EAORC BULLETIN 1,123 – 22 December 2024

CONTENTS

NOTICES

FORMATTED VERSION OF THIS BULLETIN

A pdf formatted version if this Bulletin is available for download at martinedwardes.me.uk/eaorc/eaorc_bulletins.htm.

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.

ACADEMIA.EDU – Neanderthals (Homo neanderthalensis): An adaptive paradox

A Human Voyage 2, Anne Keenleyside & Richard A. Lazenby (eds.), Nelson Education (2018).

ZOE GAVAN – Neanderthals (Homo neanderthalensis): An adaptive paradox

Neanderthals are widely believed to be a cold-adapted species due its unique craniofacial and postcranial characteristics (Harvati 2003), however in recent years this theory has come in to question (Churchill 1998; Holton and Fransiscus 2008; Rae et al. 2011). This essay reviews arguments that the morphology of Neanderthals are adaptations to a cold environment, and critically examines their validity. This essay begins by outlining the distribution and environment of Neanderthals from 300,000 to 30,000 years ago, provide an overview of Neanderthal derived morphological traits and discuss alternative arguments to the cold-adaptation hypotheses for these traits. The increased pneumatisation, prognathism, and the dolichocephalic cranium found in Neanderthals are unlikely to be a direct adaptation to cold climates. These findings are consistent with Neanderthal postcranial morphology, where body size and shape cannot solely be explained by adaptation to the cold. Instead, other theories are explored, such as increased mobility and activity, anterior dental loading, and hormonal anomalies. Evidence reviewed in this article indicates that the unique morphological characteristics of Neanderthals are likely to be the result of a combination of factors, and are not solely due to cold adaptation.
https://www.academia.edu/67774057/Neanderthals_Homo_neanderthalensis_An_adaptive_paradox

ACADEMIA.EDU – Neanderthal Skeletal Structure and its Place in European Hominid Phylogeny

Human Evolution 21, 269-274 (2006).

IAN TATTERSALL – Neanderthal Skeletal Structure and the Place of Homo neanderthalensis in European Hominid Phylogeny

Although the debate rages on over whether the Neanderthals merit their own species status or should be viewed as an odd variant of Homo sapiens, recent evidence has accumulated that overwhelmingly supports the former interpretation. Among this evidence is a recent full-body skeletal reconstruction that not only highlights the extreme differences between the highly apomorphic H. sapiens and H. neanderthalensis in the construction of the thorax and pelvic girdle, but strongly suggests significant gait differences between the two species that add to the probability that the two kinds of hominid would not have recognized each other as breeding partners. This is hardly surprising since the two species possessed a relatively remote common ancestry, and it is indeed suggested here that Homo neanderthalensis was merely one species embedded within a diverse and endemic middle Pleistocene European hominid radiation. Clearly more than one lineage of hominids simultaneously occupied Europe during the middle Pleistocene.
https://www.academia.edu/51146123/Neanderthal_Skeletal_Structure_and_the_Place_of_Homo_neanderthalensis_in_European_Hominid_Phylogeny

CONFERENCE ALERT – 31st SCIENCE OF CONSCIOUSNESS CONFERENCE Barcelona SPAIN July 6-11, 2025

Workshops, Plenaries, Concurrents, Exhibits, Demos, Social, Poetry Slam, Dancing
CALL FOR ABSTRACTS
Deadline: February 10, 2025.
Notifications: February 20, 2025.
https://auth.oxfordabstracts.com/?redirect=/stages/76463/submitter

The Science of Consciousness ('TSC') conference is the world's longest running inter-disciplinary gathering on the study of consciousness, the nature of existence and our place in the universe. TSC has alternated yearly since 1994 between Tucson, Arizona USA and elsewhere including Italy, Denmark, Japan, Sweden, Czech Republic, Hungary, Hong Kong, India, California, Switzerland, Finland, and in 2023 Taormina, on the island of Sicily. In 2025 TSC will be in Barcelona, Spain preceding and in conjunction with The Festival of Consciousness.
https://consciousness.arizona.edu/

CONFERENCE ALERT – 4th FESTIVAL OF CONSCIOUSNESS Barcelona SPAIN July 11-13, 2025

Music, Art, Experiential, Inspiration, Spirituality, Education, Business, Evolution

We are at a crossroads in the age-old study of consciousness. Over the past thirty years approaches to understanding consciousness have diverged along two distinct paths: 1) 'neurocomputational' views of the brain as a complex computer of simple neurons, a view compatible with AI systems becoming conscious, and 2) 'fundamental' views in which consciousness is intrinsic to the universe, connected to the brain through quantum biology. Exploring the funda-mental view, TSC embraces neuroscience biology far more rigorously than AI-compatible simple neurons. Ironically, conscious AI may be most likely to occur in biomimetic quantum computers.
https://thefestivalofconsciousness.org/en/

NEWS

NATURE BRIEFING – We don't know what probability is

Probability probably doesn't exist — but it is useful to act like it does, argues statistician David Spiegelhalter. From coin flips to weather forecasts, all predictions hinge on subjective, if reasonable, assumptions and judgements. So, outside of quantum mechanics — which offers fixed probabilities founded on firm mathematical ground — what is an objective, or 'true', probability? After walking us through the history of attempts to put numbers on chance and uncertainty, Spiegelhalter advises a pragmatic approach to this elusive question.
https://www.nature.com/articles/d41586-024-04096-5

NATURE BRIEFING – These legs were made for running

Modern humans could outrun our ancient human relatives Australopithecus afarensis, according to an analysis of a 3D digital model of the iconic 'Lucy' fossil. Researchers recreated Lucy by merging details of her near-complete 3.2 million-year-old skeleton, the muscular features of modern apes and an estimate of muscle mass based on the bones' surface area. The model showed that Lucy could run on two legs, albeit slowly, despite lacking the lengthened Achilles tendon and shortened muscle fibres of modern humans — which suggests that adaptations in these muscles are what prepare us for endurance running.
https://www.nature.com/articles/d41586-024-04194-4

SCIAM NEWS – Great Apes Joke Around, Suggesting Humor Is Older Than Humans

Studies of great apes hint at why and when clowning behavior evolved.
https://www.scientificamerican.com/article/great-apes-joke-around-suggesting-humor-is-older-than-humans/

