EAORC BULLETIN 1,046 – 2 July 2023

CONTENTS

NOTICES

PUBLICATION ALERTS

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

EDITORIAL INTERJECTIONS

Comments in curly brackets are editorial interjections. The Editor reserves the right to be wrong.

CONFERENCE ALERT – Neuroscience Needs a Revolution to Understand Consciousness

Summer Symposium, August 18-20, 2023, Encinitas, California

SPEAKERS:
Sir Roger Penrose - Stuart Hameroff - Hartmut Neven - Riccardo Manzotti - Anirban Bandyopadhyay - Esh Farschi - Paavo Pylkkanen - Daniel Sheehan - Paulo Roberto Silva de Souza - Santosh Helekar - Thomas Brophy - Hide Saegusa - Tam Hunt - Sean Esbjörn-Hargens - Aliya Grig - Sterling Cooley - Dante Lauretta - Aarat Kalra - Travis Craddock - Jeffery Martin - Dean Radin - Rajnish Khanna - Jessica Corneille - Jonathan Schooler - Jay Sanguinetti - Zina Cinker - Cassandra Vieten - Erik Viirre - Jack Tuszynski - Subject to change

ORGANIZERS:
Thomas Brophy, Stuart Hameroff,
Abi Behar-Montefiore, Nicole Riel

FORMAT
Hybrid - Live, Encinitas, California and remote/online. Invited Speakers
plus accepted digital poster presentations.
Abstract Submissions, Evening Beach Party

VENUE:
California Institute for Human Science, 701 Garden View Court, Encinitas, CA 92024

DATE AND TIME: PST
August 18, 2023 - 1:00 pm-6:00 pm
August 19, 2023 - 9:00 am-5:00 pm
August 20, 2023 - 9:00 am-4:00 pm

REGISTRATION
in person: $ 300
remote: $ 75

ABSTRACT SUBMISSIONS
Abstracts due: July 15, 2023

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abi behar montefiore

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HYBRID FORMAT, LIVE AND REMOTE/ON-LINE
We view consciousness as the most important unsolved problem in science and philosophy today. Despite extraordinary advances in physics, chemistry, biology and details about the brain, consciousness, the essential aspect of human existence, remains a mystery. The advent of artificial intelligence ('AI') has supported the belief that the brain is a complex computer of simple neurons, each functioning algorithmically as an integrate-and-fire threshold logic device, as described by the 1950s Hodgkin-Huxley model neuron. Relevant signaling is attributed solely to membrane potentials on neuronal surfaces, with neurons, axonal firings and synaptic transmissions serving as fundamental 'bit-like' information units.

And yet single cell organisms like paramecium can swim, learn, find food and mates, and have sex, without synapses or higher-order networks. They do so by their internal microtubules, cylindrical polymers of the protein tubulin, capable of information processing in which states of a billion tubulins per neuron are fundamental units. Microtubules in all cells enact purposeful spatiotemporal activities, and in the brain, microtubules establish neuronal shape, create and regulate synapses, and are proposed to underlie memory, consciousness and cognition. Tubulin is the brain's most prevalent protein, so the brain is largely made of microtubules, each with unique, high frequency vibrational and quantum optical properties from non-polar aromatic ring pathways.

Whereas membrane signaling occurs in slow frequencies (0 to 100 hertz, cycles per second), microtubules have been shown by Anirban Bandyopadhyay to have coherent self-similar resonance vibrational patterns repeating from kilohertz to megahertz, gigahertz and terahertz frequencies, including quantum vibrations.

The 'Orch OR' theory proposes consciousness depends on 'orchestrated' ('Orch') quantum state 'objective reductions' ('Penrose OR') in microtubules inside brain neurons connecting to the fine scale structure of spacetime geometry. Orch OR can account for cognitive binding, real-time conscious causal action (through non-computable Penrose OR and retroactivity), memory encoding, and the 'hard problem' of phenomenal experience. Consciousness as a non-local quantum process in spacetime geometry provides potentially plausible accounts for near-death and out-of-body experiences, pre-cognition, afterlife and reincarnation.

Presently, relevance to consciousness of megahertz, gigahertz and terahertz and quantum optical frequency processes in microtubules are testable. Experimental evidence shows that anti-depressants, psychedelics and general anesthetics (which selectively block consciousness) all act via microtubules.

Mainstream neuroscience theories of consciousness based on membrane-only 'cartoon' neurons are no different from current AI. These theories are an insult to the reality of what neurons actually are. Consideration of hierarchical resonance models extending inward, deeper and faster inside neurons to microtubule dynamics in health and disease offers therapeutic opportunities, e.g. terahertz (photons) and megahertz (ultrasound) for mental and cognitive disorders including Alzheimer's, traumatic brain injury, depression, coma etc. Neuroscience needs a revolution to understand consciousness and treat its disorders.

Thomas Brophy, CIHS
Stuart Hameroff, CCS

NEWS

NATURE BRIEFING – Ancient humans probably ate each other
A carved-up leg bone might be the earliest evidence that ancient humans butchered and ate each other's flesh. The 1.45-million-year-old hominin bone features cuts similar to the butchery marks made by stone tools found on fossilized animal bones. The scrapes are located at an opportune spot for removing muscle, suggesting that they were made with the intention of carving up the carcass for food. It isn't possible to say whether this is an example of cannibalism, because the bone belongs to an unidentified hominin species. The discovery was "shocking, honestly, and very surprising, but very exciting", says palaeoanthropologist Briana Pobiner.
https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=4fce2e7fc3&e=1db4b9a19b

NATURE BRIEFING – Woman the hunter
Evidence from 67 hunter-gatherer societies going back to the late 1800s shows that women hunt in most of them, with little evidence for rigid rules about who did what. "If somebody liked to hunt, they could just hunt," says biological anthropologist and co-author Cara Wall-Scheffler. The work overturns the last vestiges of the tenacious 'Man the Hunter' myth that says 'men hunt and women gather', which can still influence how archaeological sites are interpreted.

https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=bb4886d819&e=1db4b9a19b

NATURE BRIEFING – Podcast: Do octopuses dream?

