



*Handbook for Majors*

**2022 – 2023**

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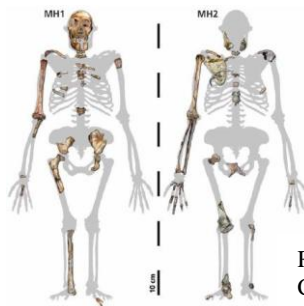
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Originally published in 1993. Updated and reprinted annually.

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Research from the Churchill lab

## **INTRODUCTION**

In Evolutionary Anthropology, we study the physical, genetic and behavioral origins of the human species. To better understand

the biology of who we are as a species, we integrate techniques and knowledge from a wide variety of disciplines. The study of fossils, for example, enables us to reconstruct the evolutionary history of the primate lineage, including humans. To aid in the interpretation of fossils, we need a broad knowledge base in anatomy, physiology, ecology and behavior. Functional anatomy helps us understand how an animal may have moved through its environment or what it ate. The behavior, ecology, physiology of modern primates is studied not only to help piece together our past, but also to understand modern human and primate behavior, the interplay between environments and social structure, and the evolution of cooperation, competition and cognition. Genetics, disease ecology, energetics, forensics and many other topics are also covered within Evolutionary Anthropology. The common theme throughout these subjects is the use of evolutionary theory and biology to piece together just what it is that makes us human and help us better understand how our species fits into the larger world.

Students who major in Evolutionary Anthropology (EvAnth) have a variety of interests and long-term goals. Some of our alumni go on to graduate study in paleontology, functional morphology, behavioral ecology, cognitive studies or conservation. Many others pursue a professional education in the health sciences (medical, dental and veterinary school, nursing, physical therapy, or physician's assistant programs) or work in health related fields such as health policy, global health, and forensics. Our alumni have become teachers, researchers, and doctors among many other professions. We strive to make our major one that prepares students for any number of science-related careers. For more descriptions of job opportunities for students with bachelors and masters degrees in evolutionary anthropology, see the careers website put together by The American Association of Physical Anthropologists (<http://physanth.org/career>).

Evolutionary Anthropology is a part of the Natural Science Division in the Trinity College of Arts and Sciences.

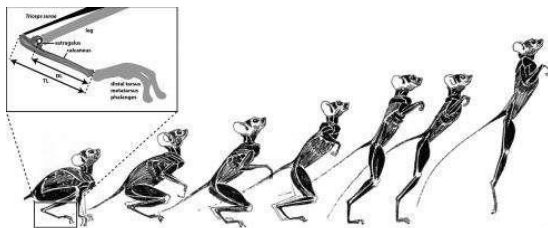
## **Becoming an EvAnth Major**

During your sophomore year, working with your pre-major advisor, you will develop a long-range plan of academic study and

declare a major. Detailed instructions are available at the Advising Center web site: <https://advising.duke.edu/joining-a-major> . If you are already a major in another department and wish to add EvAnth or change your major, you can do so online (more info here: <https://trinity.duke.edu/undergraduate/academic-policies/change-major-minor-certificate> ). After declaring your major, we will contact you and ask your preference for an advisor. We will do our best to match you with your preferred advisor, but naturally that is not always possible. Advisors and their research interests are listed on pages 15 - 16 of this booklet.

To aid you in developing your academic plan, **we have included a worksheet at the end of this booklet.** As you put together your long-range plan, keep in mind that some advanced courses are offered only once a year and others even less frequently. The DUS can help you assess when particular courses are most likely to be offered. Also remember that some courses have prerequisites that must be met before registering for the course (e.g., most 500-level courses require at least one 200 or 300-level course in the same area of study). It is a good idea to complete both of the 200-300 level core requirements – one in anatomy/paleontology, the other in behavior, ecology or cognition – early in your academic career. This will prepare you for most 400 and 500-level courses which are designed to be taken in the junior or senior year.

We encourage you to take advantage of the opportunity to participate in faculty research projects and independent study projects. See the DUS for help in getting started in a research lab.



Research from the Boyer lab  
(image adapted from Jonathan Kingdon)

## Major Requirements

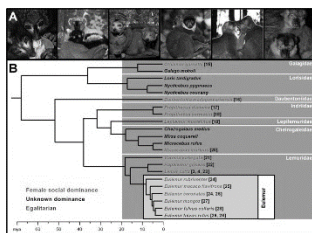
The EvAnth major offers two degree tracks: the Bachelor of Arts (A.B.) and the Bachelor of Science (B.S). Within either track, you can declare a concentration in “Anatomy and Paleoanthropology” or “Behavior, Ecology and Cognition” or “Human Biology”. If you would like to have two concentrations, the courses used for each should not overlap. We also offer a minor. Requirements for each track and concentration are provided on pages 6-9.

The B.S. degree is the best option for students intending to pursue research or professional careers in evolutionary anthropology (also referred to as physical anthropology or biological anthropology), the health professions and other science-related careers. The A.B. degree is the more general liberal arts major. Although both majors require a similar number of courses, the B.S. has a greater number of pre- and co-requisites that reflect a greater breadth in the natural sciences. Concentrations (see page 9) are the same for both tracks.

In both degrees there is the opportunity to take relevant courses in other departments (e.g., Biology, Chemistry, Psychology and Neuroscience). There is a list of pre-approved electives from other departments available on page 29. Students may also petition their advisors and the Director of Undergraduate Studies (DUS), in writing, to have other courses count toward their electives (this is especially encouraged for one-time special topics courses that might be of particular relevance to EvAnth).

Specific requirements are continued on the following page.

