

## EAORC BULLETIN 1,059 – 1 October 2023

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## NOTICES

### PUBLICATION ALERTS

If you have had a paper or book published, or you see something which would be of interest to the group, please send me a publication alert so that I can include it in the newsletter. Many thanks to those who have already sent in alerts.

If there is a journal you feel I should be tracking on a regular basis, let me know.

And if you have any other ideas for extending the “EAORC experience”, please contact me.

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### EDITORIAL INTERJECTIONS

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

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### OTHER PUBLICATIONS – Human Uniqueness in Evolutionary Anthropology and Cognitive Science

*In Heidelberger Graduiertenjournal für Geisteswissenschaften Bd. 2 (2012).*

#### **MICHAEL PLEYER – Human Uniqueness from the Perspective of Evolutionary Anthropology and Cognitive Science**

In this paper I explore the question of what is unique and special about modern humans (*homo sapiens*) from the perspective of evolutionary anthropology and cognitive science. I first give a brief overview of the evolution of the human brain. Then I discuss six candidates for what makes human cognition unique: (1) the ability to adopt a shared perspective (2) symbolic, analogical reasoning (3) a Theory of Mind (4) the creation of a symbolic 'niche' with shared cultural artefacts and norms (5) mental time travel (6) language. Most importantly, a comparison of the sociocognitive capacities and motivations of humans and other primates indicates that humans might possess a unique adaptation for cultural interaction, transmission and learning. This is already evident in infants and young children, who show unique abilities and motivations in the domain of sharing intentions, understanding joint commitments, and sharing attention and other psychological states.

<https://journals.ub.uni-heidelberg.de/index.php/logoi/article/view/9513>

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## NEWS

### JOHN TEMPLETON FOUNDATION – The belief paradox (Video)

What is the capacity for belief in humans, and how does it shape our lives and interactions with the world? According to Agustin Fuentes, a professor of anthropology at Princeton University and author of *Why We Believe: Evolution and the Human Way of Being*, the human capacity for belief is the most significant trait that sets us apart from other animals.

<https://www.youtube.com/watch?v=iJitID2HAhc>

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### JOHN TEMPLETON FOUNDATION – What Is the Signature Adaptation of the Human Species? (Podcast)

Dr. David Sloan Wilson is an evolutionary biologist and professor emeritus at Binghamton University. During his career, David started the Evolutionary Studies program at Binghamton to unify diverse disciplines under the theory of evolution. He also co-founded the Evolution Institute, advanced multilevel selection theory, and is a prominent proponent of group selection in evolution. David joins the podcast to discuss the theory of group selection, the advantages of ultra-social “super organisms,” and why it’s important to create an alignment between the way that we think about spirituality intellectually and the way we feel it experientially.

<https://www.templeton.org/news/how-cooperation-makes-the-human-species-special>

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### SCIENCEADVISER – Tiny jellies don’t need a brain to learn

If beauty is truly in the eye of the beholder, then the Caribbean box jelly (*Tripedalia cystophora*) might be the world’s leading expert on aesthetics. This fingernail-sized jelly may not have a brain, but it does have a whopping 24 eyes, which help it hunt and dodge underwater roots in its mangrove habitat. Now, research published in *Current Biology* suggests *T. cystophora* can also learn from past experiences—an ability never before observed in an animal with such a simple nervous system.

<https://www.science.org/content/article/no-brain-no-problem-jellyfish-learn-just-fine>

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### SCIENCE.ORG NEWS – No brain, no problem. Jellyfish learn just fine

Despite lacking a centralized brain, the translucent creatures can learn from past experiences to avoid bumping into obstacles.

<https://www.science.org/content/article/no-brain-no-problem-jellyfish-learn-just-fine>

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## PUBLICATIONS

### Current Biology

#### ARTICLES

##### **MICHAEL GROSS – Hidden histories**

Ancient DNA yields insights into human societies, family structures and movements that have so far remained outside the historic record, from prehistoric populations to enslaved workers in the 19th century.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(23\)01226-5](https://www.cell.com/current-biology/fulltext/S0960-9822(23)01226-5)

#### PAPERS

##### **SAMUEL ESSLER et al – The cultural basis of cultural evolution: Longitudinal evidence that infant imitation develops by being imitated**

Humans are widely considered the most socially sophisticated species on the planet. Their remarkable abilities in navigating the social world have given rise to complex societies and the advancement of cultural intelligence. But what characterizes us as ultra-social beings? Theoretical advances in social sciences over the last century purport imitation as a central mechanism for the emergence of humans' unique social-cognitive abilities. Uncovering the ontogeny of imitation is therefore paramount for understanding human cultural evolution. Yet, how humans become able to imitate is unclear and intensely debated. Recently, multidisciplinary findings have challenged long-standing assumptions that imitation is inborn. So what are the underlying processes supporting the development of imitation? One fascinating possibility is that infants become able to imitate by being imitated. Cognitive theories have suggested that by perceiving others imitating one's own behavior, visual and motor representations of that behavior are coactivated and associated, leading to the emergence of imitation abilities. Here, we show that being imitated by sensitive caregivers in infancy constitutes a psychological process giving rise to infants' imitation abilities. Results demonstrated (1) that maternal imitation at 14 months positively predicted infants' imitation abilities at 18 months and (2) that maternal imitation at 14 months mediated the positive effect of maternal sensitivity at 6 months on infants' imitation abilities at 18 months. This offers substantial evidence for the role of social interactions in the emergence of imitation as a key factor for human cultural learning.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(23\)01164-8](https://www.cell.com/current-biology/fulltext/S0960-9822(23)01164-8)

