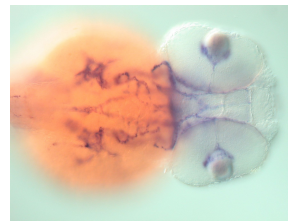
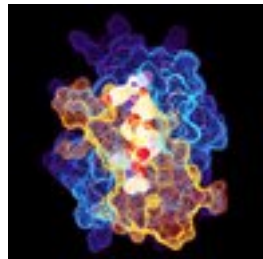
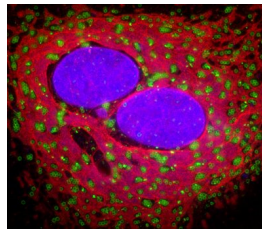
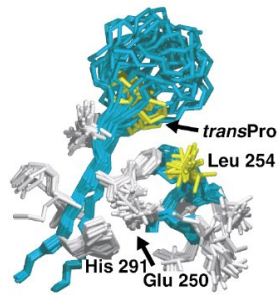
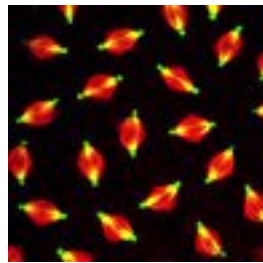


IOWA STATE UNIVERSITY

Molecular, Cellular & Developmental Biology

Interdepartmental Graduate Program



Discovering the mechanisms of life

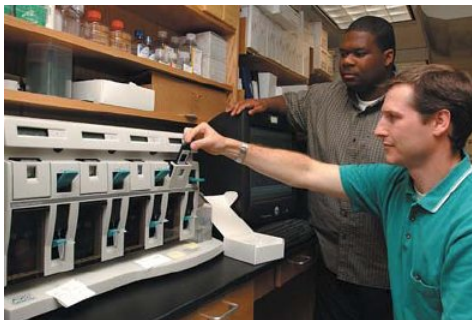
www.mcdb.iastate.edu

WELCOME!

The Molecular, Cellular, and Developmental Biology (MCDB) Program invites you to explore the opportunities for broad and in-depth training in interdisciplinary graduate research at Iowa State University.

Our MCDB program provides:

- An outstanding environment for graduate education and intellectual development.
- Over 60 internationally recognized faculty in over a dozen departments, who support MCDB graduate students conducting cutting-edge research.
- A wide range of graduate research choices and opportunities in plant, animal, microbial, and biomedical research, at the cellular and molecular levels.
- Generous stipends and tuition remission to all students.
- Abundant career opportunities: MCDB graduates are in big demand in academia, the biotech industry, and in government research labs in the US and around the world.



MCDB is an interdepartmental program that allows graduate students to investigate and discover the mechanisms of life processes. The program is designed for students with a bachelor's degree to go directly to a Ph.D. without first obtaining a master's degree. In the first year, students select a permanent lab for their Ph.D. research by participating in laboratory rotations that involve temporary but substantial research projects. After completing a balanced program of classroom study, and a major body of independent research that contributes significant new knowledge to the life sciences, the student is awarded a doctor of

philosophy degree in Molecular, Cellular, and Developmental Biology.

AMES, IOWA

The state of Iowa is committed to biotechnology as a cornerstone of its economy, with Iowa State University as a major hub.



Ames combines the friendly, livable environment of a small town with the diverse cultural, intellectual and sports activities of a thriving large university community.

CAREER OPPORTUNITIES

Graduates of the MCDB program are highly qualified researchers with a solid grounding in molecular, cellular and developmental biological sciences. Moreover, they have the ability to think and perform research independently. This breadth and depth of training provides graduates with a wide field of post-graduate career opportunities. Many of our graduates choose research and/or teaching careers at major universities, medical schools, or small colleges. Other graduates choose positions in agricultural or pharmaceutical companies, or government laboratories.