*\* Note - the university has put together a great website with lists of university requirements, resources and commonly used forms (e.g. transfer credit requests: <https://trinity.duke.edu/undergraduate/academic-policies> or search “Duke T-Reqs”*



Research from the Drea lab

**B.S. degree in Evolutionary Anthropology**

[worksheet can be found on the back of the handbook]

Prerequisites: EvAnth 101 or 101D

Co- requisites: Biology 201L and 202L or Bio 203L

Chemistry 101DL (or equivalent\*) and 201DL

Math 111L (or equivalent\*)

Physics 141L (or equivalent\*)

Introductory level Statistics (typically Stats 101 or 102 or Psych 201)

*\*note that several of the co-requisites can be satisfied by AP credits, but these must be posted appropriately on your Duke transcript.*

**Major requirements:** Eight courses numbered 200 or above are required (not including the above pre- and co-requisites) of which one course must be an EvAnth capstone course (this currently includes all 400 and 500-level courses within the department). One course is required in each of the following areas 1) human/primate paleontology or anatomy and 2) primate behavior, ecology or cognition (see pg. 8). At least 5 courses must be taken in Evolutionary Anthropology; up to three courses may be taken in related departments based on a pre-approved list of electives or pre-approval by the DUS. One course must be a lab/field experience in EvAnth (research independent studies may count toward this requirement). No more than two independent studies can be used toward the 8 courses.

### **A.B. degree in Evolutionary Anthropology**

*Prerequisites:* EvAnth 101 or 101D

*Co- requisite:* Biology 202L or 203L

**Major requirements:** Nine courses are required (not including the above pre- and co-requisites) of which eight courses must be 200-level or above and one course must be an EvAnth capstone course (this currently includes all 400 and 500-level courses within the department). One course is required in each of the following areas 1) human/primate paleontology or anatomy and 2) primate behavior, ecology and/or cognition (see pg. 8). At least 5 courses must be taken in Evolutionary Anthropology; up to four courses may be taken in related departments based on a pre-approved list of electives (see pg. 29) or pre-approval by the DUS. One course must be a lab/field experience in EvAnth (research independent study may count toward this requirement). Note that no more than 2 independent studies may be counted toward the 9 courses.

### **The Minor in EvAnth**

Requirements: EvAnth 101 or 101D; one course in from the Anatomy and Paleoanthropology area (see below); one course the Behavior, Ecology and Cognition area (see below) and at least two elective courses numbered 200 or above in EvAnth for a total of 5 courses. Note that all five courses must be in EvAnth.

### **AREA COURSES**

The following courses qualify for the area requirements for both majors and minors (other courses may be approved by the DUS as appropriate). Note that it is recommended that students take these courses early in the academic career to prepare for more advanced courses during their junior and senior years.

#### **Anatomy and Paleoanthropology**

EvAnth 220, 221S, 230, 231L, 235L, 330, 333L, 334L, 336S,

#### **Behavior, Ecology, and Cognition:**

EvAnth 212FS, 246, 253, 257, 260, 310, 341, 344L, 347D, 359S, 363S, 385D

### **Areas of Concentration for the Evolutionary Anthropology**

#### **Major:**

Students may elect to complete courses representing an in-depth study of a given area within Evolutionary Anthropology. These areas include: "Anatomy & Paleoanthropology" and "Behavior, Ecology & Cognition" and "Human Biology". Students who choose to pursue a concentration must complete all of the requirements for the AB or the BS and the following requirements (the courses listed below would count toward 3 of the 5 required EvAnth courses). Note that students can petition to use special topics courses (EvAnth 390, 490 or 590) as appropriate for a given concentration.

#### **Anatomy and Paleoanthropology**

Three of the following courses: Evolutionary Anthropology 215S, 220, 221S, 230, 231L, 235L, 330, 333L, 334L, 336S, 520S, 522, 530, 582S, 588S, 570S

#### **Behavior, Ecology, and Cognition:**

Three of the following courses: EvAnth 212FS, 246, 253, 257, 260, 310, 341, 344L, 347D, 359S, 363S, 385D, 510SL, 546S, 560S, 561S, 570S

#### **Human Biology**

Three of the following courses: EvAnth 221S, 230, 231L, 257, 260, 285, 318, 330, 333L, 334L, 336S, 341D, 530, 561S, 570S.

### **GRADUATION WITH DISTINCTION**



'Graduation with Distinction' is how Duke recognizes those students who dedicate their senior year to an in-depth mentored research project and who write up a substantial thesis paper. To qualify students:

- Must have a GPA of 3.0 overall and 3.5 for EvAnth courses (does not include co-requisites)
- Register for Independent Study 393 and/or EvAnth 495S during their senior year (495S in the fall, 393 in the spring)
- Outline a project no later than the first week of classes of your senior year with the advice and consent of your thesis advisor
- Conduct original research, typically over the course of two semesters, and write up a thesis (typically 30-40 pages)
- Defend your thesis to a committee of 3 faculty members.

Students must submit a brief (one- to two-paragraph) description of the honors project, the names of the faculty comprising the examination committee, and the signature of the student's faculty mentor to the DUS by the end of the first week of classes of the student's next-to-last semester (e.g., fall semester for May graduates) for approval. The examination committee consists of three faculty members, at least two of whom are in Evolutionary Anthropology. Students must conduct research and prepare their papers as part of a formal independent study course (exceptions can be approved by the DUS). It is expected that projects will be substantial and take place over the course of the academic year, with frequent feedback from the student's mentor. The student's committee should be given a progress report at the end of the first semester and kept updated as the project nears completion. Note that the completed thesis must be turned in to committee members for review at least one week prior to the examination date. The thesis defense must be successfully completed before the last day of classes and typically lasts about an hour.

For those who are planning to graduate with distinction, we strongly recommend that you take EvAnth 495S: Advanced Research in Evolutionary Anthropology in place of EvAnth 393 in the fall semester. This course adds a one hour per week seminar to the usual requirements of an independent study to review hypothesis testing, funding opportunities, methods, data analysis, and initiating a draft of the thesis. In the spring semester of your senior year, GwD students sign up for EvAnth 393 (Research Independent Study). Feel free to stop by the DUS office for more details.