Sleeping octopuses' skin sometimes flashes with incredible patterns — the same patterns that are associated with camouflage, hunting or communication in awake animals. Octopuses are the first invertebrates to show signs of going through a similar two-stage sleep cycle as mammals, birds and reptiles. In humans, the active stage (called rapid eye movement sleep) is associated with vivid dreams. Sleeping octopuses' skin patterns could be "the reactivation of the waking experience for something like memory consolidation or even something like dream", neuroethologist Sam Reiter tells the Nature Podcast. It's still not clear what two-stage sleep is for, but it seems to be important: Reiter suggests that it evolved independently in invertebrates and vertebrates.

https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=05a8c2edea&e=1db4b9a19b

SCIENCE.ORG NEWS – Dolphin moms use 'baby talk' with their calves

Striking similarities discovered between human and dolphin "motherese".

https://www.science.org/content/article/dolphin-moms-use-baby-talk-their-calves

SCIENCE.ORG NEWS – 'Adversarial' search for neural basis of consciousness yields first results

Two rival theories about the basis of perception went head-to-head in neuroscience experiments, but advocates of "losing" idea aren't conceding yet.

https://www.science.org/content/article/search-neural-basis-consciousness-yields-first-results

SCIENCE.ORG NEWS – Worldwide survey kills the myth of 'Man the Hunter'

For decades anthropologists have witnessed forager women—those who live in societies that both hunt and gather—around the world skillfully slay prey: In the 1980s, Agta women of the Philippines drew bows and arrows as tall as themselves and aimed at wild pigs and deer, and Matses Amazonians struck paca rodents with machetes. Observations from the 1990s described Aka great-grandmothers and girls as young as age 5 trapping duiker and porcupine in central Africa.

https://www.science.org/content/article/worldwide-survey-kills-myth-man-hunter

PUBLICATIONS

American Journal of Biological Anthropology

PAPERS

N. D. S. GRUNSTRA et al – There is an obstetrical dilemma: Misconceptions about the evolution of human childbirth and pelvic form

Compared to other primates, modern humans face high rates of maternal and neonatal morbidity and mortality during childbirth. Since the early 20th century, this "difficulty" of human parturition has prompted numerous evolutionary explanations, typically assuming antagonistic selective forces acting on maternal and fetal traits, which has been termed the "obstetrical dilemma." Recently, there has been a growing tendency among some anthropologists to question the difficulty of human childbirth and its evolutionary origin in an antagonistic selective regime. Partly, this stems from the motivation to combat increasing pathologization and overmedicalization of childbirth in industrialized countries. Some authors have argued that there is no obstetrical dilemma at all, and that the difficulty of childbirth mainly results from modern lifestyles and inappropriate and patriarchal obstetric practices. The failure of some studies to identify biomechanical and metabolic constraints on pelvic dimensions is sometimes interpreted as empirical support for discarding an obstetrical dilemma. Here we explain why these points are important but do not invalidate evolutionary explanations of human childbirth. We present robust empirical evidence and solid evolutionary theory supporting an obstetrical dilemma, yet one that is much more complex than originally conceived in the 20th century. We argue that evolutionary research does not hinder appropriate midwifery and obstetric care, nor does it promote negative views of female bodies. Understanding the evolutionary entanglement of biological and sociocultural factors underlying human childbirth can help us to understand individual variation in the risk factors of obstructed labor, and thus can contribute to more individualized maternal care.

https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24802

MARTHA M. ROBBINS et al – Comparative life history patterns of female gorillas

Several theories have been proposed to explain the impact of ecological conditions on differences in life history variables within and between species. Here we compare female life history parameters of one western lowland gorilla population (Gorilla gorilla gorilla) and two mountain gorilla populations (Gorilla beringei beringei). We compared the age of natal dispersal, age of first birth, interbirth interval, and birth rates using long-term demographic datasets from Mbeli Bai (western gorillas), Bwindi Impenetrable National Park and the Virunga Massif (mountain gorillas). The Mbeli western gorillas had the latest age at first birth, longest interbirth interval, and slowest surviving birth rate compared to the Virunga mountain gorillas. Bwindi mountain gorillas were intermediate in their life history patterns. These patterns are consistent with

differences in feeding ecology across sites. However, it is not possible to determine the evolutionary mechanisms responsible for these differences, whether a consequence of genetic adaptation to fluctuating food supplies ("ecological risk aversion hypothesis") or phenotypic plasticity in response to the abundance of food ("energy balance hypothesis"). Our results do not seem consistent with the extrinsic mortality risks at each site, but current conditions for mountain gorillas are unlikely to match their evolutionary history. Not all traits fell along the expected fast-slow continuum, which illustrates that they can vary independently from each other ("modularity model"). Thus, the life history traits of each gorilla population may reflect a complex interplay of multiple ecological influences that are operating through both genetic adaptations and phenotypic plasticity.
https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24792

Biology Letters
PAPERS

DAVIDE BALDAN et al – Repeatable negotiation rules? Only females show repeatable responses to partner removal in a brood-provisioning songbird
Theoretical models indicate that the evolution of biparental care depends on how parents behaviourally negotiate their level of care in response to those of their partner and whether sexes and individuals consistently vary in their response (compensatory response). While the compensatory response has been widely investigated empirically, its repeatability has rarely been assessed. In this study, we used a reaction norm approach to investigate the repeatability of the compensatory offspring provisioning of a parent after temporary removal of its partner in the pied flycatcher (Ficedula hypoleuca) across different breeding seasons and partners. We found that only females partially compensated for the short-term removal of the partner and their response was significantly repeatable across years while breeding with different partners. This study highlights the importance of considering among individual differences in negotiation rules to better understand the role of negotiation mechanisms in the evolution of parental care strategies.
https://royalsocietypublishing.org/doi/full/10.1098/rsbl.2023.0136

