EAORC BULLETIN 1,014 – 20 November 2022

CONTENTS

NOTICES

PUBLICATION ALERTS

If you have had a paper or book published, or you see something which would be of interest to the group, please send me a publication alert so that I can include it in the newsletter. Many thanks to those who have already sent in alerts.
If there is a journal you feel I should be tracking on a regular basis, let me know.
And if you have any other ideas for extending the "EAORC experience", please contact me.

ACADEMIA.EDU – The Acheulian Site at Rodafnidia, Lisvori, on Lesbos,Greece: 2010-2012

In Katerina Harvati & Mirjana Roksandic (eds.), Paleoanthropology of the Balkans and Anatolia: Human Evolution and its Context, Springer, 119-138 (2016).

NENA GALANIDOU et al – The Acheulian Site at Rodafnidia, Lisvori, on Lesbos, Greece: 2010-2012

Rodafnidia is an Acheulian site on Lesbos Island, in the north-east Aegean Sea. This chapter presents the model that guided Paleolithic investigations on the island, the his-tory of research, and the results of the 2012 expedition of systematic work in the field, which consisted of surface survey and excavation. The typology and technology of lithic artifacts from the surface and the uppermost Unit 1, as well as the first cluster of luminescence dates, firmly place the early component of the site in the Middle Pleistocene. The Acheulian industry derives from fluvio-lacustrine deposits at a locale with abundant fresh-water and lithic resources. Situated in the north-east Mediterranean Basin, an area where research on early hominin prehistory is intensifying, Rodafnidia holds the potential to contribute to Eurasian Lower Paleolithic archaeology and fill the gap in our under-standing of early hominin presence and activity where Asia meets Europe.
https://www.academia.edu/31164962/The_Acheulian_Site_at_Rodafnidia_Lisvori_on_Lesbos_Greece_2010_2012

RESEARCHGATE – The Evolution of Primate Short-Term Memory

In Animal Behavior and Cognition 7:2, 151-158 (2020).

MANYPRIMATES et al with JUDITH M. BURKART & JOSEP CALL – The Evolution of Primate Short-Term Memory

Abstract – Short-term memory is implicated in a range of cognitive abilities and is critical for understanding primate cognitive evolution. To investigate the effects of phylogeny, ecology and sociality on short-term memory, we tested the largest and most diverse primate sample to date (421 non-human primates across 41 species) in an experimental delayed-response task. Our results confirm previous findings that longer delays decrease memory performance across species and taxa. Our analyses demonstrate a considerable contribution of phylogeny over ecological and social factors on the distribution of short-term memory performance in primates; closely related species had more similar short-term memory abilities. Overall, individuals in the branch of Hominoidea performed better compared to Cercopithecoidea, who in turn performed above Platyrrhini and Strepsirrhini. Interdependencies between phylogeny and socioecology of a given species presented an obstacle to disentangling the effects of each of these factors on the evolution of short-term memory capacity. However, this study offers an important step forward in understanding the interspecies and individual variation in short-term memory ability by providing the first phylogenetic reconstruction of this trait's evolutionary history. The dataset constitutes a unique resource for studying the evolution of primate cognition and the role of short-term memory in other cognitive abilities.
https://www.researchgate.net/publication/365155041_The_Evolution_of_Primate_Short-Term_Memory

NEWS

NATURE BRIEFING – Bronze hand might rewrite history of Basque

A flat, life-size bronze hand engraved with symbols could prove the existence of written Vasconic — the language that developed into Basque. "This piece upends how we'd thought about the Vascones and writing until now," says linguist Joaquín Gorrochategui, who was involved in the analysis by the Aranzadi Science Society, a Basque research institute. "We were almost convinced that the ancient Vascones were illiterate and didn't use writing except when it came to minting coins."
https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=cf5aab4d79&e=1db4b9a19b

SAPIENS – Neanderthal Bones: Signs of Their Sex Lives

With whom did Neanderthals mate? In some cases, inbreeding looks likely.
https://www.sapiens.org/biology/neanderthal-sex-lives-bones/

SAPIENS – Who Started the First Fire?

