Human Evolutionary Biology (EBH)

Major in Human Evolutionary Biology

Departments of Anthropology and Ecology and Evolution, College of Arts and Sciences

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Minors of particular interest to students majoring in Human Evolutionary Biology: Biology (BIO), China Studies (CNS), History (HIS), Japanese Studies (JNS), Judaic Studies (JDS), Korean Studies (KOR), Middle Eastern Studies (MES), Psychology (PSY)

Department Information - Human Evolutionary Biology

The major in Human Evolutionary Biology is offered jointly by the Departments of Anthropology and of Ecology and Evolution. It provides interdisciplinary training in the natural sciences and anthropology to examine how evolutionary forces shaped the human condition. Core courses provide a strong background in the natural sciences, mathematics, and statistics and an introduction to each of three subfields, which include human evolution and morphology, human and non-human primate genetics and genomics, and the evolutionary basis of behavior.

The subfield of human evolution and morphology aims at an understanding of the evolution of the human lineage and its precursors exploring the paleontological, morphological, and cultural transitions in our human ancestors. The emphasis of the human and non-human primate genetics and genomics track is to develop an understanding of the evolution of human variation exploring human genetic diversity and its underlying causes, as well as the phylogenetic relationships of human populations and primate relatives. This includes the basic genetics of humans, human population structure, prehistoric migration and genetic adaptation, and the comparative molecular evolution of the human genome and other primate genomes. The subfield of the evolutionary basis of behavior aims at an understanding of extant human and nonhuman primate behavior and psychology based on the principles of evolutionary theory. The field explores the variation in social systems and life histories and its underlying physiological mechanisms, ecological contexts, and evolutionary bases.

Majors are strongly encouraged to explore research opportunities, either in faculty laboratories or in field projects such as the Turkana Basin or Madagascar Field Schools. The major is suitable for students planning careers in the fields of medicine, dentistry, public health, allied health, biotechnology, and related academic fields such as biological anthropology, bioarchaeology, and evolutionary biology. Interested students should contact the director of the program for details.

Requirements for the Major in Human Evolutionary Biology

The major in Human Evolutionary Biology leads to the Bachelor of Science degree. Completion of the major requires a minimum of 60 credits. At least 21 credits must be upper division courses (300 level or higher). Students must complete a minimum of 31-32 credits in the Core Requirements (I., A-C) and a minimum of 28-29 credits in the Subfield Courses (II., A-C). Students can either sample broadly across all areas or focus on one of the three subfields. No more than 6-7 credits in the Subfields can be substituted from the area of Related Courses (II., D).

All major courses (including transfer credits) must be passed with a letter grade of C or higher. Courses with S/U grading and courses taken under the Pass/No Credit option may not be used to satisfy major requirements. EBH 495 and 496 do not count toward the major requirements.

I. Core Requirements

Students must complete a minimum of 31 credits from three areas including Biology (A), Related Fields (B), and Major Subfields (C).

A. Biology and Scientific Skills (11-12 credits)

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Fall 2017

• BIO 201 Fundamentals of Biology: Organisms to Ecosystems
• BIO 202 Fundamentals of Biology: Molecular and Cellular Biology
• BIO 204 Fundamentals of Scientific Inquiry in the Biological Sciences I or EBH 204 Research Skills
• BIO 354 Evolution

B. Courses Required in Related Fields (11 credits)

• CHE 131 General Chemistry IB or CHE 152 Molecular Science I (or CHE 129 with CHE 130 and MAT 123)
• MAT 125 Calculus A or MAT 131 Calculus or MAT 141 Honors Calculus I or MAT 171 Accelerated Single Variable Calculus or level 8 or 9

on the Mathematics Placement Examination. If students do not place into MAT 125 or higher on the basis of the math placement examination, MAT 123 is a required course for the major and MAT 125 can be substituted with AMS 151.
• EBH 230 Computer-Based Biostatistics

C. Courses Required from Major Subfields (9 credits)

• EBH 200 Evolution of Human Behavior
• ANP 201 Human Evolution
• EBH 302 Human Genetics

II. Subfield Courses

Students must complete a minimum of 28 credits in the Subfield Courses. Students may sample broadly across all subfields, taking classes from Sections A, B and C, or choose to specialize in only one of the three areas. BIO 205 (or BIO 207), EBH 391, EBH 401, EBH 447 (max. 2 credits), and EBH 487 (max. 3 credits) are not specific to one of the Subfields, but can be applied towards the major.

