

EAORC BULLETIN 1,092 – 19 May 2024

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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.

EDITORIAL INTERJECTIONS

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

NEWS

NATURE BRIEFING – The Neanderthal we want to see

A reconstruction of a Neanderthal woman’s face sports an enigmatic smile reminiscent of the Mona Lisa. It says more about how our views about her species are changing than it does about what she really looked like, argues Fay Bound Alberti. “As a historian of emotion and the human face, I can tell you there is more art than science at work here,” Alberti writes. “By representing this 75,000-year-old woman as a contemplative and kindly soul who we can relate to, rather than a snarling, angry (or blank featured) cypher, we are saying more about our need to rethink the past than any concrete fact about the emotional lives of Neanderthals.”

<https://theconversation.com/the-reconstruction-of-a-75-000-year-old-neanderthal-womans-face-makes-her-look-quite-friendly-theres-a-problem-with-that-229324>

NATURE BRIEFING – How embryos embrace asymmetry

The two cells that make up a one-day old embryo make dramatically different contributions to a human body. This is contrary to the idea that embryonic cells don’t specialise until later in development. Studies with mice, and now with human embryos, have shown that one of the first two cells develops to become most of the mammalian body, whereas the other mainly forms the yolk sac. The cell that divides faster seems to form the body, but it’s not clear why this preference develops. The finding could eventually improve screening for in vitro fertilization to select embryos more likely to develop into a fetus and lead to successful pregnancies.

<https://www.nature.com/articles/d41586-024-01403-y>

NATURE BRIEFING – Brain-reader decodes ‘internal speech’

A brain-computer interface device is the first to decode words entirely from neuronal recordings, without the aid of spoken or mimed speech. The system used arrays of tiny electrodes implanted in the brains of two people with spinal-cord injuries. It decoded one participant’s imagined speech with 79% accuracy and the other’s with 23% accuracy. Some neurons were active only during internal speech and not when the person spoke aloud, suggesting the brain processes imagined speech differently. Clinical applications are still a long way off. “The problem with internal speech is we don’t know what’s happening and how is it processed,” says computational neuroscientist Christian Herff.

<https://www.nature.com/articles/d41586-024-01424-7>

NATURE BRIEFING – How does ChatGPT ‘think’?

Researchers are borrowing approaches from psychology and neuroscience to crack open the ‘black box’ of artificial intelligence (AI) systems. “The nice thing about artificial neural networks is that we can do experiments that neuroscientists would only dream of,” says computer scientist David Bau. “We can look at every single neuron, we can run networks millions of times, we can do all sorts of crazy measurements and interventions and abuse these things. And we don’t have to get a consent form.” Others treat AI models like human subjects and ask them to explain their reasoning. “It is nonsensical to say that a [large language model] has feelings,” says computer scientist Thilo Hagendorff. “It is nonsensical to say that it is self-aware or that it has intentions. But I don’t think it is nonsensical to say that these machines are able to learn or to deceive.”

<https://www.nature.com/articles/d41586-024-01314-y>

NATURE BRIEFING – Why men became good fathers

In her book *Father Time*, primatologist Sarah Hrdy takes us on a quest to discover when and how men — unlike other male great apes — began to nurture their young. When our ancestors became cooperative breeders, with groups of parents raising children together, natural selection favoured men who were more cooperative, Hrdy argues. She suggests that the advent of agriculture masked this truth: it brought with it the need to protect resources, which increased the segregation of men and women in domestic and social spheres. Although Hrdy's model for how male care evolved is necessarily speculative, her broad, accessible writing is a joy to read, says biological anthropologist and reviewer Kermyt Anderson.

<https://www.nature.com/articles/d41586-024-01371-3>

NATURE BRIEFING – Can you lose your native language?

Linguists are re-examining the idea that people are shaped by a single, 'native' language. "There is no age at which a language, even a native tongue, is so firmly cemented into the brain that it can't be dislodged or altered by a new one," notes linguist Julie Sedivy. Language attrition can be the result of several tongues vying for attention and can be tied up with the emotional values attached to a language. "I was physically unable to speak German," a Jewish woman who emigrated before the Second World War told linguist Monika Schmid, who found that émigrés who had experienced more of the Nazi regime had a weaker relationship to their native German.

<https://www.nytimes.com/2024/05/14/magazine/native-language-loss.html>

SCIAM NEWS – Belugas Flirt and Fight by Morphing Their Squishy Forehead

Scientists are putting together a catalog of communications from belugas' forehead "melon".

<https://www.scientificamerican.com/article/belugas-flirt-and-fight-by-morphing-their-squishy-forehead/?et rid=17774313&et cid=5213816>

SCIENCEADVISER – Slow and steady wins the meal

Maybe you're used to jogging down to the corner store for a sandwich and a bag of chips, but that's nothing compared to the hunting strategies of some early hunter-gatherer societies. A study out this week in *Nature Human Behaviour* makes the case that early people frequently used endurance running to outlast quicker prey.

While the basic idea isn't exactly novel, many scientists had questioned how often this really happened in the past, arguing that historical records rarely mention the practice, and that it's rather uncommon among contemporary foraging societies. Yet when a team of scientists from Trent University did a deep dive into the literature, they found many more references to so-called "pursuit hunting" than had previously been believed to exist. Ultimately, they noted 391 historical reports of hunters doggedly jogging down elusive prey like antelopes and kangaroos. It's possible, the authors argue, that reliance on these techniques favored certain anatomical features common in modern people, such as springy arched feet, slow-twitch muscle fibers optimized for efficiency, heat-shedding bare skin, and prodigious ability to sweat.

Yet some skeptics note that even with these expanded references, pursuit hunting still may have been a comparatively rare hunting strategy, and that a lot more data is needed before they'll accept that it played a strong evolutionary role.