Humans' ability to control fire is among the most important technological advances in our evolutionary history. Research on Neanderthal cave sites in France is offering new insights on this old enigma.
https://www.sapiens.org/archaeology/neanderthal-fire/

SAPIENS – Imagining the Neanderthal's World

In Kindred, an archaeologist urges readers to rethink a long-maligned member of humanity's family tree.
https://www.sapiens.org/archaeology/kindred-neanderthal-book/

SOCIETY FOR SCIENCE – 50 years ago, Stonehenge's purpose mystified scientists. It still does

In 1972, scientists thought Stonehenge may have been a calendar. Today, we still don't know its purpose, but we have gained insight on its origin.
https://www.sciencenews.org/article/50-years-ago-stonehenge-purpose-origin

THE CONVERSATION – 8 billion people: how different the world would look if Neanderthals had prevailed

Neanderthals were wiped out by chance changes in the environment. The rise of Homo sapiens wasn't inevitable.
https://theconversationuk.cmail19.com/t/r-l-tjtjkha-khhlilahh-w/

PUBLICATIONS

Current Biology

PAPERS

CHRISTOPH GRÜTER & LUCY HAYES – Sociality is a key driver of foraging ranges in bees

Bees are important pollinators of wild and agricultural plants and there is increasing evidence that many bee populations decline due to a combination of habitat loss, climate change, pesticides, and other anthropogenic effects. One trait that shapes both their role in plant reproduction and their exposure to anthropogenic stressors is the distance at which bees forage. It has been suggested that bee sociality and diet affect bee foraging ranges, but how these traits and their potential

interactions drive foraging ranges remains unclear. We analyzed flight distance data from 90 bee species and developed an agent-based model to test how social, dietary, and environmental factors affect foraging ranges. We confirm that bee sociality is positively associated with foraging range, with average-sized social bees foraging up to 3 times farther from the nest than size-matched solitary bees. A comparative analysis of social bees and computer simulations shows that foraging distances increase with colony size, supporting the hypothesis that greater foraging distances are an emergent property of increasing colony sizes in a food-limited environment. Flower constancy and communication, two traits often found in social bees, synergistically increase foraging distances further in many simulated environments. Diet breadth (oligolectic versus polylectic diet), on the other hand, does not appear to affect foraging ranges in solitary bees. Our findings suggest that multiple traits linked to bee sociality explain why social bees have greater foraging ranges. This has implications for predicting pollination services and for developing effective conservation strategies for bees and isolated plant populations.
https://www.cell.com/current-biology/fulltext/S0960-9822(22)01712-2

eLife

PAPERS

JAMES C PANG et al – Evolutionary shaping of human brain dynamics

The human brain is distinct from those of other species in terms of size, organization, and connectivity. How do structural evolutionary differences drive patterns of neural activity enabling brain function? Here, we combine brain imaging and biophysical modeling to show that the anatomical wiring of the human brain distinctly shapes neural dynamics. This shaping is characterized by a narrower distribution of dynamic ranges across brain regions compared with that of chimpanzees, our closest living primate relatives. We find that such a narrow dynamic range distribution supports faster integration between regions, particularly in transmodal systems. Conversely, a broad dynamic range distribution as seen in chimpanzees facilitates brain processes relying more on neural interactions within specialized local brain systems. These findings suggest that human brain dynamics have evolved to foster rapid associative processes in service of complex cognitive functions and behavior.
https://elifesciences.org/articles/80627

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/10.1098/rsif.2022.0570

iScience

PAPERS

XIXIAN MA & SHUHUA XU – Archaic introgression contributed to the pre-agriculture adaptation of vitamin B1 metabolism in East Asia

Thiamine (vitamin B1) is an essential micronutrient. Genes involved in thiamine metabolisms, such as SLC19A2, SLC35F3, and SLC35F4, were assumed to be underlying positive selection in East Asians, but the detailed mechanism remains unknown. Here, we analyzed genome data of 3,823 individuals representing 223 global populations and identified the adaptive haplotypes at thiamine genes. Interestingly, the putative adaptive haplotype at SLC35F4 was of Neanderthal ancestry, while that at SLC35F3 was also likely of archaic origins. Leveraging new methods and available ancient DNA data, we further demonstrated that the beneficial haplotypes reached a high frequency at least 10,000 years ago and are maintained persistently in present-day East Asians. We argue that pathogens, rather than agriculture developed ~10,000 years ago in East Asia, were likely the initial driving force of the putative positive selection. Notably, the first American people did not carry the putative adaptive haplotype at SLC35F4.
https://www.cell.com/iscience/fulltext/S2589-0042(22)01886-7

WENJING YANG et al – Comparative immune-relevant transcriptome reveals the evolutionary basis of complex traits

