anthropogeny tracks
a CARTA newsletter
Volume 2, Issue 1 - February 2014

Birth to Grandmotherhood: Childrearing in Human Evolution

"From the moment of birth, human infants require an inordinate amount of care," say Kristen Hawkes (University of Utah) and Wenda Trevathan (New Mexico State University), co-chairs of the next CARTA symposium, **Birth to Grandmotherhood: Childrearing in Human Origins**.

The role of childrearing in humans is unique, as the chairs point out, because we, "...unlike our nearest living relatives, remain dependent on a variety of caretakers during an unusually long maturation period followed by extraordinary adult longevity."

This free public symposium on February 21 features a panel of experts who will explore the importance of childrearing in human evolution, from birth to the impact of grandmothers. They will take a comparative perspective and consider neuroendocrine factors, energetics, life-history trade-offs and consequences for culture, while reflecting on how such a distinctive pattern of development evolved and what other uniquely human features are linked.

Presentations and Speakers

Birth and the Newborn Infant • Wenda Trevathan, New Mexico State University

Infant State in Apes and Humans • Kim Bard, University of Portsmouth, UK

Breast Milk and Breastfeeding • Katie Hinde, Harvard University

Oxytocin Pathways and Human Evolution • Sue Carter, University of North Carolina, Chapel Hill

Sharing Childcare and Knowledge in Infancy • Barry Hewlett, Washington State University, Vancouver

Human Fathers • Hillard Kaplan, University of New Mexico

Hunter-Gatherer Childhood and Human Evolution • Melvin Konner, Emory University

Grandmothers and the Extended Family • Kristen Hawkes, University of Utah

Born Human: How the Utterly Dependent Survive • Sarah Blaffer Hrdy, UC Davis

Symposium Details

- Friday, February 21, 1:00 - 5:30 p.m., PT
- Hojel Auditorium, Institute of the Americas, UC San Diego campus
- http://carta.anthropogeny.org/events/from-birth-grandmotherhood-childrearing-human-evolution
- Free, but online registration required
- Live webcast, details on the event website
- For more information, contact CARTA at carta-info@anthropogeny.org

This CARTA symposium is made possible by **The G. Harold and Leila Y. Mathers Charitable Foundation**

Center for Academic Research and Training in Anthropogeny
"to explore and explain the origins of the human phenomenon"
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Students Reflect on the Anthropogeny Field Course in Africa

Five anthropogeny specialization students spent three weeks of non-stop learning in the field last August in Ethiopia and Tanzania. Students were introduced to the three major field-based approaches to studying human origins: fossil and archaeological evidence, comparison with non-human primates, and studies of human foragers living in environments similar to those in which the human species evolved. Throughout the course, students are made keenly aware of the importance of the ecological and cultural context of human adaptation. Below, the students provide some of their most poignant memories, experiences, and lessons from the field course.

Jeremy Karnowski, Cognitive Science

Given that a part of my research focuses on facilitating and automating the processing and analysis of animal behavior and vocalizations through big data methods, I was particularly struck by the realities of various approaches to collecting primate data in the wild. The experiences at Gombe and the Ugalla Primate Project provided me with an understanding of how these traditional methods can inform Cognitive Science, as well as how to collaborate with researchers in the field.

Robert Thomas, Biomedical Sciences

Watching an adult chimpanzee manipulate tools but avoid teaching her offspring simultaneously highlighted both the similarities and differences between our two, closely related, species. It was moments like that during the field course that gave concrete, first-hand perspective to my anthropogeny studies, and these experiences will shape my professional development as I pursue evolutionary medicine. The field course provided the richest learning experience of my graduate career.

Heidi Sharipov, Neurosciences

At the National Museum of Ethiopia, we saw a fossil progress from a rock-like formation all the way to a skeleton so complete that the inner-ear ossicles were still intact. I never realized how much detailed work went into fossil preparation, and this visit completely changed the way that I viewed paleontology. Another paradigm-altering experience was during a hunt with Mahiaya, a Hadza hunter. It was an exhilarating adventure of stalking several animal species, but it was also our best opportunity to communicate, with minimal shared language, with someone who has lived a completely different lifestyle. Mahiaya taught me that the curiosities and aspirations of people are surprisingly similar, independent of their culture, and he made it clear that the questions of anthropogeny are universal.

Sara Goico, Anthropology

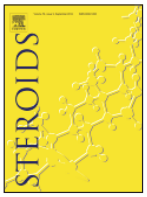
Although Mongo, a Hadza woman, was shy at first, she and I attempted to teach each other words in our respective languages. That quickly gave way to an impromptu Q&A session, sharing about our different cultures, learning from one another and laughing at our differences. Mongo also taught me how to make sinew rope. As I clumsily attempted to braid together the pieces of sinew, it came to mind what an apt metaphor it was for our study of human origins. No one strip of sinew is strong enough to string a bow, just like no one field of study holds the key to understanding human origins. We try to weave together the different lines of evidence, and when the weave is worked just so, we will have a narrative that is much more than the sum of its parts.