SCIENCEADVISER – While grownups sketched, Ice Age kids made rock art, too

No doubt Ice Age parents would have hung these on the fridge if they could have. Izzy Wisher/government of Cantabria
The walls of Spain's Las Monedas Cave are decorated with polished charcoal drawings of reindeer, horses, and other ice age mammals, drawn by firelight about 14,000 years ago. But archaeologists have long wondered about one odd panel of art tucked away in a corner, which excavators in the 1950s dubbed the "Panel of the Enigmatic Signs." Now archaeologists and developmental psychologists argue in Hunter Gatherer Research that the puzzling scribbles were made by children, likely between the ages of 3 and 6, working alone at toddler eyelevel while adults drew nearby.
On a tour of the cave, childhood art expert John Matthews was struck by the difference between the skillful drawings high up and the emphatic scrawls below. "It's more or less identical to anything you'd find in any reasonably run nursery school," he says. The team made 3D scans of the drawings and compared them with the artistic efforts of modern children, such as the furiously scribbled circles and push-pull lines typical of 3-year-olds, and the wobbly, right-angled figures of slightly older kids beginning to master fine motor skills. The cave contains both, superimposed on each other as though two or more children—siblings or a mixed-age play group—were drawing at once. "They're not trying to draw animals, they're just trying to break the charcoal," says co-author and archaeologist Felix Riede.
https://www.science.org/content/article/enigmatic-cave-art-was-made-ice-age-children

SCIENCEADVISER – Ancient DNA reveals family ties of earliest Europeans

For the earliest modern humans in Europe, pioneering was something of a family affair. An analysis of ancient DNA from 45,000-year-old bones found in caves separated by hundreds of kilometers revealed that the occupants were, in fact, cousins.

The achievement was made possible by what archaeologist Michelle Langley called “a Goldilocks situation … You need the right location, the right time period, and the right level of preservation where you can get DNA. … It’s a really remarkable find.”

The skeletons came from two caves: one woman from Zlatý kůň in the Czech Republic and six people from Ranis in Germany. The researchers discovered that two of the people in the German cave were mother and daughter. Only about six generations separated them from the woman who perished at Zlatý kůň.

Diving deeper into their genetics, the scientists learned that they belonged to a population numbering only about 200 people at any given time. They probably lived in small, scattered bands that came together occasionally to exchange mates.

The researchers also pieced together what these people may have looked like. Because the Zlatý kůň skull was largely intact, they could reconstruct the general shape of the woman’s face. She and the Ranis individuals shared genes for dark skin and eyes. “This group is among the earliest to split from the lineage that left Africa,” says the study’s lead author, paleogeneticist Arev Sümer. “It makes sense that they reflect the phenotypical characteristics of sub-Saharan African groups.”

https://www.science.org/content/article/mystery-woman-s-dna-reveals-close-family-ties-between-europe-s-earliest-people

SCIENCE DAILY – Study sheds light on the origin of the genetic code

Nearly all living organisms use the same genetic code, a complicated mechanism by which genetic information is translated into proteins, the building blocks of life. A new study suggests conventional wisdom about how the code evolved is likely flawed.

https://www.sciencedaily.com/releases/2024/12/241212190257.htm

SCIENCE DAILY – Resolving ambiguity: How the brain uses context in decision-making and learning

Life can be tricky. We have so many decisions to make. It's a good thing we have an orbitofrontal cortex and hippocampus to help us. These areas of the brain work together to help us sort through tasks that require resolving ambiguity, that is, situations in which the meaning of stimuli changes depending on context.

https://www.sciencedaily.com/releases/2024/12/241210142045.htm

SCIENCE DAILY – Butchered bones suggest violent 'othering' of enemies in Bronze Age Britain

Analysis of the remains of at least 37 individuals from Early Bronze Age England finds they were killed, butchered, and probably consumed before being thrown down a 15m-deep shaft. It is the largest-scale example of interpersonal violence from British prehistory. The treatment of the remains was likely a means to dehumanize or 'other' the victims. This massacre was probably revenge for a perceived offense, implying a cycle of violence and questioning the idea that Early Bronze Age Britain was relatively peaceful.

https://www.sciencedaily.com/releases/2024/12/241216000434.htm

SCIENCE DAILY – A new timeline for Neanderthal interbreeding with modern humans

Neanderthal genes make up 1-2% of the genomes of non-Africans. Scientists analyzed the lengths of regions of Neanderthal DNA in 58 ancient Eurasian genomes of early modern humans and determined that the introgressed genes result from interbreeding between Homo sapiens and Neanderthals about 47,000 years ago, over a single, extended period of about 7,000 years. The findings help pin down dates for out-of-Africa migration and the dispersal of Homo sapiens.

https://www.sciencedaily.com/releases/2024/12/241212145726.htm

PUBLICATIONS

Current Biology

PAPERS

AARIT AHUJA et al – Monkeys engage in visual simulation to solve complex problems

Visual simulation—i.e., using internal reconstructions of the world to experience potential future versions of events that are not currently happening—is among the most sophisticated capacities of the human mind. But is this ability in fact uniquely human? To answer this question, we tested monkeys on a series of experiments involving the “Planko” game, which we have previously used to evoke visual simulation in human participants. We found that monkeys were able to successfully play the game using a simulation strategy, predicting the trajectory of a ball through a field of planks while demonstrating a level of accuracy and behavioral signatures comparable with those of humans. Computational analyses further revealed that the monkeys’ strategy while playing Planko aligned with a recurrent neural network (RNN) that approached the task using a spontaneously learned simulation strategy. Finally, we carried out awake functional magnetic resonance imaging while

monkeys played Planko. We found activity in motion-sensitive regions of the monkey brain during hypothesized simulation periods, even without any perceived visual motion cues. This neural result closely mirrors previous findings from human research, suggesting a shared mechanism of visual simulation across species. Taken together, these findings challenge traditional views of animal cognition, proposing that nonhuman primates possess a complex cognitive landscape, capable of invoking imaginative and predictive mental experiences to solve complex everyday problems.
https://www.cell.com/current-biology/abstract/S0960-9822(24)01380-0

LIRAN SAMUNI et al with CATHERINE CROCKFORD & ROMAN M. WITTIG – Social play fosters cooperation in wild adult chimpanzees

