

EAORC BULLETIN 903 – 4 October 2020

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EAORC NOTICES

PUBLICATION ALERTS

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

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

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

EAORC NEWS – Biennial Membership Check – Please Respond

2020 is a membership checking year, when I ask for confirmation that you wish to continue receiving the bulletins. So please let me know that you wish to continue by emailing me with Bulletin Yes, or something similar. If you do not wish to continue receiving the bulletin then you need do nothing. Anyone who has not indicated they wish to continue will be taken off the list at the end of October. This biennial membership check has been in operation since 2008, and GDPR has made it even more important that it is carried out regularly.

Many thanks to everyone who has responded so far. I already have enough to ensure the continued existence of the list.

When I am about to purge the list, you will receive a separate email, either confirmation of your continued membership, or notification of your final issue.

ACADEMIA.EDU – Theories and Models of Communication

De Gruyter Mouton: Berlin, Germany (2013).

PAUL COBLEY & PETER J. SCHULZ (eds.) – Theories and Models of Communication

The series is a major publishing venture which aims to offer a portrait of the current state of the art in the study of communication. But it seeks to do more than just assemble our knowledge of communication structures and processes; it seeks to integrate this knowledge. It does so by offering comprehensive articles in all the volumes instead of small entries in the style of an encyclopedia. An extensive index in each Handbook in the series, serves the encyclopedic task of finding

relevant specific pieces of information. There are already several handbooks in sub-disciplines of communication sciences such as political communication, methodology, organisational communication – but none so far has tried to comprehensively cover the discipline as a whole.

https://www.academia.edu/42885683/Theories_and_Models_of_Communication?email_work_card=view-paper

ACADEMIA.EDU – Multimodal communication and language origins

Biological Reviews (2019), 94:5, 1809-1829.

MARLEN FRÖHLICH et al with CAREL P. VAN SCHAIK – Multimodal communication and language origins: integrating gestures and vocalizations

The presence of divergent and independent research traditions in the gestural and vocal domains of primate communication has resulted in major discrepancies in the definition and operationalization of cognitive concepts. However, in recent years, accumulating evidence from behavioural and neurobiological research has shown that both human and non-human primate communication is inherently multimodal. It is therefore timely to integrate the study of gestural and vocal communication. Herein, we review evidence demonstrating that there is no clear difference between primate gestures and vocalizations in the extent to which they show evidence for the presence of key language properties: intentionality, reference, iconicity and turn-taking. We also find high overlap in the neurobiological mechanisms producing primate gestures and vocalizations, as well as in ontogenetic flexibility. These findings confirm that human language had multimodal origins. Nonetheless, we note that in great apes, gestures seem to fulfil a carrying (i.e. predominantly informative) role in close-range communication, whereas the opposite holds for face-to-face interactions of humans. This suggests an evolutionary shift in the carrying role from the gestural to the vocal stream, and we explore this transition in the carrying modality. Finally, we suggest that future studies should focus on the links between complex communication, sociality and cooperative tendency to strengthen the study of language origins.

https://www.academia.edu/39713322/Multimodal_communication_and_language_origins_integrating_gestures_and_vocalizations?email_work_card=view-paper

LECTURE ALERT – CAT HOBAITER – The Language of Life – Online lecture

We are delighted to invite you to join us for the next instalment in our Saints Talk online lecture series when Dr Cat Hobaiter - a field primatologist at the University - will talk about The Language of Life.

Language is the most powerful social tool any species has evolved - we can use it to share any idea we can think of with the minds of those around us: from poetry, Shakespeare, and physics, to internet memes, it underpins what defines us as a species. But despite centuries of thought and study we still have very little idea of how and why language evolved.

Dr Hobaiter has spent 15 years living and working with wild apes in the rainforests and mountains of Uganda. Using her studies of ape communication and mind, she will trace the different ways we've tried to ask questions about the uniqueness - or not - of human language.

The Language of Life will premiere on the Alumni YouTube channel

(<https://www.youtube.com/watch?v=QBSsnsJvEFA&feature=youtu.be>) on Tuesday 6 October at 5pm (BST).

Dr Hobaiter will be watching the premiere with us and will be answering any questions via a live Q&A on the premiere chat bar. You can submit questions in advance to developmentevents@st-andrews.ac.uk or live during the event on the premiere chat bar. (Please note, in order to ask questions on the premiere chat bar you will need to be signed into a YouTube account.)

We hope you can join us!

NEWS

SOCIETY FOR SCIENCE – Neandertal genes in people today may raise risk of severe COVID-19

People in South Asia and Europe are more likely to carry a genetic heirloom from Neandertals linked to susceptibility to the coronavirus.

