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CHaPRE

Center for Human and Primate Reproductive Ecology

Richard G. Bribiescas, Director

Evolution, Life History, Darwinian Medicine, Conservation...

A Yale Institute for Biospheric Studies Research Center

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CHaPRE opens July 1, 2005

Evolution, life history, Darwinian medicine, and conservation...

On July 1, 2005, the Center for Human and Primate Reproductive Ecology (CHaPRE), a research center sponsored by the Yale Institute of Biospheric Studies, officially opened. Conceived as a focal point of research involving the interaction between reproductive biology and the ecology of humans and non-human primates, the mission of the center is to support laboratory and field based research that addresses questions related to reproduction, ecology, evolution, life history theory, Darwinian medicine, and conservation, as well as facilitate collaborative research between institutions. The core resource is an endocrinology laboratory, capable of assessing most hormones and biological agents related to reproduction, growth, and immune function.

What is Reproductive Ecology?

The importance of reproductive biology to our understanding of Darwinian evolution is obvious. Organisms that experience higher reproductive success pass a greater proportion of their genes to subsequent generations. The primary mechanisms for differential success are greater fertility and/or survivorship, with reproduction encompassing the lion's share of importance. However, the vast majority of our knowledge regarding human and non-human primate reproductive biology emanates from clinical research. While clinical medicine is without a doubt a central and important facet of the biological sciences, it is largely devoid of any evolutionary perspective, and as biologist Theodosious Dobzhansky aptly pointed out:

"Nothing in biology makes sense except in the light of evolution"

To completely understand human and non-human primate reproductive biology, an evolutionary perspective is indispensable. Moreover, the expression of any organism's reproductive biology is not the sole result of its genetic complement, but the interaction between physiology and environmental challenges. They may involve energetic stresses that manifest themselves through diet and activity, immunologic hurdles that result in the reallocation of energetic resources, or perhaps psychosocial stresses that exert subtle but definitive effects on reproductive function.

Why the emphasis on hormones?

The core resource of CHaPRE is the endocrinology laboratory located within the Yale University Environmental Sciences Center, 21 Sachem St. Why the emphasis on hormones? Endocrine function is at the crux of many questions related to the evolution of an organism's life history, including the organization and timing of reproductive events, such as age of menarche, as well as growth and immune function. Moreover, hormones act as a key mediating force between an organism's genes, ecological challenges, and the ultimate expression of physical traits. The relationship between an organism's genes and how they are expressed as physical characteristics are immensely complex. The simple dominant/recessive interactions in Mendel's pea experiments are the exception, and not the rule in evolutionary genetics. Not only are most phenotypic characteristics the result of multiple genes, the expression of many of those genes are reliant on environmental cues.

A central mechanism that monitors and reacts to environmental cues is the neuroendocrine system. For example, changes in blood glucose resulting from dietary or activity fluctuations exert important effects on insulin levels. Changes in insulin then exert a wide variety of effects, including several on reproductive function.

The mission

The primary goal of CHaPRE is to provide laboratory resources and logistical support to faculty, postdoctoral fellows, and graduate students interested in conducting investigations of human and nonhuman primate reproductive ecology, both within Yale and at other institutions. Proposals are accepted at any time and assessed by the director and affiliated scholars for scientific merit. Resources are also available to train a limited number of scholars in laboratory and analytical methods.

CHaPRE is sponsored by the Yale Institute of Biospheric Studies. Further information is available at the center website (http://www.yale.edu/chapre).

- Richard G. Bribiescas, Director

A few words from Peter Ellison...