ADMISSION REQUIREMENTS

Applicants are expected to have an undergraduate or advanced degree in one of the basic or applied life sciences. The following courses are generally required for admission into the MCDB Program: mathematics, through one year of calculus; organic chemistry, one year; physics, one year; biological sciences, two years

Applicants may be admitted without some of these requirements if, in the judgment of the MCDB Admissions Committee, a deficiency can be remedied by courses during graduate studies. The MCDB program also requires the submission of official GRE general scores. GRE subject tests in biology or biochemistry are to the applicant's advantage. TOEFL is required of non-native speakers that have not obtained a degree from a United States college or university. The minimum acceptable TOEFL score is 580. paper based.

APPLICATION INSTRUCTIONS

Admission to both MCDB and ISU is required if an offer is made. To be considered for admission please send application materials for the pre-application review.

1. An MCDB online program application.
2. Two official academic transcripts from each previous institution attended in sealed envelopes.
3. Official GRE score results
4. Official TOEFL score for nonnative speakers.
5. Statement of goals and research interests.
6. Three letters of recommendation.
7. Resume or curriculum vitae.

Send the COMPLETE application to:

MCDB Program
Iowa State University
2018 Molecular Biology Building
Ames, IA 50011-3260

An online application can be found at the MCDB Program's website: www.mcdb.iastate.edu
Applications for Fall admission can be submitted at any time, but the admissions committee begins making admissions decisions on January 15. The department requires students to submit a free pre-application packet to be reviewed by the Admissions Committee. Students should not apply to the ISU Graduate College unless they are notified to do so by the MCDB Program Coordinator. A Pre-application packet checklist can be requested by emailing Amy at IDGP@iastate.edu.

FINANCIAL SUPPORT

Graduate Assistantships. Students are supported by research assistantships from the MCDB Program in the first year and by research grants, fellowships, and teaching assistantships in subsequent years. In the 2008-2009 academic year, entering MCDB students received a minimum annual stipend of \$22,000

Health insurance benefits are excellent. Each entering student receives free single coverage health insurance.

Tuition remission. MCDB students accepted into the PhD program will pay no tuition their

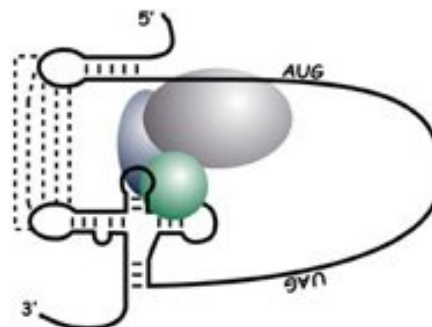
first year but will be responsible for all fees assessed by the University.

Fellowships. In addition to the above support, students with outstanding academic records are eligible for fellowships from the Biotechnology Council, the Plant Sciences Institute, the Graduate Minority Assistantship Program, Miller Fellowship funds, and other sources. These provide generous supplements to stipends. The Admissions Committee nominates the students for these awards.

CURRICULUM

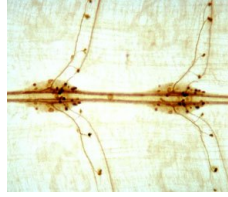
MCDB students are required to take one course each in molecular biology, cell biology and developmental biology. There are several courses in each category to choose from, focusing for example on plants or animals. The remainder of the courses are tailored to the student's research interests with the advice of the Program of Study (POS) committee. The POS committee consists of five professors chosen by the student, with expertise and interest in the student's field of research. The POS committee monitors the student's research progress and ultimately approves the final dissertation.

The ability to communicate is essential for a Ph.D. Therefore MCDB students are required to serve one semester as a teaching assistant, and present their research in annual student seminars.



RESEARCH FACILITIES

A wide variety of state-of-the-art facilities and services supplement individual investigators' research laboratories.



Examples:

- Electron microscopy and elemental analysis
- Confocal microscopy and image analysis facility
- Nucleic acid facility for automated nucleic acid synthesis and sequencing
- Hybridoma service for monoclonal antibody production and application
- Proteomics facility for amino acid analysis, peptide synthesis, and sequencing
- Cell facility for flow cytometry and cell sorting
- Bioinformatics and computational biology facility
- Genomics facility: a variety of DNA microarray systems
- Plant transformation facility; transgenic maize and soybeans made to order.