Daniel Frysinger, Cognitive Science

For me, the defining character of the field course was contrast - a contrast between cultures, expectations and reality, and the many fields of study and distinct methodologies at work - with each contrast highlighting a shift in understanding and the mental tickle of a new perception of the world. I am reminded of the contrasts in chimpanzee social politics. Having studied and read so much about alpha male politics and violence involved in establishing and maintaining dominant control over a community and the struggles and threats present in trying to raise an infant in that environment, it was a bit of a shock to see the peaceful, calm, and often nurturing side of the day-to-day life of an actual chimpanzee community.

CARTA-Inspired Publications

Transdisciplinary interaction is at the core of CARTA's mission in advancing human origins research. CARTA symposia provide a forum for experts from vastly different fields to share knowledge and work together to spark new research. The following is a selection of publications inspired by interactions amongst CARTA members (**in bold**) and facilitated by CARTA. (Complete list at the CARTA website)

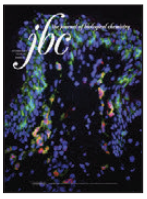


Baker, M.E. What are the physiological estrogens? *Steroids.* 2013; 78(3):321-386.

I proposed that Adiol was an ancestral vertebrate estrogen and that some of its ancient activities are found in humans. Recently, Adiol was shown to bind to the estrogen receptor, inhibiting inflammation in microglia, while estradiol, the main physiological estrogen, had no effect. Thus, Adiol has a biological activity that estradiol lacks. More Adiol-specific activities in humans are likely.

Capra, J.A., et al. including **Pollard, K.S.** Many human accelerated regions are developmental enhancers. *Philos Trans R Soc Lond B Biol Sci.* 2013; 368(1632):20130025.

Human proteins are nearly identical to chimpanzees and other animals. What makes us human is how we use genes. This study reveals that the evolutionary rewiring of our genome since divergence from chimpanzees and ancient hominids is concentrated in a relatively small number of mutations inside developmental enhancers, DNA sequences that control gene expression in the embryo.



Changeux, J.P. The concept of allosteric interaction and its consequences for the chemistry of the brain. *J Biol Chem.* 2013; 288(38):26969-86.

The recent finding that basic building blocks of the brain, the receptors for neurotransmitters, have not markedly changed for 3 billion years raises an interesting issue about the evolution of the brain. The dynamics of our mental processes are constrained by the time-scale of conformational transitions which developed in bacteria. This is perhaps why our brains are so slow compared to computers.

Dingwall, H.L., Hatala, K.G., Wunderlich, R.E., and **Richmond, B.G.** Hominin stature, body mass, and walking speed estimates based on 1.5 million-year-old fossil footprints at Ileret, Kenya. *J Hum Evol.* 2013; 64(6):556-68.

The recent discovery of 1.52 million-year old hominin footprints from multiple horizons in Ileret, Kenya, provides new data on the complete foot size of early Pleistocene hominins as well as stride lengths and other characteristics of their gaits. The large sizes of these footprints provide strong evidence that hominin body size increased during the early Pleistocene.

Donald, M. Mimesis theory re-examined, twenty years after the fact. In: Hatfield G.C., and Pittman H. eds. *Evolution of Mind, Brain and Culture.* Philadelphia: University of Pennsylvania Museum of Archaeology and Anthropology; 2013:169-92.

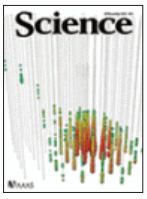
Mimesis theory proposes an archaic bridging brain adaptation in hominins (-2 Mya) that shifted brain evolution toward flexible, creative, and socially distributed systems of cognitive governance, and away from rigidly modular internal systems. This adaptation was primarily about refining motor skills for toolmaking, but it had an important exaptive spinoff: a cognitive capacity eventually capable of generating a conventionalized system of expression.

Hernandez-Aguilar, R.A., **Moore, J.**, and **Stanford, C.B.** Chimpanzee nesting patterns in savanna habitat: Environmental influences and preferences. *Am J Primatol.* 2013; 75(10):979-94.

Early archaeological sites have been interpreted as evidence of home bases and thus of modern human behavior, but savanna chimpanzees reuse sleeping sites in ways that mimic site formation. Identifying their preferences helps to interpret early hominin sites and understand antecedents of home-base behavior. We show that Ugalla chimpanzees choose tree structure (not just height) to avoid predators, and orient nests toward sunlight.

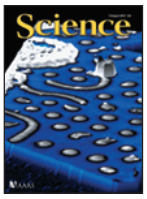
Kaas, J.H. The evolution of brains from early mammals to humans. *Wiley Interdiscip Rev Cogn Sci.* 2013; 4(1):33-45.

