EAORC BULLETIN 1,085 – 31 March 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.

ACADEMIA.EDU – Human evolution and cognition

Theory in Biosciences 129, 193-201 (2010).

IAN TATTERSALL – Human evolution and cognition

Human beings are distinguished from all other organisms by their symbolic way of processing information about the world. This unique cognitive style is qualitatively different from all the earlier hominid cognitive styles, and is not simply an improved version of them. The hominid fossil and archaeological records show clearly that biological and technological innovations have typically been highly sporadic, and totally out of phase, since the invention of stone tools some 2.5 million years ago. They also confirm that this pattern applied in the arrival of modern cognition: the anatomically recognizable species Homo sapiens was well established long before any population of it began to show indications of behaving symbolically. This places the origin of symbolic thought in the realms of exaptation, whereby new structures come into existence before being recruited to new uses, and of emergence, whereby entire new levels of complexity are achieved through new combinations of attributes unremarkable in themselves. Both these phenomena involve entirely routine evolutionary processes; special as we human beings may consider ourselves, there was nothing special about the way we came into existence. Modern human cognition is a very recent acquisition; and its emergence ushered in an entirely new pattern of technological (and other behavioral) innovation, in which constant change results from the ceaseless exploration of the potential inherent in our new capacity.

https://www.academia.edu/82270238/ORIGINAL_PAPER_Human_evolution_and_cognition

CONFERENCE ALERT – EVOLANG 2024 News & Updates

Preliminary program

Follow us on X (twitter) @evolangconf to get regular updates

Please find below updates about the preliminary program as well as format of posters and talks at EVOLANG XV.

The preliminary conference schedule can be found here: https://evolang2024.github.io/proceedings/

Talks

Podium talks will be organized into 4 parallel sessions in adjacent rooms. To facilitate a smooth transition between presentations and allow attendees to switch sessions easily, please adhere strictly to the allocated time for your talk.

Each speaker is allotted 15 minutes for their presentation, followed by 7 minutes for questions and answers.

Please plan on using your own laptop for presenting. We will have laser pointers and remotes available for use, or you are free to use your own. We will have HDMI and USB-C connections available. If you require a different connection, please bring a dongle.

Posters

Our poster boards are wide, measuring 91 inches (231 cm) in width and 44.75 inches (113.6 cm) in height. Please design your poster to fit within these dimensions. A poster spanning this entire area would be quite large, and you may want to print it at a somewhat smaller size.

Maximum Landscape Size: A0 size (46.8 × 33.1 inches or 118.8 x 84.1 cm). This is the preferred format for its visibility and space efficiency.

Maximum Long (Portrait) Format: Do not exceed the height of the poster boards, which is 44 inches (111.7 cm). Note: The portrait format offers slightly less display area compared to the landscape (A0) format often used at conferences.

Poster Content, Design Tips and Procedures:

Ensure your poster is readable from a distance. Use large fonts and clear, concise language.

Include your poster title, author(s), affiliation(s), and a brief abstract at the top.

Use visuals (charts, graphs, images) to complement your text and highlight key findings.

Consider the flow of information; organize your content logically from left to right and top to bottom.

You may want to add a QR code to a digital version, print handout versions and/or make a signup sheet for people wanting more details.

Set up and take down your poster within the designated times. Specific details will be provided closer to the conference date.

Be present at your poster during the assigned poster session times to discuss your work with attendees.

Flash Talks: If you have an accepted poster and would like to give a 90 seconds flash talk prior to the poster session, please submit this form (https://evolang.us16.list-manage.com/track/click?u=3c02037f31127170cc4814a4e&id=661cec868b&e=1da5838da4). We recommend giving a flash talk as an opportunity to promote your poster and increase its visibility. The deadline to register your flash talk is May 1st.

The flash talk session will take place right before the poster session/reception in the afternoon of May 19th. Each speaker will have 90 seconds and one static slide. We will get in touch a week or so before the conference to ask for your slide so that we can host it on a single computer since there won't be time to switch computers in between presentations.

Registration

The registration for the conference is open. You can register here: https://uwmadison.eventsair.com/evolang-xv/registration/Site/Landing

Please note that the accepted workshops can be found here: https://evolang2024.github.io/#workshops-section

If you have any questions please email scientific-committee@evolang.org.

For general information, please visit https://evolang2024.github.io/

Accommodation and Room-Sharing

We have pre-booked room blocks at several hotels within a short walking distance to the conference venue. Using these rooms unlocks savings that allow the conference to offer additional food and beverages to the attendees. You can reserve a room at Hilton Monona Terrace using this link or call Hilton Reservations at 800-445-8667 or the hotel directly at 608-255-5100 and reference the group code EVO24. An alternative is Park Hotel Madison. Both hotels offer single and double rooms. If you are interested in sharing a room, please use this spreadsheet to make arrangements.

Looking forward to seeing you in Madison in May!

EVOLANG SCIENTIFIC COMMITTEE

NEWS

NATURE BRIEFING – 'After you': first symbolic gesture in birds

Japanese tits (Parus minor) flutter their wings to invite their mate to enter the nest first. Scientists who observed eight breeding pairs of wild tits noticed that when one of the birds sat in front of the next box and fluttered its wings, the other would go in first. It's the first documented evidence of birds using a symbolic gesture: one that has a specific meaning (like waving 'goodbye') but isn't simply pointing at an object of interest. "It implies that birds have a level of understanding of symbolism that probably a lot of people wouldn't have given them credit for before," says ornithologist Mike Webster.

