EAORC BULLETIN 1,183 – 15 February 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.

NEWS

NATURE BRIEFING – Baboons have sibling rivalries too

Young chacma baboons (Papio ursinus) vie for their mother's attention more often when she's grooming one of their siblings than when she's free, which suggests that they get jealous of one another. Researchers found that the monkeys were more likely to interrupt their mother if she was grooming a younger sibling or one of the same sex. Their tactics included tantrums, attempts to physically come between their mother and sibling, and even tricks to lure their sibling away from their mother and take their place.
https://www.nytimes.com/2026/02/10/science/jealousy-siblings-baboons-monkeys.html

NATURE BRIEFING – Hunter-gatherers in Europe's 'water world' resisted switch to farming for millennia

Inhabitants of the Rhine–Meuse river delta stubbornly resisted the population shifts that transformed most of Europe. Plus, a deep dive into the caves of Laos and the progress of clean-energy initiatives.
https://www.nature.com/articles/d41586-026-00465-4

NEW SCIENTIST HUMAN STORY – Ape-like hominin Paranthropus was more adaptable than we thought

A fossil discovery in northern Ethiopia expands the known range of Paranthropus, a genus of strong-jawed hominins that lived around 2 million years ago, and suggests they lived in a range of habitats.
https://www.newscientist.com/article/2512373-ape-like-hominin-paranthropus-was-more-adaptable-than-we-thought/

NEW SCIENTIST HUMAN STORY – Neanderthals and early humans may have interbred over a vast area

We are getting a clearer sense of where and how often Homo sapiens and Neanderthals interbred, and it turns out the behaviour was much more common than we first thought.
https://www.newscientist.com/article/2513892-neanderthals-and-early-humans-may-have-interbred-over-a-vast-area/

NEW SCIENTIST HUMAN STORY – Revealing the epic story of ancient humans: Best ideas of the century

Since the turn of the millennium, our understanding of our ancestors and extended cousins has shifted dramatically, thanks to a swathe of surprising archaeological discoveries.
https://www.newscientist.com/article/2508854-revealing-the-epic-story-of-ancient-humans-best-ideas-of-the-century/

NEW SCIENTIST HUMAN STORY – How Homo naledi is changing what we know about death

In 2013, deep inside South Africa's Rising Star cave system, scientists discovered the remains of Homo naledi, an ancient human species with a brain just one-third the size of ours. Yet some evidence suggests they may have intentionally placed their dead there. If true, this would push the birth of burial rituals back hundreds of thousands of years and challenge the idea that complex emotions like grief require big brains. Were these ancient humans performing funerals? Or are we reading too much into the evidence? Watch here for the story of Homo naledi and a discovery that forces us to rethink what it truly means to be human.
https://www.newscientist.com/video/2513622-how-homo-naledi-is-changing-what-we-know-about-death/

SCIENCEADVISER – Hunter-gatherers held out in 'water world'

Ancient genomic data has revealed that inhabitants of the Rhine-Meuse river delta — wetland and coastal areas of modern-day Netherlands, Belgium and western Germany — maintained high levels of hunter-gatherer genetic ancestry for thousands of years after successive migrations from the east transformed most of Europe into farming and animal-herding communities. This group's eventual mix with communities of people with ancestry from the central Eurasian steppe catalysed the expansion of Bell Beaker culture, which was accompanied by major shifts in the genetic make-up of both Britain and the Rhine–Meuse delta.
https://www.nature.com/articles/d41586-026-00440-z

SCIENCEADVISER – Monkey see, monkey jealous

Researchers observing baboons in Namibia have noticed that siblings often compete for their mother's attention, suggesting that our distant cousins also feel jealousy. "This group of researchers has really pushed the envelope about what we know about relationships between individuals," said one primatologist, adding: "It's totally relatable."
https://www.nytimes.com/2026/02/10/science/jealousy-siblings-baboons-monkeys.html

SCIENCEADVISER – Birds of different feathers flock together

Observations in Texas suggest that different bird species may preen each other often. "People think that nature is always about violence and conflict, red in tooth and claw," said one expert. "But actually there's a lot of collaboration and cooperation that goes on."
https://www.nytimes.com/2026/02/09/science/birds-preening-species-texas.html

PUBLICATIONS

Ecology and Evolution

PAPERS

LORI BOIES, FRANCHESCA TINACBA & TERRY J. SHACKLEFORD – Urban Green Spaces Set the Stage for Rare Interspecific Allopreening Between Crested Caracara (Caracara plancus) and Black Vultures (Coragyps atratus)

Urban green spaces and wildlife corridors provide unique opportunities to observe how animals adapt and interact in human-dominated landscapes. In San Antonio, Texas, both adjacent to and within the Phil Hardberger Park and the Robert L.B. Tobin Land Bridge, the largest wildlife bridge in the United States at the time of its construction, we documented a rare case of interspecific allopreening. On May 15, 2022, two Crested Caracaras (Caracara plancus) engaged in mutual head and neck allopreening, followed by two Black Vultures (Coragyps atratus) initiating preening of the Crested Caracara. Subsequent behaviors consisted of perching, self-preening, and wing-spreading by vultures, with no additional allopreening observed. The same behavior was also observed on February 4, 2023 within Phil Hardberger Park. While allopreening is well documented within species for social and hygienic purposes, interspecific allopreening is rare and has only been reported a few times globally and only in rural settings. Our observation is the first record of its kind in an urban green space and expands the ecological and geographic scope of such behavior, demonstrating that urban green infrastructure may act as a stage for uncommon avian social interactions. This record contributes to the growing body of urban wildlife research and highlights the value of systematic observation in cities for revealing overlooked aspects of avian behaviors.
https://onlinelibrary.wiley.com/doi/full/10.1002/ece3.72669

eLife

PAPERS

YASAMIN ESMAEILI et al – Decoding state specific connectivity during speech production and perception

