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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.

RESEARCHGATE – Segmental Units in Nonhuman Animal Vocalization

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

DAN C. MANN & MARISA HOESCHELE – Segmental Units in Nonhuman Animal Vocalization as a Window into Meaning, Structure, and the Evolution of Language

Human vocalizations are made up of meaningless units or segments that are combined to create meaningful words and phrases. Jackendoff (1999) hypothesized that the ability of humans to combine segments together is necessitated by the fact that we need to express an almost limitless amount of symbolic or referential information that could occur in a different time or space. So far, there is very little evidence for this symbolic and referentiality meaning in animal vocalizations. Furthermore, segments have also rarely been identified in the animal kingdom, with units divided by intakes of breaths taken as the most fundamental. However, if we are to take Jackendoff's hypothesis seriously, we must do more detailed analyses at the level of the segment (subunits within a single breath) in animal vocalizations. Here we discuss the current status of animal vocal communication and its relation to Jackendoff's hypothesis. We propose further research into segmental units in animal vocalizations is a key next step to determining the evolution of human vocal behavior.

https://www.researchgate.net/publication/341107536_Segmental_units_in_nonhuman_animal_vocalization_as_a_window_into_meaning_structure_and_the_evolution_of_language

NEWS

JOHN TEMPLETON FOUNDATION – What Are Minds, and Where Will You Find Them?

Mind is an elusive concept, perplexing the world's greatest thinkers from time immemorial. Is the mind fundamentally material, immaterial, or something in between? Philosophers, psychologists, and neuroscientists have offered many different accounts, but they often suffer from overly technical terminology and hyper-specialization. Science writer Philip Ball presents an insightful, relatable account of minds wherever we might find them, including in human and non-human animals, machines, and extraterrestrials.

<https://templeton.us14.list-manage.com/track/click?u=afebe06609a423c59c59cee74&id=dd2f747ec5&e=3098989a4b>

NATURE BRIEFING – eLife won't reject papers once they are under review — what researchers think

Prestigious journal's announcement has drawn a mixed reaction from scientists.

<https://www.nature.com/articles/d41586-022-03534-6>

SAPIENS – Neanderthal Families

Novel genetic analysis of ancient DNA and artifacts suggests Neanderthals in Siberia lived in close-knit communities.

<https://sapiens.us11.list-manage.com/track/click?u=80f6cf678900daf984bf763b7&id=6e50acd5cb&e=dc0eff6180>

SOCIETY FOR SCIENCE – Why fuzzy definitions are a problem in the social sciences

Social sciences research is plagued by murky definitions and measurements. Here's why that matters.

<http://click.societyforscience->

email.com/?qs=bc303a28bd8ac068f1af8649da31b006e8b5c91fa2801ec175d0f183cbeb3da46830354d465b222038ded26ad85b803803218b2177e39a49c130a5cf5812f21a

THE CONVERSATION – Wild chimpanzees and gorillas can form friendly associations that last decades

Friendships between these two very different primates likely outlasted your promise to be best buds forever with your school classmates.

<https://theconversationuk.cmail19.com/t/r-l-tijtthik-khhlilahh-p/>

THE CONVERSATION – Neanderthals: how a carnivore diet may have led to their demise

Zinc in their bones reveal that these early humans were top of the food chain.

<https://theconversationuk.cmail19.com/t/r-l-tjduiuy-khhlilahh-b/>

THE CONVERSATION – How complex models can lead to useless scientific predictions

The assumption that more detail is better is questioned by a new study.

<https://theconversationuk.cmail19.com/t/r-l-tjduiuy-khhlilahh-m/>

PUBLICATIONS

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>

Evolutionary Anthropology

PAPERS

KEVIN G. HATALA, NEIL T. ROACH & ANNA K. BEHRENSMEYER – Fossil footprints and what they mean for hominin paleobiology

Hominin footprints have not traditionally played prominent roles in paleoanthropological studies, aside from the famous 3.66 Ma footprints discovered at Laetoli, Tanzania in the late 1970s. This contrasts with the importance of trace fossils (ichnology) in the broader field of paleontology. Lack of attention to hominin footprints can probably be explained by perceptions that these are exceptionally rare and “curiosities” rather than sources of data that yield insights on par with skeletal fossils or artifacts. In recent years, however, discoveries of hominin footprints have surged in frequency, shining important new light on anatomy, locomotion, behaviors, and environments from a wide variety of times and places. Here, we discuss why these data are often overlooked and consider whether they are as “rare” as previously assumed. We review new ways footprint data are being used to address questions about hominin paleobiology, and we outline key opportunities for future research in hominin ichnology.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.21963>