https://www.cell.com/current-biology/abstract/S0960-9822(24)00030-7

NATURE BRIEFING – Hub for humans' journey out of Africa found

After Homo sapiens expanded out of Africa 70,000 years ago, they seem to have paused for some 20,000 years before colonizing Europe and Asia. Now researchers think they know where. Looking at ancient and modern DNA, and the environment of the time, scientists have pinpointed the Persian Plateau — which in this definition encompasses Iran, the United Arab Emirates, Kuwait and parts of Oman — as the perfect place. Finding local archaeological evidence to confirm this could be difficult. "There's very little work being done there because of geopolitics," says archaeologist and study co-author Michael Petraglia.

https://www.abc.net.au/news/science/2024-03-26/out-of-africa-human-migration-persian-plateau/103614458

SAPIENS – What's Behind the Evolution of Neanderthal Portraits

Since the 1800s, Neanderthal depictions have evolved not only with changing science but also due to social views. An archaeologist explains why visualizations of our evolutionary cousins matter.

https://www.sapiens.org/archaeology/neanderthal-art-paleolithic-archaeology/

SAPIENS – Finding Footprints Laid at the Dawn of Time

In the Brazilian Amazon, a university-trained archaeologist and Wajãpi Indigenous people understand traces from the past differently—but their partnership bears fruit for both.

https://www.sapiens.org/archaeology/indigenous-knowledge-archaeology-amazon-brazil/

SCIENCEADVISER – 'After you!' A female bird's flutter conveys a polite message to her mate

Videos suggest wild birds use complex gestures, like humans do.

https://www.science.org/content/article/after-you-female-bird-s-flutter-conveys-polite-message-her-mate

THE CONVERSATION – Why did modern humans replace the Neanderthals? Different social structures?

Neanderthals and humans may have been equally smart and skilled, but some evidence points to humans living in larger groups.

https://theconversation.com/why-did-modern-humans-replace-the-neanderthals-the-key-might-lie-in-our-social-structures-195056

PUBLICATIONS

Academia Biology

PAPERS

DANIEL J.M. CROUCH & WALTER F. BODMER – Evolution by natural selection is a scientific law and not just a theory
The concept of evolution by natural selection was developed primarily by Darwin and Wallace in the 19th century as an explanation for the diversity and origin of complex organisms. They, however, did not have access to a mechanism of inheritance, which was needed for a proper understanding of how evolution by natural selection could work. Mendel's discovery of the basic laws of inheritance in diploid sexual organisms enabled Fisher, Haldane, and Wright to provide a theoretical framework for understanding the selective process of evolution by natural selection. The developing knowledge of prokaryotic microorganisms and the discovery of DNA or RNA as the fundamental basis of inheritance in all living organisms, together with Mendel's laws, now provide the four basic conditions for evolution by natural selection, namely reproduction that is stable, but allows for variation that can increase fitness in the broadest sense. These definitive conditions establish an exponential growth law for evolution by natural selection that applied initially for the longest period of time to the evolution of asexual clonal organisms, and through Mendel's laws, extends to bisexual multicellular organisms. It is mistaking evolution by natural selection to be a scientific theory rather than a law that has led to unnecessary disagreements over its fundamental validity and explanatory power.
https://www.academia.edu/articles/10.20935/AcadBiol6158

VALERIY SBITNEV – The edge of chaos is that where consciousness manifests itself through intermittent dynamics
Consciousness is a special type of interaction between subjects that is exchanged by lingua quanta (phonemes). A set of lingua quanta composes a thesaurus placed on the edge of chaos. Its library is a memory, modification of which is due to tuning of memristive neural elements scattered in the brain volume. The memristive neural model considers two types of neurons, excitatory and inhibitory, and current leakage at body temperature (T = 310 K). At such temperatures, only heavy ions, such as hydrogen ions (protons), can pass robustly through the water medium of the brain. Robust ion transport involves proton water wires supported by the Grotthuss mechanism. The final aims of the ions are the gap junctions (electric synapses) linking the nearest neurons. Following these observations, a model of excitable nervous tissue was constructed. One-to-one mapping written on the basis of sigmoid curves is capable of reproducing chaotic modes of neural activity, as proved by positive values of the Lyapunov exponent. The edge of chaos is located near the bifurcation boundary dividing chaos and the periodic convulsive activity typical of epileptic discharges. In this region, self-sustained spiral waves occur. Intermittent activity of competing excitatory and inhibitory neurons is observed at the edge of chaos. The intermittent electrical activity of neural tissues is shown by records both from different literature issues and records made by the author and Dr. A. Dudkin on slices of the CA1 field of the hippocampus.
https://www.academia.edu/articles/10.20935/AcadBiol6169

Current Biology

ARTICLES

KAREN E. ADOLPH & CATHERINE S. TAMIS-LEMONDA – Self-recognition: From touching the body to knowing the self
Recognizing oneself in a mirror is a classic test of self-concept. A new study has revealed the perceptual-motor foundations of conceptual self-knowledge: infants' success in the mirror test was accelerated after touching a tactile stimulus while viewing themselves in a mirror.
https://www.cell.com/current-biology/abstract/S0960-9822(24)00149-0

PAPERS

DARBY M. LOSEY et al – Learning leaves a memory trace in motor cortex
How are we able to learn new behaviors without disrupting previously learned ones? To understand how the brain achieves this, we used a brain-computer interface (BCI) learning paradigm, which enables us to detect the presence of a memory of one behavior while performing another. We found that learning to use a new BCI map altered the neural activity that monkeys produced when they returned to using a familiar BCI map in a way that was specific to the learning experience. That is, learning left a "memory trace" in the primary motor cortex. This memory trace coexisted with proficient performance under the familiar map, primarily by altering neural activity in dimensions that did not impact behavior. Forming memory traces might be how the brain is able to provide for the joint learning of multiple behaviors without interference.
https://www.cell.com/current-biology/abstract/S0960-9822(24)00298-7