Principal Investigator of the Reproductive Ecology Laboratory at Harvard University

***P**eter T. Ellison, John Cowles Professor of Anthropology at Harvard University, was one of the pioneers of the field of human reproductive ecology and continues to be at the forefront of research in the field. He is also a CHaPRE distinguished scholar. His seminal research on the impact of energetic stress on human reproductive function through the novel use of salivary hormone assessments has inspired a generation of biological anthropologists to continue the pursuit of questions related to reproduction, ecology, and human evolution. CHaPRE asked Professor Ellison to provide some brief comments on the opening of the center.*

Reproductive Ecology Comes Of Age

The launching of the Center for Human and Primate Reproductive Ecology at Yale marks an important life history transition in this young field. In the 1980's, as new techniques for studying reproductive physiology under field conditions began to be introduced into anthropology, the term "reproductive ecology" began to be used in meeting papers and then publications, and a few courses began to be offered under the reproductive ecology rubric at a handful of institutions. The 1990's saw the publication of the Human Reproductive Ecology volume edited by Campbell and Wood, comprised of the papers from the New York Academy of Sciences conference with the same title, and an increasing number of publications and courses focused on the topic. Interest in primate reproductive ecology began to burgeon as well as techniques and paradigms borrowed from human reproductive ecology began to be deployed in primate field studies. Now, in the first decade of the 21st century, a number of new books, published and in press, reveal a widening interest in what rightly can be identified as a vigorous subfield of human and primate evolutionary biology.

Why such interest? Is this a fad or a temporary focus that will fade and be replaced, or will it become a more lasting and influential part of evolutionary anthropology? The field itself is at an interesting point in its own life history, its adolescence if you will, when its adult character will take shape. Much depends, it seems to me, on two important characteristics associated with successful adulthood – generativity and relatedness. Generativity will be the ultimate measure of the field's success. Will new, young scientists emerge who identify reproductive ecology as their central focus? Will this new cohort generate fresh ideas and paradigms, challenging and replacing the paradigms of their mentors and predecessors and producing novel insights? Will the scope of what is touched by these insights continue to grow? Will the syllabi of courses in this area expand and ultimately exceed what can be covered in a single term?

The generative success of the field in turn may well depend on its relatedness to adjacent fields and disciplines. In its infancy, reproductive ecology was formed at the intersection of evolutionary anthropology, reproductive physiology, demography, and medicine. Its continued vigor will be reflected in its widening circle of interaction with other areas such as environmental science, human geography, conservation science, genetics and genomics, and public policy. If these affinities, which are merely nascent at this point, become robust connections, then reproductive ecology will find its place in the lasting lexicon of modern life sciences.

Now you can see why I view the launching of CHaPRE as so significant. CHaPRE has a crucial role to play in determining the future of this field, by training new scientists, supporting new research, and fostering new interactions among a broadening array of adjacent fields. Those of us who may feel we helped to fan the spark of life into the study of reproductive ecology should be thrilled to see the flame transferred to such a hearth.

- Peter Ellison

Chimpanzees of Ngogo

Ngogo, Kibale Forest, Uganda, is the home of the largest concentration of wild chimpanzees in the world (photo courtesy of David Watts)

Understanding the evolution and life history of our closest evolutionary relative....

CHaPRE is partnered with the primate field site at Ngogo, in the Kibale Forest, Uganda. Established by Professors David Watts of Yale University and John Mitani of the University of Michigan, Ngogo has been the focus of numerous investigations into the socioecology and evolutionary biology of wild chimpanzees and other primates. Indeed, it is the largest community of chimpanzees in the wild, numbering over one hundred individuals.

David Watts, Professor of Anthropology at Yale University, co-primary investigator of Ngogo.

CHaPRE is currently providing support to pilot research being conducted by Yale anthropology graduate student Sholly Gunter and her advisor, Professor David Watts. Gunter is interested in variation in reproductive behavior during the ovulatory and non-ovulatory period of female estrous, as well as male responses. She will be using hormonal assessments to determine timing of ovulation.

Featured Scientist: Stephanie Anestis

Schwartz Foundation Post-Doctoral Research Associate, CHaPRE Research Associate

Stephanie Anestis is a newly minted Ph.D. in anthropology from Yale University, having earned her degree in the spring of 2005. As of July 1 2005, she will be a Schwartz Family Foundation Post Doctoral Research Associate and CHaPRE Research Associate. Dr. Anestis is the author of several peer reviewed scientific articles and will be a lecturer within the Department of Anthropology at Yale University for the academic year 2005-6, teaching introductory undergraduate courses in biological anthropology and the evolutionary physiology of human life histories. Her research has focused on hormonal correlates of stress, development, and behavioral style among captive chimpanzees (Pan troglodytes). Dr. Anestis discusses her future research at CHaPRE.

