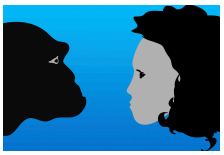
Syllabus for BIOM 225 "Introduction to Anthropogeny"

Location: SSRB 310, Museum of Primatology **Fall 2011**



Approaches to explaining a singular phenomenon: The Human Phenomenon, a phenomenon that is not the object of any single discipline

FORMAT: ONE HOUR OF LECTURE AND ONE HOUR OF DISCUSSION.
READING MATERIAL: TWO BROAD REVIEWS OR BOOK CHAPTERS PER SESSION, POSTED ON THE WEB SITE AS DOWNLOADABLE PDF'S IN ADVANCE.
DAY: THURSDAY
TIME: 1 TO 3 PM
EXAM: 10 PAGE ESSAY "KEY QUESTIONS IN ANTHROPOGENY"

"*From molecules to societies*
From fossils to living organisms
From phylogenies to histories"

Boxed text indicates levels covered in each lecture

LECTURE 1 PASCAL GAGNEUX SEPT 22
INTRODUCTION , HUMANS AS PECULIAR MAMMALS
Humans as primate "turbo-mammals". From mammalian phylogeny to free milk oligosaccharides to oxytocin, mothering, global formula commerce and its impact on health. Ranging in time scale from >140 million years of mammalian evolution to millisecond action potentials in the brain, in spatial scale, from 1 nm monosaccharides to 1 m australopithecines to km^2 home ranges, to continental migrations. Human milk to ape milk to domestic animal milk; recent human adaptation (lactase persistence) and ongoing effects of replacing mother's milk with bovine based formula.

Learning Objectives: Vastness of temporal and spatial scales included in the subject. How societal phenomena can be influenced by nanometer sized molecules. Humans are firmly rooted in animal (mammalian and primate) biology, yet have given rise to powerful cultural forces with clear biological consequences. There are profound consequences of even minor changes to development.

phylogeny
the hominin fossil record
genetics (lysozyme to lactase synthase)
biochemistry (glycans, lipids and proteins)
endocrinology (prolactin, oxytocin)
behavior (mothering, domestication, husbandry)
technology, commerce
microbiology

LECTURE 2 PASCAL GAGNEUX SEPT 29
REPRODUCTION, DEVELOPMENT & ECOLOGY
Contrasting mating systems of hominids. The role of pair-bonding in the human lineage, the cultural impact on mating systems and regulation of sexual behavior. Slow-down of human development allowing for brain development with maximum cultural input. What was the ancestral mating system like? Derived mating systems in both species of *Pan*? How rapidly can mating systems evolve? Ongoing evolution with delayed reproduction, assisted reproduction, female infanticide and selective abortions, sex ratio etc.

Learning Objectives: Ecology and reproduction can be tightly linked. Development integrates many aspects of the environment with genetic instructions to produce subsequent generations of reproductive individuals. Human reproduction has come under very strong normative cultural control as its regulation is at the core of many human belief systems.

reproductive biology
development
ecology
resource distribution
social organization, mating system
introduction to MOCA, development

LECTURE 3 **MARGARET SCHOENINGER** **OCT 6**
NUTRITION ANATOMY/ PALEONTOLOGY

Learning Objectives: What you eat makes you who you are and where you live makes what you eat. Understanding the paleontological record as living ecology.

- nutrition,
- metabolism
- anatomy
- bone development
- chemistry
- paleoclimate
- bones and stones

LECTURE 5 **AJIT VARKI** **OCT13**
COMPARATIVE MEDICINE

Learning Objectives: Human uniqueness that is making us sick. Medical consequences of mismatch between environment of evolutionary adaptation and modern life. The price of human evolutionary novelty.

- genetics
- biochemistry
- immunology
- physiology
- evolution in health and disease
- society and mental health
- MOCA comparative medicine

LECTURE 4 **ROBERT KLUENDER** **OCT20**
LANGUAGE AND COMMUNICATION

Learning Objectives: Contrasting the uniqueness of human language with the many complex communication systems of other animals.

