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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.

ACADEMIA.EDU – Evolutionary Discontinuity in the Late Pleistocene Levant

In P. Mellars, K. Boyle, O. Bar-Yosef and C. Stringer (eds.), Rethinking the Human Revolution, McDonald Institute for Archaeological Research Monographs, 219-232 (2007).

JOHN J. SHEA – The Boulevard of Broken Dreams: Evolutionary Discontinuity in the Late Pleistocene Levant

Tracing the thread of evolutionary continuity from our remote hominin ancestors to living humans is the central enterprise of human origins research. But not all hominins are ancestral. Extinction is an important factor in human evolution (Tattersall & Schwartz 2000), as it is in the evolution of all living things (Raup 1991). It seems reasonable that we should expect meaningful correlations between hominin extinctions and discontinuities in the archaeological record, but, it is difficult to find such correlations. Theoretically, hypotheses about evolutionary continuity between chronologically successive fossil samples can be falsified by examining patterned variation in morphological features of known evolutionary ‘polarity’ (i.e. whether or not they are ancestral or derived conditions). Palaeolithic archaeology differs from hominin palaeontology in that it lacks an equivalent method for falsifying claims of continuity among lithic assemblages. Because cultural evolution is fundamentally Lamarckian (i.e. acquired characteristics can be passed on), one cannot know the evolutionary polarity of a particular technological or typological character. Palaeolithic archaeologists routinely claim cultural continuity among stone tool assemblages scattered across hundreds of thousands, often millions, of square kilometres and hundreds of millennia. By implication, they also claim biological continuity among the authors of those assemblages. Yet, without a method for falsifying claims of continuity in the archaeological record, we risk accepting hypotheses about continuity because of systemic bias against the recognition of discontinuity.

[https://www.academia.edu/2635522/John J Shea 2007 The Boulevard of Broken Dreams Evolutionary Discontinuity in the Late Pleistocene Levant In P Mellars K Boyle O Bar Yosef and C Stringer Eds Rethinking the Human Revolution pp 219 232 Cambridge UK McDonald Institute for Archaeological Research Monographs](https://www.academia.edu/2635522/John_J_Shea_2007_The_Boulevard_of_Broken_Dreams_Evolutionary_Discontinuity_in_the_Late_Pleistocene_Levant_In_P_Mellars_K_Boyle_O_Bar_Yosef_and_C_Stringer_Eds_Rethinking_the_Human_Revolution_pp_219_232_Cambridge_UK_McDonald_Institute_for_Archaeological_Research_Monographs)

ACADEMIA.EDU – The Acheulian of Western Europe

In N. Goren-Inbar and G. Sharon (eds.), Axe Age: Acheulian Toolmaking from Quarry to Discard, Equinox (2006).

MANUEL SANTONJA & PAOLA VILLA – The Acheulian of Western Europe

In the current state of knowledge, the European distribution of Acheulian industries that include handaxes and cleavers appears to be centered in southwestern Europe; their maximum northward expansion reaches England and Germany. North of latitude 52° and east of Germany and Italy, handaxe industries are conspicuously absent, occurring only sporadically in southeastern Europe. Handaxe industries are again well documented in western Asia, from Georgia to Israel and the Arabian Peninsula, clearly indicating an East African origin. The gap between eastern and western Eurasia and the high density of finds in the Iberian Peninsula suggests that the Acheulian in southwestern Europe may derive from the Maghreb,

notwithstanding the lack of direct evidence for the crossing of the Straits of Gibraltar. In the Spanish Meseta the geological formations containing Acheulian industries are dated to the time range of OIS 11 to 6. The chronological gap between the earlier human occupation sites at Gran Dolina and in the Orce region and the Spanish Acheulian (an interval of about 300–400,000 years) would seem to reflect an earlier settlement in warm-temperate Europe that did not take a stronghold. The distribution of cleavers coincides only partly with that of Acheulian handaxes. Cleavers are most abundant in regions in which the raw material occurs in the form of large quartzite cobbles that do not need extensive decortication and shaping prior to the removal of large flakes, as in the Spanish Meseta and the Garonne and Tarn valleys of southwestern France. Elsewhere (northern France, England, Italy), cleavers also occur in different raw materials (flint or limestone) but are not common. In Spain, the transition from Acheulian industries to assemblages characterized by the Levallois method without large cutting tools may be as old as 300 ka, based on the age of stratigraphic units TD 10 and 11 at Gran Dolina. However, the evidence from open-air sites suggests a possible coexistence of industries traditionally called Upper Acheulian and others included in the Mousterian complex up to the end of the Middle Pleistocene. In northern France and adjacent countries (Belgium, the Netherlands), assemblages containing rare bifaces and Levallois debitage occur during OIS 8, broadly contemporaneous with assemblages containing bifaces and non-Levallois debitage. The Levallois method is well documented from OIS 7 onward.

[https://www.academia.edu/28895208/The Acheulian of Western Europe](https://www.academia.edu/28895208/The_Acheulian_of_Western_Europe)

NEWS

GUARDIAN SCIENCE – Now AI can write students' essays for them, will everyone become a cheat?

Parents and teachers across the world are rejoicing as students have returned to classrooms. But unbeknownst to them, an unexpected insidious academic threat is on the scene: a revolution in artificial intelligence has created powerful new automatic writing tools. These are machines optimised for cheating on school and university papers, a potential siren song for students that is difficult, if not outright impossible, to catch.

<https://www.theguardian.com/commentisfree/2022/nov/28/ai-students-essays-cheat-teachers-plagiarism-tech>

NATURE BRIEFING – Exciting ancient skull uncovered in China

A rare, well-preserved ancient human skull found in central China could be a million-year-old Homo erectus. As excavation of the fossil continues, archaeologists and palaeoanthropologists anticipate that the skull could give a fuller picture of the diverse family tree of archaic humans living throughout Eurasia in prehistoric times. It lies 35 metres from where two significant finds — dubbed the Yunxian Man skulls — were unearthed in 1989 and 1990 but, unlike them, it has not been crushed and distorted after millennia underground.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=a298776a7e&e=1db4b9a19b>

SOCIETY FOR SCIENCE – Mammoths may have gone extinct much earlier than DNA suggests

Ancient DNA in sediments may be leading paleontologists astray in attempts to figure out when woolly mammoths and woolly rhinos died out, a new study argues.

<http://click.societyforscience-email.com/?qs=9c65d0c9816f4b781384034b2136a3ea9a904636f4ef1865bb6769e0a56004cb9e1addb416f3a1ed8bf336bf4e3c2b8013e780b617d05e1c4430bcd2a591fd79>

PUBLICATIONS

American Journal of Biological Anthropology

PAPERS

ELLIOT ELLIOTT et al – Sex bias in Neolithic megalithic burials

Genetic and osteological information from human individuals from 32 megalithic sites in the UK and Ireland dating from 4000 to 2500 cal. BCE was collected and statistically analyzed to test whether there is a true over-representation of males at these sites. The published dataset from the study by Sánchez-Quinto et al. in 2019 was initially analyzed before being refined and included in a larger dataset. Osteological analysis of sex bias was limited to adults with available sex estimations, and genetic analysis limited to published data.

<https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24645>

Biology Letters

PAPERS

THOM SCOTT-PHILLIPS – Biological adaptations for cultural transmission?

