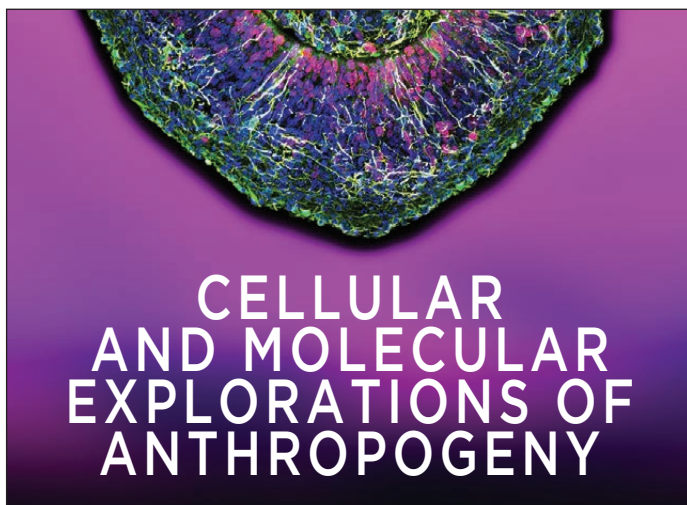




# anthropogeny tracks

a CARTA newsletter    Volume 5, Issue 3 - September 2017

## A “Microscopic” View of Human Origins



Evolution can be studied in many different scales: From multi-million year old phylogenies and fossil remains to millisecond physiological processes and cells and molecules. It is the latter, what the naked eye can't see, that experts will discuss at the next CARTA symposium, **Cellular and Molecular Explorations of Anthropogeny**.

Cellular and Molecular Anthropogeny is a relatively new area of evolutionary inquiry made possible by advancements in comparative genomics, molecular techniques, and cell biology. Genomic comparisons with our living and extinct relatives, along with precise gene editing, help to determine which changes had important consequences for human uniqueness. Such studies provide insights into the molecular underpinnings of the human condition and can point to novel treatments for diseases affecting our species. This symposium will explore the progress of this new field of human evolution research, featuring notable speakers such as Svante Pääbo and Fred H. Gage, among others.

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

The fantastic lineup of speakers includes:

***Cellular and Molecular Mechanisms that Differentiate Human and Non-Human Neural Development***

Fred H. Gage, Salk Institute (Co-Chair)

***Understanding Primate Brain Development Using Stem Cell Systems***

Rick Livesey, Gurdon Institute, University of Cambridge

***Human-Specific Genes and Neocortex Expansion in Development and Evolution***

Wieland Huttner, Max Planck Institute of Molecular Cell Biology and Genetics

***Cellular and Molecular Features of Human Brain Expansion and Evolution***

Arnold Kriegstein, UC San Francisco

***Making Faces: Regulatory Evolution and Variation in the Human Neural Crest***

Joanna Wysocka, Stanford University

***Reconstructing Uniquely Human Cellular Functions Using Ancient Genomes, Mice and Stem Cells***

Svante Pääbo, Max Planck Institute for Evolutionary Anthropology (Co-Chair)

***Molecular and Cellular Mechanisms Underlying Human-Specific Evolution of Cortical Connectivity***

Franck Polleux, Columbia University

***Evolution and Tinkering: Nuclear Structure and Primate-Specific Gene Regulation***

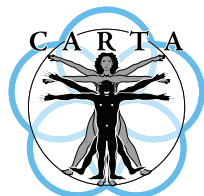
Martin Hetzer, Salk Institute

***The Evolution of Human-Specific Genes by Duplication***

Evan Eichler, University of Washington

### Symposium Details

- Friday, September 29, 1:00 - 5:30 p.m., Pacific
- Conrad T. Prebys Auditorium, Salk Institute
- Free and open to the public (registration is required)
- Live webcast
- For more information or to register, visit: <https://carta.anthropogeny.org/symposia/upcoming>



**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

# 2017 Anthropogeny Specialization Graduates

This spring we said goodbye, metaphorically, to four outstanding students who completed the requirements for the Graduate Specialization in Anthropogeny at UC San Diego: Emily Verla Bovino (Visual Arts), Emily Little (Psychology), Sequoyah Reynoso (Neurosciences), and Camille Toarmino (Psychology). By successfully completing the program requirements, each student has added a parenthetical degree in Anthropogeny to their respective Ph.D.s. To celebrate this achievement, a few of their reflections on their participation in the Specialization are shared below. Join us in wishing the 2017 Anthropogeny graduates congratulations, as well as continued success in their future academic and professional careers!

