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## NOTICES

### PUBLICATION ALERTS

If you have had a paper or book published, or you see something which would be of interest to the group, please send me a publication alert so that I can include it in the newsletter. Many thanks to those who have already sent in alerts.

If there is a journal you feel I should be tracking on a regular basis, let me know.

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

### RESEARCHGATE – Diverse & Convergent Evidence Against Vocal Culture via Copying in Humpback Whales

*In Animal Behavior and Cognition 9:2, 196-206 (2022).*

#### **EDUARDO MERCADO III – The Humpback’s New Songs: Diverse and Convergent Evidence Against Vocal Culture via Copying in Humpback Whales**

Singing humpback whales constantly modify their songs over hours, days, months, and years, throughout their adult lives. Intriguingly, humpbacks appear to vary songs in concert, with most singers in a population producing similar songs at any given time. The convergent vocal dynamics of singing humpbacks have convinced many that songs are vocal customs, passed from singer to singer through vocal imitation. This interpretation has recently been challenged, however, by the discovery that singers not in acoustic contact may sing highly similar songs, and also appear to change their songs along similar trajectories. How could singers that cannot hear each other culturally conform? Here, it is argued that the changes humpback whales make to songs are inconsistent with either communal copying or competitive improvisation. Instead, singers appear to be continuously morphing the acoustic properties of songs in predictable ways both within and across songs, even in the absence of cross-population interactions. There is no direct evidence that singing humpback whales learn songs by copying other singers. The fact that groups of singers change songs in similar ways is not evidence of vocal imitation, cultural transmission, or cultural evolution. So called “cultural revolutions” in humpback whale songs, which have been touted as the clearest and most impressive evidence of culture in any nonhuman animal, actually provide evidence against vocal culture in humpback whales. Vocal complexity and convergence can arise through mechanisms other than cultural transmission via vocal imitation, and in the case of humpback whales, genetic predispositions and ecological conditions may be more relevant to determining how singers collectively change songs over time.

<https://www.researchgate.net/publication/360309848> The Humpback's New Songs Diverse and Convergent Evidence Against Vocal Culture via Copying in Humpback Whales

### RESEARCHGATE – Do Chimpanzees Predict Others’ Behavior by Simulating Their Beliefs?

*Animal Behavior and Cognition 9:2, 153-175 (2022).*

#### **ROBERT LURZ et al – Do Chimpanzees Predict Others’ Behavior by Simulating Their Beliefs?**

Recent studies have shown that great apes predict that other agents will search for objects of interest where the agents believe the objects are hidden. Little is understood about the cognitive process that apes undergo to make such predictions. According to prevailing models, great apes make such predictions by metarepresenting others’ beliefs or perceptual states. We investigated the simpler simulation model. In this model, apes predict where other agents will search for objects of interest by simulating believing what another agent believes about the location of the object. The simulation model predicts that simulating what another believes should manifest in altercentric biasing effects, such as behaving as if one shares another’s belief in cases where the other’s belief is false. We tested this by giving chimpanzees a novel search paradigm embedded in a change-of-location false-belief test and measured where they searched for a grape that they witnessed moved from its original location to a new location. In true-belief trials, chimpanzees were presented with an agent who knew (as they did) that the grape was hidden in the new location; in false-belief trials, the agent falsely believed the grape was still hidden in the original location while the chimpanzee knew it was hidden in the new location. As predicted by the simulation model, chimpanzees searched for the grape closer to its original location than to its new location in significantly more false-belief trials than true-belief trials. Results suggest that chimpanzees show a signature altercentric biasing effect of simulating believing what others believe and may use simulation, rather than metarepresentation, to predict where others will search for objects of interest.

<https://www.researchgate.net/publication/360307864> Do Chimpanzees Predict Others' Behavior by Simulating Their Beliefs

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## NEWS

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### NATURE BRIEFING – Ancient DNA maps ‘dawn of farming’

Europe’s first farming populations descend mostly from farmers in the Anatolian peninsula, in what is now Turkey. And the ancient Anatolian farmers descended from repeated mixing between distinct hunter-gather groups from Europe and the Middle East. A pair of ancient-DNA studies — including one of the largest assemblages of ancient human genomes yet published — reveal finer details of the dawn of farming, thanks to ‘high coverage’, or high-quality, genomes — a rarity in ancient-genomics work.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=2201f8220b&e=1db4b9a19b>

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### SCIENCE DAILY – Psychopathic individuals are more likely to have larger striatum region in the brain

Neuroscientists have established the existence of a biological difference between psychopaths and non-psychopaths.

