EAORC BULLETIN 1,148 – 15 June 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.

ACADEMIA.EDU – An Introduction to Cognitive Archaeology

Current Directions in Psychological Science 25:6, 386-392 (2016).

FREDERICK L. COOLIDGE & THOMAS WYNN – An Introduction to Cognitive Archaeology

Cognitive archaeology studies human cognitive evolution by applying cognitive-science theories and concepts to archaeological remains of the prehistoric past. After reviewing the basic epistemological stance of cognitive archaeology, this article illustrates this interdisciplinary endeavor through an examination of two of the most important transitions in hominin cognitive evolution—the appearance of Homo erectus about 2 million years ago, and the recent enhancement of working-memory capacity within the past 200,000 years. Although intentionally created stone tools date to about 3.3 million years ago, Homo erectus produced a bifacial, symmetrical handaxe whose design then persisted for nearly the next 2 million years. An enhancement in working-memory capacity may have been responsible for the relative explosion of culture within the past 50,000 years, which included personal ornamentation, highly ritualized burials, bow-and-arrow technology, depictive cave art, and artistic figurines.

https://www.academia.edu/112376238/An_Introduction_to_Cognitive_Archaeology

ACADEMIA.EDU – What Can the Lithic Record Tell Us About the Evolution of Hominin Cognition?

Topoi 40, 245-259, (2021).

ROSS PAIN – What Can the Lithic Record Tell Us About the Evolution of Hominin Cognition?

This paper examines the inferential framework employed by Palaeolithic cognitive archaeologists, using the work of Wynn and Coolidge as a case study. I begin by distinguishing minimal-capacity inferences from cognitive-transition inferences. Minimal-capacity inferences attempt to infer the cognitive prerequisites required for the production of a technology. Cognitive-transition inferences use transitions in technological complexity to infer transitions in cognitive evolution. I argue that cognitive archaeology has typically used cognitive-transition inferences informed by minimal-capacity inferences, and that this reflects a tendency to favour cognitive explanations for transitions in technological complexity. Next I look at two alternative explanations for transitions in technological complexity: the demographic hypothesis and the environmental hypothesis. This presents us with a dilemma: either reject these alternative explanations or reject traditional cognitive-transition inferences. Rejecting the former is unappealing as there is strong evidence that demographic and environmental influences play some causal role in technological transitions. Rejecting the latter is unappealing as it means abandoning the idea that technological transitions tell us anything about transitions in hominin cognitive evolution. I finish by briefly outlining some conceptual tools from the philosophical literature that might help shed some light on the problem.

https://www.academia.edu/40748638/What_Can_the_Lithic_Record_Tell_Us_About_the_Evolution_of_Hominin_Cognition

ACADEMIA.EDU – Hominin cognitive evolution: Patterns and processes in fossil and archaeological record

Philosophical Transactions of the Royal Society B 367, 2130-2140 (2012).

SUSANNE SHULTZ, EMMA NELSON & ROBIN I. M. DUNBAR – Hominin cognitive evolution: identifying patterns and processes in the fossil and archaeological record

As only limited insight into behaviour is available from the archaeological record, much of our understanding of historical changes in human cognition is restricted to identifying changes in brain size and architecture. Using both absolute and residual brain size estimates, we show that hominin brain evolution was likely to be the result of a mix of processes; punctuated changes at approximately 100 kya, 1 Mya and 1.8 Mya are supplemented by gradual within-lineage changes in Homo erectus and Homo sapiens sensu lato. While brain size increase in Homo in Africa is a gradual process, migration of hominins into Eurasia is associated with step changes at approximately 400 kya and approximately 100 kya. We then demonstrate that periods of rapid change in hominin brain size are not temporally associated with changes in environmental unpredictability or with long-term palaeoclimate trends. Thus, we argue that commonly used global sea level or Indian Ocean dust palaeoclimate records provide little evidence for either the variability selection or aridity hypotheses explaining changes in hominin brain size. Brain size change at approximately 100 kya is coincident with demographic change and the appearance of fully modern language. However, gaps remain in our understanding of the external pressures driving encephalization, which will only be filled by novel applications of the fossil, palaeoclimatic and archaeological records.

https://www.academia.edu/48337693/Hominin_cognitive_evolution_identifying_patterns_and_processes_in_the_fossil_and_archaeological_record

NEWS

THE CONVERSATION – Animals can't talk like humans –hunting for their languages gives us nothing