According to several interlinked and influential lines of argument, human minds have been shaped by natural selection so as to include biological adaptations with the evolved, naturally selected function to facilitate the transmission of cultural knowledge. This 'cultural minds' hypothesis has proved highly influential, and if it is correct it is a major step forward in understanding how and why humans have survived and prospered in a hugely diverse range of ecologies. It can be

contrasted with a ‘social minds’ hypothesis, according to which cultural transmission occurs as an outcome, but not the biologically evolved function, of social cognition the domain of which is relatively small-group interaction. Here, I critique the cultural minds hypothesis and I argue that the data favour the social minds perspective. Cultural phenomena can clearly emerge and persist over time without cognitive adaptations for cultural transmission. Overtly intentional communication plays an especially pivotal role.

<https://royalsocietypublishing.org/doi/full/10.1098/rsbl.2022.0439>

Current Anthropology

PAPERS

TIM INGOLD – Evolution without Inheritance: Steps to an Ecology of Learning

Attempts to integrate human culture, history, or symbolic imagination into a comprehensive theory of evolution have, up to now, foundered on a bifurcation between mind and nature deeply embedded in the project of modern science. This article attempts to overcome the bifurcation by foregrounding the process of learning, understood neither as the lifetime expression of evolved attributes nor as a supplementary (nongenetic) mechanism for their inheritance but as an intergenerational life process unfolding in a matrix of relations that overflows the emergent boundaries between organisms and their environments. The argument is presented in three steps. The first is to explain how a distinction between life and inheritance came to be built into the “modern synthesis” of evolutionary biology. In the second step, this synthesis is shown to have been stymied by its failure to deliver an adequate account of the role of ontogenesis in evolution. Of the several attempts to rectify this failure by extending the synthesis, the article focuses on just one, which introduces the paired concepts of “niche construction” and “ecological inheritance.” The third step reveals that the residual commitment of such an extended evolutionary synthesis to the logic of inheritance leaves it compromised. To resolve the impasse, the article proposes a revitalized theory of learning that promises to unify the fields of evolution and ecology. This can be achieved, however, only by relinquishing the concept of inheritance.

<https://www.journals.uchicago.edu/doi/abs/10.1086/722437>

Current Biology

PAPERS

SIYING XIE et al – Visual category representations in the infant brain

Visual categorization is a human core cognitive capacity that depends on the development of visual category representations in the infant brain. However, the exact nature of infant visual category representations and their relationship to the corresponding adult form remains unknown. Our results clarify the nature of visual category representations from electroencephalography (EEG) data in 6- to 8-month-old infants and their developmental trajectory toward adult maturity in the key characteristics of temporal dynamics, representational format, and spectral properties. Temporal dynamics change from slowly emerging, developing representations in infants to quickly emerging, complex representations in adults. Despite those differences, infants and adults already partly share visual category representations. The format of infants’ representations is visual features of low to intermediate complexity, whereas adults’ representations also encode high-complexity features. Theta band activity contributes to visual category representations in infants, and these representations are shifted to the alpha/beta band in adults. Together, we reveal the developmental neural basis of visual categorization in humans, show how information transmission channels change in development, and demonstrate the power of advanced multivariate analysis techniques in infant EEG research for theory building in developmental cognitive science.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(22\)01772-9](https://www.cell.com/current-biology/fulltext/S0960-9822(22)01772-9)

eLife

PAPERS

JAMES P HIGHAM – Evolution: Kin selection spreads

By spending more time around infants which physically resemble their own, mandrill mothers may increase how frequently their offspring interact with their paternal half siblings.

<https://elifesciences.org/articles/84142>

Evolution and Human Behavior

PAPERS

DANIEL J. KRUGER, MARYANNE L. FISHER & CATHERINE SALMON – What do evolutionary researchers believe about human psychology and behavior?

We investigated the prevalence of beliefs in several key and contested aspects of human psychology and behavior in a broad sample of evolutionary-informed scholars (N = 581). Nearly all participants believed that developmental environments substantially shape human adult psychology and behavior, that there are differences in human psychology and behavior based on sex differences from sexual selection, and that there are individual differences in human psychology and behavior resulting from different genotypes. About three-quarters of participants believed that there are population differences from

dissimilar ancestral ecologies/environments and within-person differences across the menstrual cycle. Three-fifths believed that the human mind consists of domain-specific, context-sensitive modules. About half of participants believed that behavioral and cognitive aspects of human life history vary along a unified fast-slow continuum. Two-fifths of participants believed that group-level selection has substantially contributed to human evolution. Results indicate that there are both shared core beliefs as well as phenomena that are accepted by varying proportions of scholars. Such patterns represent the views of contemporary scholars and the current state of the field. The degree of acceptance for some phenomena may change over time as evolutionary science advances through the accumulation of empirical evidence.

<https://www.sciencedirect.com/science/article/pii/S1090513822000836>

Evolutionary Anthropology

PAPERS

ALASTAIR KEY & NICK ASHTON – Hominins likely occupied northern Europe before one million years ago

Our understanding of when hominins first reached northern Europe is dependent on a fragmented archaeological and fossil record known from as early as marine isotope stage (MIS) 21 or 25 (c. 840 or 950 thousand years ago [Ka]). This contrasts sharply with southern Europe, where hominin occupation is evidenced from MIS 37 to 45 (c. 1.22 or 1.39 million years ago [Ma]). Northern Europe, however, exhibits climatic, geological, demographic, and historical disadvantages when it comes to preserving fossil and archaeological evidence of early hominin habitation. It is argued here that perceived differences in first occupation timings between the two European regions needs to be revised in light of these factors. To enhance this understanding, optimal linear estimation models are run using data from the current fossil and artefact record. Results suggest northern Europe to have first been occupied as early as 1.16 Ma, or as late as 913 Ka. These timings could represent minimum date expectations and be extended through future archaeological and fossil discoveries.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.21966>

Heliyon

PAPERS

CRISTIAN CANDIA et al – Reciprocity heightens academic performance in elementary school students

Social relationships are pivotal for human beings. Yet, we still lack a complete understanding of the types and conditions of social relationships that facilitate learning among children. Here, we present the results of a study involving 855 elementary school children from 14 different public schools in Chile designed to understand their social learning strategies in classrooms. We mapped students' social relationships using a behavioral experiment—a non-anonymous social dilemma—that allows us to measure cooperation and infer reciprocal and asymmetrical relationships between peers. We implemented the experiment synchronously in each classroom using networked tablets and a friendly user interface to mitigate cognitive barriers and boost students' engagement. Using regression models, we found a positive and significant association between reciprocity and academic performance. This result holds after controlling for class attendance, sex, parents' education, social status, individual cooperative dispositions, and fixed effects per class group. Finally, using a difference-in-difference framework, we found robust evidence that reciprocity heightens academic performance by comparing two consecutive academic semesters. This effect is heterogeneous and is considerably more prominent for the top 20% students experiencing higher levels of reciprocity in their social relationships. We expect these results to inform cooperative learning interventions in elementary education.

[https://www.cell.com/heliyon/fulltext/S2405-8440\(22\)03204-2](https://www.cell.com/heliyon/fulltext/S2405-8440(22)03204-2)

Interface: Journal of the Royal Society

PAPERS

BLAI VIDIELLA et al – A cultural evolutionary theory that explains both gradual and punctuated change

Cumulative cultural evolution (CCE) occurs among humans who may be presented with many similar options from which to choose, as well as many social influences and diverse environments. It is unknown what general principles underlie the wide range of CCE dynamics and whether they can all be explained by the same unified paradigm. Here, we present a scalable evolutionary model of discrete choice with social learning, based on a few behavioural science assumptions. This paradigm connects the degree of transparency in social learning to the human tendency to imitate others. Computer simulations and quantitative analysis show the interaction of three primary factors—information transparency, popularity bias and population size—drives the pace of CCE. The model predicts a stable rate of evolutionary change for modest degrees of popularity bias. As popularity bias grows, the transition from gradual to punctuated change occurs, with maladaptive subpopulations arising on their own. When the popularity bias gets too severe, CCE stops. This provides a consistent framework for explaining the rich and complex adaptive dynamics taking place in the real world, such as modern digital media.

