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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, do 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, do let me know.

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

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### SCIENCE NEWS – Publishers roll out alternative routes to open access

In the push for “open access” (OA)—making scientific papers immediately free to everyone—it’s easy to forget that publishing costs haven’t vanished. They have simply shifted from subscriptions paid mostly by university librarians to fees charged to authors. Those article-processing fees (APCs), which can be several thousand dollars per paper, raise concerns of their own. Universities fear they could end up paying more to help their scientists publish their work than they do now for subscriptions. Scientists who have small research budgets fret that they won’t be able to afford APCs. And some nonprofit scientific societies that publish journals worry APCs won’t generate enough revenue to support other activities, such as meetings and training.

[https://www.sciencemag.org/news/2020/03/publishers-roll-out-alternative-routes-open-access?utm\\_campaign=news\\_daily\\_2020-03-09&et rid=17774313&et cid=3237926](https://www.sciencemag.org/news/2020/03/publishers-roll-out-alternative-routes-open-access?utm_campaign=news_daily_2020-03-09&et rid=17774313&et cid=3237926)

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### SOCIETY FOR SCIENCE – An ancient social safety net in Africa was built on beads

A Stone Age network of communities across southern Africans was established using ostrich shell beads by around 33,000 years ago.

<http://click.societyforscience-email.com/?qs=4ce22c366a382055053152b6171dc2ecb2c55f2d8b687128c565fc27b873acc813fd283cc9414da2d98116bdd261b1bfb234856f786eef6c>

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### BREAKING SCIENCE – Western Lowland Gorillas Display Territorial Behavior, New Study Says

Groups of western lowland gorillas (*Gorilla gorilla gorilla*) recognize ownership of specific regions; they are also more likely to avoid contact with other groups the closer they are to the centre of their neighbors’ home range, for fear of conflict, according to a new study.

[http://feedproxy.google.com/~r/BreakingScienceNews/~3/Qw1PTFxBlrk/western-lowland-gorillas-territorial-behavior-08222.html?utm\\_source=feedburner&utm\\_medium=email](http://feedproxy.google.com/~r/BreakingScienceNews/~3/Qw1PTFxBlrk/western-lowland-gorillas-territorial-behavior-08222.html?utm_source=feedburner&utm_medium=email)

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## SCIENCE DAILY – Don't blame the messenger -- unless it's all stats and no story

In some cases of ineffective messaging, it might be appropriate, despite the aphorism to the contrary, to blame the messenger.

<https://www.sciencedaily.com/releases/2020/03/200306183205.htm>

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## SCIENCE DAILY – Cosmic impact caused destruction of one of world's earliest human settlements

Before the Taqba Dam impounded the Euphrates River in northern Syria in the 1970s, an archaeological site named Abu Hureyra bore witness to the moment ancient nomadic people first settled down and started cultivating crops. A large mound marks the settlement, which now lies under Lake Assad.

<https://www.sciencedaily.com/releases/2020/03/200306183153.htm>

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## SCIENCE DAILY – Stone-age 'likes': Eggshell beads exchanged over 30,000 years ago

A clump of grass grows on an outcrop of shale 33,000 years ago. An ostrich pecks at the grass, and atoms taken up from the shale and into the grass become part of the eggshell the ostrich lays.

<https://www.sciencedaily.com/releases/2020/03/200309152101.htm>

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## SCIENCE DAILY – Robots that admit mistakes foster better conversation in humans

A new study showed that the humans on teams that included a robot expressing vulnerability communicated more with each other and later reported having a more positive group experience than people teamed with silent robots or with robots that made neutral statements, like reciting the game's score.

<https://www.sciencedaily.com/releases/2020/03/200309152047.htm>

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## SCIENCE DAILY – At 8 months, babies already know basic grammar

Even before uttering their first words, babies master the grammar basics of their mother tongue, according to new research.

<https://www.sciencedaily.com/releases/2020/03/200312142254.htm>

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## SCIENCE DAILY – Gorillas display territorial behavior

Scientists have discovered that gorillas really are territorial -- and their behavior is very similar to our own.

<https://www.sciencedaily.com/releases/2020/03/200312123644.htm>

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## NATURE BRIEFING – The parrots that understand probabilities

A group of kea, a type of parrot from New Zealand, have been surprising scientists by passing a series of intelligence tests based around probabilities and social cues. Researchers found that kea can outperform monkeys, showing abilities previously seen only in great apes such as humans and chimpanzees.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=bee8c1259d&e=1db4b9a19b>

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## THE CONVERSATION – How a brilliant 18th century linguist linked the Celtic languages

The Scottish Gaelic language is experiencing a new surge of interest in Scotland and further afield. A Gaelic course launched on language learning app Duolingo in November 2019 has attracted 232,000 active learners in just four months, meaning there are just over four times more learners than there are Gaelic speakers in Scotland. Education in Gaelic is also experiencing high demand and expanding both within and beyond the language's stronghold in the Western Isles.

