

## EAORC BULLETIN 1,062 – 22 October 2023

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## NOTICES

### 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.

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### EDITORIAL INTERJECTIONS

Comments in curly brackets are editorial interjections. The Editor reserves the right to be wrong.

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### OTHER PUBLICATIONS – What made us “hunter-gatherers of words”

*In Frontiers in Neuroscience 17:1080861 (2023).*

#### **CEDRIC BOECKX – What made us “hunter-gatherers of words”**

This paper makes three interconnected claims: (i) the “human condition” cannot be captured by evolutionary narratives that reduce it to a recent ‘cognitive modernity’, nor by narratives that eliminates all cognitive differences between us and our closest extinct relatives, (ii) signals from paleogenomics, especially coming from deserts of introgression but also from signatures of positive selection, point to the importance of mutations that impact neurodevelopment, plausibly leading to temperamental differences, which may impact cultural evolutionary trajectories in specific ways, and (iii) these trajectories are expected to affect the language phenotypes, modifying what is being learned and how it is put to use. In particular, I hypothesize that these different trajectories influence the development of symbolic systems, the flexible ways in which symbols combine, and the size and configurations of the communities in which these systems are put to use.

{Thanks to Chris Knight for this. I missed it in my weekly round-up.}

<https://www.frontiersin.org/articles/10.3389/fnins.2023.1080861/full>

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## NEWS

### NATURE BRIEFING – Why assembly theory got us all riled up

What is life and how did it arise? A recent paper grappled with these eternal questions using a method called ‘assembly theory’ — and kicked a hornet’s nest in the scientific community. Assembly theory is a framework for understanding how complexity and evolution emerge in nature, before biological building blocks arise. Its attempts to bridge physics and biology tap into “a longstanding tension” between the fields, writes science journalist Philip Ball. “There is an inglorious history of other scientists (physicists in particular) barging into biology only to contribute very little.”

<https://www.chemistryworld.com/opinion/will-the-assembly-theory-imbroglio-do-anything-for-evolution/4018232.article>

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### NATURE BRIEFING – Neanderthals hunted cave lions

A spear mark on the 48,000-year-old skeleton of a cave lion (*Panthera spelaea*) is the oldest evidence of Neanderthals hunting the ice-age predators. The puncture crater on the big cat’s rib, initially thought to be a bite mark made by another animal, is probably the result of a fatal stab with a wooden spear. And Neanderthal hunters were probably after more than just meat: a set of cave-lion bones from about 190,000 years ago shows that care had been taken to preserve the cat’s paws and claws as part of the pelt.

<https://www.science.org/content/article/neanderthals-hunted-and-revered-cave-lions>

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### SCIAM NEWS – Grammar Changes How We See, an Australian Language Shows

An Aboriginal language provides unexpected insight into how language influences perception.

<https://www.scientificamerican.com/article/grammar-changes-how-we-see-an-australian-language-shows/>

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## PUBLICATIONS

### Animal Behaviour

#### PAPERS

#### **PAUL DEUTCHMAN et al with REDOUAN BSHARY – Punishment is sensitive to outside options in humans but not in cleaner fish (*Labroides dimidiatus*)**

Across human and animal societies, punishment is used as a means of responding to cheating and modifying the behaviour of others. A growing body of work shows that human punishment decisions involve representing both the outcomes of transgressions as well as whether a transgressor chose to do wrong. An important question in comparative cognition is whether nonhuman animals demonstrate a similar sensitivity to choice when punishing. Understanding whether and to what extent animals integrate information about choice into their punishment decisions can shed light on the selective pressures

and cognitive mechanisms that shape punishment. Here we explore this question by comparing punishment in cooperative pairs of reef-dwelling cleaner wrasses, *Labroides dimidiatus*, and humans, *Homo sapiens*. In study 1, we investigate whether punishment in adult male cleaners is influenced by whether females had a choice to cheat. In study 2, we ask the same question of human adults, using a novel task inspired by the cooperative interactions between pairs of cleaners and their client fish. Our results support previous work finding that punishment of cheating in humans is sensitive to whether transgressors chose to cheat: they punished more when the alternative option was cooperation. However, we did not find a similar sensitivity to alternative options in cleaners. Our results provide a direct comparison of the role of alternative options in punishment decisions in humans and a distantly related cooperative species. We suggest that important cognitive constraints may be in place that limit cleaners' ability to simultaneously represent both the choice a transgressor makes as well as the choices they could have made.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002130>

#### **SHENG-FENG SHEN et al – Group size and the resolution of insider–outsider conflict in animal societies**

Although social group size and stability are key areas of interest for studying the evolution and maintenance of animal societies, the evolution of group membership control and how that affects the resulting group size have not been fully explored. Here we develop a game-theoretical model that considers how social and ecological factors jointly affect the resolution of conflict over group size between current group members (insiders) and potential joiners (outsiders). Our model predicts that group size will more closely approach the optimum for insiders when the potential conflict between insiders and outsiders is large, as well as when the cost of engaging in social conflict is high. We also show that the joining effort, repelling effort, cost of selfishness and genetic relatedness have interacting effects on conflict resolution between insiders and outsiders and, thus, on expected group size and structure. Our model further predicts that the expected group size will increase as genetic relatedness between insiders and an outsider increases, assuming that the direct fitness cost for insiders to accept an outsider is relatively large or that the benefit to the outsider joining is small. Ultimately, our model synthesizes previous insider–outsider conflict models to generate a framework for understanding the evolution of both group membership control and the size and structure of the resulting social groups.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347223002129>

