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NOTICES

PUBLICATION ALERTS

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

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

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

ACADEMIA.EDU – Diversity and multiplicity in the Asian Acheulian

In L'Anthropologie 122:1, 59-73 (2018).

DEBORAH BARSKY, EUDALD CARBONELL & ROBERT SALA RAMOS – Diversity and multiplicity in the Asian Acheulian

The emergence of the Acheulian Techno-Complex in Asia appears to have occurred quasi-concurrently in the Levant, South Asia, East and South Africa. Throughout many parts of the huge geographical expanse of Asia, as elsewhere, this genesis was followed by the rapid diffusion of Acheulian techno-behaviors. This phenomenon of cultural radiation is attested in the archeological record throughout the Old World by an increased number of occurrences documenting growing demographic trends of Acheulian peoples, into the latter phases of the Middle Pleistocene. The “Homogeneity to Multiplicity Model” (HMM) is used here to provide a window for understanding the mechanisms behind the evolutionary changes observed throughout the very long duration and extensive geographical context of the Asian Acheulian. Since the beginning of the 19th century, Asia has continuously provided archeological evidence that is vital to our understanding of the “Acheulian revolution” and the plausible links it may have had with the appearance and evolution of *Homo erectus* s. l. The emphasis traditionally put on handaxes as hallmarks of Acheulian culture has falsely led many archeologists to propose models of cultural diffusion that have masked the true nature of the Acheulian as a worldwide phenomenon in which Asia has always played a key role.

https://www.academia.edu/35985372/Diversity_and_multiplicity_in_the_Asian_Acheulian

ACADEMIA.EDU – The Pre-Mousterian industrial complex in Europe between 400 and 300 ka

Quaternary International 409:B, 222-240 (2016)

VLADIMIR DORONICHEV – The Pre-Mousterian industrial complex in Europe between 400 and 300 ka: Interpreting its origin and spatiotemporal variability

The author discusses data indicating that the non-handaxe (non-Acheulean) tradition of small tools and core-choppers was present in parts of West Eurasia during the early Middle Pleistocene – the period marked by a wide spread of Acheulean in West Asia and West Europe – and survived until 400-300 ka and perhaps later in some areas, beyond the area of the maximum Acheulean distribution, in the Danube basin and the Balkans, and to a limited extent north of the Danube basin in Central Europe, and in the south of Russian plain and Northern Caucasus in Eastern Europe. The author defines these Middle Pleistocene assemblages, which are totally lacking true Acheulean handaxes and debitage resulted from large flake or Levallois knapping technologies, as the “Pre-Mousterian industrial complex”. The assemblages of Pre-Mousterian complex are variable due to their functional differentiation and other reasons, but generally comprise the next three components: (1) simple (mostly primary and orthogonal, and also rare unipolar and centripetal) cores with short reduction sequences, consisting of flaking of 1-3 flakes from one platform, followed by the core rotation or discard; (2) flake-tools, which are made mostly (but not exclusively) on small-sized flakes with beveled platforms and include varieties of simple side-scrapers, denticulates, notches, thick end-scrapers, awls, and convergent pieces, as well as small numbers of tools with flat ventral retouch or bifacial retouched edges; and (3) large-sized tools are always present and include mostly unifacial choppers, and more rare chopping-tools and proto-bifaces (or pointed choppers) with partial bifacial processing. The author discusses that the hominids that produced lithic industries of Pre-Mousterian complex acquired a high behavioural plasticity to settle in most uncomfortable (within Western Eurasia) forested and forest-steppe environments with cold winters in Central and Eastern Europe. The hominids developed tool inventories well suited for bone- and wood-working, made real wooden throwing spears and composite tools with wooden hafts that are found in Schöningen. In contrast to the Acheulean complex in West Europe and West Asia, assemblages of Pre-Mousterian complex do not show a transition (temporally being placed now during MIS 8-MIS 7, between c. 300-200 ka in both the regions) toward the Middle Palaeolithic or Mousterian technology. In contrast to the Acheulean to Middle Palaeolithic transition, which is associated with final Neanderthalization of *H. heidelbergensis* and the origin of *H. neanderthalensis*, the assemblages of Pre-Mousterian complex disappear with the spread of Early Middle Paleolithic Neanderthals.