TOSHITAKA N. SUZUKI & NORIMASA SUGITA – The 'after you' gesture in a bird
Gestures are ubiquitous in human communication, involving movements of body parts produced for a variety of purposes, such as pointing out objects (deictic gestures) or conveying messages (symbolic gestures). While displays of body parts have been described in many animals, their functional similarity to human gestures has primarily been explored in great apes, with little research attention given to other animal groups. To date, only a few studies have provided evidence for deictic gestures

in birds and fish, but it is unclear whether non-primate animals can employ symbolic gestures, such as waving to mean 'goodbye', which are, in humans, more cognitively demanding than deictic gestures. Here, we report that the Japanese tit (Parus minor), a socially monogamous bird, uses wing-fluttering to prompt their mated partner to enter the nest first, and that wing-fluttering functions as a symbolic gesture conveying a specific message ('after you'). Our findings encourage further research on animal gestures, which may help in understanding the evolution of complex communication, including language.
https://www.cell.com/current-biology/abstract/S0960-9822(24)00030-7

Evolutionary Anthropology
REVIEWS

RENÉ BOBE – The biogeography of our evolutionary history
Review of 'Origin Africa: Safaris in Deep Time' by Jonathan Kingdon, William Collins (2023).
No Abstract available.
https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.22026

Heliyon
PAPERS

LINDSAY MURRAY – Ape recognition of familiar human faces changed by time and COVID-19 face masks
Reports of primates being able to recognise familiar humans are rare in the literature and tend to be regarded as anecdotal. The COVID-19 pandemic created two unique conditions facilitating the observation of spontaneous face recognition in zoo apes: i) lengthy gaps in contact with human visitors due to lockdowns and zoo closures, and ii) the wearing of face masks obscuring at least half the face of familiar individuals. Here, I report on the historical context of the familiarity between a primatologist and individual apes of two species, how those apes consistently showed recognition of this particular human over a time span of up to thirty years, how facial recognition was extended to family members, and how recognition persisted even when a significant portion of the face was obscured by a mask. This constitutes, to my knowledge, the first documented cases of recognition of familiar human faces changed by time and COVID-19 face masks in two great ape species. Although based on just two individuals, the documentation of this ability is important because it arose in a more naturalistic and spontaneous context compared to typical face processing research in which primates are tested with experimental stimuli in a laboratory setting. Implications for face processing theory and applications for the therapeutic utility of faces are discussed. These observations provide insight into the evolutionary origins of face recognition and, sitting at the interface of science and society, are of interest to a wide audience.
https://www.cell.com/heliyon/fulltext/S2405-8440(24)03907-0

iScience
PAPERS

FABIO DI BELLO, ROSSELLA FALCONE & ALDO GENOVESIO – Simultaneous Oscillatory Encoding of 'Hot' and 'Cold' Information During Social Interactions in the Monkey Medial Prefrontal Cortex
Social interactions in primates require social cognition abilities such as anticipating the partner's future choices, as well as pure cognitive skills involving processing task-relevant information. The medial prefrontal cortex (mPFC) has been implicated in these cognitive processes. Here, we investigated the neural oscillations underlying the complex social behaviors involving the interplay of social roles (Actor vs Observer) and interaction types (whether working with a "Good" or "Bad" partner). We found opposite power modulations of the beta and gamma bands by social roles, indicating dedicated processing for task-related information. Concurrently, the interaction type was conveyed by lower frequencies, which are commonly associated with neural circuits linked to performance and reward monitoring. Thus, the mPFC exhibits parallel coding of both "cold" processes (purely cognitive) and "hot" processes (reward and social-related). This allocation of neural resources gives the mPFC a key neural node, flexibly integrating multiple sources of information during social interactions.
https://www.cell.com/iscience/fulltext/S2589-0042(24)00781-8

Mind & Language
PAPERS

FREDERIK TOLLERUP JUNKER & THOR GRÜNBAUM – Is the wandering mind a planning mind?
Recent studies on mind-wandering reveal its potential role in goal exploration and planning future actions. How to understand these explorative functions and their impact on planning remains unclear. Given certain conceptions of intentions and beliefs, the explorative functions of mind-wandering could lead to regular reconsideration of one's intentions. However, this would be in tension with the stability of intentions central to rational planning agency. We analyze the potential issue of excessive reconsideration caused by mind-wandering. Our response resolves this tension, presenting a model that aligns the roles of mind-wandering in planning with empirical evidence and the sustained stability of intentions.
https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12503

Nature Communications
PAPERS

JAKUB KOPAL et mul – Using rare genetic mutations to revisit structural brain asymmetry
Asymmetry between the left and right hemisphere is a key feature of brain organization. Hemispheric functional specialization underlies some of the most advanced human-defining cognitive operations, such as articulated language, perspective taking, or rapid detection of facial cues. Yet, genetic investigations into brain asymmetry have mostly relied on common variants, which typically exert small effects on brain-related phenotypes. Here, we leverage rare genomic deletions and duplications to study how genetic alterations reverberate in human brain and behavior. We designed a pattern-learning approach to dissect the impact of eight high-effect-size copy number variations (CNVs) on brain asymmetry in a multi-site cohort of 552 CNV carriers and 290 non-carriers. Isolated multivariate brain asymmetry patterns spotlighted regions typically thought to subserve lateralized functions, including language, hearing, as well as visual, face and word recognition. Planum temporale asymmetry emerged as especially susceptible to deletions and duplications of specific gene sets. Targeted analysis of common variants through genome-wide association study (GWAS) consolidated partly diverging genetic influences on the right versus left planum temporale structure. In conclusion, our gene-brain-behavior data fusion highlights the consequences of genetically controlled brain lateralization on uniquely human cognitive capacities.
https://www.nature.com/articles/s41467-024-46784-w

