EAORC BULLETIN 1,093 – 26 May 2024

CONTENTS

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 – Counting crows

Carrion crows (Corvus corone) can reliably caw a number of times from one to four on command — a skill that had only been seen in people. Over several months, birds were trained with treats to associate a screen showing the digits, or a related sound, with the right number of calls. The crows were not displaying a 'true' counting ability, which requires a symbolic understanding of numbers, say researchers. But they are nevertheless able to produce a deliberate number of vocalizations on cue, which is "a very impressive achievement", says neuroscientist Giorgio Vallortigara.
https://www.nature.com/articles/d41586-024-01482-x

SAPIENS – Chimpanzees Can't Tell Us Much About Being Human

Although there is merit in recognizing how we resemble our primate relatives, sometimes we need to understand what sets our species apart.
https://www.sapiens.org/biology/chimpanzees-cant-tell-us-much-about-being-human/

SAPIENS – The Problems of Evolution as a "March of Progress"

The idea that evolution is a hierarchy of complexity with humans on top lurks in everything from biology classes to politics. It's time to unlearn this false and harmful view.
https://www.sapiens.org/biology/evolution-march-of-progress/

SAPIENS – How Power Pervades Portrayals of Human Evolution

An evolutionary scholar examines racist and sexist depictions of human evolution that continue to permeate science, education, and popular culture.
https://www.sapiens.org/biology/racism-sexism-human-evolution/

SCIENCEADVISER – Report slams archaeologist couple for intimidation, abuse of power, & remains theft

Leading scientist at Leiden University and her husband created a 30-year "culture of fear" and violated academic integrity, investigation panel says.
https://www.science.org/content/article/report-slams-dutch-archaeologist-couple-intimidation-abuse-power-and-theft-human

SCIENCEADVISER – Crows count 'one, two, three' out loud

Carrion crows are known as "feathered apes" for a number of good reasons. And scientists just discovered another: They can count out loud, researchers reported yesterday in Science. The work suggests that the birds understand numbers and counting in the same way humans do, making them the only other species known to have this ability.
One hallmark of human language is our ability to associate and utter a sound, such as a word, with something we see or hear. We might say "three" if we see three apples, for example. Could crows do this as well? To find out, a team worked with three carrion crows trained to produce one to four calls (a kraak) when they saw an Arabic numeral on a screen or heard a short noise. In thousands of trials, the birds usually made the correct number of kraaks required by the visual cue, but often took longer to respond to cues requiring three or four calls.

John Marzluff, a wildlife scientist and crow expert who was not involved in the study, says that suggests the crows engage in the same kind of “mental planning” that humans do when asked a question requiring more than a one-word reply. “We now know that numerical competence, once considered a hallmark of human intelligence, isn’t just a human trait,” he adds.
https://www.science.org/content/article/these-crows-may-count-way-similar-human-toddlers

SCIENCE DAILY – Meerkat chit-chat

Researchers unravel the vocal interactions of meerkat groups and show they use two different types of interactions to stay in touch.
https://www.sciencedaily.com/releases/2024/05/240520122825.htm

SCIENCE DAILY – Cortex's self-organizing abilities in neural development

Researchers have investigated how highly organized patterns of neural activity emerge during development.
https://www.sciencedaily.com/releases/2024/05/240521124356.htm

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 DAILY – How neighboring whale families learn each other's vocal style

Researchers have developed a method to investigate sperm whale communication by determining their vocal style, finding that groups living in close proximity can develop similar styles to each other.
https://www.sciencedaily.com/releases/2024/05/240516160159.htm

SCIENCE DAILY – Eurasian jays can use 'mental time travel' like humans, study finds

Eurasian jays can remember incidental details of past events, which is characteristic of episodic memory in humans, according to a new study.
https://www.sciencedaily.com/releases/2024/05/240515164232.htm

SCIENCE.ORG NEWS – Tool use keeps these adorable otters out of the dentist’s chair

Rocks and other objects allow the marine mammals to eat tougher prey without damaging their teeth—and females benefit most.
https://www.science.org/content/article/tool-use-keeps-these-adorable-otters-out-dentist-s-chair

SCIENCE.ORG NEWS – Neanderthals and modern humans made babies 47,000 years ago

Genome analysis genomes refines timing of critical and mysterious juncture in human history.
https://www.science.org/content/article/neanderthals-and-modern-humans-made-babies-47-000-years-ago

SCIENCE.ORG NEWS – These crows may count in a way similar to human toddlers

Find in carrion crows suggests a language system that may be akin to ours.
https://www.science.org/content/article/these-crows-may-count-way-similar-human-toddlers

THE CONVERSATION – Newborn chicks help settle a centuries-old debate about cognition and our senses

Philosophers have been debating whether we need conditioning to link information from different senses for centuries.
https://theconversation.com/how-newborn-chicks-are-helping-to-settle-a-centuries-old-debate-about-cognition-and-our-senses-229824

THE CONVERSATION – Neanderthal language differed from ours – they probably didn’t use metaphors

The two human species had many similarities but their communication would have been different.
https://theconversation.com/how-neanderthal-language-differed-from-modern-human-they-probably-didnt-use-metaphors-229942

PUBLICATIONS

eLife

PAPERS

ANDREA I. LUPPI et al – A Synergistic Workspace for Human Consciousness Revealed by Integrated Information Decomposition