#### **SARAH L. JACOBSON et al – Innovating to solve a novel puzzle: wild Asian elephants vary in their ability to problem solve**

An animal's capacity for innovation or solving novel problems likely has important implications for how quickly they can adapt to environmental change. Asian elephants, *Elephas maximus*, living in zoos have previously demonstrated a capacity to innovate, but problem solving has never been studied experimentally in a wild elephant population. We installed puzzle boxes with multiple possible solutions inside a protected area in western Thailand to determine individual variation in innovation, as well as other behavioural traits associated with elephants' problem solving, including persistence, exploratory diversity and neophilia. We recorded 77 elephants approaching the puzzle box, with 44 interacting with the box in their first exposure. Individuals varied widely in their success opening the doors of the puzzle box. Such success was influenced by persistence and exploratory diversity in both the first interaction as well as across multiple interactions. However, when considering each individual's overall innovation scores, which represented how many different doors elephants were able to open across all of their interactions with the puzzle box, only greater persistence and interaction number were associated with reaching a higher innovation score. We observed that elephants who interacted with the box multiple times learned to open a door of any type more quickly as their interactions increased, but we did not see evidence of learning to open specific door types over time. Overall, this study about how innovation and its associated behaviours vary in wild elephants not only informs our understanding of how a capacity for problem solving is expressed, but also how well elephants may be able to adapt to, overcome or avoid increasingly frequent interactions with humans within their natural habitat.

<https://www.sciencedirect.com/science/article/abs/pii/S000334722300218X>

#### **WALTER D. KOENIG et al – Territory inheritance and the evolution of cooperative breeding in the acorn woodpecker**

There are two main hypotheses for why offspring in cooperatively breeding taxa delay dispersal and remain on their natal territory rather than disperse. First, ecological constraints may force offspring to remain on their natal territory until a reproductive opportunity presents itself in an otherwise saturated habitat. Alternatively, delaying dispersal and helping kin may increase an offspring's inclusive fitness. One means by which offspring might enhance their direct fitness by delaying dispersal is by inheriting breeding status on their natal territory. Such territory inheritance regularly occurs in acorn woodpeckers, *Melanerpes formicivorus*, a species whose social groups consist of a cooperatively polygynandrous breeding core along with nonbreeding helpers of both sexes that are offspring from prior breeding efforts. Here we examine the life-history differences and the fitness consequences of birds attaining breeder status by either inheriting their natal territory or dispersing to a new territory. Despite significant differences in life history, including the mean territory quality on which individuals bred and mean co-breeder coalition size of breeders, we found no statistical differences in either direct or kin-selected (indirect) fitness benefits for breeders that inherited and dispersed. The incidence of birds engaging in both strategies, inheriting their natal territory and later dispersing, or dispersing but later returning to inherit their natal territory, further reduces the potential direct fitness benefits of inheritance relative to dispersal, since neither precludes the other.

Territory inheritance is an important, alternative means of achieving breeding status in this population. However, ecological constraints to dispersal and kin-selected fitness benefits as a helper likely play larger roles driving the acorn woodpecker's extraordinary social system.

<https://www.sciencedirect.com/science/article/pii/S0003347223002208>

## Biology Letters

### PAPERS

#### **KNUT WIIK VOLLSET, IAN DOHOO & ROBERT J. LENNOX – The paradox of predation studies**

Understanding the causal relationships that contribute to mortality in populations is a priority for epidemiology, animal husbandry and ecology. Of all the sources of mortality in nature, predation is perhaps the most important, while simultaneously being one of the most difficult to study and understand. In this opinion piece, we use the epidemiological concept of the sufficient-component cause model to outline why we believe that predation studies often misrepresent predators as sufficient cause of death (or natural mortality) in ecological studies. This is pivotal in conservation biology because such studies have often led to demands for predator removal throughout the world. We use the sufficient-component cause model to illustrate the paradox that multiple studies, each studying singular putative causes of mortality (including predation), will sum to more than 100% mortality when added together. We suggest that the sufficient-component framework should be integrated into both fundamental and applied ecology to better understand the role of predators in natural ecosystems.

<https://royalsocietypublishing.org/doi/10.1098/rsbl.2023.0354>

## eLife

### PAPERS

#### **MAHEEN SIDDIQUI et al – Using multi-modal neuroimaging to characterise social brain specialisation in infants**

The specialised regional functionality of the mature human cortex partly emerges through experience-dependent specialisation during early development. Our existing understanding of functional specialisation in the infant brain is based on evidence from unitary imaging modalities and has thus focused on isolated estimates of spatial or temporal selectivity of neural or haemodynamic activation, giving an incomplete picture. We speculate that functional specialisation will be underpinned by better coordinated haemodynamic and metabolic changes in a broadly orchestrated physiological response. To enable researchers to track this process through development, we develop new tools that allow the simultaneous measurement of coordinated neural activity (EEG), metabolic rate and oxygenated blood supply (broadband near-infrared spectroscopy) in the awake infant. In 4-to-7-month-old infants, we use these new tools to show that social processing is accompanied by spatially and temporally specific increases in coupled activation in the temporal-parietal junction, a core hub region of the adult social brain. During non-social processing coupled activation decreased in the same region, indicating specificity to social processing. Coupling was strongest with high frequency brain activity (beta and gamma), consistent with the greater energetic requirements and more localised action of high frequency brain activity. The development of simultaneous multi-modal neural measures will enable future researchers to open new vistas in understanding functional specialisation of the brain.

