

EAORC BULLETIN 1,208 – 9 August 2026

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NOTICES

FORMATTED VERSION OF THIS BULLETIN

A pdf formatted version of this Bulletin is available for download at martinedwardes.me.uk/eaorc/eaorc_bulletins.htm.

PUBLICATION ALERTS

If you have had a paper or book published, or you see something which would be of interest to the group, please send me a publication alert so that I can include it in the newsletter. Many thanks to those who have already sent in alerts.

If there is a journal you feel I should be tracking on a regular basis, let me know.

And if you have any other ideas for extending the “EAORC experience”, please contact me.

EDITORIAL INTERJECTIONS

Comments in curly brackets are editorial interjections. The Editor reserves the right to be wrong, and doesn’t object to being called out on it.

OTHER PUBLICATIONS – Minimal self-sentience

Synthese 208:91 (2026).

GUIDO BAGGIO & SHAUN GALLAGHER – Minimal self-sentience

This article develops the concept of minimal self-sentience to extend the phenomenological notion of minimal self-awareness to non-human animals. Drawing on the phenomenological account of minimal pre-reflective self-awareness (e.g., Zahavi), and on the view that such a minimal form of self-experience can be attributed to non-human animals (e.g.,

Strawson), we propose to deepen the analysis to show that sentience can be understood as a reflexive, automatic, and affectively valenced form of bodily responsiveness through which an organism experiences its own interactions with the environment prior to any higher-order cognition or reflective act. To develop this proposal, we examine and critically assess two influential accounts of the emergence of sentience. First, we engage with Nicholas Humphrey's evolutionary theory, which ties phenomenal experience to the privatisation of sensorimotor feedback and the formation of recursive neural loops. Humphrey's discontinuist framework locates the threshold of sentience at a relatively advanced stage of neural organisation, and his treatment of proprioception as phenomenally inert conflicts with substantial empirical evidence. Second, we consider Anil Seth's predictive processing account, which grounds selfhood in interoceptive inference and homeostatic regulation. Although this approach, reconnects subjectivity to bodily life, it presupposes a hierarchical neural architecture that risks reproducing neurocentric limitations similar to Humphrey. We then propose an enactive reframing of Seth's model, informed by an account of dynamical brain-body-environment coupling. To motivate this enactive reframing, we turn to William James's notion of "warmth and intimacy" as the affective quality through which somatic self-experience is felt as mine, prior to any complex cognitive processing or reflective judgment. We argue that this Jamesian dimension, rooted in the sensorimotor feedback loop between organism and environment, identifies a phenomenological stratum that neither Humphrey nor Seth fully captures – one that constitutes the experiential core of minimal self-sentience.

<https://link.springer.com/article/10.1007/s11229-026-05742-3>

OTHER PUBLICATIONS – How one small tribe conquered the world 70,000 years ago

Evolutionary Linguistic Theory 8, 1-2 (2026).

ANDREY VYSHEDSKIY – How one small tribe conquered the world 70,000 years ago

Genetic evidence indicates that most humans descend from a single tribe that 70,000–40,000ya rapidly replaced the entire Eurasian population while also gradually expanding within Africa. This rapid expansion of one tribe is supported by five lines of genetic evidence: (1) Y-chromosome data tracing most non-African male lineages to haplogroup CT 70,000ya; (2) mitochondrial DNA, which shows that most non-Africans descend from haplogroup L3 and its M and N branches that spread across Eurasia 70,000ya; (3) nuclear DNA analyses confirming that all non-Africans derive from a single migration event 70,000–50,000ya; (4) evidence of genetic bottleneck; (5) 2% Neanderthal DNA in all non-Africans, showing interbreeding before Eurasian dispersal. What social, cognitive, or technological advantage enabled this extraordinary expansion? The discovery of three discrete levels of language comprehension in modern individuals suggests the possibility that this ancestral tribe experienced a leap from the Modifier to the Syntactic Phenotype, unlocking unprecedented capacities for coordination, strategizing, and deception.

https://www.academia.edu/171425728/How_one_small_tribe_conquered_the_world_70_000_years_ago

NEWS

NEWS FROM SCIENCE – Neanderthal growth gene turns modern humans into muscle heads

People with DNA variant from our evolutionary cousins tend to have more lean muscle mass.