<https://www.science.org/content/article/born-run-early-endurance-running--may-have-evolved-help-humans-chase-down-prey>

SCIENCEADVISER – Signatures of speech and song

Singing comes naturally to our species. But it's actually quite weird the way we do it—so distinctively different from the other way we communicate with our voices. As someone who loves to sing, I was fascinated by Daniela Sammler's Focus article on a recent *Science Advances* paper, which found specific differences between speech and music across cultures. I find it exciting that studies like this might be getting us closer to understanding why we make music at all.

<https://www.science.org/doi/10.1126/sciadv.adp9620>

SCIENCE DAILY – Otters, especially females, use tools to survive a changing world

Sea otters are one of the few animals that use tools to access their food, and a new study has found that individual sea otters that use tools -- most of whom are female -- are able to eat larger prey and reduce tooth damage when their preferred prey becomes depleted.

<https://www.sciencedaily.com/releases/2024/05/240516160511.htm>

SCIENCE.ORG NEWS – Endurance running may have evolved to help humans chase down prey

"Pursuit hunting" was sometimes more efficient than stalking, survey of Indigenous hunting methods suggests.

<https://www.science.org/content/article/born-run-early-endurance-running--may-have-evolved-help-humans-chase-down-prey>

SCIENCE.ORG NEWS – Human ancestors may have hunted cave bears 300,000 years ago

Later, more intense hunting by modern humans probably pushed cave bears to extinction.

<https://www.science.org/content/article/human-ancestors-may-have-hunted-cave-bears-300-000-years-ago>

THE CONVERSATION – Are we really about to talk to whales?

It's certainly an exciting time to study communication in whales and dolphins.

<https://theconversation.com/are-we-really-about-to-talk-to-whales-229778>

PUBLICATIONS

Animal Behaviour**PAPERS****ISABEL DRISCOLL, ELODIE F. BRIEFER & MARTA B. MANSER – The role of neighbour proximity and context on meerkat close call acoustic structure**

In many animal species, including humans, producer arousal state is considered a key modifier of vocal production and structure. Encoding of affective arousal state in vocalizations provides a rapid means of information transfer about an individual's internal state, potentially reflecting its response to external stimuli. Meerkats, *Suricata suricatta*, are a highly vocal species. They use close calls to maintain group cohesion while foraging. Due to their patchily distributed prey, motivation for neighbour proximity varies; being too close results in competition (increased arousal–aggression), while too far results in risks of losing the group and predation threats (increased arousal–fear). We investigated how neighbour proximity and behavioural, social and environmental context influence the acoustic structure of wild meerkats' close calls. We found little effect of neighbour distance on the majority of the acoustic parameters measured, although close calls were longer and had a higher fundamental frequency when in very close proximity. However, there was a consistent effect of the behavioural context in which the call was given across several acoustic parameters. Overall, meerkat close calls potentially convey information on current behaviour, highlighting a potential mechanism in the diversification of acoustic signals.

<https://www.sciencedirect.com/science/article/pii/S0003347224001015>

Biolinguistics**PAPERS****AXEL G. EKSTRÖM – A Theory That Never Was: Wrong Way to the “Dawn of Speech”**

Recent literature argues that a purportedly long-standing theory—so-called “laryngeal descent theory”—in speech evolution has been refuted (Boë et al., 2019, <https://doi.org/10.1126/sciadv.aaw3916>). However, an investigation into the relevant source material reveals that the theory described has never been a prominent line of thinking in speech-centric sciences. The confusion arises from a fundamental misunderstanding: the argument that the descent of the larynx and the accompanying changes in the hominin vocal tract expanded the range of possible speech sounds for human ancestors (a theory that enjoys wide interdisciplinary support) is mistakenly interpreted as a belief that all speech was impossible without such changes—a notion that was never widely endorsed in relevant literature. This work aims not to stir controversy but to highlight important historical context in the study of speech evolution.

<https://bioling.psychopen.eu/index.php/bioling/article/view/14285>

Cell Reports**PAPERS****CARISSA CHEN et al – Trans-omic profiling uncovers molecular controls of early human cerebral organoid formation**

Defining the molecular networks orchestrating human brain formation is crucial for understanding neurodevelopment and neurological disorders. Challenges in acquiring early brain tissue have incentivized the use of three-dimensional human pluripotent stem cell (hPSC)-derived neural organoids to recapitulate neurodevelopment. To elucidate the molecular programs that drive this highly dynamic process, here, we generate a comprehensive trans-omic map of the phosphoproteome, proteome, and transcriptome of the exit of pluripotency and neural differentiation toward human cerebral organoids (hCOs). These data reveal key phospho-signaling events and their convergence on transcriptional factors to regulate hCO formation. Comparative analysis with developing human and mouse embryos demonstrates the fidelity of our hCOs in modeling embryonic brain development. Finally, we demonstrate that biochemical modulation of AKT signaling can control hCO differentiation. Together, our data provide a comprehensive resource to study molecular controls in human embryonic brain development and provide a guide for the future development of hCO differentiation protocols.

[https://www.cell.com/cell-reports/fulltext/S2211-1247\(24\)00547-3](https://www.cell.com/cell-reports/fulltext/S2211-1247(24)00547-3)

Frontiers in Psychology
PAPERS**KEN MOGI – Artificial intelligence, human cognition, and conscious supremacy**

