

EAORC BULLETIN 1,033 – 2 April 2023

CONTENTS

NOTICES	2
PUBLICATION ALERTS.....	2
NEWS	2
SAPIENS – Following a New Trail of Crumbs to Agriculture’s Origins.....	2
SCIENCE.ORG NEWS – Fast-growing open-access journals stripped of coveted impact factors.....	2
SOCIETY FOR SCIENCE – Your brain wires itself to match your native language.....	2
SOCIETY FOR SCIENCE – A surprising food may have been a staple of the real Paleo diet: rotten meat.....	2
THE CONVERSATION – Body language books get it wrong: the truth about reading nonverbal cues.....	2
THE CONVERSATION – What the social lives of wasps can teach us about the evolution of animal societies.....	3
THE CONVERSATION – Why some people lose their accents but others don’t – linguistic expert.....	3
PUBLICATIONS	3
Biology Letters.....	3
PAPERS	3
CONNER S. PHILSON & DANIEL T. BLUMSTEIN – Emergent social structure is typically not associated with survival in a facultatively social mammal.....	3
Current Biology.....	3
ARTICLES	3
EDITOR – Q&A: Dora Biro.....	3
VLADIMIR M. SLOUTSKY & BRANDON M. TURNER – Cognition: The power of simple associative learning.....	3
PAPERS	3
EDWARD A. WASSERMAN, ANDREW G. KAIN & ELLEN M. O’DONOGHUE – Resolving the associative learning paradox by category learning in pigeons.....	3
LYDIA SMITH-OSBORNE et al – Female dominance hierarchies influence responses to psychosocial stressors.....	4
Frontiers in Bioengineering and Biotechnology.....	4
PAPERS	4
RUNDONG LIAO et al – Modeling and simulation of extended ant colony labor division for benefit distribution of the all-for-one tourism supply chain with front and back decoupling.....	4
Frontiers in Computer Science.....	4
PAPERS	4
ELIE MAALOUY et al – Assessing the effect of dialogue on altruism toward future generations: A preliminary study.....	4
Frontiers in Human Neuroscience.....	4
PAPERS	4
EHSAN SHEKARI & NAZBANOU NOZARI – A narrative review of the anatomy and function of the white matter tracts in language production and comprehension.....	4
Frontiers in Psychology.....	5
PAPERS	5
PASCAL MICHAEL, DAVID LUKE & OLIVER ROBINSON – An encounter with the self: A thematic and content analysis of the DMT experience from a naturalistic field study.....	5
Heliyon.....	5
PAPERS	5
AZWIHANGWISI HELEN MAVHANDU-MUDZUSI et al – Terms which LGBTIQ+ individuals prefer or hate to be called by.....	5
Nature Communications.....	6
PAPERS	6
SHAWN A. RHOADS et al – Unselfish traits and social decision-making patterns characterize six populations of real-world extraordinary altruists.....	6
Nature Communications Biology.....	6
PAPERS	6
PAYAL ARYA et al – Tracing development of song memory with fMRI in zebra finches after a second tutoring experience.....	6
Nature Humanities & Social Sciences Communications.....	6
PAPERS	6
DAN C. BACIU – Causal models, creativity, and diversity.....	6
Nature Machine Intelligence.....	6
PAPERS	6

SILVIA MILANO, JOSHUA A. MCGRANE & SABINA LEONELLI – Large language models challenge the future of higher education	6
PLoS One	7
PAPERS	7
JU-HYUN LEE & HA-CHEOL SUNG – Morphological characteristics convey social status signals in captive tree sparrows (<i>Passer montanus</i>)	7
PNAS	7
PAPERS	7
MELANIE MITCHELL & DAVID C. KRAKAUER – The debate over understanding in AI’s large language models	7
COMMENTARIES	7
DARRYL E. GRANGER et al – Monkey fossils do not negate cosmogenic dating at Sterkfontein	7
STEPHEN R. FROST et al – Reply to Granger et al.: Multiple, independent lines of evidence suggest Sterkfontein is less than 2.8 My old	7
Proceedings of the Royal Society B	8
PAPERS	8
JONATHAN S. REEVES et al – Simulation and social network analysis provide insight into the acquisition of tool behaviour in hybrid macaques	8
Royal Society Open Science	8
PAPERS	8
ZHISHENG TANG & MAYANK KEJRIWAL – Can language representation models think in bets?	8
MD SAMS AFIF NIRJHOR & MAYUKO NAKAMARU – The evolution of cooperation in the unidirectional linear division of labour of finite roles	8
ROWAN TITCHENER et al with JULIA FISCHER – Social disappointment and partner presence affect long-tailed macaque refusal behaviour in an ‘inequity aversion’ experiment	9
Trends in Cognitive Sciences	9
PAPERS	9
AMAR SARKAR & RICHARD W. WRANGHAM – Evolutionary and neuroendocrine foundations of human aggression	9
SUBSCRIBE to the EAORC Bulletin	9
UNSUBSCRIBE from the EAORC Bulletin	9
PRODUCED BY AND FOR THE EAORC EMAIL GROUP	9