Courses in the Subfields may be supplemented by courses listed in section D (Related Courses), although only a maximum of 7 of these credits can be applied towards the major.

One of the classes in the Subfields must be a 400-level seminar chosen from ANP 404, ANP 405, ANP 406, ANP 410, ANT 417, ANT 418, ANT 419, ANT 420, EBH 401, or EBH 405.

All advanced Biology courses have one or more 200 level courses as a prerequisite. A grade of C or higher is required in each 200 level prerequisite in order to enroll in any 300 level Biology course.

Some of the courses in the Subfields may require additional prerequisites.

A. Human evolution and morphology

Courses in subfield A:

• ANP 300 Human Anatomy
• ANP 321 Primate Evolution
• ANP 404 Human Osteology
• ANP 405 Human Evolution in the Headlines
• ANP 410 Comparative Primate Anatomy
• ANT 104 Introduction to Archaeology
• ANT 268 Archaeology of Human Origins
• ANT 290 Science and Technology in Ancient Society
• ANT 357 The Agricultural Revolution
• ANT 358 Ways to Civilization
• ANT 373 Archaeology of Human Dispersal
• ANT 417 Primitive Technology
• ANT 418 Lithic Technology
• ANT 419 Zoarchaeology
• BIO 208 Cell, Brain, Mind
• BIO 344 Chordate Zoology
• EBH 316 The Evolution of the Human Brain

B. Human genetics and genomics

Courses in subfield B:

• BIO 203 Fundamentals of Biology: Cellular and Organ Physiology
• BIO 312 Bioinformatics and Computation Biology
• BIO 320 General Genetics or BIO 321 Introduction to Ecological Genetics and Genomics
- BIO 325 Animal Development
- BIO 327 Developmental Genetics Laboratory
- BIO 350 Darwinian Medicine
- BIO 367 Molecular Diversity Lab
- EBH 370 Advanced Human Genetics
- EBH 380 Genomics
- EBH 381 Genomics Laboratory

**C. Evolutionary bases of behavior**

Courses in subfield C:

- ANP 220 Controversies in Human Biology and Behavior
- ANT 377 Animal Tool Use
- BIO 328 Mammalian Physiology
- EBH 325 Evolution of Sex
- EBH 331 Hormones and Behavior
- EBH 359 Behavioral Ecology
- EBH 362 Evolution of Social Complexity
- EBH 405 Life History and Development
- PSY 356 Physiological Psychology
- PSY 357 Animal Learning

**D. Related courses**

- ANP 304 Ecology: Linking People and Nature (with emphasis on the Turkana Basin)
- ANP 305 Earth and Life Through Time: Vertebrate Paleontology and Paleoecology (with emphasis on the Turkana Basin)
- ANP 306 Human Evolution (and evidence from the Turkana Basin)
- ANP 307 Comparing Ecosystems in Madagascar
- ANP 308 Paleoanthropological Field Methods
- ANP 310 Environments, Ecosystems and Evolution: Evidence from the Turkana Basin
- ANP 326 Lemurs of Madagascar
- ANP 350 Methods Studying Primates
- ANP 360 Primate Conservation
- ANP 406 Pseudoscience and Anthropology
- ANT 215 Climate and Culture
- ANT 307 Prehistoric Archaeology of Africa (with emphasis on the Turkana Basin)
- ANT 321 Archaeological Field Methods
- ANT 410 Ethnobotany and Paleoethnobotany
- ANT 420 Environmental Analysis Using Remote Sensing and Geographic Information Systems
- BIO 351 Ecology
- BIO 352 Ecological Laboratory
- GEO 303 Sedimentary Geology and Geochronology (with emphasis on the Turkana Basin)

**E. Double major in Biology and Human Evolutionary Biology**

For students electing a double major in Biology and Human Evolutionary Biology 12 credits (4 subfield courses) must be non-overlapping with Biology and chosen from subfields A and C:

- ANP 220 Controversies in Human Biology and Behavior
- ANP 300 Human Anatomy
- ANP 321 Primate Evolution
- ANP 404 Human Osteology
- ANP 405 Human Evolution in the Headlines
- ANP 410 Comparative Primate Anatomy
- ANT 104 Introduction to Archaeology
- ANT 268 Archaeology of Human Origins
- ANT 290 Science and Technology in Ancient Society
- ANT 357 The Agricultural Revolution
- ANT 358 Ways to Civilization
- ANT 373 Archaeology of Human Dispersal
- ANT 377 Animal Tool Use
- ANT 417 Primitive Technology
- ANT 418 Lithic Technology
- ANT 419 Zooarchaeology
• EBH 325 Evolution of Sex
• EBH 331 Hormones and Behavior
• EBH 362 Evolution of Social Complexity
• EBH 405 Life History and Development
• PSY 356 Physiological Psychology
• PSY 357 Animal Learning

III. Upper-Division Writing Requirement

Human Evolutionary Biology students are required to either take one of the elective courses of the major satisfying the WRTD requirement or register for the 0-credit EBH 459 Write Effectively in Human Evolutionary Biology. EBH 459 has to be taken in conjunction with an upper-division elective course in the major (including Reading or Research courses). Students must inform the instructor of the course in advance of their plan to co-register for EBH 459 to satisfy the WRTD requirement. Students must earn a grade of ‘S’ in EBH 459 to satisfy the WRTD requirement. EBH 459 also satisfies the Stony Brook Curriculum learning objective WRTD. Students completing the DEC requirements may choose to submit a paper written for a 300-level or higher course (including Reading or Research courses) without registering for EBH 459. The paper must be of appropriate length and format and must have been deemed satisfactory by the instructor (graded C or higher). Students who wish to use a paper should present the necessary form to the course instructor and obtain signatures on the form and the paper. The form and the original paper must then be submitted to the director of the program. Students who wish to use this option must consult with the director of the program to ensure that their plan for completing the Upper Division Writing Requirement is consistent with university graduation requirements for General Education.

Students should consult with the department advisor to ensure that their plan for completing the Upper Division Writing Requirement is consistent with university graduation requirements for General Education. Students completing the Stony Brook Curriculum (SBC) must complete a course that satisfies the "Write Effectively within One's Discipline" (WRTD) learning objective to graduate. The Upper Division Writing Requirement is consistent in most cases with the SBC learning outcomes for WRTD.

Honors Program in Human Evolutionary Biology

Graduation with honors in Human Evolutionary Biology requires both of the following:

1. A cumulative grade point average of 3.50 or higher in all courses for the major.
2. Completion of an honors thesis based on a one-year independent research project (EBH 495 and 496) under the direction of a faculty member written in the form of a scientific report (20 pages or more). The completed thesis must be approved by a thesis committee.

A student interested in becoming a candidate for honors should, after asking a faculty member to be a sponsor, submit a proposal indicating the topic and procedure of the planned research to the director of the program. The submission should include a supporting statement by the supervising faculty member and the names and approval of two faculty committee members, one of them from a department different from that of the research sponsor. This must ordinarily be done several weeks prior to the beginning of the student's senior year. The student must present a copy of the finished thesis to each member of the thesis committee for their approval at least 14 days before the date of graduation.

Sample Course Sequence for the Major in Human Evolutionary Biology

Stony Brook University: www.stonybrook.edu/ugbulletin
A course planning guide for this major may be found here. The major course planning guides are not part of the official Undergraduate Bulletin, and are only updated periodically for use as an advising tool. The Undergraduate Bulletin supersedes any errors or omissions in the major course planning guides.

