EAORC BULLETIN 908 – 8 November 2020

CONTENTS

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.

ACADEMIA.EDU – Hominin Language Development

Biosemiotics 8, 67-90, (2015).

JAMES COLE – Hominin Language Development: A New Method of Archaeological Assessment

The question of language development and origin is a subject that is vital to our understanding of what it means to be human. This is reflected in the large range of academic disciplines that are dedicated to the subject. Language development has in particular been related to studies in cognitive capacity and the ability for mind reading, often termed a theory of mind. The Social Brain Hypothesis has been the only attempt to correlate a cognitive scale of complexity incorporating a theory of mind and intentionality orders to the archaeological record and hominin phylogeny. However, a method is still lacking that allows a correlation of the orders of intentionality (and by inference a theory of mind and language development) to the archaeological signatures that represent the physical expression of hominin behaviour. This paper is primarily concerned with

introducing a new theoretical perspective – termed the identity model – which facilitates such a correlation between a scale of cognitive acuity, hominin behaviour through the archaeological record and subsequently language development within an evolutionary context.

https://www.academia.edu/6353669/Hominin_Language_Development_A_New_Method_of_Archaeological_Assessment?email_work_card=title

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ACADEMIA.EDU – Hominin Language Development

Time in action. In C. Callender (ed.), Oxford Handbook on Time. Oxford: Oxford University Press, 419-437 (2011).

SHAUN GALLAGHER – Time in Action

When we look at infants younger than three months of age our impression is that their movements lack proper coordination. When they move their arms and legs they seem to be flailing about, attempting, perhaps, to gain control over their movements as they adjust to their newly found gravity (Hopkins and Prechtl 1984; Prechtl and Hopkins 1986). For this reason, in part, developmental studies have traditionally argued that body schemas (understood as mechanisms of motor control) are absent at birth, and that their development depends on prolonged experience. Video studies, however, have shown that there is more organization in these movements than the casual glance reveals. Close to one-third of all arm movements resulting in contact with any part of the head lead to contact with the mouth, either directly (14%) or following contact with other parts of the face (18%) (Butterworth and Hopkins 1988;Lew and Butterworth 1995). Moreover, a significant percentage of the arm movements that result in contact with the mouth are associated with an open or opening mouth posture, compared with those landing on other parts of the face. In these movements the mouth anticipates arrival of the hand.

https://www.academia.edu/42925200/Gallagher_S_2011_Time_in_action_Oxford_Handbook_on_Time_419_37_C_Callender_ed_Oxford_Oxford_University_Press?email_work_card=view-paper

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NEWS

SCIENCE NEWS – Woman the hunter: Ancient Andean remains challenge ideas of who speared big game

When archaeologists discovered the bones of a 9000-year-old human in a burial pit high in the Andes, they were impressed by a tool kit of 20 stone projectile points and blades stacked neatly by the person's side. All signs pointed to the discovery of a high-status hunter. "Everybody was talking about how this was a great chief, a big man," says archaeologist Randy Haas of the University of California (UC), Davis.

Then, bioarchaeologist Jim Watson of the University of Arizona noted that the bones were slender and light. "I think your hunter might be female," he told Haas.

https://www.sciencemag.org/news/2020/11/woman-hunter-ancient-andean-remains-challenge-old-ideas-who-speared-big-game?utm_campaign=news_daily_2020-11-04&et_rid=17774313&et_cid=3544938

SCIENCENEWS – The first Denisovan DNA outside Siberia unveils a long stint on the roof of the world

Genetic evidence puts Denisovans on the Tibetan Plateau from 100,000 to 60,000 years ago.

https://www.sciencenews.org/article/first-denisovan-dna-outside-siberia-found-tibetan-plateau-cave

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SOCIETY FOR SCIENCE – The first Denisovan DNA outside Siberia unveils a long stint in Himalayas

Genetic evidence puts Denisovans, humankind's now-extinct cousins, on the Tibetan Plateau from 100,000 to at least 60,000 years ago.

http://click.societyforscience-email.com/?qs=c7e2be0b33530648d91ce071ea649fbd8a5e880fe6fe5d5cf09cd09234e538c54ceee79c0a422fc8aadb54ec4bf943f7201ea9ad7490418f

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BREAKING SCIENCE – Denisovan Mitochondrial DNA Found in Tibetan Cave

In 1980, the 160,000-year-old fossilized partial jawbone of a Denisovan — the so-called Xiahe mandible — was found in Baishiya Karst Cave, a limestone cave at the northeast margin of the Tibetan Plateau. Now, an international team of researchers has extracted genetic material from the sediments in Baishiya Karst Cave and identified mitochondrial DNA (mtDNA) from Denisovans indicating their presence at about 100,000 years ago, 60,000 years ago, and possibly 45,000 years ago.

http://feedproxy.google.com/~r/BreakingScienceNews/~3/MZQFAnLqBT4/denisovan-mitochondrial-dna-baishiya-karst-cave-09010.html?utm_source=feedburner&utm_medium=email

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BREAKING SCIENCE – New Research Sheds Light on Early Life of Neanderthals

A new study published in the Proceedings of the National Academy of Sciences reveals that the modern human nursing strategy, with onset of weaning at 5 to 6 months, was present among Neanderthals who lived between 70,000 and 50,000 years ago in what is now Italy.