Many reproductive ecology laboratories focus only on humans or nonhuman primates. There is great value in creating an academic community where researchers from both fields can share ideas, especially when expanding our understanding of comparative life histories is the ultimate goal. I am thrilled to be a part of CHaPRE, where I will be continuing my research on chimpanzee social behavior and its endocrine correlates. For my dissertation research I collected behavioral data and several thousand urine samples from young chimpanzees at the New Iberia Research Center in Louisiana to test hypotheses about the relationship between dominance rank, behavioral style, and the hormones cortisol and testosterone. The hormone analyses were conducted at Yale's Reproductive Ecology Laboratory. This large dataset, spanning four years during the chimpanzees' transition to adolescence, allows me to explore a variety of as yet unanswered questions, especially those pertaining to the physiological development of captive chimpanzees. During my tenure at CHaPRE I hope to answer questions such as: how is the development of mating behavior related to changes in testosterone level in both males and females? Are behavioral indicators of anxiety (such as self-scratching) correlated with physiological measures of stress, specifically baseline urinary cortisol, and does this relationship change as individuals mature? Is cortisol purely an indicator of negative stress events, or is it elevated in response to unusual (and from the chimpanzees' perspective, exciting) positive events as well?"

The answers to these questions are particularly relevant to captive animal care, as they may give insight into the management and enrichment of chimpanzees in captivity. However they can also be a valuable starting point for investigations of wild chimpanzee behavior/hormone relationships. For example, although chimpanzees in captivity mature earlier than their wild counterparts, the relationship between testosterone and mating behavior in adolescents may be similar. Wild and captive chimpanzees may display behavioral indicators of anxiety with different frequencies, but knowing whether self-scratching is an indicator of physiological arousal as reflected by urinary cortisol would be useful for researchers in both settings. Ultimately, I hope to add to the longitudinal database on the New Iberia chimpanzees by setting up long-term data collection protocols there, while also collaborating with researchers at Ngogo to test similar hypotheses in wild chimpanzees.

- Stephanie Anestis, Ph.D

To read more on Dr. Anestis' research, see:

Anestis, SF (in press) Behavioral style, dominance rank, and stress in young chimpanzees (*Pan troglodytes*). *Behaviour*.

Anestis, SF and Bribiescas RG (2004) Rapid changes in chimpanzee (*Pan troglodytes*) urinary cortisol excretion. *Hormones and Behavior* 45(3): 209-13.

Anestis, SF (2004) Genito-genital rubbing in a group of captive chimpanzees. *International Journal of Primatology* 25(2): 477-88.

Firos, S (2001) Absence of intragroup coalitionary behavior in adult male red colobus (*Colobus badius tephrosceles*) in the Kibale National Park, Uganda. *Folia Primatologica*.72(1):54-6.

CHaPRE Affiliated Scholars

CHaPRE relies on the counsel of many scholars and scientists. Those that advise the director include:

Michael Dove, Professor
School of Forestry and Environmental Sciences
Department of Anthropology
http://www.yale.edu/forestry/bios/dove.html

Professor Dove is a world renowned authority on sustainable development in human populations. He has conducted extensive research on local community resource use, particularly in southeast Asia.

Linda-Anne Rebhun, Associate Professor
Department of Anthropology
http://www.yale.edu/anthrøpeople/lrebhun.html

Professor Rebhun is a medical anthropologist known for her work on traditional and folk medicines in Brazil and other parts of Latin America. She is particularly interested in child survivorship, economic development, and perceptions of intimate relationships and perceptions of love and affection in Latin America.

Stephen Stearns, Professsor
Department of Ecology and Evolutionary Biology
http://www.yale.edu/eeb/stearns/index.htm

Professor Stearns is a leading expert in life history theory and evolutionary biology. He has published extensively on various aspects of organismal biology, evolutionary functional genomics, and recently edited a book on evolutionary medicine.

