EAORC BULLETIN 1,202 – 28 June 2026

CONTENTS

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.

ACADEMIA.EDU – Poverty of the Stimulus Revisited

Cognitive Science 2011, 1-36 (2011).

ROBERT C. BERWICK et al with NOAM CHOMSKY – Poverty of the Stimulus Revisited

A central goal of modern generative grammar has been to discover invariant properties of human languages that reflect ''the innate schematism of mind that is applied to the data of experience'' and that ''might reasonably be attributed to the organism itself as its contribution to the task of the acquisition of knowledge'' (Chomsky, 1971). Candidates for such invariances include the structure dependence of grammatical rules, and in particular, certain constraints on question formation. Various ''poverty of stimulus'' (POS) arguments suggest that these invariances reflect an innate human endowment, as opposed to common experience: Such experience warrants selection of the grammars acquired only if humans assume, a priori, that selectable grammars respect substantive constraints. Recently, several researchers have tried to rebut these POS arguments. In response, we illustrate why POS arguments remain an important source of support for appeal to a priori structure-dependent constraints on the grammars that humans naturally acquire.
https://www.academia.edu/74086393/Poverty_of_the_Stimulus_Revisited

NEWS

NATURE BRIEFING – Humans and apes share a laugh

Chimpanzees (Pan troglodytes), gorillas (Gorilla gorilla) and children laugh in similar rhythms when tickled. Researchers found that kids and apes left evenly spaced intervals between laughing sounds during a tickle attack, though children had a faster laughter rhythm compared with apes. Laughter might have picked up pace during the course of human evolution, the team suggests, which could reveal "something about laughter itself, but also, in a way, about the evolution of human speech", says primatologist and study co-author Chiara De Gregorio.
https://www.nature.com/articles/d41586-026-01994-8

NATURE BRIEFING – Sperm whales in the Med have accents

Isolated groups of sperm whales (Physeter macrocephalus) in the Mediterranean Sea seem to have developed their own dialects of their species' primary social vocalization, a pattern of clicks and pauses. Researchers analysed 20 years of audio recordings and found that whales in the Hellenic Trench, near Greece, use a faster version of the pattern than do whales around the Balearic Islands, between Gibraltar and Italy.
https://royalsocietypublishing.org/rspb/article/293/2073/20260165/482241/Dialect-variation-in-Mediterranean-sperm-whales

NEWS FROM SCIENCE – Do animals perceive time differently from humans?

Science chats with a researcher whose team is using "timescapes" to understand how nonhumans experience the world.
https://www.science.org/content/article/do-animals-perceive-time-differently-humans

NEWS FROM SCIENCE – Your heartbeat quietly shapes how your brain processes information

Frequently ignored bodily rhythms may be skewing neuroscience experiments.
https://www.science.org/content/article/your-heartbeat-quietly-shapes-how-your-brain-processes-information

NEWS FROM SCIENCE – Why have papers by one of history's most famous physicists been retracted?

Springer Nature has removed two studies by Max Planck. A bot may be to blame.
[Why we can give AI the same level of trust we extend to the current US President.]
https://www.science.org/content/article/why-have-papers-one-history-s-most-famous-physicists-been-retracted

NEWS FROM SCIENCE – Why were mysterious ancient humans found in an African cave all female?

Analysis of fossil proteins deepens mystery of the enigmatic Homo naledi.
https://www.science.org/content/article/why-were-mysterious-ancient-humans-found-african-cave-all-female

NEWS FROM SCIENCE – Inbreeding didn't doom the Neanderthals, study suggests

Analysis of more than two dozen new genomes suggests our closest cousins remained genetically healthy, just before they vanished.
https://www.science.org/content/article/inbreeding-didn-t-doom-neanderthals-study-suggests

SCIENCEADVISER – Heartbeats quietly shape your brain activity

On the screen, two side-by-side squares of color flicker rapidly. A study participant is tasked with pressing a button whenever one of them briefly changes hue. What they don't know is that one square tends to change at the exact moment their heart contracts, while the other changes between beats. Yet their brain apparently takes note of this timing: over hundreds of trials, it responds differently to the two squares.
That result, from a 2024 study in NeuroImage, is one of a growing number suggesting that the heartbeat quietly shapes how the brain processes information. These findings also raise the uncomfortable possibility that internal rhythms frequently treated as background noise may be subtly skewing results in neuroscience experiments. "Heart function is never irrelevant to any task," explained Lisa Feldman Barrett, a neuroscientist whose research links emotion, prediction, and bodily regulation.
Some researchers are now warning about the issue, and a paper published in April lays out guidelines for standardizing how studies should document and account for these internal rhythms.
https://www.science.org/content/article/your-heartbeat-quietly-shapes-how-your-brain-processes-information

SCIENCEADVISER – Brain waves move in speedy spirals

Brain waves are electrical discharges from neurons firing in tandem. Traveling brain waves sweep fast around the cortex, helping the brain consolidate memory, coordinate tasks, and many other functions that remain unknown. A few studies in humans and animals have discerned the shapes these waves can take, but they're hard to see fully using conventional recording methods like implanted electrodes.
A new mouse study combining two types of imaging with brain-cell mapping data shows that many traveling waves take on a spiral shape, thanks to the circular layout of the neurons generating them; this pattern repeats itself instantaneously throughout the brain, including in unexpected parts of the deep brain. The findings, senior study author Nick Steinmetz told News from Science, show that cortical and deep-brain regions " are not discrete processors. They're a shared processing system." And neuroscientist Earl Miller, who wasn't involved in the research, thinks the waves' spiral shape is more than just a consequence of how neurons are laid out. The new work shows the waves are "highly organized across the [mouse] cortex and amazingly, across the hemispheres," he said. "When you see this kind of organization, it means something fundamental to function."
https://www.science.org/content/article/speedy-spiraling-electrical-waves-may-be-key-brain-s-information-flow

SCIENCEADVISER – Lampreys provide jaw-dropping insight into vertebrate brain evolution

With their slimy bodies, toothy suction-cup mouths, and hunger for blood, lampreys might seem like something out of a horror film. But these jawless creatures, which split off from jawed vertebrates roughly 450 million years ago and have remained virtually unchanged since then, also serve as valuable models for scientists seeking to unravel the mysteries of vertebrate brain evolution.
In a new study, researchers combined single-nucleus RNA sequencing with high-resolution spatial transcriptomics—two techniques that map the expression of genes in cells and tissues—to create a detailed, 3D atlas of an adult lamprey's brain. The team compared this atlas with those of fish, reptiles, birds, and mice, revealing "a deep evolutionary conservation in the brain's overall blueprint." Structures like the olfactory bulb and thalamus, for example, look remarkably similar in lampreys and mice.
These findings suggest that, by 500 million years ago, vertebrate ancestors already had fairly complex brains with distinct anatomical regions. Over time, the study authors report, neurons specialized to form precise, segregated circuits—a transition that ultimately drove the complexity and diversity of modern vertebrate brains.
https://www.science.org/doi/10.1126/science.aea2535

SCIENCEADVISER – Inbreeding didn't doom Neanderthals

Until recently, most of our knowledge of Neanderthals' genetic diversity came from four ancient genomes that largely point to a highly inbred, small, isolated population that likely would have suffered from poor health due to a buildup of deleterious mutations. Those genomes led some to speculate that a "genetic meltdown" may have played a contributing role to Neanderthals' eventual extinction. Yet three of those four genomes come from skeletons found in southern Siberia, at the far eastern fringe of Neanderthals' range. Could their geographic remoteness have made them genetic outliers?
According to a study out this week in Nature, the answer is yes . Researchers sequenced a whopping 27 new genomes from Neanderthal remains previously excavated from caves throughout Belgium, which was much more centrally located within their range. Many of the remains dated to less than 45,000 years ago, shortly before Neanderthals went extinct. In these

genomes, researchers found a relatively deep pool of genetic diversity, with individuals mostly being distantly related to one another. They also bore none of the genetic hallmarks of inbreeding, suggesting that at the tail end of their existence, Neanderthals were genetically healthy.
"It's pretty compelling evidence that genetic deterioration probably didn't contribute to their downfall," says Joshua Akey, a geneticist who wasn't involved in the work.
The newly sequenced Neanderthal genomes were also curiously devoid of modern human ancestry. Modern human genomes harbor a small subset of genes that came from Neanderthals, the result of ancient interbreeding. In fact, all 13 modern human genomes older than 40,000 years that scientists have analyzed contain Neanderthal ancestry, and some Neanderthal genomes older than 100,000 years contain genes from modern humans. Yet not one of the 27 Neanderthals sequenced in the new study held modern human ancestry, suggesting modern humans and Neanderthals either ignored or avoided each other in the Belgium region, or that children resulting from such mixes ended up being raised exclusively by modern humans.
https://www.science.org/content/article/inbreeding-didn-t-doom-neanderthals-study-suggests

SCIENCEADVISER – Missing males

Analysis of fossil proteins has revealed that ancient skeletons belonging to the hominin Homo naledi buried deep in a South African cave were all female, adding yet another wrinkle to the mystery of the site.
https://www.cell.com/cell/fulltext/S0092-8674(26)00644-6

THE CONVERSATION – Secrets of Stonehenge and other ancient sites unlocked for the summer solstice

The Virtual World of Stonehenge has been released to coincide with the summer solstice.
https://theconversation.com/secrets-of-stonehenge-and-other-ancient-sites-unlocked-for-the-summer-solstice-285766

THE CONVERSATION – Free will: does refusing to believe in it make you a 'bad' person?