Understanding how dynamic brain networks support language perception and production is central to cognitive neuroscience. A vast network based literature has employed functional connectivity (FC), primarily using resting-state and task-based fMRI. However, methodological limitations have hindered this approach in language processing, particularly during speech production. Here, we address this gap by employing a large cohort of electrocorticographic (ECoG) patients (N=42) to investigate the networks driving speech perception and production. We acquired data while patients were engaged in a controlled battery of speech production tasks focusing on five cognitive states (auditory perception, picture perception, reading perception, speech production, and baseline). Using linear classifiers we were able to robustly decode cognitive states from single-trial FC (i.e. Pearson correlations) of the neural activity patterns, achieving a mean accuracy of 64.4%. These classifiers revealed distinct network signatures underlying auditory and visual perception as well as speech production via stable network connectivity. Importantly, the network signatures included both regions with robust local neural activity and those with minimal or no detectable activation. Such signatures indicate that even low-activity regions contribute critically to differentiating cognitive states. Our findings underscore the significance of functional connectivity analysis as a complementary dimension to investigating local neural activity, and suggest that the functional networks supporting speech extend beyond the most metabolically active regions.
https://elifesciences.org/reviewed-preprints/109566

Frontiers in Artificial Intelligence

PAPERS

MURAT SARIYAR – Large language models as cognitive shortcuts: a systems-theoretic reframing beyond bullshit

Large Language Models (LLMs) are often framed through metaphors such as "bullshit" or "stochastic parrots," emphasizing missing grounding, belief, or intention. While rhetorically powerful, these framings obscure how LLMs are used for sense-

making, ideation, and communication. We reframe LLMs as Operators for General Cognitive Shortcuts (GECOS) within techno-semiotic assemblages.
We develop a functional model by integrating concepts from Luhmannian systems theory, Deleuzian ontology, and minimally from Husserlian phenomenology. Using conceptual analysis as functional–comparative synthesis, we analyze human–LLM interaction without attributing agency, belief, or understanding to the model.
GECOS explains LLM usefulness as communicative complexity reduction: models generate connectable continuations by approximating second-order expectations ("what is expected to be expected"), enabling interactional continuity without reference to truth or intention. Via Luhmann's contingency formula, LLMs help users navigate uncertainty through procedurally plausible coherence.
The framework shifts attention from ontological debates about "understanding" to the operational role of LLMs in distributed sense-making. It also highlights risks: overreliance, emotional projection, and normative flattening when connectability substitutes for justification.
GECOS offers a non-anthropomorphic alternative to deficit metaphors by modeling LLMs as pragmatic operators that sustain communicative momentum and enable workable continuations in complex socio-technical environments.
https://www.frontiersin.org/journals/artificial-intelligence/articles/10.3389/frai.2026.1681525/full

Frontiers in Ecology and Evolution

PAPERS

TREVOR L. KEEVIL et al – A comparative bone surface modification database for revealing the origins and evolution of human carnivory

Fossilized trace marks left by our ancestors as they processed animals for food are important clues to the emergence and intensification of human carnivory and tool use. When studied in tandem with fossilized tooth marks made by carnivorous predators, butchery marks also help reconstruct the larger ecological framework and trophic dynamics of paleoecosystems. However, some taphonomic processes produce bone surface modifications that mimic the morphology of butchery marks, introducing the potential for misclassification when relying on imprecise criteria. The implementation of digital modeling techniques that allow the collection of microscopic quantitative data has begun to improve the reliability of mark identification. Although many digital taphonomy methods appear promising, their broader applications are limited by a lack of replicable methods, unpublished and closed-source databases, and statistical methodologies that violate core assumptions for accurate model inference. In this paper, we present an open-source database of experimentally generated cut, percussion, tooth, and trample marks measured and analyzed using high-resolution confocal profilometry and a replicable quantification protocol. Statistical classificatory models using our taphonomic measurement database can distinguish between experimentally generated bone surface modifications with 74% to 83% accuracy, depending on the comparative groupings. Our aim for these classification models is to facilitate accurate identification of the processes that created fossilized bone surface modifications, which is the first step to resolving long-standing debates surrounding the origins and evolution of human carnivory. Additionally, we hope that publishing our open-source data and code underscores the need for more replicable, collaborative, and transparent methods in paleoanthropological research.
https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2026.1681814/full

