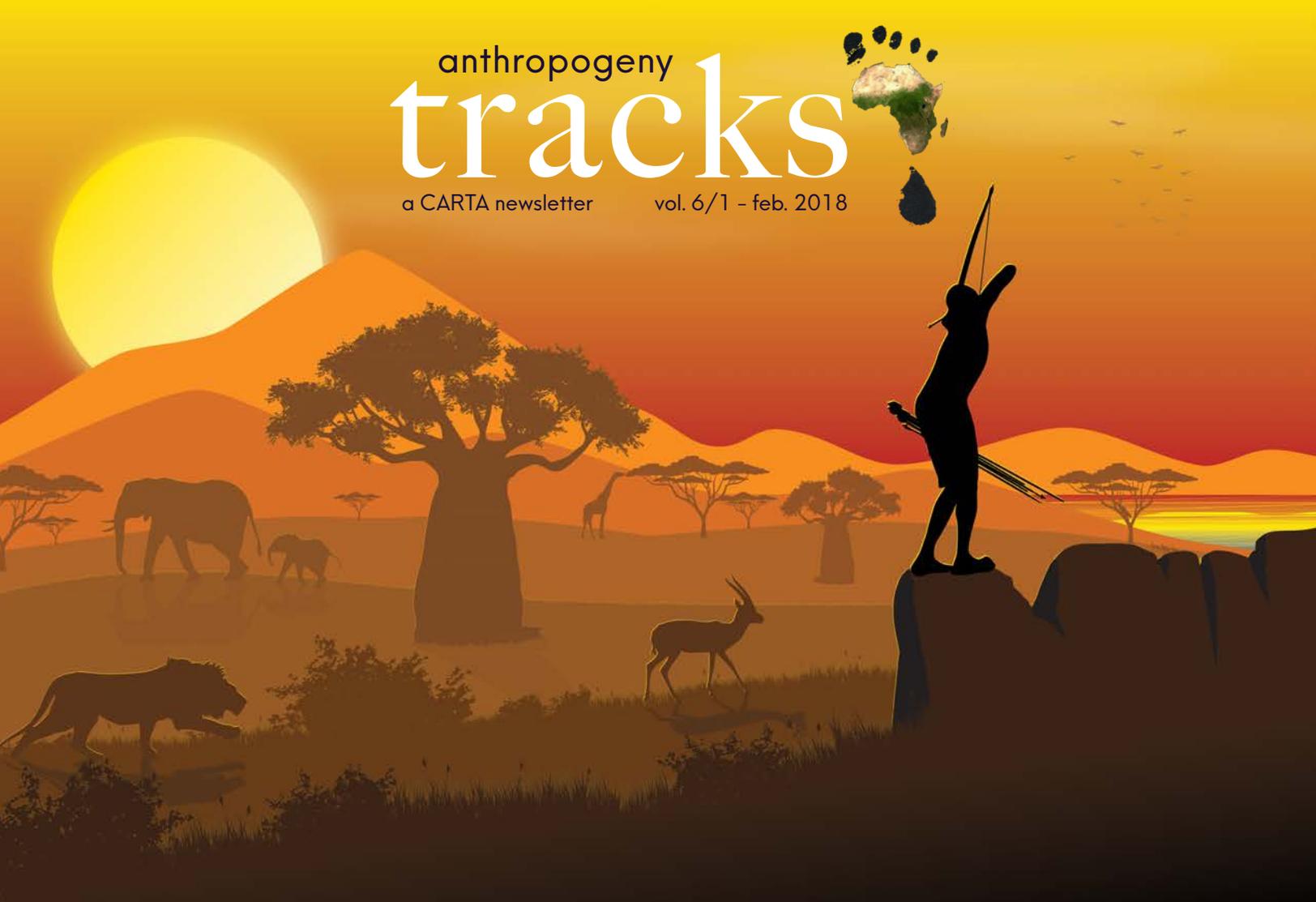


anthropogeny tracks

a CARTA newsletter

vol. 6/1 - feb. 2018



The Role of Hunting in Human Origins

Seen as a key human adaptation, **hunting** is thought to have influenced our anatomy, physiology and behavior. While humans have been hunter-gatherers for most of our existence as a species, there is considerable uncertainty about where, when, why, and how our early ancestors came to consume vertebrate meat on a regular basis.