Research has found that when you manipulate people to doubt free will, bad things happen – including cheating and aggression. But does it hold up?
https://theconversation.com/free-will-does-refusing-to-believe-in-it-make-you-a-bad-person-research-is-challenging-this-old-idea-283307

THE CONVERSATION – Helping their friends to read can boost children's attainment

Children receive support from their partner throughout the session, with their teacher monitoring the interactions in the class.
https://theconversation.com/helping-their-friends-to-read-can-boost-childrens-attainment-241516

THE CONVERSATION – Citizenship education: primary school children are already able to think politically

Children are already thinking about power and whose voices get heard.
https://theconversation.com/citizenship-education-primary-school-children-are-already-able-to-think-politically-285615

THE CONVERSATION – 3my after Lucy walked upright in Africa, the inside story of another journey

More than any other ancient relative, Lucy has challenged us to think deeply about what it means to be human.
https://theconversation.com/three-million-years-after-lucy-walked-upright-in-africa-the-inside-story-of-another-landmark-journey-285834

PUBLICATIONS

American Journal of Biological Anthropology

PAPERS

ZITAN SONG et al with CAREL P. VAN SCHAIK – Sensorimotor Complexity and Cognition as Predictors of Primate Brain Size

As animal brain size increases, cognitive performance generally increases. However, other key brain functions, such as the regulation of somatic processes, processing of sensory input, and planning and initiation of motor actions, are also closely tied to brain size. Thus, the observed correlations between cognitive performance and brain size may be spurious, a suggestion boosted by recent work showing fishes perform as well as primates on various cognitive tests.
Here, we applied multi-response Bayesian phylogenetic mixed models, in which the four main functions of brains were dependent variables predicted by brain size as the independent variable, as well as a phylogenetic path analysis.
Among varying sets of primate species, brain size strongly predicted somatic functions (as indexed by body size), with similar, somewhat weaker effect sizes for the other three functional traits. The path analysis suggested that body size also independently affected brain size, which in turn predicted the three non-somatic functions with nearly equal strength.

This result suggests that the correlation between body and brain size is the sum of two distinct processes: correlated evolution between body and brain size and a brain size effect on somatic functions, although estimating the strength of the two components is currently impossible. We reject the challenge posed by cognition data on fishes, but find that primate cognition tightly coevolved with sensory and motor functions.
https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.70281

Animal Behaviour

PAPERS

LUCA PEDRUZZI et al – Multimodal yawns signal emotional arousal in geladas

Group living requires individuals to make their internal states perceptible to sustain coordination and cohesion. Multimodal signals may efficiently convey such socioemotional information. Although often considered reflexive, yawning exhibits structural variability and can trigger contagion, suggesting communicative potential. In humans and geladas, Theropithecus gelada, yawns can include a vocal component that alone triggers yawn contagion, yet the reasons behind its emergence remain underexplored. We conducted the first systematic study of vocalized yawns in geladas, analysing over 2500 yawns from nearly 200 wild and captive individuals to test whether multimodal yawning reflects affective states. Using Bayesian modelling, we tested hypotheses linking yawn vocalizations to emotional valence, arousal or motor by-products. Multimodal yawns were more frequent in adult males, who face greater socioemotional demands, and were strongly associated with high-arousal contexts: they occurred most often after aggression, copulations and greetings, less during grooming and least during rest. Moreover, yawn vocalizations often co-occurred with other species-specific affiliative calls, which are known to index arousal and maintain cross-sex bonds, indicating integration within the species' broader communicative system. Our findings indicate that yawn vocalizations may act as socioemotional signals, amplifying arousal and integrating into the species' vocal repertoire. By externalizing internal states, they could enhance emotional attunement, synchrony and social cohesion in complex social groups.
https://www.sciencedirect.com/science/article/pii/S0003347226001454

VINÍCIUS DA CUNHA MELO et al with.SIMONE PIKA – The role of intentional communication in monkeys: evidence from gestural signalling in common marmosets in the wild

Human communication relies on a distinct capacity for social interaction, underpinned by cognitive skills like intentionality. To communicate intentionally, signallers produce signals with the explicit goal of influencing the behaviour or the mental states of receivers. Although long thought to be uniquely human, comparative studies have provided evidence consistent with first-order intentional communication (i.e. the signaller intends to change the recipient's behaviour) in great apes and some monkey species. Despite being cooperative breeders like humans and renowned for their sophisticated vocal and cognitive skills, common marmosets, Callithrix jacchus, are still largely unstudied with respect to the intentional nature of their gestural communication. Here, we thus aimed to increase our understanding of common marmosets' intentional abilities by studying communicative interactions of 20 adult individuals living in four different groups in a semiarid environment in Brazil. We especially focused on the context of grooming, a crucial context for the exchange of signals, and investigated the presence and role of gestures and whether these were aligned with intentional communication patterns. From focal animal sampling and video footage, we found that marmosets produced three different gestures (Touch, Roll-over and Present) both to initiate grooming and during ongoing interactions. These findings suggest that intentional communication plays a crucial role in the cooperative interactions of common marmosets, showing that flexible, goal-directed signalling is not restricted to the vocal domain or great apes, but may be a convergent trait driven by the demands of a cooperative social lifestyle.
https://www.sciencedirect.com/science/article/pii/S0003347226001387

K. DUNKLEY et al – The ecology and evolution of cues and signals in animal interspecies cooperation

Mutualistic interactions have played a central role in generating biodiversity and are often facilitated by an exchange of information between participating parties. Cues and signals are likely to be particularly crucial in animal interspecies cooperation, a specific form of mutualism that depends on real-time, interactive behavioural coordination to secure mutual benefit. Yet, despite the taxonomic breadth and ecological significance of these interactions, our understanding of the roles of cues and signals in animal interspecies cooperation remains relatively underexplored compared to their well-documented roles in other mutualisms, intraspecies cooperation and interactions involving collective behaviour. Here, we examine the ecology and evolution of cues and signals in animal interspecies cooperation. Drawing on diverse natural history examples, we first assess the ecological functions, benefits and costs of cues and signals, and discuss how the information they convey about partner identity, motivation and reliability informs decisions about whether, when and how to cooperate with heterospecifics. Second, we outline the evolutionary origins, variation and heritability of cues and signals, and discuss the potential for coevolution between signallers and perceivers. Third, we draw on relevant insights from broader mutualisms and cooperation within species to highlight key similarities and differences in the use of cues and signals across interaction types. Overall, our review clarifies how information underpins animal interspecies cooperation, highlights key gaps in the scientific literature, and identifies promising avenues for future research on its ecological and evolutionary significance.
https://www.sciencedirect.com/science/article/pii/S000334722600148X

Cell

PAPERS

XINYUAN YAN et al – Shared neural geometries for bilingual semantic representations in human hippocampal neurons

The human brain has the remarkable ability to comprehend and express similar concepts in multiple languages. To understand how it does so, we examined responses of hippocampal neurons during passive listening, directed speaking, and spontaneous conversation in both English and Spanish in a small group of balanced bilinguals. We found a small number of putative "cross-language neurons," whose responses to equivalent words (e.g., "tierra" and "earth") are correlated. However, neurons' semantic tunings differed substantially by language, suggesting language-specific neural implementations. Instead, the crucial driver of translation was a preserved geometric organization of neural responses between the two languages, one that did not depend on neuron-level functional overlap. Indeed, that geometry was implemented by a common set of neurons along distinct readout axes; this difference in readout may help prevent cross-language interference. Together, these results suggest that the hippocampus encodes a language-independent internal model for meaning.
https://www.cell.com/cell/fulltext/S0092-8674(26)00579-9