<https://elifesciences.org/articles/84122>

#### **OLGA KEPINSKA et al – Auditory cortex anatomy reflects multilingual phonological experience**

This study explores the relationship between the anatomy of the auditory cortex and multilingual experience, shedding light on the complex mechanisms of auditory processing in humans. Integrating previous research on auditory information processing and the impact of bi- and multilingualism on brain structure, we investigate how the morphology of auditory brain regions reflects individuals' language experience and, more specifically, their phonological repertoire. Leveraging two distinct samples comprising over 200 participants, each exposed to between 1 and 7 languages encompassing 36 different languages, we explore whether the morphological variability of auditory brain regions reflects individual language experience, specifically focusing on the phonological repertoire. Additionally, we examine the potential influence of typological distances between languages spoken by multilingual individuals on the neural signatures of multilingualism within the auditory cortex. Our findings revealed a relationship between the average thickness of the left and right second transverse temporal gyrus (TTG) and participants' language experience. Model comparisons demonstrated that the inclusion of phoneme-level information in the language experience index accounted for the greatest variance in average TTG thickness (bilaterally). The direction of this effect was negative, indicating that a more extensive and more phonologically diverse language experience was associated with thinner cortices in the second TTG. Across two independent datasets, we provide robust evidence linking the degree of language experience and typological distance between languages to cortical thickness in early auditory brain regions. We propose that this phenomenon may reflect experience-driven pruning and neural efficiency, warranting further investigation through longitudinal studies of language acquisition. Moreover, our findings support the notion that experiences with typologically similar languages differ from those with typologically distant languages, offering valuable insights into the intricate relationship between language diversity and brain structure. Our findings also indicate that early

auditory regions seem to represent phoneme-level cross-linguistic information, contrary to the most established models of language processing in the brain, which suggest that phonological processing happens in more lateral posterior STG and STS. <https://elifesciences.org/reviewed-preprints/90269>

**EMILY A.M. PHILLIPS et al – Endogenous oscillatory rhythms and interactive contingencies jointly influence infant attention during early infant-caregiver interaction**

Almost all early cognitive development takes place in social contexts. At the moment, however, we know little about the neural and cognitive mechanisms that drive infant attention during social interactions. Recording EEG during naturalistic caregiver-infant interactions (N=66), we compare two different accounts. Attentional scaffolding perspectives emphasise the role of the caregiver in structuring the child's behaviour, whilst active learning models focus on motivational factors, endogenous to the infant, that guide their attention. Our results show that, already by 12-months, intrinsic cognitive processes control infants' attention: fluctuations in endogenous oscillatory neural activity associated with changes in infant attentiveness, and predicted the length of infant attention episodes towards objects. In comparison, infant attention was not forwards-predicted by caregiver gaze, or modulations in the spectral and temporal properties of their caregiver's speech. Instead, caregivers rapidly modulated their behaviours in response to changes in infant attention and cognitive engagement, and greater reactive changes associated with longer infant attention. Our findings suggest that shared attention develops through interactive but asymmetric, infant-led processes that operate across the caregiver-child dyad. <https://elifesciences.org/reviewed-preprints/88775>

## Evolutionary Anthropology

### ARTICLES

**ISOBEL WISHER et al – Beyond the Image: Interdisciplinary and contextual approaches to understanding symbolic cognition in Paleolithic parietal art**

Conference review.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.21996>

### PAPERS

**STEPHANIE B. LEVY & RICHARD G. BRIBIESCAS – Hierarchies in the energy budget: Thyroid hormones and the evolution of human life history patterns**

The evolution of human life history characteristics required dramatic shifts in energy allocation mechanisms compared with our primate ancestors. Thyroid hormones, such as thyroxine (T4) and triiodothyronine (T3), are sensitive to energy balance, and are significant determinants for both tissue-specific and whole-body metabolic rate. Thus, thyroid hormones are in part responsible for setting the body's overall energy budget and likely played an important role in the evolution of human life history patterns. We propose that the dynamics of mammalian T3 production, uptake, and action have evolved so that energy allocation prioritizes the high demands of brain development and functioning, often at the expense of growth and reproduction. This paper explores the role of thyroid hormone dynamics in the evolution of human encephalization, prolonged childhood and adolescence, long lifespans, reproduction, and human aging.