<https://www.science.org/content/article/neanderthal-growth-gene-turns-modern-humans-muscle-heads>

SCIENCEADVISER – How Neanderthals got ripped

Do people gawk at your guns when you go sleeveless? If so, you could have your Neanderthal ancestry to thank for it, researchers report this week in *Current Biology*. Skeletal evidence suggests our close evolutionary cousins were stockier and more buff than modern humans, with broader jaws and pronounced brow ridges. Now, by perusing ancient genomes from modern and archaic humans, scientists have identified a Neanderthal-specific variant of the gene that codes for a growth hormone receptor, which could partially account for those features.

When they synthesized cells in a lab that expressed either variant, then flushed them with growth hormones, the cells with the Neanderthal version of the gene grew about 40% larger than those with the more common modern human version. Next, they identified this variant in a small subset of people living today: about 0.5% of Europeans, 2% of Indigenous Americans, 15% of East Asians and 20% of South Asians. Modern humans may have acquired it from mixing with Neanderthals some 47,000 years ago, the researchers suggest. People with this variant tend to carry, on average, 270 grams more lean muscle mass than those with the more standard variant, and to have a subtly different jaw shape.

Neither of the study's lead authors carries this Neanderthal gene variant. But one of their co-authors, geneticist Tomislav Maričić, does, "and he's huge," said evolutionary anthropologist and first author Philipp Kanis, who has a comparatively slight build. "When we give talks, Tomi and I stand next to each other and flex our arms and let the audience guess which one of us carries the Neanderthal variant."

<https://www.science.org/content/article/neanderthal-growth-gene-turns-modern-humans-muscle-heads>

THE CONVERSATION – How your conscious and unconscious mind interact

The modern scientific consensus is that your unconscious mind does the heavy lifting.

<https://theconversation.com/how-your-conscious-and-unconscious-mind-interact-283196>

THE CONVERSATION – Stone age hunters made sea voyages to Malta – thousands of years before sails

People reached the Mediterranean island at least 8,500 years ago.

<https://theconversation.com/europes-stone-age-hunters-made-sea-voyages-to-malta-thousands-of-years-before-evidence-of-sails-288969>

PUBLICATIONS

Academia Neuroscience and Brain Research

PAPERS

RÜDIGER J. SEITZ et al – Perceptuo-cognitive development in infancy and childhood

This paper reviews the development of perceptual and cognitive abilities during infancy and childhood as reported in the literature to connect them with the same in adults. First, infants are engaged with encoding perceptual information about objects and events in memory. When they acquire language skills, they begin to associate words with these perceptual representations and to encode narratives they have heard. This enables them to communicate to others what they have encoded and to reflect on it. Integrating perceptual encounters with emotional loading renders them personally relevant and enforces their encoding. However, the encounters experienced before the age of four years can rarely be recalled in adolescence or adulthood. Thus, beliefs formed during infancy remain largely inaccessible to memory recall later in life, although they are fundamental for individuals' behavior and the development of a person's perspective.

<https://www.academia.edu/3071-4087/2/3/10.20935/AcadNeurosci8401>

American Journal of Biological Anthropology

PAPERS

EMMA GUIMARAES, EVIE VEREECKE & ASHLEIGH L. WISEMAN – Functional Differences in Muscle Architecture Across the Pelvis and Hind Limb of Primates

Understanding the architectural diversity of primate musculature is essential for interpreting locomotor function and reconstructing evolutionary adaptations. This study examines whether interspecific differences in pelvic and hind limb muscle architecture reflect functional differentiation among major muscle groups.

We present detailed dissection data from six primate species, alongside a large sample of additional specimens collected from previous studies. We quantify fascicle length, pennation angle, muscle mass, and physiological cross-sectional area across the hind limb and pelvis in each species. We assessed whether differences in muscle architecture were consistent across functional groups and taxa. Differences in muscle architecture were analyzed across functional groups, muscles, and species, with architectural specialization interpreted in functional terms, e.g., reflecting relative emphasis on force, power, displacement, or generalist/stabilizing roles.