The goal of CARTA's **March 2, 2018** symposium, **The Role of Hunting in Anthropogeny**, is to explore evidence pertaining to understanding the origins of hominin hunting in an attempt to focus research agendas for the future.

Turn the page for more details!

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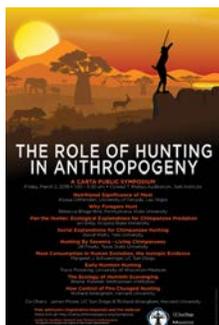
2017
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CARTA Symposium: *The Role of Hunting in Anthropogeny*



Each CARTA symposium features experts who present on topics addressing the origins of the human phenomenon.

CARTA symposia are free and open to the public. If you're curious about where we came from and how we got here, consider attending one of our events.

For more information on this symposium, to register, to watch the live webcast, or for information on past and future events, please visit:

<https://carta.anthropogeny.org/symposia>

This symposium is presented by

**UC San Diego/Salk Institute
Center for Academic Research and
Training in Anthropogeny (CARTA)**

And made possible by support from

**The G. Harold and Leila Y. Mathers
Charitable Foundation**

Friday, March 2

1:00 - 5:30 pm (Pacific)

Conrad T. Prebys Auditorium, Salk Institute

FREE ADMISSION!

LIVE WEBCAST!

Co-Chaired by

James Moore, UC San Diego
& Richard Wrangham, Harvard University

Featuring the following talks and speakers

Nutritional Significance of Meat

Alyssa Crittenden, University of Nevada, Las Vegas

Why Foragers Hunt

Rebecca Bliege Bird, Pennsylvania State University

Pan the Hunter: Ecological Explanations for Chimpanzee Predation

Ian Gilby, Arizona State University

Social Explanations for Chimpanzee Hunting

David Watts, Yale University

Hunting by Savanna - Living Chimpanzees

Jill Pruetz, Texas State University

How We Determine What Food Fueled Human Evolution

Margaret Schoeninger, UC San Diego

The Ecology of Hominin Scavenging

Briana Pobiner, Smithsonian Institution

How Control of Fire Changed Hunting

Richard Wrangham, Harvard University

UC San Diego



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“The gold standard” on evolution of nervous systems across the animal kingdom

The *Evolution of Nervous Systems, 2nd Edition*, is a work featuring many CARTA connections: Edited by CARTA member, Jon Kaas, and with numerous chapters authored by CARTA members (see list below). CARTA is proud to share partnership with these great minds as they lend their expertise in this edited volume.

From the publisher:

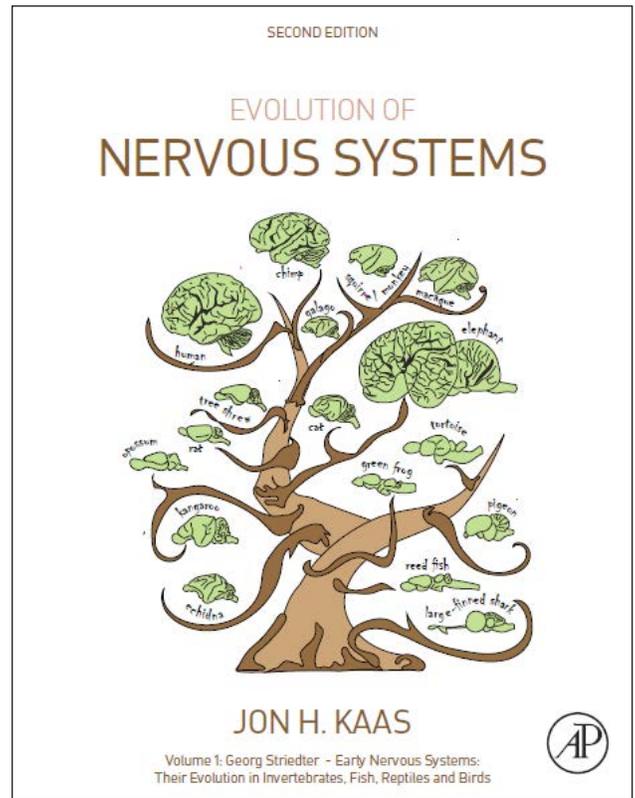
Evolution of Nervous Systems, Second Edition is a unique, major reference which offers the gold standard for those interested both in evolution and nervous systems. All biology only makes sense when seen in the light of evolution, and this is especially true for the nervous system. All animals have nervous systems that mediate their behaviors, many of them species specific, yet these nervous systems all evolved from the simple nervous system of a common ancestor. To understand these nervous systems, we need to know how they vary and how this variation emerged in evolution.

