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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 – The evolution of the human pelvis

Philosophical Transactions of the Royal Society B 370: 20140063 (2015)

LAURA TOBIAS GRUSS & DANIEL SCHMITT – The evolution of the human pelvis: changing adaptations to bipedalism, obstetrics and thermoregulation

The fossil record of the human pelvis reveals the selective priorities acting on hominin anatomy at different points in our evolutionary history, during which mechanical requirements for locomotion, childbirth and thermoregulation often conflicted. In our earliest upright ancestors, fundamental alterations of the pelvis compared with non-human primates facilitated bipedal walking. Further changes early in hominin evolution produced a platypelloid birth canal in a pelvis that was wide overall, with flaring ilia. This pelvic form was maintained over 3–4 Myr with only moderate changes in response to greater habitat diversity, changes in locomotor behaviour and increases in brain size. It was not until *Homo sapiens* evolved in Africa and the Middle East 200 000 years ago that the narrow anatomically modern pelvis with a more circular birth canal emerged. This major change appears to reflect selective pressures for further increases in neonatal brain size and for a narrow body shape associated with heat dissipation in warm environments. The advent of the modern birth canal, the shape and alignment of which require fetal rotation during birth, allowed the earliest members of our species to deal obstetrically with increases in encephalization while maintaining a narrow body to meet thermoregulatory demands and enhance locomotor performance.

https://www.academia.edu/21559028/The_evolution_of_the_human_pelvis_changing_adaptations_to_bipedalism_obstetrics_and_thermoregulation

ACADEMIA.EDU – Brain size at birth throughout human evolution

Philosophical Transactions of the Royal Society B 370: 20140063 (2015)

JEREMY M. DESILVA & JULIE J. LESNIK – Brain size at birth throughout human evolution: A new method for estimating neonatal brain size in hominins

An increase in brain size is a hallmark of human evolution. Questions regarding the evolution of brain development and obstetric constraints in the human lineage can be addressed with accurate estimates of the size of the brain at birth in

hominins. Previous estimates of brain size at birth in fossil hominins have been calculated from regressions of neonatal body or brain mass to adult body mass, but this approach is problematic for two reasons: modern humans are outliers for these regressions, and hominin adult body masses are difficult to estimate. To accurately estimate the brain size at birth in extinct human ancestors, an equation is needed for which modern humans fit the anthropoid regression and one in which the hominin variable entered into the regression equation has limited error. Using phylogenetically sensitive statistics, a resampling approach, and brain-mass data from the literature and from National Primate Research Centers on 362 neonates and 2802 adults from eight different anthropoid species, we found that the size of the adult brain can strongly predict the size of the neonatal brain ($r^2=0.97$). This regression predicts human brain size, indicating that humans have precisely the brain size expected as an adult given the size of the brain at birth. We estimated the size of the neonatal brain in fossil hominins from a reduced major axis regression equation using published cranial capacities of 89 adult fossil crania. We suggest that australopiths gave birth to infants with cranial capacities that were on average 180 cc (95% CI: 158–205 cc), slightly larger than the average neonatal brain size of chimpanzees. Neonatal brain size increased in early Homo to 225 cc (95% CI: 198–257 cc) and in Homo erectus to approximately 270 cc (95% CI: 237–310 cc). These results have implications for interpreting the evolution of the birth process and brain development in all hominins from the australopiths and early Homo, through H. erectus, to Homo sapiens.

https://www.academia.edu/4733015/Brain_size_at_birth_throughout_human_evolution_A_new_method_for_estimating_neonatal_brain_size_in_hominins

ACADEMIA.EDU – From Australopithecus to Homo: the transition that wasn't

Philosophical Transactions of the Royal Society B 371:20150248 (2016)

WILLIAM H. KIMBEL & BRIAN VILMOARE – From Australopithecus to Homo: the transition that wasn't

Although the transition from Australopithecus to Homo is usually thought of as a momentous transformation, the fossil record bearing on the origin and earliest evolution of Homo is virtually undocumented. As a result, the poles of the transition are frequently attached to taxa (e.g. A. afarensis, at ca 3.0 Ma versus H. habilis or H. erectus, at ca 2.0-1.7 Ma) in which substantial adaptive differences have accumulated over significant spans of independent evolution. Such comparisons, in which temporally remote and adaptively divergent species are used to identify a 'transition', lend credence to the idea that genera should be conceived at once as monophyletic clades and adaptively unified grades. However, when the problem is recast in terms of lineages, rather than taxa per se, the adaptive criterion becomes a problem of subjectively privileging 'key' characteristics from what is typically a stepwise pattern of acquisition of novel characters beginning in the basal representatives of a clade. This is the pattern inferred for species usually included in early Homo, including H. erectus, which has often been cast in the role as earliest humanlike hominin. A fresh look at brain size, hand morphology and earliest technology suggests that a number of key Homo attributes may already be present in generalized species of Australopithecus, and that adaptive distinctions in Homo are simply amplifications or extensions of ancient hominin trends.