The computational significance of consciousness is an important and potentially more tractable research theme than the hard problem of consciousness, as one could look at the correlation of consciousness and computational capacities through, e.g., algorithmic or complexity analyses. In the literature, consciousness is defined as what it is like to be an agent (i.e., a human or a bat), with phenomenal properties, such as qualia, intentionality, and self-awareness. The absence of these properties would be termed “unconscious.” The recent success of large language models (LLMs), such as ChatGPT, has raised new questions about the computational significance of human conscious processing. Although instances from biological systems would typically suggest a robust correlation between intelligence and consciousness, certain states of consciousness seem to exist without manifest existence of intelligence. On the other hand, AI systems seem to exhibit intelligence without consciousness. These instances seem to suggest possible dissociations between consciousness and intelligence in natural and artificial systems. Here, I review some salient ideas about the computational significance of human conscious processes and identify several cognitive domains potentially unique to consciousness, such as flexible attention modulation, robust handling of new contexts, choice and decision making, cognition reflecting a wide spectrum of sensory information in an integrated manner, and finally embodied cognition, which might involve unconscious processes as well. Compared to such cognitive tasks, characterized by flexible and ad hoc judgments and choices, adequately acquired knowledge and skills are typically processed unconsciously in humans, consistent with the view that computation exhibited by LLMs, which are pretrained on a large dataset, could in principle be processed without consciousness, although conversations in humans are typically done consciously, with awareness of auditory qualia as well as the semantics of what are being said. I discuss the theoretically and practically important issue of separating computations, which need to be conducted consciously from those which could be done unconsciously, in areas, such as perception, language, and driving. I propose conscious supremacy as a concept analogous to quantum supremacy, which would help identify computations possibly unique to consciousness in biologically practical time and resource limits. I explore possible mechanisms supporting the hypothetical conscious supremacy. Finally, I discuss the relevance of issues covered here for AI alignment, where computations of AI and humans need to be aligned.

<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1364714/full>

KATHERINE T. RHODES, LINDSEY E. RICHLAND & LUCIA ALCALÁ – Problem solving is embedded in context... so how do we measure it?

Problem solving encompasses the broad domain of human, goal-directed behaviors. Though we may attempt to measure problem solving using tightly controlled and decontextualized tasks, it is inextricably embedded in both reasoners’ experiences and their contexts. Without situating problem solvers, problem contexts, and our own experiential partialities as researchers, we risk intertwining the research of information relevance with our own confirmatory biases about people, environments, and ourselves. We review each of these ecological facets of information relevance in problem solving, and we suggest a framework to guide its measurement. We ground this framework with concrete examples of ecologically valid, culturally relevant measurement of problem solving.

<https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1380178/full>

iScience
PAPERS**SARAH BROCARD et al with KLAUS ZUBERBÜHLER & BALTHASAR BICKEL – A universal preference for animate agents in hominids**

When conversing, humans instantaneously predict meaning from fragmentary and ambiguous speech, long before utterance completion. They do this by integrating priors (initial assumptions about the world) with contextual evidence to rapidly decide on the most likely meaning. One powerful prior is attentional preference for agents, that biases sentence processing but universally so only if agents are animate. Here, we investigate the evolutionary origins of this preference, by allowing chimpanzees, gorillas, orangutans, human children and adults to freely choose between agents and patients in still images, following video clips depicting their dyadic interaction. All participants preferred animate (and occasionally inanimate) agents, although the effect was attenuated if patients were also animate. Findings suggest that a preference for animate agents evolved before language and is not reducible to simple perceptual biases. To conclude, both humans and great apes prefer animate agents in decision tasks, echoing a universal prior in human language processing.

[https://www.cell.com/iscience/fulltext/S2589-0042\(24\)01221-5](https://www.cell.com/iscience/fulltext/S2589-0042(24)01221-5)

MICHELLE GIRAUD et al – Mapping the Emotional Homunculus with fMRI

Emotions are commonly associated with bodily sensations, e.g., boiling with anger when overwhelmed with rage. Studies have shown that emotions are related to specific body parts, suggesting that somatotopically organized cortical regions that commonly respond to somatosensory and motor experiences might be involved in the generation of emotions. We used functional magnetic resonance imaging to investigate whether the subjective feelings of emotion are accompanied by the activation of somatotopically defined sensorimotor brain regions, thus aiming to reconstruct an “emotional

homunculus". By defining the convergence of the brain activation patterns evoked by self-generated emotions during scanning onto a sensorimotor map created on participants' tactile and motor brain activity, we showed that all the evoked emotions activated parts of this sensorimotor map, yet with considerable overlap among different emotions. Although we could not find a highly specific segmentation of discrete emotions over sensorimotor regions, our results support an embodied experience of emotions.

[https://www.cell.com/iscience/fulltext/S2589-0042\(24\)01207-0](https://www.cell.com/iscience/fulltext/S2589-0042(24)01207-0)

LIXIN QIU et al – Functional specialization of medial and lateral orbitofrontal cortex in inferential decision-making

Inferring prospective outcomes and updating behavior are prerequisites for making flexible decisions in the changing world. These abilities are highly associated with the functions of the orbitofrontal cortex (OFC) in humans and animals. The functional specialization of OFC subregions in decision-making has been established in animals. However, the understanding of how human OFC contributes to decision-making remains limited. Therefore, we studied this issue by examining the information representation and functional interactions of human OFC subregions during inference-based decision-making. We found that the medial OFC (mOFC) and lateral OFC (lOFC) collectively represented the inferred outcomes, which however were context-general coding in the mOFC, and context-specific in the lOFC. Furthermore, the mOFC-motor and lOFC-frontoparietal functional connectivity may indicate the motor execution of mOFC and the cognitive control of lOFC during behavioral updating. In conclusion, our findings support the dissociable functional roles of OFC subregions in decision-making.

[https://www.cell.com/iscience/fulltext/S2589-0042\(24\)01232-X](https://www.cell.com/iscience/fulltext/S2589-0042(24)01232-X)

Nature

NEWS

Human embryos embrace asymmetry to form the body

The cells generated by the very first division of the fertilized egg make a lopsided contribution to the body's organs and tissues.

<https://www.nature.com/articles/d41586-024-01403-y>

Brain-reading device is best yet at decoding 'internal speech'

Technology that enables researchers to interpret brain signals could one day allow people to talk using only their thoughts.

<https://www.nature.com/articles/d41586-024-01424-7>

REVIEWS

KERMYT G. ANDERSON – How men evolved to care for babies — before society got in the way

An exploration of the evolution of male nurturing shows why, unlike fathers among other great apes, human dads are biologically wired to be hands-on parents.