## Emily Little, Psychology



Joining the CARTA graduate student specialization track was by far the best decision I made while in the Ph.D. program at UCSD.

Being in the experimental psychology program, I had very limited exposure to research from other academic disciplines during my first year of graduate school. Upon joining CARTA, I was immediately introduced to a wide range of both faculty members and graduate students in other fields. My

first impactful experience was being a graduate student participant in the **Birth to Grandmotherhood: Childrearing in Human Evolution** symposium, during which I was paired with Katie Hinde who spoke on “Breastmilk and Breastfeeding.” Conversations with Dr. Hinde, as well as Dr. Barry Hewlett, dramatically shaped my research trajectory. My research interests shifted from mother-infant interaction in the context of early learning and cognitive development to cultural variation in breastfeeding practices, which was the inspiration for my dissertation research on mother-infant physical contact and breastfeeding responsiveness.

My involvement in CARTA motivated me to take an interdisciplinary approach to my research questions, combining perspectives from psychology, anthropology, and human evolution to address cultural variation in breastfeeding practices. Exposure to these interdisciplinary mentors and fellow graduate students through CARTA was so impactful that I started a nonprofit organization (nurturely.org) that seeks to use interdisciplinary, academic research on breastfeeding and infant care practices to improve global outcomes for infant health and development through innovative health education programs.

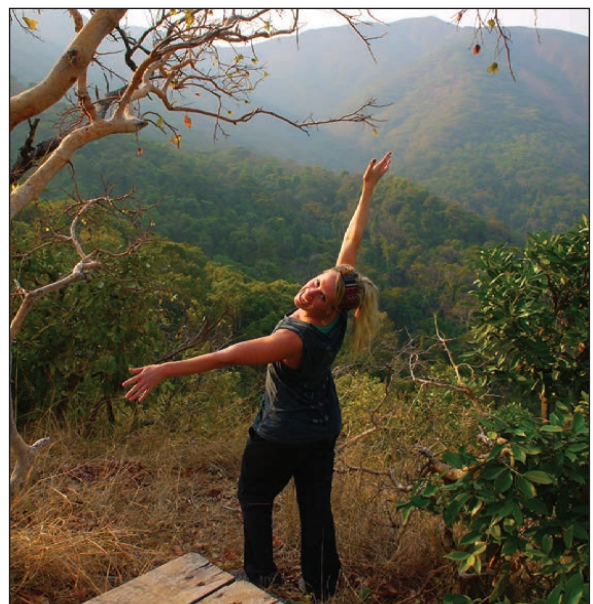
In addition to having a huge influence on my academic trajectory, CARTA's focus on experiential learning was a huge asset as well. The Africa Field Course was an unforgettable experience in so many ways. We were able to see first hand the archaeological sites that were the basis of much of our knowledge of human origins, learned about stone tool construction, and gained direct experience in primatology research methods. My favorite memory from this trip was spending three days staying with the Hadza hunter-gatherers of Tanzania. We spent a day digging for tubers with Hadza women while the toddlers watched and practiced their digging techniques, got up at sunrise for a fast-paced bow-and-arrow hunt that ended successfully with a dead hyrax, and shared an insightful Q&A where we learned about Hadza perspectives on everything from formal schooling to intertribal relations. What we learned on this trip could not have been taught in an academic setting, and I am grateful that the leaders of the CARTA program recognize the profound value of international, experiential education.