https://www.academia.edu/26475279/From_Australopithecus_to_Homo_the_transition_that_wasnt

SCIEDIRECT – Loss of air sacs improved hominin speech abilities

Journal of Human Evolution 62:1, 1-6 (2012)

BART DE BOER – Loss of air sacs improved hominin speech abilities

In this paper, the acoustic-perceptual effects of air sacs are investigated. Using an adaptive hearing experiment, it is shown that air sacs reduce the perceptual effect of vowel-like articulations. Air sacs are a feature of the vocal tract of all great apes, except humans. Because the presence or absence of air sacs is correlated with the anatomy of the hyoid bone, a probable minimum and maximum date of the loss of air sacs can be estimated from fossil hyoid bones. Australopithecus afarensis still had air sacs about 3.3 Ma, while Homo heidelbergensis, some 600 000 years ago and Homo neandertalensis some 60 000 years ago, did no longer. The reduced distinctiveness of articulations produced with an air sac is in line with the hypothesis that air sacs were selected against because of the evolution of complex vocal communication. This relation between complex vocal communication and fossil evidence may help to get a firmer estimate of when speech first evolved.

<https://www.sciencedirect.com/science/article/abs/pii/S0047248411002004>

SCIEDIRECT – Explaining brain size variation: from social to cultural brain

Trends in Cognitive Sciences 16:5, 277-284 (2012)

CAREL P. VAN SCHAIK, KARIN ISLER & JUDITH M. BURKART – Explaining brain size variation: from social to cultural brain

Although the social brain hypothesis has found near-universal acceptance as the best explanation for the evolution of extensive variation in brain size among mammals, it faces two problems. First, it cannot account for grade shifts, where species or complete lineages have a very different brain size than expected based on their social organization. Second, it cannot account for the observation that species with high socio-cognitive abilities also excel in general cognition. These problems may be related. For birds and mammals, we propose to integrate the social brain hypothesis into a broader framework we call cultural intelligence, which stresses the importance of the high costs of brain tissue, general behavioral flexibility and the role of social learning in acquiring cognitive skills.

<https://www.sciencedirect.com/science/article/abs/pii/S1364661312000824>

SCIENCEDIRECT – Evidence for primate vocal learning & cultural substrates for speech evolution

Neuroscience & Biobehavioral Reviews 83, 429-439 (2017)

ADRIANO R. LAMEIRA – Bidding evidence for primate vocal learning and the cultural substrates for speech evolution

Speech evolution seems to defy scientific explanation. Progress on this front has been jammed in an entrenched orthodoxy about what great apes can and (mostly) cannot do vocally, an idea epitomized by the Kuypers/Jürgens hypothesis. Findings by great ape researchers paint, however, starkly different and more optimistic landscapes for speech evolution. Over twenty studies qualify as positive evidence for primate vocal (production) learning following accepted terminology. Additionally, the Kuypers/Jürgens hypothesis shows low etymological, empirical, and theoretical soundness. Great apes can produce novel voiced calls and voluntarily control their modification – observations supposedly impossible. Furthermore, no valid pretext justifies dismissing heuristically the production of new voiceless consonant-like calls by great apes. To underscore this point, new evidence is provided for a novel supra-genera voiceless call across all great ape species. Their vocal invention and vocal learning faculties are real and sufficiently potent to, at times, uphold vocal traditions. These data overpower conventional predicaments in speech evolution theory and will help to make new strides explaining why, among hominids, only humans developed speech.

<https://www.sciencedirect.com/science/article/abs/pii/S0149763417300684>

OTHER PUBLICATIONS – DYSOC: Evolving institutions for collective action by imitation and design

Evolution and Human Behavior 42: 1-11 (2021)

SERGEY GAVRILETS & MAHENDRA DUWAL SHRESTHA – Evolving institutions for collective action by selective imitation and self-interested design

Human behavior and collective actions are strongly affected by social institutions. A question of great theoretical and practical importance is how successful social institutions get established and spread across groups and societies. Here, using institutionalized punishment in small-scale societies as an example, we contrast two prominent mechanisms - selective imitation and self-interested design - with respect to their ability to converge to cooperative social institutions. While selective imitation has received a great deal of attention in studies of social and cultural evolution, the theoretical toolbox for studying self-interested design is limited. Recently Perry, Shrestha, Vose, and Gavrillets (2018) expanded this toolbox by introducing a novel approach, which they called foresight, generalizing standard myopic best response for the case of individuals with a bounded ability to anticipate actions of their group-mates and care about future payoffs. Here we apply this approach to two general types of collective action – “us vs. nature” and “us vs. them” games. We consider groups composed by a number of regular members producing collective good and a leader monitoring and punishing free-riders. Our results show that foresight increases leaders' willingness to punish free-riders. This, in turn, leads to increased production and the emergence of an effective institution for collective action. We also observed that largely similar outcomes can be achieved by selective imitation, as argued earlier. Selective imitation by leaders (i.e. cultural group selection) outperforms self-interested design if leaders strongly discount the future. Foresight and selective imitation can interact synergistically leading to a faster convergence to an equilibrium. Our approach is applicable to many other types of social institutions and collective action