<https://royalsocietypublishing.org/doi/full/10.1098/rsif.2022.0570>

MICHAEL RAMSCAR – How children learn to communicate discriminatively

How do children learn to communicate, and what do they learn? Traditionally, most theories have taken an associative, compositional approach to these questions, supposing children acquire an inventory of form-meaning associations, and procedures for composing / decomposing them; into / from messages in production and comprehension. This paper presents an alternative account of human communication and its acquisition based on the systematic, discriminative approach embodied in psychological and computational models of learning, and formally described by communication theory. It describes how discriminative learning theory offers an alternative perspective on the way that systems of semantic cues are conditioned onto communicative codes, while information theory provides a very different view of the nature of the codes themselves. It shows how the distributional properties of languages satisfy the communicative requirements described in information theory, enabling language learners to align their expectations despite the vastly different levels of experience among language users, and to master communication systems far more abstract than linguistic intuitions traditionally assume. Topics reviewed include morphological development, the acquisition of verb argument structures, and the functions of linguistic systems that have proven to be stumbling blocks for compositional theories: grammatical gender and personal names.

<https://www.cambridge.org/core/journals/journal-of-child-language/article/how-children-learn-to-communicate-discriminatively/25796886D9D5A892B661DAA39A77DA2C>

HEIKE BEHRENS – Constructivist Approaches to First Language Acquisition

Constructivist approaches to language acquisition predict that form-function mappings are derived from distributional patterns in the input, and their contextual embedding. This requires a detailed analysis of the input, and the integration of information from different contingencies. Regarding the acquisition of morphology, it is shown which types of information leads to the induction of (lexical) categories, and to paradigm building. Regarding the acquisition of word order, it is shown how languages with fixed or variable word order profit from stable syntactic hyperschemas, but require a more detailed analyses of the form-function contingencies to identify the underlying, more specific semantic, syntactic and morphological patterns. At a theoretical level, it is shown how findings from acquisition and processing converge into new linguistic theories that aim to account for regular as well as irregular phenomena in language.

<https://www.cambridge.org/core/journals/journal-of-child-language/article/constructivist-approaches-to-first-language-acquisition/9859E93FA9AA8D32F269DE38E721EEA6>

FABIA FRANCO et al – Singing to infants matters: Early singing interactions affect musical preferences and facilitate vocabulary building

This research revealed that the frequency of reported parent-infant singing interactions predicted 6-month-old infants' performance in laboratory music experiments and mediated their language development in the second year. At 6 months, infants ($n = 36$) were tested using a preferential listening procedure assessing their sustained attention to instrumental and sung versions of the same novel tunes whilst the parents completed an ad-hoc questionnaire assessing home musical interactions with their infants. Language development was assessed with a follow-up when the infants were 14-month-old ($n = 26$). The main results showed that 6-month-olds preferred listening to sung rather than instrumental melodies, and that self-reported high levels of parental singing with their infants [i] were associated with less pronounced preference for the sung over the instrumental version of the tunes at 6 months, and [ii] predicted significant advantages on the language outcomes in the second year. The results are interpreted in relation to conceptions of developmental plasticity.

<https://www.cambridge.org/core/journals/journal-of-child-language/article/singing-to-infants-matters-early-singing-interactions-affect-musical-preferences-and-facilitate-vocabulary-building/103D68368DDDCB6B80D2939C5667FD7F>

ALEXANDER C. WILSON & DOROTHY V. M. BISHOP – A novel online assessment of pragmatic and core language skills: An attempt to tease apart language domains in children

It remains unclear whether pragmatic language skills and core language skills (grammar and vocabulary) are distinct language domains. The present work aimed to tease apart these domains using a novel online assessment battery administered to almost 400 children aged 7 to 13 years. Confirmatory factor analysis indicated that pragmatic and core language domains could be measured separately, but that both domains were highly related ($r = .79$). However, zero-order correlations between pragmatic tests were quite small, indicating that task-specific skills played an important role in performance, and follow-up exploratory factor analysis suggested that pragmatics might be best understood as a family of skills rather than a domain. This means that these different pragmatic skills may have different cognitive underpinnings and also need to be assessed separately. However, our overall results supported the idea that pragmatic and core aspects of language are closely related during development, with one area scaffolding development in the other.

<https://www.cambridge.org/core/journals/journal-of-child-language/article/novel-online-assessment-of-pragmatic-and-core-language-skills-an-attempt-to-tease-apart-language-domains-in-children/2A2BA35AC8D46C219C0BB31D4CB8C838>

Journal of Human Genetics

PAPERS

A. S. FERNANDO et al – The mitochondrial genomes of two Pre-historic Hunter Gatherers in Sri Lanka

Sri Lanka is an island in the Indian Ocean connected by the sea routes of the Western and Eastern worlds. Although settlements of anatomically modern humans date back to 48,000 years, to date there is no genetic information on pre-historic individuals in Sri Lanka. We report here the first complete mitochondrial sequences for Mesolithic hunter-gatherers from two cave sites. The mitochondrial haplogroups of pre-historic individuals were M18a and M35a. Pre-historic mitochondrial lineage M18a was found at a low prevalence among Sinhalese, Sri Lankan Tamils, and Sri Lankan Indian Tamil in the Sri Lankan population, whereas M35a lineage was observed across all Sri Lankan populations with a comparatively higher frequency among the Sinhalese. Both haplogroups are Indian derived and observed in the South Asian region and rarely outside the region.

<https://www.nature.com/articles/s10038-022-01099-w>

Nature

NEWS

Ancient skull uncovered in China could be million-year-old Homo erectus

Fieldwork is under way to excavate a rare, well-preserved specimen in central China.

<https://www.nature.com/articles/d41586-022-04142-0>

ARTICLES

PATRIZIA D'ETTORRE & KAZUKI TSUJI – A fluid role in ant society as adults give larvae 'milk' from pupae

Parental-care behaviours include mammalian lactation to provide milk for offspring. The discovery that adult ants harvest nutritious fluid from pupae and give larvae this fluid reveals social feeding that aids colony success.

<https://www.nature.com/articles/d41586-022-03722-4>

PAPERS

ORLI SNIR et al – The pupal moulting fluid has evolved social functions in ants

Insect societies are tightly integrated, complex biological systems in which group-level properties arise from the interactions between individuals. However, these interactions have not been studied systematically and therefore remain incompletely known. Here, using a reverse engineering approach, we reveal that unlike solitary insects, ant pupae extrude a secretion derived from the moulting fluid that is rich in nutrients, hormones and neuroactive substances. This secretion elicits parental care behaviour and is rapidly removed and consumed by the adults. This behaviour is crucial for pupal survival; if the secretion is not removed, pupae develop fungal infections and die. Analogous to mammalian milk, the secretion is also an important source of early larval nutrition, and young larvae exhibit stunted growth and decreased survival without access to the fluid. We show that this derived social function of the moulting fluid generalizes across the ants. This secretion thus forms the basis of a central and hitherto overlooked interaction network in ant societies, and constitutes a rare example of how a conserved developmental process can be co-opted to provide the mechanistic basis of social interactions. These results implicate moulting fluids in having a major role in the evolution of ant eusociality.