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.

NEWS

SAPIENS – Following a New Trail of Crumbs to Agriculture’s Origins

Archaeologists have found tiny pieces of ancient bread from hunter-gatherers that predate agriculture by about 4,000 years.

<https://www.sapiens.org/archaeology/oldest-known-bread-crumbs-discovered/>

SCIENCE.ORG NEWS – Fast-growing open-access journals stripped of coveted impact factors

Web of Science delists some 50 journals, including one of the world’s largest.

<https://www.science.org/content/article/fast-growing-open-access-journals-stripped-coveted-impact-factors>

SOCIETY FOR SCIENCE – Your brain wires itself to match your native language

MRI scans of nearly 100 native speakers of either German or Arabic revealed differences in how the language circuits of their brains are connected.

<https://www.sciencenews.org/article/brain-wires-native-language-neurons>

SOCIETY FOR SCIENCE – A surprising food may have been a staple of the real Paleo diet: rotten meat

The realization that people have long eaten putrid foods has archaeologists rethinking what Neandertals and other ancient hominids ate.

<https://www.sciencenews.org/article/meat-rotten-putrid-paleo-diet-fire-neanderthal>

THE CONVERSATION – Body language books get it wrong: the truth about reading nonverbal cues

Why you shouldn’t judge a book by its cover: the limitations of reading body language.

<https://theconversationuk.cmail19.com/t/r-l-ttoukiy-khhiliah-w/>

THE CONVERSATION – What the social lives of wasps can teach us about the evolution of animal societies

Think your social life is complicated? Consider the wasp.

<https://theconversationuk.cmail20.com/t/r-l-ttniuky-khhililahlh-g/>

THE CONVERSATION – Why some people lose their accents but others don't – linguistic expert

Your subconscious sense of identity can influence how much your accent changes.

<https://theconversationuk.cmail20.com/t/r-l-ttniuky-khhililahlh-yh/>

PUBLICATIONS

Biology Letters**PAPERS****CONNER S. PHILSON & DANIEL T. BLUMSTEIN – Emergent social structure is typically not associated with survival in a facultatively social mammal**

For social animals, group social structure has important consequences for disease and information spread. While prior studies showed individual connectedness within a group has fitness consequences, less is known about the fitness consequences of group social structure for the individuals who comprise the group. Using a long-term dataset on a wild population of facultatively social yellow-bellied marmots (*Marmota flaviventris*), we showed social structure had largely no relationship with survival, suggesting consequences of individual social phenotypes may not scale to the group social phenotype. An observed relationship for winter survival suggests a potentially contrasting direction of selection between the group and previous research on the individual level; less social individuals, but individuals in more social groups experience greater winter survival. This work provides valuable insights into evolutionary implications across social phenotypic scales.

<https://royalsocietypublishing.org/doi/full/10.1098/rsbl.2022.0511>

Current Biology**ARTICLES****EDITOR – Q&A: Dora Biro**

Dora Biro is Professor of Brain and Cognitive Sciences at the University of Rochester and Professor of Animal Behaviour at the University of Oxford (currently on leave). She received her undergraduate and graduate degrees from the University of Oxford, and later held a postdoctoral research position there, as well as at Kyoto University. She was awarded a University Research Fellowship from the Royal Society in 2007 and a L'Oréal-UNESCO For Women in Science Fellowship in 2010, and took up her first faculty position in 2013 at the Department of Zoology (now Biology) at Oxford. Her research focuses on various aspects of animal cognition in the physical, social, and symbolic domains, including navigation, tool use, numerical competence, innovation, social learning, coordination, collective problem-solving, and cultural transmission.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(23\)00080-5](https://www.cell.com/current-biology/fulltext/S0960-9822(23)00080-5)