<https://onlinelibrary.wiley.com/doi/full/10.1002/evan.22000>

## Frontiers in Artificial Intelligence

### PAPERS

**JUN INUKAI et al – Recursive Metropolis-Hastings naming game: symbol emergence in a multi-agent system based on probabilistic generative models**

In the studies on symbol emergence and emergent communication in a population of agents, a computational model was employed in which agents participate in various language games. Among these, the Metropolis-Hastings naming game (MHNG) possesses a notable mathematical property: symbol emergence through MHNG is proven to be a decentralized Bayesian inference of representations shared by the agents. However, the previously proposed MHNG is limited to a two-agent scenario. This paper extends MHNG to an N-agent scenario. The main contributions of this paper are twofold: (1) we propose the recursive Metropolis-Hastings naming game (RMHNG) as an N-agent version of MHNG and demonstrate that RMHNG is an approximate Bayesian inference method for the posterior distribution over a latent variable shared by agents, similar to MHNG; and (2) we empirically evaluate the performance of RMHNG on synthetic and real image data, i.e., YCB object dataset, enabling multiple agents to develop and share a symbol system. Furthermore, we introduce two types of approximations—one-sample and limited-length—to reduce computational complexity while maintaining the ability to explain communication in a population of agents. The experimental findings showcased the efficacy of RMHNG as a decentralized Bayesian inference for approximating the posterior distribution concerning latent variables, which are jointly shared among agents, akin to MHNG, although the improvement in ARI and  $\kappa$  coefficient is smaller in the real image dataset condition. Moreover, the utilization of RMHNG elucidated the agents' capacity to exchange symbols. Furthermore, the study discovered that even the computationally simplified version of RMHNG could enable symbols to emerge among the agents.

<https://www.frontiersin.org/articles/10.3389/frai.2023.1229127/full>



## Frontiers in Psychology

### PAPERS

#### **YURIA CELIDWEN & DACHER KELTNER – Kin relationality and ecological belonging: a cultural psychology of Indigenous transcendence**

In this article, we consider prosociality through the lens of an Indigenous “ethics of belonging” and its two constitutive concepts: kin relationality and ecological belonging. Kin relationality predicates that all living beings and phenomena share a familial identity of interdependence, mutuality, and organization. Within the value system of ecological belonging, an individual’s identity is constituted in relation to the natural environment, centered on the sentiments of responsibility and reverence for Nature. We detail how Indigenous perspectives upon prosociality differ from Western scientific accounts in terms of the motives, scope, and rewards of altruistic action. Grounded in this understanding, we then profile three self-transcendent states, compassion, gratitude, and awe, and their similarities across Indigenous and Western approaches, and how kin relationality and ecological belonging give rise to cultural variations. We consider convergent insights across Indigenous and Western science concerning the role of ritual and narrative and the cultural cultivation of kin relationality and ecological belonging. We conclude by highlighting how these two core concepts might guide future inquiry in cultural psychology.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.994508/full>

#### **ARITZ IRURTZUN – Biological, cultural, and environmental factors catalyzing the emergence of (alternate) sign languages**

In the last decades, there has been a growing number of studies analyzing the extent to which and the mechanisms by which language-external factors affect particular aspects of the design of human language(s). Here I want to make a plea for what I consider are the clearest and most spectacular cases of language-external factors variably affecting language design. I argue that the choice of modality of a language (spoken/gestural) can be independently determined by (i) biological, (ii) cultural, and (iii) environmental factors. What is more, these will not be factors affecting cumulative diachronic language change, but rather language design ex nihilo —to the extent that these are “new” languages, i.e., not derived by regular diachronic change of the local oral language structures<sup>1</sup>. Thus, they constitute evidence against any a priori skeptical view on the possibility for language-external factors to substantially affect core aspects of the grammar of languages (see e.g., Benítez-Burraco and Moran, 2018 for discussion).

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1224437/full>

#### **CRENGUȚA MIHAELA MACOVEI, ȘTEFANIA BUMBUC & FABIANA MARTINESCU-BĂDĂLAN – The role of personality traits In mediating the relation between fear of negative evaluation and social interaction anxiety**

Social interaction anxiety and fear of negative evaluation have many maladaptive outcomes and, in order to counteract their effects, it is essential to identify those psychological or social factors that make people vulnerable to them. One of these factors is the individual’s personality structure: some personality traits increase the individuals’ vulnerability to symptoms of social anxiety, while others protect them.

The aim of this paper is to analyse the role of HEXACO personality traits in mediating the relationship between fear of negative evaluation and social anxiety, in a sample of 352 cadets from the Land Forces Academy of Sibiu. The relationships between these concepts were analysed using structural equation modeling (SEM) in several hypothetical models, two of which were ultimately validated.

In the first model, the fear of negative evaluation has an indirect effect on social interaction anxiety through the mediation of extraversion, conscientiousness, and altruism, separately. Furthermore, extraversion, conscientiousness, and altruism play a serial mediating role in the association between the fear of negative evaluation and social interaction anxiety. In the second model, the fear of negative evaluation has an indirect effect on social interaction anxiety through the mediation of social boldness, liveliness, and organization, separately, but not through altruism. Social boldness, liveliness, and organization played a serial mediating role in the relationship between the two constructs, while altruism moderated the relationship between liveliness, organization, and social interaction anxiety.

