

Genetics and Molecular Biology



EMORY

L A N E Y
GRADUATE
S C H O O L



Today, the opportunities in the fields of genetics and molecular biology are amazing. The wealth of genetic information and the potential to use this information for developing novel medical therapies and diagnostic procedures is unprecedented. With this in mind, the goal and philosophy of the doctoral program in Genetics and Molecular Biology (GMB) is to provide both in-depth training in a core area of genetics and molecular biology and broad-based training in the related disciplines of biochemistry, cell biology, statistics, and bioinformatics. This combined education is designed to develop the scientific leaders of the twenty-first century.

Research Foci

The GMB program offers six core areas of genetics and molecular biology research. Within the areas described below, model genetic systems—bacteria, yeast, *C. elegans*, *Drosophila*, zebrafish, and the mouse—are used to explore genetic and molecular biology principles.

Regulation of Gene Expression

Understanding the molecular and genetic mechanisms that regulate genes is fundamental to all areas of biology. In this area of research, genetic principles are applied to investigate basic mechanisms of transcription, gene expression, transcription factor interactions with DNA, chromatin structure and protein-protein interactions. A broad range of systems are studied, including the human immune system; visual system genes; dosage compensation in *Drosophila*; the role of oncogenes and tumor suppressors on gene expression; and bacterial differentiation and pathogenesis.

Genetics of Development and Differentiation

Most organisms undergo developmental programs to form or adapt to their environment. Research opportunities in this area include elucidating the genetic programs and circuitry in bacterial sporulation, muscle development, sperm development, germ cell specification and renewal, development of the nervous system and the eye, and sex determination.

Cancer Genetics and Human Disease

Cancer is a genetic disease—alterations in genome integrity ultimately drive cell transformation and tumor formation. GMB cancer investigators are members of the Winship Cancer Institute, which enables comprehensive training from the “bench to the clinic.” Research topics include understanding cancer formation and malignant progression using bioinformatics and array technologies, DNA methylation and epigenetic mechanisms of human carcinogenesis, genetic regulation of cell cycle control, and apoptosis. Specific areas of focus include brain, prostate, breast, head and neck, skin, and gastro-intestinal cancers.

DISCOVER

the unexpected

Human and Medical Genetics

Interactions between the clinical and public health faculty, diagnostic laboratories, and basic scientists offer a unique opportunity to study patient populations, identify and understand the basis of inherited disease, and to develop novel treatments for such disorders. GMB laboratories conduct numerous research programs, including studies of inborn errors of metabolism, chromosomal disorders (Down syndrome), single gene disorders (e.g., fragile X syndrome, Huntington disease), and multifactorial disorders (e.g., dementia, epilepsy, autism, infertility, schizophrenia, and bipolar disease). Opportunities also exist for students to attend weekly genetic clinics and genetic counseling sessions.

Bioinformatics and Comparative Genomics

The sequencing of the human and other genomes initiated a great opportunity in scientific investigation. In this focus, students use the current databases and collect and develop their own data sets to understand the basis of evolution, the dissemination of disease and variations that occur with disease genes, the identification of disease traits, the actions of retrotransposons, and the predictive nature of complex genomic analyses. Students have access to state-of-the-art facilities to investigate gene expression profiles, copy number variation, genetic polymorphisms, and transcription-factor occupancy across the genome.

Genome Stability, Replication and Repair

The stability of genomes and their ability to exchange information is critical to the survival and evolution of all organisms. This exciting area includes studies that examine the mechanisms and regulation of DNA replication, the mechanisms of genetic recombination, and the repair of DNA damage caused by mutagenic agents and the environment. This subgroup also conducts studies on centromere and telomere structure, function and role in disease.

Faculty

GMB faculty are drawn from departments within the Emory School of Medicine and the Department of Biology, representing a wide range of expertise and research areas.

The program is part of the Graduate Division of Biological and Biomedical Sciences and enjoys close working relationships with students and faculty in the Division's other programs (see final page).

A complete list of GMB faculty members, with links to publications, grants and other information, is on our website, www.biomed.emory.edu/program_sites/gmb/faculty.html.



Students

The GMB program invites applications from students with education and experience in genetics, biology, biochemistry, chemistry, molecular biology, or a related field. Applicants with other backgrounds should contact the GMB admissions coordinator. The GMB program has an average of 55-65 students enrolled and actively engaged in dissertation research.

Our website is updated quarterly and features student research project titles, student awards, student research presentations, student and faculty retreat photos and the GMB seminar listing. The website also has a list of recent student publications.

Students graduating the GMB program find ample postdoctoral opportunities across the United States and Europe. The great majority of our graduates hold academic, government, or pharmaceutical research positions. Others have used their education to pursue educational, editorships, intellectual property, legal and science administration professions.

Curriculum

The GMB curriculum is divided into classroom coursework and research.