VLADIMIR M. SLOUTSKY & BRANDON M. TURNER – Cognition: The power of simple associative learning

Associative learning is traditionally considered to be slow and inefficient compared to 'smarter' rule-based learning. New research reveals the remarkable ability of associative learning in acquiring exceedingly complex categories.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(23\)00131-8](https://www.cell.com/current-biology/fulltext/S0960-9822(23)00131-8)

PAPERS**EDWARD A. WASSERMAN, ANDREW G. KAIN & ELLEN M. O'DONOGHUE – Resolving the associative learning paradox by category learning in pigeons**

A wealth of evidence indicates that humans can engage two types of mechanisms to solve category-learning tasks: declarative mechanisms, which involve forming and testing verbalizable decision rules, and associative mechanisms, which involve gradually linking stimuli to appropriate behavioral responses. In contrast to declarative mechanisms, associative mechanisms have received surprisingly little attention in the broader category-learning literature. Although various forms of associatively driven artificial intelligence (AI) have matched—and even surpassed—humans' performance on several challenging problems, associative learning is routinely dismissed as being too simple to power the impressive cognitive achievements of both humans and non-human species. Here, we attempt to resolve this paradox by demonstrating that pigeons—which appear to rely solely on associative learning mechanisms in several tasks that promote declarative rule use by humans—succeed at learning a novel, highly demanding category structure that ought to hinder declarative rule use: the sectioned-rings task. Our findings highlight the power and flexibility that associative mechanisms afford in the realm of category learning.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(23\)00058-1](https://www.cell.com/current-biology/fulltext/S0960-9822(23)00058-1)

LYDIA SMITH-OSBORNE et al – Female dominance hierarchies influence responses to psychosocial stressors

Social species form dominance hierarchies to ensure survival and promote reproductive success. Traditionally studied in males, rodent hierarchies are considered despotic, and dominant social rank results from a history of winning agonistic encounters. By contrast, female hierarchies are thought to be less despotic, and rank is conferred by intrinsic traits. Both social buffering and elevated social status confer resilience to depression, anxiety, and other consequences of chronic stress. Here, we investigate whether female social hierarchies and individual traits related to social rank likewise influence stress resilience. We observe the formation of dyadic female hierarchies under varying conditions of ambient light and circadian phase and subject mice to two forms of chronic psychosocial stress: social isolation or social instability. We find that stable female hierarchies emerge rapidly in dyads. Individual behavioral and endocrinological traits are characteristic of rank, some of which are circadian phase dependent. Further, female social rank is predicted by behavior and stress status prior to social introduction. Other behavioral characteristics suggest that rank is motivation-based, indicating that female rank identity serves an evolutionarily relevant purpose. Rank is associated with alterations in behavior in response to social instability stress and prolonged social isolation, but the different forms of stress produce disparate rank responses in endocrine status. Histological examination of c-Fos protein expression identified brain regions that respond to social novelty or social reunion following chronic isolation in a rank-specific manner. Collectively, female rank is linked to neurobiology, and hierarchies exert context-specific influence upon stress outcomes.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(23\)00308-1](https://www.cell.com/current-biology/fulltext/S0960-9822(23)00308-1)

Frontiers in Bioengineering and Biotechnology**PAPERS****RUNDONG LIAO et al – Modeling and simulation of extended ant colony labor division for benefit distribution of the all-for-one tourism supply chain with front and back decoupling**

This paper takes the supply chain alliance under the decoupling of the front and back of the all-for-one tourism as the research object. Considering the three behavior stimuli of self-benefit, altruism, and invariance, this article resets the attributes such as environmental stimuli and response threshold of ants based on the characteristics of the all-for-one tourism supply chain with shared services as the core under the decoupling of the front and back. Moreover, it introduces dual intervention factors to coordinate the benefit distribution process of different member companies, takes fairness as the main goal of benefit distribution, introduces relative deprivation as the measure index of fairness, and establishes a dynamic all-for-one tourism supply chain alliance benefit distribution model. The experimental results show that the extended model has good flexibility of benefit distribution and realizes the fair distribution of supply chain benefits.

