

A Vision for Biological Anthropology at Duke University: A Department of Evolutionary Anthropology

“He who wishes to decide whether man is the modified descendant of some pre-existing form, would probably first enquire whether man varies, however slightly, in bodily structure and in mental faculties; and if so, whether the variations are transmitted to his offspring in accordance with the laws which prevail with the lower animals.”

Charles Darwin, *The Descent of Man* (1871)

In the opening sentence of *The Descent of Man* (1871), Charles Darwin proposed that insight into human origins requires a thorough understanding of our own species’ biology relative to other organisms. This proposal still resonates over 130 years later and defines the research and teaching program of biological anthropologists. Biological anthropology is dedicated to bridging gaps — between humans and other animals, between biology, civilization, and culture, and across academic disciplines ranging from physics to linguistics. In an age of increasing specialization, our discipline commits us to seeking connections across all the scales of human organization, from genes to tissues to organisms to societies and cultures, and from the past to the present.

The mission of Biological Anthropology--examination of humans in an evolutionary context--has never been more important. We prepare students for a critical evaluation of themselves and their role in the natural world. The Department of Biological Anthropology and Anatomy has always been at the forefront of a broad and comparative exploration of human evolution and has established Duke as a world center for research on human origins. Through BAA, Duke has set the standard for this field. Other universities, including the University of Arizona, Stony Brook University, Max Planck Institute, and Harvard, have followed suit in forming dedicated biological anthropology programs.

Never before have we had such a diversity of tools for exploring our evolution and ecology. Recent developments provide new techniques by which to carry out Darwin’s program and necessarily influence the way we think about human biology, behavior, and our own evolution. Our department will continue to set the direction for our field by capitalizing on recent advances in genomics, physiology and cognitive studies and by taking advantage of the natural interdisciplinary collaborations that exist at Duke. We envision a re-focused department centered on interdisciplinary work related to human biological evolution. This department will: (1) expand core faculty strengths, (2) capitalize on important theoretical shifts in our discipline, and (3) build on growing intellectual centers at Duke.

These changes can be accomplished by the current faculty and by recruitment of new faculty who embrace a research program that spans multiple aspects of analysis--decoding human evolution within a specific evolutionary context in the areas of evolutionary genomics, human behavioral ecology, and paleontology. To reflect this new vision we propose a new name for our department: *The Department of Evolutionary Anthropology*.

The Importance of Evolutionary Anthropology to Duke's Strategic Mission

The question of how and why humans evolved is critical to understanding human biology and culture and must be a central theme for any serious institution of higher learning. The study of human evolution has implications for understanding issues of local and global scale that are critically relevant to our students and society as a whole. In a world with increasingly complex and urgent conservation issues, understanding the dynamics of human interaction with the environment, and the evolutionary basis of our more destructive behaviors, has never been more important. In a world in which racial and cultural conflicts are increasingly deadly, understanding human nature is vital. In a world beset by scientific illiteracy, teaching evolution has never been more imperative. Evolutionary anthropology reaches across the human-animal boundary to understand fundamental aspects of human nature. Evolutionary anthropology engages the university in real-world issues through the practice and promotion of conservation biology and through the teaching of human evolution. The aim of our mission is to gain knowledge in the service of human society.

The most dynamic areas in Evolutionary Anthropology are a natural fit for the enduring themes and specific initiatives of Duke's Strategic Plan. Our department is perfectly positioned to engage with several other departments at Duke to crystallize a large core of faculty interested in the critical issues of human biological evolution.

Evolutionary anthropology involves integration across multiple scales along two critical pathways. Along a complexity vector, we work from the level of genes to decipher the actions of the genetic program through ontogeny that produce the whole organism, to the behavior of the organism as it relates to its social and physical world, to the self-assembly of organisms into communities, and finally to the role of those communities within ecosystems. Along a time vector, we study behavioral and physiological processes that operate over time spans from milliseconds to millions of years and produce the adaptations that form the foundation of our lineage. The interplay between the study of the anatomy and behavior of primates, the communities to which we belong, and the evolutionary pathways that lead to our modern form and behavior is a source of enduring vitality for our discipline.

Duke's specific initiatives are well served by our early establishment of and continued relationship with the Duke Lemur Center (DLC), with its extensive collections of living and fossil primates. Our connections with the Departments of Biology, Chemistry, Engineering, Neurobiology, Cell Biology, Radiology, Surgery, Anesthesiology, Community and Family Medicine, and the School of the Environment are also strong. We have recently strengthened our ties with the Center for Cognitive Neuroscience (CCN) through the hire of Brian Hare. Our multidisciplinary perspective on human evolution is also in line with the Duke's investment in the National Evolutionary Synthesis Center (NESCent) and we are engaged in discussions to promote synergy with the Institute for Genomic Science and Policy (IGSP).