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### Frontiers in Artificial Intelligence

#### PAPERS

##### **MICHELE CAFAGNA et al – Interpreting vision and language generative models with semantic visual priors**

When applied to Image-to-text models, explainability methods have two challenges. First, they often provide token-by-token explanations namely, they compute a visual explanation for each token of the generated sequence. This makes explanations expensive to compute and unable to comprehensively explain the model's output. Second, for models with visual inputs, explainability methods such as SHAP typically consider superpixels as features. Since superpixels do not correspond to semantically meaningful regions of an image, this makes explanations harder to interpret. We develop a framework based on SHAP, that allows for generating comprehensive, meaningful explanations leveraging the meaning representation of the output sequence as a whole. Moreover, by exploiting semantic priors in the visual backbone, we extract an arbitrary number of features that allows the efficient computation of Shapley values on large-scale models, generating at the same time highly meaningful visual explanations. We demonstrate that our method generates semantically more expressive explanations than traditional methods at a lower compute cost and that it can be generalized to a large family of vision-language models.

<https://www.frontiersin.org/articles/10.3389/frai.2023.1220476/full>

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### Frontiers in Complex Systems

#### PAPERS

##### **JONATHAN DUNN – Syntactic variation across the grammar: modelling a complex adaptive system**

While language is a complex adaptive system, most work on syntactic variation observes a few individual constructions in isolation from the rest of the grammar. This means that the grammar, a network which connects thousands of structures at different levels of abstraction, is reduced to a few disconnected variables. This paper quantifies the impact of such reductions by systematically modelling dialectal variation across 49 local populations of English speakers in 16 countries. We perform dialect classification with both an entire grammar as well as with isolated nodes within the grammar in order to characterize the syntactic differences between these dialects. The results show, first, that many individual nodes within the grammar are subject to variation but, in isolation, none perform as well as the grammar as a whole. This indicates that an important part of syntactic variation consists of interactions between different parts of the grammar. Second, the results show that the similarity between dialects depends heavily on the sub-set of the grammar being observed: for example, New Zealand English could be more similar to Australian English in phrasal verbs but at the same time more similar to UK English in dative phrases.

<https://www.frontiersin.org/articles/10.3389/fcpxs.2023.1273741/full>

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**Frontiers in Human Neuroscience****PAPERS****ANNALISA TOSONI et al – Neuroimaging evidence supporting a dual-network architecture for the control of visuospatial attention in the human brain: a mini review**

Neuroimaging studies conducted in the last three decades have distinguished two frontoparietal networks responsible for the control of visuospatial attention. The present review summarizes recent findings on the neurophysiological mechanisms implemented in both networks and describes the evolution from a model centered on the distinction between top-down and bottom-up attention to a model that emphasizes the dynamic interplay between the two networks based on attentional demands. The role of the dorsal attention network (DAN) in attentional orienting, by boosting behavioral performance, has been investigated with multiple experimental approaches. This research effort allowed us to trace a distinction between DAN regions involved in shifting vs. maintenance of attention, gather evidence for the modulatory influence exerted by the DAN over sensory cortices, and identify the electrophysiological correlates of the orienting function. Simultaneously, other studies have contributed to reframing our understanding of the functions of the ventral attention network (VAN) and its relevance for behavior. The VAN is not simply involved in bottom-up attentional capture but interacts with the DAN during reorienting to behaviorally relevant targets, exhibiting a general resetting function. Further studies have confirmed the selective rightward asymmetry of the VAN, proposed a functional dissociation along the anteroposterior axis, and suggested hypotheses about its emergence during the evolution of the primate brain. Finally, novel models of network interactions explain the expression of complex attentional functions and the emergence and restorations of symptoms characterizing unilateral spatial neglect. These latter studies emphasize the importance of considering patterns of network interactions for understanding the consequences of brain lesions.

<https://www.frontiersin.org/articles/10.3389/fnhum.2023.1250096/full>

**NAZIFE AYYILDIZ et al – Changes in the superior longitudinal fasciculus and anterior thalamic radiation in the left brain are associated with developmental dyscalculia**

Developmental dyscalculia is a neurodevelopmental disorder specific to arithmetic learning even with normal intelligence and age-appropriate education. Difficulties often persist from childhood through adulthood lowering the individual's quality of life. However, the neural correlates of developmental dyscalculia are poorly understood. This study aimed to identify brain structural connectivity alterations in developmental dyscalculia. All participants were recruited from a large scale, non-referred population sample in a longitudinal design. We studied 10 children with developmental dyscalculia ( $11.3 \pm 0.7$  years) and 16 typically developing peers ( $11.2 \pm 0.6$  years) using diffusion-weighted magnetic resonance imaging. We assessed white matter microstructure with tract-based spatial statistics in regions-of-interest tracts that had previously been related to math ability in children. Then we used global probabilistic tractography for the first time to measure and compare tract length between developmental dyscalculia and typically developing groups. The high angular resolution diffusion-weighted magnetic resonance imaging and crossing-fiber probabilistic tractography allowed us to evaluate the length of the pathways compared to previous studies. The major findings of our study were reduced white matter coherence and shorter tract length of the left superior longitudinal/arcuate fasciculus and left anterior thalamic radiation in the developmental dyscalculia group. Furthermore, the lower white matter coherence and shorter pathways tended to be associated with the lower math performance. These results from the regional analyses indicate that learning, memory and language-related pathways in the left hemisphere might be related to developmental dyscalculia in children.