Frontiers for Young Minds

PAPERS

LAUREN FINK et al – The Dúndún Drum Helps Us Understand How We Process Speech and Music

Every day, you hear many sounds in your environment, like speech, music, animal calls, or passing cars. How do you tease apart these unique categories of sounds? We aimed to understand more about how people distinguish speech and music by using an instrument that can both “speak” and play music: the dúndún talking drum. We were interested in whether people could tell if the sound produced by the drum was speech or music. People who were familiar with the dúndún were good at the task, but so were those who had never heard the dúndún, suggesting that there are general characteristics of sound that define speech and music categories. We observed that music is faster, more regular, and more variable in volume than “speech.” This research helps us understand the interesting instrument that is dúndún and provides insights about how humans distinguish two important types of sound: speech and music.

<https://kids.frontiersin.org/articles/10.3389/frym.2022.755390>

Frontiers in Communication

PAPERS

KATHARINA J. ROHLFING et al – Which “motionese” parameters change with children's age? Disentangling attention-getting from action-structuring modifications

Modified action demonstration—dubbed motionese—has been proposed as a way to help children recognize the structure and meaning of actions. However, until now, it has been investigated only in young infants. This brief research report presents findings from a cross-sectional study of parental action demonstrations to three groups of 8–11, 12–23, and 24–30-month-old children that applied seven motionese parameters; a second study investigated the youngest group of participants longitudinally to corroborate the cross-sectional results. Results of both studies suggested that four motionese parameters (Motion Pauses, Pace, Velocity, Acceleration) seem to structure the action by organizing it in motion pauses. Whereas these parameters persist over different ages, three other parameters (Demonstration Length, Roundness, and Range) occur predominantly in the younger group and seem to serve to organize infants' attention on the basis of movement. Results are discussed in terms of facilitative vs. pedagogical learning.

<https://www.frontiersin.org/articles/10.3389/fcomm.2022.922405/full>

Frontiers in Psychology

PAPERS

MATTEO MARAN et al – Online neurostimulation of Broca's area does not interfere with syntactic predictions: A combined TMS-EEG approach to basic linguistic combination

Categorical predictions have been proposed as the key mechanism supporting the fast pace of syntactic composition in language. Accordingly, grammar-based expectations are formed—e.g., the determiner “a” triggers the prediction for a noun—and facilitate the analysis of incoming syntactic information, which is then checked against a single or few other word categories. Previous functional neuroimaging studies point towards Broca's area in the left inferior frontal gyrus (IFG) as one fundamental cortical region involved in categorical prediction during incremental language processing. Causal evidence for this hypothesis is however still missing. In this study, we combined Electroencephalography (EEG) and Transcranial Magnetic Stimulation (TMS) to test whether Broca's area is functionally relevant in predictive mechanisms for language. We transiently perturbed Broca's area during the first word in a two-word construction, while simultaneously measuring the Event-Related Potential (ERP) correlates of syntactic composition. We reasoned that if Broca's area is involved in predictive mechanisms for syntax, disruptive TMS during the first word would mitigate the difference in the ERP responses for predicted and unpredicted categories in basic two-word constructions. Contrary to this hypothesis, perturbation of Broca's area at the predictive stage did not affect the ERP correlates of basic composition. The correlation strength between the electrical field induced by TMS and the ERP responses further confirmed this pattern. We discuss the present results considering an

alternative account of the role of Broca's area in syntactic composition, namely the bottom-up integration of words into constituents, and of compensatory mechanisms within the language predictive network.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2022.968836/full>

Interface: Journal of the Royal Society

PAPERS

GABRIEL MADIROLAS et al – The motor Wisdom of the Crowd

Wisdom of the Crowd is the aggregation of many individual estimates to obtain a better collective one. Because of its enormous social potential, this effect has been thoroughly investigated, but predominantly on tasks that involve rational thinking (such as estimating a number). Here we tested this effect in the context of drawing geometrical shapes, which still enacts cognitive processes but mainly involves visuomotor control. We asked more than 700 school students to trace five patterns shown on a touchscreen and then aggregated their individual trajectories to improve the match with the original pattern. Our results show the characteristics of the strongest examples of Wisdom of the Crowd. First, the aggregate trajectory can be up to 5 times more accurate than the individual ones. Second, this great improvement requires aggregating trajectories from different individuals (rather than trials from the same individual). Third, the aggregate trajectory outperforms more than 99% of individual trajectories. Fourth, while older individuals outperform younger ones, a crowd of young individuals outperforms the average older one. These results demonstrate for the first time Wisdom of the Crowd in the realm of motor control, opening the door to further studies of human and also animal behavioural trajectories and their mechanistic underpinnings.