LEONARDO VALLINI et al with MICHAEL D. PETRAGLIA – The Persian plateau served as hub for Homo sapiens after the main out of Africa dispersal
A combination of evidence, based on genetic, fossil and archaeological findings, indicates that Homo sapiens spread out of Africa between ~70-60 thousand years ago (kya). However, it appears that once outside of Africa, human populations did not expand across all of Eurasia until ~45 kya. The geographic whereabouts of these early settlers in the timeframe between ~70-60 to 45 kya has been difficult to reconcile. Here we combine genetic evidence and palaeoecological models to infer the geographic location that acted as the Hub for our species during the early phases of colonisation of Eurasia. Leveraging on available genomic evidence we show that populations from the Persian Plateau carry an ancestry component that closely matches the population that settled the Hub outside Africa. With the paleoclimatic data available to date, we built ecological models showing that the Persian Plateau was suitable for human occupation and that it could sustain a larger population compared to other West Asian regions, strengthening this claim.
https://www.nature.com/articles/s41467-024-46161-7

Nature Computational Science
ARTICLES

PETER BAUER et al – Digital twins of Earth and the computing challenge of human interaction
Digital twins of Earth have the capability to offer versatile access to detailed information on our changing world, helping societies to adapt to climate change and to manage the effects of local impacts, globally. Nevertheless, human interaction with digital twins requires advances in computational science, particularly where complex geophysical data is turned into information to support decision making.
https://www.nature.com/articles/s43588-024-00599-3

Nature Human Behaviour
ARTICLES

REUVEN YESHURUN – Signalling Palaeolithic identity
The sense of belonging to a larger group is a central feature of humanity but its identification in Palaeolithic societies is challenging. Baker et al. use a pan-European dataset of personal ornaments to show that these markers of group identity form distinct clusters that cannot be explained simply by geographical proximity or shared biological descent.
https://www.nature.com/articles/s41562-023-01805-4

RICHARD HEERSMINK – Use of large language models might affect our cognitive skills
Large language models can generate sophisticated text or code with little input from a user, which has the potential to impoverish our own writing and thinking skills. We need to understand the effect of this technology on our cognition and to decide whether this is what we want.
https://www.nature.com/articles/s41562-024-01859-y

PAPERS

JACK BAKER et al with FRANCESCO D'ERRICO – Evidence from personal ornaments suggest nine distinct cultural groups between 34,000 and 24,000 years ago in Europe
Mechanisms governing the relationship between genetic and cultural evolution are the subject of debate, data analysis and modelling efforts. Here we present a new georeferenced dataset of personal ornaments worn by European hunter-gatherers during the so-called Gravettian technocomplex (34,000–24,000 years ago), analyse it with multivariate and geospatial

statistics, model the impact of distance on cultural diversity and contrast the outcome of our analyses with up-to-date palaeogenetic data. We demonstrate that Gravettian ornament variability cannot be explained solely by isolation-by-distance. Analysis of Gravettian ornaments identified nine geographically discrete cultural entities across Europe. While broadly in agreement with palaeogenetic data, our results highlight a more complex pattern, with cultural entities located in areas not yet sampled by palaeogenetics and distinctive entities in regions inhabited by populations of similar genetic ancestry. Integrating personal ornament and biological data from other Palaeolithic cultures will elucidate the complex narrative of population dynamics of Upper Palaeolithic Europe.
https://www.nature.com/articles/s41562-023-01803-6

GRETA TUCKUTE et al with & EVELINA FEDORENKO – Driving and suppressing the human language network using large language models

using functional-MRI-measured brain responses to 1,000 diverse sentences, we first show that a GPT-based encoding model can predict the magnitude of the brain response associated with each sentence. We then use the model to identify new sentences that are predicted to drive or suppress responses in the human language network. We show that these model-selected novel sentences indeed strongly drive and suppress the activity of human language areas in new individuals. A systematic analysis of the model-selected sentences reveals that surprisal and well-formedness of linguistic input are key determinants of response strength in the language network. These results establish the ability of neural network models to not only mimic human language but also non-invasively control neural activity in higher-level cortical areas, such as the language network.
https://www.nature.com/articles/s41562-023-01783-7

Nature Scientific Reports

PAPERS

OLENA SHCHERBAKOVA et al – The evolutionary dynamics of how languages signal who does what to whom

Languages vary in how they signal "who does what to whom". Three main strategies to indicate the participant roles of "who" and "whom" are case, verbal indexing, and rigid word order. Languages that disambiguate these roles with case tend to have either verb-final or flexible word order. Most previous studies that found these patterns used limited language samples and overlooked the causal mechanisms that could jointly explain the association between all three features. Here we analyze grammatical data from a Grambank sample of 1705 languages with phylogenetic causal graph methods. Our results corroborate the claims that verb-final word order generally gives rise to case and, strikingly, establish that case tends to lead to the development of flexible word order. The combination of novel statistical methods and the Grambank database provides a model for the rigorous testing of causal claims about the factors that shape patterns of linguistic diversity.
https://www.nature.com/articles/s41598-024-51542-5

YUKUN ZHAO et al – Risk and prosocial behavioural cues elicit human-like response patterns from AI chatbots

Emotions, long deemed a distinctly human characteristic, guide a repertoire of behaviors, e.g., promoting risk-aversion under negative emotional states or generosity under positive ones. The question of whether Artificial Intelligence (AI) can possess emotions remains elusive, chiefly due to the absence of an operationalized consensus on what constitutes 'emotion' within AI. Adopting a pragmatic approach, this study investigated the response patterns of AI chatbots—specifically, large language models (LLMs)—to various emotional primes. We engaged AI chatbots as one would human participants, presenting scenarios designed to elicit positive, negative, or neutral emotional states. Multiple accounts of OpenAI's ChatGPT Plus were then tasked with responding to inquiries concerning investment decisions and prosocial behaviors. Our analysis revealed that ChatGPT-4 bots, when primed with positive, negative, or neutral emotions, exhibited distinct response patterns in both risk-taking and prosocial decisions, a phenomenon less evident in the ChatGPT-3.5 iterations. This observation suggests an enhanced capacity for modulating responses based on emotional cues in more advanced LLMs. While these findings do not suggest the presence of emotions in AI, they underline the feasibility of swaying AI responses by leveraging emotional indicators.
https://www.nature.com/articles/s41598-024-55949-y

