

# ANATOMY, PH.D.

Saint Louis University's doctoral degree in anatomy provides training in clinical human anatomy and independent research for individuals seeking a career in teaching and research at the medical school or university level.

Teaching faculty and mentors in Saint Louis University's anatomy Ph.D. program are drawn from a select group of scientists and clinicians at the School of Medicine. The anatomy faculty are united by their extensive experience in teaching and training young scientists, medical students and physicians-in-training.

## Curriculum Overview

A total of 48 credits (36 credits of coursework and 12 credits of dissertation research) are required for graduation. A concentration in neurobiology provides training for students preparing for academic or professional careers in neuroscience-related areas.

Dissertation research is related to the Saint Louis University's Center for Anatomical Science and Education's current research focus, including examining clinically relevant topics in neurobiology, pathology, and/or biological structure and function.

## Fieldwork and Research Opportunities

Graduate students in anatomy at SLU perform research projects by working with a faculty mentor whose research interests match their own. Doctoral students are expected to publish and present a minimum of two research projects.

Faculty members are engaged in multidisciplinary research of biological structure and function ranging from ultrastructural to gross anatomical levels, with a major interest in clinically relevant anatomy and neurobiology. Other research interests include cell biology and pathobiology.

Facilities are available for autoradiography, electrophysiology, gel electrophoresis, immunoblotting, immunostaining (immunocytochemistry, immunohistochemistry, immunofluorescence), high-performance liquid chromatography, in situ hybridization, microsurgery, stereotaxic neurosurgery, microinjections and animal behavioral assays. The Saint Louis University Center for Anatomical Science and Education is also equipped to perform optical imaging, including bright field, phase contrast and fluorescence microscopy.

## Careers

Possible careers for graduates with a Ph.D. in anatomy include medical doctor, allied health professional and university professor.

## Admission Requirements

Applicants are admitted on a competitive basis and must have a B.S. or B.A. degree from an accredited U.S. college or university with a minimum overall GPA of 3.0 and/or science GPA of 2.8. In addition, applicants must have a GRE general test score at the 40th percentile.

## Application Requirements

- Application form and fee
- Transcript(s)
- Three letters of recommendation

- GRE G scores (GRE S optional)
- Résumé
- Interview
- Professional goal statement

## Requirements for International Students

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency
- Proof of financial support must include:
  - A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
  - A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
- Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

## Application Deadlines

Students should apply by March 1 for fall admission.

## Scholarships and Financial Aid

For priority consideration for graduate assistantship, apply by Feb. 1.

For more information, visit the student financial services office online at <http://finaid.slu.edu>.

## Requirements

Code	Title	Credits
<b>Required Courses</b>		
ANAT 5000	Human Gross Anatomy	8
ANAT 5100	Human Histology and Ultrastructure	5
ANAT 5200	Human Embryology	2
ANAT 5300	Human Systems Neurobiology	5
ANAT 5400	Human Systems Physiology	4
ANAT 5440	Basic Research Techniques	2
BBS 5100	Ethics for Research Scientists	0
BST 5000	Principles of Biostatistics	3
ANAT 6900	Anatomy Journal Club	1
<b>Elective Courses</b>		
Select 5-6 ANAT 6xxx courses		6
<b>Dissertation Research</b>		
ANAT 6990	Dissertation Research (taken over multiple semesters)	12
<b>Total Credits</b>		<b>48</b>

## Neurobiology Concentration

For a concentration in Neurobiology, students must conduct dissertation research in neurobiology and are required to complete at least 7 credits from the following courses:

Code	Title	Credits
ANAT 6320	Developmental Neurobiology	
ANAT 6670	Visual Neuroscience	
PPY 5110	Introduction to Pharmacology	
PATH 5010	Pathobiology	

## Non-Course Requirements

### Qualifying Examination and Defense

After completing the core curriculum, Basic Research Techniques in Anatomy and Principles of Biostatistics, the student must prepare for and successfully pass the doctoral qualifying examination.

### Doctoral Qualifying Examination

The qualifying exam is a written examination that is designed to test the student's fundamental knowledge of human structure and function, critical analysis and thinking, and design of an independent research proposal. An ad hoc exam committee will be constituted by the director of the anatomy graduate program and include five members of the graduate faculty, four of which shall be anatomists. The program director or associate director shall chair the committee. The written test shall occur over a five-day period (excluding weekends). The committee will request the faculty to submit questions on: material covered in any of the coursework completed by the student to date, research papers or reviews that will be provided to the student, and/or philosophical matters related to the history of anatomy and medicine or national or world events that impact medical education and biomedical research. The committee will review the submitted questions and questions will be selected or created by the committee to ensure the questions are fair and appropriate, that they test the student's knowledge base for areas of anatomy (gross anatomy, neuroanatomy, histology and embryology), and that they help evaluate the problem-solving skills of the student. Failing the qualifying exam will result in the student being recommended to being dropped from the Ph.D. program. In this case, the director of the anatomy graduate program can elect to offer the failed student the option of completing a terminal master's degree.