<https://royalsocietypublishing.org/doi/full/10.1098/rsif.2022.0480>

HELENA MITON & SIMON DEDEO – The cultural transmission of tacit knowledge

A wide variety of cultural practices have a 'tacit' dimension, whose principles are neither obvious to an observer, nor known explicitly by experts. This poses a problem for cultural evolution: if beginners cannot spot the principles to imitate, and experts cannot say what they are doing, how can tacit knowledge pass from generation to generation? We present a domain-general model of 'tacit teaching', drawn from statistical physics, that shows how high-accuracy transmission of tacit knowledge is possible. It applies when the practice's underlying features are subject to interacting and competing constraints. Our model makes predictions for key features of the teaching process. It predicts a tell-tale distribution of teaching outcomes, with some students near-perfect performers while others receiving the same instruction are disastrously bad. This differs from standard cultural evolution models that rely on direct, high-fidelity copying, which lead to a much narrower distribution of mostly mediocre outcomes. The model also predicts generic features of the cultural evolution of tacit knowledge. The evolution of tacit knowledge is expected to be bursty, with long periods of stability interspersed with brief periods of dramatic change, and where tacit knowledge, once lost, becomes essentially impossible to recover.

<https://royalsocietypublishing.org/doi/full/10.1098/rsif.2022.0238>

Nature Communications

PAPERS

PETER COPPOLA et al – The complexity of the stream of consciousness

Typical consciousness can be defined as an individual-specific stream of experiences. Modern consciousness research on dynamic functional connectivity uses clustering techniques to create common bases on which to compare different individuals. We propose an alternative approach by combining modern theories of consciousness and insights arising from phenomenology and dynamical systems theory. This approach enables a representation of an individual's connectivity dynamics in an intrinsically-defined, individual-specific landscape. Given the wealth of evidence relating functional connectivity to experiential states, we assume this landscape is a proxy measure of an individual's stream of consciousness. By investigating the properties of this landscape in individuals in different states of consciousness, we show that consciousness is associated with short term transitions that are less predictable, quicker, but, on average, more constant. We also show that temporally-specific connectivity states are less easily describable by network patterns that are distant in time, suggesting a richer space of possible states. We show that the cortex, cerebellum and subcortex all display consciousness-relevant dynamics and discuss the implication of our results in forming a point of contact between dynamical systems interpretations and phenomenology.

<https://www.nature.com/articles/s42003-022-04109-x>

Nature Ecology & Evolution

PAPERS

M. VIDAL-CORDASCO et al – Ecosystem productivity affected the spatiotemporal disappearance of Neanderthals in Iberia

What role did fluctuations play in biomass availability for secondary consumers in the disappearance of Neanderthals and the survival of modern humans? To answer this, we quantify the effects of stadial and interstadial conditions on ecosystem productivity and human spatiotemporal distribution patterns during the Middle to Upper Palaeolithic transition (50,000–30,000 calibrated years before the present) in Iberia. First, we used summed probability distribution, optimal linear

estimation and Bayesian age modelling to reconstruct an updated timescale for the transition. Next, we executed a generalized dynamic vegetation model to estimate the net primary productivity. Finally, we developed a macroecological model validated with present-day observations to calculate herbivore abundance. The results indicate that, in the Eurosiberian region, the disappearance of Neanderthal groups was contemporaneous with a significant decrease in the available biomass for secondary consumers, and the arrival of the first *Homo sapiens* populations coincided with an increase in herbivore carrying capacity. During stadials, the Mediterranean region had the most stable conditions and the highest biomass of medium and medium–large herbivores. These outcomes support an ecological cause for the hiatus between the Mousterian and Aurignacian technocomplexes in Northern Iberia and the longer persistence of Neanderthals in southern latitudes.

<https://www.nature.com/articles/s41559-022-01861-5>

YASSINE SOULMI et al – Admixture has obscured signals of historical hard sweeps in humans

The role of natural selection in shaping biological diversity is an area of intense interest in modern biology. To date, studies of positive selection have primarily relied on genomic datasets from contemporary populations, which are susceptible to confounding factors associated with complex and often unknown aspects of population history. In particular, admixture between diverged populations can distort or hide prior selection events in modern genomes, though this process is not explicitly accounted for in most selection studies despite its apparent ubiquity in humans and other species. Through analyses of ancient and modern human genomes, we show that previously reported Holocene-era admixture has masked more than 50 historic hard sweeps in modern European genomes. Our results imply that this canonical mode of selection has probably been underappreciated in the evolutionary history of humans and suggest that our current understanding of the tempo and mode of selection in natural populations may be inaccurate.