Our results reveal conserved configurations in load-bearing muscles, but marked divergence in others, particularly in knee and hip musculature. Notably, muscle specialization was more conserved between species with similarity in their ecology/locomotor mode than between those who are closely related, indicating that muscle architecture is closely linked to habitual hind limb function.

These findings suggest that patterns of pelvic and hind limb muscle specialization across primates are driven primarily by ecological and locomotor function, rather than evolutionary relatedness. The dataset provides a detailed, anatomically grounded resource for future comparative and biomechanical studies of primate hind limb function.

<https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.70329>

Biology Letters

PAPERS

MARIE J. E. CHARPENTIER et al – Costs and benefits of heterosexual interactions on female mandrills

In primates, most evidence linking sociality to fitness comes from studies of female–female bonds, whereas the consequences of heterosexual relationships remain understudied. This is particularly true in species such as mandrills (*Mandrillus sphinx*), where male group tenure is short, and interactions with females can range from affiliative to coercive. Using 13 years of behavioural and life-history data on 76 adult females, we show that grooming exchanged with all males has contrasting fitness consequences depending on its direction. Grooming given to males tended to improve female survival and was associated with higher juvenile offspring survival, whereas grooming received from males reduced female survival. These opposing effects suggest that heterosexual grooming interactions may entail both benefits and costs for females, depending on whether females provide or receive affiliation. Finally, agonistic interactions between females and males showed modest evidence of negative associations with juvenile survival, whereas male–female spatial proximity had no detectable effect overall. Our results show that even transient male–female associations can have lasting consequences for fitness and that these effects depend critically on the direction and timing of specific interactions rather than on global measures of sociality.

<https://royalsocietypublishing.org/rsbl/article-abstract/22/8/20260275/482705/Costs-and-benefits-of-heterosexual-interactions-on>

Cell**PAPERS****PARMINDER SINGH et al – Why studying females reveals more about aging: The reproductive resilience hypothesis for the evolution of sex-specific aging**

Classical evolutionary theories of aging, including antagonistic pleiotropy (AP) and the disposable soma theory (DST), explain why aging exists but are often applied without considering how sex-specific reproductive strategies shape the forces of natural selection on survival. They do not explain why females consistently outlive males across taxa, despite their greater reproductive investment, or why in some contexts, such as eusocial queens, extraordinary fecundity is coupled with exceptional longevity. To explain these patterns, we propose the reproductive resilience hypothesis (RRH), which posits that when reproductive success depends on prolonged survival and caregiving, natural selection favors coupling reproduction with enhanced somatic maintenance rather than trading it off. We suggest that reproductive events, including age at sexual maturity, pregnancy, lactation, and menopause, are pivotal life-history transitions and must be explicitly integrated into studies of sex differences that drive aging and susceptibility to age-related diseases. We further propose that loss of reproductive resilience is a sex-specific hallmark of aging that coordinates the emergence of multiple downstream hallmarks, helping explain the acceleration of systemic aging and age-related disease following reproductive decline. We propose that, for these reasons, studying females should be prioritized, as it has unique implications for discovering pathways to slow aging and prevent age-related diseases, ultimately benefiting both women and men.

[https://www.cell.com/cell/abstract/S0092-8674\(26\)00811-1](https://www.cell.com/cell/abstract/S0092-8674(26)00811-1)

Current Biology**PAPERS****JULIA M. ZEH et al – Humpback whales match song production to dive patterns**

Understanding the function and origin of a complex animal display requires a holistic study of its performance. For example, movement is linked to sound production by enhancing or biomechanically facilitating displays, exploiting additional sensory channels, or affecting signal development and perception. Among animal displays, humpback whale (*Megaptera novaeangliae*) song is remarkable for its hierarchical structure, syntax, and cultural transmission, but it has been challenging to study the whole performance. Using temporarily attached sound and movement recording tags, we conducted an individual-level examination of fine-scale movement during humpback whale song performance. We discovered a tight correspondence between dives and songs, which were repeated without stopping for up to 16 h. Repeating song elements, known as themes, were linked to specific parts of a dive; ascent and descent song themes were consistent across individuals and years, while a greater number of theme types occurred at depth. Different levels of variability in song components across dive phases suggest that features of themes from the bottom portion of a dive, where the depth is stable, are more likely to be driven by song sharing under sexual selection. Movement during song performance illustrates important connections between physiology, environment, and behavior for learned, rhythmic acoustic displays.