Adult social play is a universal human trait, promoting the tolerance, bonding, cooperation, and collective action that sustain our large and complex societies. Play serves as a conduit for transmitting positive emotions, thereby stimulating psychological resilience to stressors and facilitating the positive intent and trust essential for cooperation emergence. In contrast, non-human adult social play is considered rare, and its role in cooperation remains unknown. We address this gap by studying the play behavior of 57 adult chimpanzees (Pan troglodytes) in Taï National Park, Côte d'Ivoire, where adult social play and collective action regularly occur. We show that adult female and male chimpanzees play more during times of increased mate competition (with males mainly playing with immatures) and with adult partners they had recent disputes with, highlighting the role of play in regulating social tension that can undermine cooperation. Chimpanzees also preferred playing with adult partners with whom they share strong affiliative bonds, aligning with the idea that play is associated with social familiarity and trust. Finally, adult chimpanzees were more likely to play before collectively defending their territory against outsiders and hunting monkeys. Those who played together were subsequently more likely to collaborate, reinforcing the notion that the positive feedback signaled via play can facilitate cooperation.5 Our findings demonstrate the sustained significance of adult social play throughout the chimpanzee lifespan, providing valuable insights into the evolution of adult social play and its societal functions, from diffusing tension to supporting social bonds and collective action.
https://www.cell.com/current-biology/abstract/S0960-9822(24)01453-2

KARL T. BATES et al – Running performance in Australopithecus afarensis

The evolution of bipedal gait is a key adaptive feature in hominids, but the running abilities of early hominins have not been extensively studied. Here, we present physics simulations of Australopithecus afarensis that demonstrate this genus was mechanically capable of bipedal running but with absolute and relative (size-normalized) maximum speeds considerably inferior to modern humans. Simulations predicted running energetics for Australopithecus that are generally consistent with values for mammals and birds of similar body size, therefore suggesting relatively low cost of transport across a limited speed range. Through model parameterization, we demonstrate the key role of ankle extensor muscle architecture (e.g., the Achilles tendon) in the evolution of hominin running energetics and indeed in an increase in speed range, which may have been intrinsically coupled with enhanced endurance running capacity. We show that skeletal strength was unlikely to have been a limiting factor in the evolution of enhanced running ability, which instead resulted from changes to muscle anatomy and particularly overall body proportions. These findings support the hypothesis that key features in the human body plan evolved specifically for improved running performance and not merely as a byproduct of selection for enhanced walking capabilities.
https://www.cell.com/current-biology/fulltext/S0960-9822(24)01566-5

DEVON GREER et al – Visual identification of conspecifics shapes social behavior in mice

Recognizing conspecifics—others of the same species—in order to determine how to interact with them appropriately is a fundamental goal of animal sensory systems. It has undergone selective pressure in nearly all species. Mice have a large repertoire of social behaviors that are the subject of a rapidly growing field of study in neuroscience. Mouse social interactions likely incorporate all available sensory modalities, and the vast majority of studies have not attempted to isolate them. Our understanding of the role of vision in mouse social interactions remains overlooked, given the prominence of olfactory research in this area. To address this, we developed a behavioral platform that allowed us to present a subject mouse with the visual information of stimulus mice in isolation from olfactory, acoustic, and tactile cues. Our results indicate that the visual identification of the sex or individual identity of other mice influences behavior. These findings highlight the underappreciated role of vision in mouse social interactions and open new avenues to study the visual circuits underlying social behavior.
https://www.cell.com/current-biology/abstract/S0960-9822(24)01582-3

eLife

PAPERS

LEI LI et al – Mother-child dyadic interactions shape children's social brain and theory of mind

Social cognition develops through a complex interplay between neural maturation and environmental factors, yet the neurobehavioral mechanisms underlying this process remain unclear. Using a naturalistic fMRI paradigm, we investigated the effects of age and parental caregiving on social brain development and Theory of Mind (ToM) in 50 mother-child dyads. The functional maturity of social brain networks was positively associated with age, while mother-child neural synchronization

during movie viewing was related to dyadic relationship quality. Crucially, parenting and child factors interactively shaped social cognition outcomes, mediated by ToM abilities. Our findings demonstrate the dynamic interplay of neurocognitive development and interpersonal synchrony in early childhood social cognition, and provide novel evidence for Bandura's theory of social learning and reciprocal determinism. This integrative approach, bridging brain, behavior, and parenting environment, advances our understanding of the complex mechanisms shaping social cognition. The insights gained can inform personalized interventions promoting social competence, emphasizing the critical importance of nurturing parental relationships in facilitating healthy social development.
https://elifesciences.org/reviewed-preprints/103017

Frontiers in Communication

PAPERS

KANGSAN NOH, EUNJEONG OH & SANGHOUN SONG – Testing language models' syntactic sensitivity to grammatical constraints: a case study of wanna contraction

Wanna contraction refers to the reduction of want to to wanna. Interestingly, native English speakers contract want to in object extraction questions but not in subject extraction questions. The present study investigated whether language models such as bidirectional encoder representations from transformers (BERT) adhere to this grammatical subtlety. Wanna contraction involves two factors: subject–object asymmetry and contraction. Disentangling these two ensures that when language models accurately identify illicit instances of wanna contraction, the detection stems from their understanding of the contraction, rather than the intervention by subject–object asymmetry. For this objective, we conducted three independent experiments. We tested whether language models detect illicit cases of contraction by maintaining constant contraction (Experiment 1) and question types (Experiment 2). We predicted that higher surprisal values would be assigned to ungrammatical instances. The overall results of the two experiments were in line with our prediction (87.5 and 75%, respectively). In addition, the analysis of by-word surprisal also indicates that the models generate higher surprisal values for subject extraction questions in illicit wanna instances (Experiment 3). Thus, the models' processing patterns of wanna contraction turn out to be close to those of native English speakers, suggesting their role as a research tool in linguistic experiments.
https://www.frontiersin.org/journals/communication/articles/10.3389/fcomm.2024.1442093/full

Frontiers in Language Sciences

PAPERS

INGRID SCHARLAU et al – When to use a metaphor: metaphors in dialogical explanations with addressees of different expertise