<https://www.nature.com/articles/s41586-022-05480-9>

Nature Computational Science

NEWS

The meaning emerging from combining words can be detected in space but not time

We used computational models built using neural networks to predict what brain areas process the new meaning that emerges when words are combined. The brain activity evoked by this composed meaning was detected only with some brain recording modalities, a finding that might have consequences for brain-computer interfaces.

<https://www.nature.com/articles/s43588-022-00361-7>

ARTICLES

KATRIN ERK – Understanding the combined meaning of words

Recent work uses a language model to gain insight into how the human brain understands the combined meaning of words in a sentence, and uncovers parts of the brain that contribute to this understanding.

<https://www.nature.com/articles/s43588-022-00338-6>

PAPERS**MARIYA TONEVA, TOM M. MITCHELL & LEILA WEHBE – Combining computational controls with natural text reveals aspects of meaning composition**

To study a core component of human intelligence—our ability to combine the meaning of words—neuroscientists have looked to linguistics. However, linguistic theories are insufficient to account for all brain responses reflecting linguistic composition. In contrast, we adopt a data-driven approach to study the composed meaning of words beyond their individual meaning, which we term ‘supra-word meaning’. We construct a computational representation for supra-word meaning and study its brain basis through brain recordings from two complementary imaging modalities. Using functional magnetic resonance imaging, we reveal that hubs that are thought to process lexical meaning also maintain supra-word meaning, suggesting a common substrate for lexical and combinatorial semantics. Surprisingly, we cannot detect supra-word meaning in magnetoencephalography, which suggests that composed meaning might be maintained through a different neural mechanism than the synchronized firing of pyramidal cells. This sensitivity difference has implications for past neuroimaging results and future wearable neurotechnology.

<https://www.nature.com/articles/s43588-022-00354-6>

Nature Human Behaviour**PAPERS****JOSHUA CONRAD JACKSON et al with QUENTIN ATKINSON – Valence-dependent mutation in lexical evolution**

A central goal of linguistics is to understand how words evolve. Past research has found that macro-level factors such as frequency of word usage and population size explain the pace of lexical evolution. Here we focus on cognitive and affective factors, testing whether valence (positivity–negativity) explains lexical evolution rates. Using estimates of cognate replacement rates for 200 concepts on an Indo-European language tree spanning six to ten millennia, we find that negative valence correlates with faster cognate replacement. This association holds when controlling for frequency of use, and follow-up analyses show that it is most robust for adjectives (‘dirty’ versus ‘clean’; ‘bad’ versus ‘good’); it does not consistently reach statistical significance for verbs, and never reaches significance for nouns. We also present experiments showing that individuals are more likely to replace words for negative versus positive concepts. Our findings suggest that emotional valence affects micro-level guided variation, which drives macro-level valence-dependent mutation in adjectives.

<https://www.nature.com/articles/s41562-022-01483-8>

Nature Humanities & Social Sciences Communications**PAPERS****XUEYING LIU, HAORAN ZHU & LEI LEI – Dependency distance minimization: a diachronic exploration of the effects of sentence length and dependency types**

Dependency distance is regarded as an index of memory load and a measure of syntactic difficulty. Previous research has found that dependency distance tends to minimize both synchronically and diachronically due to the limited resource of working memory. However, little is known concerning the effects of different dependency types on the dependency distance minimization. In addition, previous studies showed inconsistent results on the anti-minimization of dependency distance in shorter sentences. Hence, a more fine-grained investigation is needed on the diachronic change of dependency distance with shorter sentences such as those of three or four words. To address these issues, this study intends to explore the diachronic change of dependency distance in terms of two variables, i.e., dependency types and sentence length. Results show that anti-minimization does exist in short sentences diachronically, and sentence length has an effect on diachronic dependency distance minimization of dependency types. More importantly, not all dependency types present a decreasing trend, while only nine types of dependency relations are responsible for the dependency distance minimization. Possible explanations for the findings are offered.

<https://www.nature.com/articles/s41599-022-01447-3>

Nature Reviews Neuroscience**PAPERS****NINA KAZANINA & ALESSANDRO TAVANO – What neural oscillations can and cannot do for syntactic structure building**

Understanding what someone says requires relating words in a sentence to one another as instructed by the grammatical rules of a language. In recent years, the neurophysiological basis for this process has become a prominent topic of discussion in cognitive neuroscience. Current proposals about the neural mechanisms of syntactic structure building converge on a key role for neural oscillations in this process, but they differ in terms of the exact function that is assigned to them. In this Perspective, we discuss two proposed functions for neural oscillations — chunking and multiscale information integration — and evaluate their merits and limitations taking into account a fundamentally hierarchical nature of syntactic representations in natural languages. We highlight insights that provide a tangible starting point for a neurocognitive model of syntactic structure building.

<https://www.nature.com/articles/s41583-022-00659-5>

YANG YANG et al – Multiturn dialogue generation by modeling sentence-level and discourse-level contexts

Currently, multiturn dialogue models generate human-like responses based on pretrained language models given a dialogue history. However, most existing models simply concatenate dialogue histories, which makes it difficult to maintain a high degree of consistency throughout the generated text. We speculate that this is because the encoder ignores information about the hierarchical structure between sentences. In this paper, we propose a novel multiturn dialogue generation model that captures contextual information at the sentence level and at the discourse level during the encoding process. The context semantic information is dynamically modeled through a difference-aware module. A sentence order prediction training task is also designed to learn representation by reconstructing the order of disrupted sentences with a learning-to-rank algorithm. Experiments on the multiturn dialogue dataset, DailyDialog, demonstrate that our model substantially outperforms the baseline model in terms of both automatic and human evaluation metrics, generating more fluent and informative responses than the baseline model.

<https://www.nature.com/articles/s41598-022-24787-1>

SARA TORRES ORTIZ et al – Memory for own actions in parrots

The ability to recall one's past actions is a crucial prerequisite for mental self-representation and episodic memory. We studied whether blue-throated macaws, a social macaw species, can remember their previous actions. The parrots were trained to repeat four previously learned actions upon command. Test sessions included repeat trials, double repeat trials and trials without repeat intermixed to test if the parrots repeated correctly, only when requested and not relying on a representation of the last behavioral command. Following their success, the parrots also received sessions with increasing time delays preceding the repeat command and successfully mastered 12–15 s delays. The parrots successfully transferred the repeat command spontaneously at first trial to three newly trained behaviors they had never repeated before, and also succeeded in a second trial intermixed with already trained actions (untrained repeat tests). This corroborates that successful repeating is not just an artifact of intense training but that blue-throated macaws can transfer the abstract "repeat rule" to untrained action. It also implies that an important aspect of self-representation has evolved in this avian group and might be adaptive, which is consistent with the complex socio-ecological environment of parrots and previous demonstrations of their complex cognition.

<https://www.nature.com/articles/s41598-022-25199-x>

FRANCESCA BELLAGAMBA et al – Abstractness emerges progressively over the second year of life

Abstract words, terms not referring to here and now, are acquired slowly in infancy. They are difficult to acquire as they are more detached from sensory modalities than concrete words. Recent theories propose that, because of their complexity, other people are pivotal for abstract concepts' acquisition and use. Eight children (4 girls) and their mothers were observed longitudinally and extensively from 12 to 24 months of age. Video recordings of mother-infant free play with toys were done every two weeks in a laboratory setting with families in the USA. Children progressively use a range of words referring to abstract concepts, with a major shift from 12 to 15 months and again from 22 to 24 months, but the qualitative data testify an incremental growth of abstract concepts. We identified a progression in the acquisition of words denoting abstract concepts in relation to the overall productive vocabulary, suggesting that having more abstract terms in one's vocabulary promotes faster language acquisition.