Comparing transcriptome can help us reveal the genetic and evolutionary architecture underlying complex phenotypes within and between species. Here, by analyzing 386 publicly available RNA sequencing samples using a uniform

bioinformatics pipeline, we systematically compared expression profiles of 10 immune-relevant tissues across human, mouse, pig, cattle, sheep, and chicken. In general, we demonstrated that gene expression of orthologous genes was conserved within tissues across species. By integrating our findings with results of genome-wide association studies (GWAS) from 17 health-relevant traits in humans and 16,539 health-relevant quantitative trait loci (QTLs) in animals, we found that transcriptionally conserved genes were significantly enriched for more heritability of complex traits, compared to species-specific genes. In conclusion, our results advanced the knowledge of the transcriptome evolution of immune tissues, and demonstrated that multi-species transcriptome comparison is highly informative for understanding the genetics of complex traits/disease.
https://www.cell.com/iscience/fulltext/S2589-0042(22)01844-2

MATT D. ANDERSON et al – The time-course of real-world scene perception: spatial and semantic processing
Real-world scene perception unfolds remarkably quickly, yet the underlying visual processes are poorly understood. Space-centered theory maintains that a scene's spatial structure (e.g., openness, mean depth) can be rapidly recovered from low-level image statistics. In turn, the statistical relationship between a scene's spatial properties and semantic content allows for semantic identity to be inferred from its layout. We tested this theory by investigating (i) the temporal dynamics of spatial and semantic perception in real-world scenes, and (ii) dependencies between spatial and semantic judgements. Participants viewed backward-masked images for 13.3 to 106.7 msecs, and identified the semantic (e.g., beach, road) or spatial structure (e.g., open, closed-off) category. We found no temporal precedence of spatial discrimination relative to semantic discrimination. Computational analyses further suggest that, instead of using spatial layout to infer semantic categories, humans exploit semantic information to discriminate spatial structure categories. These findings challenge traditional 'bottom-up' views of scene perception.
https://www.cell.com/iscience/fulltext/S2589-0042(22)01905-8

Mind & Language

PAPERS

GREYSON ABID – Recognition and the perception–cognition divide
Recent discussions have fixated on the distinction between perception and cognition. How should recognition be understood in light of this distinction? The relevant sense of recognition involves a sensitivity to particulars from one's past. Recognizing the face of a familiar friend is one instance of this phenomenon, as is recognizing an object or place that one has viewed before. In this article, I argue that recognition is an interface capacity that straddles the border between perception and cognition.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12362

BENJAMIN KOZUCH – Underwhelming force: Evaluating the neuropsychological evidence for higher-order theories of consciousness
Proponents of the higher-order (HO) theory of consciousness (e.g., Lau and Rosenthal) have recently appealed to brain lesion evidence to support their thesis that mental states are conscious when and only when represented by other mental states. This article argues that this evidence fails to support HO theory, doing this by first determining what kinds of conscious deficit should result when HO state-producing areas are damaged, then arguing that these kinds of deficit do not occur in the studies to which HO theorists appeal. The article also develops an apparatus that can be used to evaluate whether other lesion evidence confirms or disconfirms HO theory.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12363

MATTHIAS MICHEL & ADRIEN DOERIG – A new empirical challenge for local theories of consciousness
Local theories of consciousness state that one is conscious of a feature if it is adequately represented and processed in sensory brain areas, given some background conditions. We challenge the core prediction of local theories based on long-lasting postdictive effects demonstrating that features can be represented for hundreds of milliseconds in perceptual areas without being consciously perceived. Unlike previous empirical data aimed against local theories, localists cannot explain these effects away by conjecturing that subjects are phenomenally conscious of features that they cannot report. We also discuss alternative explanations that localists could offer.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12319

ELIOT MICHAELSON – Speaker's reference, semantic reference, sneaky reference
According to what is perhaps the dominant picture of reference, what a referential term refers to in a context is determined by what the speaker intends for her audience to identify as the referent. I argue that this sort of broadly Gricean view entails, counterintuitively, that it is impossible to knowingly use referential terms in ways that one expects or intends to be misunderstood. Then I sketch an alternative which can better account for such opaque uses of language, or what I call "sneaky reference." I close by reflecting on the ramifications of these arguments for the theory of meaning more broadly.
https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12349

FRANCESCO PUPA – Determiners are phrases
It is generally thought that definite determiners exclusively mark nouns as definite. In several languages, however, definite determiners may modify both nouns and verbs. As I will argue, the existence of these "multi-functional" elements suggests that determiners are in fact phrases. This syntactic move has a philosophical payoff. Among other things, it allows us to cast Donnellan's distinction as an ordinary consequence of the context-invariant compositional semantics of natural language, not as a matter of contextual manipulation or lexical ambiguity. Multi-functional determiners show us that Donnellan's distinction is, contra Donnellan, a matter of grammar.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12340

