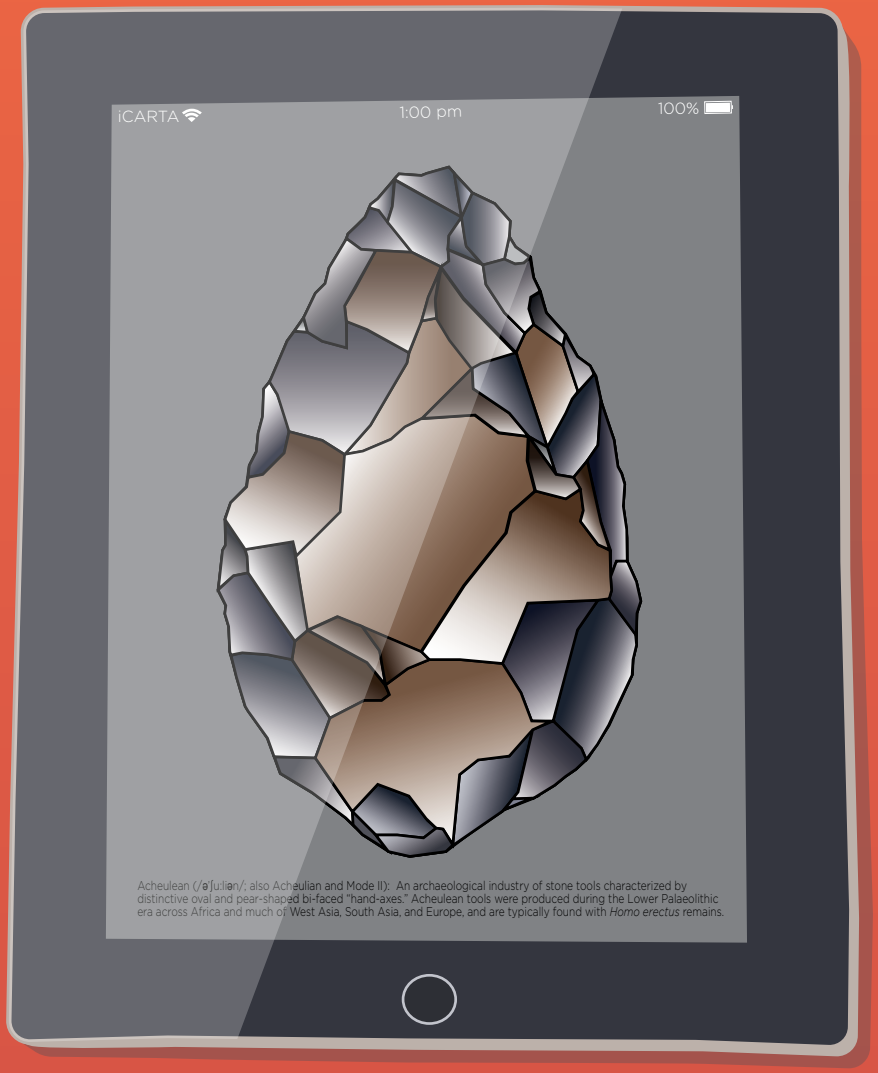
anthropogeny
tracks
a CARTA newsletter vol. 6/3 – oct. 2018



IMPACT OF TOOL USE & TECHNOLOGY ON THE EVOLUTION OF THE HUMAN MIND

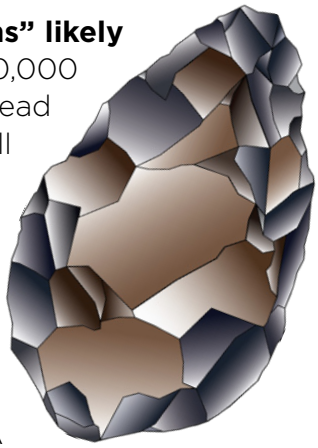
A PUBLIC SYMPOSIUM

Inside this Issue...

CARTA SYMPOSIUM

Impact of Tool Use and Technology on the Evolution of the Human Mind **is CARTA's October 2018 symposium on gene-culture co-evolution of human biology and technological innovation.**

"Behaviorally modern humans" likely emerged within the last 300,000 years in Africa and then spread across the planet, replacing all closely related archaic human species in the process. The question is, *What made us so unique that we are the "lone survivors" who now populate the Earth?*



A "hand-axe" like this is reminiscent of the Acheulean industry of stone tools produced across Africa and much of West Asia, South Asia, and Europe, and is associated with Homo erectus. c. 3.3m-300k years ago.

The subject of this CARTA symposium, ***Impact of Tool Use and Technology on the Evolution of the Human Mind***, offers one possible answer to this question: The interaction between genes and a continually evolving culture may explain our trans-continental success and competitive advantage over other human-like species.