Over 100 distinguished neuroscientists contributed to this important 4-volume reference.

CARTA members (in bold) have contributed to this transdisciplinary work in the following chapters:

- An Introduction to Human Brain Evolutionary Studies. (**Preuss, T**)
- Comparative Structure of the Cerebral Cortex in Large Mammals. (Raghanti, MA, Munger, EL, Wicinski, B, Butti C, **Hof PR**)
- Evolution of Human Language Circuits Revealed With Comparative Diffusion Tensor Imaging. (**Rilling, JK**)
- Evolution of Mirror Neuron Mechanism in Primates. (**Rizzolatti, G**, Fogassi, L)
- Evolution of the Human Life History. (**Bogin, BA**, Varea, C)
- Evolution of Parietal Cortex in Mammals: From Manipulation to Tool Use. (Goldring, AB, **Krubitzer, LA**)
- Evolution of Parietal-Frontal Networks in Primates. (**Kaas, JH**, Qi, HX, Stepniewska, I)
- Evolution of Visual Cortex in Primates. (**Kaas, JH**)
- Evolutionary Specializations of Human Brain Microstructure. (**Sherwood, CC**, Bauernfeind, AL, Verendeev, A, Raghanti, MA, **Hof, PR**)
- Evolutionary Specializations of the Human Limbic System. (Lew, CH, **Semendeferi, K**)
- Evolutionary Specializations of the Human Prefrontal Cortex. (Passingham, RE, Smaers JB, **Sherwood, CC**)
- Hands, Brains, and Precision Grips: Origins of Tool Use Behaviors. (Almécija, S, **Sherwood, CC**)
- Human Evolutionary History. (Boyle, EK, **Wood, B**)
- Neocortex Expansion in Development and Evolution: The Cell Biology of Neural Stem and Progenitor Cells and the Impact of Human-Specific Gene Expression. (Kalebic, N, Long, K, **Huttner, WB**)
- The Developmental Basis of Evolutionary Trends in Primate Encephalization. (Halley, AC, **Deacon, TW**)
- The Expansion of the Cortical Sheet in Primates. (Mayer, S, **Kriegstein, AR**)
- The Organization of Neocortex in Early Mammals. (**Kaas, JH**)

Evolution of Nervous Systems, 2nd Edition



In Living Color: 2017 Anthropogeny Field Course

ADDIS ABABA, ETHIOPIA



"Salem" (*Australopithecus afarensis*) cast, at the National Museum of Ethiopia.



Fossil of an *Ardipithecus ramidus* hand cast, at the National Museum of Ethiopia.



Stone tool assemblage at the National Museum of Ethiopia. Oldowan (Mode 1).

Traversing landscapes (and millions of years of hominin evolution) across Ethiopia and Tanzania, six Ph.D. students from the Anthropogeny Graduate Specialization at UC San Diego participated in the 2017 Anthropogeny Field Course. The students, **Matt Boisvert** (Neurosciences), **Emily Bovino** (Visual Arts), **Alie Caldwell** (Neurosciences), **Catie Profaci** (Neurosciences), **Mike Vaill** (Biomedical Sciences), and **Haleh Yazdi** (Psychology), explored the ecological context for human adaptation and were provided with a hands-on introduction to the three major approaches to studying the origins of our species: fossil evidence, ethnography of human foragers, and comparative biology.

The National Museum in Addis Ababa, Ethiopia, set the foundation for the learning experience. There, the students accessed 8 million years of fossil evidence, including important hominin fossils, and observed how experts prepare these important remains.

