

Anatomical Sciences (HBA)

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Degree awarded: Ph.D. in Anatomical Sciences

Multidisciplinary Graduate Program in Anatomical Sciences

The Department of Anatomical Sciences, within the Health Sciences Center, offers a multidisciplinary graduate program leading to the Ph.D. degree. Students receive comprehensive training to prepare them for teaching and research in the areas of evolutionary morphology, functional morphology, musculoskeletal biology, systematics, and vertebrate paleontology. Graduate students are guided through a program of courses designed for their particular needs. In this regard, the Department of Anatomical Sciences interacts not only with other departments in the School of Medicine but also with those in the College of Arts and Sciences (e.g., Departments of Anthropology, Ecology and Evolution, and Geosciences), as well as other regional doctoral programs (American Museum of Natural History, City University of New York).

The program is concerned with the analysis and interpretation of gross vertebrate structure in relation to adaptation and systematics. Training and research focus on (a) an evolutionary perspective in the analysis of morphology, including the roles of function, structure, and phylogenetic history, and (b) the structural adaptations of bone as a load-bearing tissue, including the physiologic mechanisms of osteogenesis and osteolysis. Both the locomotor and the cranio-dental systems are regions of current interest and investigation within the program. Several faculty in the Department specialize in the application of experimental and quantitative techniques to the analysis of the relationship between form and function. Studies of skeletal adaptations are also facilitated by collaboration with the Musculoskeletal Research Laboratory of the Department of Orthopaedics. Questions of systematics are approached at many different levels, ranging from alpha taxonomy to higher-order relationships utilizing such techniques as phylogenetic systematics.

Students in the program have the opportunity to master a variety of research methods and analytical strategies: behavioral ecology, biogeography, cineradiography, electromyography, finite element analysis, kinematics and kinetics, *in vivo* bone strain measurement, phylogenetic systematics, principles of paleontological fieldwork, quantitative morphology including scaling (allometry) and multivariate morphometrics, and scanning electron microscopy and tandem-scanning, reflected-light microscopy.

Facilities

The Department has exceptionally well-equipped research facilities. These include a primate colony and the apparatus necessary for telemetered electromyography; cinematographic and cineradiographic motion analysis equipment; force-plates; scanning and transmission electron microscopes; tandem-scanning, reflected-light microscopes; three-dimensional reflex microscopes; and two-dimensional and three-dimensional sonic digitizers. For students with a focus on paleontology, the Department has a recently constructed Vertebrate Fossil Preparation laboratory with contemporary equipment for preparation, molding, and casting original fossil material. The Department also has original fossil collections, extensive cast collections, and several ongoing paleontological field projects in Africa, China, Madagascar, and the western interior of North America. Finally, the program offers extensive microcomputing and excellent mainframe computing facilities.

Admission

In addition to the minimum Graduate School requirements, the following are required:

A. A bachelor's degree with the following minimal preparation: mathematics through one year of calculus; chemistry, including organic chemistry; general physics; and one year of biology with laboratory;

B. A minimum grade point average

of 3.0 in all undergraduate coursework and 3.25 in science courses;

C. Letters from three previous instructors;

D. Results of the Graduate Record Examination (GRE) General Test and TOEFL for international students;

E. Acceptance by the Department of Anatomical Sciences and by the Graduate School.

In special cases, students not meeting requirements A through D may be admitted on a provisional basis. These students must act to remedy deficiencies within the first year, following the requirements of the individual graduate studies.

Faculty

Distinguished Professor

Fleagle, John G., Ph.D., 1976, Harvard University: Evolutionary biology of higher primates; vertebrate paleontology; behavioral and experimental analysis of comparative musculoskeletal anatomy; skeletal growth and development.

Distinguished Service Professor

Krause, David W.,⁴ Ph.D., 1982, University of Michigan: Vertebrate paleontology; mammalian evolution; functional morphology of masticatory and locomotor systems.

Distinguished Teaching Professor

Stern, Jack T., Jr., Ph.D., 1969, University of Chicago: Functional gross morphology; relationship between primate locomotor behavior and structure; human muscle function in relation to athletic activity and orthopaedics; radiotelemetered electromyography.

Professors

Brink, Peter R.,² Ph.D., 1976, University of Illinois: Physiology and biophysics of junctional and excitable membranes.

Demes, A. Brigitte, Ph.D., 1982, University of Bochum, Federal Republic of Germany: Biomechanics; functional morphology; scaling effects on locomotion.