<http://volweb2.utk.edu/~gavrila/papers/design.pdf>

NEWS

BREAKING SCIENCE – Animals Laugh Too, Researchers Say

Scientists at the University of California, Los Angeles took a closer look at vocal play signals — or what might be thought of as laughter — across the animal kingdom. Play is common in a few lineages of the animal kingdom, being especially prevalent among some birds and many mammals.

http://feedproxy.google.com/~r/BreakingScienceNews/~3/IYYAKkB1ZhA/animal-play-vocalizations-09681.html?utm_source=feedburner&utm_medium=email

SCIENCE DAILY – Our dreams' weirdness might be why we have them

Why we dream is a divisive topic within the scientific community, and the neuroscience field is saturated with hypotheses. Inspired by techniques used to train deep neural networks, a neuroscience researcher argues for a new theory of dreams: the overfitted brain hypothesis. The hypothesis suggests that the strangeness of our dreams serves to help our brains better generalize our day-to-day experiences.

<https://www.sciencedaily.com/releases/2021/05/210514134208.htm>

SCIENCE DAILY – Independent of IQ, 'decision acuity' predicts broad range of decision-making abilities

A common factor called 'decision acuity' underpins diverse decision-making abilities in adolescents and young adults, suggests a new study. A large set of behavioral and neuroimaging data revealed that decision acuity is stable over time, distinct from IQ, and reduced in individuals with low general social functioning.

<https://www.sciencedaily.com/releases/2021/05/210520133924.htm>

SCIENCE DAILY – Young orangutans have sex-specific role models

Social learning in orangutans is shaped by their sex. Young males learn their foraging skills from immigrant individuals, while young females get their skills by observing their mothers and other residents in the area. These different sets of ecological knowledge help secure their survival.

<https://www.sciencedaily.com/releases/2021/05/210520133753.htm>

SCIENCE DAILY – Brain's memory center stays active during 'infantile amnesia'

A new brain imaging study shows that infants as young as three months are already enlisting the hippocampus to recognize and learn patterns.

<https://www.sciencedaily.com/releases/2021/05/210521115342.htm>

SCIENCE DAILY – Culture influences mask wearing, study finds

Countries and US states more predisposed to collectivist behavior have more people following mask guidelines during the COVID-19 pandemic, according to a new study.

<https://www.sciencedaily.com/releases/2021/05/210520164647.htm>

SCIENCE NEWS – No shared language? People across cultures understand clues from 'vocal charades'

One of the hardest questions for evolutionary linguists is why humans speak at all. When people don't share a language, they quickly resort to using their hands, rather than their voices: It's easier to mime "drink" than it is to make a noise that sounds like drinking. Those gestures, over time, can easily blossom into full-fledged sign languages. "If gesture is good enough for language," says Aleksandra Ćwiek, a linguistics Ph.D. student at the Leibniz-Centre General Linguistics, "why the hell do we talk?"

<https://www.sciencemag.org/news/2021/05/no-shared-language-no-problem-people-across-cultures-understand-clues-vocal-charades>

THE CONVERSATION – Incest isn't a taboo in the animal kingdom – new study

Reviewing studies of 88 species, researchers found little evidence that animals avoid inbreeding.

<https://theconversationuk.cmail19.com/t/r-l-tlitldll-khhlilalh-x/>

PUBLICATIONS

Current Biology

PAPERS

EMMA SVENSSON et al – Genome of Peștera Mulerii skull shows high diversity and low mutational load in pre-glacial Europe

Few complete human genomes from the European Early Upper Palaeolithic (EUP) have been sequenced. Using novel sampling and DNA extraction approaches, we sequenced the genome of a woman from "Peștera Muierii," Romania who lived ~34,000 years ago to 13.5x coverage. The genome shows similarities to modern-day Europeans, but she is not a direct ancestor. Although her cranium exhibits both modern human and Neanderthal features, the genome shows similar levels of Neanderthal admixture (~3.1%) to most EUP humans but only half compared to the ~40,000-year-old Peștera Oase 1. All EUP European hunter-gatherers display high genetic diversity, demonstrating that the severe loss of diversity occurred during and after the Last Glacial Maximum (LGM) rather than just during the out-of-Africa migration. The prevalence of genetic diseases is expected to increase with low diversity; however, pathogenic variant load was relatively constant from EUP to modern times, despite post-LGM hunter-gatherers having the lowest diversity ever observed among Europeans.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(21\)00592-3](https://www.cell.com/current-biology/fulltext/S0960-9822(21)00592-3)