After an arrow-crafting session with the Hadza. Anthropogeny Course, Tanzania, July 2016.



Emily and a Hadza take a break from digging for tubers. Anthropogeny Field Course, Tanzania, July 2016.



Presenting Jane Goodall's Overlook in Gombe National Stream Park. Anthropogeny Field Course, Tanzania, July 2016.

## Sequoyah Reynoso, Neuroscience



What a journey. I first learned about CARTA through a pamphlet in my "Welcome to Grad School" orientation folder. It was my first day as a graduate student, and as I flipped through the various forms in the folder I found a glossy, eye-catching piece of cardstock. There was a modified da Vinci Vitruvian diagram of a human woman occluded

by a chimpanzee. I thought it might be an advertisement for the latest Dan Brown novel. In a way that pamphlet was like the cover of a story, a story filled with knowledge and excitement.

I enrolled in the Introduction to Anthropogeny class led by Pascal Gagneux. I was so impressed with his enthusiasm I asked to join his laboratory, despite it not being part of my home department at the time. As I sped down the specialization track, I had the privilege to serve as the student host for symposium speakers Sarah-Jayne Blakemore, Robert Franciscus, Nina Jablonksi, Dan Lieberman, Christina Warinner, and Randy Nesse. In addition to these respected professors, I also enjoyed the company of a host of other academics who attended the symposia. I owe virtually all of these interactions to CARTA's facilitation. I want to express additional appreciation for Sarah-Jayne Blakemore, Nina Jablonski, Robert Franciscus, Christina Warinner, David Perlmutter, Stephen Stearns, and Ingrid Benirschke Perkins for the excellent conversations and full attention they bestowed on me. I am both grateful and impressed by their advice, feedback, and follow-up with me. I hope to live by their example.

I was fortunate enough to participate in the anthropogeny field course in Ethiopia and Tanzania. I saw with my own eyes some of the fossilized specimens most important to the current understanding of human origins. I experienced a similar environment that my human ancestors inhabited. An elephant threatened to charge on my first night camping on the edge of Ngorongoro Crater. The green eyes

of zebra floated in darkness as I exited my tent in the middle of the night. A Hadza hunter-gatherer steadied my hand as I sharpened an arrow scavenged from the rugged landscape. I walked the same trails as a group of chimpanzees, our closest living relatives, in Gombe National Park and Ugalla. I gazed on a snoozing congress of chimpanzees as two juveniles playfully hurled themselves out of a tree onto their unsuspecting parents. I cowered as the same group suddenly transformed into a maelstrom of hooting fury and encircled us for several tense moments. The wind tussled my hair on the plains of the Serengeti the same way it rustled the individual grains of the Shifting Sands. I stumbled up the last couple miles of Mount Kilimanjaro, shivering but steadied by fellow CARTA student Andrew Schork. I watched, wiping the frost off my goggles, as the rising sun's rays hit the glaciers atop the tallest mountain in Africa.

I feel indebted and deeply grateful for the special experience and knowledge the Anthropogeny track has granted me. In my final year in the track, I am honored to be supported by Annette Merle-Smith and owe her additional thanks. I received and loved your postcard of Cuba, Annette! I wish to express my sincere appreciation to those who made all of this possible for me.



Sequoyah learning the art of arrow-craft from Hadza hunters. Anthropogeny Field Course, Tanzania, August 2014.



## Camille Toarmino, Psychology



When I started the anthropogeny program, I was seeking to take my narrow scope of expertise and open it up to new viewpoints and knowledge about our ancestors and living relatives. Feeling isolated in my own degree program and research, anthropogeny provided a community of people wondering the same question as I was - why are we here? Everyone came from different backgrounds, but that was what made us unique. Our different fields and viewpoints provided a complementary approach to the

study of human origins - a topic that no one field can find answers to alone.