Current Biology
PAPERS

MELISSA JOHNSTON, KATHARINA F. BRECHT & ANDREAS NIEDER – Crows flexibly apply statistical inferences based on previous experience
Statistical inference, the ability to use limited information to draw conclusions about the likelihood of an event, is critical for decision-making during uncertainty. The ability to make statistical inferences was thought to be a uniquely human skill requiring verbal instruction and mathematical reasoning. However, basic inferences have been demonstrated in both preliterate and pre-numerate individuals, as well as non-human primates. More recently, the ability to make statistical inferences has been extended to members outside of the primate lineage in birds. True statistical inference requires subjects use relative rather than absolute frequency of previously experienced events. Here, we show that crows can relate memorized reward probabilities to infer reward-maximizing decisions. Two crows were trained to associate multiple reward probabilities ranging from 10% to 90% to arbitrary stimuli. When later faced with the choice between various stimulus combinations, crows retrieved the reward probabilities associated with individual stimuli from memory and used them to gain maximum reward. The crows showed behavioral distance and size effects when judging reward values, indicating that the crows represented probabilities as abstract magnitudes. When controlling for absolute reward frequency, crows still made reward-maximizing choices, which is the signature of true statistical inference. Our study provides compelling evidence of decision-making by relative reward frequency in a statistical inference task.
https://www.cell.com/current-biology/fulltext/S0960-9822(23)00774-1

eLife
PAPERS

ROBERT SCHOLZ, ARNO VILLRINGER & MAURICIO J.D. MARTINS – Distinct hippocampal and cortical contributions in the representation of hierarchies
Humans generate complex hierarchies across a variety of domains, including language and music, and this capacity is often associated with activity in inferior frontal gyrus (IFG). Non-human animals have also been shown to represent simple hierarchies in spatial navigation, and human neuroimaging work has implicated the hippocampus in the encoding of items-in-contexts representations, which constitute 2-level hierarchical dependencies. These fields of research use distinct paradigms, leading to disjoint models and precluding adequate cross-species comparisons. In this study, we developed a paradigm to bring together these two areas of research and show that anterior hippocampus and medial prefrontal cortex encode hierarchical context, mimicking findings from animal spatial navigation. Additionally, we replicated classic neurolinguistic findings of 1) left IFG and posterior temporal cortex in the representation of hierarchies and 2) the association between IFG and processing automaticity. We propose that mammals share an evolutionary ancient system for the generation of simple hierarchies which is complemented in humans by additional capacities.
https://elifesciences.org/reviewed-preprints/87075

SEBASTIEN BOURET et al – Linking the evolution of two prefrontal brain regions to social and foraging challenges in primates

The diversity of cognitive skills across primates remains both a fascinating and a controversial issue. Recent comparative studies provided conflicting results regarding the contribution of social vs ecological constraints to the evolution of cognition. Here, we used an interdisciplinary approach combining comparative cognitive neurosciences and behavioral ecology. Using brain imaging data from 16 primate species, we measured the size of two prefrontal brain regions, the frontal pole (FP) and the dorso-lateral prefrontal cortex (DLPFC), respectively involved in metacognition and working memory, and examined their relation to a combination of socio-ecological variables. The size of these prefrontal regions, as well as the whole brain, was best explained by three variables: body mass, daily travelled distance (an index of ecological constraints) and population density (an index of social constraint). The strong influence of ecological constraints on FP and DLPFC volumes suggests that both metacognition and working memory are critical for foraging in primates. Interestingly, FP volume was much more sensitive to social constraints than DLPFC volume, in line with laboratory studies showing an implication of FP in complex social interactions. Thus, our data clarifies the relative weight of social vs ecological constraints on the evolution of specific prefrontal brain regions and their associated cognitive operations in primates.
https://elifesciences.org/reviewed-preprints/87780

Evolutionary Anthropology

PAPERS

CHRISTOPHER B. RUFF & BERNARD A. WOOD – The estimation and evolution of hominin body mass

Body mass is a critical variable in many hominin evolutionary studies, with implications for reconstructing relative brain size, diet, locomotion, subsistence strategy, and social organization. We review methods that have been proposed for estimating body mass from true and trace fossils, consider their applicability in different contexts, and the appropriateness of different modern reference samples. Recently developed techniques based on a wider range of modern populations hold promise for providing more accurate estimates in earlier hominins, although uncertainties remain, particularly in non-Homo taxa. When these methods are applied to almost 300 Late Miocene through Late Pleistocene specimens, the resulting body mass estimates fall within a 25–60 kg range for early non-Homo taxa, increase in early Homo to about 50–90 kg, then remain constant until the Terminal Pleistocene, when they decline.
https://onlinelibrary.wiley.com/doi/full/10.1002/evan.21988

Heliyon

PAPERS

MICHELLE GIRAUD, MARCO MARELLI & ELENA NAVA – Embodied language of emotions: Predicting human intuitions with linguistic distributions in blind and sighted individuals

Recent constructionist theories have suggested that language and sensory experience play a crucial role not only in how individuals categorise emotions but also in how they experience and shape them, helping to acquire abstract concepts that are used to make sense of bodily perceptions associated with specific emotions.

Here, we aimed to investigate the role of sensory experience in conceptualising bodily felt emotions by asking 126 Italian blind participants to freely recall in which part of the body they commonly feel specific emotions (N = 15). Participants varied concerning visual experience in terms of blindness onset (i.e., congenital vs late) and degree of visual experience (i.e., total vs partial sensory loss). Using an Italian semantic model to estimate to what extent discrete emotions are associated with body parts in language experience, we found that all participants' reports correlated with the model predictions. Interestingly, blind – and especially congenitally blind - participants' responses were more strongly correlated with the model, suggesting that language might be one of the possible compensatory mechanisms for the lack of visual feedback in constructing bodily felt emotions.

Our findings present theoretical implications for the study of emotions, as well as potential real-world applications for blind individuals, by revealing, on the one hand, that vision plays an essential role in the construction of felt emotions and the way we talk about our related bodily (emotional) experiences. On the other hand, evidence that blind individuals rely more strongly on linguistic cues suggests that vision is a strong cue to acquire emotional information from the surrounding world, influencing how we experience emotions.