Grine, Federick E.,¹ Ph.D., 1984, University of Witwatersrand, South Africa: Hominid evolution; functional morphology of the masticatory system; vertebrate paleontology; dental structure and comparative odontology.

Jungers, William L., *Chair*, Ph.D., 1976, University of Michigan: Paleoanthropology; comparative primate anatomy; biomechanics; primate paleontology and systematics.

Larson, Susan G., Ph.D., 1982, University of Wisconsin: Functional morphology of human and nonhuman primate locomotor systems; human and primate evolution; telemetered electromyography.

Martin, Lawrence B., *Dean of the Graduate School*,¹ Ph.D., 1983, University of London, England: Primate evolution; thickness, development, and microstructure of dental enamel; neogene vertebrate paleontology.

Rubin, Clinton T.,³ Ph.D., 1982, Bristol University, England: Structural adaptation in bone; skeletal remodeling and morphology.

Susman, Randall L., Ph.D., 1976, University of Chicago: Functional morphology and behavior of primates; evolution of apes and humans; gross anatomy.

Associate Professors

Doran, Diane M.,¹ Ph.D., 1989, Stony Brook University: Behavior and ecology of African apes; relationship of positional behavior and morphology.

O'Leary, Maureen A.,⁴ Ph.D., 1997, Johns Hopkins University: Vertebrate paleontology; phylogenetic systematics; mammalian evolution.

Assistant Professors

Kley, Nathan J., Ph.D., 2001, University of Massachusetts Amherst: Functional morphology and evolution of feeding and locomotor systems in vertebrates; phylogenetic origin, interrelationships, and early evolution of snakes.

Seiffert, Erik, Ph.D., 2003, Duke University: Primate systematics, evolutionary history of placental mammals, biogeography.

Adjunct Faculty

Jouffroy, Francoise K., Ph.D., 1962, Université de Paris: Comparative vertebrate anatomy; functional morphology of locomotion; histochemistry and immunohistochemistry of muscle.

Leakey, Meave G., Ph.D., 1968, University of North Wales: Human evolution, primate evolution, Africa.

Mittermeier, Russell, Ph.D., 1977, Harvard University: Ecology and behavior of primates; primate conservation.

Number of teaching, graduate, and research assistantships, Fall 2007: approximately 7

1) Joint appointment, Department of Anthropology

2) Joint appointment, Department of Physiology

3) Joint appointment, Department of Biomedical Engineering

4) Joint appointment, Department of Earth and Space Sciences

Degree Requirements

M.S. Degree Requirements

Graduate Studies in Anatomical Sciences does not accept students whose goal is a master's degree. In exceptional

instances, a student already in the program may be awarded an M.S. degree upon completing an approved course of study, including a minimum of 30 graduate credit hours, and either passing a comprehensive examination, or submitting and defending a master's thesis.

Requirements for the Ph.D. Degree

In addition to the minimum requirements of the Graduate School, the following are required:

A. Formal Course Requirements

The following courses are required for all students in the program:

1. Human Gross Anatomy and Embryology
2. An approved course in Statistics

In addition, students are required to take three courses chosen in consultation with the student's advisor such as:

1. Genetics
2. Organ Systems
3. Neurosciences
4. Functional Morphology or Animal Mechanics
5. Vertebrate Evolution
6. Principles of Evolution or Macroevolution
7. Developmental Biology
8. Systematics

Depending on the area of specialization, students may be required to take additional courses, such as Biomedical Engineering, Mammalian Evolution, Solid Mechanics, or Systematics.

All students must achieve a B or higher in all required courses and must maintain a B average or higher in all elective courses.

B. Preliminary Examination

All students are required to take an oral preliminary examination upon completion of formal courses, normally at the beginning of their fourth semester. All students will be examined in human gross anatomy and embryology. The third subject will depend on the student's area of specialization, such as musculoskeletal biology, neuroanatomy, or vertebrate evolution.

C. Advancement to Candidacy

The faculty will recommend a student to the Graduate School for advancement to candidacy upon satisfactory completion of all required coursework and the preliminary examination. The student

then becomes a formal candidate for the Ph.D.

D. Dissertation Proposal Examination

Following advancement to candidacy, the student selects a dissertation advisor and committee consisting of at least two additional members of the Department of Anatomical Sciences and one person from outside the Department. In consultation with this committee, the student prepares a dissertation proposal.

The dissertation proposal examination consists of an oral presentation of this proposal to the Department as a whole, followed by an oral defense before the dissertation committee. This examination should occur no later than 12 months after passing the oral preliminary examination.

