

EAORC BULLETIN 1,115 – 27 October 2024

CONTENTS

NOTICES	3
PUBLICATION ALERTS.....	3
EDITORIAL INTERJECTIONS.....	3
NEWS	3
JOHN TEMPLETON FOUNDATION – Evolution Before the Origin of Life?	3
NATURE BRIEFING – How we get our heads around zero	4
NATURE BRIEFING – Humans comprehend sentences in a flash	4
SAPIENS – Unraveling a “Ghost” Neanderthal Lineage	4
SAPIENS – India’s Third Gender Rises Again.....	4
SAPIENS – What Our Skeletons Say About the Sex Binary.....	4
SAPIENS – What Ancient Gender Fluidity Taught Me About Modern Patriarchy	4
SCIENCEADVISER – Butterfly brains offer new insights into the evolution of learning and memory	4
SCIENCE DAILY – Butterfly brains reveal the tweaks required for cognitive innovation.....	5
SCIENCE DAILY – Crucial role of cerebellum in social and cognitive functioning.....	5
SCIENCE DAILY – Rare fossils of extinct elephant document earliest known instance of butchery in India	5
SCIENCE DAILY – Birth: It’s a tight squeeze for chimpanzees, too	5
SCIENCE.ORG NEWS – How humans evolved a starch-digesting superpower long before farming	5
PUBLICATIONS	5
Current Biology	5
ARTICLES	5
ALEX H. TAYLOR & MELISSA JOHNSTON – How do animals understand the physical world?	5
MICHAEL GROSS – Modelling moves.....	5
ANNA LINDERHOLM – Sedimentary DNA: Archaeology reinvented.....	5
PAPERS	5
PERNILLE M. SØRENSEN et al with STEPHANIE L. KING – Communication range predicts dolphin alliance size in a cooperative mating system.....	5
ESTHER F. KUTTER et al with ANDREAS NIEDER – Single-neuron representation of nonsymbolic and symbolic number zero in the human medial temporal lobe	6
MAX S. FARNWORTH et al – Mosaic evolution of a learning and memory circuit in Heliconiini butterflies	6
MATTHEW H. VAN DAM et al – Biogeography confounds the signal of cospeciation in Batesian mimicry	6
Evolutionary Anthropology	7
PAPERS	7
ADRIANO R. LAMEIRA – The evolutionary origin of human kissing	7
Frontiers in Environmental Archaeology	7
PAPERS	7
LUCÍA COBO-SÁNCHEZ, ANNA RUFÀ & JOÃO CASCALHEIRA – Alternating carnivore and Neanderthal activities at Escoural Cave: insights from the taphonomic and machine learning analysis of leporid remains	7
Frontiers in Human Neuroscience	7
PAPERS	7
GIORGIO LAZZARI et al – Pleasantness makes a good time: musical consonance shapes interpersonal synchronization in dyadic joint action	7
Frontiers in Psychology	8
PAPERS	8
ANTONIO BENÍTEZ-BURRACO & LJILJANA PROGOVAC – Syntax and the brain: language evolution as the missing link(ing theory)?	8
MANUELA FILIPPA et al – Effect of an early music intervention on emotional and neurodevelopmental outcomes of preterm infants at 12 and 24 months.....	8
Interface: Journal of the Royal Society	8
COMMENTARIES	8
CHRIS J. JACKSON & CHRISTIAN CRIADO-PEREZ – Why the Fermi paradox may not be well explained by Wong and Bartlett’s theory of civilization collapse. A Comment on: ‘Asymptotic burnout and homeostatic awakening: a possible solution to the Fermi paradox?’ (2022) by Wong and Bartlett.....	8
MICHAEL L. WONG & STUART BARTLETT – Asymptotic burnout and homeostatic awakening: a possible solution to the Fermi paradox?	9
Interface Focus	9

PAPERS	9
RICARD SOLÉ et al – Fundamental constraints to the logic of living systems	9
LAURA NUÑO DE LA ROSA & GERD B. MÜLLER – The legacy and evolvability of Pere Alberch’s ideas	9
iScience.....	9
PAPERS	9
JEFFREY C. NEKOLA, JAN DIVÍŠEK & MICHAL HORSÁK – The ghost of ice ages past: impact of Last Glacial Maximum landscapes on modern biodiversity	9
Mind & Language.....	9
PAPERS	9
IGOR DOUVEN – The learnability of natural concepts	9
Nature	10
ARTICLES	10
MARI KAWAKATSU & SEBASTIÁN MICHEL-MATA – ‘Look twice and forgive once’ when judging social behaviour.....	10
Nature Communications	10
PAPERS	10
HANNAH TARDER-STOLL, CHRISTOPHER BALDASSANO & MARIAM ALY – The brain hierarchically represents the past and future during multistep anticipation.....	10
SEONG-HWAN HWANG et al – Convergent representation of values from tactile and visual inputs for efficient goal-directed behavior in the primate putamen	10
Nature Ecology & Evolution.....	10
PAPERS	10
NICOLE M. WEBB et al – Gradual exacerbation of obstetric constraints during hominoid evolution implied by re-evaluation of cephalopelvic fit in chimpanzees.....	10
Nature Human Behaviour.....	11
PAPERS	11
RADA MIHALCEA et al with JAMES W. PENNEBAKER – How developments in natural language processing help us in understanding human behaviour.....	11
Nature India	11
NEWS	11
Nature Reviews Neuroscience.....	11
PAPERS	11
FRANK VAN OVERWALLE – Social and emotional learning in the cerebellum.....	11
Nature Scientific Reports.....	11
PAPERS	11
ARMIN TOGHI, MOJTABA CHIZARI & REZA KHOSROWABADI – A causal role of the right dorsolateral prefrontal cortex in random exploration	11
LAURA E. DIAMOND et al – Aboriginal Australian weapons and human efficiency	12
MINORU HAYASHI, TETSUO KIDA & KOJI INUI – Segmentation window of speech information processing in the human auditory cortex.....	12
LAURIN PLANK & ARMIN ZLOMUZICA – Natural language processing reveals differences in mental time travel at higher levels of self-efficacy ...	12
Neuron.....	12
PAPERS	12
MAIKE HILLE et al – From animal models to human individuality: Integrative approaches to the study of brain plasticity	12
PeerJ	13
ARTICLES	13
COMMUNITIES @ PEERJ – Unlocking the Mysteries of Animal Behavior and Cognition	13
PAPERS	13
XINYU CHEN et al – Distinct role of Klotho in long bone and craniofacial bone: skeletal development, repair and regeneration	13
PLoS Biology.....	13
PAPERS	13
LIN CAI et al with SIMON W. TOWNSEND – Functional reorganization of brain regions supporting artificial grammar learning across the first half year of life.....	13
PABLO CAPILLA-LASHERAS et al – Evolution of sex differences in cooperation can be explained by trade-offs with dispersal.....	13
PLoS One.....	14
PAPERS	14
DAISUNG JANG et al – Estrogen predicts multimodal emotion recognition accuracy across the menstrual cycle	14
K. KANOHO HOSODA & MICA ESTRADA – The influence of kindness on academics’ identity, well-being and stress	14
DRIES CNUTS & VEERLE ROTS – Examining the effect of post-depositional processes on the preservation and identification of stone tool residues from temperate environments: An experimental approach	14
REBECCA FARBSTAIN & APRIL NOWELL – Children at play: The role of novices in the production of Europe’s earliest Upper Paleolithic ceramics	15
BENIAMINO MECOZZI et al with MARIE-HÉLÈNE MONCEL – Climatic and environmental changes of ~100 thousand years: The mammals from the early Middle Pleistocene sequence of Notarchirico (southern Italy)	15

PNAS.....	15
ARTICLES	15
W. FORD DOOLITTLE – Science offers the best way of knowing—as long as we don’t confuse what “is” with what “ought to be”	15
Proceedings of the Royal Society B.....	16
PAPERS	16
LARA NELLISSSEN et al with KLAUS ZUBERBÜHLER – Vocal consensus building for collective departures in wild western gorillas	16
CAMERON ROUSE TURNER, THOMAS J. H. MORGAN & THOMAS L. GRIFFITHS – Environmental complexity and regularity shape the evolution of cognition.....	16
Royal Society Open Science.....	16
PAPERS	16
VIOLET GIBSON et al with MARINA DAVILA-ROSS – Young sanctuary-living chimpanzees produce more communicative expressions with artificial objects than with natural objects	16
LEE R. ALACOQUE, RICHARD W. BULLIET & KAI A. JAMES – Reconstructing the invention of the wheel using computational structural analysis and design	16
MD. FAHIMUR RAHMAN SHUVO & K. M. ARIFUL KABIR – Investigating the impact of environmental feedback on the optional prisoner’s dilemma for insights into cyclic dominance and evolution of cooperation.....	17
Science.....	17
ARTICLES	17
PATRIK NOSIL – Predicting and anticipating rapid evolution	17
PAPERS	17
STEVEN NI et al – Human-driven evolution of color in a stonefly mimic.....	17
REVIEWS	17
ANDREW ROBINSON – Spreading the word.....	17
Science Advances.....	18
PAPERS	18
JACQUELINE FALLON & LIINA PYLKKÄNEN – Language at a glance: How our brains grasp linguistic structure from parallel visual input	18
Trends in Cognitive Sciences	18
PAPERS	18
MARJORIE RHODES, SUSAN A. GELMAN & SARAH-JANE LESLIE – How generic language shapes the development of social thought	18
KENNY R. COVENTRY & HOLGER DIESSEL – Spatial communication systems and action.....	18
COMMENTARIES	18
AMRISHA VAISH & TOBIAS GROSSMANN – How sharp is the compassion–sympathy distinction?.....	18
SHAUN GALLAGHER, ANTONINO RAFFONE & SALVATORE M. AGLIOTI – Compassion and prosocial behavior: response to Vaish and Grossmann.....	18
SHAUN GALLAGHER, ANTONINO RAFFONE & SALVATORE M. AGLIOTI – The pattern theory of compassion	19
Trends in Ecology and Evolution.....	19
PAPERS	19
KATHRYN R. ELMER & JEAN CLOBERT – Dollo’s law of irreversibility in the post-genomic age	19
SUBSCRIBE to the EAORC Bulletin	19
UNSUBSCRIBE from the EAORC Bulletin	19
PRODUCED BY AND FOR THE EAORC EMAIL GROUP.....	19

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.