Gene-culture co-evolution likely spans millions of years and played a role in human brain expansion and technological advances like simple stone tools, control of fire, containers, projectile weapons, reading, writing, computers, space travel, and virtual reality.

Perhaps this exploration will give clues to the obvious follow up question, *What is the future of the human mind?*

FRIDAY, OCT 12, 2018, 1:00 - 5:30 PM (PT)

Conrad T. Prebys Auditorium, Salk Institute

FREE ADMISSION & LIVE WEBCAST!

Culture, Demography and Patterns of Human Genetic Diversity
Marcus Feldman, Stanford University

Tool Use by Non-Human Primates
Dorothy Fragaszy, University of Georgia

Early Hominin Stone Tools
Dietrich Stout, Emory University

The Combinatorial Creature: Cortical Phenotypes Within and Across Lifetimes
Leah Krubitzer, UC Davis

Behavioral Modernity vs. Complexity: What Stone Tools Teach Us
John Shea, Stony Brook University

Writing & Reading: The Evolution of Social Media
Paula Tallal, Salk Institute

Quantity, Number, and Mathematics
Rafael Núñez, UC San Diego

Digital Technologies and the Development of the Human Mind
Candice Odgers, UC Irvine

The Collective Brain
Joe Henrich, Harvard University

Co-Chairs: Tim White, UC Berkeley
& Patricia Churchland, UC San Diego

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UC San Diego

*Curious about where we came from and how we got here? Consider attending one of our **FREE** symposia on anthropogeny (the study of human origins) where experts present on topics addressing the origins of the human phenomenon. Can't make it in person? We also offer a **FREE LIVE WEBCAST**. For more details about this CARTA symposium, including registration, the live webcast, or for information on past and future events, please visit:*

https://carta.anthropogeny.org/symposia

Anthropogeny Tracks newsletter is produced by CARTA staff and faculty

Center for Academic Research and Training in Anthropogeny
"to explore and explain the origins of the human phenomenon"
University of California, San Diego • 9500 Gilman Drive, MC# 0060 • La Jolla, CA 92093
https://carta.anthropogeny.org

UC San Diego's Anthropogeny Graduate Specialization is a unique human origins training program that offers a parenthetical degree for graduate students from eight diverse fields of study. Each year, fellowships are given to the most deserving students, which allows for significant investment in their studies. It is with great pleasure that we announce the fellowship recipients for the 2018-19 academic year.

ANTHROPOGENY FELLOWS 2018–19

Annette Merle Smith Fellowships: Established in 2015, thanks to a generous gift from long-time CARTA supporter, Annette Merle-Smith, this award is given to students who have performed at the highest level in the Graduate Specialization in Anthropogeny.

Catie Profaci
Neurosciences

Catie is interested in the molecular mechanisms underlying the breakdown and repair of the blood-brain barrier (BBB). She works with an animal model of multiple sclerosis and hopes to identify and reverse the negative effects of BBB.

Linnea Wilder
Anthropology

Linnea's interests lie in the evolution and development of the brain, and in defining neuroanatomical features and developmental patterns that are either unique to humans or shared with our closest living relatives, the great apes.

CARTA Fellowships: CARTA fellowships are possible due to the generosity of The G. Harold and Leila Y. Mathers Charitable Foundation and the support from an anonymous donor.

Vanessa Bateman
Visual Arts

Vanessa's research focuses on visual representations of hunting in the early twentieth century, connecting hunting practices to technological developments in visual media of the time.

Sascha Pohflepp
Visual Arts

Sascha probes the role of technology in our efforts to understand and influence our environment. His work ranges from synthetic biology to geo-engineering and space exploration.

Arturs Semenuks
Cognitive Science

Arturs is investigating if cross-linguistic differences in grammars of languages translate into differences in how speakers of these languages think about the world around them.

Haleh Yazdi
Psychology

Haleh explores how individuals across cultures develop prosocial behaviors such as sharing, altruism, and cooperation.

We extend our most sincere congratulations to this year's fellows and all Anthropogeny students for their hard work.