E. Ph.D. Dissertation

The student, under the supervision of the dissertation committee, performs the research leading to the preparation of a written dissertation. The dissertation must contain the results of original and significant investigation.

F. Dissertation Defense

Following completion of the dissertation, the student presents his or her findings in a formal public oral defense. The defense is conducted by the dissertation committee, but is not chaired by the student's advisor. Following the presentation of results, the student is questioned by members of the committee and by other members of the audience.

G. Teaching Requirement

Every student is required to teach medical human gross anatomy (HBA 531) at least once before graduation. In addition, students receiving a teaching assistantship are required to teach.

H. Residence Requirement

The University requires at least two consecutive semesters of full-time graduate study. Generally, the demands of the course of study necessitate a longer period of residence. However, pursuit of a degree on a part-time basis will be considered under special circumstances.

Courses

HBA 521 Gross Anatomy of Head, Neck, and Trunk

Tutorial laboratories with emphasis on dissections of the human head, neck, and trunk.
Prerequisites: Permission of instructor
Fall modules, 8 credits, ABCF grading

HBA 531 The Body

A lecture and laboratory with emphasis on dissection of the entire human body. Topics include functional and topographic anatomy, embryology, clinical correlations, and an introduction to radiology.

*Prerequisites: Permission of instructor
Fall, 8 credits, S/F grading*

HBA 540 Human Anatomy for Physical Therapists

Lecture followed by laboratory dissection of the human body. Regional approach to the gross anatomy of the human body for physical therapy graduate students (DPT). The course is presented in three modules. Module one covers the back, thorax, abdomen, pelvis, and perineum. Lectures will cover the regional anatomy of the above as well as conceptual information about the peripheral nervous system, the heart, and respiratory system. Module two covers the brain, head, and neck. Lecture will address the anatomy and organization of the central nervous system, the cranial nerves, introduction to the anatomy of the special senses, and mastication. Module three will offer an expanded view of the functional anatomy of the limbs and musculoskeletal system. Lectures will address the functional anatomy of the hand and the foot as well as posture and locomotion. In module three clinical faculty will address the latest developments in radiology and skeletal imaging, and the clinical anatomy of the back, shoulder, elbow, hand, hip, knee, and foot.

6 credits, ABCF grading

HBA 541 Evolutionary Anatomy

A lecture and laboratory with emphasis on dissection of the entire human body. Includes functional and comparative anatomy with special emphasis on the musculoskeletal morphology of humans and higher primates. This course is offered as both DPA 541 and HBA 541.

*Prerequisite: Permission of instructor
Fall, 8 credits, ABCF grading*

HBA 550 Vertebrate Evolution

Survey of the fossil record of vertebrate evolution. The course emphasizes the origin, phylogeny, comparative and functional morphology, biogeography, and paleontology of vertebrate animals. Laboratory included. The lectures and laboratories will utilize an extensive collection of comparative anatomical material, fossil casts, and slides.

*Prerequisite: Previous course in human or vertebrate anatomy and permission of instructor
Spring, alternate years, 4 credits, ABCF grading*

HBA 560 Advanced Regional Anatomy

Advanced human gross anatomy for graduate students or advanced undergraduates in biology, anthropology, and other life sciences.

*Prerequisite: Permission of instructor
Fall, Spring, Summer, 3-8 credits, ABCF grading*

HBA 561 Human Gross Anatomy

A lecture and laboratory course that includes dissections of the entire human body. The course is organized in three modules: (1) thorax and abdomen, (2) head and neck, including neuroanatomy, and (3) limbs. It covers regional and conceptual information on the gross anatomy of all organ systems in the human body.

*Prerequisite: Permission of instructor for students not enrolled in Stony Brook's Occupational Therapy, Physician Assistant, or Respiratory Therapy programs
Summer, every year, 5 credits, ABCF grading
May be repeated once for credit*

HBA 563 Aspects of Animal Mechanics

An introduction to biomechanics. Covers freebody mechanics and kinetics as applied to vertebrate locomotion. Considers the structure and physiology of muscle as it relates to adaptations of the musculoskeletal system. This course is offered as both HBA 563 and DPA 563.

*Prerequisite: Introductory physics and biology or permission of instructor
Spring, odd years, 2 credits, ABCF grading*

HBA 564 Primate Evolution

The taxonomic relationships and evolutionary history of primates as documented by their fossil record and structural and chemical evidence. Emphasis on primates prior to the origin of the human lineage. This course is offered as ANT 564, DPA 564, and HBA 564.