IAN TOWLE – How tooth wear in Papioninae offers insight into hominin evolution

Old World monkeys are typically placed within a single family, Cercopithecidae, subdivided into Colobinae (leaf monkeys) and Cercopithecinae (cheek pouched monkeys). Molecular and fossil evidence supports a deep split between colobines and cercopithecines, occurring around the Oligocene-Miocene boundary, or slightly later in the early Miocene (~20 million years ago; e.g., Perelman et al., 2011; Finstermeier et al., 2013; Pozzi et al., 2014). This split is comparable in age to family level divergences in other anthropoid primate clades. For example, the common ancestor of living Cercopithecidae likely lived at a similar time as the common ancestor of living apes (Hominoidea) and New World monkeys (Platyrrhini), although there remains debate over which group has the deepest evolutionary roots (Finstermeier et al., 2013; Shao et al., 2023). Yet, in contrast to Cercopithecidae, these two other major extant anthropoid groups are subdivided into multiple families, three to five families are recognized among extant platyrrhines (Kay, 2015; Rylands et al., 2016; Silvestro et al., 2019), and two among apes (or more if the human lineage is retained at the family level; White et al., 2009; Tuttle, 2014; Schwartz, 2016). Combined with their pronounced differences in physiology, behaviour, and ecological specializations, this evidence strengthens the case for recognizing Colobidae and Cercopithecidae as distinct families within Cercopithecoidea. Such a two-family framework is not new, advocated by Hill (Hill, 1966) and later by Groves (Groves, 2000), and aligns with efforts to standardize higher level taxonomic ranks across primates (Goodman et al., 1998).
If colobines and cercopithecines are elevated to family status, the major clades within cheek pouched monkeys must also be raised in rank, Papioninae (formerly Papionini) and Cercopithecinae (formerly Cercopithecini). This opinion piece focuses on tooth wear research on Papioninae, encompassing baboons (Papio), geladas (Theropithecus), macaques (Macaca), drills and mandrills (Mandrillus), and the paraphyletic mangabeys (Lophocebus, Rungwecebus, Cercocebus). I highlight recent advances positioning Papioninae as a key group for reconstructing hominin evolutionary history and ecology, focusing on tooth wear. The aim is to highlight recent developments and outline future directions, demonstrating how tooth wear in all Papioninae genera is useful for paleoanthropology.

https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2026.1747007/full

Frontiers in Psychology

PAPERS

AKBOTA TLEUBERDINOVA – On the origin of Earth's Universal BioConsciousness

The origin of consciousness remains one of the oldest problems in both science and philosophy. Several emerging theories provide new perspectives on the origin and evolution of consciousness, including Cellular Basis of Consciousness (CBC) theory and the Cognition-Based Evolution (CBE) theory. Moreover, declarations such as the New York Declaration on animal consciousness further underscore the need for a unified understanding of consciousness. To bridge this gap, this paper presents a unified framework on the origin of Earth Universal BioConsciousness through the intersection of evolutionary biology, consciousness studies, and philosophy, incorporating the following core principles: (1) Universal BioConsciousness (UBC) theory or BioConsciousness originates from BioConsciousness (BoB) theory states that cell bioconsciousness originates from pre-existing cell bioconsciousness, developing not spontaneously but rather continuously from pre-existing first conscious cell—FUCA; (2) Absolute BioConsciousness and Relative Cell Biomatter (ABC) theory. suggests that bioconsciousness evolution precedes genome and organic evolution: (2.1) Spencer's theory of life states that life precedes organization; (2.2) Minot's theory of biological consciousness is the primary cause of biological evolution; (2.3) Popper's theory of evolutionary hierarchy: functional changes precede structural ones, and evolution proceeds as a cyclical process; (3) Universal Genome Evolution (UGE) theory states that universal DNA is a structural correlate of universal bioconsciousness; in this framework, bioconsciousness is a primary causal agent, directing genetic adaptations; (4) Ontogenetic Evolution of Universal Bioconsciousness (OEUB) theory states that the individual lifetime's evolution of bioconsciousness begins at the moment of egg cell fertilization—zygote; furthermore, (5) The first principle of philosopher Descartes, 'Cogito ergo sum,' gains a novel interpretation through the exploration of relationships between bioconsciousness, verbal thought, and verbal language. Consequently, the (6) Verbal Communication Sense (VCS) theory argues that verbal thought is dependent on bioconsciousness and lacks an independent capacity for thinking; therefore, its primary function is "communication sense''. 7) Positive and Negative BioConsciousness (PNB) theory suggests that unicellular bioconsciousness and multicellular bioconsciousness exist in two forms: positive and negative. Finally, (8) the emergence of human-like artificial consciousness is highly unlikely, as bioconsciousness is tied to biological lineage and does not arise spontaneously.

https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2025.1636473/full

iScience

PAPERS

FLÁVIA A. RODRIGUES, NICLAS F. STURM & FLÁVIO L. PINHEIRO – A Linguistic Comparison Between Human and AI-generated Content

This study explores the linguistic differences between AI-generated content and human-written texts, particularly in Portuguese. We created two datasets: one with factual and false human-written texts, and another with texts generated by advanced LLMs (GPT-4o, Mistral Large, Llama 3.3 70B) using various prompts. Using tools like LIWC and SAGE, we identified distinctive traits: AI-generated text tends to be more formal, structured, positive, and motivational, while human texts vary more in length, exhibit negative emotions, and often use personal references. Additionally, a misinformation detection model performed well on human texts (93% accuracy) but struggled with LLM outputs (75% accuracy). This highlights the unique linguistic patterns of AI-generated misinformation and underscores the need for better detection methods to tackle misleading content in Portuguese.

https://www.cell.com/iscience/fulltext/S2589-0042(26)00351-2

KETIKA GARG, WENNING DENG & DEAN MOBBS – Utilizing Social Foraging as a Framework to Study Decisions in Groups

A central goal of the behavioral sciences is to understand how individuals decide between rewarding and conflicting options. Foraging theory, which is rooted in ecology and evolutionary theory, has helped advance this pursuit but has largely focused on individual decision-making processes. In this article, we extend beyond individual agents and propose social foraging as a promising avenue to study social decisions. We synthesize key socio-cognitive elements of social interactions that are particularly amenable to study through foraging paradigms, such as social inference, coordination and collective behavior, especially in humans. We then propose a social foraging framework that distinguishes between the asocial and social components involved in the decision-making process and describes how the integration of these components drives decisions in social foraging. Our framework bridges research across disciplines to provide a promising new avenue for the study of social behavior by linking decisions across different scales, from individuals to collectives.