In Tanzania, the students visited the genome center in Moshi, toured the Rift Valley, visited the Ngorongoro Crater, Serengeti National Park, and Olduvai Gorge. This was followed by interactions with the Hadza hunter-gatherers. The remainder of the course focused on observations of chimpanzees, baboons, guenons, and red colobus monkeys at Gombe Stream National Park and at the Ugalla Primate Project in Issa Valley.

The Field Course is led by **Dr. Pascal Gagneux** (UC San Diego) and **Dr. Alex Piel** (Liverpool John Moores University).

Please enjoy this visual tour of the students' experiences from the 2017 field course.



Fossil preparation at the National Museum of Ethiopia.

ARUSHA, TANZANIA



With Professor Blandina Mbaga, Director of the Kilimanjaro Clinical Research Institute, where microbiome samples are analyzed.



Happiness Kumburu, a Ph.D. student at the Kilimanjaro Clinical Research Institute.



Alie, Dr. Piel, and Happiness Kumburu at Kilimanjaro Clinical Research Institute cold room.

EASTERN RIFT VALLEY, TANZANIA



Sunrise in the Eastern Rift Valley floor.



Matt and the Eastern Rift Valley.



Douglas Simbeye, our safari guide, explaining how termites invented mushroom farming long before humans.



The faithful steed.



Corn growing at the top of the Eastern Rift wall.



Alie next to a termite mound. In the background you can see creeping modernity.

NGORONGORO CRATER, TANZANIA



Ngorongoro Crater (technically, it's a caldera) is 12 miles in diameter and home to over 20,000 large mammals.



Wildebeests, one of the dominant ruminant species.



An elusive bushbuck.



Students met Dr. Tim Caro who studies how zebra stripes protect against biting flies.



Paleontologists use series of pig fossils to calibrate timing and ecology information.



Zebras and wildebeests graze together in Ngorongoro Crater.



A living hippo in Ngorongoro. We saw cut marks on hippo fossils at the National Museum in Ethiopia.



Lovely herd of pachyderms.



Not your average house cat.

OLDUVAI AND THE SERENGETI, TANZANIA



Olduvai Gorge. Little known fact: Olduvai is a misspelling because German explorers couldn't say "Oldupai."



Haleh with an Olduvai skeletal collection.



Masai giraffe.



Spotted hyenas are a species with female social dominance.

THE HADZA HUNTER-GATHERERS OF TANZANIA



Hadza reading multiple tracks to find the impala they shot.



Success! They will process the impala and use every part of it.



Women dig for tubers during the dry season, making them the major providers of calories for the tribe.



Arrow fletching, Hadza-style.



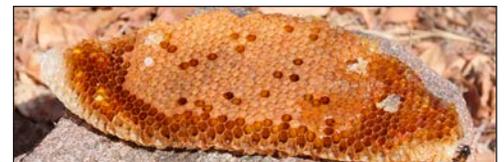
Matt making fire.



Believe it or not, there is a human hugging the baobab tree.



Tubers roasting on an open ground fire.



Honey and bee larva are also important foods for the Hadza and require fire to safely collect.

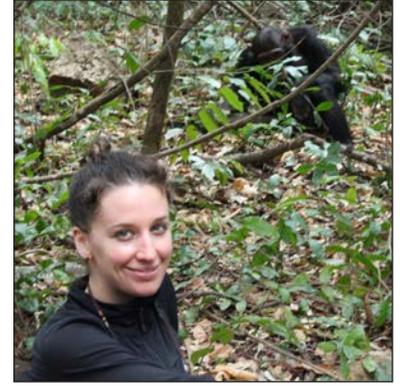
PRIMATE TIME AT GOMBE AND UGALLA



Lunch time at Gombe Stream National Park...



...Followed by snooze central.



Emily in the forest chimping.



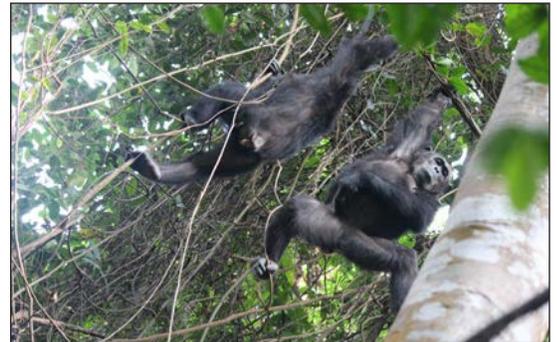
A close encounter for Catie.