<https://www.frontiersin.org/articles/10.3389/fnhum.2023.1147352/full>

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**Frontiers in Psychology****ARTICLES****ZENAN RUAN – The necessary and sufficient mechanism of consciousness in a layered mind**

The study of consciousness is becoming one of several significant challenges at the frontiers of science, in contrast to its previously being off-limits. With the application of binocular rivalry, split brain, blindsight, and other paradigms by passionate pioneers in the last century (Seth, 2018), empirical theories of consciousness have emerged in neuroscience. Currently, the situation has reached a critical point of both hope and challenge in that a large number of theories of consciousness (ToCs), each with specific empirical support, have claimed their respective plausibilities, and their proposed conjectures have led to diverging predictions (Del Pin et al., 2021; Signorelli et al., 2021; Seth and Bayne, 2022; Yaron et al., 2022). Various theories have been discussed, and it appears that this issue is becoming more prevalent. Currently, the lack of collaboration between different groups and fields hinders the advancement of theories of consciousness. However, a fundamental theory which is not limited by the boundaries of individual theories is expected to emerge in the future (Koch, 2018).

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1280959/full>

**PAPERS****ROBERTO GRACI & ALESSANDRO CAPONE – Perspectives on the semantics/pragmatics debate: Insights from aphasia research**

In the philosophy of language, there are many ongoing controversies that stem from relying too heavily on an utterance-based framework. The traditional approach of rigidly partitioning the utterance's meaning into what is grammatically determined from what is not may not fully capture the complexity of human language in real-world communicative contexts. To address this issue, we suggest shifting focus toward a broader analysis level encompassing conversations and discourses. From this broader perspective, it is possible to obtain a more integrated view of how linguistic and extra-linguistic aspects dynamically interact and thus reconsider semantics/pragmatics dichotomy as complementary dimensions. Meaning is not confined to linguistic structures alone but emerges from the dynamic interplay of words, sociocultural knowledge, discursive situations, and psychological dispositions of speakers. Substantiating this perspective calls for embracing an interdisciplinary approach that synthesizes research from various domains, including linguistics, cognitive psychology, and philosophy of language. This paper focuses on a particularly compelling case study: aphasia. Speeches produced by individuals with aphasia represent complex scenarios where the balance between linguistic and extra-linguistic aspects is notably compromised, often to the former's detriment. Aphasics' productions represent a vivid example of how the interpretation of speeches can be far from involving fixed and static operations. Instead, it entails continuously reallocating cognitive resources toward the most readily available and accessible sources for the speakers. This case study ultimately demonstrates that the influence of semantic and pragmatic processes in shaping and conveying meanings displays remarkable adaptability, continuously adjusting to the ever changing demands placed upon speakers.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1250170/full>

**Heliyon****PAPERS****MILENA CARVALHO, SUSANA MARTINS & CLÁUDIA PINTO – Landscape and cultural heritage: Object and information**

Culture and Museology use information and communication technologies as mediating communication tools, enhancing the conservation and "socialisation" of museum collections, promoting access to cultural information, through the interdisciplinarity required between the museologist and other professionals who, together, organize and disseminate the collections. In the age of digital transformation, we live in, this reality is even more evident. The museum transforms objects into perceptible information as it is a repository of information. The common link between Museology and Information Science involves valuing the human action of creating, interpreting, using, selecting and distributing knowledge products and records, thus creating a connection with the concept of information.

Information is central to the process of cultural development. This communication clarifies the relationship between Information Science, Heritage and Museology, presenting the information professional as a partner of Museology, working the object as a document with communicative properties, as a message intended for a specific audience and as information that impacts that audience.

[https://www.cell.com/heliyon/fulltext/S2405-8440\(23\)07603-X](https://www.cell.com/heliyon/fulltext/S2405-8440(23)07603-X)

**Interface: Journal of the Royal Society****PAPERS****YAO MENG, MARK BROOM & AMING LI – Impact of misinformation in the evolution of collective cooperation on networks**

Human societies are organized and developed through collective cooperative behaviours. Based on the information in their environment, individuals can form collective cooperation by strategically changing unfavourable surroundings and imitating superior behaviours. However, facing the rampant proliferation and spreading of misinformation, we still lack systematic investigations into the impact of misinformation on the evolution of collective cooperation. Here, we study this problem by classical evolutionary game theory. We find that the existence of misinformation generally impedes the emergence of collective cooperation on networks, although the level of cooperation is slightly higher for weak social cooperative dilemma below a proven threshold. We further show that this possible advantage diminishes as social connections become denser, suggesting that the detrimental effect of misinformation further increases when 'social viscosity' is low. Our results uncover the quantitative effect of misinformation on suppressing collective cooperation, and pave the way for designing possible mechanisms to improve collective cooperation.

<https://royalsocietypublishing.org/doi/full/10.1098/rsif.2023.0295>

**iScience****PAPERS****TATIANA BORTOLATO, ANGELA D. FRIEDERICI, CÉDRIC GIRARD-BUTTOZ, ROMAN M. WITTIG & CATHERINE CROCKFORD – Chimpanzees show the capacity to communicate about concomitant daily life events**

One universal of human language is its versatility in communicating about juxtapositions of everyday events. Versatile combinatorial systems of communication can be selected for if (a) several vocal units are flexibly combined into numerous



and long vocal sequences and (b) vocal sequences relate to numerous daily life events. Chimpanzees fulfil (a) but there is limited evidence for (b) in non-human animals. We propose (b) is more likely during simultaneous or serial (concomitant) events than single events. We analysed 9391 vocal utterances across the repertoire of wild chimpanzees and their events of production. Chimpanzees used vocal sequences across a range of daily life events and twice as often during concomitant than single events. Also, utterance diversity correlated positively with event diversity. Our results show the potential of chimpanzee vocal sequences to convey combined information about numerous daily life events, a step from which generalised combinatoriality could have evolved.