Many scientists see evidence of language in the sounds animals put together, but they may be kidding themselves.

https://theconversation.com/animals-cant-talk-like-humans-do-heres-why-the-hunt-for-their-languages-has-left-us-empty-handed-258321

THE CONVERSATION – Horses have a complex repertoire of facial expressions, just like primates

The study has created a catalogue of horse facial expressions to help people understand how to read these incredible animals.
https://theconversation.com/horses-have-a-complex-repertoire-of-facial-expressions-just-like-primates-257996

THE CONVERSATION – Inside the chimpanzee medicine cabinet: how chimps treat wounds with plants

The plants chimpanzees use to treat their wounds have been found to have medicinal properties.
https://theconversation.com/inside-the-chimpanzee-medicine-cabinet-weve-found-a-new-way-chimps-treat-wounds-with-plants-258094

PUBLICATIONS

Current Biology

ARTICLES

ELENA CAVANI & STEFFEN R. HAGE – Vocal communication: Sound check in the primate brain

Vocal communication relies on accurate vocal output and real-time self-monitoring through auditory feedback. A recent study in marmoset monkeys explores the underlying neural mechanisms, revealing bidirectional communication between frontal and auditory cortices during vocalization. These findings suggest a key role for these brain areas in vocal monitoring and error detection.
https://www.cell.com/current-biology/abstract/S0960-9822(25)00564-0

eLife

PAPERS

ELLIOT HOWARD-SPINK et al with CATHERINE HOBAITER& DORA BIRO – 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, which are essential for survival. Some wild apes use tools during foraging and, given the additional cognitive and physical challenges presented by tool use, we predict that such behaviors are at a heightened risk of senescence. However, until the present, longitudinal analysis of the effects of progressive aging on wild ape tool-use behaviors has not been possible due to a lack of available data. In response to this research gap, we sampled data from a longitudinal video archive that contained footage of wild chimpanzees engaging in one of their most complex forms of tool use - the cracking of hard-shelled nuts with hammers and anvil stones, termed nut cracking - at an 'outdoor laboratory' at Bossou, Guinea. By sampling data over a 17-year period, we describe how the extent to which wild chimpanzees engage in – and efficiently perform – nut cracking changes between the ages of approximately 39-44 to 56-61 years of age. Over this extended sampling period, chimpanzees began attending experimental nut cracking sites less frequently than younger individuals. Several elderly chimpanzees exhibited reductions in efficiency across multiple components of nut cracking, including taking more time to select stone tools prior to use, and taking longer to crack open nuts and consume the associated pieces of kernel. Two chimpanzees also began using less streamlined behavioral sequences to crack nuts, including a greater number of actions (such as more numerous strikes of the hammer stone). Most 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 tool engagement and efficiency – as well as differences in the specific aspects of nut cracking behaviors that changed for each individual as they aged. We discuss the possible causes of these changes with reference to research into senescence in captive primates, and provide future directions for research of primate aging in both captive and wild settings.
https://elifesciences.org/reviewed-preprints/105411

LEI LI et al – Mother-child dyadic interactions shape children's social brain and theory of mind

Social cognition develops through a complex interplay between neural maturation and environmental factors, yet the neurobehavioral mechanisms underlying this process remain unclear. Using a naturalistic fMRI paradigm, we investigated the effects of age and parental caregiving on social brain development and Theory of Mind (ToM) in 34 mother-child dyads. The functional maturity of social brain networks was positively associated with age, while mother-child neural synchronization during movie viewing was related to dyadic relationship quality. Crucially, parenting and child factors interactively shaped social cognition outcomes, mediated by ToM abilities. Our findings demonstrate the dynamic interplay of neurocognitive development and interpersonal synchrony in early childhood social cognition, and provide novel evidence for neurodevelopmental plasticity and reciprocal determinism. This integrative approach, bridging brain, behavior, and parenting environment, advances our understanding of the complex mechanisms shaping social cognition. The insights gained can inform personalized interventions promoting social competence, emphasizing the critical importance of nurturing parental relationships in facilitating healthy social development.
https://elifesciences.org/reviewed-preprints/103017