A central goal of neuroscience is to understand how the brain orchestrates information from multiple input streams into a unified conscious experience. Here, we address two fundamental questions: how is the human information-processing architecture functionally organised, and how does its organisation support consciousness? We combine network science and a rigorous information-theoretic notion of synergy to delineate a "synergistic global workspace", comprising gateway regions that gather synergistic information from specialised modules across the brain. This information is then integrated within the workspace and widely distributed via broadcaster regions. Through functional MRI analysis, we show that gateway regions of the synergistic workspace correspond to the brain's default mode network, whereas broadcasters coincide with the executive control network. Demonstrating the empirical relevance of our proposed architecture for neural information processing, we show that loss of consciousness due to general anaesthesia or disorders of consciousness corresponds to a diminished ability of the synergistic workspace to integrate information, which is restored upon recovery. Thus, loss of consciousness coincides with a breakdown of information integration within the synergistic workspace of the human brain. This work contributes to conceptual and empirical reconciliation between two prominent scientific theories of consciousness, the Global Neuronal Workspace and Integrated Information Theory. Taken together, this work provides a new perspective on the role of prominent resting-state networks within the human information-processing architecture, while also advancing our understanding of how the human brain supports consciousness through the synergistic integration of information.
https://elifesciences.org/reviewed-preprints/88173

ZILU LIANG et al – Social navigation: distance and grid-like codes support navigation of abstract social space in human brain

People form impressions about others during daily social encounters and infer personality traits from others' behaviors. Such trait inference is thought to rely on two universal dimensions, i.e., competence and warmth. These two dimensions can be used to construct a 'social cognitive map' organizing massive information obtained from social encounters efficiently. Originated from spatial cognition, the neural codes supporting representation and navigation of spatial cognitive map has been widely studied. Recent studies suggest similar neural mechanism subserves the map-like architecture in social cognition as well. Here we investigated how spatial codes operate beyond physical environment and support the representation and navigation of social cognitive map. We designed a social value space defined by two dimensions of competence and warmth. Behaviorally, participants were able to navigate to a learned location from random starting locations in this abstract social space. At neural level, we identified representation of distance in precuneus, fusiform gyrus and middle occipital gyrus. We also found partial evidence of grid-like representation patterns in medial prefrontal cortex and entorhinal cortex. Moreover, the intensity of grid-like response scaled with performance of navigating in social space and social avoidance trait scores. Our findings suggest a neurocognitive mechanism by which social information can be organized into a structured representation namely cognitive map and its relevance to social well-being.
https://elifesciences.org/reviewed-preprints/89025

OMID ABBASI et al – Frequency-specific cortico-subcortical interaction in continuous speaking and listening

Speech production and perception involve complex neural dynamics in the human brain. Using magnetoencephalography (MEG), our study explores the interaction between cortico-cortical and cortico-subcortical connectivities during these processes. Our connectivity findings during speaking revealed a significant connection from the right cerebellum to the left temporal areas in low frequencies, which displayed an opposite trend in high frequencies. Notably, high-frequency connectivity was absent during the listening condition. These findings underscore the vital roles of cortico-cortical and cortico-subcortical connections within the speech production and perception network. The results of our new study enhance our understanding of the complex dynamics of brain connectivity during speech processes, emphasizing the distinct frequency-based interactions between various brain regions.
https://elifesciences.org/reviewed-preprints/97083

Evolutionary Anthropology

PAPERS

MASAHITO MORITA, YURI NISHIKAWA & YUDAI TOKUMASU – Human musical capacity and products should have been induced by the hominin-specific combination of several biosocial features: A three-phase scheme on socio-ecological, cognitive, and cultural evolution

Various selection pressures have shaped human uniqueness, for instance, music. When and why did musical universality and diversity emerge? Our hypothesis is that "music" initially originated from manipulative calls with limited musical elements. Thereafter, vocalizations became more complex and flexible along with a greater degree of social learning. Finally, constructed musical instruments and the language faculty resulted in diverse and context-specific music. Music precursors

correspond to vocal communication among nonhuman primates, songbirds, and cetaceans. To place this scenario in hominin history, a three-phase scheme for music evolution is presented herein. We emphasize (1) the evolution of sociality and life history in australopithecines, (2) the evolution of cognitive and learning abilities in early/middle Homo, and (3) cultural evolution, primarily in Homo sapiens. Human musical capacity and products should be due to the hominin-specific combination of several biosocial features, including bipedalism, stable pair bonding, alloparenting, expanded brain size, and sexual selection.
https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.22031

Frontiers in Human Neuroscience

PAPERS

NATÀLIA GORINA-CARETA et al – Exposure to bilingual or monolingual maternal speech during pregnancy affects the neurophysiological encoding of speech sounds in neonates differently

Exposure to maternal speech during the prenatal period shapes speech perception and linguistic preferences, allowing neonates to recognize stories heard frequently in utero and demonstrating an enhanced preference for their mother's voice and native language. Yet, with a high prevalence of bilingualism worldwide, it remains an open question whether monolingual or bilingual maternal speech during pregnancy influence differently the fetus' neural mechanisms underlying speech sound encoding.

In the present study, the frequency-following response (FFR), an auditory evoked potential that reflects the complex spectrotemporal dynamics of speech sounds, was recorded to a two-vowel /oa/ stimulus in a sample of 129 healthy term neonates within 1 to 3 days after birth. Newborns were divided into two groups according to maternal language usage during the last trimester of gestation (monolingual; bilingual). Spectral amplitudes and spectral signal-to-noise ratios (SNR) at the stimulus fundamental (F0) and first formant (F1) frequencies of each vowel were, respectively, taken as measures of pitch and formant structure neural encoding.

Our results reveal that while spectral amplitudes at F0 did not differ between groups, neonates from bilingual mothers exhibited a lower spectral SNR. Additionally, monolingually exposed neonates exhibited a higher spectral amplitude and SNR at F1 frequencies.