[https://www.cell.com/science/fulltext/S2589-0042\(23\)02167-3](https://www.cell.com/science/fulltext/S2589-0042(23)02167-3)

#### **MARIA BORTOT & GIORGIO VALLORTIGARA – Transfer from continuous to discrete quantities in honeybees**

Honeybees can estimate quantities having different dimensions: continuous and uncountable such as the relative size of visual objects in an array, or discrete and countable such as the number of objects of the array. Honeybees can transfer quantity discrimination (i.e., choosing the larger/smaller stimulus) from number to size. Here we investigated whether honeybees could also generalize from the size (continuous) to the number (discrete) dimension. We trained free-flying foragers to discriminate between large and small size elements. At test, bees were presented with a comparison between larger and smaller numerosities controlled for different continuous variables co-varying with numerosity such as total area, total perimeter, convex hull, and element size. Results showed that bees generalized from the size to the numerical dimension of the stimuli. This cross-dimensional transfer supports the idea of a universal mechanism for the encoding of abstract magnitudes in invertebrate species comparable to that of vertebrate species.

[https://www.cell.com/science/fulltext/S2589-0042\(23\)02112-0](https://www.cell.com/science/fulltext/S2589-0042(23)02112-0)

#### **ALEXANDER B. HERMAN et al – Pretrial predictors of conflict response efficacy in human prefrontal cortex**

The ability to perform motor actions depends, in part, on the brain's initial state. We hypothesized that initial state dependence is a more general principle and applies to cognitive control. To test this idea, we examined human single units recorded from dorsolateral prefrontal (dlPFC) cortex and dorsal anterior cingulate cortex (dACC) during a task that interleaves motor and perceptual conflict trials, the multisource interference task (MSIT). In both brain regions, variability in pre-trial firing rates predicted subsequent reaction time (RT) on conflict trials. In dlPFC, ensemble firing rate patterns suggested the existence of domain-specific initial states, while in dACC, firing patterns were more consistent with a domain-general initial state. The deployment of shared and independent factors that we observe for conflict resolution may allow for flexible and fast responses mediated by cognitive initial states. These results also support hypotheses that place dACC hierarchically earlier than dlPFC in proactive control.

[https://www.cell.com/science/fulltext/S2589-0042\(23\)02124-7](https://www.cell.com/science/fulltext/S2589-0042(23)02124-7)

#### **SERENA VAGLIETTI et al – PolyQ length-based molecular encoding of vocalization frequency in FOXP2**

The transcription factor FOXP2, a regulator of vocalization- and speech/language-related phenotypes, contains two long polyQ repeats (Q1 and Q2) displaying marked, still enigmatic, length variation across mammals. We found that the Q1/Q2 length ratio quantitatively encodes vocalization frequency ranges, from the infrasonic to the ultrasonic, displaying striking convergent evolution patterns. Thus, species emitting ultrasonic vocalizations converge with bats in having a low ratio, whereas species vocalizing in the low-frequency/infrasonic range converge with elephants and whales, which have higher ratios. Similar, taxon-specific patterns were observed for the FOXP2-related protein FOXP1. At the molecular level, we observed that the FOXP2 polyQ tracts form coiled coils, assembling into condensates and fibrils, and drive liquid-liquid phase separation (LLPS). By integrating evolutionary and molecular analyses, we found that polyQ length variation related to vocalization frequency impacts FOXP2 structure, LLPS, and transcriptional activity, thus defining a novel form of polyQ length-based molecular encoding of vocalization frequency.

[https://www.cell.com/science/fulltext/S2589-0042\(23\)02113-2](https://www.cell.com/science/fulltext/S2589-0042(23)02113-2)

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## Journal of Language Evolution

### PAPERS

#### **MARA MOITA, ANA MARIA ABREU & ANA MINEIRO – Iconicity in the emergence of a phonological system?**

Iconicity has been described as an impetus for creating sign forms in emerging sign languages and forming signs in established sign languages. Iconic signs are defined as spontaneous or stable signs that directly reflect the representation of their referent. In established sign languages, iconic signs have phonological features. Regarding the link between the motivation for iconic signs and phonological features, we aim to investigate how iconicity might influence the emergence of a phonological system along with the evolution of a new sign language by observing how the rise of a phonological system might be revealed by the evolution of emerging iconic gestures and signs in a new sign language. For this purpose, we inventoried and coded the iconicity nature and phonological structure of 200 signed lexical items collected in two moments of Sao Tome and Principe Sign Language (LGSTP) emergence: at T1 (after 2 years since the deaf habitants initiated their social meetings) and T2 (8 years subsequent to T1 data collection). In the 8 years of LGSTP's emergence, we found a dominance of iconic signs in tandem with changes in the signs' internal structure. The handshape is revealed to be the phonological parameter with the greatest development, presenting itself as more complex. The LGSTP lexicon reveals that iconicity seems

to prompt the emergence of sign forms. However, iconic strategies remain stable across the evolution of the emergent signs and are independent of the internal structure change of the sign.