LIVESCIENCE – Ancient burial of fierce female hunter (and her weapons) discovered in Peru
Early hunter-gatherer women in the ancient Americas hunted big game just as much as men did, a new study suggests.
https://www.livescience.com/ancient-burial-female-hunter-peru.html

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SCIENCE DAILY – New study finds earliest evidence for mammal social behavior
A new study by paleontologists indicates that the earliest evidence of mammal social behavior goes back to the Age of Dinosaurs. The multituberculate Filikomys primaevus engaged in multi-generational, group-nesting and burrowing behavior, and possibly lived in colonies, some 75.5 million years ago.
https://www.sciencedaily.com/releases/2020/11/201102120055.htm

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SCIENCE DAILY – Neanderthal children grew and were weaned similar to us
Neanderthals behaved not so differently from us in raising their children, whose pace of growth was similar to Homo sapiens. Thanks to the combination of geochemical and histological analyses of three Neanderthal milk teeth, researchers were able to determine their pace of growth and the weaning onset time. These teeth belonged to three different Neanderthal children who have lived between 70,000 and 45,000 years ago in a small area of northeastern Italy.
https://www.sciencedaily.com/releases/2020/11/201102150850.htm

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SCIENCE DAILY – When new males take over, these female primates hurry up and mature
Most mammals -- including humans and other primates -- reach sexual maturity early or late depending on lots of different factors, such as how much food there is to eat. Now, researchers studying close primate relatives of baboons known as geladas have shown for the first time that females of this species suddenly hurry up and mature when a new male enters the picture.
https://www.sciencedaily.com/releases/2020/11/201105113012.htm

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SCIENCE DAILY – Early big-game hunters of the Americas were female, researchers suggest
For centuries, historians and scientists mostly agreed that when early human groups sought food, men hunted and women gathered. Not so, say researchers.
https://www.sciencedaily.com/releases/2020/11/201105083724.htm

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NATURE BRIEFING – Female Neolithic big-game hunters
The remains of an ancient female hunter shed light on the women who were hunting big game in Neolithic times. After researchers discovered that a 9,000-year-old individual buried in the Andes with an impressive toolkit was actually a woman, they then re-examined reports of other ancient burials in the Americas. They found another 10 women and 16 men buried with hunting tools. But not everyone is convinced. The presence of tools in a grave doesn't always mean that the person used them in life, notes anthropologist Robert Kelly — for example, two of the burials with tools were of infants.
https://nature.us17.list-manage.com/track/click?u=2c6057c528fdc6f73fa196d9d&id=4860a0ec95&e=1db4b9a19b

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SAPIENS – Hominin extinctions
A new study suggests at least two close relatives of Homo sapiens may have died out as their environments changed.
https://sapiens.us11.list-manage.com/track/click?u=80f6cf678900daf984bf763b7&id=a82eaf4bc5&e=dc0eff6180

THE CONVERSATION – How our species battled with Neanderthals for supremacy for over 100,000 years
Did Neanderthal military superiority delay our migration out of Africa?
https://theconversationuk.cmail20.com/t/r-l-jutyiily-khhlilahh-yd/

THE CONVERSATION – Did prehistoric women hunt? New research suggests so
New research is challenging the hypothesis that men did the hunting in prehistoric societies.
https://theconversationuk.cmail19.com/t/r-l-juttjthl-khhlilahh-q/

THE CONVERSATION – Prehistoric communities off the coast of Britain embraced rising seas
New research has mapped sea-level rise around the Isles of Scilly over the last 12,000 years.
https://theconversationuk.cmail20.com/t/r-l-jutdthlt-khhlilahh-g/

GUARDIAN SCIENCE – Dorset mega henge may be 'last hurrah' of stone-age builders
Study of Mount Pleasant site suggests it was constructed over decades, not centuries.

PUBLICATIONS

American Journal of Physical Anthropology

PAPERS

ZACHARY COFRAN, MADELEINE BOONE & MARISA PETTICORD – Virtually estimated endocranial volumes of the Krapina Neandertals

We used virtual methods, including high-resolution surface models of fossils and 3D geometric morphometrics, to reconstruct endocasts and estimate ECV for five Krapina crania. We generated 10 reconstructions of each endocast to quantify missing data uncertainty. To assess the method and our ECV estimates, we applied these techniques to the Spy II Neandertal, and estimated ECV of a human reference endocast simulating the missing data of the Krapina fossils.