<https://theconversation.com/how-a-brilliant-18th-century-linguist-linked-the-celtic-languages-132572>

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## PUBLICATIONS

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### American Journal of Physical Anthropology

#### PAPERS

#### **CARLY H. BATIST & JESSICA A. MAYHEW – Lateralization in seven lemur species when presented with a novel cognitive task**

Asymmetrical behavior patterns are observed in many animal species, but the potential adaptive significance of lateralization and the evolutionary forces driving it remain unclear. Most laterality studies have focused on a single species, which makes interspecies comparisons difficult. The aim of this study was to examine differences in the strength and direction of lateralization in multiple lemur species when engaged in a standardized, novel cognitive task.

We found evidence of an individual learning trajectory in which the hand used on a lemur's first success was canalized as the preferred (and lateralized) hand, in support of the "cognitive simplicity" hypothesis. Individual variability in hand preference was high, which is consistent with previous research. Between-genera differences in mouth use appear to reflect species-specific feeding postures and differences in manual dexterity.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/ajpa.24037?campaign=wolearlyview>

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## Nature Communications

### PAPERS

#### **MANUELA FRIEDRICH et al with ANGELA D. FRIEDERICI – Sleep-dependent memory consolidation in infants protects new episodic memories from existing semantic memories**

Any experienced event may be encoded and retained in detail as part of our episodic memory, and may also refer and contribute to our generalized knowledge stored in semantic memory. The beginnings of this declarative memory formation are only poorly understood. Even less is known about the interrelation between episodic and semantic memory during the earliest developmental stages. Here, we show that the formation of episodic memories in 14- to 17-month-old infants depends on sleep, subsequent to exposure to novel events. Infant brain responses reveal that, after sleep-dependent consolidation, the newly stored events are not processed semantically, although appropriate lexical-semantic memories are present and accessible by similar events that were not experienced before the nap. We propose that temporarily disabled semantic processing protects precise episodic memories from interference with generalized semantic memories. Selectively restricted semantic access could also trigger semantic refinement, and thus, might even improve semantic memory.

<https://www.nature.com/articles/s41467-020-14850-8>

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## Nature Scientific Reports

### PAPERS

#### **ANDREW M. T. MOORE et al – Evidence of Cosmic Impact at Abu Hureyra, Syria at the Younger Dryas Onset (~12.8ka): High-temperature melting at >2200 °C**

At Abu Hureyra (AH), Syria, the 12,800-year-old Younger Dryas boundary layer (YDB) contains peak abundances in meltglass, nanodiamonds, microspherules, and charcoal. AH meltglass comprises 1.6 wt.% of bulk sediment, and crossed polarizers indicate that the meltglass is isotropic. High YDB concentrations of iridium, platinum, nickel, and cobalt suggest mixing of melted local sediment with small quantities of meteoritic material. Approximately 40% of AH glass display carbon-infused, siliceous plant imprints that laboratory experiments show formed at a minimum of 1200°–1300 °C; however, reflectance-inferred temperatures for the encapsulated carbon were lower by up to 1000 °C. Alternately, melted grains of quartz, chromferide, and magnetite in AH glass suggest exposure to minimum temperatures of 1720 °C ranging to >2200 °C. This argues against formation of AH meltglass in thatched hut fires at 1100°–1200 °C, and low values of remanent magnetism indicate the meltglass was not created by lightning. Low meltglass water content (0.02–0.05% H<sub>2</sub>O) is consistent with a formation process similar to that of tektites and inconsistent with volcanism and anthropogenesis. The wide range of evidence supports the hypothesis that a cosmic event occurred at Abu Hureyra ~12,800 years ago, coeval with impacts that deposited high-temperature meltglass, melted microspherules, and/or platinum at other YDB sites on four continents.

<https://www.nature.com/articles/s41598-020-60867-w>

#### **BRUNO BIANCHI et al – Human and computer estimations of Predictability of words in written language**

When we read printed text, we are continuously predicting upcoming words to integrate information and guide future eye movements. Thus, the Predictability of a given word has become one of the most important variables when explaining human behaviour and information processing during reading. In parallel, the Natural Language Processing (NLP) field evolved by developing a wide variety of applications. Here, we show that using different word embeddings techniques (like Latent Semantic Analysis, Word2Vec, and FastText) and N-gram-based language models we were able to estimate how humans predict words (cloze-task Predictability) and how to better understand eye movements in long Spanish texts. Both types of models partially captured aspects of predictability. On the one hand, our N-gram model performed well when added as a replacement for the cloze-task Predictability of the fixated word. On the other hand, word embeddings were useful to mimic Predictability of the following word. Our study joins efforts from neurolinguistic and NLP fields to understand human information processing during reading to potentially improve NLP algorithms.

<https://www.nature.com/articles/s41598-020-61353-z>

#### **KAITLYN M. A. PARKS et al – Statistical Learning and Social Competency: The Mediating Role of Language**

The current study sought to examine the contribution of auditory and visual statistical learning on language and social competency abilities as well as whether decreased statistical learning abilities are related to increased autistic traits. To answer these questions, participants' (N = 95) auditory and visual statistical learning abilities, language, social competency, and level of autistic traits were assessed. Although the relationships observed were relatively small in magnitude, our results demonstrated that visual statistical learning related to language and social competency abilities and that auditory learning was more related to autism symptomatology than visual statistical learning. Furthermore, the relationship between visual statistical learning and social competency was mediated by language comprehension abilities, suggesting that impairments in statistical learning may cascade into impairments in language and social abilities.