We interpret our results under the consideration that bilingual maternal speech, as compared to monolingual, is characterized by a greater complexity in the speech sound signal, rendering newborns from bilingual mothers more sensitive to a wider range of speech frequencies without generating a particularly strong response at any of them. Our results contribute to an expanding body of research indicating the influence of prenatal experiences on language acquisition and underscore the necessity of including prenatal language exposure in developmental studies on language acquisition, a variable often overlooked yet capable of influencing research outcomes.
https://www.frontiersin.org/articles/10.3389/fnhum.2024.1379660/full

BÁLINT FORGÁCS – Meaning as mentalization

The way we establish meaning has been a profound question not only in language research but in developmental science as well. The relation between linguistic form and content has been loosened up in recent pragmatic approaches to communication, showing that code-based models of language comprehension must be augmented by context-sensitive, pragmatic-inferential mechanisms to recover the speaker's intended meaning. Language acquisition has traditionally been thought to involve building a mental lexicon and extracting syntactic rules from noisy linguistic input, while communicative-pragmatic inferences have also been argued to be indispensable. Recent research findings exploring the electrophysiological indicator of semantic processing, the N400, have raised serious questions about the traditional separation between semantic decoding and pragmatic inferential processes. The N400 appears to be sensitive to mentalization—the ability to attribute beliefs to social partners—already from its developmental onset. This finding raises the possibility that mentalization may not simply contribute to pragmatic inferences that enrich linguistic decoding processes but that the semantic system may be functioning in a fundamentally mentalistic manner. The present review first summarizes the key contributions of pragmatic models of communication to language comprehension. Then, it provides an overview of how communicative intentions are interpreted in developmental theories of communication, with a special emphasis on mentalization. Next, it discusses the sensitivity of infants to the information-transmitting potential of language, their ability to pick up its code-like features, and their capacity to track language comprehension of social partners using mentalization. In conclusion, I argue that the recovery of meaning during linguistic communication is not adequately modeled as a process of code-based semantic retrieval complemented by pragmatic inferences. Instead, the semantic system may establish meaning, as intended, during language comprehension and acquisition through mentalistic attribution of content to communicative partners.
https://www.frontiersin.org/articles/10.3389/fnhum.2024.1384116/full

Frontiers in Psychiatry

PAPERS

MARIAN SIMARRO GONZALEZ et al – Beyond words: an investigation of fine motor skills and the verbal communication spectrum in autism

Participants completed assessments of motor and verbal communication skills, including finger tapping speed, grooved pegboard, grip strength, visual-motor integration tasks, and measures of speech and communication skills. ASD group performance on motor tests was compared to controls. Non-parametric tests were used to analyze group differences and correlations between motor and verbal communication skills. Based on prior research, we hypothesized that individuals on the autism spectrum would exhibit deficits in fine motor speed, dexterity, pencil motor control, but not manual motor strength. Additionally, we expected that impaired fine motor skills would be linked to poorer performance on standardized measures of verbal abilities.

The results indicated that 80% of autistic participants demonstrated an impairment on at least one measure of motor skills, and as a group, they exhibited significantly poorer fine motor performance compared to the non-ASD group in dominant hand finger tapping speed, bilateral fine motor dexterity measured via the grooved pegboard task, and pencil motor coordination and visual-motor integration measured on the Beery-Buktenica Developmental Test of Visual-Motor Integration-Sixth Edition. Moreover, impaired fine motor skills were associated with poorer performance on standardized clinical measures of verbal abilities, including articulation errors, receptive and expressive language and vocabulary, rapid naming, oromotor sequencing, and parent reported functional communication skills and social communication symptoms. Overall, our findings suggest there is a high prevalence of fine motor impairments in ASD, and these impairments were associated with a range of verbal abilities. Further research is warranted to better understand the underlying mechanisms of these associations and develop targeted interventions to address both fine motor and verbal impairments in ASD.

https://www.frontiersin.org/journals/psychiatry/articles/10.3389/fpsyt.2024.1379307/full

Heliyon

PAPERS

JOSÉ-MIGUEL TEJERO et mul – Cervidae antlers exploited to manufacture Prehistoric tools and hunting implements as a reliable source of ancient DNA

Antler is one of the primary animal raw materials exploited for technical purposes by the hunter-gatherer groups of the Eurasian Upper Palaeolithic (UP) all over the ecological range of deers, and beyond. It was exhaustively employed to produce one of the most critical tools for the survival of the UP societies: hunting weapons. However, antler implements can be made from diverse deer taxa, with different ecological requirements and ethological behaviours. Identifying the antler's origin at a taxonomic level is thus essential in improving our knowledge of humans' functional, practical and symbolic choices, as well as the human-animal interface during Prehistoric times. Nevertheless, palaeogenetics analyses have focused mainly on bone and teeth, with genetic studies of antler generally focused on modern deer conservation. Here we present the results of the first whole mitochondrial genome ancient DNA (aDNA) analysis by means of in-solution hybridisation capture of antlers from pre-Holocene archaeological contexts. We analysed a set of 50 Palaeolithic and Neolithic (c. 34-8ka) antler and osseous objects from South-Western Europe, Central Europe and the Caucasus. We successfully obtained aDNA, allowing us to identify the exploited taxa and demonstrate the archaeological relevance of those finds. Moreover, as most of the antlers were sampled using a minimally-invasive method, further analyses (morphometric, technical, genetic, radiometric and more) remain possible on these objects.

https://www.cell.com/heliyon/fulltext/S2405-8440(24)07889-7

EDMUND T. ROLLS – The memory systems of the human brain and generative artificial intelligence

Generative Artificial Intelligence foundation models (for example Generative Pre-trained Transformer – GPT – models) can generate the next token given a sequence of tokens. How can this 'generative AI' be compared with the 'real' intelligence of the human brain, when for example a human generates a whole memory in response to an incomplete retrieval cue, and then generates further prospective thoughts? Here these two types of generative intelligence, artificial in machines and real in the human brain are compared, and it is shown how when whole memories are generated by hippocampal recall in response to an incomplete retrieval cue, what the human brain computes, and how it computes it, are very different from generative AI. Key differences are the use of local associative learning rules in the hippocampal memory system, and of non-local backpropagation of error learning in AI. Indeed, it is argued that the whole operation of the human brain is performed computationally very differently to what is implemented in generative AI. Moreover, it is emphasized that the primate including human hippocampal system includes computations about spatial view and where objects and people are in scenes, whereas in rodents the emphasis is on place cells and path integration by movements between places. This comparison with generative memory and processing in the human brain has interesting implications for the further development of generative AI and for neuroscience research.