For a complete list and details see:
http://www.biotech.iastate.edu/Current_Research/tablecontents.html

DEPARTMENTS

	<u>Abbr.</u>
Agronomy	Agron
Animal Science	An Sci
Biochemistry, Biophysics & Molecular Biology	BBMB
Biomedical Sciences	BMS
Entomology	Entom
Food Science & Human Nutrition	FSHN
Genetics, Developmental & Cellular Biology	GDCB
Horticulture	Hort
Plant Pathology	Plant Path
Physics & Astronomy	Physics
Veterinary Microbiology & Preventive Medicine	VMPM
Veterinary Pathology	Vet Path

MCDB FACULTY RESEARCH INTERESTS

Lloyd Anderson An Sci
 Dr. Anderson's areas of research are mechanisms regulating relaxin and progesterone secretion and their effects, effects of antiprogestrone, and neuroendocrine mechanisms regulating growth and reproduction in farm animals.

Lyric Bartholomay Entom
 Medical entomology. Molecular biology of mosquito-pathogen interactions.



Diane Bassham GDCB
 Plant cell biology and stress responses. Protein trafficking. Role of vacuolar autophagy in development and in survival under stress conditions. Signal perception and transduction during nutrient stress. Mechanisms of protein transport to the vacuole.

Thomas Baum Plant Path
 Compatible interaction between cyst nematodes and their hosts with particular emphasis on the soybean cyst nematode (*Heterodera glycines*).

Gwyn Beattie Plant Path
 Genetics, physiology and ecology of plant-associated bacteria; influence of host genotype on bacterial populations; molecular basis of bacterial epiphytic fitness; bacteria as biosensors in natural environments.

Philip Becraft GDCB
 Developmental and molecular genetics of plants, genomics, signal transduction.

Jeff Beetham Vet Path
 Interaction of the human parasite *Leishmania* spp. with the innate immune system, and regulation of *Leishmania* gene expression and pathogenesis.

Donald Beitz An Sci/BBMB
 Dr. Beitz's research activities include the etiology and prevention of ketosis in dairy cows, role of animal-derived foods, other dietary ingredients, and a cholesterol homeostasis and/or obesity in animals and humans, and nutritional and genetic control of milk and meat animal composition. His

cooperative research program may be defined as selected topics in nutritional biochemistry.

Madan Bhattacharyya Agron

Soybean-Phytophthora sojae interactions; signal transduction in disease resistance; mechanism of resistance and susceptibility in plants; and non-host resistance.

Diane Birt FSHN

Cancer prevention by novel dietary constituents; mechanisms of cancer enhancement by overeating and obesity. Mechanisms of botanical supplements.

Bradley Blitvich VMPPM

Molecular determinants of arthropod-borne virus-vector interactions; apoptotic regulation in mosquito vectors; epidemic potential of West Nile virus in Mexico.

Adam Bogdanove Plant Path

Cell and molecular biology and genomics, of plant interactions with bacterial pathogens; plant disease resistance.

Bryony Bonning Entomology

Virus-based strategies for management of insect pests. Regulation of juvenile hormone esterase in insect development.

Byron Brehm-Stecher FSHN

Rapid detection of foodborne pathogens and development of new antimicrobial approaches, including use and development of novel biomimetic reagents: fluorescence in situ hybridization (FISH), flow cytometry, automated turbidimetry and real-time PCR.

Clark Coffman GDCB

Cell migration; programmed cell death; cell fate specification; Drosophila development, models and metastasis.

Drena Dobbs GDCB

Prediction and validation of ligand binding residues in proteins (for protein, DNA, RNA and small molecules), rational design of zinc finger DNA binding proteins, and prediction of functional effects of SNPs in unannotated proteins.

Matthew Ellinwood Ani Sci

Companion animal models of human genetic disease, pathogenesis and therapy for neuropathic lysosomal storage diseases, brain targeted gene therapy, enzyme replacement therapy, pharmacoperone therapy, novel enzyme constructs.

