



# anthropogeny tracks

a CARTA newsletter

Volume 1, Issue 2 - May 2013

## “Behaviorally Modern Humans: The Origin of Us”

Current evidence suggests that multiple upright-walking, tool-dependent species in the genus *Homo* co-existed in the Old World (Africa, Asia, and Europe) for most of the last 2 million years. Yet, only one surviving “behaviorally modern” species of *Homo* exists today. Integral to understanding the human story is knowing when, where, and how we “Behaviorally Modern Humans” emerged and eventually replaced all the other human-like species.

CARTA’s May 10, 2013 symposium, “Behaviorally Modern Humans: The Origin of Us,” will take a fresh look at those questions and examine available evidence from multiple sources, including climate proxies, geology, fossils, archaeology, linguistics, immunology, genetics and genomics, as well as evolutionary neuroscience/cognitive archaeology. Noted experts representing numerous fields of research from around the globe will share their knowledge:

### ***African Climate of the Last 400,000 Years***

Rick Potts, Smithsonian Institution

### ***Fossil Record of Anatomically Modern Humans***

Chris Stringer, Natural History Museum, London

### ***East African Archaeological Evidence***

Alison S. Brooks, George Washington University/Smithsonian Institution and Sally McBrearty, University of Connecticut

### ***South African Archaeological Evidence***

Lyn Wadley, University of the Witwatersrand, Johannesburg

### ***Interbreeding with Archaic Humans in Africa***

Michael Hammer, University of Arizona

### ***Relationships of Ancient African Languages***

Christopher Ehret, UCLA

### ***Evidence for the Spread of Modern Humans***

Ofer Bar-Yosef, Harvard University

### ***Interbreeding with Archaic Humans Outside Africa***

Richard “Ed” Green, UC Santa Cruz

### ***Stone Tools and Cognition: Lessons from Australia***

Iain Davidson, University of New England, Australia



“Behaviorally Modern Humans: The Origin of Us” is co-chaired by Ajit Varki (UC San Diego) and Alison S. Brooks (George Washington University/Smithsonian Institution) and is presented by CARTA. Supported by the G. Harold and Leila Y. Mathers Charitable Foundation.

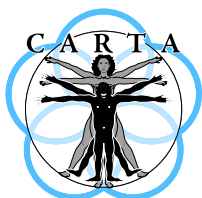
**DATE AND TIME:** May 10, 2013, 1:00 - 5:30 p.m., PT

**ADMISSION:** Free, but online registration is required

**WEBSITE:** <http://carta.anthropogeny.org/events/behaviorally-modern-humans-the-origin-us>

**WEBCAST:** A live webcast will be offered. Look for details on the event page

For more information, contact CARTA at [carta-info@anthropogeny.org](mailto:carta-info@anthropogeny.org)



**Center for Academic Research and Training in Anthropogeny**  
“to explore and explain the origins of the human phenomenon”

CARTA • University of California, San Diego • 9500 Gilman Drive, MC# 0060 • La Jolla, CA 92093

# Training the Next Generation of Transdisciplinary Thinkers

In 2011, the Graduate Specialization in Anthropogeny was established to provide students from existing PhD programs across the UCSD campus the opportunity to extend their research interests to include transdisciplinary study of human origins.

The 3-year program consists of human origins curriculum, active engagement in CARTA symposia, networking with leading researchers across the globe, a field course in Africa, and regular participation in an anthropogeny think tank. Students who successfully complete the specialization

earn a parenthetical degree in anthropogeny alongside their PhD. The specialization is the first transdisciplinary human origins focused program offered anywhere, and is organized and supported by the Faculty of Anthropogeny, which consists of UCSD professors and researchers whose expertise span the social, natural, and medical sciences.

This transdisciplinary education is especially important as students embark on their future careers. Whether these are in teaching, basic research, industry,

public service or private enterprise, the ability to mediate between different types of knowledge bases is a rare, yet increasingly vital, skill set.

Next month, the first three enrollees will graduate from this unique program. We asked each of them to reflect on their experience as an anthropogeny specialization student and to consider its effect on their career, and, for that matter, on their life. Here are the comments from each graduate.