<https://www.frontiersin.org/articles/10.3389/fbioe.2023.985550/full>

Frontiers in Computer Science**PAPERS****ELIE MAALOULY et al – Assessing the effect of dialogue on altruism toward future generations: A preliminary study**

Despite the abundance of evidence on climate change and its consequences on future generations, people, in general, are still reluctant to change their actions and behaviors toward the environment that would particularly benefit posterity. In this study, we took a preliminary step in a new research direction to explore humans' altruistic behavior toward future generations of people and whether it can be affected by dialogue.

We used an android robot called Telenoid as a representative of future generations by explaining that the robot is controlled by an Artificial Intelligence (AI) living in a simulation of our world in the future. To measure people's altruistic behavior toward it, we asked the participants to play a round of the Dictator Game with the Telenoid before having an interactive conversation with the Telenoid and then playing another round.

On average, participants gave more money to the Telenoid in the second round (after having an interactive conversation).

The average amount of money increased from 20% in the first to about 30% in the second round.

The results indicate that the conversation with the robot might have been responsible for the change in altruistic behavior toward the Telenoid. Contrary to our expectations, the personality of the participants did not appear to have an influence on their change of behavior, but other factors might have contributed. We finally discuss the influence of other possible factors such as empathy and the appearance of the robot. However, the preliminary nature of this study should deter us from making any definitive conclusions, but the results are promising for establishing the ground for future experiments.

<https://www.frontiersin.org/articles/10.3389/fcomp.2023.1129340/full>

Frontiers in Human Neuroscience**PAPERS****EHSAN SHEKARI & NAZBANOU NOZARI – A narrative review of the anatomy and function of the white matter tracts in language production and comprehension**

Much is known about the role of cortical areas in language processing. The shift towards network approaches in recent years has highlighted the importance of uncovering the role of white matter in connecting these areas. However, despite a large body of research, many of these tracts' functions are not well-understood. We present a comprehensive review of the

empirical evidence on the role of eight major tracts that are hypothesized to be involved in language processing (inferior longitudinal fasciculus, inferior fronto-occipital fasciculus, uncinate fasciculus, extreme capsule, middle longitudinal fasciculus, superior longitudinal fasciculus, arcuate fasciculus, and frontal aslant tract). For each tract, we hypothesize its role based on the function of the cortical regions it connects. We then evaluate these hypotheses with data from three sources: studies in neurotypical individuals, neuropsychological data, and intraoperative stimulation studies. Finally, we summarize the conclusions supported by the data and highlight the areas needing further investigation.

<https://www.frontiersin.org/articles/10.3389/fnhum.2023.1139292/full>

Frontiers in Psychology

PAPERS

PASCAL MICHAEL, DAVID LUKE & OLIVER ROBINSON – An encounter with the self: A thematic and content analysis of the DMT experience from a naturalistic field study

N,N-Dimethyltryptamine (DMT) is an endogenous serotonergic psychedelic capable of producing radical shifts in an experience that have significant implications for consciousness and its neural correlates, especially given the “disconnected consciousness” suggested by the “breakthrough” DMT state. Its increasing usage and clinical trial indicate the growing importance of a thorough elucidation of the experience’s qualitative content, over and above the phenomenological structure. This is particularly in light of the intensely pervasive effects of DMT occasions in all dimensions of the self, which are often ontologically challenging yet potentially transformative.

This is the second report on the first naturalistic field study of DMT use exploring its qualitative analysis. Screened, healthy, anonymized, and experienced DMT users were observed during their non-clinical use of the drug at home (40–75-mg inhaled). In-depth semi-structured interviews, inspired by the micro-phenomenological technique, were employed immediately after their experience. This study reports on the thematic and content analysis of one major domain of the breakthrough experiences elicited, the “self”; where analyses of the “other” were previously reported. A total of 36 post-DMT experience interviews with mostly Caucasian (83%) men (eight women) of a mean of 37 years were predominantly inductively coded.

Invariably, profound and highly intense experiences occurred. The first overarching category comprised the onset of effects, encompassing super-ordinate themes including sensory, emotion and body, and space-time shifts; the second category comprised bodily effects, encompassing themes including pleasurable, neutral/both, and uncomfortable; the third category comprised the sensorial effects, encompassing open-eye, visual, and cross-modal and other; the fourth comprised the psychological effects, encompassing memory and language, awareness and sense of self, and time distortions; and the fifth comprised the emotional effects, encompassing positive, neither/both, and challenging experiences. Many further subthemes also illuminate the rich content of the DMT experience.

