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## NOTICES

### PUBLICATION ALERTS

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

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

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

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## ACADEMIA.EDU – Multiple Approaches to the Study of Bifacial Technologies

*University of Pennsylvania Museum of Archaeology and Anthropology: Philadelphia, PA, USA (2003).*

### MARIE SORESSI & HAROLD L. DIBBLE (EDS.) – Multiple Approaches to the Study of Bifacial Technologies

This volume is based on the proceedings of a symposium held in Philadelphia during the 2000 meeting of the Society for American Archaeology. The symposium was entitled “From Coups-de-Poing to Clovis: Multiple Approaches to Biface

Variability” and included most, but not all, of the authors represented here. Unfortunately, some of the presenters to that symposium were unable to contribute their work to the present volume. The reason for organizing this symposium is that bifacial technology represents one of the most widespread, though highly varied, lithic technologies known. Bifaces have been used by archaeologists to document the evolution of human technology and cognition during the Pleistocene and as index fossils for a myriad of cultures in both the Old and New Worlds. They also provide some of the most convincing dimensions of stylistic variability observable in stone tool assemblages. While it could be tempting to treat bifaces as a single technological unity, there is every reason to think that bifacial technology is every bit as complex and varied as any other chipped-stone technology. From the first African industries to the very recent cultures of the New World, each bifacial technology deals with some of the same technical constraints but at the same time each demonstrates subtle variation in skill and purpose. And, as with every other class of lithic evidence, there are a number of ways to approach that variability analytically. Up to the present, there has not been any attempt to provide a comprehensive overview of bifacial technology, in spite of its importance as a major and widespread phenomenon.

[https://www.academia.edu/1442465/Technological and typological variability in the bifaces from Tabun Cave Israel](https://www.academia.edu/1442465/Technological_and_typological_variability_in_the_bifaces_from_Tabun_Cave_Israel)

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## RESEARCHGATE – Do chimpanzees learn reputation by observation?

*In Animal Cognition 11:4, 611-23 (2008).*

### **FRANCYS SUBIAUL et al – Do chimpanzees learn reputation by observation? Evidence from direct and indirect experience with generous and selfish strangers**

Can chimpanzees learn the reputation of strangers indirectly by observation? Or are such stable behavioral attributions made exclusively by first-person interactions? To address this question, we let seven chimpanzees observe unfamiliar humans either consistently give (generous donor) or refuse to give (selfish donor) food to a familiar human recipient (Experiments 1 and 2) and a conspecific (Experiment 3). While chimpanzees did not initially prefer to beg for food from the generous donor (Experiment 1), after continued opportunities to observe the same behavioral exchanges, four chimpanzees developed a preference for gesturing to the generous donor (Experiment 2), and transferred this preference to novel unfamiliar donor pairs, significantly preferring to beg from the novel generous donors on the first opportunity to do so. In Experiment 3, four chimpanzees observed novel selfish and generous acts directed toward other chimpanzees by human experimenters. During the first half of testing, three chimpanzees exhibited a preference for the novel generous donor on the first trial. These results demonstrate that chimpanzees can infer the reputation of strangers by eavesdropping on third-party interactions.

[https://www.researchgate.net/publication/5495969 Do chimpanzees learn reputation by observation Evidence from direct and indirect experience with generous and selfish strangers](https://www.researchgate.net/publication/5495969_Do_chimpanzees_learn_reputation_by_observation_Evidence_from_direct_and_indirect_experience_with_generous_and_selfish_strangers)

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## PLOS ARCHIVE – The Language of Innovation

*In PLoS 15:4, e0230107 (2020).*

### **ANDREA TACHELLA, ANDREA NAPOLETANO & LUCIANO PIETRONERO – The Language of Innovation**

Predicting innovation is a peculiar problem in data science. Following its definition, an innovation is always a never-seen-before event, leaving no room for traditional supervised learning approaches. Here we propose a strategy to address the problem in the context of innovative patents, by defining innovations as never-seen-before associations of technologies and exploiting self-supervised learning techniques. We think of technological codes present in patents as a vocabulary and the whole technological corpus as written in a specific, evolving language. We leverage such structure with techniques borrowed from Natural Language Processing by embedding technologies in a high dimensional euclidean space where relative positions are representative of learned semantics. Proximity in this space is an effective predictor of specific innovation events, that outperforms a wide range of standard link-prediction metrics. The success of patented innovations follows a complex dynamics characterized by different patterns which we analyze in details with specific examples. The methods proposed in this paper provide a completely new way of understanding and forecasting innovation, by tackling it from a revealing perspective and opening interesting scenarios for a number of applications and further analytic approaches.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0230107>

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## PLOS ARCHIVE – Recruitment of Non-Classical Language Areas in Bilinguals

*In PLoS 6:3, e18240 (2011).*

### **MATTHEW K. LEONARD et al – Language Proficiency Modulates the Recruitment of Non-Classical Language Areas in Bilinguals**