LUCA GASPARRI et al – Notions of arbitrariness
Arbitrariness is a distinctive feature of human language, and a growing body of comparative work is investigating its presence in animal communication. But what is arbitrariness, exactly? We propose to distinguish four notions of semiotic arbitrariness: a notion of opaque association between sign forms and semiotic functions, one of sign-function mapping optionality, one of acquisition-dependent sign-function coupling, and one of lack of motivatedness. We characterize these notions, illustrate the benefits of keeping them apart, and describe two reactions to our proposal: abandoning arbitrariness-talk in favor of the newly introduced conceptual vocabulary, or feeding the distinctions back into the parent concept.
https://onlinelibrary.wiley.com/doi/abs/10.1111/mila.12443

Nature

NEWS

Pressure to publish is 'fuelling illegal practices in palaeontology'
More safeguards and stronger journal policies are needed to curb the problem, say authors of analysis on publication trends.
https://www.nature.com/articles/d41586-022-03745-x

Nature Communications

PAPERS

GABRIELE SCORRANO et al – Genomic ancestry, diet and microbiomes of Upper Palaeolithic hunter-gatherers from San Teodoro cave
Recent improvements in the analysis of ancient biomolecules from human remains and associated dental calculus have provided new insights into the prehistoric diet and genetic diversity of our species. Here we present a multi-omics study, integrating metagenomic and proteomic analyses of dental calculus, and human ancient DNA analysis of the petrous bones of two post-Last Glacial Maximum (LGM) individuals from San Teodoro cave (Italy), to reconstruct their lifestyle and the post-LGM resettlement of Europe. Our analyses show genetic homogeneity in Sicily during the Palaeolithic, representing a hitherto unknown Italian genetic lineage within the previously identified Villabruna cluster. We argue that this lineage took refuge in Italy during the LGM, followed by a subsequent spread to central-western Europe. Analysis of dental calculus showed a diet rich in animal proteins which is also reflected on the oral microbiome composition. Our results demonstrate the power of this approach in the study of prehistoric humans and will enable future research to reach a more holistic understanding of the population dynamics and ecology.
https://www.nature.com/articles/s42003-022-04190-2

KAMILA M. JOZWIK et al – Disentangling five dimensions of animacy in human brain and behaviour
Distinguishing animate from inanimate things is of great behavioural importance. Despite distinct brain and behavioural responses to animate and inanimate things, it remains unclear which object properties drive these responses. Here, we investigate the importance of five object dimensions related to animacy ("being alive", "looking like an animal", "having agency", "having mobility", and "being unpredictable") in brain (fMRI, EEG) and behaviour (property and similarity judgements) of 19 participants. We used a stimulus set of 128 images, optimized by a genetic algorithm to disentangle these five dimensions. The five dimensions explained much variance in the similarity judgments. Each dimension explained significant variance in the brain representations (except, surprisingly, "being alive"), however, to a lesser extent than in behaviour. Different brain regions sensitive to animacy may represent distinct dimensions, either as accessible perceptual stepping stones toward detecting whether something is alive or because they are of behavioural importance in their own right.
https://www.nature.com/articles/s42003-022-04194-y

TOMOYA NAKAI & SHINJI NISHIMOTO – Representations and decodability of diverse cognitive functions are preserved across the human cortex, cerebellum, and subcortex
Which part of the brain contributes to our complex cognitive processes? Studies have revealed contributions of the cerebellum and subcortex to higher-order cognitive functions; however, it has been unclear whether such functional representations are preserved across the cortex, cerebellum, and subcortex. In this study, we use functional magnetic resonance imaging data with 103 cognitive tasks and construct three voxel-wise encoding and decoding models

independently using cortical, cerebellar, and subcortical voxels. Representational similarity analysis reveals that the structure of task representations is preserved across the three brain parts. Principal component analysis visualizes distinct organizations of abstract cognitive functions in each part of the cerebellum and subcortex. More than 90% of the cognitive tasks are decodable from the cerebellum and subcortical activities, even for the novel tasks not included in model training. Furthermore, we show that the cerebellum and subcortex have sufficient information to reconstruct activity in the cerebral cortex.
https://www.nature.com/articles/s42003-022-04221-y