EDITORIAL INTERJECTIONS

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

NEWS

JOHN TEMPLETON FOUNDATION – Evolution Before the Origin of Life?

In 2018, Dian Fiantis, a professor of soil science at Andalas University in Indonesia, traveled to Mt. Anak Krakatoa (which emerged after the famous Krakatoa’s eruption) to collect the volcanic ash it ejected two months before. In her lab, she found out that volcanic glass (SiO₂), the dominant chemical found in the ash, has extremely tiny holes that could store water. “A good place for cyanobacteria to grow,” said Fiantis. The microbe, which scientists called “nature’s little alchemist,”

engineered the surrounding environment so that complex living systems like lichens and vascular plants could grow. Fiantis' research shows us what happens "before life" in modern circumstances. It might not tell us how life began on the early Earth, but this is the closest contemporary example of the blurry line between life and non-life.

<https://www.templeton.org/news/evolution-before-the-origin-of-life>

NATURE BRIEFING – How we get our heads around zero

"Zero is, by many mathematicians, definitely considered one of the greatest — or maybe the greatest — achievement of mankind," says neuroscientist Andreas Nieder. Zero wasn't first used until relatively recently in our history, compared to other numbers. A unique digit, it requires our minds to make a cognitive leap: recognize absence as a mathematical object. Now, Nieder's research has shown that our brains might handle the concept of zero differently, with more neurons coding for zero than any other small number.

<https://www.quantamagazine.org/how-the-human-brain-contends-with-the-strangeness-of-zero-20241018/>

NATURE BRIEFING – Humans comprehend sentences in a flash

Our brains can comprehend some basic sentence structures quite literally in the blink of an eye. Researchers measured the brain activity of people shown a three-word sentence for 300 milliseconds, followed by another that was either the same or differed by one word. Participants made faster, more accurate judgments when the sentences contained a subject, verb and object, with brain activity detected within 130 milliseconds, which is about the length of an eye-blink. "Just like your own car is quickly identifiable in a parking lot, certain language structures are quickly identifiable and can then give rise to a rapid effect of syntax in the brain," says linguist and study co-author Liina Pyllkanen.

<https://www.theguardian.com/science/2024/oct/23/human-brain-can-process-certain-sentences-in-blink-of-an-eye-says-study>

SAPIENS – Unraveling a "Ghost" Neanderthal Lineage

Remains in France found by archaeologists and geneticists suggest at least two lineages—not just one—of late Neanderthals in Europe.

<https://www.sapiens.org/archaeology/ghost-neanderthal-lineage/>

SAPIENS – India's Third Gender Rises Again

Hijras are striving to overcome a century of discrimination and reclaim their holy status in society—through a mix of faith rituals and Facebook.

<https://www.sapiens.org/biology/hijra-india-third-gender/>

SAPIENS – What Our Skeletons Say About the Sex Binary

Society increasingly accepts gender identity as existing along a spectrum. The study of people, and their remains, shows that sex should be viewed the same way.

<https://www.sapiens.org/biology/intersex-biological-sex/>

SAPIENS – What Ancient Gender Fluidity Taught Me About Modern Patriarchy

Nonbinary genders and male hierarchy as expressed in Ecuadorian clay sculptures led one archaeologist to see biases in her modern life with fresh eyes.

<https://www.sapiens.org/archaeology/archaeology-biases/>

SCIENCEADVISER – Butterfly brains offer new insights into the evolution of learning and memory

Butterflies are typically known for their beauty, not their brains. But *Heliconius* butterflies, the only known genus to feed on both nectar and pollen, are remarkably good at learning and remembering spatial information. Instead of foraging at random, these adventurous eaters navigate between food sources using fixed, efficient routes.

When scientists took a closer look at the brains of these butterflies, they discovered that structures responsible for learning and memory—known as mushroom bodies—were unusually well-developed compared to species that only eat nectar. But these structures hadn't just evolved to be bigger, the team reports. While certain groups of neurons expanded, others stayed the same, ultimately creating a mosaic-like pattern of changes.

"We predict that because we see these mosaic patterns of neural changes, these will relate to specific shifts in behavioral performance," lead study author Max Farnworth explains in a press release. When it comes to learning and memory, he notes, *Heliconius* butterflies only outperform their close relatives in "very specific contexts." Overall, the findings illustrate how subtle changes in neural circuits can bring about new cognitive skills and specialized behaviors.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(24\)01337-X](https://www.cell.com/current-biology/fulltext/S0960-9822(24)01337-X)

SCIENCE DAILY – Butterfly brains reveal the tweaks required for cognitive innovation

A species of tropical butterfly with unusually expanded brain structures display a fascinating mosaic pattern of neural expansion linked to a cognitive innovation.

<https://www.sciencedaily.com/releases/2024/10/241018131224.htm>

SCIENCE DAILY – Crucial role of cerebellum in social and cognitive functioning

Scientists shed light on the often-overlooked role of the cerebellum in both motor and social-cognitive processes. His research contributes to a growing shift in the field of neuroscience, which has traditionally focused on the cerebrum. For decades, the cerebellum was primarily associated with motor coordination.

<https://www.sciencedaily.com/releases/2024/10/241022104651.htm>

SCIENCE DAILY – Rare fossils of extinct elephant document earliest known instance of butchery in India

Scientists have discovered the earliest evidence of animal butchery by humans in India.

<https://www.sciencedaily.com/releases/2024/10/241021133245.htm>

SCIENCE DAILY – Birth: It's a tight squeeze for chimpanzees, too

According to a new study, chimpanzees, like humans, must contend with a confined bony birth canal when giving birth. In humans, the problem was exacerbated by our unique form of upright walking since this led to a twisting of the bony birth canal, while the fetal head got larger. The 'obstetrical dilemma' therefore evolved gradually over the course of primate evolution rather than suddenly in humans as originally argued.

<https://www.sciencedaily.com/releases/2024/10/241023131336.htm>

SCIENCE.ORG NEWS – How humans evolved a starch-digesting superpower long before farming

Two papers show how agriculture drove gene to duplicate again and again, confirming and extending earlier studies.

<https://www.science.org/content/article/how-humans-evolved-starch-digesting-superpower-long-farming>

PUBLICATIONS

Current Biology

ARTICLES

ALEX H. TAYLOR & MELISSA JOHNSTON – How do animals understand the physical world?

The natural world is full of examples of animals interacting with their physical environment in surprising ways: capuchin monkeys crack open nuts with rocks; dolphins use sponges as 'gloves' on their rostra when searching for prey on the sea floor; and New Caledonian crows manufacture stick tools to pull grubs from logs. Deeper into the phylogenetic tree we continue to see interesting examples of behaviors of this kind, such as octopuses using coconut shells for protection, tuskfish breaking open cockles by hitting them against coral heads, and bees learning to pull string to gain out-of-reach food. These sophisticated behavioral interactions with their physical environment suggest that animals might have a deep understanding of their physical world at a cognitive level. In this primer, we review the performances of a variety of species when faced with tasks that probe their understanding of their physical world.

[https://www.cell.com/current-biology/abstract/S0960-9822\(24\)00908-4](https://www.cell.com/current-biology/abstract/S0960-9822(24)00908-4)

MICHAEL GROSS – Modelling moves

From the first animals crawling on the sea floor to pterosaurs rising to the sky with wingspans up to ten metres across, understanding animal moves of the deep evolutionary past remains a challenge. In addition to exceptional fossils, advanced computer modelling methods and soft robotics are now helping to elucidate how bygone species were able to walk, swim and fly.

[https://www.cell.com/current-biology/abstract/S0960-9822\(24\)01358-7](https://www.cell.com/current-biology/abstract/S0960-9822(24)01358-7)

ANNA LINDERHOLM – Sedimentary DNA: Archaeology reinvented

How can we better understand the human agency in prehistory? A recent study explores a novel way of using sedimentary DNA extracted from sediments of a rock shelter to investigate the human impact on the landscape.