<https://www.nature.com/articles/s41559-022-01914-9>

Nature Reviews Physics

ARTICLES

MATTHEW D. SCHWARTZ – Should artificial intelligence be interpretable to humans?

As artificial intelligence (AI) makes increasingly impressive contributions to science, scientists increasingly want to understand how AI reaches its conclusions. Matthew D. Schwartz discusses what it means to understand AI and whether such a goal is achievable — or even needed.

<https://www.nature.com/articles/s42254-022-00538-z>

Nature Scientific Reports

PAPERS

WILLEM JAN ZACHARIASSE & LUCAS J. LOURENS – About the age and depositional depth of the sediments with reported bipedal footprints at Trachilos (NW Crete, Greece)

New data on the foraminifers and the regional geological setting of the Trachilos sediments (NW Crete, Greece) from which Gierlinski et al. (*Proc Geol Assoc* 128: 697–710, 2017) described hominin-like footprints show that the published 6.05 Ma-shallow marine interpretation is incorrect. In our new interpretation, the Trachilos succession is Late Pliocene and part of a shallowing marine series that became subaerially exposed some 3 millions of years ago. Placed in a larger geological context, Crete was an island during the Late Pliocene and separated by ~ 100 km of open sea from the nearest European mainland, and therefore out of reach of Late Pliocene hominins.

<https://www.nature.com/articles/s41598-022-23296-5>

FEMKE H. REIDSMA – Laboratory-based experimental research into the effect of diagenesis on heated bone: Implications and improved tools for the characterisation of ancient fire

The use of fire is considered to be one of the most important cultural innovations in human evolution. Understanding the taphonomy of fire remains is an important prerequisite for valid interpretations of hominin fire-related behaviour. Presented here are the results of a series of laboratory-based experiments testing the effect of different pH conditions (acidic, neutral, alkaline) on the physical and chemical properties of heated bone (charred and combusted). By taking a fundamental-research approach the study gives insight into the specific effect of pH exposure and its underlying chemical processes, and provides data that can be applied to heated bone from any context and time period. Results show that diagenesis has a significant impact on the preservation potential of heated bones, as well as on the reliability of the analytical techniques used to reconstruct past heating conditions. The study provides reference data and a toolkit for the analysis of heated bone, that explicitly takes diagenesis into account, and in doing so offers a significant improvement to the accuracy with which we can reconstruct heating conditions and fire-related human behaviour in the past.

<https://www.nature.com/articles/s41598-022-21622-5>

ALISON E. COMRIE, LOREN M. FRANK & KENNETH KAY – Imagination as a fundamental function of the hippocampus

Imagination is a biological function that is vital to human experience and advanced cognition. Despite this importance, it remains unknown how imagination is realized in the brain. Substantial research focusing on the hippocampus, a brain structure traditionally linked to memory, indicates that firing patterns in spatially tuned neurons can represent previous and upcoming paths in space. This work has generally been interpreted under standard views that the hippocampus implements cognitive abilities primarily related to actual experience, whether in the past (e.g. recollection, consolidation), present (e.g. spatial mapping) or future (e.g. planning). However, relatively recent findings in rodents identify robust patterns of hippocampal firing corresponding to a variety of alternatives to actual experience, in many cases without overt reference to the past, present or future. Given these findings, and others on hippocampal contributions to human imagination, we suggest that a fundamental function of the hippocampus is to generate a wealth of hypothetical experiences and thoughts. Under this view, traditional accounts of hippocampal function in episodic memory and spatial navigation can be understood as particular applications of a more general system for imagination. This view also suggests that the hippocampus contributes to a wider range of cognitive abilities than previously thought.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0336>

ARI KHOUDARY et al – Neural differences between internal and external episodic counterfactual thoughts

Episodic counterfactual thoughts (eCFT) consist of imagining alternative outcomes to past experiences. A common sub-class of eCFT—upward eCFT—involves imagining how past negative experiences could have been better, either because one could have done something differently (internal) or because something about the circumstances could have been different (external). Although previous neuroimaging research has shown that the brain's default mode network (DMN) supports upward eCFT, it is unclear how it is differentially recruited during internal versus external upward eCFT. We collected functional magnetic resonance imaging data while participants remembered negative autobiographical memories, generated either internal or external upward eCFT for the memory, and then rated the plausibility, perceived control and difficulty of eCFT generation. Both internal and external eCFT engaged midline regions of cingulate cortex, a central node of the DMN. Most activity differentiating eCFT, however, occurred outside the DMN. External eCFT engaged cuneus, angular gyrus and precuneus, whereas internal eCFT engaged posterior cingulate and precentral gyrus. Angular gyrus and precuneus were additionally sensitive to perceived plausibility of external eCFT, while postcentral gyrus and insula activity scaled with perceived plausibility of internal eCFT. These results highlight the key brain regions that might be involved in cases of maladaptive mental simulations.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0337>

