

Department of Anatomy and Cell Biology

The Cell Biology and Anatomy Graduate Program is designed to prepare the student for a career in independent research and/or teaching with concentrations in the following areas:

- Cell Biology
- Developmental Biology
- Neuroscience
- Renal Biology
- Reproductive Biology

The graduate program emphasizes acquiring the skills and knowledge required to perform and communicate the results of laboratory research. Individual research programs within the Division of Cell Biology and Anatomy are largely complementary and focus on understanding the biological processes that contribute to human health and disease. Experimental systems include the use of cell and tissue culture, as well as model systems such as *Drosophila melanogaster*, chameleon, frog, chick, zebrafish, rats, and transgenic mice.

In 2021, the Division of Cell Biology and Anatomy brought in nearly \$6 million in grant funding from the National Institutes of Health, placing it at the top of all basic science departments within KUMC and 35th (out of 78) among all Anatomy and Cell Biology departments in the country. Faculty members and trainees also received funding from the National Science Foundation, American Heart Association, the Cystic Fibrosis Foundation, and various other agencies. Graduates of this program have obtained positions in industry, government, and consulting, as well as faculty positions at the college, university, and medical/graduate school level.

Courses

ANAT 831. Fellowship Grant Development. 3 Credits.

This 3-hour course will provide instruction and feedback towards the development of a fellowship-style grant application. Topics to be covered will include Biosketch, Candidate Background and Career Goals, Specific Aims, Significance and Innovation, Experimental Design and Approach, Sponsor Statement, Training Plan, and Grant Review Procedures. The learner will gain a deeper insight into the development and execution of each component of a fellowship application, as well as receive feedback from fellow students and participating faculty on how to improve their proposal. They will also gain a deeper appreciation of how the components of a fellowship proposal are reviewed and scored. It is anticipated that by the end of the course, the student should have a fully developed fellowship application that can be submitted to a funding agency. Prerequisite: IGPBS core curriculum or first two years of ACE curriculum.

ANAT 832. Electron Microscopy Techniques. 3 Credits.

Basic methods in preparation of tissues and cells for ultrastructural studies; use of electron microscopy in specific research problems; interpretation of biological ultrastructure; reading assignments and discussion sessions. Prerequisite: ANAT 830, or consent of course instructor.

ANAT 845. Graduate Histology. 3 Credits.

This course will bridge student knowledge of systems/organs with cellular histology and is designed as an accelerated introduction to histological

techniques, microscopy/optics, and histology of normal and diseased tissues. Classes meet once a week and the format includes a 1 hour lecture on individual tissues within related organ systems followed by 1 hour of microscopic observation. (Same as NEUS 845.) Prerequisite: Completion of the IGPBS core curriculum or consent of instructor.

ANAT 846. Advanced Neuroscience. 4 Credits.

Team-taught, in-depth neuroscience course focusing on normal and diseased brain function at the molecular, cellular and systems levels. Lectures and discussions will emphasize current issues in neuroscience research. (Same as PHCL 846, PHSL 846, NURO 846, and NEUS 846.) Prerequisite: Permission of the course director.

ANAT 847. Developmental Neurobiology. 2 Credits.

Development of the nervous system from early induction to the development of learning and memory. Topics include: Induction; Cellular Differentiation; Axon Growth and Guidance; Target Selection; Cell Survival and Growth; Synapse Formation; Synapse Elimination; and Development of Behavior. (Same as NURO 847, PHSL 847 and NEUS 847.) Prerequisite: Advanced Neuroscience (ANAT 846; NURO 846; PHSL 846) or consent of instructor.

ANAT 848. Molecular Mechanisms of Neurological Disorders. 3 Credits.

An in-depth coverage of pathogenic mechanisms in neurological diseases; cellular and molecular responses to brain injury and disease, neuroinflammatory diseases (e.g., multiple sclerosis), neurodegenerative diseases (e.g., Alzheimer's, Parkinson's, Huntington's, amyotrophic lateral sclerosis, and prion diseases), neurogenetic diseases (e.g., lysosomal and peroxisomal disorders, Down's syndrome and fragile X), trauma, stroke, and viral diseases (e.g., HIV encephalitis). (Same as NURO 848, PHCL 848, PHSL 848, and NEUS 848.) Prerequisite: Advanced Neuroscience (ANAT 846, PHCL 846 or PHSL 846) or an equivalent course and consent of instructor.