<https://www.sciencedaily.com/releases/2022/05/220510102942.htm>

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### SCIENCE DAILY – Rare discovery: How a gene mutation causes higher intelligence

When genes mutate, this can lead to severe diseases of the human nervous system. Researchers have now used fruit flies to demonstrate how, apart from the negative effect, the mutation of a neuronal gene can have a positive effect -- namely higher IQ in humans.

<https://www.sciencedaily.com/releases/2022/05/220510102926.htm>

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### SCIENCE DAILY – Complex human childbirth and cognitive abilities a result of walking upright

Childbirth in humans is much more complex and painful than in great apes. It was long believed that this was a result of humans' larger brains and the narrow dimensions of the mother's pelvis. Researchers have now used 3D simulations to show that childbirth was also a highly complex process in early hominins that gave birth to relatively small-brained newborns -- with important implications for their cognitive development.

<https://www.sciencedaily.com/releases/2022/05/220510102920.htm>

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## PUBLICATIONS

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### Current Biology

#### ARTICLES

##### **MICHAEL S.A. GRAZIANO – Conscious intention: New data on where and how in the brain**

How do we decide to act, and how do those decisions relate to conscious choice? A new study helps dissociate the neuronal mechanisms that choose, prepare, and trigger movement from our explicit reports of conscious intention.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(22\)00509-7](https://www.cell.com/current-biology/fulltext/S0960-9822(22)00509-7)

#### PAPERS

##### **ELIZABETH L. JOHNSON et al – Orbitofrontal cortex governs working memory for temporal order**

How do we think about time? Converging lesion and neuroimaging evidence indicates that orbitofrontal cortex (OFC) supports the encoding and retrieval of temporal context in long-term memory, which may contribute to confabulation in individuals with OFC damage. Here, we reveal that OFC damage diminishes working memory for temporal order, that is, the ability to disentangle the relative recency of events as they unfold. OFC lesions reduced working memory for temporal order but not spatial position, and individual deficits were commensurate with lesion size. Comparable effects were absent in patients with lesions restricted to lateral prefrontal cortex (PFC). Based on these findings, we propose that OFC supports understanding of the order of events. Well-documented behavioral changes in individuals with OFC damage may relate to impaired temporal-order understanding.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(22\)00561-9](https://www.cell.com/current-biology/fulltext/S0960-9822(22)00561-9)

##### **TYSON AFLALO – Implicit mechanisms of intention**

High-level cortical regions encode motor decisions before or even absent awareness, suggesting that neural processes predetermine behavior before conscious choice. Such early neural encoding challenges popular conceptions of human agency. It also raises fundamental questions for brain-machine interfaces (BMIs) that traditionally assume that neural activity reflects the user’s conscious intentions. Here, we study the timing of human posterior parietal cortex single-neuron activity recorded from implanted microelectrode arrays relative to the explicit urge to initiate movement. Participants were free to choose when to move, whether to move, and what to move, and they retrospectively reported the time they felt the urge to move. We replicate prior studies by showing that posterior parietal cortex (PPC) neural activity sharply rises hundreds of milliseconds before the reported urge. However, we find that this “preconscious” activity is part of a dynamic neural population response that initiates much earlier, when the participant first chooses to perform the task. Together with details of neural timing, our results suggest that PPC encodes an internal model of the motor planning network that transforms high-level task objectives into appropriate motor behavior. These new data challenge traditional interpretations of early neural

activity and offer a more holistic perspective on the interplay between choice, behavior, and their neural underpinnings. Our results have important implications for translating BMIs into more complex real-world environments. We find that early neural dynamics are sufficient to drive BMI movements before the participant intends to initiate movement. Appropriate algorithms ensure that BMI movements align with the subject's awareness of choice.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(22\)00442-0](https://www.cell.com/current-biology/fulltext/S0960-9822(22)00442-0)