https://www.cell.com/iscience/fulltext/S2589-0042(26)00315-9

MARTYNA GORKOWSKA-NOSAL et al – The role of dopamine-sensitive motor cortical circuits in the development and execution of skilled forelimb movements

Dopamine (DA) signalling in the motor cortex (M1) is crucial for motor skill learning. However, the DA dynamics in the M1 during the formation and execution of skilled behavior have not yet been investigated. We trained head-fixed D1Cre and D2Cre mice to perform skilled forelimb movements with a joystick to collect water rewards, and used fiber photometry to simultaneously monitor DA dynamics and population-level calcium (Ca2+) activity from D1+ and D2+ neurons in the M1 forelimb area. We found that the activity of DA and neuronal populations in M1 is temporally linked to joystick movements and reward consumption, tracks actual reward availability, and reflects the vigor of forelimb movement. Our findings show how DA dynamics and activity of local dopaminoceptive circuits in the M1 are shaped during motor learning and execution of skilled behavior.

https://www.cell.com/iscience/fulltext/S2589-0042(26)00358-5

Mind & Language

PAPERS

ORI HACOHEN & KENNETH AIZAWA – Error detection is not necessary for representation

Some philosophers have recently proposed an error detection condition (EDC) for representation, such that for R to be a representation for system S, S must be capable of detecting errors in tokenings of R. We argue that this condition is unmotivated, and that it is too strong. We show that theories of representation that are committed to the EDC will fail to capture cases of representation proposed to account for visual illusions.

https://onlinelibrary.wiley.com/doi/full/10.1111/mila.70011

Nature

NEWS

Hunter-gatherers took refuge in European 'water world' for millennia

Ancient inhabitants of the Rhine–Meuse river delta resisted population shifts that transformed most of Europe — until they helped to catalyse the expansion of 'Bell Beaker' culture.

https://www.nature.com/articles/d41586-026-00440-z

Nature Communications

PAPERS

TODD A. VOGEL et al – Humans are more prosocial in poor foraging environments

Prosocial behaviours are essential for solving global challenges. Often, these behaviours have been measured using economic games or tasks where people decide between helping or not. However, in everyday life current behaviours are interrupted with alternative opportunities. Across three independent samples (two preregistered, total n = 510), people watched a movie whilst encountering opportunities that benefitted another person or themselves. Crucially, participants decided in different poor and rich foraging environments where the average reward values of opportunities changed. We demonstrate a stronger environmental influence on decisions that benefit others: people were more willing to interrupt their behaviour to help others in poor environments, where the average reward value was lower, compared to richer environments where average reward value was higher. Computational modelling revealed that the opportunity costs of the different foraging environments were valued distinctly for others. Factors of utilitarianism, and empathy/emotional motivation, captured variability in opportunity costs for others. We show that when humans decide to engage in prosocial behaviours depends on the quality of opportunities in one's environment, which is critical as environments change.

https://www.nature.com/articles/s41467-025-66880-9

Nature Human Behaviour

PAPERS

PARISA A. VAZIRI, SAMUEL D. MCDOUGLE & DAMON A. CLARK – Humans can use positive and negative spectrotemporal correlations to detect rising and falling pitch

To discern speech or appreciate music, the human auditory system detects how pitch changes over time (pitch motion). Here, using psychophysics, computational modelling, functional neuroimaging and analysis of recorded speech, we ask whether humans can detect pitch motion using computations analogous to those used by the visual system. We adapted stimuli from studies of vision to create novel auditory correlated noise stimuli that elicited robust pitch motion percepts. In psychophysical experiments, we discovered that humans can judge pitch direction from spectrotemporal intensity correlations. Robust sensitivity to negative spectrotemporal correlations is a direct analogue of illusory 'reverse-phi' motion in vision, constituting a new auditory illusion. Functional MRI measurements in auditory cortex supported the hypothesis that human auditory processing may employ pitch direction opponency. Linking lab findings to real-world perception, we analysed recordings of English and Mandarin speech and found that pitch direction was signalled by both positive and negative spectrotemporal correlations, suggesting that sensitivity to both types confers ecological benefits. This work reveals

how motion detection algorithms sensitive to local correlations are deployed by the central nervous system across disparate modalities (vision and audition) and dimensions (space and frequency).
https://www.nature.com/articles/s41562-025-02371-7

Nature Scientific Reports

PAPERS

CHUNMIAO MAI et al – Revisiting our primate roots in infants grooming

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.

Grooming is a common behavior across many animal species, including non-human primates (NHP), and serves a variety of functions, such as cleaning hair, alleviating stress, and enhancing social bonds. This study aims to explore whether grooming-like behaviors are present in humans during early developmental stages, before the emergence of gestural and language communication. Through the observations of 67 preverbal infants, we identified frequent manual behaviors, including grasping, holding, and behaviors resembling grooming, particularly directed toward caregivers' hairy skin. These behaviors were analyzed and validated by twelve independent primatologists, who confirmed that behavioral sequences and their kinematics closely resembled grooming behaviors seen in NHPs, while also distinguishing them from other types of manual actions such as holding or grasping. Longitudinal analyses demonstrated a significant reduction in infants' grooming behaviors beginning at 8 months, with these behaviors no longer observed by 15 months, a developmental shift that coincided with the emergence of more sophisticated gestural communication. Interestingly, grooming frequency, but not other actions, peaked during a specific time window, between 2pm and 4pm, which corresponds with a well-documented circadian dip in beta-endorphins, a neurochemical associated with stress regulation and social bonding. This alignment points toward a potential physiological underpinning for the timing of these behaviors. These findings suggest that infant grooming behavior represents a vestigial motor pattern, likely reflecting conserved evolutionary mechanisms shared with non-human primates. This behavior may represent a primitive form of early social interaction, highlighting the role of ancient motor programs in shaping prelinguistic communication.
https://www.nature.com/articles/s41598-026-39909-2

RUI HE et al with WOLFRAM HINZEN – Reduced linguistic coherence in psychosis defies semantic similarity accounts and relates to altered large-scale cortical hierarchy

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.