While our findings do not suggest that blind individuals experience emotions in an atypical and dysfunctional way, they nonetheless support the view that promoting the use of non-visual emotional signs and body language since early on might help the blind child to develop a good emotional awareness as well as good emotion regulation abilities.
https://www.cell.com/heliyon/fulltext/S2405-8440(23)05072-7

REA ANTONIOU et al – Contrasting two models of utilitarian reasoning

One influential framework for examining human moral cognition has been a dual process model, in which utilitarian judgment (e.g., infliction of harm for the greater good) is associated with cognitive control processes, while non-utilitarian judgment (e.g., avoiding such harms) is associated with emotional, automatic processes. Another framework of moral

cognition, the two-dimensional model of utilitarian psychology, posits that utilitarian choices may reflect either instrumental harm, i.e., inflicting harm on an individual for the greater good; or impartial beneficence, i.e., impartially and altruistically acting for the benefit of the overall welfare. We evaluated preregistered hypotheses (https://osf.io/m425d) derived from these models of moral cognition in a sample of 275 neurologically healthy older adults. Our results suggest that both the dual process and two-dimensional models provided insights regarding utilitarian reasoning, including three cardinal domains of conflict between utilitarianism and common-sense morality: agent-centered permissions, special obligations, and personal rights. One prediction of the dual process-based model was supported by our findings, with higher emotionality associated with decreased endorsement of utilitarian judgments (b = - 0.12, p < .001). We also found partial support for the two-dimensional model, as utilitarian judgments about dilemmas involving agent-centered permissions and personal rights were dissociated; however, both sets of judgments were associated with utilitarian judgments involving special obligations (p < .001 and p = .008, respectively). We propose that our findings, with support for some elements of the dual process and two-dimensional models, can be integrated into a revised two-dimensional model of utilitarian judgment as including impartial beneficence and acceptance of attributable harms.
https://www.cell.com/heliyon/fulltext/S2405-8440(23)04706-0

International Journal of Anthropology & Ethnology
PAPERS

SAID BOUTICHE – Language evolution and computational capabilities: conceptualization of the first language units
This work addresses from the perspective of evolutionary pressure, the delicate issue of the mechanisms and causes that are behind the emergence of the faculty of language among early Homo sapiens ancestors. It mainly focuses on the motives or driving forces that are behind the emergence of the first units of language. The latter are defined in this paper, as the first vocal signals that convey information and meanings that go far beyond the usual vocal repertoire of non-human primates. They emerged as a consequence to make a sense to the principle of fairness by probing equal amounts of quantities in the context of food sharing operations after a collaborative labor. Early hominins realized that learning how to make equal food quantities, which should be regarded today as the most fundamental level for doing mathematics, is a prerequisite for the sustainability of collaborative labor (cooperation). This ancestral computing innovation is shown in this paper to be the greatest achievement of evolution in the Homo lineage. By developing the first computational capabilities, early hominins passed successfully the transition that allowed them to move from the instinct driven behavior, which prevails in the animal realm, to reasoning guided behavior in which processing information and language are two fundamental consequences.
https://ijae.springeropen.com/articles/10.1186/s41257-023-00090-3

iScience
PAPERS

MEREDITH J. MCCARTY et al – Intraoperative cortical localization of music and language reveals signatures of structural complexity in posterior temporal cortex
Language and music involve the productive combination of basic units into structures. It remains unclear whether brain regions sensitive to linguistic and musical structure are co-localized. We report an intraoperative awake craniotomy in which a left-hemispheric language-dominant professional musician underwent cortical stimulation mapping (CSM) and electrocorticography of music and language perception and production during repetition tasks. Musical sequences were melodic or amelodic, and differed in algorithmic compressibility (Lempel-Ziv complexity). Auditory recordings of sentences differed in syntactic complexity (single vs. multiple phrasal embeddings). CSM of posterior superior temporal gyrus (pSTG) disrupted music perception and production, along with speech production. pSTG and posterior middle temporal gyrus (pMTG) activated for language and music (broadband gamma; 70–150 Hz). pMTG activity was modulated by musical complexity, while pSTG activity was modulated by syntactic complexity. This points to shared resources for music and language comprehension, but distinct neural signatures for the processing of domain-specific structural features.
https://www.cell.com/iscience/fulltext/S2589-0042(23)01300-7

Mind & Language
PAPERS

MICHELLE LIU – Mental simulation and language comprehension: The case of copredication
Empirical evidence suggests that perceptual-motor simulations are often constitutively involved in language comprehension. Call this "the simulation view of language comprehension". This article applies the simulation view to illuminate the much-discussed phenomenon of copredication, where a noun permits multiple predications which seem to select different senses of the noun simultaneously. On the proposed account, the (in)felicitousness of a copredicational sentence is closely associated with the perceptual simulations that the language user deploys in comprehending the sentence.
https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12459

Nature

NEWS

Did our human ancestors eat each other? Carved-up bone offers clues
A fossilized hominin leg shows gashes that were probably made by stone tools.
https://www.nature.com/articles/d41586-023-02082-x

PAPERS

BAS VAN OPHEUSDEN et al – Expertise increases planning depth in human gameplay
A hallmark of human intelligence is the ability to plan multiple steps into the future. Despite decades of research, it is still debated whether skilled decision-makers plan more steps ahead than novices. Traditionally, the study of expertise in planning has used board games such as chess, but the complexity of these games poses a barrier to quantitative estimates of planning depth. Conversely, common planning tasks in cognitive science often have a lower complexity and impose a ceiling for the depth to which any player can plan. Here we investigate expertise in a complex board game that offers ample opportunity for skilled players to plan deeply. We use model fitting methods to show that human behaviour can be captured using a computational cognitive model based on heuristic search. To validate this model, we predict human choices, response times and eye movements. We also perform a Turing test and a reconstruction experiment. Using the model, we find robust evidence for increased planning depth with expertise in both laboratory and large-scale mobile data. Experts memorize and reconstruct board features more accurately. Using complex tasks combined with precise behavioural modelling might expand our understanding of human planning and help to bridge the gap with progress in artificial intelligence.
https://www.nature.com/articles/s41586-023-06124-2

Nature Africa

ARTICLES

CHINYERE OPIA & ENGELA DUVENAGE – Exploring the great serendipity of prehistoric tracks
South Africa's southern Cape coastline is emerging as one of the best places for ichnologists to study the fossilized tracks and traces left by ancient animals and humans.
https://www.nature.com/articles/d44148-023-00161-9