<https://www.nature.com/articles/s41598-020-61047-6>

#### **F. WÖRGÖTTER et al – Humans Predict Action using Grammar-like Structures**

Efficient action prediction is of central importance for the fluent workflow between humans and equally so for human-robot interaction. To achieve prediction, actions can be algorithmically encoded by a series of events, where every event

corresponds to a change in a (static or dynamic) relation between some of the objects in the scene. These structures are similar to a context-free grammar and, importantly, within this framework the actual objects are irrelevant for prediction, only their relational changes matter. Manipulation actions and others can be uniquely encoded this way. Using a virtual reality setup and testing several different manipulation actions, here we show that humans predict actions in an event-based manner following the sequence of relational changes. Testing this with chained actions, we measure the percentage predictive temporal gain for humans and compare it to action-chains performed by robots showing that the gain is approximately equal. Event-based and, thus, object independent action recognition and prediction may be important for cognitively deducing properties of unknown objects seen in action, helping to address bootstrapping of object knowledge especially in infants.

<https://www.nature.com/articles/s41598-020-60923-5>

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PeerJ

PAPERS

### **DAMIEN NEADLE, ELISA BANDINI & CLAUDIO TENNIE – Testing the individual and social learning abilities of task-naïve captive chimpanzees (*Pan troglodytes* sp.) in a nut-cracking task**

Nut-cracking is often cited as one of the most complex behaviours observed in wild chimpanzees. However, the cognitive mechanisms behind its acquisition are still debated. The current null hypothesis is that the form of nut-cracking behaviour relies on variants of social learning, with some researchers arguing, more precisely, that copying variants of social learning mechanisms are necessary. However, to date, very few experiments have directly investigated the potentially sufficient role of individual learning in explaining the behavioural form of nut-cracking. Despite this, the available data provides some evidence for the spontaneous acquisition of nut-cracking by chimpanzees; later group acquisition was then found to be at least facilitated by (unspecified) variants of social learning. The latter findings are in line with both suggested hypotheses, i.e., that copying social learning is required and that other (non-copying) social learning mechanisms are at play. Here we present the first study which focused (initially) on the role of individual learning for the acquisition of the nut-cracking behavioural form in chimpanzees. We tested task-naïve chimpanzees (N = 13) with an extended baseline condition to examine whether the behaviour would emerge spontaneously. After the baseline condition (which was unsuccessful), we tested for the role of social learning by providing social information in a step-wise fashion, culminating in a full action demonstration of nut-cracking by a human demonstrator (this last condition made it possible for the observers to copy all actions underlying the behaviour). Despite the opportunities to individually and/or socially learn nut-cracking, none of the chimpanzees tested here cracked nuts using tools in any of the conditions in our study; thus, providing no conclusive evidence for either competing hypothesis. We conclude that this failure was the product of an interplay of factors, including behavioural conservatism and the existence of a potential sensitive learning period for nut-cracking in chimpanzees. The possibility remains that nut-cracking is a behaviour that chimpanzees can individually learn. However, this behaviour might only be acquired when chimpanzees are still inside their sensitive learning period, and when ecological and developmental conditions allow for it. The possibility remains that nut-cracking is an example of a culture dependent trait in non-human great apes. Recommendations for future research projects to address this question are considered.

<https://peerj.com/articles/8734/>

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Philosophical Transactions of the Royal Society B

PAPERS

### **JUSSI LEHTONEN – The Price equation and the unity of social evolution theory**

The Price equation has been entangled with social evolution theory from the start. It has been used to derive the most general versions of kin selection theory, and Price himself produced a multilevel equation that provides an alternative formulation of social evolution theory, dividing selection into components between and within groups. In this sense, the Price equation forms a basis for both kin and group selection, so often pitted against each other in the literature. Contextual analysis and the neighbour approach are prominent alternatives for analysing group selection. I discuss these four approaches to social evolution theory and their connections to the Price equation, focusing on their similarities and common mathematical structure. Despite different notations and modelling traditions, all four approaches are ultimately linked by a common set of mathematical components, revealing their underlying unity in a transparent way. The Price equation can similarly be used in the derivation of streamlined, weak selection social evolution modelling methods. These weak selection models are practical and powerful methods for constructing models in evolutionary and behavioural ecology; they can clarify the causal structure of models, and can be easily converted between the four social evolution approaches just like their regression counterparts.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0362>

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### **DANIEL NETTLE – Selection, adaptation, inheritance and design in human culture: the view from the Price equation**

For decades, parts of the literature on human culture have been gripped by an analogy: culture changes in a way that is substantially isomorphic to genetic evolution. This leads to a number of sub-claims: that design-like properties in cultural traditions should be explained in a parallel way to the design-like features of organisms, namely with reference to selection; that culture is a system of inheritance; and that cultural evolutionary processes can produce adaptation in the genetic sense.