Review of 'Father Time: A Natural History of Men and Babies' by Sarah Blaffer Hrdy, Princeton University Press (2024)

<https://www.nature.com/articles/d41586-024-01371-3>

OBITUARIES

ELDAR SHAFIR – Daniel Kahneman: psychologist who revolutionized the way we think about thinking

Nobel prizewinner whose insights into the foibles of human decision-making launched the field of behavioural economics and sent ripples through all social sciences.

<https://www.nature.com/articles/d41586-024-01344-6>

LIAD MUDRIK – Daniel Dennett obituary: 'New atheism' philosopher who sparked debate on consciousness

Cognitive scientist who boldly explored free will, the human mind and AI, and rejected the existence of God.

<https://www.nature.com/articles/d41586-024-01478-7>

Nature Communications

PAPERS

LAURENT CAPLETTE & NICHOLAS B. TURK-BROWNE – Computational reconstruction of mental representations using human behavior

Revealing how the mind represents information is a longstanding goal of cognitive science. However, there is currently no framework for reconstructing the broad range of mental representations that humans possess. Here, we ask participants to indicate what they perceive in images made of random visual features in a deep neural network. We then infer associations between the semantic features of their responses and the visual features of the images. This allows us to reconstruct the mental representations of multiple visual concepts, both those supplied by participants and other concepts extrapolated from the same semantic space. We validate these reconstructions in separate participants and further generalize our approach to predict behavior for new stimuli and in a new task. Finally, we reconstruct the mental representations of

individual observers and of a neural network. This framework enables a large-scale investigation of conceptual representations.

<https://www.nature.com/articles/s41467-024-48114-6>

Nature Human Behaviour

NEWS

Brain–machine-interface device translates internal speech into text

For patients affected by speech disorders, brain–machine-interface (BMI) devices could restore their ability to verbally communicate. In this work, we captured neural activity associated with internal speech — words said within the mind with no associated movement or audio output — and translated these cortical signals into text in real time.

<https://www.nature.com/articles/s41562-024-01869-w>

ARTICLES

YU XU & CHUAN-CHAO WANG – Language evolution in China

The impetus behind the development of various Chinese dialects is as yet unknown. In a comprehensive quantitative coanalysis of linguistic and genetic data across China, Yang et al. find evidence to suggest that demographic diffusion, cultural diffusion and linguistic assimilation all contributed to the expansive diversity of Chinese dialects.

<https://www.nature.com/articles/s41562-024-01898-5>

PAPERS

CHENGKUN YANG et al – Large-scale lexical and genetic alignment supports a hybrid model of Han Chinese demic and cultural diffusions

The Han Chinese history is shaped by substantial demographic activities and sociocultural transmissions. However, it remains challenging to assess the contributions of demic and cultural diffusion to Han culture and language, primarily due to the lack of rigorous examination of genetic–linguistic congruence. Here we digitized a large-scale linguistic inventory comprising 1,018 lexical traits across 926 dialect varieties. Using phylogenetic analysis and admixture inference, we revealed a north–south gradient of lexical differences that probably resulted from historical migrations. Furthermore, we quantified extensive horizontal language transfers and pinpointed central China as a dialectal melting pot. Integrating genetic data from 30,408 Han Chinese individuals, we compared the lexical and genetic landscapes across 26 provinces. Our results support a hybrid model where demic diffusion predominantly impacts central China, while cultural diffusion and language assimilation occur in southwestern and coastal regions, respectively. This interdisciplinary study sheds light on the complex social-genetic history of the Han Chinese.

<https://www.nature.com/articles/s41562-024-01886-9>

SARAH K. WANDEL et al – Representation of internal speech by single neurons in human supramarginal gyrus

Speech brain–machine interfaces (BMIs) translate brain signals into words or audio outputs, enabling communication for people having lost their speech abilities due to diseases or injury. While important advances in vocalized, attempted and mimed speech decoding have been achieved, results for internal speech decoding are sparse and have yet to achieve high functionality. Notably, it is still unclear from which brain areas internal speech can be decoded. Here two participants with tetraplegia with implanted microelectrode arrays located in the supramarginal gyrus (SMG) and primary somatosensory cortex (S1) performed internal and vocalized speech of six words and two pseudowords. In both participants, we found significant neural representation of internal and vocalized speech, at the single neuron and population level in the SMG. From recorded population activity in the SMG, the internally spoken and vocalized words were significantly decodable. In an offline analysis, we achieved average decoding accuracies of 55% and 24% for each participant, respectively (chance level 12.5%), and during an online internal speech BMI task, we averaged 79% and 23% accuracy, respectively. Evidence of shared neural representations between internal speech, word reading and vocalized speech processes was found in participant 1. SMG represented words as well as pseudowords, providing evidence for phonetic encoding. Furthermore, our decoder achieved high classification with multiple internal speech strategies (auditory imagination/visual imagination). Activity in S1 was modulated by vocalized but not internal speech in both participants, suggesting no articulator movements of the vocal tract occurred during internal speech production. This work represents a proof-of-concept for a high-performance internal speech BMI.

<https://www.nature.com/articles/s41562-024-01867-y>

EUGÈNE MORIN & BRUCE WINTERHALDER – Ethnography and ethnohistory support the efficiency of hunting through endurance running in humans

Humans have two features rare in mammals: our locomotor muscles are dominated by fatigue-resistant fibres and we effectively dissipate through sweating the metabolic heat generated through prolonged, elevated activity. A promising evolutionary explanation of these features is the endurance pursuit (EP) hypothesis, which argues that both traits evolved to facilitate running down game by persistence. However, this hypothesis has faced two challenges: running is energetically

costly and accounts of EPs among late twentieth century foragers are rare. While both observations appear to suggest that EPs would be ineffective, we use foraging theory to demonstrate that EPs can be quite efficient. We likewise analyse an ethnohistoric and ethnographic database of nearly 400 EP cases representing 272 globally distributed locations. We provide estimates for return rates of EPs and argue that these are comparable to other pre-modern hunting methods in specified contexts. EP hunting as a method of food procurement would have probably been available and attractive to Plio/Pleistocene hominins.