We have provided new estimates of brain size of the Krapina Neandertals, including the first estimates for Krapina 2. Brain size at Krapina was similar to other pre-Würm Neandertals, within the range of but lower than the average of later Neandertals. Although the virtual approach overcomes many challenges of fossil preservation, our results are nevertheless subject to future revision.

https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24165?campaign=wolearlyview

ERIN MARIE WILLIAMS-HATALA et al – Kinetics of stone tool production among novice and expert tool makers

As is the case among many complex motor tasks that require prolonged practice before achieving expertise, aspects of the biomechanics of knapping vary according to the relative experience/skill level of the practitioner. In archaeological experiments focused on the production of Plio-Pleistocene stone tools, these skill-mediated biomechanical differences have bearings on experimental design, the interpretation of results, and lithic assemblage analysis. A robust body of work exists on variation in kinematic patterns across skill levels but less is known about potential kinetic differences. The current study was undertaken to better understand kinetic patterns observed across skill levels during "Oldowan," freehand stone tool production.

Manual pressure data were collected from 23 novice and 9 expert stone tool makers during the production of simple stone flakes using direct hard hammer percussion.

The similar and consistent emphasis of the thumb by both skill groups indicates the importance of this digit in stabilizing the hammerstone. The emphasis placed on digit II is exclusive to expert knappers, and so this digit may offer osteological signals diagnostic of habitual expert tool production.

https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24159?campaign=wolearlyview

JUDITH BEIER et al – Prevalence of cranial trauma in Eurasian Upper Paleolithic humans

This study characterizes patterns of cranial trauma prevalence in a large sample of Upper Paleolithic (UP) fossil specimens (40,000–10,000 BP).

Models predicted a mean cranial trauma prevalence of 0.07 (95% CI 0.003–0.19) at the level of skeletal elements, and of 0.26 (95% CI 0.08–0.48) at the level of specimens, each when 76–100% complete. Trauma prevalence increased with skeletal preservation. Across specimen and skeletal element datasets, trauma prevalence tended to be higher for males, and was consistently higher in the old age group. We found no time-specific trauma prevalence patterns for the two sexes or age cohorts when comparing samples from before and after the LGM. Samples showed higher trauma prevalence in the vault than in the face, with vault remains being affected predominantly in males.

Cranial trauma prevalence in UP humans falls within the variation described for Mesolithic and Neolithic samples. According to our current dataset, UP males and females were exposed to slightly different injury risks and trauma distributions, potentially due to different activities or behaviors, yet both sexes exhibit more trauma among the old. Environmental stressors associated with climatic changes of the Last Glacial Maximum are not reflected in cranial trauma prevalence. To analyze trauma in incomplete skeletal remains we propose generalized linear mixed models as an informative alternative to crude frequency calculations.

https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.24163?campaign=wolearlyview

Animal Behaviour

PAPERS

SUMIR KEENAN et al with KLAUSZUBERBÜHLER – The reliability of individual vocal signature varies across the bonobo's graded repertoire

Vocalizations often contain both 'dynamic' information, related to short-term fluctuations in the individual's emotional states, and 'static' information, related to long-term attributes such as age, sex, weight and body size which define an 'individual vocal signature'. While both types of information may be of functional value to receivers, dynamic information

requires acoustic versatility, while static information depends on acoustic stability. Here we investigated whether an individual vocal signature is present across the vocal repertoire of the bonobo, Pan paniscus. First, the analysis of the acoustic structure of its five most common tonal vocalizations emphasized the highly graded structure of its repertoire. We then evaluated the reliability of identity information across these call types. The results show that, while all call types supported information related to identity, the reliability of these vocal signatures was not consistent along the graded vocal continuum. Caller identity was strongly encoded at one end of the acoustic gradation (high-hoot) and decreased from bark, soft bark, peep-yelp to peep calls. Strikingly, the reliability of the individual signature thus decreased from calls used in high-arousal contexts to those used in low-arousal contexts. To the best of our knowledge, this is the first demonstration that an acoustic gradation that codes for 'dynamic' information can be accompanied by variation in the 'static' information that supports vocal individuality.

https://www.sciencedirect.com/science/article/abs/pii/S0003347220302670?dgcid=raven_sd_via_email

EBI ANTONY GEORGE et al – Similarities in dance follower behaviour across honey bee species suggest a conserved mechanism of dance communication

Social communication systems are predominantly multimodal and can combine modulatory and information-bearing signals. The honey bee waggle dance, one of the most elaborate forms of social communication in animals, activates nestmates to search for food and communicates symbolic information about the location of the food source. Previous studies on the dance behaviour in diverse honey bee species demonstrated distinct differences in the concurrence of visual, auditory, olfactory and tactile signals produced by the dancer. We studied the behaviour of dance signal receivers, the dance followers, to explore the potential significance of different signals in the communication process. In particular, we asked whether the behaviour of dance followers differs between the three major Asian honey bee species, Apis florea, Apis dorsata and Apis cerana, and whether this might correlate with the differences in the signals produced by the dancing foragers. Our comparison demonstrated that the behaviour of the dance followers is highly similar across all three species. The mean body orientation of the dance followers with respect to the waggle dancer was close to 90° throughout the run, with the majority positioning themselves lateral to the dancer. These findings suggest that the communication of spatial information might be more conserved than implied by the differences in the signals produced by the dancer. Along with studies in Apis mellifera, our results suggest that all honey bee species rely on tactile contacts between the dancer and follower to communicate spatial information. The cues and signals that differ between the species may be involved in attracting the followers towards the dancer or increasing their motivation to start foraging in the different nest environments.