[https://www.cell.com/current-biology/abstract/S0960-9822\(26\)00879-1](https://www.cell.com/current-biology/abstract/S0960-9822(26)00879-1)

PHILIPP KANIS et al with SVANTE PÄÄBO – Increased signaling of the Neanderthal growth hormone receptor

Neanderthals had a robust build and distinctive skeletal features. The hypothalamic-pituitary-somatotropic (HPS) axis, with growth hormone (GH) as a central signaling molecule, plays a crucial role in regulating skeletal development. To explore whether Neanderthal-specific genetic variations in the HPS axis contributed to their physical robustness, we examined genes encoding the relevant receptors and hormones. We find that the Neanderthal growth hormone receptor (GHR) carried two amino acid changes and one deletion. When the Neanderthal GHR is expressed in a GH-dependent cell line, the cells proliferate faster than cells expressing the modern human GHR when stimulated by pituitary GH but not by placental GH. We also show that some present-day humans have inherited the gene encoding the Neanderthal GHR. These individuals tend to have more muscle mass and exhibit some craniofacial traits reminiscent of Neanderthals. Thus, aspects of Neanderthal anatomy live on in people today.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(26\)00890-0](https://www.cell.com/current-biology/fulltext/S0960-9822(26)00890-0)

eLife**NEWS****Not just a figment of imagination**

Synesthesia leaves a physical trace in the eye, with pupils reacting to the colors synesthetes see in gray numbers.

<https://elifesciences.org/digests/110390/not-just-a-figment-of-imagination>

PAPERS**CHRISTOPH STRAUCH, CASPER LEENAARS & ROMKE ROUW – Pupil size reveals the perceptual quality and effortless nature of synesthesia**

Synesthesia describes cross-over processes that can generate ‘extra’ conscious percepts, such as seeing additional color when reading numbers. While existing research focuses on the mechanisms and effects of synesthetic associations, it often overlooks its most distinctive feature: unique sensory phenomenology. Here, we introduce pupillometry as an objective physiological measure of synesthetic color phenomenology. Across 16 grapheme-color synesthetes and two matched control groups, pupil responses tracked the brightness of synesthetic colors under constant physical visual input, scaling with self-reported strength. Synesthetic colors elicited pupil dynamics comparable to real colors, dissociating synesthetes from non-synesthetes. These responses emerged too rapidly to reflect imagery and scaled with reported color brightness, revealing cross-over caused genuine perceptual processing. Controls required to generate color associations showed greater effort-linked pupil dilation than synesthetes or controls who did not report colors, providing evidence for the effortless nature of synesthesia. Synesthesia thus provides a tractable human model for studying physiologically measurable phenomenology.

<https://elifesciences.org/articles/110390>

Frontiers in Psychology**PAPERS****LEA MARIE PETRASCH & REGINA JUCKS – Linguistic perspective-taking in verbal communication with LLMs: evidence of an egocentric bias**

Since the expansion of generative AI’s functions, chatbots such as Open AI’s Chat-GPT appear as more than tools. They can be perceived as communicative partners, shaping exchanges with high variability and linguistic competence. Current versions, such as Chat-GPT 5.5, even provide spoken language using different verbal styles and vocabulary, intonation and prosody. Investigating this new context of communication, we question whether people expect chatbots to detect non-literal meanings. Extending the illusory transparency of intention research paradigm introduced by Keysar, information was presented through scenarios of interactions with the Chat-GPT voice function that disambiguated the presented verbal information as either non-literal (sarcastic) or literal (sincere) in an within-subject experimental design (N = 327). Scenarios were placed within the higher education context. Results reveal that participants did not only falsely expect the chatbot to detect a non-literal meaning, but they also even expected the chatbot to reply accordingly. Implications for higher education contexts are discussed.