The present study provides a systematic and nuanced analysis of the content of the breakthrough DMT state pertaining to one’s personal and self-referential experiences of the body, senses, psychology, and emotions. The resonances both with previous DMT studies and other types of extraordinary experiences, such as the alien abduction, shamanic and near-death experiences, are also elaborated upon. Putative neural mechanisms and their promise as a psychotherapeutic agent, especially owing to deep emotional impact, are discussed.

<https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1083356/full>

Heliyon

PAPERS

AZWIHANGWISI HELEN MAVHANDU-MUDZUSI et al – Terms which LGBTQI+ individuals prefer or hate to be called by

The evolution of the abbreviation LGBTQI+ comes on the backdrop of numerous studies that were conducted as a form of advocacy to promote the inclusion of LGBTQI+ individuals into society. This study sought to explore the terms that LGBTQI+ individuals prefer to be called and those they hate to be called by. The study adopted a qualitative approach underpinned by Husserl’s descriptive phenomenological research design. Data was collected through WhatsApp-based semi-structured individual interviews from 19 participants who were sampled using purposive and snowballing sampling methods. Data analysis was done using Colaizzi’s phenomenological analysis method, and all ethical considerations to safeguard participants were adhered to. The analysis yielded two main themes as preferred terminologies and terms that are hated by the LGBTQI+ persons. The findings show an evolution in the terminologies used in relation to the LGBTQI+ identifying persons. Terms such as Queer, LGBTQI+ community, terms confirming gender identity, SOGI neutral, and preferred pronouns emerged as terms that LGBTQI+ people preferred to be called or addressed by. On the other side of the coin, the findings revealed terms that the LGBTQI+ people hated as these were perceived to be discriminatory and derogatory, such as terms like “moffie” and “stabane”. LGBTQI+ terms are forever evolving and there is a need to raise community awareness and conscientisation towards moving away from the use of derogatory and hateful terms. The hated terms continue to perpetuate verbal abuse, stigmatisation and discrimination of the LGBTQI+ community. Therefore, a nuanced approach to develop and adopt inclusive language policies to promote diversity in public and private spheres.

[https://www.cell.com/heliyon/fulltext/S2405-8440\(23\)02197-7](https://www.cell.com/heliyon/fulltext/S2405-8440(23)02197-7)

Nature Communications

PAPERS

SHAWN A. RHOADS et al – Unselfish traits and social decision-making patterns characterize six populations of real-world extraordinary altruists

Acts of extraordinary, costly altruism, in which significant risks or costs are assumed to benefit strangers, have long represented a motivational puzzle. But the features that consistently distinguish individuals who engage in such acts have not been identified. We assess six groups of real-world extraordinary altruists who had performed costly or risky and normatively rare (<0.00005% per capita) altruistic acts: heroic rescues, non-directed and directed kidney donations, liver donations, marrow or hematopoietic stem cell donations, and humanitarian aid work. Here, we show that the features that best distinguish altruists from controls are traits and decision-making patterns indicating unusually high valuation of others' outcomes: high Honesty-Humility, reduced Social Discounting, and reduced Personal Distress. Two independent samples of adults who were asked what traits would characterize altruists failed to predict this pattern. These findings suggest that theories regarding self-focused motivations for altruism (e.g., self-enhancing reciprocity, reputation enhancement) alone are insufficient explanations for acts of real-world self-sacrifice.

<https://www.nature.com/articles/s41467-023-37283-5>

Nature Communications Biology

PAPERS

PAYAL ARYA et al – Tracing development of song memory with fMRI in zebra finches after a second tutoring experience

Sensory experiences in early development shape higher cognitive functions such as language acquisition in humans and song learning in birds. Zebra finches (*Taeniopygia guttata*) sequentially exposed to two different song 'tutors' during the sensitive period in development are able to learn from their second tutor and eventually imitate aspects of his song, but the neural substrate involved in learning a second song is unknown. We used fMRI to examine neural activity associated with learning two songs sequentially. We found that acquisition of a second song changes lateralization of the auditory midbrain. Interestingly, activity in the caudolateral Nidopallium (NCL), a region adjacent to the secondary auditory cortex, was related to the fidelity of second-song imitation. These findings demonstrate that experience with a second tutor can permanently alter neural activity in brain regions involved in auditory perception and song learning.