<http://click.societyforscience-email.com/?qs=05c0c75d2356e9e5aaf59d7120e38d055cd4c3dff54051079f1b867be34ff8eb85f592299288259976cf9066eca96d68be2ff885fe81dceb>

SCIAM NEWS – Bird Brains Are Far More Humanlike Than Once Thought

The avian cortex had been hiding in plain sight all along. Humans were just too birdbrained to see it.

<https://www.scientificamerican.com/article/bird-brains-are-far-more-humanlike-than-once-thought/>

BREAKING SCIENCE – New Species of Truffle Found in Congo, Thanks to Mushroom-Munching Bonobos

Fungi play a significant role in the diets and nutrition of diverse vertebrates. Many fungi, particularly truffle-like species, have evolved close associations with animals that help to disperse their spores. These animal-fungus associations are frequently overlooked, but they are an important part of functional ecosystems and imperative for the dispersal of fungi through these systems. [...]

http://feedproxy.google.com/~r/BreakingScienceNews/~3/-CSvMB1vCWY/hysterangium-bonobo-08903.html?utm_source=feedburner&utm_medium=email

SCIENCE DAILY – Evolutionary and heritable axes shape our brain

Every region has its place in the brain. However, it has been unclear why brain regions are located where they are. Now, scientists have defined two main axes along which brain regions are genetically organized, stretching from posterior to anterior and inferior to superior in the brain. These axes are mainly shaped by genes and evolution.

<https://www.sciencedaily.com/releases/2020/09/200928133147.htm>

SCIENCE DAILY – The ancient Neanderthal hand in severe COVID-19

Genetic variants that leave their carrier more susceptible to severe COVID-19 are inherited from Neanderthals, a new study finds.

<https://www.sciencedaily.com/releases/2020/09/200930094758.htm>

SCIENCE DAILY – Modern humans reached westernmost Europe 5,000 years earlier

Modern humans arrived in westernmost Europe 41,000 to 38,000 years ago, about 5,000 years earlier than previously known, according to an international team of researchers that discovered stone tools used by modern humans dated to the earlier time period in a cave near the Atlantic coast of central Portugal. The tools document the presence of modern humans at a time when Neanderthals were thought to be present in the region.

<https://www.sciencedaily.com/releases/2020/09/200928152919.htm>

SCIENCE DAILY – Woodpeckers' drumming: Conserved meaning despite different structure over the years

How do animals produce and perceive biological information in sounds? To what extent does the acoustic structure and its associated meaning change during evolution? An international team has reconstructed the evolutionary history of an animal communication system, focusing on drumming signals of woodpeckers.

<https://www.sciencedaily.com/releases/2020/10/201002091037.htm>

SCIENCE DAILY – Babies' random choices become their preferences

When a baby reaches for one stuffed animal in a room filled with others just like it, that random choice is very bad news for those unpicked toys: the baby has likely just decided she doesn't like what she didn't choose. Researchers have known that adults build unconscious biases over a lifetime of choosing between things that are essentially the same, but finding that even babies do it demonstrates this way of justifying choice is fundamental to the human experience.

<https://www.sciencedaily.com/releases/2020/10/201002091027.htm>

NATURE BRIEFING – Why birds are so smart

Time to lay the 'birdbrain' stereotype to rest forever. Two studies have revealed that birds have a brain structure that is analogous to our cerebral cortex, and that brains of carrion crows (*Corvus corone*) show signs of consciousness. Researchers worked with two carrion crows (named Ozzy and Glenn) in an experiment in which the crows had to keep track of what they had seen to receive a reward. The activity of the crows' neurons showed that they had 'sensory consciousness': they knew what they had seen. A separate study of the neuroanatomy of birds found that a part of their forebrains — the pallium — does the heavy cognitive lifting that the cerebral cortex does in mammals.

<https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=1f49031f03&e=1db4b9a19b>

PUBLICATIONS

Acta Linguistica Hafniensia

PAPERS

BERT CAPPELLE – Not on my watch and similar not-fragments: stored forms with pragmatic content

This paper discusses the English idiom Not on my watch, which is a member of a family of both lexically fixed and constructional idioms, including Not if I can help it, Not as long as I ... and, as a more distant member, Not in a million years. I argue that in these expressions, not is technically a negative proform referring to a contextually salient proposition and that, at least across conversational turns, it reverses the polarity of that clause. However, attempts to reconstruct Not on my watch as a full clause (e.g. This will not happen on my watch) do not do justice to the fact that this phrase is felt to be a single unit, as is witnessed, moreover, by its capacity to trigger subject-auxiliary inversion (e.g. Not on my watch will you be

harmed). Functionally, not on my watch and its close relatives do not just emphatically deny a proposition but many of them are also used as a pledge not to let something happen.