## GETTING ADVICE

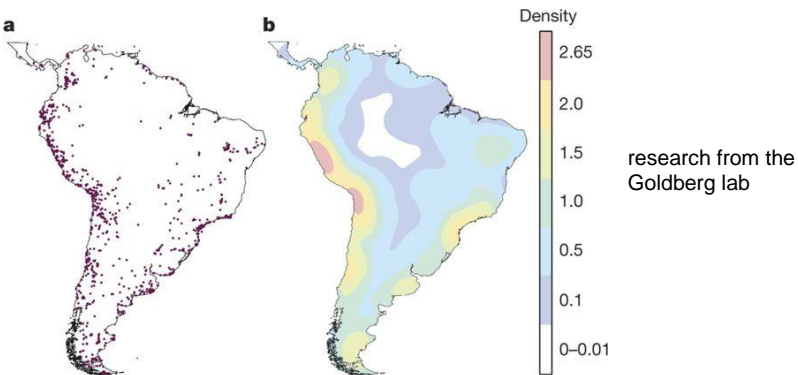
The Director of Undergraduate Studies (DUS) is always available to discuss courses and academic plans with pre-major students as well as majors. After declaring your major, you will be assigned an academic advisor from among the faculty in our department (see pages 15 – 16). We will try to assign you to the faculty member of your choice, coinciding with your interests. However, this may not always be possible. Note that all faculty members are happy to discuss academic interests and careers with students.

Students typically meet with their academic advisor at least once a semester in order to be cleared for registration (this is university policy). These meetings are important not only to discuss your plan for the upcoming semester, but also your long-range goals and how to get the most from your time at Duke. Your advisor can also be a help in finding a research mentor for you in the department. Advisors manage their own schedules and can be contacted directly to set up a meeting time.

**DUS: Dr. Leslie Digby**

**Office: 08A Biological Sciences (basement level)**

**E-mail: [ldigby@duke.edu](mailto:ldigby@duke.edu)**



## **OPPORTUNITIES OUTSIDE THE CLASSROOM**

Duke and the department offer numerous opportunities for discussion and research in Evolutionary Anthropology.

Seminars - The department offers a weekly seminar series (EATS) featuring leading researchers in the field as well as research updates from our faculty and graduate students. Attending these seminars will give you the opportunity to get greater insight into the research of faculty members and is a great chance to interact on a more personal level with all members of the department. Seminar announcements are generally posted around the Biological Sciences Building and on the Evolutionary Anthropology website.

Labs - Opportunities exist to work in a variety of faculty labs including studying biomechanics, behavior, cognition, energetics, paleontology, disease ecology, genetics, and behavioral endocrinology. Contact possible faculty mentors directly and arrange to talk about your shared interests and any possible openings in their labs. Note that work study positions in the department and elsewhere at the university are generally posted on Duke List (<http://dukelist.duke.edu/>) or MUSER. Feel free to contact the DUS for help in identifying labs that match your interests.

The Duke Lemur Center - The Duke Lemur Center contains the world's largest collection of captive prosimian/strepsirrhine primates. Many species are free-ranging in natural habitat enclosures during the summer months. Opportunities exist for research in primate behavior, functional morphology, physiology, reproduction, disease ecology and genetics. To get involved in research at the DLC, it's best to contact faculty members who work at the center to see if they are looking for volunteers or independent study students. If you are interested in simply volunteering at the center (as a tour guide or as an assistant to the animal technicians) contact the Center at (919) 489-3364. Note that the Lemur Center also administers the DLC Museum of Natural Sciences (previously the Division of Fossil Primates; located on Broad Street). Potential opportunities exist for working with their fossil collection (call 919 416-8584).

Field work - Many faculty members conduct field work around the world. Opportunities exist to join them during fossil digs or behavioral ecology projects Contact the DUS for more information.



**EvAnth Teaching Faculty:** *\*Note – there are post-docs and secondary faculty who can also serve as research mentors.*

**BRIAN HARE** (Chair/Advisor) Evolution of cognitive abilities, comparative psychology of apes (esp. humans, chimps and bonobos), dogs and other mammals, Behavioral biology, cooperation and competition

**SUSAN ALBERTS** (Advisor-on sabbatical 2022-23) Primate behavior, ecology, hormones, and genetics

**DOUG BOYER** (Advisor) Ecological transitions in primate evolution, comparative / functional anatomy of primates, reconstruction of early Cenozoic N. American ecology, new computation methods for comparative anatomy

**STEVEN CHURCHILL** (Advisor) Functional morphology of the hominin postcranial skeleton, and adaptive and technological changes in the later stages of human evolution: Early Homo, Neanderthals, early modern humans, and extant hunter-gatherers.

**LESLIE J. DIGBY** (Advisor; Director of Undergraduate Studies) Evolution of social behavior, methods in behavior & ecology, 3D use of space, behavioral thermoregulation; marmosets/tamarins, lemurs

**CHRISTINE DREA** (Advisor) Social behavior of complex, group-living mammals, primate and carnivore reproductive behavior, social, cognitive, and behavioral development; communication; behavioral ecology

**JOSEPH FELDBLUM** (not an advisor) Evolution of social relationships, social network structure, and reproductive strategies in chimpanzees and other mammals

**AMY GOLDBERG** (Advisor) Population genetics, computational archaeology, mathematical modeling, adaptation to infectious disease

**ELAINE GUEVARA** (Advisor) Aging and life history, sensory ecology, epigenetics, conservation, lemurs

**RICHARD KAY** (Advisor – on sabbatical 2022-23) Primate phylogeny, anthropoid origins, tertiary paleontology of the Neotropics, cranial and dental adaptations of arboreal mammals

**CHARLIE NUNN** (Advisor; Dir. of Graduate Studies) Disease ecology in humans and other primates, phylogenetic methods, evolution of sleep

**HERMAN PONTZER** (Advisor) Human and ape physiology and evolution, energy expenditure, life history, metabolic health, locomotion

**DANIEL SCHMITT** (Advisor) Primate locomotor biomechanics, human health and the evolution of primate locomotor behavior

**KEEGAN SELIG** (not an advisor) Functional dental morphology of primates and other mammals, dental development, dietary reconstruction, dental disease, early mammals

**JENNY TUNG** (Advisor – on leave until 2024) Primate evolutionary genetics and genomics, primate hybridization, baboons, rhesus monkeys

**ANGEL ZEININGER** (Animal Locomotion Lab) Biomechanics, anatomy, locomotion

**Other faculty, research scientists, post-docs and adjuncts in EvAnth.** These faculty (some of whom may not be housed in the department) may be research mentors or can serve as useful contacts in other departments and institutions.