<https://www.nature.com/articles/s41562-024-01876-x>

Nature Molecular Psychiatry

PAPERS

RINI PAULY et al – Enrichment of a subset of Neanderthal polymorphisms in autistic probands and siblings

Homo sapiens and Neanderthals underwent hybridization during the Middle/Upper Paleolithic age, culminating in retention of small amounts of Neanderthal-derived DNA in the modern human genome. In the current study, we address the potential roles Neanderthal single nucleotide polymorphisms (SNP) may be playing in autism susceptibility in samples of black non-Hispanic, white Hispanic, and white non-Hispanic people using data from the Simons Foundation Powering Autism Research (SPARK), Genotype-Tissue Expression (GTEx), and 1000 Genomes (1000G) databases. We have discovered that rare variants are significantly enriched in autistic probands compared to race-matched controls. In addition, we have identified 25 rare and common SNPs that are significantly enriched in autism on different ethnic backgrounds, some of which show significant clinical associations. We have also identified other SNPs that share more specific genotype-phenotype correlations but which are not necessarily enriched in autism and yet may nevertheless play roles in comorbid phenotype expression (e.g., intellectual disability, epilepsy, and language regression). These results strongly suggest Neanderthal-derived DNA is playing a significant role in autism susceptibility across major populations in the United States.

<https://www.nature.com/articles/s41380-024-02593-7>

Nature Scientific Reports

PAPERS

JUNMING ZHANG et al – Sign language recognition based on dual-path background erasure convolutional neural network

Sign language is an important way to provide expression information to people with hearing and speaking disabilities. Therefore, sign language recognition has always been a very important research topic. However, many sign language recognition systems currently require complex deep models and rely on expensive sensors, which limits the application scenarios of sign language recognition. To address this issue, based on computer vision, this study proposed a lightweight, dual-path background erasing deep convolutional neural network (DPCNN) model for sign language recognition. The DPCNN consists of two paths. One path is used to learn the overall features, while the other path learns the background features. The background features are gradually subtracted from the overall features to obtain an effective representation of hand features. Then, these features are flattened into a one-dimensional layer, and pass through a fully connected layer with an output unit of 128. Finally, use a fully connected layer with an output unit of 24 as the output layer. Based on the ASL Finger Spelling dataset, the total accuracy and Macro-F1 scores of the proposed method is 99.52% and 0.997, respectively. More importantly, the proposed method can be applied to small terminals, thereby improving the application scenarios of sign language recognition. Through experimental comparison, the dual path background erasure network model proposed in this paper has better generalization ability.

<https://www.nature.com/articles/s41598-024-62008-z>

Neuron

ARTICLES

CHRISTOF KOCH – Footprints of consciousness

In this talk with Neuron, Christof Koch, a physicist and neuroscientist, advocates for a pragmatic program to track the footprints of consciousness in the brain and for team science, explains the recent pseudo-controversy regarding integrated information theory of consciousness, and speaks about the joy of exploring the mysteries around us.

[https://www.cell.com/neuron/fulltext/S0896-6273\(24\)00160-0](https://www.cell.com/neuron/fulltext/S0896-6273(24)00160-0)

STANISLAS DEHAENE – The role of theory in neuroscience

Stanislas Dehaene is a cognitive neuroscientist elucidating the biological mechanisms that give rise to human perception and cognition. In a conversation with Neuron, he talks about his ongoing interest in consciousness research, the role of theory in neuroscience, and his current work on education and the science of learning.

[https://www.cell.com/neuron/fulltext/S0896-6273\(24\)00159-4](https://www.cell.com/neuron/fulltext/S0896-6273(24)00159-4)

PAPERS**CHRISTOPHER J. WHYTE et al – Thalamic contributions to the state and contents of consciousness**

Consciousness can be conceptualized as varying along at least two dimensions: the global state of consciousness and the content of conscious experience. Here, we highlight the cellular and systems-level contributions of the thalamus to conscious state and then argue for thalamic contributions to conscious content, including the integrated, segregated, and continuous nature of our experience. We underscore vital, yet distinct roles for core- and matrix-type thalamic neurons. Through reciprocal interactions with deep-layer cortical neurons, matrix neurons support wakefulness and determine perceptual thresholds, whereas the cortical interactions of core neurons maintain content and enable perceptual constancy. We further propose that conscious integration, segregation, and continuity depend on the convergent nature of corticothalamic projections enabling dimensionality reduction, a thalamic reticular nucleus-mediated divisive normalization-like process, and sustained coherent activity in thalamocortical loops, respectively. Overall, we conclude that the thalamus plays a central topological role in brain structures controlling conscious experience.

[https://www.cell.com/neuron/fulltext/S0896-6273\(24\)00280-0](https://www.cell.com/neuron/fulltext/S0896-6273(24)00280-0)

THEOFANIS I. PANAGIOTAROPOULOS – An integrative view of the role of prefrontal cortex in consciousness

The involvement of the prefrontal cortex (PFC) in consciousness is an ongoing focus of intense investigation. An important question is whether representations of conscious contents and experiences in the PFC are confounded by post-perceptual processes related to cognitive functions. Here, I review recent findings suggesting that neuronal representations of consciously perceived contents—in the absence of post-perceptual processes—can indeed be observed in the PFC. Slower ongoing fluctuations in the electrophysiological state of the PFC seem to control the stability and updates of these prefrontal representations of conscious awareness. In addition to conscious perception, the PFC has been shown to play a critical role in controlling the levels of consciousness as observed during anesthesia, while prefrontal lesions can result in severe loss of perceptual awareness. Together, the convergence of these processes in the PFC suggests its integrative role in consciousness and highlights the complex nature of consciousness itself.