<https://www.tandfonline.com/doi/abs/10.1080/03740463.2020.1812365>

Biology Letters

PAPERS

NICLAS KOLM et al – The link between selection for function and human-directed play behaviour in dogs

Human-directed play behaviour is a distinct behavioural feature of domestic dogs. But the role that artificial selection for contemporary dog breeds has played for human-directed play behaviour remains elusive. Here, we investigate how human-directed play behaviour has evolved in relation to the selection for different functions, considering processes of shared ancestry and gene flow among the different breeds. We use the American Kennel Club (AKC) breed group categorization to reflect the major functional differences and combine this with observational data on human-directed play behaviour for over 132 breeds across 89 352 individuals from the Swedish Dog Mentality Assessment project. Our analyses demonstrate that ancestor dogs already showed intermediate levels of human-directed play behaviour, levels that are shared with several modern breed types. Herding and Sporting breeds display higher levels of human-directed play behaviour, statistically distinguishable from Non-sporting and Toy breeds. Our results suggest that human-directed play behaviour played a role in the early domestication of dogs and that subsequent artificial selection for function has been important for contemporary variation in a behavioural phenotype mediating the social bond with humans.

<https://royalsocietypublishing.org/doi/full/10.1098/rsbl.2020.0366>

JOHANNA ECKERT, SASHA L. WINKLER & ERICA A. CARTMILL – Just kidding: the evolutionary roots of playful teasing

Accounts of teasing have a long history in psychological and sociological research, yet teasing itself is vastly underdeveloped as a topic of study. As a phenomenon that moves along the border between aggression and play, teasing presents an opportunity to investigate key foundations of social and mental life. Developmental studies suggest that preverbal human infants already playfully tease their parents by performing ‘the unexpected,’ apparently deliberately violating the recipient’s expectations to create a shared humorous experience. Teasing behaviour may be phylogenetically old and perhaps an evolutionary precursor to joking. In this review, we present preliminary evidence suggesting that non-human primates also exhibit playful teasing. In particular, we argue that great apes display three types of playful teasing described in preverbal human infants: teasing with offer and withdrawal, provocative non-compliance and disrupting others’ activities. We highlight the potential of this behaviour to provide a window into complex socio-cognitive processes such as attribution of others’ expectations and, finally, we propose directions for future research and call for systematic studies of teasing behaviour in non-human primates.

<https://royalsocietypublishing.org/doi/full/10.1098/rsbl.2020.0370>

Current Biology

PAPERS

SAMANTHA J. GREEN et al – Chimpanzees Use Least-Cost Routes to Out-of-Sight Goals

While the ability of naturally ranging animals to recall the location of food resources and use straight-line routes between them has been demonstrated in several studies, it is not known whether animals can use knowledge of their landscape to walk least-cost routes. This ability is likely to be particularly important for animals living in highly variable energy landscapes, where movement costs are exacerbated. Here, we used least-cost modeling, which determines the most efficient route assuming full knowledge of the environment, to investigate whether chimpanzees (*Pan troglodytes*) living in a rugged, montane environment walk least-cost routes to out-of-sight goals. We compared the “costs” and geometry of observed movements with predicted least-cost routes and local knowledge (agent-based) and straight-line null models. The least-cost model performed better than the local knowledge and straight-line models across all parameters, and linear mixed modeling showed a strong relationship between the cost of observed chimpanzee travel and least-cost routes. Our study provides the first example of the ability to take least-cost routes to out-of-sight goals by chimpanzees and suggests they have spatial memory of their home range landscape. This ability may be a key trait that has enabled chimpanzees to maintain their energy balance in a low-resource environment. Our findings provide a further example of how the advanced cognitive complexity of hominins may have facilitated their adaptation to a variety of environmental conditions and lead us to hypothesize that landscape complexity may play a role in shaping cognition.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(20\)31266-5?dgcid=raven_jbs_aip_email](https://www.cell.com/current-biology/fulltext/S0960-9822(20)31266-5?dgcid=raven_jbs_aip_email)

Frontiers in Ecology and Evolution

PAPERS

JEAN-FRANÇOIS DOHERTY & BRANDON RUEHLE – An Integrated Landscape of Fear and Disgust: The Evolution of Avoidance Behaviors Amidst a Myriad of Natural Enemies

