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Cultural  
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# CES

## RABAT 2026

CONFERENCE PROGRAM - ABSTRACTS  
11-13 MAY 2026, RABAT, MOROCCO

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# Plenary speakers

# What culture can and cannot escape: On constraints and cultural Evolution

**Helena Milton**

This talk provides an overview of how to understand cultural evolution through the lens of constraints. Constraints play three key roles: they shape cultural productions, they form an important part of cultural transmission, and they can themselves be altered by cultural evolution. The first part presents case studies across a range of domains, from motor constraints shaping rhythm to cognitive biases driving portrait conventions to communicative pressures structuring writing systems, illustrating how constraints of different kinds lead cultural products to take specific, predictable forms. The second part turns to the role constraints play in cultural transmission. Drawing on a model that represents cultural practices as networks of constraints, it argues that taking the constrained aspect of culture seriously predicts a specific distribution of learners' outcomes and a punctuated evolutionary path. The final part presents ongoing work on how culture can itself alter the constraints it operates under. While the cultural evolution of technology provides ample evidence that culture can exploit physical constraints, less attention has been paid to how cultural evolution can alter cognitive constraints. This talk proposes that, from complex technological systems to globalized exchanges, this is owed to a specific subset of cultural innovations: cultural cognitive scaffolds.

# Land and people of the margins observed: Transitional evolution in oases and mountains of Morocco

**Abdellatif Ben Cherifa, UIR, Morocco**

I look into cultural evolution through the study of social-spatial change from a cultural ecological perspective. It is a well established fact that cultures are dynamic and change over time. The question of how they do so involves the very processes as well as mechanisms which lie behind these changes. In this presentation, as a cultural geographer, I build on my past fifty years of research activities in the marginal rural areas of Morocco, to address these questions.

In my paper, I rely on two marginal areas: the oases of Figuig, and the western Anti Atlas Mountains, to try and describe how the change dynamics among traditional societies in these two settings did unfold through time, as a response to a set of interoperating factors: environmental, social, and external. Long term cultural change within these rural settings takes various forms: social adaptation, innovation adoption and diffusion, technological change, migration, etc.

While cultural change encompasses a myriad of expressions, there is, however, one constant feature which remains systematically present: the obsessive struggle of preserving identity, honoring past heritage, and resisting the power of the change. Balancing the preservation of traditional culture while adjusting to the pressure for innovation and adaptation are the key challenges that traditional societies are facing as they respond to internal and external pressures.

# Empire, Discipline, Field: Imaginary and Possible Futures for Cultural Evolution

**Stephen Vaisey, Duke University, USA**

Cultural evolution has produced impressive theoretical and empirical advances, but its institutional future remains uncertain. Drawing on lessons from the history of social science—including both famous failures and quiet successes—this talk examines three possible futures: empire, discipline, and field. I argue that the field model offers the most promising path, but that realizing it will require more than shared ideas or informal networks. It will require explicit attention to the organizational and institutional processes that cultural evolutionists are not always well-equipped to see.

# Culture in reproduction: How cultural learning shapes childbearing and childrearing across the lifespan

**Michelle A. Kline, Brunel University of London**

Culture shapes childbearing and childrearing including who provides care, what constitutes safe or sufficient care, as well as parenting goals and expectations. Fundamental tasks such as feeding and sleep depend upon socially transmitted information. This talk examines how cultural information is transmitted, monitored, and contested across the reproductive lifespan, drawing on evolutionary and cultural frameworks alongside mixed-methods empirical data.

Before birth, cultural norms shape the experience of pregnancy, contributing to a complex information environment in the perinatal period. Part one of the talk presents a qualitative study of social monitoring during pregnancy ( $n = 205$ ), exploring who monitors pregnant women's behaviour, on which topics, and the effects of that monitoring. Results show that monitoring is most frequently carried out by senior women family members, in domains such as exercise, body/weight. Pregnant women respond by adopting strategies to tolerate, resist, directly confront, or withdraw from monitoring—more often than they change their behaviour.

Part two of the talk describes caregiving support networks for early years parents (children <6yo) in Western, high-income, ultra-low fertility populations. The survey data ( $n = 506$ ) to characterize families as living in nuclear households, with low community embeddedness, and heavy reliance on grandparents and paid care for support beyond the home. I expand these insights with ongoing fieldwork in the UK into how structural features of contemporary life constrain access to networks of community care. Together these findings highlight the importance of distinguishing between information and actionable, trustworthy knowledge in childbearing and childrearing.

# Evolution of learned behaviors: Insights from birds and humans

**Nicole Creanza, Vanderbilt University, USA**

The long-term goal of my research program is to understand the evolution of learned behaviors: how and why behaviors change over time as well as how behaviors shape genetic evolution. By applying new quantitative and data-intensive approaches to the study of genetic variation and learned behaviors, we ask: (1) What are the evolutionary dynamics of learned behaviors, and how far into the past can we reconstruct their ancestral states? (2) How do selection pressures such as environmental differences and species interactions affect the evolution of behaviors? (3) In what ways can learned behaviors change the course of biological evolution? In this talk, I will discuss research on these questions in multiple systems, particularly human linguistic and genomic variation and the evolutionary dynamics of learned birdsong. In these systems, the research conducted in my laboratory has led to discoveries about how behaviors evolve and, in turn, shape evolutionary processes. In songbirds, we show that learned songs are shaped by diverse selection pressures, ranging from sexual selection to complex social structures. In addition, we have studied how learned birdsong can influence the formation of new species and how sexual selection favoring elaborate birdsong can affect the evolution of the brain. In humans, we have studied how linguistic dialects can act as a barrier to gene flow and how the processes of population contact influence creole languages. Ultimately, by synthesizing large-scale acoustic, genetic, and cultural datasets, our research illuminates the dynamic feedback loops where learned behaviors both respond to and shape evolutionary trajectories across diverse species.

# The evolution of reason and the cultural evolution of reasons

**Hugo Mercier, CNRS/Jean Nicod, France**

The study of human reason has long stalled, arguably because it wasn't a well-defined cognitive mechanism, and because it was attributed implausible powers. Using an evolutionary framework, Dan Sperber and I suggested that reason is a cognitive mechanism that produces and evaluates reasons, and whose function is to facilitate communication and cooperation. This interactionist theory of reason explains its most robust features: a myside bias, a lack of exigence towards one's own reasons, an ability to evaluate others reasons critically but fairly, and an ability to deliver good outcomes in the right social context. We document these features not only in convenience samples of adult participants, but also across cultures and in young children. This pattern of results suggests that reason did evolve to serve the social functions of exchanging arguments and justifications with others. Reason produces reasons, most of which are promptly forgotten, but a few of which spread more widely, becoming cultural. Scientific reasons—addressing a question of no direct practical import, using valid arguments, and accurate data—are convincing, but they face difficulties emerging and spreading in culture. I will sketch an argument that this is because such reasons are produced largely to impress, and that scientific reasons are outcompeted in each of the relevant dimensions on their own—addressing less relevant questions than philosophers, using duller or less valid arguments than mathematicians, and more boring data than naturalists or historians.

# Standard Talks

## Shifting away from Indigenous languages in Vanuatu: Exploring the dynamics of ongoing language endangerment with national census data

**Guy Lavender Forsyth**

Vanuatu hosts the greatest density of Indigenous languages anywhere on earth. Census data affirm that Indigenous languages are vital today, with 84% of the population easily able to speak an Indigenous language and 75% having learnt an Indigenous first language in childhood. However, we use these same census data – containing individual-level data for nearly the entire population – to show that a shift away from Indigenous languages is also currently occurring. We show that younger people are much less likely to speak an Indigenous language easily and to have learnt an Indigenous first language than older generations. Using Amortized Bayesian Inference techniques, we interrogate the geographic generalisability of this pattern, testing whether it exists not only in urban centres but rural areas too, whether it exists in all seven provinces of Vanuatu, all 66 islands, and even all ~800 census enumeration areas. Identification of this trend and geographical variation therein furthermore provides the opportunity to explore the potential causes of this large-scale cultural shift in unprecedented detail. We outline how Vanuatu's census data can be used, in conjunction with invaluable insights from linguists, ethnographers, and community representatives, to understand the process of language shift while it is still ongoing and potentially inform interventions led by the national government, civil society organisations, and communities. broader theories of cultural evolution and the role of spirituality in contemporary meaning-making and psychological adaptation.

## “With magic... I can escape from all this going on around me”: Magic solutions to modern problems

Lora Adair · Sotirios Kolios · Ava Sitbon

Neo-paganism is spreading - in England and Wales, the number of people who identify as neo-pagan or spiritual believers (e.g., Pagan, Wicca, Shamanism) in the census have increased approximately 45% from 2011 - 2021. The religious landscape is changing and this project explores mechanisms for this change. Specifically, we posit that contemporary neo-pagan and spiritual magic practices represent a fascinating case study in how religious beliefs adapt to meet the psychological and social needs of practitioners in modern contexts. We apply cultural evolutionary theory to examine how historic elements of various magical practices and religious traditions are selectively retained, modified, and repurposed to help magic practitioners navigate contemporary challenges. Drawing on the history of western magical practices and ethnographic data (participant observation and semi-structured interviews) collected in the town of Glastonbury UK, we demonstrate how core practices like spellwork, ritual, and divination have been reframed as tools for psychological well-being, personal empowerment, community building, and a way to motivate people towards better habits and the completion of mundane tasks. The integration of environmental awareness, feminist spirituality, and psychological self-work into traditional witchcraft frameworks suggests these practices are undergoing adaptive evolution to address modern existential concerns and social pressures. This research contributes to our understanding of how religious practices evolve to maintain relevance while preserving connection to historical traditions. The findings have implications for broader theories of cultural evolution and the role of spirituality in contemporary meaning-making and psychological adaptation.

## Amazigh Nomads Show Strong Desire to Settle and Low Regret Despite Economic Costs

**Sarah Alami** · **Salma Es-Sbih** · **Mohamed Ibboubark** · **Edmond Seabright**

Culture has enabled humans to survive and thrive in a wide range of environments, climates, and ecologies. At the heart of this adaptability lies the way communities organize the acquisition and distribution of food resources. Over the past ~12,000 years, humans have developed new modes of subsistence centered around domesticated plants and animals, each relying on specific sets of practices, skills and knowledge. These transitions have, in turn, driven major socioeconomic, demographic and cultural transformations. Here, we investigate the drivers and consequences of one such ongoing transition: the sedentarisation of transhumant pastoralists in the Moroccan High Atlas. We collected demographic, economic, and social-network data in a village composed of former nomads (n = 194), complemented by interviews with a convenience sample of 75 current nomads to explore motivations for settling and the challenges encountered when adopting a sedentary lifestyle. Our findings show that sedentarisation is a long and nonlinear process, primarily motivated by the desire to reduce physical hardship and secure educational opportunities for children. Despite substantial economic costs and a lack of immediate improvements in water or food security, most former nomads express no regret about settling, and are able to find in their newfound community networks of social support that are higher than in their previous lifestyle. Paradoxically, settling reduces reliance on the market economy and increases dependence on social ties. As such we conceptualize settling for many nomads as a form of retirement which despite nostalgia for traditional ways of living, they aspire and look forward to.

## Lower song complexity in older singers reveal insight into humpback whale song ontogeny

Jenny Allen · Emma Carroll · Solene Derville · Claire Garrigue

Insight into vocal learning ontogeny is critical to understanding the ecological role that cultural communication systems play. Studies of birdsong development place species into two categories: closed-ended learners with an early-life learning stage, and open-ended learners that learn throughout life. Humpback whales are likely to be open-ended learners; males sing an elaborate culturally transmitted song that changes each year but shows population-wide conformity providing a rare opportunity to examine open-ended song ontogeny in a mammalian species. Previous work on South Pacific humpback song dynamics has shown that over time populations demonstrate an oscillating pattern in song complexity, a feature linked to female mate preference in songbirds. We investigated the relationship between age and song complexity using 23 years of data (1998-2020) from the South Pacific humpback population of New Caledonia. Complexity was quantified for 666 complete song cycles, providing a baseline of population-wide song complexity each year. From this, population-normalized complexity scores were calculated for the songs of 49 identified singers for whom epigenetic age was calculated from tissue samples. Complexity showed a negative relationship with age, with older males singing a less complex version of the song compared to the population as a whole. We hypothesize that this is due to 1) improved learning ability of older males to more accurately match the population song pattern compared to higher variability in less accurate younger males and/or 2) a decreased emphasis on complexity due to the population-wide conformity, which may instead select for features such as consistency or accuracy.

## Mechanistic model of socially structured gene flow

**Niccole Porras Alvarez** · Anne Kandler

From ancient migrations to colonial expansions, previously isolated populations have interacted and admixed. Recent admixture studies have taken a mechanistic approach to describe how gene flow shapes ancestry distributions over time. These approaches are valuable both for understanding the processes underlying admixture patterns and for integrating the inherent complexity of the admixture process. Humans are cultural beings, and cultural markers and norms can shape and bias admixture in ways that we still don't fully understand. In this study, we aim to examine how cultural norms influence the distribution of admixture proportions in a hybrid population through time. Our approach provides a mechanistic link between cultural rules of interaction and the temporal dynamics of admixture. As a case study, we focus on the caste system of colonial New Spain, which offers an example of how cultural structures can affect admixture processes. We consider two source populations contributing to the ancestry of the hybrid population, with cultural norms dictating interactions among individuals. For a random individual at a given point in time, we calculate the fraction of genetic ancestry derived from one of the source populations. By linking cultural structure to genetic outcomes, our model reveals how socially imposed boundaries can leave lasting signatures on the genetic makeup of admixed populations.

## Use it or Lose it: are we losing cultural loss?

**Andreu Arinyo-i-Prats** · Mark Collard · Dennis Sandgathe

Were humans able to survive cold climates without fire? Can seemingly essential technologies be lost yet populations persist? Does well-being get affected when culture is lost? And which modes of cultural loss most strongly shape these dynamics—does demography matter at all? Are we blinded on ratcheting and forgetting to study cultural loss as part of evolution? To address these questions, we developed EMBERS, a model simulating the maintenance of fire in isolated populations that rely solely on wildfire-embers for ignition. Our findings show that cultural loss is the most likely outcome, even under conservative assumptions of perfect skill and knowledge transmission. Under isolation, we identified only three parameters governing loss: variability in the use of fire-foraging skills, expertise decay time, and the maximum pool of experts. Ranking their contributions revealed that increased variability in practice exponentially accelerates loss, expertise decay has a linear effect, and demography is only logarithmically relevant—this last point is consistent with previous modelling work. These results highlight two overlooked modes of cultural loss that dominate evolutionary dynamics: variability in practice timing and mnemonic decay. Unlike previous research, our model predicts that cultural traits not routinely performed, and/or those that decay quickly in memory, are especially prone to extinction. This modelling exercise has important implications for understanding cultural fragility, how it is connected to well-being and identity, the role of ritual and repeated practice, the emergence and maintenance of mnemonic devices, and the limited role of population size in explaining spatiotemporal cultural change.

## Cultural Transmission During Luhya Mourning Rituals

**Stephen Asatsa**

**Abstract.** This study examines the transmission of knowledge during mourning rituals among the Luhya community in Kenya, focusing on what is learned, how it is conveyed, and by whom. Anchored in cultural evolutionary theory, the study employed a mixed-method approach including focus groups, structured observations, and free-listing. We surveyed bereaved adults, bereaved adolescents, community elders, and ceremony leaders to explore ritual transmission. Data were collected from 45 community elders, 30 bereaved adults, 30 bereaved adolescents, and 8 religious leaders through focus group discussions and interviews. Our findings indicate that cooperation, kinship roles, and emotion management are central themes transmitted during mourning rituals. Mechanisms of transmission include admonition, participation, modelling, teaching, and communal singing, with elders and grandparents serving as key knowledge bearers. This research contributes to an understanding of ritual as vital for cultural transmission, emotional processing, and community cohesion. The insights gained could enhance existing mental health support for grief-related complications, and bolster community wellbeing.

## Conservatism as parochialism? Two dimensions of ideology differently predict concern for local, national, and global issues

Quentin Atkinson · Nichola Raihani · Amelie Murphy

Politics connects the evolution of culture and cooperation. Many of the most pressing challenges of our time - from how we respond to climate change and global pandemics, to the provision of universal healthcare and maintenance of security - can be understood as social dilemmas. Liberal versus conservative solutions to such social dilemmas are argued to reflect different evolved cooperative preferences. Some see conservatives as generally less cooperative, while others propose that they simply favour more local forms of cooperation. Moreover, recent work argues that cultural variation in political ideology is best characterised by not one but two basic dimensions, connected to evolutionary trade-offs related to competition versus cooperation and individuality versus group conformity. Here we test these ideas using large representative online samples from both the United States ( $n=560$ ) and United Kingdom ( $n=336$ ) to examine the relationship between various measures of political ideology and concern for a range of local, national and global social dilemmas. We find that while conservatives in the US (but not the UK) are less concerned about the social dilemmas in our survey in general, in both countries conservatives show a greater reduction in concern (relative to liberals) for higher-level (national and global) social dilemmas. Moreover, in both countries, and consistent with our theoretical predictions, it is conservatives characterised by preference for competition (over cooperation) rather than group conformity (over individuality) that show reduced concern for higher level social dilemmas. In fact, for some issues, group conformity is associated with increased concern.

## Co-Evolving with the Gods: Cycles of Economic Life, Devotion, and Gender Norms in Hindu Communities

Feryl Badiani · Nachita Rosun · Rita McNamara · Aiyana Willard

Religious belief and communal norms often co-evolve to help groups meet the socio-economic demands of their environment. We examine this dynamic within two Hindu Indo-linguistic communities in India, Gujaratis and Maharashtrians, who differ in their economic niches. Gujaratis are historically mercantile, relying on family-run trade networks in which trust, reputation, and adherence to convention are essential. Maharashtrians, by contrast, primarily pursue salaried employment, where education rather than communal signalling underpins economic success. Drawing on fieldwork and prior qualitative work, we show that these economic differences map onto distinct religious patterns. Gujaratis primarily pray to Krishna, whose mythology emphasises diplomacy and feminine devotion. This devotion is ritually enacted by women through the caregiving of Bal (baby) Krishna, reinforcing traditional gender roles that publicly signal stability and trustworthiness within merchant networks. Maharashtrians predominantly worship Ganesha, the god of wisdom and learning, whose mythology aligns more closely with their education-oriented economic niche and exhibits looser gender role expectations. Using nationally representative Pew Research Center data (N = 20,503), we tested whether these community-level patterns scaled nationally. Gujaratis, who overwhelmingly worship Krishna, endorsed significantly stronger patriarchal attitudes than Maharashtrians. Nationally, individuals reporting greater closeness to Krishna also scored higher on patriarchal values than those devoted to Ganesha or Lakshmi. Although causality cannot be inferred, these findings suggest that religious internalisation both shapes and is shaped by the cooperative demands of each community, generating a cyclical relationship between economic niche, gender norms, and the gods who embody them. These patterns directly influence reproductive rights policy.

## A tale of two birds: cognitive simplicity drives collective route improvements in homing pigeons

**Shoubhik Banerjee** · Fritz Francisco

Cognitive abilities are central to how animals navigate complex environments. Beyond individual cognition, group living can also enhance navigation by pooling individually acquired information. One way this may be achieved is by following experienced leaders, which requires recognizing expertise within group members. Alternatively, accurate decisions could also emerge without expert opinions, through simpler mechanisms like the ‘wisdom of crowds’ principle that average out individual biases. Consequently, collective navigation strategies range from cognitively complex to simple, and yet, the prevalence or interplay of different collective strategies in nature remains unexplored. In this study, we asked: what is the navigation mechanism(s), requiring minimal cognitive demands, that is necessary and sufficient to quantitatively replicate the experimental results of a 2017 study on homing pigeons (*Columba livia*), which showed that sequential chains of bird pairs flying home, similar to a game of telephone, led to shorter homing routes compared to control birds flying individually or in fixed pairs. Our results show that the experimental data aligns closely with the simplest strategy — route averaging. Surprisingly, the complex mechanism of selectively propagating the best flight through social learning offered no additional advantage. We further observed that mixed strategies, although not supported by the experimental data, in theory combined advantages from both averaging and active selection of better routes, resulting in even greater performance. Hence, our results highlight the potential for future research to investigate selective pressures shaping the evolution of cultural learning and trade-offs among different decision mechanisms theoretically available to social animals in nature.

## On Networks, Trees and Traits: Evaluating Explanatory Power of Network Models in Cultural Evolutionary Research

**Karim Baraghith**

Cultural evolution researchers routinely use network models: phylogenetic trees, death-birth graphs, interaction networks, or trait networks (“cultural systems”). But which model is best suited for which kind of research question? I offer a clear, philosophy of science motivated analysis to match prominent CET research questions to the right model and to say what kind of explanation each model can deliver. I start from six recurring why-questions: branching vs. borrowing; fixation under structure; diffusion routes/speeds; schema reuse across different domains; invariant-driven outcomes; convergence vs. transfer. I then map these onto four network model families (phylogenetic trees, death-birth graphs, interaction networks, and trait networks) and three complementary “modes of explanation” from philosophy of science: causal-mechanical (difference-making components), unificationist (reusable modelling schemata), and topological (structural/mathematical properties of networks that constrain outcomes). Two practical ideas make the framework operational for CET researchers: intrinsic affordances—what a given model already provides to address a certain question, and supplement load—what must be added (minimal dynamics, measurement, or data) for the explanation to carry weight. For practitioners, the payoff is a diagnostic matrix to (i) pick the model that fits the specific why-question of interest, (ii) plan the least additional data/assumptions, and (iii) report limits transparently. For philosophers of science, it motivates a pluralist, non-aggregative view of explanatory strength that travels well across CET subfields. The aim is a checklist that could improve study design, comparability, and review—without forcing a single “best” network model for CET.

## Innovation and Cultural Transmission in Island Ecosystems

**Brendan Barrett**

Innovations, particularly foraging innovations like tool use, are exceptionally common on islands and island-like systems. Yet, these behaviors can become endemic to or localized within an island due to strong spatial ecological gradients or dispersal potential limiting cultural transmission. I review the diversity of foraging innovations on island-living animal populations. I highlight how factors of island ecology--- namely dietary stress, predator-release, climactic perturbations, and inter- and intra-specific competition--- might explain the evolutionary origins of innovations on insular populations. Using insular white-faced capuchin monkeys (genus *Cebus*) as an example, I highlight how island ecology might drive innovation in an exploratory, investigative species by creating the potential for free time in an under-stimulating environment. Lastly, I highlight how species richness affecting potential diet breadth, is an overlooked aspect of explaining the origins of innovations on islands, and how island ecology might inform a more realistic mathematical modeling framework for studying innovations.

## The evolution of cultural diversity and extinction risk in cetaceans

**Kiran Basava**

Numerous cultural behaviors have been documented across cetaceans (whales, dolphins, and porpoises). These include vocal dialects that define different social units, socially learned foraging tactics, vertically-transmitted migratory traditions, and various types of play. As with many other groups, environmental variability has been discussed as a potential driver of behavioral flexibility and cultural complexity among cetacean species. Their capacity for social learning has allowed for behavioral responses to climate change and other human disturbances to the environment, but has also created risks of anthropo-dependence, injuries, degradation of social structures, and other vulnerabilities. As part of the Animal Culture Database (ACDB), this study assembles a dataset of cultural behaviors across cetacean species along with data on environmental variability and conservation status. This will be used to quantify evidence for cultural diversity across the cetacean phylogeny and explore how it evolves, including whether levels of environmental variability predict cultural diversity. Using IUCN Red List classifications and data on anthropogenic stressors, we will also test whether species with greater cultural variation between populations and larger cultural repertoires are less vulnerable to anthropogenic disturbances.

## Identity Mapping Reveals Adaptive Labeling Across Cultural Boundaries

**Adrian Bell** · Paul Smaldino

Individuals assign labels or group identifiers to others depending on the mode and pressures to coordinate or cooperate. Likewise, observed individuals may display identity signals to communicate to which group an individual belongs and with whom they would be willing to collaborate. On this basis a strong theoretical framework has developed over the last few decades, predicting that larger, more ethnically diverse populations will employ a greater breadth of identity categories where ethnicity is the primary focus. Further, in the presence of a clear majority group, out-group observers will select for more coarse-grain labeling while in-group observers will highlight culture-specific roles. We test these expectations by introducing a new empirical approach – identity mapping – where observer-subject free-listing produces a map of label dependencies. After collecting data in the Kingdom of Tonga and Salt Lake City, Utah, we produced identity maps to evaluate expectations regarding how Tongan identity shifts across cultural boundaries. Supporting formal theory, a greater number of labels were ascribed in the larger, more complex U.S. population where ethnic labels were also more salient. For Tongan in-group observers, gender, age, and wealth were the most salient identity groups with strong interdependencies, whereas U.S. out-group respondents used a wide variety of categories including wealth, age, ethnicity, but downplayed gender. These empirical insights highlight clear implications for identity evolution, suggesting new directions for cultural evolutionary models and further development of the observer-subject ethnographic framework.

## Seeing History from Space: How the Built Environment Can Inform Cultural and Social Evolution

**Pietro Beltrame**

Reconstructing the long-term evolution of societies is challenging because direct behavioral evidence rarely survives. What remains are traces—oral accounts, written documents, and artefacts—whose resolution and geographic coverage vary widely across time. As these records thin out, especially before the early modern period, scholars increasingly turn to material culture. Yet while most archaeological evidence lies underground and is costly to excavate, one form of past material culture often still stands in place and at scale: architecture. Buildings constitute exceptionally durable evidence of human activity, but they remain underexploited as quantitative data. This talk introduces a framework for “seeing history from space”: treating the built environment as a spatial archive of cultural and social evolution. By leveraging recent advances in satellite imaging, machine learning, and large language models, we can identify buildings globally, measure their size and form, and infer construction histories from large corpora of texts. Because structures preserve their original locations and their histories are often well-documented, they offer rare temporal and geographic precision for studying the human past at high resolution and large scale. I illustrate this approach using an original dataset of over 55,000 European churches spanning the last millennium. These structures capture the effects and pace of major historical transformations—from the heavy-plow agricultural revolution and the diffusion of Gothic architectural innovations to the shifts in social institutions following the Protestant Reformation. Together, they show how architecture fossilizes cultural and social processes into measurable material signatures that can help disentangle the drivers of long-term historical change.

## Ancient disease and cultural evolution of subsistence and settlement behaviour

### R. Alexander Bentley

We examine how archaeological evidence can be reused to model ancient disease transmission and, crucially, to understand the cultural evolution of subsistence and settlement behaviour. Modern epidemiology benefits from abundant but short-term data, whereas archaeology offers long-term records of how human groups adapted culturally and demographically to recurring pathogenic pressures. Bringing these approaches together yields mutual insight. As a case study, we apply contemporary SIRS (susceptible–infected–recovered–susceptible) models to digitized site plans and regional databases from the Trypillia mega-settlements (post-4000 BC). Here we simulate disease spread on clustered networks to explore how population density and inter-community connectivity shaped the cultural evolution of settlement planning and subsistence interaction. We identify threshold conditions under which outbreaks become persistent, revealing how neighbourhood layouts characteristic of low-density urbanism—together with culturally transmitted norms of inter-community contact—may have been adaptive responses to emerging zoonotic pathogens such as salmonella, plague, and tuberculosis. With relevance for the present century, we discuss how integrating epidemiological modelling ancient pathogen data can illuminate long-term coevolutionary dynamics between disease, demography, cultural practices, and built environments.

## Words, social learning, and co-cultures in dog-human interaction

**Leda Berio**

Relying on recent research on dogs' word use and comprehension (Bastos et al., 2024) and on a view of enculturation as fostering social learning (Berio & Moore, 2023), I argue for two distinct claims. Firstly, I show that these new studies lend additional support to the idea that dog's social learning abilities are an adaptation (Kaminski et al., 2009) and not a byproduct of selection for tameness (Hare & Tomasello, 2005): labels in human-dog communication train their (social) attention and have historically selected for heightened social learning skills; at the same time, dog's high motivation for cooperation with us is what allows them to be more sensitive to our communicative tools, such as pointing and words, in the first place. Secondly, I argue that, considering labels as a bit of technological culture (Heyes, 2018), aimed at catalyzing attention (Lupyan et al. 2007), the particular heterospecific relationship between dogs and humans, despite the wide morphological gap, is particularly apt to be studied in terms of the development of a co-culture (Seuer and Huffman, 2024) resulting from co-evolution (Marzluff & Angell, 2005) of joint attention mechanisms. Labels act as attention boosting mechanisms (Call, Agnetta, and Tomasello, 2008; Lupyan et al., 2007) which allow the dog-human group to establish joint attention and joint commitment local norms that are positively maintained (Westra et al., 2024), informing us more generally on the correlational abilities to join intentionality in the animal kingdom (Genty et al., 2020), on the possibility of interspecies co-cultures, and on interspecific norms.

## Stability and diversity of vocal sub-cultures depend on interaction networks

**Renata Biaggi Biazzi** · Asif Ghazanfar

Across species, vocalizations can be used to mediate social relationships by signaling either affiliation or antagonism. One mechanism by which this function is realized is vocal accommodation, a form of social learning in which individuals modify their species-typical vocalizations to acoustically converge with others. Despite extensive evidence of this ability in many birds and mammals, including humans (e.g., accent adaptation), we lack formal predictions about how individual-level vocal adjustments shape the vocal cultures that emerge within collectives. To address this gap, we developed an agent-based model that simulates vocal interactions among individuals embedded in a diverse range of network structures. We hypothesized that the extent of vocal adjustment and the structure of the interaction network would lead to different group-level outcomes. For example, groups initially exhibiting individual variation in a single vocalization could, after repeated interactions, exhibit either complete convergence on one form (i.e., a stable monoculture) or no convergence at all. Preliminary results confirm these two outcomes, but also reveal a third possibility. Certain levels of vocal adjustment can produce the stable coexistence of multiple variants of the same vocalization (i.e., subcultures). We also explored how network features such as size, connectedness, and hierarchy influence the stability and diversity of vocal cultures. The parameters and results of our model can be directly related to measurable species' traits, providing a means to compare data across humans and other species, and to predict group-level outcomes of vocal accommodation in species for which empirical data are not yet available.

## End of world beliefs are common, diverse, and predict how people perceive and respond to global risks.

**Matthew Billet** · Azim Shariff · Ara Norenzayan

Do you believe the world will end in your lifetime, and does that belief change the way you see existential threats? For many people, this question is real and pressing. End of world beliefs (EWBs) are historically and globally prevalent, but come in many flavors: How soon? What will cause it? Is it avoidable? What will come after? EWBs have been linked to a variety of social perception and behavior, from passive comfort to revolutionary violence. Yet research on EWBs is lacking. We present the results of 6 pilot studies (N=2,079) and a pre-registered study (N=1,409) that establish a framework for EWBs. A measure of EWBs was validated across 6 religious populations (Catholics, Mainline Protestants, Evangelical Protestants, Muslims, Jews, Nonreligious). We find that EWBs are common, vary along several meaningful dimensions, and are uniquely predictive of people's risk perception, risk tolerance, and willingness to support extreme action to address the five most pressing global existential risks as defined by the World Economic Forum's Global Risk Report (i.e., economic, environmental, geopolitical, societal, and technological). Results support the idea that belief in apocalyptic narratives—irrespective of their accuracy—is consequential for how different populations confront concrete risks that threaten humanity today. The social function of these beliefs are explored in light of models of cultural evolution and societal risk.