Bilingualism provides a unique opportunity for understanding the relative roles of proficiency and order of acquisition in determining how the brain represents language. In a previous study, we combined magnetoencephalography (MEG) and magnetic resonance imaging (MRI) to examine the spatiotemporal dynamics of word processing in a group of Spanish-English bilinguals who were more proficient in their native language. We found that from the earliest stages of lexical processing, words in the second language evoke greater activity in bilateral posterior visual regions, while activity to the native language is largely confined to classical left hemisphere fronto-temporal areas. In the present study, we sought to examine whether these effects relate to language proficiency or order of language acquisition by testing Spanish-English bilingual subjects who had become dominant in their second language. Additionally, we wanted to determine whether activity in bilateral visual regions was related to the presentation of written words in our previous study, so we presented subjects with both written

and auditory words. We found greater activity for the less proficient native language in bilateral posterior visual regions for both the visual and auditory modalities, which started during the earliest word encoding stages and continued through lexico-semantic processing. In classical left fronto-temporal regions, the two languages evoked similar activity. Therefore, it is the lack of proficiency rather than secondary acquisition order that determines the recruitment of non-classical areas for word processing.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0018240>

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## PLOS ARCHIVE – On the Accuracy of Language Trees

*In PLoS 6:6, e20109 (2011).*

### **SIMONE POMPEI, VITTORIO LORETO & FRANCESCA TRIA – On the Accuracy of Language Trees**

Historical linguistics aims at inferring the most likely language phylogenetic tree starting from information concerning the evolutionary relatedness of languages. The available information are typically lists of homologous (lexical, phonological, syntactic) features or characters for many different languages: a set of parallel corpora whose compilation represents a paramount achievement in linguistics.

From this perspective the reconstruction of language trees is an example of inverse problems: starting from present, incomplete and often noisy, information, one aims at inferring the most likely past evolutionary history. A fundamental issue in inverse problems is the evaluation of the inference made. A standard way of dealing with this question is to generate data with artificial models in order to have full access to the evolutionary process one is going to infer. This procedure presents an intrinsic limitation: when dealing with real data sets, one typically does not know which model of evolution is the most suitable for them. A possible way out is to compare algorithmic inference with expert classifications. This is the point of view we take here by conducting a thorough survey of the accuracy of reconstruction methods as compared with the Ethnologue expert classifications. We focus in particular on state-of-the-art distance-based methods for phylogeny reconstruction using worldwide linguistic databases.

In order to assess the accuracy of the inferred trees we introduce and characterize two generalizations of standard definitions of distances between trees. Based on these scores we quantify the relative performances of the distance-based algorithms considered. Further we quantify how the completeness and the coverage of the available databases affect the accuracy of the reconstruction. Finally we draw some conclusions about where the accuracy of the reconstructions in historical linguistics stands and about the leading directions to improve it.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0020109>

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## SAPIENS ARCHIVE – The World’s Most Sustainable Technology (2016)

### **STEPHEN E. NASH – The World’s Most Sustainable Technology**

The Acheulean hand ax is one of the most beautifully designed tools ever produced. And it's by far the most sustainable technology in human history.

<https://www.sapiens.org/archaeology/hand-ax/>

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## OTHER PUBLICATIONS – bimodal acoustic calls used in mate-choice and aggression by red-eyed treefrogs

*In Journal of Experimental Biology 225:16, jeb244460 (2022).*

### **MICHAEL S. CALDWELL et al – Beyond sound: bimodal acoustic calls used in mate-choice and aggression by red-eyed treefrogs**

Airborne sound signals function as key mediators of mate-choice, aggression and other social interactions in a wide range of vertebrate and invertebrate animals. Calling animals produce more than sound, however. When displaying on or near a solid substrate, such as vegetation or soil, they also unavoidably excite substrate vibrations because of the physics of sound production and of acoustic propagation, and these vibrations can propagate to receivers. Despite their near ubiquity, these vibrational signal components have received very little research attention and in vertebrates it is unknown whether they are relevant to mate-choice, an important driver of evolutionary divergence. Here, we show that female red-eyed treefrogs are more than twice as likely to choose a male mating call when airborne sound is paired with its corresponding substrate vibrations. Furthermore, males of the same species are more aggressive towards and display a greater range of aggressive behaviors in response to bimodal (sound and vibration) versus unimodal (sound or vibration alone) calls. In aggressive contexts, at least, air- and substrate-borne signal components function non-redundantly. These results are a clear demonstration that vibrations produced by a calling animal can function together with airborne sound to markedly enhance the function of a signal. If this phenomenon proves widespread, this finding has the potential to substantially influence our understanding of the function and evolution of acoustic signals.

*{Thanks to Jermaine Horton for this source.}*

<https://journals.biologists.com/jeb/article-abstract/225/16/jeb244460/276426/Beyond-sound-bimodal-acoustic-calls-used-in-mate>

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## NEWS

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### JOHN TEMPLETON FOUNDATION – DARYL R. VAN TONGEREN – Is Gratitude Universal?