This review focuses on the challenging issue of how the large, complex human brain, with mediating abilities unmatched by any other species, evolved from distant mammalian ancestors with small, simpler brains. Many of the important changes occurred in cerebral cortex, where the number of functional subdivisions increased ten-fold, and the number of cortical neurons reached 16 billion.



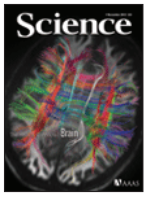
Lieberman, P. Synapses, language, and being human. *Science.* 2013; 342(6161):944-5.

Humans differ from other living species in our ability to learn to do most anything and in our creative impulse - manifested in art, science, language and continual changes in how we act. These qualities, in part, derive from mutations in the FOXP2 gene that increased the number of synapses in neural circuits of our brains that link cortex with basal ganglia structures predating the dinosaurs.



Lister, R., et al. including **Sejnowski, T.** Global epigenomic reconfiguration during mammalian brain development. *Science.* 2013; 341(6146):1237905.

The sequences of genomes give us clues to the evolution of primates, but epigenetic marks on genes control which are expressed in different cells. This paper reveals a unique pattern of epigenetic regulation found only in neurons that may give us more clues to what makes the human brain human.



McConnell, M.J, et al. including **Gage, F.H.** Mosaic copy number variation in human neurons. *Science.* 2013; 342(6158):632-7.

The only way to know for sure that neurons from the same person harbor unique DNA is by profiling the genomes of single cells instead of bulk cell populations, the latter of which produce an average. Now, using single-cell sequencing, Salk researchers and their collaborators have shown that the genomic structures of individual neurons differ from each other even more than expected. Contrary to what we once thought, the genetic makeup of individual neurons in the brain are not identical, but rather vary, and in some cases quite substantially from one another.

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CARTA-Inspired Publications, Continued

Mills, D.L., et al. including **Bellugi, U.**, and **Korenberg, J.R.** Genetic mapping of brain plasticity in Williams Syndrome: ERP markers of face and language processing across development. *Dev Neuropsychol.* 2013; 38(8):613-42.

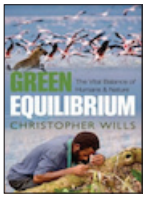
This study investigated how genes affect brain activity across development in individuals with Williams syndrome, a rare genetic disorder. The scientists showed that the brain can adapt to the genetic abnormality by using different neural systems. By comparing brain activity from individuals with fewer genes deleted, they were able to see how very slight genetic differences affected brain activity separately for faces and language.

Nievergelt, C.M., et al. including **Kidd, K.K.** Inference of human continental origin and admixture proportions using a highly discriminative ancestry informative 41-SNP panel. *Investig Genet.* 2013; 4(1):13.

Today's human populations have undergone a long history from their origin in Africa to populating most of the world's continents. Evolutionary forces during this process have led to genetic diversity between human populations. These genetic differences can be employed to determine geographic origins of a subject. We have developed a small and highly informative marker panel to do this conveniently.

Varki, A. Dating the origin of us. *The Scientist.* 2013; 27(11):28-9.

Many steps in human origins are difficult to reconstruct, and "thought experiments" can be useful in such instances. This essay tries to date the origin of us "behaviorally modern humans" by imagining the outcomes of time travel involving 1,000 healthy newborn babies. Diverse responses to an anonymous poll of CARTA faculty and students on this subject serve to highlight the current uncertainties.



Wills, C. *Green equilibrium: the vital balance of humans & nature.* Oxford, UK: Oxford University Press; 2013.

UCSD evolutionary biologist Christopher Wills takes his readers on a tour of the planet. He explores the balance of ecological and evolutionary forces that keep the world's ecosystems diverse and healthy, a condition he calls green equilibrium. And he shows how similar balancing selective pressures have led to our own evolution, and to our growing ability to heal the planet.

CARTA Symposia Schedule

Birth to Grandmotherhood: Childrearing in Human Evolution
February 21, 2014 • UC San Diego

Male Aggression and Violence in Human Evolution
May 16, 2014 • Salk Institute

Domestication and Human Evolution
October 10, 2014 • Salk Institute

Language in Human Origins
Winter 2015, Location TBD

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Want to rewatch a CARTA symposium? Our symposia, including **"Mind Reading: Human Origins and Theory of Mind"** (October 2013), are available at these websites.

What is CARTA?

The UC San Diego/Salk Institute Center for Academic Research and Training in Anthropogeny (CARTA) is dedicated to answering the age old questions "where did we come from?" and "how did we get here?" As CARTA explores the origins of humanity, we are not only answering philosophical and existential questions, but also addressing very practical issues such as human nutrition, medicine, mental disease, the organization of society, the upbringing of our young, and the interactions of humans with one another and with our environment. CARTA organizes symposia aimed at exploring key issues surrounding the pursuit of understanding our origins.

For more information, please visit
http://carta.anthropogeny.org

Support CARTA

Your donation to CARTA has the power to impact and transform the study of anthropogeny and the understanding of human origins. There are three ways to donate to CARTA:

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