https://www.sciencedirect.com/science/article/abs/pii/S0003347220302785?dgcid=raven_sd_via_email

Current Biology

ARTICLES

BIANCA M. LUPAN & DEBRA L. SILVER – Evolution: Does More Time Buy More Neurons?

Brain expansion and increased neuronal number are hallmarks of cortical evolution, particularly in humans. A new study establishes a link between the length of gestation, neurogenesis, the maternal environment, and key features associated with more complex brains.

https://www.cell.com/current-biology/fulltext/S0960-9822(20)31288-4?dgcid=raven_jbs_etoc_email

PAPERS

CRISTINA RISUENO-SEGOVIA & STEFFEN R. HAGE – Theta Synchronization of Phonatory and Articulatory Systems in Marmoset Monkey Vocal Production

Human speech shares a 3–8-Hz theta rhythm across all languages. According to the frame/content theory of speech evolution, this rhythm corresponds to syllabic rates derived from natural mandibular-associated oscillations. The underlying pattern originates from oscillatory movements of articulatory muscles tightly linked to periodic vocal fold vibrations. Such phono-articulatory rhythms have been proposed as one of the crucial preadaptations for human speech evolution. However, the evolutionary link in phono-articulatory rhythmicity between vertebrate vocalization and human speech remains unclear. From the phonatory perspective, theta oscillations might be phylogenetically preserved throughout all vertebrate clades. From the articulatory perspective, theta oscillations are present in non-vocal lip smacking, teeth chattering, vocal lip smacking, and clicks and faux-speech in non-human primates, potential evolutionary precursors for speech rhythmicity. Notably, a universal phono-articulatory rhythmicity similar to that in human speech is considered to be absent in non-human primate vocalizations, typically produced with sound modulations lacking concomitant articulatory movements. Here, we challenge this view by investigating the coupling of phonatory and articulatory systems in marmoset vocalizations. Using quantitative measures of acoustic call structure, e.g., amplitude envelope, and call-associated articulatory movements, i.e., inter-lip distance, we show that marmosets display speech-like bi-motor rhythmicity. These oscillations are synchronized and phase locked at theta rhythms. Our findings suggest that oscillatory rhythms underlying speech production evolved early in the primate lineage, identifying marmosets as a suitable animal model to decipher the evolutionary and neural basis of coupled phono-articulatory movements.

https://www.cell.com/current-biology/fulltext/S0960-9822(20)31173-8?dgcid=raven_jbs_etoc_email

Evolutionary Anthropology

ABIGAIL E. PAGE & JENNIFER C. FRENCH – Reconstructing prehistoric demography: What role for extant hunter-gatherers?

Demography is central to biological, behavioral, and cultural evolution. Knowledge of the demography of prehistoric populations of both Homo sapiens and earlier members of the genus Homo is, therefore, key to the study of human evolution. Unfortunately, demographic processes (fertility, mortality, migration) leave little mark on the archeological and paleoanthropological records. One common solution to this issue is the application of demographic data from extant hunter-gatherers to prehistory. With the aim of strengthening this line of enquiry, here we outline some pitfalls and their interpretative implications. In doing so, we provide recommendations about the application of hunter-gatherer data to the study of demographic trends throughout human evolution. We use published demographic data from extant hunter-gatherers to show that it is the diversity seen among extant hunter-gatherers—both intra- and inter-population variability—that is most relevant and useful for understanding past hunter-gatherer demography.
https://onlinelibrary.wiley.com/doi/full/10.1002/evan.21869?campaign=wolearlyview

Frontiers in Neuroscience

FREDERICK BENJAMIN JUNKER et al – Transition From Sublexical to Lexico-Semantic Stimulus Processing

Resembling letter-by-letter translation, Morse code can be used to investigate various linguistic components by slowing down the cognitive process of language decoding. Using fMRI and Morse code, we investigated patterns of brain activation associated with decoding three-letter words or non-words and making a lexical decision. Our data suggest that early sublexical processing is associated with activation in brain regions that are involved in sound-patterns to phoneme conversion (inferior parietal lobule), phonological output buffer (inferior frontal cortex: pars opercularis) as well as phonological and semantic top-down predictions (inferior frontal cortex: pars triangularis). In addition, later lexico-semantic processing of meaningful stimuli is associated with activation of the phonological lexicon (angular gyrus) and the semantic system (default mode network). Overall, our data indicate that sublexical and lexico-semantic analyses comprise two cognitive processes that rely on neighboring networks in the left frontal cortex and parietal lobule.
https://www.frontiersin.org/articles/10.3389/fnsys.2020.522384/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1473550_55_Neuros_20201103_arts_A