My time in anthropogeny was marked by the most satisfying intellectual conversations I had in graduate school. Constantly learning about new human origins research and meeting incredible scientists was complemented by an immersive experience exploring hominid bones in Ethiopia and living with hunter-gatherers in Tanzania. I learned what it was like to live like our ancestors - an unparalleled educational experience that easily

superseded any research article I could have read. I met Jane Goodall's chimpanzees, and saw the real bones of Ardi first hand, which only a select few people in the world can relate to (including Barack Obama).

In the spirit of full disclosure, the anthropogeny program was the unrivaled highlight of my graduate school experience. Without this community of interesting people seeking all kinds of knowledge, my time at UCSD would have been very different. Thank you CARTA!



Camille observes how multi-million year old fossils are prepared at the National Museum, Addis Ababa, Ethiopia, and how to shoot arrows the Hadza way. Anthropogeny Field Course, Tanzania, July 2016.



# Announcing the 2017-18 Anthropogeny Fellows

CARTA is pleased to recognize the 2017-18 recipients of the Merle-Smith Fellowship in Anthropogeny: Landon Klein (Neurosciences), Sascha Pohlfepp (Visual Arts), and Haleh Yazdi (Psychology). While Landon is entering his final year of the Anthropogeny Specialization, both Sascha and Haleh have been active in the program for two years now. 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.

Also deserving of recognition are the students who received CARTA fellowship awards: Sean Coffinger (Psychology), Nina Semushina (Linguistics), and Linnea Wilder (Anthropology). The 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.

The Graduate Specialization in Anthropogeny is a three-year program offered by the Faculty of Anthropogeny, and administered

by CARTA, to UC San Diego graduate students from a variety of participating Ph.D. programs. Students enrolled in the program are required to complete the curriculum of elective courses on anthropogeny (explaining the origin of our species), participate in CARTA's scientific symposia and ensuing discussions, network with researchers from around the world, and cross-train with peers from a variety of disciplines.

Graduate students complementing a traditional degree with a specialization in anthropogeny gain valuable training in transdisciplinary research spanning sciences and humanities. Such skill and qualification greatly benefits students as they embark on future careers in both public and private sectors, where the ability to mediate between different types of knowledge bases is becoming increasingly important.

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

**Sean Coffinger**, Psychology



Sean's research investigates vocal learners to study temporal pattern processing and the role of the temporal fine structure in vocal recognition.

**Landon Klein**, Neurosciences



Landon investigates the mechanism of hallucinogen action from multiple angles, including the neurochemical events and neural circuitry involved in specific hallucinogen-mediated behaviors.

**Sascha Pohlfepp**, 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.

**Nina Semushina**, Linguistics



Nina's specialization is Sign Language Linguistics, including numeral incorporation in Russian Sign Language, which can give unique insights about morpho-phonology of sign languages and therefore must be studied crosslinguistically.

**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.

**Haleh Yazdi**, Psychology



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

# CARTA Member Awards and Honors

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



## Francisco J. Ayala (UC Irvine):

The Center for Theology and the Natural Sciences (CTNS) at the Graduate Theology Union (Berkeley, CA) renamed as “The Francisco J. Ayala Center for Theology and the Natural Sciences,” February 2017.

Francisco José Ayala Center for Science Technology and Religion, Universidad Pontificia Comillas Madrid (Spain), renamed in Dr. Ayala’s honor by the University’s Executive Board.

Awarded Medalla de Mérito Académico San Pablo, Universidad Católica Boliviana (La Paz, Bolivia), as part of their 50th Anniversary celebrations.

Honorary Fellow, Academia Boliviana de Ciencias Económicas (ABCE), La Paz, Bolivia.

Dean’s Award for Distinguished Achievement, Graduate School of Arts and Sciences and the GSAS Alumni Association, Columbia University.

Honorary Fellow, International Society for Science and Religion (ISSR), United Kingdom.



## Clark Spencer Larsen (Ohio State University):

Elected to the National Academy of Sciences in 2016, followed with the induction in May, 2017.



## Linda Marchant (Miami University):

Awarded Miami University’s prestigious Benjamin Harrison Medallion, 2017.

Selected as the Midwest Primate Interest Group Distinguished Primatologist, 2017.