Another critically important component of Duke's mission is its commitment to training of women and underrepresented minorities in science. Our teaching record exemplifies this commitment. Our undergraduate major provides students with a unique perspective unavailable in other departments or by taking single anthropology courses. While maintaining a comparatively large undergraduate major (currently 120+ majors) with comparable rigor to the other natural sciences (our major requires the same core competencies as does the biology major), we have by far the highest percentages within the

sciences of women and minorities: more than 65% of our majors are women and more than 40% are underrepresented minorities. Our educational mission is further enhanced by our commitment to undergraduate research. Our appeal to students reflects not only the accessibility of our field of study as a natural science, but also the hard work of our faculty as teachers and mentors. More than 25% of our senior class are being mentored in year-long Graduation with Distinction projects, with many more students participating in semester-long research independent studies. Some of this research is carried out through our interdisciplinary Certificate Program that provides extensive research opportunities at the DLC and other campus facilities. All of this reflects the accessibility of Evolutionary Anthropology as a natural science and its obvious relevance to enhancing the students' understanding of themselves and their evolutionary history.

Lastly, it is essential that Duke maintain a role in educating the public about human evolution. Our studies reach out to people in the community and educate them about evolution, the course of human history, and our place in nature. The attention paid to biological anthropology in the pages of leading scholarly journals as well as in the popular press illustrates the enormous appeal of our field of study.

New Perspectives and New Directions

To realize our vision for a Department of Evolutionary Anthropology, and to strengthen our role in Duke's initiatives, it is imperative that we have both the support of the administration to pursue our intellectual goals and a critical mass of departmental colleagues focused on human evolution. In what follows, we set forth a vision for an integrated research and teaching program in harmony with the university's strategic initiatives.

We currently have strong faculty representation in the areas of evolutionary comparative anatomy, evolutionary behavioral ecology, paleontology, and primate cognitive evolution. The first three are long-standing areas of strength for our department and core components of research in evolutionary anthropology. The fourth area is an area of growth for us established by Christine Drea and expanded with the recent hire of Brian Hare.

The approach of our faculty typifies integration across scale and is fundamentally multidisciplinary in terms of theoretical approach and methodology. Rich Kay and Matt Cartmill, for example, work on the major trends in primate and human evolution incorporating neontological and paleontological data and methods drawn from a variety of disciplines. Christine Drea collects anatomical, physiological, genetic and developmental data to study social behavior. Ken Glander and Brian Hare use a combination of field and lab techniques to study ecology and cognition, respectively.

Our areas of current strength and recent growth provide a solid base for our proposed expansion into evolutionary genomics, human biobehavioral ecology, and paleontology. The first area represents an exciting and relatively new area of research that fits with the university's strategic goals. The latter two represent a chance to evolve areas of existing strength with new approaches and ideas.

Evolutionary Genomics: We seek to explore human origins through a better understanding of genomic and developmental factors shaping patterns of primate and human variation. Understanding the relationships that underlie phenotypic variation leads to a deeper understanding of evolutionary pathways. Evolutionary genomics provides a powerful means of deciphering the evolutionary processes that led to our distinctive human qualities. A new focus on human and primate evolutionary genomics fits well with initiatives at the Institute for Genomic Science and Policy (IGSP), the DLC (including their extensive tissue and genetic library), and the CCN and allows us to create a critical synergy with our department and faculty in several other areas at Duke. We are in an opportune position to relate genetic variation across species to variation in developmental programs, in adult morphology and physiological processes, and in cognitive capacities and behavior. This work, in conjunction with molecular studies aimed at discerning phylogenetic relationships within the order Primates, will help to elucidate evolutionary relationships and pathways leading to the evolution of modern humans.

Human Behavioral Ecology: One of the most dynamic areas of intellectual growth in biological anthropology is human behavioral ecology. We plan to promote a comparative and evolutionary approach to the study of human variability, life history, and adaptive plasticity. Potential key research areas include disease ecology and its impact on the evolution of human and primate social behavior; life history evolution, perhaps with an emphasis on growth, diet, and aging; human reproduction and sexuality; population demographics; and the interplay between nutrition, health, and disease. Through growth in this area, we will better understand our adaptive success over the past several hundred thousand years and our current relationship to modern ecosystems. These lines of inquiry would compliment synergistic with our existing strengths in primate reproductive biology, comparative endocrinology, and sociobiology and have great potential for integration with other departments and centers at Duke, including the Duke Population Research Institute, The Global Health Institute, and the Center for Aging.

Paleontology: The pathway of human evolution is most clearly traced by the rich fossil record of our extinct relatives, much of which has been collected and analyzed by scientists in our department over the past 30 years. The extensive African and South American fossil collections assembled by Elwyn Simons and Rich Kay represent a unique resource for research and teaching. Paleontology has important ties with Duke's Strategic Plan through public outreach, international collaboration, and links with the DLC. Paleontology is being transformed by the application of new technologies such as nondestructive imaging methods and image rendering software, Geographic Information Systems, and ancient DNA extraction and amplification tools, which greatly enhance our ability to analyze fossil material. One of the most exciting periods of human evolution is the late Miocene and Pliocene (12 – 2 million years ago), when our ancestors split from the other apes and began to diversify in Africa. By adding an Old World paleontologist with a concentration in this area of research, the department would have a core group of paleontologists upon which to base a unified program in evolutionary anthropology, and Duke would become the only university to cover all periods of primate and human evolution.