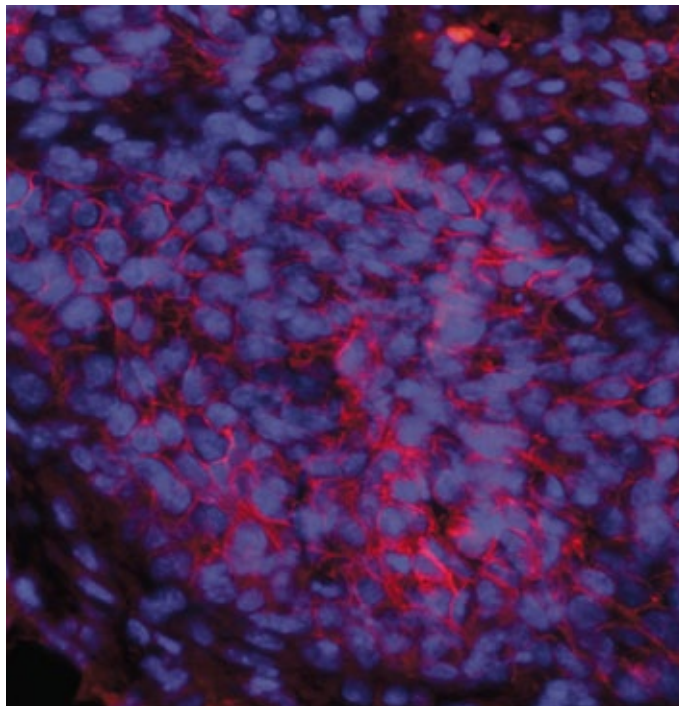
The comprehensive curriculum ensures that students receive broad training in genetics and molecular biology. Required coursework in the first two years covers basic and advanced genetics, biochemistry, cellular biology, and the use of model genetic systems. A host of electives enables students to specialize in the field of interest. Some favorite elective topics include bioinformatics, cancer genetics, developmental genetics, epidemiology, and chromatin structure. A detailed list is available on our website.

The mainstay of the educational experience is independent student research. To select a laboratory and mentor, GMB students spend two months in a number of laboratories during the first year. As students develop their own questions in their areas of interest, they can investigate them using cutting edge technologies with state-of-the-art equipment and resources. Interactions with their mentor and dissertation committee serve to guide the student's project to completion.

The GMB program sponsors activities to enhance knowledge and to develop interactions and collaborations between students and faculty. Some of these activities include a seminar series, journal club, and program retreat.

Seminars

To provide breadth and to bring new knowledge into the program, the GMB program sponsors a robust outside speaker seminar program. Students have an opportunity to meet with the visiting scientists and discuss their work. A student research-in-progress presentation series provides feedback to the students about their research plan and an opportunity for the students to gain oral presentation skills.



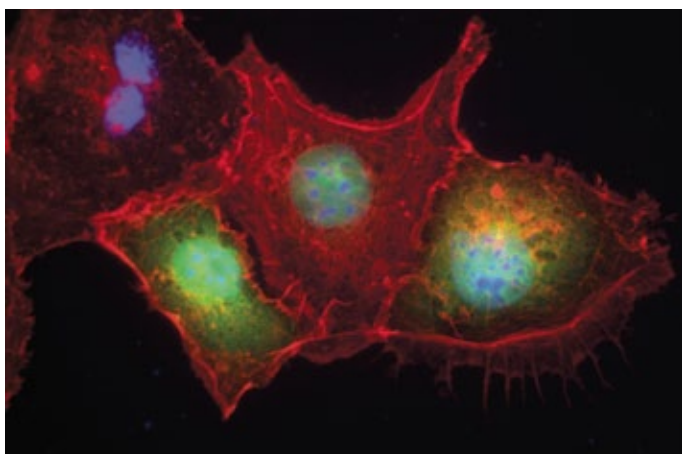
Clubs

Laboratory groups with shared research interests meet in monthly and biweekly clubs to discuss the hottest topics in their laboratories. Some of these clubs include: the Chromatin Interest Group; Cancer Genetics and Genome Instability; the Emory Fly Group; the Worm Club; and the Yeast Group.

Training in Teaching

As scientists we are also teachers, whether in formal education or just in the process of presenting our work and field to lay persons. At Emory, all doctoral students receive training in pedagogy and other elements of teaching, through the Teaching Assistant Training and Teaching Opportunity Program (TATTO), administered by the Graduate School.

After a brief summer workshop (usually before the second year), students assist a faculty member as a lecturer, laboratory instructor or discussion leader for one semester. The Graduate Division offers additional TATTO courses, as well as additional teaching opportunities.



About the GDBBS

Emory University is one of the major biological research and medical referral centers in the Southeast and is among the fastest growing Medical Centers in the United States. Emory is consistently ranked in the top 20 institutions nationally for NIH research support. Emory was recently named one of the 25 “New Ivies” by *Newsweek*, a testament to its quality and dedication to education.

The Graduate Division of Biological and Biomedical Sciences (GDBBS) has over 460 graduate students in eight interdisciplinary Ph.D. programs:

- Biochemistry, Cell and Developmental Biology
- Genetics and Molecular Biology
- Immunology and Molecular Pathogenesis
- Microbiology and Molecular Genetics
- Molecular and Systems Pharmacology
- Neuroscience
- Nutrition and Health Sciences
- Population Biology, Ecology and Evolution

Over 330 world-renowned researchers mentor students admitted to these programs, giving them a unique opportunity to train with faculty at:

- the American Cancer Society
- the U.S. Centers for Disease Control and Prevention
- Emory College
- the Robert W. Woodruff Health Sciences Center
- the Rollins School of Public Health
- The Carter Center
- the Winship Cancer Institute
- the Yerkes National Primate Research Center

Financial support includes a tuition scholarship, health insurance and stipend (\$24,500 for the 2009 – 2010 academic year). Funding is guaranteed as long as the student is making satisfactory progress toward their degree. The average time to degree is about 5.5 years. Training is interdisciplinary and students have the flexibility to work with GDBBS faculty outside their program. Students typically perform three rotations before affiliating with a faculty member for their dissertation research.

The application deadline is January 3rd for the following fall semester.



EMORY
LANEY
GRADUATE
SCHOOL

Requests for Additional Information:

RECRUITMENT AND ADMISSIONS

Graduate Division of
Biological and Biomedical Sciences
Emory University
1462 Clifton Road, Suite 314
Atlanta, GA 30322

(404) 727-2545 (direct line)
gdbbs@emory.edu

<http://www.biomed.emory.edu>
http://www.biomed.emory.edu/program_sites/gmb