<https://www.nature.com/articles/s42003-023-04724-2>

Nature Humanities & Social Sciences Communications

PAPERS

DAN C. BACIU – Causal models, creativity, and diversity

Causal models find application in almost all areas of science, and they often support the development of theories that are straightforward and testable. Yet scientists also observe things that surprise them. Fascinated by such observations, they learn to admire the playful aspects of life, as well as its creativity and diversity. Under these circumstances, a compelling question arises: Can causal models explain life's creativity and diversity? Some life scientists say yes. However, other humanities scholars cast doubt, positing that they reached the end of theory. Here, I build on common empirical observations as well as long-accumulated modeling experience, and I develop a unified framework for causal modeling. The framework gives special attention to life's creativity and diversity, and it applies to all sciences including physics, biology, the sciences of the city, and the humanities.

<https://www.nature.com/articles/s41599-023-01540-1>

Nature Machine Intelligence

PAPERS

SILVIA MILANO, JOSHUA A. MCGRANE & SABINA LEONELLI – Large language models challenge the future of higher education

ChatGPT is a chatbot based on a large language model (LLM) that generates text in dialogue format. It was publicly released by OpenAI in December 2022 and has sent shockwaves through the higher education sector for its ability to create polished, confident-sounding text, which could be used to write essays and assignments. While for now it can produce answers¹ that are only competent enough to achieve a passing mark, it is capable of correctly answering multiple-choice questions across several subject areas, including passing sample questions from high-profile licensing examinations. The rate of progress of such applications has been such that it is not difficult to imagine that a much-improved successor of ChatGPT will be released soon.

<https://www.nature.com/articles/s42256-023-00644-2>

PLoS One

PAPERS

JU-HYUN LEE & HA-CHEOL SUNG – Morphological characteristics convey social status signals in captive tree sparrows (*Passer montanus*)

In social animals that form flocks, individuals compete or cooperate to gain access to shared resources. In particular, group-foraging individuals frequently engage in aggressive interactions with conspecifics, including threat displays and physical attacks, in order to acquire food resources. Here, we investigated social interactions in flocks of captive tree sparrows (*Passer montanus*) to observe the formation of dominance hierarchies. We also examined correlations between social status and morphological traits to identify which physical traits act as indicators of dominance. To do so, we recorded aggressive behaviours (attacks and threats) of tree sparrows caught in two distinct regions in the Republic of Korea (Gwangju and Gurye). After merging the two groups, we examined dominance structures using David's scores for one month, and we recorded 1,051 aggressive interactions at a feeder in a group of 19 individuals. Using the number of aggressions and attack and threat behaviours, we tested whether morphological traits and sex influenced dominance structures. Aggressions were significantly more frequent in males than in females. However, no significant difference was observed the frequency of between- and within-sex aggression. In addition, differences in the frequency of aggression behaviours were observed between capture-site groups. Dominance structure was significantly correlated with certain morphological traits; specifically, the frequency of attacking behaviours was correlated with bill-nose length, and the frequency of threat displays was correlated with sex and badge size. These results suggest that social signals are closely related to morphological traits that are used to form dominance hierarchies in tree sparrow flocks.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0283625>

PNAS

PAPERS

MELANIE MITCHELL & DAVID C. KRAKAUER – The debate over understanding in AI's large language models

We survey a current, heated debate in the artificial intelligence (AI) research community on whether large pretrained language models can be said to understand language—and the physical and social situations language encodes—in any humanlike sense. We describe arguments that have been made for and against such understanding and key questions for the broader sciences of intelligence that have arisen in light of these arguments. We contend that an extended science of intelligence can be developed that will provide insight into distinct modes of understanding, their strengths and limitations, and the challenge of integrating diverse forms of cognition.

<https://www.pnas.org/doi/abs/10.1073/pnas.2215907120>

COMMENTARIES

DARRYL E. GRANGER et al – Monkey fossils do not negate cosmogenic dating at Sterkfontein

Frost et al. show that molars of the East African *Theropithecus oswaldi* lineage become systematically larger from 4.0 to 0.5 My. They use this trend to infer ages for various South African fossil sites, assuming no clinal variation in tooth size over the continent. They estimate an age of ca. 2.4 My from the large *T. oswaldi darti* teeth at Makapansgat. Sterkfontein Members 4 and 2 lack *Theropithecus* but preserve other cercopithecoid species similar to Makapansgat, so they propose a similar age, rejecting radiometric dates and stratigraphic observations (2) placing Sterkfontein Members 4 and 2 from ca. 3.4 to 3.7 My. We do not question that tooth size can be helpful for relative dating in East Africa but rather challenge the extrapolation of inferred ages to Sterkfontein.