SARAH SILVÈRE et al – Neuroanatomical foundations of social tolerance across macaque species
The macaque genus includes 25 species with hugely diverse social systems, ranging from low to high tolerance social organization. Such interspecific behavioral variability provides a unique model to tackle the evolutionary foundation of primate social brain. Yet, the neuroanatomical correlates of these social tolerance grades remain unknown. To address this question, we analyzed post-mortem structural scans from 12 macaque species. Our results show that amygdala volume is a subcortical predictor of macaques' social tolerance, with high tolerance species exhibiting larger amygdala than low tolerance ones. To tackle the issue of nature versus nurture origin of the social tolerance effect on amygdala volume, we investigated the development of amygdala across species with different social grades. Intolerant species showed a gradual increase in relative amygdala volume across the lifespan. Unexpectedly, tolerant species exhibited an opposite trend, previously undescribed in primates. Taken together, these findings provide valuable insights into the neuroanatomical and evolutionary basis of primates' social behaviors.
https://elifesciences.org/reviewed-preprints/106424

LEE R BERGER et al with AGUSTÍN FUENTES – An initial report of c241,000 to 335,000 Year old Rock Engravings and their relation to Homo naledi in the Rising Star cave system, South Africa
The production of painted, etched or engraved designs on cave walls or other surfaces is recognized as a major cognitive step in human evolution. Such intentional designs, which are widely interpreted as signifying, recording, and transmitting information in a durable manner were once considered exclusive to Late Pleistocene Homo sapiens. Here we present observations of what appear to be engraved abstract patterns and shapes within the Dinaledi Subsystem of the Rising Star cave system in South Africa, incised into the dolomitic limestone walls of the cave. The markings described here are found on a pillar in the Hill Antechamber that extends into the natural fissure corridor that links the two chambers and we associate them with H. naledi. They include deeply impressed lines, cross-hatchings, percussion marks, and other geometric shapes on flat wall surfaces and in and around existing cracks and grooves in the dolomitic limestone walls, found in one specific location of the Dinaledi Subsystem. Remains of multiple Homo naledi are found in this part of the cave system and evidence mortuary behaviour appears in both the Dinaledi Chamber and adjacent Hill Antechamber dated to between 241 and 335 ka (Dirks et al., 2017; Robbins et al., 2021, Berger et al, 2025).
https://elifesciences.org/reviewed-preprints/89102

Frontiers in Ecology and Evolution

PAPERS

PHILIPPA HAMMOND RENÉ BOBE & SUSANA CARVALHO – The behavioural ecology of hominin locomotion: what can we learn from landscapes of fear and primate terrestriality?
A defining feature of the hominin clade is bipedality, often parcelled together with terrestriality. However, there is increasing evidence of locomotor diversity, both within the hominin clade and amongst the Miocene apes that came before them. There is also growing recognition that bipedalism might have arboreal origins and that arboreality persisted in several hominin taxa, including our own genus Homo. Furthermore, the difference between terms like "habitual" and "obligate" bipedality is not clearly defined and is often inferred from fossil features, rather than a description of each behaviour in vivo. Combining fossil and palaeoecological evidence with insights from behavioural ecology facilitates new interpretations of evolutionary pathways and highlights the importance of considering convergent evolution in the emergence of locomotor traits and characteristics. Taking such an approach also moves away from assumptions of a straight-line trajectory towards modern human locomotion and explores the likelihood that independent forms of bipedality and terrestriality arose at different times and in different combinations with other features of ape morphology and behaviour. Evidence from extant primate species can broaden our understanding of the correlates, causes, and consequences of terrestriality and can be used to generate hypotheses which are then explored further using paleontological methods. In this paper, we explore the evolutionary origins of hominin locomotion, but extend our review to include broader timescales, a wider range of primate taxa, and an integrated set of methods and disciplines for generating and testing hypotheses about locomotion. Perceived risk (or, the "landscape of fear") is a key pressure that has selected for primate arboreality – particularly nocturnal arboreality. We propose that shifts in Plio-Pleistocene landscapes of fear – caused by declining carnivoran abundance and diversity – might also have been a key selection pressure in changes to primate locomotion, particularly papionin and hominid terrestriality. We discuss this hypothesis and propose future research avenues to explore it further. Not only will such research provide a more nuanced view of the causes and consequences of a rare behavioural trait in primates, but it could ultimately help us explain how one group of African apes came to spend all their time on the ground, and how that made them human.
https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2025.1473794/full

Frontiers in Psychology

PAPERS

QIUJIAN XU et al – The impact of songs with prosocial lyrics on implicit cognition and prosocial behavior: a prospective event-related brain potential study

Music with prosocial lyrics is a significant area of study in music psychology. Based on the General Learning Model, such music can effectively enhance prosocial behaviors. However, little is known about the neural correlates of the impact on prosocial behavior of short-term exposure to music with prosocial lyrics. Previous research has primarily used self-report measures to explore the relationship between music and prosocial cognition and behavior. However, these measures can be influenced by social desirability biases when dealing with sensitive issues such as moral behavior. The study of implicit cognition can effectively avoid these biases and has thus attracted widespread attention.