**RICH BERGL** (NC Zoo) Conservation

**MATTHEW BORTHS** (Duke Lemur Center – Division of Fossil Primates) Paleontology; evolution of African mammals

**ROSIE CANIZARES** (Duke Physical Therapy); advisor for pre-physical therapy students

**KEN GLANDER** (Emeritus) Socioecology of primates, plant-animal interactions, morphometric variation, thermoregulation, howling monkeys; Costa Rica, lemurs

**JULIANN HORVATH ROTH** (Director, Genomics and Microbiology Research Lab – NC Museum of Natural Sciences) Primate genomics

**ANNE PUSEY** (Emerita) Primate behavioral ecology, evolution of social structure, function of social relationships, long-term study of the chimpanzees of Gombe, Tanzania

**CHRISTINE E. WALL** (Emerita) Evolutionary morphology of the primate skull and biomechanics

**BLYTHE A. WILLIAMS** (Emerita) Primate paleontology, primate systematics, functional morphology, ecological adaptations of living and fossil primates

## **COURSES**

Key for Modes of Inquiry & Areas of Knowledge

<b>NS</b>	Natural Science
<b>STS</b>	Science, Technology, & Society
<b>CCI</b>	Cross-Cultural Inquiry
<b>CZ</b>	Civilization
<b>SS</b>	Social Sciences
<b>R</b>	Research
<b>W</b>	Writing
<b>QS</b>	Quantitative Studies
<b>EI</b>	Ethical Inquiry

### **Recommended course sequences**

Note that while most 300-level courses may only list introductory EvAnth or Biology as a pre-requisite, many of these classes benefit from additional experience in 200-level courses. Here are some examples:

Before taking EvAnth 333L – The Human Body, it's best to get some experience in anatomy first. Good choices right after the introductory course include Primate Anatomy or Bodies of Evidence (Forensics). Human Anatomy and Physiology or Human Osteology are also at the 300-level and benefit from prior experience in anatomy, but also make for strong lead-in courses for Human Body.

Before taking EvAnth 341D: Primate Sexuality or EvAnth 344L Primate Field Biology, it's best to take Primate Ecology or Sociobiology first.

### **Check with your advisor about other courses and recommended course sequences.**

Remember that we are a multidisciplinary department and we encourage our majors to take related courses from outside the major. Pre-approved courses from other departments are listed on p. 30.

## **089S -- First-Year Seminar**

*Prerequisites:* None. Topics vary

## **101 -- Introduction to Evolutionary Anthropology (NS, STS)**

*Prerequisites:* None. The study of human origins, anatomy, and behavior from an perspective. Evolutionary theory; genetics; microevolution and macroevolution; the modern synthesis framing the study of human origins and behavior in the context of modern evolutionary biology; primate behavioral ecology and evolution; a survey of primate and human paleontology, adaptation and variation; the biological origins of human social organization and culture.

## **101D -- Introduction to Evolutionary Anthropology: Lecture with Discussion Section (NS, STS)**

*Prerequisites:* None. Same as 101 but includes a one hour per week discussion section. The discussion/lab sections give students the opportunity to examine for themselves primate skeletal material and fossil casts. Students can spend more time on difficult topics which have been presented in lecture; Note that signing up for 101D automatically enrolls you in the lecture.

## **190A – Duke-Administered Study Abroad: Special Topics**

### **190FS – FOCUS Program Special Topics (NS)**

*Prerequisites:* None. Open only to students in the FOCUS Program.

## **212FS – Evolution, Society and Health in Comparative Perspective (NS, STS);** *Prerequisite:* none; open only to Focus students. (currently on hiatus)

## **215S - Genetics and Genomics of Human Variation (NS, CCI, STS); Only open to students in the Duke Immerse program.**

Research over the last 50 years has demonstrated that the human species is characterized by low genetic diversity and extensive recombination. Yet, social constructions of 'race' based on phenotypic differences are ingrained in our understanding of how humans vary. This course will uncover how the human species varies at the genetic and genomic levels, in the context of other primate species. Given this background, we will discuss the social construction of 'race' and the intersection of macroevolution, genetics, and phenotype. Finally, we will explore current research that suggests a genetic or epigenetic basis for perceived racial health disparities and outcomes in biomedicine. C-L Bio 260S

## **220 -- Human Evolution (NS)**

*Prerequisites:* EvAnth 101 / 101D. The fossil and archaeological evidence for human evolution. This course provides an overview of evolutionary concepts necessary to interpret the hominin fossil evidence; a short overview of primate evolution; and a detailed treatment of hominin fossil material, from *Australopithecus* and early *Homo*, to *Homo erectus* and the transition into anatomically modern *Homo sapiens*. It also gives special consideration to historical and current controversies.

## **221S – Becoming Human (formally The Ape-Human Transition) (NS, R)**

*Prerequisites:* EvAnth 101 / 101D. Study of the evolution of some of the key features that make human's such unusual animals, including bipedalism, large brains, social complexity, language, the arts, and reliance on technology. Emphasis is on evidence from the prehistoric record but includes insights from genomics and living populations.

## **230 – Bodies of Evidence: Intro. To Forensic Anthropology (NS, STS)**

*Prerequisites:* None. An introduction to medicolegal anthropology and death investigation. Topics include crime scene protocol and body recovery, basics of osteology, determining time since death, making personal IDs, determining the cause and manner of death, post-mortem modification of skeletal remains, protocols for mass disasters, human rights applications, and courtroom testimony. Open to majors and non-majors.

**231L – Anatomy of Lower Extremities (NS)** Introduction to the functional anatomy of the lower extremities. Students locate, identify, and dissect all major muscular, nervous, vascular, bony, and soft tissue structures using cadaveric specimens. Students participate in the dissection.