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EBH Faculty

Faculty information for this program can be found at http://www.stonybrook.edu/commcms/ecoenv/people/index.html and http://www.stonybrook.edu/commcms/anthropology/faculty-and-staff/
EBH
Human Evolutionary Biology

EBH 200: The Evolution of Human Behavior
An examination of how evolutionary theory informs our understanding of human behavior, psychology and culture. Topics include assessing what behavioral traits are unique to humans and critical to our ecological expansion. Course will provide a synthetic overview of current topics in human behavioral ecology, evolutionary psychology, and gene-culture coevolution. Formerly offered as ANP 200. Not for credit in addition to ANP 200.
Prerequisite: ANP 120 or BIO 201 or BIO 202
DEC: F
SBC: SBS+
3 credits

EBH 204: Research Skills
Gives students an understanding of and experience with the basic research skills that are needed to do biological and anthropological research. The course includes practical skills in reading and understanding anthropological and biological scientific literature, presentation skills, making scientific posters in biology and anthropology, writing complex arguments, and database management. The accompanying lab section introduces the software that is used to acquire these skills and provides students with practical experience in using them with respect to their own research interests. Formerly offered as ANP 204. Not for credit in addition to ANP 204.
Prerequisite: one course chosen from the following: ANP 120, ANT 104, BIO 201, BIO 202, BIO 203
SBC: ESI, SPK
3 credits

EBH 230: Computer-based Biostatistics
An introductory course in statistical analyses, specifically focusing on techniques relevant to research designs in the biological and anthropological sciences. The accompanying lab section will provide students with practical experience in using statistical software to run analyses. Formerly offered as ANP 230. Not for credit in addition to ANP 230.
Prerequisite: satisfaction of entry skill in mathematics requirement or level 2+ on the mathematics placement examination
DEC: C
SBC: QPS

EBH 302: Human Genetics
An introduction to human genetics. Topics include the principles of inheritance, physical properties of DNA and proteins, molecular techniques for studying DNA, the genetic basis of mutations, using DNA to study ancient human history and human evolution, forensic applications of DNA fingerprinting, and the genetic basis of immunity and cancer. Human genetic diseases are discussed and an introduction is given to human chromosome maps, the Human Genome Project, and methods for mapping disease mutations. Formerly offered as BIO 302. Not for credit in addition to BIO 302.
Prerequisite: C or higher in BIO 201 and BIO 202
3 credits

EBH 316: The Evolution of the Human Brain
Provides a detailed overview of how the human brain has evolved, placing it in a broader primate, mammalian, and vertebrate context. Emphasizing the interaction between brain and behavior, the course will detail how adaptation has shaped the brain across millions of years of evolution. The central theme throughout the course will be to what extent we can consider the human brain as 'special' compared with other species, and, if so, what sets it apart. Formerly offered as ANP 316. Not for credit in addition to ANP 316.
Prerequisite: ANP 120 or any Biology course
DEC: E
SBC: STEM+
3 credits

EBH 325: Evolution of Sex
Focuses on the ultimate (evolutionary) and proximate (mechanistic) explanations for sex, both as it relates to reproduction, and as it relates to the origin of male and female phenotypes. Unit 1 (Ultimate Aspects of Sex) will review hypotheses related to recombination and anisogamy (different sized gametes), continuing on to sexual selection theory, which is the theoretical backbone for understanding sex differences in morphology and behavior. In Unit 2 (Proximate Aspects of Sex), we take a step back and discuss the genetic and hormonal mechanisms governing sex-typical development. Here we will also address alternative pathways of sexual differentiation, the physiological underpinnings of sexual motivation and sexual response, and puberty. Finally, in Unit 3 (Human Sexuality), we will take these two approaches and apply them to questions of human sexuality, addressing controversial topics such as mate choice, sexuality, sexual coercion, as well as more curious topics such as the evolution of the female orgasm and external testes.
Prerequisite: ANP 120 or EBH 200 (previously ANP 200)
SBC: SPK, STEM+
3 credits

EBH 331: Hormones and Behavior
Examines the relationship between hormones and behavior, both in terms of how hormones affect behavior, and how behavioral interactions can alter hormones. Because hormonal structure and function is remarkably conserved across vertebrates, we will take a comparative approach, exploring data from a variety of vertebrate model systems, while maintaining a keen eye on how such models inform of us about hormones and behavior in humans and non-human primates. Topics to be explored include sex determination, reproductive behavior, personality, dominance and aggression, biological rhythms, the stress response, and the role of endocrine disrupting chemicals in behavior. Formerly offered as ANP 331. Not for credit in addition to ANP 331.
Prerequisite: one of the following courses: ANP 120, BIO 201, BIO 202, BIO 203, PSY 250
SBC: STEM+
3 credits