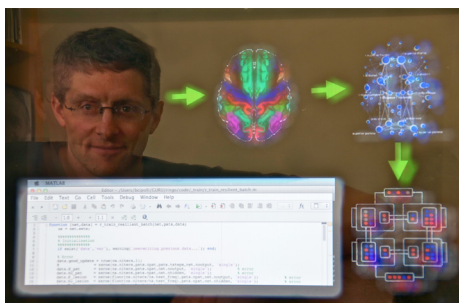
## Ben Cipollini Cognitive Science

I entered graduate school in Cognitive Science at UC San Diego with one question in mind: why do people do the things that they do? My research is an honest attempt to combine the little that we know about the underlying biology and physiology of visual processing asymmetries between left and right cerebral hemispheres into a coherent neural network model of cerebral asymmetry and interhemispheric cooperation in time.

Studying human origins and being trained in methods for examining the trajectories of humanity are not impersonal endeavors. Like all knowledge, answers can be wrenching as you encounter them, whether you're ready to listen or not.

The people of CARTA have been wonderfully generous in sharing their wide-ranging interests, knowledge, and support. Knowledge of principles of evolution and how to think about and interpret cross-species research provide me with a real competitive advantage in my field. For these things, and for the generosity of our funders, I am extremely grateful.

What will the future hold? Surprisingly, there is specific demand for computer programmers holding a Ph.D. with an added specialization in anthropogeny. Unsurprisingly, studying anthropogeny has prepared me to accept whatever path I, and we, wind up taking. I'm looking forward to both!



Ben and a hemispheric neural network model

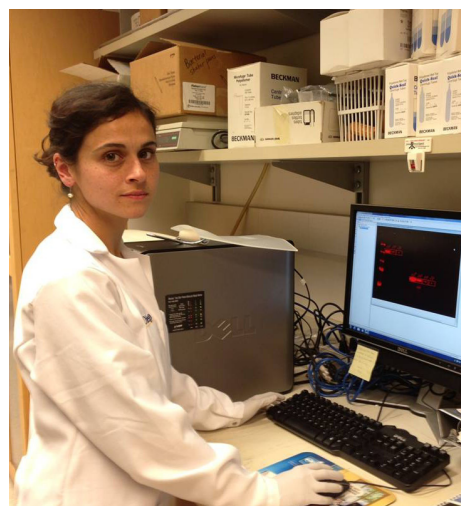
## Leela Davies BioMedical Sciences

As a joint MD/PhD student working in the Department of Cellular and Molecular Medicine and the Glycobiology Research and Training Center at UC San Diego, I explore the evolutionary aspects of the sugar, sialic acid, in brain development.

Although many students have an intense and narrow focus in their graduate career, the remarkable opportunities and experiences I have had in the Graduate Specialization in Anthropogeny have dramatically broadened my scientific knowledge and perspective. The tiny sugars and cells that I work on are contextualized within individuals, societies, and ecologies.

Further, I have gained scientific fluidity, a degree of confidence reading and discussing material outside my own field, which has already proved invaluable in understanding the scientific questions I am interested in.

In the future, I hope that the unique perspective CARTA has provided will help me to explore the evolutionary foundations of some of the diseases that afflict our species.



Leela in the lab

## Hope Morgan Linguistics

I feel incredibly lucky to have been a student here at UC San Diego at the inception of the Graduate Specialization in Anthropogeny. This program has been mind-opening, challenging, and also a lot of fun.

One benefit of the program's breadth and regular periods of intensive input (symposia, classes, field school) is that the big picture questions come into focus in an organic, holistic way rather than through the minutiae of a single field or narrow theoretical window, resulting in a rich foundation. I've gained a broader perspective on the goals of multiple diverse fields and the confidence to interact with a community of individual experts whose shared base of knowledge may barely overlap.

The field school in Tanzania will always be a highlight. Spending a few days with the Hadza hunter-gatherers in their environment, as well as visiting Ugalla, deepened my impressions of human origins. I got a feel for how the pacing of days is prioritized around obtaining food and water and how an E. African grassland environment might actually provide these things to an early bipedal hominin with intelligence, tools, shared reference, provisioning, etc.

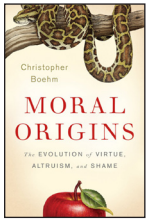
As I currently work on my thesis—a linguistic analysis of a 50-year-old sign language in Kenya—issues in anthropogeny are present in the details of how language forms emerge and become systematic throughout a population.



Hope (right) conducting research in Kenya

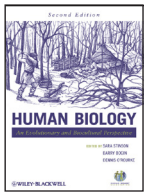
# CARTA-Inspired Publications

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 are a selection of publications inspired by interactions amongst CARTA members (in **bold**), facilitated by CARTA (complete list at the CARTA website).