<https://academic.oup.com/jole/article/8/1/1/7224657>

### **MARTA SIBIERSKA et al with PRZEMYSŁAW ŻYWICZYŃSKI & JORDAN ZLATEV – Constraints on communicating the order of events in stories through pantomime**

Pantomime is a means of bodily visual communication that is based on iconic gestures that are not fully conventional. It has become a key element in many models of language evolution and a strong candidate for the original human-specific communicative system (Zlatev et al. 2020). Although pantomime affords successful communication in many contexts, it has some semiotic limitations. In this study, we looked at one of them, connected with communicating the order of events in stories. We assumed that pantomime is well-suited for communicating simple stories, where events are arranged in chronological order, and less so for communicating complex stories, where events are arranged in a non-chronological order. To test this assumption, we designed a semiotic game in which participants took turns as directors and matchers. The task of the directors was to mime a story in one of two conditions: chronological or non-chronological; the task of the matchers was to interpret what was mimed. The results showed that the chronological condition was easier for the participants. In the non-chronological condition, we observed that initially, poor communicative success improved as the participants started to use various markers of event order. The results of our study provide insight into the early stages of conventionalisation in bodily visual communication, a potential first step towards protolanguage.

<https://academic.oup.com/jole/article-abstract/8/1/18/7223128>

## Mind & Language

### PAPERS

#### **JAMES LAING – Interpersonal connection**

We are social animals that seek to connect with others of our kind. However, this common thought stands in need of elaboration. In this article, I argue for three theses. First, that we pursue certain forms of communicative interaction for their own sake insofar as they are ways of connecting with another. Second, that interpersonal connection is a metaphysically primitive emotional relation which resists reductive analysis in terms of the states of individuals. And finally, that our desire for interpersonal connection has a strong claim to being explanatorily and normatively prior to our desires for mutual-attachment, interpersonal belonging and approbation.

<https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12480>

#### **CONSTANT BONARD – Underdeterminacy without ostension: A blind spot in the prevailing models of communication**

Together, the code and inferential models of communication are often thought to range over all cases of communication. However, their prevailing versions seem unable to fully explain what I call underdeterminacy without ostension. The latter is constituted by communication where stimuli that are not (nor appear to be) produced with communicative or informative intentions nevertheless communicate information underdetermined by the relevant codes. Though the prevailing accounts of communication cannot fully explain how communication works in such cases, I suggest that some version of the inferential model can—if we allow it to extend to non-ostensive, non-intentional behaviors.

<https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12481>

## Nature Africa

### NEWS

#### **Footprints could be evidence of first shoes**

Three small track sites with sandal-shaped marks found along the South African coastline.

<https://www.nature.com/articles/d44148-023-00250-9>

## Nature Human Behaviour

### ARTICLES

#### **Could a shift in society's conception of 'honesty' explain the spread of misinformation in the USA?**

We identified two components of honesty — 'belief speaking' and 'fact speaking' — in public-facing communication by US politicians. For Republicans, belief speaking is strongly associated with the sharing of untrustworthy information. Fact speaking is associated with the sharing of more reliable information, irrespective of party affiliation.

<https://www.nature.com/articles/s41562-023-01692-9>

### PAPERS

#### **JANA LASSER et al – From alternative conceptions of honesty to alternative facts in communications by US politicians**

The spread of online misinformation on social media is increasingly perceived as a problem for societal cohesion and democracy. The role of political leaders in this process has attracted less research attention, even though politicians who 'speak their mind' are perceived by segments of the public as authentic and honest even if their statements are unsupported



by evidence. By analysing communications by members of the US Congress on Twitter between 2011 and 2022, we show that politicians' conception of honesty has undergone a distinct shift, with authentic belief speaking that may be decoupled from evidence becoming more prominent and more differentiated from explicitly evidence-based fact speaking. We show that for Republicans—but not Democrats—an increase in belief speaking of 10% is associated with a decrease of 12.8 points of quality (NewsGuard scoring system) in the sources shared in a tweet. In contrast, an increase in fact-speaking language is associated with an increase in quality of sources for both parties. Our study is observational and cannot support causal inferences. However, our results are consistent with the hypothesis that the current dissemination of misinformation in political discourse is linked to an alternative understanding of truth and honesty that emphasizes invocation of subjective belief at the expense of reliance on evidence.

<https://www.nature.com/articles/s41562-023-01691-w>

## Nature Humanities & Social Sciences Communications

### PAPERS

#### **ABDULRAHMAN ESSA AL LILY et al – ChatGPT and the rise of semi-humans**

This article explores the research question: 'What are ChatGPT's human-like traits as perceived by society?' Thematic analyses of insights from 452 individuals worldwide yielded two categories of traits. Category 1 entails social traits, where ChatGPT embodies the social roles of 'author' (imitating human phrasing and paraphrasing practices) and 'interactor' (simulating human collaboration and emotion). Category 2 encompasses political traits, with ChatGPT assuming the political roles of 'agent' (emulating human cognition and identity) and 'influencer' (mimicking human diplomacy and consultation). When asked, ChatGPT confirmed the possession of these human-like traits (except for one trait). Thus, ChatGPT displays human-like qualities, humanising itself through the 'game of algorithms'. It transcends its inherent technical essence and machine-based origins to manifest as a 'semi-human' living actor within human society, showcasing the emergence of semi-humans. Therefore, researchers should redirect their attention towards the 'sociology of semi-humans' (studying their socio-political traits) beyond the 'biology of semi-humans' (examining their technical traits). While medieval society was captivated by mythical semi-human beings (e.g. mermaids), modern society finds itself increasingly captivated by computational semi-human beings like ChatGPT. Ethical concerns arise as semi-humans impersonate human traits without consent or genuine human existence, blurring the boundaries between what is authentically and artificially 'human'.