Coherence in speech is clinically significant in mental disorders but remains difficult to quantify. We tested the widely-held assumption that semantic similarity metrics derived from large language models capture human-rated coherence. Across three large neurotypical datasets in different languages, semantic similarity failed to correlate with human ratings, while six other metrics, especially the probability-based metrics, showed significant but weak correlations. In an additional English dataset of 94 individuals, including healthy controls and patients with schizophrenia spectrum disorders (SSD), speech coherence was reduced in SSD. Incoherence in the drug-naïve first-episode samples related to altered whole-brain intrinsic functional gradients, and to the probabilistic metric of perplexity in speech. Together, these findings call into question semantic similarity as a proxy for coherence, motivate greater emphasis on probabilistic predictability measures for evaluating coherence, and substantiate the perspective of spontaneous speech as an overt readout of an alteration of hierarchical cortical organization in schizophrenia.
https://www.nature.com/articles/s41598-026-39025-1

Neuron

PAPERS

COOPER D. GROSSMAN, VINCENT MAN & JOHN P. O'DOHERTY – The representation and valuation of subgoals in the human brain during model-based hierarchical behavior

Planning and performing complex, sequential behavior toward distant goals relies on dividing behavior into structured segments. This hierarchical organization requires the brain to designate certain states as subgoals to mark successful segment completion. How the brain represents subgoals and computes decision values as a function of them remains unknown. While most models of hierarchical behavior lack environmental knowledge, decision-making involves planning with an internal world model. Consequently, how the brain integrates hierarchical and model-based processes is unknown. Using a sequential-subgoal decision-making task with functional magnetic resonance imaging (fMRI), we evoked hierarchical, model-based behavior. We decoded the current subgoal in insula and ventromedial prefrontal cortex activity—a critical latent representation for orienting sequential behavior. Using a model-based, hierarchical reinforcement learning model, we identified key decision value signals in the frontal cortex. These findings illuminate neural correlates of subgoals and decision values computed as a function of subgoals and environmental knowledge.

https://www.cell.com/neuron/abstract/S0896-6273(25)00979-1

New Scientist

NEWS

Specific cognitive training has 'astonishing' effect on dementia risk
A type of cognitive training that tests people's quick recall seems to reduce the risk of dementia, including Alzheimer's disease.
https://www.newscientist.com/article/2514823-specific-cognitive-training-has-astonishing-effect-on-dementia-risk/

Bonobo's pretend tea party shows capacity for imagination
Kanzi, a bonobo with exceptional language skills, took part in a make-believe tea party that demonstrated cognitive abilities never seen before in non-human primates.
https://www.newscientist.com/article/2514366-bonobos-pretend-tea-party-shows-capacity-for-imagination/

ARTICLES

CONOR FEEHLY – How teaching molecules to think is revealing what a 'mind' really is
Networks of molecules in our body behave as though they have goals and desires. Understanding this phenomenon could solve the origins of life and mind in one fell swoop.
https://www.newscientist.com/article/2513815-how-teaching-molecules-to-think-is-revealing-what-a-mind-really-is/

MICHAEL LE PAGE – Can we genetically improve humans using George Church's famous list?
Columnist Michael Le Page delves into a catalogue of hundreds of potentially beneficial gene mutations and variants that is popular with transhumanists
https://www.newscientist.com/article/2513878-can-we-genetically-improve-humans-using-george-churchs-famous-list/

PLoS Biology

PAPERS

JIE HU, MARIUS MOISA & CHRISTIAN C. RUFF – Augmentation of frontoparietal gamma-band phase coupling enhances human altruistic behavior
Cooperation, productivity, and cohesion in human societies depend on altruism, the tendency to share resources with others even though this is costly. While altruism is a widely shared social norm, people vary strongly in their inclination to behave altruistically, in particular across situations with different types of inequality in resource distribution. What neurobiological factors underlie this variability? And can these be targeted by interventions to enhance altruistic behavior? Here, we build on electroencephalography (EEG) evidence that altruistic choices during disadvantageous inequality correlate with oscillatory gamma-band coherence between frontal regions (representing other's interest) and parietal regions (representing neural evidence accumulation). We apply a transcranial alternating current stimulation protocol designed to exogenously enhance this fronto-parietal coherence and find that this leads to increased altruism, specifically during disadvantageous inequality as hypothesized based on the EEG findings. Computational modeling reveals that this transcranial entrainment does not just add noise to the decision process but specifically increases the weight individuals assign to other-regarding concerns during choices. Our findings show that altruism can be enhanced by neurostimulation designed to enhance oscillatory synchronization between frontal and parietal areas. This establishes a neural basis for altruism and identifies a neural target for interventions aimed at improving prosocial behavior.
https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3003602

PLoS One

PAPERS

VALENTINA DECEMBRINI et al – Earliest geometries: A cognitive investigation of Howiesons Poort engraved ostrich eggshells
This article presents the first quantitative geometric and spatial analysis of engraved ostrich eggshell (EOES) fragments from the Howiesons Poort (HP) technocomplex of the African late Middle Stone Age (MSA), to evaluate whether the EOES demonstrates genuine formal structuring and visuo-spatial organization. By considering their 'non-accidental properties'—such as curvature, parallelism, and co-termination—which remain consistent across different viewpoints, as well as their metric properties, including angular inclinations, based on empirical thresholds, we show that the HP dataset systematically employs salient geometric features. These features are combined and embedded through complex cognitive operations, including the iteration and alignment of parallel lines, rotation of lines generating intersections with variable angular openings, and translation of specific elements nested within organized spatial layouts. These engravings therefore constitute an early material expression of complex graphic representation, attesting to a species-specific human capacity for organizing geometric thought. Overall, the patterns reflect a system of rules through which Homo sapiens in the HP organized visual forms, revealing the cognitive foundations of structured graphic behavior.