The present study aims to understand how metaphors are used in explanations. According to many current theories, metaphors have a conceptual function for the understanding of abstract objects. From this theoretical assumption, we derived the hypothesis that the lower the expertise of the addressee of an explanation, the more metaphors should be used. We tested this hypothesis on a relatively natural data set of 24 published videos with close to 100,000 words overall in which experts explain abstract, mostly scientific concepts to persons of different expertise, varying from minimal (children) to profound (expert). Contrary to our expectations, the frequency of metaphors did not decrease with expertise, but actually increased. This increase could be statistically substantiated with higher differences in expertise. The study contributes to a better understanding of the use of metaphors in actual explanatory processes and how metaphor use depends on contextual factors. It thus supports the expansion of the conceptual and linguistic perspective on metaphors to include the aspect of how metaphors are used by speakers.
https://www.frontiersin.org/journals/language-sciences/articles/10.3389/flang.2024.1474924/full

Frontiers in Psychology

PAPERS

GIULIA CALIGNANO et al – Words before pictures: the role of language in biasing visual attention

The present study investigated whether semantic processing of word and object primes can bias visual attention using top-down influences, even within an exogenous cueing framework. We hypothesized that real words and familiar objects would more effectively bias attentional engagement and target detection than pseudowords or pseudo-objects, as they can trigger prior knowledge to influence attention orienting and target detection.

To examine this, we conducted two web-based eye-tracking experiments that ensured participants maintained central fixation on the screen during remote data collection. In Experiment 1, participants viewed a central prime—either a real word or pseudo-word—followed by a spatial cue directing them to a target on the left or right, which they located by pressing a key. Experiment 2 presented participants with real objects or pseudo-objects as primes, with primes and targets that either matched or did not match in identity. Importantly, primes in both experiments conveyed no information about target location.

Results from Experiment 1 indicated that real word primes were associated with faster target detection than pseudo-words. In Experiment 2, participants detected targets more quickly when primed with real objects and when prime-target identity

matched. Comparisons across both experiments suggest an automatic influence of semantic knowledge on target detection and spatial attention.
These findings indicate that words can contribute to attentional capture, potentially through top-down processes, even within an exogenous cueing paradigm in which semantic processing is task-irrelevant.
https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1439397/full

HOLLY E. JENKINS et al – Assessing serial recall as a measure of artificial grammar learning
Implicit statistical learning is, by definition, learning that occurs without conscious awareness. However, measures that putatively assess implicit statistical learning often require explicit reflection, for example, deciding if a sequence is 'grammatical' or 'ungrammatical'. By contrast, 'processing-based' tasks can measure learning without requiring conscious reflection, by measuring processes that are facilitated by implicit statistical learning. For example, when multiple stimuli consistently co-occur, it is efficient to 'chunk' them into a single cognitive unit, thus reducing working memory demands. Previous research has shown that when sequences of phonemes can be chunked into 'words', participants are better able to recall these sequences than random ones. Here, in two experiments, we investigated whether serial visual recall could be used to effectively measure the learning of a more complex artificial grammar that is designed to emulate the between-word relationships found in language.
We adapted the design of a previous Artificial Grammar Learning (AGL) study to use a visual serial recall task, as well as more traditional reflection-based grammaticality judgement and sequence completion tasks. After exposure to "grammatical" sequences of visual symbols generated by the artificial grammar, the participants were presented with novel testing sequences. After a brief pause, participants were asked to recall the sequence by clicking on the visual symbols on the screen in order.
In both experiments, we found no evidence of artificial grammar learning in the Visual Serial Recall task. However, we did replicate previously reported learning effects in the reflection-based measures.
In light of the success of serial recall tasks in previous experiments, we discuss several methodological factors that influence the extent to which implicit statistical learning can be measured using these tasks.
https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1497201/full

iScience

PAPERS

JIANXIONG RUAN et al – Connectional differences between humans and macaques in the MT+ complex
MT+ is pivotal in the dorsal visual stream, encoding tool-use characteristics like motion speed and direction. Despite its conservation between humans and monkeys, differences in MT+ spatial location and organization may lead to divergent, yet unexplored, connectivity patterns and functional characteristics. Using diffusion tensor imaging, we examined the structural connectivity of MT+ subregions in macaques and humans. We also employed graph-theoretical analyses on the constructed homologous tool-use network to assess their functional roles. Our results revealed location-dependent connectivity in macaques, with MST, MT, and FST predominantly connected to dorsal, middle, and ventral surfaces, respectively. Humans showed similar connectivity across all subregions. Differences in connectivity between MST and FST are more pronounced in macaques. In humans, the entire MT+ region, especially MST, exhibited stronger information transmission capabilities. Our findings suggest that the differences in tool use between humans and macaques may originate earlier than previously thought, particularly within the MT+ region.
https://www.cell.com/iscience/fulltext/S2589-0042(24)02844-X

LORENZO CICCIONE et al with STANISLAS DEHAENE – Can non-human primates extract the linear trend from a noisy scatterplot?
Recent studies showed that humans, regardless of age, education, and culture, can extract the linear trend of a noisy scatterplot. Although this capacity looks sophisticated, it may simply reflect the extraction of the principal trend of the graph, as if the cloud of dots was processed as an oriented object. To test this idea, we trained Guinea baboons to associate arbitrary shapes with the increasing or decreasing trends of noiseless and noisy scatterplots, while varying the number of points, the noise level, and the regression slope. Many baboons successfully learned this conditional match-to-sample task and their accuracy varied as a sigmoid function of the t-value of the regression, the same statistical index upon which humans also base their answers. The perceptual component of human graphics abilities seems thus based on the recycling of a phylogenetically older competence of the primate visual system for extracting the principal axes of visual displays.
https://www.cell.com/iscience/fulltext/S2589-0042(24)02888-8

Journal of the Royal Society Interface

PAPERS

KAYNE A. DUNCANSON et al – Modelling individual variation in human walking gait across populations and walking conditions via gait recognition