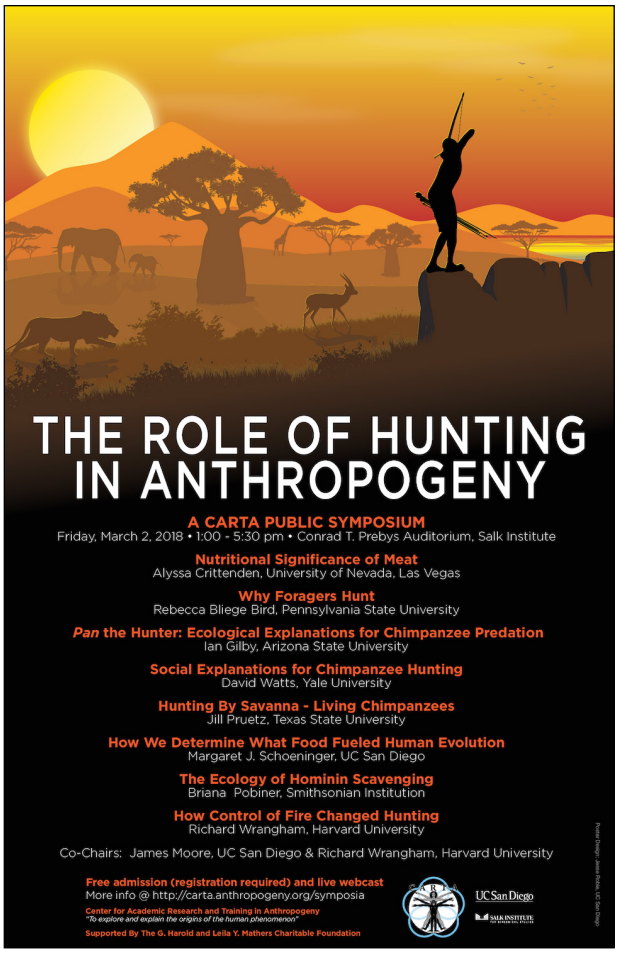
SYMPOSIUM WRITEUPS

A recent CARTA symposium is highlighted over the next three pages through the perspective of two Anthropogeny Specialization Student essays that address the symposium topic and questions or connections raised during the proceedings.

Reviewed by Vanessa Bateman, Visual Arts

In 2017, Jim Moore, et al., published the article, "Chimpanzee vertebrate consumption: Savanna and forest chimpanzees compared," in the *Journal of Human Origins*, addressing the long established argument that important changes in our lineage came about in the savanna.

The study showed that savanna chimpanzee populations do not differ quantitatively in % feces containing vertebrate remains from forest populations. Through comparison of fecal analyses, it is evident that savanna chimpanzees "consume smaller vertebrates that are less likely to be shared, and they do so more seasonally."[1] Thus, the findings problematize the argument "that increased faunivory was causally connected with hominin adaptation to open, savanna habitats."[2]



The study was a starting point for Moore to propose a CARTA symposium on hunting as a means to continue to probe the question: why do chimpanzees hunt?

Due to the interdisciplinary nature of CARTA, the symposium was intended to facilitate a discussion by a group of scholars with a range of specializations on the role of hunting and human origins. In other words, the CARTA symposium allowed for a diverse discussion on the role of hunting in anthropogeny that would not be possible within field-specific conferences. The variety of presentations created a rounded exploration of the topic and raised some larger questions when considering these in juxtaposition.

Some questions that were raised during the symposium included: *Why, in some populations, do chimpanzees hunt more than others? Is it really for nutritional benefits or social reasons? How and why have hunting and gathering been gendered? What are the social and political meanings of human hunting? How does sharing play a role in hunting? What are the costs versus the benefits of hunting?* And an essential question: *How do we explain the increased hunting in hominins?*

During the symposium I kept asking myself: *Is hunting an instinct? Or — is it just something that is learned, since it can be taught?*

Human (and chimpanzee) hunting is very different from other species that hunt (e.g., cat hunting, for which 'instinct' seems pretty likely). What exactly is an "instinct" in this sense? In humans, this knowledge is often passed down from one kin to the next through various social and cultural practices. Jill Pruetz's discussion of the Fongoli savanna chimpanzees using tools to hunt made me wonder: is this an instinctual behavior or is

it learned? My interpretation of the videos she showed was that the young chimpanzees were using tools because the adults were doing so. It begs the question: are modes of hunting instinctual, or are they learned? Can it be both? If the Fongoli chimpanzees are not genetically isolated, and other populations do not exhibit this behavior — this form of hunting is learned/cultural. It is very hard to explain a localized behavior as "instinct" if other populations, not genetically different, do not show it.

Hunting is a means for survival, but what about its role as demonstrative of value and power? When did the social and cultural dynamics of the hunt emerge, and how did they play a role in anthropogeny?

While cave painting did not come up in any of the presentations, it did come up in the course of discussions I had with various presenters. The long established interpretation of cave paintings of animals has been that they are connected to symbolic thought and hunting. However, taking a different approach, why does the use of visual language have to be interpreted as symbolic? Why can't these paintings be interpreted as instructional or historical recordings?

Hadza women forage for tubers, a reliable calorie source.