Mike at the top of Gombe.



A young chimp with the typical light skin of an adolescent.



"Whatcha doin'?" "Ah, just hangin'."



"He who understands baboons would do more towards metaphysics than Locke." C. Darwin



A red-tailed monkey feeding.



A red-tailed monkey leaping from tree-to-tree to avoid the ground.



The field course group plus researchers and staff, Ugalla, Tanzania.

Transdisciplinary interaction is at the core of CARTA's mission to advance 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.)



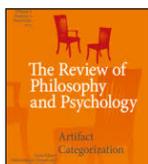
Astling, DP, et al., including **Sikela, JM**. High resolution measurement of DUF1220 domain copy number from whole genome sequence data. *BMC Genomics*. 2017;18(1):614-630.

Sequences encoding the DUF1220 protein domain (now called Olduvai) have undergone the largest human-specific increase in copy number of any coding region in the genome. However, with ~300 copies in the human genome, measurement of Olduvai copy number has been challenging. Here we present a new method that allows Olduvai copy number to be measured with high precision from whole genome sequence data.



Boehm, C. Gossip and Reputation in Small Scale Societies: A View from Evolutionary Anthropology. In: Giardini, F, Wittek, R, eds. *Oxford Handbook of Gossip and Reputation*. Oxford: Oxford University Press; 2016.

Gossiping would appear to be uniquely human, and it is well documented for hunter-gatherers of the types found in the Late Pleistocene. These people live in moral communities and privately they speak candidly about others, as they evaluate their behaviors; the result is that social reputations are known and social choices can be made accordingly. Such private communication allows entire groups to evaluate serious social problems such as the presence of a dangerous social predator, and can lead to capital punishment that enhances group cooperative functions.



Boyette, AH, **Hewlett, BS**. Teaching in Hunter-Gatherers. *Review of Philosophy and Psychology*. 2017;1-27.

The paper considers whether teaching is universal and a requirement for culture. Most of what we know about teaching comes from research with stratified societies with formal education systems. Little is known about teaching in the hunting-gathering lifeway that characterized most of human history. The paper finds that learning in these intimate and egalitarian societies is autonomous but that teaching occurs in brief, subtle ways, situated in shared activities, and is critical to learning essential cultural knowledge and skills.



Brand, CM, et al., including **Marchant, LF**. Laterality of Grooming and Tool Use in a Group of Captive Bonobos (*Pan paniscus*). *Folia Primatol*. 2017;88(2):210-222.

Human right-handedness is a species-wide phenotype with an observed ratio of 9:1. Whether this characteristic is a derived trait in the hominin lineage, or reflects shared ancestry of humans and genus *Pan spp.*, was studied in captive bonobos. For grooming, there was no group or individual hand preference. However, in a tool-use task - termite fishing - 7/8 subjects who produced adequate observations, had strong individual hand preference, 4 for the left hand, and 3 the right. Perhaps *Pan* is an intermediate model for the origins of manual lateralization when apes engage in tool use?



Bray, J, **Pusey, AE**, Gilby, IC. Incomplete control and concessions explain mating skew in male chimpanzees. *Proc Biol Sci*. 2016;283(1842):2016-2071.

Among chimpanzees, it's good to have powerful friends. Here, subordinate males that often groomed the alpha male (who typically has priority of access to mates) had higher than expected mating success when he was nearby, suggesting that he selectively tolerated mating attempts by his allies. This indicates that the human tendency to form strong social bonds has deep evolutionary roots.



Cooperrider, K, Slotta, J, **Núñez, R**. The Preference for Pointing With the Hand Is Not Universal. *Cogn Sci*. 2018;1-16.

Pointing is a cornerstone of human communication. But do people in all cultures prefer to point with the index finger? With a novel experiment this study shows that the Yupno of Papua New Guinea prefer to point using radically different articulators: nose and head. These findings raise questions about why groups differ in their pointing preferences and why humans communicate in the ways they do.

CARTA-Inspired Publications



Humphrey, N. The Lure of Death: Suicide and Human Evolution. *Philos Trans R Soc Lond.* In Press. doi:10.1098/rstb.2017.0269.

