EAORC BULLETIN 1,153 – 20 July 2025

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

NEWS FROM SCIENCE – Mysterious pre-Islamic script from Oman finally deciphered

Cracking the main subtype of the Dhofari script could reveal "an entirely new page of the history of Arabia".
https://www.science.org/content/article/mysterious-pre-islamic-script-oman-finally-deciphered

NEWS FROM SCIENCE – Ancient human ancestor emerges from sunken Southeast Asian landmass

Submerged fossils are revealing long-held secrets from a region known as Sundaland.
https://www.science.org/content/article/ancient-human-ancestor-emerges-sunken-southeast-asian-landmass

SAPIENS – To Raise Children, We Must First Raise Parents

An anthropologist compares her early motherhood in London with child care experiences in a hunter-gatherer community of Central Africa.
https://www.sapiens.org/biology/to-raise-children-we-must-first-raise-parents/

SCIENCEADVISER – Mysterious pre-Islamic script from Oman finally deciphered

Rock faces within Oman's Dhofar governorate bearing nearly 2400-year-old writings known as the Dhofari script have defied decipherment for more than a century. Now, linguist Ahmad Al-Jallad says he has deciphered the main subtype of the Dhofari script—and has found evidence that its alphabet didn't originate in southern Arabia.

While examining photos of the inscriptions, Al-Jallad noticed that several writings only had about 26 individual symbols, or glyphs, that never repeated. Al-Jallad strongly suspected he wasn't dealing with a long sentence, but rather an abecedary, a listing of the script's individual letters akin to our ABCs. To suss out the Dhofari alphabet, Al-Jallad looked at the broadly similar scripts of ancient Yemen and ancient North Arabia, whose alphabets begin with the sequence h-l-ḥ-m and are therefore called halḥam. By matching the glyphs with their equivalents in halḥam, Al-Jallad could assign sounds to them and gain the ability to pronounce—and begin to decipher—words of a long-lost language.

Those words hold clues about the people who used the Dhofari script to write their language. For one, this language was not Arabic, but an ancient relative of Oman's pre-Islamic indigenous languages, which are still spoken today. Al-Jallad also concluded that the alphabet's glyphs most likely descended from those used on the northern side of the Arabian Peninsula, suggesting the letterforms somehow made their way southward.

Epigraphist Michael Macdonald, who was not involved in the work, calls Al-Jallad's work a "major breakthrough," adding that the script's glyphs provide a "potentially extremely important" clue to how writing systems moved across the region.
https://www.science.org/content/article/mysterious-pre-islamic-script-oman-finally-deciphered

SCIENCEADVISER – Submerged fossils reveal long-held secrets

Over the past 2.5 million years, sea levels have waxed and waned around the islands of Southeast Asia, sometimes exposing a sunken landmass—now called Sundaland—and letting animals migrate from mainland Asia onto islands like Borneo and Java. Now, in a series of four papers, researchers have described the first hominin to be uncovered from this now-sunken landscape, as well as other vertebrate remains.

The new discoveries piggyback off of a construction megaproject. In 2014 and 2015, an Indonesian port company dredged about 5 million cubic meters of sand from the sea floor off Java's northern coast to build an artificial island. Geologist Harold Berghuis, a consultant with the dredging company, suspected the area might contain important fossils. So, he asked the port authorities whether he could survey newly made island.

When he did, fossils were everywhere. In all, Berghuis collected more than 6300 fossils from dozens of vertebrate species—including ancient humans, sharks, rays, panthers, turtles, rhinos, elephants, and Komodo dragons—that are probably between 131,000 and 146,000 years old. To study the fossils, Berghuis decided to go back to school, switching careers from port consultant to paleontologist.

The fossils shed light on how hominins first moved into what is now Indonesia. Close analysis of two Sundaland skull fragments revealed a strong resemblance to H. erectus skulls previously found on Java. We even have an inkling of what these humans ate. Some of the bones bear marks consistent with butchery, including going after bovids' tongues, and the breaking open of bones to collect marrow—some of the first evidence of its kind found in Southeast Asia.
https://www.science.org/content/article/ancient-human-ancestor-emerges-sunken-southeast-asian-landmass

THE CONVERSATION – Alpha males are surprisingly rare among primates – new research

In most primates one sex isn't dominant over the other.
https://theconversation.com/alpha-males-are-surprisingly-rare-among-primates-new-research-260472

PUBLICATIONS

American Journal of Biological Anthropology

PAPERS

TIM SCHUURMAN & EMILIANO BRUNER – Comparative Anatomical Network Analysis of Chimpanzee and Human Craniocerebral Topology

We examine which structural components are fundamental in the craniocerebral spatial arrangement of chimpanzees (Pan troglodytes, Blumenbach 1776) and humans, contrast underlying phenotypic patterns of spatial variation and try to comprehend how these structural components and phenotypic patterns might have influenced the evolution of brain morphology in the two lineages.

A chimpanzee craniocerebral network (126 nodes and 539 edges) is introduced and compared with a prior human model by means of network analysis. Network analysis considers both local and global parameters of systems and can assess spatial constraints due to physical interactions.

The chimpanzee craniocerebral system exhibits (1) a structurally relevant inferior-medial region which might be suggested to constrain morphological evolution; (2) efficient diffusion of information, an essential aspect of morphological variability in terms of plasticity; and (3) the concurrence of a longitudinal and a vertical modular partition, indicative of the cranial constraints imposed on cerebral topology.