[https://www.cell.com/current-biology/abstract/S0960-9822\(24\)01236-3](https://www.cell.com/current-biology/abstract/S0960-9822(24)01236-3)

PAPERS

PERNILLE M. SØRENSEN et al with STEPHANIE L. KING – Communication range predicts dolphin alliance size in a cooperative mating system

It is well known that communication range, often termed active space, varies with habitat structure, and this variation can influence individual vocal behavior across taxa. While theoretical predictions imply that communication distances can drive

the evolution of mammalian alliance sizes, empirical tests of this hypothesis are currently lacking. In Shark Bay, Western Australia, unrelated male bottlenose dolphins form multilevel alliances, where males work together in pairs or trios to herd single estrus females. Here, we use empirical measures of male dolphin vocalizations, ambient noise levels, and high-resolution bathymetry data to estimate variation in active space across the study site. We combine this with long-term data on male alliance behavior to determine how active space influences alliance group size and mating success. We show that the active space of vocalizations used by allied males in a reproductive context predicts the number of preferred alliance partners with whom individuals cooperate over the longer term, ultimately contributing significantly to male access to mating opportunities. These results reveal that variation in sensory ecology driven by heterogeneous habitat influences optimal cooperative group size and mating success within a single population of wild animals.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(24\)01147-3](https://www.cell.com/current-biology/fulltext/S0960-9822(24)01147-3)

ESTHER F. KUTTER et al with ANDREAS NIEDER – Single-neuron representation of nonsymbolic and symbolic number zero in the human medial temporal lobe

The number zero holds a special status among numbers, indispensable for developing a comprehensive number theory. Despite its importance in mathematics, the neuronal foundation of zero in the human brain is unknown. We conducted single-neuron recordings in neurosurgical patients while they made judgments involving nonsymbolic number representations (dot numerosity), including the empty set, and symbolic numbers (Arabic numerals), including numeral zero. Neurons showed responsiveness to either the empty set or numeral zero, but not both. Neuronal activity to zero in both nonsymbolic and symbolic formats exhibited a numerical distance effect, indicating that zero representations are integrated together with countable numerosities and positive integers at the low end of the number line. A boundary in neuronal coding existed between the nonsymbolic empty set and small numerosities, correlating with the relative difficulty in discriminating numerosity zero behaviorally. Conversely, no such boundary was found for symbolic zero activity, suggesting that symbolic representations integrate zero with other numerals along the number line, reconciling its outlier role. The status of zero as a special nonsymbolic numerical quantity is reflected in the activity of neurons in the human brain, which seems to serve as a scaffold for more advanced representations of zero as a symbolic number.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(24\)01156-4](https://www.cell.com/current-biology/fulltext/S0960-9822(24)01156-4)

MAX S. FARNWORTH et al – Mosaic evolution of a learning and memory circuit in Heliconiini butterflies

How do neural circuits accommodate changes that produce cognitive variation? We explore this question by analyzing the evolutionary dynamics of an insect learning and memory circuit centered within the mushroom body. Mushroom bodies are composed of a conserved wiring logic, mainly consisting of Kenyon cells, dopaminergic neurons, and mushroom body output neurons. Despite this conserved makeup, there is huge diversity in mushroom body size and shape across insects. However, empirical data on how evolution modifies the function and architecture of this circuit are largely lacking. To address this, we leverage the recent radiation of a Neotropical tribe of butterflies, the Heliconiini (Nymphalidae), which show extensive variation in mushroom body size over comparatively short phylogenetic timescales, linked to specific changes in foraging ecology, life history, and cognition. To understand how such an extensive increase in size is accommodated through changes in lobe circuit architecture, we combined immunostainings of structural markers, neurotransmitters, and neural injections to generate new, quantitative anatomies of the Nymphalid mushroom body lobe. Our comparative analyses across Heliconiini demonstrate that some Kenyon cell sub-populations expanded at higher rates than others in Heliconius and identify an additional increase in GABA-ergic feedback neurons, which are essential for non-elemental learning and sparse coding. Taken together, our results demonstrate mosaic evolution of functionally related neural systems and cell types and identify that evolutionary malleability in an architecturally conserved parallel circuit guides adaptation in cognitive ability.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(24\)01337-X](https://www.cell.com/current-biology/fulltext/S0960-9822(24)01337-X)

MATTHEW H. VAN DAM et al – Biogeography confounds the signal of cospeciation in Batesian mimicry

Since the inception of the field of evolution, mimicry has yielded insights into foundational evolutionary processes, including adaptive peak shifts, speciation, and the emergence and maintenance of phenotypic polymorphisms. In recent years, the coevolutionary processes generating mimicry have gained increasing attention from researchers. Despite significant advances in understanding Batesian and Müllerian mimicry in Lepidopteran systems, few other mimetic systems have received similar detailed research. Here, we present a Batesian mimicry complex involving flightless, armored Pachyrhynchus weevils and their winged Doliops longhorn beetle mimics and examine their coevolutionary patterns within the Philippine archipelagos. Pachyrhynchus weevils are primarily found in the Philippines, where distinct species radiations have occurred on different islands, each with unique color patterns serving as a warning to predators. This defensive trait and mimicry between unrelated species were first described by Wallace in 1889. Notably, the distantly related longhorn beetle Doliops, despite being soft-bodied and ostensibly palatable, mimics the heavily armored, flightless Pachyrhynchus. To address mimicry in this system, we reconstructed the phylogeny of Doliops using a probe set consisting of 38,000 ultraconserved elements. Our study examines the following questions central to understanding the Pachyrhynchus-Doliops mimicry system: (1) to what extent are coevolutionary interactions conserved (i.e., lineage-constrained) and (2) are the codiversification patterns primarily driven by biotic or abiotic factors? To assess color mimicry and cospeciation, we examined the evolution of nanostructure-based warning colors and the effect of island biogeography on cospeciation. Our findings demonstrate the

beetle's ability to repeatedly evolve multiple solutions to similar evolutionary challenges, evolving similar color patterns using different types of photonic crystals with varying degrees of order. We revealed that the observed pattern of cospeciation is driven mainly by abiotic factors from their biogeographic history. Unlike the patterns of coevolution seen between angiosperms and insect lineages,⁷ most ecological interactions do not persist longer than a few million years, leading to patterns of modularity rather than ecological nestedness.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(24\)01352-6](https://www.cell.com/current-biology/fulltext/S0960-9822(24)01352-6)

Evolutionary Anthropology

PAPERS

ADRIANO R. LAMEIRA – The evolutionary origin of human kissing

A kiss has been a signal of special affection across continents and cultures for millennia. Between times and peoples, social norms invariably prescribe kissing to specific affiliations and contexts, implying deeper biological bases. Why the protruding of the lips and slight suction when touching another? Capuchin monkeys stick their fingers in their friends' eyes as sign of affection, why have humans developed kissing? Here I briefly review proposed hypotheses for the evolution of human kissing. Great ape social behavior suggests that kissing is likely the conserved final mouth-contact stage of a grooming bout when the groomer sucks with protruded lips the fur or skin of the groomed to latch on debris or a parasite. The hygienic relevance of grooming decreased over human evolution due to fur-loss, but shorter sessions would have predictably retained a final "kissing" stage, ultimately, remaining the only vestige of a once ritualistic behavior for signaling and strengthening social and kinship ties in an ancestral ape.

<https://onlinelibrary.wiley.com/doi/full/10.1002/evan.22050>

Frontiers in Environmental Archaeology

PAPERS

LUCÍA COBO-SÁNCHEZ, ANNA RUFÀ & JOÃO CASCALHEIRA – Alternating carnivore and Neanderthal activities at Escoural Cave: insights from the taphonomic and machine learning analysis of leporid remains

Exploring the varied subsistence strategies and cave occupation patterns of Neanderthals is key to understanding their complex behaviors and ecological adaptations. Small game consumption, in particular, is considered a relevant indicator of their behavioral complexity. Rabbit assemblages from Pleistocene cave sites provide valuable insights into Neanderthal interactions with small prey and potential competition with carnivores. Here, we present the first detailed taphonomic analysis of faunal remains from Escoural Cave (Portugal), where a European rabbit (*Oryctolagus cuniculus*) assemblage was found alongside Middle Paleolithic stone tools and some macromammal remains. This study combines traditional zooarchaeological and taphonomic analysis of the rabbit remains with multivariate statistics and machine learning methods to establish the origin of the accumulation, and the implications for Neanderthal subsistence and cave use. Results from the taphonomic analysis show no evidence of human consumption but abundant evidence of small terrestrial carnivore activity, primarily from lynxes. This could indicate a sequential occurrence of Neanderthal and carnivore activities in the cave, with Neanderthal activities likely related to something other than rabbit consumption. Our study contributes to characterizing Iberian carnivore fossil accumulations and differentiating between faunal assemblages accumulated by carnivores and those by hominins. Additionally, we show that the use of machine learning analysis provides a robust and objective method for identifying and classifying taphonomic signatures, enhancing the accuracy and reliability of our interpretations. Future work will focus on analyzing additional faunal collections from both past and new excavations at Escoural, to test whether carnivores and Neanderthals focused on different prey types and how they shared the cave space.

<https://www.frontiersin.org/journals/environmental-archaeology/articles/10.3389/fearc.2024.1473266/full>

Frontiers in Human Neuroscience

PAPERS

GIORGIO LAZZARI et al – Pleasantness makes a good time: musical consonance shapes interpersonal synchronization in dyadic joint action

Music making is a process by which humans across cultures come together to create patterns of sounds that are aesthetically pleasing. What remains unclear is how this aesthetic outcome affects the sensorimotor interaction between participants. Here we approach this question using an interpersonal sensorimotor synchronization paradigm to test whether the quality of a jointly created chord (consonant vs. dissonant) affects movement coordination. We recruited non-musician participants in dyads to perform a dyadic synchronization-continuation task (dSCT): on each trial, participants first synchronized their movements to a metronome (synchronization phase) and then continued tapping together at the same tempo without the metronome (continuation phase). Each tap yielded a note and participants heard both their own and that of their partner, thus creating a chord that was varied to be either consonant (Perf5 or Maj6) or dissonant (Min2 or Maj2). For each trial, participants also rated the pleasure they felt in creating the sounds together. Additionally, they completed questionnaires about social closeness to the other participant, musical reward sensitivity and musical training.

Results showed that participants' taps were closer in time when they jointly created consonant (high pleasure) vs. dissonant (low pleasure) chords, and that pleasure experienced by the dyad in each trial predicted interpersonal synchronization.

However, consonance did not affect individual synchronization with the metronome or individual tapping when the metronome was discontinued. The effect of consonance on synchronization was greater in dyads who reported feeling less close prior to the task.