Advances in human understanding, brought about by the co-evolution of the brain and culture, have had costs as well as benefits. The understanding of death provides a poignant example. Once individuals realized that death could bring release from pain, it became possible that, when times were hard, they would make the maladaptive choice to kill themselves rather than carry on.



Hurtado-López, J, et al., including **Sejnowski, TJ.** Decision-making neural circuits mediating social behaviors : An attractor network model. *J Comput Neurosci.* 2017;43(2):127-142.

When neurons at a particular location in the mouse brain are stimulated, specific stereotypic behaviors can be elicited. Stimulation at a particular location at a low level produces approach and mounting behaviors, but with a somewhat stronger stimulation the behavior switches to aggression, against the same mouse. We developed a computational model of a neural circuit based on known anatomy that can explain this dramatic switch.



Gurven, M et al, including **Finch, CE, Kaplan, H.** Cardiovascular disease and type 2 diabetes in evolutionary perspective: a critical role for helminths. *Evol Med Public Health.* 2016;1(1):338-357.

We lay out a framework and provide evidence for how helminth infection may have protective effects against atherosclerosis and type 2 diabetes. While the relative absence of parasites in urban environments has been widely linked to autoimmune-related diseases, we suggest that the absence combined with other risk factors, can impact cardiometabolic disease due to effects on obesity, insulin resistance and immune dysregulation.



Koukoulis, et al., including **Changeux, JP.** Nicotine reverses hypofrontality in animal models of addiction and schizophrenia. *Nat Med.* 2017;23(3):347-354.

The prefrontal cortex underlies higher cognitive processes that are modulated by nicotinic acetylcholine receptor. Mice expressing a single-nucleotide polymorphisms in the human $\alpha 5$ nicotinic subunit gene, exhibit deficits in social interaction and sensorimotor gating together with a decreased activity which resembles the hypofrontality observed in schizophrenia and addiction. Nicotine might be a treatment.



Loucks, J, Mutschler, C, **Meltzoff, AN.** Children's Representation and Imitation of Events: How Goal Organization Influences 3-Year-Old Children's Memory for Action Sequences. *Cogn Sci.* 2017;41(7):1904-1933.

Children are ultra-social and learn from observing others. But the behavioral stream is messy, akin to Chomsky's poverty of the stimulus: Parents often multi-task and are interrupted. How can children learn from watching this jumbled stream? Children use a mental shortcut. They organize the surface behavior into chunks of goal-directed acts. The brain's knack for action segmentation and memory for goals provides the building blocks of human culture.



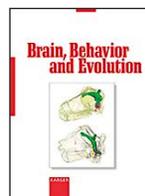
Moore, J, et al. Chimpanzee vertebrate consumption: Savanna and forest chimpanzees compared. *J Hum Evol.* 2017;112:30-40.

Some have argued that adaption to savannas "drove" increased meat eating in human evolution. We show that relative to forest populations, savanna chimpanzees consume somewhat LESS meat, from smaller, less-shared prey, but do so more seasonally. This suggests greater hominin faunivory was related to differences between hominins and chimpanzees and/or between modern and Pliocene environments.



Neubauer, S, **Hublin, JJ,** Gunz, P. The evolution of modern human brain shape. *Sci Adv.* 2018;4(1):eaao5961.

Recent modern humans display a globular shape of the brain, contrasting with the more elongated shape observed in *Homo erectus* or Neandertals. This relates to more salient parietal areas and a recent increase of the cerebellum size. Although for the past 300,000 years, our species already displayed large endocranial volumes, a fully modern brain organization emerged only between 100,000 and 35,000 years ago.



Pereira-Pedro, AS, et al., including **Rilling, JK, Preuss, TM.** Midsagittal Brain Variation among Non-Human Primates: Insights into Evolutionary Expansion of the Human Precuneus. *Brain Behav Evol.* 2017;90(3):255-263.

The precuneus occupies a segment of the medial hemisphere and is involved in visual cognition and body coordination. We recently provided evidence that it underwent differential expansion in the human lineage after our separation from Neanderthals. This study reinforces the distinctiveness of modern humans, showing that precuneus proportions do not vary with brain size across a broad sample of primates.