<https://www.nature.com/articles/s41598-022-25426-5>

STUART K. WATSON, SUSAN P. LAMBETH & STEVEN J. SCHAPIRO – Innovative multi-material tool use in the pant-hoot display of a chimpanzee

'Pant-hoot displays' are a species-typical, multi-modal communicative behaviour in chimpanzees in which pant-hoot vocalisations are combined with varied behavioural displays. In both captivity and the wild, individuals commonly incorporate striking or throwing elements of their environment into these displays. In this case study, we present five videos of an unenculturated, captive, adult male chimpanzee combining a large rubber feeding tub with excelsior (wood wool) in a multi-step process, which was then integrated into the subject's pant-hoot displays as a percussive tool or 'instrument'. During the construction process, the subject demonstrated an understanding of the relevant properties of these materials, 'repairing' the tub to be a more functional drum when necessary. We supplement these videos with a survey of care staff from the study site for additional detail and context. Although care must be taken in generalising data from a single individual, the behaviour reported here hints at three intriguing features of chimpanzee communicative cognition: (1) it suggests a degree of voluntary control over vocal production, (2) it is a so-far unique example of compound tool innovation and use in communicative behaviour and (3) it may represent an example of forward planning in communicative behaviour. Each of these would represent hitherto undocumented dimensions of flexibility in chimpanzee communication, mapping fertile ground for future research.

<https://www.nature.com/articles/s41598-022-24770-w>

PeerJ

PAPERS

JAY W. SCHWARTZ & HAROLD GOUZOULES – Humans read emotional arousal in monkey vocalizations: evidence for evolutionary continuities in communication

Humans and other mammalian species communicate emotions in ways that reflect evolutionary conservation and continuity, an observation first made by Darwin. One approach to testing this hypothesis has been to assess the capacity to perceive the emotional content of the vocalizations of other species. Using a binary forced choice task, we tested perception of the emotional intensity represented in coos and screams of infant and juvenile female rhesus macaques (*Macaca mulatta*) by 113 human listeners without, and 12 listeners with, experience (as researchers or care technicians) with this species. Each stimulus pair contained one high- and one low-arousal vocalization, as measured at the time of recording by stress hormone levels for coos and the degree of intensity of aggression for screams. For coos as well as screams, both inexperienced and experienced participants accurately identified the high-arousal vocalization at significantly above-chance rates. Experience was associated with significantly greater accuracy with scream stimuli but not coo stimuli, and with a tendency to indicate screams as reflecting greater emotional intensity than coos. Neither measures of empathy, human emotion recognition, nor attitudes toward animal welfare showed any relationship with responses. Participants were sensitive to the fundamental frequency, noisiness, and duration of vocalizations; some of these tendencies likely facilitated accurate perceptions, perhaps due to evolutionary homologies in the physiology of arousal and vocal production between humans and macaques. Overall, our findings support a view of evolutionary continuity in emotional vocal communication. We discuss hypotheses about how distinctive dimensions of human nonverbal communication, like the expansion of scream usage across a range of contexts, might influence perceptions of other species' vocalizations.

<https://peerj.com/articles/14471/>

Philosophical Transactions of the Royal Society B

PAPERS

JENNIFER E. SMITH et al with JOAN B. SILK – Sex differences in cooperative coalitions: a mammalian perspective

In group-living species, cooperative tactics can offset asymmetries in resource-holding potential between individuals and alter the outcome of intragroup conflicts. Differences in the kinds of competitive pressures that males and females face might influence the benefits they gain from forming intragroup coalitions. We predicted that there would be a female bias in intragroup coalitions because females (1) are more like to live with kin than males are, and (2) compete over resources that are more readily shared than resources males compete over. We tested this main prediction using information about coalition formation across mammalian species and phylogenetic comparative analyses. We found that for nearly all species in which intragroup coalitions occur, members of both sexes participate, making this the typical mammalian pattern. The presence and frequency of female or male coalitions were not strongly associated with key socio-ecological factors like resource defensibility, sexual dimorphism or philopatry. This suggests that once the ability to form intragroup coalitions emerges in one sex, it is likely to emerge in the other sex as well and that there is no strong phylogenetic legacy of sex differences in this form of cooperation.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0426>

STEPHANIE A. FOX et al with RICHARD WRANGHAM – Weak, but not strong, ties support coalition formation among wild female chimpanzees

In social species, individuals may be able to overcome competitive constraints on cooperation by leveraging relationships with familiar, tolerant partners. While strong social ties have been linked to cooperation in several social mammals, it is unclear the extent to which weak social ties can support cooperation, particularly among non-kin. We tested the hypothesis that weakly affiliative social relationships support cooperative coalition formation using 10 years of behavioural data on wild female chimpanzees. Female chimpanzees typically disperse and reside with non-kin as adults. Their social relationships are differentiated but often relatively weak, with few dyads sharing strong bonds. Females occasionally form aggressive coalitions together. Three measures of relationship quality—party association, five-metre proximity and whether a dyad groomed—positively predicted coalitions, indicating that relationship quality influenced coalition partnerships. However, dyads that groomed frequently did not form more coalitions than dyads that groomed occasionally, and kin did not cooperate more than expected given their relationship quality. Thus, strong bonds and kinship did not bolster cooperation. We conclude that cooperative coalitions among female chimpanzees depend on social tolerance but do not require strong bonds. Our findings highlight social tolerance as a distinct pathway through which females can cultivate cooperative relationships.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0427>

CHRISTOPHER YOUNG & MARTHA M. ROBBINS – Association patterns of female gorillas

Social interactions ultimately impact health and fitness in gregarious mammals. However, research focusing on the strength of affiliative interactions has primarily been conducted on female philopatric species. Gorillas provide an interesting counterpoint to previous research as females emigrate multiple times throughout their lives. We compare female–female

association strength, duration and consistency in wild mountain (*Gorilla beringei beringei*) and western gorillas (*Gorilla gorilla gorilla*). Additionally, we examine whether the alpha male influences female association strength and if these associations are an artefact of both females concurrently in spatial proximity of the alpha male. In this between-species comparison, female gorillas had differentiated association patterns that were consistent on average for 2 years. The alpha males did not influence female association strength, with associations being similar in his presence or absence. Finally, we found more variability in association patterns among mountain gorillas with higher average association scores and higher proportion of 'preferred associates' than western gorillas. The rare dispersal pattern in the *Gorilla* genus may lead to greater flexibility in female association patterns than in species exhibiting female philopatry and strong kinship bonds. This may echo ancestral human society and provide new evidence to help us understand the evolution of modern human society.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0429>

K. E. STARKWEATHER et al – Shodagor women cooperate across domains of work and childcare to solve an adaptive problem

Across human societies, women's economic production and their contributions to childcare are critical in supporting reproductive fitness for themselves, their spouses and children. Yet, the necessity of performing both work and childcare tasks presents women with an adaptive problem in which they must determine how best to allocate their time and energy between these tasks. Women often use cooperative relationships with alloparents to solve this problem, but whether or not women cooperate across different domains (e.g. work and childcare) to access alloparents remains relatively under-explored. Using social network data collected with Shodagor households in Bangladesh, we show that women who need childcare help in order to work draw on cooperative work partners as potential alloparents, and that all women rely heavily on kin, but not reciprocal cooperation for childcare help. These results indicate that Shodagor women strategize to create work and childcare relationships in ways that help solve the adaptive problem they face. We discuss the implications of our results and the example provided by Shodagor women for a broader understanding of women's cooperative relationships, including the importance of socio-ecological circumstances and gendered divisions of labour in shaping women's cooperative strategies.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0433>