Frontiers in Psychology

SARAH S. HUGHES-BERHEIM, LAURA M. MORETT & RAYMOND BULGER – Semantic Relationships Between Representational Gestures and Their Lexical Affiliates Are Evaluated Similarly for Speech and Text

This research examined whether the semantic relationships between representational gestures and their lexical affiliates are evaluated similarly when lexical affiliates are conveyed via speech and text. In two studies, adult native English speakers rated the similarity of the meanings of representational gesture-word pairs presented via speech and text. Gesture-word pairs in each modality consisted of gestures and words matching in meaning (semantically-congruent pairs) as well as gestures and words mismatching in meaning (semantically-incongruent pairs). The results revealed that ratings differed by semantic congruency but not language modality. These findings provide the first evidence that semantic relationships between representational gestures and their lexical affiliates are evaluated similarly regardless of language modality. Moreover, this research provides an open normed database of semantically-congruent and semantically-incongruent gesture-word pairs in both text and speech that will be useful for future research investigating gesture-language integration.
https://www.frontiersin.org/articles/10.3389/fpsyg.2020.575991/full?utm_source=F-AAE&utm_medium=EMLF&utm_campaign=MRK_1473550_69_Psycho_20201103_arts_A

Mind & Language

BRANDON ASHBY – Rainbow's end: The structure, character, and content of conscious experience

Separatism, representationalism, and phenomenal intentionalism are the primary views on the relationship between the phenomenality and intentionality of experience. I defend a novel position that is incompatible with separatism, can enrich representationalism and phenomenal intentionalism, but can also be accepted independently of those views. I call it phenomenal schematics: The phenomenal characters of our experiences have structures that place a priori, formal, and sometimes semantic constraints on our experience's possible intentional contents. Phenomenal structures are like the grammar of a language (or the compositional rules governing maps, models, and diagrams). Unlike words, however, phenomenal characters possess their "grammatical properties" essentially.
https://onlinelibrary.wiley.com/doi/full/10.1111/mila.12316?campaign=wolearlyview

Nature

SÉBASTIEN BALLESTA et al – Values encoded in orbitofrontal cortex are causally related to economic choices

In the eighteenth century, Daniel Bernoulli, Adam Smith and Jeremy Bentham proposed that economic choices rely on the computation and comparison of subjective values[1]. This hypothesis continues to inform modern economic theory[2] and research in behavioural economics[3], but behavioural measures are ultimately not sufficient to verify the proposal[4]. Consistent with the hypothesis, when agents make choices, neurons in the orbitofrontal cortex (OFC) encode the subjective value of offered and chosen goods[5]. Value-encoding cells integrate multiple dimensions[6,7,8,9], variability in the activity of each cell group correlates with variability in choices[10,11] and the population dynamics suggests the formation of a decision[12]. However, it is unclear whether these neural processes are causally related to choices. More generally, the evidence linking economic choices to value signals in the brain[13,14,15] remains correlational[16]. Here we show that neuronal activity in the OFC is causal to economic choices. We conducted two experiments using electrical stimulation in rhesus monkeys (Macaca mulatta). Low-current stimulation increased the subjective value of individual offers and thus predictably biased choices. Conversely, high-current stimulation disrupted both the computation and the comparison of subjective values, and thus increased choice variability. These results demonstrate a causal chain linking subjective values encoded in OFC to valuation and choice.

https://www.nature.com/articles/s41586-020-2880-x

Nature Communications

PHILIP R. JANSEN et al – Genome-wide meta-analysis of brain volume identifies genomic loci and genes shared with intelligence

The phenotypic correlation between human intelligence and brain volume (BV) is considerable ($r \approx 0.40$), and has been shown to be due to shared genetic factors. To further examine specific genetic factors driving this correlation, we present genomic analyses of the genetic overlap between intelligence and BV using genome-wide association study (GWAS) results. First, we conduct a large BV GWAS meta-analysis (N = 47,316 individuals), followed by functional annotation and gene-mapping. We identify 18 genomic loci (14 not previously associated), implicating 343 genes (270 not previously associated) and 18 biological pathways for BV. Second, we use an existing GWAS for intelligence (N = 269,867 individuals), and estimate the genetic correlation (r_g) between BV and intelligence to be 0.24. We show that the r_g is partly attributable to physical overlap of GWAS hits in 5 genomic loci. We identify 92 shared genes between BV and intelligence, which are mainly involved in signaling pathways regulating cell growth. Out of these 92, we prioritize 32 that are most likely to have functional impact. These results provide information on the genetics of BV and provide biological insight into BV's shared genetic etiology with intelligence.