The Price equation provides a minimal description of any evolutionary system, and a method for identifying the action of selection. As such, it helps clarify some of these claims about culture conceptually. Looking closely through the lens of the Price equation, the differences between genes and culture come into sharp relief. Culture is only a system of inheritance metaphorically, or as an idealization, and the idealization may lead us to overlook causally important features of how cultural influence works. Design-like properties in cultural systems may owe more to transmission biases than to cultural selection. Where culture enhances genetic fitness, it is ambiguous whether what is doing the work is cultural transmission, or just the genetically evolved properties of the mind. I conclude that there are costs to trying to press culture into a template based on Darwinian evolution, even if one broadens the definition of 'Darwinian'.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0358>

### **DEBORAH E. SHELTON & RICHARD E. MICHOD – Group and individual selection during evolutionary transitions in individuality: meanings and partitions**

The Price equation embodies the 'conditions approach' to evolution in which the Darwinian conditions of heritable variation in fitness are represented in equation form. The equation can be applied recursively, leading to a partition of selection at the group and individual levels. After reviewing the well-known issues with the Price partition, as well as issues with a partition based on contextual analysis, we summarize a partition of group and individual selection based on counterfactual fitness, the fitness that grouped cells would have were they solitary. To understand 'group selection' in multi-level selection models, we assume that only group selection can make cells suboptimal when they are removed from the group. Our analyses suggest that there are at least three kinds of selection that can be occurring at the same time: group-specific selection along with two kinds of individual selection, within-group selection and global individual selection. Analyses based on counterfactual fitness allow us to specify how close a group is to being a pseudo-group, and this can be a basis for quantifying progression through an evolutionary transition in individuality (ETI). During an ETI, fitnesses at the two levels, group and individual, become decoupled, in the sense that fitness in a group may be quite high, even as counterfactual fitness goes to zero.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0364>

### **MATTHIJS VAN VEELLEN – The problem with the Price equation**

In this paper, I will argue that the generality of the Price equation comes at a cost, and that is that the terms in it become meaningless. There are simple linear models that can be written in a Price equation-like form, and for those the terms in them have a meaningful interpretation. There are also models for which that is not the case, and in general, when no assumptions on the shape of the fitness function are made, and all possible models are allowed for, the regression coefficients in the Price equation do not allow for a meaningful interpretation. The failure to recognize that the Price equation, although general, only has a meaningful interpretation under restrictive assumptions, has done real damage to the field of social evolution, as will be illustrated by looking at an application of the Price equation to group selection.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2019.0355>

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## **PLoS Genetics**

### **PAPERS**

#### **GERRIT BRANDIS & DIARMAID HUGHES – The SNAP hypothesis: Chromosomal rearrangements could emerge from positive Selection during Niche Adaptation**

The relative linear order of most genes on bacterial chromosomes is not conserved over evolutionary timescales. One explanation is that selection is weak, allowing recombination to randomize gene order by genetic drift. However, most chromosomal rearrangements are deleterious to fitness. In contrast, we propose the hypothesis that rearrangements in gene order are more likely the result of selection during niche adaptation (SNAP). Partial chromosomal duplications occur very frequently by recombination between direct repeat sequences. Duplicated regions may contain tens to hundreds of genes and segregate quickly unless maintained by selection. Bacteria exposed to non-lethal selections (for example, a requirement to grow on a poor nutrient) can adapt by maintaining a duplication that includes a gene that improves relative fitness. Further improvements in fitness result from the loss or inactivation of non-selected genes within each copy of the duplication. When genes that are essential in single copy are lost from different copies of the duplication, segregation is prevented even if the original selection is lifted. Functional gene loss continues until a new genetic equilibrium is reached. The outcome is a rearranged gene order. Mathematical modelling shows that this process of positive selection to adapt to a new niche can rapidly drive rearrangements in gene order to fixation. Signature features (duplication formation and divergence) of the SNAP model were identified in natural isolates from multiple species showing that the initial two steps in the SNAP process can occur with a remarkably high frequency. Further bioinformatic and experimental analyses are required to test if and to which extend the SNAP process acts on bacterial genomes.

<https://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1008615>

**MICHAEL J. WEIR et al – Language effects on bargaining**

Language is critical to coordination in groups. Though, how language affects coordination in groups is not well understood. We prime distributive and integrative language in a bargaining experiment to better understand the links between group outcomes and communication. We accomplish this by priming interests or positions language in randomized groups. We find that priming positions as opposed to interests language leads to agreements where controllers, subjects with unilateral authority over the group outcome, receive a larger share of the benefits but where the total benefits to the group are unaffected. In contrast to common justifications for the use of integrative language in bargaining, our experimental approach revealed no significant differences between priming interests and positions language in regards to increasing joint outcomes for the groups. Across treatments, we find subjects that use gain frames and make reference to visual aids during bargaining experience larger gains for the group, while loss frames and pro-self language experience larger gains for the individual through side payments. This finding suggests a bargainer's dilemma: whether to employ language that claims a larger share of group's assets or employ language to increase joint gains.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229501>