Nature Communications Biology

PAPERS

MAGDALENA BOCH et al – Functionally analogous body- and animacy-responsive areas are present in the dog (Canis familiaris) and human occipito-temporal lobe
Comparing the neural correlates of socio-cognitive skills across species provides insights into the evolution of the social brain and has revealed face- and body-sensitive regions in the primate temporal lobe. Although from a different lineage, dogs share convergent visuo-cognitive skills with humans and a temporal lobe which evolved independently in carnivorans. We investigated the neural correlates of face and body perception in dogs (N = 15) and humans (N = 40) using functional MRI. Combining univariate and multivariate analysis approaches, we found functionally analogous occipito-temporal regions involved in the perception of animate entities and bodies in both species and face-sensitive regions in humans. Though unpredicted, we also observed neural representations of faces compared to inanimate objects, and dog compared to human bodies in dog olfactory regions. These findings shed light on the evolutionary foundations of human and dog social cognition and the predominant role of the temporal lobe.
https://www.nature.com/articles/s42003-023-05014-7

Nature Reviews Psychology

ARTICLES

MICHAEL C. FRANK – Baby steps in evaluating the capacities of large language models
Large language models show remarkable capacities, but it is unclear what abstractions support their behaviour. Methods from developmental psychology can help researchers to understand the representations used by these models, complementing standard computational approaches — and perhaps leading to insights about the nature of mind.
https://www.nature.com/articles/s44159-023-00211-x

Nature Scientific Reports

PAPERS

SILVIA POLVER et al – Early maturation of sound duration processing in the infant's brain
The ability to process sound duration is crucial already at a very early age for laying the foundation for the main functions of auditory perception, such as object perception and music and language acquisition. With the availability of age-appropriate structural anatomical templates, we can reconstruct EEG source activity with much-improved reliability. The current study

capitalized on this possibility by reconstructing the sources of event-related potential (ERP) waveforms sensitive to sound duration in 4- and 9-month-old infants. Infants were presented with short (200 ms) and long (300 ms) sounds equiprobable delivered in random order. Two temporally separate ERP waveforms were found to be modulated by sound duration. Generators of these waveforms were mainly located in the primary and secondary auditory areas and other language-related regions. The results show marked developmental changes between 4 and 9 months, partly reflected by scalp-recorded ERPs, but appearing in the underlying generators in a far more nuanced way. The results also confirm the feasibility of the application of anatomical templates in developmental populations.
https://www.nature.com/articles/s41598-023-36794-x

SILVIA RIGATO et al – Infant visual preference for the mother's face and longitudinal associations with emotional reactivity in the first year of life

Past research has focused on infants' visual preference for the mother's face, however it is still unknown how these responses change over time and what factors associate with such changes. A longitudinal study (N ~ 60) was conducted to investigate the trajectories of infant visual preference for the mother's face and how these are related to the development of emotional reactivity in the first year of life. Two face stimuli (i.e., the infant's mother and a consistent stranger face) were used in a visual preference task at 2 weeks, 4, 6, and 9 months of age. At each time point, mothers were asked to complete a measure of infant temperament via standardised questionnaires. Our results show that while at 2 weeks, 4 months and 9 months of age infants looked equally at both faces, infants at 6 months looked significantly longer at their mother's face. We also observed prospective associations with emotional reactivity variables so that infants who looked longer at the mother's face at 6 months showed higher falling reactivity, i.e. a better ability to recover from distress, at 9 months. We discuss these findings in light of the roles that both infant development and the caregiver play in emerging emotion regulation capacities during the first year of life.
https://www.nature.com/articles/s41598-023-37448-8

BRIANA POBINER, MICHAEL PANTE & TREVOR KEEVIL – Early Pleistocene cut marked hominin fossil from Koobi Fora, Kenya

Identification of butchery marks on hominin fossils from the early Pleistocene is rare. Our taphonomic investigation of published hominin fossils from the Turkana region of Kenya revealed likely cut marks on KNM-ER 741, a ~ 1.45 Ma proximal hominin left tibia shaft found in the Okote Member of the Koobi Fora Formation. An impression of the marks was created with dental molding material and scanned with a Nanovea white-light confocal profilometer, and the resulting 3-D models were measured and compared with an actualistic database of 898 individual tooth, butchery, and trample marks created through controlled experiments. This comparison confirms the presence of multiple ancient cut marks that are consistent with those produced experimentally. These are to our knowledge the first (and to date only) cut marks identified on an early Pleistocene postcranial hominin fossil.
https://www.nature.com/articles/s41598-023-35702-7

JULEN AIZPURUA-IRAOLA et al – Whole mitogenomes reveal that NW Africa has acted both as a source and a destination for multiple human movements

Despite being enclosed between the Mediterranean Sea and the Sahara Desert, North Africa has been the scenario of multiple human migrations that have shaped the genetic structure of its present-day populations. Despite its richness, North Africa remains underrepresented in genomic studies. To overcome this, we have sequenced and analyzed 264 mitogenomes from the Algerian Chaoui-speaking Imazighen (a.k.a. Berbers) living in the Aurès region. The maternal genetic composition of the Aurès is similar to Arab populations in the region, dominated by West Eurasian lineages with a moderate presence of M1/U6 North African and L sub-Saharan lineages. When focusing on the time and geographic origin of the North African specific clades within the non-autochthonous haplogroups, different geographical neighboring regions contributed to the North African maternal gene pool during time periods that could be attributed to previously suggested admixture events in the region, since Paleolithic times to recent historical movements such as the Arabization. We have also observed the role of North Africa as a source of geneflow mainly in Southern European regions since Neolithic times. Finally, the present work constitutes an effort to increase the representation of North African populations in genetic databases, which is key to understand their history.
https://www.nature.com/articles/s41598-023-37549-4

ZIXUAN TANG et al – Strengths of social ties modulate brain computations for third-party punishment

Costly punishment of social norm transgressors by third-parties has been considered as a decisive stage in the evolution of human cooperation. An important facet of social relationship knowledge concerns the strength of the social ties between individuals, as measured by social distance. Yet, it is unclear how the enforcement of social norms is influenced by the social distance between a third-party and a norm violator at the behavioral and the brain system levels. Here, we investigated how social distance between punishers and norm-violators influences third-party punishment. Participants as third-party punished norm violators more severely as social distance between them increased. Using model-based fMRI, we disentangled key computations contributing to third-party punishment: inequity aversion, social distance between

participant and norm violator and integration of the cost to punish with these signals. Inequity aversion increased activity in the anterior cingulate cortex and bilateral insula, and processing social distance engaged a bilateral fronto-parietal cortex brain network. These two brain signals and the cost to punish were integrated in a subjective value signal of sanctions that modulated activity in the ventromedial prefrontal cortex. Together, our results reveal the neurocomputational underpinnings of third-party punishment and how social distance modulates enforcement of social norms in humans.
https://www.nature.com/articles/s41598-023-37286-8