Analysing the relationship between the individuals’ personality traits, social anxiety, and fear of negative evaluation facilitated the identification of ways to cultivate desirable behaviours in social environments typified by compliance, discipline, uniformity, and rigor.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1268052/full>

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## Interface: Journal of the Royal Society

### PAPERS

#### **NIKHIL PHANIRAJ et al with JUDITH M. BURKART – Who is calling? Optimizing source identification from marmoset vocalizations with hierarchical machine learning classifiers**

With their highly social nature and complex vocal communication system, marmosets are important models for comparative studies of vocal communication and, eventually, language evolution. However, our knowledge about marmoset vocalizations

predominantly originates from playback studies or vocal interactions between dyads, and there is a need to move towards studying group-level communication dynamics. Efficient source identification from marmoset vocalizations is essential for this challenge, and machine learning algorithms (MLAs) can aid it. Here we built a pipeline capable of plentiful feature extraction, meaningful feature selection, and supervised classification of vocalizations of up to 18 marmosets. We optimized the classifier by building a hierarchical MLA that first learned to determine the sex of the source, narrowed down the possible source individuals based on their sex and then determined the source identity. We were able to correctly identify the source individual with high precisions (87.21%–94.42%, depending on call type, and up to 97.79% after the removal of twins from the dataset). We also examine the robustness of identification across varying sample sizes. Our pipeline is a promising tool not only for source identification from marmoset vocalizations but also for analysing vocalizations of other species.

<https://royalsocietypublishing.org/doi/10.1098/rsif.2023.0399>

## Mind & Language

### REVIEWS

#### **BARBU REVCU & GERGELY CSIBRA – The missing link between core knowledge and language**

*Review of ‘What babies know, volume 1’ by Elizabeth Spelke. Oxford University Press (2022).*

Spelke’s book defends two hypotheses about human cognition. First, humans and other species are endowed with core knowledge systems—innate computational structures that use abstract concepts to represent various aspects of the environment. Second, humans, and only humans, acquire natural languages, whose syntax and compositional semantics allow them to construct new concepts by combining the outputs of core systems. We endorse the first hypothesis but doubt that language acquisition alone explains the productivity of human cognition. In particular, we argue against the claim that infants use aspects of language to develop a new conception of other people.

<https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12482>

## Nature Communications

### PAPERS

#### **LINGYUN ZHAO & XIAOQIN WANG – Frontal cortex activity during the production of diverse social communication calls in marmoset monkeys**

Vocal communication is essential for social behaviors in humans and non-human primates. While the frontal cortex is crucial to human speech production, its role in vocal production in non-human primates has long been questioned. It is unclear whether activities in the frontal cortex represent diverse vocal signals used in non-human primate communication. Here we studied single neuron activities and local field potentials (LFP) in the frontal cortex of male marmoset monkeys while the animal engaged in vocal exchanges with conspecifics in a social environment. We found that both single neuron activities and LFP were modulated by the production of each of the four major call types. Moreover, neural activities showed distinct patterns for different call types and theta-band LFP oscillations showed phase-locking to the phrases of twitter calls, suggesting a neural representation of vocalization features. Our results suggest important functions of the marmoset frontal cortex in supporting the production of diverse vocalizations in communication.

<https://www.nature.com/articles/s41467-023-42052-5>

## Nature Communications Biology

### PAPERS

#### **RITA SORRENTINO et al with JEAN-JACQUES HUBLIN – Morphological and evolutionary insights into the keystone element of the human foot’s medial longitudinal arch**

The evolution of the medial longitudinal arch (MLA) is one of the most impactful adaptations in the hominin foot that emerged with bipedalism. When and how it evolved in the human lineage is still unresolved. Complicating the issue, clinical definitions of flatfoot in living *Homo sapiens* have not reached a consensus. Here we digitally investigate the navicular morphology of *H. sapiens* (living, archaeological, and fossil), great apes, and fossil hominins and its correlation with the MLA. A distinctive navicular shape characterises living *H. sapiens* with adult acquired flexible flatfoot, while the congenital flexible flatfoot exhibits a ‘normal’ navicular shape. All *H. sapiens* groups differentiate from great apes independently from variations in the MLA, likely because of bipedalism. Most australopith, *H. naledi*, and *H. floresiensis* navicular shapes are closer to those of great apes, which is inconsistent with a human-like MLA and instead might suggest a certain degree of arboreality. Navicular shape of OH 8 and fossil *H. sapiens* falls within the normal living *H. sapiens* spectrum of variation of the MLA (including congenital flexible flatfoot and individuals with a well-developed MLA). At the same time, *H. neanderthalensis* seem to be characterised by a different expression of the MLA.

<https://www.nature.com/articles/s42003-023-05431-8>



## Nature Human Behaviour

### PAPERS

#### **BONAN ZHAO, CHRISTOPHER G. LUCAS & NEIL R. BRAMLEY – A model of conceptual bootstrapping in human cognition**

To tackle a hard problem, it is often wise to reuse and recombine existing knowledge. Such an ability to bootstrap enables us to grow rich mental concepts despite limited cognitive resources. Here we present a computational model of conceptual bootstrapping. This model uses a dynamic conceptual repertoire that can cache and later reuse elements of earlier insights in principled ways, modelling learning as a series of compositional generalizations. This model predicts systematically different learned concepts when the same evidence is processed in different orders, without any extra assumptions about previous beliefs or background knowledge. Across four behavioural experiments (total  $n = 570$ ), we demonstrate strong curriculum-order and conceptual garden-pathing effects that closely resemble our model predictions and differ from those of alternative accounts. Taken together, this work offers a computational account of how past experiences shape future conceptual discoveries and showcases the importance of curriculum design in human inductive concept inferences.