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0338509

AMALIA P. M. BASTOS et al – Do dogs rationally infer the causes of failed actions?
Humans regularly reason about the causes of events and actions we observe in the world, both to infer the physical properties and mechanisms of objects, and to understand others' actions. Evidence for causal reasoning in nonhuman animals is mixed, and may be more easily detected in some contexts than others. Dogs, for example, fail at most tests of causal reasoning pertaining to physical cognition, yet possess sophisticated sociocognitive abilities. In this pre-registered study, we test whether dogs are capable of making rational inferences about the causes of failed actions in two analogous experiments, which differed only in the nature of said failures. Dogs observed human agents either succeed or fail to open two gates, in contexts where their failures could be attributed either to the lack of competency of an agent, or the physical properties of a gate. If dogs are capable of making causal inferences equally in social and physical contexts, they should succeed in both experiments. However, if dogs are more likely to make social rather than physical causal inferences, they should find the competency context more interpretable than the physical one. Dogs failed to make rational inferences in either context, raising theoretical and methodological questions for future work.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0341872

Proceedings of the Royal Society B

PAPERS

AXELLE DELAUNAY et al – Sibling interference in mother–offspring interactions reveals jealous reactions in wild baboons
Whether non-human animals can experience complex emotions like jealousy remains debated. In humans, jealousy is particularly salient in sibships, where children often disrupt affiliative parent–sibling interactions. Jealousy could similarly mediate competitive interactions among siblings in animals. Here, we examine the context, targets and function of sibling interference in mother–offspring grooming interactions in wild chacma baboons. We test the jealousy hypothesis proposing that juveniles interfere to disrupt parent–sibling affiliation without immediate reward, alongside two alternatives stating that interference instead aims at interacting with the mother or sibling. Our results support the jealousy hypothesis, with patterns strikingly echoing observations on children. First, juveniles approach their mother more often when she is grooming a sibling than when she is socially available. Second, they preferentially target same-sex and younger siblings, as well as 'maternal favourites' that receive a disproportionate share of maternal grooming. Third, interference is more successful at disrupting mother–sibling grooming than at obtaining attention from either the mother or the sibling. This study introduces a novel framework to study the expression of jealousy and the emotional mechanisms underpinning family conflicts in animals, thereby opening perspectives in the growing field of the ecology of emotions.
https://royalsocietypublishing.org/rspb/article/293/2064/20252102/480239/Sibling-interference-in-mother-offspring

EKATERINA STANSFIELD et al – Did energy costs of walking limit the evolution of a larger human birth canal?
Human childbirth is uniquely challenging among primates, which has been attributed to evolutionary trade-offs between birthing large-brained infants and bipedal locomotion ('obstetrical dilemma'). Adapted for efficient upright walking and running, the human pelvis forms a rigid ring that leaves little leeway for parturition and causes a relatively high risk of obstructed labour. Static mechanics suggests that a wider pelvis increases the energy demands of the abductor muscles during locomotion. Recent empirical studies, however, have not observed a significant increase in whole-body locomotor costs in individuals with wider pelves. To investigate this discrepancy, we employed a detailed musculoskeletal model and predictive forward modelling to simulate human gait while systematically varying body dimensions beyond modern human variation. Our results confirm that a wider pelvis substantially increases abductor muscle energy demands and activation (± 10% for ± 20% width change), consistent with predictions based on lever mechanics. However, during dynamic walking, these increased demands are offset by a redistribution of energy costs to other muscles, leading to only minimal increases in whole-body metabolic cost (± 1% for ± 20% width change). In contrast, lower limb length shows a 2.5-fold greater effect on metabolic cost than pelvic width. These findings reconcile static mechanics predictions with whole-body measurements: while abductor muscle costs increase with pelvic width as predicted, these costs are compensated mainly at the organismal level. We propose that if locomotor costs constrained pelvic evolution, they likely operated through subsystem-level mechanisms, such as muscle-specific energetics and fatigue, rather than whole-body energy economy.
https://royalsocietypublishing.org/rspb/article/293/2064/20252895/480184/Did-energy-costs-of-walking-limit-the-evolution-of

BOLIVAR REYES-JAQUEZ, FRANCESCO MARGONI & YUSUKE MORIGUCHI – The development of bribe-taking aversion in four societies
Large-scale cooperation between genetic strangers, albeit surprising, is viable thanks to social institutions that punish antisocial behaviour and reward prosocial behaviour. Nevertheless, an anti-egalitarian, self-serving aspect of human sociality—corruption—often threatens institutions' integrity. While much is known about how prosocial reciprocity emerges in different settings, human preferences against corrupt reciprocity are poorly understood. Here, we test how one of such preferences, aversion to taking bribes, develops in 3–11-year-old children (N = 697) from four societies that differ in their

corruption and interdependence levels: Norway, Japan, the USA and Italy. To examine whether bribe rejection is grounded in basic egalitarian motives, we also test children's inequity aversion. We find that inequity aversion is dissociated from bribe-taking aversion: whereas humans' rejection of unequal allocations emerges across settings by age 10 years (and, in some settings and studies, as early as age 3), we find that bribe rejection is present during late childhood in some contexts only. We discuss these findings while considering questions about culture's role in shaping preferences against human selfishness.
https://royalsocietypublishing.org/rspb/article/293/2064/20252523/480182/The-development-of-bribe-taking-aversion-in-four