## Linguistic diversity over the Holocene and the cultural bottleneck

**Damián Blasi** · Claire Bowern · Marcus Hamilton

Linguistic diversity is both a proxy and a cause of human cultural diversity and as such a reflection of our species' cultural nature. Most extant linguistic diversity resulted from a handful of important demographic, social, and technological events during the Holocene. However, contemporary methods are unable to extrapolate past stages of global linguistic diversity over this period because (1) language change is highly sensitive to a host of extra-linguistic factors that have changed substantially over the Holocene, and (2) they are honed for groups of ostensibly related languages (i.e. language families), which leaves extinct and small language groups out of the global picture. In this talk, we introduce a novel set of statistical models to estimate the number of languages that have existed at some point over the last 12,000 years, sourcing contemporary linguistic diversity data as well as insights from paleodemography, human biology, and ethnographic records. We find that the worldwide number of languages immediately before the Holocene was smaller, and that its trajectory until today's 7,000 languages was most likely complex and non-monotonic, with a particularly eventful period of rapid expansion and contraction around 3,000-2,000 years ago.

## Experimental evidence for language-driven cultural evolution of mental models

**Alexandre Bluet**

Language provides humans with a remarkably flexible and abstract means of transmitting information. Here, we tested the hypothesis that language enables cultural evolution to improve our mental models of the world. We investigated the role of language in cultural evolution from a reinforcement learning (RL) perspective, combining experimental data with computational modeling. We implemented a sequential decision-making task, requiring a mental model of the task structure within an online transmission chain design ( $n = 2000$ , 10 generations, 2 treatments). Successive participants completed the task and learned from the previous generation under one of two treatments: language or observation. In the language treatment, participants provided written advice for the next generation; in the observation treatment, they learned by watching their predecessor's performance. Performance improved only in the language treatment, where participants outperformed those in the observation treatment. Analysis also showed that participants in the language treatment had more knowledge about the underlying task structure. Natural language processing of the written advice further showed that model-related content directly explained this increase in task-model knowledge. Using an RL computational model, we found that higher usage of a mental model reflecting the task structure predicted higher task performance and that participants in the language treatment relied on this mental model significantly more. These results confirm that language enabled the transmission of essential model-related information across generations. Overall, these results suggest that language allows cultural evolution to grow better models of the world by successive combinations and refinement of individual mental models.

## Overshooting of (Useful) Cultural Practices

**Francisco Brahm** · **Christoph Loch**

Prior research has traditionally examined how useful practices spread in organizations and how they develop over time. However, it has been observed that practices can “overshoot,” either because there is overdiffusion—some agents adopt to the detriment of organizational performance—or because there is oversophistication—the practice is overly developed, becoming too elaborate and reducing organizational performance. Independent models of over-diffusion and over-sophistication have been proposed; this paper integrates both aspects in a simple and unified model of overshooting. We offer a cultural evolution model that studies how interaction dynamics among employees are able to diffuse and stabilize an equilibrium of under-performing cultural practices, and at the same time, over-develop the practice so its sophistication goes beyond productive levels. People adopt practices from others based on information about the practice’s true productive value (including its decreasing marginal return as it diffuses), but also influenced by social dynamics with other employees, such as social pressure and status. Our model clarifies under which circumstances over-diffusion and over-sophistication can happen, and how these two elements of overshooting relate to one another. We map our model in detail to two cases: process management practices (e.g., six sigma) and Uber’s aggressive culture.

## Population turnover in language evolution explains age-related differences in language preferences

Ellis Cain · Paul Smaldino

'Language' changes over time, both in terms of how it's used and who is using it. Corpus analyses show that syntactic constructions (e.g., Of-genitive: "The fall of Rome" vs. S-genitive: "Rome's fall") rise and fall in popularity (Wolk et al., 2013) and that age cohort differences in the preference for one construction over the other are predicted by those diachronic trends (Cain & Ryskin, 2024). Yet little attention has been paid to the relationship between whole-lifespan language learning and group-level language evolution. We used an agent-based model of Bayesian learners in a social network to explore the relationship between population turnover and syntactic preferences. Every timestep, agents synchronously produce an utterance with a binary feature, listen and update their prior, and age. We tested the influence of population size and expected lifespan ( $\lambda$ ) across a variety of starting conditions. Each agent had an  $1/\lambda$  chance of dying every timestep, at which point it was replaced by a new agent with uninformative priors. Our model successfully replicated empirical patterns of syntactic usages, where the communities developed a preference for a specific syntactic construction, even when each agent started with uninformative priors. Short lifespans delayed, but did not prevent, stabilization of usage distributions. As lifespans increased, the preferences of independently-sampled agent age cohorts became more similar, demonstrating that population turnover is a sufficient condition for age differences in preferences. Our model highlights the importance of considering population composition when modeling the evolution of language and other socially-transmitted constructs.

## Perceptions of Other Nations Produce Selective Cultural Transmission

**Nava Caluori**

Globalization, increased migration, and mass-media are providing more opportunities than ever for cultural transmission across national borders. Some predict this will produce cultural homogenization as culture diffuses from global superpowers. Do individual-level transmission decisions support this prediction of wholesale transmission from prestigious nations? Across three experiments, we examine how perceptions of a nation's prestige shape transmission from that nation, and whether this depends on the domain of cultural information (instrumental vs. value-oriented), and perceived competition with that nation. In a novel advice-transmission paradigm, participants choose whether to transmit advice from a model in another nation to people in their own. In Studies 1-2 (1,361 U.S. participants), we find that the model's nation's prestige increases transmission of the model's advice only on instrumental (e.g. how to succeed at work/financially)—not value-oriented (how to be a good friend/parent)—topics. Perceived competition independently increases transmission of instrumental advice. Study 3 replicates these effects in the U.S. and New Zealand (N=888), culturally similar nations that vary in self-perceived prestige. U.S. participants view competition as a stronger signal of a nation's prestige than NZ participants, and competition does not increase advice transmission among NZ participants. Findings extend theories of prestige-based and domain-specific cultural transmission, as national prestige (and in the U.S., competition) signal esteem in instrumental, not value-oriented, domains. Results suggest that cultural evolutionary processes support selective cultural transmission from powerful nations, challenging predictions of cultural homogenization and suggesting more nuanced forms of cultural change.

## Cultural dynamics in Microcultures: Innovation and Persistence in Octopus Fishing in North Patagonia, Argentina

**Marcelo Cardillo** · Agustín Venzi-Zanazzi · Eugenia Carranza · Florencia Borella  
· Ana Cinti

Microcultures—cultural groups embedded within larger societies—exhibit their own evolutionary dynamics. Their small size and internal cohesion make them tractable units for analyzing cultural change, while still posing the challenges of naturalistic and observational study. This paper presents an interdisciplinary approach to the Pulperos, the self-denomination of those who seasonally harvested the Tehuelche octopus (*Octopus tehuelchus*) along the western coast of San Matías Gulf, North Patagonia, Argentina, drawing on archaeological, anthropological, and conservation biology evidence. Although no direct archaeological traces of octopus capture have been identified, shellfish gathering and fishing date back at least 3,000 years in the region. Octopus harvesting, however, belongs to the oral history of the Mapuche-Tehuelche communities. The contemporary practice emerged in the early 20th century as an economic activity distinct from subsistence, combining European influences—such as the iron “hook” (*gancho*) and Galician techniques—with indigenous knowledge of coastal environments, shelters (*enramadas*), pathways (*rastrilladas*), and marine ecology. At its peak, the activity involved whole families inhabiting the coast during the 4–5-month octopus season, leaving a distinctive archaeological record characterized by opportunistic technological strategies and rapid material innovation. From an evolutionary perspective, the Pulperos microculture illustrates the interplay between the rational exploitation of a predictable resource and cultural behaviors not strictly adaptive in economic terms. Family-based cultural transmission fostered continuity, while archaeological evidence reflects variability and innovation. This case highlights how microcultures shape human–environment interactions, illuminate processes of cultural evolution, and inform current

discussions on resilience and local ecological knowledge.

## How to Measure What's in a Mind

**Matthew Cashman**

Cultural evolution is changing us much faster than genetic evolution, but at present we lack methods for empirically grounding models of cultural evolution analogous to how counting genes in a population empirically grounds population genetics. To address this gap, I develop a method which estimates how much information from a cultural artifact (such as a book) is stored in a mind. This technique uses a classic cloze completion (fill-in-the-blank) task, where subjects guess the next symbol in a random sequence taken from a target work until they get it right. Entropy of the target (e.g. Harry Potter) is estimated with a sample who have read the book, Readers, and a sample of Non-Readers. Retained Novel Information (RNI) is the difference between these estimates, measured in bits per character. Readers make fewer guesses on average and show lower entropy (fewer bits per symbol) relative to Non-Readers because of the information from the book they have stored in their minds. This method is content-agnostic (it does not require deciding what is important to ask about), quantitative, continuous, and denominated in a common currency: bits. Beyond language, it can be applied to anything that can be framed as a cloze completion, from music to chess. Data from 24,000 completions across 473 subjects show a clear signal of exposure to a book and the signal's decay with time. Data from 20,000 completions on class notes across 278 Masters students,

combined with exam scores, speak to external validity.

## **The Who and Whom of Social Learning: How Personality Influences Human Social Learning Strategies**

**Camilla Cenni** · Jennifer Eck · Alex Mesoudi

Social learning, the process of acquiring knowledge from others, is central to human culture. Previous research has identified characteristics of the demonstrator, and to a lesser extent of the learner, that make social learning more or less likely, often treating these two factors in isolation. Yet social learning is inherently dyadic, and the joint influence of learner and demonstrator personality has not been systematically investigated. We address this gap by focusing on the Big Two personality dimensions of Agency and Communion. Unlike the Big Five taxonomy, the Big Two emerge across large- and small-scale societies, including WEIRD and non-WEIRD populations, and are fundamental to interpersonal behavior, making them ideal to study dyadic dynamics. We designed a novel demonstrator-learner paradigm, using large-language models to simulate human demonstrators systematically varying in Agency (assertiveness) and Communion (benevolence). Participants perceived these demonstrators as real humans based on their behavior and personality cues, ensuring the study captures valid aspects of interpersonal social learning. Across three large-scale exploratory experiments (each  $N > 1000$ ) and a preregistered near-direct confirmatory replication, participants interacted with demonstrators described as having either no personal stake or potential benefits from misleading or helping the learner. Demonstrator Agency consistently emerged as the strongest predictor of social learning. Learner Agency also influenced copying, with lower-Agency learners showing greater social learning. Communion effects were modest and dependent on demonstrator incentives. These findings reveal how personality differences jointly influence social learning strategies, highlighting the

interpersonal foundation of cultural transmission.

## **Visual attention networks predict social learning in great tits (*Parus major*)**

**Michael Chimento** · Lucy M. Aplin · Fumihiko Kano

In studies of cultural transmission in animals, co-occurrence networks are often used as a proxy for social learning opportunities. Advances in computer vision and automated data collection methods have created new opportunities for exploring fine-scale behaviour of wild animals, including how they attend visually to other objects. We conduct a cultural diffusion experiment in a wild population of great tits (*Parus major*) using automated 2-option tasks. We 3D-track individually identifiable birds as they interact around the task. Analysis using generative network models of bird's visual attention show evidence for sex-biased attention. We also find strong evidence that birds attend more to others when they are interacting with the puzzle, compared to other contexts. Finally, a multi-network NBDA shows evidence that attention networks, above and beyond co-

occurrence, predict social transmission of knowledge of the task.

## **In search of peace of mind: The quest to decipher whether theory of mind is a culturally universal cognitive trait or a plastic trait**

### **Chirag Chittar**

Theory mind (ToM) is the universal understanding of beliefs, knowledge, and emotions of conspecifics. ToM comprehension could be a significant step in accessing the mental states of others that could facilitate socio-cognitive mechanisms of information transfer such as teaching. However, the test designs implemented (including the classic Sally-Anne test) across diverse communities have produced inconsistent results, contradicting the consistency of the developmental timing of ToM. Communities with diverse social systems, subsistence means, and parental practices have also been largely ignored in false belief studies. In addition, the studies fail to attribute reasoning for the emergence of ToM in human evolutionary history and whether ToM perception is susceptible to cultural/environmental triggers. Our study is the first attempt to conduct a set of variations on the Sally-Anne test (to account for its design limitations) on three hunter-gatherer groups (Agta, Mbendjele BaYaka, and Raute) and farmer groups (Filipino, Bantu, Nepali) from three different countries (Philippines, Congo-Brazzaville, and Nepal) varying in subsistence and access to education. Moreover, our study aims to investigate whether ToM is a universal socio-cognitive trait having a consistent developmental timing across different groups or is triggered by socioecological pressures causing acceleration or deceleration in its development. For the study, access to schooling was considered as a socioecological pressure. Nevertheless, our study found that schooling influenced test passing. The study shows that ToM is potentially a plastic socio-cognitive trait susceptible to different socio-ecological pressures.

## Task and Culture-Dependent Attractors, Not Selection, Shape Evolution in an Experimental Study of 3D Artifact Evolution

Petr Chlup · Petr Tureček

Cultural evolution often involves convergence of artifacts towards stable cultural attractors, arising from systematic transformations guided by cognitive biases or environmental constraints. Clarifying how task goals and cultural backgrounds shape these attractors in continuous multi-dimensional trait spaces is essential for understanding the emergence of stable technological or aesthetic forms, and for distinguishing the influence of attraction from selection. We employed a transmission chain experiment across three populations (Czech Republic, Cameroon). Participants iteratively designed a 3D artifact in a 5-dimensional parameter space to optimize for Engineering (function), Aesthetics (peer-rated appeal), or Averaging (baseline) task. We tracked artifact parameters across three generations and analyzed convergence dynamics using a hierarchical Bayesian non-linear Beta regression model to explicitly estimate the strength and position of cultural attractors. We observed convergence into distinct morphotypes and performance improvement across generations, however, the effect of selection was not significant. Instead, evolution was driven by attractors shaped by task type and cultural background. The Engineering task, with objective constraints, converged toward a single attractor aligned with performance optima. Conversely, the Aesthetics task exhibited weaker convergence and wider distributions, reflecting a complex landscape with multiple optima difficult for participants to estimate. While cultural background influenced attractor positions in both tasks, differences were most pronounced in the Aesthetics task due to distinct preferences. We demonstrate that task-specific and culture-dependent attractors, rather than selection, primarily shape the process and outcomes of cultural evolution in this context. These findings highlight the dominance of attraction dynamics in driving goal-directed cultural adaptation and artifact evolution.

## **Grassroots multilingualism and socio-cultural sustainability. The evolution of linguistically diverse ecologies in Ahuacatlan, Mexico.**

**Bartłomiej Chromik**

In this paper we discuss the combined results of research carried out in the multilingual region of Ahuacatlan in the linguistically diverse area of the Sierra Norte de Puebla in Mexico. According to the last national census of 2020, in the entire municipality 77.51% of residents aged three and older speak an Indigenous language, either Nahuatl and Totonac, most of them living in the communities outside the municipal head town much more assimilated to Spanish. This paper is based on the combined results of the study of historical sources, a quantitative survey and of a multi-layered qualitative research including semi-structured interviews, participant observation and language portraits methodology. After an overview of the historical reconstruction of the evolution of linguistic diversity in the region, we discuss the present-day data that show that grassroots multilingualism, although still present, is becoming fragile. Although Indigenous languages remain the primary means of communication with middle and older generations, the transmission gap is increasing. However, grassroots multilingualism gives access to the local informal economy, while the emic sense of well-being is closely linked to the participation in social networks based on the use of local languages. Accordingly, our research shows that the driving force behind resistance to assimilation have been many forms of informal economy operating in Nahuatl and Totonac, strong social networks based on intra-community and inter-ethnic levels of reciprocal relationships and exchange, as well as access to traditional cultural knowledge facilitating access to the place-based social capital and control over natural resources.

## Inferring Social Organisation from Genetic Data: How Distinct Kinship Systems Can Produce Similar Genetic Signatures

**Willem Church** · Adam Powell

Ancient DNA now enables the reconstruction of multi-generational genetic family trees from prehistoric remains, driving interest in inferring institutionalised kinship norms from genetic data. Current interpretations rely on typological categories—such as “patrilineal” and “patrilocal”—assumed to map cleanly onto distinctive genetic signatures. However, the ethnographic record shows that residence, descent, affiliation, and burial practices frequently diverge, raising the possibility of substantial equifinality in the genetic traces of social organisation. We formalise this problem using an agent-based model that generates multi-generational pedigrees under three often elided institutional logics: strict patrilineal descent, flexible patrilineal systems with incorporation, and patrilocality without descent groups. The model simulates marriage, migration, reproduction, and burial across multiple generations under varying patrilocality rates and taphonomic loss. We subsequently analyse the resulting pedigrees, sex-specific relatedness profiles, uniparental haplogroup diversity, and the effects of taphonomic loss. Analyses of uniparental haplogroups and pedigree structure reveal that (i) haplogroup homozygosity tracks sex-biased movement but is unreliable for distinguishing social organisation; (ii) flexible incorporation yields genetic patterns equifinal with both strict patrilineal and non-lineal systems unless incorporation is frequent; (iii) standard sampling procedures and taphonomic loss systematically homogenise pedigrees, biasing inference toward simplified categories. Our results highlight the importance of formally estimating sex-biased movement, avoiding the conflation of patrilineal pedigree structure with patrilineal organisation, and incorporating all recoverable individuals to reduce systematic error. More generally, our findings highlight the need to translate ethnographically documented social norms, such as flexible incorporation, into explicit models to demarcate the limits of inference from genetic data.

## The Evolution of Human Cooperation: A data-driven archaeological study

Ivan Colagè · Claudio Tagliapietra

Cumulative Cultural Evolution (CCE) generates culturally transmitted behaviors that no single human individual could invent on their own (Boyd and Richerson 1996). Cooperation therefore appears to be key for CCE. Although the literature on cooperation is extensive, we still lack a comprehensive timeline of how cooperation evolved within the Homo lineage. In this study, we address this gap by examining the cooperation requirements associated with more than 100 cultural traits that emerged between 3.3 million and 6 thousand years ago. We define five levels of cooperation inclusiveness (individual, kin, allies, whole band, intergroup) and score the degree to which each level is implicated in the production and use of each trait, based on available archaeological, experimental and ethnographical data. Our analysis shows that cooperation requirements differ markedly between the production of a cultural trait and its use. Production remains largely an individual activity throughout most of the Paleolithic; cooperative production becomes more frequent only around 70–50 thousand years ago and never reaches high levels. In contrast, cooperation in use appears already in early periods and becomes both widespread and intensive after approximately 300 thousand years ago. Statistical analysis of the full dataset (combining production and use) reveals a clear evolutionary trend over the last 400 thousand years: cooperation during production increasingly involves allies, whereas cooperation during use increasingly engages the entire band. Our study offers insights relevant not only for understanding the evolution of past hominin societies but also for interpreting cooperative dynamics in contemporary traditional and industrialized societies.

## Can we track microevolution in Archaeology?

**Alfredo Cortell-Nicolau**

While some recent work in Cultural Evolution has pointed out how archaeological data is unprepared to tackle microevolutionary questions due to its lack of resolution, others have claimed to successfully capture microevolutionary signals in selected assemblages. The question of the feasibility of tracking microevolutionary patterns is not settled, but this cannot stop archaeologists from asking questions where macroevolutionary approaches fall short. Furthermore, there is no single metric that can attest the validity of 'the archaeological record' per se, as this involves several scales and degrees of resolution both in the chronological and spatial levels. Indeed, the archaeological time domain encompasses hundreds of millennia, and the resolution expected cannot be the same depending on the chronological focus of our study. In this work, we highlight the potential liabilities that arise when applying microevolutionary techniques to archaeology if typical archaeological data problems are disregarded. By reproducing a simulation with clear and previously known microevolutionary tendencies, we apply different algorithms to emulate the process of loss of the archaeological record and subsequently mimic the decrease in data resolution which commonly affects archaeological data. We then track whether signals that could account for microevolutionary tendencies can be recaptured under conditions of poor data resolution and apply this to different contexts, situations and models of transmission.

## Traditional political institutions, cooperation, and public goods in Oaxaca, Mexico

Cameron Curtin · Yunitza Vásquez Vásquez · Joseph Henrich

The cross-cultural variation in human cooperation is an evolutionary puzzle. Cultural evolution researchers have proposed that this variation can be traced to differences in social norms and institutions. However, the role of norms and institutions in cooperation remains a topic of debate. Here, we leverage a unique natural laboratory to study the relationship between institutions and cooperation. In the highly culturally diverse state of Oaxaca, Mexico, there is broad variation in the traditional indigenous political institutions by which communities self-govern. Drawing on cultural evolutionary theory, we preregistered the hypothesis that communities with institutions that (1) comprise more powerful norms about service to the community, (2) levy harsher sanctions against defectors, and (3) build more interdependence are better able to mobilize collective action and provide public goods. To test this hypothesis, we applied a preregistered econometric framework to a new dataset that combines secondary data and systematically coded ethnographic data for 418 Oaxacan communities. Results reveal that communities with stronger institutions mobilize more cooperation for the group benefit, such as migrant remittances for public works projects. Moreover, we find that strong institutions have a greater effect in larger communities, while smaller communities are able to sustain higher levels of cooperation in the absence of strong institutions. This offers insights for the scaling up of cooperation over cultural evolutionary time. However, we find little evidence that this cooperation translates into tangible public goods outcomes. This study provides support for the cultural evolutionary hypotheses that link institutions to cooperation and raises new questions.

## Environmental Regimes and the Changing Architecture of Cultural Transmission

Francesco D'Errico · Lloyd Courtenay

How did cultural transmission evolve in the human lineage, and what forces shaped the emergence of increasingly structured forms of teaching and learning? Although climate change is often cited as a major factor influencing hominin evolution, its potential role in shaping cultural transmission systems has not been examined across the long timespan of the archaeological record. This study explores whether large-scale climatic regimes may have influenced how knowledge was transmitted during major episodes of cultural innovation over the last 3.3 million years. To address this, a dataset of archaeological innovations was analysed alongside high-resolution paleoclimate records. Transmission strategies were coded along three dimensions that capture how knowledge can move between individuals: (1) spatial relationships between learner and expert, (2) temporal structuring of learning sequences, and (3) social selectivity of transmission. The analysis applies Fourier-based periodic regression modelling to evaluate the strength of relationships that could exist between transmission modes and climatic phases and environmental shifts. Within a gradual trend toward a complexification of mode of cultural transmission, glacial periods are associated with low investment, observation-based strategies that enable rapid diffusion of simple behaviours within small, fragmented populations. Interglacial periods show a rise of structured, explanation-based and modular strategies involving higher cognitive and social investment, enabling the stabilization of increasingly complex cultural traits. The strongest alignment between climate and transmission systems occurs between 500–200 ka, followed by progressive decoupling after 50 ka, when transmission systems become self-sustaining and less environmentally constrained.

## Outside options and the advent of Inequalities?

**Angarika Deb**

Human societies display a tension between moral commitments to equality and persistent, often legitimized, inequalities. While experimental research highlights prosocial preferences for equal sharing, sociological records show that inequality can become stable, acceptable, even normatively endorsed. What determines then, whether coordination settles on equality or inequality? We examined how individuals trade-off between fairness preferences, partner expectations, and strategic incentives in a series of coordination games. Across four experimental Nash bargaining games, participants had to coordinate decisions on allocating benefits between themselves and their partner. We varied what outside options people have - i.e., their payoffs if they fail to coordinate; what they know about their partners' outside options; what sort of partners (benevolent or payoff-maximising) they are paired with; and what they can predict about future interactions. We found that people generally express a preference for equality—even when they hold substantially better outside options—thereby foregoing strategically advantageous payoffs. However, inequalities reliably emerged when participants interacted with payoff-maximising partners and when they received stable cues about their position of advantage or disadvantage in future encounters. In a fifth study, we found that simple social categorization based on unequal outside options can generate inequalities, highlighting the role of minimal structural information on seeding asymmetric norms. We discuss these patterns in the broader context of cultural evolution, proposing that both equality and inequality function as coordination solutions that become attractive under different informational and social conditions. These results demonstrate how inequalities can arise and persist despite individual-level commitments to fairness.

## Demography in cultural evolution studies: A case for the joint use of cultural and genetic data

Hélios Delbrassine · Massimo Mezzavilla · Eugenio Bortolini

The role of demography in human cultural evolution has been a crucial point of contention among scholars for over 20 years. While pioneering theoretical works have underlined its importance, empirical studies have provided mixed results, sometimes rather pointing at environmental pressures as the driving factor of cultural change. The data on which such analyses were based, however, often showed discrepancies in its nature and/or reliability, making their conclusions difficult to confront and build upon. On the other hand, the last decade has seen an increase in the availability of present-day and ancient genomic data, as well as in methods capable of inferring demographic changes through time from them. In particular, effective population size (a measure of genetic diversity) has been demonstrated to serve as a reliable proxy for census size in humans. Here, we capitalize on recent advances in population genetics to derive demographic histories worldwide and compare them with known cultural transitions, such as shifts between lithic technologies in the Palaeolithic and the emergence of writing. We also investigate the diffusion of mythological motifs around the world and its time-depth by leveraging a global dataset representative of present-day and ancient genetic diversity. Through these empirical works, we start untangling the complex relationship between demography and cultural changes and make the case for an interdisciplinary research framework in cultural evolution studies involving population genetics.

## People do not spontaneously track others' minds in social learning

Pierre Le Denmat · David Schultner

Social learning encompasses processes ranging from model-free strategies (e.g., pure imitation or reinforcement-based learning without internal representations) to model-based approaches (involving constructing models of the world and others' minds). Inferring others' minds (i.e., mentalizing) can optimize learning but is cognitively costly compared to model-free learning. While individuals can flexibly switch between these modes depending on their utility, the conditions under which model-based processes are favoured remain unclear. Building a model of another's mind requires tracking their behavior, even when it is not directly relevant to one's own goals. In this study, we examined whether participants ( $N = 140$ ) spontaneously track a demonstrator's choice preferences during a 4-arm bandit task, despite these preferences being orthogonal to participants' own reward outcomes. Participants accurately tracked the demonstrator's preferences only for choices that related to their own rewards, but not for irrelevant choices, indicating that model-based processes are not deployed automatically but selectively when they serve instrumental goals. A control experiment ( $N = 50$ ) confirmed that this was not due to task difficulty: when incentivized, participants reliably reported all of the demonstrator's preferences. These findings suggest that people mentalize only when it serves their goals. More generally, this supports utility-based accounts of how people allocate cognitive resources in social interaction, and challenges assumptions that mentalizing operates automatically. To further investigate cost-benefit trade-offs in social learning, future work will test whether expectations about future interactions modulate mentalizing processes.

## Disentangling the roles of reasoning and cultural transmission in technological evolution

**Maxime Derex**

Humans are uniquely capable of producing highly efficient tools, but the extent to which this capacity depends on individual reasoning abilities remains unclear. In particular, the respective roles of causal and technical reasoning versus cultural transmission in driving technological improvement are the subject of long-standing debate. We address this question by directly manipulating causal and technical reasoning in transmission chains, where participants sequentially inherit and refine prior solutions. Across two transmission chain experiments, participants ( $n = 900$ ) completed tasks under three conditions: (1) technical reasoning, involving physical tasks and intuitive physics; (2) causal reasoning, where similar causal structures could be exploited without physical context; and (3) pure cultural transmission, in which causal structures were removed. We found that cumulative improvement occurred across generations even in the absence of causal structure, demonstrating that cultural transmission alone can drive technological improvement. While causal reasoning accelerated early improvement by helping participants focus on promising regions of the design space, its impact diminished over time. Notably, technical reasoning offered no added benefit over causal reasoning. By disentangling the roles of reasoning and cultural transmission in technological evolution, these findings have significant implications for inferring cognitive capacities from archaeological artefacts and for reconstructing the evolutionary history of human cognition.

## Social essentialism and adherence to traditional social norms in two South Asian communities

**Ivan Deschenaux**

A body of work in psychology and anthropology suggests that humans have an innate disposition to conceive of certain social categories as if they were biological or natural kinds. Race, ethnicity and caste, this literature suggests, are social identities that humans readily develop essentialist construals of. This tendency towards social essentialism is, in turn, thought to be tightly coupled with discriminatory social norms and intergroup prejudice. The present study, based on original data collected in Nepal and Uttar Pradesh, India, challenges the existing view. Participants ( $n = 283$  in Nepal and  $n = 379$  in India) were administered an “adoption task”, an “intermarriage task”, and a set of items evaluating their reaction to hypothetical violations of traditional caste norms. Response patterns show that, overall, caste is not construed along essentialist lines and violations of traditional norms are seen as unproblematic. However, a non-negligible minority of respondents deviated from this pattern, suggesting that social essentialism and traditional norms prevail in a subset of the population. To characterise this subset, we use the rich geospatial, demographic, economic, and social network data that we have collected for the populations in which the study was conducted. This allows us to model the social “pockets” in which essentialist views are maintained and helps us understand who, within a population, resists change in social norms. With this work, we aim to contribute to the study of caste in South Asia, psychological essentialism and innate biases, and the relation between social norms and social network structure.

## **Beyond punitive high gods: Moralistic supernatural explanations across 114 societies are seldom attributed to high gods and are often reward-focused**

**Danica Dillion** · Joshua Jackson

Moralistic supernatural explanations—attributing events to supernatural reward for moral behavior or punishment for immoral behavior—are thought to coevolve with social scale by promoting cooperation. Yet most cross-cultural evidence focuses on punitive “high gods,” potentially underestimating moralization in small-scale societies and overlooking variation in moral content. We analyze 706 supernatural explanations from 114 historical societies to assess (a) the prevalence of moralistic explanations, (b) their link to social complexity, (c) their reward versus punishment orientation, and (d) their association with different supernatural agents. We find that moralistic explanations are widespread—even in small-scale societies—with 89% of societies including at least one, and on average, 44% of a society’s supernatural explanations being moralized. Moralistic explanations are more common in large-scale societies, but this pattern is driven largely by an increase in supernatural reward, not punishment, with social complexity. Moreover, these explanations are more often attributed to superior gods, deities overseeing communities or regions, than to high gods believed to have created or governed all reality. These findings reveal that moralizing religious beliefs are more pervasive across societies and, in large-scale societies, more focused on reward and associated with a wider range of supernatural agents beyond high gods than previously recognized, challenging the emphasis on punitive moralizing “high gods” in theories of cultural evolution.