Spring, even years, 4 credits, ABCF grading

HBA 565 Human Evolution

A survey of the fossil record of hominid evolution through the Pliocene and Pleistocene with emphasis on the morphological structure and function of locomotor, masticatory, and neural systems. Includes utilization of comparative anatomical material and extensive cast and slide collections. This course is offered as ANT 565, DPA 565, and HBA 565.

Fall, even years, 4 credits, ABCF grading

HBA 566 Studies in Functional Morphology

Introduction to the theory and methods of functional morphology. Various methods of analysis and the application of experimental techniques such as electromyography or bone strain analysis are discussed as they pertain to the understanding of the interaction between form and function. Special emphasis is placed on the analysis of human and nonhuman primate morphology, and the application of this analysis to interpretation of the fossil evidence for human and nonhuman primate evolution. This course is offered as both HBA 566 and DPA 566.

*Prerequisite: Permission of instructor
Summer, even years, 2 credits, ABCF grading*

HBA 582 Comparative Anatomy of Primates

The comparative anatomy of living primates. Laboratory dissection with emphasis on relating structural diversity to behavior and biomechanics. This course is offered as both HBA 582 and DPA 582.

Prerequisite: HBA 364 and previous course in human or vertebrate anatomy and permission of instructor

Spring, alternate years, 4 credits, ABCF grading

HBA 590 Projects in Anatomical Sciences

Individual laboratory projects closely supervised by faculty members to be carried out in staff research laboratories.

*Prerequisite: Permission of instructor
Fall and spring, 1-6 credits, S/U grading
May be repeated up to three times for credit*

HBA 656 Cell Biology

Introduction to the structural and functional organization of cells and tissues and to the way structure relates to function. Particular emphasis is placed on nuclear and chromosomal structure, signal transduction, protein translocation, the cytoskeleton, and the extracellular matrix. The interaction of cellular structures and components and their regulation is stressed as is the organization and interaction of cells in tissues. The course is comparative and includes examples of cells and tissues from vertebrates, invertebrates, plants, and prokaryotic systems.

*Prerequisite: Matriculation in graduate program or permission of instructor
Summer, 4 credits, ABCF grading*

HBA 690 Graduate Seminar

Seminars by graduate students on current literature in the areas of the anatomical sciences.

*Prerequisite: Permission of instructor
Fall and spring, 1 credit, S/U grading
May be repeated three times for credit*

HBA 692 Advanced Topics in Anatomical Sciences Literature

Tutorial readings in anatomical sciences with periodic conferences, reports, and examinations arranged with the instructor.

*Prerequisite: Permission of instructor
Fall and spring, 1-2 credits, S/U grading
May be repeated for credit*

HBA 695 Practicum in Teaching

Practical instruction in the teaching of anatomical sciences carried out under faculty supervision.

*Prerequisites: Permission of instructor
1-4 credits, S/U grading
May be repeated for credit*

HBA 699 Dissertation Research on Campus

Original investigation under supervision of thesis advisor and committee.

*Prerequisites: Advancement to candidacy (G5); permission of thesis advisor; major portion of research must take place on SB campus, at Cold Spring Harbor, or at Brookhaven National Lab
Fall, spring, and summer, 1-9 credits, S/U grading
May be repeated for credit*

HBA 700 Dissertation Research off Campus—Domestic

Prerequisites: Must be advanced to candidacy (G5); major portion of research will take place off campus, but in the U.S. and/or U.S. provinces (Brookhaven National Lab and Cold Spring Harbor Lab are considered on campus); all international students

must enroll in one of the graduate student insurance plans and should be advised by an International Advisor
Fall, spring, and summer, 1-9 credits, S/U grading
May be repeated for credit

HBA 701 Dissertation Research off Campus-International

Prerequisite: Must be advanced to candidacy (G5); major portion of research will take place outside of the U.S. and/or U.S. provinces; domestic students have the option of the health plan and may also enroll in MEDEX; international students who are in their home country are not covered by mandatory health plan and must contact the Insurance Office for the insurance charge to be removed; international students who are not in their home country are charged for the mandatory health insurance (if they are to be covered by another insurance plan they must file a waiver by the second week of classes; the charge will only be removed if other plan is deemed comparable); all international students must received clearance from an International Advisor
Fall, spring, and summer, 1-9 credits, S/U grading
May be repeated for credit

HBA 800 Full-Time Summer Research

Full-time laboratory research projects supervised by staff members.
Prerequisites: Permission of instructor and full-time graduate student status
0 credit; S/U grading
May be repeated