During her presentation on the Martu people, Rebecca Bliege Bird used images of sand painting and rock art to illustrate the significance of male hunters to the community. While she did not go into detail about their importance, the images were used to demonstrate the social hierarchy of hunting and the use of cultural practices by male hunters in contrast to the female hunters. During her discussion of how men and women forage and hunt differently (women and young children hunt and forage in groups for smaller animals with higher success rates, while men spend more time hunting larger animals with lower success rates), I could not help but wonder how a consideration of the importance of cultural practice could help facilitate this discussion. If there is cultural importance placed on particular symbols for the Martu, in particular the use of abstract imagery by male members of the tribe, could culture not tell us more about the gender roles of hunting practices? Recordings of hunting through visual language are not exclusively tied to the killing of animals (i.e., success) because there is also cultural importance of the practice or act of hunting.

Throughout the symposium, I noticed an overlap with a previous symposium, ***Awareness of Death and Personal Mortality***, especially Dora Biro's presentation "Responses to Death in Chimpanzees and Other Mammals." I was surprised that the concept of death did not come up more during a symposium on hunting — death is required for a successful hunt. There was mention of chimpanzees avoiding found dead animals, but I am curious about the connection between avoidance and use. There was discussion of how chimps scavenge or beg for meat from one another and I am interested in the connection between scavenging amongst chimps versus coming across dead animals which they could potentially use, but choose not to (in most cases). In terms of the scavenging versus hunting question, Briana Pobiner's presentation brought to mind something I had not considered before: perhaps there was once a pivotal moment of change from an avoidance of dead animals to the use of them for sustenance. Both humans and chimpanzees hunt, but only humans readily scavenge.

[1] From Abstract: James Moore et al., "Chimpanzee vertebrate consumption: Savanna and forest chimpanzees compared," *Journal of Human Evolution*. 2017; 112:30-40.

Reviewed by Linnea Wilder, Anthropology

At the CARTA symposium, ***The Role of Hunting in Anthropogeny***, questions of when, why, and how hunting, or meat eating, emerged and became such an important human adaptation were addressed by examining archaeological evidence and looking at modern human foragers and hunting behaviors in chimpanzees, humans' closest living relative.

The hunting and foraging activities of women and children were a central theme at this recent symposium, in contrast to the stereotypical idea of "Man the Hunter" as central to hominin evolution. Dr. Alyssa Crittenden pointed out that children can be active in foraging, acquiring both plant and animal foods. Although returns vary widely between individuals, some children are remarkably productive, regularly procuring close to or even more than needed to satisfy their own caloric needs.

Hunting large game is a high risk proposition that is often unsuccessful and can require extreme effort by many hunters, as above.

But the reward is worth the effort, such as this kudu at left, which will feed the entire camp for several days.

Dr. Rebecca Bliege Bird discussed the hunting activities of Martu women. These women regularly hunt goanna, a large lizard, in small hunting groups. When women hunt, they share their food, in particular with other, unrelated, women and children to create strong social bonds. Martu children are also active hunters, specializing in prey they can easily acquire, such as small lizards.

The hunting contributions of men were not completely ignored at this symposium. Men in foraging societies do hunt, and compared to female hunters, they tend to focus on larger, often less reliable, prey. At least among some human groups, they share their kills extensively, creating a large, but loosely connected, social network.

The difference in hunting activities of men and women seems to be best explained by a difference in sensitivity to risk. Men spend more time hunting high risk large prey, occasionally acquiring a high value animal, but often returning with nothing.

In contrast, women focus on predictable, smaller prey, and rarely face a day of no hunting success. This pattern of risk sensitivity appears to emerge early in life, among the Hadza: boys are less risk-averse than girls in their foraging decisions. Interestingly, this pattern may exist in chimpanzees as well. Most hunting observed in chimpanzees is done by males, but when females do hunt, they are more likely to specialize in sedentary or non-dangerous prey, and utilize tools, which can decrease their risk of injury.

It is not known exactly when modern patterns of human hunting may have emerged, but it is clear that hominins have a long history of using animals for food in ways not seen in any living non-human primate.

Dr. Margaret Schoeninger discussed isotopic evidence for diet shifts in the hominin lineage. Early hominins likely had plant based diets similar to modern non-human primates, but by the time of *Homo ergaster*, the diet seems to have changed considerably, and included significantly more meat consumption.

Dr. Briana Pobiner presented data on hominin

butchering activities from 1.5-million-year-old sites at Koobi Fora. Butchery marks such as cut marks from limb defleshing, and percussion marks made by breaking bones to access marrow, were found on a wide variety of bones, and likely included both scavenged and hunted animals. Given the diversity of species found at these sites, including hippos, monkeys, and grassland bovids, it appears that by 1.5 million years ago, hominins were exploiting a variety of habitats, and extensively using tools to process a wider range of animal species than any living non-human primate.