Human walking gait is a personal story written by the body, a tool for understanding biological identity in healthcare and security. Gait analysis methods traditionally diverged between these domains but are now merging their complementary strengths to unlock new possibilities. Using large ground reaction force (GRF) datasets for gait recognition is a way to uncover subtle variations that define individual gait patterns. Previously, this was done by developing and evaluating machine learning models on the same individuals or the same dataset, potentially biasing findings towards population samples or walking conditions. This study introduces a new method for analysing gait variation across individuals, groups and datasets to explore how demographics and walking conditions shape individual gait patterns. Machine learning models were implemented using numerous configurations of four large walking GRF datasets from different countries (740 individuals, 7400 samples) and analysed using explainable artificial intelligence tools. Recognition accuracy ranged from 52 to 100%, with factors like footwear, walking speed and body mass playing interactive roles in defining gait. Models developed with individuals walking in personal footwear at multiple speeds effectively recognized novel individuals across populations and conditions (89–99% accuracy). Integrating force platform hardware and gait recognition software could be invaluable for reading the complex stories of human walking.
https://royalsocietypublishing.org/doi/10.1098/rsif.2024.0565

Linguistic Anthropology

PAPERS

MICHAEL BERMAN – Toward a linguistic anthropological approach to listening: An ear with power and the policing of "active listening" volunteers in Japan

This article develops the concept of an ear with power. An ear with power works through listeners who can, by listening, alter people's speech and other actions. It does so in ways that suit the institutions on whose behalf the listener acts. Unlike approaches focused on the effects of listening in interactions, an ear with power is a triadic relation in process, requires listening to listeners, and shows how absent listeners affect social relations. The article traces the implications of a complaint filed against Buddhist "active listening" volunteers in Japan after the 2011 disasters. Despite not using "Buddhist language" while volunteering, they were reported for "religious-sounding speech," which led to the temporary hiatus of their volunteer activities. Analyzing the distributed listening that led to that censure, this article demonstrates how linguistic anthropology might reframe critical analyses of power and governance, which have tended to rely on vision and speech. More specifically, it considers the ramifications of acts of listening that precede the speech that they are imagined to follow, the process whereby listeners come to hear themselves through the ear of another, and the ways that policing listening can alienate listening from listeners.
https://anthrosource.onlinelibrary.wiley.com/doi/abs/10.1111/jola.12436

Nature

NEWS

Humans evolved for distance running – but ancestor 'Lucy' didn't go far or fast

3D models of Australopithecus afarensis suggest the muscular adaptations that made modern humans better runners.
https://www.nature.com/articles/d41586-024-04194-4

Nature Communications Psychology

PAPERS

ERKIN ASUTAY & DANIEL VÄSTFJÄLL – Affective integration in experience, judgment, and decision-making

The role of affect in value-based judgment and decision-making has attracted increasing interest in recent decades. Most previous approaches neglect the temporal dependence of mental states leading to mapping a relatively well-defined, but largely static, feeling state to a behavioral tendency. In contrast, we posit that expected and experienced consequences of actions are integrated over time into a unified overall affective experience reflecting current resources under current demands. This affective integration is shaped by context and continually modulates judgments and decisions. Changes in affective states modulate evaluation of new information (affect-as-information), signal changes in the environment (affect-as-a-spotlight) and influence behavioral tendencies in relation to goals (affect-as-motivation). We advocate for an approach that integrates affective dynamics into decision-making paradigms. This dynamical account identifies the key variables explaining how changes in affect influence information processing may provide us with new insights into the role of affect in value-based judgment and decision-making.
https://www.nature.com/articles/s44271-024-00178-2

HERNÁN ANLLÓ et al – Experience and advice consequences shape information sharing strategies

Individuals often rely on the advice of more experienced peers to minimise uncertainty and increase success likelihood. In most domains where knowledge is acquired through experience, advisers are themselves continuously learning. Here we examine the way advising behaviour changes throughout the learning process, and the way individual traits and costs and benefits of giving advice shape this behaviour. We ran a series of experiments implementing a decision task within a reinforcement learning framework, where participants could decide to share their choices as advice to others. Participants were overall likely to share their choices as advice, even on the first trial before learning. Tendency to share advice and advice quality increased as advisers learned about the value of choices, and moved from exploratory to exploitative behaviour. The introduction of consequences to advising resulted in a shift of the overall tendency to give advice, lowering it when advising implicated monetary loss, and increasing it when advising held reputational value. Individual differences in social anxiety levels were associated with lower tendency to share exploratory decisions. Our results show that advisers tend to share choices that are backed by their own experience, but that this relationship can be altered by advice-consequences and individual traits.

https://www.nature.com/articles/s44271-024-00175-5

Nature Computational Science

PAPERS

TIANCHENG HU et al – Generative language models exhibit social identity biases

Social identity biases, particularly the tendency to favor one's own group (ingroup solidarity) and derogate other groups (outgroup hostility), are deeply rooted in human psychology and social behavior. However, it is unknown if such biases are also present in artificial intelligence systems. Here we show that large language models (LLMs) exhibit patterns of social identity bias, similarly to humans. By administering sentence completion prompts to 77 different LLMs (for instance, 'We are…'), we demonstrate that nearly all base models and some instruction-tuned and preference-tuned models display clear ingroup favoritism and outgroup derogation. These biases manifest both in controlled experimental settings and in naturalistic human–LLM conversations. However, we find that careful curation of training data and specialized fine-tuning can substantially reduce bias levels. These findings have important implications for developing more equitable artificial intelligence systems and highlight the urgent need to understand how human–LLM interactions might reinforce existing social biases.

https://www.nature.com/articles/s43588-024-00741-1

Nature Human Behaviour

PAPERS

EVAN ORTICIO, MARTIN MEYER & CELESTE KIDD – Exposure to detectable inaccuracies makes children more diligent fact-checkers of novel claims

How do children decide when to believe a claim? Here we show that children fact-check claims more and are better able to catch misinformation when they have been exposed to detectable inaccuracies. In two experiments (N = 122), 4–7-year-old children exposed to falsity (as opposed to all true information) sampled more evidence before verifying a test claim in a novel domain. Children's evidentiary standards were graded: fact-checking increased with higher proportions of false statements heard during exposure. A simulation suggests that children's behaviour is adaptive, because increased fact-checking in more dubious environments supports the discovery of potential misinformation. Importantly, children were least diligent at fact-checking a new claim when all prior information was true, suggesting that sanitizing children's informational environments may inadvertently dampen their natural scepticism. Instead, these findings support the counterintuitive possibility that exposing children to some nonsense may scaffold vigilance towards more subtle misinformation in the future.

https://www.nature.com/articles/s41562-024-01992-8

Nature Portfolio

ARTICLES

THE KAVLI FOUNDATION – Making sense of the human face

ADVERTISEMENT FEATURE: Advertiser retains sole responsibility for the content of this article

In the spring of 1995, Nancy Kanwisher was granted access to the functional magnetic resonance imaging (fMRI) machine at the Massachusetts General Hospital. After making little headway using the nascent technology to explore the visual perception of shape, she climbed inside the machine, gazed at photos of people's faces, and had her coworkers scan her brain.