https://www.academia.edu/16734132/The_Pre_Mousterian_industrial_complex_in_Europe_between_400_and_300_ka_Interpreting_its_origin_and_spatiotemporal_variability

ACADEMIA.EDU – The Lower Paleolithic of Iran

Archaeology Ethnology & Anthropology of Eurasia 43:1, 3-15 (2015)

D. DAVOUDI et al – The Lower Paleolithic of Iran: probing new finds from Mar Gwergalan cave (Holeylan, central Zagros)

The last half of the 20th century has been marked by spectacular new discoveries about the earliest colonization of Western Asia. In lands surrounding Iran, increasing evidence of Lower Paleolithic occurrences highlights this country as a geographical crossroads between Africa, Asia, and Europe. New effort recently accorded to this research has yielded probing surface finds from the Mar Gwergalan Cave in Holeylan. This paper provides a detailed description of the artifacts, and discusses them within a larger context of other Lower Paleolithic occurrences—both in Iran and in Western Asia, to ascertain the potential of this area for future research.

https://www.academia.edu/35108416/Lower_pal_of_Iran

NEWS

BREAKING SCIENCE – Scientists Find Ancient Hominin and Animal DNA in Cave Sediments

A research team led by Max Planck Institute for Evolutionary Anthropology and Flinders University scientists has successfully extracted ancient DNA from a collection of undisturbed blocks of Pleistocene sediment recovered from 13 archaeological sites in Europe, Asia, Africa and North America and soaked in synthetic plastic-like (polyester) resin as long as four decades ago.

http://www.sci-news.com/archaeology/cave-sediment-dna-10411.html?utm_source=feedburner&utm_medium=email

THE CONVERSATION – A handful of prehistoric geniuses launched humanity's technological revolution

The stone age saw a pattern where technologies like spears, fire and bows were invented once, then spread

<https://theconversationuk.cmail20.com/t/r-l-trhdlje-khhilalah-c/>

THE CONVERSATION – How orangutans mothers help their offspring learn

Orangutan mothers use a range of techniques to teach their offspring up the age of five - but their tolerance for sharing their food only lasts so long.

<https://theconversationuk.cmail20.com/t/r-l-trhdlje-khhilalah-g/>

PUBLICATIONS

American Journal of Biological Anthropology

PAPERS

FRANÇOIS DRUELLE et al – Development of bipedal walking in olive baboons, *Papio anubis*: A kinematic analysis

Although extant nonhuman primates are not habitual bipeds, they are able to walk bipedally from an early age. In humans, children improve their walking skills through developmental processes and learning experience. In nonhuman primates, infants do not routinely experience bipedalism and their musculoskeletal system gradually specializes for other locomotor modes. The aim of this study is to explore the development of occasional bipedal walking in olive baboon and to test whether the postural adjustments change with age.

We collected kinematics and spatiotemporal parameters of bipedal gait in an ontogenetic sample of 24 baboons. Data were collected at the primatology station of the CNRS (France) and a total of 47 bipedal strides were extracted for the present analysis.

Adults and adolescents walk bipedally in the same way, and the average kinematic pattern is similar across the age-classes. Infants walk bipedally with longer duty factor, they present larger movement amplitude of the thigh and the amplitude of the knee joint decreases with speed. In contrast, older baboons increase the amplitude of the knee and ankle joints with speed.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/ajpa.24454>

Animal Behaviour

PAPERS

DANIEL J.HORSCHLER et al – Dogs re-engage human partners when joint social play is interrupted: a behavioural signature of shared intentionality?