ANTOINE MULLER, GONEN SHARON & LEORE GROSMAN – Automatic analysis of the continuous edges of stone tools reveals fundamental handaxe variability

The edges of stone tools have significant technological and functional implications. The nature of these edges–their sharpness, whether they are concave or convex, and their asymmetry–reflect how they were made and how they could be used. Similarly, blunt portions of a tool's perimeter hint at how they could have been grasped or hafted and in which directions force could be applied. However, due to the difficulty in accurately measuring the complex 3D geometry of tool edges with traditional methods, their attributes are often overlooked. When they are analyzed, they have traditionally been assessed with visual qualitative categories or unreliable physical measurements. We introduce new computational 3D methods for automatically and repeatably measuring key attributes of stone tool edges. These methods allow us to automatically identify the 3D perimeter of tools, segment this perimeter according to changes in edge angles, and measure these discrete edge segments with a range of metrics. We test this new computational toolkit on a large sample of 3D models

of handaxes from the later Acheulean of the southern Levant. Despite these handaxes being otherwise technologically and morphologically similar, we find marked differences in the amount of knapped outline, edge angle, and the concavity of their edges. We find many handaxes possess blunt portions of perimeter, suitable for grasping, and some handaxes even possess more than one discrete sharp edge. Among our sample, sites with longer occupations and more diverse toolkits possessed handaxes with more diverse edges. Above all, this paper offers new methods for computing the complex 3D geometry of stone tool edges that could be applied to any number of artifact types. These methods are fully automated, allowing the analysis and visualization of entire assemblages.
https://www.nature.com/articles/s41598-024-57450-y

VINCENT FLEURY – Electrical stimulation of chicken embryo development supports the Inside story scenario of human development and evolution

Animal evolution is driven by random mutations at the genome level. However, it has long been suggested that there exist physical constraints which limit the set of possible outcomes. In craniate evolution, it has been observed that head features, notably in the genus homo, can be ordered in a morphological diagram such that, as the brain expands, the head rocks more forward, face features become less prognathous and the mouth tends to recede. One school of paleontologists suggests that this trend is wired somewhere structurally inside the anatomy, and that random modifications of genes push up or down animal forms along a pre-determined path. No actual experiment has been able to settle the dispute. I present here an experiment of electric stimulation of the head in the chicken embryo which is able to enhance the magnitude of tension forces during development. This experimental intervention causes a correlated brain shrinkage and rotatory movement of the head, congruent with tissue texture, which proves that head dilation and flexure are intimately linked. Numerical modelling explains why the brain curls when it dilates. This gives support to the idea that there exists, in the texture of the vertebrate embryo, a latent dynamic pattern for the observed paleontological trends in craniates towards homo, a concept known as Inside story.
https://www.nature.com/articles/s41598-024-56686-y

New Scientist

NEWS

Dogs really do understand that words stand for objects

Pet dogs have different patterns of brain activity when they are shown an object that doesn't match the word they hear, suggesting they have a mental representation of what words mean.
https://www.newscientist.com/article/2423634-dogs-really-do-understand-that-words-stand-for-objects/

ARTICLES

MICHAEL MARSHALL – The unexpected reasons why human childhood is extraordinarily long

Why childhood is so protracted has long been mysterious, now a spate of archaeological discoveries suggest an intriguing explanation.
https://www.newscientist.com/article/mg26134840-500-the-unexpected-reasons-why-human-childhood-is-extraordinarily-long/

PeerJ

PAPERS

EDEN T.H. NG & AKIRA R. KINJO – Plasticity-led and mutation-led evolutions are different modes of the same developmental gene regulatory network

The standard theory of evolution proposes that mutations cause heritable variations, which are naturally selected, leading to evolution. However, this mutation-led evolution (MLE) is being questioned by an alternative theory called plasticity-led evolution (PLE). PLE suggests that an environmental change induces adaptive phenotypes, which are later genetically accommodated. According to PLE, developmental systems should be able to respond to environmental changes adaptively. However, developmental systems are known to be robust against environmental and mutational perturbations. Thus, we expect a transition from a robust state to a plastic one. To test this hypothesis, we constructed a gene regulatory network (GRN) model that integrates developmental processes, hierarchical regulation, and environmental cues. We then simulated its evolution over different magnitudes of environmental changes. Our findings indicate that this GRN model exhibits PLE under large environmental changes and MLE under small environmental changes. Furthermore, we observed that the GRN model is susceptible to environmental or genetic fluctuations under large environmental changes but is robust under small environmental changes. This indicates a breakdown of robustness due to large environmental changes. Before the breakdown of robustness, the distribution of phenotypes is biased and aligned to the environmental changes, which would facilitate rapid adaptation should a large environmental change occur. These observations suggest that the evolutionary transition from mutation-led to plasticity-led evolution is due to a developmental transition from robust to susceptible regimes over increasing magnitudes of environmental change. Thus, the GRN model can reconcile these conflicting theories of evolution.

https://peerj.com/articles/17102/

PLoS Biology

PAPERS

JUN NI, JIAXIN YANG & YINA MA – Social bonding in groups of humans selectively increases inter-status information exchange and prefrontal neural synchronization