Jeffrey Essner GDCB

We use the model system zebrafish to investigate the development of the vascular system. We are conducting genetic screens and taking genomic approaches to identify genes involved in endothelial sprouting, migration, and tube formation during angiogenesis. Once characterized, these genes will be used as "targets" for therapeutic development of anticancer drugs.

Clark Ford FSHN

Protein engineering, enzyme structure and function, microbial biotechnology.

David Hannapel Hort

Full-length mobile RNAs that act as long distance signals to regulate development; the role of RNA-binding proteins that facilitate this movement.

Eric Henderson GDCB

Scanning probe microscopy; nanotechnology.

Jorgen Johansen BBMB

Nuclear structure and organization, cell and molecular biology of spindle function during mitosis, regulation of chromatin structure and gene expression.

Kristen Johansen BBMB

Regulation of chromatin structure; nuclear organization and function; cell and molecular biology of spindle function during mitosis.

Doug Jones Vet Path

Host factors that influence the development of resistance and susceptibility to infectious diseases caused by intracellular pathogens.

Russell Jurenka Entomology

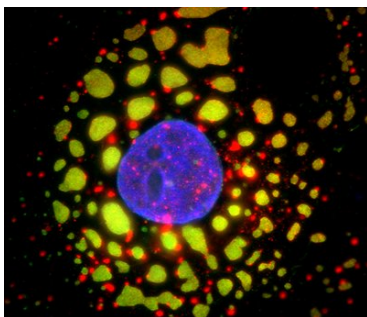
Insect physiology and molecular biology. Regulation of sex pheromone biosynthesis in moths; biosynthesis of polyunsaturated fatty acids and prostaglandins in insects.

Anumantha Kanthasamy BMS
Parkinson's disease and related movement disorders.

Charles Link, Jr. GDCB
Gene therapy of cancer; ovarian cancer; growth factor adjuvant for chemotherapy; DNA repair.

Gustavo Macintosh BBMB
Genetics and proteomics of secreted ribonucleases in plants, in relation to defense, development and stress; signal transduction in wound and stress responses.

Richard Martin BMS
Electrical properties of cells and their responses to drugs; mode of action of antiparasite drugs and mechanisms of resistance. The neuropharmacology and toxicology of nematode ion channels studied using patch-clamp techniques. Development of new target sites for anthelmintic drugs

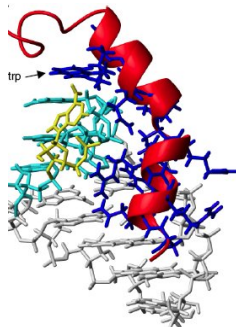


Maura McGrail GDCB
Molecular basis of animal development and the mechanisms underlying cancer in humans.

Cathy Miller VMPM
How reoviruses commandeer cellular space and proteins to replicate their genomes, translate their proteins, and assemble into progeny virions.

W. Allen Miller Plant Path/BBMB
Plant RNA virus replication and genomics; control of translation; RNA structure and function.

F. Chris Minion VMPM
Genetic basis of pathogenesis of bacterial pathogens (mycoplasmas, E.coli O157:H7, Listeria monocytogenes, Yersinia pestis), gene arrays, quorum sensing and vaccinatedevelopment.



Alan Myers BBMB
Molecular mechanisms of cellular morphogenesis; mechanisms of starch biogenesis and metabolic engineering of the starch biosynthetic pathway.

Basil Nikolau BBMB
Functional genomics of plant metabolism; metabolomics; systems biology of metabolism; functional genomics of biotin; functional genomics for bioenergy; cuticular waxes.

Marit Nilsen-Hamilton BBMB
Regulation of gene expression by growth factors; roles of growth factor-regulated gene products in tissue remodeling. Aptamers for imaging gene expression and medical applications.

Lisa Nolan VMPM
We study Mechanisms of virulence and resistance used by bacterial pathogens to cause disease in animals and/or human hosts with the idea that we learn today can reduce the occurrence and impact of infectious disease tomorrow.

Christine Petersen Vet Path
Interaction between mouse dendritic cells and leishmania species; signaling events required to induce clearance of disease vs. chronicity and canine immune systems.