### **JULIA YURKOVIC-HARDING et al – Children with ASD establish joint attention during free-flowing toy play without face looks**

Children's ability to share attention with another person (i.e., achieve joint attention) is critical for learning about their environments in general and supporting language and object word learning in particular. While joint attention (JA) as it pertains to autism spectrum disorder (ASD) is often more narrowly operationalized as arising from eye gaze or explicit pointing cues alone, recent evidence demonstrates that JA in natural environments can be achieved more broadly through multiple other pathways beyond gaze and gestures. Here, we use dual head-mounted eye tracking to examine pathways into and characteristics of JA episodes during free-flowing parent-child toy play, comparing children with ASD to typically developing (TD) children. Moments of JA were defined objectively as both the child's and parent's gaze directed to the same object at the same time. Consistent with previous work in TD children, we found that both TD and ASD children rarely look at their parent's face in this unstructured free play context. Nevertheless, both groups achieved similarly high rates of JA that far exceeded chance, suggesting the use of alternative pathways into JA. We characterize these alternate pathways, find they occur at similar levels across both groups, and achieve similar ends: namely, for both groups, targets of JA are named more frequently by parents in those moments than non-jointly attended objects. These findings broaden the conceptualization of JA abilities and impairment in ASD and raise questions regarding the mechanistic role of the face-gaze-mediated JA pathway in ASD.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(22\)00662-5](https://www.cell.com/current-biology/fulltext/S0960-9822(22)00662-5)

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## Frontiers in Ecology and Evolution

### PAPERS

### **ANTOINE DANCHIN & ANDRÉ A. FENTON – From Analog to Digital Computing: Is Homo sapiens' Brain on Its Way to Become a Turing Machine?**

The abstract basis of modern computation is the formal description of a finite state machine, the Universal Turing Machine, based on manipulation of integers and logic symbols. In this contribution to the discourse on the computer-brain analogy, we discuss the extent to which analog computing, as performed by the mammalian brain, is like and unlike the digital computing of Universal Turing Machines. We begin with ordinary reality being a permanent dialog between continuous and discontinuous worlds. So it is with computing, which can be analog or digital, and is often mixed. The theory behind computers is essentially digital, but efficient simulations of phenomena can be performed by analog devices; indeed, any physical calculation requires implementation in the physical world and is therefore analog to some extent, despite being based on abstract logic and arithmetic. The mammalian brain, comprised of neuronal networks, functions as an analog device and has given rise to artificial neural networks that are implemented as digital algorithms but function as analog models would. Analog constructs compute with the implementation of a variety of feedback and feedforward loops. In contrast, digital algorithms allow the implementation of recursive processes that enable them to generate unparalleled emergent properties. We briefly illustrate how the cortical organization of neurons can integrate signals and make predictions analogically. While we conclude that brains are not digital computers, we speculate on the recent implementation of human writing in the brain as a possible digital path that slowly evolves the brain into a genuine (slow) Turing machine.

<https://www.frontiersin.org/articles/10.3389/fevo.2022.796413/full>

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## Journal of Human Genetics

### PAPERS

### **KAISAR DAUYEY & NARUYA SAITOU – Inferring Intelligence of ancient people based on modern genomic studies**

Quantification of ancient human intelligence has become possible with recent advances in polygenic prediction. Intelligence is a complex trait that has both environmental and genetic components and high heritability. Large-scale genome-wide association studies based on ~270,000 individuals have demonstrated highly significant single-nucleotide polymorphisms (SNPs) associated with intelligence in present-day humans. We utilized those previously reported 12,037 SNPs to estimate a genetic component of intelligence in ancient Funadomari Jomon individual from 3700 years BP as well as four individuals of Afanasievo nuclear family from about 4100 years BP and who are considered anatomically modern humans. We have demonstrated that ancient individuals could have been not inferior in intelligence compared to present-day humans through assessment of the genetic component of intelligence. We have also confirmed that alleles associated with intelligence tend to spread equally between ancestral and derived origin suggesting that intelligence may be a neutral trait in human evolution.