Social groups in various social species are organized with hierarchical structures that shape group dynamics and the nature of within-group interactions. In-group social bonding, exemplified by grooming behaviors among animals and collective rituals and team-building activities in human societies, is recognized as a practical adaptive strategy to foster group harmony and stabilize hierarchical structures in both human and nonhuman animal groups. However, the neurocognitive mechanisms underlying the effects of social bonding on hierarchical groups remain largely unexplored. Here, we conducted simultaneous neural recordings on human participants engaged in-group communications within small hierarchical groups (n = 528, organized into 176 three-person groups) to investigate how social bonding influenced hierarchical interactions and neural synchronizations. We differentiated interpersonal interactions between individuals of different (inter-status) or same (intra-status) social status and observed distinct effects of social bonding on inter-status and intra-status interactions. Specifically, social bonding selectively increased frequent and rapid information exchange and prefrontal neural synchronization for inter-status dyads but not intra-status dyads. Furthermore, social bonding facilitated unidirectional neural alignment from group leader to followers, enabling group leaders to predictively align their prefrontal activity with that of followers. These findings provide insights into how social bonding influences hierarchical dynamics and neural synchronization while highlighting the role of social status in shaping the strength and nature of social bonding experiences in human groups.

https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3002545

PLoS One

PAPERS

ISABELLE ENGEL et al – How self-states help: Observing the embodiment of self-states through nonverbal behavior

The concept of self-states is a recurring theme in various psychotherapeutic and counseling methodologies. However, the predominantly unconscious nature of these self-states presents two challenges. Firstly, it renders the process of working with them susceptible to biases and therapeutic suggestions. Secondly, there is skepticism regarding the observability and differentiation of self-states beyond subjective experiences. In this study, we demonstrate the feasibility of eliciting self-states from clients and objectively distinguishing these evoked self-states through the lens of neutral observers. The self-state constellation method, utilized as an embodied approach, facilitated the activation of diverse self-states. External observers then assessed the nonverbal manifestations of affect along three primary dimensions: emotional valence, arousal, and dominance. Our findings indicate that external observers could reliably discern and differentiate individual self-states based on the bodily displayed valence and dominance. However, the ability to distinguish states based on displayed arousal was not evident. Importantly, this distinctiveness of various self-states was not limited to specific individuals but extended across the entire recording sample. Therefore, within the framework of the self-state constellation method, it is evident that individual self-states can be intentionally evoked, and these states can be objectively differentiated beyond the subjective experiences of the client.

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0300682

NICOLETTE BARBER et al – Culture, prefrontal volume, and memory

Prior cross-cultural studies have demonstrated differences among Eastern and Western cultures in memory and cognition along with variation in neuroanatomy and functional engagement. We further probed cultural neuroanatomical variability in terms of its relationship with memory performance. Specifically, we investigated how memory performance related to gray matter volume in several prefrontal lobe structures, including across cultures. For 58 American and 57 Taiwanese young adults, memory performance was measured with the California Verbal Learning Test (CVLT) using performance on learning trial 1, on which Americans had higher scores than the Taiwanese, and the long delayed free recall task, on which groups performed similarly. MRI data were reconstructed using FreeSurfer. Across both cultures, we observed that larger volumes of the bilateral rostral anterior cingulate were associated with lower scores on both CVLT tasks. In terms of effects of culture, the relationship between learning trial 1 scores and gray matter volumes in the right superior frontal gyrus had a trend for a positive relationship in Taiwanese but not in Americans. In addition to the a priori analysis of select frontal volumes, an exploratory whole-brain analysis compared volumes—without considering CVLT performance—across the two cultural groups in order to assess convergence with prior research. Several cultural differences were found, such that Americans had larger volumes in the bilateral superior frontal and lateral occipital cortex, whereas Taiwanese had larger volumes in the bilateral rostral middle frontal and inferior temporal cortex, and the right precuneus.

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0298235

SANDY SCHUMANN & HAZEM ZOHNY – Does attitude importance moderate the effects of person-first language? A registered report

Previous research has demonstrated that exposure to outgroup descriptions that use person-first, as compared to identity-first, language can attenuate negative stereotypes or prejudice and enhance support for policies that seek to advance outgroup rights. However, those benefits of person-first language may not apply to all social groups equally. The present study examines a boundary condition of the effects of person-first language. Specifically, we postulate that person-first language reduces the stigmatization of outgroups to a lesser degree if individuals hold more important negative attitudes towards the respective communities. We will test this hypothesis in a two-factorial 2 (target group) x 2 (descriptor) online experiment that includes a control group and for which we will recruit a general-population sample (N = 681). Stereotyping, dehumanization, as well as negative affect and behavioral intentions towards two outgroups will be compared: people with a physical disability/the physically disabled (i.e., negative attitudes are expected to be less important) and people who have committed a violent crime/violent criminals (i.e., negative attitudes are expected to be more important). Our findings will bear implications for understanding when language use could influence public opinion of different social groups. Additionally, the research can inform the development of more effective communication policies to promote inclusion and reduce stigma.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0300879

BOGDÁN ASZTALOS, GERGELY PALLA & DÁNIEL CZÉGEL – Anomalous diffusion analysis of semantic evolution in major Indo-European languages

How do words change their meaning? Although semantic evolution is driven by a variety of distinct factors, including linguistic, societal, and technological ones, we find that there is one law that holds universally across five major Indo-European languages: that semantic evolution is subdiffusive. Using an automated pipeline of diachronic distributional semantic embedding that controls for underlying symmetries, we show that words follow stochastic trajectories in meaning space with an anomalous diffusion exponent $\alpha = 0.45 \pm 0.05$ across languages, in contrast with diffusing particles that follow $\alpha = 1$. Randomization methods indicate that preserving temporal correlations in semantic change directions is necessary to recover strongly subdiffusive behavior; however, correlations in change sizes play an important role too. We furthermore show that strong subdiffusion is a robust phenomenon under a wide variety of choices in data analysis and interpretation, such as the choice of fitting an ensemble average of displacements or averaging best-fit exponents of individual word trajectories.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0298650