PALESA P. MADUPE et al with LEE BERGER – Proteomic analysis of dental enamel from 20 Homo naledi individuals shows no male markers

The Rising Star cave system excavations resulted in a high number of well-preserved skeletal specimens from multiple individuals of Homo naledi, showing a high degree of morphological homogeneity, including dental variation possibly consistent with a single-sex sample. Here, we report the paleoproteomic analysis of dental enamel proteins extracted via micro-destructive acid etching from 23 H. naledi specimens belonging to a minimum of 20 individuals. After excluding the possibility of technical bias, no convincing evidence supporting the confident identification of male individuals was detected in any of the investigated samples. We also detect no variability in the recovered proteome, and we observe two amino acid substitutions: a derived one in amelogenin X compared with Homo, and an ancestral one in COL17A1, also present in Paranthropus robustus. Our results further support the homogeneity of H. naledi fossils and show how to sustainably investigate extinct hominins.
https://www.cell.com/cell/fulltext/S0092-8674(26)00644-6

Current Biology

PAPERS

WILLIAM J. WRIGHT et al – Local plasticity underlies the reorganization of cortical circuit dynamics during motor learning

During learning, neural circuits reorganize to encode new information and adapt behavioral responses. Ca2+/calmodulin-dependent protein kinase II (CaMKII)-dependent plasticity is thought to underlie this process by reshaping neural circuits to transform their activity. However, the activity changes of a circuit may arise from plasticity within the circuit, or they may be inherited from plasticity occurring in upstream areas. Therefore, the precise role of plasticity within a brain area in reorganizing the activity of the neural circuit and how this contributes to behavioral adaptation remains unclear. Using an optical tool to block CaMKII-dependent plasticity in pyramidal neurons in combination with in vivo two-photon population imaging, we found that local plasticity within the primary motor cortex (M1) is necessary for the acquisition of stable, stereotyped movements during motor learning. Furthermore, local plasticity also underlies the emergence of reproducible spatiotemporal activity patterns within M1 that reliably encode movements. These results demonstrate a critical role for local plasticity in reorganizing the spatiotemporal dynamics of neural circuits during learning.
https://www.cell.com/current-biology/abstract/S0960-9822(26)00587-7

ROHINI MURUGAN et al – Rhesus macaques show metacognitive sensitivity to artificial grammars

Human language, and cognition more generally, is subserved by two interacting systems: an implicit system that acts rapidly and automatically and an explicit system that allows conscious access to knowledge. While grammatical rules are initially acquired implicitly, explicit awareness develops over time supporting error monitoring and more flexible learning. Critically, even preverbal infants demonstrate metacognition, or sensitivity to their internal cognitive states. Therefore, this form of metacognition may represent a developmental, and possibly evolutionary, precursor to the more explicit representations seen in humans. Indeed, nonhuman animals have been shown to have metacognitive sensitivity in perceptual and working memory tasks. Moreover, artificial grammar learning paradigms have demonstrated that nonhuman animals can learn simple analogs of the grammatical rules of language. Here, we combine an artificial grammar paradigm with a test of metacognitive sensitivity in nonhuman primates. Six rhesus macaques were presented with three static visual stimulus sequences conforming to different artificial grammars and were required both to select the "correct" sequence and to maintain their response (touching the stimulus on the screen) for a variable waiting time (5–12 s) to receive a reward. Monkeys waited significantly longer following correct than incorrect responses, demonstrating metacognitive sensitivity during an artificial grammar task.

https://www.cell.com/current-biology/abstract/S0960-9822(26)00593-2

EMMA POMEROY – Palaeoanthropology: A Neanderthal start to life
The unusually slow pattern of modern human growth and development fundamentally shapes our cognition, behaviour and ability to navigate the social world. But did Neanderthal growth patterns differ from those of humans, and if so, what might that mean?
https://www.cell.com/current-biology/abstract/S0960-9822(26)00522-1

eLife

PAPERS

CHIARA BULGARELLI et al – Head before heart: cognitive empathy emerges before affective empathy in the developing brain
Empathy is crucial for social interactions across all cultures, and is foundational to establishing social cooperation and group ties in human societies. Challenging the current predominant view, we recently proposed that understanding others' emotions (cognitive empathy) might emerge earlier than actually sharing those emotions (affective empathy) (Bulgarelli & Jones, 2023). Here we test this hypothesis by measuring which empathic component matures first during toddlerhood, a critical period for the development of broader social networks. Addressing this question is critical to understand the mechanisms through which caregivers scaffold empathy development. Traditional approaches are inadequate, as they rely on children's verbal skills or unfamiliar scenarios that lack ecological validity.
In this preregistered study, we employed a novel toddler-appropriate task to dissociate neural and physiological correlates of cognitive and affective empathy in N=90 3-to-5-year-olds using functional near-infrared spectroscopy (fNIRS) and simultaneous heart rate monitoring to identify internal markers of empathy.
We found that brain regions supporting affective and cognitive empathy in young children resemble those observed in adults. Importantly, we showed an effect of age on network specialisation with brain activations of cognitive empathy stronger in younger compared to older preschoolers, and brain activations of affective empathy stronger in older compared to younger preschoolers. These results provide the first evidence that cognitive empathy develops earlier than affective empathy in preschoolers, challenging existing models and suggesting a new framework for understanding the development of empathy.
https://elifesciences.org/reviewed-preprints/110899

VALENTINA MIONE et al – Cognitive control networks in human and macaque
A much-replicated finding in human brain imaging is a distributed "multiple-demand" or MD system, increasing in activity for many kinds of cognitive demand, and centrally involved in cognitive control. MD regions are proposed to encode a distributed mental model of critical task events, bound together in the roles and relationships needed to direct action selection. Though previous data hint at a corresponding network in the macaque, there has been no direct comparison to human data. Here we used functional magnetic resonance imaging to measure whole brain activation in a multi-step saccadic maze task, compared to a control requiring similar moves but without goal-based decisions. Human data were a close match to the canonical MD network, extended to include adjacent regions and in particular much of the canonical dorsal attention network. Monkey data suggested correspondences in dorsomedial frontal, lateral and medial parietal, insula/orbitofrontal and posterior temporal cortex. In lateral frontal cortex there was just a single, largely dorsal activation patch, in contrast to multiple distinct human patches. In macaque as in human, together with previous data, our findings suggest an extended and strongly interconnected brain network recruited by increased cognitive challenge.
https://elifesciences.org/reviewed-preprints/111502

Evolutionary Anthropology

ARTICLES

MARIE-HELENE MONCEL et al with CHRISTOPHER J. BAE – What Is the Acheulean?
The Acheulean represents the longest cultural period known to human history, lasting globally for more than 1.75 million years. It may have emerged as early as 1.95 Ma in Africa, spreading throughout much of the continent and then into Eurasia and lasting up to 350–200 ka in western Europe and South Asia, and even later in eastern Asia. Originally defined in the 1870s, the term Acheulean is one of the earliest and most contested classifications in prehistoric archaeology. Almost 150 years after its first appearance, it remains a source of continuous debate. This paper summarizes roundtable discussions that took place at the Musée de l'Homme (Paris) in November 2025 that focused on the meaning of the Acheulean and the diversity of its manifestations across Eurasia. Some 20 researchers, from various institutions across Europe, Asia, and the Pacific participated in this event, during which it became clear that the Acheulean had different meanings to the participants. Among the major points raised during the meeting was the question of how different specialists differentiate the Acheulean from the older Oldowan techno-complex, with specificities emerging from each of their respective regions of study. The geographic origins and hominin species' attribution of the Acheulean toolmakers were also brought to the fore since important questions have been raised in the last decades by the growing record of hominin taxa that existed during this

timeframe across Eurasia and the relatively late arrival of this techno-complex in Europe. These issues become even more important when we consider the recent evidence emanating out of Asia, which indicates that hominins were present well before their earliest appearance in Europe. The purpose of this paper is not only to make a statement regarding how to define the Acheulean, but also to illustrate its diversity across Eurasia.
https://onlinelibrary.wiley.com/doi/full/10.1002/evan.70029