<https://www.nature.com/articles/s41562-023-01719-1>

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## Neuron

### PAPERS

#### **ALI MAHMOODI et al – A frontopolar-temporal circuit determines the impact of social information in macaque decision making**

When choosing, primates are guided not only by personal experience of objects but also by social information such as others' attitudes toward the objects. Crucially, both sources of information—personal and socially derived—vary in reliability. To choose optimally, one must sometimes override choice guidance by personal experience and follow social cues instead, and sometimes one must do the opposite. The dorsomedial frontopolar cortex (dmFPC) tracks reliability of social information and determines whether it will be attended to guide behavior. To do this, dmFPC activity enters specific patterns of interaction with a region in the mid-superior temporal sulcus (mSTS). Reversible disruption of dmFPC activity with transcranial ultrasound stimulation (TUS) led macaques to fail to be guided by social information when it was reliable but to be more likely to use it when it was unreliable. By contrast, mSTS disruption uniformly downregulated the impact of social information on behavior.

[https://www.cell.com/neuron/fulltext/S0896-6273\(23\)00748-1](https://www.cell.com/neuron/fulltext/S0896-6273(23)00748-1)

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## New Scientist

### NEWS

#### **Early humans lived in Ethiopian highlands 2 million years ago**

A child's jawbone found in Ethiopia is one of the earliest fossils identified as *Homo erectus*, and shows ancient hominins settled in high-altitude areas.

<https://www.newscientist.com/article/2397291-early-humans-lived-in-ethiopian-highlands-2-million-years-ago/>

#### **A site used by ancient humans was also a latrine for giant hyenas**

Stone tools, mammal bones and fossilised faeces hint that hominins and hyenas scavenged for food at the same place 1.4 million years ago.

<https://www.newscientist.com/article/2397457-a-site-used-by-ancient-humans-was-also-a-latrine-for-giant-hyenas/>

### ARTICLES

#### **TIMOTHY REVELL – Why free will doesn't exist, according to Robert Sapolsky (Podcast)**

It's hard to let go of the idea that free will exists, but neuroscientist Robert Sapolsky says that society starts to look very different once you do.

<https://www.newscientist.com/article/2398369-why-free-will-doesnt-exist-according-to-robert-sapolsky/>

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## Philosophical Transactions of the Royal Society B

### PAPERS

#### **CHRISTOPHER J. MAYERL & REBECCA Z. GERMAN – Evolution, diversification and function of the maternal–infant dyad in mammalian feeding**

The evolution of the mother/infant dyad providing a source of nutrition for infants is essential for the origin and subsequent diversification of mammals. Despite the importance of this dyad, research on maternal and infant function is often treated independently. Our goal is to synthesize the work on maternal and infant function, discuss our own studies of suckling, and compare the origins of lactation and suckling with their ensuing diversification. Our central premise is that while extensive work has demonstrated variation across mammals in the maternal aspect of this system, very little has been done to address how this relates to infant function. We start with a discussion of the fundamental anatomy and physiology of both mother

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and infant. We next discuss the origin of mammary glands and milk, and infant suckling, which is distinct from their subsequent diversification. We then discuss the diversification of maternal and infant function, highlighting the evolutionary diversity present in maternal function (both anatomically and physiologically), before arguing that the diversity of infant function is unexplored, and needs to be better studied in the future. We end by discussing some of the holes in our understanding, and suggestions for future work that can address these lacunae.

<https://royalsocietypublishing.org/doi/10.1098/rstb.2022.0554>

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## PLoS Biology

### PAPERS

#### **TAMRA C. MENDELSON, GAIL L. PATRICELLI & EILEEN A. HEBETS – Could sexual selection be driven by the mistaken inferences of young females?**

A new evolutionary model of mate choice copying, published in PLOS Biology, aims to reconcile mismatches between theory and data by proposing that juvenile females mistakenly imprint on male phenotypes that were not in fact preferred by the female they copied.

<https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002321>

#### **FLORIAN SANDHAEGER et al – Abstract perceptual choice signals during action-linked decisions in the human brain**

Humans can make abstract choices independent of motor actions. However, in laboratory tasks, choices are typically reported with an associated action. Consequentially, knowledge about the neural representation of abstract choices is sparse, and choices are often thought to evolve as motor intentions. Here, we show that in the human brain, perceptual choices are represented in an abstract, motor-independent manner, even when they are directly linked to an action. We measured MEG signals while participants made choices with known or unknown motor response mapping. Using multivariate decoding, we quantified stimulus, perceptual choice, and motor response information with distinct cortical distributions. Choice representations were invariant to whether the response mapping was known during stimulus presentation, and they occupied a distinct representational space from motor signals. As expected from an internal decision variable, they were informed by the stimuli, and their strength predicted decision confidence and accuracy. Our results demonstrate abstract neural choice signals that generalize to action-linked decisions, suggesting a general role of an abstract choice stage in human decision-making.