## **235L -- Primate Anatomy (NS)**

*Prerequisites:* EvAnth 101 / 101D. A survey of the anatomical diversity of living and fossil primates. This course consists of both lecture and laboratory sessions. The approach is systemic rather than taxonomic -- the functional anatomy and evolution of various organ systems is presented with reference to locomotor and positional behavior, diet, reproduction, and social behavior. Each system is interpreted from the perspective of growth and adaptation. Special attention is given to anatomical systems that



have left a fossil record. Laboratory study of human and non-human anatomy, primarily from prosected specimens and anatomical models.

### **246 – Sociobiology (NS, STS)**

*Prerequisites:* EvAnth 101 / 101D or Intro Biology. The principles of behavioral ecology and sociobiology. The first part is a survey of major ideas of sociobiology, the evolutionary approach to social behavior; many examples, but by no means all, refer to primates. We review ideas on competition and cooperation, and sex and sexual selection. In the second part, these ideas are applied to (the evolution of) human social behavior.

### **253 -- Primate Ecology (NS, R)**

*Prerequisites:* EvAnth 101 / 101D, or Intro Biology. An introduction to the biology of living primates (prosimians, monkeys, apes, and humans) and to primate ecology. Materials include an overview of the primate radiations, and their biological and ecological features; primate biogeography; primate life history and ecology; socioecology; synecology; and co-evolution.

### **257 -- Ecology and Adaptation of Hunters and Gatherers (CCI, NS)**

*Prerequisites:* EvAnth 101 / 101D or Introductory Biology. The ecology of extant and extinct foraging societies; focus on human behavioral solutions to subsistence problems associated with different environments (tropical/neotropical forest, boreal forest, coastal, arctic, grassland/savannah, desert). Topics include edible resource distribution in varied environments and its relationship to mobility and subsistence strategies in modern hunter-gatherers; and the archaeological and fossil evidence for the evolution of human subsistence behavior.

### **260 – Human Cognitive Evolution (NS, SS)**

*Prerequisites:* EvAnth 101, 101D or equivalent. Survey of methods/theories used in the study of human cognitive evolution; development of cognition in children, cognitive abilities of great apes; paleoanthropology of early and modern humans and evidence for mental abilities and culture; cross-cultural and sex differences in human cognition; genetics and the evolution of cognition. Cross-listed with Psy 255 and Neuro 260

**285 -- Human Health in Evolutionary Perspective (NS, R, STS)** Covers evolutionary approaches to understand human health at a global scale. Integration of evolutionary thinking and medical science provides new insights to a wide array of medical issues including obesity, cancer, allergies, and mental illness. Evolutionary perspectives reveal why some pathogens are more harmful than others, shed light on the origins and spread of infectious diseases in humans, and help in controlling antibiotic resistance. Evolutionary approaches provide insights as to why we age and provide solutions to alleviate human health problems that often differ from modern medical practice. Course will place these perspectives in the context of global health challenges. Cross-listed with GH 304D

**310 – Primate Evolutionary Genetics (NS, R)**

*Prerequisite:* Biology 202L; Recommended: Biology 201L, Evolutionary Anthropology 101. Genetic perspectives on primate evolution. Interpretation of molecular data in understanding primate origins, historical and present-day distributions, and natural selection. Topics include: the genetic signature of pathogen pressure; population differentiation and local adaptation to ecological differences; genetic signatures of admixture, including in the human lineage; molecular marker-based tests of kin-biased behavior and paternal care; primate behavioral genetics and genomics; phylogenetic methods to investigate the evolution of primate social structures; conservation genetics. Cross-listed: Biology 310

**318: Human Evolutionary Genetics NS, R**

*Prerequisites:* EvAnth 101(D), Biology 202 or equivalent, some probability and programming experiences is helpful but not required. An evolutionary perspective on human genetics and genomics, with an emphasis on current models and inference methods using medically important examples. Topics include: population differences in disease risk; adaptation to local environments and pathogens; identifying regions of the genome underlying traits; models of neutral variation, migration, and genetic ancestry. Computational and quantitative skills will be emphasized throughout.

**330 – Human Physiology and Anatomy: An Evolutionary Perspective (NS)**

*Prerequisites:* EvAnth 101 or Introductory Biology. Human physiology from a functional and evolutionary perspective. System-based and regional approach that differs from both a

standard anatomy and physiology course by examining each system (musculoskeletal, digestive, cardiovascular, etc.) and regional units (liver, heart, lungs, etc.) from a functional standpoint, considering their anatomy and their physiological role together. This course further explores the evolutionary context of how and why our bodies function the way they do. Emphasis on human physiology.

### **333L -- The Human Body (NS)**

*Prerequisites:* EvAnth 101 or Intro Biology; Previous courses in anatomy (e.g., Primate Anatomy or Osteology) are strongly recommended but not required.

An introduction to human gross anatomy. The regional anatomy of the human body is studied as a series of progressively specialized deviations from a schematic typical body segment. During weekly laboratory work, participants review the lecture topics using prosected cadavers.

### **334L – Human Osteology (NS)**

*Prerequisites:* EvAnth 101, 101D or Introductory Biology.

An introduction to the basics of human osteological analysis. Identification and siding of all the bones of the human body and the major osteological landmarks on each bone; basics of bone histology, development, and growth; and fundamentals of anthropological analysis of human skeletal remains (archaeological treatment of burials; determination of sex, age at death, ancestry, and stature; paleopathological analysis; medicolegal applications).

### **336S -- Dance Science: An Evolutionary Approach to Functional Anatomy (ALP, NS, R) *Currently on hiatus***

### **341 & 341D – Primate Sexuality (NS, STS)**

*Prerequisites:* EvAnth 101 or 101D or Intro Biology. A comparative and integrative study of primate sex and reproduction. The material is presented in three sections: the first focuses on primate social organization, mating systems, and reproductive strategies; the second focuses on the endocrine system and behavioral endocrinology; and, the third focuses on sexual differentiation of morphology, brain, and behavior. In each section, this course places human sexuality within the broader context of the primate order. Cross-listed: Biology 341, 341D adds a discussion section.