## Katherine Pollard (UC San Francisco):

Appointed as a Chan-Zuckerberg Biohub Investigator, 2017.



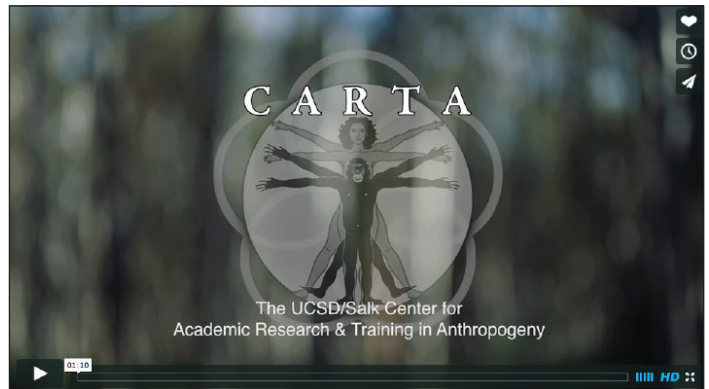
## Jean-Pierre Changeux (Institut Pasteur and College de France):

Received the Doctorate Honoris Causa from Monash University Australia September 19th 2017



## Jean-Jacques Hublin (Max-Planck-Institute for Evolutionary Anthropology):

Awarded the “Wissam Al Kafaa Al Fikria” by the king of Morocco in person on July 30, 2017.



Check out the CARTA bumper video!  
<http://carta.anthropogeny.org/donate>

### Interested in learning more about human origins?

All past CARTA symposia are viewable online at:  
[https://carta.anthropogeny.org/symposia/past\\_list](https://carta.anthropogeny.org/symposia/past_list)

### Did you know?

CARTA posts relevant and informative anthropogeny articles on Facebook and Twitter every day? Stay up-to-date on anthropogeny by visiting:



[facebook.com/ucsdcarta](https://facebook.com/ucsdcarta)  
[twitter.com/cartaucsd](https://twitter.com/cartaucsd)



# CARTA-Inspired Publications

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.)



**Ayala FJ, Cela-Conde CJ.** The First Humans [Internet]. *OUPblog*. <https://blog.oup.com/2017/07/first-humans-jebel-irhoud/>. Published July 23, 2017. Accessed August 31, 2017.

The discovery in Jebel Irhoud, Morocco of human fossils with modern facial features, similar to ours, has been a wonderful surprise. The fossils are associated with tools from the Middle Stone Age, the technique immediately preceding the Upper Pleistocene. The surprise is due to the age of the tools and of the fossils, somewhat older than 300,000 years. The oldest *Homo sapiens* previously known, from Florisbad, South Africa, are more recent.



**Boyette AH, Hewlett BS.** Autonomy, Equality, and Teaching among Aka Foragers and Ngandu Farmers of the Congo Basin. *Hum Nat*. 2017;28(3):289–322.

This paper uses a quantitative, cross-cultural approach to investigate the role of teaching among Aka forager and Ngandu farmer middle-aged children in central Africa. Children received teaching from a variety of non-parental individuals and children utilized diverse methods to teach other children. The paper demonstrates how forager values of autonomy and egalitarianism impact the frequency and forms of teaching. The study supports the conclusion that teaching is a universal, early emerging cognitive ability in humans.



**Cameron N, et al., including Bogin B.** The postcranial skeletal maturation of *Australopithecus sediba*. *Am J Phys Anthropol*. 2017;163(3):633–640.

People grow more slowly than the living apes. Skulls and teeth alone cannot tell us when the human pattern evolved. The 1.9 million-year-old *Australopithecus sediba* specimen from South Africa includes enough post-cranial skeletal material to indicate that this juvenile boy matured quickly, like an ape. *Au. sediba* suggests that modern human-like delayed skeletal maturity evolved recently.



**Cho JI, et al., Di Rienzo A, Beall CM.** Ethnically Tibetan women in Nepal with low hemoglobin concentration have better reproductive outcomes. *Evol Med Public Health*. 2017;2017(1):82–96.