PAPERS

YEGANEH SEKHAVATI, KALEB C. SELLERS & CALLUM F. ROSS – Biomechanics and Evolution of the Primate Tongue
Primate tongue morphology and function are critical to understanding the evolution of feeding, swallowing, and vocalization. In this paper, we examine the primate tongue as a muscular hydrostat with regionally specialized neuromuscular compartments. We integrate anatomical, kinematic, and biomechanical modeling approaches to analyze how muscle architecture and fiber orientation drive complex tongue deformations during functional behaviors. We evaluate the hydraulic mechanisms underlying tongue-base retraction, highlight species-specific adaptations in macaques and humans, and review primate tongue kinematics across distinct feeding stages. Finally, we synthesize recent advances in biomechanical modeling and experimental studies of tongue kinematics and their contributions to advancing three-dimensional analyses of tongue movement during feeding and speech.
https://onlinelibrary.wiley.com/doi/full/10.1002/evan.70026

MATTHEW LOMAS et al – The Cognitive Foundations of Teaching
The propensity to teach is vital to human cultural evolution and to our ecological dominance of the planet, but its cognitive foundations remain poorly understood. Traditional explanations argue that teaching hinges on particular cognitive pre-requisites, such as Theory of Mind. However, such explanations conflate the function of teaching—promoting learning in others—with how it is achieved, and overlook the role of comparatively simple mechanisms like the heuristics known to underpin teaching in some non-human animals. We propose a novel framework integrating evolutionary and psychological perspectives to understand the diversity of teaching by focusing on the cognitive requirements for flexibility and sensitivity to pupil needs. Synthesizing theory and evidence across disciplines, our framework evaluates the contributions of different mechanisms in determining who and what is taught, and how teaching is achieved. This allows us to understand the cognitive foundations of teaching across different species, in diverse human societies, and neurodiverse populations.
https://onlinelibrary.wiley.com/doi/full/10.1002/evan.70032

CORIJN VAN MAZIJK – Opaque Social Instruments: A Cultural Evolutionary Approach to Pleistocene Symbolic Artifacts
Prehistoric “symbolic” artifacts remain incompletely explained by semiotic models, which emphasize representational meaning but offer limited insight into how such materials emerged and spread across Pleistocene populations. This article develops a cultural evolutionary framework that reconceives early ornaments, pigments, figurines, and related materials as opaque social instruments (OSIs): culturally transmitted, socially functional traits whose coordinating effects typically exceed users' explicit understanding of their roles. A heuristic distinction is introduced between participation-embedded OSIs, whose efficacy derives from embodied participation in shared, interactionally dense practices, and frame-embedded OSIs, whose efficacy depends more heavily on publicly stabilized interpretive frames and role structures that extend across contexts and generations. Because these modes operate under different transmission environments and selective pressures, they are expected to generate distinct patterns of reproduction, contextual embedding, and archeological visibility. Reframing prehistoric “symbolic” materials as OSIs shifts explanatory focus from encoded meaning to social coordination, functional opacity, and transmission dynamics, offering a mechanistic account of how materially mediated practices became reproducible components of Pleistocene social systems.
https://onlinelibrary.wiley.com/doi/full/10.1002/evan.70036

ELIZABETH AGEY, DANIEL CONROY-BEAM & DAVID W. LAWSON – The Role and Consequences of Arranged Marriage in the Evolution of Human Mating
Mate selection has important fitness implications and thus has been a prominent focus across the evolutionary social sciences. However, despite ample evidence that human mate selection is uniquely shaped by others, existing research allocates outsized attention to individual preferences. Here, we take stock of the implications of arranged marriage, highlighting measurement issues that obscure continua of parental influence and likely drive inconsistency in the downstream literature. Focusing on parent–offspring conflict over spouse selection, we find (i) culturally widespread evidence of conflicting preferences, but limited evidence that conflict impacts realized spouse selection, (ii) parental approval predicts marriage outcomes more so than parental control, and (iii) that key predictions about socioecological variation in the form and consequences of conflict remain largely untested. We conclude that a more satisfying account of human mating will require refined measurement of its social embeddedness, greater focus on conflict negotiation, and continued cross-cultural research.
https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.70035

DANIEL BIGGS, BRAEDON FARKAS & BERNARD WOOD – Expanding Homo erectus
We focus on three researchers—Davidson Black, Franz Weidenreich and Ralph von Koenigswald—who have made major contributions to the recovery of the fossil record of the hominin taxon now known as Homo erectus. Black was responsible for the recognition of Sinanthropus pekinensis and for the recovery of the initial hypodigm from Choukoutien*. Almost all of the original S. pekinensis fossils were lost during the Second World War, but the precise documentation and meticulous descriptions prepared by Franz Weidenreich substantially mitigate their loss. An earlier article in this series focused on Eugène Dubois' recovery of the type specimen of Pithecanthropus erectus from Trinil in Java, and while a few additional specimens from Trinil were recognized, the majority of the Javan hypodigm of P. erectus was recovered thanks to initiatives led or encouraged by Ralph von Koenigswald.
https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.70031

Evolutionary Human Sciences

PAPERS

JUAN OLVIDO PEREA-GARCÍA et al with PRZEMYSLAW ZYWICZYNSKI & SLAWOMIR WACEWICZ – Gaze in context: non-human eyes can be more salient under ecologically-relevant conditions
Primate eyes vary strikingly in pigmentation, yet the drivers of said variation are strongly debated. Recent revisions of the Cooperative Eye Hypothesis (CEH) propose that the human eye's sclerae evolved to enhance gaze communication specifically under challenging conditions of visibility. We tested this idea under ecologically realistic conditions by presenting observers with a live model wearing contact lenses that simulated either a human-like or a chimpanzee-like eye. At a university lab, observers judged gaze direction at different viewing distances and lighting levels. Contrary to expectations, chimpanzee-like outperformed human-like eyes in dim lighting and close-viewing conditions. Human-like eyes yielded the highest accuracy under bright, far-viewing conditions, consistent with a long-distance signaling advantage. Our results demonstrate that ecological visual constraints shape the potential informativeness of distinct ocular configurations. We hypothesize that species-typical eye appearances may be tuned to their species-typical visual ecology.
https://www.cambridge.org/core/journals/evolutionary-human-sciences/article/gaze-in-context-nonhuman-eyes-can-be-more-salient-under-ecologicallyrelevant-conditions/CFF8C3A96BD19E3F42AD1F710CC87B7E

Frontiers in Ecology and Evolution

PAPERS

BELÉN ALONSO-ESTANILLO & ANA FIDALGO – Beyond maternal behavioral profiles: biparental care and individual behavioral variability in cooperatively breeding common marmosets (Callithrix jacchus)
While general maternal care behaviors such as carrying and nursing are well-documented in primates, recent research highlights significant inter-individual behavioral differences in offspring-directed actions. In many cercopithecine species, these differences are described as maternal profiles. However, in callitrichids, a family of New World primates characterized by cooperative parenting, the role of the father is fundamental, necessitating a broader framework. This study investigated the behavioral variability of both mothers and fathers from four captive Callithrix jacchus families (N = 8). Given the limited sample size, this work serves as an exploratory 'proof of concept' rather than a confirmation of fixed latent structures. To identify emergent patterns of parental care without a priori assumptions, we employed Principal Component Analysis (PCA) on a wide range of infant-directed variables. K-means cluster analysis was subsequently used to categorize individuals based on these emergent behavioral dimensions. To assess the consistency of these categorizations, we examined the Hinde's Rejection Index (the relative frequency of rejection). Our results suggest the existence of potential consistent parental Behavioral Profiles in C. jacchus, analogous to those observed in other primate species. Two primary phenotypes were identified: Protective and Rejecting. The Protective Behavioral Profile is characterized by high rates of carrying, grooming, and infant inspection, whereas the Rejecting Behavioral Profile involves increased termination of contact and higher frequencies of carrying rejection. Notably, parental pairs within the same family tended to share similar Behavioral Profiles. Due to the statistical non-independence of the data and the small sample size, these findings should be interpreted with caution; further research with larger cohorts is required to determine whether these profiles represent robust individual traits or are primarily shaped by the shared environment.
https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2026.1872117/full