https://www.cell.com/heliyon/fulltext/S2405-8440(24)07996-9

Language and Cognition

PAPERS

CLAUDIA MAZZUCA et al – Gender is conceptualized in different ways across cultures

Gender can be considered an embodied social concept encompassing biological and cultural components. In this study, we explored whether the concept of gender varies as a function of different cultural and linguistic norms by comparing communities that vary in their social treatment of gender-related issues and linguistic encoding of gender. In Study 1, Italian, Dutch, and English-speaking participants completed a free-listing task, which showed Italians and Dutch were the most distinct in their conceptualization of gender: Italian participants focused more on socio-cultural features (e.g., discrimination, politics, and power), whereas Dutch participants focused more on the corporeal sphere (e.g., hormones, breasts, and genitals). Study 2 replicated this finding focusing on Italian and Dutch and using a typicality rating task: socio-cultural and abstract features were considered as more typical of "gender" by Italian than Dutch participants. Study 3 addressed Italian and Dutch participants' explicit beliefs about gender with a questionnaire measuring essentialism and constructivism, and consolidated results from Studies 1 and 2 showing that Dutch participants endorsed more essentialist beliefs about gender than Italian participants. Consistent with socio-cultural constructivist accounts, our results provide evidence that gender is conceptualized differently by diverse groups and is adapted to specific cultural and linguistic environments.
https://www.cambridge.org/core/journals/language-and-cognition/article/gender-is-conceptualized-in-different-ways-across-cultures/88A19740AE09E6299B9836158053B57F

MARGOT VANCAUWENBERGH & KARLIEN FRANCO – Women, blood, and dangerous things: socio-cultural variation in the conceptualization of menstruation

This study examines a collection of expressions for the taboo topic of menstruation in Dutch, German, and Mandarin Chinese. A model for the identification of conceptualization patterns in taboo verbalizations is set up, analyzing each expression according to the X-phemistic mechanisms and, if applicable, the metaphorical source domains or metonymic vehicles at its origin. The various conceptualizations of menstruation are approached from a socio-cultural perspective; variation in conceptualization is examined through a correspondence regression analysis with three speaker-related explanatory variables (L1 and associated cultural background, menstrual experience, and age group). The underlying interest is linguo-cultural as the study aims to verify whether dominant menstrual attitudes are reflected in the linguistic conceptualization of menstruation within each socio-cultural group. Such correlations are indeed found, although the youngest age-group shows some unexpected linguistic behavior.
https://www.cambridge.org/core/journals/language-and-cognition/article/women-blood-and-dangerous-things-sociocultural-variation-in-the-conceptualization-of-menstruation/237909774A715FADE12F617C349DF807

Nature

NEWS

Neanderthal–human baby-making was recent — and brief

Analysis of dozens of ancient genomes reveals that close encounters between the two species took place in a narrow time window.
https://www.nature.com/articles/d41586-024-01452-3

Nature Africa

NEWS

Were hominins a pan-African species?

European Research Council funds project on pre-human evolution.
https://www.nature.com/articles/d44148-024-00156-0

Nature Communications

PAPERS

MARIA OSETROVA et al – Lipidome atlas of the adult human brain

Lipids are the most abundant but poorly explored components of the human brain. Here, we present a lipidome map of the human brain comprising 75 regions, including 52 neocortical ones. The lipidome composition varies greatly among the brain regions, affecting 93% of the 419 analyzed lipids. These differences reflect the brain's structural characteristics, such as myelin content (345 lipids) and cell type composition (353 lipids), but also functional traits: functional connectivity (76 lipids) and information processing hierarchy (60 lipids). Combining lipid composition and mRNA expression data further enhances functional connectivity association. Biochemically, lipids linked with structural and functional brain features display distinct lipid class distribution, unsaturation extent, and prevalence of omega-3 and omega-6 fatty acid residues. We verified our conclusions by parallel analysis of three adult macaque brains, targeted analysis of 216 lipids, mass spectrometry imaging, and lipidome assessment of sorted murine neurons.
https://www.nature.com/articles/s41467-024-48734-y

CERI SHIPTON et al with MIKE W. MORLEY – Abrupt onset of intensive human occupation 44,000 years ago on the threshold of Sahul

Archaeological evidence attests multiple early dispersals of Homo sapiens out of Africa, but genetic evidence points to the primacy of a single dispersal 70-40 ka. Laili in Timor-Leste is on the southern dispersal route between Eurasia and Australasia and has the earliest record of human occupation in the eastern Wallacean archipelago. New evidence from the site shows that, unusually in the region, sediment accumulated in the shelter without human occupation, in the window 59–54 ka. This was followed by an abrupt onset of intensive human habitation beginning ~44 ka. The initial occupation is distinctive from overlying layers in the aquatic focus of faunal exploitation, while it has similarities in material culture to other early Homo sapiens sites in Wallacea. We suggest that the intensive early occupation at Laili represents a colonisation phase, which may have overwhelmed previous human dispersals in this part of the world.
https://www.nature.com/articles/s41467-024-48395-x

FRÉDÉRIK SALTRÉ et al – Environmental conditions associated with initial northern expansion of anatomically modern humans

The ability of our ancestors to switch food sources and to migrate to more favourable environments enabled the rapid global expansion of anatomically modern humans beyond Africa as early as 120,000 years ago. Whether this versatility was largely the result of environmentally determined processes or was instead dominated by cultural drivers, social structures, and interactions among different groups, is unclear. We develop a statistical approach that combines both archaeological and genetic data to infer the more-likely initial expansion routes in northern Eurasia and the Americas. We then quantify the main differences in past environmental conditions between the more-likely routes and other potential (less-likely) routes of expansion. We establish that, even though cultural drivers remain plausible at finer scales, the emergent migration corridors were predominantly constrained by a combination of regional environmental conditions, including the presence of a forest-grassland ecotone, changes in temperature and precipitation, and proximity to rivers.
https://www.nature.com/articles/s41467-024-48762-8