Hypotheses regarding the evolution of uniquely human social cognition often emphasize not only mental state representation, but also mental state sharing. Mental state sharing is evident in instances of joint intentionality – mutual understanding between individuals of each other's simultaneous and interdependent commitment to a shared activity or goal. Comparative studies supporting the human uniqueness of joint intentionality show that, as compared to human children, chimpanzees, Pan troglodytes, who engage with humans as cooperative partners do not altruistically help others achieve their goals across the same range of contexts, do not attempt to re-engage cooperative partners in problem-solving or social games at the same rate and do not show spontaneous role reversal. Although recent work supports the possibility that bonobos, Pan paniscus, may re-engage conspecific partners after interrupted social grooming, the extent to which other

animals show similar behaviour across more diverse contexts remains largely unexplored. Domestic dogs', *Canis familiaris*, propensity to interact with humans in cooperative contexts makes them a potentially promising comparative model of prosocial mental state sharing. Here, we investigated a behavioural signature of joint intentionality during social play between humans and dogs (N = 82). Our results present the first experimental evidence of re-engagement behaviour in dogs, as dogs preferentially attempted to reinitiate an interrupted social game with their previous partner relative to a passive bystander. These findings suggest that dogs exhibit a key marker of joint intentionality and open the door for future research on the cognitive mechanisms supporting this behaviour.

<https://www.sciencedirect.com/science/article/abs/pii/S0003347221003572>

Evolutionary Anthropology

PAPERS

THORE J. BERGMAN & JACINTA C. BEEHNER – Leveling with Tinbergen: Four levels simplified to causes and consequences

In 1963, Niko Tinbergen published his foundational manuscript identifying the four questions we ask in animal behavior—how does the behavior emerge across the lifespan (development); how does it work (mechanism); how and why did it evolve (evolution); and why is it adaptive (function). Tinbergen clarified that these 'levels of analysis' are complementary, not competing, thereby avoiding many fruitless scientific debates. However, the relationships among the four levels was never established. Here, we propose 'leveling' Tinbergen's questions to a single temporal timescale divided into causes (encompassing mechanism, development, and evolution) and consequences (encompassing function). Scientific advances now seamlessly link evolution, development, and mechanism into a continuum of 'causes'. The cause–consequence distinction separates the processes that precede (and lead to) a behavior, from the processes that come after (and result from) a behavior. Even for past behaviors, the functional outcomes are (historical) consequences of the causes that preceded them.

<https://onlinelibrary.wiley.com/doi/abs/10.1002/evan.21931>

Evolutionary Human Sciences

PAPERS

J. MCCLYMONT, K. DAVIDS & R.H. CROMPTON – Variation, mosaicism and degeneracy in the hominin foot

The fossil record is scarce and incomplete by nature. Animals and ecological processes devour soft tissue and important bony details over time and, when the dust settles, we are faced with a patchy record full of variation. Fossil taxa are usually defined by craniodental characteristics, so unless postcranial bones are found associated with a skull, assignment to taxon is unstable. Naming a locomotor category based on fossil bone morphology by analogy to living hominoids is not uncommon, and when no single locomotor label fits, postcrania are often described as exhibiting a "mosaic" of traits. Here, we contend that the unavoidable variation that characterises the fossil record can be described far more rigorously based on extensive work in human neurobiology and neuroanatomy, movement sciences and motor control and biomechanics research. In neurobiology, degeneracy is a natural mechanism of adaptation allowing system elements that are structurally different to perform the same function. This concept differs from redundancy as understood in engineering, where the same function is performed by identical elements. Assuming degeneracy, structurally different elements are able to produce different outputs in a range of environmental contexts, favouring ecological robusticity by enabling adaptations. Furthermore, as degeneracy extends to genome level, genetic variation is sustained, so that genes which might benefit an organism in a different environment remain part of the genome, favouring species' evolvability.