Fear of natural enemies in non-human animals is a concept dating back to the time of Darwin. Now recognized as a non-consumptive effect, the ecological and evolutionary impact of fear has been studied in a number of predator-prey systems within the last few decades. However, comparatively little consideration has been given to the non-consumptive effects that

parasites have on their hosts, which have evolved behaviors to avoid parasites, impacting habitat selection, mate choice, and foraging activity. These avoidance behaviors create a “landscape of disgust,” wherein hosts navigate to avoid parasites, akin to the “landscape of fear” in prey. Evolutionarily speaking, however, predators and parasites are but two examples of natural enemies. Pathogens, parasites, predators, and parasitoids, among others, each exert their own fitness cost on the victims they attack. Since animals likely evolve in the presence of multiple natural enemies, they must adopt a range of avoidance behaviors to navigate through the resulting “landscape of peril.” Therefore, in line with recent efforts to combine the landscapes of fear and disgust, we offer a theoretical framework to better understand the impacts of natural enemies on the evolution of trait-mediated avoidance behaviors in animals. More precisely, we look at how victims may evolve to allocate energy optimally among distinct avoidance behaviors under the selective pressures imposed by different types of natural enemy. This framework is then put into the more realistic context of a food web, which highlights the impact of trophic interactions and trophic level on the evolution of avoidance behaviors.

https://www.frontiersin.org/articles/10.3389/fevo.2020.564343/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1443314_6_Ecolog_20200929_arts_A

Frontiers in Neuroscience

PAPERS

CARINE SIGNORET et al – The Influence of Form- and Meaning-Based Predictions on Cortical Speech Processing Under Challenging Listening Conditions: A MEG Study

Under adverse listening conditions, prior linguistic knowledge about the form (i.e., phonology) and meaning (i.e., semantics) help us to predict what an interlocutor is about to say. Previous research has shown that accurate predictions of incoming speech increase speech intelligibility, and that semantic predictions enhance the perceptual clarity of degraded speech even when exact phonological predictions are possible. In addition, working memory (WM) is thought to have specific influence over anticipatory mechanisms by actively maintaining and updating the relevance of predicted vs. unpredicted speech inputs. However, the relative impact on speech processing of deviations from expectations related to form and meaning is incompletely understood. Here, we use MEG to investigate the cortical temporal processing of deviations from the expected form and meaning of final words during sentence processing. Our overall aim was to observe how deviations from the expected form and meaning modulate cortical speech processing under adverse listening conditions and investigate the degree to which this is associated with WM capacity. Results indicated that different types of deviations are processed differently in the auditory N400 and Mismatch Negativity (MMN) components. In particular, MMN was sensitive to the type of deviation (form or meaning) whereas the N400 was sensitive to the magnitude of the deviation rather than its type. WM capacity was associated with the ability to process phonological incoming information and semantic integration.

https://www.frontiersin.org/articles/10.3389/fnins.2020.573254/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1446223_55_Neuro_20201001_arts_A

Frontiers in Psychology

PAPERS

MARÍA J. CABRERA-ÁLVAREZ & NICOLA S. CLAYTON – Neural Processes Underlying Tool Use in Humans, Macaques, and Corvids

It was thought that tool use in animals is an adaptive specialization. Recent studies, however, have shown that some non-tool-users, such as rooks and jays, can use and manufacture tools in laboratory settings. Despite the abundant evidence of tool use in corvids, little is known about the neural mechanisms underlying tool use in this family of birds. This review summarizes the current knowledge on the neural processes underlying tool use in humans, macaques and corvids. We suggest a possible neural network for tool use in macaques and hope this might inspire research to discover a similar brain network in corvids. We hope to establish a framework to elucidate the neural mechanisms that supported the convergent evolution of tool use in birds and mammals.

https://www.frontiersin.org/articles/10.3389/fpsyg.2020.560669/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1446223_69_Psycho_20201001_arts_A

MIQUEL LLOMPART & EWA DĄBROWSKA – Explicit but Not Implicit Memory Predicts Ultimate Attainment in the Native Language

The present paper examines the relationship between explicit and implicit memory and ultimate attainment in the native language. Two groups of native speakers of English with different levels of academic attainment (i.e., high vs. low) took part in three language tasks which assessed grammar, vocabulary and collocational knowledge, as well as phonological short-term memory (assessed using a forward digit-span task), explicit associative memory (assessed using a paired-associates task) and implicit memory (assessed using a deterministic serial reaction time task). Results revealed strong relationships between phonological short-term memory and explicit associative memory on the one hand and the three language tasks on the other hand, and no relation between linguistic performance and implicit memory. Taken together, these results cast doubts on the common assumption that L1 grammar learning depends almost entirely on implicit memory and align with the claims of usage-based models of language acquisition that grammatical and lexical knowledge depend on the same cognitive mechanisms.

https://www.frontiersin.org/articles/10.3389/fpsyg.2020.569586/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1446223_69_Psycho_20201001_arts_A

RAY JACKENDOFF & JENNY AUDRING – Relational Morphology: A Cousin of Construction Grammar