## Irreducible cultural variation in Switzerland

**Charles Efferson** · Rafael Lalive

A prominent hypothesis in gene-culture coevolution says that cultural evolutionary processes stabilize group-level differences that would otherwise not be possible. This kind of variation is a necessary but not sufficient condition for the cultural group to be a meaningful unit of organization - and by extension selection - in human populations. While many of us may be comfortable with the notion that cultures vary when regaling party goers with tales from our latest vacation, isolating cultural variation from other forms of group-level variation is a formidable empirical task. The challenge is that cultural boundaries often correlate with others boundaries linked, for example, to the environment or political institutions. The French-German language border in Switzerland offers an unusual opportunity to sidestep these confounds. Using a pre-registered regression discontinuity design, we analyzed several potential discontinuities related to health, reproduction, and well-being. Results show that people in the two parts of Switzerland lead different lifestyles in terms of sleep, social support, and physical activity. They do not differ, however, in terms of diverse outcomes related to fertility, physiological disease, and physiological function. The two groups do differ psychologically, with significant discontinuities associated with major depressive episodes, psychological distress, and suicide attempts. Given that the daily flow of people and ideas across the language border is extreme, Switzerland presents conditions especially unfavorable for the maintenance of cultural variation. Observed variation thus supports the claim that cultural transmission, as a distinct evolutionary process, can and does sustain group-level differences.

## Professional artists' skills transfer to a technologically evolving landscape

**Thomas Eisenmann** · Mar Canet Sola · Levin Brinkmann · Bramantyo Supriatno

Recent advances in generative AI have sparked debate over its impact on human creativity. Here, we define creativity as divergence from known cultural traits: a core mechanism bringing about innovation in cultural evolution. Traditionally, highly trained experts such as professional artists have played a major role as creative actors by building on their extensive skillset. However, this role is now threatened by promises that simple natural language instructions to AI, called prompts, can “make everyone an artist”. Alternatively, professionals’ existing skills might transfer to using this new technology. If so, we would expect them to outperform laypeople even under the constraints of writing prompts for AI. We test this hypothesis by comparing 50 active professional artists and a demographically matched sample of laypeople in a pre-registered experiment. We designed two tasks approximating artistic practices, testing capabilities in both faithful and creative image creation: writing prompts to replicate a reference image, or to move as far away as possible from it. Artists produced more faithful and creative outputs than their lay counterparts, as shown by the average similarity between reference images and participants’ creations. This suggests that the skillset of artists is likely to remain relevant even when using these tools. In an additional explorative comparison, GPT-4o matched average artists in copying accuracy and outperformed them in creativity. However, the top-performing artists exceeded both laypeople and GPT-4o. These outcomes highlight the importance of integrating artistic skills with AI training to prepare artists and other professionals for a technologically evolving landscape.

## The uses of native psilocybin among indigenous Southern African healers

**Eli Elster**

In 2023, mycologists reported a new native species of psilocybin mushroom in Lesotho -- and in their report, they suggested that Basotho healers in the region were using the mushrooms for ritual and medicinal purposes. It was widely noted that, if true, this would make the Basotho the first known culture outside the Americas to display indigenous use of serotonergic psychedelics. Here, I report the first results of in-depth ethnographic fieldwork on Basotho use of psilocybin, based on fieldwork conducted in collaboration with local healers from June-August 2025 and January-March 2026. Prior records of indigenous psychedelic use have focused on intense altered states of consciousness triggered by large doses of hallucinogens. In contrast, I report that Basotho use is generally more akin to 'microdosing': the practice of consuming small, subperceptual doses of a psychoactive substance. These practices suggest a distinct and potentially underreported niche for which human groups may develop techniques for ingesting the psychoactive compounds found in their environments. They also motivate further ethnographic investigation of psychedelic use around the world, particularly in understudied regions like Southern Africa.

## Monetization in Dark Age Scandinavia: Agent-Based Modelling between theory and data

**Natalia Fedorova**

While commonplace today, monetization and the emergence of money unfolded unevenly and variably across the globe, raising questions of how the material-cultural-institutional complex emerged, and how it was transmitted. We consider the case of 7th century Scandinavia, where the appearance of scaettas marks an important step in the history of economic development. scaettas are early silver pennies that started as trading tokens and were eventually co-opted as royal coinage, thus tracing monetization in the area. This transformation from token to coinage is the focus of unresolved debate, to which we wish to contribute a theoretical model based on classic work in the emergence of money (Kiyotaki & Wright, 1989.) and the corpus of modelling work in cultural evolution seeking to understand economic change (e.g. Gintis, 1997). Here, we present a prototype of this model, which addresses the transmission of the coin economy across the North Sea region using Agent-Based Modelling. The model considers the role of Wics (trading centers) in the transmission process, as well as the flows of ideas and material (silver) between them, thus taking a spatial and diachronic perspective on the process of monetization in the area. Given expanding empirical data on scaetta hoards and planned analyses of silver provenance in the region, we construct the theoretical model to eventually provide a close fit with the archaeological data. While parametrizing cultural evolutionary models with data is the goal, we spend time discussing the modelling choices, methodological developments, and assumptions that make this possible.

## The Concept of a Group in Cultural Evolution: Deep Intellectual Roots

**Yael Feitelson**

The concept of a group is discussed in different branches of cultural evolution. Debates over multi-level selection, the individuality-group continuum as part of major evolutionary transitions, human altruism, the roots of humans' sociality, a shift from small to large groups in humanity's pre-history, comparison studies between groups of apes and humans, and more. While explicit discussion regarding groups in cultural evolution spans the last 30 years, I claim that this concept was present in subtle ways since the early years of the field. This talk will provide insight into the deep roots of the concept of a group in cultural evolution. Its perspective is integrated history and philosophy of cultural evolution. Drawing on a rich intellectual history spanning social psychology, anthropology, but mostly focusing on population genetics, this work aims to further our understanding of current tensions in cultural evolution, by studying their roots. I will weave together the stories of key historical figures such as Herbert Spencer, Ronald A. Fisher, Theodosius Dobzhansky, and Richard Lewontin, ending with the pioneering works in cultural evolution from the 1980s by Luca Cavalli Sforza, Marcus Feldman, Robert Boyd, and Peter Richerson. Taking into consideration their scientific work, institutional considerations, and political tensions, but mostly focusing on their theories and concepts. In contextualizing these scientists' work in light of current debates in philosophy of models, I hope to enrich and refine theories and models in cultural evolution today.

## Pathways to Sustainable Behavior Transformations: A Complex Systems Model Integrating Cultural, Structural, and Psychological Dimensions

Kelly Finke · Elke Weber · Corina Tarnita

Meeting near-term climate targets will require rapid cultural transformations, particularly in high-emissions domains such as diet, transportation, and energy use. While structural shifts—such as new infrastructures, technologies, or economic incentives—are central to these transitions, psychological and social processes have the potential to critically accelerate, or stall, change. Yet, many existing frameworks treat these drivers in isolation, limiting our ability to anticipate how behavior-change interventions unfold in complex, culturally embedded systems. We introduce an integrative framework, grounded in cultural evolution and complex-systems perspectives, that captures interactions among five key drivers of behavior change: structural incentives, cultural biases, social influence, history dependence, and the bidirectional link between attitudes and behaviors. To explore how these factors jointly shape population-level dynamics, we implement the framework as a minimal agent-based model. Systematically varying each driver yields a Behavioral Outcomes Map that reveals when specific intervention strategies are likely to be effective and feasible. By treating context-dependence as a navigable design space, this framework offers a principled way to compare, prioritize, and sequence behavioral and structural levers. Critically, it enables researchers and practitioners to probe emergent, long-term, and population-scale dynamics that remain inaccessible to conventional behavioral-science methods. More broadly, our results highlight how integrating cultural-evolutionary and structural perspectives can improve the design of interventions aimed at catalyzing sustainable behavior change.

## High rates of polygyny do not lock large proportions of men out of the marriage market

Laura Fortunato · Rebecca · Sear Hampton Gaddy

There is a widespread belief, in both the scholarly literature and the popular press, that polygyny prevents large numbers of men from marrying by skewing the sex ratio of the marriage market. In turn, the exclusion of men from marriage is thought to lead to negative outcomes, e.g., by fueling crime and armed conflict. We investigate systematically the relationship between polygyny and men's marriage prospects. First, using a demographic model, we show that marriage markets are skewed sufficiently feminine, under a range of realistic demographic scenarios, to sustain some level of polygyny without locking any men out of marriage. Second, through analysis of 84.1 million census records from 30 countries across Africa, Asia, and Oceania between 1969 and 2016, we show that the subnational association between the prevalence of polygyny and the prevalence of unmarried men is negative or null, rather than positive, for almost all countries in the sample. Third, through analysis of the full-count 1880 US federal census, we show that the average prevalence of unmarried men is lower, not higher, across counties of the West with Mormon polygyny, compared to other counties of the West, and to counties of the Midwest and the Northeast; it is higher only compared to counties of the South. Overall, these findings challenge a dominant narrative linking polygyny to negative social outcomes; we discuss their implications for theories that monogamous marriage evolved through a process of (cultural) group selection.

## Cultural Tightness, Democratic Rule-Making, and the Stability of Peer-Designed Norms

**Sergey Gavrilets**

Many prosocial norms emerge not through authorities but through collective discussions among peers. Historical, ethnographic, and experimental work shows that such peer-designed norms can be highly effective, yet their persistence is puzzling because individuals often incur costs to cooperate and sanction violators. At the same time, cultural differences shape how groups respond to democratically chosen rules: democratic processes raise cooperation in some societies but have little or even negative effects in others. Explaining this variability requires integrating cultural psychology, institutional design, and dynamic social behavior. I develop an individual-based model that traces the coevolution of behavior and personal norms in repeated social interactions. Individuals decide whether to cooperate and whether to punish free-riders, adjusting both actions and attitudes through material incentives, cognitive processes, and social influence. Cultural tightness–looseness enters the model by shaping conformity pressures, responsiveness to social information, resistance to change, and the perceived legitimacy and effectiveness of sanctions. Simulations across broad parameter ranges show that tightness is the dominant structural determinant of cooperation and norm stability. Peer-designed norms create a clear “democracy premium” in loose cultures, where democratic processes elevate expectations, boost legitimacy, and strengthen group identity. This premium shrinks around moderate tightness and becomes negative in very tight cultures, where democratic procedures soften enforcement and reduce compliance. The model yields testable predictions about when democratic rule-making enhances or undermines cooperation and clarifies how cultural context moderates the sustainability of peer-designed norms.

## How Organizational Hierarchy Perception Shapes Information Sharing Across Cultures

**Ghizlane Goubraim**

Human societies evolved from small, egalitarian groups to large-scale hierarchical organizations, fundamentally changing how information flows through communities. Cultural learning and transmission depend critically on who shares information with whom, and hierarchy determines these patterns. Yet even within the same organizational structure, individuals perceive hierarchy differently, creating variation in how cultural knowledge moves through groups. How does this variation in hierarchy perception shape information sharing? To answer this, we examined whether people evaluate information differently depending on how hierarchical they perceive their environment. We focused on two characteristics of information: informativeness (specific details) versus plausibility (believable generalities) to understand what gets shared in different hierarchical contexts. We tested 201 participants using workplace scenarios. Results show hierarchy perception is the key driver of willingness to share. Employees perceiving hierarchical organizations share less than those perceiving flat structures. In hierarchical contexts, information flows primarily upward to seniors, creating bottlenecks. In flat organizations, information spreads evenly across all levels. Position matters too: seniors share broadly regardless of structure, while juniors become selective in hierarchical environments. The type of information shared also shifts, informativeness drives upward escalation, while plausibility enables broad sharing. We will also present results from a cross-cultural replication testing whether these patterns reflect culturally-specific hierarchical norms, with employees in France, Morocco, and the USA, where data collection is currently underway.

## Bidirectional influence between social behaviour and social information in wild jackdaws

Luca Hahn · Guillam Mclvor · Ines Fürtbauer · Andrew J King

Social behaviour can determine the transmission of social information among individuals. Conversely, social information about individuals can determine their social behaviour towards others. However, little is known about bidirectional influence between social behaviour and social information use. Furthermore, it remains unclear whether individuals adjust their social behaviour solely based on others' performance without benefitting immediately. Here, we investigated such bidirectional influence in wild jackdaws (*Corvus monedula*) through experiments using RFID feeding stations. To establish how social behaviour influences social information transmission, we characterised social networks and conducted a patch discovery experiment. There was evidence that social information about novel patches spread along the social network. Moreover, individuals with higher degree centrality were more likely to visit at least one novel patch, suggesting a benefit of being well-connected. To examine how foraging performance influences social behaviour, we experimentally enhanced some individuals' perceived "knowledge" by selectively permitting them access to feeding stations containing higher quality food. Subsequently, "informed" individuals were subjected to opportunistic aggressive scrounging attempts (displacement), particularly by "naïve" bystanders using social information about their performance. "Informed" and "naïve" individuals did not show a different change in network position or dyadic associations. Therefore, others responded to the manipulation opportunistically but without appearing to update their information about "informed" individuals across contexts. Investigating bidirectional feedback between social behaviour and social information can advance our understanding of how sociality and cognition might co-evolve in animal societies, with implications for cultural evolution.

## The meanings of kin terms are not adapted for cultural communicative need

Maisy Hallam · Fiona Jordan · Kenny Smith

Kin terms, the words that denote family relationships, are strikingly varied across the world's languages. Different languages encode different aspects of meaning: for example, English speakers distinguish their 'brother' from their 'sister' by gender, while Indonesian speakers distinguish 'kakak' (older sibling) from 'adik' (younger sibling) by seniority. Kin term variation has typically been described as an adaptation to the social reality and communicative needs of communities. For instance, kinship systems may be organised to reflect who belongs to the matriline or patriline, or which cousins are marriageable (Murdock, 1949). However, evidence is mixed on whether these hypotheses are supported cross-culturally (Passmore and Jordan, 2020; Guillon and Mace, 2016); additionally, many analyses rely on outdated kinship typologies rather than examining the semantics of individual kin terms. Here, we used kin term data from Kinbank (Passmore et al., 2023) and cross-cultural data from D-PLACE (Kirby et al., 2021) to provide a more direct test of whether patterns of descent or cousin marriage practice predict kin term semantics. Using an existing measure of the extent to which kinship terms encode particular semantic features (Hallam et al., 2025), we found no evidence that kin term semantics reflect a society's descent type, and only weak evidence that they reflect cousin marriage preferences. Our results suggest that cultural communicative need plays a surprisingly small role in shaping kin categorisation. We propose instead that kin term semantics are primarily shaped by pressures from human cognition (cf. Kemp and Regier, 2012), rather than cognition-external social pressures.

## Cognitive universals and cultural variation in the perception of tonal hierarchies

**Courtney Hilton**

Just as the meaning of a word depends on which words came before it, how a pitch is perceived musically depends on the preceding pitches and rhythms, and on how these musical elements are integrated into a dynamically unfolding mental representation called tonality. Perceived tonally, pitches are not just high or low, but more or less stable, forming a hierarchy of stability relationships. Such tonal hierarchies are a characteristic feature of human music perception. But precisely how this structure is shaped by culture remains unclear. This is partly because tonal perception is so complex and multifaceted, requiring large datasets to disentangle individual, group, and stimulus-level variation. Here, we address these challenges by combining large citizen science data (over 30,000 participants; data collection ongoing) with Bayesian multi-level modelling, exploring a large combinatorial stimulus space comprising 5,280 pairings of probe tones with naturalistic, culturally-diverse musical excerpts. This data-intensive approach revealed clear structural regularities in tonal perception across diverse real-world musical stimuli, while at the same time also revealing substantial variation in the strength of these percepts across, individuals, populations of interest, and musical cultures. What this means for our understanding of tonal perception—and for how the musical mind is shaped by the interaction of cognitive constraints with cultural evolutionary processes—will be discussed.

## When Witch-Hunting Went Viral. A Cultural Darwinian Analysis of European Witch Persecutions

**Steije Hofhuis**

Between the fifteenth and seventeenth centuries, a remarkable concept of witchcraft took shape across Europe, complete with sabbaths, diabolical pacts, harmful magic, and night-flight. It seemed almost engineered to incite large-scale persecutions, so earlier historians explained this “intelligent design” by positing hidden agendas such as the oppression of women, financial gains, or clerical power struggles. Today, however, most specialists agree that no grand plan existed: contemporaries sincerely believed in witchcraft, and the prosecutions often unfolded in fragmented, locally contingent ways. The effects of witchcraft panics were often harmful for communities and even for the actors perpetrating the trials. Most experts thus conclude that no general theoretical framework holds – a favorite among historians. The questions then remain: how did such a seemingly well-designed cultural phenomenon arise? And why did it spread if no one substantially benefited? This paper presents a novel perspective grounded in Darwinian cultural evolution. Drawing on detailed qualitative analysis of historical documents and specific witchcraft panics in early modern Germany, it will be argued that the concept of witchcraft was a gradually evolving “design without designer.” Numerous cultural variants regarding witchcraft emerged, but only those best adapted to their historical context survived. Ideas and practices that accidentally fueled new and larger witch persecutions evolved into an increasingly contagious concept. Historians have often compared witch-hunting to epidemic disease, but only as a figure of speech. This presentation, however, genuinely views witch-hunting as a ‘selfishly’ reproducing cultural phenomenon that spread at the expense of its human hosts.

## **Chance as a (non)explanation: A cross-cultural examination of folk understanding of chance and coincidence.**

**Ze Hong**

Causal explanations are a key component of human cognition. While we possess certain causal models of the world that offer satisfactory explanations for a range of phenomena, our cognitive capacities have their limits when dealing with the complexities of the world, leaving the causes of many events elusive. In this talk, I integrate ethnographic and historical evidence to show that, despite our limited understanding of why certain events occur, people throughout human history and across diverse societies have seldom invoked “chance”—a concept that has gained significant importance in contemporary, modern societies—as an explanation. Instead, they frequently propose putative causal relationships or posit intermediary entities such as “luck” to account for why specific events unfold within their particular spatial–temporal contexts. I discuss the psychological, cognitive, and cultural evolutionary factors that hinder the development of chance-based explanations and argue that the conceptualization of chance as something measurable and its subsequent acceptance as a legitimate explanation emerged relatively late in human history, marking a pivotal intellectual shift with profound implications on how we perceive and manage uncertainty in our daily lives. (PsycInfo Database Record (c) 2025 APA, all rights reserved)

## Exploring cultural variability in the D-PLACE using spatiophylogenetic models

Václav Hrnčíř · Simon Greenhill · Fiona Jordan · Russell Gray

The past decades of empirical macroevolution studies have shown that different cultural traits have different evolutionary trajectories. Some traits have been transmitted primarily vertically from ancestral to descendant populations, while others spread rather horizontally among contemporary, typically neighboring populations. In this talk, we will present the results of our study analyzing 26 binary cultural traits of a global sample of 962 societies from the D-PLACE (Database of Places, Language, Culture and Environment). The traits include various categories, from subsistence, to marriage rules, kinship, class differentiation, community organization, and house construction. We use recently developed spatiophylogenetic models to quantify the influence of genealogical inheritance versus geographical diffusion for each cultural trait. We use a global phylogenetic language tree to model genealogical relationships between societies, and spatial Gaussian processes to model spatial dependencies. Our study brings a new approach and set of results within the long-standing debate on the role of space versus phylogeny in shaping patterns of cross-cultural diversity.

## Pox, Piety and Paradox: The Economics of Vaccination in British India

**Malik Hussain**

This paper presents new historical evidence on the cultural roots of vaccine hesitancy and its medium-term effects. Using a newly compiled district-level dataset with religion-specific vaccination rates across colonial India (1868-1878), I examine how Hindu religious beliefs affected smallpox vaccination uptake. An instrumental variables approach using historical Hindu temple desecration sites shows that a one standard deviation increase in Hindu population share leads to a 0.89 to 1.98 percent- age points decrease in Hindu vaccination rate at the district level. These effects are specific to Hindu populations and operate through religious and cultural practices. By 1891, a one standard deviation increase in Hindu share is associated with 17.7 and 12.6 percentage point increases in unmarried and widow ratios among young adults aged 10-25. The findings highlight the societal impact of culturally-driven vaccine hesitancy and guide culturally sensitive health policies.

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## Self-organized institutions in evolutionary dynamical-systems games

**Kenji Ito**

How do communities self-organize social institutions to manage a changing environment? Institutions are systems of shared norms and rules that regulate people's behaviors, often emerging without external enforcement. They provide criteria to distinguish cooperation from defection and establish rules to sustain cooperation. To address the mechanisms of their emergence, we introduce the evolutionary dynamical-systems game theory that couples game actions with environmental dynamics and explores the evolution of cognitive frameworks for decision-making. We analyze a minimal model of common-pool resource management, where resources grow naturally and are harvested. Players use decision-making functions to determine whether to harvest at each step, based on environmental and peer monitoring. After evolution, decision-making functions enable players to detect selfish harvesting and punish it by degrading the environment. This process leads to the self-organization of norms that classify harvesting actions as cooperative, defective, or punitive. The emergent norms for "cooperativeness" and rules of punishment serve as institutions. The environmental and players' states converge to distinct modes characterized by limit-cycle attractors, representing temporal regularities in socio-ecological systems. These modes remain stable despite slight variations in individual decision-making, illustrating the stability of institutions. We measure evolutionary robustness of decision-making functions, defined as the capacity to keep dominance against invasion. It is revealed that plasticity, the ability to adjust actions to cope with diverse opponents, allows for such robustness. This work introduces foundational concepts in evolutionary dynamical-systems games and elucidates the mechanisms underlying the self-organization of social institutions.

## Generosity and Reputational Concern Across Cultures: Networked Dictator Games in Five Countries

Poorvi Iyer · Komal Chauhan · Cody Ross · Sarah Alami

We conduct experimental economic games to study how reputational stake influences people's decision-making. Players make a series of "Dictator Game" decisions, splitting an endowment between themselves and a recipient. Crucially, recipients are not anonymous strangers but are other community members, presented via photo. By varying the identity of the recipient and whether they will come to know the identity of the donor, we effectively vary the reputational exposure of the donor's decision. We expect that players will be more generous when their decisions have greater reputational stake. This greater reputational stake could come from: the revelation of the donor's identity, the social proximity of donor and recipient, and their respective network positions. We conduct these games in eight rural communities in five countries (India, Colombia, Nepal, Morocco, and Mexico), where we already have full sociodemographic and social network data. While there is substantial cross-site variation in the average amount given (implying different cultural norms), we find strikingly similar effects of social proximity and revelation across sites. Donors give more of their endowment to friends or friends-of-friends, as opposed to more distant recipients. We further find a small but consistent effect of revelation on Dictator Game allocations: donors give more of their endowment when their identity is revealed, as opposed to being kept anonymous. The heterogeneous ways in which revelation interacts with social proximity and network position, and how these, in turn, shape reputational judgments of givers, carry important implications that we examine further.

## How Social Media Distorts Cultural Evolution

**Joshua Jackson** · Curtis Puryear · Hongkai Mao · Nour Kteily

Social media discourse has changed dramatically and distinctively over time. Using data from over 2.1B Reddit comments and 9.7M Twitter posts, we find that social media discourse (but not online news) became more moralistic and negative from 2013-2021. What explains these changes? We point to two ways that social media distorts cultural evolutionary processes. First, many sites use engagement-based algorithms, which move posts with views and shares to the top of newsfeeds, distorting users' perceptions of discourse norms. Using two experiments (N = 6,170) and a field study on BlueSky (N = 1,600), we show that participants randomly assigned to use engagement-based algorithms come to overestimate the prevalence and acceptability of moral blame compared to participants assigned to chronological algorithms. Engagement-based algorithms lead users to misperceive engaging but rare content (e.g., moral blame) as popular and widespread. Second, sites like Reddit organize discourse into topic-based threads. Although threads allow users to sort by shared interests, they lead users to increasingly disagree in an effort to offer new perspectives on the same topic. We find evidence for this account in an analysis of 115,961 threads, where users increasingly disagree as the thread becomes longer. In two experiments (N = 6,000), we replicate the effect when users are incentivized to differentiate themselves, but not when they are incentivized to conform. Together, our multi-method studies offer complementary cultural evolutionary mechanisms for why social media has become more negative and moralistic. New forces are reshaping cultural evolution in the digital age.

## Does synchronized singing enhance social bonding more than group conversation?

Zixuan Jia · Patrick Savage

The evolutionary function of music has long been debated. While Steven Pinker (1997) described music as “auditory cheesecake,” other scholars have argued that music may have evolved for adaptive purposes, such as signaling mate quality (Miller, 1999), strengthening social cohesion (Savage et al., 2021), soothing infants (Dissanayake, 2000; Mehr & Krasnow, 2017) and advertising coalitions (Hagen & Bryant, 2003), etc. Although reconstructing the original evolutionary mechanisms is challenging, the Music and Social Bonding hypothesis (Savage et al. 2021) proposes a concrete and testable hypothesis: music is particularly effective in rapidly enhancing social cohesion within large, complex groups, compared to other forms such as language, laughter, etc. This talk aims to test this hypothesis by addressing the question: Does synchronized singing enhance social bonding more than group conversation? We plan to present the full data from approximately 1000 participants across around 40 global sites, comparing changes in bonding scores after group singing, recitation, or conversation. Data collection is expected to be completed by February 2026, in accordance with our Registered Report protocol (Savage et al., 2024). Preliminary results ( $n = 315$  participants from 15 language/sites) indicated that group singing enhanced social bonding more than group recitation or conversation, with 24% increase compared to 16% or 17% increase, respectively. Additional exploratory analyses will also be conducted to examine how factors (such as age, musicianship, etc.) may influence social cohesion. Overall, this talk contributes to a better understanding of the evolutionary function of music, and the relationships among music, language, and social cohesion.

## Network structure explains intellectual discourse across human history

**Katie Johnson** · Alyssa Ortega

The production of knowledge is a collective endeavor. Scientific discovery, for instance, reflects not only the insights of individual scientists but also interactions among scientists. This is often taken to reflect social influences on collective epistemic vitality, the capacity to generate and synthesize new ideas. However, in science, it is difficult to separate intellectual influence from access to material resources, such as equipment and grant funding, since networks of collaboration influence the circulation of both intellectual and non-intellectual resources. Here, as a strict test of how social structure shapes intellectual discourse, we use the three-thousand-year history of a human debate in communities that relied on intellectual argumentation (rather than, say, empirical experiments). Building on the work of historians and sociologists, we digitized and quantified the time-evolving network structure of interaction among intellectuals ( $N = 3187$ ), broadly construed, from religious debate in ancient India (c. 800 BCE) to 20th century debates about the logical foundations of mathematics in Europe and North America. We find that the production or preservation of knowledge by a community is explained by its network structure but not with overall levels of antagonism, suggesting that how communities are organized matters more for intellectual progress than how contentious they are. Extending tools from collective intelligence to intellectual history, we call for an integration of the science of science, the philosophy of science, and the history of ideas to forge a comprehensive understanding of the social dynamics of knowledge.

## Rejection and Ghosting with Reputational Costs

**Katrina Johnson**

Women often face retaliatory costs for rejecting advances from men. In The Ghosting Game, the decision to accept or reject an offer depends on a recipient's belief about the proposer's likelihood of retaliating after rejection. A third strategy, ghosting, allows recipients to exit an interaction without directly accepting or refusing, avoiding immediate retaliation. Building on insights from Walk Away strategies in iterated game theory (Aktipis, 2004), we extend The Ghosting Game into an agent-based model in which agents learn from repeated interactions, update social beliefs about potential partners, and selectively "ghost" men perceived as retaliatory. Our model also incorporates reputational costs and learning dynamics on behalf of male agents: when female agents ghost or avoid retaliatory male agents, men agents lower their offer rates to women who are known to reject, contributing to patterns of dating withdrawal and social fragmentation. We show how dynamics such as dating freezes, widespread ghosting, and coordination breakdown can emerge even when only a small minority of agents retaliate. The model illustrates how coercive norms can propagate through a population not because coercion is common, but because the possibility of retaliation reshapes collective expectations. Our results therefore highlight how expectations about coercive behavior can stabilize and spread as cultural norms through risk avoidance and iterated social learning, even when underlying behaviors are rare.

## A Coherence Framework for Narrative Decision-Making Under Uncertainty

**James Holland Jones**

The genus *Homo* emerged on the East African mixed savanna in a period of intense climate volatility. Decision-making can be challenging when variability is high, when change is non-stationary, or when choice complexity is especially high. These characteristics define uncertainty, a condition in which it is impossible to know the full distribution out potential outcomes. Clearly, when full distributions are unavailable, decisions based on the moments of distributions (e.g., mean, variance) are not possible. I suggest that humans adapted to the need to make decisions under uncertainty. The key tool in the human decision-making arsenal is narrative. A narrative is a temporally-ordered causal structure that can communicate meaning, affect, valence, affect, etc. Narratives also have the property of being easily transmitted. The quality of a narrative from the standpoint of decision-making cannot typically be assessed by standard accuracy criteria. Instead, the quality of a narrative depends on its coherence. Coherence is a property both of the narrative itself but also its compatibility with existing accepted narratives. I develop a theory of narrative coherence by building on Thagard's principles of explanatory coherence. Unlike an explanatory network, a narrative is a directed graph. I show that coherence is a property of the existence of directed cycles and semi-cycles involving coherent elements. I suggest that the coherence criterion is a powerful feature of narrative decision-making in information-poor ecologies. This same feature can become problematic in information-rich ecologies.

## Phylogenetic reconstructions of Polynesian medicinal plant use reveal adaptive strategies

Fiona Jordan · Julie Hawkins · Catherine Martinez

Modern migrants using plants to meet their health needs are known to conserve traditional knowledge, but also to innovate to adapt to their new environment. The voyage into Polynesia is amongst the most remarkable of human migrations, resulting in the peopling of isolated archipelagos. We use this context to determine the role for adaptation in plant-based healthcare at pre-historic timescales. Our dataset of Oceanic ethnobotanical knowledge includes recognition of traditional and indigenous knowledge-holders, in an effort to raise their visibility in cross-cultural analyses. Testing the extent to which the new floristic environments encountered, cultural ancestry, or geographic proximity predict the composition of ethnopharmacopoeias, we reveal adaptation to new floristic environments across 20 Oceanic ethnolinguistic groups. Reconstructions using data that encompass therapeutic applications and plant parts reveal more many of the plants used cross-culturally have use likely to be innovations by the first migrants into Oceania. There are non-tree-like patterns in therapeutic applications and plant parts used, showing that even when plants have continuity of use there is lability in how they are used. Our study highlights the remarkable flexibility of Polynesian people seeking to meet health needs.