One simple explanation to address the question of why hunt, or why consume animals for food more generally, is nutrition. Meat is a high-quality source of calories, easy to digest and rich in many key nutrients, including iron and sodium.

Dr. Crittenden discussed the importance of iron for health. While non-heme iron can be found in many plant foods, it has low bioavailability, and is poorly absorbed. In contrast, heme iron, found in animal tissue, is both readily absorbed, and helps with the absorption of non-heme iron.

Dr. Richard Wrangham brought up a possible role of sodium in driving interest in animal products. Sodium is predictably found in animals, but tends to be absent or only found in low quantities in plants. Although most modern humans do not face sodium deficiencies, it can be an issue for non-meat eating primates. Chimpanzees show a strong desire for sodium, competing for small scraps of meat or even drops of blood with enthusiasm, or eating decayed wood that is high in sodium among some less predatory groups of chimpanzees. Although meat provides many benefits, the high rate of red meat consumption in modern humans has several drawbacks, including health problems such as cancer and heart disease, and a negative impact on the environment. Despite these drawbacks, hunting and eating meat played a significant role in the course of human evolution.

This special issue focuses on brain, behavior, and communication in humans and non-human primates. Contributions by three CARTA members and an invited speaker (CARTA's *Impact of Tool Use on the Evolution of the Human Mind* symposium) include:

SPECIAL ISSUE
INTERACTION STUDIES
19:1/2, 2018

- Introducing a Special Issue: "How the Brain Got Language: Towards a New Road Map." (**Michael A. Arbib**)
- Computational challenges of evolving the language-ready brain: 1. From manual action to protosign. (**Michael A. Arbib**)
- Computational challenges of evolving the language-ready brain: 2. Building towards neurolingustics. (**Michael A. Arbib**)
- Why do we want to talk? Evolution of neural substrates of emotion and social cognition. (**Katerina Semendeferi**)
- Social manipulation, turn-taking and cooperation in apes: Implications for the evolution of language-based interaction in humans. (**Federico Rossano**)
- Archaeology and the evolutionary neuroscience of language: The technological pedagogy hypothesis. (**Dietrich Stout**)

ASK AN ANTHROPOGENY EXPERT

Are you chewing on a particular and ponderous problem related to anthropogeny? Perhaps you're cogitating on where we came from and how we got here. Propose your question to us and we'll recruit experts to weigh in with answers. Selected questions will be featured in a future CARTA newsletter.

Email questions to: carta-info@anthropogeny.org

Q Humans can use language to instruct and learn to great effects. Stone tool making is difficult and complex tool-making even more so. Is there evidence for language development via instruction or learning of tool manufacture?

Submitted by Z.J., San Diego, CA

A We actually know less about this than you might think. There is some ethnographic and experimental evidence that language can facilitate tool-making skill learning, but this is a long way from demonstrating that it was required at any particular point in human technological evolution. I think the more general point is that tool-making and language are both socially-learned skills dependent on human capacities for mutual understanding and cooperation, and so they probably evolved together in a mutually reinforcing way.

Answered by Dr. Dietrich Stout, Emory University

AWARDS & HONORS

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

Leslie Aiello (Wenner-Gren Foundation):
Elected Corresponding Fellow of the British Academy, 2018.

Jean-Pierre Changeux (Institut Pasteur and College de France):
Received Albert Einstein World Award of Science, 2018.

Prix Science et laicité du "Comité Laicité République", Paris, 2018.

Co-recipient, Goldman-Rakic Prize of the Brain & Behavior Research Foundation, 2018.

Christine Harris (UC San Diego):
Elected President of the International Society for Research on Emotion, 2018.

Awarded Fellow status by the Association for Psychological Science, 2018.

Awarded Fellow status at Revelle College, UC San Diego, 2018.

Tony Hunter (Salk Institute):
Tang Prize for Biopharmaceutical Science, 2018.

Aniruddh Patel (Tufts University):
Guggenheim Fellowship, 2018.

Radcliffe Institute for Advanced Studies at Harvard University Fellowship, 2018.

Katherine S. Pollard (UC San Francisco):
Named Chan-Zuckerberg Biohub Investigator, 2018.

Caren Walker (UC San Diego):
Received the Association for Psychological Science's "Rising Star" Award, 2018.

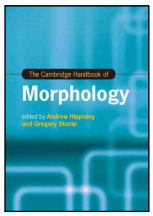
Named a Hellman Fellow, 2018.

Transdisciplinary interaction is a core CARTA principle, and our anthropogeny symposia provide a forum for experts from different spheres of knowledge to interact and spark new research on the origins of the human phenomenon. These selected publications were inspired by such interactions. CARTA members are listed in bold. Visit carta.anthropogeny.org for the complete list.