The craniocerebral systems of both species display many similarities, which probably trace back to their Last Common Ancestor (LCA), 7–10 million years ago. Nevertheless, some differences are also found. The ethmoid bone's contribution to craniocerebral integration, specifically, is exceptional in humans but modest in chimpanzees, possibly due to differences in the growth process of the face. Another difference lies in their modularity: in chimpanzees, the frontal bone is lumped together with other elements of the calvaria and with the brain, whereas in humans, it participates in the facial block, probably owing to the relatively anterior position of the frontal bone in this species.

https://onlinelibrary.wiley.com/doi/abs/10.1002/ajpa.70083

RICHARD F. KAY et al – The Fossil Record of Anthropoid Brain Evolution

We estimated the size of the brain and the proportions of its components using new estimates of body mass and a broad sample of virtual endocasts of extant primates and Oligocene–mid-Miocene anthropoids.

Brain size relative to body mass and brain proportions relative to brain size were evaluated. Compared with body mass, (1) Brain size enlargement has occurred convergently in many anthropoid lineages. (2) Tarsiers and anthropoids evolved smaller olfactory bulbs and larger neocortices than strepsirrhines. (3) Enlargement of tarsier and anthropoid non-frontal regions (occipital, parietal, and temporal lobes), not of the frontal lobe, accounts for larger neocortex size. Considering brain proportions relative to brain size yields similar findings: (1) Tarsiers and extant and fossil anthropoids have smaller olfactory bulbs and larger neocortices than strepsirrhines. (2) Tarsier and anthropoid neocortical expansion occurred principally in regions where visual signals are processed. (3) Correspondingly, species with relatively more visual input also have larger non-frontal neocortex.

Shifts in brain proportions found in the stem anthropoid Simonsius, and stem platyrrhines and catarrhines were established before brain enlargement. The neocortex was enlarged, with disproportionate expansion of regions where visual signals are processed, emphasizing the heightened importance of the haplorhine visual system. Depending on the phylogenetic position of omomyoid haplorhines, large shifts in neocorticalization either occurred separately in stem tarsiids and anthropoids or once in the stem lineage leading to tarsiids and anthropoids.

https://onlinelibrary.wiley.com/doi/abs/10.1002/ajpa.70081

ADAM D. GORDON – Sexual Size Dimorphism in Australopithecus: Postcranial Dimorphism Differs Significantly Among Australopithecus afarensis, A. africanus, and Modern Humans Despite Low-Power Resampling Analyses

Dimorphism estimates are used to infer competition levels, social structure, and mating system in fossil hominins. However, previous studies have reached conflicting conclusions about the degree of postcranial dimorphism present in Australopithecus afarensis, and statistical comparisons of postcranial size dimorphism between A. afarensis and other early hominins are lacking. This study addresses reasons for differences in published studies and directly compares dimorphism in A. afarensis, A. africanus, and extant hominids.

Eight postcranial variables represent size for three extant hominids (gorillas, humans, and chimpanzees) and two extinct hominins (Australopithecus afarensis and A. africanus). A modified version of Gordon et al.'s (2008) geometric mean method is used to perform significance tests for direct comparisons of estimated sexual size dimorphism in two fossil samples with different patterns of missing data.

Both Australopithecus species are highly dimorphic—significantly more dimorphic than chimpanzees and modern humans. A. afarensis is also significantly more dimorphic than A. africanus.

Previous studies (and this analysis) are typically too low-powered to find significant differences between humans and extant African apes when sampled in the same manner as fossils, rendering negative results for fossil comparisons noninformative. In this study, effect sizes for differences in dimorphism between fossils and other species are large enough to be significant, even at low power. Results suggest intense sexual selection maintained high dimorphism in both fossil species, but also that

different species-specific suites of selection pressure produced diversity in the degree of dimorphism present across Australopithecus species.
https://onlinelibrary.wiley.com/doi/abs/10.1002/ajpa.70093

eLife

PAPERS

XIAOYAN WU et al – The Self-Interest of Adolescents Overrules Cooperation in Social Dilemmas

Reviewed Preprint v1 July 11, 2025. Not revised.

Cooperation is essential for success in society. Research consistently showed that adolescents are less cooperative than adults, which is often attributed to underdeveloped mentalizing that limits their expectations of others. However, the internal computations underlying this reduced cooperation remain largely unexplored. This study compared cooperation between adolescents and adults using a repeated Prisoner's Dilemma Game. Adolescents cooperated less than adults, particularly after their partner's cooperation. Computational modeling revealed that adults increased their intrinsic reward for reciprocating when their partner continued cooperating, a pattern absent in adolescents. Both computational modeling and self-reported ratings showed that adolescents did not differ from adults in building expectations of their partner's cooperation. Therefore, the reduced cooperation appears driven by a lower intrinsic reward for reciprocity, reflecting a stronger motive to prioritize self-interest, rather than a deficiency in mentalizing or social learning. These findings provide insights into the developmental trajectory of cooperation from adolescence to adulthood.
https://elifesciences.org/reviewed-preprints/106840

MATTHIJS VAN VEELEN – The general version of Hamilton's rule

Reviewed Preprint

The generality of Hamilton's rule1,2 is much debated3–14. In this paper, I show that this debate can be resolved by constructing a general version of Hamilton's rule, which allows for a large variety of ways in which the fitness of an individual can depend on the social behaviour of oneself and of others. For this, I first derive the Generalized Price equation, which reconnects the Price equation15 with the statistics it borrows its terminology from.