Together, these results highlight the role of consonance in shaping the temporal coordination of our actions with others. More broadly, this work shows that the aesthetic outcome of what we create together affects joint behaviors.

<https://www.frontiersin.org/journals/human-neuroscience/articles/10.3389/fnhum.2024.1472632/full>

Frontiers in Psychology

PAPERS

ANTONIO BENÍTEZ-BURRACO & LJILJANA PROGOVAC – Syntax and the brain: language evolution as the missing link(Ing theory)?

This paper provides proof of concept that neurolinguistic research on human language syntax would benefit greatly by expanding its scope to include evolutionary considerations, as well as non-propositional functions of language, including naming/nicknaming and verbal aggression. In particular, an evolutionary approach can help circumvent the so-called granularity problem in studying the processing of syntax in the brain, that is, the apparent mismatch between the abstract postulates of syntax (e.g. Tense Phrase (TP), Determiner Phrase (DP), etc.) and the concrete units of neurobiology (neurons, axons, etc.).

First, we decompose syntax into its evolutionary primitives, identifying one of the earliest stages as a simple, flat combination of just one verb and one noun. Next, we identify proxies (“living fossils”) of such a stage in present-day languages, including compounds and small clauses, lacking at least some layers of structure, e.g. TPs and DPs. These proxies of ancestral language have been subjected to fMRI neuroimaging experiments.

We discuss the finding that less hierarchical small clauses, in contrast to full sentences with TPs and DPs, show reduced activation in the left Broca’s area (BA) 44 and the right basal ganglia, consistent with the hypothesis that more recent, more elaborate syntax requires more connectivity in the Broca’s-basal ganglia network, whose neuronal density has been significantly enhanced in recent evolution, implicating mutations in FOXP2 and other genes. We also discuss the finding that the processing of ancestral verb-noun compounds, which are typically used for (derogatory) naming and nicknaming, shows enhanced activation in the right fusiform gyrus area (BA 37), the area that is implicated in the processing of metaphoricity and imageability, but also in naming and face recognition, opening up an intriguing possibility that the enhanced face recognition in humans was facilitated by the early emergence of a simple syntactic strategy for naming.

The considerations in this paper are consistent with the hypothesis of a gradual gene-culture co-evolution of syntax and the brain, targeting cortico-striatal brain networks. It is also of note that a sound grounding in neurobiology of language should in turn inform syntactic theories themselves.

<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1445192/full>

MANUELA FILIPPA et al – Effect of an early music intervention on emotional and neurodevelopmental outcomes of preterm infants at 12 and 24 months

Few studies have found long-term effects of early musical environmental enrichment in the NICU on preterm infant’s development. This study examines how early music enrichment affects emotional development and effortful control abilities in 12- and 24-month-old very preterm (VPT) infants.

One hundred nineteen newborns were recruited, including 83 VPTs and 36 full-term (FT) infants. The VPT infants were randomly assigned to the music intervention (44 VPT-Music) or control (39 VPT-control) groups. VPT-Music infants listened specifically designed music intervention from the 33rd week of gestation until hospital discharge. At 12 and 24 months, children were clinically evaluated using the Bayley-III Scales of Infant and Toddler Development and the Laboratory Temperament Assessment Battery, and at 24 months, with 3 additional episodes of the Effortful Control Battery.

Our analysis showed that during a fear eliciting task, the VPT-Music group expressed lower level of fear reactivity and higher positive motor actions than VPT-controls and FT infants. At 24 months, the VPT-music group had lower scores for negative motor actions in the joy task, compared to both VPT-control and FT groups. In addition, both FT and VPT-music had higher scores of sustained attention compared to VPT-controls, but the contrasts were not significant. No significant effects on mental, language and motor outcomes were identified and for all three dimensions of the ECBQ.

The present study suggests that an early music intervention in the NICU might influence preterm children’s emotional processing at 12 and 24 months. Limitations and suggestions for future research are highlighted.

<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1443080/full>

Interface: Journal of the Royal Society

COMMENTARIES

CHRIS J. JACKSON & CHRISTIAN CRIADO-PEREZ – Why the Fermi paradox may not be well explained by Wong and Bartlett’s theory of civilization collapse. A Comment on: ‘Asymptotic burnout and homeostatic awakening: a possible solution to the Fermi paradox?’ (2022) by Wong and Bartlett

Wong and Bartlett explain the Fermi paradox by arguing that neither human nor extra-terrestrial civilizations can escape the time window singularity which, they claim, results from the way in which social characteristics of civilizations follow super-

linear growth curves of cities. We question if data at the city level necessarily can lead to conclusions at the civilization level. More specifically, we suggest ways in which learnings from research, foresight, diversity and effective future government might act outside of their model to regulate super-linear growth curves of civilizations, and thus substantively increase the likelihood of civilizations progressing towards higher levels of the Kardashev scale. Moreover, we believe their claimed history of the collapse of terrestrial societies used to evidence their model is difficult to justify. Overall, we cast reasonable doubt on the ability of their proposed model to satisfactorily explain the Fermi paradox.

<https://royalsocietypublishing.org/doi/10.1098/rsif.2024.0140>

MICHAEL L. WONG & STUART BARTLETT – Asymptotic burnout and homeostatic awakening: a possible solution to the Fermi paradox?

Original paper: Journal of the Royal Society Interface (2022). [EAORC Bulletin 989.]

<https://royalsocietypublishing.org/doi/full/10.1098/rsif.2022.0029>

Interface Focus

PAPERS

RICARD SOLÉ et al – Fundamental constraints to the logic of living systems

It has been argued that the historical nature of evolution makes it a highly path-dependent process. Under this view, the outcome of evolutionary dynamics could have resulted in organisms with different forms and functions. At the same time, there is ample evidence that convergence and constraints strongly limit the domain of the potential design principles that evolution can achieve. Are these limitations relevant in shaping the fabric of the possible? Here, we argue that fundamental constraints are associated with the logic of living matter. We illustrate this idea by considering the thermodynamic properties of living systems, the linear nature of molecular information, the cellular nature of the building blocks of life, multicellularity and development, the threshold nature of computations in cognitive systems and the discrete nature of the architecture of ecosystems. In all these examples, we present available evidence and suggest potential avenues towards a well-defined theoretical formulation.

<https://royalsocietypublishing.org/doi/10.1098/rsfs.2024.0010>

LAURA NUÑO DE LA ROSA & GERD B. MÜLLER – The legacy and evolvability of Pere Alberch's ideas

Pere Alberch played a pivotal role in shaping the field of evolutionary developmental biology during the 1980s and 1990s. Whereas initially his contributions were sidelined by the empirical advancements of the molecular revolution in developmental and evolutionary biology, his theoretical insights have left a lasting impact on the discipline. This article provides a comprehensive review of the legacy and evolvability of Alberch's ideas in contemporary evo-devo, which included the study of morphogenesis as the proper level of developmental causation, the interplay between developmental constraints and natural selection, the epistemic role of teratologies, the origin of evolutionary novelties and the concept of evolvability.

<https://royalsocietypublishing.org/doi/10.1098/rsfs.2024.0011>

iScience

PAPERS

JEFFREY C. NEKOLA, JAN DIVÍŠEK & MICHAL HORSÁK – The ghost of Ice ages past: Impact of Last Glacial Maximum landscapes on modern biodiversity

Modeled modern and Last Glacial Maximum (LGM) climate ranges for 47 genetically-confirmed small Holarctic land snails documented profound landscape dynamism over the last 21,000 years: Following deglaciation, range areas tended to increase by 50% while isolating barrier widths were cut in half. At the same time, the nature of isolating barriers underwent profound change, with the North American continental ice sheet becoming as important in the LGM as the Atlantic Ocean is today in separating Nearctic and Palearctic faunas. Because appropriate modern climate occurs for these species throughout the Holarctic, with no clear barriers being present – especially for such efficient passive dispersers – the current >90% turnover observed between Eurasian and North American species pools appears at least in part related to the LGM landscape. Understanding current and predicting potential future biodiversity patterns thus requires consideration of the landscape template across at least 15,000 year time scales.

[https://www.cell.com/iscience/fulltext/S2589-0042\(24\)02497-0](https://www.cell.com/iscience/fulltext/S2589-0042(24)02497-0)

Mind & Language

PAPERS

IGOR DOUVEN – The learnability of natural concepts

According to a recent proposal, natural concepts are represented in an optimally designed similarity space, adhering to principles a skilled engineer would use for creatures with our perceptual and cognitive capacities. One key principle is that natural concepts should be easily learnable. While evidence exists for parts of this optimal design proposal, there has been

no direct evidence linking naturalness to learning until now. This article presents results from a computational study on perceptual color space, demonstrating that naturalness indeed facilitates learning.

<https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12523>

Nature

ARTICLES

MARI KAWAKATSU & SEBASTIÁN MICHEL-MATA – ‘Look twice and forgive once’ when judging social behaviour

How should people judge someone when they know a lot about that person’s social behaviour? Mathematical modelling reveals a simple and effective method for assigning reputations that uses several observations and forgives some bad actions. This strategy benefits society by maintaining cooperation even without complex norms or public institutions previously considered essential.

This is a summary of: Michel-Mata, S. et al. The evolution of private reputations in information-abundant landscapes. *Nature* 634, 883–889 (2024) [EAORC Bulletin 1,111].