<https://www.cambridge.org/core/journals/evolutionary-human-sciences/article/variation-mosaicism-and-degeneracy-in-the-hominin-foot/ABEF396A89F4A38C7B7FC1452729E4A6>

Frontiers in Ecology and Evolution

PAPERS

PATRICK FRASER, RICARD SOLÉ, & GEMMA DE LAS CUEVAS – Why Can the Brain (and Not a Computer) Make Sense of the Liar Paradox?

Ordinary computing machines prohibit self-reference because it leads to logical inconsistencies and undecidability. In contrast, the human mind can understand self-referential statements without necessitating physically impossible brain states. Why can the brain make sense of self-reference? Here, we address this question by defining the Strange Loop Model, which features causal feedback between two brain modules, and circumvents the paradoxes of self-reference and negation by unfolding the inconsistency in time. We also argue that the metastable dynamics of the brain inhibit and terminate unhalting inferences. Finally, we show that the representation of logical inconsistencies in the Strange Loop Model leads to causal incongruence between brain subsystems in Integrated Information Theory.

<https://www.frontiersin.org/articles/10.3389/fevo.2021.802300/full>

CHRISTOPH THIES & RICHARD A. WATSON – Identifying Causes of Social Evolution: Contextual Analysis, the Price Approach, and Multilevel Selection

Kin selection theory and multilevel selection theory are distinct approaches to explaining the evolution of social traits. The latter claims that it is useful to regard selection as a process that can occur on multiple levels of organisation such as the level of individuals and the level of groups. This is reflected in a decomposition of fitness into an individual component and a group component. This multilevel view is central to understanding and characterising evolutionary transitions in individuality, e.g., from unicellular life to multicellular organisms, but currently suffers from the lack of a consistent, quantifiable measure. Specifically, the two major statistical tools to determine the coefficients of such a decomposition, the multilevel Price equation and contextual analysis, are inconsistent and may disagree on whether group selection is present. Here we show that the reason for the discrepancies is that underlying the multilevel Price equation and contextual analysis are two non-equivalent causal models for the generation of individual fitness effects (thus leaving different “remainders” explained by group effects). While the multilevel Price equation assumes that the individual effect of a trait determines an individual's relative success within a group, contextual analysis posits that the individual effect is context-independent. Since these different assumptions reflect claims about the causal structure of the system, the correct approach cannot be determined on general theoretical or statistical grounds but must be identified by experimental intervention. We outline interventions that reveal the underlying causal structure and thus facilitate choosing the appropriate approach. We note that kin selection theory with its focus on the individual is immune to such inconsistency because it does not address causal structure with respect to levels of organisation. In contrast, our analysis of the two approaches to measuring group selection demonstrates that multilevel selection theory adds meaningful (falsifiable) causal structure to explain the sources of individual fitness and thereby constitutes a proper refinement of kin selection theory. Taking such refined causal structure into account seems indispensable for studying evolutionary transitions in individuality because these transitions are characterised by changes in the selection pressures that act on the respective levels.

<https://www.frontiersin.org/articles/10.3389/fevo.2021.780508/full>

DHRUBA NAUG & CATHERINE TAIT – Slow-Fast Cognitive Phenotypes and Their Significance for Social Behavior: What Can We Learn from Honeybees?

Cognitive variation is proposed to be the fundamental underlying factor that drives behavioral variation, yet it is still to be fully integrated with the observed variation at other phenotypic levels that has recently been unified under the common pace-of-life framework. This cognitive and the resulting behavioral diversity is especially significant in the context of a social group, the performance of which is a collective outcome of this diversity. In this review, we argue about the utility of classifying cognitive traits along a slow-fast continuum in the larger context of the pace-of-life framework. Using Tinbergen's explanatory framework for different levels of analyses and drawing from the large body of knowledge about honeybee behavior, we discuss the observed interindividual variation in cognitive traits and slow-fast cognitive phenotypes from an adaptive, evolutionary, mechanistic and developmental perspective. We discuss the challenges in this endeavor and suggest possible next steps in terms of methodological, statistical and theoretical approaches to move the field forward for an integrative understanding of how slow-fast cognitive differences, by influencing collective behavior, impact social evolution.