This study is the first to investigate the electrophysiological characteristics of the relationship between exposure to music with prosocial lyrics and enhanced altruistic behavior and to elucidate the effects of such music on implicit prosocial cognition.

This laboratory study will recruit 45 college students, who will be tasked with listening to either music with prosocial lyrics or neutral music. We will then use the Single Category Implicit Association Test (SC-IAT) paradigm combined with event-related potentials (ERP) to investigate the impact of music with prosocial lyrics on participants' implicit prosocial cognition and further reveal the predictive power of implicit cognition on prosocial behavior (measured by assessing the level of voluntary unpaid participation in subsequent experiments).

The findings of this study will provide neuroscientific evidence on how music with prosocial lyrics influences prosocial behavior through cognitive processes and clarify the effectiveness of music with prosocial lyrics in enhancing implicit prosocial cognition and behavior. In addition, these findings will not only deepen the understanding of the relationship between music and social behavior but also provide theoretical foundations and practical guidance for education, psychological interventions, and strategies to improve social behavior, thereby promoting the application of music in fostering social harmony.

https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2025.1426891/full

iScience

PAPERS

JOSEPH T. FELDBLUM et al with ELIZABETH V. LONSDORF – Socially integrated female chimpanzees have lower offspring mortality

In humans and other social mammals, more socially connected females often have higher fitness. Yet evidence linking female sociality to offspring survival remains inconsistent, and is limited to a handful of primate species in which females depend on close female kin for social status. Here we examine the relationship between female social integration and offspring survival in eastern chimpanzees. We find that females that were more socially integrated with other females in the year before giving birth had higher offspring survival to age 1 (the period of highest mortality) and age 5 (the approximate age of weaning). Furthermore, social integration remained a strong predictor of offspring survival among females without close female kin. Our results thus add to a small set of studies linking sociality with offspring survival, here in the dispersing sex. As in humans, more socially connected female chimpanzees have higher offspring survival, despite primarily residing with non-kin.

https://www.cell.com/iscience/fulltext/S2589-0042(25)01124-1

Nature

ARTICLES

MIRYAM NADDAF – How to spot suspicious papers: a sleuthing guide for scientists

An open collection of tips and tools could help researchers and publishers to pick up on problematic research.

https://www.nature.com/articles/d41586-025-01826-1

Nature Human Behaviour

PAPERS

MASAHIRO YAMASHITA, RIEKO KUBO & SHINJI NISHIMOTO – Conversational content is organized across multiple timescales in the brain

The evolution of conversation facilitates the exchange of intricate thoughts and emotions. The meaning is progressively constructed by integrating both produced and perceived speech into hierarchical linguistic structures across multiple timescales, including words, sentences and discourse. However, the neural mechanisms underlying these interactive sense-making processes remain largely unknown. Here we used functional magnetic resonance imaging to measure brain activity during hours of spontaneous conversations, modelling neural representations of conversational content using contextual embeddings derived from a large language model (GPT) at varying timescales. Our results reveal that linguistic representations are both shared and distinct between production and comprehension, distributed across various functional networks. Shared representations, predominantly localized within language-selective regions, were consistently observed at shorter timescales, corresponding to words and single sentences. By contrast, modality-specific representations exhibited

opposing timescale selectivity: shorter for production and longer for comprehension, suggesting that distinct mechanisms are involved in contextual integration. These findings suggest that conversational meaning emerges from the interplay between shared linguistic codes and modality-specific temporal integration, facilitating context-dependent comprehension and adaptive speech production.
https://www.nature.com/articles/s41562-025-02231-4