<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2026.1894763/full>

Mind & Language**PAPERS****KRYSZYNA BIELECKA & MARCIN MIŁKOWSKI – Contentful skills: Procedural memory and the representational challenge to non-representational cognition**

Procedural memory—the system underlying skills and habits—is inherently contentful. We argue, drawing on standard accounts of intentionality, that it exhibits a world-to-mind direction of fit and is governed by satisfaction conditions that normatively guide skilled action. Four convergent arguments support this: the conceptual structure of procedural memory’s directive function; the phenomenon of misrepresentation in apraxia; the constitutive role of contentful goal states in motor control models; and the semantic interface between verbal instruction and action. This challenges anti-representationalist accounts in embodied cognition and philosophy of memory—including radical enactivism and the skilled intentionality framework—and supports a unified representationalist framework for embodied agency.

<https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.70057>

ELIZABETH SCHECHTER – Two candidate cases of multiple personhood

The split-brain phenomenon and dissociative identity disorder (DID) have been posed as candidate cases of multiple persons in one body. Philosophers have typically argued that DID subjects are better candidates for multiple personhood because their behavior is more disunified. While a DID subject is intuitively more like multiple persons than is a split-brain subject, I argue here that the grounds of this intuition do not concern disunified behavior per se. Rather, they concern the differing self-conceptions of split-brain subjects on the one hand and at least many DID subjects on the other.

<https://onlinelibrary.wiley.com/doi/full/10.1111/mila.70056>

Nature**NEWS****Neanderthal gene makes some modern humans taller and more muscular**

The ancient genetic variant is most common in people of South and East Asian ancestry.

<https://www.nature.com/articles/d41586-026-02439-y>

Nature Africa

ARTICLES

ELSABE BRITS – Ancient tooth proteins deepen the Homo naledi mystery

South African molecular scientist Palesa Madupe expected proteins preserved in fossil enamel to clarify why *Homo naledi* remains look so alike. Instead, teeth from at least 20 individuals yielded no male protein markers.

<https://www.nature.com/articles/d44148-026-00224-7>

Nature Communications

PAPERS

MARCO ROSARIO CAPODIFERRO et al – Archaic ancestry inference in imputed ancient human genomes

We are providing an unedited version of this manuscript to give early access to its findings. Before final publication, the manuscript will undergo further editing. Please note there may be errors present which affect the content, and all legal disclaimers apply.

When modern humans expanded from Africa into Eurasia, they interbred with archaic hominins such as Neanderthals and Denisovans. This introgression shaped human evolution, yet most insights have been gained from present-day genomes, leaving little known about how archaic variants evolved after interbreeding. Ancient genomes offer a direct view of this process, but low coverage and poor quality have limited their use. Recent advances in genotype imputation offer a way to overcome these challenges by reconstructing missing information from reference panels and recovering evolutionary signals from low-coverage data. Here, we show that imputation enables accurate detection and quantification of archaic introgression in ancient genomes, improves local archaic ancestry inference, and that regions of archaic ancestry are imputed with especially high accuracy. We further demonstrate that imputed genomes can reconstruct the trajectories of introgressed haplotypes, distinguish populations across time and geography, and identify both known and additional candidates for adaptive introgression.

<https://www.nature.com/articles/s41467-026-76204-0>

Nature Reviews Psychology

PAPERS

KARA D. FEDERMEIER et al – Prediction in language comprehension across the lifespan

Comprehending language in real time requires the brain to keep pace with ambiguous, variable and often noisy input. One way in which individuals address this challenge is by actively predicting (generating and/or selecting) what might occur next. However, prediction is not a unitary mechanism and is not engaged uniformly among individuals or across the lifespan. In this Review, we examine predictive mechanisms across the lifespan, synthesizing evidence from children, young adults and older adults to show how different aspects of prediction are deployed under different developmental and processing conditions. Viewed developmentally, differences in prediction have multifaceted roots that reflect the joint influence of cognitive resources, linguistic experience and the momentary utility of predictive engagement. Prediction is not an invariant hallmark of comprehension but a dynamically configured system, whose components are selectively engaged to meet the functional demands of language use across life.