Nature Human Behaviour

PAPERS

JAMES W. A. STRACHAN et al with MICHAEL S. A. GRAZIANO – Testing theory of mind in large language models and humans

At the core of what defines us as humans is the concept of theory of mind: the ability to track other people's mental states. The recent development of large language models (LLMs) such as ChatGPT has led to intense debate about the possibility that these models exhibit behaviour that is indistinguishable from human behaviour in theory of mind tasks. Here we compare human and LLM performance on a comprehensive battery of measurements that aim to measure different theory of mind abilities, from understanding false beliefs to interpreting indirect requests and recognizing irony and faux pas. We tested two families of LLMs (GPT and LLaMA2) repeatedly against these measures and compared their performance with those from a sample of 1,907 human participants. Across the battery of theory of mind tests, we found that GPT-4 models performed at, or even sometimes above, human levels at identifying indirect requests, false beliefs and misdirection, but struggled with detecting faux pas. Faux pas, however, was the only test where LLaMA2 outperformed humans. Follow-up manipulations of the belief likelihood revealed that the superiority of LLaMA2 was illusory, possibly reflecting a bias towards attributing ignorance. By contrast, the poor performance of GPT originated from a hyperconservative approach towards committing to conclusions rather than from a genuine failure of inference. These findings not only demonstrate that LLMs exhibit behaviour that is consistent with the outputs of mentalistic inference in humans but also highlight the importance of systematic testing to ensure a non-superficial comparison between human and artificial intelligences.
https://www.nature.com/articles/s41562-024-01882-z

Nature Scientific Reports

PAPERS

LAURA SOPHIA LIMMER et al with KATE MCGRATH & KATERINA HARVATI – Differences in childhood stress between Neanderthals and early modern humans as reflected by dental enamel growth disruptions

Neanderthals' lives were historically portrayed as highly stressful, shaped by constant pressures to survive in harsh ecological conditions, thus potentially contributing to their extinction. Recent work has challenged this interpretation, leaving the issue of stress among Paleolithic populations highly contested and warranting in-depth examination. Here, we analyze the frequency of dental enamel hypoplasia, a growth disruption indicator of early life stress, in the largest sample of Neanderthal and Upper Paleolithic dentitions investigated to date for these features. To track potential species-specific patterns in the ontogenetic distribution of childhood stress, we present the first comprehensive Bayesian modelling of the likelihood of occurrence of individual and matched enamel growth disruptions throughout ontogeny. Our findings support similar overall stress levels in both groups but reveal species-specific patterns in its ontogenetic distribution. While Neanderthal children faced increasing likelihoods of growth disruptions starting with the weaning process and culminating in intensity post-

weaning, growth disruptions in Upper Paleolithic children were found to be limited around the period of weaning and substantially dropping after its expected completion. These results might, at least in part, reflect differences in childcare or other behavioral strategies between the two taxa, including those that were advantageous for modern humans' long-term survival.
https://www.nature.com/articles/s41598-024-61321-x

JANNINE D. LASALETA, TIM WILDSCHUT & CONSTANTINE SEDIKIDES – Nostalgia increases punitiveness by intensifying moral concern
We addressed the relation between nostalgia and moral judgment or behavior. We hypothesized that nostalgia, a social emotion, increases moral concern (H1), nostalgia intensifies punitiveness against moral transgressors (H2), and that the nostalgia—punitiveness link is mediated by moral concern (H3). We conducted three cross-sectional (Studies 1, 2, 4) and one experimental (Study 3) investigations (N = 1145). The investigations, involving distinct operationalizations of the relevant constructs (nostalgia, moral concern, punitiveness) and diverse samples (U.S., Canadian, and European Prolific workers, French business school students, Dutch community members), yielded results consistent with the hypotheses. Nostalgia keeps one's moral compass in check. The findings enrich the emotions and morality literatures.
https://www.nature.com/articles/s41598-024-61858-x

KATHARINE L. BALOLIA & PIPPA L. FITZGERALD – Male proboscis monkey cranionasal size and shape is associated with visual and acoustic signalling
The large nose adorned by adult male proboscis monkeys is hypothesised to serve as an audiovisual signal of sexual selection. It serves as a visual signal of male quality and social status, and as an acoustic signal, through the expression of loud, low-formant nasalised calls in dense rainforests, where visibility is poor. However, it is unclear how the male proboscis monkey nasal complex, including the internal structure of the nose, plays a role in visual or acoustic signalling. Here, we use cranionasal data to assess whether large noses found in male proboscis monkeys serve visual and/or acoustic signalling functions. Our findings support a visual signalling function for male nasal enlargement through a relatively high degree of nasal aperture sexual size dimorphism, the craniofacial region to which nasal soft tissue attaches. We additionally find nasal aperture size increases beyond dental maturity among male proboscis monkeys, consistent with the visual signalling hypothesis. We show that the cranionasal region has an acoustic signalling role through pronounced nasal cavity sexual shape dimorphism, wherein male nasal cavity shape allows the expression of loud, low-formant nasalised calls. Our findings provide robust support for the male proboscis monkey nasal complex serving both visual and acoustic functions.
https://www.nature.com/articles/s41598-024-60665-8

FLAVIA MARINELLI, MARIE-HELÉNÈ MONCEL & CRISTINA LEMORINI – The use of bones as tools in Late Lower Paleolithic of Central Italy
The Latium area in Italy has yielded rich evidence of Lower Paleolithic sites with both faunal remains, artefacts, and human fossil remains, such as the Ceprano human skull. Many are the sites where lithic industry has been found in association with bone industry. Medium and large animals were a key resource because they provided an enormous amount of meat and fat. However, they were extensively exploited for their bones, rich in marrow, and as raw material for tool production. Bone tools are so far few documented for early period of time and especially for the Middle Pleistocene in Western Europe. We report here evidence of bone tools and their efficiency of use for hominin groups living in the Frosinone-Ceprano basin during the MIS 11/10, a key period which records behavioral innovations and onset of the Neanderthal behaviors. In three sites, Isoletta, Colle Avarone and Selvotta, several bone tools and bone flakes have been discovered (MIS 11/10). They were associated to stone artefacts part of the hominins tool-kit. Technological and use-wear analyses conducted on these bone industries, dated between 410 and 430 ka, yield relevant results to understand the effectiveness of the bones tools found associated with lithic series, including handaxes.
https://www.nature.com/articles/s41598-024-62612-z