Spanish speakers say “gracias” to express their gratitude. Italians show appreciation with a “grazie.” Both of these words come from the Latin root “gratia,” which denotes grace, graciousness, and gratefulness. For those who speak Spanish and Italian, their way of saying “thank you” has purely positive connotations. Pan east across the globe and you’ll find other translations of gratitude that aren’t only positive in association. In Japan and Korea, gratitude is often expressed by saying “I’m sorry” and the terms for gratitude and indebtedness are used almost interchangeably. These linguistic differences only scratch the surface of both the problem and the potential of studying gratitude, which is this: gratitude manifests in distinct ways across different societies. Up to this point, the majority of research on gratitude has been conducted on people from Western, Educated, Industrialized, Rich, and Democratic nations, also known as WEIRD societies. Even though research on the subject is booming, the sample size represents only a sliver of humanity.

<https://templeton.us14.list-manage.com/track/click?u=afebe06609a423c59c59cee74&id=088ac2a9d7&e=3098989a4b>

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### NATURE BRIEFING – My life without a left temporal lobe

Helen Santoro was born missing her left temporal lobe, a brain region involved in memory, emotion recognition and language production. Doctors said Santoro “would never speak and would need to be institutionalized”, she writes. “But month after month, I surprised the experts, meeting all of the typical milestones of children my age.” She studied neuroscience and is now a science journalist. She describes her life as a research subject and her participation in a study that has uncovered the unusual way in which her neurons have rewired themselves.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=36aca14f96&e=1db4b9a19b>

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### NATURE BRIEFING – “What if these crows no longer know how to speak crow?”

Behavioural ecologist Christian Rutz is among the scientists using machine learning to better understand what animals are saying — including whether Hawaiian crows (*Corvus hawaiiensis*) bred in captivity have the vocal repertoire to make it in the wild. (The New York Times | 10 min read)

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=f24031cb14&e=1db4b9a19b>

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### NATURE BRIEFING – The first known surgical amputation

The skeleton of a person who lived 31,000 years ago bears hallmarks of the deliberate removal of their lower left leg — the earliest known surgery of its kind. Discovered in a limestone cave in Borneo, the remains pre-date the previous oldest known case of limb amputation by more than 20,000 years. The person appears to have survived for at least six to nine years after the surgery.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=4ebcf01f15&e=1db4b9a19b>

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### NATURE BRIEFING – Podcast: World’s oldest amputation

A skeleton with an amputated foot discovered in Borneo has been dated to 31,000 years ago, suggesting that complex surgery might be much older than previously thought. The person survived for years after the procedure, which researchers say shows that the ‘surgeon’ probably had detailed knowledge of anatomy and access to antiseptic compounds.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=4dd837a06a&e=1db4b9a19b>

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### SCIENCE NEWS – World’s oldest amputation – without modern antibiotics or painkillers

Skeleton buried in Borneo cave suggests early artists were also early surgeons

<https://www.science.org/content/article/world-s-oldest-amputation-foot-removed-31-000-years-ago-without-modern-antibiotics-or>

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### SCIENCE NEWS – How modern humans grow more brain cells than Neanderthals

Lab experiments pinpoint extra brain growth orchestrated by a single gene change in modern humans.

<https://www.science.org/content/article/breakthrough-finding-shows-how-modern-humans-grow-more-brain-cells-neanderthals>

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### SOCIETY FOR SCIENCE – The oldest known surgical amputation occurred 31,000 years ago

A young adult on the island of Borneo survived a lower left leg removal thanks to medically savvy rainforest surgeons.

<https://www.sciencenews.org/article/amputation-surgery-oldest-fossil-borneo>

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### SOCIETY FOR SCIENCE – Indigenous Americans ruled democratically long before the U.S. did

Oklahoma's Muscogee people, among others, promoted rule by the people long before the U.S. Constitution was written.

<https://www.sciencenews.org/article/democracy-indigenous-americans-people-rule-muscogee>

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## PUBLICATIONS

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### Current Biology

#### PAPERS

##### **KAYA VON EUGEN et al – Avian neurons consume three times less glucose than mammalian neurons**

Brains are among the most energetically costly tissues in the mammalian body. This is predominantly caused by expensive neurons with high glucose demands. Across mammals, the neuronal energy budget appears to be fixed, possibly posing an evolutionary constraint on brain growth. Compared to similarly sized mammals, birds have higher numbers of neurons, and this advantage conceivably contributes to their cognitive prowess. We set out to determine the neuronal energy budget of birds to elucidate how they can metabolically support such high numbers of neurons. We estimated glucose metabolism using positron emission tomography (PET) and 2-[<sup>18</sup>F]fluoro-2-deoxyglucose ([<sup>18</sup>F]FDG) as the radiotracer in awake and anesthetized pigeons. Combined with kinetic modeling, this is the gold standard to quantify cerebral metabolic rate of glucose consumption (CMR<sub>glc</sub>). We found that neural tissue in the pigeon consumes  $27.29 \pm 1.57$   $\mu$ mol glucose per 100 g per min in an awake state, which translates into a surprisingly low neuronal energy budget of  $1.86 \times 10^{-9} \pm 0.2 \times 10^{-9}$   $\mu$ mol glucose per neuron per minute. This is approximately 3 times lower than the rate in the average mammalian neuron. The remarkably low neuronal energy budget explains how pigeons, and possibly other avian species, can support such high numbers of neurons without associated metabolic costs or compromising neuronal signaling. The advantage in neuronal processing of information at a higher efficiency possibly emerged during the distinct evolution of the avian brain.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(22\)01219-2](https://www.cell.com/current-biology/fulltext/S0960-9822(22)01219-2)