<https://www.nature.com/articles/s44159-026-00599-2>

New Scientist

NEWS

The genome of a long-extinct ancient human is hiding within us

We all have bits of DNA from a long-lost “ghost ancestor” inside us – and by putting all the different bits together, we might be able to reconstruct their genome.

<https://www.newscientist.com/article/2582522-the-genome-of-a-long-extinct-ancient-human-is-hiding-within-us/>

Lost civilisation in the Amazon may have numbered 3 million people

Laser-scanning surveys reveal that the ancient Aquiri civilisation was bigger than previously thought, building tens of thousands of large geometric earthworks in what was once thought to be pristine wilderness.

<https://www.newscientist.com/article/2582152-lost-civilisation-in-the-amazon-may-have-numbered-3-million-people/>

Flat head syndrome discovered in Iron Age skeletons

Certain sleeping positions can lead to babies developing flattened heads, and an analysis of ancient skulls from Italy reveals that this condition affected people in the 9th century BC.

<https://www.newscientist.com/article/2582200-flat-head-syndrome-discovered-in-iron-age-skeletons/>

PLOS One

PAPERS

BASILE GARCIA, CRYSTAL QIAN & STEFANO PALMINTERI – A moral Turing test: How belief and source shape detection of and agreement with LLM judgments

As large language models (LLMs) are increasingly integrated into decision-making systems (e.g., autonomous vehicles and medical devices), understanding how humans perceive and evaluate AI-generated judgments is crucial. To investigate this, we conducted a series of experiments in which participants evaluated justifications for moral and non-moral choices, generated either by humans or LLMs. Participants attempted to identify the source of each justification (either human or LLM) and indicated their agreement with its content. We found that while detection accuracy was consistently above chance, it remained below 75%. In terms of agreement, there was no overall preference for human-generated responses, even though machine-generated justifications were favored in particularly challenging moral scenarios. Notably, we observed a systematic anti-AI bias: participants were less likely to agree with judgments they believed were AI-generated, regardless of the true source. Linguistic cues, such as response length, typos, first-person pronouns, and cost-benefit language markers (e.g., “lives,” “save”), influenced both detection and agreement. Participants tended to disagree with cost-benefit calculations, possibly due to an expectation that AI would favor such reasoning. These findings highlight the influence of motivated belief and ingroup/outgroup bias in shaping human evaluation of AI-generated content, particularly in morally sensitive contexts.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0353391>

SRIKANT NATARAJAN et al – Geometric morphometric analysis of maxillary molar sexual dimorphism: A cross-sectional study

The sexual dimorphism of permanent maxillary molars has been extensively documented through metric and subjective shape analysis. The aim of this study was to evaluate sexual dimorphism in the shape of permanent maxillary first (UM1) and second molars (UM2) using geometric morphometric analysis.

This cross-sectional study analysed digitized dental casts from 60 males and 60 females. The casts were scanned using a laser surface scanner, and 28 three-dimensional landmarks, defined based on anatomical and geometric landmarks, were marked using SlicerMorph software. The shape data was then analysed using Procrustes superimposition, principal components analysis, regression, and discriminant function analysis to test the shape changes, allometry, and differences between the sexes.

Centroid size did not differ significantly between sexes for UM1 and UM2 ($p > 0.05$). Shape differences were not significant in UM1 ($p = 0.15$) but were significant in UM2 ($p = 0.01$). Allometry was observed in both molars, with a greater contribution in UM2 (6.96%) compared to UM1 (2.39%) ($p < 0.001$). Discriminant function analysis identified patterns of shape variation between groups; however, these findings should be interpreted cautiously as no cross-validation was performed.