<https://www.nature.com/articles/s10038-022-01039-8>

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## Nature Scientific Data

### PAPERS

#### **BO TAN et al – Spatial distribution data of cultural sites from the Paleolithic to Bronze Age in Xinjiang, China**

The published map recording cultural sites in Xinjiang shows that there is a lack of data collection on the distribution of sites in the area, and no relevant data sets have been released. Existing written materials indicate that there are more cultural sites in this area. For this reason, we have collected and sorted out information. Our cultural site database provides the geographic location and corresponding geographic environment of each site in Xinjiang from the Paleolithic to the Bronze Age. The data record the human development and settlement process, settlement environment landscape characteristics, scale, type, quantity, and spatial distribution in Xinjiang in prehistoric China. These data not only are the basis for further understanding the spatial distribution of prehistoric humans in Xinjiang, but also provide references for understanding prehistoric human behavior and prehistoric man-land relationship, and the exchange of eastern and western civilizations. It is of great significance to modern social planning, site protection, and resource utilization.

<https://www.nature.com/articles/s41597-022-01306-5>

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## Nature Scientific Reports

### PAPERS

#### **ELADIO MONTERO-PORRAS et al – Inferring strategies from observations in long iterated Prisoner's dilemma experiments**

While many theoretical studies have revealed the strategies that could lead to and maintain cooperation in the Iterated Prisoner's dilemma, less is known about what human participants actually do in this game and how strategies change when being confronted with anonymous partners in each round. Previous attempts used short experiments, made different assumptions of possible strategies, and led to very different conclusions. We present here two long treatments that differ in the partner matching strategy used, i.e. fixed or shuffled partners. Here we use unsupervised methods to cluster the players based on their actions and then Hidden Markov Model to infer what the memory-one strategies are in each cluster. Analysis of the inferred strategies reveals that fixed partner interaction leads to behavioral self-organization. Shuffled partners generate subgroups of memory-one strategies that remain entangled, apparently blocking the self-selection process that leads to fully cooperating participants in the fixed partner treatment. Analyzing the latter in more detail shows that AIIC, AIID, TFT- and WSL-like behavior can be observed. This study also reveals that long treatments are needed as experiments with less than 25 rounds capture mostly the learning phase participants go through in these kinds of experiments.

<https://www.nature.com/articles/s41598-022-11654-2>

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## PLoS One

### PAPERS

#### **ANDY NEEDHAM et al – Art by firelight? Using experimental and digital techniques to explore Magdalenian engraved plaquette use at Montastruc (France)**

Palaeolithic stone plaquettes are a type of mobiliary art featuring engravings and recovered primarily from Magdalenian sites, where they can number from single finds to several thousand examples. Where context is available, they demonstrate complex traces of use, including surface refreshing, heating, and fragmentation. However, for plaquettes with limited or no archaeological context, research tends to gravitate toward their engraved surfaces. This paper focuses on 50 limestone plaquettes excavated by Peccadeau de l'Isle from Montastruc, a Magdalenian rockshelter site in southern France with limited archaeological context; a feature common to many art bearing sites excavated across the 19th and early 20th Centuries. Plaquette use at Montastruc was explored via a programme of microscopy, 3D modelling, colour enhancement using DStretch®, virtual reality (VR) modelling, and experimental archaeology, the latter focusing on limestone heating related to different functional and non-functional uses. While the limited archaeological context available ensures the results remain only indicative, the data generated suggests plaquettes from Montastruc were likely positioned in proximity to hearths during low ambient light conditions. The interaction of engraved stone and roving fire light made engraved forms appear dynamic and alive, suggesting this may have been important in their use. Human neurology is particularly attuned to interpreting shifting light and shadow as movement and identifying visually familiar forms in such varying light conditions through mechanisms such as pareidolic experience. This interpretation encourages a consideration of the possible conceptual connections between art made and experienced in similar circumstances, such as parietal art in dark cave environments. The toolset used to investigate the Montastruc assemblage may have application to other collections of plaquettes, particularly those with limited associated context.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0266146>

#### **MAAYAN SHEMER et al – Late Acheulian Jaljulia – Early human occupations in the paleo-landscape of the central coastal plain of Israel**