### **344L -- Primate Field Biology (NS, R, W)**

*Prerequisites:* EvAnth 101/101D or Intro Biology. Survey of field methods used to document primate behavior; development of research project; data analysis and writing of formal research articles; lab includes observations of free-ranging primates at the Duke Lemur Center. Students work outside and need a current TB test. Transportation via Lyft is available. Note – typically taken by juniors or seniors; previous course in primate ecology or behavior is helpful but not required.

### **347D - Behavioral Ecology and the Evolution of Animal Behavior. (NS, R, STS, W) – some versions do not include R & W codes.**

*Prerequisites:* Biology 202; How animal behavior is shaped by natural selection, historical factors, and ecological constraints. These factors considered in the context of mating systems, parental care, foraging, and other current issues in behavior. C-L: Biology 267D

### **359S -- Primate Conservation (NS, EI, STS)**

*Prerequisites:* None. Concepts, practice and ethics of conservation biology, both at the species and community level. Relevant aspects of biogeography, ecology, behavior, and demography; human impact, conservation strategies/policies; impact on cultural, political, ethical considerations on primate conservation.

### **363S --Animal Intelligence and the Social Brain (NS, R)**

*Prerequisites:* EvAnth 101 or Bio 202

Complexity of animals' social lives, with focus on cognitive implications of sociality on acquisition, expression, and transmission of knowledge. Topics include: discrimination & insight learning; social influences on behavior; tool use & causality; traditions & cultural transmission; mechanisms of recognition, knowledge of social domain; prosociality & play; coalitions, cooperation, & reciprocity; conflict, punishment, & reconciliation; vocal & gestural communication; sharing; language & instruction; knowing what others know; self-recognition & social monitoring; tactical deception & social manipulation; social norms/morality.

### **385D --Primate Disease Ecology and Global Health (NS, R, STS) [sometimes taught in seminar format 385S]**

*Prerequisites:* EvAnth 101/101D or Intro Bio

Covers concepts of disease ecology, with specific application to primates, human evolution, and global health. Explores the epidemiology and evolution of infectious diseases through the primary literature, focusing on infectious diseases of wild primates, humans, and other mammals. Students learn about the diversity of infectious diseases found in humans, and the basics of epidemiology, disease evolution and emergence, and primate behavioral ecology. Students also gain experience in thinking critically about scientific research, identifying interesting research questions, and communicating science to others. Cross-listed with Global Health 315D

### **390, 390L, & 390S -- Current Issues in EvAnth (NS)**

Surveys of new developments in the field of biological anthropology and anatomy that are not covered by currently scheduled courses. EvAnth 390L is laboratory format and EvAnth 390S is seminar format.

### **391 – Independent Study**

*Prerequisites:* Consent of instructor and DUS. Directed reading and individual project in a field of special interest. Typically involves substantial library research, regular discussion with the faculty supervisor, and the production of a review paper that seeks to thoughtfully analyze, critique, and synthesize the literature on a previously approved topic. Before being given permission to register, students must submit to the faculty advisor and DUS a written proposal outlining the area of study and listing the goals and meeting schedule.

### **393 – Research Independent Study (R)**

*Prerequisites:* Consent of instructor and DUS. Individual, hypothesis-driven, research; data collection and data analysis culminating in a substantive written report. Open to qualified students who, before being given permission to register, must submit to the faculty advisor and DUS a written proposal outlining the area of study and listing the goals and meeting schedule.

***\*\*Note – 400 and 500-level courses are typically taken in the junior or senior year and most require at least one 200 to 300-level course in that given area of study.***

### **490S – Advance Current Topics in EvAnth**

Current topics in Evolutionary Anthropology taught at the advanced level.

### **495S – Advanced Research in EvAnth (NS, R, W)**

*Pre-requisites:* Consent of instructor. Advanced research in an EvAnth-related topic, typically leading to Graduation with Distinction. This course includes a one-hour weekly seminar on topics such as hypothesis testing, research design, data analysis, and writing up preliminary data. Students are also expected to complete original research (equivalent to an independent study) with a faculty mentor during the semester. Note that this course takes the place of 393 for a given semester.

### **510SL – Molecular Anthropology in Practice (NS, R, W)**

Hands-on introduction to research in molecular anthropology and primate genomics. Engagement in collaborative research on the use and interpretation of molecular data to understand primate evolution. Topics include: molecular and analytical tools for generating and interpreting genomic data; methods for identifying the signature of natural selection; basic computational and statistical methods for data analysis; research culture and collaboration in the natural sciences; scientific writing and revision.

### **518S – Humans on the Move: Evolutionary Perspectives on Prehistoric Human Migration (NS)**

With over seven billion people, humans currently dominate almost all corners of the globe. Indeed human relatives have been making large-scale migrations for almost two million years with important cultural and biological consequences for our species. Each week will cover a theme related to the causes and consequence of human migrations. The focus will be on biological, environmental, and cultural drivers of human migration, as well as the impact of migration events on human populations. This is a capstone course in EvAnth, suggested for seniors with multiple previous EvAnth courses or graduate students.

### **520S – Reconstructing the Past: Primate Paleobiology and ecology (NS, R)**

*Prerequisites:* EvAnth 101 and 200-300 level course in paleoanthropology or ecology consent of instructor. Interpretation of the paleobiology of extinct primates relies on indirect evidence linking morphology to particular attributes of a species' ecological niche—be it diet, mode of locomotion, body

size, sensory ecology, social systems, etc. Reconstructions require understanding the functional attributes of the anatomical systems of living primates followed by an inference by analogy about the behavior of the extinct ones. We examine similarities and differences in the primates living on different continents through time as well as contested paleoecological scenarios related to primate origins and ape and human origins.

### **522 – The Hominin Fossil Record (NS)**

*Prerequisites:* EvAnth 101 or 101D; EvAnth 220. Rigorous review of the fossil record of hominin evolution from the late Miocene to the end of the Pleistocene. Using primary literature and casts of key fossil specimens, students explore current controversies in the field of paleoanthropology.