CAMERON T. ELLIS et al – Evidence of hippocampal learning in human infants

The hippocampus is essential for human memory. The protracted maturation of memory capacities from infancy through early childhood is thus often attributed to hippocampal immaturity. The hippocampus of human infants has been characterized in terms of anatomy, but its function has never been tested directly because of technical challenges. Here, we use recently developed methods for task-based fMRI in awake human infants to test the hypothesis that the infant hippocampus supports statistical learning. Hippocampal activity increased with exposure to visual sequences of objects when the temporal order contained regularities to be learned, compared to when the order was random. Despite the hippocampus doubling in anatomical volume across infancy, learning-related functional activity bore no relationship to age. This suggests that the hippocampus is recruited for statistical learning at the youngest ages in our sample, around 3 months. Within the hippocampus, statistical learning was clearer in anterior than posterior divisions. This is consistent with the theory that statistical learning occurs in the monosynaptic pathway, which is more strongly represented in the anterior hippocampus. The monosynaptic pathway develops earlier than the trisynaptic pathway, which is linked to episodic memory, raising the

possibility that the infant hippocampus participates in statistical learning before it forms durable memories. Beyond the hippocampus, the medial prefrontal cortex showed statistical learning, consistent with its role in adult memory integration and generalization. These results suggest that the hippocampus supports the vital ability of infants to extract the structure of their environment through experience.

[https://www.cell.com/current-biology/fulltext/S0960-9822\(21\)00619-9](https://www.cell.com/current-biology/fulltext/S0960-9822(21)00619-9)

eLife

PAPERS

ANJALI M PRABHAT et al – Homoplasy in the evolution of modern human-like joint proportions in *Australopithecus afarensis*

The evolution of bipedalism and reduced reliance on arboreality in hominins resulted in larger lower limb joints relative to the joints of the upper limb. The pattern and timing of this transition, however, remains unresolved. Here, we find the limb joint proportions of *Australopithecus afarensis*, *Homo erectus*, and *Homo naledi* to resemble those of modern humans, whereas those of *A. africanus*, *Australopithecus sediba*, *Paranthropus robustus*, *Paranthropus boisei*, *Homo habilis*, and *Homo floresiensis* are more ape-like. The homology of limb joint proportions in *A. afarensis* and modern humans can only be explained by a series of evolutionary reversals irrespective of differing phylogenetic hypotheses. Thus, the independent evolution of modern human-like limb joint proportions in *A. afarensis* is a more parsimonious explanation. Overall, these results support an emerging perspective in hominin paleobiology that *A. afarensis* was the most terrestrially adapted australopithecine despite the importance of arboreality throughout much of early hominin evolution.

<https://elifesciences.org/articles/65897>

Language and Cognition

PAPERS

AMY BIDGOOD et al – Verb argument structure overgeneralisations for the English intransitive and transitive constructions: grammaticality judgments and production priming

We used a multi-method approach to investigate how children avoid (or retreat from) argument structure overgeneralisation errors (e.g., *You giggled me). Experiment 1 investigated how semantic and statistical constraints (preemption and entrenchment) influence children's and adults' judgments of the grammatical acceptability of 120 verbs in transitive and intransitive sentences. Experiment 2 used syntactic priming to elicit overgeneralisation errors from children (aged 5–6) to investigate whether the same constraints operate in production. For judgments, the data showed effects of preemption, entrenchment, and semantics for all ages. For production, only an effect of preemption was observed, and only for transitivity errors with intransitive-only verbs (e.g., *The man laughed the girl). We conclude that preemption, entrenchment, and semantic effects are real, but are obscured by particular features of the present production task.

<https://www.cambridge.org/core/journals/language-and-cognition/article/verb-argument-structure-overgeneralisations-for-the-english-intransitive-and-transitive-constructions-grammaticality-judgments-and-production-priming/2DB0E9BEA85A2D46EAAC12048728B2A3>

Nature Human Behaviour

PAPERS

UNAI ALVAREZ-RODRIGUEZ et al – Evolutionary dynamics of higher-order interactions in social networks

We live and cooperate in networks. However, links in networks only allow for pairwise interactions, thus making the framework suitable for dyadic games, but not for games that are played in larger groups. Here, we study the evolutionary dynamics of a public goods game in social systems with higher-order interactions. First, we show that the game on uniform hypergraphs corresponds to the replicator dynamics in the well-mixed limit, providing a formal theoretical foundation to study cooperation in networked groups. Second, we unveil how the presence of hubs and the coexistence of interactions in groups of different sizes affects the evolution of cooperation. Finally, we apply the proposed framework to extract the actual dependence of the synergy factor on the size of a group from real-world collaboration data in science and technology. Our work provides a way to implement informed actions to boost cooperation in social groups.