Higher maternal hemoglobin concentration associated extremely strongly with lower reproductive success among 1,006 post-reproductive Tibetan women residing at 3000-4000m in Nepal, taking into account sociocultural and public health factors. These findings are consistent with the hypothesis that average hemoglobin concentration is an adaptation shaped by natural selection against elevated levels.



**Davidson I.** Paleolithic Art. In: Jackson, J, ed. *Oxford Bibliographies in Anthropology*. Oxford: Oxford University Press; 2017.

Paleolithic Art, in the annotated *Oxford Bibliographies in Anthropology*, explores world Pleistocene rock, cave, and mobile art balanced by variation in time and space, and among scholars.

Discussions include what makes something art, how Paleolithic art is studied and interpreted, ethics, and dating methods. References include the earliest art and prominent sites by region. All citations are linked to text and to online sources where possible.



**Enard W.** The Molecular Basis of Human Brain Evolution. *Curr Biol*. 2016;26(20):R1109–R1117.

The genetic and molecular basis of human-specific properties can for obvious ethical reasons not be directly investigated. In this review, Wolfgang Enard sketches a framework how indirect evidence can be obtained and how a comprehensive comparative approach, leveraging cellular systems and genomic technologies, could inform the evolution of our brain in the future.



**Foerster S, et al., including Pusey AE.** Chimpanzee females queue but males compete for social status. *Sci Rep*. 2016;6. doi: 10.1038/srep3504

While male chimpanzees rise in rank by challenging and defeating rivals, females do not switch rank with other females once they have entered the female hierarchy. Most females enter low in the hierarchy and rise in rank with age as others above them die or depart and new females enter below them, but natal females whose mothers are still alive enter higher in the hierarchy.



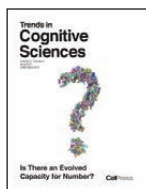
**Hublin JJ, et al.** New fossils from Jebel Irhoud, Morocco and the pan-African origin of *Homo sapiens*. *Nature*. 2017;546(7657):289–292.

Jebel Irhoud, Morocco, documents the earliest stage of evolution of *Homo*. These 300,000 year old hominins display facial features within present-day variation. However, their brain case still bears a rather primitive shape. The Irhoud evidence suggests that the evolution of our direct ancestors mostly results from the accretion of a series of mutations affecting brain structure and development. It also indicates that the emergence of so-called “modern humans” was not restricted to sub-Saharan Africa.



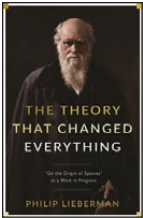
**Koukoulis F, et al., including Changeux JP.** Nicotinic receptors in mouse prefrontal cortex modulate ultraslow fluctuations related to conscious processing. *Proc Natl Acad Sci U S A*. 2016;113(51):14823–14828.

In humans as in animal models, the prefrontal cortex (PFC) plays an important role in cognitive processes, including access to consciousness. The PFC receives significant cholinergic innervation and nicotinic acetylcholine receptors (nAChRs) contribute greatly to the effects of acetylcholine signaling. Recording of the ongoing spontaneous activity in mouse PFC using in vivo two-photon imaging reveals ultraslow fluctuations (less than 0.1Hz) which are also present in humans and have been related to conscious processing. They are altered in particular by deletion of the beta 2-subunit of the nAChR, by application of the antagonist mecamylamine and by mild general anesthesia, underlying the critical role of the nAChR in the orchestration of higher brain function.



**Núñez RE.** Is There Really an Evolved Capacity for Number? *Trends Cogn Sci*. 2017;21(6):403–424.

Conventional wisdom posits that there is a biologically evolved capacity specific for number that humans share with other species. But data say otherwise. Biologically evolved preconditions for quantification exist, but number proper emerged via cultural practices, which supported by language and symbolic reference, lie largely outside natural selection. Number captures the saga of human evolution.