Frontiers in Psychology

PAPERS

ELISA PELLEGRINO & VOLKER DELLWO – As group size increases, individuals modify their vocal features to signal cooperation while remaining recognizable
Cooperation is essential to humans and manifests in speech through acoustic convergence, in which interlocutors' voices become more similar. Yet convergence can be limited when signaling individuality is more important than aligning with others. In such contexts, speakers may adopt non-accommodative strategies to preserve their vocal identity and recognizability. Drawing on animal communication research—which shows that species in larger social groups exhibit greater

vocal individuality—we test how group size (3 and 5 interactants) shapes the balance between remaining identifiable while still cooperating to support communication.
In an interactive online game, players collaborated on a shared task while trying to recognize one another by voice, with the player recognized best receiving a reward. To assess how group size influences accommodation under these dual demands, we analyzed the speech of three players who participated in both game sessions. Acoustic features relevant to voice identity and amenable to accommodation—harmonicity, jitter, F0, formant dispersion, and duration—were extracted and reduced through Principal Component Analysis to two dimensions accounting for 52.9% of the variance. Following the identification of group size effects on these components, we assessed whether inter-speaker acoustic differences increased, decreased, or remained stable across conditions. Additionally, within-speaker variability was examined as a function of group size to determine whether observed changes in the five-player condition were driven by all speakers or only a subset.
In larger groups, accommodation was selective: players modulated their acoustic features, maintaining some while converging on others. No significant differences as a function of group size were observed for PC1, interpreted as reflecting maintenance and primarily associated with voice quality measures (harmonicity and jitter). In contrast, significant differences emerged for PC2, largely driven by F0 standard deviation and duration. These changes indicated reduced inter-speaker differences in the larger group, consistent with convergence. In the larger group setting, convergence was observed when two speakers showed mutual alignment and also shifted toward the speech patterns of a third participant, who remained comparatively stable in their acoustic behavior.
The pattern of selective and asymmetrical convergence indicates that speakers strategically balance the goals of cooperation and individuality, suggesting that recognizability demands also shape accommodation.
https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2026.1765090/full

iScience

PAPERS

SWATHI PRABHU et al – Number-action coupling across the lifespan: Sensorimotor foundations of numerical cognition
A growing body of evidence suggests that aspects of numerical cognition interact with action systems, particularly hand motor control, although the strength and nature of this coupling vary across tasks, developmental stages, and cultural contexts. This narrative review synthesizes behavioral, developmental, comparative, and neurophysiological evidence to address four central questions: (1) how early the connection between number and action emerges and how it changes with development; (2) the extent to which education and culture shape number-action coupling; (3) how aging alters these processes and their neural substrates; and (5) what number-action interactions reveal about the broader organization of shared cognitive and sensorimotor mechanisms. Although the evidence remains heterogeneous, as causal demonstrations remain limited and effects are often task-specific, this review nevertheless suggests that number-action mappings are present from infancy, supported by overlapping parietal-frontal networks, and are progressively refined through motor experience. Across childhood, finger gnosis and fine motor skills scaffold numerical development, while cultural practices such as finger-counting shape enduring representational formats. In adulthood, numerical magnitude and action show a robust bidirectional influence, with converging neuroimaging evidence for shared fronto-parietal substrates. In older age, despite executive slowing and motor decline, number-action overlap appears preserved via compensatory recruitment, and embodied interventions show promise. Together, these findings support a layered account in which action systems contribute to scaffold and modulate numerical cognition across the lifespan.
https://www.cell.com/iscience/fulltext/S2589-0042(26)01795-5

ELIAS GARCIA-PELEGRIN – Learning pathway determines motor organization and long-term retention of tool use in hornbills
Social learning is widely used to explain behavioral traditions, yet whether it determines their long-term stability remains unclear. This study tested this in hornbills learning a novel stone-dropping tool task by dissociating individual reinforcement from action-based demonstration by a human experimenter. Hornbills did not innovate after exposure to the solved outcome alone. Although both routes enabled acquisition, they generated different motor solutions and sharply different retention. Individually trained birds solved rapidly using push-based insertions, whereas socially trained birds learned more slowly and adopted grab-lift actions matching the demonstration. After 12 months, all socially trained birds retained the behavior, whereas none of the individually trained birds did. Observing organized action may therefore promote the consolidation of novel behavior into durable, tradition-like forms.
https://www.cell.com/iscience/fulltext/S2589-0042(26)01864-X

Journal of Linguistics

PAPERS

JIAYI LU, JULIE ANNE LEGATE & CHARLES YANG – The learnability of bridge effects
The distinction between bridge verbs, which allow long-distance questions out of their CP complement, and non-bridge verbs, which do not, is found in a range of languages. In the previous literature, this distinction has been variably attributed to the lexical semantic/discourse properties of the CP-embedding verbs, or the syntactic positioning of the dependent CP. In

this study, we provide evidence for an alternative, learning-based account, whereby positive input evidence is needed for children to acquire the possibility of wh-dependencies across a CP-embedding verb, and to further generalize this property to all such verbs. We examine the bridge/non-bridge distinction in English and Mandarin, with a corpus analysis of child-directed speech and experimental evidence provided for each language. We demonstrate that while English shows a clear bridge/non-bridge distinction, Mandarin CP-embedding verbs are all bridge verbs for both argument and adjunct wh-dependencies. These findings are predicted by a difference in the structure of the input data available to English versus Mandarin children as they acquire long-distance wh-dependencies, along with the proposed learning-based account of the bridge effect.
https://www.cambridge.org/core/journals/journal-of-linguistics/article/learnability-of-bridge-effects/CC684E04D1479FB8CCC1F08924F5FAEC

Journal of the Royal Society Interface

PAPERS

LU ZHONG et al – Switching exploration modes in human mobility

Recent advances in human mobility research have revealed consistent pairwise characteristics in movement behaviour, yet existing mobility models often overlook the spatial and topological structure of mobility networks. By analysing millions of devices' anonymized cell phone trajectories, we show that human mobility networks exhibit a pronounced polycentric and modular structure, in which movements within spatial modules differ fundamentally from movements between modules. This finding challenges the common assumption of uniform mobility dynamics across spatial scales. Inspired by switching behaviours in animal movement patterns, we introduce a 'switch mechanism' to distinguish intra-module and inter-module exploration modes. Incorporating this mechanism into a generative mobility model allows us to simultaneously reproduce individual-level mobility statistics and emergent network-level structures, including high modularity, long topological distances and frequent long-range travel. Our results provide a unified mechanistic explanation for the emergence of polycentric human mobility patterns and highlight the importance of scale-dependent movement dynamics, with implications for urban planning, transportation modelling and epidemic forecasting.
https://royalsocietypublishing.org/rsif/article/23/239/20250817/482196/Switching-exploration-modes-in-human

Language and Cognition

PAPERS

VITA V. KOGAN, LUKAS NEMESTOTHY & SUSANNE MARIA REITERER – The aesthetics of language: what sound patterns reveal about language aesthetic appeal

Phonaesthetics examines why some languages are perceived as more aesthetically appealing than others, independent of meaning. Here we test whether phonetic and phonological properties predict listeners' evaluations of 24 European languages using studio-quality recordings of native speakers reading the same text. 204 participants rated each recording on four dimensions: beauty, eros, status and order on 0–100 scales and indicated whether the language sounded familiar. Because familiarity reliably boosts evaluations, we first quantified its impact and then focused our main analyses on trials where languages were not recognized. We fitted Bayesian multilevel models with random intercepts for listener and language to examine a broad set of predictors: consonant place and manner distributions, vocalic share, voiced consonants, a sonority index, vowel height and backness and suprasegmental typology (speech rate, syllable structure, stress and rhythm type). Across most model families, effects were small and uncertain, with credible intervals (CrIs) overlapping zero, and variance was dominated by between-listener differences. The clearest and most consistent segmental signal was vowel height: a higher proportion of close vowels predicted lower status and order ratings. Overall, the results suggest that while a few fine-grained segmental cues may shape specific evaluative dimensions, phonaesthetic judgments are strongly shaped by listener-level variability, with only a small number of fixed individual-difference and phonetic predictors showing robust associations.
https://www.cambridge.org/core/journals/language-and-cognition/article/aesthetics-of-language-what-sound-patterns-reveal-about-language-aesthetic-appeal/A941E6C491F284D6D8089F737126271B

Mind & Language

PAPERS

EDOARDO VACCARGIU & DIANA MAZZARELLA – Redescribing early pragmatics

Developmental work on ostensive communication calls for reconsidering existing theoretical accounts within a comprehensive framework of early pragmatics and its development. In this paper, we propose a new perspective on the ontogeny and development of ostensive communication as underpinned by a process of knowledge and representational redescription. By discussing relevant empirical data, we ground early pragmatics on in-built principles of implicit knowledge that are redescribed during communicative development, shedding new light on the representations underlying infant ostensive communication and its development into rich pragmatic knowledge involving complex intentions and metarepresentations.
https://onlinelibrary.wiley.com/doi/full/10.1111/mila.70051