<https://www.nature.com/articles/s41599-023-02154-3>

#### **KEVIN KAGO & PRABHU VENKATARAMAN – Possibility of conjunction between altruism and egoism**

Both altruism and egoism are two types of motivations for action. An altruistic action is performed to benefit the other, whereas egoistic action is performed to benefit oneself. The strict definition of altruism states that an action ceases to be altruistic if the actor receives the benefit of his action as a consequence directly or indirectly. On the other hand, egoism particularly psychological egoism presupposes that all actions, whether performed for oneself or the other, are always self-interested in nature and hence, egoistic. Given the dichotomous existence between the two types of actions, which on many occasions create conceptual misapprehension, a different alternative will be explored. The new inquiry will throw light on the possibility that we commit some kind of motivational extremism on a conceptual level. It will further be argued that altruism and egoism may have one singular motivational source through which various actions emerge.

<https://www.nature.com/articles/s41599-023-02163-2>

## Nature Reviews Neuroscience

### COMMENTARIES

#### **NAI DING – Low-frequency neural parsing of hierarchical linguistic structures**

When a person is listening to speech, their cortical dynamics can track multiword linguistic structures. Kazanina and Tavano provide an in-depth discussion about the interpretation of this phenomenon in a recent Perspective article (Kazanina, N. & Tavano, A. What neural oscillations can and cannot do for syntactic structure building. *Nat. Rev. Neurosci.* 24, 113–128; 2023).

<https://www.nature.com/articles/s41583-023-00749-y>

#### **NINA KAZANINA & ALESSANDRO TAVANO – Reply to 'Low-frequency neural parsing of hierarchical linguistic structures'**

We are pleased that our Perspective (Kazanina, N. & Tavano, A. What neural oscillations can and cannot do for syntactic structure building. *Nat. Rev. Neurosci.* 24, 113–128; 2023) led to a commentary by Ding (Ding, N. Low-frequency neural parsing of hierarchical linguistic structures. *Nat. Rev. Neurosci.* <https://doi.org/10.1038/s41583-023-00749-y>; 2023), who authored a key publication on the topic.

<https://www.nature.com/articles/s41583-023-00750-5>

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## Nature Scientific Reports

### PAPERS

#### **JESÚS RODRÍGUEZ et al – Computer simulation of scavenging by hominins and giant hyenas in the late Early Pleistocene**

Consumption of animal-sourced food is an important factor in broadening the diet of early hominins, promoting brain and body growth, and increasing behavioural complexity. However, whether early hominins obtained animal food by scavenging or hunting large mammals remains debated. Sabre-toothed felids have been proposed to facilitate the expansion of early Homo out of Africa into Europe 1.4–0.8 Ma by creating a niche for scavengers in Eurasia as the carcasses abandoned by these felids still contained abundant edible resources. In contrast, it has been argued that the niche for a large scavenger was already occupied in Eurasia by the giant hyena, preventing hominins from utilising this resource. This study shows that sabre-toothed felids generated carcasses rich in edible resources and that hominins were capable of competing with giant hyenas for this resource. The simulation experiments showed that maintaining an optimum group size is essential for the success of the hominin scavenging strategy. Early hominins could outcompete giant hyenas only if they could successfully dispute carcasses with them. Thus, in the presence of a strong competitor, passive scavenging is essentially the same as confrontational scavenging.

<https://www.nature.com/articles/s41598-023-39776-1>

#### **ANNE-MARIE BACON et al with MIKE W. MORLEY & JEAN-JACQUES HUBLIN – Palaeoenvironments and hominin evolutionary dynamics in southeast Asia**

Secure environmental contexts are crucial for hominin interpretation and comparison. The discovery of a Denisovan individual and associated fauna at Tam Ngu Hao 2 (Cobra) Cave, Laos, dating back to 164–131 ka, allows for environmental comparisons between this (sub)tropical site and the Palearctic Denisovan sites of Denisova Cave (Russia) and Baishiya Karst Cave (China). Denisovans from northern latitudes foraged in a mix of forested and open landscapes, including tundra and steppe. Using stable isotope values from the Cobra Cave assemblage, we demonstrate that, despite the presence of nearby canopy forests, the Denisovan individual from Cobra Cave primarily consumed plants and/or animals from open forests and savannah. Using faunal evidence and proxy indicators of climates, results herein highlight a local expansion of rainforest at ~ 130 ka, raising questions about how Denisovans responded to this local climate change. Comparing the diet and habitat of the archaic hominin from Cobra Cave with those of early Homo sapiens from Tam Pà Ling Cave (46–43 ka), Laos, it appears that only our species was able to exploit rainforest resources.

<https://www.nature.com/articles/s41598-023-43011-2>

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## New Scientist

### NEWS

#### **Prehistoric people in Spain may have made tools from human bones**

The Cueva de los Marmoles cave in Granada, Spain, was used as a prehistoric human burial site. Researchers have found that nearly a third of the bones that remain were altered by tools, possibly to make bowls, cups or spatulas.

<https://www.newscientist.com/article/2393136-prehistoric-people-in-spain-may-have-made-tools-from-human-bones/>

#### **Earliest evidence of buildings made from wood is 476,000 years old**

We tend to think that ancient humans were constantly on the move, but at a site in Zambia there are the first tentative hints that people stayed put and built large wooden dwellings.

<https://www.newscientist.com/article/2392894-earliest-evidence-of-buildings-made-from-wood-is-476000-years-old/>

#### **Theory of consciousness branded 'pseudoscience' by neuroscientists**

Integrated information theory is seen by some people as a leading theory of consciousness, but now over 100 neuroscientists have signed an open letter calling it untestable pseudoscience.

<https://www.newscientist.com/article/2392771-theory-of-consciousness-branded-pseudoscience-by-neuroscientists/>

#### **Jellyfish can learn from experience even though they lack a brain**

As one of the biologically simplest kinds of animal, we might have thought jellyfish can't learn, but it turns out they can.