<https://www.nature.com/articles/s41562-020-01024-1>

Nature Scientific Reports

PAPERS

CALEB LIANG et al – Experiential ownership and body ownership are different phenomena

Body ownership concerns what it is like to feel a body part or a full body as mine, and has become a prominent area of study. We propose that there is a closely related type of bodily self-consciousness largely neglected by researchers—experiential ownership. It refers to the sense that I am the one who is having a conscious experience. Are body ownership and experiential ownership actually the same phenomenon or are they genuinely different? In our experiments, the participant watched a rubber hand or someone else's body from the first-person perspective and was touched either synchronously or asynchronously. The main findings: (1) The sense of body ownership was hindered in the asynchronous conditions of both the body-part and the full-body experiments. However, a strong sense of experiential ownership was observed in those

conditions. (2) We found the opposite when the participants' responses were measured after tactile stimulations had ceased for 5 s. In the synchronous conditions of another set of body-part and full-body experiments, only experiential ownership was blocked but not body ownership. These results demonstrate for the first time the double dissociation between body ownership and experiential ownership. Experiential ownership is indeed a distinct type of bodily self-consciousness.

<https://www.nature.com/articles/s41598-021-90014-y>

CHARLOTTE CANTELOUP et al with ERICA VAN DE WAAL – Processing of novel food reveals payoff and rank-biased social learning in a wild primate

Social learning—learning from others—is the basis for behavioural traditions. Different social learning strategies (SLS), where individuals biasedly learn behaviours based on their content or who demonstrates them, may increase an individual's fitness and generate behavioural traditions. While SLS have been mostly studied in isolation, their interaction and the interplay between individual and social learning is less understood. We performed a field-based open diffusion experiment in a wild primate. We provided two groups of vervet monkeys with a novel food, unshelled peanuts, and documented how three different peanut opening techniques spread within the groups. We analysed data using hierarchical Bayesian dynamic learning models that explore the integration of multiple SLS with individual learning. We (1) report evidence of social learning compared to strictly individual learning, (2) show that vervets preferentially socially learn the technique that yields the highest observed payoff and (3) also bias attention toward individuals of higher rank. This shows that behavioural preferences can arise when individuals integrate social information about the efficiency of a behaviour alongside cues related to the rank of a demonstrator. When these preferences converge to the same behaviour in a group, they may result in stable behavioural traditions.

<https://www.nature.com/articles/s41598-021-88857-6>

BALARAJU BATTU – Evolution of altruistic punishments among heterogeneous conditional cooperators

It has been known that altruistic punishments solve the free rider problem in public goods games. Considering spatial structure and considering pure strategies significant advances have been made in understanding the evolution of altruistic punishments. However, these models have not considered key behavior regularities observed in experimental and field settings, where the individuals behave like conditional cooperators who are more willing to donate and are also more willing to punish free riders. Considering these behavioral regularities, without imposing a spatial structure on the population, I propose an evolutionary agent-based model in which agents behave like conditional cooperators, each agent's donation conditional on the difference between the number of donations in the past and the threshold value and the propensity value of the agent. Altruistic punishment depends on the difference between the threshold value of the focal agent and the randomly matched another agent. The simulations show that, for certain inflicted costs of punishments, generous altruistic punishments evolve and stabilize cooperation. The results show that, unlike previous models, it is not necessary to punish all free riders equally; it is necessary to do so in the case of the selfish free riders but not in the case of negative reciprocators.

<https://www.nature.com/articles/s41598-021-89563-z>

ALESSIA D'AGOSTINO et al – Environmental implications and evidence of natural products from dental calculi of a Neolithic–Chalcolithic community (central Italy)

In this contribution, we investigated the role of plants in the prehistoric community of Casale del Dolce (Anagni, FR, central Italy), through microparticles recovered from dental calculus. The finding of a great amount of pollen types, even in form of compact lumps, could indicate use of natural substances, such as honeybee products and/or conifer resins. This plant-microremain record also suggested environmental implications relative to the Neolithic and Chalcolithic period. Additionally, the stability of the tartar microenvironment had preserved starches and other microparticles, such as one epidermal trichome, a sporangium, and fragments of plant tissue, rarely detected in ancient dental calculus. The detection of secondary metabolites in the ancient matrix confirmed the familiarity of this community with plant resources. All these data supply various interesting food for thought and expand the knowledge about the potential of dental calculus in archaeological and archaeobotanical fields with a special focus on palaeoecology.

<https://www.nature.com/articles/s41598-021-89999-3>

New Scientist

NEWS

The way we use emojis evolves like language and changes their meaning

The meaning of emojis changes depending on the context in which they're used and when they've been posted, according to the first study of their use over time.