MAXIMILIAN E. KIRSCHHOCK & ANDREAS NIEDER – Number selective sensorimotor neurons in the crow translate perceived numerosity into number of actions
Translating a perceived number into a matching number of self-generated actions is a hallmark of numerical reasoning in humans and animals alike. To explore this sensorimotor transformation, we trained crows to judge numerical values in displays and to flexibly plan and perform a matching number of pecks. We report number selective sensorimotor neurons in the crow telencephalon that signaled the impending number of self-generated actions. Neuronal population activity during the sensorimotor transformation period predicted whether the crows mistakenly planned fewer or more pecks than instructed. During sensorimotor transformation, both a static neuronal code characterized by persistently number-selective neurons and a dynamic code originating from neurons carrying rapidly changing numerical information emerged. The findings indicate there are distinct functions of abstract neuronal codes supporting the sensorimotor number system.
https://www.nature.com/articles/s41467-022-34457-5

Nature Ecology & Evolution

PAPERS

IRIT ZOHAR et al – Evidence for the cooking of fish 780,000 years ago at Gesher Benot Ya'aqov, Israel
Although cooking is regarded as a key element in the evolutionary success of the genus Homo, impacting various biological and social aspects, when intentional cooking first began remains unknown. The early Middle Pleistocene site of Gesher Benot Ya'aqov, Israel (marine isotope stages 18–20; ~0.78 million years ago), has preserved evidence of hearth-related hominin activities and large numbers of freshwater fish remains (>40,000). A taphonomic study and isotopic analyses revealed significant differences between the characteristics of the fish bone assemblages recovered in eight sequential archaeological horizons of Area B (Layer II-6 levels 1–7) and natural fish bone assemblages (identified in Area A). Gesher Benot Ya'aqov archaeological horizons II-6 L1–7 exhibited low fish species richness, with a clear preference for two species of large Cyprinidae (Luciobarbus longiceps and Carasobarbus canis) and the almost total absence of fish bones in contrast to the richness of pharyngeal teeth (>95%). Most of the pharyngeal teeth recovered in archaeological horizons II-6 L1–7 were spatially associated with 'phantom' hearths (clusters of burnt flint microartifacts). Size–strain analysis using X-ray powder diffraction provided evidence that these teeth had been exposed to low temperature (<500 °C), suggesting, together with the archaeological and taphonomic data, that the fish from the archaeological horizons of Area B had been cooked and consumed on site. This is the earliest evidence of cooking by hominins.
https://www.nature.com/articles/s41559-022-01910-z

Nature Human Behaviour

PAPERS

COURTNEY B. HILTON et mul with QUENTIN D. ATKINSON & AUDAX MABULLA – Acoustic regularities in infant-directed speech and song across cultures
When interacting with infants, humans often alter their speech and song in ways thought to support communication. Theories of human child-rearing, informed by data on vocal signalling across species, predict that such alterations should appear globally. Here, we show acoustic differences between infant-directed and adult-directed vocalizations across cultures. We collected 1,615 recordings of infant- and adult-directed speech and song produced by 410 people in 21 urban, rural and small-scale societies. Infant-directedness was reliably classified from acoustic features only, with acoustic profiles of infant-directedness differing across language and music but in consistent fashions. We then studied listener sensitivity to these acoustic features. We played the recordings to 51,065 people from 187 countries, recruited via an English-language website, who guessed whether each vocalization was infant-directed. Their intuitions were more accurate than chance, predictable in part by common sets of acoustic features and robust to the effects of linguistic relatedness between vocalizer and listener. These findings inform hypotheses of the psychological functions and evolution of human communication.
https://www.nature.com/articles/s41562-022-01410-x

MADELINE C. PELZ et al – Foundations of intuitive power analyses in children and adults
Decades of research indicate that some of the epistemic practices that support scientific enquiry emerge as part of intuitive reasoning in early childhood. Here, we ask whether adults and young children can use intuitive statistical reasoning and metacognitive strategies to estimate how much information they might need to solve different discrimination problems, suggesting that they have some of the foundations for 'intuitive power analyses'. Across five experiments, both adults

(N = 290) and children (N = 48, 6–8 years) were able to precisely represent the relative difficulty of discriminating populations and recognized that larger samples were required for populations with greater overlap. Participants were sensitive to the cost of sampling, as well as the perceptual nature of the stimuli. These findings indicate that both young children and adults metacognitively represent their own ability to make discriminations even in the absence of data, and can use this to guide efficient and effective exploration.
https://www.nature.com/articles/s41562-022-01427-2