What Kanwisher discovered would launch a 30-year journey to unravel how humans perform a vital social task: making sense of each other's faces. Those early experiments revealed a small patch of increased blood flow in a brain region that responded more vigorously to images of faces than random objects. That first scan showed "a promising blob on the bottom of my right hemisphere," Kanwisher writes in a 2017 retrospective about the work. To be certain, she had her colleagues scan her again and again. "To our delight, the trusty little blob showed up in exactly the same place every time."

To learn more about the work of Kavli Prize Laureates, visit kavliprize.org.

https://www.nature.com/articles/d42473-024-00353-3

Nature Reviews Neuroscience

COMMENTARIES

ANGELA D. FRIEDERICI & YANNICK BECKER – The core language network separated from other networks during primate evolution

In their Review article earlier this year, Fedorenko, Ivanova & Regev (Fedorenko, E., Ivanova, A. A. & Regev, T. I. The language network as a natural kind within the broader landscape of the human brain. Nat. Rev. Neurosci. 25, 289–312 (2024))1 propose a functional separation between the core language network and other perceptual, motor and higher-level cognitive components of communication-related networks in the left hemisphere of the human brain. In the 'Open questions and a way forward'1 section that ends their Review, the authors discuss the need for cross-species comparative research to disentangle how these brain networks came to support human language. Here, we suggest that the authors' functional separation of a core language network and other components in the human brain is grounded in the evolution of two separate structural networks within primate brains.

https://www.nature.com/articles/s41583-024-00897-9

EVELINA FEDORENKO, ANNA A. IVANOVA & TAMAR I. REGEV – Reply to 'The core language network separated from other networks during primate evolution'

We thank Friederici and Becker for insightful comments on our Review (Fedorenko, E., Ivanova, A. A. & Regev, T. I. The language network as a natural kind within the broader landscape of the human brain. Nat. Rev. Neurosci. 25, 289–312 (2024)), which we respond to below (Friederici, A. D. & Becker, Y. The core language network separated from other networks during primate evolution. Nat. Rev. Neurosci. https://doi.org/10.1038/s41583-024-00897-9 (2024)).

{Original paper: EAORC Bulletin 1,087. Other commentary: EAORC Bulletin 1,104.}

https://www.nature.com/articles/s41583-024-00899-7

CORRECTIONS

CHRISTOPHER J. BAE & XIUJIE WU – Author Correction: Making sense of eastern Asian Late Quaternary hominin variability

Correction to: Nature Communications https://doi.org/10.1038/s41467-024-53918-7, published online 02 November 2024 The original version of this Article contained errors in Box 1. In Box 1, the numbers in the Reference column were incorrect.

{Original Paper: EAORC Bulletin 1,117.}

https://www.nature.com/articles/s41467-024-55313-8

Neuron

PAPERS

JIEYU ZHENG & MARKUS MEISTER – The unbearable slowness of being: Why do we live at 10 bits/s?

This article is about the neural conundrum behind the slowness of human behavior. The information throughput of a human being is about 10 bits/s. In comparison, our sensory systems gather data at ∼10^9 bits/s. The stark contrast between these numbers remains unexplained and touches on fundamental aspects of brain function: what neural substrate sets this speed limit on the pace of our existence? Why does the brain need billions of neurons to process 10 bits/s? Why can we only think about one thing at a time? The brain seems to operate in two distinct modes: the "outer" brain handles fast high-dimensional sensory and motor signals, whereas the "inner" brain processes the reduced few bits needed to control behavior. Plausible explanations exist for the large neuron numbers in the outer brain, but not for the inner brain, and we propose new research directions to remedy this.

https://www.cell.com/neuron/abstract/S0896-6273(24)00808-0

TALHA SOLUOKU & JAMES M. HYMAN – Complexity demands more flexibility and the prefrontal cortex has an answer

Cognitive flexibility allows us to adapt our behavior to keep up with a changing environment. In this issue of Neuron, Mugan and colleagues manipulate the complexity of an environment to demonstrate how the medial prefrontal cortex controls a cognitive flexibility circuit featuring the dorsolateral striatum and hippocampus.

https://www.cell.com/neuron/abstract/S0896-6273(24)00874-2

New Scientist

NEWS

Toddler bones show mammoths were the main food of the first Americans

The bones of a child who died nearly 13,000 years ago suggest that the people who moved from Asia into North America at this time ate a lot of mammoth.

https://www.newscientist.com/article/2458844-toddler-bones-show-mammoths-were-the-main-food-of-the-first-americans/

Survival of the wittiest: Could wordplay have boosted human evolution?
Evidence for the origins of complex language can be found in creative two-word insults such as busy-body and kill-joy.
https://www.newscientist.com/article/mg26435212-500-survival-of-the-wittiest-could-wordplay-have-boosted-human-evolution/

PLoS One

PAPERS

LUCAS HARAPED et al with WALTER F. BISCHOF – Looking, pointing, and talking together: How dyads of differential expertise coordinate attention during conversation
When people discuss something that they can both see, their attention becomes increasingly coupled. Previous studies have found that this coupling is temporally asymmetric (e.g., one person leads and one follows) when dyads are assigned conversational roles (e.g., speaker and listener). And while such studies have focused on the coupling of gaze, there is also evidence that people use their hands to coordinate attention. The present study uses a visual task to expand on this past work in two respects. First, rather than assigning conversational roles, participants' background knowledge was manipulated (e.g., expert and novice) to elicit differential roles inherent to the conversation. Second, participants were permitted to gesture freely while interacting. Cross Recurrence Quantification Analysis with data from mobile eye trackers and manually coded pointing gestures revealed that although more knowledgeable participants dominated the dialogue by talking and pointing more, the symmetry of coupled behaviors (gaze and pointing) between participants remained fixed. Asymmetric attentional coupling emerged, although this was dependent on conversational turn taking. Specifically, regardless of background knowledge, the currently speaking participant led attention, both with the eyes and with the hands. These findings suggest stable, turn-dependent interpersonal coupling dynamics, and highlight the role of pointing gestures and conversational turn-taking in multimodal attention coordination.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0315728