<https://www.newscientist.com/article/2277527-the-way-we-use-emojis-evolves-like-language-and-changes-their-meaning/#ixzz6vRlxQET>

MARCO SMOLLA et al – Underappreciated features of cultural evolution

Cultural evolution theory has long been inspired by evolutionary biology. Conceptual analogies between biological and cultural evolution have led to the adoption of a range of formal theoretical approaches from population dynamics and genetics. However, this has resulted in a research programme with a strong focus on cultural transmission. Here, we contrast biological with cultural evolution, and highlight aspects of cultural evolution that have not received sufficient attention previously. We outline possible implications for evolutionary dynamics and argue that not taking them into account will limit our understanding of cultural systems. We propose 12 key questions for future research, among which are calls to improve our understanding of the combinatorial properties of cultural innovation, and the role of development and life history in cultural dynamics. Finally, we discuss how this vibrant research field can make progress by embracing its multidisciplinary nature.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0259>

FREDRIK JANSSON et al – Modelling cultural systems and selective filters

A specific goal of the field of cultural evolution is to understand how processes of transmission and selection at the individual level lead to population-wide patterns of cultural diversity and change. Models of cultural evolution have typically assumed that traits are independent of one another and essentially exchangeable. But culture has a structure: traits bear relationships to one another that affect the transmission and selection process itself. Here, we introduce a modelling framework to explore the effect of interdependencies on the process of learning. Through simulations, we find that introducing a simple structure changes the cultural dynamics. Based on a basic filtering mechanism for parsing trait relationships, more elaborate cultural filters emerge. In a mostly incompatible cultural domain of traits, these filters organize culture into mostly (but not fully) consistent and stable systems. Incompatible domains produce small homogeneous cultures, while more compatibility increases size, diversity and group divergence. When individuals copy based on a trait's features (here, its compatibility relationships), they produce more homogeneous cultures than when they copy based on the agent carrying the cultural trait. We discuss the implications of considering cultural systems and filters in the dynamics of cultural change.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0045>

ALEX MESOUDI – Cultural selection and biased transformation: two dynamics of cultural evolution

Here, I discuss two broad versions of human cultural evolution which currently exist in the literature and which emphasize different underlying dynamics. One, which originates in population-genetic-style modelling, emphasizes how cultural selection causes some cultural variants to be favoured and gradually increase in frequency over others. The other, which draws more from cognitive science, holds that cultural change is driven by the biased transformation of cultural variants by individuals in non-random and consistent directions. Despite claims that cultural evolution is characterized by one or the other of these dynamics, these are neither mutually exclusive nor a dichotomy. Different domains of human culture are likely to be more or less strongly weighted towards cultural selection or biased transformation. Identifying cultural dynamics in real-world cultural data is challenging given that they can generate the same population-level patterns, such as directional change or cross-cultural stability, and the same cognitive and emotional mechanisms may underlie both cultural selection and biased transformation. Nevertheless, fine-grained historical analysis and laboratory experiments, combined with formal models to generate quantitative predictions, offer the best way of distinguishing them.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0053>

BRAM KUIJPER et al – The evolution of social learning as phenotypic cue integration

Most analyses of the origins of cultural evolution focus on when and where social learning prevails over individual learning, overlooking the fact that there are other developmental inputs that influence phenotypic fit to the selective environment. This raises the question of how the presence of other cue 'channels' affects the scope for social learning. Here, we present a model that considers the simultaneous evolution of (i) multiple forms of social learning (involving vertical or horizontal learning based on either prestige or conformity biases) within the broader context of other evolving inputs on phenotype determination, including (ii) heritable epigenetic factors, (iii) individual learning, (iv) environmental and cascading maternal effects, (v) conservative bet-hedging, and (vi) genetic cues. In fluctuating environments that are autocorrelated (and hence predictable), we find that social learning from members of the same generation (horizontal social learning) explains the large majority of phenotypic variation, whereas other cues are much less important. Moreover, social learning based on prestige biases typically prevails in positively autocorrelated environments, whereas conformity biases prevail in negatively autocorrelated environments. Only when environments are unpredictable or horizontal social learning is characterized by an intrinsically low information content, other cues such as conservative bet-hedging or vertical prestige biases prevail.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0048>

THOMAS E. CURRIE et al – The cultural evolution and ecology of institutions

Human societies are structured by what we refer to as 'institutions', which are socially created and culturally inherited proscriptions on behaviour that define roles and set expectations about social interactions. The study of institutions in several social science fields has provided many important insights that have not been fully appreciated in the evolutionary

human sciences. However, such research has often lacked a shared understanding of general processes of change that shape institutional diversity across space and time. We argue that evolutionary theory can provide a useful framework for synthesizing information from different disciplines to address issues such as how and why institutions change over time, how institutional rules co-evolve with other culturally inherited traits, and the role that ecological factors might play in shaping institutional diversity. We argue that we can gain important insights by applying cultural evolutionary thinking to the study of institutions, but that we also need to expand and adapt our approaches to better handle the ways that institutions work, and how they might change over time. In this paper, we illustrate our approach by describing macro-scale empirical comparative analyses that demonstrate how evolutionary theory can be used to generate and test hypotheses about the processes that have shaped some of the major patterns we see in institutional diversity over time and across the world today. We then go on to discuss how we might usefully develop micro-scale models of institutional change by adapting concepts from game theory and agent-based modelling. We end by considering current challenges and areas for future research, and the potential implications for other areas of study and real-world applications.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0047>