ROBERT D. RUPERT – Mixed-resource modeling meets the philosophy of mind
This essay argues for a mixed-resource approach to scientific modeling and applies it to questions in philosophy of mind. A mixed-resource approach makes use of whatever resources—at whatever scale, from whatever academic discipline—seem useful, freely combining such varied resources in individual models. The success of mixed-resource modeling challenges the widely shared commitment to a personal level in the context of which mental states are to be studied in relative isolation. The adoption of a mixed-resource perspective has the potential to transform treatment of further matters in philosophy of mind, which is illustrated by discussion of psychological Frege cases.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.70043

PAUL L. HARRIS, YI ZHANG & SINING TAO – Self-other asymmetries in young children's talk about the mind
Young children's spontaneous production of mental state utterances involving want, know, and think differed markedly depending on the target of the utterance. Whereas children's affirmations and denials mostly pertained to their own mental states rather than those of others, their questions mostly pertained to the mental states of others rather than their own. This asymmetry was evident for all three mental state verbs, and among both English-speaking and Mandarin-speaking children. By implication, children enjoy some form of special access to their own mental states but presume no such special access to the mental states of other people.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.70045

Nature

NEWS

Oo oo, ha ha: why humans and great apes giggle alike when tickled
The rhythmic patterns of laughter found in apes and humans reveal that complex primate vocal control might have started evolving 15 million years ago.
https://www.nature.com/articles/d41586-026-01994-8

Genomic insights into the population dynamics and demise of Neanderthals
A surge of genetic data from the skeletal remains of Neanderthals disproves some assumptions and generates fresh questions about these ancient hominins.
https://www.nature.com/articles/d41586-026-01704-4

ARTICLES

ALBA BOSSOMS MESA et mul with JEAN-JACQUES HUBLIN & SVANTE PÄÄBO – Genetic diversity of late Neanderthals in northwestern Europe
Archaeological, osteological and genetic evidence suggests that Neanderthals lived in small groups; however, less is known about whether these groups were part of isolated communities or belonged to larger, well-connected populations. The dense concentration of broadly contemporaneous Neanderthal sites in the Meuse Basin, Belgium4, provides a rare opportunity to study regional populations at high resolution. Here we generated genetic data from 27 Neanderthals who lived less than approximately 52,500 years ago from ten archaeological sites in Belgium and France, including a high-coverage genome from a 45,000-year-old individual from Goyet, Belgium. We show that most of these individuals are more closely related to one another than to other contemporaneous late Neanderthals in Europe. Further, some of these individuals carry DNA from a Neanderthal lineage predating the split of late Neanderthals. Although these Neanderthals overlapped temporally with early modern humans in northwestern Europe from around 47,000 years ago, we find no evidence of recent gene flow from modern humans. They also do not show the genetic signatures of mating among close relatives found in Altai Neanderthals, suggesting that they lived in larger or better-connected groups. Moreover, genetic load did not accumulate over time, arguing against progressive genetic deterioration as a driver of Neanderthal extinction.
https://www.nature.com/articles/s41586-026-10625-1

Nature Communications

PAPERS

ALBA BOSSOMS MESA et mul with GENEVIEVE VON PETZINGER, JANET KELSO & KAY PRÜFER – Investigating ancient human DNA preservation on cave walls and in rock art
Previous efforts to link Palaeolithic cultural records to specific populations through DNA analysis have focused on materials from archaeological floor deposits such as bones, sediments, and artefacts. In this study, we explore whether rock art, a spatially distinct expression of human activity, can also preserve DNA traces from its creators. We analyse DNA preservation in pigment samples collected in and around 24 rock art panels from 11 caves across Spain and Portugal, including simple marks (from nine sites), hand stencils (Maltravieso Cave, Extremadura, Spain), and figurative paintings (Cave of Altamira, Cantabria, Spain). We recover traces of ancient human mitochondrial and nuclear DNA, unaccompanied by faunal DNA, from a pigmented calcite crust at Escoural Cave (Portugal), as well as from an unpigmented cave wall sample from the same site. The absence of faunal DNA in both samples suggests direct DNA deposition through human contact. In contrast, three

additional unpigmented samples, from Escoural and Covarón Cave (Asturias, Spain), yielded mixtures of human and faunal DNA, suggesting indirect deposition. Although our results do not conclusively link ancient human DNA preservation to the generation of cave art, we show that traces of human DNA can persist on cave walls for thousands of years.
https://www.nature.com/articles/s41467-026-74234-2

Nature Communications Biology

PAPERS

CHIARA DE GREGORIO, MARINA DAVILA-ROSS & ADRIANO R. LAMEIRA – Rhythm and timing in laughter reveal that human vocal plasticity falls on a hominid continuum

Laughter is an important, universal form of human non-linguistic vocal expression and, being shared by all extant great apes, offers a valuable proxy for tracing the evolution of vocal control that ultimately enabled language. Yet surprisingly little is known about the evolution of its defining feature, rhythm. Here we show, through comparative analyses of laughter across all extant great apes (orangutans, gorillas, bonobos, chimpanzees, humans), that the laughter of the last common ancestor was already isochronous, becoming faster, more variable, and increasingly context-sensitive over hominid evolution. The evolution of laughter's rhythm reveals a progressive increase in vocal rhythmic plasticity, with humans following the overall trajectory toward enhanced vocal control.
https://www.nature.com/articles/s42003-026-10499-z

Nature Communications Psychology

PAPERS

SYDNEY E. PHLEGAR et al – Teams perform worse when newcomers hold critical information than when original group members do

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.

In this study, two new acquaintances joined an online chatroom, spent five minutes discussing the qualities of a job candidate, then a newcomer joined the chat. The three group members (Ntriads = 370; Nparticipants = 1110) engaged in the Hidden Profile Task during which they chose the best job candidate among four to hire. Before they began, all group members received common information and one group member—either one of the initial members or the newcomer—received critical, unshared information about one candidate that the team needed to make the correct decision. Teams in which the newcomer held critical information were less likely to make the correct decision than teams in which one of the initial members held it. Newcomers with critical information showed weaker linguistic coordination to group members—a measure of social alignment that captures the degree to which group members mimic each other's language style—and reported greater perceived task conflict than newcomers who did not have critical information. Lastly, we tested whether a manipulation of prestige-based status—giving false feedback on a test for skills ostensibly relevant to decision making—could overpower newcomer status; however, we did not find credible evidence that it did so. These findings illustrate the power of brief interactions for shaping biases against newcomers.
https://www.nature.com/articles/s44271-026-00490-z

Nature Computational Science

ARTICLES

YARA KYRYCHENKO & SANDER VAN DER LINDEN – Social technologies need societal alignment

Although social technologies are increasingly co-shaping the public sphere, these systems were not designed as democratic infrastructure. Here, we propose a framework for societal alignment that focuses on procedural fairness to mitigate urgent risks and align emerging technology with societal values.
https://www.nature.com/articles/s43588-026-01004-x

Nature Neuroscience

PAPERS

MICHAŁ J. WÓJCIK et al – Learning shapes neural geometry in the primate prefrontal cortex

The relationship between the geometry of neural representations and the task being performed is a central question in neuroscience. The primate prefrontal cortex (PFC) is a primary focus of inquiry, as it can encode information with geometries that either rely on past experience or are experience agnostic. One hypothesis is that PFC representations should evolve with learning, from a format that supports exploration of all possible task rules to a format that minimizes the encoding of task-irrelevant features and supports generalization. Here we test this idea by recording neural activity from the macaque PFC when learning a new rule ('XOR rule') from scratch. We show that PFC representations progress from being high dimensional, nonlinear and randomly mixed to low dimensional and rule selective. Upon generalizing the rule to new stimuli, these

representations further evolve into an abstract, stimulus-invariant geometry. These findings reconcile previously conflicting accounts of PFC function by demonstrating how neural representations adapt across distinct stages of learning.
https://www.nature.com/articles/s41593-026-02333-w

Nature Scientific Reports

PAPERS

JULIANE BRÄUER et al – Striking global similarities in dog–human interactions
Most of our knowledge about the dog–human relationship comes from studies with dogs from 'WEIRD' (Western, Educated, Industrialized, Rich, and Democratic) societies. Here, we investigate cultural differences in dog–owner interactions worldwide. To achieve this, we developed a test battery comprising six well-established social-cognitive experiments and a questionnaire that assessed the psychological and practical aspects of the dog–human bond. We tested hunting dogs alongside their owners in five rural societies across culturally diverse locations in various countries: Vanuatu, Mongolia, Madagascar, Peru, and Germany. Despite dramatic cultural and environmental differences, we found that dog–human relationships were remarkably similar. Residual differences may be attributed to variations in hunting techniques and differences between WEIRD and non-WEIRD societies.
https://www.nature.com/articles/s41598-026-57657-1