Relational morphology (RM) is a novel approach to word structure that bears a close relation to construction grammar (CxG). Based on the parallel architecture framework, its basic question is: what linguistic entities are stored in long-term memory, and in what form? Like CxG, RM situates the “rules of grammar” in an extended lexicon, right along with words, multiword expressions such as idioms and collocations, and meaningful syntactic constructions. However, its notion of schema enriches CxG’s notion of construction in a number of respects, including (a) the possibility of purely formal schemas that lack meaning, (b) a more precise way of specifying relations among lexical items than standard inheritance, (c) the possibility of “horizontal” relations between individual words and between schemas, (d) a clearer characterization of the distinction between productive and nonproductive phenomena, and (e) more explicit integration with theories of language processing and of other domains of cognition.

https://www.frontiersin.org/articles/10.3389/fpsyg.2020.02241/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1446223_69_Psycho_20201001_arts_A

SARAH BRO TRASMUNDI & STEPHEN J. COWLEY – Reading: How Readers Beget Imagining

We trace reading to an embodied synthetic process that drives the rapid scales of imagining. As sensorimotor engagement with written artifacts permeates experience, it sharpens the sensibility that brings forth understanding. We thus trace material engagement with written artifacts to fine control over saccadic eye movements and voicing that draws on humans or what the Greeks knew as aisthesis. In reading, we identify aisthesis in how prereflective judgments punctuate the flow of engagement with written documents. While the study of reading often begins with “texts,” we start with how written artifacts are put to use. We use cognitive ethnography to trace reading to how fine multiscale coordination enables readers to engage with written artifacts such as books. Our ethnography of reading provides descriptions of how readers use sensorimotor activity to integrate understanding with saccading and actual or imagined vocalization in ways that show how reading connects sensorimotor schemata with highly skilled use of written artifacts. By pursuing the power of rapid multiscale dynamics, we complement views of reading as slow-scale subjective experience. Rather than focus on interaction between a reader and an imagined author, we turn to coordinating with an affordance-rich environment. Human prereflective judgments demonstrably use collective experience with written signs. In fine-grained analysis of authentic data, we therefore track kinesthetic experience to how a child’s vocalizations beget understanding and, at once, imagining. These observations show how engagement brings life to written signs by connecting other peoples’ pasts with the use of gaze, gesture, voice, and touch. While describing saccades and bursts of vocalizing, we reach beyond analogies with interaction and, in so doing, the multiscale approach takes enactive-ecological work beyond the slow interactional and social scales or reported experience. Imagining arises as readers use multiscale happenings to bind the anticipated, the seen, and collective aspects of experience.

https://www.frontiersin.org/articles/10.3389/fpsyg.2020.531682/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1446223_69_Psycho_20201001_arts_A

Interface: Journal of the Royal Society

PAPERS

BERTRAND JAYLES et al – The impact of incorrect social information on collective wisdom in human groups

A major problem resulting from the massive use of social media is the potential spread of incorrect information. Yet, very few studies have investigated the impact of incorrect information on individual and collective decisions. We performed experiments in which participants had to estimate a series of quantities, before and after receiving social information. Unbeknownst to them, we controlled the degree of inaccuracy of the social information through ‘virtual influencers’, who provided some incorrect information. We find that a large proportion of individuals only partially follow the social information, thus resisting incorrect information. Moreover, incorrect information can help improve group performance more than correct information, when going against a human underestimation bias. We then design a computational model whose predictions are in good agreement with the empirical data, and sheds light on the mechanisms underlying our results. Besides these main findings, we demonstrate that the dispersion of estimates varies a lot between quantities, and must thus be considered when normalizing and aggregating estimates of quantities that are very different in nature. Overall, our results suggest that incorrect information does not necessarily impair the collective wisdom of groups, and can even be used to dampen the negative effects of known cognitive biases.

<https://royalsocietypublishing.org/doi/abs/10.1098/rsif.2020.0496>

Nature

PAPERS

HUGO ZEBERG & SVANTE PÄÄBO – The major genetic risk factor for severe COVID-19 is inherited from Neanderthals

A recent genetic association study¹ identified a gene cluster on chromosome 3 as a risk locus for respiratory failure upon SARS-CoV-2 infection. A new study² comprising 3,199 hospitalized COVID-19 patients and controls finds that this is the major

genetic risk factor for severe SARS-CoV-2 infection and hospitalization (COVID-19 Host Genetics Initiative). Here, we show that the risk is conferred by a genomic segment of ~50 kb that is inherited from Neanderthals and is carried by ~50% of people in South Asia and ~16% of people in Europe today.