CARTA-INSPIRED PUBLICATIONS

Alisson-Silva, F, et al., including **Varki, N**, **Varki, A**. Human evolutionary loss of epithelial Neu5Gc expression and species-specific susceptibility to cholera. *PLoS Pathog*. 2018;14(6):e1007133.

Robert Koch defined rules to affirm the role of an infectious agent in a disease, including an animal model, but he failed to find a nonhuman animal sensitive to *V. cholerae*, which causes epidemic diarrhea (cholera) in humans. Human evolution eliminated a cell surface glycan called Neu5Gc. Human cells and human-like Neu5Gc-deficient mice have features that may explain why cholera is uniquely human.



Aronoff, M. A Fox Knows Many Things but a Hedgehog One Big Thing. In: Hippisley, A, Stump, G, eds. *The Cambridge Handbook of Morphology*. Cambridge, UK: Cambridge University Press; 2017.

"A fox knows many things but a hedgehog one big thing" is a line from the Greek poet Archilochus, and the title of a short book by Isaiah Berlin. Berlin divides writers and thinkers into hedgehogs, "who relate everything to a single central vision," and foxes, who do not. Darwin made a similar distinction: "Those who make many species are the 'splitters', and those who make few are the 'lumpers'." This article treats research in linguistic morphology as a battle between foxes and hedgehogs.

Baldwin, MKL, et al., including **Kaas, JH**. The Evolution and Functions of Nuclei of the Visual Pulvinar in Primates. *J Comp Neurol*. 2017;525(15):3207-3226.

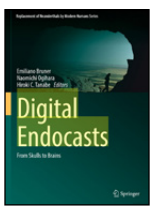
The pulvinar distributes information from the visual midbrain and visual cortex to areas of visual cortex. Early primates replaced much of the information from the midbrain to cortex via the pulvinar with information from primary visual cortex to the pulvinar and to other areas of cortex in a way that likely facilitated the expansion of posterior parietal cortex and visually guided hand use.

Boehm, C. Collective Intentionality: A Basic and Early Component of Moral Evolution. *Philosophical Psychology*. 2018;31(5):680-702.

Recently Michael Tomasello stated that humans but not chimpanzees were capable of collective intentionality, as expressed in moral communities. Patrolling and 13 instances of wild chimpanzees gang-attacking group members suggest this position was generalized from captive experiments that were merely dyadic; wild group behaviors strongly suggest an ancestral capacity in this direction.

Bogin, B, Scheffler, C, Hermanussen, M. Global effects of income and income inequality on adult height and sexual dimorphism in height. *Am J Hum Biol*. 2017;29(2):e22980.

The fossil evidence shows that our ancestors were relatively tall with men about 5 inches taller-sexual dimorphism. Part of the sex difference is biology, but part is due to living conditions. Our analysis of 169 counties found that lower national income and greater income inequality predict shorter average height for both sexes and less sexual dimorphism, due to poverty and its social disadvantages.



Bryant, KL, **Preuss, T**. A Comparative Perspective on the Human Temporal Lobe. In: Bruner, E; Ogihara, N; Tanable, HC, eds. *Digital Endocasts: From Skulls to Brains*. Tokyo, Japan: Springer Japan; 2018:239-258.

The temporal lobe underwent significant changes in hominoid evolution. Compared to macaques,

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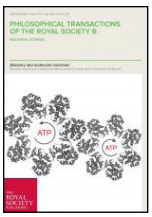
human visual areas are displaced posteroinferiorly, and most of the cortex is dominated by semantic representation. Chimpanzee cortex is poorly understood, although there is less posterior displacement of visual cortex than in humans, while the sulci and white-matter tracts resemble humans.



Changeux, JP. The nicotinic acetylcholine receptor: a typical "allosteric machine." *Philos Trans R Soc Lond B Biol Sci*. 2018; 373(1749): 20170174.

The nicotinic acetylcholine receptor is the first membrane receptor for a neurotransmitter to be biochemically identified as a protein. As an allosteric machine, it mediates signal transduction between topographically distinct sites, the acetylcholine site and the ion channel, through a discrete conformational change. Homologs of nicotinic receptors are found in Bacteria revealing the ancient origins of Human brain receptors.

Davidson, I. Comment on: Early stone tools and cultural transmission. Tennie, C, Premo, LS, Braun, DR, McPherron, SP. *Current Anthropology*. 2017;58(5):652-672.

Traditional ways of interpreting the cultural status of stone tools lack evidence for the existence of traditions rather than individual discovery and for the spread of practices of knapping. In light of the original research by Moore and Perston (*PLoS ONE*, 11(7), e0158803), I approach the study of cognitive evolution using a reassessment of the key transitions in making tools from lumps of stone.