THOMAS S. KRAFT et al with MICHAEL GURVEN – Female cooperative labour networks in hunter-gatherers and horticulturalists

Cooperation in food acquisition is a hallmark of the human species. Given that costs and benefits of cooperation vary among production regimes and work activities, the transition from hunting-and-gathering to agriculture is likely to have reshaped the structure of cooperative subsistence networks. Hunter-gatherers often forage in groups and are generally more interdependent and experience higher short-term food acquisition risk than horticulturalists, suggesting that cooperative labour should be more widespread and frequent for hunter-gatherers. Here we compare female cooperative labour networks of Batek hunter-gatherers of Peninsular Malaysia and Tsimane forager-horticulturalists of Bolivia. We find that Batek foraging results in high daily variation in labour partnerships, facilitating frequent cooperation in diffuse networks comprised of kin and non-kin. By contrast, Tsimane horticulture involves more restricted giving and receiving of labour, confined mostly to spouses and primary or distant kin. Tsimane women also interact with few individuals in the context of hunting/fishing activities and forage mainly with spouses and primary kin. These differences give rise to camp- or village-level networks that are more modular (have more substructure when partitioned) among Tsimane horticulturalists. Our findings suggest that subsistence activities shape the formation and extent of female social networks, particularly with respect to connections with other women and non-kin. We discuss the implications of restricted female labour networks in the context of gender relations, power dynamics and the adoption of farming in humans.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0431>

JOSEPH HACKMAN & KAREN L. KRAMER – Kin networks and opportunities for reproductive cooperation and conflict among hunter-gatherers

Little is known about the potential for reproductive conflict among hunter-gatherer populations, who are characterized by bilateral kinship ties, flexible residential mobility, and high offspring mortality. To assess the potential for reproductive conflict, we use longitudinal residence and reproductive history data for two bands of South American foragers. Using multilevel logistic regressions (N = 44 women, N = 712 person years), we examine how yearly measures of (i) camp composition, (ii) distribution of female kin and (iii) a woman's position in a female kinship network impact the likelihood of giving birth or experiencing a child's death. We compare conflict models to a demographic model that accounts for the proportion of women giving birth in a given year. Contrary to conflict models, results show that the odds of giving birth increase with the presence of highly related women. However, the odds of experiencing an offspring death are insensitive to the presence of coresident women. Network measures of closeness and centrality in the female kin network also show no significant effect on reproductive outcomes. Furthermore, chances of both births and deaths increase in years when proportionally more women are giving birth. We argue that demographic stochasticity relating to ecological conditions best predicts reproductive outcomes for women.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0434>

ALESSANDRA CASSAR & MARY RIGDON – Sustaining the potential for cooperation as female competitive strategy

The lower female competitiveness often found in economic experiments presents a puzzle. If accumulating wealth and reaching high status affords women essential benefits for themselves and their children, why do women appear less competitive? By looking at behavioural strategies from a cooperative breeding perspective, we propose that women may have evolved an adaptation to strategically suppress competitiveness to elicit cooperation for the benefit of raising offspring. To support this idea, we review the literature that shows that women's behaviour is, in general, more reactive than men's to the social conditions of the different games. In particular, we focus on our experimental work where we show that women are not less competitive than men once the games evoke a parenting frame (by substituting cash with rewards that could benefit the participants' offspring), a gender-typical one (by using vouchers for prizes acceptable as domain of female interests), or include a prosocial option (by allowing winners to share some of the gains with losers). We conclude that, for women, nurturing the potential for cooperation intertwines with competitiveness to produce a complex, adaptive female social strategy.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0440>

GIULIANA SPADARO, SHUXIAN JIN & DANIEL BALLIET – Gender differences in cooperation across 20 societies: a meta-analysis

Past research hypothesized that men and women differ in their tendency to cooperate with strangers in situations that involve a conflict of interests. However, recent empirical research has provided converging evidence that men and women cooperate to a similar extent, and that differences in cooperation can emerge in response to specific situational and societal contexts. Here we analyse six decades of empirical research on human cooperation using social dilemmas (1961–2017, $k = 126$) conducted across 20 industrialized societies, testing pre-registered hypotheses derived from evolutionary theory and social role theory. Overall, our findings revealed little-to-no evidence for an association between gender and cooperation using different meta-analytic approaches. We did not find within-study differences in cooperation between men and women ($d = 0.011$, 95% CI $[-0.038, 0.060]$). However, cooperation was slightly higher across studies with predominantly female samples ($k = 972$). In addition, contrary to our predictions, gender differences in cooperation did not emerge in response to the degree of conflicting interests in the situation, and societal levels of gender equality and economic development. We discuss the implications of these findings for our understanding of gender differences in cooperation.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0438>

BAILEY HOUSE, JOAN B. SILK & KATHERINE MCAULIFFE – No strong evidence for universal gender differences in the development of cooperative behaviour across societies

Human cooperation varies both across and within societies, and developmental studies can inform our understanding of the sources of both kinds of variation. One key candidate for explaining within-society variation in cooperative behaviour is gender, but we know little about whether gender differences in cooperation take root early in ontogeny or emerge similarly across diverse societies. Here, we explore two existing cross-cultural datasets of 4- to 15-year-old children's preferences for equality in experimental tasks measuring prosociality (14 societies) and fairness (seven societies), and we look for evidence of (i) widespread gender differences in the development of cooperation, and (ii) substantial societal variation in gender differences. This cross-cultural approach is crucial for revealing universal human gender differences in the development of cooperation, and it helps answer recent calls for greater cultural diversity in the study of human development. We find that gender has little impact on the development of prosociality and fairness within these datasets, and we do not find much evidence for substantial societal variation in gender differences. We discuss the implications of these findings for our knowledge about the nature and origin of gender differences in cooperation, and for future research attempting to study human development using diverse cultural samples.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0439>

KAREN L. KRAMER – Female cooperation: evolutionary, cross-cultural and ethnographic evidence

Women and girls cooperate with each other across many domains and at many scales. However, much of this information is buried in the ethnographic record and has been overlooked in theoretic constructions of the evolution of human sociality and cooperation. The assumed primacy of male bonding, hunting, patrilocality and philopatry has dominated the discussion of cooperation without balanced consideration. A closer look at the ethnographic record reveals that in addition to cooperative childcare and food production, women and girls collectively form coalitions, have their own cooperative political, ceremonial, economic and social institutions, and develop female-based exchange and support networks. The numerous ethnographic examples of female cooperation urge reconsideration of gender stereotypes and the limits of female cooperation. This review brings together theoretic, cross-cultural and cross-lifespan research on female cooperation to present a more even and empirically supported view of female sociality. Following the lead from trends in evolutionary biology and sexual selection theory, the hope going forward is that the focus shifts from rote characterizations of sex differences to highlighting sources of variation and conditions that enhance or constrain female cooperative engagement.