<https://www.frontiersin.org/articles/10.3389/fevo.2021.766414/full>

SANDRINE GALLOIS & AMANDA G. HENRY – The Cost of Gathering Among the Baka Forager-Horticulturalists From Southeastern Cameroon

What present-day foragers do for their living and what they eat have long been privileged areas for exploring human behavior, global health, and human evolution. While many studies have focused on hunting and meat acquisition, less attention has been given to gathering and plant foods. Despite evidence of variation in both nutritional quality and energetic costs of gathering different plants, the overall effort spent on gathering in relation to other subsistence tasks is still under explored. In the current context of economic, climate, and social changes, many forager societies also rely on other subsistence strategies, including agriculture and wage labor. In this study, we aim to explore the place of gathering in the livelihood of a mixed economy society, the Baka forager-horticulturalists of southeastern Cameroon, by comparing the involvement and the costs of activities related to food acquisition. From a pool of 153 adult participants (97 women and 56 men), we collected 246 daily records using a GPS (Global Positioning System) tracker combined with heart rate monitor and time allocation recalls. We compared the duration, distance traveled, and the intensity of work, measured by calculating the metabolic equivalent of task (MET), of subsistence activities related to food acquisition. Results from this work show that gathering activities, performed by both women and men, are energetically costly, with higher MET values than hunting and fishing activities. Furthermore, the MET values vary depending on the targeted plant foods. We discuss these insights in the overall framework of subsistence patterns, merging them with the socio-cultural and environmental factors that might explain Baka livelihood and subsistence strategy.

<https://www.frontiersin.org/articles/10.3389/fevo.2021.768003/full>

GIOVANNI PEZZULO, THOMAS PARR & KARL FRISTON – The evolution of brain architectures for predictive coding and active inference

This article considers the evolution of brain architectures for predictive processing. We argue that brain mechanisms for predictive perception and action are not late evolutionary additions of advanced creatures like us. Rather, they emerged gradually from simpler predictive loops (e.g. autonomic and motor reflexes) that were a legacy from our earlier evolutionary ancestors—and were key to solving their fundamental problems of adaptive regulation. We characterize simpler-to-more-complex brains formally, in terms of generative models that include predictive loops of increasing hierarchical breadth and depth. These may start from a simple homeostatic motif and be elaborated during evolution in four main ways: these include the multimodal expansion of predictive control into an allostatic loop; its duplication to form multiple sensorimotor loops that expand an animal's behavioural repertoire; and the gradual endowment of generative models with hierarchical depth (to deal with aspects of the world that unfold at different spatial scales) and temporal depth (to select plans in a future-oriented manner). In turn, these elaborations underwrite the solution to biological regulation problems faced by increasingly sophisticated animals. Our proposal aligns neuroscientific theorising—about predictive processing—with evolutionary and comparative data on brain architectures in different animal species.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0531>

PAUL CISEK – Evolution of behavioural control from chordates to primates

This article outlines a hypothetical sequence of evolutionary innovations, along the lineage that produced humans, which extended behavioural control from simple feedback loops to sophisticated control of diverse species-typical actions. I begin with basic feedback mechanisms of ancient mobile animals and follow the major niche transitions from aquatic to terrestrial life, the retreat into nocturnality in early mammals, the transition to arboreal life and the return to diurnality. Along the way, I propose a sequence of elaboration and diversification of the behavioural repertoire and associated neuroanatomical substrates. This includes midbrain control of approach versus escape actions, telencephalic control of local versus long-range foraging, detection of affordances by the dorsal pallium, diversified control of nocturnal foraging in the mammalian neocortex and expansion of primate frontal, temporal and parietal cortex to support a wide variety of primate-specific behavioural strategies. The result is a proposed functional architecture consisting of parallel control systems, each dedicated to specifying the affordances for guiding particular species-typical actions, which compete against each other through a hierarchy of selection mechanisms.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0522>