Fuentes, A. How Humans and Apes Are Different, and Why It Matters. *Journal of Anthropological Research*. 2018;74(2):151-167.

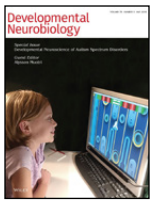
Humans and chimpanzees share a lot, but not everything. We are a particular kind of creature with capacity for amazing kindness and profound cruelty; we reshape the world, ourselves, and every other living thing with increasing speed and impact. How and why this is the case is of interest to us all, and the answer resides in the interface of our fascinating evolutionary story and our current reality.

Gonçalves, A, **Biro, D**. Comparative thanatology, an integrative approach: exploring sensory/cognitive aspects of death recognition in vertebrates and invertebrates. *Philos Trans R Soc Lond B Biol Sci*. 2018; 373(1754): 20170263.

Understanding how and why animals respond to death is central to the emerging field of comparative thanatology – the scientific study of death and dying from an evolutionary perspective. We examine the sensory and cognitive bases of how animals, including humans, detect life and death in others, and discuss proximate and ultimate evolutionary drivers behind their capacities to do so.

Guethlein, LA, et al., including **Parham, P**. Two Orangutan Species Have Evolved Different *KIR* Alleles and Haplotypes. *J Immunol*. 2017;198(8):3157–3169.

Human Natural Killer cells are essential for defeating viruses and building placentas. Their effects are mediated by variable receptors that interact with two forms of cell-surface ligand. As orangutans have only one of the ligands, they provided a half-way house in which to examine evolution of the human system. Numerous differences distinguish the receptors of Bornean and Sumatran orangutans.



Hanson, KL, et al., including **Bellugi, U**, **Semendeferi, K**. Increased glia density in the caudate nucleus in williams syndrome: Implications for frontostriatal dysfunction in autism. *Dev Neurobiol*. 2018;78(5):531-545.

Williams syndrome (WS), a genetic disorder known for its unusually friendly phenotype, offers unique insights into human pro-sociality and its evolution. In this study, we found increased density of oligodendrocytes, glia involved in myelination, in the caudate nucleus in humans with WS. Neurobiological evidence thus suggests that altered distribution of glia may underlie differences contributing to hypersociality in WS, with important implications for autism.

Harris, PL. Children's understanding of death: from biology to religion. *Philos Trans R Soc Lond B Biol Sci*. 2018;373(1754): 20170266.

Children gradually realize that death ends all bodily and mental processes.

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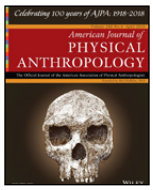
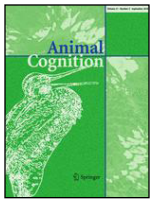
Yet, they often believe in an afterlife. A plausible basis for this belief is that humans think about people to whom they are attached even in their absence. This explains the pervasive metaphor of death as a departure not a terminus and the maintenance of ties to the dead, even though their departure is irreversible.



Hawkes, K, O'Connell, J, **Blurton-Jones, N**. Hunter-gatherer studies and human evolution: A very selective review. *Am J of Phys Anthropol*. 2018;165(4):777-800.

Events in evolutionary biology spurred our use of behavioral ecology in hunter-gatherer ethnography and ethnoarchaeology aimed to explain variation among living foragers and the record of what happened in human evolution. This is a history of our collaboration, findings that challenged received wisdom and our own previous assumptions, revisions that followed, and where, provisionally, things stand.



Hennefield, L, Hwang, HG, Weston, SJ, **Povinelli, DJ**. Meta-analytic techniques reveal that corvid causal reasoning in the Aesop's Fable paradigm is driven by trial-and-error learning. *Anim Cogn*. 2018. https://doi.org/10.1007/s10071-018-1206-y

Numerous lab-based analogs of Aesop's "Crow and the Pitcher" fable find that crows will drop stones into tubes of water to retrieve floating worms. Biologists and psychologists have claimed this is evidence that crows understand higher-order causal relations—an ability oft considered uniquely human. In contrast, our meta-analysis finds trial-and-error learning (localized in feedback of water movement caused by each stone drop) accounts for the results.

Kostka, D, Holloway, AK, **Pollard, KS**. Developmental Loci Harbor Clusters of Accelerated Regions That Evolved Independently in Ape Lineages. *Mol Biol Evo*. 2018;35(8): 2034-2045.