**Lieberman P.** *The Theory That Changed Everything: "On the Origin of Species" as a Work in Progress.* New York: Columbia University Press; 2017.

Natural Selection is not the only evolutionary mechanism that Darwin introduced in 1859. He observed heritable changes that current research shows are "epigenetic" – the complex process that transforms the information coded in genes into the anatomy and neural circuits accounting for why we neither look like nor generally act like chimpanzees. Darwin also pointed out the role of "recycling" in evolution – anatomy and structures of brains that had evolved for one purpose taking on new roles, accounting for articulate human speech and enhanced cognitive capabilities. And Darwin stressed the continual interplay between ecosystems and biology. Darwin was one of the first to make use of the modern scientific method – proposing a hypothesis and testing it against data. One can only speculate what he would make of controversial issues today such as GMOs, Intelligent Design, and the God question.



Luo C, et al., including **Sejnowski, T.J.** Single-cell methylomes identify neuronal subtypes and regulatory elements in mammalian cortex. *Science*. 2017;357(6351):600–604.

How many different types of neurons are there in the brain? Has this changed during evolution? This paper used gene sequencing to determine which genes were turned off in single cortical neurons and found 21 human neuronal subpopulations, some previously unknown and some not found in mice. This technique can survey all cell types in the brain and across all species.



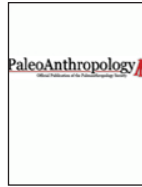
Okerblom JJ, et al., including **Varki A.** Loss of CMAH during Human Evolution Primed the Monocyte-Macrophage Lineage toward a More Inflammatory and Phagocytic State. *J Immunol*. 2017;198(6):2366–2373.

We earlier found a mutation that arose ~3 million years ago in our ancestors, and may have contributed to speciation. Modeling this mutation in cells and mice, we noted immune system changes that could have given an advantage to our ancestors during the transition to butchery with stone tools. The findings may also help explain why this mutation alters the severity of mouse models for human disease.



Peyégne S, et al., **Prüfer K.** Detecting ancient positive selection in humans using extended lineage sorting. *Genome Res*. 2017;27(9):1563-1572.

This paper describes a method to detect old events of selection that occurred on the human lineage after the split from Neandertals ~500kya. The method detects ~300 candidate regions, which are significantly enriched in gene regulatory elements. Two of the potentially selected genes, *ROBO2* and *SLIT2*, interact to guide developing axons in the nervous system.



**Speth JD.** Putrid Meat and Fish in the Eurasian Middle and Upper Paleolithic: Are We Missing a Key Part of Neanderthal and Modern Human Diet? *PaleoAnthropology*. 2017:44–72.

Arctic foragers today and in the Paleolithic faced similar problems: shortage of fuel and vitamin C. Paleolithic hominins, like modern Inuit, likely solved these problems in a similar way—by putrefying their meat. Putrefaction "pre-digests" meat without cooking and anaerobic bacteria prevent scarce vitamin C from oxidizing. The disgust we feel toward rotten meat is not universal, it is learned.



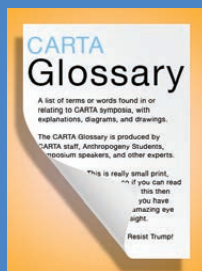
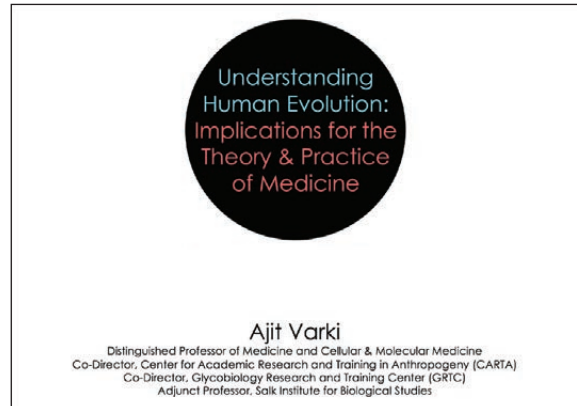
Takeya R, et al., including **Patel AD.** Predictive and tempo-flexible synchronization to a visual metronome in monkeys. *Sci Rep*. 2017;7(1):6127.