### **530 -- Human Functional Anatomy (NS)**

*Prerequisites:* EvAnth 101 or 101D and EvAnth 333L or 334L. The basics of functional morphology (including elementary biomechanics), an overview of connective tissue structure and mechanics, and an overview of human anatomy from a functional perspective. Emphasis on connective and other tissues involved in functioning of the musculoskeletal system (primarily bone, cartilage, tendons, ligaments, and muscle).

### **537S – Orthopedic Biomechanics and Kinesiology (NS, R)**

*Prerequisites:* EvAnth 101 or 101D; also recommended Physics 141L and 200+ course in anatomy. Seminar discussions and research addressing fundamental theoretical and practical aspects of clinical biomechanics of the human musculoskeletal system. Readings from primary literature will be assessed in class along with proposals for future research. Students will select a research question, develop an appropriate data collection protocol and collect preliminary data, the results of which are presented to the class as part of a formal poster presentation.

### **546S -- Primate Social Evolution (NS, R)**

*Prerequisites:* EvAnth 101 or 101D and EvAnth 253, 344L or 246, or consent of instructor. The effects of ecological conditions and biological constraints on the social systems of primate species. Examines classifications of social systems and extracts their relevant features; uncovers the social rules underlying the dynamics of social relationships and societies; examines the determinants of social relationships and applies this approach to social evolution in hominids.

### **560S – Topics in Primate Cognition (NS)**

*Prerequisite:* at least one 200+-level course in cognition  
Advanced readings and discussion in the evolution of primate cognition. Topics include evolution of social tolerance, communication, cooperation, competition, etc. role these behaviors play in the evolution of cognitive abilities. Note that topics will change from semester to semester and course can be taken more than once. Consent of instructor required.

### **561S – Evolution, Cognition and Society (NS, STS)**

*Prerequisite:* at least one 200+-level course in cognition  
Using primary literature in evolutionary anthropology and cognitive science to discuss major societal events, behaviors and issues. Emphasis on biological and cognitive perspectives to solving today's biggest personal, local and global problems. Pre-requisite: at least one course in behavior, ecology or cognition at the 200+ level

### **570S – Energetics, Ecology and Evolution (NS, R)**

Examine the role of energy expenditure in human evolution & ecology, including: 1) growth, reproduction, and aging, 2) metabolically costly organs such as the brain, and 3) daily physical activity. Discuss methods for measuring energy expenditure. Investigate the effects of diet and exercise on daily energy expenditure in humans. Discuss the role of energy expenditure in modern cardiometabolic disease (e.g., obesity, heart disease, and diabetes). Students will complete and present an independent research project on a topic related to the course. Prerequisites: One of the following recommended: EvAnth 330, Biology 329D/L, Biology 321, or permission of the instructor

### **580S – Ethics in Evolutionary Anthropology (NS, EI, STS)**

*Prerequisite:* at least one course in EvAnth at the 200 or 300 level.  
Ethical issues and controversies in the study of evolutionary anthropology including treatment of primates in research; appropriate use of human genetic data, skeletal remains, and fossils. Professional ethics will also be addressed (e.g., ethical behavior in grant and paper reviewing, plagiarism, intellectual property). Course will make use of films, interviews and discussion primary and popular literature. Instructor consent required.

### **582S – Primate Adaptation (NS)**

*Prerequisite:* 200+-level anatomy or morphology course or consent of instructor. Primate adaptation from an evolutionary perspective. History and functional significance of locomotor and feeding



adaptations, craniofacial morphology, sense organs, reproductive systems, language in primates, including humans.

**585 - Statistical Rethinking: Methods and Applications in Evolutionary Anthropology and Biology (NS, QS, R)**

*Prerequisite:* 200+-level course in EvAnth and Introductory Statistics. *Offered occasionally*

Application of modern statistical methods in evolutionary anthropology and biology, including their theoretical foundations and application to phylogenetics, comparative methods, morphometrics, etc. The goal is to move from the limitations of frequentist statistical tests (i.e., p-values) and toward a richer assessment of scientific hypotheses, including Bayesian approaches. We will use a flipped classroom to provide hands-on team-based learning in R

**588S – Macroevolution (NS)**

*Prerequisites:* BIO 101L; course in animal diversity. Evolutionary patterns and processes at and above the species level, and species concepts, speciation, diversification, extinction, ontogeny and phylogeny, rates of evolution, and alternative explanations for adaptation and evolutionary trends. Cross-listed: Biology 588S

**590S/590L – Seminar or Lab in Selected Topics (NS)**

*Prerequisites:* Consent of instructor. Special topics in methodology, theory, or area.