The Generalized Price equation moreover shows that there is not just one Price equation, but there is a Price-like equation for every possible true model. This implies that there are also multiple, nested rules to describe selection. The simplest rule is the rule for selection of non-social traits with linear fitness effects. This rule is nested in the classical version of Hamilton's rule, for which there is consensus that it works for social traits with linear, independent fitness effects. The classical version of Hamilton's rule, in turn, is nested in more general rules, that for instance allow for nonlinear and/or interdependent fitness effects, like Queller's rule16. The general version of Hamilton's rule therefore is a constructive solution, that allows us to accurately describe when costly cooperation evolves in a wide variety of circumstances. As a byproduct, we also find a hierarchy of nested rules for selection of non-social traits.
https://elifesciences.org/reviewed-preprints/105065

ELLIOT HOWARD-SPINK et al with SUSANA CARVALHO & CATHERINE HOBAITER – Old age variably impacts chimpanzee engagement and efficiency in stone tool use

We know vanishingly little about how long-lived apes experience senescence in the wild, particularly with respect to their foraging behaviors. Chimpanzees use tools during foraging, and given the cognitive and physical challenges presented by tool use, tool-use behaviors are potentially at a heightened risk of senescence, though this has never been investigated in wild individuals. Accordingly, we sampled data from a longitudinal video archive that contained footage of wild chimpanzees using stone hammers and anvils to crack hard-shelled nuts (nut cracking) at an 'outdoor laboratory' over a 17-year period (with focal chimpanzees aging from approximately 39–44 to 56–61 years across this period). Over time, elderly chimpanzees began attending experimental nut-cracking sites less frequently than younger individuals. Several elderly chimpanzees exhibited reductions in efficiency across multiple stages of nut cracking, including taking longer to both select stone tools prior to use and use tools to crack open nuts and consume the associated pieces of kernel. Two chimpanzees began using less streamlined behavioral sequences to crack nuts, including a greater number of actions (such as more numerous hammer strikes). Notably, we report interindividual variability in the extent to which elderly chimpanzees' tool-use behaviors changed during our sample period – ranging from small to profound reductions in engagement and efficiency – as well as differences in the specific aspects of nut cracking that changed for each individual. We discuss the possible causes of these changes – and recommendations for future research – with reference to literature surrounding the senescence of captive and wild primates.
https://elifesciences.org/articles/105411

JOSEPH M BARNBY et al with London Personality and Mood Disorders Consortium – Self-other generalisation shapes social interaction and is disrupted in borderline personality disorder

Generalising information from ourselves to others, and others to ourselves allows for both a dependable source of navigation and adaptability in interpersonal exchange. Disturbances to social development in sensitive periods can cause enduring and distressing damage to lasting healthy relationships. However, identifying the mechanisms of healthy exchange has been

difficult. We introduce a theory of self-other generalisation tested with data from a three-phase social value orientation task – the Intentions Game. We involved humans with (n=50) and without (n=53) a diagnosis of borderline personality disorder and assessed whether infractions to self-other generalisation may explain prior findings of disrupted social learning and instability. Healthy controls initially used their preferences to predict others and were influenced by their partners, leading to self-other convergence. In contrast, individuals with borderline personality disorder maintained distinct self-other representations when learning about others. This allowed for equal predictive performance compared to controls despite reduced updating sensitivity. Furthermore, we explored theory-driven individual differences underpinning contagion. Overall, the findings provide a clear explanation of how self-other generalisation constrains and assists learning, and how childhood adversity is associated with separation of internalised beliefs. Our model makes clear predictions about the mechanisms of social information generalisation concerning both joint and individual reward.
https://elifesciences.org/articles/104008

COMMENTARIES

BENJAMIN ALLEN – Evolutionary Biology: Embracing the complexity of cooperation
Nature is marked not only by struggles for survival, but also by remarkable feats of cooperation. From microbes to insects to humans, organisms work together in a variety of ways to gather and share resources, to build habitats, and to defend against common threats.
One explanation for the evolution of cooperation is shared genes. For example, if an individual saves the life of a close relative, the genes for this cooperative behavior may also be found in the relative's genome, and could spread from there to future generations. In 1964, attempting to quantify this insight, the evolutionary biologist WD Hamilton proposed a now-famous rule: a cooperative behavior is favored by natural selection if br >c, where b is the benefit in fitness to the recipient, r is the relatedness of the recipient to the actor, and c is the cost in fitness to the actor (Hamilton, 1964).
https://elifesciences.org/articles/108039

Evolutionary Anthropology

PAPERS

NICOLE M. HERZOG & KATHRYN DEMPS – Adaptive Responses to Adversity Drive Innovation in Human Evolutionary History
Thinking is costly. Nonetheless, humans develop novel solutions to problems and share that knowledge prosocially. We propose that adversity, not prosperity, created a dependence on innovation in our ancestors who were forced through fitness valleys to develop new behaviors, which shaped our life history characteristics and a new evolutionary trajectory. Driven by competitive exclusion into novel habitats, and unable to reduce costs associated with finding appropriate food sources once there, our Pliocene ancestors adopted a diet different from our forest-dwelling great ape cousins. In a reimagining of classic foraging models we outline how those individuals, pushed into an ecotone with lower fitness, climbed out of the fitness valley by shifting to a diet dependent on extractive foraging. By reducing handling costs through gregarious foraging and emergent technology, our ancestors would have been able to find new optima on the fitness landscape, decreasing mortality by reducing risk and increasing returns, leading to extended life cycles and social reliance.
https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.70006