https://www.nature.com/articles/s41467-020-19378-5

Nature Scientific Reports

DANIEL MARTIN KATZ et al – Complex societies and the growth of the law

While many informal factors influence how people interact, modern societies rely upon law as a primary mechanism to formally control human behaviour. How legal rules impact societal development depends on the interplay between two types of actors: the people who create the rules and the people to which the rules potentially apply. We hypothesise that an increasingly diverse and interconnected society might create increasingly diverse and interconnected rules, and assert that legal networks provide a useful lens through which to observe the interaction between law and society. To evaluate these propositions, we present a novel and generalizable model of statutory materials as multidimensional, time-evolving document networks. Applying this model to the federal legislation of the United States and Germany, we find impressive expansion in the size and complexity of laws over the past two and a half decades. We investigate the sources of this development using methods from network science and natural language processing. To allow for cross-country comparisons over time, based on the explicit cross-references between legal rules, we algorithmically reorganise the legislative materials of the United States and Germany into cluster families that reflect legal topics. This reorganisation reveals that the main driver behind the growth of the law in both jurisdictions is the expansion of the welfare state, backed by an expansion of the tax state. Hence, our findings highlight the power of document network analysis for understanding the evolution of law and its relationship with society.

https://www.nature.com/articles/s41598-020-73623-x

MANUEL DOMÍNGUEZ-RODRIGO et al – Artificial intelligence provides greater accuracy in the classification of modern and ancient bone surface modifications

Bone surface modifications are foundational to the correct identification of hominin butchery traces in the archaeological record. Until present, no analytical technique existed that could provide objectivity, high accuracy, and an estimate of probability in the identification of multiple structurally-similar and dissimilar marks. Here, we present a major methodological breakthrough that incorporates these three elements using Artificial Intelligence (AI) through computer vision techniques,

based on convolutional neural networks. This method, when applied to controlled experimental marks on bones, yielded the highest rate documented to date of accurate classification (92%) of cut, tooth and trampling marks. After testing this method experimentally, it was applied to published images of some important traces purportedly indicating a very ancient hominin presence in Africa, America and Europe. The preliminary results are supportive of interpretations of ancient butchery in some places, but not in others, and suggest that new analyses of these controversial marks should be done following the protocol described here to confirm or disprove these archaeological interpretations.
https://www.nature.com/articles/s41598-020-75994-7

New Scientist
ARTICLES

ERIK HOEL – How the strangeness of our dreams reveals their true purpose

A new explanation for dreaming suggests it does something far more profound than reinforcing learning as we sleep. It might even explain our love of stories

https://www.newscientist.com/article/mg24833073-600-how-the-strangeness-of-our-dreams-reveals-their-true-purpose/#ixzz6cxiMcqKF

PLoS Biology
PAPERS

JOAN ORPELLA et al – Integrating when and what information in the left parietal lobule allows language rule generalization

This is an uncorrected proof

A crucial aspect when learning a language is discovering the rules that govern how words are combined in order to convey meanings. Because rules are characterized by sequential co-occurrences between elements (e.g., "These cupcakes are unbelievable"), tracking the statistical relationships between these elements is fundamental. However, purely bottom-up statistical learning alone cannot fully account for the ability to create abstract rule representations that can be generalized, a paramount requirement of linguistic rules. Here, we provide evidence that, after the statistical relations between words have been extracted, the engagement of goal-directed attention is key to enable rule generalization. Incidental learning performance during a rule-learning task on an artificial language revealed a progressive shift from statistical learning to goal-directed attention. In addition, and consistent with the recruitment of attention, functional MRI (fMRI) analyses of late learning stages showed left parietal activity within a broad bilateral dorsal frontoparietal network. Critically, repetitive transcranial magnetic stimulation (rTMS) on participants' peak of activation within the left parietal cortex impaired their ability to generalize learned rules to a structurally analogous new language. No stimulation or rTMS on a nonrelevant brain region did not have the same interfering effect on generalization. Performance on an additional attentional task showed that this rTMS on the parietal site hindered participants' ability to integrate "what" (stimulus identity) and "when" (stimulus timing) information about an expected target. The present findings suggest that learning rules from speech is a two-stage process: following statistical learning, goal-directed attention—involving left parietal regions—integrates "what" and "when" stimulus information to facilitate rapid rule generalization.

https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.3000895

PLoS One
PAPERS

DIANE POULIN-DUBOIS et al – Testing the stability of theory of mind: A longitudinal approach

An explicit understanding of false belief develops around the age of four years. However, tasks based on spontaneous responses have revealed an implicit understanding of belief and other theory of mind constructs in infants in their second year of life. The few longitudinal studies that have examined conceptual continuity of theory of mind from infancy to early childhood have reported mixed findings. Here we report two longitudinal experiments to investigate the developmental relation between implicit and explicit theory of mind. No link was observed in the first experiment between false belief and intention understanding measured at 14 and 18 months with the violation of expectation paradigm and tasks measuring explicit and implicit false belief at four or five years of age. In the second experiment, infants aged 18 months were tested with a battery of tasks that measured knowledge inference and false belief. They were then tested with the theory of mind scale at five years of age. The parents completed the Children's Social Understanding Scale (CSUS) and the Social Communication Questionnaire (SCQ). As in the first experiment, there were no associations between early and later forms of theory of mind. We suggest that these findings do not support the view that there is conceptual continuity in theory of mind development.