<https://www.nature.com/articles/s41586-020-2818-3>

Nature Ecology & Evolution

PAPERS

DAVID C. RINKER et al – Neanderthal introgression reintroduced functional ancestral alleles lost in Eurasian populations

Neanderthal ancestry remains across modern Eurasian genomes and introgressed sequences influence diverse phenotypes. Here, we demonstrate that introgressed sequences reintroduced thousands of ancestral alleles that were lost in Eurasian populations before introgression. Our simulations and variant effect predictions argue that these reintroduced alleles (RAs) are more likely to be tolerated by modern humans than are introgressed Neanderthal-derived alleles (NDAs) due to their distinct evolutionary histories. Consistent with this, we show enrichment for RAs and depletion for NDAs on introgressed haplotypes with expression quantitative trait loci (eQTL) and phenotype associations. Analysis of available cross-population eQTLs and massively parallel reporter assay data show that RAs commonly influence gene expression independent of linked NDAs. We further validate these independent effects for one RA in vitro. Finally, we demonstrate that NDAs are depleted for regulatory activity compared to RAs, while RAs have activity levels similar to non-introgressed variants. In summary, our study reveals that Neanderthal introgression reintroduced thousands of lost ancestral variants with gene regulatory activity and that these RAs were more tolerated than NDAs. Thus, RAs and their distinct evolutionary histories must be considered when evaluating the effects of introgression.

<https://www.nature.com/articles/s41559-020-1261-z>

Nature Scientific Reports

PAPERS

MAYA INBAR, EITAN GROSSMAN & AYELET N. LANDAU – Sequences of Intonation Units form a ~ 1 Hz rhythm

Studies of speech processing investigate the relationship between temporal structure in speech stimuli and neural activity. Despite clear evidence that the brain tracks speech at low frequencies (~ 1 Hz), it is not well understood what linguistic information gives rise to this rhythm. In this study, we harness linguistic theory to draw attention to Intonation Units (IUs), a fundamental prosodic unit of human language, and characterize their temporal structure as captured in the speech envelope, an acoustic representation relevant to the neural processing of speech. IUs are defined by a specific pattern of syllable delivery, together with resets in pitch and articulatory force. Linguistic studies of spontaneous speech indicate that this prosodic segmentation paces new information in language use across diverse languages. Therefore, IUs provide a universal structural cue for the cognitive dynamics of speech production and comprehension. We study the relation between IUs and periodicities in the speech envelope, applying methods from investigations of neural synchronization. Our sample includes recordings from every-day speech contexts of over 100 speakers and six languages. We find that sequences of IUs form a consistent low-frequency rhythm and constitute a significant periodic cue within the speech envelope. Our findings allow to predict that IUs are utilized by the neural system when tracking speech. The methods we introduce here facilitate testing this prediction in the future (i.e., with physiological data).

<https://www.nature.com/articles/s41598-020-72739-4>

ANASTASIA SHUSTER & DINO J. LEVY – Contribution of self- and other-regarding motives to (dis)honesty

Why would people tell the truth when there is an obvious gain in lying and no risk of being caught? Previous work suggests the involvement of two motives, self-interest and regard for others. However, it remains unknown if these motives are related or distinctly contribute to (dis)honesty, and what are the neural instantiations of these motives. Using a modified Message Game task, in which a Sender sends a dishonest (yet profitable) or honest (less profitable) message to a Receiver, we found that these two motives contributed to dishonesty independently. Furthermore, the two motives involve distinct brain networks: the LPFC tracked potential value to self, whereas the rTPJ tracked potential losses to other, and individual differences in motives modulated these neural responses. Finally, activity in the vmPFC represented a balance of the two motives unique to each participant. Taken together, our results suggest that (dis)honest decisions incorporate at least two separate cognitive and neural processes—valuation of potential profits to self and valuation of potential harm to others.

<https://www.nature.com/articles/s41598-020-72255-5>

ARTICLES

EVAN M. GORDON – Functional boundaries within human subcortex

Abrupt spatial changes in anatomic and functional properties of the brain demarcate boundaries between discrete functional areas. While previous work has identified these boundaries in cortex, a new study by Tian et al. applies this approach for the first time to subcortical structures within the in vivo human brain.

<https://www.nature.com/articles/s41593-020-00721-4>

JAMES D. GILBERT, STEPHEN J. ROSSITER & CHRIS G. FAULKES – The relationship between individual phenotype and the division of labour in naked mole-rats: it's complicated

The naked mole-rat (*Heterocephalus glaber*) is among the most social mammals on the planet, living in eusocial groups of up to 300 individuals that contain a single reproductive female and up to three reproductive males. A critical aspect of their complex social system is the division of labour that allows non-breeders to form an effective workforce. Age- or weight-based polyethisms are widely cited as explanations for how labour is divided, but evidence in support of these hypotheses has been equivocal.

To assess the extent to which individual working behaviour is determined by sex, age, weight and social rank, we studied the behaviours of 103 animals from eight captive colonies. We performed focal sampling and ran mixed-effects models to assess which factors explained variation in working behaviour during six ten-minute observation periods per individual.

Contrary to widely-held beliefs, we found that working behaviour did not decrease linearly with weight, although polynomial regressions indicated younger and medium-sized individuals worked most frequently, while high-ranking individuals worked for the shortest periods of time. Working behaviour and its relationship with individual characteristics also varied between colonies.