<https://www.newscientist.com/article/2392994-jellyfish-can-learn-from-experience-even-though-they-lack-a-brain/>

### ARTICLES

#### **CLARE WILSON – Free will: Can neuroscience reveal if your choices are yours to make?**

Philosophers have wrestled with the question of whether we are truly free to decide on our actions for centuries. Now, insights from genetics, neuroscience and evolutionary biology are shedding fresh light on the issue.

<https://www.newscientist.com/article/mg25934580-900-free-will-can-neuroscience-reveal-if-your-choices-are-yours-to-make/>

**REVIEWS****PAT KANE – Life and Language Beyond Earth review: How aliens might communicate**

Raymond Hickey's fascinating book asks how "exobeings", as he calls them, might acquire language - and if we might ever commune with them. Review of 'Life and Language Beyond Earth' by Raymond Hickey, Cambridge University Press (2023). <https://www.newscientist.com/article/mg25934580-600-life-and-language-beyond-earth-review-how-aliens-might-communicate/>

**PLoS One****PAPERS****CARRIE GEORGES, VÉRONIQUE CORNU & CHRISTINE SCHILTZ – The importance of spatial language for early numerical development in preschool: Going beyond verbal number skills**

Recent evidence suggests that spatial language in preschool positively affects the development of verbal number skills, as indexed by aggregated performances on counting and number naming tasks. We firstly aimed to specify whether spatial language (the knowledge of locative prepositions) significantly relates to both of these measures. In addition, we assessed whether the predictive value of spatial language extends beyond verbal number skills to numerical subdomains without explicit verbal component, such as number writing, symbolic magnitude classifications, ordinal judgments and numerosity comparisons. To determine the unique contributions of spatial language to these numerical skills, we controlled in our regression analyses for intrinsic and extrinsic spatial abilities, phonological awareness as well as age, socioeconomic status and home language. With respect to verbal number skills, it appeared that spatial language uniquely predicted forward and backward counting but not number naming, which was significantly affected only by phonological awareness. Regarding numerical tasks that do not contain explicit verbal components, spatial language did not relate to number writing or numerosity comparisons. Conversely, it explained unique variance in symbolic magnitude classifications and was the only predictor of ordinal judgments. These findings thus highlight the importance of spatial language for early numerical development beyond verbal number skills and suggest that the knowledge of spatial terms is especially relevant for processing cardinal and ordinal relations between symbolic numbers. Promoting spatial language in preschool might thus be an interesting avenue for fostering the acquisition of these symbolic numerical skills prior to formal schooling.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0292291>

**TATSUYA DAIKOKU et al – Non-autistic persons modulate their speech rhythm while talking to autistic individuals**

How non-autistic persons modulate their speech rhythm while talking to autistic (AUT) individuals remains unclear. We investigated two types of phonological characteristics: (1) the frequency power of each prosodic, syllabic, and phonetic rhythm and (2) the dynamic interaction among these rhythms using speech between AUT and neurotypical (NT) individuals. Eight adults diagnosed with AUT (all men; age range, 24–44 years) and eight age-matched non-autistic NT adults (three women, five men; age range, 23–45 years) participated in this study. Six NT and eight AUT respondents were asked by one of the two NT questioners (both men) to share their recent experiences on 12 topics. We included 87 samples of AUT-directed speech (from an NT questioner to an AUT respondent), 72 of NT-directed speech (from an NT questioner to an NT respondent), 74 of AUT speech (from an AUT respondent to an NT questioner), and 55 of NT speech (from an NT respondent to an NT questioner). We found similarities between AUT speech and AUT-directed speech, and between NT speech and NT-directed speech. Prosody and interactions between prosodic, syllabic, and phonetic rhythms were significantly weaker in AUT-directed and AUT speech than in NT-directed and NT speech, respectively. AUT speech showed weaker dynamic processing from higher to lower phonological bands (e.g. from prosody to syllable) than NT speech. Further, we found that the weaker the frequency power of prosody in NT and AUT respondents, the weaker the frequency power of prosody in NT questioners. This suggests that NT individuals spontaneously imitate speech rhythms of the NT and AUT interlocutor. Although the speech sample of questioners came from just two NT individuals, our findings may suggest the possibility that the phonological characteristics of a speaker influence those of the interlocutor.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0285591>

**Proceedings of the Royal Society B****PAPERS****CRISTINA RISUENO-SEGOVIA et al – Linguistic law-like compression strategies emerge to maximize coding efficiency in marmoset vocal communication**

Human language follows statistical regularities or linguistic laws. For instance, Zipf's law of brevity states that the more frequently a word is used, the shorter it tends to be. All human languages adhere to this word structure. However, it is unclear whether Zipf's law emerged de novo in humans or whether it also exists in the non-linguistic vocal systems of our primate ancestors. Using a vocal conditioning paradigm, we examined the capacity of marmoset monkeys to efficiently encode vocalizations. We observed that marmosets adopted vocal compression strategies at three levels: (i) increasing call rate, (ii) decreasing call duration and (iii) increasing the proportion of short calls. Our results demonstrate that marmosets, when able to freely choose what to vocalize, exhibit vocal statistical regularities consistent with Zipf's law of brevity that go

beyond their context-specific natural vocal behaviour. This suggests that linguistic laws emerged in non-linguistic vocal systems in the primate lineage.