**Boehm, C.**, *Moral Origins: The Evolution of Altruism, Virtue, and Shame*, Basic Books, (2012)

*Moral Origins* presents a new and highly readable hypothesis to explain both human altruism and the development of the human conscience. This is based on a uniquely human mechanism in the form of social selection, which involves not only rewards going to individuals who behave altruistically, but strong reproductive costs going to selfish deviants. A combination of group public opinion, individual choice, and group punishment account for these effects, and the result has been a moral being unparalleled in the world of nature.



Stinson, S.; **Bogin, B.**; O'Rourke, D. (eds.), *Human Biology: An Evolutionary and Biocultural Approach*, 2nd Edition, Wiley, (2012)

*Human Biology* attempts to understand genetic variation, adaptation to climate, disease causation, physical growth, nutrition, demography, and aging in the human species. Human origins are central to these understandings. Written by 26 specialists, the 'human condition' is examined in evolutionary and biocultural perspective. Of special interest to CARTA is Chapter 11, "Evolution of the Human Life Cycle."



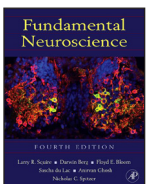
**Finch, C.E.**, *Evolution of the Human Lifespan, Past, Present, and Future: Phases in the Evolution of Human Life Expectancy in Relation to the Inflammatory Load*, Proceedings of the American Philosophical Society, p. 9, (2012)

This essay poses two major questions: How did humans evolve uniquely long lifespans relative to the great apes, despite radical changes in diet and exposure to infection and inflammation that would, otherwise, be predicted to shorten lifespan. And, will the increases in lifespan since 1800 continue into the 21st Century during global deteriorations of our environment? Answers to both questions concern mechanisms of inflammation that interact with the major diseases of human aging.



Hancks, D.C.; **Kazazian, H.H. Jr.**, *Active Human Retrotransposons: Variation and Disease*, Current Opinion in Genetics & Development, p. 191, (2012)

Humans have three types of "jumping Genes," DNA elements copied and pasted into new genomic sites. When they jump, they can hit a gene, knock it out, and cause disease. About 100 disease cases, such as hemophilia, are due to "jumping genes." One "jumping gene" type, SVA, is present in ~3,000 copies. SVAs have only existed 15-20 million years. They are composites of pieces from three other DNA elements. How these pieces get together has now been traced in primates. Although there are many fewer SVAs than other "jumping genes," they cause an inordinate number of disease cases.



**Kaas, J.H.**; **Preuss, T.M.**, *Human Brain Evolution*. In *Fundamental Neuroscience*, 4th Edition, Squire, L., et al. (eds.), p. 901, Academic Press, (2012)

This is a general, textbook-level review, highlighting recent advances in our understanding of primate and human brain evolution.



Lipovich, L. et al. including **Grossman, L.I.**; **Hof, P.R.**; **Sherwood, C.C.**; **Goodman, M.**, *Developmental Changes in the Transcriptome of Human Cerebral Cortex Tissue: Long Noncoding RNA Transcripts, Cerebral Cortex*, (in press)

Humans have large brains for their size, which require a relatively long period of development to construct their neuronal connections. We are interested in genes that spring into action at different times during this process and, in this study, in genetic regions that don't specify protein but rather a product called long noncoding RNA. We had access to surgically resected human brain tissue from individuals of different ages and found 8 such RNAs with distinct patterns of being made during development. This can help us understand how brain development is controlled.



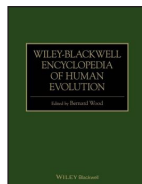
**Lieberman, P.**, *The Unpredictable Species: What Makes Humans Unique*, Princeton Univ Press, (2013)

What makes us unique is the human brain's creative capacity. I suggest that mutations on "master" transcriptional genes supercharged neural mechanisms that we share with apes. We can form and learn new concepts, create art, fashions, tools, devices and turn on a dime. In this view, it is unnecessary to invoke specific genes proposed by others as determining language, art, morality and so on.



O'Brien, M.; Searles, V.B.; **Varki, A.**; **Gagneux, P.**; **Sikela, J.M.**, *Evolution of Genetic and Genomic Features Unique to the Human Lineage*, Nature Reviews Genetics, p. 853, (2012)

Due to the wealth of new genomic tools and resources that have become available for comparing genomes, identification of the genomic changes unique to the human species has begun to dramatically accelerate, ushering in what will likely be a golden age of human evolutionary genomics. This review provides an overview of current knowledge in this rapidly advancing field, covering both recent discoveries and remaining challenges.