New Scientist
NEWS

Dolphins 'talk' to their young in a higher pitch, just like humans do
Female dolphins modify their vocalisations in the presence of their offspring, mirroring the 'baby talk' used by humans.
https://www.newscientist.com/article/2379783-dolphins-talk-to-their-young-in-a-higher-pitch-just-like-humans-do/

Finger marks on cave walls are among the earliest Neanderthal art
Symbols have been found carved on the walls of a cave in France that was inhabited by Neanderthals before being sealed off at least 57,000 years ago.
https://www.newscientist.com/article/2379164-finger-marks-on-cave-walls-are-among-the-earliest-neanderthal-art/

Utopia: The ancient discoveries that point to the ideal human society
Anthropology and archaeology are revealing that a human society can take myriad forms, which can teach us how to build a modern society that is more equal, resilient and stable.
https://www.newscientist.com/article/0-utopia-the-ancient-discoveries-that-point-to-the-ideal-human-society/

The societies proving that inequality and patriarchy aren't inevitable
Today's complex societies are pretty homogeneous, but experimental cultures, past and present, teach us how to think more creatively about the way we live.
https://www.newscientist.com/article/0-the-societies-proving-that-inequality-and-patriarchy-arent-inevitable/

ARTICLES

MICHAEL MARSHALL – The civilisation myth: How new discoveries are rewriting human history
In an evolutionary eyeblink, our species has gone from hunting and gathering to living in complex societies. We need to rethink the story of this monumental transition.
https://www.newscientist.com/article/mg25834450-800-the-civilisation-myth-how-new-discoveries-are-rewriting-human-history/

Philosophical Transactions of the Royal Society B
PAPERS

MAUD MOUGINOT et al – Reproductive inequality among males in the genus Pan
Reproductive inequality, or reproductive skew, drives natural selection, but has been difficult to assess, particularly for males in species with promiscuous mating and slow life histories, such as bonobos (Pan paniscus) and chimpanzees (Pan troglodytes). Although bonobos are often portrayed as more egalitarian than chimpanzees, genetic studies have found high male reproductive skew in bonobos. Here, we discuss mechanisms likely to affect male reproductive skew in Pan, then re-examine skew patterns using paternity data from published work and new data from the Kokolopori Bonobo Reserve, Democratic Republic of Congo and Gombe National Park, Tanzania. Using the multinomial index (M), we found considerable overlap in skew between the species, but the highest skew occurred among bonobos. Additionally, for two of three bonobo communities, but no chimpanzee communities, the highest ranking male had greater siring success than predicted by priority-of-access. Thus, an expanded dataset covering a broader demographic range confirms that bonobos have high male reproductive skew. Detailed comparison of data from Pan highlights that reproductive skew models should consider male–male dynamics including the effect of between-group competition on incentives for reproductive concessions, but also female grouping patterns and factors related to male–female dynamics including the expression of female choice.
https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2022.0301

SIMON T. POWERS, CEDRIC PERRET & THOMAS E. CURRIE – Playing the political game: the coevolution of institutions with group size and political inequality
All societies need to form institutional rules to regulate their social interactions. These specify what actions individuals should take in particular situations, and what sanctions will apply if individuals violate these rules. However, forming these institutional rules involves playing a political game—a process of negotiation between individuals that is costly and time-consuming. Intuitively, this cost should be expected to increase as a group becomes larger, which could then select for a transition to hierarchy to keep the cost of playing the political game down as group size increases. However, previous work

has lacked a mechanistic yet general model of political games that could formalize this argument and test the conditions under which it holds. We address this by formalizing the political game using a standard consensus formation model. We show that the increasing cost of forming a consensus over institutional rules selects for a transition from egalitarian to hierarchical organization over a wide range of conditions. Playing a political game to form institutional rules in this way captures and unites a previously disparate set of voluntary theories for hierarchy formation, and can explain why the increasing group size in the Neolithic would lead to strong political inequality.
https://royalsocietypublishing.org/doi/full/10.1098/rstb.2022.0303

DITHAPELO MEDUPE et al – Why did foraging, horticulture and pastoralism persist after the Neolithic transition? The oasis theory of agricultural intensification

Despite the global spread of intensive agriculture, many populations retained foraging or mixed subsistence strategies until well into the twentieth century. Understanding why has been a longstanding puzzle. One explanation, called the marginal habitat hypothesis, is that foraging persisted because foragers tended to live in marginal habitats generally not suited to agriculture. However, recent empirical studies have not supported this view. The alternative but untested oasis hypothesis of agricultural intensification claims that intensive agriculture developed in areas with low biodiversity and a reliable water source not reliant on local rainfall. We test both the marginal habitat and oasis hypotheses using a cross-cultural sample drawn from the 'Ethnographic atlas' (Murdock 1967 Ethnology 6, 109–236). Our analyses provide support for both hypotheses. We found that intensive agriculture was unlikely in areas with high rainfall. Further, high biodiversity, including pathogens associated with high rainfall, appears to have limited the development of intensive agriculture. Our analyses of African societies show that tsetse flies, elephants and malaria are negatively associated with intensive agriculture, but only the effect of tsetse flies reached significance. Our results suggest that in certain ecologies intensive agriculture may be difficult or impossible to develop but that generally lower rainfall and biodiversity is favourable for its emergence.
https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2022.0300

PLoS One
PAPERS

ABIGAIL ANDERSON et al – The Myth of Man the Hunter: Women's contribution to the hunt across ethnographic contexts