MANVIR SINGH et al with THOM SCOTT-PHILLIPS & MONICA TAMARIZ – Beyond social learning

Cultural evolution requires the social transmission of information. For this reason, scholars have emphasized social learning when explaining how and why culture evolves. Yet cultural evolution results from many mechanisms operating in concert. Here, we argue that the emphasis on social learning has distracted scholars from appreciating both the full range of mechanisms contributing to cultural evolution and how interactions among those mechanisms and other factors affect the output of cultural evolution. We examine understudied mechanisms and other factors and call for a more inclusive programme of investigation that probes multiple levels of the organization, spanning the neural, cognitive-behavioural and populational levels. To guide our discussion, we focus on factors involved in three core topics of cultural evolution: the emergence of culture, the emergence of cumulative cultural evolution and the design of cultural traits. Studying mechanisms across levels can add explanatory power while revealing gaps and misconceptions in our knowledge.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0050>

SUSAN PERRY et al – Not by transmission alone: the role of invention in cultural evolution

Innovation—the combination of invention and social learning—can empower species to invade new niches via cultural adaptation. Social learning has typically been regarded as the fundamental driver for the emergence of traditions and thus culture. Consequently, invention has been relatively understudied outside the human lineage—despite being the source of new traditions. This neglect leaves basic questions unanswered: what factors promote the creation of new ideas and practices? What affects their spread or loss? We critically review the existing literature, focusing on four levels of investigation: traits (what sorts of behaviours are easiest to invent?), individuals (what factors make some individuals more likely to be inventors?), ecological contexts (what aspects of the environment make invention or transmission more likely?), and populations (what features of relationships and societies promote the rise and spread of new inventions?). We aim to inspire new research by highlighting theoretical and empirical gaps in the study of innovation, focusing primarily on inventions in non-humans. Understanding the role of invention and innovation in the history of life requires a well-developed theoretical framework (which embraces cognitive processes) and a taxonomically broad, cross-species dataset that explicitly investigates inventions and their transmission. We outline such an agenda here.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0049>

JONATHAN BIRCH & CECILIA HEYES – The cultural evolution of cultural evolution

What makes fast, cumulative cultural evolution work? Where did it come from? Why is it the sole preserve of humans? We set out a self-assembly hypothesis: cultural evolution evolved culturally. We present an evolutionary account that shows this hypothesis to be coherent, plausible, and worthy of further investigation. It has the following steps: (0) in common with other animals, early hominins had significant capacity for social learning; (1) knowledge and skills learned by offspring from their parents began to spread because bearers had more offspring, a process we call CS1 (or Cultural Selection 1); (2) CS1 shaped attentional learning biases; (3) these attentional biases were augmented by explicit learning biases (judgements about what should be copied from whom). Explicit learning biases enabled (4) the high-fidelity, exclusive copying required for fast cultural accumulation of knowledge and skills by a process we call CS2 (or Cultural Selection 2) and (5) the emergence of cognitive processes such as imitation, mindreading and metacognition—‘cognitive gadgets’ specialized for cultural learning. This self-assembly hypothesis is consistent with archaeological evidence that the stone tools used by early hominins were not dependent on fast, cumulative cultural evolution, and suggests new priorities for research on ‘animal culture’.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0051>

OLIVIER MORIN et al with KRIST VAESEN – Social information use and social information waste

Social information is immensely valuable. Yet we waste it. The information we get from observing other humans and from communicating with them is a cheap and reliable informational resource. It is considered the backbone of human cultural evolution. Theories and models focused on the evolution of social learning show the great adaptive benefits of evolving cognitive tools to process it. In spite of this, human adults in the experimental literature use social information quite inefficiently: they do not take it sufficiently into account. A comprehensive review of the literature on five experimental tasks

documented 45 studies showing social information waste, and four studies showing social information being over-used. These studies cover 'egocentric discounting' phenomena as studied by social psychology, but also include experimental social learning studies. Social information waste means that human adults fail to give social information its optimal weight. Both proximal explanations and accounts derived from evolutionary theory leave crucial aspects of the phenomenon unaccounted for: egocentric discounting is a pervasive effect that no single unifying explanation fully captures. Cultural evolutionary theory's insistence on the power and benefits of social influence is to be balanced against this phenomenon.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0052>

CARA L. EVANS et al – The uses and abuses of tree thinking in cultural evolution

Modern phylogenetic methods are increasingly being used to address questions about macro-level patterns in cultural evolution. These methods can illuminate the unobservable histories of cultural traits and identify the evolutionary drivers of trait change over time, but their application is not without pitfalls. Here, we outline the current scope of research in cultural tree thinking, highlighting a toolkit of best practices to navigate and avoid the pitfalls and 'abuses' associated with their application. We emphasize two principles that support the appropriate application of phylogenetic methodologies in cross-cultural research: researchers should (1) draw on multiple lines of evidence when deciding if and which types of phylogenetic methods and models are suitable for their cross-cultural data, and (2) carefully consider how different cultural traits might have different evolutionary histories across space and time. When used appropriately phylogenetic methods can provide powerful insights into the processes of evolutionary change that have shaped the broad patterns of human history.

