



EMORY  
LANEY  
GRADUATE  
SCHOOL

GRADUATE DIVISION OF BIOLOGICAL AND BIOMEDICAL SCIENCES

# CANCER BIOLOGY

The Program in Cancer Biology (CB) provides outstanding training opportunities in every aspect of cancer research, from basic to translational research. This includes molecular and cellular biology, genetics and epigenetics, immunotherapy, signal transduction, genetic engineering, nanotechnologies, and many other disciplines used to understand the development and progression of cancer. Many different approaches are applied to a range of model systems to address how a normal cell becomes a cancer cell, how cancer progresses to a metastatic state at the molecular level and how our understanding of these mechanisms can be exploited for the design of new cancer therapies or novel ways to apply existing anti-cancer agents in the clinic.

## GOALS

The major goal of the CB doctoral program is to provide outstanding training opportunities for future leaders in the different aspects of cancer research in preparation for a diversity of career paths in research, teaching, and medicine from academia to industry. Specific goals include training future independent cancer researchers in various aspects of cancer biology, including basic and translational cancer research. Using appropriate model systems, from in vitro cell culture

to modeling in animals, the Cancer Biology program trains students in the study of the various processes associated with cancer biogenesis. At the completion of their training students will be able to design and conduct hypothesis-driven research using state-of-the-art techniques. Students will be able to critically interpret the scientific literature and use effective written and oral communication to present their scientific discoveries.

## PROFESSIONAL DEVELOPMENT

The Laney Graduate School offers a range of programs that encourages students to develop their professional skills, engage with broader professional communities, and prepare for their careers.

VISIT [GS.EMORY.EDU](http://GS.EMORY.EDU) TO LEARN MORE.

## FACULTY

The Cancer Biology program has a diverse membership including over 100 different departments on the Emory campus, both basic science and clinical. The faculty have a common research interest in cancer, but apply a variety of disciplines including virology, molecular biology, biochemistry, genetics, immunology and cell biology to understand the mechanisms of cancer formation and malignant progression, from basic principles to the development of novel experimental therapeutics.

Most of the CB faculty have dual appointments and actively participate in other Graduate Division of Biological and Biomedical Sciences (GDBBS) graduate programs, including Genetics and Molecular Biology (GMB), Immunology and Molecular Pathogenesis (IMP), Biochemistry, Cell and Developmental Biology (BCDB), Microbiology and Molecular Genetics (MMG) among others. Such dual appointments enhance the opportunity for collaboration and increase the exposure of students to different aspects of cancer biology and medicine. A number of our faculty are practicing physicians and many studies utilize patient-derived samples.

CB faculty are outstanding scientists with national and international stature in their fields and a strong track record with the National Cancer Institute, American Cancer Society and other cancer-related funding sources. Our faculty is actively involved in team science and these collaborations are supported by center grants and program projects from the NIH. A complete list of faculty members, with descriptions of research interests and links to publications, is on our website, [www.biomed.emory.edu/PROGRAM\\_SITES/CB](http://www.biomed.emory.edu/PROGRAM_SITES/CB).

Most faculty belong to the Winship Cancer Institute of Emory University, an NCI designated Comprehensive Cancer Center (<http://winshipcancer.emory.edu/>). Many cancer laboratories are located within open spaces that foster a highly collaborative environment among investigators. Since the Winship Cancer Institute's scientific focus groups and the GDBBS programs are both interdisciplinary and interdepartmental, collaborations among investigators from various departments and research areas give both faculty and students the opportunity to explore diverse areas of biomedical research. The innovative research conducted by these programs is shared at weekly seminars and annual symposia. An active invited speaker program further fosters scientific exchange and collaborations at these venues.

## STUDENTS

Emory's graduate program in cancer biology accepted its first class in 2011 and currently has 43 graduate students. This group of students were recruited nationally and display both academic and personal diversity. The CB 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 CB admissions coordinator. All students offered admission receive stipend support, a tuition scholarship and health insurance. Additionally, a number of external and internal special fellowships are available for top applicants and four of our current students hold prestigious NIH predoctoral fellowships. The program and GDBBS also recognize meritorious students with awards for their academic and research performance at an annual celebration. Our website is updated quarterly and features profiles of our current students and the faculty with whom they are performing their research.

## RESEARCH AREAS

The CB doctoral program provides outstanding training in three main research areas.