New Scientist

NEWS

Early humans took northern route to Australia, cave find suggests
An excavation on Timor reveals humans first settled on the island 44,000 years ago, long after the earliest occupation of Australia – suggesting migration to the latter took another route.
https://www.newscientist.com/article/2432435-early-humans-took-northern-route-to-australia-cave-find-suggests/

ARTICLES

KATE DOUGLAS – What is thought and how does thinking manifest in the brain?
We can describe different kinds of thought and how they arise, to some extent, but the relationship between neural activity and the nature of what we are thinking isn't well understood.
https://www.newscientist.com/article/mg26234920-900-what-is-thought-and-how-does-thinking-manifest-in-the-brain/

CAT BOHANNON – To stay alive, try being more female
From infections to brain injuries, the female body is more resilient than the male. It is time to reassess the "weaker" sex.
https://www.newscientist.com/article/mg26234924-000-to-stay-alive-try-being-more-female/

Philosophical Transactions of the Royal Society B

PAPERS

SARAH L. WALSH et al with SIMON W. TOWNSEND – Call combination production is linked to the social environment in Western Australian magpies (Gymnorhina tibicen dorsalis)
It has recently become clear that some language-specific traits previously thought to be unique to humans (such as the capacity to combine sounds) are widespread in the animal kingdom. Despite the increase in studies documenting the presence of call combinations in non-human animals, factors promoting this vocal trait are unclear. One leading hypothesis proposes that communicative complexity co-evolved with social complexity owing to the need to transmit a diversity of information to a wider range of social partners. The Western Australian magpie (Gymnorhina tibicen dorsalis) provides a unique model to investigate this proposed link because it is a group-living, vocal learning species that is capable of multi-level combinatoriality (independently produced calls contain vocal segments and comprise combinations). Here, we compare variations in the production of call combinations across magpie groups ranging in size from 2 to 11 birds. We found that callers in larger groups give call combinations: (i) in greater diversity and (ii) more frequently than callers in smaller groups. Significantly, these observations support the hypothesis that combinatorial complexity may be related to social complexity in an open-ended vocal learner, providing an important step in understanding the role that sociality may have played in the development of vocal combinatorial complexity.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2023.0198

EMMA CHERESKIN et al with STEPHANIE L. KING – In pop pursuit: social bond strength predicts vocal synchrony during cooperative mate guarding in bottlenose dolphins
Vocal communication is an emblematic feature of group-living animals, used to share information and strengthen social bonds. Vocalizations are also used to coordinate group-level behaviours in many taxa, but little is known of the factors that may influence vocal behaviour during cooperative acts. Allied male Indo-Pacific bottlenose dolphins (Tursiops aduncus) use the 'pop' vocalization as a coercive signal when working together to herd single oestrous females. Using long-term association and acoustic data, we examined the influence of social and non-social factors on pop use by allied male dolphins in this context. Neither pop rate nor pop bout duration were influenced by any of the factors examined. However, allied males with stronger social bonds engaged in higher rates of vocal synchrony; whereby they actively matched the timing of their pop production. Hence, social bond strength influenced pop use in a cooperative context, suggesting dual functions of pop use: to induce the female to remain close, and to promote social bond maintenance and cooperation among males.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2023.0194

HUGO LONING, SIMON C. GRIFFITH & MARC NAGUIB – The ecology of zebra finch song and its implications for vocal communication in multi-level societies
Acoustic signalling is crucial in affecting movements and in social interactions. In species with dynamic social structures, such as multi-level societies, acoustic signals can provide a key mechanism allowing individuals to identify and find or avoid each other and to exchange information. Yet, if the spacing between individuals regularly exceeds the maximum signalling range, the relation between movements and signals becomes more complex. As the best-studied songbird in captivity, the zebra finch (Taeniopygia castanotis) is a species with individually distinct songs that are audible over just a few metres and a widely ranging dynamic multi-level social organization in the wild, raising questions on the actual role of its song in social cohesion and coordination. Here, we provide an overview of birdsong in social organizations (networks) and use the ecology of the zebra finch and male song to discuss how singing can facilitate social cohesion and coordination in species where the signal range is very short. We raise the question of the extent to which zebra finches are a representative species to understand the function of song in communication, and we broaden current views on the function of birdsong and its individual signature.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2023.0191

VLAD DEMARTSEV et al – Mapping vocal interactions in space and time differentiates signal broadcast versus signal exchange in meerkat groups
Animal vocal communication research traditionally focuses on acoustic and contextual features of calls, yet substantial information is also contained in response selectivity and timing during vocalization events. By examining the spatiotemporal structure of vocal interactions, we can distinguish between 'broadcast' and 'exchange' signalling modes, with the former potentially serving to transmit signallers' general state and the latter reflecting more interactive signalling behaviour. Here, we tracked the movements and vocalizations of wild meerkat (Suricata suricatta) groups simultaneously using collars to explore this distinction. We found evidence that close calls (used for maintaining group cohesion) are given as signal exchanges. They are typically given in temporally structured call–response sequences and are also strongly affected by the social environment, with individuals calling more when they have more neighbours and juveniles responding more to adults than the reverse. In contrast, short note calls appear mainly in sequences produced by single individuals and show little

dependence on social surroundings, suggesting a broadcast signalling mode. Despite these differences, both call categories show similar clustering in space and time at a group level. Our results highlight how the fine-scale structure of vocal interactions can give important insights into the usage and function of signals in social groups.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2023.0188

CHRISTOPHE A. H. BOUSQUET et al – Individual and ecological heterogeneity promote complex communication in social vertebrate group decisions