## The effect of culture on children's reality-judgements of natural, supernatural, and fictional entities.

Rohan Kapitany · Thalia Goldstein

Are children's reality judgements of natural and supernatural entities trait-like? Do they vary temporally according to consistency and quality of evidence, or do they exhibit robustness and consistency once learned? Several factors likely contribute to children's reality judgements: direct experience, indirect experience, the quality and source of testimony, and symbolic/ritual commitments (i.e., religious celebrations). Some entities are directly self-evident due to routine physical encounters (like cats, or grandparents). However, some entities are only experienced indirectly (via media or testimony/discussion), while a select few - cultural and religious entities - are supported by symbolic ritual commitments. We asked ~130 UK-based parents to interview their children (Mean age at T1 - 5.80 years, SD = 1.06) and report reality judgments on 14 entities once per month over 12 months. The targets included: Santa Claus, The Tooth Fairy, The Easter Bunny, [a] T-Rex, Germs, Aliens, Vampires, Ghosts, Princess Elsa, Spiderman, [their] God, a real adult in the child's life, a real adult from media, and a child's friend. We intend to quantify the cultural, social and cognitive-developmental factors that contribute to enduring reality judgements. Specifically, we will examine how the seasonal occurrences of religious/cultural festivals (e.g., Christmas and Easter), as well as indirect (media) exposures influences reported reality judgements on natural, supernatural, and fictional entities. We will also examine the degree to which 12-months of socio-cognitive development uniquely explains and interacts with these factors.

## Spatial Dynamics of Cooperative Sustainability in Chimpanzees and Bonobos

**Stephan Kaufhold**

Common-pool resources (CPRs), i.e., shared, depletable resources that can be accessed by anyone, pose a challenge for group-living species because individuals must balance immediate gains against the long-term benefits of collective restraint. Experiments with dyads of children show they coordinate through fairness, whereas chimpanzee dyads succeed through dominance-mediated inequality. However, dyadic paradigms provide limited sociological validity and cannot capture how cooperative sustainability emerges when individuals can freely associate, intervene in others' behavior, and act within existing dominance structures and sex-biased hierarchies. To assess group-level strategies in a naturalistic setting, we tested two chimpanzee and two bonobo groups using a renewable, collapsible CPR apparatus accessible from the apes' everyday enclosures. The apparatus continuously dispenses a valuable food resource at regular intervals but can be collapsed at any time for a modest, immediate one-time windfall, a tradeoff against the larger yield that can be achieved through sustained restraint. This creates a weakest-link problem in which group success depends on the behavior of each individual. Sustainable outcomes depend not only on restraint, but also on how individuals position themselves, approach the resource, avoid conflict, and regulate others' access. To capture these dynamics, we combine fine-grained behavioral coding (co-feeding tolerance, dominance interactions, sex-inequality indices) with a hybrid computer-vision multi-animal tracking pipeline. This provides precise measurements of trajectories, spatial configuration, proximity networks, and displacement patterns. Integrating spatial and behavioral metrics, we present preliminary cross-species data showing how group structure, movement, and social affordances shape cooperative sustainability in great apes.

## A typology of value systems and their historical origins

**Nick Kay**

The Schwartz Theory of Basic Values identifies ten universal values that guide behavior across cultures, but people differ in how they resolve conflicts among values. In Study 1, across 14 large datasets, 747,358 participants, 95 countries, and two decades, we used Latent Profile Analysis to reveal three value systems that recur across countries and time—Stability Seekers (emphasizing security, tradition, conformity), Status Seekers (emphasizing power, achievement), and Experience Seekers (emphasizing self-direction, stimulation). In Study 2, we zoom in on regional variation in the prevalence of these value systems across Europe (European Social Survey; 332 regions; 365,483 participants), examining the effects of historical shocks on modern value systems. Using Instrumental Variable analyses, we test whether variables such as Black Death mortality, Protestant diffusion, Napoleonic reforms, industrialization, and Cold War divisions can provide causal explanations for why different value systems are more or less prevalent across European regions, illuminating the historical forces that have shaped the cultural evolution of these value systems.

## The Power of Words: How Language Transforms Social Norms

**Daniel Kelly**

We develop a distinction between unarticulated and articulated norms and argue that it tracks a cluster of consequential differences in the underlying cognitive and social processes that affect how they are they are learned, transmitted, and enforced. While articulated norms continue to be processed by many of the same psychological mechanisms as unarticulated norms, expressing a norm linguistically carries several distinctive effects. First, individual norms are rarely acquired one at a time. Rather, proper adherence to an articulated norm typically requires some grasp of a larger package of norms, including those connecting it to formal and informal institutions. Second, articulating norms makes them more transmissible both within and across populations. Third, articulation allows individuals' norm-relevant behaviors to become the subject of social commentary and gossip, making it possible for communities to better keep track of individuals' reputations for compliance and transgression. Fourth, articulating norms brings them into the "space of reasons," allowing communities to treat norms themselves as objects of critical attention. C communities can then engage in public debate about those norms, and individuals can deliberate about whether to avow or disavow the norms of their communities. Finally, norm articulation creates a series of potential traps for those trying to change norms: the fact that a norm has been explicitly articulated can create the illusion that it is a discrete entity, easy to change, obscuring the fact all norms are interwoven into a larger social fabric, entangled with a variety of other norms and an array of psychological processes.

## Language-like statistical structure arises in culturally evolving communication: evidence from birdsong

Simon Kirby · Ellen Garland · Miki Takahashi · Inbal Arnon

All human languages have statistically coherent parts (e.g., words) whose distribution follows a power law (Zipf, 1948). These properties arise in language because they facilitate its faithful cultural transmission (Arnon & Kirby, 2024). Recently, the same two properties were found, for the first time, in another species which, like humans, have culturally evolving communication: humpback whales (Arnon et al. 2025). This makes the strong prediction that this statistical structure, previously thought to be uniquely human, will be found wherever complex communicative signals are culturally transmitted. Bengalese finch song provides an ideal test for this prediction because it is learned, culturally transmitted, and song development is well-documented (Okanoya, 2004). In this paper, using the exact same tools that have been applied to human language and whale song, we reveal that Bengalese finch song has statistically coherent sub-sequences whose distribution follows a power law. In Bengalese finches, unlike in whales, we also have data on song development and can track changes in structure over the lifetime of the bird. We show that statistical coherence increases over time, but the power law is present throughout, suggesting it reflects a fundamental organizing principle of learned representations. Finding these parallels between three evolutionarily distant species illustrates the importance of learning and cultural transmission in shaping communication systems and suggests that core properties of language arise through convergent evolution.

## Beyond network size: How interaction structure shapes language evolution

**Alexey Koshevoy**

Population size is often claimed to determine communicative outcomes, with larger groups producing more systematic conventions in language experiments. However, the mechanisms that yield these effects remain unclear. In this talk, we argue that population size influences communicative outcomes indirectly, through its impact on the structure of interactions. As group size increases, participants typically experience interactions with more partners, but also less interactions with the same partner, thus changing the distribution of interactions per pair and per participant. We suggest that this change in interaction structure, rather than population size itself, drives the observed effects on communication. Using a simple model, we manipulate population size and interaction structure (frequency of interactions between agents) independently. We show that when the number of interactions per participant is held constant, the effect of population size on communicative success disappears. Conversely, increasing interaction frequency within a fixed population reproduces the apparent effect of larger groups. Moreover, we test our predictions by reanalyzing data from recent studies that explored the role of network size in the emergence of conventions. Taken together, our findings suggest that the effect of population size is likely mediated by the structure of interactions within the group, which determines how conventions spread and stabilize.

## Teaching Under Constraint: Biases, Trade-Offs, and Cultural Transmission

**Nyatefe Kufoalor** · Sarah Alami

Teaching is a deliberate and central pathway of cultural transmission, yet its selective nature is often overlooked. Because teaching requires time, effort, and sometimes risk, teachers cannot invest equally in all learners, raising the question of who gets taught when teaching is costly. We address this question by building an agent-based model, focusing on three qualities of learners that might influence a teacher's choice. Aptitude reflects a learner's ability and thus the net cost of instructing them. Closeness refers to the distance between the teacher and the learner in a network, which can generate altruistic motivations for teaching (for instance, because of indirect fitness benefits). Centrality refers to the learner's position within the network and thus the potential reputational benefits of teaching them. To investigate how these attributes matter under constraint, we systematically vary teaching costs and attribute bias within the model, exploring how different incentive structures for teachers can impact the distribution of knowledge or beliefs over time in a network. By generating testable hypotheses about the role of teaching biases on knowledge acquisition and distribution, this study serves as a starting point for a broader research program that will incorporate experimental methods and cross-cultural comparative studies.

## Differential benefit estimation in an extreme ritual in Mauritius: A modification of costly signaling theory of religion

Radek Kundt · Martin Lang · Pushkar Puryag

The canonical costly signaling theory, applied to the case of human cooperative signals in physically demanding and harmful rituals, focuses on the differential estimation of costs. Due to habituation, committed members of religious groups who have been socialized into their communities since childhood are argued to estimate the costs of ritual participation as lower than outsiders. Modifying this theory, we propose that, in addition to cooperative benefits, committed members also believe in supernaturally induced benefits, which motivate participation in extreme rituals and stabilize their effects on cooperative assortment. Using Thaipusam Kavadi as a prototypical costly ritual, Tamil (ingroup) and Christian (outgroup) participants in Mauritius (N = 369) assessed the costs and benefits of participating in Kavadi or hiking. We found that ingroup participants estimated material costs as larger than outgroups, physical costs as lower, and benefits as larger. These findings suggest that estimated costs may vary by modality and cultural expectations (e.g., Kavadi participants are not supposed to display pain). At the same time, supernaturally induced benefits were consistently reported as larger by ingroups compared to outgroups. We conclude that differential estimation of ritual benefits, rather than costs, is key to the persistence of extreme rituals and their function in the assortment of committed members, effectively modifying the cost-benefit trade-off that individuals compute when deciding whether to signal.

## Cognitive computations underlying ritual evolution and persistence

**Martin Lang**

From petitionary prayers to collective ceremonies, rituals are found across time and space in every known human culture, yet their evolutionary functions remain debated. Two major hypotheses currently dominate evolutionary theories: rituals as practices intended to intervene in an uncertain world, and rituals as signals that stabilize cooperation and group cohesion. These accounts imply different pathways for how rituals are learned, transmitted, and maintained, and both find support in contemporary data. In this talk, I will synthesize recent empirical evidence from our lab relevant to each functional pathway and examine the cognitive computations that could support their emergence, including culturally transmitted expectations about ritual efficacy, accumulated affective and social reinforcement during performance, and the preferential retention of practices that appear to yield benefits. Together, understanding the cognitive computations underlying ritual performance can inform cultural evolutionary explanations of why some ritual forms persist, transform, or decline across generations.

## Testing cultural adaptation in industrial agriculture

**Taylor Lange** · Timothy Waring · Brian McGill · Nicholas Gotelli

The cumulative performance improvement of cultural practices, institutions and technologies in a population is termed cumulative cultural evolution (CCE). Although this process is presumed to be common in human societies, empirical investigations of CCE are often encumbered by extensive data requirements and confounded by the possibility of individual creativity. As a result, CCE has mostly been studied in experimental or archeological contexts, rendering tests of theoretically essential population-level factors like size, network structure, or standing trait diversity difficult to test. Here, we attempt to bridge this gap by studying adaptive cultural change at the population level in industrial agriculture using a long-term government data set. We construct a measure of adaptive response in commodity crop agricultural planting at the level of a US county (population level) by measuring the relationship between changes in current crop planting behavior (area planted) and previous changes in local crop performance (per acre yield). We then test how a set of population-level evolutionary predictors, including population size and density impact adaptive response. We find substantial variation in adaptive response across counties, and that those with greater population densities tend to show a greater degree of adaptive response. Finally, we conduct a multiverse analysis of our adaptive response measure to test the impact of different imputation methods on our results, and find they are relatively similar across data processing decisions.

## Social learning and information transmission in online chess

Egor Lappo · Marcus Feldman · Noah Rosenberg

Quantitative analyses of social learning in human cultural systems are central to the study of cultural evolution. However, such analyses are often hindered by difficulties with precisely characterizing and recording specific behaviors. In this study, we utilize the precise records of billions of online chess games on the Lichess platform to characterize social learning and information transmission across many opening positions. Analyzing the frequencies of specific opening moves over time, we find that online players imitate the past move choices of professional players, indicating the presence of social learning. In particular, players at many levels utilize social learning from professionals in many positions that are reached at the end of specific named openings. The role of negative frequency-dependent bias (anti-conformity) in move choices increases with player skill and is strongest in positions for which a small set of moves is regularly played. In general, across thousands of board positions, we observe that strategic use of social information varies with player experience and board position. Our study provides a model for analysis of large datasets of precise human behaviors for which cultural dynamics are affected by multiple types of social influences.

## Why cultural traits become cultural packages

Patrick Lauer · Anne Kandler

Cultural traits (e.g. behaviours, beliefs, material culture) are often interrelated and transmitted together. Such 'packaging' underlies the formation of complex culture such as technologies or social institutions. However, little is known about how links between socially learned traits emerge and stabilize to form these cultural packages. Here, we address this question by proposing a formal model of cultural linkage, drawing on insights from modifier theory in population genetics. Specifically, we build on models of recombination modification, in which a selectively neutral trait, influences the recombination rate between two traits under selection. Some cultural trait combinations interact epistatically, meaning the fitness or benefit of certain combinations is more or less than the sum of their parts, as is the case for many technologies. In our model, the modifier trait represents a tendency to learn traits in packages or acquire them independently, while individuals are subject to cultural transmission biases. We explore how the interplay between trait interdependence (cultural epistasis), initial trait frequencies in the population, and transmission biases drives the emergence or breakdown of links between traits. Without transmission biases, the evolution of the modifier follows the direction of associations between trait combinations under selection (linkage disequilibria). However, even slight transmission biases can cause strong deviations from this pattern. Moreover, the formation of links is highly dependent on the initial variant frequencies. Taken together, we propose a mechanism by which cultural packages can form or break depending on trait interdependence, selection, initial conditions, and transmission biases.

## Reimagining International Collaboration in Anthropology: Tanzania as a Case Study

**Dunstan Matungwa · David Lawson · Alyssa Crittenden · Alexander Ishungisa**

Anthropology offers remarkable insight into human cultural and biological variation. Yet, the discipline, including cultural evolution research, remains tainted by colonial legacies and extractive research practices that privilege researchers and institutions in high-income countries (HICs), while often relegating low and middle-income countries (LMICs) and marginalized communities to merely subjects or tools of data collection. In June 2025, we brought together a consortium of Tanzanian anthropologists and international collaborators in Mwanza, Tanzania to chart a new path forward. As LMIC research capacity and critical reflection on research ethics expands, we argue that, with concerted effort, anthropology can reach its potential as an ethically-engaged discipline uniquely positioned to both understand and represent human diversity. We present Tanzania as a microcosm of this turning point, highlighting its remarkable contributions to anthropology across all its subfields, and the recent expansion of relevant training and expertise across the country. We present a declaration of shared priorities to guide future scholarship. Moving beyond calls to 'decolonize anthropology', these priorities emphasize the value of pluralistic and integrated knowledge systems, the transformative potential of equitable collaboration, and the need to confront power asymmetries not only between HIC and LMICs, but also within them and with collaborating study communities.

## World Aesthetic Survey (WAS): What people like to see and hear across 62 societies

Harin Lee · Elif Çelen · Zofia Hołubowska · Manuel Anglada-Tort

Understanding the origins of aesthetic preferences requires determining whether they reflect universal cognitive mechanisms or culturally-specific learned patterns. We conducted a global experiment with 31,288 participants across 61 countries and one small-scale society (Tsimané people in the Bolivian rainforest), examining aesthetic judgments across five modalities: shapes, curvature, color combinations, musical harmony, and melody. Rather than using predetermined categories, we continuously sampled stimuli across each modality's parametric space, allowing us to capture cultural variation and subtle nuances without imposing prior structural assumptions. We found systematic cross-cultural variation in aesthetic preferences, with education level, socio-cultural values, and economy emerging as strongest predictors. Musical preferences showed the strongest adherence to mathematical ratio relations, while color preferences showed the least. Classical findings, such as preferences for symmetry and consonant harmonies, replicated robustly in most countries but were substantially weaker or absent among the Tsimané. These findings reveal that cross-cultural variation in aesthetics is not random but systematically organised by a combination of domain-specific regularities (particularly in music) and culturally-variable factors related to values, connectivity, and development. They offer implications for understanding how globalisation and modernisation shape perceptual experience.

## Why human societies adopt rigid moral rules: the efficiency–robustness trade-off

Julien Lie-Panis · Nicolas Baumard · Jean-Baptiste André

Humans are capable of remarkably flexible moral judgment. Yet societies rely on rigid rules—obligations and prohibitions that apply categorically, even when case-by-case reasoning could yield better outcomes. Why would a species capable of such flexibility bind itself to inflexible rules? We propose that rigid rules arise as social technologies for managing ambiguity around noncooperation. People often have legitimate reasons for failing to cooperate, yet those reasons are typically opaque to observers, allowing opportunists to disguise selfishness as justified hardship. We formalize this idea with an evolutionary game-theoretic model. Two cooperative equilibria emerge: a flexible norm that accommodates legitimate excuses but is vulnerable to exploitation, and a rigid norm that closes this loophole by mandating cooperation even when inefficient. Comparing these equilibria reveals an efficiency–robustness trade-off: flexibility maximizes welfare when trust is secure, whereas rigidity preserves cooperation when trust is fragile. This explains why rigid rules prevail in low-trust settings—interactions with strangers, formal institutions, or tight societies—where flexibility is more common in high-trust contexts.

## The Cultural Evolution of English Trait Language: Content, Structure, and History

Yuanze Liu · Alex Koch · Andrew Luttrell · Joshua Jackson

Traits are the currency of personality and social psychologists; they help us understand and represent both real and perceived differences between people and groups. Here, we advance our understanding of traits by revealing new insights into their content, structure, and evolution using large language models and human raters. Across four studies, we: (a) introduce one of the most comprehensive trait lists to-date (2,847 trait words); (b) establish normative human ratings of these traits (from N = 3,070 English speakers) along 24 empirically-derived dimensions; (c) detect a four-factor structure of Fitness, Agency, Communion, and Traditionalism (FACT) from these dimensions; and (d) reveal systematic differences in the coherence, valence, and historical evolution of these dimensions and factors. Moreover, these four factors differ in their coherence (e.g., Communion is the most semantic coherent while Traditionalism is the least), valence (e.g., Communion and Agency show more alignment between their semantic direction and valence than Traditionalism and Fitness; Communion has more negative words while Agency and Traditionalism have more positive ones); and historical usage (e.g., Fitness and Communion are older than Traditionalism; Communion is converging in semantic space while Agency is diverging). Our paper showcases new methods for discovering and analyzing trait words, and provides a new functional constructionist theoretical perspective on the structure, content, and evolution of trait language.

## How effective is teaching in Autistic and non-Autistic transmission chains?

**Matthew Lomas** · Mike Kings · Luca Hahn · Lamprini Psychogiou

Human cumulative culture is facilitated by our ability to actively help others learn through teaching. This ability is often assumed to depend on Theory of Mind (ToM), leading to claims that autistic people may be limited in their ability to teach. However, emerging research suggests autistic individuals can transmit information effectively. Whether autistic teaching can also support the incremental improvements that characterise cumulative culture remains unclear. We conducted a replacement transmission chain experiment where groups composed of either autistic or non-autistic adolescents built pipe-cleaner tools to carry marbles. Within each chain (N = 14 chains, total of 105 participants), groups of three participants worked together to build a tool, with an experienced member replaced by a naïve one at each step. Tool performance was assessed after each build, and video coding quantified communication and teaching behaviours. Non-autistic groups showed more shared attention and joint engagement with materials, while autistic groups used fewer clarifications and design-related statements. Despite these differences, both autistic and non-autistic chains showed clear cumulative cultural improvement, with tools performance increasing over successive generations. Higher ToM scores predicted greater reference to past designs during teaching, but ToM was unrelated to cumulative gains in tool performance. These findings show that despite differences in how they communicate during teaching interactions, autistic groups generate cumulative cultural improvements equivalent to non-autistic groups. This indicates that neurotypical ToM is not a prerequisite for effective teaching and provides new insight into the diversity of mechanisms that can support cumulative culture.

## Local gods, supernatural punishment, and the expansion of human society: A cross-cultural causal analysis

Daniel Major-Smith · Sevgi Demiroglu · Byamba Ichinkhorloo · Martin Kocsis

Do beliefs in punitive and omniscient supernatural agents promote cooperation among distant and unrelated individuals, potentially facilitating the evolution of large-scale cooperation? While previous cross-cultural research suggests that it might, many open questions remain, chief among them the extent to which beliefs in supernatural punishment and monitoring regarding local deities - as opposed to more traditionally 'morally-concerned' gods - may enhance cooperation. Here, we extend this previous work by including data from a larger number of societies, with data from seven new field-sites (total sites=22: total n=ca. 2,800) with data on experimental measures of cooperation towards distant co-religionists in the local religious tradition (with cooperation assessed using the Random Allocation Game [RAG] and Dictator Game [DG]). This work explicitly employs a causal inference approach, helping to assess whether results can be taken as causal estimates, given our assumptions. Analyses will use aggregated binomial (for RAG) and ordinal (for DG) multi-level models, with g-computation used to calculate our marginal causal effects of interest. Our estimand is the joint causal effect of supernatural punishment and omniscience/monitoring beliefs on cooperation with distant co-religionists, and whether this is moderated by 'moralising' vs 'local' religious traditions. These results will allow us to explore whether any effect of supernatural punishment on cooperation is specific to moralising religious traditions or is applicable to deities more broadly, with implications for understanding the interplay between religion and cooperation throughout human evolution. Data collection for this project is currently in progress, and analyses will be finalised by the conference.

## Detecting competition and convergence in language evolution

**Stephen Mann** · Mary Walworth · Simon Greenhill · Russell Gray

The world's 7000 languages are highly unevenly distributed across the globe. The causes of this variation in language richness are subject to ongoing debate. Sophisticated predictive models have recently been deployed to test linguists' informal hypotheses, but their results find conflicting support for several candidate factors explaining variation in richness. Despite their potentially greater power to detect mechanistic links between sociodemographic causes and linguistic outcomes, few generative models have been used to this end. Here we introduce an agent-based model that represents language evolution over a timescale of thousands of years. Agents are speech communities, and their social dynamics represent the settlement of island groups in Remote Oceania -- a tractable microcosm of global variation in richness -- in the period before European contact. The model is designed to investigate the striking difference between Vanuatu (over 100 languages) and Fiji (fewer than ten languages). Two distinct mechanisms have been proposed to explain this empirical pattern of richness: both increased community interconnectedness ('convergence') and a bias towards prestige language varieties ('competition') would account for the vastly fewer languages in Fiji. Using new empirical data and metrics designed to capture structural relations between communalects, we found that models implementing convergence better match the data than those incorporating only competition mechanisms, suggesting that political complexity likely explains the difference in numbers of languages via convergence rather than competition. The causes of language richness globally can similarly be traced by comparing simulation results against empirical data.

## Opaque Social Instruments: Rethinking Stone Age Symbolic Artefacts

**Corijn van Mazijk**

**Abstract (243 words)** This paper reinterprets prehistoric “symbolic” objects by shifting attention from semiotic classification of sign-objects to their roles within shared social practices. Extending enactivist approaches in cognitive archaeology, it emphasizes the social and intersubjective dimensions of artefact use: symbolic cognition arises not only from engaging with things, but from acting with others within shared horizons of understanding. On this basis, beads, pendants, ochre, figurines, and related materials are recast as opaque social instruments (OSIs): material tools that tacitly organize social life by signaling identity, managing intergroup relations, reinforcing norms, and stabilizing collective narratives. Their social efficacy does not depend on arbitrary convention or explicit meaning, and often remains phenomenologically opaque to participants themselves, as objects appear non-utilitarian, beautiful, or sacred rather than overtly functional. A distinction is developed between practice-embedded OSIs, whose significance relies on participation in recurrent joint activities, and narrative-embedded OSIs, which are sustained through shared stories, ritual, and institutional roles. This reframing yields operational consequences for archaeology: interpretive focus should fall on practice contexts, patterned associations, artifact co-occurrence, visibility and movement pathways, and demographic or institutional settings through which OSIs were produced, circulated, and reproduced, rather than on inferred semiotic codes. This presentation builds on a broader research program currently being prepared for publication as a thematic issue (together with Thomas Wynn, Karenleigh Overmann, Frederick Coolidge, Steven Kuhn, James Cole, and Rex Welshon), situating OSIs within ongoing debates about material culture, cognition, and the evolution of social complexity.

## Permanent Body Modification: Archaeological and Early Historical Evidence

**Brea McCauley**

Today, permanent body modification (PBM) is very popular. Studies suggest that billions of people have at least one permanent modification on their body. But what is the history of PBM? When did the different types originate? Were they invented recently, or do they have a long history? Did they appear simultaneously or at different times? In this presentation, we shed some light on these questions. We begin by considering whether there is any evidence of PBM in non-human animals or our extinct hominin relatives. From there, we discuss the early archaeological and historical evidence of seven of the main types of PBM practiced by modern humans: tattooing, scarification, amputation, piercing, genital modification, dental modification, and bone shaping. We first outline some of the earliest possible evidence of the types, followed by some of the later, yet more secure, evidence for them. There is, we show, strong evidence indicating that humans have been practicing PBM for at least 15,000 years. We also show that there is weaker but still intriguing evidence suggesting that PBM has a much deeper antiquity in human history, perhaps dating as far back as 80,000 years ago.

## Taming Comparative Innovativeness In the Middle Pleistocene

**Andra Meneganzin**

The behavioral repertoire of Neanderthals, along with the Mousterian lithic technocomplex, has traditionally been characterized by notable “conservatism” (i.e., “continuity” or “persistence”) when compared to the quasi-contemporaneous African Middle Stone Age (300-30 Kya) and later Upper Paleolithic hominins (Mellars 1998; Kuhn and Stiner 1998). However, it seems unlikely that a species with such a vast geographic range, from the Iberian Peninsula to Siberia, could persist for hundreds of thousands of years with such behavioral inflexibility. Recent evolutionary approaches are offering more nuanced perspectives on this assessment, distinguishing between claims of a relative lack of substantial technological innovations and those concerning the absence of a clear directional trend in technological evolution (de la Torre et al. 2013; Kuhn 2020). This paper examines claims of comparative innovativeness in light of material evidence and the philosophical challenges these claims present. Drawing on recent developments in the philosophy of biology regarding comparative assessments of innovation (Ramsey and Meneganzin 2025), the philosophy of paleoanthropology—particularly in relation to ‘trait’ or character identification (Meneganzin et al. 2024)—and theoretical archaeology, especially concerning cultural taxonomy (Reynold and Riede 2019), I identify two key problems hindering progress in this area: (1) the inertia created by treating named assemblages as relevant units of analysis and proxies for loci of innovation, and (2) the neglect of a multidimensional, multilevel approach to comparative innovativeness. By outlining productive ways forward, this paper aims to contribute to the redefinition and reassessment of the material explanandum of innovativeness in the Middle Pleistocene archaeological record.

## Experimental evidence that reputation-based partner choice facilitates information sharing in humans

Alex Mesoudi · Keith Jensen · Lei Chang

A necessary prerequisite for the accumulation of beneficial knowledge, or ‘cumulative cultural evolution’, is the sharing of information via social learning. Yet little work in the field of cultural evolution has examined the mechanisms that support information sharing in the face of exploitative information free-riding and information hoarding. We ran a series of online interactive experiments ( $N = 716$ ) combined with computational reinforcement and social learning models to test whether the mechanism of reputation-based partner choice can effectively support information sharing. Participants in groups chose whether to (i) engage in costly innovation and (ii) whether to share the resultant knowledge. Sharers received increased reputations for sharing and participants could use reputations to select recipients of knowledge. Study 1 found, in participants from the UK and China, high levels of information sharing but only weak partner choice. Study 2 replicated this finding with various methodological improvements. Study 3 showed that participants used partner choice to exclude non-sharing artificial bots from receiving information. Study 4 found that when partner choice was impossible, preferences for information sharing declined to levels comparable to non-sharing. Overall, our findings provide tentative positive experimental evidence that partner choice can facilitate information sharing and enable cumulative cultural evolution.

## Cultural Tuning of Caregiving: An Investigation of Attentional Mechanisms and Conceptual Associations to Baby-Schema Cues Across Small-Scale and Urban Communities

Marie Michael · Frankie Fong

Human infancy is characterized by an extended period of high vulnerability that results in high costs for caretakers. One proposed evolved mechanism facilitating such caretaking is the 'baby-schema'. Konrad Lorenz (1941) predicted that these infant-typical features elicit caregiving independently of kinship, experience and, notably, species - reflecting an evolutionarily generalized mechanism. However, the extent to which these predictions about baby-schema responses are in fact culturally invariant has not been examined beyond Global North samples. Here, we tested whether conceptual associations typical in Global North samples (Liking, Cuteness, Age, Health) generalize across cultures. We further examine whether overt visual attention constitutes a mechanistic pathway for baby-schema responses. To investigate this, we employed pre-registered 2-Alternative-Forced-Choice-Tasks and a Preferential Looking Eye-Tracking paradigm, both depicting human and cat faces systematically manipulated for baby-schema level in two small-scale Malaysian communities (hunter-gatherer Batek, slash-and-burn-farming Temiar) and one urban German sample. Results indicate that while no visual attentional modulation related to baby-schema occurs, the concepts associated with baby-schema vary based on species and community. More precisely, while we could show expected strong effects in the German sample, the two small-scale communities showed more attenuated or absent effects. In a follow up study (data collection completed), we aim to replicate and extend our insights to how group membership of shown faces modulates these conceptual associations. This project indicates that this putatively universal evolved caregiving mechanism may be culturally tuned and a cultural evolution perspective may help clarify a richer hypothesis space for causal origins of this trait.

## Collective threats shift cooperative norms, but not the punishment of norm violations

**Catherine Molho**

Influential theories in the social and behavioral sciences argue that collective threats shape how human groups enforce cooperation. Tightness-looseness theory proposes that groups exposed to more threats—such as resource scarcity or ecological disasters—respond by developing stronger cooperative norms and punishing norm violations more severely. In this “complementarity” hypothesis, norms and punishment work together to enforce cooperation. An alternative “substitutability” hypothesis holds that strong norms in groups that face high threats should suffice to ensure cooperation, reducing the need for punishment. We tested these hypotheses in a controlled behavioral experiment with 301 participants. In the first stage, we manipulated collective threat (high vs. low) in a collective risk dilemma to identify its causal effect on norms and cooperation. In the second stage, participants voted on whether to adopt punishment institutions in a public goods game and could determine how strict and severe these institutions would be. We found that groups exposed to high threats formed stronger cooperative norms and contributed more to public goods. However, they were not more likely to vote in favor of punishment institutions and did not select harsher penalties for norm violations. Norms established under threat persisted even when a different norm would have been more efficient, indicating their stickiness across contexts. Altogether, our study demonstrates how controlled experiments can identify causal pathways behind the emergence and change of social norms.