<https://www.nature.com/articles/d41586-024-03389-z>

Nature Communications

PAPERS

HANNAH TARDER-STOLL, CHRISTOPHER BALDASSANO & MARIAM ALY – The brain hierarchically represents the past and future during multistep anticipation

Memory for temporal structure enables both planning of future events and retrospection of past events. We investigated how the brain flexibly represents extended temporal sequences into the past and future during anticipation. Participants learned sequences of environments in immersive virtual reality. Pairs of sequences had the same environments in a different order, enabling context-specific learning. During fMRI, participants anticipated upcoming environments multiple steps into the future in a given sequence. Temporal structure was represented in the hippocampus and across higher-order visual regions (1) bidirectionally, with graded representations into the past and future and (2) hierarchically, with further events into the past and future represented in successively more anterior brain regions. In hippocampus, these bidirectional representations were context-specific, and suppression of far-away environments predicted response time costs in anticipation. Together, this work sheds light on how we flexibly represent sequential structure to enable planning over multiple timescales.

<https://www.nature.com/articles/s41467-024-53293-3>

SEONG-HWAN HWANG et al – Convergent representation of values from tactile and visual inputs for efficient goal-directed behavior in the primate putamen

Animals can discriminate diverse sensory values with a limited number of neurons, raising questions about how the brain utilizes neural resources to efficiently process multi-dimensional inputs for decision-making. Here, we demonstrate that this efficiency is achieved by reducing sensory dimensions and converging towards the value dimension essential for goal-directed behavior in the putamen. Humans and monkeys performed tactile and visual value discrimination tasks while their neural responses were examined. Value information, whether originating from tactile or visual stimuli, was found to be processed within the human putamen using fMRI. Notably, at the single-neuron level in the macaque putamen, half of the individual neurons encode values independently of sensory inputs, while the other half selectively encode tactile or visual value. The responses of bimodal value neurons correlate with value-guided finger insertion behavior in both tasks, whereas modality-selective value neurons show task-specific correlations. Simulation using these neurons reveals that the presence of bimodal value neurons enables value discrimination with a significantly reduced number of neurons compared to simulations without them. Our data indicate that individual neurons in the primate putamen process different values in a convergent manner, thereby facilitating the efficient use of constrained neural resources for value-guided behavior.

<https://www.nature.com/articles/s41467-024-53342-x>

Nature Ecology & Evolution

PAPERS

NICOLE M. WEBB et al – Gradual exacerbation of obstetric constraints during hominoid evolution implied by re-evaluation of cephalopelvic fit in chimpanzees

Under the obstetrical dilemma hypothesis, sexual dimorphism in pelvic shape is a solution to accommodate high fetopelvic constraints. It is therefore unclear why chimpanzees display a human-like pattern of pelvic sexual dimorphism despite having easier births enabled by small neonates and capacious pelvic canals. Here we reassessed chimpanzee fetopelvic fit using three-dimensional simulations, revealing a similarly constricted midpelvis as in humans, with even narrower outlet dimensions. Geometric morphometric analyses confirm that female chimpanzees have larger pelvic canals than males despite a smaller body size and a morphology that maximizes pelvic dimensions favourable for parturition, particularly in smaller-bodied individuals. Together with evidence for increased neurological immaturity at birth relative to monkeys, our findings imply substantial obstetric constraints in chimpanzees and possibly other apes. We therefore propose that difficult

birth did not arise abruptly in Homo with increasing encephalization but evolved gradually through a series of obstetric compromises from an already constricted birth canal shared across anthropoid primates. Specifically, we propose that obstetric selection pressures exacerbated incrementally with the stiffening of the symphysis that accompanied body size increase in hominoids, while subsequent adaptations to bipedalism shortened the ilium. The resulting contorted birth canal required obligatory fetal rotation, thus greatly increasing birth difficulty.

<https://www.nature.com/articles/s41559-024-02558-7>

Nature Human Behaviour

PAPERS

RADA MIHALCEA et al with JAMES W. PENNEBAKER – How developments in natural language processing help us in understanding human behaviour

The ways people use language can reveal clues to their emotions, social behaviours, thinking styles, cultures and the worlds around them. In the past two decades, research at the intersection of social psychology and computer science has been developing tools to analyse natural language from written or spoken text to better understand social processes and behaviour. The goal of this Review is to provide a brief overview of the methods and data currently being used and to discuss the underlying meaning of what language analyses can reveal in comparison with more traditional methodologies such as surveys or hand-scored language samples.

<https://www.nature.com/articles/s41562-024-01938-0>

Nature India

NEWS

Elephant fossils and stone tools reveal India's first butchery site

Bone flakes found on tools suggest early humans used large mammals 400,000 years ago

<https://www.nature.com/articles/d44151-024-00174-9>

Nature Reviews Neuroscience

PAPERS

FRANK VAN OVERWALLE – Social and emotional learning in the cerebellum

The posterior cerebellum has a critical role in human social and emotional learning. Three systems and related neural networks support this cerebellar function: a biological action observation system as part of an extended sensorimotor integration network, a mentalizing system for understanding a person's mental and emotional state subserved by a mentalizing network, and a limbic network supporting core emotional (dis)pleasure and arousal processes. In this Review, I describe how these systems and networks support social and emotional learning via functional reciprocal connections initiating and terminating in the posterior cerebellum and cerebral neocortex. It is hypothesized that a major function of the posterior cerebellum is to identify and encode temporal sequences of events, which might help to fine-tune and automatize social and emotional learning. I discuss research using neuroimaging and non-invasive stimulation that provides converging evidence for this hypothesized function of cerebellar sequencing, but also other potential functional accounts of the posterior cerebellum's role in these social and emotional processes.

<https://www.nature.com/articles/s41583-024-00871-5>

Nature Scientific Reports

PAPERS

ARMIN TOGHI, MOJTABA CHIZARI & REZA KHOSROWABADI – A causal role of the right dorsolateral prefrontal cortex in random exploration

Decision to explore new options with uncertain outcomes or exploit familiar options with known outcomes is a fundamental challenge that the brain faces in almost all real-life decisions. Previous studies have shown that humans use two main explorative strategies to negotiate this explore-exploit tradeoff. Exploring for the sake of information is called directed exploration, and exploration driven by behavioral variability is known as random exploration. While previous neuroimaging studies have shown different neural correlates for these explorative strategies, including right frontopolar cortex (FPC), right dorsolateral prefrontal cortex (DLPFC), and dorsal anterior cingulate cortex (dACC), there is still a lack of causal evidence for most of these brain regions. Here, we focused on the right DLPFC, which was previously supported to be involved in exploration. Using the continuous theta burst stimulation (cTBS) and Horizon task on twenty-five healthy right-handed adult participants, we showed that inhibiting rDLPFC did not change directed exploration but selectively reduced random exploration, by increasing reward sensitivity over the average reward of each option. This suggests a causal role for rDLPFC in random exploration, and further supports dissociable neural implementations for these two explorative strategies.

<https://www.nature.com/articles/s41598-024-76025-5>

LAURA E. DIAMOND et al – Aboriginal Australian weapons and human efficiency

Aggression—and its role in human societal development—continues to be hotly debated within both the sciences and the humanities. Whatever the evolutionary origins and repercussions of interpersonal and intergroup conflict for the human story, cultures around the globe have invested significant time and effort into designing deadly hand-held weaponry. Here, we describe for the first time, how humans deliver a deadly strike using two iconic and widespread Aboriginal Australian weapons: the kodj and the leangle with parrying shield. We present the world's first evaluation of striking biomechanics and human and weapon efficiency regarding this class of implement. Results demonstrate the leangle is far more effective at delivering devastating blows to the human body, while the kodj—a multi-functional tool—is more efficient for a human to manoeuvre and still capable of delivering severe blows that can cause death. Together, these data provide the beginnings of an in-depth understanding of how hand-held weaponry has impacted the human body throughout the deep past.

<https://www.nature.com/articles/s41598-024-76317-w>

MINORU HAYASHI, TETSUO KIDA & KOJI INUI – Segmentation window of speech information processing in the human auditory cortex

Humans perceive continuous speech signals as discrete sequences. To clarify the temporal segmentation window of speech information processing in the human auditory cortex, the relationship between speech perception and cortical responses was investigated using auditory evoked magnetic fields (AEFs). AEFs were measured while participants heard synthetic Japanese words /atataka/. There were eight types of /atataka/ with different speech rates. The durations of the words ranged from 75 to 600 ms. The results revealed a clear correlation between the AEFs and syllables. Specifically, when the durations of the words were between 375 and 600 ms, the evoked responses exhibited four clear responses from the superior temporal area, M100, that corresponded not only to the onset of speech but also to each group of consonant/vowel syllable units. The number of evoked M100 responses was correlated to the duration of the stimulus as well as the number of perceived syllables. The approximate range of the temporal segmentation window limit of speech perception was considered to be between 75 and 94 ms. This finding may contribute to optimizing the temporal performance of high-speed synthesized speech generation systems.

<https://www.nature.com/articles/s41598-024-76137-y>

LAURIN PLANK & ARMIN ZLOMUZICA – Natural language processing reveals differences in mental time travel at higher levels of self-efficacy

The (re-)construction of past and future personal experiences, termed mental time travel (MTT), is highly adaptive and contributes to self-related beliefs and attitudes. Mounting evidence suggests that self-efficacy (SE), the belief that one can overcome obstacles on their own account, is functionally related to MTT. In the present study, we used novel methods for the analysis of MTT narratives based on natural language processing (NLP) to investigate the relation between SE and MTT. We demonstrated that self-efficacious participants remembered and imagined experiences which were semantically less similar and contained a wider variety of contents. Additionally, increased SE was related to a positive reappraisal of personal episodes and reports of a more active role within mental scenarios. In conclusion, NLP appears to be a valuable method to quantify changes to the (re-)construction of personal experience that might support cognitive and emotional functioning.