Once the student has passed the doctoral qualifying examination, the student must register for Dissertation Research. A minimum of 12 credits are required for degree completion and typically occurs over 2-3 academic years. Initially, the student must identify a research project under the guidance of a faculty member. A Ph.D. dissertation committee will then be formed as the student prepares their research proposal.

A three-member Ph.D. dissertation committee, chaired by the student's primary adviser, will be appointed by the director of the anatomy graduate program. The committee must include at least two members of the anatomy graduate faculty. A third member of the committee can be appointed by the graduate program director if they are graduate faculty in other departments or at another university. It is the decision of the anatomy graduate program director to accept the adviser's recommendation and to identify the final member of the committee. Once the proposal has been approved by the Ph.D. dissertation committee it is then submitted to the Office of Graduate Education.

### Doctoral Oral Qualifying Examination

The oral qualifying exam will be scheduled after the student has submitted a detailed dissertation research proposal, conducted preliminary experiments to substantiate the proposal and the dissertation advisory committee formed. The committee will consist of five members of the graduate faculty and will be approved by program director. The oral exam will be public and designed to test the student's fundamental

knowledge of their proposed studies, background for the studies, and critical analysis and thinking.

Prior to the doctoral student's request for consideration for advancement to candidacy, submission of their research proposal, formation of their research committee, initiation of the major components of their proposed doctoral research project, and registration for any research credits, the student must have completed most of their required core or elective coursework and successfully passed their preliminary/written qualifying exam.

### Advancement to Candidacy

Completion of the dissertation research project entails the following: writing of the thesis, application for advancement to candidacy and the dissertation defense. It shall be the responsibility of the student to initiate their candidacy by filling out a candidacy form through the Office of Graduate Education. The completed form must be returned by the deadline stated in the graduate education calendar of deadlines. Once the completed candidacy form has been processed by the Office of Graduate Education, the thesis committee chair will receive ballots for the oral defense of the thesis. The ballots are distributed to the other committee members by the thesis committee chair when they vote on the oral defense. Once the ballots are completed, signed and sealed, it is the committee chairperson's responsibility to deliver the ballots to the Office of Graduate Education immediately following the defense.

### Dissertation Defense

The defense of the dissertation provides an opportunity for the student to formally present their findings to their committee, the faculty and students in CASE, and to any family member or anyone from the general public wishing to attend. Two weeks before the dissertation defense, an electronic and print announcement of the date, time, location and title of the defense will be publicized to all members of CASE. A final draft of the student's dissertation must be placed in the anatomy conference room for faculty and students to review at least seven working days prior to the defense. The dissertation defense is two parts. First, the student will make an oral, PowerPoint presentation of no longer than 45 minutes duration where they present their research. Following the presentation, questions from the collective audience will be encouraged. Once all questions have been satisfactorily answered by the student, the audience is excused and the closed, or executive, part of the defense takes place with only the student and their committee present. The dissertation committee can ask detailed questions and expect the student to demonstrate thorough knowledge of their project and related research. Questions on general topics in anatomy, unrelated to their research, may also be asked. Following all questioning, the student is excused from the room and the committee members, without discussion, complete the defense ballot.

### Continuation Standards

Students must maintain a cumulative GPA of 3.00 in all required graduate/professional courses.

## Learning Outcomes

1. Graduates will be able to demonstrate:
  - a. knowledge and application of the underlying concepts, advanced knowledge and analytical approaches used in general and advanced gross anatomy, microscopic anatomy, neuroanatomy, physiology, and embryology;
  - b. the application of current scientific literature, especially in areas representing gaps of knowledge, through framing hypotheses-

- driven experiments, independent reading and the completion of additional work; and
- c. the application of designing and conducting experiments and to analyze and interpret data.
2. Graduates will be able to demonstrate:
    - a. the ability to gather data to verify the existence of a problem, conduct extended research/analysis into a problem/topic, evaluate the evidence, generate ideas for possible solutions and formulate a thesis based on analysis; and
    - b. the ability to read materials carefully and analyze them critically
  3. Graduates will be able to demonstrate:
    - a. written communication skills with respect to clarity, use of appropriate grammar, syntax and vocabulary appropriate to the development of a NIH-style grant proposal; organizes research materials to support an original thesis; and, present ideas and arguments clearly, logically and with an appropriate balance of text and graphic materials; and
    - b. oral communication skills with respect to designing, organizing and presenting main points concisely and clearly; providing persuasive arguments, using data and information, that are appropriate for the audience and occasion; using language vocal variety, pronunciation and physical behaviors that support the verbal message for the audience and occasion; using visual aids appropriate for technical presentation, and ability to answer audience questions.