## **Bayesian inference produces a novel frequency-dependent learning rule that outcompetes classic strategies and promotes cultural adaptation**

**Thomas Morgan**

Cultural evolution is driven by how individuals learn from each other. Two well-known social learning strategies – conformist and anticonformist transmission – bias individuals toward or away from common behaviors. Each can be adaptive in some contexts, but both are typically studied by assuming their form in advance. Here we take a different approach by exploring the learning biases that emerge naturally from Bayesian inference. Starting from Bayes' rule we derive the probability that one of two options is correct given (1) asocial information of varying quality, (2) the observed choices of group-mates and (3) the observer's prior belief in the accuracy of their culture. We then use evolutionary simulations in an unstable environment to determine the equilibrium value of the prior and reconstruct the resulting implicit response to behavioral frequencies. This identifies a novel frequency-dependent learning rule that combines aspects of both conformist and anticonformist transmission. Further evolutionary simulations show that this Bayesian rule outcompetes both classic strategies under realistic conditions. Bayesian inference thus offers a unifying foundation for understanding adaptive social learning.

## Constraints and communicative pressures shape creativity in a musical task

**Katie Mudd** · Margaret Schedel

While creativity is fundamental to human culture, its precise contribution to cultural evolution remains unclear and understudied (Fogarty et al., 2015). This project examines how individual and collective creativity shape human culture, focusing on music and language to study how creativity affects signal space exploration using a drum machine. An online experiment was completed by 120 participants placed in one of four conditions, varying by the number of constraints (2 or 3 sounds) and domain (music or communication). In the music task, participants were asked to create an appealing rhythm and in the communication task, they were asked to create a rhythm to describe a color. Participants also completed a divergent creativity test (DAT; Olson et al., 2021). We found that exploration was influenced by domain and number of constraints but not by creativity level. Participants explored the signal space most in the music condition with two sounds, with overall greater exploration for two sounds than three, and for music over communication. An ongoing follow-up study exploring creativity will give participants feedback on their rhythms, as we posit that a more challenging task may push more creative individuals to increase their exploration of the signal space. A subsequent study will have participants interact and give feedback on rhythm productions to further investigate how creativity functions at the collective level. By examining creativity within constrained signal spaces, we aim to shed light on the mechanisms through which new communicative forms, and cultural innovations more broadly, emerge and stabilize.

## Evolving Interaction Protocols for Open-ended Collective Innovation

Eleni Nisioti · Jérémy Perez

Human collective innovation is an open-ended process shaped by the complex social dynamics within groups. Empirical studies in both laboratory and real-world settings show that increasing connectivity among group members accelerates short-term innovation but reduces diversity, ultimately hindering sustained discovery. Consequently, intermediate levels of communication often yield the best balance between exploration and exploitation. Prior computational work has reproduced this phenomenon in populations of evolving agents, reinforcement-learning systems, and groups of interacting Large Language Models (LLMs), underscoring the importance of collective dynamics in engineered multi-agent systems. Yet, systematic methods for optimising how groups interact remain underdeveloped. In this work, we introduce a framework for designing interaction protocols (IPs) that specify who communicates with whom, what information is shared, and when communication occurs. Our computational study uses the popular video game *Little Alchemy 2* and includes simulated players of three types: random, empowerment-based, and LLM-driven. We evolve populations of candidate IPs represented as executable code, explicitly maintaining diversity and leveraging LLMs as efficient mutation operators. Our results show that evolved IPs significantly outperform manually designed protocols proposed in previous research. Moreover, IPs evolved for one population generalise effectively to groups composed of different agent types, suggesting robust underlying principles. As a next step, we plan to evaluate these evolved IPs with human participants through an online experiment. Overall, this work lays a foundation for the principled design of collective-intelligence systems in exploratory domains—such as education, organisational decision-making, and human-resources management—where traditional optimisation approaches often fall short.

## **Multilingual worlds, neglected histories. A cross-cultural comparative study of the dynamics of historical and contemporary multilingualism**

**Justyna Olko**

In this talk we present the methods and headline results of a cross-institutional ERC-funded project that addresses the multi-level dimensions of historical and contemporary multilingualism. The project includes selected multilingual hotspots from Central-Eastern Europe, Mesoamerica, South Africa and Vanuatu, which represent a diversity of colonial and post-colonial contexts. Furthermore, our aim has been to better understand the causal mechanisms underlying the processes behind linguistic diversification. Our methodology combines quantitative and qualitative historical and contemporary data analysis with mathematical modeling, experimental economic games and GIS mapping. In addition to screening and analysis of data-heavy historical sources, we rely on cross-case survey, language biographies and language portraits methodology. Modelling approaches include a combination of game-theoretic and cultural evolutionary frameworks, and both analytical and agent-based analysis. Our evidence reveals patterns of linguistic continuity not adequately captured by Western theories of language shift and acculturation strategies. Factors include attitudes toward internal linguistic variation; defying the notion of established languages and maintaining blurry linguistic boundaries; relying on social networks and informal economy. Our evidence questions the assumption that the language “with more prestige” is always preferred by Indigenous communities over their own languages. Here, connections with the maintenance of cultural and ritual knowledge is important, highlighting the interconnectedness of linguistic and cultural systems. We also show that key causal processes are reversing: while the role of inter-community marriages historically created linguistic boundaries, contributing to diversification processes, today they play an increasingly homogenizing role in local ecologies where colonial-era *linguae francae* became vernaculars transmitted to children.

## Cultural Bridges in Historical Knowledge Networks

Rui Pan · Seokkyun Woo

Human innovation relies on transmitting information through social networks spanning space and time. Yet we know little about how these interactions evolve. In this work, we focus on a particular type of interaction, cultural bridges, defined as network ties between individuals from different cultural groups. We aim to understand how transmission dynamics through cultural bridges have evolved historically and whether these bridges have facilitated historical innovation. We constructed a large-scale, multiplex social network of about 120,828 global creative knowledge producers (1000-1899 CE). Our method draws from a cross-validated database of knowledge producers and their Wikipedia linkages, identifying 986,892 ties. We develop a pipeline using GPT-5 to categorize ties for their relationship types (e.g., influence, collaboration) based on textual evidence. We find cultural bridges vary across knowledge domains (e.g., humanities, natural science, music, visual art) and history. Music and natural sciences show more cultural bridging than social sciences and arts. The cultural bridges in academia declined over time, potentially due to the rise of scientific institutions and the decline of common languages. A key finding is that an individual's creative eminence is positively correlated with cultural diversity within their immediate predecessors' social networks, above and beyond their fame. This shows that accessing a social context rich in culturally distant information has implications for creative impact. These findings suggest how cross-cultural exchange has unfolded throughout history and its implications for creative success. Our network-based approach offers a scalable method for studying collaboration and cultural transmission across historical periods and knowledge domains.

## An Indigenous perspective on music and cooperation across cultures

**Danya Pavlovich** · Suzanne Purdy

The Social Bonding Hypothesis poses that humans evolved musicality to facilitate cooperation within groups (Savage et al., 2021). Much of the research focusing on Social Bonding Theory centres quantitative, Western methodologies. WEIRD science has historically excluded Indigenous voices, overlooking a large portion of the world population. Qualitative and/or Indigenous approaches to social bonding could provide additional insight into the processes that help people to understand cooperation in groups. Māori are the Indigenous people of Aotearoa (New Zealand), they are also the ethnic group two of the three coauthors belong to. Within a Māori health model, whanaungatanga (one's connection to family, immediate and extended) is labelled an essential element of wellbeing (Pere, 1991). One medium that helps Māori connect in an accessible way is waiata (song) (Sheehan, 2017). Our quantitative, experimental study (n=21 participants) showed a larger increase in bonding after singing waiata (36% increase), than after speaking (5% increase) or reciting lyrics (18% increase). Further, in a qualitative exploration (n=11), I studied my family's experience of learning and singing a waiata that narrates our tribal genealogy. Key findings from a follow-up discussion showed increased feelings of bonding as a result of coming together as a family to sing waiata. Both of these studies are part of global, ongoing projects comparing music across a range of cultures (Pavlovich et al., in prep.; Savage et al., 2025). Through global collaboration between Indigenous and Western researchers, coupled with mixed-methodologies, a richer understanding of the evolution of music and cooperation can be achieved.

## The evolution of asabiyya or “social cohesion” understood as behavioral innovation in frontier zones

**Juan Perote-Peña**

In this article I propose a different interpretation of asabiyya, a central concept in Ibn Khaldun’s Muqaddimah and study its dynamics using an agent-based model coded in NetLogo. Asabiyya is the type of “social capital” arising from a sense of solidarity, group loyalty, and shared purpose that binds members of a group, tribe, or society and accumulates in frontier zones due to the higher need for protection. This accumulation process typically tends to destabilize polities and empires generating political cycles (Turchin, 2003). I argue that, on the one hand, the higher opportunities to interact with individuals of other ethnicities or cultural groups in frontier lands decreases the gains from cooperation that can be obtained, since indirect reciprocity is supposed to be more intense when dealing with individuals of the same group and therefore defecting from cooperation turns out to be more costly to people living in the frontier zone. But, on the other hand, the lower social control when dealing with foreigners allow them to innovate more often and use different cooperation strategies that are randomly discovered, because in case of being interpreted as defections from typical ways of cooperation there are less punishing possibilities. Cultural diffusion of these innovations through imitation of the successful will typically spread from the frontier zones and the periphery towards the center and give a fitness advantage to the frontier people. This dynamic process can also create cycles of political and cultural shifts that move the centers to the borders and vice-versa.

## A Computational Approach to the Cultural Evolution of Maps

**Rémi Petitpierre**

In this research, we study the way cartography emerged in Western culture as a set of techniques, processes, and visual sign systems used to describe territories and express worldviews. Adopting a cultural evolutionary perspective, we investigate influence patterns and variation in map figuration over a period of six centuries, beginning with the advent of printing. Our work is based on the computational analysis of 41 million signs, extracted from nearly 100,000 map artifacts in five countries. These signs, which correspond to distinct icons, symbols, or visual markers indicating the use of certain colors or techniques, are used pragmatically as operable observation units. The analysis examines the historical-cultural dynamics of map figuration using both statistical modeling and visualization. Specifically, it addresses the diversification of signs across time and geographic areas. It also highlights cultural shifts or transition patterns and suggests that cartographic signs, as significant systems, seem to form consistent, co-adapted complexes, within which signs tend to be replicated jointly. By reconstructing the graph of work collaborations among mapmakers, the study also engages with the dynamics of social transmission, confirming the influence of large producers on their peers. At a larger scale of analysis, it addresses transmission pathways among production centers, demonstrating the role of major cities as transmission hubs, and showing how they emerge as differentiated, contrasting figurative cultures. In conclusion, this research proposes a methodological framework for studying cultural evolutionary dynamics based on historical big data, considering maps as material artifacts of print culture.

## Evolutionary branching of social preferences in a public good provision game

**Jorge Peña**

Most game-theoretic models in cultural evolution examine the dynamics of a discrete set of behavioral types. In contrast, we study an evolutionary game-theoretic model in which a continuous trait (capturing the extent of other-regarding preferences in a public goods game) evolves through payoff-based biased social learning. Individuals are rational agents who play the Nash equilibrium of the strategic interaction given their preferences, yet they differ in the weight they assign to others' payoffs, representing varying degrees of benevolence or malevolence. The evolutionary dynamics of this weight follow the framework of adaptive dynamics. We find that monomorphic populations are evolutionarily stable only when effort complementarity in the public good is sufficiently strong. Under such conditions, preferences converge toward either benevolence or malevolence, depending on initial conditions. When contributions to the public good are instead highly substitutable, monomorphic states can become unstable, leading to the emergence of polymorphic populations in which multiple preference types coexist. These results identify the strategic conditions under which cultural evolution generates homogeneous versus heterogeneous distributions of social preferences. More broadly, our analysis highlights how the structure of the public goods environment shapes the evolution and diversity of other-regarding motivations in culturally evolving populations.

## Using natural experiments to interrogate the causal relationship between Islam and cooperation among Sama marine fisher-foragers

Julia Phelps · Kim Hill · Hillary Lenfesty

Does religion promote cooperation? While the phenomenal cultural success of world religions may be attributed, in part, to their ability to promote prosocial behavior, evidence for this hypothesis is mixed and incomplete. Studies finding a positive association between religion and prosociality typically come from western and industrialized populations that do not characterize the ancestral conditions in which these religious institutions emerged, and most existing studies can only claim correlational – not causal – evidence of this relationship. Addressing these gaps, I will discuss a novel methodological approach and preliminary results from an ongoing study that leverages natural experimental opportunities to interrogate the causal relationship between religious exposure and everyday cooperation within a community of Sama marine fisher-foragers off the coast of Southern Mindanao Island, Philippines. Daily reciprocal and kin-directed sharing and helping behaviors ensure this village's wellbeing in the face of poor fishing harvests, bouts of illness, and numerous dependent children. However, recent years have witnessed an emergent role of Islam that may be influencing cooperation: Residents increasingly appeal to Islamic prosocial norms to justify sharing material goods and services, even when this help is unreciprocated. Making use of natural variation in didactic sermon content and attendance during weekly Islamic religious services, this study investigates whether transmission of Islamic prosocial norms or participation in collective religious rituals have a causal impact on subsequent real-world cooperation, or if instead, this religious exposure simply influences congregants' post-hoc justifications for cooperative behaviors that ultimately arise from other mechanisms like reciprocity and kin selection.

## Both long-distance social relationships and nested institutions can support collective action

**Anne Pisor** · Bertha Aron · Kasambo Bernard · Paschal Fimbo

Both the cultural evolution and conservation literatures agree that when institutions are nested, with small groups embedded in larger groups with shared norms, it is easier to get collective action toward joint goals. At the same time, however, much received wisdom in the conservation literature is that social relationships between these smaller groups can undercut natural resource management. In a recent piece in *Conservation Letters*, we asked whether relationships between these smaller groups can support collective action in a coastal fishery. We interviewed 1317 people in 28 fishing villages in Tanzania about their participation in managing open-access fisheries and their social relationships. People with more friends in other villages trusted more people in those villages and were more likely to participate in collective action to manage the shared fishery, such as reporting others for destructive fishing practices. These results underscore that both nested institutions and long-distance relationships can support collective action for natural resource management.

## Pattern induction in Amazonian children: Evidence for a domain-general learning mechanism

**Benjamin Pitt** · David O'Shaughnessy · Charlene Gallardo · Stephen Ferrigno

The remarkable cognitive flexibility of humans allows us to adapt to a wide variety of environments and to acquire any number of cultural skills, from whittling to Wordle, but the cognitive mechanisms that support such fast, flexible learning remain unresolved. Inspired by theories in artificial intelligence, here we show evidence for one such mechanism – program induction – a general-purpose process by which learners infer the computational rules that underlie the data they observe. In two experiments, children from two cultures – one industrialized and one indigenous – viewed short sequences and were asked to generalize these novel patterns to new stimuli, alphabets, and lengths, without instruction or feedback. Despite receiving only small amounts of data (e.g. a 4-item pattern) in an unfamiliar task, participants across ages, cultures, and conditions constructed response patterns consistent with the abstract structure of the sample patterns. Computational modeling showed that response patterns likely reflected discovery of latent rules, rather than simple heuristics or statistical associations, even among children with little or no formal schooling. The results suggest that program induction serves as a domain-general learning mechanism from early in life, allowing children across cultures to rapidly infer the algorithmic structure of their natural and cultural environment, whatever it might be.

## How do homophily and wealth bias individual perceptions and experiences of inequality?

**Eleanor Power** · The ENDOW Team

In the study of socio-economic inequality, a common finding is that people do rather poorly at assessing the scale of inequality in their societies. Similarly, people often misjudge their own economic position relative to others. Why this is the case is poorly understood: we do not know what mechanisms warp or bias people's perceptions of inequality. Here, we begin to address this gap by showing how individual perceptions and experiences of inequality vary both with an individual's own wealth and their social connections. We draw from an original dataset comprising rich geospatial, demographic, economic, and social network data from over forty communities around the world. For each household in this dataset, we construct a set of plausible "immediate social worlds" and show how the inequality in these immediate social worlds can bias their assessments of the inequality in the community at large. Two results stand out: first, there is an association between an individual's own wealth and their experience of inequality. Second, homophily systematically reduces individual perceptions of inequality. With these insights, we contribute to the growing body of work aimed at understanding people's perceptions of and preferences regarding inequality.

## Traditionalism mediates social learning biases of novel health interventions in Himba pastoralists

Sean Prall · Aparicio Lopes · Kasey Schleper · Bel Savastio

Public health interventions often occur in response to uncertain and rapidly changing conditions where individual trial-and-error learning is particularly risky. This makes them an ideal arena for testing predictions about the role of social learning. To understand how social learning biases impact healthcare decisions, we created a study to assess interest in the adoption of novel health interventions among Himba pastoralists (N=473) from 17 villages in northern Namibia. Three social learning biases (parochialism, conformity, and prestige) were compared across four health intervention vignettes. Across interventions, the conformity condition had the strongest impact on likelihood of adoption. We also studied how market integration and traditionalism interacted with social learning biases. Market integration tended to lower adoption of health interventions generally, while traditionalism mediated uptake by social learning domain. For example, in the parochial condition, more traditional respondents were less likely to adopt the intervention when it was advocated by an outgroup member. These results indicate that conformity biases play a strong role in considerations about novel health interventions in indigenous communities, but also that traditional values and beliefs are instrumental in shaping social learning biases. While previous focus has centered on market integration as a key predictor, we found the degree of traditionalism to be a critical and thus far underappreciated factor that should be assessed when designing health intervention strategies.

## Cumulative Cultural Evolution in the Age of Agentic AI

**Maria Pykälä** · Anil Yaman, Björn Lindström ·

Humans rely on the production, evaluation, and sharing of information to sustain cumulative cultural evolution. Increasingly, however, these processes are mediated by agentic AI systems that generate, filter, and transmit knowledge on behalf of users. This shift from a purely social to a socio-technical system introduces new information transmission dynamics that may reshape how knowledge accumulates over time. Agentic AI enables the delegation of information production to agents with opaque outputs and incentives. We model cumulative cultural evolution driven by humans and AI agents jointly searching for solutions in a combinatorial innovation task. The model captures key features of emerging human–agent interaction, including delegation, imperfect evaluation of agent outputs, and strategic information withholding. Humans adapt their reliance on AI over time through social learning, while agents can also adapt their alignment with user objectives. Our results suggest that the interaction between delegation, evaluation, and alignment generates complex trade-offs between individual performance and collective knowledge outcomes. These findings highlight how agent-mediated information production may reshape cumulative cultural evolution and collective innovation.

## Experimentally Testing the Role of Explicit Metacognition in Cultural Transmission

Arian Rajaeian · Thomas Morgan

Humans' ecological dominance has been attributed to our ability to accumulate adaptive cultural information over generations. Yet, it remains unclear which aspects of cultural transmission are uniquely augmented in humans. Recent theory highlights the role of explicit metacognition (the ability to reason about and communicate mental states) in enabling more strategic and selective social learning, thereby supporting cumulative culture. We tested this hypothesis in a two-player online experiment. Player 1 completed a task and left advice for player 2, who then completed the task twice: first alone, then again after receiving player 1's advice. We varied participants' incentives such that they benefited when their partner performed well on the task (cooperative), when their partner performed poorly (competitive), or did not benefit either way (neutral). We also varied participants' access to metacognitive information. In the non-metacognitive condition, the first participant only left advice regarding the task, whereas in the metacognitive condition they also indicated how confident they were in their advice. Results show that while social information improved task performance in the cooperative and neutral (but not competitive) conditions, metacognitive information did not further improve performance. This is because player 1's stated confidence did not increase their influence, except (unexpectedly) in the competitive condition. Moreover, stated confidence did not predict greater player 1 performance, and actually predicted worse performance in the cooperative condition. These results suggest that humans do not use metacognitive information as predicted by relevant theory, raising new questions about when and how explicit metacognition supports cultural learning.

## The cultural evolution of task construals: Cumulative culture can design and transmit maps that simplify navigation problems

Xavier Roberts-Gaal · Fiery Cushman

It's received wisdom that cumulative culture increases in complexity over time--- innovations accumulate, and individuals become able to do or build things so complex no one person could invent them from scratch within a lifetime. Intuitively, as the world grows more complex, the representations we use to navigate it should match that complexity. For instance, artifacts like maps should increase in the access they provide to information about the (increasingly complex) environment. But, a relatively under-emphasized function of artifacts like maps is to shape how we think about the problem of navigation, not just to provide information about spatial relationships. Artifacts like maps, dashboards, and orreries/almanacs are models that highlight which features of an extremely complex world are worth paying attention to in order to solve problems like navigation, decision-making, or prediction. This suggests that simplicity is what makes maps useful: They leave out irrelevant detail, representing a set of potential navigation tasks in such a way that they can be easily solved. We formalize this simplicity advantage in a computational model, leveraging the task construal framework (Ho et al., 2022). We then construct a cultural evolutionary model capturing replicator-mutator dynamics. Inspecting the model, we observe that cultures tend to evolve and transmit simpler, increasingly effective maps that are tailored to the navigational strategies (e.g., pathfinding algorithms) of learners. This holds under a range of transmission conditions. These findings have important implications for understanding the interplay between cultural evolution and individual cognition and its impacts on material culture.

## Examining the roles of vertical, horizontal, and prestige-biased oblique transmission in the revitalization of a severely endangered language

**Cody Ross**

Palenquero is the last surviving Spanish-African creole in South America. Proficiency-levels and usage rates, however, have declined sharply over the last century, with fewer than 200 proficient speakers remaining. This culture loss was driven in large part by widespread racial, cultural, and linguistic discrimination from non-Palenquero Colombians: Palenquero parents chose to refrain from teaching their children Palenquero so as to increase their perceived educational standing and employment opportunities outside of Palenque—fracturing inter-generation language transmission. In the mid-2000s, however, San Basilio de Palenque was declared a Masterpiece of the oral and intangible heritage of humanity by UNESCO, and local musicians Kombilesa Mi achieved tremendous domestic and international success by rapping in their local creole. Jointly, these events triggered a sharp transition in attitudes about Palenquero and a resurgence of interest in protecting the language. Our prospective longitudinal study tracks individual-level changes in Palenquero proficiency over time for a nearly-complete census of the entire population of potential speakers (~2,500 individuals). We link proficiency estimates to complete sociocentric network data to determine how much people are learning, and from whom. This allows us to disentangle the roles of vertical transmission, horizontal transmission, and prestige-biased oblique transmission (youth learning from high-status adults) in the linguistic revitalization of a severely endangered language.

## Shrinking Networks? Population Structure, Social Opportunities, and Mental Health Across UK Regions

**Amanda Rotella**

Human social networks are shaped by ecological pressures, population structure, and transmitted norms governing relationship formation. Yet modern environments have changed dramatically: populations have doubled since the 1970s, urbanisation has accelerated, and inequality has risen sharply. Concurrently, social networks have contracted, and loneliness has increased sharply. We propose these trends are linked: rapid population-level changes have outpaced our evolved psychology, disrupting the environmental conditions that historically supported social connection. To start testing this hypothesis, we investigated how different population structures impact social networks and wellbeing across three UK regions, which vary systematically in density, inequality, and deprivation, at two time-points. At Time 1 (N = 1,500), we linked subjective perceptions of neighbourhood characteristics and social network structure to objective postcode-level indicators, examining how structural and ecological factors of where we live impact social networks. At Time 2 (N = 858), we probed perceived barriers and facilitators of social connection and assessed mental health outcomes. We present results examining whether neighbourhood-level factors predict network size and quality, whether these relationships mediate mental health outcomes, and what environmental features constrain or enable connection. This research applies cultural evolutionary thinking to a pressing societal challenge: understanding why social ties are weakening despite humans' fundamental need for connection. By identifying how modern population structures create mismatches with our evolved social psychology, findings point toward place-based interventions and inform cross-cultural extensions examining social opportunity structures worldwide.

## Testing social learning strategies in the wild

**Alexander Schakowski**

Social learning is central to human adaptability, ecological success, and cultural evolution. Foraging, i.e. locating and extracting resources from the environment, presents a core adaptive challenge that requires individuals to integrate personally acquired information about the resource distribution with social information that is obtained through observing others. While laboratory experiments have shed light on how humans use social learning strategies in virtual foraging tasks, little is known about how these strategies translate to natural, dynamic environments. To address this gap, we analyzed data from large-scale ice-fishing competitions in Finland, encompassing over 250 foraging trips across five lakes. During each event, 40–50 participants were equipped with GPS tracking devices and head-mounted cameras, allowing detailed reconstruction of spatial search behavior and foraging success (i.e., fish catches). Additionally, we collected data on participants' familiarity (i.e., how well participants know each other) and perceived competence (i.e., how well participants expect competitors to perform) to examine whether individuals relied on frequency-dependent copying strategies, or whether they selectively copy successful, familiar or competent others. Preliminary analyses indicate that competence, but not familiarity is related to foraging success. Foraging decisions, however, were well explained by frequency-dependent copying strategies, with little effect of familiarity and competence ratings. This suggests that in dynamically changing and uncertain environments individuals primarily follow where most others forage rather than who is most skilled or familiar. These findings provide field-evidence on human social learning strategies and help bridge the gap between controlled experimental paradigms and real-world behavior.

## Interactions of the common-is-moral heuristic and inequality aversion in shaping moral judgments

David Schultner · Björn Lindström

Social norms regulate social life in ways that can promote prosocial behavior. Not only directly involved individuals, but also uninvolved third parties judge and punish norm violators. However, the principles underlying third-party judgments remain unclear, particularly since moral decisions often involve the interplay of multiple psychological processes that have previously been studied only in isolation. Here, we investigate the interactive effects of two key moral motivations: Inequality aversion (equal outcomes are seen as more moral than unequal ones) and the common-is-moral heuristic (frequent actions are seen as more moral than rare ones). In Study 1, participants provided third-party judgments of others' behavior in two economic games designed to engage each motivation separately, revealing distinct contributions of both. In Study 2, participants completed a combined game designed to reveal the interplay between inequality aversion and the commonness effect. Analyses show that the effect of inequality aversion was not fixed but scaled with commonness of the focal action: Sensitivity to inequality decreased when behaviors became more frequent. This result suggests that moral concern for fairness can be suppressed when inequality becomes normalized. Study 3 replicates this pattern and shows that participants' willingness to punish follows the same trajectory as moral judgments. Lastly, we used agent-based simulations to show how this nonlinear effect may allow or hinder the emergence of prosocial behavior in social groups. Together, these findings disentangle the interplay of fairness preferences and the common-is-moral heuristic, highlighting the importance of investigating moral processes in rich contexts and considering their interaction effects.

## **Reconsidering allomothering: what do associations, or lack of them, between kin and fitness outcomes tell us about the importance of support for raising children in our species?**

**Rebecca Sear** · Anushe Hassan · Mary Shenk · John Shaver

Positive associations between kin presence or availability and either child outcomes or fertility rates are often assumed to provide evidence that humans are cooperative breeders; in other words, that allomothering – help from individuals beyond the mother – is key to successfully raising children in our species. But these associations are not always seen; sometimes kin presence or availability is not associated with fitness outcomes, or is negatively associated with these outcomes. Here, we reconsider the theoretical mechanisms which may bring about positive, negative or null associations between kin presence/availability and fitness outcomes, bringing together disparate literatures. These mechanisms include not just the provision of direct help by kin (allomothering), but also the buffering of extrinsic mortality risks by kin, kin providing cultural information, and kin acting as a cue to environmental context. We then focus on allomothering and consider methodological reasons why null or negative associations may be seen between alloparenting and fitness outcomes, for example, differential helping from kin according to need of the recipients of care. We use these discussions to consider whether we need to rethink what empirical evidence on kin and fitness outcomes tells us about alloparenting and cooperative breeding in our species, in order to bring greater clarity into research on this fundamental human trait.

## Topological traps in evolutionary games

**Jose Segovia-Martin**

How cooperation originates and persists among self-interested individuals is a central question in the social and behavioural sciences. In the canonical two-dimensional spatial Prisoner's Dilemma with unconditional imitation introduced by Nowak and May (1992), simulations on a Moore lattice show an abrupt drop in cooperation near the temptation  $T \approx 5/3$ , yet even under these harsh conditions cooperative structures can still arise. However, the nucleation rates of these motifs, and their contribution along the full cooperation curve had not been quantified. Here we show, using large-scale Monte Carlo simulations combined with automatic cluster classification, that on the Moore lattice for  $T \geq 5/3$  residual cooperation is dominated by  $3 \times 3$  (or larger) rectangular "cooperator bricks", whereas on degree-8 random-regular graphs for  $T \geq 1.5$  it is dominated by star-like motifs (1 hub + 8 leaves). Once the dynamics becomes nucleation-limited, the macroscopic cooperation level is therefore governed by the statistics of a few exceptionally resilient shapes, rather than by many different cooperator motifs. Furthermore, we show that the lattice cooperation collapse near  $T = 5/3$  is kinetic rather than critical: the reduction in cooperation is not due to a loss of growth capacity of rectangular bricks, but to the progressive destabilisation of the subcritical motifs that dominate just below this threshold. Our results show that residual cooperation at high temptation is a rare-event nucleation phenomenon governed by a small set of topological traps, and highlight the value of motif-level analysis for explaining and engineering cooperation in spatial, social, and technological networks.

## LLM-based text embeddings of political speeches reveal the cultural morphospace of ideology

**Ana Shapiro**

Core question in modelling the cultural evolution of human political systems is the extent to which political discourse is ideological – that is, made up of a stable and coherent systems of beliefs, values and attitudes – versus simply a collection of unstructured or inconsistent viewpoints that has more to do with “public passions”, group identities and alliances than a coherent ideology. Existing approaches to political discourse analysis come in various forms, but each present limitations that impede understanding; qualitative assessments are vulnerable to subjective interpretation, while traditional quantitative methods cannot capture higher-level structure and implicit patterns. Here we overcome these limitations using large language models to analyse a database of parliamentary speeches and debates spanning several decades by politicians from across the ideological spectrum in a western democracy. We use text embeddings to extract and quantify in a rigorous and repeatable way for each politician their “worldviews” – systems of foundational beliefs about reality that are posited to function as superordinate structures for other beliefs, including explicitly political ones. First, we test whether worldview beliefs predict partisan alignment in a large dataset of politician speeches, supporting the hypothesis that ideology (particularly its worldview foundations) structures political discourse. Second, we identify the most important worldview beliefs and use these to evaluate proposed evolutionary foundations of human political ideology. Beyond our own results, the approach we present offers a novel methodology for discourse analysis and holds the promise of deeper insight into the psychological structure of ideology.

## The impact of oblique transmission on the evolution of teaching

**Tsuyoshi Shimodaira**

Social learning is important to achieve cumulative culture, and teaching contributes to it by improving the efficiency of social learning. In spite of this advantage, the species that perform teaching are quite limited and the widespread teaching in the society is unique to humans. This may be because teaching is an altruistic behavior and because oblique cultural transmission diminishes the kin-selected benefit of teaching. In this study, we theoretically examined the impact of the existence of oblique transmission on the evolution of teaching. We assume two life stages: learning stage and mature stage. Learning stage is further divided into social learning and individual learning, during which the skill level of an individual develops. In social learning, an individual learns skills from his/her role model. A learner probabilistically chooses either his/her own parent or a random individual from the parental generation as a role model. During the mature stage, an individual invests into reproduction and teaching. We define fitness as the product of the skill level and the amount of investment into reproduction. One's investment into teaching improves the efficiency of social learning of learners if he/she is chosen as a role model. We analyze this model and obtain an evolutionarily stable strategy, which is the equilibrium life-schedule as a result of evolution. We find that if there is even a slight chance that a genetic parent is not chosen as a role model, the evolution of teaching becomes drastically difficult.