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### Evolutionary Anthropology

#### PAPERS

##### **ROBERT BOYD & PETER J. RICHERSON – Large-scale cooperation in small-scale foraging societies**

We present evidence that people in small-scale mobile hunter-gatherer societies cooperated in large numbers to produce collective goods. Foragers engaged in large-scale communal hunts and constructed shared capital facilities; they made shared investments in improving the local environment; and they participated in warfare, formed enduring alliances, and established trading networks. Large-scale collective action often played a crucial role in subsistence. The provision of public goods involved the cooperation of many individuals, so each person made only a small contribution. This evidence suggests that large-scale cooperation occurred in the Pleistocene societies that encompass most of human evolutionary history, and therefore it is unlikely that large-scale cooperation in Holocene food producing societies results from an evolved psychology shaped only in small-group interactions. Instead, large-scale human cooperation needs to be explained as an adaptation, likely rooted in distinctive features of human biology, grammatical language, increased cognitive ability, and cumulative cultural adaptation.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.21944>

##### **ANDRA MENEGANZIN, TELMO PIEVANI & GIORGIO MANZI – Pan-Africanism vs. single-origin of Homo sapiens: Putting the debate in the light of evolutionary biology**

The scenario of Homo sapiens origin/s within Africa has become increasingly complex, with a pan-African perspective currently challenging the long-established single-origin hypothesis. In this paper, we review the lines of evidence employed in support of each model, highlighting inferential limitations and possible terminological misunderstandings. We argue that the metapopulation scenario envisaged by pan-African proponents well describes a mosaic diversification among late Middle Pleistocene groups. However, this does not rule out a major contribution that emerged from a single population where crucial derived features—notably, a globular braincase—appeared as the result of a punctuated, cladogenetic event. Thus, we suggest that a synthesis is possible and propose a scenario that, in our view, better reconciles with consolidated expectations in evolutionary theory. These indicate cladogenesis in allopatry as an ordinary pattern for the origin of a new species, particularly during phases of marked climatic and environmental instability.

<https://onlinelibrary.wiley.com/doi/full/10.1002/evan.21955>

#### REVIEWS

##### **GEOFFREY GUINARD – The propensity of the human species to integrate a purpose into existence and achievements**

Review of 'Meaning of Life, Human Nature, and Delusions: How Tales About Love, Sex, Races, Gods and Progress Affect Our Lives and Earth's Splendor' by R. Diogo (2022), Nature, Switzerland.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.21953>

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### Frontiers in Neuroscience

#### PAPERS

##### **BRAULIO PINACHO-GUENDULAIN et al – Social complexity as a driving force of gut microbiota exchange among conspecific hosts in non-human primates**

The emergent concept of the social microbiome implies a view of a highly connected biological world, in which microbial interchange across organisms may be influenced by social and ecological connections occurring at different levels of

biological organization. We explore this idea reviewing evidence of whether increasing social complexity in primate societies is associated with both higher diversity and greater similarity in the composition of the gut microbiota. By proposing a series of predictions regarding such relationship, we evaluate the existence of a link between gut microbiota and primate social behavior. Overall, we find that enough empirical evidence already supports these predictions. Nonetheless, we conclude that studies with the necessary, sufficient, explicit, and available evidence are still scarce. Therefore, we reflect on the benefit of founding future analyses on the utility of social complexity as a theoretical framework.

<https://www.frontiersin.org/articles/10.3389/fnint.2022.876849/full>

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## Frontiers in Psychology

### PAPERS

#### **RACHEL REETZKE et al – Profiles and correlates of language and social communication differences among young autistic children**

Delays in early language development are characteristic of young autistic children, and one of the most recognizable first concerns that motivate parents to seek a diagnostic evaluation for their child. Although early language abilities are one of the strongest predictors of long-term outcomes, there is still much to be understood about the role of language impairment in the heterogeneous phenotypic presentation of autism. Using a person-centered, Latent Profile Analysis, we first aimed to identify distinct patterns of language and social communication ability in a clinic-based sample of 498 autistic children, ranging in age from 18 to 60 months ( $M = 33$  mo,  $SD = 12$  mo). Next, a multinomial logistic regression analysis was implemented to examine sociodemographic and child-based developmental differences among the identified language and social communication profiles. Three clinically meaningful profiles were identified from parent-rated and clinician-administered measures: Profile 1 (48% of the sample) “Relatively Low Language and Social Communication Abilities,” Profile 2 (34% of the sample) “Relatively Elevated Language and Social Communication Abilities,” and Profile 3 (18% of the sample) “Informant Discrepant Language and Relatively Elevated Social Communication Abilities.” Overall, young autistic children from the lowest-resource households exhibited the lowest language and social communication abilities, and the lowest non-verbal problem-solving and fine-motor skills, along with more features of attention-deficit/hyperactivity disorder and atypical auditory processing. These findings highlight the need for effective community-based implementation strategies for young autistic children from low-resource households and underrepresented communities to improve access to individualized quality care.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2022.936392/full>