ANAT 849. Advanced Cell Biology. 2 Credits.

This course focuses on modern trends in cell biology and their role in disease processes. Topics include cellular organelles, cell diversity, and cellular processes. Each two hour class will consist of a one hour lecture followed by a journal club discussion of the previous week's topic. Oral presentations of written assignments will allow students to integrate lecture material. By the end of the course, the learner will have acquired knowledge of the cellular mechanisms essential to organismal health, developed creative and critical thinking skills by integrating multiple aspects of cell biology to address a research problem, and honed their oral presentation and scientific writing skills. Prerequisite: Completion of the IGPBS core curriculum or consent of the instructor.

ANAT 868. Advanced Developmental Biology. 2 Credits.

This is an advanced graduate course which is designed for 2nd year graduate students who have some previous exposure to embryology / developmental biology at the undergraduate or graduate level. The class will focus on aspects of development that are currently at the leading edge of the field and will include a combination of lectures, discussion of late breaking papers, and seminars by outside speakers. Prerequisite: IGPBS Core Curriculum or consent of instructor.

ANAT 869. Grant Writing. 3 Credits.

All aspects of preparing grant applications are covered. This includes writing an actual grant application containing all the usual elements of grants - budgets, biosketches, resources, and scientific text. In addition, different funding agencies, building research teams, the review process, responding to reviewers, and resubmitting grants will be covered. (Same as HP&M 878 and NRSG 889.) Prerequisite: Appropriate research methods and statistics courses in student's current graduate program; and

permission of the instructor. For students in the Outcomes Management and Research concentration, HP&M 821.

ANAT 870. Research Methods and Advanced Technologies in Biomedical Research. 1 Credits.

This course will introduce students to novel research techniques and their application across a variety of disciplines. The class will meet weekly and consist of monthly faculty lectures on current or developing techniques and student-led presentations and discussions occurring during non-lecture classes. Prerequisite: Completion of the IGPBS core curriculum or consent of instructor.

ANAT 880. Advanced Topics: _____. 1-5 Credits.

Special study allowing a student to pursue a particular subject through readings, laboratory work, and conferences with a faculty member. Prerequisite: Consent of instructor.

ANAT 885. Seminar. 1 Credits.

Research-oriented presentations in a seminar format by students, faculty, and guests.

ANAT 890. Graduate Research. 1-10 Credits.

Independent laboratory investigation approved by and under the supervision of the student's advisor, and in partial fulfillment of the requirements for the M.S. or Ph.D. degree. Prerequisite: Consent of advisor.

ANAT 899. Master's Thesis. 1-6 Credits.

Preparation of the formal thesis based upon independent research and in partial fulfillment of the requirements for the M.S. degree. Credits will be given only after the thesis has been accepted by the department. Prerequisite: Consent of advisor.

ANAT 900. Analysis of Scientific Papers. 1 Credits.

Research articles are analyzed and presented by the student with the guidance of an instructor. Assessment will be based on the of quality and mechanics of the presentation and participation in group discussion. One or more articles may be discussed in each tutorial session. The research topics are chosen in accordance with the research interest of the student and at the discretion of the instructor.

ANAT 990. Doctoral Research. 1-12 Credits.

Original and independent laboratory investigation, approved by and conducted under the supervision of the students' advisor and advisory committee, in partial fulfillment of the requirements for the Ph.D. degree. Prerequisite: Consent of advisor.

ANAT 999. Doctoral Dissertation. 1-12 Credits.

Preparation of the dissertation based upon original research and in partial fulfillment of the requirements for the Ph.D. degree. Credits will be given only after the dissertation has been accepted by the student's dissertation committee. Prerequisite: Consent of advisor.