Geometric morphometric analysis identified significant shape differences in the maxillary second molar. These findings demonstrate the utility of 3D geometric morphometric analysis for assessing tooth shape variation and support its application to evaluating sexual dimorphism of maxillary molars. Further studies involving larger and more diverse populations are warranted to validate these findings.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0355612>

Proceedings of the Royal Society B

PAPERS

JOHANNA HENKE-VON DER MALSBURG et al with TOMOS PROFFITT – Social cues on stone tools outweigh raw material properties in wild primates

Tool use is known among many taxa but its frequency in the animal kingdom is rare. The socio-ecological conditions through which tool use is acquired, transmitted and maintained are the subject of extensive study. Understanding these dynamics offers valuable insight into the evolution of tool use in our species. A fundamental requirement of tool use is the ability to select materials suitable for a given task. In extant primates, material selection is influenced by social and ecological factors; their relative roles, however, remain difficult to disentangle. We present an experimental approach to examine the factors influencing tool selection in robust capuchin monkeys. We provided two naturally tool-using populations with nut-cracking tasks that varied in the material properties of stones and visual evidence of previous use. When presented with unused stones, both populations persistently selected tools based on their material properties. When stones showed signs of previous use, they preferably selected those regardless of material properties. These findings suggest that capuchin monkeys can assess raw material properties but prioritize tools that exhibit evidence of previous nut-cracking activities, indicating that tool selection is shaped by indirect social cues and highlighting the importance of culturally transmitted information in the development of technological skill.

<https://royalsocietypublishing.org/rspb/article/293/2076/20260416/482681/Social-cues-on-stone-tools-outweigh-raw-material>

Science

ARTICLES

ROBERT A. BARTON – The visual brain hypothesis

Virtual models of primate crania support visual system influence on brain size.

<https://www.science.org/doi/10.1126/science.aek0212>

PAPERS

RICHARD F. KAY et al – Fossil evidence favors a role for vision in the modular evolution of the primate neocortex

Neocortical expansion is a key innovation of crown primates, although fossil evidence for how the neocortex has evolved remains elusive. We studied neocortical evolution using virtual brain endocasts from extant and Eocene-Miocene fossil primates. We found that neocortex size increased in parallel across crown primate clades, with rapid increases in tarsiers and anthropoids. Although the frontal lobe is commonly described as having expanded disproportionately in primates, we show that it evolved gradually, following a common pattern for allometric scaling. By contrast, nonfrontal neocortical regions underwent rapid increases relative to brain size in haplorhines. Neocortical expansion occurred in concert with increases in optic foramen area, suggesting that visual sensory inputs are functionally tied to modular evolution of the primate neocortex.

<https://www.science.org/doi/10.1126/science.aee3541>

JENNIE BRAND-MILLER et al – A central role for dietary sugars in human evolution

What foods enabled the evolution of the large human brain? Currently, that diet is usually framed around increasing intake of animal foods: meat, protein, fat, and omega-3 fatty acids. In evolutionary terms, we take an earlier standpoint and reframe hominin diet reconstruction around the need for glycemic carbohydrate as a source of glucose to support brain metabolism and encephalization. Hominins have existed for about 4 million years, their brain size increasing from 300 g in *Australopithecus afarensis* to 1500 g in *Homo sapiens*. Weighing only 2% of adult body weight, it now represents 20% of basal metabolic rate, 66% in a 5-year-old. Although the driving force is unknown, we do know that this exorbitantly expensive organ is fueled primarily by glucose. Humans can synthesize glucose from precursors such as gluconeogenic amino acids, but the process is inefficient and finite.

We started with metabolic and nutritional considerations, including the rate of glucose oxidation by the brain (~5 mg/min per 100 g). We calculated total obligatory glucose demand (g/day) by the brain, red cells, kidneys, and reproductive organs (fetus, placenta, and mammary glands). In six incremental steps based on the ratio of animal food to plant food, we modeled dietary intake and carbohydrate availability against obligatory glucose demand according to brain and body size. At step 1, we used the known dietary composition of chimpanzee diets with an animal:plant energy ratio of 5:95. At step 6, we applied two ratios based on contemporary warm-climate hunter-gatherers: 35:65 and 50:50. We integrated multiple lines of evidence, including food composition, metabolism and physiology, fossil isotope ratios, dental morphology, and genetic changes, to corroborate our findings.