## Play Repertoires and Peer Relations in Yurakare Children

**Natalia Siekiera**

Play is one of the most natural ways for children to develop socially, allowing them to refine and construct their skills in a playful context (Pellegrini, 2009). It is a fundamental aspect of childhood and a powerful developmental tool across cultures. In the case of Indigenous Yurakare children, observations based on the focal follow method reveal that they spend most of their time playing in mixed-age groups without adult supervision. This presentation examines how Yurakare children play and with whom they engage. The conclusions draw on 2,419 time-sample observations of 22 children (Mage = 49.71 months, SD = 17.16; 59.7% female), complemented by field notes from two stays in a Yurakare community in 2021 and 2022. A Mann–Whitney U test assessed gender differences in overall play time. Results showed a significant effect of gender,  $U = 89.00$ ,  $Z = 2.04$ ,  $p < .05$ : boys ( $M = 39.78$ ,  $SD = 9.58$ ) engaged in more play than girls ( $M = 30.92$ ,  $SD = 9.71$ ). Children in early and middle childhood spent most of their play time in manipulative activities (64.5%), followed by large-motor (21.3%) and imaginative play (14.2%). The presentation will also extend beyond early and middle childhood to show how play practices gradually prepare children for the work activities embedded in their peer-culture structure. The discussion will address the autonomy and responsibility of children within this community. Additionally, a connected evolutionary hypothesis concerning play and peer groups (Lew-Levy & Amir, 2024) will be presented with ideas for further investigation.

## The Development of Risk Behaviors and Their Cultural Transmission

Paul Smaldino · Bret Beheim

We use cultural evolutionary models to examine how individual experiences and culturally inherited information jointly shape risk-taking behavior under environmental uncertainty. We find that learning processes not only generate considerable variation in risk beliefs and behaviors, but also that conservative learning strategies—emphasizing the preservation of generational knowledge—excel in high-risk settings, promoting risk avoidance and long-term survival but limiting growth when conditions improve. In contrast, exploratory learning strategies—leveraging juvenile exploration and peer influence—foster risk-tolerant behaviors that thrive in affluent, low-risk settings where wealth buffers and social safety nets reduce the costs of miscalculations. Introducing economic stratification to the model reveals how wealth disparities and interclass interactions reinforce these patterns, exacerbating differences in learning strategies and risk-taking behaviors within populations, and perpetuating socioeconomic inequalities through the cultural inertia of excessive risk avoidance. Our framework unites developmental, social, and evolutionary perspectives and provides a lens on the cultural evolution of risk-taking behavior and its broader societal implications.

## Melodic structure is sufficient to communicate the behavioral context of a cross-cultural sample of music

Martynas Snarskis · Samuel Mehr

Human beings all over the world sing in order to soothe their children, dance in social gatherings, express love, and a plethora of other reasons. Despite their diversity, human musical cultures share regularities in both behavioral contexts and acoustic qualities. This enables listeners to infer reliable social information regarding unfamiliar, foreign music based only on the acoustic content of the song. Such effects could be driven by aspects of song performance (e.g. dynamics, timbre, instrumentation), by structural musical components (i.e. tones and rhythms), or both: exactly how and what music communicates is an open question. Here, we test whether people can still infer the function of songs which have been stripped of potentially informative cues such as the number and gender of singers, the presence of instrumentation, and vocal dynamics in order to isolate the contribution of solely tonal and rhythmic information present in the song's melody. We created digitally synthesized audio of vocal melodies from transcriptions of a cross-cultural sample of music so that they lacked performative cues informative about behavioral context. Participants in a multilingual online study ( $n=2,140$ , in 17 languages) and in an English-language gamified citizen-science experiment ( $n=41,776$ ) listened to the synthesized audio and were asked to infer the social function of the song. We find that participants were able to infer the social function of synthesized songs at above-chance, albeit less accurately compared to inferences about the original recordings.

## Dynamic networks of book evolution

Oleg Sobchuk · Artjoms Šeja · Peeter Tinitis · Olivier Morin

Phylogenetic trees are commonly used for modeling cultural transmission. They are well suited for the domains of culture with low degree of horizontal transfer: languages, traditions, etc. But how should one model non-tree-like transmission: say, in literature or music? Neither phylogenetic trees nor phylogenetic networks would help us draw the convoluted picture of the transmission of ideas in the arts. Our study suggests a new approach to building the dynamic networks of the evolution of literary fiction, and addresses several fundamental problems of literary history. We rely on a massive collection of books: NovelTM dataset of Anglophone fiction, containing over 140,000 works. All these books have years of first publication, and the methodological challenge is to estimate the intertextual influences between them (e.g., did Winnie-the-Pooh influence Stephen King's It?) and to find the dynamic communities on the network of influences (akin to genres). To estimate influences, we created a new model that combines intertextual similarity (specifically, distances between doc2vec embeddings of books: a common approach in text mining) and the models of cultural memory (where books that are remembered longer have prolonged influence). We then identify the communities with the Leiden algorithm, and check their thematic coherence using LLM-based scores. Using this dynamic network, we address fundamental questions of literary history: 1) Do literary genres have limited "lifespans"? 2) Do genres die because of declining diversity within them? 3) Does the origin and popularity of books influence longevity of genres?

## Normativity beyond norms: How norm psychology can account for particularistic moral systems

**Mark Stanford**

Norms are a central concept in cultural evolutionary thinking. Typically, they are characterised as rules, or regularities that can be modelled as rules. But in many non-WEIRD societies, normative life revolves not around general rules, but around particularistic obligations arising from specific relationship histories or other contextual factors. In this paper, I argue that the rule-based view of normativity struggles to capture several key features of normative life: moral particularism, moral conflict, and deliberation between conflicting obligations. Drawing on recent work in metaethics, I suggest that norms are better thought of as a special case of obligations. These are better understood not as rules, but as something like the defaults proposed in John Harty's application of non-monotonic logic to model normative reasoning. I suggest that if this is right, then Heyes' 'gadgets' approach to normativity provides a more promising avenue than traditional views of norm psychology. Everyday normative life in most societies involves continual navigation of multiple, changing and conflicting obligations, which we address through social processes such as consultation, as well as private deliberation and intuitive emotional response. Rather than a 'norm database' encoding an elaborate set of rules applicable to any situation, it is more plausible to see norm psychology as a combined result of implicit and explicit processes which have culturally evolved to facilitate this messy and difficult task. This underlines the potential of investigating the cultural evolution not only of norms, but of practices by which obligations are formed, understood, negotiated and changed.

## Solving the “Meaning Problem” in the Evolution of Music: A Teleosemantic Account

**Tomasz Szubart**

A persistent challenge in evolutionary accounts of music is the “meaning problem” (Savage, 2019): unlike language, music appears to lack clear referential semantic content, making it hard to say what musical signals/representations/symbols are about and how they acquire normative meaning across cultures. I offer a theory-first solution grounded in teleosemantics. Following Millikan (1987), musical forms can have proper functions when their historical success within producer–consumer systems explains their continued reproduction. On Shea’s (2018) mechanistic criteria, those functions yield representational content precisely when consumer mechanisms exploit structural carriers (contour, meter, tempo, timbre, tension–release) to guide regulation and coordination. Thus, musical tokens possess stance-like contents (e.g., soothing, lament, rousing synchrony) fixed by selection-like histories—often via cultural selection—which also underwrite conditions for misrepresentation and malfunction (failed uptake, context drift, enculturation gaps). The framework reconciles adaptation vs by-product debates (exaptive origins, functional stabilization), unifies proximate mechanisms with ultimate payoffs (bonding, coalition display, parental care), and explains cross-cultural variability as code diversity over biologically functionally stable roles. Function fixes content; structure carries it; consumers exploit it—this allows us to 1) naturalize musical meaning within a broad evolutionary perspective (Cross 2009; Mehr et al. 2023) and 2) exaptively respond to reductionism objection.

## Youth Well-Being From a Cultural Evolution Perspective: Social Connection, Household Contributions, and Coming-of-Age Milestones in Hunter-Gatherer vs. Industrialized Societies

**Michelle Tang**

Recent decades of rapid cultural change have created environments for young people that differ sharply from those in which human psychology evolved. This evolutionary mismatch is reflected in rising youth mental health concerns, highlighted by the U.S. Surgeon General's warning of an "epidemic of loneliness," public health alerts about social media, and growing scholarship on youth distress. Yet major research gaps persist: biomedical models often overlook cultural and evolutionary contexts; cultural anthropology emphasizes variation but not evolution; and evolutionary psychiatry remains largely theoretical. This study addresses these gaps by empirically integrating cultural, evolutionary, and psychological perspectives. We examine individuals aged 11–35, focusing on (1) social connection, (2) opportunities for adult-typical contributions to household or community, and (3) culturally recognized coming-of-age milestones. To establish an ancestral baseline, we systematically analyze two centuries of hunter-gatherer ethnographies from the Human Relations Area Files and compare them to surveys from industrialized societies worldwide. We hypothesize that, compared to ancestral societies, young people in industrialized societies (1) have weaker in-person social connections, especially with extended family and long-term relationships; (2) have fewer opportunities for adult-typical household or community contributions (e.g., hunting, childcare); and (3) navigate less culturally defined and more varied, ambiguous pathways to adulthood. Achievements today are more individualized (e.g., grades, social media metrics), with less recognition from adults and more from institutions or digital platforms. These shifts may increase loneliness and erode purpose or well-being. Findings aim to inform more culturally and evolutionarily resonant approaches to youth mental health globally.

## Successful stone tool shaping in the absence of cultural models

**Claudio Tennie**

Human culture today often relies heavily and by necessity - directly and indirectly; and among other things - on “know-how copying”: the reproduction of know-how beyond in-principle individual inventive reach (e.g. words). This is rare in animals and ~absent in other apes. Recent work has undermined claims that such copying must already have been present in the Lomekwian/Oldowan stone tool record, as their knapping know-how can arise without cultural models (Snyder et al. 2022, Sci Adv). Together with other relevant evidence, this has shifted copying claims toward early Acheulean stone tools, where the know-how of shaping stone via knapping (e.g. into handaxes) is often argued to require direct cultural transmission from expert model shapers. We tested this latter claim with a new “puppet” method that separates knapping know-how from shaping know-how: human participants naïve to stone shaping were asked to produce predefined stone shapes by directing the individual blows of an expert knapper, where the expert knapper’s own shaping agency was removed. At no point were participants told or shown how to produce shapes in stone via knapping. Despite this complete absence of shaping-know-how transmission, participants succeeded in producing target shapes, including six arbitrary forms and the handaxe form. We conclude that the archaeological presence of shaped stone per se, and of shaping early handaxes, can no longer be taken as clear evidence of know-how copying. This study (Ferar et al., accepted MS) supports our recent conclusions regarding a late onset (at ca. 1-0.6mya).

## Modelling the flow of information in European book publishing 1500-1800

Peeter Tinitis · Iiro Tiihonen · Eetu Mäkelä · Mikko Tolonen

A growing body of research has shown a critical connection between the social structure of human groups and the flow of information; experimental modification of group connectivity and cross-sectional studies of social networks have both shown effects on rates of innovation and social cohesion. The extent to which these findings generalize to large populations in historical time is still mostly unknown. Using historical records of books published across Europe over 300 years, we examine how authors and their ideas move across a dynamic and heterogeneous cultural landscape. We adapt models from social learning research (Network Based Diffusion Analysis) to infer a network of connections between the cities as it changed over time. We rely on the Heritage of Printed Books (HPB) database, which combines 60+ library collections to collect entries on ca. 10 million books published in Early Modern Europe (1454-1830). With this data, we track the arrival of the most popular authors ( $n = 16,574$ ) across Europe through their individual publications ( $n = 3,691,600$ ). Using this technique, we can identify major highways of information flow between cultural centers in Europe, and track the change in these pathways with major historical events. This novel technique allows us to study the informational ecology associated with religious reformations and political revolutions, the rise and fall of European linguistic communities, and the informational antecedents of the Industrial Revolution. This project provides an important historical application of recent theoretical and experimental work in cultural evolution related to community structure, linguistic diversity, and population size.

## The Role of Multilevel Selection in Cultural Macroevolution

**Peter Turchin**

During the Holocene the scale and complexity of human societies increased dramatically. Generations of scholars have proposed different theories explaining this evolution, which range from functionalist explanations, focusing on the provision of public goods, to conflict theories, emphasizing the role of internal class struggle or external warfare. I use a general dynamical model, based on the theoretical framework of cultural macroevolution (CME), and data in Seshat: Global History Databank to quantitatively test these theories. The best-supported model indicates a strong causal role played by a combination of increasing agricultural productivity and intensity of interpolity warfare, proxied by invention/adoption of military technologies. Overall, these empirical results provide support for two major theoretical ideas in CME: cumulative cultural evolution and (still controversial) cultural multi-level selection.

## Decomposition of variance in cultural transmission and the autoencoder as a model of the social brain

**Petr Tureček**

When Ronald Fisher reduced the biological heredity of continuous traits (such as body height) to Mendelian genetics, he effectively justified the constant standard deviation of offspring from the parental mean in the Galton–Pearson model. All randomness in genetics occurs at the individual level: mutation happens at the level of an individual allele, recombination and segregation of alleles take place at the level of the parental chromosomes, and deviation from the expected phenotype appears at the level of the individual offspring. None of the stochastic components of the resulting trait has to deal with integrating information from multiple sources. Just as it is useful to reduce continuous biological traits to discrete replicators, in culture it is appropriate to prioritize a continuous model of “culturespace” over discrete “memes.” A tied-weights autoencoder can then serve as a good model of a brain that observes co-occurrences of cultural variants. The inner layer of the autoencoder corresponds to the continuous latent representational space on which cultural transmission can be modelled using appropriately parameterized probability density functions. This treatment enables a decomposition of transmission variance, in which the components correspond essentially one-to-one with Fisher’s. For two of them, however, we expect proportionality between the variance of inputs (“cultural parents,” “models”) and the variance of outputs (“cultural offspring,” “apprentices”). This proportionality of variance helps explain two important cultural phenomena: the uneven rate of cultural evolution (cultural traits at the population level change either very rapidly or hardly at all) and the ease of subculture formation.

## Flexible Decision-Making Strategies Across Multi-Level Human Groups

**Bhavya Deepti Vadavalli** · Luke Glowacki

Consensus decision-making is central to cohesion in social groups across species. Humans, however, must build consensus across multiple nested social levels. In centralized societies, formal institutions help coordinate decisions across social levels, while in decentralized societies, consensus about mobility, cooperation, punishment, or warfare emerges from local interactions. We study how decentralized, multi-layered social groups employ different interaction strategies to make decisions, and how consensus and information sharing at one level can trade off with consensus at other levels. We built an agent-based model where individuals first self-organize into marriages, forming immediate families. These families then combine into extended families, residential groups, socioeconomic units, and an ethnolinguistic group, with each larger social group containing the same number of smaller units. This number is the branching ratio. All agents then choose between two options using two different strategies: a family-first strategy, where families share information and reach consensus internally before interacting with non-family members, or a male-coalitionary strategy, where male heads of household exchange information and decide on behalf of their families. We found that male-coalitionary strategies allowed the groups to reach full consensus, whereas when the information being pooled first at the family level significantly slowed down the consensus-building process. Our results were not driven by males having superior information, but rather by a reduction in effective group size and informational noise. This suggests that representative bodies, such as elders, special councils, and male heads of households, play structural, not just symbolic roles in facilitating consensus, despite being exclusionary.

## The cultural macroevolution of arcade video games: innovation, collaboration, and collapse

Sergi Valverde · Andrej Spiridonov · R. Alexander Bentley

Arcade video games evolved in a constrained design space, following patterns of diversification, stabilisation, and collapse that mirror macroevolutionary processes. Despite their historical significance and detailed digital records, arcade games remain underexplored in cultural evolution research. Drawing on a dataset of 7,205 machines spanning four decades, we reconstruct the evolutionary trajectories of arcade niches using a multi-scale framework that integrates trait-level innovation, genre-level selection, and systemic constraints. We identify two contrasting dynamics: (1) resilient genres—such as Fighter and Driving—maintained long-term viability through innovation and collaboration networks, while (2) early Maze and Shooter subgenres collapsed due to imitation and weak collaboration. Morphospace analysis reveals how technological traits—specifically CPU speed and ROM size—co-evolved with gameplay complexity, shaping the viable design space. We argue that genres operated as evolving cultural-ecological units—structured niches that shaped trait evolution through reinforcement, constraint, and feedback. This multi-scale perspective positions arcade games as a rich model system for studying cultural macroevolution.

## The effect of environmental variability on transmission modes of local ecological knowledge

**Daniel Villar** · Luke Matthews

Local ecological knowledge is the knowledge local people have of their natural resources. Local ecological knowledge can be transmitted by a variety of modes, ranging from traditional ecological knowledge, which has deep historical roots in a culture, to knowledge individuals teach themselves. Other things being equal, cultural evolutionary models suggest that if a resource's location and availability is stable over generations, it is expected that information of how to use it would be transmitted vertically. Meanwhile, information of how to use natural resources whose availability is more sporadic spatially and/or temporally is expected to be transmitted horizontally. We tested whether this is the case, using data collected by anthropologists in four field sites across the world; from Hoonah, Alaska, USA, Zhetysu, Kazakhstan, Chiapas, Mexico, and Khovd Mongolia. In each site, we used standardised instruments to collect data on the transmission route used to learn how to use individual species. We used publicly available repositories of the occurrences of each of these species to construct Bayesian Additive Regression Tree based Species Distribution Models to map their present range, using the standard set of Bioclimatic variables. These models were then back-cast to see how the availability of suitable habitat for each species varied over time in the last 1000 years, at 100 year intervals. The variability in the species availability with the cultural area of each studied culture, as defined by HRAF, was then associated with the mode of transmission (vertical, oblique, or horizontal) for it in the present.

## Congolese BaYaka children's learning and exploring in a village context

**Amandine Visine** · Eve Holden · Roger Ndenguele · Armel Ondaye

Childhood is a key period for acquiring and transmitting cultural knowledge and skills. Hunter-gatherer children, such as the Congolese BaYaka, learn autonomously through exploration, play, and participation in foraging and domestic activities in a dense social environment. Here, we aim to further investigate children's learning ecologies by investigating (1) how children sample their social and physical environments, (2) whom they spend time with, and (3) how they allocate their time to play, work-themed play, and work. We do so by ethnographically and statistically analysing continuous video observations of 57 children aged between 7 and 16 years old. BaYaka children spent 75% of their time in the village and the rest in the surrounding forest. They spent most of their time alone or in children-only groups, rather than with adults. Children spent a third of their time playing and allocated less time to playing as they aged. They also spent a third of their time engaged in foraging or domestic tasks, and uninterrupted work session duration increased with age. There was no effect of gender, group size, and presence of adults on overall time allocation or uninterrupted activity duration. These findings illustrate how BaYaka children flexibly and playfully navigate between activities, learning through peer interaction, exploration, and participation to acquire skills and knowledge essential during adulthood. Child-led learning pathways and autonomy might be fundamental mechanisms for cultural acquisition and transmission in a small-scale society.

## **Evolving genealogies in cultural evolution, the descendant process, and the number of cultural traits**

**Joe Wakano**

We consider a Moran-type model of cultural evolution, which describes how cultural traits emerge, are transmitted, and get lost in populations. In contrast to a standard forward-in-time analysis, our analysis focuses on the underlying cultural genealogies, that is, cultural ancestors of each individual. They are closely related to the ancestral selection graph of population genetics, wherefore we call them ancestral learning graphs. We investigate their dynamical behavior, that is, we are concerned with evolving genealogies. In particular, we consider the total length of the cultural genealogy of the entire population as a function of the (forward) time where we start looking back. This quantity shows a sawtooth-like dynamics with linear increase interrupted by collapses to near-zero at random times. By assuming simple innovation and learning rules on top of this cultural genealogy, we illustrate how the number of distinct cultural traits behaves over time. Our theoretical results predict a non-stationary cultural dynamics with repeated mass extinction events of almost all cultural traits, followed by accumulations of newly innovated cultural traits.

## Measuring cultural group selection in the wild: the life and death of consumer food clubs

Tim Waring · Leah Keating · Jean-Gabriel Young

Cultural group selection (CGS) is the process by which cultural traits that provide functional benefits to a group are more likely to be transmitted among groups than those that do not. Models of CGS demonstrate the logical possibility of the mechanism, and everyday experience suggests that CGS is common in human society. However, CGS has been hard to study in part because estimating the strength of CGS (relative to individual level cultural change) entails punishing data requirements. For this reason, observational evidence has been rare. We present a study of cultural group selection in a population of self-organized consumer food cooperatives. These food clubs purchase bulk food items to share among members. Qualitative evidence suggests that club survival and function requires cooperative effort among members. Through a collaborative research partnership, we assembled a unique dataset with individual economic choices, interactions and outcomes as well as club-level characteristics and outcomes, across a population of food clubs over many years. To test the prediction that clubs with certain traits (cooperative behaviors and rules to manage cooperation) function more effectively or survive longer than clubs without those traits, we develop a Bayesian multilevel survival model in which members may exit a club, and clubs may expire. Preliminary results suggest that certain traits of food clubs, including club size, administrative roles, and the presence of certain rules allows clubs to survive longer, and achieve greater co-purchasing success. This study provides the first quantitative measurements of cultural group selection among cooperative organizations in the wild.

## Religious cultural diversity is associated with less religious conflict around the world

Cindel White · Nava Caluori

Many cultural evolutionary theories of religion argue that religious norms primarily evolved to promote parochial prosociality. Religious norms foster cooperation with fellow co-religionists that would promote group survival, but religious values do not necessarily encourage universal prosociality, extended towards outgroups and non-believers. Religious values and identities are often central features of enduring intergroup conflicts, as people express hostility toward outgroups perceived to have incompatible cultural values, and cooperating with people very different from oneself causes tensions and challenges that are absent in more homogeneous societies. However, in many modern nations people with different religious identities also peacefully cooperate toward common goals, indicating that religious commitments may not necessarily generate intergroup biases and conflict in all contexts. The present study provides a global test of whether religious cultural diversity predicts religious social hostilities. We use the World Values Survey (95 countries, >260,000 participants) to assess two indicators of religious diversity within each country: the probability that people hold different religious identities (Herfindahl index), and the size of differences in cultural values between different religious groups (Cultural Fixation Index). We find that countries with more diverse religious groups, and greater cultural differences between members of religious groups, tend to have less social hostilities (e.g., religion-related violence, harassment, and armed conflict), even controlling for other differences between countries. Results show that instead of necessarily creating conflict, many different religious groups who endorse substantially different cultural values can peacefully coexist in many nations.

## Modelling the cultural evolution of problems and solutions

**James Winters**

Much of the focus in existing models of cumulative cultural evolution has been on problem-solving and the collective capacities underpinning the generation, transmission, and selection of cultural solutions. Less attention is paid to the construction of problems: the process by which individuals interact with the environment to build representations of the problem space. In this talk, we present a model where agents generate probabilistic problem and solution recipes. Each timestep, agents engage with the environment by constructing problems and using these to constrain the discovery of solutions. Here, the environment is represented as an NK landscape that determines the complexity and ruggedness of the payoffs:  $N$  specifies the dimensionality of the search space, while  $K$  controls the interdependencies between dimensions. Payoffs depend on how well the problem aligns with the environment and how closely the solution matches the problem. Individual learning corresponds to a process of refining problem and solution recipes, using information about the payoffs to update their representations via Bayesian inference. We then manipulate the type of social learning available to agents: (i) agents who just copy solution recipes, (ii) agents who just copy problem recipes, and (iii) agents who copy both problem and solution recipes. Our findings demonstrate that cumulative improvement is only reliable when populations culturally transmit both problem and solution recipes. The advantage of transmitting both scales with environmental complexity: simple environments (low  $N/K$ ) show no advantage over just copying solutions, while complex environments (high  $N/K$ ) show a distinct benefit for copying both.

## Children's narrow cognitive bottleneck accelerates the emergence of statistical properties of language

Lucie Wolters · Inbal Arnon

Learners are limited in how much they can learn when a language is passed from generation to generation. This transmission bottleneck is thought to play a crucial role in shaping language by promoting the emergence of systematic structure that enhances learnability. Prior work has investigated the impact of bottlenecks by manipulating how much data learners receive. However, in natural language learning, bottlenecks can also result from learners' cognitive limitations. To address this, we present a novel approach that compares cultural transmission in two populations with differing cognitive constraints: children and adults. Specifically, we investigate the emergence of two cross-linguistic statistical properties that were shown to facilitate learning: statistically coherent words and Zipfian word frequency distributions. Transmission chains of child and adult learners observed and reproduced sets of colour sequences that were produced by the preceding participant. For both age groups, initially random sequence sets evolved to have statistically coherent units with a Zipfian frequency distribution but crucially, these statistical properties emerged faster in children. In addition, using a different sample of participants, we show that children and adults learn the final child-generated sets more easily than the adult-generated ones. Together, these findings suggest that children's more limited cognitive capacities create a narrower learning bottleneck, which in turn accelerates the emergence of statistical properties that enhance learnability. These results provide novel evidence that cognitive constraints modulate the emergence of structural properties that facilitate learning and that cultural transmission by children can drive the emergence of cross-linguistic structural properties.

## Biases in cultural transmission of information about a minimal ingroup

**Mateusz Woźniak** · Guenther Knoblich

Group membership and our beliefs about the groups we belong to are the building blocks of our social and cultural identity. Here, we investigated whether transmission of information about how often different personality traits occur in a minimal ingroup and outgroup results in distinct patterns of cultural evolution. Participants transmitted information about the occurrence of positive, negative and neutral traits to other participants in linear transmission chains. First, we found a general tendency for occurrence of all traits to decrease across generations. However, our control experiment revealed that this general decrease was not specific to transmission of information about traits but represented a low-level response bias. Critically, this decrease across generations was smaller when participants were transmitting information about ingroup than outgroup traits, but only for positive and neutral traits. No significant difference emerged for negative traits. Together, these results show that minimal group membership can selectively bias transmission of information about ingroup and outgroup. We propose that this results from two processes: an ingroup-positivity bias and higher motivation to accurately transmit ingroup-related information. Overall, our study provides an example of how examining mechanisms of cultural transmission can elucidate our understanding of processes of formation and evolution of social-cultural identity.

## A novel coding scheme for studying bodily movements: Kinotographic analysis

**Sarah Wright** · Jeremy Kendal

The transmission of cultural information is relevant to the variation, heritability, and selection of cultural traits. It is therefore of central importance to understanding how culture evolves. However, the transmission of bodily movements is an underdeveloped research area, partly due to a lack of widely validated and applicable methods for coding the similarity in bodily movements across individuals. I developed a novel coding framework, kinotographic analysis, based on the Labanotation system (Hutchinson Guest, 2005) and propositional analysis (Kintsch, 1974). This framework enabled analysis of participants' (N=72) movements, and thus transmission fidelity during a serial reproduction experiment. For each movement the participants made, I created individual 'kinotographs' i.e. symbols denoting the position and movements of parts of the body (total number = 127). I then produced a numeric list of movements per participant (range per participant: 0-23 movements) and calculated the proportion of movements which were accurately transmitted by each participant. The rigour and detail means the coding framework, which originated in dance choreography, can be adapted to diverse transmission projects. It can be used for highly detailed (the position of each finger), and simpler (whether the left arm is raised or lowered) analysis. I will describe the coding framework, giving examples from the research for which it was developed, and argue its value for many possible areas of imitation and transmission studies, including studying imitation in rich, naturalistic contexts, and the evolution of skilled practice. As such, it promises to be a valuable tool for the field of cultural evolution.

## Emergent cultural transmission of knowledge without mentalizing

Charley Wu · Claudio Tennie

How do individuals acquire rich, flexible knowledge about their environment from others? A common answer for humans is that we engage in computationally costly forms of mentalizing—inferring goals, values, or world models from others' behavior. In contrast, cultural evolution has long emphasized how simple, low-cost social cues can give rise to surprisingly sophisticated behaviour. In this work, we use Reinforcement Learning simulations to explore how “model-based” internal representations of the environment can emerge from very simple forms of social learning. We place a naïve forager in a spatially reconfigurable environment and allow it either to learn alone or to observe an expert forager. Importantly, the naïve agent does not attempt to infer the expert's beliefs or motives. Instead, it merely copies the expert's actions (i.e., their tendency to occupy particular locations), analogous to local enhancement. Despite their simplicity, these social cues systematically bias what the learner experiences, allowing its internal representation of the environment to become more similar to the expert's. As a result, the learner acquires aspects of the expert's world representation without needing to infer it through costly computations. We compare different learning strategies and show that model-based learners benefit most from social exposure, displaying faster learning and more expert-like representations. Overall, our results suggest that complex cultural transmission can arise from simple, non-mentalizing processes that “hijack” asocial learning mechanisms. This provides a computationally grounded pathway by which rich knowledge can catalyze across individuals in both human and non-human societies.

## **A norm about harvest division is maintained by a desire to follow tradition, not by social policing**

**Minhua Yan** · Robert Boyd · Zhizhong Li · Yuanmei Li

Determining how people behave in contexts governed by social norms can clarify both how norms influence human behavior and how norms evolve. We examined cooperative farming harvest division among the Derung, a Tibeto-Burman-speaking horticultural society in southwestern China. In the village of Dizhengdang, the norm dictates that cofarming harvests should be divided equally among participating households. This contrasts with an alternative norm followed in some other Derung villages that holds that harvests should be divided equally among participating laborers. Rational choice theory and evolutionary models of norm-based cooperation assume that individuals weigh the material and social payoffs of different actions and follow norms because doing so maximizes their payoff. However, the behavior of the Derung in Dizhengdang is not consistent with payoff maximization. Using interviews on co-farming behaviors and attitudes, along with an ultimatum game experiment framed as co-farming harvest division, we found that most respondents preferred divisions based on labor contribution. They also accurately guessed that others shared this preference and would approve of such divisions. Nonetheless, they still followed the prevailing norm of dividing by household. Their self-reported explanation for this behavior was that they desired to follow their traditional practices. Such a normative decision-making algorithm can allow individually consequential norms to persist without costly policing by other group members.