NICOLÒ CESANA-ARLOTTI, BÁLINT VARGA & ERNŐ TÉGLÁS – The pupillometry of the possible: an investigation of infants' representation of alternative possibilities

Contrasting possibilities has a fundamental adaptive value for prediction and learning. Developmental research, however, has yielded controversial findings. Some data suggest that preschoolers might have trouble in planning actions that take into account mutually exclusive possibilities, while other studies revealed an early understanding of alternative future outcomes based on infants' looking behaviour. To better understand the origin of such abilities, here we use pupil dilation as a potential indicator of infants' representation of possibilities. Ten- and 14-month-olds were engaged in an object-identification task by watching video animations where three different objects with identical top parts moved behind two screens. Importantly, a target object emerged from one of the screens but remained in partial occlusion, revealing only its top part, which was compatible with a varying number of possible identities. Just as adults' pupil diameter grows monotonically with the amount of information held in memory, we expected that infants' pupil size would increase with the number of alternatives sustained in memory as candidate identities for the partially occluded object. We found that pupil diameter increased with the object's potential identities in 14- but not in 10-month-olds. We discuss the implications of these results for the foundation of humans' capacities to represent alternatives.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0343>

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/abs/10.1098/rstb.2022.0022>

MYRTO GRIGOROGLOU & PATRICIA A. GANEA – Language as a mechanism for reasoning about possibilities

The ability to entertain and reflect on possibilities is a crucial component of human reasoning. However, the origin of this reasoning—whether it is language-based or not—is highly debated. We contribute to this debate by investigating the relation between language and thought in the domain of possibility from a developmental perspective. Our investigation focuses on disjunctive syllogism, a specific type of possibility reasoning that has been explored extensively in the developmental literature and has clear linguistic correlates. Seeking links between conceptual and linguistic representations, we review evidence on how children reason by the disjunctive syllogism and how they acquire logical and modal language. We sketch a proposal for how language and thought interact during development.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0334>

SHALINI GAUTAM, THOMAS SUDDENDORF & JONATHAN REDSHAW – Counterfactual thinking elicits emotional change in young children

Adults often reason about what might have happened had they chosen an alternative course of action in the past, which can elicit the counterfactual emotion of regret. It is unclear whether young children's emotions are similarly impacted by counterfactual thinking about past possibilities. In this study, 4- to 9-year-old children (N = 160) opened one of two boxes, which concealed small and large prizes, respectively. Some children had the means to open either box, whereas other children only had the means to open one box. After seeing that the prize they did not obtain was larger than the one they did obtain, children were significantly more likely to report a negative change in emotion when the non-obtained prize had been a straightforward counterfactual possibility than when it had not. This shows that even young children experience counterfactual emotions following choices, which may ultimately drive them to make better choices in the future.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0346>

LILY FITZGIBBON & KOU MURAYAMA – Counterfactual curiosity: motivated thinking about what might have been

Counterfactual information, information about what might have been, forms the content of counterfactual thoughts and emotions like regret and relief. Recent research suggests that human adults and children, as well as rhesus monkeys, demonstrate 'counterfactual curiosity': they are motivated to seek out counterfactual information after making decisions. Based on contemporary theories of curiosity and information seeking and a broad range of empirical literature, we suggest multiple heterogeneous psychological processes that contribute to people's motivation for counterfactual information. This includes processes that are identified in the curiosity literature more generally—the potential use of counterfactual information for adaptive decision making (its long-term instrumental value) and the drive to reduce uncertainty. Additionally, we suggest that counterfactual information may be particularly alluring because of its role in causal reasoning; its relationship with prediction and decision making; and its potential to fulfil emotion regulation and self-serving goals. Some future directions have been suggested, including investigating the role of individual differences in counterfactual curiosity on learning and wellbeing.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0340>

ALEXANDRA K. SCHNELL, MARKUS BOECKLE & NICOLA S. CLAYTON – Waiting for a better possibility: delay of gratification in corvids and its relationship to other cognitive capacities