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0241721

PAPERS

ALESSIA NAVA et mul – Early life of Neanderthals

The early onset of weaning in modern humans has been linked to the high nutritional demand of brain development that is intimately connected with infant physiology and growth rate. In Neanderthals, ontogenetic patterns in early life are still debated, with some studies suggesting an accelerated development and others indicating only subtle differences vs. modern humans. Here we report the onset of weaning and rates of enamel growth using an unprecedented sample set of three late (~70 to 50 ka) Neanderthals and one Upper Paleolithic modern human from northeastern Italy via spatially resolved chemical/isotopic analyses and histomorphometry of deciduous teeth. Our results reveal that the modern human nursing strategy, with onset of weaning at 5 to 6 mo, was present among these Neanderthals. This evidence, combined with dental development akin to modern humans, highlights their similar metabolic constraints during early life and excludes late weaning as a factor contributing to Neanderthals' demise.

https://www.pnas.org/content/early/2020/10/27/2011765117.abstract?etoc

TOMAS KAY, LAURENT KELLER & LAURENT LEHMANN – The evolution of altruism and the serial rediscovery of the role of relatedness

The genetic evolution of altruism (i.e., a behavior resulting in a net reduction of the survival and/or reproduction of an actor to benefit a recipient) once perplexed biologists because it seemed paradoxical in a Darwinian world. More than half a century ago, W. D. Hamilton explained that when interacting individuals are genetically related, alleles for altruism can be favored by selection because they are carried by individuals more likely to interact with other individuals carrying the alleles for altruism than random individuals in the population ("kin selection"). In recent decades, a substantial number of supposedly alternative pathways to altruism have been published, leading to controversies surrounding explanations for the evolution of altruism. Here, we systematically review the 200 most impactful papers published on the evolution of altruism and identify 43 evolutionary models in which altruism evolves and where the authors attribute the evolution of altruism to a pathway other than kin selection and/or deny the role of relatedness. An analysis of these models reveals that in every case the life cycle assumptions entail local reproduction and local interactions, thereby leading to interacting individuals being genetically related. Thus, contrary to the authors' claims, Hamilton's relatedness drives the evolution to altruism in their models. The fact that several decades of investigating the evolution to altruism have resulted in the systematic and unwitting rediscovery of the same mechanism is testament to the fundamental importance of positive relatedness between actor and recipient for explaining the evolution of altruism.

https://www.pnas.org/content/early/2020/10/27/2013596117.abstract?etoc

NABIL IMAM & BARBARA L. FINLAY – Self-organization of cortical areas in the development and evolution of neocortex

While the mechanisms generating the topographic organization of primary sensory areas in the neocortex are well studied, what generates secondary cortical areas is virtually unknown. Using physical parameters representing primary and secondary visual areas as they vary from monkey to mouse, we derived a network growth model to explore if characteristic features of secondary areas could be produced from correlated activity patterns arising from V1 alone. We found that V1 seeded variable numbers of secondary areas based on activity-driven wiring and wiring-density limits within the cortical surface. These secondary areas exhibited the typical mirror-reversal of map topography on cortical area boundaries and progressive reduction of the area and spatial resolution of each new map on the caudorostral axis. Activity-based map formation may be the basic mechanism that establishes the matrix of topographically organized cortical areas available for later computational specialization.

https://www.pnas.org/content/early/2020/10/30/2011724117.abstract?etoc

MARION ROUAULT & STEPHEN M. FLEMING – Formation of global self-beliefs in the human brain

Humans create metacognitive beliefs about their performance across many levels of abstraction—from local confidence in individual decisions to global estimates of our skills and abilities. Despite a rich literature on the neural basis of local confidence judgements, how global self-performance estimates (SPEs) are constructed remains unknown. Using functional magnetic resonance imaging, we scanned human subjects while they performed several short blocks of tasks and reported on which task they think they performed best, providing a behavioral proxy for global SPEs. In a frontoparietal network sensitive to fluctuations in local confidence, we found that activity within ventromedial prefrontal cortex and precuneus was additionally modulated by global SPEs. In contrast, activity in ventral striatum was associated with subjects' global SPEs irrespective of fluctuations in local confidence, and predicted the extent to which global SPEs tracked objective task difficulty across individuals. Our findings reveal neural representations of global SPEs that go beyond the tracking of local confidence, and lay the groundwork for understanding how a formation of global self-beliefs may go awry in conditions characterized by distorted self-evaluation.