<https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002324>

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## PLoS One

### PAPERS

#### **JOANA BELMIRO, XAVIER TERRADAS & JOÃO CASCALHEIRA – Creating frames of reference for chert exploitation during the Late Pleistocene in Southwesternmost Iberia**

Southwestern Iberia has played a key role in characterizing Late Pleistocene human ecodynamics. Among other aspects of human behavior, chert procurement and management studies in this region have received increasing attention in the past two decades, especially focusing on the sites showing repeated human occupation, such as the case of Vale Boi (Southern Portugal). However, these studies have been very limited in their geographical scope, and mostly focused on brief macroscopic descriptions of the raw materials. To further our knowledge of the relationship between regional availability of raw materials and its impact on human adaptations and mobility, a more detailed approach to characterizing geological sources is needed. This paper characterizes chert raw materials location, diversity, and availability in a geologically well-defined region of southern Portugal - the Algarve. Through macroscopic and petrographic approaches, we provide a detailed characterization of geological chert sources to build a frame of reference for chert exploitation in the region. Our results show that there are four main chert formations in Algarve, and that despite the within-source variability, sufficient differences at macroscopic and petrographic levels are present to allow clear source attribution. These results provide a baseline for raw material studies in archaeological assemblages across southwestern Iberia, that will be essential to further characterize the dynamics of human behavior in some of the most important eco-cultural niches.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0293223>

#### **LOUKAS GEORGE KOUNGOULOS, JANE BALME & SUE O'CONNOR – Dingoes, companions in life and death: The significance of archaeological canid burial practices in Australia**

The dingo, also known as the Australian native dog, was introduced in the late Holocene. Dingoes were primarily wild animals but a number resided in Aboriginal people's camps. Traditionally, these individuals were taken from wild litters before weaning and raised by Aboriginal people. It is generally believed that these dingoes were not directly provided for, and upon sexual maturity, returned to reproduce in the wild. However, some died while in the company of people and, were buried in occupation sites. This Australian practice parallels the burial of domestic dogs in many regions of the Asia-Pacific and beyond but has attracted very little research. We explore the historical and archaeological evidence for dingo burial, examining its different forms, chronological and geographic distribution, and cultural significance. Dingoes were usually buried in the same manner as Aboriginal community members and often in areas used for human burial, sometimes alongside people. This

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practice probably occurred from the time of their introduction until soon after European colonisation. We present a case study of dingo burials from Curracurrang Rockshelter (NSW) which provides insights into the lives of ancient tame dingoes, and suggests that domestication and genetic continuity between successive camp-dwelling generations may have occurred prior to European contact.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0286576>

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## PNAS

### PAPERS

#### **THOM SCOTT-PHILLIPS & CHRISTOPHE HEINTZ – Great ape interaction: Ladyginian but not Gricean**

Nonhuman great apes inform one another in ways that can seem very humanlike. Especially in the gestural domain, their behavior exhibits many similarities with human communication, meeting widely used empirical criteria for intentionality. At the same time, there remain some manifest differences, most obviously the enormous range and scope of human expression. How to account for these similarities and differences in a unified way remains a major challenge. Here, we make a key distinction between the expression of intentions (Ladyginian) and the expression of specifically informative intentions (Gricean), and we situate this distinction within a “special case of” framework for classifying different modes of attention manipulation. We hence describe how the attested tendencies of great ape interaction—for instance, to be dyadic rather than triadic, to be about the here-and-now rather than “displaced,” and to have a high degree of perceptual resemblance between form and meaning—are products of its Ladyginian but not Gricean character. We also reinterpret video footage of great ape gesture as Ladyginian but not Gricean, and we distinguish several varieties of meaning that are continuous with one another. We conclude that the evolutionary origins of linguistic meaning lie not in gradual changes in communication systems, but rather in gradual changes in social cognition, and specifically in what modes of attention manipulation are enabled by a species’ cognitive phenotype: first Ladyginian and in turn Gricean. The second of these shifts rendered humans, and only humans, “language ready.”

<https://www.pnas.org/doi/abs/10.1073/pnas.2300243120>

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## Proceedings of the Royal Society B

### PAPERS

#### **ROBIN E. MORRISON et al – Multiple mechanisms for inbreeding avoidance used simultaneously in a wild ape**

Mating with close kin can have considerable negative fitness consequences, which are expected to result in selective pressure for inbreeding avoidance mechanisms, such as dispersal, mate choice and post-copulatory biases. Captive studies have suggested that inbreeding avoidance through mate choice is far less widespread than expected and may be absent where other mechanisms already limit inbreeding. However, few studies have examined multiple mechanisms of inbreeding avoidance simultaneously, particularly in the wild. We use 13 years of detailed dispersal, copulation and paternity data from mountain gorillas to examine inbreeding avoidance. We find that partial dispersal of both sexes results in high kinship in multimale groups, but that copulations between close kin occur 40% less than expected. We find strong kin discrimination in mate choice, with significant avoidance of maternal kin but more limited avoidance of paternal kin. We find no evidence for post-copulatory inbreeding avoidance. Our analyses support familiarity-based mechanisms of kin identification and age-based avoidance that limits mating between fathers and daughters in their natal group. Our findings demonstrate that multiple complementary mechanisms for inbreeding avoidance can evolve in a single species and suggest that inbreeding avoidance through mate choice may enable more flexible dispersal systems to evolve.