Paul Turner, Assistant Professor
Department of Ecology and Evolutionary Biology
http://www.yale.edu/eeb/turner/index.htm

Professor Turner conducts experimental evolution on microbial organisms. He is also interested in the evolution of emerging pathogens and their impact on the development of new human diseases.

David Watts, Professor
Department of Anthropology
http://www.yale.edu/anthrøpeople/dwatts.html

Professor Watts is a world leader in primate behavior and has conducted extensive research among wild populations of mountain gorillas, sifakas, and most recently, wild chimpanzees. With his colleague University of Michigan Professor John Mitani, Professor Watts maintains Ngogo Field Station in Kibale National Park, Uganda, home to the largest concentration of wild chimpanzees in the world (over 100).

External Collaborators and Consultants

Gillian Bentley
Royal Society University Research Fellow
Department of Anthropology
University College, London
http://www.ucl.ac.uk/anthropology/bioanth/staff_member_bentley.htm

Dr. Bentley has conducted reproductive ecology research among populations in central Africa, Nepal, and Bolivia. Her research is focused on the impact of energetic fluctuations on female reproductive function.

Peter Ellison, Professor
Department of Anthropology, Harvard University
http://www.people.fas.harvard.edu/%7epellison/

Professor Ellison is arguably the intellectual father of reproductive ecology. His seminal work among Efe foragers and Lese horticulturalists of central Africa first illustrated the role of environmental factors such as food availability and energetic expenditure on human female ovarian function. Along with his research associate Dr. Susan Lipson, Professor Ellison has developed crucial field and laboratory methods that allow the quantification of hormones under difficult and remote field conditions.

Grazyna Jasienska, Associate Professor
Institute of Public Health, Collegium Medicum, Jagiellonian University
http://www.people.fas.harvard.edu/~pellison/Grazyna_Jasienska.html

Professor Jasienska has conducted extensive investigations of seasonal variation in ovarian hormones in rural Polish women. Her investigations have shown that independent of energy intake, energetic expenditure alone can alter ovarian function.

James Holland Jones, Assistant Professor
Department of Anthropological Sciences, Stanford University
http://www.stanford.edu/~jhj1/

Professor Jones is a leader in the field of evolutionary demography and has conducted research into the implications of patterns of sexual contact on the development of epidemics. He is also interested in demographic aspects of life history theory.

Cheryl Knott, Associate Professor
Department of Anthropology, Harvard University
http://www.fas.harvard.edu/~gporang/knott/

Professor Knott's research focus is on primate reproductive ecology. Over the past ten years, she has conducted ground breaking research on wild orangutan reproductive function using new field collection methods and assays. She is currently also involved in conservation efforts at her field site, Gunung Palung in Indonesia.

Michael Muehlenbein, Assistant Professor
Department of Anthropology, University of Wisconsin, Milwaukee
http://www.uwm.edu/%7empm1/

Professor Muehlenbein is the director of the Laboratory for Evolutionary Physiology and Parasitology at UWM. His primary research interests include the examination of energetic trade offs between reproduction and survivorship in humans and primates using assessments of hormone and immunological profiles. He has conducted field work among wild chimpanzees, rural Honduran populations, and captive macaque colonies.

Randolph Nesse, Professor
Departments of Psychology and Psychiatry, University of Michigan
http://www-personal.umich.edu/%7enesse/

Professor Nesse is a leader in the field of evolutionary medicine and is co-author of the seminal book, Why We Get Sick.

Claudia Valeggia, Assistant Professor
Department of Anthropology, University of Pennsylvania

Professor Valeggia is widely known for her research on the effects of lactation and nursing on the resumption of menses and interbirth intervals among indigenous Toba women of northern Argentina.

Supporting and Collaborating with CHaPRE

If you are interested in supporting or collaborating with CHaPRE, please contact the director, Richard G. Bribiescas (203-432-3671) or:

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