To receive the benefits of social living, individuals must make effective group decisions that enable them to achieve behavioural coordination and maintain cohesion. However, heterogeneity in the physical and social environments surrounding group decision-making contexts can increase the level of difficulty social organisms face in making decisions. Groups that live in variable physical environments (high ecological heterogeneity) can experience barriers to information transfer and increased levels of ecological uncertainty. In addition, in groups with large phenotypic variation (high individual heterogeneity), individuals can have substantial conflicts of interest regarding the timing and nature of activities, making it difficult for them to coordinate their behaviours or reach a consensus. In such cases, active communication can increase individuals' abilities to achieve coordination, such as by facilitating the transfer and aggregation of information about the environment or individual behavioural preferences. Here, we review the role of communication in vertebrate group decision-making and its relationship to heterogeneity in the ecological and social environment surrounding group decision-making contexts. We propose that complex communication has evolved to facilitate decision-making in specific socio-ecological contexts, and we provide a framework for studying this topic and testing related hypotheses as part of future research in this area.
https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2023.0204

CHUN-CHIEH LIAO et al with MARTA B. MANSER – The relative contribution of acoustic signals versus movement cues in group coordination and collective decision-making

To benefit from group living, individuals need to maintain cohesion and coordinate their activities. Effective communication thus becomes critical, facilitating rapid coordination of behaviours and reducing consensus costs when group members have differing needs and information. In many bird and mammal species, collective decisions rely on acoustic signals in some contexts but on movement cues in others. Yet, to date, there is no clear conceptual framework that predicts when decisions should evolve to be based on acoustic signals versus movement cues. Here, we first review how acoustic signals and movement cues are used for coordinating activities. We then outline how information masking, discrimination ability (Weber's Law) and encoding limitations, as well as trade-offs between these, can identify which types of collective behaviours likely rely on acoustic signals or movement cues. Specifically, our framework proposes that behaviours involving the timing of events or expression of specific actions should rely more on acoustic signals, whereas decisions involving complex choices with multiple options (e.g. direction and destination) should generally use movement cues because sounds are more vulnerable to information masking and Weber's Law effects. We then discuss potential future avenues of enquiry, including multimodal communication and collective decision-making by mixed-species animal groups.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2023.0184

BING XIE et al – Exploring the role of vocalizations in regulating group dynamics

Because of the diverging needs of individuals, group life can lead to disputes and competition, but it also has many advantages, such as reduced predation risk, information sharing and increased hunting success. Social animals have to maintain group cohesion and need to synchronize activities, such as foraging, resting, social interactions and movements, in order to thrive in groups. Acoustic signals are highly relevant for social dynamics, some because they are long-ranging and others because they are short-ranging, which may serve important within-group functions. However, although there has been an increase in studies concentrating on acoustic communication within groups in the past decade, many aspects of how vocalizations relate to group dynamics are still poorly understood. The aim of this review is to present an overview of our current knowledge on the role of vocalizations in regulating social group dynamics, identify knowledge gaps and recommend potential future research directions. We review the role that vocalizations play in (i) collective movement, (ii) separation risk and cohesion maintenance, (iii) fission–fusion dynamics, and (iv) social networks. We recommend that future studies aim to increase the diversity of studied species and strengthen the integration of state-of-the-art tools to study social dynamics and acoustic signals.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2023.0183

CLAUDIA FICHTEL, KLARA DINTER & FANOMEZANA RATSOAVINA – Benefits but not the dual functions of submissive signals differ between two Malagasy primates

Many animals use formalized signals to communicate dominance relationships. In some primates, such as macaques, the function of such signals varies with dominance style. Despotic species produce unidirectional submission signals that have a dual function: in conflict contexts, they signal a willingness to withdraw, whereas in peaceful contexts, they indicate the agreement to subordination. More despotic species produce these calls to a lesser extent than less despotic species. Here, we investigated whether the use of unidirectional submission signals is also related to dominance style in two lemur species

and whether signalling subordination stabilizes social relationships at the group level. Ring-tailed lemurs (Lemur catta) exhibit a more despotic dominance hierarchy than Verreaux's sifakas (Propithecus verreauxi). We observed social interactions in 75 dyads of Verreaux's sifakas and 118 dyads of ring-tailed lemurs. Both species used unidirectional submissive calls that have a dual function, potentially suggesting convergent evolution of the function of these signals in independent primate lineages. However, signalling subordination did not stabilize social relationships at the group level in both species. Additionally, subordination occurred more frequently in dyads of the more despotic ring-tailed lemurs than in Verreaux's sifakas, indicating opposite patterns to macaques in the coevolution of social traits with dominance style.
https://royalsocietypublishing.org/doi/10.1098/rstb.2023.0197

IACOPO IACOPINI et al – Not your private tête-à-tête: leveraging the power of higher-order networks to study animal communication
Animal communication is frequently studied with conventional network representations that link pairs of individuals who interact, for example, through vocalization. However, acoustic signals often have multiple simultaneous receivers, or receivers integrate information from multiple signallers, meaning these interactions are not dyadic. Additionally, non-dyadic social structures often shape an individual's behavioural response to vocal communication. Recently, major advances have been made in the study of these non-dyadic, higher-order networks (e.g. hypergraphs and simplicial complexes). Here, we show how these approaches can provide new insights into vocal communication through three case studies that illustrate how higher-order network models can: (i) alter predictions made about the outcome of vocally coordinated group departures; (ii) generate different patterns of song synchronization from models that only include dyadic interactions; and (iii) inform models of cultural evolution of vocal communication. Together, our examples highlight the potential power of higher-order networks to study animal vocal communication. We then build on our case studies to identify key challenges in applying higher-order network approaches in this context and outline important research questions that these techniques could help answer.
https://royalsocietypublishing.org/doi/10.1098/rstb.2023.0190