Gregory Phillips VMPM
Membrane protein biogenesis and localization in bacteria; mechanisms of antimicrobial persistence in pathogenic bacteria.

JoAnne Powell-Coffman GDCB
C. elegans developmental genetics; aryl hydrocarbon receptor function and regulation; hypoxia signaling and response.

James Reecy An Sci
Identification of genetic mechanisms that control skeletal muscle growth, meat quality, and resistance to disease. Development of bioinformatics resources for livestock community.

Richard Robson An Sci/BBMB
Molecular biology, structure, and function of contractile and cytoskeletal proteins; muscle and nonmuscle cell motility and cytoskeleton.

Matthew Rowling FSHN

Nutrient and hormone transport mechanisms in relation to chronic disease. Health protective effects of nutritional supplementation relevant to chronic disease

Donald Sakaguchi GDCB

Developmental neurobiology; stem cell transplants as a strategy for CNS rescue and repair; development and plasticity of vertebrate visual systems.

Kevin Schalinske FSHN

Nutritional biochemistry; folate-dependent one-carbon pool and subsequent metabolism of methyl groups.

Patrick Schnable Agron/GDCB

Plant genetics and genomics: cytoplasmic male sterility and meiotic recombination

Joshua Selsby Ani Sci

Muscle physiology with a particular emphasis on mechanisms of pathology in Duchenne muscular dystrophy and disuse atrophy as well as the development of interventions for these conditions.

Sheldon Shen GDCB

Cell and molecular mechanisms of fertilization and early development.

Michael Shogren-Knaak BBMB

Role and establishment of histone modifications; chromatin structure

Ravindra Singh BMS

Role of alternative splicing in human and animal diseases

Martin Spalding GDCB

Photosynthetic metabolism; acclimation to changes in CO₂ availability; function of the CO₂-concentrating mechanism of Chlamydomonas.

Robert Thornburg BBMB

Regulation of plant defense genes; nectar proteins

Christopher Tuggle An Sci

Functional genomic analysis of growth, immunological and developmental pathways.

Erik Vollbrecht GDCB

Mechanisms of shoot meristem function and plant reproduction, using developmental, molecular and evolutionary genetic approaches.

Kan Wang Agron

Provide services in genetic transformation of corn, soybean and rice for academic researchers. Develop advanced technology for genetic transformation. Develop corn-based edible vaccines for livestock. Elucidate the molecular mechanisms by which plants respond to environmental stress and hormonal signals. Develop stress-tolerant crops. Develop cellulase producing corn for biorenewable material.

Eve Wurtele GDCB

Molecular regulation of plant development, metabolic networking and computational biology. Development of Meta!Blast video game.

Bing Yang GDCB

The long term goal of research in my laboratory is to better understand the plant disease, and gain knowledge to aid the design of more intelligent breeding strategies for disease control by blocking the host disease susceptibility pathway in addition to deployment of genetic disease resistance genes in crop plants.

Yanhai Yin GDCB

Plant steroid hormone signal transduction in the regulation of plant growth and development, using genetic, genomic, biochemical and cell biological approaches.

Edward Yu Physics & Astronomy

Structures and mechanisms of multidrug efflux pumps (membrane transporters), using X-ray crystallography and site-specific mutagenesis.

Olga Zobotina BBMB

Plant Cell Wall Structure; Polysaccharide Biosynthesis, Modification and Degradation; Bioactive Carbohydrates

Qijing Zhang VMPM

Molecular and cellular basis of pathogen-host interaction, antimicrobial resistance mechanism, and horizontal gene transfer in bacterial pathogens.

MCDB CONTACT INFORMATION

Administrators

Amy Ahrens

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Office: 1-515-294-7252

idgp@iastate.edu

MCDB Program Director

Dr. Jeff Beetham

jbeetham@iastate.edu

Address

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Iowa State University

Ames, Iowa 50011-3260

MCDB Program Website:

www.mcdb.iastate.edu

Graduate College Website:

<http://www.grad-college.iastate.edu>