Frontiers for Young Minds

PAPERS

ELEANOR M. HAY, MICHELLE E. AFKHAMI & CHRISTOPHER A. SEARCY – What Drives Birdsong Evolution?
Just like how people have different languages, bird species have their own songs. These songs help birds recognize each other and find mates. Two factors may shape birdsong evolution: the habitat a bird lives in and a bird's physical features. First, habitat affects how far songs can travel. Second, body size and beak shape can limit the types of sounds a bird produces. We explored how these factors influence song evolution in a group of birds called honeyeaters. Body size is the most important factor explaining differences in song. We found that larger birds produce lower-frequency songs, just like how larger humans have deeper voices! Some findings suggest habitat influences song evolution too. However, this is likely because of differences in body size between different habitats. These results are important because birds are expected to get smaller with future climate change, and this could alter how birds communicate!
https://kids.frontiersin.org/articles/10.3389/frym.2025.1461108/full

Frontiers in Environmental Archaeology

PAPERS

ANAËLLE JALLON et al with ERELLA HOVERS – Cut from the same cloth? Comparing Neanderthal processing of faunal resources at Amud and Kebara caves (Israel) through cut-marks analyses
Amud and Kebara caves (northern Israel) are two broadly contemporaneous Middle Paleolithic sites dated to ca. 70–50 Ka BP, both located in the Mediterranean realm of the southern Levant. Neanderthal occupations at these sites are represented by considerable amounts of lithic artifacts, combustion features and abundant faunal material as well as human remains. As

similar mammalian taxonomic distributions were observed in these two Neanderthal cave sites, we explore the complexity and diversity of their animal resources processing techniques by comparing cut-marks characteristics and patterns. A total of 344 animal bone fragments bearing cut-marks were selected from specific stratigraphic contexts from both sites, and studied using macroscopic and microscopic techniques (i.e., Focus Variation microscopy) to quantify, characterize, and measure the cut-marks left on the bones. The observations were compared across the stratigraphic units and between the sites. Despite comparable taxonomic distributions, there are notable differences in the density and layout of cut-marks between the two caves. The micro-morphometric characteristics of these marks also highlight intra- and inter-site differences and similarities. This evidence might suggest distinctive butchering strategies between the Neanderthal populations in Amud and Kebara caves despite comparable occupation intensities, similar lithic technologies, and access to similar food resources. Such discrepancies could possibly reflect inter-group cultural differences related to carcass processing preferences, organization of tasks within the group, or socially transmitted traditions.
https://www.frontiersin.org/journals/environmental-archaeology/articles/10.3389/fearc.2025.1575572/full

Frontiers in Language Sciences

PAPERS

ANDREA KARSTEN – Understanding personal agency through metaphor, or Why academic writing is (not) like a roller-coaster ride

Building on and methodologically extending conceptual metaphor theory, the article examines how personal agency as a discursively produced sociopsychological phenomenon can be studied in elicited metaphors through a discourse-analytical approach. More concretely, the study illustrates how early-career researchers experience and express their agency in research writing through personal metaphors of academic writing such as riding a roller coaster or baking a wedding cake. A two-step discursive analysis adapts Hopper and Thompson's multidimensional approach to linguistic transitivity to study agency in language. The analytical approach involves both an in-depth parametrized analysis of all metaphors in the sample and a qualitative cross-analysis of the data. The results show that the participants' metaphors reflect both nuanced personal experiences and cultural expectations of academic writing, the writer, and the text. This emphasizes that research writing is not only a highly subjective practice but also one that is socially and culturally influenced. The article argues that research on agency thus needs elaborate methodological tools to trace discursive and sociopsychological trajectories of complex socio-cognitive practices like academic writing. This has implications not only for the nexus of research writing, identity, and academic enculturation but also for other fields focusing on agency in language.
https://www.frontiersin.org/journals/language-sciences/articles/10.3389/flang.2025.1567498/full

Nature Communications Physics

PAPERS

BINGJIE HAO, ELIJAH PLATNICK & ISTVÁN A. KOVÁCS – Social balance in directed networks

Social networks inherently exhibit complex relationships that can be positive or negative, as well as directional. Understanding balance in these networks is crucial for unraveling social dynamics, yet current approaches struggle to incorporate directed interactions. Here, we present a comprehensive framework for understanding balance in signed directed networks, extending traditional balance theory to account for directed interactions, advancing our understanding of complex social systems and their dynamics. Balance is indicated by the enrichment of higher-order patterns like triads compared to an adequate null model, where the network is randomized with some key aspects being preserved. As a special case, we propose a “maximally” constrained signed directed null model based on the maximum-entropy principle that reveals consistent patterns of balance across large-scale social networks. We also consider directed generalizations of balance theory and find that the observed patterns are well aligned with two proposed directed notions of strong balance.
https://www.nature.com/articles/s42005-025-02221-y

Nature Communications Psychology

PAPERS

GINO BATTISTELLO et al – Subjective valuation as a domain-general process in creative thinking