<https://www.nature.com/articles/s41598-024-76959-w>

Neuron**PAPERS****MAIKE HILLE et al – From animal models to human individuality: Integrative approaches to the study of brain plasticity**

Plasticity allows organisms to form lasting adaptive changes in neural structures in response to interactions with the environment. It serves both species-general functions and individualized skill acquisition. To better understand human plasticity, we need to strengthen the dialogue between human research and animal models. Therefore, we propose to (1) enhance the interpretability of macroscopic methods used in human research by complementing molecular and fine-structural measures used in animals with such macroscopic methods, preferably applied to the same animals, to create macroscopic metrics common to both examined species; (2) launch dedicated cross-species research programs, using either well-controlled experimental paradigms, such as motor skill acquisition, or more naturalistic environments, where individuals of either species are observed in their habitats; and (3) develop conceptual and computational models linking molecular and fine-structural events to phenomena accessible by macroscopic methods. In concert, these three component strategies can foster new insights into the nature of plastic change.

[https://www.cell.com/neuron/fulltext/S0896-6273\(24\)00727-X](https://www.cell.com/neuron/fulltext/S0896-6273(24)00727-X)

PeerJ

ARTICLES

COMMUNITIES @ PEERJ – Unlocking the Mysteries of Animal Behavior and Cognition***Advancing Understanding of the Functions and Mechanisms Underlying Animal Behavior and Cognition in Diverse Environments***

Ethology is the study of animal behavior. It emerged as a distinct discipline thanks to the pioneering efforts of biologists such as Nikolaas Tinbergen, Konrad Lorenz, and Karl von Frisch. In the 50+ years since the Nobel Prize was awarded to them in 1973, Tinbergen's four fundamental questions for the study of animal behavior, questions of function and mechanism, remain pivotal to our understanding of the evolution and ontogeny of animal (including human) behavior and cognition. Although novel methods for understanding the neurological and genetic underpinnings of behavior and cognition have furthered our understanding, many questions remain unaddressed. In particular, many species remain understudied, preventing a full appreciation of the various ecological factors (social and physical) that impact cognition, both evolutionarily and ontogenetically. Given the impact of humans on other species, studies of animal behavior today must address questions of how animals adapt to environments that (often) are intervened upon by humans and therefore must incorporate considerations of ethics, conservation, and welfare.

<https://peerj.com/blog/post/115284889885/unlocking-the-mysteries-of-animal-behavior-and-cognition/>

PAPERS

XINYU CHEN et al – Distinct role of Klotho in long bone and craniofacial bone: skeletal development, repair and regeneration

Bone defects are highly prevalent diseases caused by trauma, tumors, inflammation, congenital malformations and endocrine abnormalities. Ideally effective and side effect free approach to dealing with bone defects remains a clinical conundrum. Klotho is an important protein, which plays an essential role in regulating aging and mineral ion homeostasis. More recently, research revealed the function of Klotho in regulating skeleton development and regeneration. Klotho has been identified in mesenchymal stem cells, osteoblasts, osteocytes and osteoclasts in different skeleton regions. The specific function and regulatory mechanisms of Klotho in long bone and craniofacial bone vary due to their different embryonic development, ossification and cell types, which remain unclear and without conclusion. Moreover, studies have confirmed that Klotho is a multifunctional protein that can inhibit inflammation, resist cancer and regulate the endocrine system, which may further accentuate the potential of Klotho to be the ideal molecule in inducing bone restoration clinically. Besides, as an endogenous protein, Klotho has a promising potential for clinical therapy without side effects. In the current review, we summarized the specific function of Klotho in long bone and craniofacial skeleton from phenotype to cellular alternation and signaling pathway. Moreover, we illustrated the possible future clinical application for Klotho. Further research on Klotho might help to solve the existing clinical difficulties in bone healing and increase the life quality of patients with bone injury and the elderly.

<https://peerj.com/articles/18269/>

PLoS Biology

PAPERS

LIN CAI et al with SIMON W. TOWNSEND – Functional reorganization of brain regions supporting artificial grammar learning across the first half year of life

Pre-babbling infants can track nonadjacent dependencies (NADs) in the auditory domain. While this forms a crucial prerequisite for language acquisition, the neurodevelopmental origins of this ability remain unknown. We applied functional near-infrared spectroscopy in neonates and 6- to 7-month-old infants to investigate the neural substrate supporting NAD learning and detection using tone sequences in an artificial grammar learning paradigm. Detection of NADs was indicated by left prefrontal activation in neonates while by left supramarginal gyrus (SMG), superior temporal gyrus (STG), and inferior frontal gyrus activation in 6- to 7-month-olds. Functional connectivity analyses further indicated that the neonate activation pattern during the test phase benefited from a brain network consisting of prefrontal regions, left SMG and STG during the rest and learning phases. These findings suggest a left-hemispheric learning-related functional brain network may emerge at birth and serve as the foundation for the later engagement of these regions for NAD detection, thus, providing a neural basis for language acquisition.

<https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002610>

PABLO CAPILLA-LASHERAS et al – Evolution of sex differences in cooperation can be explained by trade-offs with dispersal

Explaining the evolution of sex differences in cooperation remains a major challenge. Comparative studies highlight that offspring of the more philopatric sex tend to be more cooperative within their family groups than those of the more dispersive sex but we do not understand why. The leading "Philopatry hypothesis" proposes that the more philopatric sex cooperates more because their higher likelihood of natal breeding increases the direct fitness benefits of natal cooperation. However, the "Dispersal trade-off hypothesis" proposes that the more dispersive sex cooperates less because preparations

for dispersal, such as extra-territorial prospecting, trade-off against natal cooperation. Here, we test both hypotheses in cooperatively breeding white-browed sparrow weavers (*Plocepasser mahali*), using a novel high-resolution automated radio-tracking method. First, we show that males are the more dispersive sex (a rare reversal of the typical avian sex difference in dispersal) and that, consistent with the predictions of both hypotheses, females contribute substantially more than males to cooperative care while within the natal group. However, the Philopatry hypothesis cannot readily explain this female-biased cooperation, as females are not more likely than males to breed within their natal group. Instead, our radio-tracking findings support the Dispersal trade-off hypothesis: males conduct pre-dispersal extra-territorial prospecting forays at higher rates than females and prospecting appears to trade-off against natal cooperation. Our findings thus highlight that the evolution of sex differences in cooperation could be widely attributable to trade-offs between cooperation and dispersal; a potentially general explanation that does not demand that cooperation yields direct fitness benefits.

<https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002859>

PLoS One

PAPERS

DAISUNG JANG et al – Estrogen predicts multimodal emotion recognition accuracy across the menstrual cycle

Researchers have proposed that variation in sex hormones across the menstrual cycle modulate the ability to recognize emotions in others. Existing research suggests that accuracy is higher during the follicular phase and ovulation compared to the luteal phase, but findings are inconsistent. Using a repeated measures design with a sample of healthy naturally cycling women (N = 63), we investigated whether emotion recognition accuracy varied between the follicular and luteal phases, and whether accuracy related to levels of estrogen (estradiol) and progesterone. Two tasks assessed recognition of a range of positive and negative emotions via brief video recordings presented in visual, auditory, and multimodal blocks, and non-linguistic vocalizations (e.g., laughter, sobs, and sighs). Multilevel models did not show differences in emotion recognition between cycle phases. However, coefficients for estrogen were significant for both emotion recognition tasks. Higher within-person levels of estrogen predicted lower accuracy, whereas higher between-person estrogen levels predicted greater accuracy. This suggests that in general having higher estrogen levels increases accuracy, but that higher-than-usual estrogen at a given time decreases it. Within-person estrogen further interacted with cycle phase for both tasks and showed a quadratic relationship with accuracy for the multimodal task. In particular, women with higher levels of estrogen were more accurate in the follicular phase and middle of the menstrual cycle. We propose that the differing role of within- and between-person hormone levels could explain some of the inconsistency in previous findings.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0312404>

K. KANOHO HOSODA & MICA ESTRADA – The influence of kindness on academics' identity, well-being and stress

The well-being of people working and studying in higher education, including students, staff, and faculty, is a topic of increasing concern. The lack of well-being may be attributed to the current academic context, which does not consistently provide cues that affirm social inclusion to all members of the academic population. This study examines the role of kindness (defined as actions that affirm dignity and social inclusion) in promoting identification with community and well-being in higher education utilizing a cross-sectional study of 182 diverse members of higher education. To assess the extent that kindness relates to the acquisition of institutional identity, well-being, and stress, we developed and validated two novel psychometric rating scales for kindness: Kindness Received ($\alpha = 0.927$, $\omega = .921$) and Kindness Given ($\alpha = .859$, $\omega = .860$). Initial analysis showed that receiving kindness was significantly associated with increased well-being, reduced stress, and improved institutional identity. Giving kindness was significantly associated with decreased stress reduction and decreased institutional identity. Results from structural equation modeling shows that institutional identity mediates the relationship between receiving kindness and well-being. Qualitative analysis of micronarratives regarding kindness showed that feeling safe and being acknowledged are the most commonly described experiences of kindness, both acts that affirm dignity. The findings from this study suggests that kindness contributes towards improving diverse people's well-being and increased identification with institutions of higher education. Measurement of kindness provides methods for assessing institutional changes that foster greater positivity and inclusion in higher education settings.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0312269>

DRIES CNUTS & VEERLE ROTTS – Examining the effect of post-depositional processes on the preservation and identification of stone tool residues from temperate environments: An experimental approach