The sexual division of labor among human foraging populations has typically been recognized as involving males as hunters and females as gatherers. Recent archeological research has questioned this paradigm with evidence that females hunted (and went to war) throughout the Homo sapiens lineage, though many of these authors assert the pattern of women hunting may only have occurred in the past. The current project gleans data from across the ethnographic literature to investigate the prevalence of women hunting in foraging societies in more recent times. Evidence from the past one hundred years supports archaeological finds from the Holocene that women from a broad range of cultures intentionally hunt for subsistence. These results aim to shift the male-hunter female-gatherer paradigm to account for the significant role females have in hunting, thus dramatically shifting stereotypes of labor, as well as mobility.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0287101

YA GAO & WENQI LIU – Measures to sustain endangered languages: A bilingual competition model with sliding mode control

There are thousands of languages in the world, many of which are in danger of extinction due to language competition and evolution. Language is an aspect of culture, the rise, and fall of a language directly affects its corresponding culture. To preserve languages and prevent their mass extinction, it is crucial to develop a mathematical model of language coexistence. In this paper, we use a qualitative theory of ordinary differential equations to analyze the bilingual competition model, and obtain the trivial and non-trivial solutions of the bilingual competition model without sliding mode control, then analyze the stability of solutions and prove that solutions of the model have positive invariance. In addition, to maintain linguistic diversity and prevent mass extinction of languages, we propose a novel bilingual competition model with sliding control. The bilingual competition model is analyzed by proposing a sliding control policy to obtain a pseudo-equilibrium point. Meanwhile, numerical simulations clearly illustrate the effectiveness of the sliding mode control strategy. The results show that the likelihood of successful language coexistence can be increased by changing the status of languages and the value of monolingual-bilingual interaction, provides theoretical analysis for the development of policies to prevent language extinction.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0287850

HERMINE XHAUFLAIR et al – The invisible plant technology of Prehistoric Southeast Asia: Indirect evidence for basket and rope making at Tabon Cave, Philippines, 39–33,000 years ago

A large part of our material culture is made of organic materials, and this was likely the case also during prehistory. Amongst this prehistoric organic material culture are textiles and cordages, taking advantage of the flexibility and resistance of plant fibres. While in very exceptional cases and under very favourable circumstances, fragments of baskets and cords have survived and were discovered in late Pleistocene and Holocene archaeological sites, these objects are generally not

preserved, especially in tropical regions. We report here indirect evidence of basket/tying material making found on stone tools dating to 39–33,000 BP from Tabon Cave, Palawan Philippines. The distribution of use-wear on these artefacts is the same as the distribution observed on experimental tools used to thin fibres, following a technique that is widespread in the region currently. The goal of this activity is to turn hard plant segments into supple strips suitable as tying material or to weave baskets, traps, and even boats. This study shows early evidence of this practice in Southeast Asia and adds to the growing set of discoveries showing that fibre technology was an integral part of late Pleistocene skillset. This paper also provides a new way to identify supple strips of fibres made of tropical plants in the archaeological record, an organic technology that is otherwise most of the time invisible.
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0281415

Proceedings of the Royal Society B
PAPERS
YOONJUNG YI, ANI MARDIASTUTI & JAE C. CHOE – How to be a good partner and father? The role of adult males in pair bond maintenance and parental care in Javan gibbons
In pair-living species, female and male pairs may maintain stable social bonds by adjusting spatial and social associations. Nevertheless, each sex invests differently to maintain the pair bond, and the investment can depend on the presence of paternal care or 'male services.' While most species live in pairs, the sex responsible for pair bond maintenance in gibbons is still controversial. We investigated pair bond maintenance and parental care in three pairs of wild Javan gibbons in Gunung Halimun-Salak National Park, Indonesia, for over 21 months. We found that Javan gibbon fathers groomed their offspring more than adult females, especially as offspring got older. While both parents increased playing time with offspring when offspring became older and more independent, fathers played with offspring 20 times more than mothers on average. Grooming within Javan gibbon pairs was male-biased, suggesting that pair bond maintenance was heavily the job of males. However, offspring age as a proxy for paternal care did not affect the pair bond maintenance. Our study highlights that adult male Javan gibbons may have an important role in pair bond maintenance and the care of juveniles.
https://royalsocietypublishing.org/doi/full/10.1098/rspb.2023.0950

Royal Society Open Science
PAPERS
OIHANE FERNANDEZ-BETELU et al – Variation in foraging activity influences area-restricted search behaviour by bottlenose dolphins
Area-restricted search (ARS) behaviour is commonly used to characterize spatio-temporal variation in foraging activity of predators, but evidence of the drivers underlying this behaviour in marine systems is sparse. Advances in underwater sound recording techniques and automated processing of acoustic data now provide opportunities to investigate these questions where species use different vocalizations when encountering prey. Here, we used passive acoustics to investigate drivers of ARS behaviour in a population of dolphins and determined if residency in key foraging areas increased following encounters with prey. Analyses were based on two independent proxies of foraging: echolocation buzzes (widely used as foraging proxies) and bray calls (vocalizations linked to salmon predation attempts). Echolocation buzzes were extracted from echolocation data loggers and bray calls from broadband recordings by a convolutional neural network. We found a strong positive relationship between the duration of encounters and the frequency of both foraging proxies, supporting the theory that bottlenose dolphins engage in ARS behaviour in response to higher prey encounter rates. This study provides empirical evidence for one driver of ARS behaviour and demonstrates the potential for applying passive acoustic monitoring in combination with deep learning-based techniques to investigate the behaviour of vocal animals.
https://royalsocietypublishing.org/doi/full/10.1098/rsos.221613

C. P. CROSS, L. G. BOOTHROYD & C. A. JEFFERSON – Agent-based models of the cultural evolution of occupational gender roles
The causes of sex differences in human behaviour are contested, with 'evolutionary' and 'social' explanations often being pitted against each other in the literature. Recent work showing positive correlations between indices of gender equality and the size of sex differences in behaviour has been argued to show support for 'evolutionary' over 'social' approaches. This argument, however, neglects the potential for social learning to generate arbitrary gender segregation. In the current paper we simulate, using agent-based models, a population where agents exist as one of two 'types' and can use social information about which types of agents are performing which 'roles' within their environment. We find that agents self-segregate into different roles even where real differences in performance do not exist, if there is a common belief (modelled as priors) that group differences may exist in 'innate' competence. Facilitating role changes such that agents should move without cost to the predicted highest-rewards for their skills (i.e. fluidity of the labour market) reduced segregation, while forcing extended exploration of different roles eradicated gender segregation. These models are interpreted in terms of bio-cultural evolution, and the impact of social learning on the expression of gender roles.
https://royalsocietypublishing.org/doi/full/10.1098/rsos.221346