EBH 359: Behavioral Ecology
A consideration of the patterns of animal behavior in relation to ecological circumstances and evolutionary history. Vertebrate examples are emphasized. Formerly offered as ANP 359 and BIO 359. Not for credit in addition to ANP 359 or BIO 359.
Prerequisite: BIO 201
DEC: E
SBC: STEM+
3 credits

EBH 362: Evolution of Social Complexity
An in-depth examination of how and why social animals establish and maintain relationships with one another, especially in large and fragmented societies. Applying the principles of evolutionary biology and behavioral ecology, this course explores: group structure and stability; conflicts and coalitions; theory of mind and social learning; and culture and communication. Current research on group-living mammals, particularly non-human primates, and human populations is
emphasized. Formerly offered as ANP 362. Not for credit in addition to ANP 362.

Prerequisite: ANP 120 or BIO 201

DEC: E
SBC: STEM+

EBH 370: Advanced Human Genetics
An advanced course in human genetics. Topics include genotype/phenotype associations, the genetic architecture of disease/phenotypes, human population genetics, methylation, and ancient DNA. This class is meant to build on major concepts in human genetic research introduced in other courses. The course will emphasize hands-on engagement with genetic data and critical reading of scientific papers. Computer laboratory analysis/assignments will make up a major component of this class. Students will be evaluated based on computer assignments and a final group research project. EBH majors will have priority to register. Formerly offered also as BIO 303. Not for credit in addition to BIO 303.

Prerequisite: C or better in either EBH 302 (formerly BIO 302) or BIO 320 or EBH 380 (formerly BIO 304)

SBC: TECH

3 credits

EBH 380: Genomics
An introduction to the rapidly developing field of genomics. Initial lectures provide a foundation in genomic structure across the tree of life (prokaryote and eukaryote). This is followed by examination of specific forces that cause variation in genomic content both within and between species. We then discuss how to sequence, assemble and analyze genomes. Finally we focus on the architecture and evolution of the human genome and compare it to non-human primate and ancient hominin genomes, and examine how the study of non-human primates can aid human health. Formerly offered also as BIO 304. Not for credit in addition to BIO 304.

Prerequisite: C or higher in both BIO 201 and BIO 202
Advisory Prerequisite: BIO 211 or EBH 230; EBH 302 (formerly BIO 302) or BIO 312

3 credits

EBH 381: Genomics Laboratory
Provides a computer lab-based introduction to comparative genomics, molecular evolutionary analysis, and next generation sequencing (NGS) data and analysis. Activities will include familiarization with both web-based and command-line tools for analyzing genomic data and summarizing/visualizing results.

Lectures and background reading will provide an introduction to basic principles of genomics to inform computer-based hands-on activities. Students will be evaluated based on computer lab assignments, as well as a final group project that applies learned concepts and approaches to a novel research question. Formerly offered as BIO 305. Not for credit in addition to BIO 305.

Prerequisite: C or higher in either EBH 302 (formerly BIO 302) or EBH 380 (formerly BIO 304)

SBC: TECH

3 credits

EBH 391: Topics in Human Evolutionary Biology
Discussion of a topic of current interest in Human Evolutionary Biology. May be repeated as the topic changes.

Prerequisite: ANP 200 or ANP 201 or EBH 302 (formerly BIO 302)
Advisory prerequisite: One other EBH or ANP course

3 credits

EBH 401: Seminar in Evolutionary Biology of Humans
Research and discussion of selected topics in evolutionary biology of humans. May be repeated as the topic changes.

Prerequisite: permission of the instructor

3 credits

EBH 405: Life History and Development
Uses life history theory as a framework for exploring the biological processes of the primate and human life cycle (development, reproduction, senescence). We will first construct a solid foundation of life history theory and the principle of energetic tradeoffs. We will then use this foundation to address why species and individuals vary in the pattern and tempo of development, reproduction, and senescence. In the process, we will address questions such as: Why do humans invest so much in offspring and what factors influence individual differences in parental investment? What is the function of menopause? What is the purpose of a prolonged juvenile period (i.e., childhood)? And when and why should the pace of development accelerate or slow down? We will examine these questions from a comparative perspective, drawing not just on studies focusing on humans, but also on those focusing on nonhuman primates and other mammals.