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## Mind & Language

### PAPERS

#### **GIULIA MARTINA – How we talk about smells**

Smells are often said to be ineffable, and linguistic research shows that languages like English lack a dedicated olfactory lexicon. Starting from this evidence, I propose an account of how we talk about smells in English. Our reports about the way things smell are comparative: When we say that something smells burnt or like roses, we characterise the thing's smell by noting its similarity to the characteristic smells of certain odorous things (burnt things, roses). The account explains both the strengths and limitations of our smell discourse, and has implications for philosophical discussions of the relation between language and appearances.

<https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12440>

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## Nature

### NEWS

#### **Prehistoric child's amputation is oldest surgery of its kind**

Skeleton missing lower left leg and dated to 31,000 years ago provides the earliest known evidence for surgical limb removal.

<https://www.nature.com/articles/d41586-022-02849-8>

#### **Missing foot reveals world's oldest amputation**

A 31,000-year-old skeleton shows evidence of complex surgery, and the latest from the Nature Briefing.

<https://www.nature.com/articles/d41586-022-02854-x>

#### **Did this gene give modern human brains their edge?**

A mutation present in modern humans seems to drive greater neuron growth than does an ancient hominin version.

<https://www.nature.com/articles/d41586-022-02895-2>

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### ARTICLES

#### **CHARLOTTE ANN ROBERTS – Earliest known surgery was of a child in Borneo 31,000 years ago**

Evidence that a child in a hunter-gatherer society survived amputation offers a remarkable insight into the origins of surgery. It challenges the current view that such procedures emerged alongside farming some 10,000 years ago.

<https://www.nature.com/articles/d41586-022-02340-4>

## PAPERS

### **TIM RYAN MALONEY et al – Surgical amputation of a limb 31,000 years ago in Borneo**

The prevailing view regarding the evolution of medicine is that the emergence of settled agricultural societies around 10,000 years ago (the Neolithic Revolution) gave rise to a host of health problems that had previously been unknown among non-sedentary foraging populations, stimulating the first major innovations in prehistoric medical practices. Such changes included the development of more advanced surgical procedures, with the oldest known indication of an 'operation' formerly thought to have consisted of the skeletal remains of a European Neolithic farmer (found in Buthiers-Boulancourt, France) whose left forearm had been surgically removed and then partially healed. Dating to around 7,000 years ago, this accepted case of amputation would have required comprehensive knowledge of human anatomy and considerable technical skill, and has thus been viewed as the earliest evidence of a complex medical act. Here, however, we report the discovery of skeletal remains of a young individual from Borneo who had the distal third of their left lower leg surgically amputated, probably as a child, at least 31,000 years ago. The individual survived the procedure and lived for another 6–9 years, before their remains were intentionally buried in Liang Tebo cave, which is located in East Kalimantan, Indonesian Borneo, in a limestone karst area that contains some of the world's earliest dated rock art. This unexpectedly early evidence of a successful limb amputation suggests that at least some modern human foraging groups in tropical Asia had developed sophisticated medical knowledge and skills long before the Neolithic farming transition.

<https://www.nature.com/articles/s41586-022-05160-8>

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## Nature Communications

### PAPERS

### **ALEJANDRO ORDONEZ & FELIX RIEDE – Changes in limiting factors for forager population dynamics in Europe across the last glacial-interglacial transition**

Population dynamics set the framework for human genetic and cultural evolution. For foragers, demographic and environmental changes correlate strongly, although the causal relations between different environmental variables and human responses through time and space likely varied. Building on the notion of limiting factors, namely that at any one time, the scarcest resource caps population size, we present a statistical approach to identify the dominant climatic constraints for hunter-gatherer population densities and then hindcast their changing dynamics in Europe for the period between 21,000 to 8000 years ago. Limiting factors shifted from temperature-related variables (effective temperature) during the Pleistocene to a regional mosaic of limiting factors in the Holocene dominated by temperature seasonality and annual precipitation. This spatiotemporal variation suggests that hunter-gatherers needed to overcome very different adaptive challenges in different parts of Europe and that these challenges varied over time. The signatures of these changing adaptations may be visible archaeologically. In addition, the spatial disaggregation of limiting factors from the Pleistocene to the Holocene coincided with and may partly explain the diversification of the cultural geography at this time.