**IZABELA CHOJNICKA & ALEKSANDER WAWER – Social language in autism spectrum disorder: A computational analysis of sentiment and linguistic abstraction**

Individuals with autism spectrum disorder (ASD) demonstrate impairments with pragmatic (social) language, including narrative skills and conversational abilities. We aimed to quantitatively characterize narrative performance in ASD using natural language processing techniques: sentiment and language abstraction analyses based on the Linguistic Category Model. Individuals with ASD and with typical development matched for age, gender, ethnicity, and verbal and nonverbal intelligence quotients produced language samples during two standardized tasks from the Autism Diagnostic Observation Schedule, Second Edition assessment: Telling a Story from a Book and Description of a Picture. Only the narratives produced during the Book Task differed between ASD and control groups in terms of emotional polarity and language abstraction. Participants with typical development used words with positive sentiment more often in comparison to individuals with ASD. In the case of words with negative sentiment, the differences were marginally significant (participants with typical development used words with negative sentiment more often). The Book Task narratives of individuals with ASD were also characterized by a lower level of language abstraction than narratives of peers with typical development. Linguistic abstraction was strongly positively correlated with a higher number of words with emotional polarity. Neither linguistic abstraction nor emotional polarity correlated with participants' age or verbal and nonverbal IQ. The results support the promise of sentiment and language abstraction analyses as a useful tool for the quantitative, fully automated assessment of narrative abilities among individuals with ASD.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229985>

**MAKIKO SADAKATA, JOEY L. WEIDEMA & HENKJAN HONING – Parallel pitch processing in speech and melody: A study of the interference of musical melody on lexical pitch perception in speakers of Mandarin**

Music and language have long been considered two distinct cognitive faculties governed by domain-specific cognitive and neural mechanisms. Recent work into the domain-specificity of pitch processing in both domains appears to suggest pitch processing to be governed by shared neural mechanisms. The current study aimed to explore the domain-specificity of pitch processing by simultaneously presenting pitch contours in speech and music to speakers of a tonal language, and measuring behavioral response and event-related potentials (ERPs). Native speakers of Mandarin were exposed to concurrent pitch contours in melody and speech. Contours in melody emulated those in speech were either congruent or incongruent with the pitch contour of the lexical tone (i.e., rising or falling). Component magnitudes of the N2b and N400 were used as indices of lexical processing. We found that the N2b was modulated by melodic pitch; incongruent item evoked significantly stronger amplitude. There was a trend of N400 to be modulated in the same way. Interestingly, these effects were present only on rising tones. Amplitude and time-course of the N2b and N400 may suggest an interference of melodic pitch contours with both early and late stages of phonological and semantic processing.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229109>

**HEZHI CHEN, ZHIJIA ZENG & JIANHONG MA – The source of punishment matters: Third-party punishment restrains observers from selfish behaviors better than does second-party punishment by shaping norm perceptions**

Punishment aims to deter individuals' selfish behaviors, but it can occasionally backfire. Some scholars have proposed promoting prosocial behaviors using punishment that communicates positive social norms because it provides additional motivation. However, it is unclear which factors affect the norm expressive function of punishment. This study proposes that third-party punishment communicates more positive normative information, and thus, promotes more prosocial behavior in observers than does second-party punishment. Using dictator games, we investigated the effects of second-party punishment compared to third-party punishment of another's unfair sharing on observers' norm perceptions and subsequent sharing decision-making. Two experiments consistently found that third-party punishment was more effective than second-party punishment at inducing observers' beliefs that unfair distribution was unusual (descriptive norm) and unacceptable (injunctive norm). The altered descriptive but not injunctive norm perception further guided individuals' own sharing

behaviors. Taken together, these results suggest that third-party punishment might be better than second-party punishment at decreasing selfish behaviors by shaping individuals' norm perceptions, especially descriptive norm perception, regarding the relevant behaviors.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229510>

### **ALBERTO PAROLA et al – Pragmatics, Theory of Mind and executive functions in schizophrenia: Disentangling the puzzle using machine learning**

Schizophrenia is associated with a severe impairment in the communicative-pragmatic domain. Recent research has tried to disentangle the relationship between communicative impairment and other domains usually impaired in schizophrenia, i.e. Theory of Mind (ToM) and cognitive functions. However, the results are inconclusive and this relationship is still unclear. Machine learning (ML) provides novel opportunities for studying complex relationships among phenomena and representing causality among multiple variables. The present research explored the potential of applying ML, specifically Bayesian network (BNs) analysis, to characterize the relationship between cognitive, ToM and pragmatic abilities in individuals with schizophrenia and healthy controls, and to identify the cognitive and pragmatic abilities that are most informative in discriminating between schizophrenia and controls.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229603>

### **JENNA L. CLARK, MELANIE C. GREEN & JOSEPH J. P. SIMONS – Narrative warmth and quantitative competence: Message type affects impressions of a speaker**