## Dynamics of collective creativity in AI art competitions

**Mason Youngblood**

Creativity is a fundamental aspect of human cultural evolution, yet the mechanisms by which human groups produce novelty are notoriously difficult to infer from the historical record. The rise of large-scale digital platforms, however, provides an unprecedented opportunity to analyze the creative process as it unfolds, offering a transparent “fossil record” of cultural innovation. In this study, we leverage one such platform, Artbreeder, which hosts daily “remix parties” where users iteratively build on each other’s work from a single seed image. We analyze a massive dataset of 130,882 images from 368 remix parties to identify the drivers of novelty, complexity, and competitive success. Using state-of-the-art machine learning models, we operationalize both image novelty and complexity: novelty is measured using CLIP embeddings and density estimation, while complexity is quantified via segment counts from the Segment Anything Model. The results reveal an interesting tension: while more novel “parent” images produce more novel and complex “children” and attract more likes, users paradoxically prefer to remix images that are less novel and complex. At the group level, larger remix parties produce more novelty at the cost of lower complexity. Additionally, images tend to converge towards common thematic “attractors” (e.g., steampunk scenes, alien architecture, furrries) over the course of remix parties. These findings reveal the complex trade-offs that shape collective creativity, and demonstrate how large-scale digital platforms can serve as laboratories for the field of cultural evolution.

## The WEIRD instrument problem and systematic bias in cross-cultural research

**Matthew Zefferman**

As researchers broaden samples to populations that are not WEIRD, they often use instruments designed for WEIRD populations. Does this practice create systematic biases when making cross-cultural comparisons? For example, various researchers have found less complex personality structures outside of WEIRD populations. In this paper, I model how administering personality instruments designed for one, typically WEIRD, population to novel populations will systematically underestimate the relative complexity of the novel populations. This occurs because instruments optimized to capture the personality structure of one population can fail to capture the complete structure of others. This bias may explain the apparently less complex personality structures outside of WEIRD populations. This suggests that a society's cultural distance from the society for which an instrument is designed should tend to be negatively associated with the apparent complexity of its personality structure. I found this relationship in both the data generated by the model and in pre-existing cross-cultural personality and cultural distance datasets. Specifically, out of 67 countries in the datasets, cultural distance from the United States, for which a cross-cultural personality instrument was designed, had the strongest negative relationship with the complexity of the personality structure as measured by the instrument. This supports the hypothesis that lower apparent complexity outside of WEIRD populations may be the result of using WEIRD instruments, rather than real differences in complexity. I propose possible reforms to avoid this type of bias.

## Social Learning and the Evolution of Humanlike Structured Intelligence

Tian Chen Zeng · Rahul Bhui · Ivan Kroupin

Human minds look computationally unique when compared to nonhuman animals or machines, because human learning is uniquely general (i.e., less content-specific) and efficient (e.g. when we learn a new word or behavioral strategy from a couple of examples). These properties are challenging to explain from an evolutionary perspective. Computationally speaking, only minds that generalize can learn in this way--i.e., minds that infer abstract, structured theories (i.e. models) from prior experience to inform responses to new situations differing from previously-encountered ones in concrete details. Using simple and general models of cognitive evolution, I show that the appearance of social learning and cumulative culture shifts "information ecologies" to favor the evolution of minds that can learn flexibly and efficiently (i.e., by learning structured, abstract models supporting generalization), at the expense of minds that respond in inflexible, fixed ways (e.g., innate responses) or minds that flexibly--but inefficiently--learn many situation-specific responses (e.g. through pure reinforcement). The intuition is that social learning floods the environment with cheap generalization problems: all organisms generalize from (costly) past experiences to future problems, but social learning creates opportunities to generalize from the behaviors of other individuals, who can be cheaply observed. Thus, the availability of social information would have profoundly altered the computational demands faced by our ancestors' brains, in ways that are predicted to drive the evolution of abstract representational capacities and a rich repertoire of inductive biases. In this way, cumulative culture drove us into the cognitive niche.

## Empirical Evidence of Cumulative Cultural Evolution in Patent Data

**Qiankun Zhong**

Humans developed complex cultural tools and technology in an impressively short time, thanks to our unique social learning heuristics and our cumulative advantages across generations. However, not all cultural groups benefit equally from this process of cumulative learning. What drives the pace of cumulative cultural evolution (CCE) in human culture and technology? How can we create better environments for long-term cultural and technological development? Henrich's model of CCE uses iterative social learning to explain this process, showing that cumulative cultural evolution requires a large population, a low learning error on average, and a high variance of individuals' learning outcomes. While this model has been used to explain the maladaptive cultural evolution in Tasmania, it has not been tested in today's fast-paced, information-rich technological environment. In this paper, we apply computational linguistic analysis to USPTO Granted Patent Data to empirically estimate the role of social learning in cumulative cultural evolution. As a result, we validated Henrich's theoretical model that the innovation in a field is positively associated with average social learning variance and negatively associated with social learning error. We also show that population has a positive effect on cumulative cultural evolution. A higher population would reduce the effect of social learning errors and enhance the effects of social learning variances. We then discuss adaptive solutions to maintain our cultural complexity and technological advancement in response to the current changing environment of AI, social media, and information technology.

## Flexible infant feeding practices respond to political transformation in rural southern Poland

Joanna Żyrek · Sarah Myers · Andrzej Galbarczyk

Human infant feeding practices are diverse and flexible, reflecting a deep history of combining breastfeeding with alternatives. However, beyond a handful of hunter-gatherer and cross-cultural studies, few microlevel data exist on combined feeding practices in subsistence populations, and, to our knowledge, there is no research on how feeding strategies change alongside ecological and cultural transformations. We document diverse feeding practices in the first six months in rural southern Poland among 670 women aged 18-90 (mean = 46.8, SD = 17.0) and their 1424 children (mean = 2.1, SD = 1.74), collected through long-form demographic interviews spanning a profound economic and political transformation. From 1989, Poland rapidly entered a market economy after decades of socialist occupation, increasingly opening up to Western norms. Yet throughout this period and to the present day, traditional smallholder farming was partially maintained. A sudden macro-economic discontinuity therefore coexists with a more continuous (until recently) farming economy. Before 1989, 'traditional' feeding strategies combined low levels of breastfeeding (18.3%) and substantial supplementary cow's milk (63.4%). Afterwards, breastfeeding and formula-feeding increased (50.6% and 29.1%, respectively). Preliminary analyses indicate two major trends. First, formula replaced cow's milk as the main substitute as market availability increased over time; initially mainly among wealthy and high-educated mothers, after which formula-use diffused across wealth and educational categories. Second, breastfeeding rates increased over time, suggesting an ideological shift. Infant feeding choices are causally complex and highly sensitive to ecological and cultural contingencies. Our results challenge stereotypes about the ubiquity of exclusive breastfeeding.

# Thematic Sessions

## The Origin and Evolution of Numeration Practices

Organizer: Jean-Charles Pelland

### Session abstract

Due to the abstract nature of numbers, their representations come in an incredible variety of formats, including words, gestures, notations, knots, pebbles, and tallies of all sorts. This diversity poses unique challenges to the study of the cultural development of numeration practices: how can such a variety of practices allow us to carry out the same (numerical) actions? Relatedly, to which extent does the shared numerical nature of these practices imply common factors and stages in their evolutionary trajectories? An important challenge in answering these questions is the lack of an all-encompassing theoretical framework with which to contrast and compare these practices across representational formats. Another challenge is that the abstract nature of numbers means that many of these practices leave little if any material traces behind. In this group session, we canvass the landscape of numeration practices with the aim of showing that, despite their variety, these practices evolved due to the pressures of common cognitive and cultural constraints. Orienting the discussion towards compositional strategies employed by numeral systems, we offer detailed case studies of numeral systems in lesser-discussed formats, including body-based systems (Dudojć & Bender), linguistic systems from the Pacific (Barlow), and ancient Egyptian notations (Courtenay). Adopting this compositional perspective allows us to show how the cognitive demands specific to each representational format — its representational effect (Zang & Norman 1995) — may have shaped their evolutionary trajectory. From common elements found among these representational effects emerge general cognitive constraints and cultural attractors in the historical development of numeration practices (Pelland).

## The Origin and Evolution of Numeration Practices

### Say it ain't so: a functionalist take on the origins of numeration practices

Jean-Charles Pelland

Studying the origins of numerical cognition offers striking confirmation of Heyes' (2018) claim that cognitive psychology and the study of cultural evolution are mutually dependent. On the one hand, we cannot rely solely on biology to explain where our numerical abilities come from, given that widespread numeracy is the product of an elaborate cultural niche. On the other, we cannot rely entirely on cultural factors, given the mountains of data showing signatures of cognitive systems like the Approximate Number System in numerical tasks (Cohen Kadosh & Dowker 2015). Unfortunately, since numerals can fail to leave material or cultural traces behind, data on the evolution of early numeration practices is limited. This means we are often left with just-so stories about how numerical cognition started with finger counting (e.g. Flegg 2012). In this talk, I propose a pluralist approach to the historical development of numeration practices that focuses on the role cognitive tools and practices needed to play for us to overcome the limitations of our innate cognitive machinery. To support my proposal, I survey cognitive and anthropological data, covering subitizing (Katzin et al. 2019), chunking (Gobet et al. 2016), learning milestones in ontogeny (Carey 2009), notations (Chrisomalis 2010), and recurring structures of restricted range linguistic numerals (Bower 2025). Based on this data I argue that cognitive tools like pebbles and fingers played the same role in the emergence of numeration practices, which is to allow us to overcome the limits of working memory by chunking objects together into new units.

## The Origin and Evolution of Numeration Practices

### **From fingers to culture: Body-based numeration practices in evolutionary perspective**

Olga Dudojć

Human hands are often regarded as the natural starting point in the emergence of numeration practices, owing to the shared anatomy of the human body. Finger counting has therefore frequently been assumed to be a universal and uniform phenomenon. However, evidence from experimental research challenges this assumption, showing that the use of fingers to represent numbers is neither universal nor innate (e.g., Butterworth et al., 2011; Crollen et al., 2011). Moreover, the considerable diversity of body-based numeration practices has often been overlooked in discussions of the evolution of numeration systems. This talk addresses these issues by presenting recent developments in the study of body-based numeration systems. Drawing on a global sample, we demonstrate that such systems exhibit substantial variability across several structural properties, including the ways in which they implement compositional principles. This variation is not limitless but gravitates toward recurring patterns, some shared with other representational formats (such as spoken language or notations), others unique to body-based systems. Furthermore, we show that these systems display phylogenetic signal, indicating that they are not merely ad hoc tools but rather culturally transmitted and often conventionalized practices. We discuss the broader evolutionary implications of these findings and suggest that body-based numeration does not follow a unilinear trajectory from simple to complex forms. We also consider the influence of language and functional demands on the development of these embodied systems.

## The Origin and Evolution of Numeration Practices

### **When less is more: The emergence of subtraction in Austronesian numeral systems**

Russell Barlow

The ubiquity of decimal systems has been attributed not only to anatomical influences but also to cognitive advantages of using the moderately sized number 10—high enough to enable efficient communication but low enough to facilitate learning (Bender 2025). Furthermore, there may be universal pressures for structural regularity in numeral formation (Koile & Blasi 2025), perhaps encouraging the evolution of “canonical” decimal systems, as found in languages like Mandarin. Nevertheless, irregularities recur across numeral systems in the world’s languages. Thus, for example, although most complex numerals are formed by addition or multiplication, sometimes one or more numerals in a system are formed—exceptionally—by subtraction. In Classical Latin, the numerals ‘eighteen’ and ‘nineteen’ were constructed as ‘two from twenty’ and ‘one from twenty’, respectively, thereby contravening the additive rules found elsewhere in the system. Latin’s descendant languages, such as Spanish and Italian, however, no longer use subtractive forms for ‘eighteen’ and ‘nineteen’, perhaps suggesting a natural progression towards “regularity”. Such a teleological view of numeral system evolution, however, is not supported by all languages or language families. This talk presents the results of a study investigating subtractive numerals in the large Austronesian language family. Although Proto-Austronesian speakers employed a decimal numeral system with simple underived numerals for ‘one’ through ‘nine’, subtractive numerals have arisen independently some twenty times or more in its descendant languages. I will survey the diversity of these innovative systems, offering explanations for what might appear to be the violation of an expected directionality in cultural evolution.

## The Origin and Evolution of Numeration Practices

### Non-linear pathways in the evolution of the written number

Lloyd A Courtenay

The history of written numerals shows how shared cognitive constraints and local cultural contexts together shaped the ways humans came to represent quantity (Chrisomalis, 2010). The emergence of numeral systems reflects recurrent tendencies in human thought, but not universals; different societies found distinct yet convergent solutions to the problem of recording numbers. Before the appearance of writing, engraved and marked artifacts may already reflect early quantification, but without access to Palaeolithic languages, their meanings remain uncertain. With the advent of writing, ancient Egypt provides a particularly rich case in which multiple distinct written numeral systems - Hieroglyphic and Hieratic - developed in parallel under different social, political, religious, and economic pressures, while sharing the same linguistic system. This talk explores how these systems relied on base-ten organization and visual regularity, yet their trajectories diverged according to their functional and symbolic roles. This shows how, rather than progressing linearly toward abstraction or efficiency, written notation underwent cycles of adaptation, simplification, and hybridization shaped by diverse cultural and practical uses. The result is a mosaic of written numeral systems that converge in structure and function without deriving from universal templates. This illustrates how culture (e.g. religious, political and economic domains) acted as a selective pressure shaping the emergence of these cognitive tools, and the challenges of tracing such processes to the origins of numerical cognition and mathematical reasoning. This example of parallel written numeral systems reflects how cultural contexts modulated cognitive load, influencing how numbers were represented, manipulated and recovered

## Cultural Evolution and Archaeology

Organizer: Maria Mercedes Martinez Okumura

### Session abstract

There is no doubt that Cultural Evolution has been an important element for some archaeological questions that have been made since the beginning of this discipline. In fact, how material culture change and what is the best fitting explanation for such change have been some of the most frequent questions in this area. The aim of this session is to highlight the diversity of archaeological contexts in which Cultural Evolutionary approaches can be profitably applied, as well as to discuss more theoretical concepts generally used in this area.

## Cultural Evolution and Archaeology

### **Gene-culture coevolution at the dawn of everything: a cophylogenetic approach**

Felix Riede

Gene-culture coevolutionary theory provides a compelling framework for understanding human biocultural history – or what has been called the ‘parallel tracks in time’ of human biological and cultural evolution. Fully operationalized implementations remain few and far between, however, not least when it comes to studying such dynamics over the long temporal scales of deep time. Here, we present initial results of the COEVOLVE project, which seeks to develop a rigorous and transparent workflow to analyse, in parallel, palaeogenomic and archaeological data from Europe dating to the period between ~20,000-11,000 years ago corresponding to approximately 400 generations. This period includes a number of major environmental upheavals and equally as many genetic and cultural changes, yet the degree to which they correlate and the question of what caused the observed changes in genetic and cultural make-up remain largely unresolved. Grounded in cultural evolutionary theory, we use cophylogenetic methods to juxtapose genetic and cultural relatedness, where their relative alignment indexes co-evolutionary convergences and divergences. Comparing the topology of genetic and cultural phylogenies facilitates interpretations of cultural contact and diffusion in relation to migration and spatial isolation. The workflow presented here utilizes published data, deploys explicit quality control measures and assesses coevolutionary dynamics with explicit reference to cultural evolutionary theory. As such, it is eminently case-transferable with applicability well beyond the European Palaeolithic.

## Cultural Evolution and Archaeology

### **An “uninteresting nonevidence for nonevolution”: stasis in the archaeological record**

Maria Mercedes Okumura

Cultural Evolutionary Theory (CET) has been successfully applied to the archaeological record to enhance our understanding of the processes underlying cultural change in the past and to generate related explanations. While numerous case studies emphasize cultural innovations that produce rapid and dramatic shifts in material culture, the phenomenon of cultural stasis has received comparatively little attention. Most discussions of stability in cultural traditions have been limited to a few contexts, particularly those concerning extinct hominins. Here, we present a case study from Late Holocene adzes from New Zealand in which cultural stability appears to be the prevailing pattern. We argue that greater attention should be given to the apparent lack of change in material culture. Far from representing an uninteresting or nonevolutionary condition, cultural stasis in the archaeological record can provide valuable insights into the active maintenance of traditions and the role of established practices in reinforcing cultural identities.

## Cultural Evolution and Archaeology

### **Mind over matter? Some problems to be addressed in CET**

Astolfo Gomes de Mello Araujo

Archaeology provides the only long-term record of human culture. Therefore, researchers interested in understanding cultural evolutionary patterns of long duration would greatly benefit from studying and incorporating data provided by archaeological materials. Cultural Evolutionary Theory (CET) postulates that one can approach cultural changes or stasis through evolutionary terms borrowed (and then adapted) from Biological Evolutionary Theory. Naturally, such terms include selection and drift. The concept of fitness is at the core of such discussion since the distinction between functional and stylistic attributes would be related to fitness enhancing versus neutral attributes. More recently, there has been a debate about how to observe and even define fitness in cultural evolution. We believe that the debate about fitness cannot advance properly without an assessment of 1) the distinction between information and knowledge; 2) the existence of four totally different modes of knowledge; 3) the necessity of adopting a clear and operational definition of culture that can be used in an evolutionary framework; 4) the necessity of stating what is meant by “fitness”; 5) the precedence of praxis (performances, behaviors, and related artifacts) over mental states ruling mechanisms of cultural transmission.

## Cultural Evolution and Archaeology

### **Cultural evolution is archaeology or it is nothing**

Ethan Edward Cochrane

As artefacts are the only evidence that records past human behaviour, archaeology is vital to evolutionary explanations of the human past. Despite this, artefact-based archaeological analyses are rare at Cultural Evolution Society (CES) meetings and in the related journal, *Evolutionary Human Sciences* (EHS). In this paper I investigate the history of archaeology in the CES and the EHS, examine the factors that have led to a lack of archaeology in these venues, and chart a programme for the reinvigoration of archaeology in cultural evolutionary studies.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

Organizer: Michael Muthukrishna

### Session abstract

Last year was the 40th anniversary of the publication of Boyd & Richerson (1985). Over these past four decades, cultural evolution has transformed from a provocative hypothesis into one of the most productive frameworks in the human sciences. This session takes stock of that journey, tracing the intellectual arcs, and envisioning directions for the decades ahead.

Robert Boyd will offer reflections on the origins of the field, its evolving assumptions, where we're going and what's missing. Joseph Henrich follows with a synthetic account of how cultural evolution now serves as a unifying framework across anthropology, psychology, and economics. Cristina Moya highlights the importance of context: how demography, ecology, and local structure shape cultural transmission and selection, and why accounting for this variation is critical for theory. Sarah Mathew discusses theory-driven fieldwork, showing how ethnographic precision refines and tests formal models. Michael Muthukrishna will introduce the session and close with the future on applied frontiers, how these models are informing policy and social design in domains from education to development. Cultural evolution has not only informed our understanding of our past, but is helping design better futures.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### Four Decades of Cultural Evolution: Reflections and Reckonings

Robert Boyd

It has been four decades since *Culture and the Evolutionary Process* (Boyd & Richerson, 1985) helped launch cultural evolution as a formal science. In that time, the field has grown from a handful of mathematical models and thought experiments into a flourishing, interdisciplinary enterprise spanning anthropology, psychology, biology, and economics. In this talk, I'll reflect on how the field has evolved - what Pete and I got right, what surprised us, and what we still don't understand.

I'll revisit some of the field's early assumptions about the role of social learning, population structure, and cumulative culture, considering which have endured and which have been reshaped by new data and theory. I'll also discuss persistent gaps: where our models still fall short of the messy realities of human behavior, and where new empirical tools, from large-scale datasets to computational modeling, offer promise. Finally, I'll consider the future of cultural evolution: what questions remain central, what we're losing and what we've gained, how the field can better integrate with the broader human sciences, and what it means for understanding the trajectory of human societies with some advice for the next generation of scholars.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### Unifying the Human Sciences through Cultural Evolution

Joseph Henrich

We now have a common language and unifying theoretical framework for understanding human behavior across disciplines that once spoke past one another. Over the last four decades, this framework has connected anthropology's ethnographic insights, psychology's cognitive mechanisms, economics' models of utility with biology's evolutionary logic. In this talk, I'll explore how this unification has unfolded, where it still faces resistance, and some of the most exciting questions ahead.

I'll argue that cultural evolution has begun to deliver a general theory of human diversity grounded in evolutionary principles. Drawing on work from small-scale societies to large-scale institutions, I'll show how culture shapes cognition, cooperation, and development, and how these feedbacks explain both universal patterns and local and historic variation. Yet major gaps remain in the dialogue between formal theory and empirical measurement, in our treatment of institutions, norms, and technologies, and in how we model cumulative change at scale. I'll sketch what a truly unified human science grounded in cultural evolution could look like: one that links micro-processes of learning to macro-patterns of institutional change.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### **Culture in Context: Demography, Ecology, and the Evolution of Variation**

Cristina Moya

Cultural evolution models often assume that transmission and selection processes operate uniformly across human populations. Yet, in reality, the social and ecological contexts in which people learn, cooperate, and innovate vary in ways that shape evolutionary dynamics.

I'll argue that understanding the patterns of cultural diversity requires greater attention to the demographic and socio-ecological environments in which cultural transmission occurs. I review models and empirical examples of how local population size, migration patterns, and kin structure alter which traits spread and which institutions persist. These contextual factors are part of the causal machinery of cultural evolution. I'll also discuss how integrating these insights can help refine theory: developing models that treat variation not as noise / residual to be explained away but as central targets of inquiry. Doing so allows us to better understand why societies diverge, how they adapt, and when they converge on similar solutions despite different starting points.

Ultimately, building a more context-sensitive science of culture will not only improve prediction, but could also reconnect cultural evolution with the rich anthropological and historical literature focused on the diversity of human experiences.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### Testing Cultural Evolution in the Field: Theory-Driven Ethnography

Sarah Mathew

If cultural evolution began as theory-rich but data-poor, it is now challenged by the opposite problem: vast descriptive data with too little connection to formal theory. Fieldwork remains essential for closing that loop. In this talk, I'll argue that theory-driven ethnography, that is, research explicitly designed to test and refine cultural evolutionary models, offers one of the most powerful ways to advance the field.

Drawing on my work among the Turkana and other small-scale societies, I'll show how field data can reveal the mechanisms behind cooperation, punishment, and collective action that models often idealize. Careful ethnographic measurement exposes both the boundaries of current theory and the conditions under which its assumptions hold. It also surfaces new puzzles about norm enforcement, intergroup competition, and institutional evolution that have thus far received inadequate theoretical attention.

I'll discuss strategies for designing field studies that engage directly with formal predictions: mapping model parameters onto measurable variables, testing for equilibrium behaviors, and identifying when real-world dynamics deviate from theoretical expectations. Cultural evolution will mature as a science when its theories are not only elegant but also properly battle-tested in the field.

## Innovation in Ritual and Religion

Organizer: Aiyana Koka Willard

### Session abstract

Religion and religious rituals are often portrayed as monoliths of unchanging tradition characterised by high-fidelity cultural transmission. Ritual specifically has been theorised as a mode of conventional learning grounded in over-imitation that actively suppresses innovation. Concepts like the 'ritual stance' focus on the role of over-imitation and causal opacity to demonstrate how ritualising behaviour can discourage questioning, curiosity, and creative modification. Yet this portrayal sits uneasily with observable reality: religious beliefs and practices undergo substantial transformation across time, and novel beliefs and practices are continuously emerging. Such change necessarily requires innovation. This series of four talks will explore some of the mechanisms and offer examples of innovation within the domains of religion and ritual. Across four talks, we examine how religious beliefs remain dynamic, adapting to meet emerging needs and new global challenges. We investigate how ritual practitioners engage in systematic experimentation, efficacy testing, and iterative modification of ritual techniques. We will give examples and evidence that practitioners treat rituals as functional technologies rather than inflexible traditions. This instrumental logic allows for continuous innovation through tinkering and adaptation. Drawing on both contemporary and historical examples, we argue that scholarly understanding of religious belief and practice must incorporate a more robust account of how innovation operates within these domains. We offer some of the first steps towards this goal.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### Innovation in Neo-Pagan Beliefs and Practices

Aiyana Willard

The high levels of innovation in contemporary neo-pagan practices presents an interesting counter point to the static nature of ritual often presented in the cultural evolution of religion literature. In this talk, we suggest that neo-pagan communities are developing a somewhat novel approach to ritual that prioritises the repetition of the emotional experience over the repetition of prescribed actions, enabling rapid evolution of these practices. This shift allows neo-pagan movements to adapt quickly to the changing needs of people in the contemporary West and could explain why these practices are growing so rapidly. We examine three case studies from the UK pagan community that illustrate different dimensions of this innovation. First, we analyse how the major public festivals of Beltane and Samhain are updated and redesigned each year to better serve dual functions: introducing curious newcomers to pagan practice and reinforcing a group identity that is itself rapidly changing. Second, we explore how group rituals in the Goddess movement incorporate novelty as feature, requiring group ritual performances to be a largely new experience each time they are conducted, allowing for a consistent sense of awe and transformation even in regularly performed rituals. Third, we investigate neo-pagan witchcraft practices where practitioners emphasize intention over prescribed ritual actions, allowing individuals to improvise rituals that feel personally authentic and accessible. These cases reveal a reconceptualization of religious ritual itself and offer us insight into how religious ritual practices might be innovated and adapted to new cultural contexts.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### The Greening of Religion

Adam Baimel

The 'greening of religion' hypothesis represents a compelling case of religious innovation, in which longstanding faith traditions reconfigure their theological and moral frameworks to address the urgent realities and challenges in modern times of the climate crisis. Here, I test predictions regarding the causes and consequences of the "greening of religion" hypothesis through a large-scale, cross-cultural experimental study (N = 11,186) spanning 15 populations across major world religions (Buddhism, Christianity, Hinduism, Judaism, and Islam). Findings show that when the salience of the climate crisis increases, religious individuals are more likely to construe environmental threats as matters of divine concern, signalling a shift in religious meaning-making. This reorientation toward ecological ethics, in turn, predicts concrete pro-environmental engagement, including real donations, behavioural intentions, and policy support. By framing ecological concern as a form of religious innovation, this work demonstrates how longstanding religious systems adapt in response to modern global challenges and how such innovation can mobilise faith-based cooperation for planetary sustainability.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### **Beyond (Irresolvable) Causal Opacity: The Instrumental Logic of Magical Rituals**

Ze Hong

The cognitive science of religion has predominantly framed ritual as goal-demoted and causally opaque, serving primarily affiliative functions. This paper challenges this dominant framework, arguing that it fails to account for magical rituals, which are explicitly goal-oriented from the practitioner's perspective. I propose the «folk-technology model,» which treats magic not as symbolic or opaque action but as an instrumental, problem-solving practice. The paper critiques the concept of «irresolvable causal opacity» by presenting three lines of evidence: first, the natural/supernatural dichotomy that underpins the concept of irresolvability is a modern Western construct often absent in the societies in question; second, many magical practices are underpinned by detailed, if scientifically inaccurate, causal theories; and third, the apparent lack of articulated theory among laypeople often reflects practical knowledge and a social distribution of expertise rather than inherent opacity. The folk-technology model is further supported by widespread ethnographic evidence of instrumental tinkering, efficacy testing, and pragmatic adaptation in practices ranging from Azande oracles and Melanesian cargo cults to contemporary AI divination. This reframing challenges classic dichotomies between technical and performative action, generates novel, testable predictions about the structure of magical systems, and revitalizes intellectualist theories of magic within a modern cognitive and (cultural) evolutionary context.

## From Theory to the World: Four Decades of Cultural Evolution (Celebration of Rob Boyd)

### **Musical Sounds as Tools in Spiritual but not Religious Ritual Practices**

Sotirios Kolios

Among the Spiritual but not Religious, music may serve as a mechanism for ritual innovation, yet the role of music in transforming ritual experiences remains largely unexplored. Ritual and music are often treated as distinct ontological domains. However, religious rituals almost always involve musical sounds. Although the nature of this relationship remains debated, it has been proposed that musical sounds enhance the efficacy of rituals by amplifying their psychological and social functions. Specifically, rituals have been found to promote social bonding, regulate emotions, and support general wellbeing. Similarly, music has been found to exert comparable effects on individuals, facilitating emotion regulation, social affiliation, and wellbeing. Ritual behaviour has also been associated with humans' tendency toward over-imitation, which is the replication of non-instrumental actions, and it may serve to preserve cultural knowledge and constrain innovation. Following this logic, the rigidity typically ascribed to ritual practices would seem to limit opportunities for creative modification, including the use of "tools" for innovation such as selecting musical sound to enhance or change the psychological outcomes of a ritual. Our ethnographic research among spiritual practitioners in Glastonbury, UK, suggested that individuals consciously use musical sounds as functional tools to achieve desired ritual outcomes. Analysis of 30 semi-structured interviews showed that practitioners consciously use musical sounds to shape emotional states, intentions, and perceived energies. Thus, challenging assumptions of ritual rigidity and suggesting that one of the ways innovation in ritual contexts can emerge is through the creative manipulation of musical sounds.

## The New Era of Ape Culture Discoveries

Organizer: Andrew Whiten

### Session abstract

It's now a quarter century since 'Cultures in Chimpanzees' (Nature, 1999) and its orangutan counterpart (Science, 2003) revealed multi-tradition cultures in great apes. Since then, long-term field studies have proliferated and built up the first intensely detailed and lifetime-long databases explicitly focused on questions of culture. In concert with genetic studies on the same populations, advances in tailor-made statistics and innovative experimental studies in the wild and captivity, research on great ape cultures has in recent years generated an unprecedented, elevated plateau in our understanding of the scope of culture in non-human species. This symposium offers the conference an appreciation of high points in these endeavours. The first talk will present an overview and serve as an introduction to the three more focused reports on recent empirical studies that follow. One of a pair of related studies of wild orangutans then draws on thousands of records of the experiences of juveniles from birth to weaning at eight years to show how social and individual learning interact to achieve ecological competence, with cultural inheritance playing a fundamental role. We can't ethically manipulate this system experimentally, so instead, a complementary study develops and validates an agent-based model, within which deprivation of social learning experiences is shown to prevent achieving crucial mature ecological competences. Together these studies evidence cultural dependence, implying a history of cumulative/accumulative culture. The third study complements these field studies in an experiment explicitly investigating the scope of cumulative social learning in sanctuary-living chimpanzees.

## The New Era of Ape Culture Discoveries

### The New Expansive Picture of Great Ape Culture and the Scope of CCE

Andrew Whiten

To echo the symposium summary, “research on great ape cultures has in recent years generated an unprecedented, elevated plateau in our understanding”. This talk offers an overview of the basis for this claim and an introduction to the three focused empirical talks in the symposium, highlighting the issue of cumulative cultural evolution (CCE), long assumed to be uniquely human. Research on ape culture has grown enormously on both micro and macro scales of granularity. At the relatively micro level, fine-grained behavioural comparisons have revealed multiple cultural variants existing even between communities spanning small regions (Boesch et al., NHB 2024). At the relatively macro level, our linking of genetic and cultural data (Gunasekaram et al., Science 2014) revealed that when the frame spans thousands of years, kilometres and chimpanzees, evidence for CCE in complex toolsets emerges. In orangutans, our new approach (Schuppli et al, this symposium) reveals that attaining ecological competence is dependent on culture, and a complementary analysis shows that cultural transmission plays the primary role in this crucial outcome (Revathe et al., this symposium). Together, these studies also implicate a measure of CCE, possibly spanning millennia. Can such millennia-scaled perspectives be reconciled with our experimental studies testing the scope of CCE in apes? A new experiment with this focus is presented by Bryon et al. in this symposium. Together with other of our recent such experiments, results present a nuanced mixture of support for limited CCE along with diagnoses of the factors that limit its expression in apes.