PNAS

ARTICLES

PATRICIA K. KUHL – Birds and babies: Ontogeny of vocal learning
In birds and human babies, the ontogeny of vocal learning shows striking parallels: Both are predisposed toward their species-specific signals at birth, require exposure to species-typical vocalizations during a "sensitive period," and both are (traditionally) hypothesized to learn in two distinct phases (1). During the sensory learning phase, infants listen and learn the species-typical song or speech signal by memorizing its auditory characteristics and representing the information in the brain; in the sensorimotor learning phase, birds and babies begin to produce song or speech using auditory feedback to improve their nascent attempts to mimic the representations stored in memory.
https://www.pnas.org/doi/full/10.1073/pnas.2405626121

Quarterly Review of Biology

PAPERS

HUGH DESMOND et al – The Varieties of Darwinism: Explanation, Logic, and Worldview
Ever since its inception, the theory of evolution has been reified into an "-ism": Darwinism. Although biologists today, by and large, do not use the term "Darwinism" in their research, it still enjoys currency in broader academic and societal contexts. "Darwinian approaches" proliferate across the sciences and humanities and, in public discourse, various so-called "Darwinian views on life" are perceived to have ethically and politically laden consequences. What exactly is Darwinism, and how precisely are its nonscientific uses related to the scientific theory of evolution? Some claim the term's meaning should be limited to scientific content, yet others call for its abolition altogether. In this paper, we propose a unified account of these varieties of Darwinism. We show how the theories introduced by Darwin have grounded a "logic" or style of reasoning about phenomena, as well as various ethically and politically charged "worldviews." The full meaning of Darwinism, as well as how this meaning has changed over time, can only be understood through the complex interaction between these dimensions.
https://www.journals.uchicago.edu/doi/abs/10.1086/730667

Science

PAPERS

DIANA A. LIAO et al with ANDREAS NIEDER – Crows "count" the number of self-generated vocalizations
Producing a specific number of vocalizations with purpose requires a sophisticated combination of numerical abilities and vocal control. Whether this capacity exists in animals other than humans is yet unknown. We show that crows can flexibly produce variable numbers of one to four vocalizations in response to arbitrary cues associated with numerical values. The acoustic features of the first vocalization of a sequence were predictive of the total number of vocalizations, indicating a planning process. Moreover, the acoustic features of vocal units predicted their order in the sequence and could be used to read out counting errors during vocal production.

https://www.science.org/doi/10.1126/science.adl0984

PRASHANT S. EMANI et mul – Single-cell genomics and regulatory networks for 388 human brains
Single-cell genomics is a powerful tool for studying heterogeneous tissues such as the brain. Yet little is understood about how genetic variants influence cell-level gene expression. Addressing this, we uniformly processed single-nuclei, multiomics datasets into a resource comprising >2.8 million nuclei from the prefrontal cortex across 388 individuals. For 28 cell types, we assessed population-level variation in expression and chromatin across gene families and drug targets. We identified >550,000 cell type–specific regulatory elements and >1.4 million single-cell expression quantitative trait loci, which we used to build cell-type regulatory and cell-to-cell communication networks. These networks manifest cellular changes in aging and neuropsychiatric disorders. We further constructed an integrative model accurately imputing single-cell expression and simulating perturbations; the model prioritized ~250 disease-risk genes and drug targets with associated cell types.
https://www.science.org/doi/10.1126/science.adi5199

LOUISE A. HUUKI-MYERS et al with PSYCHENCODE CONSORTIUM – A data-driven single-cell and spatial transcriptomic map of the human prefrontal cortex
The molecular organization of the human neocortex historically has been studied in the context of its histological layers. However, emerging spatial transcriptomic technologies have enabled unbiased identification of transcriptionally defined spatial domains that move beyond classic cytoarchitecture. We used the Visium spatial gene expression platform to generate a data-driven molecular neuroanatomical atlas across the anterior-posterior axis of the human dorsolateral prefrontal cortex. Integration with paired single-nucleus RNA-sequencing data revealed distinct cell type compositions and cell-cell interactions across spatial domains. Using PsychENCODE and publicly available data, we mapped the enrichment of cell types and genes associated with neuropsychiatric disorders to discrete spatial domains.
https://www.science.org/doi/10.1126/science.adh1938

Synthese

PAPERS

HAYDEN KEE – "Humanity is another corporeity": The evolution of human bodily appearance and sociality
Some accounts of human distinctiveness focus on anatomical features, such as bipedalism and brain size. Others focus on cognitive abilities, such as tool use and manufacture, language, and social cognition. Embodied approaches to cognition highlight the internal relations between these two groups of characteristics, arguing that cognition is rooted in and shaped by embodiment. This paper complements existing embodied approaches by focusing on an underappreciated aspect of embodiment: the appearance of the human body as condition of human sociality and cognition. I approach this issue through Merleau-Ponty's understanding of the animate body as an intertwining of perceiving and perceivable aspects. The eye is both an animal's embodied, perceptual openness onto the world, and the means by which that experiential openness can be perceived by others. The morphology and appearance of its embodiment condition how an animal comes to understand others and itself as animate subjects. I interpret the perceivable appearance of the human eye and skin in comparison with those of other animals. An underappreciated dimension of human distinctiveness, I argue, is the way the human sense organs render human perceiving comparatively more perceivable to conspecifics.
https://link.springer.com/article/10.1007/s11229-024-04581-4

Trends in Cognitive Sciences

PAPERS

TOBIAS GERSTENBERG – Counterfactual simulation in causal cognition
How do people make causal judgments and assign responsibility? In this review article, I argue that counterfactual simulations are key. To simulate counterfactuals, we need three ingredients: a generative mental model of the world, the ability to perform interventions on that model, and the capacity to simulate the consequences of these interventions. The counterfactual simulation model (CSM) uses these ingredients to capture people's intuitive understanding of the physical and social world. In the physical domain, the CSM predicts people's causal judgments about dynamic collision events, complex situations that involve multiple causes, omissions as causes, and causes that sustain physical stability. In the social domain, the CSM predicts responsibility judgments in helping and hindering scenarios.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00107-4

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