Royal Society Open Science

PAPERS

YASUNARI TANAKA et al – Asymmetrical physiological cost of reproduction shapes caste-specific resource allocation in an ant, Diacamma cf. indicum from Japan

In eusocial insects, queens demonstrate high reproductive capacity and extended longevity, representing examples of the trade-off in resource allocation. Workers perform non-reproductive tasks, such as caring for broods and foraging, thus reducing the energetic demands of queens. As queens dedicate their lives to reproduction, these reduced energetic demands enable them to live longer, laying many eggs. However, the physiological specialization of queens is markedly distinct from that of workers. This study examines the trade-off between immunocompetence and reproduction among castes in an ant species, Diacamma cf. indicum, from Japan, which lacks a morphological queen caste. First, gamergates (functional queens) exhibited higher expression of innate immunity genes than the workers. Second, to experimentally skew resource allocation towards immunocompetence, gamergates and reproductive workers were subjected to an immune challenge. As a result, the expression of the antimicrobial peptide gene Hymenoptaecin was increased in gamergates without compromising reproduction-related genes, such as Vitellogenin. By contrast, the expression of genes associated with reproduction was decreased in reproductive workers. Moreover, we revealed that gamergates possessed a remarkably low fat content, similar to non-reproductive foragers. These findings suggest that, while gamergates can overcome the trade-off, reproductive workers are constrained by the physiological costs of reproduction.
https://royalsocietypublishing.org/rsos/article/13/2/251482/480305/Asymmetrical-physiological-cost-of-reproduction

GITANJALI E. GNANADESIKAN et al – Characterizing the heritability of cognitive and behavioural traits across development in domestic dogs

In humans, many behavioural and cognitive traits are moderately-to-highly heritable, with cognitive measures tending to increase in heritability over the lifespan, and personality measures tending to decrease in heritability. However, fewer studies have explored the heritability of analogous traits in non-human animals or the changes of these heritability estimates across development. We phenotyped 415 dog puppies and 520 adults—from the assistance dog organization Canine Companions—on the Dog Cognitive Development Battery. Scores across tasks were weakly intercorrelated, and we observed a wide range of estimated heritabilities. Using an animal model and the population pedigree, the most heritable traits in puppies involved looking to a human when spoken to ('human interest looking', $h2 = 0.32$) and reactions to a novel object ($h2 = 0.56$) and surprising events ($h2 = 0.61$). Most heritability estimates remained relatively stable or decreased over development, although human interest looking time ($h2 = 0.36$) and novel object reactions ($h2 = 0.31$) remained moderately heritable in adults. Similar heritability estimates were found using a genomic-relatedness matrix in a subset of individuals (69% of puppies, 96% of adults). Our results address the psychological structure of individual differences early in dog development, characterize the extent to which these traits are heritable and available to selection, and demonstrate changes in heritability across dog development.
https://royalsocietypublishing.org/rsos/article/13/2/241918/480261/Characterizing-the-heritability-of-cognitive-and

CECI QING CAI et al – Does laughter make everything funnier? Implicit laughter processing in autistic and non-autistic adults

What does laughter mean, and why does laughter make things funnier? Using a novel implicit measure of laughter processing, we added genuine or posed laughter to various forms of comedic stimuli to examine the similarities and differences in the modulatory effects of laughter between autistic and non-autistic people. In non-autistic adults, adding laughter increased the perceived funniness of humorous stimuli, including jokes, burps and slapstick videos, with genuine laughter leading to funnier ratings than posed laughter. However, these laughter modulation effects were not consistently observed in autistic adults. While the laughter modulation effect was present for jokes, it was less pronounced than in non-autistic adults and was absent when modulating the funniness of burps and slapstick videos. Overall, our findings highlight the distinct ways autistic people experience the implicit processing of laughter, which may impact social communication in daily interactions. This study offers a novel perspective on how the interplay between humour and laughter contribute to everyday social experiences.
https://royalsocietypublishing.org/rsos/article/13/2/251348/480292/Does-laughter-make-everything-funnier-Implicit

RAJALAKSHMI MADHAVAN – Egocentricity in infants' play with familiar objects in caregiver–child interactions
The current study explored the dynamics of parent–child coordinated attention to novel and familiar objects during a play session, to examine whether parents or children are more likely to lead instances of coordinated joint attention to novel or familiar objects, and how children learn from periods of child-led or parent-led joint attention. Particularly, we investigated whether: (i) parents or children lead more instances of joint attention when playing with novel relative to familiar objects; (ii) parents preferentially label novel relative to familiar objects; and (iii) children's learning of novel word–object associations is affected by object labelling frequency and children's sustained attention towards the objects. We found that not only do children lead more instances of joint attention, but, relative to their caregivers, children lead more instances of joint attention to familiar objects relative to novel objects. Parents also appeared to follow their child's attention and labelled familiar objects more often than novel objects. Furthermore, we found no evidence for children's recognition of the novel word–object associations. Our findings highlight the contingent nature of social interactions between caregivers and infants, with children leading and parents following their child's lead, especially with regard to more familiar objects in the child's environment.
https://royalsocietypublishing.org/rsos/article/13/2/250852/480263/Egocentricity-in-infants-play-with-familiar