Nature Humanities & Social Sciences Communications

PAPERS

UGUR SOYTAS & RAMAZAN SARI – Societal well-being and resource use

A production function defines the link between economic output and consumption of resources. However, our knowledge of how societal well-being is linked to resource use is limited. The current research predominantly emphasizes a diminishing contribution of energy use to well-being across all countries, indicating a non-linear saturation function. In this paper, an argument is made for an S-shaped association of societal well-being to resource use more broadly. The variations in the roles of hedonic and eudaimonic well-being dimensions explain the S curve. At low levels of resource use, the hedonic dimension leads to an exponential increase in well-being. When short-run needs are met, well-being contributions of resource use start declining. After this inflection point, we argue that the eudaimonic dimension starts dominating. The knee point of the S refers to the level after which contributions to well-being become negligible. Based on these turning points, fair and subsistence use levels are introduced as innovative social boundaries of resource consumption. Without imposing any functional form, the kernel estimates between Human Development Indexes and material footprints support the S-shape conjecture, with slight deviations for biomass, fossil fuel, metal, and mineral footprints. We argue that, as expected, well-being can decline when environmental impacts of excessive resource use are considered.
https://www.nature.com/articles/s41599-025-05162-7

Nature Neuroscience

COMMENTARIES

BRITTON A. SAUERBREI & J. ANDREW PRUSZYNSKI – The brain works at more than 10 bits per second

A recent article makes a claim with far-reaching implications for neuroscience, technology, and society: that the human brain is subject to an information processing 'speed limit' of 10 bits per second. Although this speed limit appears to hold for high-level cognitive functions, we argue that unconscious processing for real-time control of movement, which occupies a majority of neurons in the central nervous system and accounts for most of the information throughput of humans, substantially exceeds this limit.
https://www.nature.com/articles/s41593-025-01997-0
ORIGINAL PAPER: Neuron 113:2, 192-204 (2024)

JIEYU ZHENG & MARKUS MEISTER – The unbearable slowness of being: Why do we live at 10 bits/s?

This article is about the neural conundrum behind the slowness of human behavior. The information throughput of a human being is about 10 bits/s. In comparison, our sensory systems gather data at ∼109 bits/s. The stark contrast between these numbers remains unexplained and touches on fundamental aspects of brain function: what neural substrate sets this speed limit on the pace of our existence? Why does the brain need billions of neurons to process 10 bits/s? Why can we only think about one thing at a time? The brain seems to operate in two distinct modes: the "outer" brain handles fast high-dimensional sensory and motor signals, whereas the "inner" brain processes the reduced few bits needed to control behavior. Plausible explanations exist for the large neuron numbers in the outer brain, but not for the inner brain, and we propose new research directions to remedy this.
https://pubmed.ncbi.nlm.nih.gov/39694032/

Nature Scientific Data

PAPERS

FEDERICA TILI et al – Mirror Neurons in Monkey Frontal and Parietal Areas

Mirror neurons (MNs) are a class of cells in the fronto-parietal regions of the primate brain that activate during both action execution and observation. Over three decades, numerous neurophysiological studies have investigated the properties of MNs, proposing their involvement in social interaction. However, variability in definitions, recorded brain regions, and response dynamics has posed challenges to replicating MN findings and achieving a comprehensive understanding of their properties. Here, we present a curated dataset of hundreds of single neurons from multielectrode recordings in three fronto-parietal areas (AIP, F5, F6) of macaques executing and observing a reach-to-grasp task. In addition to motor neurons, many cells responded to both executed and observed actions, thus fulfilling the MN criteria. The dataset includes spike times and behavioural events in HDF5 format, a standard for neuroscience data sharing, along with example MATLAB and Python code for dataset exploration and analysis. This resource offers a platform for investigating MNs across different brain areas and task conditions, enabling data-driven hypothesis-testing of their motor and social properties.
https://www.nature.com/articles/s41597-025-05299-9

Neuron

ARTICLES

BENJAMIN BECKER – Will our social brain inherently shape and be shaped by interactions with AI?
Social-specific brain circuits enable rapid understanding and affiliation in interpersonal interactions. These evolutionarily and experience-shaped mechanisms will influence—and be influenced by—interactions with conversational AI agents (chatbots, avatars). This NeuroView explores fundamental circuits, computations, and societal implications.
https://www.cell.com/neuron/abstract/S0896-6273(25)00346-0

New Scientist

NEWS

Crafty cockatoos learn to use public drinking fountains
Sulphur-crested cockatoos are waiting in line at public drinking fountains in Sydney to have their daily drinks of water in the latest example of cultural evolution in urban birds.
https://www.newscientist.com/article/2482652-crafty-cockatoos-learn-to-use-public-drinking-fountains/