Studying taphonomy is crucial for understanding how post-depositional processes impact archaeological remains. This knowledge is pivotal for accurately interpreting the archaeological record. Although taphonomy has a long tradition in archaeology, it is less developed in the analysis of stone tool residues compared to other subdisciplines. To address this gap, our study aims to further develop our understanding of the preservation potential of stone tool residues in temperate environments through actualist experiments. To achieve this, we develop a multidimensional experimental program that features the first biweekly monitoring of weathering processes on residues over a one-year cycle, aiming to understand the short-term effects of weathering immediately after tool discard. Additionally, the program involves the study of longer-term burial and weathering visual effects on different residue types within various previously unexplored depositional environments. This approach allows us to observe the visual effects of both weathering and burial processes and to improve

our understanding of the different mechanisms involved in the diagenesis of stone tool residues. While known factors such as microbial activity and soil acidity play a primary role in residue decay, specific stone tool-related factors also prove important, underscoring the need to develop further a specific branch of taphonomy related to stone tool residues. Moreover, our results show that certain residue types may survive within these environments that are often considered as being hostile. A residue analysis of stone tools from temperate contexts may thus contribute unique data that can improve our understanding of past human behaviour. Future research with more diverse residue types and depositional conditions will permit further refinement of our understanding of how taphonomy affects residue preservation and enhance the reliability of residue identifications. As such, stone tool residue analysis will become firmly rooted within broader functional approaches to address how humans use stone tools and how this affects stone tool variability.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0309060>

REBECCA FARBSTEIN & APRIL NOWELL – Children at play: The role of novices in the production of Europe's earliest Upper Paleolithic ceramics

Although archaeologists are learning more about the lives of Upper Paleolithic children, the significant contributions they made to the welfare of their communities, including their role in craft production, remain understudied. In the present study, we use high resolution photographs of 489 ceramic artifacts from Dolní Věstonice I and II, Pavlov I and VI, and Předmostí, five archaeological sites in Czechia (ca. 30,000 BP) to address two questions: 1. Can the ceramic products of novices be distinguished from those made by experts? 2. If so, can we tell if these novices were children? To address these questions, we documented variables known ethnographically and archaeologically to be associated with learners in a sample from these five sites. The sample is composed of fired ("ceramic") and unfired ("sedimentary") anthropomorphic and zoomorphic figurines, non-diagnostic figurine fragments and a sample of the so-called "pellets" from one site, Pavlov I. Our results support the hypothesis that ceramic objects are the products of novices, and in many cases, these novices are children. Our findings have implications for inter-generational knowledge transmission, the role of children in craft production and the importance of learning through play.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0309107>

BENIAMINO MECOZZI et al with MARIE-HÉLÈNE MONCEL – Climatic and environmental changes of ~100 thousand years: The mammals from the early Middle Pleistocene sequence of Notarchirico (southern Italy)

Here we revise all the paleontological sample of Notarchirico, including historical collections and new findings collected during 2016–2023 excavations. Notarchirico is one of the most significant sites for the study of human evolution and terrestrial ecosystem dynamics during the Early-Middle Pleistocene Transition, preserving nearly 100,000 years of environmental and climatic changes constrained between 695 ± 6 ka and 614 ± 12 ka. The deposit yielded the oldest human fossil of the Italian Peninsula, and one of the oldest European evidence of *Homo heidelbergensis*, as well as one of the earliest evidence of bifacial tools in western Europe, commonly associated with the Acheulean techno-complex. Our paleontological results revealed the presence of three different mammal complexes, documenting faunal dynamics in response of climatic driven-changes recognized during the early Middle Pleistocene. The lower complex (levels I2-G) indicates the dominance of wooded spaces, sparse steppes, and the existence of water bodies (lakes or ponds), indicating a deterioration of the fully interglacial conditions recorded during the end of MIS 17; the middle complex (levels G-C) with a low number of mammal remains can be attributed to the glacial conditions of MIS 16; the upper complex (levels B-above α) indicates an improvement in climate, transitioning towards the full interglacial conditions of the of MIS 15. The faunal sample of Notarchirico, based on its firm chronological setting, offers important data for the Biochronological Scheme of European Land Mammals, including one of the oldest records of *Palaeoloxodon antiquus* and *Cervus elaphus* in Europe, *Panthera spelaea* in southwestern Europe, *Dama cf. roberti* in Italian Peninsula, and one of the latest occurrences of *Bison schoetensacki* in Europe.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0311623>

PNAS

ARTICLES

W. FORD DOOLITTLE – Science offers the best way of knowing—as long as we don't confuse what "is" with what "ought to be"

Most humanists and scientists now agree that science is special in its relationship to the real world, more special than are other human activities—religion and politics, for instance. But philosophers of science keep arguing about why that should be. There is, I believe, a good evolutionary explanation of why—one that incorporates what is often called group selection (1). But group selection will only move humans closer to the truth if researchers and others take care to ensure that social values don't distract or mislead.

So, my plea is that scientists and others ensure that science remains independent from social values. Social values are constraints—limitations on the evolutionary process. I worry that mixing science and social values hampers scientific progress.

<https://www.pnas.org/doi/full/10.1073/pnas.2416452121>

Proceedings of the Royal Society B

PAPERS

LARA NELLISSEN et al with KLAUS ZUBERBÜHLER – Vocal consensus building for collective departures in wild western gorillas

The ability to coordinate actions is of vital importance for group-living animals, particularly in relation to travel. Groups can only remain cohesive if members possess a cooperative mechanism to overcome differences in individual priorities and social power when coordinating departures. To better understand how hominids achieve spatio-temporally coordinated group movements, we investigated vocally initiated group departures in three habituated groups of western gorillas (*Gorilla gorilla*) in the Central African Republic. The large sexual dimorphism of gorillas has led to the untested assumption that the silverback males are the sole decision-makers in gorilla groups, although there are also observations that suggest otherwise. To address this, we analysed the direction and timing of group departures and found that high-ranking individuals (silverbacks and high-ranking females) were more successful in indicating the direction of future travel than others, but that the timing of departure was the apparent result of a cumulative vocal voting process among all adult group members. Our findings illustrate that even in species with a large sexual size dimorphism, travel decisions can be taken collectively via a consensus-building process.

<https://royalsocietypublishing.org/doi/10.1098/rspb.2024.0597>

CAMERON ROUSE TURNER, THOMAS J. H. MORGAN & THOMAS L. GRIFFITHS – Environmental complexity and regularity shape the evolution of cognition

The environmental complexity hypothesis suggests that cognition evolves to allow animals to negotiate a complex and changing environment. By contrast, signal detection theory suggests cognition exploits environmental regularities by containing biases (e.g. to avoid dangerous predators). Therefore, two significant bodies of theory on cognitive evolution may be in tension: one foregrounds environmental complexity, the other regularity. Difficulty in reconciling these theories stems from their focus on different aspects of cognition. The environmental complexity hypothesis focuses on the reliability of sensors in the origin of cognition, while signal detection theory focuses on decision making in cognitively sophisticated animals. Here, we extend the signal detection model to examine the joint evolution of mechanisms for detecting information (sensory systems) and those that process information to produce behaviour (decision-making systems). We find that the transition to cognition can only occur if processing compensates for unreliable sensors by trading-off errors. Further, we provide an explanation for why animals with sophisticated sensory systems nonetheless disregard the reliable information it provides, by having biases for particular behaviours. Our model suggests that there is greater nuance than has been previously appreciated, and that both complexity and regularity can promote cognition.

<https://royalsocietypublishing.org/doi/10.1098/rspb.2024.1524>

Royal Society Open Science

PAPERS

VIOLET GIBSON et al with MARINA DAVILA-ROSS – Young sanctuary-living chimpanzees produce more communicative expressions with artificial objects than with natural objects

In humans, interactions with objects are often embedded in communicative exchanges. Objects offer unique affordances to explore, carry functions and hold cultural relevance, which can shape children's interactions and communication. Research indicates that the use of artificial objects, such as certain toys, helps promote pre-linguistic communication, consequently impacting language development. Given that chimpanzees use objects extensively compared to other great apes, and considering the differences between chimpanzees and bonobos in intrinsic motivation for tool use and the extended developmental period during which they learn to use objects, it is reasonable to expect that objects may influence chimpanzees' communication. Here, we examined interactions of 31 immature sanctuary-living chimpanzees with non-novel artificial and natural objects and tested their vocal and facial expressions, applying methods previously designed for children. Our results showed an increase in these expressions associated with artificial objects. These findings provide the first empirical evidence that chimpanzee communicative expressions may be influenced by inherent properties of objects, potentially promoting varied communication, comparable to the impact distinctive objects have on pre-linguistic children. By exploring this connection between object-centric interactions and communication, this study reveals deep phylogenetic roots where objects may have shaped great ape communication and possibly evolutionary foundations of language.

<https://royalsocietypublishing.org/doi/10.1098/rsos.240632>

LEE R. ALACOQUE, RICHARD W. BULLIET & KAI A. JAMES – Reconstructing the invention of the wheel using computational structural analysis and design

The invention of the wheel is widely credited as a pivotal moment in human history, yet the details surrounding its discovery are shrouded in mystery. There remains no scholarly consensus on key questions such as where, how and by whom this technology was originally invented. In this study, we employ state-of-the-art techniques from computational structural mechanics to shed light on this long-standing puzzle. Based on this analysis, we propose a probable path along which the wheel evolved via a sequence of three major innovations. We also introduce an original computational design algorithm that

autonomously generates a wheel-and-axle system using an evolutionary process that offers insight into the way in which the first wheels probably evolved nearly 6000 years ago. Our analysis provides new supporting evidence for the recently advanced theory that the wheel was probably invented by Neolithic miners harvesting copper ore from the Carpathian Mountains as early as 3900 BC. Moreover, we show how the discovery of the wheel was made possible by the unique physical features of the mine environment, whose impact was analogous to the selective environmental pressures that drive biological evolution.