The Lower Paleolithic Late Acheulian in the Levant marks a fascinating chapter in human cultural and biological evolution. Nevertheless, many aspects of the Late Acheulian are still undeciphered, hindered by the complex nature of each site on the one hand, a scarcity of wide, multidisciplinary studies on the other, and by difficulties in obtaining absolute chronology for this timeframe. Therefore, subjects such as human subsistence strategies and modes of adaptation, regional diversity, and

the possible existence and nature of interactions between hominin groups are largely understudied. The discovery and study of Jaljulia, a large-scale Late Acheulian site at the central Coastal Plain, Israel, add valuable insights to the research of this chapter in human history. Considered to represent recurrent occupations at a favored, water and flint-rich setting, the site has provided extensive lithic assemblages obtained from several localities. Absolute chronology places the human activity on-site at roughly 500–300 ky (and possibly even later), which is suggested to be divided into several main occupation phases. Geomorphological and sedimentological analyses show a change in environmental conditions, from aeolian sand deposition and overlying Hamra soil during the Middle Pleistocene to high energy fluvial regime which transported large gravels in a north-south paleo-channel. Wetland environments, correlating to the human activity on site, developed later due to higher sea levels and a coastline shifts to the eastward, which caused a blockage of the Yarkon stream corridor to the sea by marine sand. In this paper we present results of the study of the site, including geomorphological formation and post-depositional processes, absolute chronology, lithic and faunal analyses. The site's extensive lithic assemblages are currently under study and future investigations are expected to shed more light on the technological nature of Late Acheulian Jaljulia.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0267672>

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## PNAS

### PAPERS

#### **MAÏTÉ RIVOLLAT et al – Ancient DNA gives new insights into a Norman Neolithic monumental cemetery dedicated to male elites**

The Middle Neolithic in western Europe is characterized by monumental funerary structures, known as megaliths, along the Atlantic façade. The first manifestations of this phenomenon occurred in modern-day France with the long mounds of the Cerny culture. Here, we present genome-wide data from the fifth-millennium BCE site of Fleury-sur-Orne in Normandy (France), famous for its impressively long monuments built for selected individuals. The site encompasses 32 monuments of variable sizes, containing the burials of 19 individuals from the Neolithic period. To address who was buried at the site, we generated genome-wide data for 14 individuals, of whom 13 are males, completing previously published data [M. Rivollat et al., *Sci. Adv.* 6, eaaz5344 (2020)]. Population genetic and Y chromosome analyses show that the Fleury-sur-Orne group fits within western European Neolithic genetic diversity and that the arrival of a new group is detected after 4,000 calibrated BCE. The results of analyzing uniparentally inherited markers and an overall low number of long runs of homozygosity suggest a patrilineal group practicing female exogamy. We find two pairs of individuals to be father and son, buried together in the same monument/grave. No other biological relationship can link monuments together, suggesting that each monument was dedicated to a genetically independent lineage. The combined data and documented father–son line of descent suggest a male-mediated transmission of sociopolitical authority. However, a single female buried with an arrowhead, otherwise considered a symbol of power of the male elite of the Cerny culture, questions a strictly biological sex bias in the burial rites of this otherwise “masculine” monumental cemetery.

<https://www.pnas.org/doi/abs/10.1073/pnas.2120786119>

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## Proceedings of the Royal Society B

### PAPERS

#### **JASMINE LITTLE, DUSTIN R. RUBENSTEIN AND SARAH GUINDRE-PARKER – Plasticity in social behaviour varies with reproductive status in an avian cooperative breeder**

Cooperatively breeding vertebrates are common in unpredictable environments where the costs and benefits of providing offspring care fluctuate temporally. To balance these fitness outcomes, individuals of cooperatively breeding species often exhibit behavioural plasticity according to environmental conditions. Although individual variation in cooperative behaviours is well-studied, less is known about variation in plasticity of social behaviour. Here, we examine the fitness benefits, plasticity and repeatability of nest guarding behaviour in cooperatively breeding superb starlings (*Lamprolornis superbus*). After demonstrating that the cumulative nest guarding performed at a nest by all breeders and helpers combined is a significant predictor of reproductive success, we model breeder and helper behavioural reaction norms to test the hypothesis that individuals invest more in guarding in favourable seasons with high rainfall. Variation in nest guarding behaviour across seasons differed for individuals of different reproductive status: breeders showed plastic nest guarding behaviour in response to rainfall, whereas helpers did not. Similarly, we found that individual breeders show repeatability and consistency in their nest guarding behaviour while individual helpers did not. Thus, individuals with the potential to gain direct fitness benefits exhibit greater plasticity and individual-level repeatability in cooperative behaviour.