https://www.pnas.org/content/117/44/27268.abstract?etoc

PATRICIA L. LOCKWOOD et al – Model-free decision making is prioritized when learning to avoid harming others

Moral behavior requires learning how our actions help or harm others. Theoretical accounts of learning propose a key division between "model-free" algorithms that cache outcome values in actions and "model-based" algorithms that map

actions to outcomes. Here, we tested the engagement of these mechanisms and their neural basis as participants learned to avoid painful electric shocks for themselves and a stranger. We found that model-free decision making was prioritized when learning to avoid harming others compared to oneself. Model-free prediction errors for others relative to self were tracked in the thalamus/caudate. At the time of choice, neural activity consistent with model-free moral learning was observed in subgenual anterior cingulate cortex (sgACC), and switching after harming others was associated with stronger connectivity between sgACC and dorsolateral prefrontal cortex. Finally, model-free moral learning varied with individual differences in moral judgment. Our findings suggest moral learning favors efficiency over flexibility and is underpinned by specific neural mechanisms.

https://www.pnas.org/content/117/44/27719.abstract?etoc

AMIR DEZFOULI, RICHARD NOCK & PETER DAYAN – Adversarial vulnerabilities of human decision-making

Adversarial examples are carefully crafted input patterns that are surprisingly poorly classified by artificial and/or natural neural networks. Here we examine adversarial vulnerabilities in the processes responsible for learning and choice in humans. Building upon recent recurrent neural network models of choice processes, we propose a general framework for generating adversarial opponents that can shape the choices of individuals in particular decision-making tasks toward the behavioral patterns desired by the adversary. We show the efficacy of the framework through three experiments involving action selection, response inhibition, and social decision-making. We further investigate the strategy used by the adversary in order to gain insights into the vulnerabilities of human choice. The framework may find applications across behavioral sciences in helping detect and avoid flawed choice.

https://www.pnas.org/content/early/2020/11/03/2016921117.abstract?etoc

BEN TSUDA et al – A modeling framework for adaptive lifelong learning with transfer and savings through gating in the prefrontal cortex

The prefrontal cortex encodes and stores numerous, often disparate, schemas and flexibly switches between them. Recent research on artificial neural networks trained by reinforcement learning has made it possible to model fundamental processes underlying schema encoding and storage. Yet how the brain is able to create new schemas while preserving and utilizing old schemas remains unclear. Here we propose a simple neural network framework that incorporates hierarchical gating to model the prefrontal cortex's ability to flexibly encode and use multiple disparate schemas. We show how gating naturally leads to transfer learning and robust memory savings. We then show how neuropsychological impairments observed in patients with prefrontal damage are mimicked by lesions of our network. Our architecture, which we call DynaMoE, provides a fundamental framework for how the prefrontal cortex may handle the abundance of schemas necessary to navigate the real world.

https://www.pnas.org/content/early/2020/11/04/2009591117.abstract?etoc

Science Advances
PAPERS

RANDALL HAAS et al – Female hunters of the early Americas

Sexual division of labor with females as gatherers and males as hunters is a major empirical regularity of hunter-gatherer ethnography, suggesting an ancestral behavioral pattern. We present an archeological discovery and meta-analysis that challenge the man-the-hunter hypothesis. Excavations at the Andean highland site of Wilamaya Patjxa reveal a 9000-year-old human burial (WMP6) associated with a hunting toolkit of stone projectile points and animal processing tools. Osteological, proteomic, and isotopic analyses indicate that this early hunter was a young adult female who subsisted on terrestrial plants and animals. Analysis of late Pleistocene and early Holocene burial practices throughout the Americas situate WMP6 as the earliest and most secure hunter burial in a sample that includes 10 other females in statistical parity with early male hunter burials. The findings are consistent with nongendered labor practices in which early hunter-gatherer females were big-game hunters.

https://advances.sciencemag.org/content/6/45/eabd0310?utm_campaign=toc_advances_2020-11-06&et_rid=17774313&et_cid=3547516

Trends in Cognitive Sciences
PAPERS

RODRIGO QUIAN QUIROGA – No Pattern Separation in the Human Hippocampus

Pattern separation is a basic principle of neuronal coding that precludes memory interference in the hippocampus. Its existence is supported by numerous theoretical, computational, and experimental findings in different species. However, I argue that recent evidence from single-neuron recordings suggests that pattern separation may not be present in the human hippocampus and that memories are instead coded by the coactivation of invariant and context-independent engrams. This alternative model prompts a reassessment of the definition of episodic memory and its distinction from semantic memory. Furthermore, I propose that a lack of pattern separation in memory coding may have profound implications that could explain cognitive abilities that are uniquely developed in humans, such as our power of generalization and of creative and abstract thinking.

https://www.cell.com/trends/cognitive-sciences/fulltext/S1364-6613(20)30227-8?dgcid=raven_jbs_aip_email

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