<https://royalsocietypublishing.org/doi/10.1098/rspb.2023.1808>

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## Science

### PAPERS

#### **MARGHERITA MUSSI et al with JEAN-JACQUES HUBLIN – Early Homo erectus lived at high altitudes and produced both Oldowan and Acheulean tools**

In Africa, the scarcity of hominin remains found in direct association with stone tools has hindered attempts to link Homo habilis and Homo erectus with particular lithic industries. The infant mandible discovered in level E at Garba IV (Melka Kunture) on the highlands of Ethiopia is critical to this issue due to its direct association with an Oldowan lithic industry. Here, we use synchrotron imaging to examine the internal morphology of the unerupted permanent dentition and confirm its identification as Homo erectus. Additionally, we utilize new palaeomagnetic ages to show that (i) the mandible in level E is ca. 2 million-years-old, and represents one of the earliest Homo erectus fossils, and (ii) that overlying level D, ca. 1.95 million-years-old, contains the earliest known Acheulean assemblage.

<https://www.science.org/doi/10.1126/science.add9115>

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## Science Advances

### PAPERS

#### **CLAUDIO S. QUILODRÁN et al – Past human expansions shaped the spatial pattern of Neanderthal ancestry**

The worldwide expansion of modern humans (*Homo sapiens*) started before the extinction of Neanderthals (*Homo neanderthalensis*). Both species coexisted and interbred, leading to slightly higher introgression in East Asians than in Europeans. This distinct ancestry level has been argued to result from selection, but range expansions of modern humans could provide an alternative explanation. This hypothesis would lead to spatial introgression gradients, increasing with distance from the expansion source. We investigate the presence of Neanderthal introgression gradients after past human expansions by analyzing Eurasian paleogenomes. We show that the out-of-Africa expansion resulted in spatial gradients of Neanderthal ancestry that persisted through time. While keeping the same gradient orientation, the expansion of early Neolithic farmers contributed decisively to reducing the Neanderthal introgression in European populations compared to Asian populations. This is because Neolithic farmers carried less Neanderthal DNA than preceding Paleolithic hunter-gatherers. This study shows that inferences about past human population dynamics can be made from the spatiotemporal variation in archaic introgression.

<https://www.science.org/doi/10.1126/sciadv.adg9817>

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## The Innovation

### PAPERS

#### **CHRISTOPHER J. BAE et al – “Dragon Man” prompts rethinking of Middle Pleistocene hominin systematics in Asia**

Chibanian (Middle Pleistocene) hominin fossils that could not be easily assigned to *Homo erectus*, *H. neanderthalensis* or *H. sapiens* have traditionally been assigned to an all-inclusive group: “archaic *H. sapiens*”. In an insightful observation of the Chibanian record almost four decades ago however, Tattersall railed against the use of the word “archaic” in this sense when referring to the human fossil record, as he justifiably noted that no other biological organism has the word “archaic” attached to it. For example, no one refers to an earlier version of *Canis domesticus* as “archaic” *C. domesticus*. The ancestor of the domestic dog is, and always has been, considered to be *Canis lupus*. In Tattersall’s opinion it would seem that these “archaic *H. sapiens*” fossils should be assigned to one or more formal taxonomic names. As such, terms like archaic *H. sapiens*, mid-Pleistocene *Homo*, and Middle Pleistocene *Homo* have always been considered to be wastebasket taxa that includes way too much morphological variability for one proposed taxonomic group. Continuing to utilize wastebasket taxa only hinders any attempts to understand true phylogenetic and evolutionary relationships.

[https://www.cell.com/the-innovation/fulltext/S2666-6758\(23\)00155-8](https://www.cell.com/the-innovation/fulltext/S2666-6758(23)00155-8)

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## Trends in Cognitive Sciences

### PAPERS

#### **MARK DINGEMANSE & N.J. ENFIELD – Interactive repair and the foundations of language**

The robustness and flexibility of human language is underpinned by a machinery of interactive repair. Repair is deeply intertwined with two core properties of human language: reflexivity (it can communicate about itself) and accountability (it is used to publicly enforce social norms). We review empirical and theoretical advances from across the cognitive sciences that mark interactive repair as a domain of pragmatic universals, a key place to study metacognition in interaction, and a system that enables collective computation. This provides novel insights into the role of repair in comparative cognition, language development, and human–computer interaction. As an always-available fallback option and an infrastructure for negotiating social commitments, interactive repair is foundational to the resilience, complexity, and flexibility of human language.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(23\)00250-4](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00250-4)

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## Trends in Neurosciences

### PAPERS

#### **JAAN ARU, MATTHEW E. LARKUM & JAMES M. SHINE – The feasibility of artificial consciousness through the lens of neuroscience**

Interactions with large language models (LLMs) have led to the suggestion that these models may soon be conscious. From the perspective of neuroscience, this position is difficult to defend. For one, the inputs to LLMs lack the embodied, embedded information content characteristic of our sensory contact with the world around us. Secondly, the architectures of present-day artificial intelligence algorithms are missing key features of the thalamocortical system that have been linked to conscious awareness in mammals. Finally, the evolutionary and developmental trajectories that led to the emergence of living conscious organisms arguably have no parallels in artificial systems as envisioned today. The existence of living organisms depends on their actions and their survival is intricately linked to multi-level cellular, inter-cellular, and organismal processes culminating in agency and consciousness.

[https://www.cell.com/trends/neurosciences/fulltext/S0166-2236\(23\)00227-8](https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(23)00227-8)

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