<https://www.nature.com/articles/s41467-022-32750-x>

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## Nature Ecology & Evolution

### PAPERS

### **K. HARVATI & R.R. ACKERMANN – Merging morphological and genetic evidence to assess hybridization in Western Eurasian late Pleistocene hominins**

Previous scientific consensus saw human evolution as defined by adaptive differences (behavioural and/or biological) and the emergence of *Homo sapiens* as the ultimate replacement of non-modern groups by a modern, adaptively more competitive group. However, recent research has shown that the process underlying our origins was considerably more complex. While archaeological and fossil evidence suggests that behavioural complexity may not be confined to the modern human lineage, recent palaeogenomic work shows that gene flow between distinct lineages (for example, Neanderthals, Denisovans, early *H. sapiens*) occurred repeatedly in the late Pleistocene, probably contributing elements to our genetic make-up that might have been crucial to our success as a diverse, adaptable species. Following these advances, the prevailing human origins model has shifted from one of near-complete replacement to a more nuanced view of partial replacement with considerable reticulation. Here we provide a brief introduction to the current genetic evidence for hybridization among hominins, its prevalence in, and effects on, comparative mammal groups, and especially how it manifests in the skull. We then explore the degree to which cranial variation seen in the fossil record of late Pleistocene hominins from Western Eurasia corresponds with our current genetic and comparative data. We are especially interested in understanding the degree to which skeletal data can reflect admixture. Our findings indicate some correspondence between these different lines of evidence, flag individual fossils as possibly admixed, and suggest that different cranial regions may preserve hybridization signals differentially. We urge further studies of the phenotype to expand our ability to detect the ways in which migration, interaction and genetic exchange have shaped the human past, beyond what is currently visible with the lens of ancient DNA.

<https://www.nature.com/articles/s41559-022-01875-z>



**M. BUTOVSKAYA et al – Variations in limited resources allocation towards friends and strangers in children and adolescents from seven economically and culturally diverse societies**

Humans are unique among primates in altruism and sharing limited resources towards non-kin. Our study revealed the differences in proportions of individuals ready to share limited resources with virtual friend compared to virtual stranger in children and adolescents from seven ethnic groups, represented by four traditional rural African societies from Tanzania with different types of economy and three societies from Russia. The study was conducted between 2015 and 2020, and the data on 2253 individuals (1104 males and 1149 females) were obtained. Six economic games with limited resource allocations were conducted: Prosocial, Envy, and Sharing games with imagined friends and stranger partners accordingly. All players were later classified according to their decisions in all six games into four behavioral types: egoistic, egalitarian, altruistic, and mixed. The effects of population origin, gender, age, and stranger/friend type of interaction on the behavior were estimated by multinomial logistic regression. It was demonstrated that more respondents prefer altruistic and egalitarian behavior than egoistic and mixed in the whole sample. However, significant parochial effect was found. The study revealed significant main effects of ethnicity, age, and the interaction effects of ethnicity and parochial tendencies, and ethnicity and age on the behavior of players.

<https://www.nature.com/articles/s41598-022-19354-7>

**AHMED M. IBRAHIM – The conditional defector strategies can violate the most crucial supporting mechanisms of cooperation**

Cooperation is essential for all domains of life. Yet, ironically, it is intrinsically vulnerable to exploitation by cheats. Hence, an explanatory necessity spurs many evolutionary biologists to search for mechanisms that could support cooperation. In general, cooperation can emerge and be maintained when cooperators are sufficiently interacting with themselves. This communication provides a kind of assortment and reciprocity. The most crucial and common mechanisms to achieve that task are kin selection, spatial structure, and enforcement (punishment). Here, we used agent-based simulation models to investigate these pivotal mechanisms against conditional defector strategies. We concluded that the latter could easily violate the former and take over the population. This surprising outcome may urge us to rethink the evolution of cooperation, as it illustrates that maintaining cooperation may be more difficult than previously thought. Moreover, empirical applications may support these theoretical findings, such as invading the cooperator population of pathogens by genetically engineered conditional defectors, which could be a potential therapy for many incurable diseases.

<https://www.nature.com/articles/s41598-022-18797-2>

**BRIGHTLIN NITHIS DHAS et al – Parents' awareness, knowledge, and experiences of play and its benefits in child development: A systematic review protocol**

Play is an important childhood occupation and a medium for development. Parents' attitudes towards play, knowledge about play and its benefits, and their experiences in facilitating effective play are key factors that determine the experiences of play in children. These factors related to parent's understanding and experiences of play gain additional significance when the child has a disability. The aim of this systematic review is to synthesize the available evidence on awareness, knowledge, and experience of play among parents and to summarise the findings.

MEDLINE, CINAHL, APA PsycINFO, Psychology Database, Sociological Abstracts, EMBASE, and Cochrane Collection Plus will be searched for studies of any design that investigate awareness, knowledge, and experience of play among parents and its benefits to child development. Manual searches from reference lists of relevant papers will also be completed. The primary outcomes are parents' knowledge (what constitutes play), experiences (what parents feel about play) and awareness (benefits of play) about play. Three independent reviewers will screen identified papers with pre-defined eligibility criteria and extract data using a customized extraction form. Discrepancies will be resolved in discussion with a fourth reviewer. A synthesis of eligible studies and summary will be provided.