Persuasion research often focuses on how source characteristics affect attitude change in response to a message; however, message characteristics may also alter perceptions of the source. The Message-Based Impression Formation effect (M-BIF) suggests that perceivers use features of messages to infer characteristics of the source, and that such inferences may have a variety of consequential outcomes. In particular, the choice of narrative versus statistical evidence may have implications for the perceived warmth and competence of a source. In five experiments, narrative arguments led to greater perceptions of source warmth and statistical arguments led to greater perceptions of source competence. Across the two behavioral studies, a matching effect emerged: participants preferred to work on cooperative tasks with partners who had provided narratives, and competitive tasks with partners who had provided statistical evidence. These results suggest that the evidence type chosen for everyday communications may affect person perception and interpersonal interaction.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0226713>

### **MARA CADINU, ANDREA CARNAGHI & FRANCESCA GUIZZO – Group meaningfulness and the causal direction of influence between the ingroup and the self or another individual: Evidence from the Induction-Deduction Paradigm**

The goal of the present study was to investigate the causal direction of influence between the ingroup as a whole and the self or another ingroup member considering a key feature of groups, i.e., their perceived meaningfulness. To this goal, in Study 1, 2, and 3 we predicted a preference for self-stereotyping and ingroup-stereotyping in the meaningful social categories of sorority women, left-handed people and psychology students. In Study 4 we further expect that the meaningfulness attributed to a group moderates the direction of causality between individual and ingroup perception. Thus, we used one's Zodiac sign as the ingroup whose degree of meaningfulness varies across participants and we hypothesized higher levels of meaningfulness attributed to the ingroup to be associated with higher self- and ingroup-stereotyping. Using the methodologically stringent Induction Deduction Paradigm, participants were given information on unfamiliar dimensions, about either the ingroup or an individual (self or other ingroup member) and asked to make inferences on those same attributes about the ingroup (induction condition) or the individual (deduction condition). As predicted, a preference for deduction to the self (i.e., self-stereotyping) and deduction to another ingroup member (i.e., ingroup-stereotyping) were found for the meaningful groups of sorority women, left-handed people, and Psychology students (Studies 1, 2, and 3). In Study 4, consistent with predictions, the higher the level of attributed meaningfulness to the Zodiac system the higher the degree of deduction both to the self (self-stereotyping) and to another Zodiac ingroup member (ingroup-stereotyping). Several implications of these results are discussed, for example in relation to the possibility of educational interventions aimed at invalidating intergroup differences.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229321>

### **RACHAEL MILLER et al – Decision-making flexibility in New Caledonian crows, young children and adult humans in a multi-dimensional tool-use task**

The ability to make profitable decisions in natural foraging contexts may be influenced by an additional requirement of tool-use, due to increased levels of relational complexity and additional work-effort imposed by tool-use, compared with simply choosing between an immediate and delayed food item. We examined the flexibility for making the most profitable decisions in a multi-dimensional tool-use task, involving different apparatuses, tools and rewards of varying quality, in 3-5-year-old children, adult humans and tool-making New Caledonian crows (*Corvus moneduloides*). We also compared our results to previous studies on habitually tool-making orangutans (*Pongo abelii*) and non-tool-making Goffin's cockatoos (*Cacatua goffiniana*). Adult humans, cockatoos and crows, but not children and orangutans, did not select a tool when it was not necessary, which was the more profitable choice in this situation. Adult humans, orangutans and cockatoos, but not crows and children, were able to refrain from selecting non-functional tools. By contrast, the birds, but not the primates tested,

struggled to attend to multiple variables—where two apparatuses, two tools and two reward qualities were presented simultaneously—without extended experience. These findings indicate: (1) in a similar manner to humans and orangutans, New Caledonian crows and Goffin's cockatoos can flexibly make profitable decisions in some decision-making tool-use tasks, though the birds may struggle when tasks become more complex; (2) children and orangutans may have a bias to use tools in situations where adults and other tool-making species do not.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0219874>

### **JOSIAH P. J. KING et al – Interpreting nonverbal cues to deception in real time**

When questioning the veracity of an utterance, we perceive certain non-linguistic behaviours to indicate that a speaker is being deceptive. Recent work has highlighted that listeners' associations between speech disfluency and dishonesty are detectable at the earliest stages of reference comprehension, suggesting that the manner of spoken delivery influences pragmatic judgements concurrently with the processing of lexical information. Here, we investigate the integration of a speaker's gestures into judgements of deception, and ask if and when associations between nonverbal cues and deception emerge. Participants saw and heard a video of a potentially dishonest speaker describe treasure hidden behind an object, while also viewing images of both the named object and a distractor object. Their task was to click on the object behind which they believed the treasure to actually be hidden. Eye and mouse movements were recorded. Experiment 1 investigated listeners' associations between visual cues and deception, using a variety of static and dynamic cues. Experiment 2 focused on adaptor gestures. We show that a speaker's nonverbal behaviour can have a rapid and direct influence on listeners' pragmatic judgements, supporting the idea that communication is fundamentally multimodal.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0229486>