MATAR NDIAYE et al – Two new Later Stone Age sites from the Final Pleistocene in the Falémé Valley, eastern Senegal

The understanding of cultural dynamics at work at the end of the Final Pleistocene in West Africa suffers from a significant lack of excavated and dated sites, particularly in the Sahelian and Sudanian ecozones. While the Later Stone Age shows varied behavioral developments in different parts of the continent, the chrono-cultural framework of this period remains largely unknown in West Africa. We report on archaeological, geomorphological, and chronological research on two Final Pleistocene Later Stone Age sites in the Falémé Valley, eastern Senegal. Optically stimulated luminescence ages place the site of Toumboura I-2017 between 17 ± 1 and 16 ± 1 ka and the Ravin de Sansandé site between 13 ± 1 ka and 12 ± 1.1 ka. The excavated lithics show typical Later Stone Age industries, characterized by chaînes opératoires of core reduction mainly producing flakes and bladelets as well as blades and laminar flakes. Segments dominate the toolkits but a few backed bladelets and end-scrapers on flake blanks were recognized. Local raw materials were used, with a preference for chert and quartz, as well as greywacke. These Later Stone Age lithic assemblages are the oldest known in Senegal so far and add to the small number of sites known in West Africa for this period, which are mainly located farther south, in sub-tropical ecozones. The Later Stone Age sites of the Falémé Valley are contemporaneous with typical Middle Stone Age technologies in Senegal dated to at least the Pleistocene/Holocene transition. Our results thus provide new archaeological evidence highlighting the complex cultural processes at work during the Final Pleistocene in West Africa.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0294346

PHILIP J. GROSSMAN & JONATHAN LEVY – It's not you (well, it is a bit you), it's me: Self- versus social image in warm-glow giving

Attempts by charities to motivate giving tend to focus on potential donors' altruistic tendencies. However, prior research suggests that approximately 50% of individuals are to some extent motivated by warm glow, the satisfaction received from the act of giving. The satisfaction derives from looking good to themselves (self-image) and/or to others (social image). We conduct an online experiment on MTurk participants (n = 960) with a more realistic simulation of being watched to determine the importance of self- and social image to warm-glow giving. We find evidence that suggests that social image concerns do not increase the likelihood that someone will give but they do increase the amount given; average giving is significantly higher in the treatments when feelings of being watched are stimulated. Our results suggest that charities looking to increase their donor bases might effectively do so by focusing on self-image concerns. Charities wishing to increase the amount donated might effectively do so by focusing on the social image concerns of the donor.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0300868

Proceedings of the Royal Society B
PAPERS

DEBOTTAM BHATTACHARJEE et al – Personality heterophily and friendship as drivers for successful cooperation

Cooperation is widespread and arguably a pivotal evolutionary force in maintaining animal societies. Yet, proximately, what underlying motivators drive individuals to cooperate remains relatively unclear. Since 'free-riders' can exploit the benefits by cheating, selecting the right partner is paramount. Such decision rules need not be based on complex calculations and can be driven by cognitively less-demanding mechanisms, like social relationships (e.g. kinship, non-kin friendships, dyadic tolerance), social status (e.g. dominance hierarchies) and personalities (social and non-social traits); however, holistic evidence related to those mechanisms is scarce. Using the classical 'loose-string paradigm', we tested cooperative tendencies of a hierarchical primate, the long-tailed macaque (Macaca fascicularis). We studied three groups (n = 21) in their social settings, allowing partner choice. We supplemented cooperation with observational and experimental data on social relationships, dominance hierarchies and personality. Friendship and dissimilarities in non-social 'exploration' and 'activity–sociability' personality traits predicted the likelihood of cooperative dyad formation. Furthermore, the magnitude of cooperative success was positively associated with friendship, low rank-distance and dissimilarity in the activity–sociability trait. Kinship did not affect cooperation. While some findings align with prior studies, the evidence of (non-social) personality heterophily promoting cooperation may deepen our understanding of the proximate mechanisms and, broadly, the evolution of cooperation.

https://royalsocietypublishing.org/doi/full/10.1098/rspb.2023.2730

Royal Society Open Science
PAPERS

KELSEY L. NEUENSWANDER et al – Social evaluative implications of sensory adaptation to human voices

People form social evaluations of others following brief exposure to their voices, and these impressions are calibrated based on recent perceptual experience. Participants adapted to voices with fundamental frequency (f o; the acoustic correlate of perceptual pitch) manipulated to be gender-typical (i.e. masculine men and feminine women) or gender-atypical (i.e. feminine men and masculine women) before evaluating unaltered test voices within the same sex. Adaptation resulted in contrastive aftereffects. Listening to gender-atypical voices caused female voices to sound more feminine and attractive (Study 1) and male voices to sound more masculine and attractive (Study 2). Studies 3a and 3b tested whether adaptation occurred on a conceptual or perceptual level, respectively. In Study 3a, perceivers adapted to gender-typical or gender-atypical voices for both men and women (i.e. adaptors pitch manipulated in opposite directions for men and women) before evaluating unaltered test voices. Findings showed weak evidence that evaluations differed between conditions. In Study 3b, perceivers adapted to masculinized or feminized voices for both men and women (i.e. adaptors pitch manipulated in the same direction for men and women) before evaluating unaltered test voices. In the feminized condition, participants rated male targets as more masculine and attractive. Conversely, in the masculinized condition, participants rated female targets as more feminine and attractive. Voices appear to be evaluated according to gender norms that are updated based on perceptual experience as well as conceptual knowledge.

https://royalsocietypublishing.org/doi/10.1098/rsos.231348

Science
PAPERS

MORGAN E. WIRTHLIN et al with ZOONOMIA CONSORTIUM – Vocal learning–associated convergent evolution in mammalian proteins and regulatory elements

Vocal production learning ("vocal learning"), or the ability to modify vocalizations according to the social environment, forms the basis of human speech production. Among the Boreoeutherian mammals, this trait has evolved independently in four different lineages: humans, bats, cetaceans, and pinnipeds. In vertebrates, the evolution of vocal learning behavior has been associated with the evolution of brain anatomical features, including cortical long-range projection neurons (e.g., songbirds and humans). Moreover, neural circuits for the production of learned vocalization display convergent evolution in patterns of gene expression.