<https://www.pnas.org/doi/full/10.1073/pnas.2300314120>

STEPHEN R. FROST et al – Reply to Granger et al.: Multiple, independent lines of evidence suggest Sterkfontein is less than 2.8 My old

We welcome the comment from Granger et al. in response to our reassessment of the entire African Plio-Pleistocene cercopithecoid assemblage and its biochronological implications for the hominin fossil record. We address their concerns as follows:

1. Regardless of the competing stratigraphic interpretations at Sterkfontein, our biochronological assessment based on the monkeys collected within the breccias is congruent with recent U–Pb and paleomagnetic analyses of the flowstones. We note that the Al–Be estimates, which are also based on samples from breccias, are clear outliers to an otherwise consistent signal.
2. Variation in fossils previously attributed to *Cercopithecoides williamsi* across localities has been reassessed over the past 20 y, with at least three species recognized in southern Africa: *C. williamsi*, *C. haasgati*, and *C. coronatus*, and the *C. williamsi* material from Makapansgat, Sterkfontein, and other sites is conspecific with that from eastern Africa. *Cercopithecoides meaveae*, not present at Sterkfontein, is the only species of *Cercopithecoides* currently known between 4 and 3 Ma. *Parapapio* may have existed over a long time range, but there are no definitive occurrences for *Pp. broomi* or *Pp. whitei* older than ~2.7 Ma.
3. SWP 31 and SWP 35, both securely placed in Member 4 by previous authors, including Pickering and Clarke, are best identified as *Papio sensu stricto*, not *?P. izodi* (10). Compared to *?P. izodi*, these specimens exhibit well-defined maxillary

fossae, significantly larger P4s, and in the case of SWP 31 [an unambiguous female, contra Heaton], a taller malar region, all diagnostic features of *Papio s.s.*

<https://www.pnas.org/doi/full/10.1073/pnas.2301351120>

Proceedings of the Royal Society B

PAPERS

JONATHAN S. REEVES et al – Simulation and social network analysis provide insight into the acquisition of tool behaviour in hybrid macaques

The pathways through which primates acquire skills are a central focus of cultural evolution studies. The roles of social and genetic inheritance processes in skill acquisition are often confounded by environmental factors. Hybrid macaques from Koram Island (Thailand) provide an opportunity to examine the roles of inheritance and social learning to skill acquisition within a single ecological setting. These hybrids are a cross between tool-using Burmese long-tailed (*Macaca fascicularis aurea*) and non-tool-using common long-tailed macaques (*Macaca fascicularis fascicularis*). This population provides an opportunity to explore the roles of social learning and inheritance processes while being able to exclude underlying ecological factors. Here, we investigate the roles of social learning and inheritance in tool use prevalence within this population using social network analysis and simulation. Agent-based modelling (ABM) is used to generate expectations for how social/asocial learning and inheritance structure the patterning in a social network. The results of the simulation show that various transmission mechanisms can be differentiated based on associations between individuals in a social network. The results provide an investigative framework for discussing tool use transmission pathways in the Koram social network. By combining ABM, network analysis, and behavioural data from the field we can investigate the roles social learning and inheritance play in tool acquisition of wild primates.

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2022.2276>

Royal Society Open Science

PAPERS

ZHISHENG TANG & MAYANK KEJRIWAL – Can language representation models think in bets?

In recent years, transformer-based language representation models (LRMs) have achieved state-of-the-art results on difficult natural language understanding problems, such as question answering and text summarization. As these models are integrated into real-world applications, evaluating their ability to make rational decisions is an important research agenda, with practical ramifications. This article investigates LRMs' rational decision-making ability through a carefully designed set of decision-making benchmarks and experiments. Inspired by classic work in cognitive science, we model the decision-making problem as a bet. We then investigate an LRM's ability to choose outcomes that have optimal, or at minimum, positive expected gain. Through a robust body of experiments on four established LRMs, we show that a model is able to 'think in bets' if it is first fine-tuned on bet questions with an identical structure. Modifying the bet question's structure, while still retaining its fundamental characteristics, decreases an LRM's performance by more than 25%, on average, although absolute performance remains well above random. LRMs are also found to be more rational when selecting outcomes with non-negative expected gain, rather than optimal or strictly positive expected gain. Our results suggest that LRMs could potentially be applied to tasks that rely on cognitive decision-making skills, but that more research is necessary before these models can robustly make rational decisions.