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## **PNAS**

### **PAPERS**

### **BRIAN A. STEWART et al – Ostrich eggshell bead strontium isotopes reveal persistent macroscale social networking across late Quaternary southern Africa**

Hunter-gatherer exchange networks dampen subsistence and reproductive risks by building relationships of mutual support outside local groups that are underwritten by symbolic gift exchange. Hxaro, the system of delayed reciprocity between Ju/'hoān individuals in southern Africa's Kalahari Desert, is the best-known such example and the basis for most analogies and models of hunter-gatherer exchange in prehistory. However, its antiquity, drivers, and development remain unclear, as they do for long-distance exchanges among African foragers more broadly. Here we show through strontium isotope analyses of ostrich eggshell beads from highland Lesotho, and associated strontium isoscape development, that such practices stretch back into the late Middle Stone Age. We argue that these exchange items originated beyond the macroband from groups occupying the more water-stressed subcontinental interior. Tracking the emergence and persistence of macroscale, transbiome social networks helps illuminate the evolution of social strategies needed to thrive in stochastic environments, strategies that in our case study show persistence over more than 33,000 y.

<https://www.pnas.org/content/early/2020/03/03/1921037117>

### **DAVID A. RAICHLIN et al with AUDAX Z. P. MABULLA – Sitting, squatting, and the evolutionary biology of human inactivity**

Recent work suggests human physiology is not well adapted to prolonged periods of inactivity, with time spent sitting increasing cardiovascular disease and mortality risk. Health risks from sitting are generally linked with reduced levels of muscle contractions in chair-sitting postures and associated reductions in muscle metabolism. These inactivity-associated health risks are somewhat paradoxical, since evolutionary pressures tend to favor energy-minimizing strategies, including rest. Here, we examined inactivity in a hunter-gatherer population (the Hadza of Tanzania) to understand how sedentary behaviors occur in a nonindustrial economic context more typical of humans' evolutionary history. We tested the hypothesis that nonambulatory rest in hunter-gatherers involves increased muscle activity that is different from chair-sitting sedentary postures used in industrialized populations. Using a combination of objectively measured inactivity from thigh-worn accelerometers, observational data, and electromyographic data, we show that hunter-gatherers have high levels of total nonambulatory time (mean  $\pm$  SD = 9.90  $\pm$  2.36 h/d), similar to those found in industrialized populations. However, nonambulatory time in Hadza adults often occurs in postures like squatting, and we show that these "active rest" postures require higher levels of lower limb muscle activity than chair sitting. Based on our results, we introduce the Inactivity Mismatch Hypothesis and propose that human physiology is likely adapted to more consistently active muscles derived from both physical activity and from nonambulatory postures with higher levels of muscle contraction. Interventions built on this model may help reduce the negative health impacts of inactivity in industrialized populations.

<https://www.pnas.org/content/early/2020/03/03/1911868117.abstract?etoc>

### **CHARLOTTE GROSSE WIESMANN et al with ANGELA D. FRIEDERICI – Two systems for thinking about others' thoughts in the developing brain**

Human social interaction crucially relies on the ability to infer what other people think. Referred to as Theory of Mind (ToM), this ability has long been argued to emerge around 4 y of age when children start passing traditional verbal ToM tasks. This developmental dogma has recently been questioned by nonverbal ToM tasks passed by infants younger than 2 y of age. How

do young children solve these tests, and what is their relation to the later-developing verbal ToM reasoning? Are there two different systems for nonverbal and verbal ToM, and when is the developmental onset of mature adult ToM? To address these questions, we related markers of cortical brain structure (i.e., cortical thickness and surface area) of 3- and 4-y-old children to their performance in novel nonverbal and traditional verbal TM tasks. We showed that verbal ToM reasoning was supported by cortical surface area and thickness of the precuneus and temporoparietal junction, classically involved in ToM in adults. Nonverbal ToM reasoning, in contrast, was supported by the cortical structure of a distinct and independent neural network including the supramarginal gyrus also involved in emotional and visual perspective taking, action observation, and social attention or encoding biases. This neural dissociation suggests two systems for reasoning about others' minds—mature verbal ToM that emerges around 4 y of age, whereas nonverbal ToM tasks rely on different earlier-developing possibly social-cognitive processes.

<https://www.pnas.org/content/early/2020/03/03/1916725117.abstract?etoc>

### **ATSUSHI NORITAKE, TAIHEI NINOMIYA & MASAKI ISODA – Representation of distinct reward variables for self and other in primate lateral hypothalamus**

The lateral hypothalamus (LH) has long been implicated in maintaining behavioral homeostasis essential for the survival of an individual. However, recent evidence suggests its more widespread roles in behavioral coordination, extending to the social domain. The neuronal and circuit mechanisms behind the LH processing of social information are unknown. Here, we show that the LH represents distinct reward variables for “self” and “other” and is causally involved in shaping socially motivated behavior. During a Pavlovian conditioning procedure incorporating ubiquitous social experiences where rewards to others affect one's motivation, LH cells encoded the subjective value of self-rewards, as well as the likelihood of self- or other-rewards. The other-reward coding was not a general consequence of other's existence, but a specific effect of other's reward availability. Coherent activity with and top-down information flow from the medial prefrontal cortex, a hub of social brain networks, contributed to signal encoding in the LH. Furthermore, deactivation of LH cells eliminated the motivational impact of other-rewards. These results indicate that the LH constitutes a subcortical node in social brain networks and shapes one's motivation by integrating cortically derived, agent-specific reward information.