KELLY RAPOEYE, ROBERT J. HARTSUIKER & AURÉLIE PISTONO – Semantic interference affects speech production by increasing disfluencies, not errors

Several studies have shown that different types of disfluency occur depending on the language production stage at which people experience difficulties. The current study combined a network task and a picture–word interference task to analyse whether lexical-semantic difficulty triggers errors and disfluencies in connected-speech production. The participants produced more disfluencies in the presence of a semantically related distractor word than an unrelated distractor word, while few semantic errors were made. These results support the hypothesis that difficulties at distinct stages of language production lead to distinct patterns of disfluency, with lexical-semantic difficulties leading to self-corrections and silent pauses. The results also have implications for the role of the monitoring system in connected-speech production.
https://royalsocietypublishing.org/doi/10.1098/rsos.230006

Science
NEWS

'Adversarial' search for neural basis of consciousness yields first results

Two rival theories about the basis of perception went head-to-head in neuroscience experiments, but advocates of "losing" idea aren't conceding yet.
https://www.science.org/content/article/search-neural-basis-consciousness-yields-first-results

Science Advances
ARTICLES

GIOVANNI SPITALE, NIKOLA BILLER-ANDORNO & FEDERICO GERMANI – AI model GPT-3 (dis)informs us better than humans

Artificial intelligence (AI) is changing the way we create and evaluate information, and this is happening during an infodemic, which has been having marked effects on global health. Here, we evaluate whether recruited individuals can distinguish disinformation from accurate information, structured in the form of tweets, and determine whether a tweet is organic or synthetic, i.e., whether it has been written by a Twitter user or by the AI model GPT-3. The results of our preregistered study, including 697 participants, show that GPT-3 is a double-edge sword: In comparison with humans, it can produce accurate information that is easier to understand, but it can also produce more compelling disinformation. We also show that humans cannot distinguish between tweets generated by GPT-3 and written by real Twitter users. Starting from our results, we reflect on the dangers of AI for disinformation and on how information campaigns can be improved to benefit global health.
https://www.science.org/doi/full/10.1126/sciadv.adh1850

Trends in Cognitive Sciences
PAPERS

BEVIL R. CONWAY, SAIMA MALIK-MORALEDA & EDWARD GIBSON – Color appearance and the end of Hering's Opponent-Colors Theory

Hering's Opponent-Colors Theory has been central to understanding color appearance for 150 years. It aims to explain the phenomenology of colors with two linked propositions. First, a psychological hypothesis stipulates that any color is described necessarily and sufficiently by the extent to which it appears reddish-versus-greenish, bluish-versus-yellowish, and blackish-versus-whitish. Second, a physiological hypothesis stipulates that these perceptual mechanisms are encoded by three innate brain mechanisms. We review the evidence and conclude that neither side of the linking proposition is accurate: the theory is wrong. We sketch out an alternative, Utility-Based Coding, by which the known retinal cone-opponent mechanisms represent optimal encoding of spectral information given competing selective pressure to extract high-acuity spatial information; and phenomenological color categories represent an adaptive, efficient, output of the brain governed by behavioral demands.
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00147-X

CORRECTIONS

EDWINA R. ORCHARD et al – Matrescence: lifetime impact of motherhood on cognition and the brain (Trends in Cognitive Sciences, 25:3 p:302–316, 2023)

On p. 303 in Box 1, it was stated that "the term matrescence was coined by the anthropologist Dana Raphael as 'the process of becoming a mother – a developmental passage where a woman transitions, through pre-conception, pregnancy and birth, surrogacy, or adoption to the postnatal period and beyond' [120]". This statement has been corrected to: "the term matrescence, the process of becoming a mother, was first coined by the anthropologist Dana Raphael [120], and later expanded by Aurélie Athan to include 'a developmental passage where a woman transitions, through pre-conception, pregnancy and birth, surrogacy, or adoption to the postnatal period and beyond' (https://www.matrescence.com/)". This has been corrected online. The authors apologize to the readers for this error.
https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(23)00146-8
Original Paper: EDWINA R. ORCHARD et al – Matrescence: lifetime impact of motherhood on cognition and the brain EAORC Bulletin 1,021

https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(22)00302-3

Trends in Ecology and Evolution
PAPERS

JELENA H. PANTEL & LUTZ BECKS – Statistical methods to identify mechanisms in studies of eco-evolutionary dynamics

While the reciprocal effects of ecological and evolutionary dynamics are increasingly recognized as an important driver for biodiversity, detection of such eco-evolutionary feedbacks, their underlying mechanisms, and their consequences remains challenging. Eco-evolutionary dynamics occur at different spatial and temporal scales and can leave signatures at different levels of organization (e.g., gene, protein, trait, community) that are often difficult to detect. Recent advances in statistical methods combined with alternative hypothesis testing provides a promising approach to identify potential eco-evolutionary drivers for observed data even in non-model systems that are not amenable to experimental manipulation. We discuss recent advances in eco-evolutionary modeling and statistical methods and discuss challenges for fitting mechanistic models to eco-evolutionary data.

https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(23)00080-0

CHIARA BENVENUTO & MARIA CRISTINA LORENZI – Social regulation of reproduction: control or signal?

Traditionally, dominant breeders have been considered to be able to control the reproduction of other individuals in multimember groups that have high variance in reproductive success/reproductive skew (e.g., forced sterility/coercion of conspecifics in eusocial animals; sex-change suppression in sequential hermaphrodites). These actions are typically presented as active impositions by reproductively dominant individuals. However, how can individuals regulate the reproductive physiology of others? Alternatively, all contestants make reproductive decisions, and less successful individuals self-downregulate reproduction in the presence of dominant breeders. Shifting perspective from a top-down manipulation to a broader view, which includes all contenders, and using a multitaxon approach, we propose a unifying framework for the resolution of reproductive skew conflicts based on signalling rather than control, along a continuum of levels of strategic regulation of reproduction.

https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(23)00132-5

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