Self-control, the ability to resist temptation and wait for better but delayed possibilities, is an important cognitive skill that underpins decision-making and planning. The capacity to exert self-control has been linked to intelligence in humans, chimpanzees and most recently cuttlefish. Here, we presented 10 Eurasian jays, *Garrulus glandarius*, with a delayed maintenance task, which measured the ability to choose a preferred outcome as well as the ability to sustain the delay prior to that outcome. Jays were able to wait for better possibilities, but maximum wait times varied across the subjects. We also presented them with five cognitive tasks that assessed spatial memory, spatial relationships and learning capacity. These tasks are commonly used as measures of general intelligence within an ecological context. Individual performance was correlated across the cognitive tasks, which suggests that there was a general intelligence factor underlying their performance. Performance in these tasks was correlated significantly with the jays' capacity to wait for better possibilities. This study demonstrates that self-control and intelligence are correlated in jays. The fact that this correlation exists in diverse species suggests that self-control is a fundamental feature of cognition. Our results are discussed in the context of convergent evolution.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0348>

MICHELLE C. LANGLEY & THOMAS SUDDENDORF – Archaeological evidence for thinking about possibilities in hominin evolution

The emergence of the ability to think about future possibilities must have played an influential role in human evolution, driving a range of foresightful behaviours, including preparation, communication and technological innovation. Here we review the archaeological evidence for such behavioural indicators of foresight. We find the earliest signs of hominins

retaining tools and transporting materials for repeated future use emerging from around 1.8 Ma. From about 0.5 Ma onwards, there are indications of technical and social changes reflecting advances in foresight. And in a third period, starting from around 140 000 years ago, hominins appear to have increasingly relied on material culture to shape the future and to exchange their ideas about possibilities. Visible signs of storytelling, even about entirely fictional scenarios, appear over the last 50 000 years. Although the current evidence suggests that there were distinct transitions in the evolution of our capacity to think about the future, we warn that issues of taphonomy and archaeological sampling are likely to skew our picture of human cognitive evolution.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2021.0350>

PLoS One

PAPERS

NADJA LINDNER et al – Children’s spatial language skills predict their verbal number skills: A longitudinal study

The process of number symbolization is assumed to be critically influenced by the acquisition of so-called verbal number skills (e.g., verbally reciting the number chain and naming Arabic numerals). For the acquisition of these verbal number skills, verbal and visuospatial skills are discussed as contributing factors. In this context, children’s verbal number skills have been found to be associated with their concurrent spatial language skills such as mastery of verbal descriptions of spatial position (e.g., in front of, behind). In a longitudinal study with three measurement times (T1, T2, T3) at an interval of about 6 months, we evaluated the predictive role of preschool children’s (mean age at T1: 3 years and 10 months) spatial language skills for the acquisition of verbal number skills. Children’s spatial language skills at T2 significantly predicted their verbal number skills at T3, when controlling for influences of important covariates such as vocabulary knowledge. In addition, further analyses replicated previous results indicating that children’s spatial language skills at T2 were associated with their verbal number skills at T2. Exploratory analyses further revealed that children’s verbal number skills at T1 predict their spatial language at T2. Results suggests that better spatial language skills at the age of 4 years facilitate the future acquisition of verbal number skills.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0277026>

JIANFENG WANG et al – Power motivation arousal promotes prosocial behavior in the dictator game depending on social presence

Despite the popular notion that power motivations are associated with aggression and antisocial behavior, this study tested the hypothesis that activating power motivations can promote prosocial behavior. Because previous research has shown that public prosocial behavior is associate with reputation and status, this study examined how making prosocial decisions publicly or privately moderates the relationship between power motivations and prosocial behavior. One hundred and forty participants were randomly assigned to watch 20 min of either The Experiment (power motivation arousal) or a documentary called Beautiful China (control condition). A modified version of the dictator game was used to measure prosocial behavior. Participants were instructed to allocate an amount of money between themselves and a stranger girl in need, in the presence of the experimenter (the experimenter registers donation amount) or in the absence of the experimenter (the donation was put in a closed envelope). The results showed that individuals in the power motivation arousal group increased their help when their reputation was under scrutiny due to the experimenter’s presence. In the private condition (experimenter is absent), power motivation is not related to prosocial behavior. The contrasting behavioral reactions resulting from the presence or absence of the experimenter are discussed in terms of reputation gain and competitive altruism.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0277294>

CHAO ZHAO, YOUNG WANG & JOHN P. WALDEN – Diachronic shifts in lithic technological transmission between the eastern Eurasian Steppe and northern China in the Late Pleistocene