<https://www.pnas.org/content/117/10/5516.abstract?etoc>

### **JOSEPH E. LEDOUX, MATTHIAS MICHEL & HAKWAN LAU – A little history goes a long way toward understanding why we study consciousness the way we do today**

Consciousness is currently a thriving area of research in psychology and neuroscience. While this is often attributed to events that took place in the early 1990s, consciousness studies today are a continuation of research that started in the late 19th century and that continued throughout the 20th century. From the beginning, the effort built on studies of animals to reveal basic principles of brain organization and function, and of human patients to gain clues about consciousness itself. Particularly important and our focus here is research in the 1950s, 1960s, and 1970s involving three groups of patients—amnesia, split brain, and blindsight. Across all three groups, a similar pattern of results was found—the patients could respond appropriately to stimuli that they denied seeing (or in the case of amnesiacs, having seen before). These studies paved the way for the current wave of research on consciousness. The field is, in fact, still grappling with the implications of the findings showing that the ability to consciously know and report the identity of a visual stimulus can be dissociated in the brain from the mechanisms that underlie the ability to behave in a meaningful way to the same stimulus.

<https://www.pnas.org/content/early/2020/03/12/1921623117.abstract?etoc>

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## Proceedings of the Royal Society B

### PAPERS

#### **SEAN P. PRALL & BROOKE A. SCENZA – Why men invest in non-biological offspring: paternal care and paternity confidence among Himba pastoralists**

Paternal investment is predicted to be a facultative calculation based on expected fitness returns and modulated by a host of social predictors including paternity uncertainty. However, the direct role of paternity confidence on the patterns of paternal investment is relatively unknown, in part due to a lack of research in populations with high levels of paternity uncertainty. Additionally, much of the work on paternity certainty uses cues of paternity confidence rather than direct assessments from fathers. We examine the effect of paternity assertions on the multiple measures of paternal investment in Himba pastoralists. Despite a high degree of paternity uncertainty, Himba have strong norms associated with social fatherhood, with men expected to invest equally in biological and non-biological offspring. Our behavioural data show patterns that largely conform to these norms. For domains of investment that are highly visible to the community, such as brideprice payments, we find no evidence of investment biased by paternity confidence. However, more private investment decisions do show some evidence of sex-specific titration. We discuss these results in light of broader considerations about paternal care and the mating–parenting trade-off.

<https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2019.2890>

#### **PATRICK L. KOHL et al – Adaptive evolution of honeybee dance dialects**

Efficient communication is highly important for the evolutionary success of social animals. Honeybees (genus *Apis*) are unique in that they communicate the spatial information of resources using a symbolic ‘language’, the waggle dance.

Different honeybee species differ in foraging ecology but it remains unknown whether this shaped variation in the dance. We studied distance dialects—interspecific differences in how waggle duration relates to flight distance—and tested the hypothesis that these evolved to maximize communication precision over the bees' foraging ranges. We performed feeder experiments with *Apis cerana*, *A. florea* and *A. dorsata* in India and found that *A. cerana* had the steepest dialect, i.e. a rapid increase in waggle duration with increasing feeder distance, *A. florea* had an intermediate, and *A. dorsata* had the lowest dialect. By decoding dances for natural food sites, we inferred that the foraging range was smallest in *A. cerana*, intermediate in *A. florea* and largest in *A. dorsata*. The inverse correlation between foraging range and dialect was corroborated when comparing six (sub)species across the geographical range of the genus including previously published data. We conclude that dance dialects constitute adaptations resulting from a trade-off between the spatial range and the spatial accuracy of communication.

*{Misuse of the word DIALECT, but interesting paper.}*

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2020.0190>

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### **MARWA EL ZEIN & BAHADOR BAHRAMI – Joining a group diverts regret and responsibility away from the individual**

It has recently been proposed that a key motivation for joining groups is the protection from the negative consequences of undesirable outcomes. To test this claim, we investigated how experienced outcomes triggering loss and regret impacted people's tendency to decide alone or join a group, and how decisions differed when voluntarily made alone versus in group. Replicated across two experiments, participants (n = 125 and n = 496) selected whether to play alone or contribute their vote to a group decision. Next, they chose between two lotteries with different probabilities of winning and losing. The higher the negative outcome, the more participants switched from deciding alone to with others. When joining a group to choose the lottery, choices were less driven by outcome and regret anticipation. Moreover, negative outcomes experienced alone, not part of a group vote, led to worse subsequent choices than positive outcomes. These results suggest that the protective shield of the collective reduces the influence of negative emotions that may help individuals re-evaluate past choices.

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2019.2251>

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