[https://www.cell.com/neuron/abstract/S0896-6273\(24\)00289-7](https://www.cell.com/neuron/abstract/S0896-6273(24)00289-7)

New Scientist**NEWS****Oldest known human viruses found hidden within Neanderthal bones**

A genetic analysis of 50,000-year-old Neanderthal skeletons has uncovered the remnants of three viruses related to modern human pathogens, and the researchers think they could be recreated.

<https://www.newscientist.com/article/2430389-oldest-known-human-viruses-found-hidden-within-neanderthal-bones/>

Did humans evolve to chase down prey over long distances?

Outrunning prey over long distances is an efficient method of hunting for humans, and it was widely used until recently, according to an analysis of ethnographic accounts.

<https://www.newscientist.com/article/2430732-did-humans-evolve-to-chase-down-prey-over-long-distances/>

Sperm whale clicks could be the closest thing to a human language yet

An analysis of thousands of exchanges between sperm whales suggests they combine short click patterns into longer sequences that could convey a wide range of meanings.

<https://www.newscientist.com/article/2429941-sperm-whale-clicks-could-be-the-closest-thing-to-a-human-language-yet/>

Monkeys can learn to tap to the beat of the Backstreet Boys

With a bit of training, macaques can make rhythmic movements in time with music, an ability only shown before by a handful of animals.

<https://www.newscientist.com/article/2430264-monkeys-can-learn-to-tap-to-the-beat-of-the-backstreet-boys/>

REVIEWS**SANDRINE CEURSTEMONT – Creativity's origins are probably too complex for simple explanations**

What makes some people so creative? There are many common beliefs about the neuroscience of innovation, but they fail to capture its true complexity. Review of 'The Creative Brain: Myths and truths' by Anna Abraham, MIT Press (2024).

<https://www.newscientist.com/article/mg26234913-400-creativitys-origins-are-probably-too-complex-for-simple-explanations/>

PeerJ

PAPERS

WENDY M. ERB et al – Vocal complexity in the long calls of Bornean orangutans

Vocal complexity is central to many evolutionary hypotheses about animal communication. Yet, quantifying and comparing complexity remains a challenge, particularly when vocal types are highly graded. Male Bornean orangutans (*Pongo pygmaeus wurmbii*) produce complex and variable “long call” vocalizations comprising multiple sound types that vary within and among individuals. Previous studies described six distinct call (or pulse) types within these complex vocalizations, but none quantified their discreteness or the ability of human observers to reliably classify them. We studied the long calls of 13 individuals to: (1) evaluate and quantify the reliability of audio-visual classification by three well-trained observers, (2) distinguish among call types using supervised classification and unsupervised clustering, and (3) compare the performance of different feature sets. Using 46 acoustic features, we used machine learning (i.e., support vector machines, affinity propagation, and fuzzy c-means) to identify call types and assess their discreteness. We additionally used Uniform Manifold Approximation and Projection (UMAP) to visualize the separation of pulses using both extracted features and spectrogram representations. Supervised approaches showed low inter-observer reliability and poor classification accuracy, indicating that pulse types were not discrete. We propose an updated pulse classification approach that is highly reproducible across observers and exhibits strong classification accuracy using support vector machines. Although the low number of call types suggests long calls are fairly simple, the continuous gradation of sounds seems to greatly boost the complexity of this system. This work responds to calls for more quantitative research to define call types and quantify gradedness in animal vocal systems and highlights the need for a more comprehensive framework for studying vocal complexity vis-à-vis graded repertoires.

<https://peerj.com/articles/17320/>

PLoS One

PAPERS

MAX ALBERHASKY & PATRICK K. DURKEE – Songs tell a story: The Arc of narrative for music

Research suggests that a core lexical structure characterized by words that define plot staging, plot progression, and cognitive tension underlies written narratives. Here, we investigate the extent to which song lyrics follow this underlying narrative structure. Using a text analytic approach and two publicly available datasets of song lyrics including a larger dataset (N = 12,280) and a smaller dataset of greatest hits (N = 2,823), we find that music lyrics tend to exhibit a core Arc of Narrative structure: setting the stage at the beginning, progressing the plot steadily until the end of the song, and peaking in cognitive tension in the middle. We also observe differences in narrative structure based on musical genre, suggesting different genres set the scene in greater detail (Country, Rap) or progress the plot faster and have a higher rate of internal conflict (Pop). These findings add to the evidence that storytelling exhibits predictable language patterns and that storytelling is evident in music lyrics.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0303188>

JAMES R. DAVIES, ELIAS GARCIA-PELEGRIN & NICOLA S. CLAYTON – Eurasian jays (*Garrulus glandarius*) show episodic-like memory through the incidental encoding of information

Episodic memory describes the conscious reimagining of our memories and is often considered to be a uniquely human ability. As these phenomenological components are embedded within its definition, major issues arise when investigating the presence of episodic memory in non-human animals. Importantly, however, when we as humans recall a specific experience, we may remember details from that experience that were inconsequential to our needs, thoughts, or desires at that time. This ‘incidental’ information is nevertheless encoded automatically as part of the memory and is subsequently recalled within a holistic representation of the event. The incidental encoding and unexpected question paradigm represents this characteristic feature of human episodic memory and can be employed to investigate memory recall in non-human animals. However, without evidence for the associated phenomenology during recall, this type of memory is termed ‘episodic-like memory’. Using this approach, we tested seven Eurasian jays (*Garrulus glandarius*) on their ability to use incidental visual information (associated with observed experimenter made ‘caches’) to solve an unexpected memory test. The birds performed above chance levels, suggesting that Eurasian jays can encode, retain, recall, and access incidental visual information within a remembered event, which is an ability indicative of episodic memory in humans.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0301298>

NICCOLÒ BUTTI et al – To touch or to be touched? comparing appraisal of vicarious execution and reception of interpersonal touch