<https://royalsocietypublishing.org/doi/10.1098/rsos.240373>

MD. FAHIMUR RAHMAN SHUVO & K. M. ARIFUL KABIR – Investigating the impact of environmental feedback on the optional prisoner’s dilemma for insights into cyclic dominance and evolution of cooperation

This study incorporates environmental feedback into the optional prisoner’s dilemma and rock–paper–scissors games to examine the mutual influence of eco-evolutionary outcomes and strategy dynamics. A novel game-theoretic model is developed that integrates the optional prisoner’s dilemma and rock–paper–scissors games by incorporating an environmental state variable. By adjusting feedback parameters, chaos, oscillations and coexistence are observed that surpass the usual outcomes of social dilemmas when the environment transitions between depleted and replenished states. Defection is no longer advantageous in evolution; cooperation, abstention and cyclic dominance arise. The observed transitions align with natural economics, ecology and sociology phenomena. The inclusion of abstention options and environmental feedback has a significant impact on collective outcomes when compared with conventional games. This has important implications for studying adaptation and decision-making in situations with ecological constraints.

<https://royalsocietypublishing.org/doi/10.1098/rsos.240717>

Science

ARTICLES

PATRIK NOSIL – Predicting and anticipating rapid evolution

Evolution can be rapid, as exemplified by arguably the most famous case of evolution by natural selection. In the early 1900s, a darkly colored form of the peppered moth appeared on the increasingly soot-covered tree trunks of England. Over the subsequent decades, rapid increases in the frequency of this camouflaged melanic form occurred, followed by decreases in frequency as pollution declined. Thus, “industrial melanism” emerged as a textbook example of evolution in action. Since then, other cases of putatively human-induced evolution have been reported. However, many lack spatial replication or ambiguities remain concerning the mechanisms of evolution and the role of genetics versus phenotypic plasticity. On page 453 of this issue, Ni et al. report a particularly convincing example of rapid, replicated, and human-induced evolution in wild insect populations. Moreover, the authors provide evidence that the mechanism of evolution is altered bird predation due to deforestation.

<https://www.science.org/doi/10.1126/science.ads9992>

PAPERS

STEVEN NI et al – Human-driven evolution of color in a stonefly mimic

Rapid adaptation is thought to be critical for the survival of species under global change, but our understanding of human-induced evolution in the wild remains limited. We show that widespread deforestation has underpinned repeated color shifts in wild insect populations. Specifically, loss of forest has led to color changes across lineages that mimic the warning coloration of a toxic forest stonefly. Predation experiments suggest that the relative fitness of color phenotypes varies between forested and deforested habitats. Genomic and coloration analyses of 1200 specimens show repeated selection at the ebony locus controlling color polymorphism across lineages. These findings represent an example of human-driven evolution linked to altered species interactions, highlighting the possibility for populations to adapt rapidly in the wake of sudden environmental change.

<https://www.science.org/doi/10.1126/science.ado5331>

REVIEWS

ANDREW ROBINSON – Spreading the word

Scholars probe the origins and decipherment of written communication.

Review of ‘Writing from Invention to Decipherment’, Edited by Silvia Ferrara, Barbara Montecchi & Miguel Valério, Oxford University Press, 2024.

<https://www.science.org/doi/10.1126/science.adr8816>

Science Advances

PAPERS

JACQUELINE FALLON & LIINA PYLKKÄNEN – Language at a glance: How our brains grasp linguistic structure from parallel visual input

Human brains grasp the gists of visual scenes from a single glance, but to what extent is this possible for language? While we typically think of language in terms of sequential speech, our everyday experience involves numerous rapidly flashing written notifications, which we understand instantly. What do our brains detect in the first few hundred milliseconds after seeing such a stimulus? We flashed short sentences during magnetoencephalography measurement, revealing sentence-sensitive neural activity in left temporal cortex within 130 milliseconds. These signals emerged for subject-verb-object sentences regardless of grammatical or semantic well-formedness, suggesting that at-a-glance language comprehension begins by detecting basic phrase structure, independent of meaning or other grammatical details. Our findings unveil one aspect of how our brains process information rapidly in today's visually saturated world.

<https://www.science.org/doi/10.1126/sciadv.adr9951>

Trends in Cognitive Sciences

PAPERS

MARJORIE RHODES, SUSAN A. GELMAN & SARAH-JANE LESLIE – How generic language shapes the development of social thought

Generic language, that is, language that refers to a category as an abstract whole (e.g., 'Girls like pink') rather than specific individuals (e.g., 'This girl likes pink'), is a common means by which children learn about social kinds. Here, we propose that children interpret generics as signaling that their referenced categories are natural, objective, and have distinctive features, and, thus, in the social domain, that such language affects children's beliefs about the social world in ways that extend far beyond the content they explicitly communicate. On this account, even generics expressing uncontentious content (e.g., 'Girls are great at math') can lead children to think of categories as defining fundamentally distinct kinds of people and contribute to the development of stereotypes and other problematic social phenomena.

[https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613\(24\)00255-9](https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00255-9)

KENNY R. COVENTRY & HOLGER DIESEL – Spatial communication systems and action

Spatial cognition is fundamental to our species. One might therefore expect that spatial communication systems would have evolved to make common distinctions. However, many have argued that spatial communication systems exhibit considerable cross-linguistic diversity, challenging the view that space structures language. We review recent work on spatial communication that merits revisiting the relationship between language and space. We provide a framework that places action as the driver of spatial communication systems across languages, in which spatial demonstratives – the earliest spatial terms – play a fundamental role in honing attention and theory of mind capacities that are crucial for language and cognition more broadly. We discuss how demonstratives emerged early in language evolution to serve a combination of spatial, social, and functional needs.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(24\)00262-6](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(24)00262-6)

COMMENTARIES

AMRISHA VAISH & TOBIAS GROSSMANN – How sharp is the compassion-sympathy distinction?

Theorists and empiricists have long been concerned with the nature of empathy and its relatives, sympathy and compassion, which are all thought to have important roles in human (pro)sociality. Yet, the field continues to lack clear and distinct conceptualizations of these phenomena. In their recent thought-provoking article in *TiCS*, Gallagher et al. seek to lay out a clear concept of compassion in particular, and propose a pattern theory of compassion that 'facilitates sharp conceptual distinctions among compassion, empathy, and sympathy' (p. 504: Highlights). The authors provide compelling arguments and empirical evidence for the distinction between compassion and empathy (or feeling what others feel; but see <https://journals.sagepub.com/doi/10.1177/17540739221082215> for a critique of this 'restrictive isomorphic matching' view of empathy as unhelpfully narrow). However, we argue that the key distinction they draw between compassion and sympathy (or concern for others) is less clear and not sufficiently supported by empirical evidence; indeed, it appears to be more prescriptive than a descriptive approach that carves nature at its joints. At the same time, we believe there are interesting avenues for constructively revising Gallagher et al.'s proposal to move the field forward.

[https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613\(24\)00220-1](https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00220-1)

SHAUN GALLAGHER, ANTONINO RAFFONE & SALVATORE M. AGLIOTI – Compassion and prosocial behavior: response to Vaish and Grossmann

In their recent Letter in *TiCS*, Vaish and Grossmann offer some thoughtful comments on our recent article, 'A pattern theory of compassion'. They argue that the distinction we draw between compassion and sympathy is not as sharp as the distinction between compassion and empathy, and neither is it supported by empirical evidence. They focus on, and take issue with, what they regard as our 'key' or 'primary' distinction between compassion and sympathy, namely that compassion involves,

but sympathy does not necessarily involve, the motivation to act prosocially to alleviate suffering. Here, we highlight some of the evidence we cited on this point, but also note that what counts as empirical evidence involves a hermeneutical issue.

[https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613\(24\)00261-4](https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00261-4)

SHAUN GALLAGHER, ANTONINO RAFFONE & SALVATORE M. AGLIOTI – The pattern theory of compassion

[Original paper: Trends in Cognitive Sciences (2024). [EAORC Bulletin 1,095.]

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(24\)00084-6](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(24)00084-6)

Trends in Ecology and Evolution

PAPERS

KATHRYN R. ELMER & JEAN CLOBERT – Dollo’s law of irreversibility in the post-genomic age

Dollo’s law of irreversibility argues that evolution cannot revert to earlier states. It has remained controversial ever since its inception in the 19th century. Enabled by advances in phylogenomics and functional genomics, recent studies show that there are very likely some cases of ‘breaking Dollo’s law’. As post-genomic research grows from showing patterns to revealing processes, new emphasis is needed on the molecular mechanisms by which Dollo’s law might be broken. Shifting the argument from ‘if it happened’ to ‘how it happened’ will provide richer understanding of organismal and evolutionary biology. Motivated by case studies and novel avenues to test trait loss and regain, we outline a set of alternative hypotheses to be evaluated and what the outcomes tell us about evolution.

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(24\)00249-0](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(24)00249-0)

SUBSCRIBE to the EAORC Bulletin

If you would like to subscribe to this free weekly newsletter, please contact martin.edwardes@btopenworld.com.

UNSUBSCRIBE from the EAORC Bulletin

Send an email to martin.edwardes@btopenworld.com with the subject "EAORC unsubscribe".

PRODUCED BY AND FOR THE EAORC EMAIL GROUP

EAORC is a fee-free academic internet news service and has no commercial sponsorship or other commercial interests.

EAORC website information is at <http://martinedwardes.me.uk/eaorc/>

If you have received this bulletin, and are unhappy about receiving it, please contact martin.edwardes@btopenworld.com.