Neuron

PAPERS

ZILU LIANG et al – Distinct roles of hippocampus and neocortex in symbolic compositional generalization
Humans can combine symbols to generate new meanings. Here, we studied the regional neural mechanisms that might make this possible. We asked participants to combine two discrete, symbolic features (a shape and a color) to make a novel spatial inference. Blood-oxygen-level-dependent (BOLD) data suggested that the hippocampus encoded elementary visual attributes in a high-dimensional, parallel format that permitted flexible individuation. In the ventromedial prefrontal cortex (vmPFC), posterior parietal cortex (PPC), and primary visual cortex (V1), neural patterns for novel stimuli (composites) could be predicted as a linear combination of signals for familiar stimuli (elements). In the vmPFC, this composition occurred in a high-dimensional format, but in PPC and V1, it took place in a low-dimensional, spatial frame of reference that was aligned with the response space. These data offer new insights into the neural circuits underlying compositional generalization.
https://www.cell.com/neuron/fulltext/S0896-6273(26)00416-2

PARUL JAIN & DANIELA SCHILLER – From first impressions to bonds: The neural dynamics of social relationships
Social relationships are best understood not as isolated interactions but as dynamic representations shaped through evaluative processes, interaction-driven learning, motivational value, and memory-based structure. This review synthesizes research across these domains to trace how relationships develop from initial impressions through repeated interactions to stable social bonds and networks. We organize the literature by relationship stage and highlight how overlapping neural systems are differentially engaged as relationships evolve over time. By treating relationships as unfolding processes, we reveal computational principles that become apparent only across time. Building on cognitive map theory, we propose that social relationships are represented as structured relational spaces supporting updating and generalization. We further highlight emerging computational and methodological approaches—including map-based models, naturalistic paradigms, and tools for analyzing dynamic social behavior—that enable the study of relationships across their temporal arc. This framework offers new ways to study the formation, maintenance, and adaptation of social bonds.
https://www.cell.com/neuron/abstract/S0896-6273(26)00446-0

New Scientist

ARTICLES

HELEN THOMSON – The surprising ways your brain changes from your 20s to your 40s
When does your brain reach adulthood? We're now understanding the many ways the organ continues to mature decades after society first deems you an adult.
https://www.newscientist.com/article/2530226-the-surprising-ways-your-brain-changes-from-your-20s-to-your-40s/

THOMAS LEWTON – Our brains have their first thoughts unexpectedly early in life
By the time we're born, our brains have all the hardware in place to form thoughts, and possibly even some conscious awareness.
https://www.newscientist.com/article/2527946-our-brains-have-their-first-thoughts-unexpectedly-early-in-life/

MICHAEL MARSHALL – Autism may have two distinct subtypes that vary by brain activity
Evidence is mounting that there are distinct subtypes of autism, and now, scientists have found that the condition can vary according to the strength of people's brain connections.
https://www.newscientist.com/article/2530459-autism-may-have-two-distinct-subtypes-that-vary-by-brain-activity/

MICHAEL MARSHALL – Ancient monument marked summer solstice centuries before Stonehenge
Archaeologists have discovered traces of a wooden structure built 5000 years ago, 5 kilometres from Stonehenge, which appears to have been an even older monument for marking the summer solstice.
https://www.newscientist.com/article/2530818-ancient-monument-marked-summer-solstice-centuries-before-stonehenge/

MICHAEL LE PAGE – Oldest known plague outbreak killed hunter-gatherer children
DNA evidence shows that plague bacteria devastated a community in Siberia more than 5000 years ago, challenging the idea that there were no major disease outbreaks before the advent of farming and large settlements.
https://www.newscientist.com/article/2530606-oldest-known-plague-outbreak-killed-hunter-gatherer-children/

Patterns

PAPERS

SHOGO OHMAE & KEIKO OHMAE – Brain-AI convergence: Generative world models and hierarchical attention for human intelligence
Large language models (LLMs) now exhibit remarkable language abilities that are indistinguishable from those of humans in blind dialog tests, renewing the question of whether brain-AI similarity is limited to superficial, output-level resemblance or extends to internal computational processes. Previous comparative surveys have focused primarily on vision and have identified some parallels. In higher cognition and intelligence, however, the prevailing view has held that the underlying internal processes of the brain and AI remain fundamentally distinct. Against this background, we extend brain-AI comparison across sensory, motor, and cognitive domains, with particular emphasis on language processing as a representative domain of higher cognition. By comparing the neocortex, the cerebellum, and modern AI including LLMs, we identify four shared computational principles: (1) the formation of world models through prediction-error learning, (2) the reuse of those predictive models for both understanding and generation, (3) hierarchical attention-based processing, and (4) adaptive intelligence enabled by attention-based switching among expert modules. Together, the first two principles reframe the mirror-neuron concept as a biological mechanism for reusing predictive models for generation, paralleling autoregressive generation in LLMs.
Importantly, this paper moves beyond merely reaffirming partial similarities and instead argues for convergent evolution in the computational foundations underpinning higher cognition and intelligence in biological and artificial systems. The insights presented in this article bridge neuroscience and AI research, guide the design of more brain-inspired AI, and shed new light on the computational principles underlying the advanced intelligence characteristic of humans and AI.
https://www.cell.com/patterns/fulltext/S2666-3899(26)00102-9

PLoS One

PAPERS

MARIUS GOLUBICKIS et al – Are societies becoming more self-centric? Evidence from five decades of popular music spanning three continents
A commonly expressed claim is that societal self-centrism has increased over recent decades. To examine this assertion, we analyzed an influential cultural product — popular music — to track changes in self-focus across five decades and three continents. Using an established linguistic analysis technique, personal pronoun usage (i.e., a marker of self-focus) was quantified in the ten most popular songs each year from 1970 to 2019 in the United States, Germany, Japan, and Hong Kong. Results indicated a significant increase in self-focused language over time in individualistic societies (i.e., United States & Germany), whereas no comparable trend was observed in more collectivistic contexts (i.e., Japan & Hong Kong). These findings demonstrate how public artifacts can be leveraged to investigate cultural variation in the expression of self-centrism. ***{A good paper, but they don't seem to have noticed the difference in meaning between the reflexives, "I like me" and "I like myself": "me" seems to be directly self-referential (1st person) while "myself" seems more like self-modelling (3rd person). As this was the topic of my first academic paper, it remains of interest to me.}***
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0349765

RITVA TORPPA et al – Development of semantic verbal fluency in children aged 2 to 5 and its relationship with participating in music activities
This cross-sectional study investigates the development of semantic verbal fluency performance (i.e., verbal recall) and the role of music participation in 79 normally-hearing Finnish children aged 2;0–5;11. The primary outcome measure was a semantic verbal fluency task where children listed as many animals or clothes as they could in 60 seconds. Additionally, parents filled in the "Role of Music in Families" questionnaire detailing their child's formal and informal music activities. Results showed that the number of correct words belonging to the given category, along with the number of semantic clusters, subcategories and switches between subcategories, increased significantly with age. The rate of development between age groups differed for different aspects of verbal fluency, and more informal music activities was associated with

better performance. These results indicate maturation of verbal recall from age 2;00 onwards, and that informal music participation is associated with the rate of development.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0350326

OLIVIER TOUBIA & JONAH BERGER – Optimally sequencing semantic search predicts creativity
Creativity is a fundamental human activity which drives progress and innovation. Extant research has documented the link between creative performance and the efficient navigation of semantic space during the creative process, but we argue that an important aspect of efficiency has been overlooked: the optimal sequence of concepts retrieved. We develop a simple cognitive test, the Shortest Semantic Path Task, and an associated automatic measure (circuitousness), which capture this insight. Five initial validation studies demonstrate that this novel measure predicts creativity above and beyond existing measures, providing a more complete picture of creative performance. The psychometric properties of the specific instruments tested also reveal opportunities to develop more robust and consistent instruments to measure optimal sequencing in semantic search.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0352328