Is a talented painter also a proficient writer? The ongoing discourse on whether creativity operates through domain-general or domain-specific mechanisms has led to challenges in our understanding of the creative process. Prior research suggests that creativity comprises two phases: idea generation and evaluation. A recent framework has proposed that the evaluation phase involves a valuation process which occurs upstream of the selection of an idea. In this framework, the value assigned to an idea, i.e., how much one likes an idea, energizes its production and drives its selection. While the role of valuation has been demonstrated in verbal semantic creativity, its domain generality remains to be tested. In this study, we assessed whether valuation is a domain-general or domain-specific process. Seventy-three participants engaged in three creativity tasks (producing semantic associations, alternate object uses, and drawings) followed by rating tasks. Using computational modeling, we found that a consistent valuation mechanism governs idea valuation across different domains. Specifically, the same value function and value parameters were shared across the evaluation of word associations, object uses and drawing completions. These findings advance our understanding of the evaluation phase of creativity, portraying the valuation

component as inherently domain-general. Identifying such core components of creative ideation contributes to elucidating the cognitive mechanisms underlying creativity and provides empirical support for including valuation as a core process in creativity.
https://www.nature.com/articles/s44271-025-00285-8

Nature Human Behaviour

PAPERS

JESSIE R. LIU et al – Speech sequencing in the human precentral gyrus
Fluent speech production is mediated by serially ordering and preparing motor plans corresponding to target speech sounds, a process known as speech-motor sequencing. Here we used high-density direct cortical recordings while 14 participants spoke utterances with varying phonemic and syllabic sequence complexity after reading a target sequence and a delay period. Phasic activations corresponding to speech production and auditory feedback were observed, but also sustained neural activity that persisted throughout all task phases including the target presentation, the delay period and production of the sequence. Furthermore, sustained activity in a specific area, the middle precentral gyrus (mPrCG), was both modulated by sequence complexity and predicted reaction time, suggesting a role in speech-motor sequencing. Electrocortical stimulation of the mPrCG caused speech disfluencies resembling those seen in apraxia of speech. These results suggest that speech-motor sequencing is mediated by a distributed cortical network in which the mPrCG plays a central role.
https://www.nature.com/articles/s41562-025-02250-1

Nature Humanities & Social Sciences Communications

PAPERS

WEI YANG et al – Translating impoliteness - literature review, translation challenges, and translation strategies in cross-cultural communication
In recent years, research integrating translation studies with impoliteness has steadily increased, significantly contributing to the interdisciplinary development of both fields. However, there remains a lack of reviews that examine how impoliteness is translated across languages and cultures, particularly from a pragmatic standpoint. This study addresses this gap by providing a focused literature review of translation studies on impoliteness, centered on current research trends, methodologies, and analytical perspectives. Twenty-one articles published between 1998 and 2023 were selected from the Scopus and Science Direct databases, focusing on translation studies and impoliteness. Analysis of these studies reveals that cultural differences represent a primary challenge when translating impoliteness. In response, strategies such as euphemism and omission are commonly adopted, often resulting in a dilution of the original pragmatic force. The findings of this study aim to guide future interdisciplinary research on translation studies and impoliteness for translators and researchers, highlighting key challenges and practical strategies in translating impoliteness across cultural boundaries.
https://www.nature.com/articles/s41599-025-05092-4

VÁCLAV HRNČÍŘ, ANGELA M. CHIRA & RUSSELL D. GRAY – Did alcohol facilitate the evolution of complex societies?
The size and complexity of human societies increased dramatically over the Holocene. Researchers have proposed a variety of potential drivers of this major transition, including our predilection for alcoholic beverages. This “drunk” hypothesis argues that drinking alcohol facilitated the rise of complex societies because it promotes social bonding, increases cooperation, and enhances human creativity. At the political level, alcohol-driven feasting serves to build alliances, mobilise labour, and implement power and authority. However, systematic cross-cultural evidence for the claim is lacking. Here we test this hypothesis with a global sample of 186 largely non-industrial societies, purpose-built dataset on intoxicants and causal inference methods. We find a positive relationship between the presence of indigenous alcoholic beverages and higher levels of political complexity, measured by the number of administrative levels. The effect (albeit modest) holds even after controlling for several potential confounders, including common ancestry, spatial proximity, environmental productivity, and agricultural intensity. Our results support the idea that the group-level social benefits of traditional non-distilled fermented beverages may outweigh their disruptive effects, and that alcohol may have facilitated the evolution of human societies. However, other contributing factors, such as agriculture or religion, were probably more effective drivers than getting drunk.
https://www.nature.com/articles/s41599-025-05503-6

MANLI WU, TAILAI WU & YUSHAN XIAO – Why people share misinformation on social media? An integration of affordance and flow theories
The widespread dissemination of misinformation on social media calls for an empirical investigation of why people share such content. By integrating affordance theory and flow theory, this study examines the underlying psychological mechanisms between social media affordances and misinformation sharing. With 533 valid questionnaires, the findings demonstrate that social media affordances (information accessibility, metavoicing and association) are positively associated with cognitive involvement and affective involvement, which then exert positive effects on users’ misinformation sharing. The results further reveal that emotional ability negatively moderates the relationship between affective involvement and misinformation sharing. Theoretically, our empirical findings extend prior studies by complementing the positive connotation

of social media affordances and demonstrating that social media affordances can drive misinformation sharing through the mechanism of flow. Practically, the findings imply that attention should be paid to the design and management of social media to curtail misinformation sharing.
https://www.nature.com/articles/s41599-025-05511-6

Nature Scientific Reports

PAPERS

ANNETTE OERTLE et al – New insights from the application of ZooMS to Late Pleistocene fauna from Grotta di Castelcivita, southern Italy