- animal communication
- origin of language
- basic linguistics
- anatomy of speech
- molecular aspect of speech e.g FOXP2
- theory of mind
- sharing brains through language

LECTURE 6 **KATERINA SEMENDEFERI** **OCT 27**
BRAIN ANATOMY

Learning Objectives: How brains with many shared characteristics, albeit with big size differences can generate very different minds.

- anatomy
- cell biology
- neurobiology
- histology
- development
- comparative anatomy

LECTURE 7 **ALYSSON MUOTRI** **NOV 3**
CELL BIOLOGY, NEUROSCIENCE

Learning Objectives: Appreciating biology at the level of a cell. From cells to organisms. How cellular processes contribute to body and mind.

- cell biology
- biochemistry
- gene expression
- control of cell fate
- from cell to tissues

LECTURE 9 **RUPERT STASCH** **NOV 10**
CULTURAL ANTHROPOLOGY
Kinship and its cultural realization.

Learning Objectives: The value of cross-cultural studies for learning about the human phenomenon. Reflexiveness of culture on human biology (e.g. kinship relations) and culture itself.

- culture
- kinship and social bonds
- social evolution
- cultural competition
- cross-cultural perspectives

LECTURE 8 **RAFAEL NUNEZ** (PASCAL OUT) **NOV 17**
HIGHER ORDER COGNITION (Nature via Nurture)

Learning Objectives: Not everything can be explained from the bottom up. Humans and their cultures generate many top-down phenomena.

- cognitive science
- embodied mind
- societal constraints on cognition
- cultural universals or lack thereof
- neuroimaging

LECTURE 10 PASCAL GAGNEUX **DEC 1**

WRAP UP: AREAS TO WATCH

General theories for explaining human origins, their many flavors and limitations:

These include: aquatic phase, coastal lives, carnivory, the running ape, niche expansion, social cognition; language/ reputation selection, sexual selection (brain as peacock's train), the family ape (sequentially, monogamous), parochial altruisms/ in-group out-group conflict, false beliefs/denial, symbolic capacity/ rituals, less-is-more, self-domestication, the ape brain with an accident; future evolution

Learning Objectives: We long for "umbrella" type hypotheses, which explain a large suite of human attributes. The multi million-year long process resulting in modern humans almost certainly allowed for a large number of factors to come to play. These likely included totally independent factors, climatic, biological and cultural which have shaped who we have become.

climate,
ecological niche
social selection
sexual selection
genome plasticity
biochemical constraints
nature via nurture
trans-generational effects

THROUGHOUT THE COURSE: STRESS CONCATENATION BETWEEN DISCIPLINES AND SCALES OF INVESTIGATION, E.G.:

- microRNAs in old ape brain sections collected by neuroanatomists and kept in paraffin.
- Yerkes medical charts kept by veterinarians and interpreted by human medical doctors.
- Induced pluripotent stem cells (IPS) for understanding species phenotypes including aspect of their neurophenotypes.
- ancient DNA, uniquely human DNA and transgenic mice (humanizing genetic control elements in mice).
- Cell surface glycans and their role in disease susceptibility and nutrition.
- Scale free network analysis gene co-expression patterns, brain modules.
- Scale free networks and epidemiology and immune evolution.
- reconstructing ancient ecosystem through plant and animal fossils, isotopes, aeolian dust, and pollen.
- Approaches from population genetics applied to phonemes in languages.
- Effects of domestication on behavior and the gene expression in domesticated animals and in humans.

CARTA areas somewhat covered (in **bold**)

- Human and Primate Genetics and Evolution
- **Paleoanthropology and Hominid Origins**
- Mammalian and Primate Neurosciences
- Primate Biology and Medicine
- Language, Communication and Cognition
- Nature-Nurture interactions in Explaining Language and Cognition
- Human and Primate Society and Culture
- Comparative Developmental Biology of Primates
- General Theories for Explaining Humans

Instruction begins Thursday Sept 22,
Veterans day Nov 11,
Thanksgiving Nov 24-25
Instruction ends December 2
Final exams Monday-Saturday Dec 5-10

Course Website (you have to be logged in):

http://carta.anthropogeny.org/training/specialization-track/courses/Intro+to+Anthropogeny