### CANCER GENETICS AND GENOMICS

Research in this area focuses on genetic and epigenetic alterations that ultimately result in cancer initiation and progression. This includes the study of DNA damage managing systems, including DNA repair, and DNA damage recognition. DNA damage includes damage induced by mutagens, as well as chromosome instability and aneuploidy triggered by oncogenes



and tumor suppressors. The epigenetics components of this research include transcription factors, DNA methylation, and chromatin modifications leading to dysregulated transcription, an important component of tumor biogenesis. Complementary investigations use cancer genomics, in which the changes in gene expression, DNA methylation, mutations, amplifications, and deletions are examined on a global scale to understand the mechanisms of cancer initiation and progression.

### CANCER SIGNAL TRANSDUCTION

Research in this area concentrates on the signaling events by which cancer cells establish themselves in the host organism and form neoplastic tissue. The biological mechanisms by which cancer cells proliferate, overcome apoptosis, develop self-sufficiency from growth factors, evade the immune system, become invasive and metastatic, and induce tumor vasculature are studied along with other hallmarks of cancer.

### CANCER THERAPEUTICS

Research in this area utilizes the knowledge acquired from the study of cancer formation to develop novel therapeutics. Our research teams interrogate diverse molecular targets to discover various anti-cancer drugs, and test those drugs in animal models with the goal of establishing clinical trials. Research approaches include signaling pathway investigation, medicinal chemistry, natural product manipulation, pharmacology, high throughput screening technology for small molecular discovery, biomarker-driven clinical trial design, pathology, and biostatistical evaluation.

### CANCER IMMUNOLOGY

Research in this area takes place at the intersection of cancer biology and immunology. This work involves the study of how tumors evade the immune system, and how the immune system can be modulated to

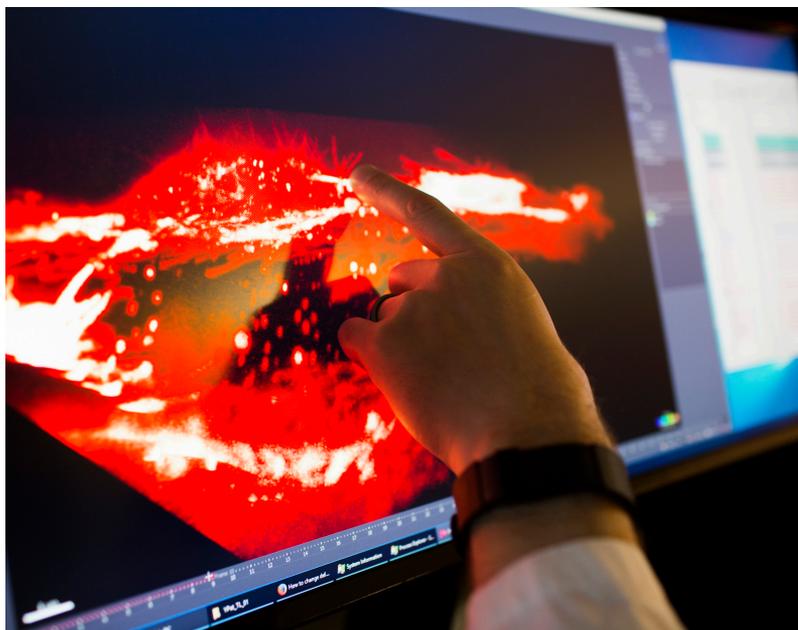


Image for a lattice microscope (L). Cancer Biology student Alyssa Duffy (R).

recognize and eradicate tumor cells. This type of research involves work with animal models that include intact immune systems, development of therapeutic compounds that modulate the immune system, and modification of immune cells to recognize tumor antigens.

A number of CB faculty member research projects extend across several of these areas, providing students with ample opportunities for exceptional interdisciplinary training. Particular strengths in organ-specific cancer research are found in breast, lung, prostate, head and neck cancer, brain tumors, hematopoietic malignancies and many others.

## RESOURCES AND OPPORTUNITIES

The Winship Cancer Institute of Emory University, a National Cancer Institute designated Cancer Center, is a great resource for graduate students in the graduate program in Cancer Biology. The Institute hosts weekly seminars in which Emory faculty and leaders in cancer research from various institutions present their novel findings. The Institute also sponsors a yearly scientific symposium in which various research focus groups sponsor scientists of international stature. An important component of the symposium is a career development workshop. The Cancer Biology weekly seminar series includes current student presentations as well as CB faculty and other invited speakers. There is a weekly Elkin Cancer Biology lecture series hosting scientists from around the country, and members within the Institute also host the annual Jean Sindab Triple Negative Breast Cancer Symposium. Additional cancer-related seminars are presented on a weekly basis throughout the School of Medicine, the various GDBBS programs, and departments at Emory University. CB faculty members are well-funded by several agencies, including the Georgia Cancer Coalition, American Cancer Society, the Leukemia and Lymphoma Society, NASA, the Department of Defense, the Komen Foundation, and NIH grants, including R01s, P01s and SP0RE grants. Faculty actively publish in top journals in cancer biology. The Institute also has several on site shared resource laboratories to facilitate research, including cores in biostatistics and bioinformatics, imaging, cancer genomics, pathology, and tissue banking. In addition, the Institute actively participates in drug development and clinical trials, facilitating bench to bedside translation.