The Middle to Upper Paleolithic cave site of Grotta di Castelcivita (Campania, Southern Italy) contains a key archaeological sequence exhibiting Late Mousterian occupation followed by the Uluzzian techno-complex and an Aurignacian sequence (Protoaurignacian and Early Aurignacian). Abundant faunal remains are found throughout the sequence with variations in taxa present in each period. Previous studies of the morphologically identifiable faunal remains have provided valuable information on species abundance and diversity to reconstruct subsistence behaviour. However, like in many Pleistocene sequences, much of the faunal assemblage is fragmented and unidentifiable. Here we focus on these unidentified fragmentary bones to add greater dimension to the observed patterns. The application of collagen peptide mass fingerprinting (or Zooarchaeology by Mass Spectrometry; ZooMS) on 1263 unidentified bones revealed distinct changes in ZooMS NISP values in the Uluzzian and Protoaurignacian periods where equids and bovids nearly doubled in quantity compared to the original morphologically identified macrofaunal assemblage. New ZooMS identifications of rhinoceros, bear, and canids were made in layers deeper than previous recorded zooarchaeological analyses, extending the presence of these taxa at the site. The unexpectedly high level of collagen preservation in the bones from the cave confirms the potential for further applications of biomolecular approaches to Pleistocene bones from southern Italy.
https://www.nature.com/articles/s41598-025-11355-6

Neuron

PAPERS

ANNA C. NOBRE & DANIELA GRESCH – How the brain shifts between external and internal attention

Focusing on relevant contents to guide adaptive behavior is a core property of the brain. For decades, scientists have investigated mechanisms to anticipate, select, prioritize, and prepare sensory signals according to goals, memories, and salient events. More recently, researchers have considered how these attention functions operate within internal representations. However, neither external nor internal attention in isolation captures everyday behavior. The brain frequently and seamlessly shifts between contents from the sensory stream and those held in mind. In this perspective, we ask how the brain shifts between external and internal attention. We describe similarities and differences between selective external and internal attention, present competing hypotheses regarding the operating principles of between-domain shifts, and highlight putative brain areas and mechanisms. We discuss the scarce experimental forays comparing attention shifts between vs. within domains and contemplate how these constrain theoretical and computational models. We conclude by suggesting open questions to guide investigation.
https://www.cell.com/neuron/fulltext/S0896-6273(25)00471-4

New Scientist

ARTICLES

MANVIR SINGH & KATE DOUGLAS – The anthropologist who says shamanism works, even if you don't believe

Shamanism is on the rise, both in practice and in popular culture. Manvir Singh has spent years exploring why it is so enduring, what we can learn from it and the surprising forms modern shamans take.
https://www.newscientist.com/article/2486715-the-anthropologist-who-says-shamanism-works-even-if-you-dont-believe/

Philosophical Transactions of the Royal Society A

PAPERS

DIEDERIK AERTS et al – The separability problem in quantum mechanics: insights from research on axiomatics and human language

Einstein's article on the Einstein-Podolsky-Rosen paradox is the most cited of his works, but not many know that it was not fully representative of the way he thought about the incompleteness of the quantum formalism. Indeed, his main worry was not Heisenberg's uncertainty principle, which he accepted, but the experimental non-separability of spatially separate systems. The same problem was also recognized, years later, by one of us, as part of an axiomatic analysis of the quantum formalism, which revealed an unexpected structural limitation of the quantum formalism in Hilbert space, preventing the description of separate systems. As we will explain, this limitation does not manifest at the level of the states, but of the projectors describing the properties, in the sense that there are not enough properties in the formalism to describe separate systems. The question remains whether separability is a possibility at the fundamental level and if a formalism should

integrate it into its mathematical structure, as a possibility. To aid our intuition, we offer a reflection based on a powerful analogy between physical systems and human conceptual entities, as the question of separability also arises for the latter.
https://royalsocietypublishing.org/doi/full/10.1098/rsta.2023.0284

DIEDERIK AERTS et al – The origin of quantum mechanical statistics: some insights from research on human language
Identical systems, or 'entities', are 'indistinguishable' in quantum mechanics (QM), and the 'symmetrization postulate' rules the possible statistical distributions of a large number of identical quantum entities. However, a thorough analysis of the historical development of QM attributes the origin of quantum statistics, in particular, 'Bose–Einstein statistics', to a lack of statistical independence of the micro-states of identical quantum entities. We have recently identified Bose–Einstein statistics in the combination of words in large texts, as a consequence of the 'entanglement' created by the meaning carried by words when they combine in human language. Relying on this investigation, we put forward the hypothesis that entanglement, hence the lack of statistical independence, is due to a 'mechanism of contextual updating', which provides deeper reasons for the appearance of Bose–Einstein statistics in human language. However, this investigation also contributes to a better understanding of the origin of quantum mechanical statistics in physics. Finally, we provide new insights into the 'intrinsically random behaviour of microscopic entities' that is generally assumed within classical statistical mechanics.
https://royalsocietypublishing.org/doi/10.1098/rsta.2023.0285

