fetal and Placental Growth and Development in Compromised Pregnancies

Department: Animal Sciences & Center for Nutrition and Pregnancy

Kenton Rodgers, Ph.D.

University of Iowa, 1988

Field: Inorganic and Bioinorganic Chemistry

Department: Chemistry and Biochemistry

Jane Schuh, Ph.D.

North Dakota State University, 2002

Field: Immunology of Chronic Airway Remodeling, Cellular Differentiation in Pulmonary Disease, Animal Modeling of Allergic Airway Disease (Asthma)

Department: Veterinary and Microbiological Sciences

Sangita Sinha, Ph.D.

Purdue University, 2000

Field: Structure Biology and Biochemistry of host pathogen interactions

Department: Chemistry and Biochemistry

Chengwen Sun, Ph.D.

Jilin University, China, 2000

Field: Blood Pressure Regulation; Cell Signaling

Department: Pharmaceutical Sciences

Kendall Swanson, Ph.D.

University of Kentucky, 2000

Field: Ruminant Nutrition, Energy Metabolism, Protein Metabolism, Pancreatic Function, Beef Cattle Production

Department: Animal Sciences

Stefan Vetter, Ph.D.

Swiss Federal Institute of Technology, 1998

Field: Development of Small Molecules and Peptides for the Modulation of Receptor for Advanced Glycation Endproducts (RAGE) in Disease States

Department: Pharmaceutical Sciences

John Wilkinson, Ph.D.

Vanderbilt University, 2001

Field: Cancer Cell Metabolism, Cell Death Pathways, Mitochondrial Gene Expression, Animal Models of Tumorigenesis

Department: Chemistry and Biochemistry

Erxi Wu, Ph.D.

Sheffield University, UK, 1998

Field: Pharmacogenomics; Tumor Therapeutic Targets; Drug Discovery; Anticancer Natural Products

Department: Pharmaceutical Sciences