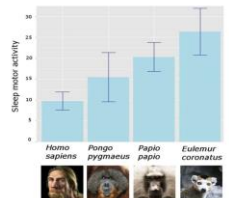


## Pre-Approved Electives (other than Evolutionary Anthropology):

<p>AAAS 261D – Race, Genomics and Society</p> <p>BIO 201L* Molecular Biology          BIO 207 Organismal Evolution          BIO 209-1 Ecology of Human Health          BIO 209 D2 Ecology for a Crowded Planet          BIO 212L General Microbiology          BIO 248D Evol of Animal Form          BIO 251L Molecular Evolution          BIO 260 Genetics of Human Variation          BIO 268D: Mechanisms of Animal Behavior          BIO 270A Conservation Biology / Policy          Bio 271 Marine Bio and Ecology          BIO 273LA Marine Ecology          BIO 278LA Physiology of Marine Animals          BIO 288A Biogeography Australia          BIO 304* Biological Data Analysis          BIO 326S Evolutionary Genomics          BIO 329L Principles of Animal Physiology          BIO 361LS Field Ecology          BIO 373LA Sen Phys/ Bhv Marine Animals          Bio 450S Genomics of Adaptation          Bio 460 Population Genetics          BIO 546S Biology of Mammals          BIO 556(L) Systematic Biology          BIO 557L Microbial Ecology and Evolution          BIO 559S Foundations of Behavior Ecology          BIO 565L Biodiversity Science and App          BIO 650 Molecular Population Genetics          BIO 665 Bayesian Inference Env Models          BIO 668 Population Ecology</p> <p>BCH 301 Introductory Biochemistry I</p> <p>* Can only be used as an elective by students on the AB track (the BS track requires Bio 201L and stats as co-requisite)</p>	<p>Chem 202L Organic Chemistry (Chem 201DL may count toward AB)</p> <p>CA 208 Anthropology of Race</p> <p>EOS 226S Field Methods Env/Earth Science (counts as field/lab)          EOS 509S Paleoclimate</p> <p><u>Economics</u> - note that students studying the evolution/ecology of behavior may be interested in some advanced level courses in economics (e.g., game theory, models of cooperation and conflict). See your advisor or the DUS about pre-reqs and appropriate courses.</p> <p>ENV 210D Cons the Variety of Life</p> <p>LINGUISTICS 510 Brain &amp; Language</p> <p>Neuro 201D Fund. of Neuroscience</p> <p>PHIL 314 Philosophy of Biology</p> <p>PSY 257 Introduction to Cog Neurosc          PSY 273 Behavior / Neurochemistry</p> <p><u>Statistics</u></p> <p>Any intro-level stats course (typically 101, 102, 198 or 199) can be used as an elective for the AB degree. BS Students will use statistics as a co-requisite rather than an elective.</p> <p><u>Other</u> – contact the EvAnth DUS if you would like to propose additional related electives</p>
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## EvAnth MINOR WORKSHEET (5 courses)

- \_\_\_\_\_ EvAnth 101 or 101D
- \_\_\_\_\_ EvAnth elec. 1 in Paleontology / Anatomy
- \_\_\_\_\_ EvAnth elec. 2 in Behavior / Ecology
- \_\_\_\_\_ EvAnth elec. 3 – 200-level or above
- \_\_\_\_\_ EvAnth elec. 4 – 200-level or above



**Concentrations – these courses are taken as part of the major requirements (they can overlap with other requirements)**

**At least three courses in chosen area:**

1) \_\_\_\_\_

2) \_\_\_\_\_

3) \_\_\_\_\_

**Anatomy and Paleoanthropology**

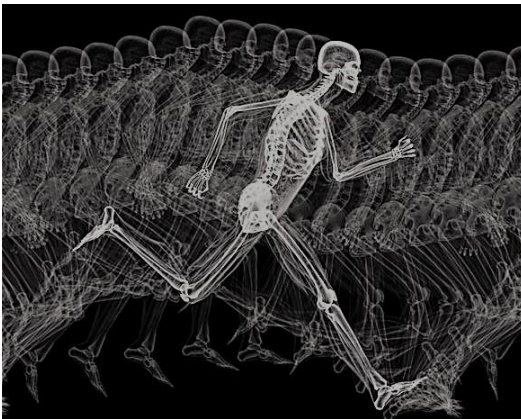
Three of the following courses: Evolutionary Anthropology 215S, 220, 221S, 230, 231L, 235L, 330, 333L, 334L, 336S, 520S, 522, 530, 537S, 582S, 588S, 570S

**Behavior, Ecology, and Cognition:**

Three of the following courses: EvAnth 212FS, 246, 253, 257, 260, 310, 341, 344L, 347D, 359S, 363S, 385D, 510SL, 546S, 560S, 561S, 570S

**Human Biology**

Three of the following courses: EvAnth 221S, 230, 231L, 257, 260, 285, 318, 330, 333L, 334L, 336S, 341D, 530, 561S, 570S.



Research from the Pontzer Lab

## EvAnth Major Worksheet

### B.S. Degree

- \_\_\_ EVANTH 101 or 101D
- \_\_\_ BIO 201L (or Bio 203)
- \_\_\_ BIO 202L (or Bio 203)
- \_\_\_ CHM 101DL
- \_\_\_ CHM 201DL
- \_\_\_ MTH 111L
- \_\_\_ PHY 141L
- \_\_\_ Statistics (intro level\*\*)

(See your advisor/DUS for which courses qualify as equivalents for the above co-requisites.)

### Core Reqs (fill in course number)

- #1 \_\_\_ EvAnth elective  
Ecology/Behavior/Cog
- #2 \_\_\_ EvAnth elective  
Anatomy/Paleo

### 200-level or above (fill in course number):

- #3 \_\_\_ EvAnth elective
- #4 \_\_\_ EvAnth elective
- #5 \_\_\_ EvAnth elective
- #6 \_\_\_ Elective\*
- #7 \_\_\_ Elective\*
- #8 \_\_\_ Elective\*

1. Which is a field/lab course?  
\_\_\_\_\_

2. Which 1 of the above 8 courses is a capstone course? \_\_\_\_\_

### A.B. Degree

- \_\_\_ EvAnth 101 or 101D
- \_\_\_ BIO 202L (or Bio 203)

### Core Reqs (fill in course number):

- #1 \_\_\_ EvAnth elective  
Ecology/Behavior/Cog
- #2 \_\_\_ EvAnth elective  
Anatomy/Paleo

### 200-level or above (fill in course number):

- #3 \_\_\_ EvAnth elective
- #4 \_\_\_ EvAnth elective
- #5 \_\_\_ EvAnth elective
- #6 \_\_\_ Elective\*
- #7 \_\_\_ Elective\*
- #8 \_\_\_ Elective\*
- #9 \_\_\_ Elective\*

1. Which is a field/lab course?  
\_\_\_\_\_

2. Which 1 of the above 9 courses is a capstone course? \_\_\_\_\_

Note that only two independent studies (391 or 393) may be counted toward the major; additional 391/393 courses can be taken for university credit.

\* Electives taken outside of EvAnth must be on our pre-approved list of electives or approved by your EvAnth advisor and the EvAnth Director of Undergraduate Studies.

\*\* Statistics can be taken in EvAnth, Biology, Statistics, or Psychology (Psych 204L/205L sequence is typically taken only by Psych double-majors/minors).