ARTICLES

MICHAEL MARSHALL – Ancient humans evolved to be better teachers as technology advanced
As our ancestors developed more advanced tools and cultural practices, they also developed new ways of explaining concepts to others – culminating in the emergence of complex language.
https://www.newscientist.com/article/2483185-ancient-humans-evolved-to-be-better-teachers-as-technology-advanced/

PeerJ

PAPERS

CATIA CORREIA-CAEIRO et al with SIMON TOWNSEND & KATJA LIEBAL – Adapting the facial action coding system for chimpanzees (Pan troglodytes) to bonobos (Pan paniscus): the ChimpFACS extension for bonobos
The Facial Action Coding System (FACS) is a widely recognised coding scheme for analysing human facial behaviour, providing an objective method to quantify discrete movements associated with facial muscles, known as Action Units (AUs), and reducing subjective bias. FACS has been adapted for nine other taxa, including apes, macaques, and domestic animals, but not yet bonobos. To carry out cross species studies of facial behaviours within and beyond apes, it is essential to include bonobos. Hence, we aimed at adapting FACS for bonobos. We followed a similar methodology as in previous FACS adaptations: first, we examined the facial muscular plan of bonobos from previously published dissections. Given the similarity between bonobo and chimpanzee musculature, we tested if ChimpFACS for chimpanzees could be applied to bonobos. Second, we used ChimpFACS to analyse spontaneous facial behaviour in bonobos through videos recorded in various contexts. Third, we noted any differences in appearance changes between the AUs included in ChimpFACS and the AUs observed in bonobos. Our findings showed that bonobos exhibit all the facial movements observed in chimpanzees, and thus ChimpFACS can reliably be applied to bonobos. Bonobos presented a diverse repertoire of 28 facial movements (22 AUs, three Action Descriptors, and three Ear Action Descriptors). Although the range of facial movement is lower than in humans, bonobo's potential for facial movement is comparable to that of chimpanzees, underscoring the significance of this behaviour modality during social interactions for both species. The ChimpFACS Extension for bonobos is an objective coding scheme for measuring facial movements in bonobos, designed to be used in conjunction with ChimpFACS. This coding scheme extension will allow us to better understand bonobos' behaviour and communication, with practical applications for assessing their welfare, particularly in human care. It also provides a framework for comparing primate species, contributing to insights into the origin and evolution of facial emotion and communication.
https://peerj.com/articles/19484/

PLoS One

PAPERS

JACOPO GENNAI et al – Buca della Iena and Grotta del Capriolo: New chronological, lithic, and faunal analyses of two late Mousterian sites in Central Italy
New radiocarbon, lithic, faunal, and documentary analyses of two sites, Buca della Iena and Grotta del Capriolo, located in Tuscany (Central Italy) and excavated in the late 1960s', are presented. The new analyses significance will be evaluated within the late Neanderthal occupation in the northwestern Italian peninsula and provide insights into their demise. Reassessment of stratigraphical and fieldwork documentation identified areas of stratigraphic reliability, supporting robust interpretations. Radiocarbon dating reveals broadly contemporaneous occupations at both sites between 50–40 ka cal BP, with Buca della Iena showing occupation from approximately 47 to 42.5 ka cal BP. Lithic analyses demonstrate the consistent application of the same chaîne opératoire across both sites. Faunal analyses indicate that carnivores, particularly Crocuta spelaea, were the dominant accumulating agents in Buca della Iena, while limited preservation at Grotta del Capriolo

prevents detailed taxonomic determination. However, hominin presence at both sites is evidenced by cut-marked bones. This study provides new perspectives on the Middle-to-Upper Palaeolithic transition in the northwestern Italian peninsula.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0315876

EMILY COCO & RADU IOVITA – Agent-based simulations reveal the possibility of multiple rapid northern routes for the second Neanderthal dispersal from Western to Eastern Eurasia