Unmyelinated C-Tactile (CT) fibres are activated by caress-like touch, eliciting a pleasant feeling that decreases for static and faster stroking. Previous studies documented this effect also for vicarious touch, hypothesising simulation mechanisms driving the perception and appreciation of observed interpersonal touch. Notably, less is known about appreciation of vicarious execution of touch, that is as referred to the one giving gentle touch. To address this issue, 53 healthy participants were asked to view and rate a series of videoclips displaying an individual being touched by another on hairy (i.e., hand

dorsum) or glabrous (i.e., palm) skin sites, with touch being delivered at CT-optimal (5 cm/s) or non-CT optimal velocities (0 cm/s or 30 cm/s). Following the observation of each clip, participants were asked to rate self-referred desirability and model-referred pleasantness of vicarious touch for both executer (toucher-referred) and receiver (touchee-referred). Consistent with the CT fibres properties, for both self-referred desirability and model-referred pleasantness judgements of vicarious touch execution and reception, participants provided higher ratings for vicarious touch delivered at CT-optimal than other velocities, and when observed CT-optimal touch was delivered to the hand-dorsum compared to the palm. However, higher ratings were attributed to vicarious reception compared to execution of CT-optimal touch. Notably, individual differences in interoceptive trusting and attitude to interpersonal touch were positively correlated with, respectively, toucher- and touchee-related overall appraisal ratings of touch. These findings suggest that the appreciation of both toucher- and touchee-referred vicarious touch is specifically attuned to CT-optimal touch, even though they might rely on different neurocognitive mechanisms to understand affective information conveyed by interpersonal tactile interactions.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0293164>

PETER TATTERSFIELD et al – Laetoli, Tanzania: Extant terrestrial mollusc faunas shed new light on climate and palaeoecology at a Pliocene hominin site

Laetoli, Tanzania is one of the most important palaeontological and palaeoanthropological localities in Africa. We report on a survey of the extant terrestrial gastropod faunas of the Laetoli-Endulen area, examine their ecological associations and re-examine the utility of Pliocene fossil molluscs in palaeoenvironmental reconstruction. Standardised collecting at 15 sites yielded 7302 individuals representing 58 mollusc species. Significant dissimilarities were found among the faunas of three broad habitat types: forest, woodland/bushland and open (grassland and scattered, xeric shrubland). Overall, more species were recorded in the woodland/bushland sites than in the forest sites. Open sites were less diverse. Environmental factors contributing most strongly to the separation of habitat types were aridity index and elevation. The results are supplemented with new mollusc data from the Mbulu Plateau south of Lake Eyasi, and compared to the list of species cumulatively recorded from the Ngorongoro area. Some regional variation is apparent and historical factors may explain the absence of some fossil taxa from Laetoli today. Differences in seasonality separated upland forest sites on the Mbulu plateau from those at Lemagurut at Laetoli. Indicator species were identified for each habitat. These included several large-bodied species analogous to the Laetoli Pliocene fossil species that were then used for palaeoenvironmental reconstruction. Based on the estimated aridity index, and adopting the widely used United Nations Environment Programme (UNEP) global climate classification, the four stratigraphic subunits of the Upper Laetoli Beds (3.6–3.85 Ma) would be placed in either the UNEP's Dry Sub-humid or Semi-arid climate classes, whereas the Upper Ndolanya Beds (2.66 Ma) and Lower Laetoli Beds (3.85–<4.36 Ma) would be assigned to the Humid and Semi-arid climate classes respectively. Pliocene precipitation at Laetoli is estimated as 847–965 mm per year, refining previous estimates. This is close or slightly higher than the present mean annual precipitation, and is likely to have corresponded to a mosaic of forest, woodland and bushland within a grassland matrix consistent with other reconstructions.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0302435>

Royal Society Open Science

PAPERS

CAREL P. VAN SCHAİK et al with JUDITH M. BURKART – Short-term memory, attentional control and brain size in primates

Brain size variability in primates has been attributed to various domain-specific socio-ecological factors. A recently published large-scale study of short-term memory abilities in 41 primate species (ManyPrimates 2022 Anim. Behav. Cogn. 9, 428–516. (doi:10.26451/abc.09.04.06.2022)) did not find any correlations with 11 different proxies of external cognitive demands. Here, we found that the interspecific variation in test performance shows correlated evolution with total brain size, with the relationship becoming tighter as species with small sample sizes were successively removed, whereas it was not predicted by the often-used encephalization quotient. In a subsample, we also found that the sizes of brain regions thought to be involved in short-term memory did not predict performance better than overall brain size. The dependence on brain size suggests that domain-general cognitive processes underlie short-term memory as tested by ManyPrimates. These results support the emerging notion that comparative studies of brain size do not generally identify domain-specific cognitive adaptations but rather reveal varying selections on domain-general cognitive abilities. Finally, because attentional processes beyond short-term memory also affect test performance, we suggest that the delayed response test can be refined.

<https://royalsocietypublishing.org/doi/10.1098/rsos.231541>

ASAMI SHINOHARA et al – Children are sensitive to the number of sources when relying on gossip

Gossip allows children to effectively identify cooperative or trustworthy partners. However, the risk of being deceived must be faced because gossip may be false. One clue for determining gossip's veracity is the number of its sources since multiple informants spreading identical reputational information about others might imply that another's moral traits are viewed unanimously among members of a social group. We investigated whether 7-year-olds (N = 108) would trust gossip from multiple independent sources. In our study, they received multiple pieces of positive/negative reputational information about one agent and neutral information about another agent by gossip from either single or multiple informants. Then they

allocated rewards to and chose rewards from the gossip targets. The 7-year-olds acted upon positive gossip from multiple informants and did not rely on positive gossip from a single informant. By contrast, they relied on negative gossip regardless of the number of informants. In either valence, however, they were more likely to allocate rewards based on gossip from multiple informants than a single informant. This result indicates they are sensitive to an objective index, specifically the number of sources, for judging the veracity of gossip.