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0056>

DIETER LUKAS, MARY TOWNER & MONIQUE BORGERHOFF MULDER – The potential to infer the historical pattern of cultural macroevolution

Phylogenetic analyses increasingly take centre-stage in our understanding of the processes shaping patterns of cultural diversity and cultural evolution over time. Just as biologists explain the origins and maintenance of trait differences among organisms using phylogenetic methods, so anthropologists studying cultural macroevolutionary processes use phylogenetic methods to uncover the history of human populations and the dynamics of culturally transmitted traits. In this paper, we revisit concerns with the validity of these methods. Specifically, we use simulations to reveal how properties of the sample (size, missing data), properties of the tree (shape) and properties of the traits (rate of change, number of variants, transmission mode) might influence the inferences that can be drawn about trait distributions across a given phylogeny and the power to discern alternative histories. Our approach shows that in two example datasets specific combinations of properties of the sample, of the tree and of the trait can lead to potentially high rates of Type I and Type II errors. We offer this simulation tool to help assess the potential impact of this list of persistent perils in future cultural macroevolutionary work.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0057>

MARIA KRONFELDNER – Digging the channels of inheritance: On how to distinguish between cultural and biological inheritance

Theories of cultural evolution rest on the assumption that cultural inheritance is distinct from biological inheritance. Cultural and biological inheritance are two separate so-called channels of inheritance, two sub-systems of the sum total of developmental resources travelling in distinct ways between individual agents. This paper asks: what justifies this assumption? In reply, a philosophical account is offered that points at three related but distinct criteria that (taken together) make the distinction between cultural and biological inheritance not only precise but also justify it as real, i.e. as ontologically adequate. These three criteria are (i) the autonomy of cultural change, (ii) the near-decomposability of culture and (iii) differences in temporal order between cultural and biological inheritance.

<https://royalsocietypublishing.org/doi/abs/10.1098/rstb.2020.0042>

JOEP LEERSSEN – Culture, humanities, evolution: the complexity of meaning-making over time

This article outlines how the historical human sciences see 'culture' and its dynamic developments over time and over generations. The operations of human culture are systemically self-reflexive and, as a result, exhibit a complexity that sets them apart, as a semiotic system, from mere communicative information transfer. Peculiar to this complexity is the two-way interaction between the 'etic' substance of the cultural exchanges and their 'emic' function. Cultural signals require parallel etic/emic processing at stacked levels of complexity. As a result of this complexity, the homeostasis and autopoiesis of human culture, including its dynamics and development over time, cannot be explained fully in terms of responses to the physical environment. How, this article ponders by way of conclusion, can an evolutionary approach be reconciled with these characteristics of human culture, or the notion of culture be applied to evolutionary modelling?

<https://royalsocietypublishing.org/doi/full/10.1098/rstb.2020.0043>

PNAS

PAPERS

JULIEN LOUYS et al – No evidence for widespread island extinctions after Pleistocene hominin arrival

The arrival of modern humans into previously unoccupied island ecosystems is closely linked to widespread extinction, and a key reason cited for Pleistocene megafauna extinction is anthropogenic overhunting. A common assumption based on late Holocene records is that humans always negatively impact insular biotas, which requires an extrapolation of recent human behavior and technology into the archaeological past. Hominins have been on islands since at least the early Pleistocene and *Homo sapiens* for at least 50 thousand y (ka). Over such lengthy intervals it is scarcely surprising that significant evolutionary, behavioral, and cultural changes occurred. However, the deep-time link between human arrival and island extinctions has never been explored globally. Here, we examine archaeological and paleontological records of all Pleistocene islands with a documented hominin presence to examine whether humans have always been destructive agents. We show that extinctions at a global level cannot be associated with Pleistocene hominin arrival based on current data and are difficult to disentangle from records of environmental change. It is not until the Holocene that large-scale changes in technology, dispersal, demography, and human behavior visibly affect island ecosystems. The extinction acceleration we are currently experiencing is thus not inherent but rather part of a more recent cultural complex.

<https://www.pnas.org/content/118/20/e2023005118.abstract>

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REVIEWS

FREDERICK E. GRINE – Hominin Postcranial Remains from Sterkfontein, South Africa, 1936-1995

Review of "Hominin Postcranial Remains from Sterkfontein, South Africa, 1936–1995. Human Evolution Series" edited by Bernhard Zipfel, Brian G. Richmond, and Carol V. Ward.

<https://www.journals.uchicago.edu/doi/abs/10.1086/714485>

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