<https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2022.0355>

#### **SHEINA LEW-LEVY et al – Costly teaching contributes to the acquisition of spear hunting skill among BaYaka forager adolescents**

Teaching likely evolved in humans to facilitate the faithful transmission of complex tasks. As the oldest evidenced hunting technology, spear hunting requires acquiring several complex physical and cognitive competencies. In this study, we used observational and interview data collected among BaYaka foragers (Republic of the Congo) to test the predictions that costlier teaching types would be observed at a greater frequency than less costly teaching in the domain of spear hunting and that teachers would calibrate their teaching to pupil skill level. To observe naturalistic teaching during spear hunting, we invited teacher–pupil groupings to spear hunt while wearing GoPro cameras. We analysed 68 h of footage totalling 519

teaching episodes. Most observed teaching events were costly. Direct instruction was the most frequently observed teaching type. Older pupils received less teaching and more opportunities to lead the spear hunt than their younger counterparts. Teachers did not appear to adjust their teaching to pupil experience, potentially because age was a more easily accessible heuristic for pupil skill than experience. Our study shows that costly teaching is frequently used to transmit complex tasks and that instruction may play a privileged role in the transmission of spear hunting knowledge.

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2022.0164>

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## Science

### REVIEWS

#### **R. DOUGLAS FIELDS – The becoming of the human brain**

Review of 'Zero to Birth: How the Human Brain Is Built' by William A. Harris, Princeton University Press.

<https://www.science.org/doi/10.1126/science.abp8642>

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## Science Advances

### PAPERS

#### **DANIEL L. CHEN & MARTIN SCHONGER – Social preferences or sacred values? Theory and evidence of deontological motivations**

Recent advances in economic theory, largely motivated by experimental findings, have led to the adoption of models of human behavior where decision-makers take into consideration not only their own payoff but also others' payoffs and any potential consequences of these payoffs. Investigations of deontological motivations, where decision-makers make their choice based on not only the consequences of a decision but also the decision per se, have been rare. We provide a formal interpretation of major moral philosophies and a revealed preference method to distinguish the presence of deontological motivations from a purely consequentialist decision-maker whose preferences satisfy first-order stochastic dominance.

<https://www.science.org/doi/full/10.1126/sciadv.abb3925>

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## Trends in Cognitive Sciences

### PAPERS

#### **LARS CHITTKA & NATACHA ROSSI – Social cognition in insects**

Insects feature some of the most complex societies in the animal kingdom, but a historic perception persists that such complexity emerges from interactions between individuals whose behaviours are largely guided by innate routines. Challenging this perception, recent work shows that insects feature many aspects of social intelligence found in vertebrate societies, such as individual recognition, learning object manipulation by observation, and elements of cultural traditions. Insects also display emotion-like states, which may be linked to social behaviours such as rescuing others from danger. We review recent developments in insect social cognition and speculate that some forms of now-hardwired behaviour (e.g., nest construction) could have initially been the result of individual innovation and subsequent cultural spread, with evolution later cementing these behaviours into innate behaviour routines.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00085-7](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00085-7)

### COMMENTARIES

#### **PAUL BLOOM – If everything is dehumanization, then nothing is**

In their recent article in TiCS, Kteily and Landry have done a real service to the field with their exhaustive and thoughtful overview of dehumanization research. But their article illustrates problems with how some psychologists think about the concept.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00059-6](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00059-6)

#### **NOUR S. KTEILY & ALEXANDER P. LANDRY – Defining dehumanization broadly does not mean including everything**

We are grateful to Paul Bloom for engaging seriously with our work and providing us with the opportunity to further clarify the theorizing underlying our perspective on dehumanization. Indeed, several of Bloom's concerns are misunderstandings of our claims or are directly addressed by our model; other critiques restate our own position.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(22\)00087-0](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00087-0)

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