DAVID A. LEOPOLD AND BRUNO B. AVERBECK – Self-tuition as an essential design feature of the brain

We are curious by nature, particularly when young. Evolution has endowed our brain with an inbuilt obligation to educate itself. In this perspectives article, we posit that self-tuition is an evolved principle of vertebrate brain design that is reflected in its basic architecture and critical for its normal development. Self-tuition involves coordination between functionally distinct components of the brain, with one set of areas motivating exploration that leads to the experiences that train another set. We review key hypothalamic and telencephalic structures involved in this interplay, including their anatomical connections and placement within the segmental architecture of conserved forebrain circuits. We discuss the nature of educative behaviours motivated by the hypothalamus, innate stimulus biases, the relationship to survival in early life, and mechanisms by which telencephalic areas gradually accumulate knowledge. We argue that this aspect of brain function is of paramount importance for systems neuroscience, as it confers neural specialization and allows animals to attain far more sophisticated behaviours than would be possible through genetic mechanisms alone. Self-tuition is of particular importance in humans and other primates, whose large brains and complex social cognition rely critically on experience-based learning during a protracted childhood period.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0530>

MARGARET A. H. BRYER et al with STEVEN T. PIANTADOSI & ANDREAS NIEDER – The evolution of quantitative sensitivity

The ability to represent approximate quantities appears to be phylogenetically widespread, but the selective pressures and proximate mechanisms favouring this ability remain unknown. We analysed quantity discrimination data from 672 subjects across 33 bird and mammal species, using a novel Bayesian model that combined phylogenetic regression with a model of number psychophysics and random effect components. This allowed us to combine data from 49 studies and calculate the Weber fraction (a measure of quantity representation precision) for each species. We then examined which cognitive, socioecological and biological factors were related to variance in Weber fraction. We found contributions of phylogeny to quantity discrimination performance across taxa. Of the neural, socioecological and general cognitive factors we tested, cortical neuron density and domain-general cognition were the strongest predictors of Weber fraction, controlling for phylogeny. Our study is a new demonstration of evolutionary constraints on cognition, as well as of a relation between species-specific neuron density and a particular cognitive ability.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0529>

JUSTIN M. FINE & BENJAMIN Y. HAYDEN – The whole prefrontal cortex is premotor cortex

We propose that the entirety of the prefrontal cortex (PFC) can be seen as fundamentally premotor in nature. By this, we mean that the PFC consists of an action abstraction hierarchy whose core function is the potentiation and depotentiation of possible action plans at different levels of granularity. We argue that the apex of the hierarchy should revolve around the process of goal-selection, which we posit is inherently a form of optimization over action abstraction. Anatomical and functional evidence supports the idea that this hierarchy originates on the orbital surface of the brain and extends dorsally to motor cortex. Accordingly, our viewpoint positions the orbitofrontal cortex in a key role in the optimization of goal-selection policies, and suggests that its other proposed roles are aspects of this more general function. Our proposed perspective will reframe outstanding questions, open up new areas of inquiry and align theories of prefrontal function with evolutionary principles.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0524>

LOUISE BARRETT, S. PETER HENZI AND ROBERT A. BARTON – Experts in action: why we need an embodied social brain hypothesis

The anthropoid primates are known for their intense sociality and large brain size. The idea that these might be causally related has given rise to a large body of work testing the 'social brain hypothesis'. Here, the emphasis has been placed on the political demands of social life, and the cognitive skills that would enable animals to track the machinations of other minds in metarepresentational ways. It seems to us that this position risks losing touch with the fact that brains primarily evolved to enable the control of action, which in turn leads us to downplay or neglect the importance of the physical body in a material world full of bodies and other objects. As an alternative, we offer a view of primate brain and social evolution that is grounded in the body and action, rather than minds and metarepresentation.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0533>

LUIZ PESSOA, LORETA MEDINA AND ESTER DESFILIS – Refocusing neuroscience: moving away from mental categories and towards complex behaviours