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2023.1503>

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## Royal Society Notes and Records

### PAPERS

#### **PHILIP BALL – Remaking Ourselves: Technologies of Flesh and the Futures of Selfhood (2022 Wilkins–Bernal–Medawar Lecture)**

Our biotechnologies have entered uncharted territory. The facility for precision editing of the human genome raises the prospect of systematic, ‘post-Darwinian’ control of inheritance. Stem cells can be used to make embryo-like structures that were never fertilized eggs and which might or might not recapitulate normal embryonic development. Neural ‘organoids’ grown in a dish force us to ask what are the minimal substrates of consciousness. It is easy to spin dystopian tales out of such developments, but those offer little guidance for the more urgent issue of how to regulate these technologies or how to discuss their ethical and societal implications. Here I argue for the importance, in those debates, of keeping historical and cultural perspectives visible and explicit: on the one hand to recognize the deep roots of the more lurid fantasies that these developments evoke, and on the other hand to consider how the latest advances challenge the narratives that scientists themselves have employed to frame their research. We should be prepared to be unsettled by what in 1890 zoologist Jacques Loeb called ‘a technology of living substance’—but perhaps not necessarily in ways we can anticipate.

<https://royalsocietypublishing.org/doi/10.1098/rsnr.2023.0061>

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## Royal Society Open Science

### PAPERS

#### **EMIL PERSSON & GUSTAV TINGHÖG – The effect of fast and slow decision-making on equity–efficiency tradeoffs and moral repugnance**

Fast-and-slow models of decision-making are commonly invoked to explain economic behaviour. However, past research has focused on human cooperation and generosity and thus largely overlooked situations where there are sharp conflicts between efficiency and equality, or between efficiency and more intuitive moral values (repugnance). Here, we contribute to fill this gap in the literature. We conducted a preregistered experiment (n = 1500 recruited from Prolific) to assess the effects of fast, intuitive decisions, under time pressure versus slow, deliberate decisions, under time delay, on (i) people’s distributional preferences and (ii) their attitudes toward repugnant transactions. The results show increased preference for equality and decreased preference for efficiency under time pressure, but no effects on moral repugnance. Exploratory analyses revealed that most of the observed treatment effects in our data were accounted for by women. Our results provide some support for theories that associate controlled cognition with concern for efficiency, and intuitive, emotional responses with inequality aversion.

<https://royalsocietypublishing.org/doi/10.1098/rsos.230558>

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## Science Advances

### PAPERS

#### **FRANCISCO MARTÍNEZ-SEVILLA et al – The earliest basketry in southern Europe: Hunter-gatherer and farmer plant-based technology in Cueva de los Murciélagos (Albuñol)**

Plant material culture can offer unique insights into the ways of life of prehistoric societies; however, its perishable nature has prevented a thorough understanding of its diverse and complex uses. Sites with exceptional preservation of organic materials provide a unique opportunity for further research. The burial site of Cueva de los Murciélagos in southern Iberia, uncovered during 19th-century mining activities, contained the best-preserved hunter-gatherer basketry in southern Europe, together with other unique organic artifacts associated with the first farming communities, such as sandals and a wooden hammer. We present 14 <sup>14</sup>C dates for the perishable artifacts (N = 76), situating the assemblage between the Early and Middle Holocene (c. 7500 to 4200 cal BCE). Our integrated analysis includes raw material determination and technological and chrono-cultural contextualization of this unique and important set of materials.

<https://www.science.org/doi/10.1126/sciadv.adi3055>

#### **BENJAMIN GAN-OR & MICHAEL LONDON – Cortical circuits modulate mouse social vocalizations**

Vocalizations provide a means of communication with high fidelity and information rate for many species. Diencephalon and brainstem neural circuits have been shown to control mouse vocal production; however, the role of cortical circuits in this process is debatable. Using electrical and optogenetic stimulation, we identified a cortical region in the anterior cingulate cortex in which stimulation elicits ultrasonic vocalizations. Moreover, fiber photometry showed an increase in Ca<sup>2+</sup> dynamics preceding vocal initiation, whereas optogenetic suppression in this cortical area caused mice to emit fewer vocalizations. Last, electrophysiological recordings indicated a differential increase in neural activity in response to female social exposure dependent on vocal output. Together, these results indicate that the cortex is a key node in the neuronal circuits controlling vocal behavior in mice.

<https://www.science.org/doi/10.1126/sciadv.ade6992>

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## Trends in Cognitive Sciences

### PAPERS

#### **CHARLES FERNYHOUGH & ANNA M. BORGHI – Inner speech as language process and cognitive tool**

Many people report a form of internal language known as inner speech (IS). This review examines recent growth of research interest in the phenomenon, which has broadly supported a theoretical model in which IS is a functional language process that can confer benefits for cognition in a range of domains. A key insight to have emerged in recent years is that IS is an embodied experience characterized by varied subjective qualities, which can be usefully modeled in artificial systems and whose neural signals have the potential to be decoded through advancing brain–computer interface technologies. Challenges for future research include understanding individual differences in IS and mapping form to function across IS subtypes.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(23\)00210-3](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00210-3)

#### **TOBY WISE, KARA EMERY & ANGELA RADULESCU – Naturalistic reinforcement learning**

Humans possess a remarkable ability to make decisions within real-world environments that are expansive, complex, and multidimensional. Human cognitive computational neuroscience has sought to exploit reinforcement learning (RL) as a framework within which to explain human decision-making, often focusing on constrained, artificial experimental tasks. In this article, we review recent efforts that use naturalistic approaches to determine how humans make decisions in complex environments that better approximate the real world, providing a clearer picture of how humans navigate the challenges posed by real-world decisions. These studies purposely embed elements of naturalistic complexity within experimental paradigms, rather than focusing on simplification, generating insights into the processes that likely underpin humans' ability to navigate complex, multidimensional real-world environments so successfully.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(23\)00212-7](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00212-7)

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