The successful occupation of the eastern Eurasian Steppe in the Late Pleistocene improved cultural connections between western Eurasia and East Asia. We document multiple waves of lithic technological transmission between the eastern Eurasian Steppe and northern China during 50–11 cal. ka BP. These waves are apparent in the sequential appearance of three techno-complexes in northern China: (1) the Mousterian techno-complex, (2) the blade techno-complex mixed with Mousterian elements, (3) and the microlithized blade techno-complex. These lithic techno-complexes were transmitted under different paleoenvironmental conditions along different pathways through the eastern Eurasian Steppe. The Mousterian techno-complex and the blade techno-complex mixed with Mousterian elements were only dispersed in the north and west peripheries of northern China (50–33 cal. ka BP). We argue that these techno-complexes failed to penetrate into the hinterland of northern China because they were not well suited to local geographical conditions. In contrast, the microlithized blade technology which diffused from the eastern Eurasian Steppe was locally modified into a Microblade techno-complex which was highly suited to local environmental conditions, and proliferated across the hinterland of northern China (28/27-11 cal. ka BP). The subsequent spread of microblade technology over vast regions of Mongolia and Siberia indicates that the Pleistocene inhabitants of northern China not only adopted and modified technologies from their neighbors in the Eurasian Steppe, but these modified variants were subsequently transmitted back into the Eurasian Steppe. These episodes of technological transmission indicate complicated patterns of population dispersal and technological interaction across northern China and the eastern Eurasian Steppe.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0275162>

MILENA TSVETKOVA et al – Inequality and fairness with heterogeneous endowments

People differ in intelligence, cognitive ability, personality traits, motivation, and similar valued and, to a large degree, inherited characteristics that determine success and achievements. When does individual heterogeneity lead to a fair distribution of rewards and outcomes? Here, we develop this question theoretically and then test it experimentally for a set of structural conditions in a specific interaction situation. We first catalogue the functional relationship between individual endowments and outcomes to distinguish between fairness concepts such as meritocracy, equality of opportunity, equality of outcomes, and Rawl's theory of justice. We then use an online experiment to study which of these fairness patterns emerge when differently endowed individuals can share their resources with others, depending on whether information about others' endowments and outcomes is available. We find that while visible outcomes lessen inequality by decreasing the statistical dispersion of outcomes across the group, endowments need to be visible for better equality of opportunity for the most disadvantaged.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0276864>

Royal Society Open Science

PAPERS

SZABOLCS SZÁMADÓ, FLÓRA SAMU & KÁROLY TAKÁCS – Condition-dependent trade-offs maintain honest signalling

How and why animals and humans signal reliably is a key issue in biology and social sciences that needs to be understood to explain the evolution of communication. In situations in which the receiver needs to differentiate between low- and high-quality signallers, once a ruling paradigm, the Handicap Principle has claimed that honest signals have to be costly to produce. Subsequent game theoretical models, however, highlighted that honest signals are not necessarily costly. Honesty is maintained by the potential cost of cheating: by the difference in the marginal benefit to marginal cost for low versus high-quality signallers; i.e. by differential trade-offs. Owing to the difficulties of manipulating signal costs and benefits, there is lack of empirical tests of these predictions. We present the results of a laboratory decision-making experiment with human participants to test the role of equilibrium signal cost and signalling trade-offs for the development of honest communication. We found that the trade-off manipulation had a much higher influence on the reliability of communication than the manipulation of the equilibrium cost of signal. Contrary to the predictions of the Handicap Principle, negative production cost promoted honesty at a very high level in the differential trade-off condition.

<https://royalsocietypublishing.org/doi/full/10.1098/rsos.220335>

PAMELA BARONE et al – Do young children track other's beliefs, or merely their perceptual access? An interactive, anticipatory measure of early theory of mind

This paper aimed to contribute to answering three questions. First, how robust and reliable are early implicit measures of false belief (FB) understanding? Second, do these measures tap FB understanding rather than simpler processes such as tracking the protagonist's perceptual access? Third, do implicit FB tasks tap an earlier, more basic form of theory of mind (ToM) than standard verbal tasks? We conducted a conceptual replication of Garnham & Perner's task (Garnham and Perner 2001 Br. J. Dev. Psychol.19, 413–432) simultaneously measuring children's anticipatory looking and interactive behaviours toward an agent with a true or FB (N = 81, M = 40 months). Additionally, we implemented an ignorance condition and a standard FB task. We successfully replicated the original findings: children's looking and interactive behaviour differed according to the agent's true or FB. However, children mostly did not differentiate between FB and ignorance conditions in various measures of anticipation and uncertainty, suggesting the use of simpler conceptual strategies than full-blown ToM. Moreover, implicit measures were all related to each other but largely not related to performance in the standard FB task, except for first look in the FB condition. Overall, our findings suggest that these implicit measures are robust but may not tap the same underlying cognitive capacity as explicit FB tasks.