<https://peerj.com/articles/9891/>

ELISA BANDINI & CLAUDIO TENNIE – Exploring the role of individual learning in animal tool-use

The notion that tool-use is unique to humans has long been refuted by the growing number of observations of animals using tools across various contexts. Yet, the mechanisms behind the emergence and sustenance of these tool-use repertoires are still heavily debated. We argue that the current animal behaviour literature is biased towards a social learning approach, in which animal, and in particular primate, tool-use repertoires are thought to require social learning mechanisms (copying variants of social learning are most often invoked). However, concrete evidence for a widespread dependency on social learning is still lacking. On the other hand, a growing body of observational and experimental data demonstrates that various animal species are capable of acquiring the forms of their tool-use behaviours via individual learning, with (non-copying) social learning regulating the frequencies of the behavioural forms within (and, indirectly, between) groups. As a first outline of the extent of the role of individual learning in animal tool-use, a literature review of reports of the spontaneous acquisition of animal tool-use behaviours was carried out across observational and experimental studies. The results of this review suggest that perhaps due to the pervasive focus on social learning in the literature, accounts of the individual learning of tool-use forms by naïve animals may have been largely overlooked, and their importance under-examined.

<https://peerj.com/articles/9877/>

CLAUDIA FICHEL, KLARA DINTER & PETER M. KAPPELER – The lemur baseline: how lemurs compare to monkeys and apes in the Primate Cognition Test Battery

Primates have relatively larger brains than other mammals even though brain tissue is energetically costly. Comparative studies of variation in cognitive skills allow testing of evolutionary hypotheses addressing socioecological factors driving the evolution of primate brain size. However, data on cognitive abilities for meaningful interspecific comparisons are only available for haplorhine primates (great apes, Old- and New World monkeys) although strepsirrhine primates (lemurs and lorises) serve as the best living models of ancestral primate cognitive skills, linking primates to other mammals. To begin filling this gap, we tested members of three lemur species (*Microcebus murinus*, *Varecia variegata*, *Lemur catta*) with the Primate Cognition Test Battery, a comprehensive set of experiments addressing physical and social cognitive skills that has previously been used in studies of haplorhines. We found no significant differences in cognitive performance among lemur species and, surprisingly, their average performance was not different from that of haplorhines in many aspects. Specifically, lemurs' overall performance was inferior in the physical domain but matched that of haplorhines in the social domain. These results question a clear-cut link between brain size and cognitive skills, suggesting a more domain-specific distribution of cognitive abilities in primates, and indicate more continuity in cognitive abilities across primate lineages than previously thought.

<https://peerj.com/articles/10025/>

ISAMU MIURA et al – Encoding of social exploration by neural ensembles in the insular cortex

This is an uncorrected proof.

The insular cortex (IC) participates in diverse complex brain functions, including social function, yet their cellular bases remain to be fully understood. Using microendoscopic calcium imaging of the agranular insular cortex (AI) in mice interacting with freely moving and restrained social targets, we identified 2 subsets of AI neurons—a larger fraction of “Social-ON” cells and a smaller fraction of “Social-OFF” cells—that change their activity in opposite directions during social exploration. Social-ON cells included those that represented social investigation independent of location and consisted of multiple subsets, each of which was preferentially active during exploration under a particular behavioral state or with a particular target of physical

contact. These results uncover a previously unknown function of AI neurons that may act to monitor the ongoing status of social exploration while an animal interacts with unfamiliar conspecifics.

<https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000584>

PNAS

PAPERS

JAMES L. MCCLELLAND et al – Placing language in an integrated understanding system: Next steps toward human-level performance in neural language models

Language is crucial for human intelligence, but what exactly is its role? We take language to be a part of a system for understanding and communicating about situations. In humans, these abilities emerge gradually from experience and depend on domain-general principles of biological neural networks: connection-based learning, distributed representation, and context-sensitive, mutual constraint satisfaction-based processing. Current artificial language processing systems rely on the same domain general principles, embodied in artificial neural networks. Indeed, recent progress in this field depends on query-based attention, which extends the ability of these systems to exploit context and has contributed to remarkable breakthroughs. Nevertheless, most current models focus exclusively on language-internal tasks, limiting their ability to perform tasks that depend on understanding situations. These systems also lack memory for the contents of prior situations outside of a fixed contextual span. We describe the organization of the brain's distributed understanding system, which includes a fast learning system that addresses the memory problem. We sketch a framework for future models of understanding drawing equally on cognitive neuroscience and artificial intelligence and exploiting query-based attention. We highlight relevant current directions and consider further developments needed to fully capture human-level language understanding in a computational system.