Prerequisite: ANP 120 or EBH 200 (previously ANP 200)

SBC: STEM+

3 credits

EBH 444: Experiential Learning
This course is designed for students who engage in a substantial, structured experiential learning activity in conjunction with another class. Experiential learning occurs when knowledge acquired through formal learning and past experience are applied to a "real-world" setting or problem to create new knowledge through a process of reflection, critical analysis, feedback and synthesis. Beyond-the-classroom experiences that support experiential learning may include: service learning, mentored research, field work, or an internship.

Prerequisite: WRT 102 or equivalent; permission of the instructor and approval of the EXP+ contract (http://sb.cc.stonybrook.edu/bulletin/current/policiesandregulations/degree_requirements/EXPplus.php)

SBC: EXP+

0 credit, S/U grading

EBH 447: Readings in Human Evolutionary Biology
Individual advanced readings on selected topics in Human Evolutionary Biology. May be repeated up to a limit of 6 credits, but not more than two credits may be used toward Human Evolutionary Biology major requirements.

Prerequisite: Permission of instructor and department

1-2 credits, S/U grading

EBH 458: Speak Effectively Before an Audience
A zero credit course that may be taken in conjunction with any EBH course that provides opportunity to achieve the learning outcomes of the Stony Brook Curriculum's SPK learning objective.

Pre- or corequisite: WRT 102 or equivalent; permission of the instructor

SBC: SPK

0 credit, S/U grading

EBH 459: Write Effectively in Human Evolutionary Biology
A zero credit course that may be taken in conjunction with any 300- or 400-level EBH course, with permission of the instructor. The course provides opportunity to practice the skills and techniques of effective academic writing and satisfies the learning outcomes of the Stony Brook Curriculum's WRTD learning objective.
Prerequisite: WRT 102; permission of the instructor

SBC: WRTD
0 credit, S/U grading

**EBH 475: Undergraduate Teaching Practicum I**
Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course. Not for Human Evolutionary Biology Major credit

Prerequisite: U3 or U4 standing; Human Evolutionary Biology Major; 3.00 g.p.a.; permission of instructor and department

SBC: EXP+
3 credits, S/U grading

**EBH 476: Undergraduate Teaching Practicum II**
Work with a faculty member as an assistant in one of the faculty member's regularly scheduled classes. Students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. The course in which the student is permitted to work as a teaching assistant must be different from the course in which he or she previously served. Not for Human Evolutionary Biology Major credit.

Prerequisite: U3 or U4 standing; Human Evolutionary Biology Major; 3.00 g.p.a.; permission of instructor and department

SBC: EXP+
3 credits, S/U grading

**EBH 478: Independent Research in Human Evolutionary Biology**
Independent research projects carried out by upper-division students. The student must propose the research project, carry it out, analyze the data, and submit the results in a written form acceptable to the sponsor. May be repeated up to a limit of six credits, but no more than three credits of research may be used for Human Evolutionary Biology Major requirements.

Prerequisite: 15 credits in Human Evolutionary Biology; permission of instructor

SBC: EXP+
0-6 credits, S/U grading

**EBH 495: Senior Honors Project in Human Evolutionary Biology**
First course of a two-semester project for EBH majors who are candidates for the degree with honors. Arranged in consultation with the director of undergraduate studies, the project involves independent readings or research and the writing of a paper under the close supervision of an appropriate faculty member on a suitable topic selected by the student. Students enrolled in EBH 495 are obliged to complete EBH 496 the following semester. Students receive only one grade upon completion of the sequence EBH 495-496.

Prerequisite: admission to the Human Evolutionary Biology honors program

3 credits

**EBH 496: Senior Honors Project in Human Evolutionary Biology**
Second course of a two-semester project for EBH majors who are candidates for the degree with honors. Arranged in consultation with the director of undergraduate studies, the project involves independent readings or research and the writing of a paper under the close supervision of an appropriate faculty member on a suitable topic selected by the student. Students receive only one grade upon completion of the sequence EBH 495-496.

Prerequisite: EBH 495 and admission to the EBH honors program

SBC: EXP+
3 credits