PLoS One

PAPERS

DAVID NORA et al – The dichotomy of human decision-making: An experimental assessment of stone tool efficiency
The physical properties of distinct raw materials, such as hardness, homogeneity, and grain size, have been recurrently suggested as some of the key reasons for human decision-making, namely the selection, production, and use of stone implements in the past. However, little is known, concerning the relationship between stone tools and human behaviour and how this is reflected in the variability seen in the archaeological record. Therefore, investigating stone tools' properties and performance brings fundamental insights into identifying and understanding the origins of some of the major human technological behavioural traits. In this study, we aim to address this topic by measuring the variability of the properties of lithic raw materials from the perspective of tool use. A controlled experiment was designed to test the mechanical performance with a focus on the efficiency (ratio between effectiveness and durability) of four distinct raw materials (quartzite, dacite, flint, and obsidian). Our study addresses the null hypothesis: "Edge efficiency does not vary according to the different lithic raw materials." Efficiency is assessedby the combination of penetration depth (proxy to measure effectiveness) and edge wear (proxy to measure durability). These two variables were measured, and the results correlated with the physical properties of various raw materials, including hardness and grain size. Our results show significant differences in the efficiency between the different types of raw materials. The outcome demonstrates that the variables by which we test the edge efficiency of lithic raw materials are highly relevant for raw material selection and, consequently, may have been of utmost importance in influencing the decision-aking process of past hunter-gatherers. A decrease in tool efficiency during use may have constrained daily activities, necessitating technological adaptations. This strongly suggests that each raw material used in archaeological contexts to produce blanks should be evaluated for its efficiency. In addition, it may be pertinent to extend this approach to other blunt artefactssuch as scrapers, burins, anvils, and hammerstones when investigating aspects of interconnected behaviours such as artefact variability, resource economy, group mobility, and site function. Such choices and decisions are coded in the archaeological record and represent cultural factors that were transmitted through learning and likely triggered the human decision-making process of past hunter-gatherers.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0327215

PNAS

PAPERS

MICHAL KOSINSKI – Evaluating large language models in theory of mind tasks
Eleven large language models (LLMs) were assessed using 40 bespoke false-belief tasks, considered a gold standard in testing theory of mind (ToM) in humans. Each task included a false-belief scenario, three closely matched true-belief control scenarios, and the reversed versions of all four. An LLM had to solve all eight scenarios to solve a single task. Older models solved no tasks; Generative Pre-trained Transformer (GPT)-3-davinci-003 (from November 2022) and ChatGPT-3.5-turbo (from March 2023) solved 20% of the tasks; ChatGPT-4 (from June 2023) solved 75% of the tasks, matching the performance of 6-y-old children observed in past studies. We explore the potential interpretation of these results, including the intriguing possibility that ToM-like ability, previously considered unique to humans, may have emerged as an unintended by-product of LLMs' improving language skills. Regardless of how we interpret these outcomes, they signify the advent of more powerful and socially skilled AI—with profound positive and negative implications.
https://www.pnas.org/doi/abs/10.1073/pnas.2405460121

XAVIER ROBERTS-GAAL, MARIJA BOLIC & FIERY A. CUSHMAN – Environmental variability shapes the representational format of cultural learning

Cumulative culture requires learning mechanisms that are both efficient and flexible in the face of environmental change. We examine models of this learning mechanism that emphasize teaching what to do (causally opaque procedures) and those that foreground what to aim for and why (goals and causal reasoning). Learning procedures is cheap but inflexible; learning goals is more flexible to changing circumstance, but requires expensive individual learning about how to achieve them. In an iterated learning experiment, we demonstrate that cultural learning adapts in precisely this way: Microcultures more often instruct future generations to follow procedures when the world is stable, but they tend to share information about valuable outcomes and causal relations when the world is variable.
https://www.pnas.org/doi/full/10.1073/pnas.2505283122

COMMENTARIES

DAMIAN K.F. PANG et al – Do large language models have a theory of mind?

Michal Kosinski's recent study on theory of mind (ToM) tasks given to different large language models (LLMs) is fascinating and offers many insights into the continued evolution and development of LLMs.
When testing ToM in animals, much ethological research has focused on differentiating "genuine" ToM from other cognitive functions. Morgan's Canon recommends using "lower" rather than "higher" psychological faculties to explain animal behavior where possible. While this "canon" may lack justification, "association-blindness" is also problematic.
Researchers working in developmental psychology and animal behavior have developed increasingly sophisticated methods to rule out alternative explanations, gradually building cumulative cases based on converging evidence. We suggest that the same should be done with LLMs. Kosinski considered some alternative explanations and included control trials to exclude simple heuristics. We suggest that this should be expanded by examining other alternatives like associative learning, which can be achieved through simple electronic circuits (6) and can be explicitly trained.
https://www.pnas.org/doi/full/10.1073/pnas.2507080122

MICHAL KOSINSKI – Reply to Pang et al.: Generalizable ability to track beliefs could be the most parsimonious explanation

We thank Pang et al. for their thoughtful commentary on our recent article, highlighting the possibility that large language models' (LLMs) success on theory-of-mind (ToM) tasks might be explained through associative learning. They observe that LLMs might "recognize" false-belief tasks and solve them by recalling memorized solutions encountered during training. They invoke Morgan's Canon, advocating for the simplest explanation of animal behavior, and Heyes's caution against "association-blindness," or neglecting associative learning as a plausible explanation for complex behavior.
We agree with Pang et al. that associative learning likely explains many apparent mental-processing feats in both LLMs and humans. As discussed in our article, both humans and LLMs memorize solutions and response patterns to previously encountered tasks. To minimize this issue, we crafted 40 bespoke false-belief scenarios characterized not merely by new particulars but by radically different patterns and contexts from tasks in the existing literature. Furthermore, each false-belief scenario was accompanied by three carefully matched true-belief control scenarios, as well as reversed versions of all four scenarios. Simple heuristics—such as consistently assuming the protagonist is mistaken or blindly trusting a misleading label—fail under these rigorous control conditions.
https://www.pnas.org/doi/full/10.1073/pnas.2511485122