Genetic and archaeological evidence imply a second major movement of Neanderthals from Western to Central and Eastern Eurasia sometime in the Late Pleistocene. The genetic data suggest a date of 120–80 ka for the dispersal and the archaeological record provides an earliest date of arrival in the Altai by ca. 60 ka. Because the number of archaeological sites linking the two regions is very small, the exact route taken and its timing have been the matter of considerable debate. In particular, climate change in this period modified landscapes considerably, changing the cost of moving in different directions. Here, we apply agent-based least-cost path simulations for the first time to Neanderthals, showing that they most likely took a northern route through the Urals and southern Siberia under all climate scenarios. Agents leaving either the southern or the northern Caucasus Mountains reach the Altai in less than 2000 years during two time windows when the climate was mild, in MIS 5e (the Last Interglacial) and in MIS 3. The latter coincides with the dated presence of Neanderthals at Chagyrskaya and Okladnikov Caves in the Altai. The results of this modeling approach demonstrate a remarkable east-west geographic connectivity of northern Eurasia via river corridors despite the presumed barriers of the Ural Mountains and major north-south flowing rivers. Our results highlight the unique strengths of agent-based simulations to reconstruct pathways for ancient migrations.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0325693

KAYLA B. WORTHEY et al with JEAN-JACQUES HUBLIN – Expansion of forest cover and coeval shifts in Later Stone Age land-use at Taforalt and Rhafas Caves, Morocco, as inferred from carbon isotopes in ungulate tooth enamel

Later Stone Age (Iberomaurusian) hunter-gatherer groups in northwestern Africa appear to have experienced a major reorganization of land-use strategies and settlement dynamics around 15–13 cal ka BP, which broadly corresponds to the globally recognized Greenland Interstadial 1 (Bølling-Allerød) climate interval. However, our understanding of the local impacts of this interval on environments in Morocco is incomplete, as is our understanding of the strength of the relationship, if any, between paleoenvironmental change and human behavior in the Moroccan Later Stone Age. This paper reconstructs changes through time in local forest canopy cover during the Later Stone Age around the archaeological cave sites of Taforalt and Rhafas (northeastern Morocco), using stable isotopes of carbon in ungulate tooth enamel. Results indicate a close link between tree cover expansion during Greenland Interstadial 1 and changes in land-use behaviors, which at Taforalt included the exploitation of storable oak and pine-derived plant foods and greater intensity of site occupation. High local productivity of nut-bearing trees paired with regional increases in human population densities likely contributed to greater intensity of occupations at Taforalt and Rhafas during Greenland Interstadial 1.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0325691

RAHMAT ABBASNEJAD SERESTI, XINYING ZHOU & SEYYED KAMAL ASADI OJAEI – The oldest Pottery Neolithic (PN) culture of northeastern Iran: First absolute dating from eastern Mazandaran plains

In the past, establishing a clear chronology for the Epipalaeolithic and Neolithic periods in eastern Mazandaran proved challenging. A major obstacle had been the lack of radiocarbon dating. Previous dates provided by Coon and McBurney were not considered reliable, even after recalibrations. However, over the last fifteen years, new archaeological fieldwork and research have significantly enhanced our understanding of these periods. Recent excavations at the PN sites of Touq Tappeh and Tappeh Valiki have provided new information about the Epipalaeolithic and Neolithic chronology and dating. The sites yielded the oldest dating of the PN in northeastern Iran so far, making the PN of eastern Mazandaran start at least from the first half of the 7th millennium BC and lasted until the early 6th millennium BC (c. 6600–5800 BC). While Tappeh Valiki represents the oldest dates, the PN periods may have started in the region even earlier, given the presence of potteries from the lowest layers of the site. Analysis of the available material from these sites through dating indicates strong regional connections, while also showing inter-regional connections. The new dating from the old and new Epipalaeolithic and Neolithic sites of eastern Mazandaran suggests there is no gap between them, which is not surprising given the favorable environment during the early Holocene.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0322478

Royal Society Open Science

PAPERS

LYDIA PAULIN SCHIDELKO et al – Do Theory of Mind and Mental Time Travel abilities build on joint cognitive foundations?

Higher cognition is special in that it goes beyond representing the here and now. Two relevant forms of such thinking are Theory of Mind (ToM) that enables us to represent others' perspectives, and Mental Time Travel (MTT) that enables us to represent other points in time. The present studies investigate how these capacities are related in development. Do they build on the same cognitive foundations and thus emerge together? Do higher-order forms of the two abilities rely on

analogous recursive embedding and thus progress in parallel and coordinated ways? We addressed these questions in four studies with 3- to 9-year-old children (N = 395). ToM was operationalized as first-, second- and third-order false belief understanding. MTT was operationalized as reasoning about future possibilities (first-order), counterfactual reasoning (second-order) and anticipating counterfactual emotions (third-order). Study 1 shows a stepwise development of both ToM and MTT and a moderate consistency of performance patterns. However, across all four studies, we did not find robust correlations between first-, second- and third-order tasks of ToM and MTT, respectively. Overall, these results show stepwise and parallel trajectories in ToM and MTT, but do not provide stringent evidence for a joint cognitive foundation of the two capacities.
https://royalsocietypublishing.org/doi/10.1098/rsos.241960