The ability to synchronize movements to a periodic beat in a predictive and tempo-flexible way is fundamental to music cognition, but until recently no non-human primate has been shown to have this ability. This study provides the first experimental evidence that monkeys have this capacity, and raises new questions about the neural precursors of music cognition in other species.

## Anthropogeny as an Introduction to the Medical Curriculum

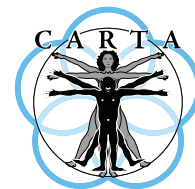
A major curriculum re-organization was recently achieved at UC San Diego's medical school. The first lecture that first year medical students now attend is "Understanding Human Evolution: Implications for the Theory & Practice of Medicine," delivered by Dr. Ajit Varki, CARTA's Executive Co-Director.

To view an earlier recording of this lecture, go to: <https://carta.anthropogeny.org/mediaplayer/play/311302/299688>



*Did you know that CARTA prepares a glossary for each symposium that defines the key terms used in the presentations? Symposium-specific glossaries can be found on the individual event pages and a combined glossary of all terms can be found here:*

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



## CARTA Partners with the American Academy of Arts and Sciences

We are privileged to announce that the American Academy of Arts and Sciences\* has partnered with CARTA to host the Morton L. Mandel Public Lecture on **How are Humans Different from Other Great Apes?**

From a genomic perspective, humans are just another kind of "Great Ape." How are we similar or different? CARTA leaders will discuss distinctly human features, ranging from genetic to cognitive to physiological to behavioral to biomedical, while considering implications for anthropogeny. The lecture is free and open to the public, however, registration is required.

*\*Since its founding in 1780, the Academy has served the nation as a champion of scholarship, civil dialogue, and useful knowledge. The Academy's membership of 4,900 Fellows and 600 Foreign Honorary Members includes accomplished scholars and practitioners worldwide, including many CARTA members. The Academy regularly sponsors meetings, lectures, panel discussions, and informal gatherings around the country.*

AMERICAN ACADEMY  
OF ARTS & SCIENCES



### How are Humans Different from Other Great Apes?

Monday, October 23, 2017, 6:00-7:15 p.m., Reception to follow  
Sanford Consortium (Roth Auditorium)  
2880 Torrey Pines Scenic Drive, La Jolla, CA  
Register online at [www.amacad.org/SanDiego2017](http://www.amacad.org/SanDiego2017)

on *Genomics, Life History and Reproduction*

**Pascal Gagneux**, Associate Professor of Pathology and Anthropology, Associate Director of CARTA, UC San Diego

on *Genetics and Brain Development*

**Fred H. Gage**, Professor, Laboratory of Genetics; Vi and John Adler Chair for Research on Age-Related Neurodegenerative Disease, Salk Institute; Co-Director of CARTA, UC San Diego

on *Anatomy and Behavior*

**Margaret J. Schoeninger**, Distinguished Professor of Anthropology, Co-Director of CARTA, UC San Diego

on *Common Disease Profiles*

**Ajit Varki**, Distinguished Professor of Medicine and Cellular & Molecular Medicine, Co-Director of CARTA, Co-Director of the Glycobiology Research Training Center, UC San Diego; Adjunct Professor, Salk Institute

### CARTA Symposia Schedule

#### Cellular and Molecular Explorations of Anthropogeny

September 29, 2017, Salk Institute

#### The Role of Hunting in Anthropogeny

March 2, 2018, Salk Institute

#### Imagination and Human Origins

June 1, 2018, Salk Institute

#### Impact of Tools and Technology on the Evolution of the Human Mind

October 12, 2018, Salk Institute

### CARTA on the Web



Want to re-watch a CARTA symposium? All symposia, including "**Extraordinary Variations of the Human Mind**" (May 2017), are available at the above websites.



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



[twitter.com/cartaucsd](https://twitter.com/cartaucsd)

### 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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