<https://royalsocietypublishing.org/doi/10.1098/rsos.230375>

Science

NEWS

Tool use promotes dental health

Using tools increases foraging success in sea otters and protects their teeth from damage.

<https://www.science.org/doi/10.1126/science.adp4375>

PAPERS

CHRIS J. LAW et al – Tool use increases mechanical foraging success and tooth health in southern sea otters (*Enhydra lutris nereis*)

Although tool use may enhance resource utilization, its fitness benefits are difficult to measure. By examining longitudinal data from 196 radio-tagged southern sea otters (*Enhydra lutris nereis*), we found that tool-using individuals, particularly females, gained access to larger and/or harder-shelled prey. These mechanical advantages translated to reduced tooth damage during food processing. We also found that tool use diminishes trade-offs between access to different prey, tooth condition, and energy intake, all of which are dependent on the relative prey availability in the environment. Tool use allowed individuals to maintain energetic requirements through the processing of alternative prey that are typically inaccessible with biting alone, suggesting that this behavior is a necessity for the survival of some otters in environments where preferred prey are depleted.

<https://www.science.org/doi/10.1126/science.adj6608>

Science Advances

ARTICLES

DANIELA SAMMLER – Signatures of speech and song: “Universal” links despite cultural diversity

Equitable collaboration between culturally diverse scientists reveals that acoustic fingerprints of human speech and song share parallel relationships across the globe.

<https://www.science.org/doi/10.1126/sciadv.adp9620>

PAPERS

YUTO OZAKI et mul with W. TECUMSEH FITCH – Globally, songs and instrumental melodies are slower and higher and use more stable pitches than speech: A Registered Report

Both music and language are found in all known human societies, yet no studies have compared similarities and differences between song, speech, and instrumental music on a global scale. In this Registered Report, we analyzed two global datasets: (i) 300 annotated audio recordings representing matched sets of traditional songs, recited lyrics, conversational speech, and instrumental melodies from our 75 coauthors speaking 55 languages; and (ii) 418 previously published adult-directed song and speech recordings from 209 individuals speaking 16 languages. Of our six preregistered predictions, five were strongly supported: Relative to speech, songs use (i) higher pitch, (ii) slower temporal rate, and (iii) more stable pitches, while both songs and speech used similar (iv) pitch interval size and (v) timbral brightness. Exploratory analyses suggest that features vary along a “musi-linguistic” continuum when including instrumental melodies and recited lyrics. Our study provides strong empirical evidence of cross-cultural regularities in music and speech.

<https://www.science.org/doi/10.1126/sciadv.adm9797>

Trends in Cognitive Sciences

PAPERS

JENS KOED MADSEN et al – Behavioral science should start by assuming people are reasonable

Should policymaking assume humans are irrational? Using empirical, theoretical, and philosophical arguments, we suggest a more useful frame is that human behavior is reasonable. Through identifying goals and systemic factors shaping behavior, we suggest that assuming people are reasonable enables behavioral science to be more effective in shaping public policy.

{Economists have been pushing Homo economicus (a rational person who pursues wealth for their own self-interest) since John Stuart Mill proposed it in 1861. I wonder how that’s working out for them? Or, to put it another way, the only x that works in “assume people are x” is “people”}.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(24\)00105-0](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(24)00105-0)

Trends in Neurosciences

ARTICLES

CAROLYN L. PYTTE – Window into the songbird brain reveals superdiffusive migration of adult-born neurons

In a recent study, Shvedov and colleagues used live two-photon imaging in transgenic zebra finches to reveal migration patterns of neuroblasts through the complex environment of the postembryonic brain. This study highlights the value of ubiquitin C/green fluorescent protein (UBC-GFP) transgenic zebra finches in studying adult neurogenesis and advances our understanding of dispersed long-distance neuronal migration in the adult brain, shedding light on this understudied phenomenon.

[https://www.cell.com/trends/neurosciences/abstract/S0166-2236\(24\)00059-6](https://www.cell.com/trends/neurosciences/abstract/S0166-2236(24)00059-6)

PAPERS

BENJAMIN M. BASILE, SPENCER J. WATERS & ELISABETH A. MURRAY – What does preferential viewing tell us about the neurobiology of recognition memory?

The two tests most widely used in nonhuman primates to assess the neurobiology of recognition memory produce conflicting results. Preferential viewing tests (e.g., visual paired comparison) produce robust impairments following hippocampal lesions, whereas matching tests (e.g., delayed nonmatching-to-sample) often show complete sparing. Here, we review the data, the proposed explanations for this discrepancy, and then critically evaluate those explanations. The most likely explanation is that preferential viewing tests are not a process-pure assessment of recognition memory, but also test elements of novelty-seeking, habituation, and motivation. These confounds likely explain the conflicting results. Thus, we propose that memory researchers should prefer explicit matching tests and readers interested in the neural substrates of recognition memory should give explicit matching tests greater interpretive weight.

[https://www.cell.com/trends/neurosciences/fulltext/S0166-2236\(24\)00040-7](https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(24)00040-7)

NICHOLAS B. TURK-BROWNE & RICHARD N. ASLIN – Infant neuroscience: how to measure brain activity in the youngest minds

The functional properties of the infant brain are poorly understood. Recent advances in cognitive neuroscience are opening new avenues for measuring brain activity in human infants. These include novel uses of existing technologies such as electroencephalography (EEG) and magnetoencephalography (MEG), the availability of newer technologies including functional near-infrared spectroscopy (fNIRS) and optically pumped magnetometry (OPM), and innovative applications of functional magnetic resonance imaging (fMRI) in awake infants during cognitive tasks. In this review article we catalog these available non-invasive methods, discuss the challenges and opportunities encountered when applying them to human infants, and highlight the potential they may ultimately hold for advancing our understanding of the youngest minds.

[https://www.cell.com/trends/neurosciences/fulltext/S0166-2236\(24\)00019-5](https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(24)00019-5)

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