<https://royalsocietypublishing.org/doi/full/10.1098/rsos.221585>

MD SAMS AFIF NIRJHOR & MAYUKO NAKAMARU – The evolution of cooperation in the unidirectional linear division of labour of finite roles

Evolution of cooperation is a puzzle in evolutionary biology and social sciences. Previous studies assumed that players are equal and have symmetric relationships. In our society, players are in different roles, have an asymmetric relationship and cooperate together. We focused on the linear division of labour in a unidirectional chain that has finite roles, each of which is assigned to one group with cooperators and defectors. A cooperator in an upstream group produces and modifies a product, paying a cost of cooperation, and hands it to a player in a downstream group who obtains the benefit from the product. If players in all roles cooperate, a final product can be completed. However, if a player in a group chooses defection, the division of labour stops, the final product cannot be completed and all players in all roles suffer damage. By using the replicator equations of the asymmetric game, we investigate which sanction system promotes the evolution of cooperation in the division of labour. We find that not the benefit of the product but the cost of cooperation matters to the evolutionary dynamics and that the probability of finding a defector determines which sanction system promotes the evolution of cooperation.

<https://royalsocietypublishing.org/doi/full/10.1098/rsos.220856>

ROWAN TITCHENER et al with JULIA FISCHER – Social disappointment and partner presence affect long-tailed macaque refusal behaviour in an ‘inequity aversion’ experiment

Protest in response to unequal reward distribution is thought to have played a central role in the evolution of human cooperation. Some animals refuse food and become demotivated when rewarded more poorly than a conspecific, and this has been taken as evidence that non-human animals, like humans, protest in the face of inequity. An alternative explanation—social disappointment—shifts the cause of this discontent away from the unequal reward, to the human experimenter who could—but elects not to—treat the subject well. This study investigates whether social disappointment could explain frustration behaviour in long-tailed macaques, *Macaca fascicularis*. We tested 12 monkeys in a novel ‘inequity aversion’ paradigm. Subjects had to pull a lever and were rewarded with low-value food; in half of the trials, a partner worked alongside the subjects receiving high-value food. Rewards were distributed either by a human or a machine. In line with the social disappointment hypothesis, monkeys rewarded by the human refused food more often than monkeys rewarded by the machine. Our study extends previous findings in chimpanzees and suggests that social disappointment plus social facilitation or food competition effects drive food refusal patterns.

<https://royalsocietypublishing.org/doi/full/10.1098/rsos.221225>

Trends in Cognitive Sciences

PAPERS

AMAR SARKAR & RICHARD W. WRANGHAM – Evolutionary and neuroendocrine foundations of human aggression

Humans present a behavioural paradox: they are peaceful in many circumstances, but they are also violent and kill conspecifics at high rates. We describe a social evolutionary theory to resolve this paradox. The theory interprets human aggression as a combination of low propensities for reactive aggression and coercive behaviour and high propensities for some forms of proactive aggression (especially coalitionary proactive aggression). These tendencies are associated with the evolution of groupishness, self-domestication, and social norms. This human aggression profile is expected to demand substantial plasticity in the evolved biological mechanisms responsible for aggression. We discuss the contributions of various social signalling molecules (testosterone, cortisol, oxytocin, vasopressin, serotonin, and dopamine) as the neuroendocrine foundation conferring such plasticity.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(23\)00047-5](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00047-5)

SUBSCRIBE to the EAORC Bulletin

If you would like to subscribe to this free weekly newsletter, please contact martin.edwardes@btopenworld.com.

UNSUBSCRIBE from the EAORC Bulletin

Send an email to martin.edwardes@btopenworld.com with the subject "EAORC unsubscribe".

PRODUCED BY AND FOR THE EAORC EMAIL GROUP

EAORC is a fee-free academic internet news service and has no commercial sponsorship or other commercial interests.

EAORC website information is at <http://martinedwardes.me.uk/eaorc/>

If you have received this bulletin, and are unhappy about receiving it, please contact martin.edwardes@btopenworld.com.