JEN LEWENDON, JAMES BRITTON & STEPHEN POLITZER-AHLES – The Phonological Mapping Negativity (PMN) as a language-specific component: Exploring responses to linguistic vs musical mismatch
The Phonological Mismatch Negativity (PMN) is an ERP component said to index the processing of phonological information, and is known to increase in amplitude when phonological expectations are violated. For example, in a context that generates expectation of a certain phoneme, the PMN will become relatively more negative if the phoneme is switched for an alternative. The response is comparable to other temporally-proximate components, insofar as it indicates a neurological response to unexpected auditory input, but remains considered distinct by the field on the basis of its proposed specific sensitivity to phonology. Despite this, reports of the PMN overlap notably, both in temporal and topographic distribution, with the Mismatch Negativity (MMN) and the N400, and limited research to date has been conducted to establish whether these extant distinctions withstand testing. In the present study, we investigate the PMN's sensitivity to non-linguistic mismatches so as to test the response's specific language sensitivity. Participants heard primes—three-syllable words—played simultaneously to three-note tunes, with the instructions to attend exclusively to either the linguistic or musical content. They were then tasked with removing the first syllable (phoneme manipulation) or note (music manipulation) to form the target. Targets either matched or mismatched primes, thus achieving physically identical note or phoneme mismatches. Results show that a PMN was not elicited during the musical mismatch condition, a finding which supports suggestions that the PMN may be a language-specific response. However, our results also indicate that further research is necessary to determine the relationship between the PMN and N400. Though our paper probes a previously unstudied dimension of the PMN, questions still remain surrounding whether the PMN, although seemingly language-specific, is truly a phonology-specific component.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0315537

JULIE GULLSTRAND, NICOLAS CLAIDIÈRE & JOËL FAGOT – Cognitive flexibility and sociality in Guinea baboons (Papio papio)
Cognitive flexibility is an executive function playing an important role in problem solving and the adaptation to contextual changes. While most studies investigated the contribution of cognitive flexibility to solve problems in the physical domain, the current study on baboons (Papio papio) investigated its contribution to sociality. The current study verified whether there is a relationship between cognitive flexibility at the individual level and the position of the individuals within their social group. Our study re-analysed for that purpose an already published dataset of 18 baboons Guinea baboons tested over two years in an adaptation of the Wisconsin Card Sorting task. The dominance rank and social network were inferred from their free access to the computer test system on which the cognitive task was presented. We found no clear-cut relationship between the hierarchical rank and cognitive flexibility (perseveration, learning latency and response time). By contrast, the most central baboons in their social network are those with the best performance in terms of cognitive flexibility. Overall, this study confirms our hypothesis that cognitive flexibility plays some roles in the regulation of the social relationship in baboons.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0308778

ANTOINE GRIGIS et al – Revisiting the standard for modeling functional brain network activity: Application to consciousness
Functional connectivity (FC) of resting-state fMRI time series can be estimated using methods that differ in their temporal sensitivity (static vs. dynamic) and the number of regions included in the connectivity estimation (derived from a prior atlas). This paper presents a novel framework for identifying and quantifying resting-state networks using resting-state fMRI recordings. The study employs a linear latent variable model to generate spatially distinct brain networks and their associated activities. It specifically addresses the atlas selection problem, and the statistical inference and multivariate analysis of the obtained brain network activities. The approach is demonstrated on a dataset of resting-state fMRI recordings from monkeys under different anesthetics using static FC. Our results suggest that two networks, one fronto-parietal and cingular and another temporo-parieto-occipital (posterior brain) strongly influences shifts in consciousness, especially between anesthesia and wakefulness. Interestingly, this observation aligns with the two prominent theories of consciousness: the global neural workspace and integrated information theories of consciousness. The proposed method is also able to decipher the level of anesthesia from the brain network activities. Overall, we provide a framework that can be effectively applied to other datasets and may be particularly useful for the study of disorders of consciousness.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0314598

Proceedings of the Royal Society B

PAPERS

MAEVATIANA NOKOLOINA RATSIMBAZAFINDRANAHAKA et al – Behavioural context of call production in humpback whale calves: identification of potential begging calls in a mysticetes species
Baleen whale calves vocalize, but the behavioural context and role of their social calls in mother–calf interactions are yet to be documented further. We investigated the context of call production in humpback whale (Megaptera novaeangliae) calves using camera-equipped animal-borne multi-sensor tags. Behavioural states, including suckling sessions, were identified using accelerometer, depth and video data. Call types were categorized through clustering techniques. We found that call types and rates predict the occurrence of a given state. Milling, resting and travelling were associated with a median call rate of 0 calls min−1, while surface play, tagging responses and suckling were associated with higher call rates, averaging up to a median of 0.5 calls min−1 for suckling. Suckling sessions were mainly associated with two sets of low-frequency calls corresponding to previously described burping, barking and snorting sounds. Surface play sessions featured mid-frequency calls with whoop-like sounds and other call types. These results address the significance of vocal signalling in mother–calf communication and the calf's development, including the first identification of potential begging calls. Overall, this study offers new insights into baleen whale behaviour, underscores the importance of social calls in mother–calf interactions and enhances our understanding of communication systems in aquatic mammalian mother–young pairs.
https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2024.2048