A systematic review of quantitative and qualitative research evidence of parents' awareness, knowledge, and experiences in play will be carried out. This will highlight parents' own views on play among their children, current theories/domains related to parents' awareness, knowledge, and experience in play, and outcome measures that have been used. In addition, comparison among views of parents of children with disabilities and parents of typically developing children will be made. The results will be presented as a summary of key findings under the themes of awareness, knowledge, and experience of parents in play.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0274238>

**ANDREAS ANGOURAKIS et al – Human-Plant Coevolution: A modelling framework for theory-building on the origins of agriculture**

The domestication of plants and the origin of agricultural societies has been the focus of much theoretical discussion on why, how, when, and where these happened. The 'when' and 'where' have been substantially addressed by different branches of archaeology, thanks to advances in methodology and the broadening of the geographical and chronological scope of

evidence. However, the 'why' and 'how' have lagged behind, holding on to relatively old models with limited explanatory power. Armed with the evidence now available, we can return to theory by revisiting the mechanisms allegedly involved, disentangling their connection to the diversity of trajectories, and identifying the weight and role of the parameters involved. We present the Human-Plant Coevolution (HPC) model, which represents the dynamics of coevolution between a human and a plant population. The model consists of an ecological positive feedback system (mutualism), which can be reinforced by positive evolutionary feedback (coevolution). The model formulation is the result of wiring together relatively simple simulation models of population ecology and evolution, through a computational implementation in R. The HPC model captures a variety of potential scenarios, though which conditions are linked to the degree and timing of population change and the intensity of selective pressures. Our results confirm that the possible trajectories leading to neolithisation are diverse and involve multiple factors. However, simulations also show how some of those factors are entangled, what are their effects on human and plant populations under different conditions, and what might be the main causes fostering agriculture and domestication.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0260904>

### **DANIEL J. DAVIS & JOHN H. CHALLIS – Foot arch rigidity in walking: In vivo evidence for the contribution of metatarsophalangeal joint dorsiflexion**

Human foot rigidity is thought to provide a more effective lever with which to push against the ground. Tension of the plantar aponeurosis (PA) with increased metatarsophalangeal (MTP) joint dorsiflexion (i.e., the windlass mechanism) has been credited with providing some of this rigidity. However, there is growing debate on whether MTP joint dorsiflexion indeed increases arch rigidity. Further, the arch can be made more rigid independent of additional MTP joint dorsiflexion (e.g., when walking with added mass). The purpose of the present study was therefore to compare the influence of increased MTP joint dorsiflexion with the influence of added mass on the quasi-stiffness of the midtarsal joint in walking. Participants walked with a rounded wedge under their toes to increase MTP joint dorsiflexion in the toe-wedge condition, and wore a weighted vest with 15% of their body mass in the added mass condition. Plantar aponeurosis behavior, foot joint energetics, and midtarsal joint quasi-stiffness were compared between conditions to analyze the mechanisms and effects of arch rigidity differences. Midtarsal joint quasi-stiffness was increased in the toe-wedge and added mass conditions compared with the control condition (both  $p < 0.001$ ). In the toe-wedge condition, the time-series profiles of MTP joint dorsiflexion and PA strain and force were increased throughout mid-stance ( $p < 0.001$ ). When walking with added mass, the time-series profile of force in the PA did not increase compared with the control condition although quasi-stiffness did, supporting previous evidence that the rigidity of the foot can be actively modulated. Finally, more mechanical power was absorbed ( $p = 0.006$ ) and negative work was performed ( $p < 0.001$ ) by structures distal to the rearfoot in the toe-wedge condition, a condition which displayed increased midtarsal joint quasi-stiffness. This indicates that a more rigid foot may not necessarily transfer power to the ground more efficiently.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0274141>

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## Science

### ARTICLES

#### **BRIGITTE MALGRANGE & LAURENT NGUYEN – Scaling brain neurogenesis across evolution**

The neocortex, the outer region of the cerebral cortex, is an evolutionarily advanced brain structure that is responsible for cognitive abilities. It has expanded in size and function across the mammalian clade. The extraordinary cognitive abilities of humans are thought to rely on brain size (and thus the number of neurons) and the intricate cytoarchitecture of the neocortex. The expansion and folding of the neocortex have been partly attributed to the existence of basal radial glial cells (bRGs). These progenitors generate most cortical neurons, and their number increases in gyrencephalic mammals (which have neocortical folds), such as primates and ferrets. On page 1170 of this issue, Pinson et al. report that expression of a variant of human transketolase-like protein 1 (TKTL1) increases the number of bRGs in modern humans and thereby the output of upper layer projection neurons. This genetic change could contribute to differences in cognition with extinct archaic humans.

<https://www.science.org/doi/10.1126/science.ade4388>

### PAPERS

#### **ANNELINE PINSON et al with SVANTE PÄÄBO – Human TKTL1 implies greater neurogenesis in frontal neocortex of modern humans than Neanderthals**

Neanderthal brains were similar in size to those of modern humans. We sought to investigate potential differences in neurogenesis during neocortex development. Modern human transketolase-like 1 (TKTL1) differs from Neanderthal TKTL1 by a lysine-to-arginine amino acid substitution. Using overexpression in developing mouse and ferret neocortex, knockout in fetal human neocortical tissue, and genome-edited cerebral organoids, we found that the modern human variant, hTKTL1, but not the Neanderthal variant, increases the abundance of basal radial glia (bRG) but not that of intermediate progenitors (bIPs). bRG generate more neocortical neurons than bIPs. The hTKTL1 effect requires the pentose phosphate pathway and fatty acid synthesis. Inhibition of these metabolic pathways reduces bRG abundance in fetal human neocortical tissue. Our data suggest that neocortical neurogenesis in modern humans differs from that in Neanderthals.