Nature Scientific Reports

PAPERS

VANESSA N. GRIS et al – Investigating subtle changes in facial expression to assess acute pain in Japanese macaques
Changes in facial expression provide cues for assessing emotional states in mammals and may provide non-verbal signals of pain. This study uses geometric morphometrics (GMM) to explore the facial shape variation in female Japanese macaques who underwent experimental laparotomy. Face image samples were collected from video footage of fourteen macaques before surgery and 1, 3, and 7 days after the procedure. Image samples in the pre-surgical condition were considered pain-free, and facial expressions emerging after surgery were investigated as potential indicators of pain. Landmarks for shape analysis were selected based on the underlying facial musculature and their corresponding facial action units and then annotated in 324 pre-surgical and 750 post-surgical images. The expression of pain is likely to vary between individuals. Tightly closed eyelids or squeezed eyes and lip tension were the most commonly observed facial changes on day 1 after surgery ($p < 0.01974$). A good overall inter-rater reliability [ICC = 0.99 (95% CI 0.75–1.0)] was observed with the method. The study emphasizes the importance of individualized assessment and provides a better understanding of facial cues to pain for captive macaque care.
https://www.nature.com/articles/s41598-022-23595-x

PeerJ

PAPERS

ALEXANDER MIELKE & SUSANA CARVALHO – Chimpanzee play sequences are structured hierarchically as games
Social play is ubiquitous in the development of many animal species and involves players adapting actions flexibly to their own previous actions and partner responses. Play differs from other behavioural contexts for which fine-scale analyses of action sequences are available, such as tool use and communication, in that its form is not defined by its function, making it potentially more unpredictable. In humans, play is often organised in games, where players know context-appropriate actions but string them together unpredictably. Here, we use the sequential nature of play elements to explore whether play elements in chimpanzees are structured hierarchically and follow predictable game-like patterns. Based on 5,711 play elements from 143 bouts, we extracted individual-level play sequences of 11 Western chimpanzees (Pan troglodytes verus) of different ages from the Bossou community. We detected transition probabilities between play elements that exceeded expected levels and show that play elements form hierarchically clustered and interchangeable groups, indicative of at least six games that can be identified from transition networks, some with different roles for different players. We also show that increased information about preceding play elements improved predictability of subsequent elements, further indicating that play elements are not strung together randomly but that flexible action rules underlie their usage. Thus, chimpanzee play is hierarchically structured in short games which limit acceptable play elements and allow players to predict and adapt to partners' actions. This "grammar of action" approach to social interactions can be valuable in understanding cognitive and communicative abilities within and across species.
https://peerj.com/articles/14294/

PLoS One

PAPERS

ADAM LEE MILES & MATTEO CAVALIERE – Cooperation dynamics in dynamical networks with history-based decisions
In many aspects of life on earth, individuals may engage in cooperation with others to contribute towards a goal they may share, which can also ensure self-preservation. In evolutionary game theory, the act of cooperation can be considered as an altruistic act of an individual producing some form of benefit or commodity that can be utilised by others they are associated with, which comes at some personal cost. Under certain conditions, individuals make use of information that they are able to perceive within a group in order to aid with their choices for who they should associate themselves within these cooperative scenarios. However, cooperative individuals can be taken advantage of by opportunistic defectors, which can cause significant disruption to the population. We study a model where the decision to establish interactions with potential partners is based on the opportune integration of the individual's private ability to perceive the intentions of others (private information) and the observation of the population, information that is available to every individual (public information). When public information is restricted to a potential partners current connection count, the population becomes highly cooperative but rather unstable with frequent invasions of cheaters and recoveries of cooperation. However, when public information considers the previous decisions of the individuals (accepted / rejected connections) the population is slightly less cooperative but more stable. Generally, we find that allowing the observation of previous decisions, as part of the

available public information, can often lead to more stable but fragmented and less prosperous networks. Our results highlight that the ability to observe previous individual decisions, balanced by individuals personal information, represents an important aspect of the interplay between individual decision-making and the resilience of cooperation in structured populations.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0275909