<https://www.pnas.org/content/early/2020/09/25/1910416117.abstract?etoc>

JONATHAN A. HAWS et al – The early Aurignacian dispersal of modern humans into westernmost Eurasia

We report the remarkable discovery of an early Aurignacian occupation, ~5,000 years older than any Upper Paleolithic site in westernmost Eurasia. The archaeological and radiocarbon data provide definitive evidence that modern humans were in western Iberia at a time when, if present at all, Neanderthal populations would have been extremely sparse. This discovery has important ramifications for our understanding of the process of modern human dispersal and replacement of Neanderthal populations. The results support a very rapid, unimpeded dispersal of modern humans across western Eurasia and support the notion that climate and environmental change played a significant role in this process.

<https://www.pnas.org/content/early/2020/09/23/2016062117.abstract?etoc>

SYDNEY LEVINE et al with FIERY CUSHMAN – The logic of universalization guides moral judgment

Humans have several different ways to decide whether an action is wrong: We might ask whether it causes harm or whether it breaks a rule. Moral psychology attempts to understand the mechanisms that underlie moral judgments. Inspired by theories of “universalization” in moral philosophy, we describe a mechanism that is complementary to existing approaches, demonstrate it in both adults and children, and formalize a precise account of its cognitive mechanisms. Specifically, we show that, when making judgments in novel circumstances, people adopt moral rules that would lead to better consequences if (hypothetically) universalized. Universalization may play a key role in allowing people to construct new moral rules when confronting social dilemmas such as voting and environmental stewardship.

<https://www.pnas.org/content/early/2020/10/01/2014505117.abstract?etoc>

Proceedings of the Royal Society B

PAPERS

MARK LIU et al – Social rank modulates how environmental quality influences cooperation and conflict within animal societies

Although dominance hierarchies occur in most societies, our understanding of how these power structures influence individual investment in cooperative and competitive behaviours remains elusive. Both conflict and cooperation in animal societies are often environmentally regulated, yet how individuals alter their cooperative and competitive investments as environmental quality changes remain unclear. Using game theoretic modelling, we predict that individuals of all ranks will invest more in cooperation and less in social conflict in harsh environments than individuals of the same ranks in benign environments. Counterintuitively, low-ranking subordinates should increase their investment in cooperation proportionally more than high-ranking dominants, suggesting that subordinates contribute relatively more when facing environmental challenges. We then test and confirm these predictions experimentally using the Asian burying beetle *Nicrophorus nepalensis*. Ultimately, we demonstrate how social rank modulates the relationships between environmental quality and cooperative and competitive behaviours, a topic crucial for understanding the evolution of complex societies.

<https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2020.1720>

KATIE COLLIER et al with SIMON W. TOWNSEND – Dwarf mongoose alarm calls: investigating a complex non-human animal call

Communication plays a vital role in the social lives of many species and varies greatly in complexity. One possible way to increase communicative complexity is by combining signals into longer sequences, which has been proposed as a mechanism allowing species with a limited repertoire to increase their communicative output. In mammals, most studies on combinatoriality have focused on vocal communication in non-human primates. Here, we investigated a potential combination of alarm calls in the dwarf mongoose (*Helogale parvula*), a non-primate mammal. Acoustic analyses and playback experiments with a wild population suggest: (i) that dwarf mongooses produce a complex call type (T3) which, at least at the surface level, seems to comprise units that are not functionally different to two meaningful alarm calls (aerial and terrestrial); and (ii) that this T3 call functions as a general alarm, produced in response to a wide range of threats. Using a novel approach, we further explored multiple interpretations of the T3 call based on the information content of the apparent comprising calls and how they are combined. We also considered an alternative, non-combinatorial interpretation that frames T3 as the origin, rather than the product, of the individual alarm calls. This study complements previous knowledge of vocal combinatoriality in non-primate mammals and introduces an approach that could facilitate comparisons between different animal and human communication systems.

<https://royalsocietypublishing.org/doi/abs/10.1098/rspb.2019.2514>

Trends in Cognitive Sciences

PAPERS

JOSHUA S. RULE, JOSHUA B. TENENBAUM & STEVEN T. PIANTADOSI – The Child as Hacker

The scope of human learning and development poses a radical challenge for cognitive science. We propose that developmental theories can address this challenge by adopting perspectives from computer science. Many of our best models treat learning as analogous to computer programming because symbolic programs provide the most compelling account of sophisticated mental representations. We specifically propose that children's learning is analogous to a particular style of programming called hacking, making code better along many dimensions through an open-ended set of goals and activities. By contrast to existing theories, which depend primarily on local search and simple metrics, this view highlights the many features of good mental representations and the multiple complementary processes children use to create them.

[https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613\(20\)30174-1?dgcid=raven_jbs_aip_email](https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(20)30174-1?dgcid=raven_jbs_aip_email)

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