Mental terms—such as perception, cognition, action, emotion, as well as attention, memory, decision-making—are epistemically sterile. We support our thesis based on extensive comparative neuroanatomy knowledge of the organization of the vertebrate brain. Evolutionary pressures have moulded the central nervous system to promote survival. Careful characterization of the vertebrate brain shows that its architecture supports an enormous amount of communication and integration of signals, especially in birds and mammals. The general architecture supports a degree of 'computational flexibility' that enables animals to cope successfully with complex and ever-changing environments. Here, we suggest that the vertebrate neuroarchitecture does not respect the boundaries of standard mental terms, and propose that neuroscience should aim to unravel the dynamic coupling between large-scale brain circuits and complex, naturalistic behaviours.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0534>

JOSEPH E. LEDOUX – As soon as there was life, there was danger: the deep history of survival behaviours and the shallower history of consciousness

It is often said that fear is a universal innate emotion that we humans have inherited from our mammalian ancestors by virtue of having inherited conserved features of their nervous systems. Contrary to this common sense-based scientific point of view, I have argued that what we have inherited from our mammalian ancestors, and they from their distal vertebrate ancestors, and they from their chordate ancestors, and so forth, is not a fear circuit. It is, instead, a defensive survival circuit that detects threats, and in response, initiates defensive survival behaviours and supporting physiological adjustments. Seen in this light, the defensive survival circuits of humans and other mammals can be conceptualized as manifestations of an ancient survival function—the ability to detect danger and respond to it—that may in fact predate animals and their nervous systems, and perhaps may go back to the beginning of life. Fear, on the other hand, from my perspective, is a product of cortical cognitive circuits. This conception is not just of academic interest. It also has practical implications, offering clues as to why efforts to treat problems related to fear and anxiety are not more effective, and what might make them better.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2021.0292>

PLoS Biology

PAPERS

TAKASHI MORITA et al – Measuring context dependency in birdsong using artificial neural networks

Context dependency is a key feature in sequential structures of human language, which requires reference between words far apart in the produced sequence. Assessing how long the past context has an effect on the current status provides crucial information to understand the mechanism for complex sequential behaviors. Birdsongs serve as a representative model for studying the context dependency in sequential signals produced by non-human animals, while previous reports were upper-bounded by methodological limitations. Here, we newly estimated the context dependency in birdsongs in a more scalable way using a modern neural-network-based language model whose accessible context length is sufficiently long. The detected context dependency was beyond the order of traditional Markovian models of birdsong, but was consistent with previous experimental investigations. We also studied the relation between the assumed/auto-detected vocabulary size of birdsong

(i.e., fine- vs. coarse-grained syllable classifications) and the context dependency. It turned out that the larger vocabulary (or the more fine-grained classification) is assumed, the shorter context dependency is detected.

<https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1009707>

PLoS One

PAPERS

LUÍS BORDA-DE-ÁGUA & STEPHEN P. HUBBELL – The relative abundance of languages: Neutral and non-neutral dynamics

Credible estimates suggest that a large number of the nearly 7000 languages in the world could go extinct this century, a prospect with profound cultural, socioeconomic, and political ramifications. Despite its importance, we still have little predictive theory for language dynamics and richness. Critical to the language extinction problem, however, is to understand the dynamics of the number of speakers of languages, the dynamics of language abundance distributions (LADs). Many regional LADs are very similar to the bell-shaped distributions of relative species abundance predicted by neutral theory in ecology. Using the tenets of neutral theory, here we show that LADs can be understood as an equilibrium or disequilibrium between stochastic rates of origination and extinction of languages. However, neutral theory does not fit some regional LADs, which can be explained if the number of speakers has grown systematically faster in some languages than others, due to cultural factors and other non-neutral processes. Only the LADs of Australia and the United States, deviate from a bell-shaped pattern. These deviations are due to the documented higher, non-equilibrium extinction rates of low-abundance languages in these countries.

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