FRÉDÉRICK MORASSE et al – How do children adapt their fairness norm? Evidence from computational modeling
Adequate social functioning during childhood requires context-appropriate social decision-making. To make such decisions, children rely on their social norms, conceptualized as cognitive models of shared expectations. Since social norms are dynamic, children must adapt their models of shared expectations and modify their behavior in line with their social environment. This study aimed to investigate children's abilities to use social information to adapt their fairness norm and to identify the computational mechanism governing this process. Thirty children (7–11 years, M = 7.9 SD = 0.85, 11 girls) played the role of Responder in a modified version of the Ultimatum Game–a two-player game based on the fairness norm–in which they had to choose to accept or reject offers from different Proposers. Norm adaptation was assessed by comparing rejection rates before and after a conditioning block in which children received several low offers. Computational models were compared to test which best explains children's behavior during the game. Mean rejection rate decreased significantly after receiving several low offers suggesting that children have the ability to dynamically update their fairness norm and adapt to changing social environments. Model-based analyses suggest that this process involves the computation of norm-prediction errors. This is the first study on norm adaptation capacities in school-aged children that uses a computational approach. Children use implicit social information to adapt their fairness norm to changing environments and this process appears to be supported by a computational mechanism in which norm-prediction errors are used to update norms.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0277508

ZILU WANG & MICHAEL C. W. YIP – The foreign language effects on strategic behavior games
The present study examined foreign language effects on the decisions made in a series of strategic behavioral games (e.g., the Prisoner's Dilemma, the Oligopolistic Competition, and the Volunteer's Dilemma). We recruited 154 native Chinese-speaking university students, with English as their second language, as participants. They were asked to make decisions while playing four simple behavioral games in either Chinese or English language version and to complete a Language History Questionnaire. The results showed that 1) the participants in each language group performed differently in the Prisoner's Dilemma Game and in one condition of the Volunteer's Dilemma Game which involved a relatively high level of uncertainty; and 2) foreign language proficiency, frequency of application and cultural identity triggered by the corresponding foreign language moderated the foreign language effects. This pattern of results is consistent with the Cultural Accommodation Hypothesis and the risk-aversion preference to use one's native language.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0277556

Proceedings of the Royal Society B

PAPERS

ANDRE LUIZ CAMPELO DOS SANTOS et al – Genomic evidence for ancient human migration routes along South America's Atlantic coast
An increasing body of archaeological and genomic evidence has hinted at a complex settlement process of the Americas by humans. This is especially true for South America, where unexpected ancestral signals have raised perplexing scenarios for the early migrations into different regions of the continent. Here, we present ancient human genomes from the archaeologically rich Northeast Brazil and compare them to ancient and present-day genomic data. We find a distinct relationship between ancient genomes from Northeast Brazil, Lagoa Santa, Uruguay and Panama, representing evidence for ancient migration routes along South America's Atlantic coast. To further add to the existing complexity, we also detect greater Denisovan than Neanderthal ancestry in ancient Uruguay and Panama individuals. Moreover, we find a strong Australasian signal in an ancient genome from Panama. This work sheds light on the deep demographic history of eastern South America and presents a starting point for future fine-scale investigations on the regional level.
https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2022.1078

THOMAS J. H. MORGAN, JORDAN W. SUCHOW & THOMAS L. GRIFFITHS – The experimental evolution of human culture: flexibility, fidelity and environmental instability
The past 2 Myr have seen both unprecedented environmental instability and the evolution of the human capacity for complex culture. This, along with the observation that cultural evolution occurs faster than genetic evolution, has led to the suggestion that culture is an adaptation to an unstable environment. We test this hypothesis by examining the ability of human social learning to respond to environmental changes. We do this by inserting human participants (n = 4800) into evolutionary simulations with a changing environment while varying the social information available to individuals across five conditions. We find that human social learning shows some signs of adaptation to environmental instability, including critical social learning, the adoption of up-and-coming traits and, unexpectedly, contrariness. However, these are insufficient to avoid significant fitness declines when the environment changes, and many individuals are highly conformist, which

exacerbates the fitness effects of environmental change. We conclude that human social learning reflects a compromise between the competing needs for flexibility to accommodate environmental change and fidelity to accurately transmit valuable cultural information.
https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2022.1614

LETICIA MICHELI et al – Brain stimulation reveals distinct motives underlying reciprocal punishment and reward
Reciprocal fairness, in the form of punishment and reward, is at the core of human societal order. Its underlying neural mechanisms are, however, not fully understood. We systemize suggestive evidence regarding the involvement of the right dorsolateral prefrontal cortex (rDLPFC) and medial prefrontal cortex (mPFC) in reciprocal fairness in three cognitive mechanisms (cognitive control, domain-general and self-reference). We test them and provide novel insights in a comprehensive behavioural experiment with non-invasive brain stimulation where participants can punish greedy actions and reward generous actions. Brain stimulation of either brain area decreases reward and punishment when reciprocation is costly but unexpectedly increases reward when it is non-costly. None of the hypothesized mechanisms fully accounts for the observed behaviour, and the asymmetric involvement of the investigated brain areas in punishment and reward suggests that different psychological mechanisms are underlying punishing selfishness and rewarding generosity. We propose that, for reciprocal punishment, the rDLPFC and the mPFC process self-relevant information, in terms of both personal cost and personal involvement; for reciprocal reward, these brain regions are involved in controlling selfish and pure reciprocity motives, while simultaneously promoting the enforcement of fairness norms. These insights bear importance for endeavours to build biologically plausible models of human behaviour.
https://royalsocietypublishing.org/doi/full/10.1098/rspb.2022.1590