KRISTEN L. SYME, NIKOS MOTOS & CAITLYN D. PLACEK – Generating units of cultural analysis with large language models: methods and validation for scalable cross-cultural research
We present a transparent, human-in-the-loop framework that uses large language models (LLMs) to transform ethnographic texts into binary, structured data suitable for statistical analysis. As a test case, we analyse ritual fasting across 56 societies from the Human Relations Area Files (HRAF), evaluating the ability of one LLM (GPT-4) to annotate constructs derived from evolutionary models of costly signalling, health trade-offs and ecological adaptation. Outputs were compared with a human consensus subset (n = 225) and two independent coders (n = 1015). GPT-4 matched or exceeded human performance on well-defined variables and highlighted systematic omissions in human annotation. Discrepancies were adjudicated to refine construct definitions and improve reliability. The resulting variables—capturing features such as leadership, sexual abstinence and resource sacrifice—function as minimal analytic units, akin to pixels in an image, enabling scalable cross-cultural comparison and statistical modelling. Although demonstrated with fasting data, the method is broadly applicable across cultural domains and theoretical frameworks, supporting reproducible, large-scale cultural analysis.
https://royalsocietypublishing.org/rsos/article/13/2/251766/480262/Generating-units-of-cultural-analysis-with-large

ELISA BANDINI et al – A comparison of tool-use flexibility between captive chimpanzees and bonobos
Despite chimpanzees and bonobos sharing close phylogenetic ties to humans, chimpanzees are the more common model species in multiple fields of comparative research. One reason for this bias is the variation in tool repertoire size observed between the two species. Previous studies have examined the factors driving this difference, but few have targeted flexibility in how tools are used. We studied bonobos and chimpanzees under similar conditions in captivity, thus excluding any ecological variation present in these species' natural habitats. We examined whether the species differed in their ability to switch between tools, a trait that may facilitate tool innovation in primates. To do so, we provided the apes with a task that required switching tool type from a rigid stick to a bendable rope to forage successfully. Our data suggest that there are no significant differences in tool-use performance between chimpanzees and bonobos in captivity. However, we found significant differences in the species' exploration tendencies. While chimpanzees fixed their attention on stick tools, bonobos switched their attention more easily towards the rope, potentially due to less functional fixedness. We also found significant within-species differences between institutions. These findings suggest that future research should disentangle intrinsic flexibility in exploration and account for institution and group level effects.
https://royalsocietypublishing.org/rsos/article/13/2/251950/480241/A-comparison-of-tool-use-flexibility-between

Science

REVIEWS

NED BLOCK – The elusive nature of consciousness
A writer grapples with neuroscience's hardest problem.
Review of 'A World Appears' by Michael Pollan, Penguin (2026).
https://www.science.org/doi/10.1126/science.aec8147

Science Advances

PAPERS

TOMOHIKO TAKEI et al – Primate dexterous hand movements are controlled by functionally distinct premotoneuronal systems
Dexterous hand movements are uniquely developed in primates and indispensable for their daily activities. Traditionally, they were thought to depend primarily on the evolutionarily "newer" direct corticomotoneuronal (CM) pathway. However, recent studies suggest that the "older" indirect corticospinal pathways, mediated by spinal premotor interneurons (PreM-INs), also contribute, highlighting the need to clarify their functional differences. Here, we recorded neuronal activity from

PreM-INs and CM cells in macaques during a precision grip task to compare their roles in generating hand muscle activity. Our results show that PreM-INs exert stronger facilitation across a broader set of muscles, promoting synergistic coactivation, whereas CM cells provide more selective facilitation, enabling control of relatively individual muscles. Decomposition analysis further revealed that these systems correspond to different control modes—synergy-based and individual-based control—balancing stability and flexibility. These findings redefine our understanding of primate dexterous hand control as emerging from the cooperative integration of evolutionarily distinct premotoneuronal systems.
https://www.science.org/doi/10.1126/sciadv.aea1184

Trends in Cognitive Sciences

ARTICLES

ANDREAS NIEDER – The making of number: from content to representation

Despite their importance to human thought, the origins of numerical abilities remain debated. Numerical quantity is a property of physical objects and events, and both humans and many animals show an innate sensitivity to this numerical content. Yet how this content is represented is a separate question: it may be encoded nonsymbolically by an innate estimation system or symbolically through culturally developed formats, such as numeral notations and number words. Distinguishing content from representational format reconciles the views that numbers are innate (nativism), learned (empiricism), or constructed (emergentism). Converging evidence from developmental psychology, comparative cognition, neuroscience, and computation suggests that number is dynamically coconstructed by biological predispositions and cultural practices, a framework that generalizes to other domains of human cognition, such as geometry and language.
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(25)00360-2

Trends in Neurosciences

PAPERS

ANASTASIA KLIMOVICH-GRAY et al – Dyslexia: a window into the cortical mechanisms of adaptive speech analysis

Atypical phonological processing is at the core of developmental dyslexia and is linked to aberrant tracking and analysis of auditory information in the cortex. Despite the importance of these mechanisms for speech processing and linguistic development, oral language comprehension in dyslexia remains largely intact. Recent findings suggest that dyslexia-linked atypical cortical processing patterns reflect both underlying deficits and compensatory strategies. This review synthesizes recent evidence linking atypical cortical tracking of auditory information in dyslexia, language development, and neurocognitive mechanisms of adaptive and resilient speech comprehension. We propose hemispheric rebalancing of linguistic analysis as a key compensatory mechanism in dyslexia, supported by interhemispheric connectivity within the distributed bilateral language network and greater reliance on lexico-semantic features during speech processing.
https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(25)00261-9

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