Proceedings of the Royal Society B

PAPERS

TAYLOR A. HERSH et al – Dialect variation in Mediterranean sperm whales shows evidence of cultural evolution in an isolated population
Population isolation and bottlenecks can affect cultural evolution. This has been shown in bird vocal dialects but is less studied in mammals. The isolated and weakly structured population of sperm whales (Physeter macrocephalus) in the Mediterranean Sea provide an opportunity to address this knowledge gap. We studied dialect variation in this population using the species' primary social vocalization, stereotyped patterns of clicks called codas. We analysed 5291 codas recorded over 112 days between 2003 and 2021 from both the western and eastern deep-water basins of the Mediterranean Sea. We confirmed previous studies showing the dominance of codas with a 3+1 pattern but also identified two distinct dialect groups. The 2+1 and slow 3+1 coda types identified the western dialect while the 8I and fast 3++1 coda types identified the eastern dialect. Notably, groups recorded in the east occasionally produced the 'western' slow 3+1 coda types but the converse was not true, suggesting a directionality in dialect formation. The similarities between the apparent effects of isolation on sperm whale dialects and isolation effects reported in studies of the cultural evolution of both bird song dialects and human languages suggest convergences in vocal dialect evolution across social taxa.
https://royalsocietypublishing.org/rspb/article/293/2073/20260165/482241/Dialect-variation-in-Mediterranean-sperm-whales

ÁNGEL V. JIMÉNEZ et al with ALEX MESOUDI – Limited evidence that reputation-based partner choice facilitates information sharing in humans
A necessary prerequisite for the accumulation of beneficial knowledge, or 'cumulative cultural evolution', is the sharing of information via social learning. Yet little work in the field of cultural evolution has examined the mechanisms that support information sharing in the face of exploitative information free-riding and information hoarding. We ran a series of online interactive experiments (N = 716) combined with computational reinforcement and social learning models to test whether the mechanism of reputation-based partner choice can effectively support information sharing. Participants in groups chose whether to (i) engage in costly innovation and (ii) whether to share the resultant knowledge. Sharers received increased reputations for sharing and participants could use reputations to select recipients of knowledge. We found strong priors for information sharing that persisted throughout the experiments in participants from both the UK and China (study 1). However, partner choice was generally too weak to explain the presence of widespread information sharing, which persisted even when we reduced the benefit of innovation (study 2), introduced exploitative bots (study 3) and removed reputations altogether (study 4). Our results suggest that indiscriminate, group-based sharing is more important for facilitating cumulative cultural evolution than discriminate reputation-based sharing.
https://royalsocietypublishing.org/rspb/article/293/2073/20260876/482258/Limited-evidence-that-reputation-based-partner

Royal Society Open Science

PAPERS

LEONARDO LAGOS-HAUSHEER et al – Energetics of human locomotion near the walk–run transition speed
This study aimed to investigate the mechanical and metabolic effects of variable-speed locomotion involving repeated walk–run and run–walk transitions. Specifically, we assessed whether such transitions introduce an additional energetic cost and how they influence mechanical work and efficiency compared with steady-state walking and running. We hypothesized that accelerations during transitions would increase mechanical work and that the metabolic cost would exceed theoretical estimates based on constant-speed trials. Twenty-two male runners completed treadmill trials at constant speeds (walking and running) and under a variable speed protocol (VSP) involving cycles of acceleration and deceleration centred on each

participant's walk–run transition speed. Mechanical work was derived from three-dimensional motion capture data, and metabolic cost from indirect calorimetry. Apparent efficiency and energy recovery were also calculated. The measured metabolic cost of VSP was compared with an estimated value based on constant-speed walking and running trials. The VSP trials produced distinct mechanical and metabolic profiles, with values typically intermediate between walking and running. The 4.7% increase in VSP metabolic cost relative to the estimated value suggests that gait transitions impose an additional energetic overhead. Internal kinetic work during VSP resembled running, while the external work and the energy recovery laid between the two gaits.
https://royalsocietypublishing.org/rsos/article/13/6/251967/482230/Energetics-of-human-locomotion-near-the-walk-run

SHIRATUJ JAHAN SHELA & MD. RAJIB AREFIN – Social viscosity with zealots
Cooperation delivers collective benefits but faces evolutionary challenges due to the advantage of selfish defection. Evolutionary game theory explains how cooperation can emerge through various social viscosity mechanisms: direct reciprocity, indirect reciprocity, kin selection, group selection and network reciprocity. This study extends these mechanisms by introducing zealots—individuals who never change their strategy—as either unconditional cooperators or unconditional defectors. Using mathematical analysis, we derive conditions under which zealous players influence cooperative outcomes. Without zealots, known conditions govern cooperation under each mechanism. With zealous cooperators, systems tend towards full cooperation or become destabilized. In contrast, zealous defectors stabilize mixed equilibria in direct and indirect reciprocity while promoting either coexistence or full defection in kin selection, group selection and network reciprocity. These results show that inflexible individuals can critically reshape the evolutionary stability of cooperation and offer novel insights into how social viscosity interacts with committed players to influence collective behaviour.
https://royalsocietypublishing.org/rsos/article/13/6/252508/482235/Social-viscosity-with-zealots

Science

NEWS

Why were mysterious ancient humans found in an African cave all female?
Analysis of fossil proteins deepens mystery of the enigmatic Homo naledi.
https://www.science.org/content/article/why-were-mysterious-ancient-humans-found-african-cave-all-female

Trends in Cognitive Sciences

PAPERS

ANA P. PINHEIRO – The developing vocal self
Developmental voice change exposes a gap in models of self-voice processing: these models explain predictive control and self-voice recognition but not how vocal signals integrate into self-representations. I propose a hierarchical framework in which recursive interactions across sensorimotor predictions, self-voice representations, and higher-order self-representations support the emergence of the vocal self.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(26)00132-4

Trends in Ecology and Evolution

PAPERS

JACOB C. DUNN et al with W. TECUMSEH FITCH – Constraint and convergence in the evolution of vertebrate sound production
Understanding vertebrate sound production offers powerful insights into constraint and convergence in evolution. Sound production falls into two broad categories: muscle-driven and airflow-driven. Muscle-driven mechanisms, widespread among fish, are tightly limited by muscle contraction rates, producing lower-frequency signals that often radiate poorly. In contrast, airflow-driven mechanisms, especially those using myoelastic aerodynamic (MEAD) principles, overcome these limits, enabling long-distance communication across a vast frequency range. MEAD-based laryngeal sound production dominates in tetrapods and convergently evolved in novel vocal organs in birds and toothed whales—all supporting complex, long-distance communication and new acoustic niches. In this review, we show how physical and physiological constraints shaped convergent innovations, positioning MEAD as a central evolutionary strategy underlying the remarkable diversity of vertebrate sounds.
https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(26)00086-8

Trends in Neurosciences

PAPERS

FAUSTO CARUANA & SOPHIE K. SCOTT – The neural basis of laughter
Laughter is a universal social signal and a defining clinical sign of various neurological disorders. Yet, its neural orchestration remains elusive, due in part to the challenge of reproducing its spontaneous nature in the laboratory. In this review, we showcase how recent invasive investigations—from direct electrical stimulation to intracranial recordings—unveil the

underlying circuitry. We propose a dual-system framework: an evolutionarily ancient cingulo-temporal network that acts as the gateway for spontaneous, involuntary outbursts; and a lateral motor-opercular system that co-opts speech-production networks for volitional, conversational laughter. This neuroethological perspective reveals how parallel cortico-subcortical pathways drive laughter as both a primal affective signal and a sophisticated communicative tool, offering a new roadmap for understanding human social bonding and its clinical disruptions.
https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(26)00099-8

Trends Open

PAPERS

PIER LUIGI SACCO – The metabolic logic of cognitive biases

The persistent resistance of cognitive biases to educational intervention raises fundamental questions about their nature. Instead of viewing biases as mere cognitive flaws, we argue that they reflect adaptations to the metabolic constraints of biological computation, though motivational and learning factors also contribute. Recent neuroimaging research reveals that brain regions supporting analytical reasoning have higher baseline metabolic costs, creating pressure toward the adoption of efficient heuristics. Although task-directed cognition adds only ~5% to total brain energy consumption, this increment operates against a narrow discretionary metabolic margin, and sustained analytical processing generates metabolic byproducts that progressively constrain cognitive control. Integrating neuroscience, cognitive psychology, behavioral economics, and cultural evolution, we propose that a key adaptive challenge is developing ecological metacognition: the capacity to recognize when environmental conditions undermine normally adaptive strategies and to upgrade them accordingly. This concept extends existing work on cognitive reflection and epistemic vigilance by emphasizing environment–strategy fit over the overriding of intuition. The framework generates testable predictions about when biases prove resistant to modification and suggests educational approaches focused on environmental diagnosis rather than bias elimination.
https://www.cell.com/trends-open/fulltext/S3117-3470(26)00035-0

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