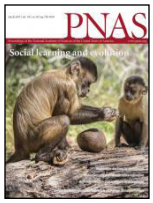
Human accelerated regions (HARs) were identified twelve years ago and subsequently shown to function as developmental enhancers. Do non-human primates have accelerated regions? They do: apes each have roughly similar numbers of them compared to humans, with similar genomic distributions. In fact they are clustered in the regulatory regions of many of the same developmental genes that have HARs.

Lieberman, P. Talking about language. *The Scientist*. July 1, 2018:34-39.

Talking entails having brains that can learn and execute complex motor acts. We also have species-specific anatomy that produces clearer speech, the cost being increasing the risk of choking. Millions of years ago, when hominins began to walk, talking became the central medium of language, but evolutionary processes going back hundreds of millions of years ultimately yielded speech and language.

Meltzoff, AN, Saby, JN, Marshall, PJ. Neural representations of the body in 60-day-old human infants. *Dev Sci*. 2018;e12698. https://doi.org/10.1111/desc.12698

Lips are crucial for language, nourishment, emotional facial expressions, kissing, and social interaction. New research suggests that there is pronounced cortical magnification of the lips in the baby brain, setting up future studies on the neuroplasticity. Using MEG brain imaging technology, we will next explore whether the neural representation of lips change as human infants begin to speak.



Perry, SE, Barrett, BJ, Godoy, I. Older, sociable capuchins (*Cebus capucinus*) invent more social behaviors, but younger monkeys innovate more in other contexts. *Proc Natl Acad Sci U S A*. 2017;114(30): 7806-7813.

Behavioral innovation is a source of phenotypic variation that provides raw material for selection. Use of new methodology for documenting innovation across a wide variety of behavioral domains indicated that wild capuchin monkeys retained about 20% of 187 innovations in individual repertoires. Sex and rank had little effect on innovative tendencies, but age and sociality were better predictors.

Saker, P, Farrell, MJ, Egan, GF, McKinley, MJ, **Denton, DA**. Influence of anterior midcingulate cortex on drinking behavior during thirst and following satiation. *Proc Natl Acad Sci U S A*. 2018;115(4):786-791.

This study provides important insight into how the human brain regulates fluid intake in response to changes in hydration status. The findings

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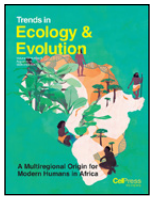
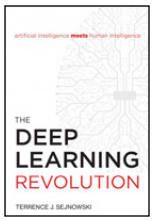
reveal activity in the anterior midcingulate cortex (aMCC) is associated with drinking responses during a state of thirst. These results are consistent also with the reduction of influence of the aMCC contributing to the conclusion of drinking before changes in blood volume and chemistry signal the restoration of fluid balance.



Scerri, EML, et al., including **Stringer, C**, **Rightmire, GP**, **Brooks, AS**, **Henn, BM**, **deMenocal, P**. Did Our Species Evolve in Subdivided Populations across Africa, and Why Does It Matter? *Trends Ecol Evol*. 2018;33(8):582-594.

This paper suggests that there is plenty of evidence that *Homo sapiens* emerged within the interactions of many different populations across Africa over an extended period of time. These populations were often isolated from each other, connecting only occasionally, when climatic change favored such connections. In this emerging view of 'African multiregionalism', some of these ancient humans may also have interbred with archaic hominins in Africa, events that were separate to the hybridization with Neanderthals and Denisovans that occurred outside of Africa.



Sejnowski, TJ. *The Deep Learning Revolution***.** Cambridge, MA: MIT Press; 2018.

Birds can find atmospheric thermals and use them to soar to great heights, but no one knows how they do it. To figure it out, we used machine learning to train gliders with six foot wingspans to autonomously navigate thermals, soaring to nearly 2,300 feet. The findings provide possible strategies that birds use to soar and could lead to the development of autonomous soaring vehicles.

Wells, JCK, **Nesse, RM**, Sear, R, Johnstone, RA, **Stearns, SC**. Evolutionary public health: introducing the concept. *The Lancet*. 2017;390(10093):500–509.

This article describes the benefits of evolutionary thinking for public health. It uses life history theory to understand how energy is allocated across the life course, and why obesity is common in modern environments. It examines genetic differences between human subpopulations that influence disease vulnerability and the tradeoffs that shape all bodily processes.

CARTA Symposia Schedule

CARTA 10th Anniversary: Revisiting the Agenda
Saturday, March 23, 2019
Conrad T. Prebys Auditorium, The Salk Institute

Anthropogeny: The Perspective from Africa
Friday, May 31, 2019
Conrad T. Prebys Auditorium, The Salk Institute

Impact of Early Life Deprivation on Cognition: Implications for the Evolutionary Origins of the Human Mind
Friday, October 11, 2019
Conrad T. Prebys Auditorium, The Salk Institute

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https://carta.anthropogeny.org

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