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PAPERS

ALEXANDRA SAFRYGHIN et al with RAMON FERRER-I-CANCHO & CATHERINE HOBAITER – Variable expression of linguistic laws in ape gesture: a case study from chimpanzee sexual solicitation
Two language laws have been identified as consistent patterns shaping animal behaviour, both acting on the organizational level of communicative systems. Zipf's law of brevity describes a negative relationship between behavioural length and frequency. Menzerath's law defines a negative correlation between the number of behaviours in a sequence and average length of the behaviour composing it. Both laws have been linked with the information-theoretic principle of compression, which tends to minimize code length. We investigated their presence in a case study of male chimpanzee sexual solicitation gesture. We failed to find evidence supporting Zipf's law of brevity, but solicitation gestures followed Menzerath's law: longer sequences had shorter average gesture duration. Our results extend previous findings suggesting gesturing may be limited by individual energetic constraints. However, such patterns may only emerge in sufficiently large datasets. Chimpanzee gestural repertoires do not appear to manifest a consistent principle of compression previously described in many other close-range systems of communication. Importantly, the same signallers and signals were previously shown to adhere to these laws in subsets of the repertoire when used in play; highlighting that, in addition to selection on the signal repertoire, ape gestural expression appears shaped by factors in the immediate socio-ecological context.
https://royalsocietypublishing.org/doi/10.1098/rsos.220849

PRANAV N. HARAVU et al – Macaca mulatta is a good model for human mandibular fixation research
Biomechanical and clinical studies have yet to converge on the optimal fixation technique for angle fractures, one of the most common and controversial fractures in terms of fixation approach. Prior pre-clinical studies have used a variety of animal models and shown abnormal strain environments exacerbated by less rigid (single-plate) Champy fixation and chewing on the side opposite the fracture (contralateral chewing). However, morphological differences between species warrant further investigation to ensure that these findings are translational. Here we present the first study to use realistically loaded finite-element models to compare the biomechanical behaviour of human and macaque mandibles pre- and post-fracture and fixation. Our results reveal only small differences in deformation and strain regimes between human and macaque mandibles. In the human model, more rigid biplanar fixation better approximated physiologically healthy global bone strains and moments around the mandible, and also resulted in less interfragmentary strain than less rigid Champy fixation. Contralateral chewing exacerbated deviations in strain, moments and interfragmentary strain, especially under Champy fixation. Our pre- and post-fracture fixation findings are congruent with those from macaques, confirming that rhesus macaques are excellent animal models for biomedical research into mandibular fixation. Furthermore, these findings strengthen the case for rigid biplanar fixation over less rigid one-plate fixation in the treatment of isolated mandibular angle fractures.
https://royalsocietypublishing.org/doi/10.1098/rsos.220438

Trends in Ecology and Evolution

PAPERS

NIELS C. RATTENBORG & GIANINA UNGUREAN – The evolution and diversification of sleep

The evolutionary origins of sleep and its sub-states, rapid eye movement (REM) and non-REM (NREM) sleep, found in mammals and birds, remain a mystery. Although the discovery of a single type of sleep in jellyfish suggests that sleep evolved much earlier than previously thought, it is unclear when and why sleep diversified into multiple types of sleep. Intriguingly, multiple types of sleep have recently been found in animals ranging from non-avian reptiles to arthropods to cephalopods. Although there are similarities between these states and those found in mammals and birds, notable differences also exist. The diversity in the way sleep is expressed confounds attempts to trace the evolution of sleep states, but also serves as a rich resource for exploring the functions of sleep.
https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(22)00253-1

Trends in Neurosciences

PAPERS

STEPHANIE L. KING, RICHARD C. CONNOR & STEPHEN H. MONTGOMERY – Social and vocal complexity in bottlenose dolphins

Bottlenose dolphins are highly social, renowned for their vocal flexibility, and possess highly enlarged brains relative to their body size. Here, we discuss some of the defining features of bottlenose dolphin social and vocal complexity and place this in the context of their cognitive evolution.
https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(22)00185-0

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