Royal Society Open Science

PAPERS

EVA REINDL et al – Humans may not have a uniquely enhanced sequence memory: sequence discrimination is facilitated by causal–logical framing in humans and chimpanzees

Humans have been suggested to possess uniquely enhanced memory for sequences, based on sequence discrimination learning (SDL) tasks involving arbitrarily ordered sequences with no functional connection to outcomes. Such tasks underestimate animals' SDL as they lack affordances of real-world situations. We tested whether stimuli causally connected to outcomes facilitate SDL. A total of 13 chimpanzees, 24 capuchin monkeys, 23 squirrel monkeys, 77 adult and 239 juvenile humans completed an AB versus BA, BB and AA task. Humans discriminated causal sequences better than arbitrary ones and one chimpanzee succeeded in the causal frame condition after 324 trials, suggesting that performance gaps in previous studies are partly due to the arbitrariness of sequences (monkeys mostly failed the training). Without causal framing, children found the task difficult until 10–11 years of age. The sequence memory hypothesis needs to be evaluated with a broader set of tasks and account for cultural scaffolding of participants' understanding of task requirements.
https://royalsocietypublishing.org/doi/10.1098/rsos.250236

NATHAN CARUANA et al – The temporal context of eye contact influences perceptions of communicative intent

This study examined the perceptual dynamics that influence the evaluation of eye contact as a communicative display. Participants (n = 137) completed a task where they decided if agents were inspecting or requesting one of three objects. Each agent shifted its gaze three times per trial, with the presence, frequency and sequence of eye contact displays manipulated

across six conditions. We found significant differences between all gaze conditions. Participants were most likely, and fastest, to perceive a request when eye contact occurred between two averted gaze shifts towards the same object. Findings suggest that the relative temporal context of eye contact and averted gaze, rather than eye contact frequency or recency, shapes its communicative potency. Commensurate effects were observed when participants completed the task with agents that appeared as humans or a humanoid robot, indicating that gaze evaluations are broadly tuned across a range of social stimuli. Our findings advance the field of gaze perception research beyond paradigms that examine singular, salient and static gaze cues and inform how signals of communicative intent can be optimally engineered in the gaze behaviours of artificial agents (e.g. robots) to promote natural and intuitive social interactions.
https://royalsocietypublishing.org/doi/10.1098/rsos.250277

IRO XENIDOU-DERVOU et al – Can adults automatically process and translate between numerical representations?
Arithmetic and the ability to use numbers are important skills. Numbers can be represented in three ways: through number words, Arabic symbols or non-symbolically. Much research attention has focused on how associations form between these three numerical representations. However, it is not yet clear whether these associations are automatic or if they require working memory (WM) resources. In this registered report, we used the dual-task paradigm to answer this question. Eighty-one adults were administered dot, digit and cross-modal (i.e. dot versus digit) magnitude comparison tasks in standalone and dual-task conditions with phonological (PL) or visuospatial (VSSP) WM interference. We found that all three types of magnitude comparison necessitated WM resources. Symbolic comparison necessitated VSSP WM. Surprisingly, in this task, accuracy improved under both WM interference conditions, evidencing the proposal that introducing executive function challenges in simple and familiar tasks can improve performance. In non-symbolic comparison, our findings demonstrated that the VSSP and the PL—albeit to a lesser extent—were employed. Finally, cross-modal comparison necessitated VSSP WM. These findings evidence the fundamental role visuospatial processing plays in numerical processing and that adults require WM resources for simply processing numerical representations and translating between them.
https://royalsocietypublishing.org/doi/10.1098/rsos.250856

Science Advances

PAPERS

SIWEN WANG et al – Is sex at birth a biological coin toss? Insights from a longitudinal and GWAS analysis
Some families consistently have offspring of only one sex, raising questions about whether sex at birth is truly random. This study investigated whether offspring sex follows a simple binomial distribution within families and identified maternal factors associated with unisexual sibships. We analyzed 58,007 US women with two or more singleton live births (146,064 pregnancies, 1956–2015). Offspring sex followed a beta-binomial rather than a simple binomial distribution, indicating that each family may have a unique probability of male or female births, akin to a weighted coin toss. Deviations from simple binomial distribution were more pronounced when we excluded each woman's last birth to reduce the influence of sex-based stopping behavior. After excluding the last birth, older maternal age at first birth was associated with higher odds of having offspring of only one sex. A genome-wide association study identified maternal SNPs linked to having female-only (NSUN6) and male-only (TSHZ1) offspring. Our findings suggest maternal factors influence offspring sex distributions.
https://www.science.org/doi/10.1126/sciadv.adu7402

Trends in Ecology and Evolution

PAPERS

PAULO ENRIQUE CARDOSO PEIXOTO & GLAUCO MACHADO – What we (don't) know about costs in animal contests
Animal contests are central to understanding the evolution of aggressive behaviors and the strategic decisions that shape survival and reproductive success across species. A key aspect of contests is the role of individual costs in determining the outcome. However, despite its obvious meaning, a clear definition of contest costs is lacking. We argue that contest costs have both short- and long-term effects that affect how aggressive behaviors evolve and show that empirical studies rarely connect these two types of cost. To address this gap, we propose methodological approaches that integrate both cost perspectives. As a result, new research integrating short- and long-term contest costs can substantially advance our understanding of strategic decision-making evolution in animal contests.
https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(25)00153-3

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