<https://royalsocietypublishing.org/doi/full/10.1098/rsos.211278>

Science

PAPERS

TRYGVE B. LEERGAARD & JAN G. BJAALIE – Atlas-based data integration for mapping the connections and architecture of the brain

Detailed knowledge about the neural connections among regions of the brain is key for advancing our understanding of normal brain function and changes that occur with aging and disease. Researchers use a range of experimental techniques to map connections at different levels of granularity in rodent animal models, but the results are often challenging to compare and integrate. Three-dimensional reference atlases of the brain provide new opportunities for cumulating, integrating, and reinterpreting research findings across studies. Here, we review approaches for integrating data describing neural connections and other modalities in rodent brain atlases and discuss how atlas-based workflows can facilitate brainwide analyses of neural network organization in relation to other facets of neuroarchitecture.

<https://www.science.org/doi/10.1126/science.abq2594>

MICHEL THIEBAUT DE SCHOTTEN & STEPHANIE J. FORKEL – The emergent properties of the connected brain

There is more to brain connections than the mere transfer of signals between brain regions. Behavior and cognition emerge through cortical area interaction. This requires integration between local and distant areas orchestrated by densely connected networks. Brain connections determine the brain's functional organization. The imaging of connections in the living brain has provided an opportunity to identify the driving factors behind the neurobiology of cognition. Connectivity differences between species and among humans have furthered the understanding of brain evolution and of diverging cognitive profiles. Brain pathologies amplify this variability through disconnections and, consequently, the disintegration of cognitive functions. The prediction of long-term symptoms is now preferentially based on brain disconnections. This paradigm shift will reshape our brain maps and challenge current brain models.

<https://www.science.org/doi/10.1126/science.abq2591>

Science Advances

PAPERS

N. EZGI ALTINIŞIK et al – A genomic snapshot of demographic and cultural dynamism in Upper Mesopotamia during the Neolithic Transition

Upper Mesopotamia played a key role in the Neolithic Transition in Southwest Asia through marked innovations in symbolism, technology, and diet. We present 13 ancient genomes (c. 8500 to 7500 cal BCE) from Pre-Pottery Neolithic Çayönü in the Tigris basin together with bioarchaeological and material culture data. Our findings reveal that Çayönü was a genetically diverse population, carrying mixed ancestry from western and eastern Fertile Crescent, and that the community received immigrants. Our results further suggest that the community was organized along biological family lines. We document bodily interventions such as head shaping and cauterization among the individuals examined, reflecting Çayönü's cultural ingenuity. Last, we identify Upper Mesopotamia as the likely source of eastern gene flow into Neolithic Anatolia, in line with material culture evidence. We hypothesize that Upper Mesopotamia's cultural dynamism during the Neolithic Transition was the product not only of its fertile lands but also of its interregional demographic connections.

<https://www.science.org/doi/full/10.1126/sciadv.abo3609>

DIANA A. LIAO et al – Recursive sequence generation in crows

Recursion, the process of embedding structures within similar structures, is often considered a foundation of symbolic competence and a uniquely human capability. To understand its evolution, we can study the recursive aptitudes of nonhuman animals. We adopted the behavioral protocol of a recent study demonstrating that humans and nonhuman primates grasp recursion. We presented sequences of bracket pair stimuli (e.g., [] and { }) to crows who were instructed to peck at training lists. They were then tested on their ability to transfer center-embedded structure to never-before-seen pairings of brackets. We reveal that crows have recursive capacities; they perform on par with children and even outperform macaques. The crows continued to produce recursive sequences after extending to longer and thus deeper embeddings. These results demonstrate that recursive capabilities are not limited to the primate genealogy and may have occurred separately from or before human symbolic competence in different animal taxa.

<https://www.science.org/doi/full/10.1126/sciadv.abq3356>

Trends in Cognitive Sciences

PAPERS

JAMES L. MCCLELLAND – Capturing advanced human cognitive abilities with deep neural networks

How can artificial neural networks capture the advanced cognitive abilities of pioneering scientists? I suggest they must learn to exploit human-invented tools of thought and human-like ways of using them, and must engage in explicit goal-directed problem solving as exemplified in the activities of scientists and mathematicians and taught in advanced educational settings.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00239-X](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00239-X)

ANDREAS K. ENGEL & CHRISTIAN GERLOFF – Dynamic functional connectivity: causative or epiphenomenal?

Dynamic coupling of neural signals is a hallmark of brain networks, but its potential relevance is still debated. Does coupling play a causal role for network functions, or is it just a by-product of structural connectivity or other physiological processes? With intervention techniques that have become available, experiments seem within reach that may provide answers to this long-standing question.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00242-X](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00242-X)

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