Despite evidence for the convergent evolution of vocal learning at the behavioral, anatomical, and gene expression levels in vertebrates, the genetic underpinnings of vocal learning and human speech in mammals are poorly understood. New machine learning approaches and the newly sequenced mammalian genomes of the Zoonomia Consortium provide the foundation to rigorously study this question. The repeated evolution of vocal learning across mammals allows us to determine which parts of the genome are significantly associated with the behavior.

First, we studied convergent evolution in protein-coding regions using the RERconverge and HyPhy methods to find 200 significantly associated genes. The genes that tend to be under higher constraint in vocal learning mammals are enriched for genes involved in human autism. However, the vast majority of genes are driven by signals from only one or two clades of vocal learning mammals, suggesting that a large component of the genetic basis for the trait may lie instead in the convergent evolution of regulatory elements. To explore that hypothesis, we performed an anatomical and functional characterization of the Egyptian fruit bat motor cortex. We identified a subregion of the motor cortex that is implicated in

vocal production and directly projects to the motoneurons controlling the bat's larynx. This allowed us to profile candidate regulatory elements active in this vocalization-associated subregion of the motor cortex by measuring open chromatin. These open chromatin regions and 222 mammalian genomes of the Zoonomia Consortium served as input to the Tissue-Aware Conservation Inference Toolkit (TACIT) machine learning approach, which was applied to find 50 candidate regulatory elements whose predicted motor cortex open chromatin measurements across mammals are highly correlated with the presence of vocal learning behavior. Many of these open chromatin regions were near genes associated with autism, and they tended to overlap with open chromatin specific to the long-range projection neurons that have been implicated in the evolution of vocal learning.

Although it is impossible to know which parts of the genome evolved for human speech production, we are able to use the repeated evolution of a component of that behavior, vocal learning, to find significantly associated genes and noncoding regions. Our results demonstrate that the presence of vocal learning behavior in a given clade leads to weak selective pressure across a broad range of genes and stronger selective pressure across a smaller number of motor cortex noncoding regions. These genes and noncoding regions show an association with autism, which suggests that there are shared regulatory networks for vocal and social behavior that tend to adapt in similar ways when a lineage evolves vocal learning behavior. More broadly, our results suggest that the evolutionary history of selective pressures across a location in the genome can provide insight into how that region might influence human behavior.

https://www.science.org/doi/10.1126/science.abn3263

Science Advances

PAPERS

LORENZO LAZZERINI OSPRI et al – Light affects the prefrontal cortex via intrinsically photosensitive retinal ganglion cells

The ventromedial prefrontal cortex (vmPFC) is a part of the limbic system engaged in the regulation of social, emotional, and cognitive states, which are characteristically impaired in disorders of the brain such as schizophrenia and depression. Here, we show that intrinsically photosensitive retinal ganglion cells (ipRGCs) modulate, through light, the integrity, activity, and function of the vmPFC. This regulatory role, which is independent of circadian and mood alterations, is mediated by an ipRGC-thalamic-corticolimbic pathway. Lack of ipRGC signaling in mice causes dendritic degeneration, dysregulation of genes involved in synaptic plasticity, and depressed neuronal activity in the vmPFC. These alterations primarily undermine the ability of the vmPFC to regulate emotions. Our discovery provides a potential light-dependent mechanism for certain PFC-centric disorders in humans.

https://www.science.org/doi/10.1126/sciadv.adh9251

HAZEM TOUTOUNJI et al – Learning the sound inventory of a complex vocal skill via an intrinsic reward

Reinforcement learning (RL) is thought to underlie the acquisition of vocal skills like birdsong and speech, where sounding like one's "tutor" is rewarding. However, what RL strategy generates the rich sound inventories for song or speech? We find that the standard actor-critic model of birdsong learning fails to explain juvenile zebra finches' efficient learning of multiple syllables. However, when we replace a single actor with multiple independent actors that jointly maximize a common intrinsic reward, then birds' empirical learning trajectories are accurately reproduced. The influence of each actor (syllable) on the magnitude of global reward is competitively determined by its acoustic similarity to target syllables. This leads to each actor matching the target it is closest to and, occasionally, to the competitive exclusion of an actor from the learning process (i.e., the learned song). We propose that a competitive-cooperative multi-actor RL (MARL) algorithm is key for the efficient learning of the action inventory of a complex skill.

https://www.science.org/doi/10.1126/sciadv.adj3824

AGNES NORBURY et al – Different components of cognitive-behavioral therapy affect specific cognitive mechanisms

Psychological therapies are among the most effective treatments for common mental health problems—however, we still know relatively little about how exactly they improve symptoms. Here, we demonstrate the power of combining theory with computational methods to parse effects of different components of cognitive-behavioral therapies onto underlying mechanisms. Specifically, we present data from a series of randomized-controlled experiments testing the effects of brief components of behavioral and cognitive therapies on different cognitive processes, using well-validated behavioral measures and associated computational models. A goal setting intervention, based on behavioral activation therapy activities, reliably and selectively reduced sensitivity to effort when deciding how to act to gain reward. By contrast, a cognitive restructuring intervention, based on cognitive therapy materials, reliably and selectively reduced the tendency to attribute negative everyday events to self-related causes. The effects of each intervention were specific to these respective measures. Our approach provides a basis for beginning to understand how different elements of common psychotherapy programs may work.

https://www.science.org/doi/10.1126/sciadv.adk3222

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.