Royal Society Open Science

PAPERS

STEPHANIE KORDON et al with FRANS B.M. DE WAAL & ZANNA CLAY – Factors shaping socio-emotional trajectories in sanctuary-living bonobos: a longitudinal approach
Early maternal loss can have lasting detrimental effects on primate social development. While many rehabilitation settings provide enriching environments to buffer against such effects in orphans, previous research indicates that young bonobo (Pan paniscus) orphans exhibit striking deficiencies in socio-emotional competence compared to their mother-reared peers. However, such studies are generally cross-sectional, without accounting for changes across the lifespan. We conducted longitudinal observations in bonobos living in an accredited African ape sanctuary to examine how rearing background, sex and age predict social tendencies including affiliation, consolation and aggression risk. Affiliative tendencies increased in females and decreased in males with age but were overall lower in orphans compared to mother-reared bonobos. Consolation tendencies decreased with age in mother-reared bonobos, while orphans showed consistently lower consolation (akin to levels of older mother-reared individuals). Young and male bonobos were more likely to receive aggression, while mother-reared and older females were more likely aggressors. Our study highlights the potential that ape sanctuaries like this can have by demonstrating that orphans exhibit decreased affiliative tendencies yet show social functioning ranging within patterns of their mother-reared peers. We discuss these results in the context of bonobos' natural social ecology and ongoing rehabilitation efforts in this species.
https://royalsocietypublishing.org/doi/10.1098/rsos.240435

Trends in Cognitive Sciences

PAPERS

PAULA RUBIO-FERNANDEZ, MARLENE D. BERKE & JULIAN JARA-ETTINGER – Tracking minds in communication
How does social cognition help us communicate through language? At what levels does this interaction occur? In classical views, social cognition is independent of language, and integrating the two can be slow, effortful, and error-prone. But new

research into word level processes reveals that communication is brimming with social micro-processes that happen in real time, guiding even the simplest choices like how we use adjectives, articles, and demonstratives. We interpret these findings in the context of advances in theoretical models of social cognition and propose a communicative mind-tracking framework, where social micro-processes are not a secondary process in how we use language – they are fundamental to how communication works.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00312-7

BENJAMIN PETERS et al – Generative adversarial collaborations: a new model of scientific discourse
Science progresses when ideas clash, leaving the most successful to survive and move us closer to the truth. In this ideal hypothetico-deductive approach, science is dynamic and fluid, with theories constantly tested and replaced. In reality, however, many opposing theories rarely meet. Scientists instead often work in entrenched paradigms or research programs – focused on their own frameworks, language, and methods – which resist direct comparison and evolve incrementally at a generational timescale rather than through confrontations. Adversarial collaborations offer a promising alternative to accelerate scientific progress: a way to bring together researchers from different camps to rigorously compare and test their competing views.
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00291-2

PAOLO BARTOLOMEO, JIANGHAO LIU & TAL SEIDEL MALKINSON – Frontoparietal asymmetries leading to conscious perception
Recent human intracerebral recordings reveal that frontoparietal circuits linked by the superior longitudinal fasciculus (SLF) have critical, hemisphere-asymmetric contributions to conscious perception. Right-hemisphere networks are crucial for attention-based prioritization of information; left-hemisphere regions contribute to perceptual decisions and model building. These asymmetries confirm and specify clinical evidence from neglect patients.
{… in a standardly-organised human brain; which is a largely mythical object (https://www.nature.com/articles/s41598-018-23696-6). We do not yet have an agreed definition of consciousness or an agreed map of brain functionality; but here we are again, defining consciousness in terms of brain functionality.}
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00323-1

KATIE L. LANCASTER & SAM V. WASS – Finding order in chaos: influences of environmental complexity and predictability on development
Environments are dynamic and complex. Some children experience more predictable early life environments than others. Here, we consider how moment-by-moment complexity and predictability in our early environments influence development. New studies using wearable sensors are quantifying this environmental variability at a fine temporal resolution across hierarchically structured physical and social features. We identify three types of predictability: periodicities ('at X time intervals, Y happens'), stability ('given stateX, stateX+1 is known'), and contingency ('when I do X, Y happens'). We discuss how the temporal dynamics of environments may differ between individuals and the diverse developmental neural pathways through which this may influence outcomes, such as central nervous system (CNS) arousal and executive control. Finally, we discuss practical consequences and directions for future research.
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(24)00321-8

COMMENTARIES

STEPHEN M. FLEMING & NICHOLAS SHEA – Empirical approaches to determining quality space computations for consciousness: a response to Dołęga et al. and Song
Our hope and aim with our recent article in TiCS was to provoke debate and research on the hypothesis that conscious experiences form quality spaces; thus, we were very pleased to receive letters from Dołęga, et al. and Song making constructive suggestions for taking this enquiry in new directions. Our focus was on how various computational theories of consciousness can accommodate the quality space hypothesis. Dołęga et al. make the helpful observation that this should also be investigated diachronically, both developmentally and during learning. Song points to valuable work that expands our methods for investigating quality spaces. She also argues that non-conventional approaches, such as Integrated Information Theory (IIT), will be needed to account for the qualitative character of consciousness. Work on IIT has been valuable in pointing to the importance of the phenomenon we grapple with in our paper (the potential interconnectedness of conscious experiences), which other theories of consciousness have tended to overlook. However, we respectfully disagree that tackling the phenomenon necessitates a non-conventional scientific approach.
{Original paper: EAORC Bulletin 1,101. Commentaries: EAORC Bulletin 1,118.}
https://www.cell.com/trends/cognitive-sciences/abstract/S1364-6613(24)00322-X

Trends in Genetics

PAPERS

NICOLAS D. MOYA et al – The long and short of hyperdivergent regions

The increasing prevalence of genome sequencing and assembly has uncovered evidence of hyperdivergent genomic regions – loci with excess genetic diversity – in species across the tree of life. Hyperdivergent regions are often enriched for genes that mediate environmental responses, such as immunity, parasitism, and sensory perception. Especially in self-fertilizing species where the majority of the genome is homozygous, the existence of hyperdivergent regions might imply the historical action of evolutionary forces such as introgression and/or balancing selection. We anticipate that the application of new sequencing technologies, broader taxonomic sampling, and evolutionary modeling of hyperdivergent regions will provide insights into the mechanisms that generate and maintain genetic diversity within and between species.
https://www.cell.com/trends/genetics/abstract/S0168-9525(24)00269-5

SUBSCRIBE to the EAORC Bulletin

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

UNSUBSCRIBE from the EAORC Bulletin

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

PRODUCED BY AND FOR THE EAORC EMAIL GROUP

EAORC is a fee-free academic internet news service and has no commercial sponsorship or other commercial interests.
EAORC website information is at http://martinedwardes.me.uk/eaorc/
If you have received this bulletin, and are unhappy about receiving it, please contact martin.edwardes@btopenworld.com.