**{So what happened when sapiens interbred with neanderthalensis?}**

## Trends in Cognitive Sciences

### PAPERS

#### **CAROLYN BAER & CELESTE KIDD – Learning with certainty in childhood**

Learners use certainty to guide learning. They maintain existing beliefs when certain, but seek further information when they feel uninformed. Here, we review developmental evidence that this metacognitive strategy does not require reportable processing. Uncertainty prompts nonverbal human infants and nonhuman animals to engage in strategies like seeking help, searching for additional information, or opting out. Certainty directs children's attention and active learning strategies and provides a common metric for comparing and integrating conflicting beliefs across people. We conclude that certainty is a continuous, domain-general signal of belief quality even early in life.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00167-X](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00167-X)

#### **MARK K. HO, REBECCA SAXE & FIERY CUSHMAN – Planning with Theory of Mind**

Understanding Theory of Mind should begin with an analysis of the problems it solves. The traditional answer is that Theory of Mind is used for predicting others' thoughts and actions. However, the same Theory of Mind is also used for planning to change others' thoughts and actions. Planning requires that Theory of Mind consists of abstract structured causal representations and supports efficient search and selection from innumerable possible actions. Theory of Mind contrasts with less cognitively demanding alternatives: statistical predictive models of other people's actions, or model-free reinforcement of actions by their effects on other people. Theory of Mind is likely used to plan novel interventions and predict their effects, for example, in pedagogy, emotion regulation, and impression management.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00185-1](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00185-1)

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## Trends in Ecology and Evolution

### PAPERS

#### **JEDEDIAH F. BRODIE & PHILIP D. MANNION – The hierarchy of factors predicting the latitudinal diversity gradient**

The numerous explanations for why Earth's biodiversity is concentrated at low latitudes fail to explain variation in the strength and even direction of the gradient through deep time. Consequently, we do not know if today's gradient is representative of what might be expected on other planets or is merely an idiosyncrasy of Earth's history. We propose a hierarchy of factors driving the latitudinal distribution of diversity: (i) over geologically long time spans, diversity is largely predicted by climate; (ii) when climatic gradients are shallow, diversity tracks habitat area; and (iii) historical contingencies linked to niche conservatism have geologically short-term, transient influence at most. Thus, latitudinal diversity gradients, although variable in strength and direction, are largely predictable on our planet and possibly others.

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(22\)00195-1](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(22)00195-1)

#### **PETER V. LIDSKY & RAUL ANDINO – Could aging evolve as a pathogen control strategy?**

Aging is often attributed to the detrimental side effects of beneficial traits but not a programmed adaptive process. Alternatively, the pathogen control hypothesis posits that defense against infectious diseases may provide a strong selection force for restriction of lifespan. Aging might have evolved to remove older individuals who carry chronic diseases that may transmit to their younger kin. Thus, selection for shorter lifespans may benefit kin's fitness. The pathogen control hypothesis addresses arguments typically raised against adaptive aging concepts: it explains the benefit of shorter lifespan and the absence of mutant variants that do not age. We discuss the consistency and explanatory power of this hypothesis and compare it with classic hypotheses of aging.

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(22\)00198-7](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(22)00198-7)

#### **JOSEP PENUELAS, JORDI SARDANS & JAUME TERRADAS – Increasing divergence between human and biological elementomes**

The human elementome, the number and amounts of elements used biologically and nonbiologically by humans, has increasingly diverged from the biological elementome that characterizes the elements used by the nonhuman living organisms. This increasing divergence due to human cultural evolution has huge ecological, evolutionary, environmental, and geopolitical consequences.

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(22\)00202-6](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(22)00202-6)

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## Trends in Neurosciences

### PAPERS

#### **JORDAN O'BYRNE & KARIM JERBI – How critical is brain criticality?**

Criticality is the singular state of complex systems poised at the brink of a phase transition between order and randomness. Such systems display remarkable information-processing capabilities, evoking the compelling hypothesis that the brain may itself be critical. This foundational idea is now drawing renewed interest thanks to high-density data and converging cross-disciplinary knowledge. Together, these lines of inquiry have shed light on the intimate link between criticality, computation,

and cognition. Here, we review these emerging trends in criticality neuroscience, highlighting new data pertaining to the edge of chaos and near-criticality, and making a case for the distance to criticality as a useful metric for probing cognitive states and mental illness. This unfolding progress in the field contributes to establishing criticality theory as a powerful mechanistic framework for studying emergent function and its efficiency in both biological and artificial neural networks. [https://www.cell.com/trends/neurosciences/fulltext/S0166-2236\(22\)00164-3](https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(22)00164-3)

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