Trends in Cognitive Sciences

PAPERS

PHILIP CORLETT et al – Pseudosocial cognition and paranoia
It has been argued that social processes are relevant to belief formation and maintenance and thence to persecutory delusions – the fixed false beliefs that others intend harm. We call this the social turn in delusions research. It suggests that paranoia is the purview of a specialized mechanism for coalitional cognition – thinking about group membership and reputation management. Here, we suggest instead that a simpler, pseudosocial learning mechanism may underwrite persecutory and other delusions. We make our case in terms of computations (prediction, not coalition), algorithm (association rather than recursion), and implementation (dopaminergic domain-general rather than social-specific regions). We conclude with suggestions for adversarial collaboration that will clarify the contributions of domain-general versus social-specific processes to delusions.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(25)00146-9

ANTONIA DÜFELD et al – Social odor as a source of learning in human infants
Maternal odor has recently emerged as an important but ill-understood factor in sociocognitive learning in early human development. We propose that social odor plays its unique role in the first year of life through dissociable affective and perceptual mechanisms. These mechanisms yield distinct predictions for future studies of social odor.
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(25)00089-0

STANISLAS DEHAENE, MATHIAS SABLÉ-MEYER & LORENZO CICCIONE – Origins of numbers: a shared language-of-thought for arithmetic and geometry?
Concepts of exact number are often thought to originate from counting and the successor function, or from a refinement of the approximate number system (ANS). We argue here for a third origin: a shared language-of-thought (LoT) for geometry and arithmetic that involves primitives of repetition, concatenation, and recursive embedding. Applied to sets, those primitives engender concepts of exact integers through recursive applications of additions and multiplications. Links between geometry and arithmetic also explain the emergence of higher-level notions (squares, primes, etc.). Under our hypothesis, understanding a number means having one or several mental expressions for it, and their minimal description length (MDL) determines how easily they can be mentally manipulated. Several historical, developmental, linguistic, and brain imaging phenomena provide preliminary support for our proposal.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(25)00059-2

SHARNA D. JAMADAR et al – The metabolic costs of cognition
Cognition and behavior are emergent properties of brain systems that seek to maximize complex and adaptive behaviors while minimizing energy utilization. Different species reconcile this trade-off in different ways, but in humans the outcome is biased towards complex behaviors and hence relatively high energy use. However, even in energy-intensive brains, numerous parsimonious processes operate to optimize energy use. We review how this balance manifests in both homeostatic processes and task-associated cognition. We also consider the perturbations and disruptions of metabolism in neurocognitive diseases.
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(24)00319-X

SAMUEL A. MEHR – Core systems of music perception
Human musicality is supported by two distinct systems of representation: one for tonal perception, which contextualizes pitch input in reference to a hierarchy of tones; and one for metrical perception, which contextualizes temporal input in reference to a hierarchy of rhythmic groupings. Growing evidence suggests that the two systems are universal, automatic, encapsulated, and relatively early-developing. But like speech perception, and unlike several other perceptual systems, they appear to be uniquely human. The systems of tonal and metrical perception form a foundational structure for musicality that, when combined with the processing of other acoustical information (e.g., timbre or auditory scenes), and applied in conjunction with other cognitive domains, yields a human psychology of music.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(25)00138-X

Trends in Ecology and Evolution

PAPERS

CRISTIÁN GUTIÉRREZ-IBÁÑEZ et al – How do big brains evolve?

In both birds and mammals, variation in brain size predominantly reflects variation in mass or volume of the pallium (neocortex) and, to a lesser extent, of the cerebellum, suggesting convergent coevolution of brains and cognition. When brain measures are based on neuron counts, however, a surprisingly different picture emerges: The number of neurons in the cerebellum surpasses those in the pallium of all mammals (including humans and other primates) and in many but not all birds studied to date. In particular, parrots and corvids, clades known for cognitive abilities that match those of primates, have brains that contain more pallial than cerebellar neurons. Birds and mammals may thus have followed different evolutionary routes of pallial–cerebellar coordination behind enhanced cognitive complexity.
https://www.cell.com/trends/ecology-evolution/abstract/S0169-5347(25)00063-1

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