**Wood, B.** (ed.), *Wiley-Blackwell Encyclopedia of Human Evolution*, (2011)

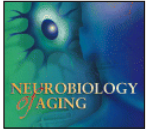
It is impossible for an individual to keep up on the many disciplines that now contribute to human evolution research. The encyclopedia is intended for researchers and senior students, but a forthcoming *W-B Dictionary of Human Evolution* is intended for undergraduates and interested lay people.



**Hrdy, S.**, *Development + Social Selection in the Emergence of "Emotionally Modern" Humans*. In: Meehan, C.L.; **Crittenden, A.N.** (eds.), *Origins and Implications of the Evolution of Childhood*, SAR Press, (in press)

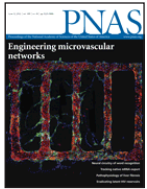
I explored developmental outcomes for infant apes who had to rely on care and provisioning from multiple caretakers and asked what would happen if resulting phenotypes were then subjected to social selection (sensu West Eberhard) favoring infants better at monitoring and evaluating others? The formulation of social selection used derived from discussions at the CARTA symposium "The Evolution of Human Altruism" (2010).

## CARTA Inspired-Publications, Continued



Chen, X. et al. including **Preuss, T.M.**; **Rilling, J.K.**, Brain aging in Humans, Chimpanzees (Pan troglodytes) and Rhesus Macaques (Macaca mulatta): MRI Studies of Macro- and Microstructural Changes, Neurobiology of Aging, (in press)

Brain aging entails changes in white matter volume and the integrity of the myelin sheaths that surround nerve fibers. Human and chimpanzee brains age at similar rates: white matter volume increases to about age 50 and then declines; white matter integrity increases to about age 30 and then declines. However, few chimpanzees survive to age 50, so humans experience a longer period of white matter decline.



Wang, X. et al. including **Tishkoff, S. A.**, **Green, E. D.**, **Varki, A.**, Specific Inactivation of Two Immunomodulatory SIGLEC Genes During Human Evolution, Proceedings of the National Academy of Sciences, p. 9935, (2012)

We “resurrected” two genes that are uniquely inactivated in all humans, and showed that they interact with bacteria that kill fetuses and infants. These genetic changes seem to have been universal to our lineage ~100-200,000 years ago. Interestingly, modern-day humans apparently emerged from a small number of ancestors at about that time. Perhaps infectious agents played the role in human origins?



Boddy, A.M. et al. including **Sherwood, C.C.**; **Grossman, L.I.**; **Goodman, M.**, Comparative Analysis of Encephalization in Mammals Reveals Relaxed Constraints on Anthropoid Primate and Cetacean Brain Scaling, Journal of Evolutionary Biology, p. 981, (2012)

Mammals whose brains are relatively large for their body size often have enhanced cognitive abilities. Among 630 species studied, the largest variation in relative brain size occurs in primates (which includes humans) and cetaceans (large ocean going mammals that include whales and dolphins). The variation among species within these groups is interpreted in terms of adaptation (natural selection) and also through neutral changes.



**Konopka, G.** et al. including **Preuss, T.M.**; **Geschwind, D.H.**, Human-Specific Transcriptional Networks in the Brain, Neuron, p. 601, (2012)

This study compared humans to chimpanzees and monkeys to identify human-specific pattern of gene expression in higher brain regions. The study identified networks of genes that are expressed in coordinated fashion in humans, but not other primates. Many of the genes in these human-specific networks have been implicated in neuropsychiatric disorders.

### CARTA Symposia Schedule

**Mind Reading: Human Origins and Theory of Mind**  
October 18, 2013 • Salk Institute

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

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

**Domestication and Human Evolution**  
October 2014 • UC San Diego

### CARTA on the Web



[carta.anthropogeny.org](http://carta.anthropogeny.org)



[facebook.com/ucsdcarta](https://www.facebook.com/ucsdcarta)



Want to rewatch a CARTA symposium? Our symposia, including “**Is the Human Mind Unique?**” (February 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:

**ONLINE** Visit <http://carta.anthropogeny.org/donate> and click on “Donate.”

**BY MAIL** Make your check payable to the **UC San Diego Foundation** and include a brief note specifying your donation is to go to CARTA. Mail to:

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