<https://royalsocietypublishing.org/doi/10.1098/rstb.2021.0425>

SIOBHÁN M. MATTISON et al – Does gender structure social networks across domains of cooperation? An exploration of gendered networks among matrilineal and patrilineal Mosuo

Cooperative networks are essential features of human society. Evolutionary theory hypothesizes that networks are used differently by men and women, yet the bulk of evidence supporting this hypothesis is based on studies conducted in a limited range of contexts and on few domains of cooperation. In this paper, we compare individual-level cooperative networks from two communities in Southwest China that differ systematically in kinship norms and institutions—one matrilineal and one patrilineal—while sharing an ethnic identity. Specifically, we investigate whether network structures differ based on prevailing kinship norms and type of gendered cooperative activity, one woman-centred (preparation of community meals) and one man-centred (farm equipment lending). Our descriptive results show a mixture of ‘feminine’ and ‘masculine’ features in all four networks. The matrilineal meals network stands out in terms of high degree skew. Exponential random graph models reveal a stronger role for geographical proximity in patrilineal and a limited role of affinal relatedness across all networks. Our results point to the need to consider domains of cooperative activity alongside gender and cultural context to fully understand variation in how women and men leverage social relationships toward different ends.

<https://royalsocietypublishing.org/doi/10.1098/rstb.2021.0436>

G. L. VALE, C. COUGHLIN & S. F. BROSANAN – The importance of thinking about the future in culture and cumulative cultural evolution

Thinking about possibilities plays a critical role in the choices humans make throughout their lives. Despite this, the influence of individuals' ability to consider what is possible on culture has been largely overlooked. We propose that the ability to reason about future possibilities or prospective cognition, has consequences for cultural change, possibly facilitating the process of cumulative cultural evolution. In particular, by considering potential future costs and benefits of specific behaviours, prospective cognition may lead to a more flexible use of cultural behaviours. In species with limited planning abilities, this may lead to the development of cultures that promote behaviours with future benefits, circumventing this limitation. Here, we examine these ideas from a comparative perspective, considering the relationship between human and nonhuman assessments of future possibilities and their cultural capacity to invent new solutions and improve them over time. Given the methodological difficulties of assessing prospective cognition across species, we focus on planning, for which we have the most data in other species. Elucidating the role of prospective cognition in culture will help us understand the variability in when and how we see culture expressed, informing ongoing debates, such as that surrounding which social learning mechanisms underlie culture.

<https://royalsocietypublishing.org/doi/10.1098/rstb.2021.0349>

PAUL L. HARRIS – Young children share imagined possibilities: evidence for an early-emerging human competence

Children's ability to reason about junctures leading to two different destinations emerges slowly, with convergent evidence for a conceptual watershed at approximately 4 years. Young children and great apes misrepresent such junctures, planning for only one expected outcome. However, singular possibilities, as opposed to two mutually exclusive possibilities, are readily imagined, shared and acted upon by 2- and 3-year-olds. Analysis of three domains supports this claim. First, 2- and 3-year-olds respond appropriately to pretend spatial displacements enacted for them by a play partner. Second, they not only respond accurately to claims regarding an alleged but unwitnessed spatial displacement, they also ask their interlocutors about the possible whereabouts of missing objects and absent persons. Third, in ordinary conversation, they appropriately mark some of their assertions as possibilities rather than actualities. In summary, although the ability to reason about mutually inconsistent possibilities develops slowly in the preschool years, the ability to imagine and share information about possibilities is evident among 2- and 3-year-olds. Nothing comparable has been observed in great apes. Young children's ability to entertain shared possibilities diverges from that of non-human primates well before any potential watershed at 4 years with respect to the understanding of mutually exclusive possibilities.

<https://royalsocietypublishing.org/doi/10.1098/rstb.2022.0022>

PLoS One**PAPERS****YUE ZHANG et al – Luminance effects on pupil dilation in speech-in-noise recognition**

There is an increasing interest in the field of audiology and speech communication to measure the effort that it takes to listen in noisy environments, with obvious implications for populations suffering from hearing loss. Pupillometry offers one avenue to make progress in this enterprise but important methodological questions remain to be addressed before such tools can serve practical applications. Typically, cocktail-party situations may occur in less-than-ideal lighting conditions, e.g. a pub or a restaurant, and it is unclear how robust pupil dynamics are to luminance changes. In this study, we first used a well-known paradigm where sentences were presented at different signal-to-noise ratios (SNR), all conducive of good intelligibility. This enabled us to replicate findings, e.g. a larger and later peak pupil dilation (PPD) at adverse SNR, or when the sentences were misunderstood, and to investigate the dependency of the PPD on sentence duration. A second experiment reiterated two of the SNR levels, 0 and +14 dB, but measured at 0, 75, and 220 lux. The results showed that the impact of luminance on the SNR effect was non-monotonic (sub-optimal in darkness or in bright light), and as such, there is no trivial way to derive pupillary metrics that are robust to differences in background light, posing considerable constraints for applications of

pupillometry in daily life. Our findings raise an under-examined but crucial issue when designing and understanding listening effort studies using pupillometry, and offer important insights to future clinical application of pupillometry across sites.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0278506>

XUAN WU et al – Combined spectral and speech features for pig speech recognition

The sound of the pig is one of its important signs, which can reflect various states such as hunger, pain or emotional state, and directly indicates the growth and health status of the pig. Existing speech recognition methods usually start with spectral features. The use of spectrograms to achieve classification of different speech sounds, while working well, may not be the best approach for solving such tasks with single-dimensional feature input. Based on the above assumptions, in order to more accurately grasp the situation of pigs and take timely measures to ensure the health status of pigs, this paper proposes a pig sound classification method based on the dual role of signal spectrum and speech. Spectrograms can visualize information about the characteristics of the sound under different time periods. The audio data are introduced, and the spectrogram features of the model input as well as the audio time-domain features are complemented with each other and passed into a pre-designed parallel network structure. The network model with the best results and the classifier were selected for combination. An accuracy of 93.39% was achieved on the pig speech classification task, while the AUC also reached 0.99163, demonstrating the superiority of the method. This study contributes to the direction of computer vision and acoustics by recognizing the sound of pigs. In addition, a total of 4,000 pig sound datasets in four categories are established in this paper to provide a research basis for later research scholars.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0276778>

LUCAS SANTANA SOUZA, YASUHIKO IRIE & SHIGETOSHI EDA – Black Queen Hypothesis, partial privatization, and quorum sensing evolution

Microorganisms produce costly cooperative goods whose benefit is partially shared with nonproducers, called ‘mixed’ goods. The Black Queen Hypothesis predicts that partial privatization has two major evolutionary implications. First, to favor strains producing several types of mixed goods over nonproducing strains. Second, to favor the maintenance of cooperative traits through different strains instead of having all cooperative traits present in a single strain (metabolic specialization). Despite the importance of quorum sensing regulation of mixed goods, it is unclear how partial privatization affects quorum sensing evolution. Here, we studied the influence of partial privatization on the evolution of quorum sensing. We developed a mathematical population genetics model of an unstructured microbial population considering four strains that differ in their ability to produce an autoinducer (quorum sensing signaling molecule) and a mixed good. Our model assumes that the production of the autoinducers and the mixed goods is constitutive and/or depends on quorum sensing. Our results suggest that, unless autoinducers are costless, partial privatization cannot favor quorum sensing. This result occurs because with costly autoinducers: (1) a strain that produces both autoinducer and goods (fully producing strain) cannot persist in the population; (2) the strain only producing the autoinducer and the strain producing mixed goods in response to the autoinducers cannot coexist, i.e., metabolic specialization cannot be favored. Together, partial privatization might have been crucial to favor a primordial form of quorum sensing—where autoinducers were thought to be a metabolic byproduct (costless)—but not the transition to nowadays costly autoinducers.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0278449>

Proceedings of the Royal Society B

PAPERS

OLOF LEIMAR & REDOUAN BSHARY – Effects of local versus global competition on reproductive skew and sex differences in social dominance behaviour

Social hierarchies are often found in group-living animals. The hierarchy position can influence reproductive success (RS), with a skew towards high-ranking individuals. The amount of aggression in social dominance varies greatly, both between species and between males and females within species. Using game theory we study this variation by taking into account the degree to which reproductive competition in a social group is mainly local to the group, emphasizing within-group relative RS, or global to a larger population, emphasizing an individual’s absolute RS. Our model is similar to recent approaches in that reinforcement learning is used as a behavioural mechanism allowing social-hierarchy formation. We test two hypotheses. The first is that local competition should favour the evolution of mating or foraging interference, and thus of reproductive skew. Second, decreases in reproductive output caused by an individual’s accumulated fighting damage, such as reduced parenting ability, will favour less intense aggression but should have little influence on reproductive skew. From individual-based simulations of the evolution of social dominance and interference, we find support for both hypotheses. We discuss to what extent our results can explain observed sex differences in reproductive skew and social dominance behaviour.