Continued from the previous page



Wroblewski, EE, et al., including **Parham, P.** Bonobos Maintain Immune System Diversity with Three Functional Types of MHC-B. *J Immunol.* 2017;198(9):3480-3493.

3000 variants of the HLA-B antigen-presenting molecule diversify human immunity against viruses. Only African apes have an exact equivalent of HLA-B. It is Papa-B in bonobos. In six wild communities we found 3-14 Papa-B variants. Three, with distinctive functions, are in all communities. Two are ligands for distinctive receptors of innate immunity, the third is dedicated to adaptive immunity.

The following awards and honors were received by CARTA members during the past year.



Francisco J. Ayala (UC Irvine):

Ocean Conservation Award, Aquarium of the Pacific, Long Beach, CA.



Bernard Comrie (UC Santa Barbara):

Neil & Sara Smith Medal for Linguistics (British Academy, lifetime achievement award), 2017.



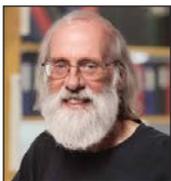
Tim Crow (Oxford University):

Awarded the Order of the British Empire in the Queen's New Years Honours List.



Paul Harris (Harvard University):

Mentor Award in Psychology, Association for Psychological Science (APS), 2017.



Tony Hunter (Salk Institute):

Inaugural Sjöberg Prize for Cancer Research, March 2017.



Katie Hinde (Arizona State University):

Individual Award for Public Anthropology, General Anthropology Division, American Anthropological Association.



Linda Marchant (Miami University in Oxford, Ohio):

Award for Outstanding Research into Human Origins, Center for Research in the Anthropological Foundations of Technology (CRAFT) and The Stone Age Institute, Indiana University.

Presented "Chimpanzees, Hands, and Tools: Models for the Evolution of Technology in Humans" at the annual Leighton Wilkie Memorial Lecture, The Stone Age Institute, Indiana University.



Randolph Nesse (Arizona State University):

Election to Fellowship at American Academy of Arts & Sciences, 2017.



Terry Sejnowski (Salk Institute):

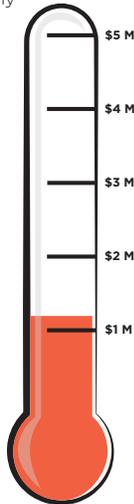
2018 Member National Academy of Inventors.

CARTA Member Awards & Honors

Endowment Progress

Honor Roll of Giving

Daniel C. Anderson	John L. Locke
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Kurt Benirschke	Lisa Marvin
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Kristen Hawkes	Ajit & Nissi Varki
Sarah Hrdy	Fedele C. Vero
Kenneth H. Kidd	Pauline Wiessner
Richard Klein	Christopher J. Wills
Megan Klingbeil	Nigel K. Woolf



In February 2016, Jim Handelman, Director of the Mathers Foundation of New York, passed away. Jim was CARTA's original and long-standing champion whose direction helped develop CARTA and its activities. In recognition of Jim, we established the **James H. Handelman Endowment for the Exploration of Anthropogeny** to form a perpetual foundation for CARTA's pursuit of understanding the human phenomenon.

Our goal of \$5 million will not only honor the legacy of Jim Handelman; it will also help to sustain the growth, innovation and impact of CARTA for generations to come. Thanks to a generous gift from the Mathers Foundation and many donations and pledges from our members and friends (listed left), we have already reached \$1.2 million. We are truly heartened by this overwhelming support.

If you, too, wish to join this incredible partnership in support of CARTA, please consider the following giving options:

- **Making outright gifts for immediate use**
- **Contributing to the Handelman Endowment fund**
- **Establishing a separate Named Endowment of your choice**
- **Exploring estate gifts and other planned gifts**

Your gift, at whatever level, is deeply appreciated and will have a meaningful impact on the future of CARTA.

CARTA Symposia Schedule

Imagination and Human Origins
June 1, 2018, Salk Institute

Impact of Tool Use and Technology on the Evolution of the Human Mind
October 12, 2018, Salk Institute

Stay tuned for our 2019 schedule!

Find past CARTA symposia at



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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 concerning 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. Transdisciplinary interaction is at the core of CARTA's mission to advance human origins research.

For more information, please visit
<https://carta.anthropogeny.org>

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