## CURRICULUM

During their first year, students will rotate through at least three independent laboratories. Those rotations allow students to acquire experimental knowledge in various disciplines addressing cancer biology. At the end of these rotations, students select a laboratory for their dissertation research. Required courses are typically completed by the second year. Courses include Basic Biological and Biomedical Sciences, Introductory Graduate Seminar, the Jones Program in Ethics course & Bioethics, Cancer Biology I and II, Advanced Graduate Seminar, Hypothesis Design and Grant Writing, Cancer Pharmacology, Advanced Graduate Research, and Cancer Clinical Colloquium. Elective courses include Eukaryotic Chromosome Organization/Function, Human Genetics, Bioinformatics, Population Biology and Evolution of Disease, Genetic Epidemiology, and the Certificate Program in Translational Research.

## TEACHING

Because teaching is an integral part of academic research, all Emory students are required to be involved in 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 are assigned by the Graduate Division of Biological and Biomedical Sciences to 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 Emory:**

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 and ranks at or near the top of institutions for students with NIH predoctoral fellowships. Emory is recognized as a leader in higher education in sustainability and has won numerous awards. The Best Colleges has placed Emory in the top 10 in the nation in the categories of greenest universities and the most beautiful college campuses.

The Graduate Division of Biological and Biomedical Sciences (GDBBS) has around 400 graduate students in eight interdisciplinary Ph.D. programs:

- Biochemistry, Cell and Developmental Biology
- Cancer Biology
- Genetics and Molecular Biology
- Immunology and Molecular Pathogenesis
- Microbiology and Molecular Genetics
- Molecular and Systems Pharmacology
- Neuroscience
- 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:

- American Cancer Society
- the U.S. Centers for Disease Control and Prevention
- Children's Healthcare of Atlanta, Inc.
- Emory College
- the Robert W. Woodruff Health Sciences Center
- the Rollins School of Public Health
- The Carter Center
- Veterans Administration Medical Center, Atlanta
- the Winship Cancer Institute
- the Yerkes National Primate Research Center

Financial support includes a tuition scholarship, health insurance and a competitive stipend (\$32,569 for the 2020 – 2021 academic year). Funding is guaranteed as long as the student is making satisfactory progress toward their degree. The average time to degree is typically around 5.5 to 6 years. Training is interdisciplinary and students have the flexibility to perform their thesis work with GDBBS faculty outside their chosen program. Students typically perform three rotations before affiliating with a faculty member for their dissertation research.

**The application deadline is December 1st for the following fall semester.**



Requests for Additional Information:

Recruitment and Admissions  
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biomed.emory.edu  
biomed.emory.edu/PROGRAM\_SITES/CB



**LANEY GRADUATE SCHOOL DEGREE PROGRAMS**

Anthropology	Biostatistics	Computer Science and Informatics	French	Immunology and Molecular Pathogenesis*	Molecular and Systems Pharmacology*	Philosophy
Art History	Business (PhD)	Development Practice	Genetics and Molecular Biology*	Islamic Civilizations Studies	Neuroscience*	Physics
Behavioral Sciences and Health Education	Cancer Biology*	Economics	Health Services Research and Health Policy	Mathematics	Neuroscience and Animal Behavior (Psychology)	Political Science
Biochemistry, Cell and Developmental Biology*	Chemistry	English	Hispanic Studies	MD/PhD	Nursing	Population Biology, Ecology, and Evolution*
Bioethics	Clinical Psychology	Environmental Health Sciences	History	Microbiology and Molecular Genetics*	Nutrition and Health Sciences	Religion
Biomedical Engineering	Cognition and Development (Psychology)	Environmental Sciences				Sociology
	Comparative Literature	Epidemiology				Women's, Gender, and Sexuality Studies

\*The Graduate Division of Biological and Biomedical Sciences is home to eight interdisciplinary graduate programs.