<https://royalsocietypublishing.org/doi/10.1098/rspb.2022.2081>

Quarterly Review of Biology

REVIEWS

HAGGEO CADENAS – The Pleistocene Social Contract

Review of 'The Pleistocene Social Contract: Culture and Cooperation in Human Evolution' by Kim Sterelny, Oxford University Press (2021).

<https://www.journals.uchicago.edu/doi/abs/10.1086/722658>

Royal Society Open Science

PAPERS

CAROLINE ARVIDSSON, DAVID PAGMAR & JULIA UDDÉN – When did you stop speaking to yourself? Age-related differences in adolescents' world knowledge-based audience design

The ability to adapt utterances to the world knowledge of one's addressee is undeniably ubiquitous in human social cognition, but its development and association with other cognitive mechanisms during adolescence have not been studied. In an online production task, we measured the ability of children entering adolescence (ages 11–12, M = 11.8, N=29, 17 girls) and adolescents (ages 15–16, M = 15.9, N=29, 17 girls) to tailor referential expressions in accordance with the inferred world knowledge of their addressee—an ability we refer to as world knowledge-based audience design (AD). A post-test survey showed that both age groups held similar assumptions about the addressees' knowledge of referents, but the younger age group did not consistently adapt their utterances in accordance with these assumptions during online production, resulting in a significantly improved AD behaviour across age groups. We also investigated the reliance of AD on executive functions (EF). Executive functioning (as reflected by performance on the Wisconsin card sorting task) increased significantly with age, but did not explain the age-related increase in AD performance. We thus provide evidence in support of an adolescent development of world knowledge-based AD over and above development of EF.

<https://royalsocietypublishing.org/doi/10.1098/rsos.220305>

GAL BADIHI et al with KLAUS ZUBERBÜHLER & CATHERINE HOBAITER – Flexibility in the social structure of male chimpanzees (*Pan troglodytes schweinfurthii*) in the Budongo Forest, Uganda

Individuals of social species experience competitive costs and social benefits of group living. Substantial flexibility in humans' social structure and the combination of different types of social structure with fission–fusion dynamics allow us to live in extremely large groups—overcoming some of the costs of group living while capitalizing on the benefits. Non-human species also show a range of social strategies to deal with this trade-off. Chimpanzees are an archetypical fission–fusion species, using dynamic changes in day-to-day association to moderate the costs of within-group competition. Using 4 years of association data from two neighbouring communities of East African chimpanzees (*Pan troglodytes schweinfurthii*), we describe an unexplored level of flexibility in chimpanzee social structure. We show that males from the larger Waibira community (N = 24–31) exhibited additional structural levels of semi-stable core–periphery society, while males from the smaller Sonso community (N = 10–13) did not. This novel core–periphery pattern adds to previous results describing alternative modular social structure in other large communities of chimpanzees. Our data support the hypothesis that chimpanzees can incorporate a range of strategies in addition to fission–fusion to overcome costs of social living, and that their social structures may be closer to that of modern humans than previously described.

<https://royalsocietypublishing.org/doi/10.1098/rsos.220904>

Trends in Cognitive Sciences

PAPERS

BRIAN MATHIAS & KATHARINA VON KRIEGSTEIN – Enriched learning: behavior, brain, and computation

The presence of complementary information across multiple sensory or motor modalities during learning, referred to as multimodal enrichment, can markedly benefit learning outcomes. Why is this? Here, we integrate cognitive, neuroscientific, and computational approaches to understanding the effectiveness of enrichment and discuss recent neuroscience findings indicating that crossmodal responses in sensory and motor brain regions causally contribute to the behavioral benefits of enrichment. The findings provide novel evidence for multimodal theories of enriched learning, challenge assumptions of longstanding cognitive theories, and provide counterevidence to unimodal neurobiologically inspired theories. Enriched educational methods are likely effective not only because they may engage greater levels of attention or deeper levels of processing, but also because multimodal interactions in the brain can enhance learning and memory.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00268-6](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00268-6)

BENEDETTO DE MARTINO & AURELIO CORTESE – Goals, usefulness and abstraction in value-based choice

Colombian drug lord Pablo Escobar, while on the run, purportedly burned two million dollars in banknotes to keep his daughter warm. A stark reminder that, in life, circumstances and goals can quickly change, forcing us to reassess and modify our values on-the-fly. Studies in decision-making and neuroeconomics have often implicitly equated value to reward, emphasising the hedonic and automatic aspect of the value computation, while overlooking its functional (concept-like) nature. Here we outline the computational and biological principles that enable the brain to compute the usefulness of an

option or action by creating abstractions that flexibly adapt to changing goals. We present different algorithmic architectures, comparing ideas from artificial intelligence (AI) and cognitive neuroscience with psychological theories and, when possible, drawing parallels.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00281-9](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00281-9)

Trends in Ecology and Evolution

PAPERS

LEE HSIANG LIOW, JOSEF UYEDA & GENE HUNT – Cross-disciplinary information for understanding macroevolution

Many different macroevolutionary models can produce the same observations. Despite efforts in building more complex and realistic models, it may still be difficult to distinguish the processes that have generated the biodiversity we observe. In this opinion we argue that we can make new progress by reaching out across disciplines, relying on independent data and theory to constrain macroevolutionary inference. Using mainly paleontological insights and data, we illustrate how we can eliminate less plausible or implausible models, and/or parts of parameter space, while applying comparative phylogenetic approaches. We emphasize that such cross-disciplinary insights and data can be drawn between many other disciplines relevant to macroevolution. We urge cross-disciplinary training, and collaboration using common-use databases as a platform for increasing our understanding.

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(22\)00280-4](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(22)00280-4)

DANIEL T. BLUMSTEIN, LOREN D. HAYES & NOA PINTER-WOLLMAN – Social consequences of rapid environmental change

While direct influences of the environment on population growth and resilience are well studied, indirect routes linking environmental changes to population consequences are less explored. We suggest that social behavior is key for understanding how anthropogenic environmental changes affect the resilience of animal populations. Social structures of animal groups are evolved and emergent phenotypes that often have demographic consequences for group members. Importantly, environmental drivers may directly influence the consequences of social structure or indirectly influence them through modifications to social interactions, group composition, or group size. We have developed a framework to study these demographic consequences. Estimating the strength of direct and indirect pathways will give us tools to understand, and potentially manage, the effect of human-induced rapid environmental changes.

[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(22\)00285-3](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(22)00285-3)

LEE HSIANG LIOW, JOSEF UYEDA & GENE HUNT – Cross-disciplinary information for understanding macroevolution

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