In human males, estimated total glucose demand is 150 to 200 g/day, in reproductive females 200 to 250 g/day, and in young children ~125 g/day. Carbohydrate availability in the diet ranges from 400 g/day at step 1 to 230 g/day at step 6. The earliest hominins were likely frugivorous, consuming >65% of energy as sugars in fruit and other sweet products. Once fire was mastered, cooked starch increasingly replaced sugars as the source of glucose. At a ratio of 35:65 animal to plant energy (E), anatomically modern humans consumed 19%E as protein, 25%E as sugars, and 25%E as starch. Carbohydrate balance, the gap between dietary carbohydrate intake and glucose demand, becomes negative with higher ratios, increasing the likelihood of ketosis in reproductive females.

Rises and falls in the availability of fruit and honey with seasons, fluctuating climates, and geographic region may have driven foraging behaviors that increased brain growth and complexity, and even extinctions. Although animal foods were clearly instrumental, changes in intake of sugars and starches also shed light on human development, health, and disease. Multiple lines of evidence, including color vision, teeth morphology, dental caries, and stable isotope ratios, suggest that the diet of early hominins was high in sugars. Our modern physiology and anatomy, including sweet taste receptors, smaller teeth, jaw, gut, and genetic variations relating to glucose metabolism, suggest genetic selection driven specifically by dietary carbohydrates.

<https://www.science.org/doi/10.1126/science.aed8437>

Science Advances

PAPERS

ADAM M. MORGAN et al – Hybrid spatial organization and evidence for magnitude-independent neural coding of linguistic information during sentence production

Humans are the only species with the ability to systematically combine words to convey an unbounded number of complex meanings. This process is guided by combinatorial processes whose underlying neural mechanisms remain obscured by inherent limitations of noninvasive brain measures and a near-total focus on comprehension paradigms. Here, we address these limitations with high-resolution neurosurgical recordings (electrocorticography) and a controlled sentence production experiment. We uncover distinct cortical networks encoding word-level and higher-order information. These networks

exhibited a hybrid spatial organization: broadly distributed across traditional language areas but with focal concentrations of sensitivity to semantic and structural contrasts in canonical language regions. In contrast to previous comprehension-based findings, we find that these networks are largely nonoverlapping. Most notably, higher-order linguistic information showed an unexpected dissociation from local activity magnitude. This result establishes an operational dissociation between activity magnitude and information content, pointing toward a potentially distinct neural coding scheme for higher-order language, with important implications for the neurobiology of language.

<https://www.science.org/doi/10.1126/sciadv.aec0518>

SIMON KIRBY et al – Language-like statistical structure arises in learned signaling: evidence from birdsong

All languages have statistically coherent subsequences (e.g., words) whose frequency distribution follows a power law. These properties facilitate language learning in humans, making them good candidates for arising through cultural transmission as a way to help faithful transmission across generations. Recently, both properties were found in whale song, which is also culturally transmitted, leading to the strong prediction that they should be found wherever complex sequential signaling is culturally transmitted. Here, we use the same tools used to analyze human data and whale song to reveal that culturally transmitted Bengalese finch song also has statistically coherent subsequences whose distribution follows a power law. We additionally show that statistical coherence increases over development, but the power law is present throughout, suggesting that it reflects a fundamental principle of learned representations. Finding these parallels between evolutionarily distant species illustrates the importance of cultural transmission in shaping communication and suggests that core properties of language arise through convergent evolution.

<https://www.science.org/doi/10.1126/sciadv.aea3015>

Trends in Cognitive Sciences

PAPERS

VICTORIA BOSCH et al – The Umwelt Representation Hypothesis: rethinking Universality

Recent studies reveal striking representational alignment between artificial neural networks (ANNs) and biological brains, leading to proposals that all sufficiently capable systems converge on universal representations of reality. We argue that this claim of Universality is premature. We introduce the Umwelt Representation Hypothesis, which proposes that alignment arises not from convergence toward a single global optimum but from overlap in the ecological constraints under which systems develop. We review empirical evidence showing that representational differences between species, individuals, and ANNs are systematic and adaptive, which is difficult to reconcile with Universality. Finally, we reframe ANN model comparison as a method for mapping clusters of alignment in the ecological constraint space rather than as a search for a single optimal world model.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(26\)00162-2](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(26)00162-2)

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