## The New Era of Ape Culture Discoveries

### **Multi-year social and asocial learning propensities during infancy synergistically shape ecological competence in juvenile Sumatran orangutans**

Thillaikumar Revathe

The adult competences that underlie humanity's vast ecological success are highly dependent on learning socially from one's culture across many years of development. Yet, individuals likely also learn through their own efforts, a process called asocial learning. Research has so far produced strong evidence for social learning in many species, however largely through snapshots of animals' lives and specific behavioural achievements like tool use. Furthermore, how different forms of learning interact to shape the entire arc of wild animals' behavioural development has remained unknown. To address these fundamental gaps in our knowledge of cultural evolution, we analysed nearly seven thousand records of behavioural indicators of social and asocial learning in wild, immature orangutans, from birth to independence at around eight years. We found that learning is largely triggered by social observation, the effect of which lasts for over 2 hours. Social learning events were five times more frequent than asocial learning events. During development, there was substantial variation among immatures in their reliance on different forms of social and asocial learning. We found that individuals with the highest social and asocial learning rates developed the broadest diets, and that the benefits of social learning were the strongest when asocial learning was low. Encompassing over 250 food items in adults, diet breadth represents a comprehensive measure of ecological competence, rather than reflecting mastery of a single behaviour. Our study reveals that social and asocial learning synergistically shape broad ecological competence to a much greater extent than previously recognized in great apes.

## The New Era of Ape Culture Discoveries

### Wild orangutans exhibit culturally dependent diet repertoires

Caroline Schuppli

Social learning enables humans to build culturally-dependent repertoires of knowledge that far exceed what individuals could develop independently. Although many nonhuman animals are capable of social learning, it remains unclear to what extent they depend on it to acquire survival-relevant knowledge, or whether their repertoires approach culturally-dependent breadths. Previous research shows strong evidence that immature nonhuman great apes utilize forms of social learning, such as different forms of enhancement and close-range social observations, to acquire foraging skills. Yet, how these forms of social learning affect individuals' long-term diet repertoire acquisition has not been quantified. To address this gap, we examined how social learning contributes to the development of dietary knowledge in Sumatran orangutans (*Pongo abelii*). We developed an agent-based model simulating the dynamics of orangutan diet development, utilizing 12 years of long-term data on wild orangutans to estimate every single model parameter. The simulation accurately reproduced individuals' average diet repertoire development observed in the wild without arbitrary parameter tuning. When we removed a single form of social learning, simulated individuals showed slower expansions of their dietary repertoires and significantly narrower repertoires by the onset of independence from their mothers as well as by adulthood. These findings provide strong evidence that wild orangutans depend on social learning to acquire culturally-dependent dietary repertoires by key developmental stages. Culturally-dependent repertoires may play a vital role in individuals' survival in other species as well, suggesting that the capacity for culturally-dependent knowledge accumulation may be an ancestral trait shared across at least the great apes.

## The New Era of Ape Culture Discoveries

### **Chimpanzee social learning and performance flexibility in a cumulative extractive foraging task**

Emile Bryon

As research on non-human animal culture progresses, so does our understanding of the potentially shared roots of Cumulative Cultural Evolution (CCE). In chimpanzees, our closest living relative, circumstantial evidence indicates that flagship cultural behaviours such as termite fishing may have resulted from a cumulative process. To investigate capacities and conditions for CCE expression in chimpanzees, an extractive foraging task was installed for 91 days inside an enclosure of a group of 15 sanctuary-based individuals. This apparatus was designed to offer opportunities for a multi-stepped collective learning process towards performance optimization, mimicking the core dynamic of CCE. Altogether, our results show that chimpanzees remain primarily individual learners, but can flexibly switch to social learning to acquire more efficient but complex solutions. Additionally, we report that grooming bonds are predictive of acquisition order in social learning contexts. Furthermore, although chimpanzees make informed decisions in assessing and adopting better strategies, they also quickly “get stuck” on inefficient ones. In conjunction, we discuss the relevance of these results in explaining the limited evidence of CCE in our closest living relatives, and how (in)flexibility in learning may impact the potential spread of complex knowledge in wild populations.

## The Evolution and Ecology of Despotism, Power, and Inequality

Elic Weitzel and Brian F. Coddling

### Session abstract

Much research across the social sciences has investigated the situations which allow for the rise of inequality, power differentials, and despotic control in our species. Recent work within the explicitly evolutionary approaches of behavioral ecology and cultural evolutionary theory has contributed to useful developments in the search for answers to these questions. In this session, participants approach the evolution and ecology of despotism, power, and inequality from several different directions. These authors explore the monopolization of economically defensible resources, subordination within patron-client dynamics, the material realities of egalitarianism, drivers of inequality, and potential avenues of anti-despotic resistance. Through this collection of both theoretical and empirical work, this session aims to shed light on the important processes of despotism and inequality that have structured so much of our species' past and continue to do so today.

## The New Era of Ape Culture Discoveries

### **Ecological Pathways to Inequality Among Hunting and Gathering Societies**

Brian F. Coddling, Ishmael Medina, Kurt Wilson, Weston McCool, and Eric Alden Smith

Social and cultural institutions emerge out of the complex interactions between human decisions and environmental variation. To better understand patterning in these socio-environmental systems, and how they lead to material wealth inequality, we propose a theoretical framework that couples models from evolutionary ecology focused on understanding decisions around resource choice, investment, and control. We then evaluate predictions with agent-based models, ethnographic case studies, and archaeological evidence. Results support predictions, highlighting specific socioecological dynamics that lead to long-term social and cultural change promoting heterarchical or hierarchical relationships.

## The New Era of Ape Culture Discoveries

### **Egalitarianism is not Equality: Moving from outcome to process in the study of human political organization**

Chris von Rueden

Authors: Chris von Rueden and Duncan Stibbard Hawkes Many traditional subsistence groups have been described as ‘egalitarian societies’. Definitions of ‘egalitarianism’, especially beyond anthropology, have often emphasized equality in resource access, prestige or rank, alongside generalized preferences for fairness and equality. However, there are no human societies where equality is genuinely realized in all areas of life. We demonstrate, empirically, that nominally egalitarian societies are often unequal across seven important interconnected domains: embodied capital, social capital, leadership, gender, age/knowledge, material capital/land tenure, and reproduction. We also highlight evidence that individuals in nominally egalitarian societies do not unflinchingly adhere to strong equality preferences. We propose a new operational framework for understanding egalitarianism in traditional subsistence groups, focusing on individual motivations, rather than equality. We redefine “egalitarianism” societies as those where socio-ecological circumstances enable most individuals to successfully secure their own resource access, status, and autonomy. We show how this emphasis on self-interest — particularly status concerns, resource access and autonomy — dispels naive enlightenment notions of the ‘noble savage’, and clarifies the plural processes (demand-sharing, risk-pooling, status-leveling, prosocial reputation-building, consensus-based collective decision-making, and residential mobility) by which relative equality is maintained. We finish with suggestions for better operationalizing egalitarianism in future research.

## The New Era of Ape Culture Discoveries

### Decreased residential mobility structures wealth inequality among the Hadza

Duncan Stibbard Hawkes and Chris von Rueden

The Hadza of Northern Tanzania traditionally subsisted through residentially mobile foraging; moving camps frequently in response to food and water. Frequent movement has long been thought to prohibit storage and accumulation: individuals can keep only those possessions they can comfortably carry and surplus is redistributed. For this reason, the Hadza are synonymous with material egalitarianism, where no one household is substantively wealthier than another. However, life throughout Hadzaland is changing. Many Hadza have settled permanently in sedentary villages. Moreover, throughout the region, once-temporary camps are now occupied year-round. In my Leverhulme-funded fieldwork, using structured interviews and comprehensive property inventories, I explored the connections between mobility and material wealth. Results show, first, that mobility is rapidly decreasing. Where people traditionally moved upwards of six times a year, even bush-living Hadza now only move 2-3 times annually. Second, as predicted, decreasing residential movement lifts the ceiling on property accumulation and is correlated with both increasing material wealth and wealth inequality. Though bush camps still had scant household-level property inequality, certain types of wealth inequality were increasing. Sedentary villages, in contrast, had pronounced wealth inequality. Some families owned permanent dwellings and thousands of dollars of stored crops and livestock, while others had almost no assets. Though it is often assumed that different forms of inequality are interrelated, the relationship between wealth- and political-inequality was not straightforward and sedentary villages retained considerable political egalitarianism. I briefly explore the role of sedentarism as a necessary but not a sufficient condition of autocracy and despotism.

## The New Era of Ape Culture Discoveries

### Modeling anti-despotic resistance

Elic M. Weitzel

Research into the evolutionary ecology of despotism has highlighted how despots often grant concessions to subordinate individuals, permitting limited resource access in exchange for other benefits. Subordination can therefore be an adaptive choice for non-despots, but nonetheless, such individuals could often do better if despots were eliminated—or at least kept under control. Here, I construct an agent-based model of subordinate resistance to despotism, exploring the conditions under which subordinates can collectively sanction or overthrow an aspiring despot. Inspired by Boehm's (1993) concept of reverse dominance hierarchies as well as models by Smith and Choi (2007) and Bell and Winterhalder (2014), I model a simple system in which a despot controls resources and subordinate individuals can either accept the situation or resist. This decision variable is modeled as a function of the potential benefits of collective resource control, the current benefits of despotic concessions and leadership, and the costs of coalitional resistance (e.g., collective action, risk of harm, etc.). The outcome consists of predictions concerning the circumstances in which anti-despotic resistance becomes beneficial. In exploring such situations, this model helps to further elucidate the dynamics of subordination within despotic systems and clarifies why resistance against despotism is challenging and overthrow of despots is often rare.

# Cultural and Behavioral Evolution in the Andean Highlands of Argentina

Hernán Juan Muscio

## Session abstract

This thematic session explores the long-term processes of cultural and behavioral evolution that shaped human adaptation in the high-altitude landscapes of the Andean Puna of Argentina. Combining archaeological and ethnographic evidence, the session examines how populations in extreme environments developed resilient ecological, social, and symbolic systems. Drawing on Human Behavioral Ecology, Niche Construction Theory, and Cultural Transmission Theory, the four papers analyze how cooperation, ritual, and material practices produced enduring forms of ecological inheritance in the South-Central Andes.

In *Rituals and Social Adaptations among the Atacameño Indigenous People of the Puna Region of Salta*, Hernán Muscio examines ritual as an adaptive mechanism for maintaining cooperation and social cohesion. Ethnographic research among the Atacameño community of Matancillas reveals that ceramic artifacts mediate relationships between humans, protective entities, and the environment. These objects serve as repositories of memory and social identity, enabling cooperation beyond kinship. Muscio argues that similar ritualized behaviors likely emerged in early Andean societies as convergent solutions to ecological risk, demonstrating how symbolic and material practices stabilized social systems in fluctuating environments.

In *Early High-Altitude Adaptations and Faunal Use in the Puna of Salta, Argentina*, Juan Pablo Orsi analyzes archaeofaunal assemblages from three sites dated between 10,000 and 3,000 BP. His results indicate adaptive strategies based on subsistence diversification, mobility, and spatial flexibility, reflecting behavioral responses to hypoxia, seasonality, and low productivity. When interpreted through Niche Construction Theory, these practices appear not only as responses to ecological constraints but as transformative actions

that redefined local ecosystems, laying the foundations for later pastoral economies. Niche Construction and Aboriginal Knowledge about Health and Disease in Matancillas, Puna de Salta, by Guido Carballo, explores how Atacameño conceptions of health and illness function as cultural components of the niche. Local medicinal knowledge integrates cosmological understandings of the landscape, where mountains, winds, and springs guide decisions about care and prevention. This symbolic ecology proved adaptive during the COVID-19 pandemic, when inherited frameworks were reinterpreted to navigate new uncertainties. Carballo demonstrates how cultural inheritance provides enduring adaptive resources within dynamic ecological contexts.

Finally, Niche Construction and Archaeological Landscapes in San Antonio de los Cobres, by Sebastián Frete, documents how repeated occupations over the Holocene produced hereditary built environments. The reuse and transformation of earlier structures illustrate ecological inheritance through architecture, where past material traces transmit knowledge and affordances across generations.

Together, these studies reveal that Andean populations were active constructors of their environments. Across millennia, ritual, technology, and symbolic systems generated cumulative adaptations that stabilized human life in high-altitude settings. The session thus highlights the Puna of Argentina as a key context for understanding how culture, behavior, and ecology coevolved through sustained human–environment interaction.

## Cultural and Behavioral Evolution in the Andean Highlands of Argentina

### Rituals and Social Adaptations among the Atacameño Indigenous People of the Puna Region of Salta.

Hernán Juan Muscio

The evolution of ritual behavior is closely tied to the emergence of cooperation and social complexity in the hominin lineage. Among modern humans, rituals play adaptive roles by identifying group members, reinforcing collective norms, maintaining cohesion, and signaling reliability and reputation. This study examines these adaptive functions through ethnographic data from the Atacameño community of Matancillas, in the Puna of Argentina. The analysis shows that ceramic artifacts occupy a central role in shaping the community's social, productive, and symbolic relationships. Cognitively, ceramics act as mediators among humans, protective entities, and the natural environment. They enable the transmission of group memory, the expression of collective identity and property, the demonstration of trustworthiness, and the preservation of social order. We propose an evolutionary analogy: in early productive economies of the South-Central Andean highlands, similar behaviors likely emerged as convergent adaptive solutions. In low-scale economies characterized by environmental risk and fluctuating productivity, social strategies needed to ensure access to diverse ecological zones and maintain a discontinuous labor supply. In such contexts, leadership grounded in cohesion, reciprocity, and shared narratives was more adaptive than competitive or resource-intensive models. Ritual commitment, by extending cooperation beyond biological kinship, provided a powerful mechanism of social evolution. Institutions such as ancestor cults may have embodied this process, structuring reciprocity and labor coordination. Ritual behaviors—especially those involving artifacts—thus functioned adaptively to stabilize cooperation, manage competition, and enhance resilience in small, vulnerable populations»

## Cultural and Behavioral Evolution in the Andean Highlands of Argentina

### Early high-altitude adaptations and faunal use in the Puna of Salta, Argentina: an approach from human behavioral ecology.

Juan Pablo Orsi

This study examines the adaptive strategies developed by early human populations in the high-altitude environments of the Puna of Salta, between ca. 10,000 and 3,000 years BP. Through archaeofaunal and contextual analysis of three representative sites—Alero Cuevas (4300 m a.s.l., 10,000–4,000 BP), Abrigo Pozo Cavado (3800 m a.s.l., 7,300–2,900 BP), and Cueva Nacimiento (4200 m a.s.l., 8,200–3,300 BP)—the research explores patterns of space use, mobility, and consumption, mainly of wild camelids. From the framework of Human Behavioral Ecology, the results suggest that the differential exploitation of gorges and salt-flat environments reflects adaptive decisions in response to social and ecological pressures derived from extreme conditions of hypoxia, seasonality, and low primary productivity. Among the strategies to buffer risk are dietary breadth, diversification in space use, diversification of economic activities, greater mobility, and the strengthening of cooperative and resource-exchange strategies. Comparison between sites reveals variations in prey acquisition, especially camelids, and in occupation strategies linked to access to critical resources in high-altitude settings. Interpreted in dialogue with Niche Construction Theory, the archaeological record of the Pastos Grandes Basin shows how early subsistence practices not only responded to environmental constraints but contributed to transforming them, establishing the ecological and cultural foundations for later processes of camelid intensification and domestication. These results broaden our understanding of the coevolution between culture, behavior, and environment in the South-Central Andes during the Early and Late Middle Holocene.

## Cultural and Behavioral Evolution in the Andean Highlands of Argentina

### Niche Construction and Aboriginal Knowledge about Health and Disease in Matancillas, Puna de Salta.

Guido Esteban Carballo

The niche construction theory holds that organisms actively modify the material conditions of their environment, generating pressures that influence the adaptive decisions of subsequent generations. In human populations, these transformations include cultural components—both material and symbolic—that form part of ecological inheritance and are differentially transmitted in accordance with the principles of Cultural Transmission Theory.

From this framework, this study analyzes the discourses and practices associated with the health–illness process in the traditional medicine of the Atacameña Community of Matancillas. Local medicinal knowledge incorporates cosmological elements that conceive the environment as an agentive space: mountains, springs, winds, plants, and protective forces delineate safe or dangerous places, regulate movement through the territory, and guide decisions related to care, prevention, and ritual consultation. Thus, the landscape is configured simultaneously as a physical and moral environment that organizes everyday patterns of action and shapes local interpretations of illness.

These environmental configurations also structure how the community responds to new or emerging ailments. In such situations, existing knowledge is reactivated, reinterpreted, and mobilized as a guide for navigating health-related uncertainty, combining preventive practices, ritual diagnostics, and the use of local medicinal resources. During the COVID-19 pandemic, this process became particularly visible, illustrating how the cultural niche provides adaptive frameworks that orient decision-making under unprecedented conditions.

The results indicate that these discourses and practices constitute cultural and symbolic components of the niche, producing environments that guide health-related decisions in both ordinary and extraordinary circumstances.

## Cultural and Behavioral Evolution in the Andean Highlands of Argentina

### Niche Construction and Archaeological Landscapes in San Antonio de los Cobres.

Sebastian Luis Frete

Ecological inheritance is a key component of niche construction theory, yet applying this framework to archaeology requires robust methodologies capable of documenting both anthropogenic and hereditary environments. This study addresses that challenge by examining the archaeological record of San Antonio de los Cobres, in the Puna of Argentina. The research focuses on the spatial and temporal distribution of artifacts and “super-artifacts” (residential structures) that together form highly aggregated palimpsests. Through spatial analysis, we identify patterns indicating that throughout the Holocene, human occupation and reoccupation progressively generated a hereditary artificial landscape. This landscape emerged from the heterogeneous use of space by High Andean hunter-gatherers, whose repeated occupations left cumulative material and structural traces. Later, pastoralist populations invested massively in architecture, reusing and transforming these earlier occupational contexts. Their selective re-appropriation of previous built environments demonstrates an adaptive strategy grounded in landscape inheritance—an efficient means of stabilizing resource use, labor organization, and habitation under high-altitude ecological constraints. The findings suggest that long-term human-environment interactions in the Puna were not random or episodic but represent a dynamic continuum of ecological inheritance. Built environments and artifact distributions functioned as vectors of adaptation, transmitting ecological knowledge and structural affordances across generations. Consequently, the San Antonio de los Cobres record provides key evidence for understanding how cumulative landscape modification and reuse embody the archaeological signature of ecological inheritance in Holocene Andean contexts.

# Musical Reproduction and Evolution: Integrating Conceptual and Methodological Approaches through Evo-Devo

Luis Alejandro Villanueva Hernandez

## Session abstract

Based on the view that cultural evolution and genetic inheritance follow similar principles (e.g., Dawkins, 1976; Mesoudi et al., 2006), scholars have adopted the modeling tools and strategies of population genetics to investigate processes of cultural transmission and change (Boyd and Richerson, 1985, 2005). Drawing on this approach, cultural evolutionists seek to predict the frequency with which cultural expressions are retained or eliminated within a population (Boyd and Richerson, 2005), often modeling such expressions as separable traits. In the case of music, this perspective has led researchers to focus primarily on the variation of sound patterns, commonly interpreting such changes as analogous to genetic mutations with fitness values (Savage, 2019). While these studies have deepened our understanding of how particular sonic features within musical traditions have evolved, treating musical expressions merely as independent acoustic entities black-boxes the crucial role of the processes through which such musical expressions are generated, learned, and transmitted both within and across generations. In light of recent approaches to social cognition (Gallagher and Ransom, 2016) and material culture (see Caporael et al., 2014), new theoretical frameworks have been proposed to improve our understanding of the multifactorial mechanisms that underlie cultural transmission and change. Evolutionary developmental biology, or evo-devo, is one of the key fields that has inspired these developments (Charbonneau, 2021; Wimsatt and Griesemer, 2007). Instead of a view that associates evolution solely with genetic variation, evo-devo focuses on exploring the generative mechanisms that reproduce and modify organismal developmental processes, and on how these mechanisms both influence and are influenced by evolution (Müller, 2007, 2021). Based on this perspective, scholars have emphasized the importance of studying the role of sociomaterial mechanisms in shaping cultural evolutionary processes

(Wimsatt, 2019). This endeavor remains ongoing (Love and Wimsatt, 2019), and the application of this approach to the study of music evolution is still in its initial stages (Villanueva and Müller, forthcoming). This session seeks to further this direction from both conceptual and methodological perspectives. Drawing on historical and anthropological studies of the revitalization of the Mexican musical genre son jarocho (García Diaz, 2022), the contributions propose new conceptual analyses, suggest novel applications of mathematical models, and provide critical insights on the scope and limits of phylogenetic approaches to musical evolution. Our aim is to address a common concern across different evolutionary approaches and methods: to advance the exploration of the complex sociomaterial generative principles of music in order to better understand how these principles can shape the transmission, variation, and persistence of musical traditions over time.that redefined local ecosystems, laying the foundations for later pastoral economies.

## Mechanisms of Musical Reproduction: An Evo-Devo Approach

### **Mechanisms of Musical Reproduction: An Evo-Devo Approach.**

Luis Alejandro Villanueva Hernandez

This talk presents an overview of recent approaches to cultural evolution grounded in an evo-devo perspective, emphasizing the relevance of this view for the study of musical evolution. It argues that this approach aligns with an ethnomusicological perspective in which music is understood as a product of social interaction and, consequently, as an inherent component of a social way of life. Drawing on the revival processes of son jarocho music, which have been developing in Mexico since the 1970s, this illustrates the main limitations of approaches to musical evolution that focus exclusively on acoustic features. In particular, it demonstrates that the revival and transformation of son jarocho music cannot be fully understood without considering the reactivation of the fandango—a collective celebration that brings together performers, instruments, repertoires, learning processes, and shared identities. Building on the analysis of the interrelation between son jarocho and fandango celebrations, this paper proposes the concept of sociomaterial system of reproduction, which integrates elements of both systems into a framework designed to provide a more nuanced understanding of musical evolution. In particular, it shows how the specific articulation of these elements can shape and bias the generation of new musical variants. Luis Alejandro Villanueva (CCTB, University of Würzburg) & Cristina Villegas (Konrad Lorenz Institute for Evolution and Cognition Research, KLI, Klosterneuburg, Austria).

## Mechanisms of Musical Reproduction: An Evo-Devo Approach

### **Emergence of musical traditions and their evolution: a social perspective**

Dharanish Rajendra

Fandangos, the collective music and dance celebrations rooted in Mexican traditions, which have been revitalized over the past few decades, serve as a perfect case to study the emergence of musical traditions and their evolutionary processes. This talk presents a model of a musical collective operating within this social environment, where individuals assume various musical and social roles. We explore how musical collaboration arises when differences in musical competence, rather than acting as barriers, become generative forces that blur group boundaries and foster flexible forms of social learning. Thus, rather than viewing musical evolution as being driven solely by acoustic rules, this model emphasizes the importance of participatory dynamics and social interaction in shaping musical continuity and evolution. Furthermore, our model highlights how these learning dynamics enable individuals to adapt flexibly to changing performance contexts, thus supporting processes of musical variation and innovation. Dharanish Rajendra (CCBT University of Würzburg) & Chaitanya Gokhale (CCTB, University of Würzburg)

## Mechanisms of Musical Reproduction: An Evo-Devo Approach

### Exploring the Limits and Potential of Phylogenetic Analysis in Music Evolution

Axel Arango Garcia

This talk provides an overview of the use of phylogenetic methods in the study of cultural evolution, with a particular emphasis on music. Drawing on historic documentation of son jarocho music, it examines the scope and limitations of the cantometric approach, developed by Lomax (1976), whose music samples are compiled in the Global Jukebox database. In particular, it highlights how phylogenetic trees generated solely from the features listed in the database may not align with historical or ethnographic evidence. Based on these observations, this paper argues that the use of the database should be complemented and cross-referenced with more detailed historical and ethnographic sources to ensure that these tools are applied more effectively and produce more robust hypotheses about the evolution of specific musical expressions over time.

## Cultural transmission and evolution of ethnomycological knowledge

Andrea Bender

### Session abstract

Edible mushrooms have been an important source of food throughout human history and around the globe, but far from all mushrooms are edible. The plethora of species, including many that are poisonous and even deadly, makes their secure identification and the reliable appraisal of their edibility both critical and challenging tasks. Although survival may depend on the faithful transmission of such knowledge, that very same process also drives diversification across ethnomycological traditions, rendering the latter a prime domain for investigating cultural evolution. In this session, we begin with illustrating how profoundly even vital knowledge can diversify across cultures and time (Bender & Oterhals); then present a cross-cultural study of the mechanisms that shape the transmission of such knowledge, depending on overall culture-specific orientations towards the domain (Papa); and conclude with introducing a (so far regional) database on mushroom-related knowledge that allows for identifying patterns in its ecological and cultural contexts, including its modes of transmission (Anceschi).

## Cultural transmission and evolution of ethnomycological knowledge

### What makes a mushroom poisonous? Cultural impacts on edibility appraisals

Axel Arango Garcia

Mushrooms are an attractive source of food, but also a risky one. Detailed knowledge is required to avoid poisonous and even deadly species, and the acquisition of this knowledge relies on trust in those who pass it on, rather than in own experimentation. As there is something factual about fungal toxins, the appraisal of which species are edible might come across as a text-book instance of (convergent) cumulative cultural evolution. And yet, edibility appraisals can be surprisingly controversial. An illustrative case for investigating this is the Cortin/Stordal field guide on mushrooms, which (starting in 1956) was published in several editions over a period of 40 years in the two neighboring and closely related countries of Sweden and Norway. To trace both changes over time and divergence across cultures, we coded all edibility appraisals of all 343 species in these editions. Our findings reveal remarkable variability along the two dimensions and help to identify both idiosyncratic and culturally shaped factors that affect those appraisals. In conclusion, we will discuss how cultural transmission may lead not only to preservation but also loss of vital knowledge.

## Cultural transmission and evolution of ethnomycological knowledge

### **Mycophilia, mycophobia, and the cultural evolution of mushroom knowledge**

Aliki Papa

Cultural orientations toward mushrooms vary widely, with some societies embracing them as valuable resources and others treating them with suspicion. These orientations shape how mushroom knowledge is classified, retained, and transmitted. We examined how cultural attitudes toward mushrooms influence classification and transmission fidelity across generations. This is the first empirical study to test how cultural variation affects the accuracy of transmitting mushroom knowledge, a domain of culturally grounded and risk-relevant expertise. Participants from Poland, Norway, and Cyprus rated unfamiliar mushrooms as edible, inedible, or poisonous and transmitted this information along linear chains. We manipulated transmission context (presence or absence of a learner) and personal impact framing (local versus distant village). According to the results, the most conservative culture, Cypriots, and the most mycophilic one, Poles, both retained information better than Norwegians. The presence of a learner further increased caution and fidelity across cultures. The key finding of our study is that high transmission fidelity is not simply a byproduct of defaulting to the safest classification. Despite Cypriots' strong conservatism in categorization and Poles' balanced use of all three categories, both groups preserved information effectively along transmission chains. Fidelity, then, appears to stem from culturally grounded transmission strategies, ranging from cautious avoidance to confident differentiation. These findings show that risk does not necessarily constrain transmission, and that diverse cultural strategies can support knowledge retention.

## Cultural transmission and evolution of ethnomycological knowledge

### Mapping cultural transmission of mushroom knowledge in Southern Africa

Chiara Anceschi

Distinguishing edible from poisonous mushrooms requires precise, context-rich expertise that depends on cultural transmission rather than individual trial and error. Hence, understanding how this knowledge is built, shared, and sometimes lost can shed light on the cultural evolutionary processes that allow complex skills to persist or disappear over time. However, because ethnomycological data is scattered, tracing these dynamics can be challenging. The MuCuSA (Mushroom Cultures in Southern Africa) database synthesizes information from more than 120 sources, representing one of the most extensive records of traditional mushroom knowledge and its ecological and cultural contexts in sub-Saharan Africa. Covering over 150 cultural groups and more than 500 species, it documents not only which mushrooms are used and for what purposes, but also how knowledge about them is accumulated and transmitted across generations. MuCuSA enables a broader examination of the mechanics of cultural transmission and the social settings in which expertise is rooted. This includes exploring how ethnomycological knowledge is distributed between genders and ages, how taboos, beliefs, and rules of thumb help guiding safe foraging, and whether these practices vary across vegetation zones and subsistence types. It also opens the door to questions about what happens when knowledge is lost, whether through migration or environmental change, and what cultural mechanisms help preserve it. Ultimately, ethnomycology can illuminate how cultural knowledge is transmitted and transformed, providing a concrete window into cultural evolution in practice.

## Ethnographic and empirical studies of patterns and processes in cultural evolution

Adam Howell Boyette

### Session abstract

While the diversity of research into cultural evolution has continued to grow, the field has remained dominated by experimental methods and theoretical modeling. This panel will feature studies on cultural evolution that draw on data collected from contemporary populations in the real world. Oriented around testing and refining cultural evolutionary theory through field research, the panelists draw from a broad range of quantitative data and ethnographically-grounded insights to advance our understanding of the ways cultural variation and inheritance are dynamically shaped within social contexts through everyday human interactions. The papers examine adolescents' roles in shifting cultural preferences under market-integration, emergence of localized norms coordinating escalator use, cultural transmission dynamics of language revitalization, empirical hurdles to parsing effects of cultural transmission biases, and the inheritance of food-sharing networks between generations. Data used in these papers come from Colombia, Germany, Japan, Congo, Tanzania, and the Arctic, and from small, hunter-gatherer communities to large post-industrialized metropolises, together yielding a theoretically focused but empirically broad view of the patterns and processes of cultural evolution in action.

## Ethnographic and empirical studies of patterns and processes in cultural evolution

### **Forager and farmer youth preferences in relation to market integration in the Republic of the Congo: Cognitive developmental and cultural dynamics in the evolution of culture**

Adam Howell Boyette

Adolescents are developmentally primed to explore, to take risks, and to flexibly attend to a broadening pool of potential models from whom they might learn cultural traits. As such, adolescents' choices (and their cognitive underpinnings) may play a unique role in determining the frequency of cultural traits in a population over time. Under conditions of social and economic change—such as when communities experience globalization and market integration (MI)—adolescents face decisions around whether to follow their elder's preferences and economic strategies or to endorse novel material culture, learn new occupations, and potentially accept new resource distribution norms. BaYaka hunter-gatherer and Bantu farmer adolescents face these exact conditions in rural, northern Republic of the Congo—although the former face greater cultural and social barriers to gaining any perceived benefits to change. In this study, two forced choice tasks were used to elicit 1) material and activity preferences and 2) perceived sharing norms among a sample of BaYaka and Bantu adults ( $n=135$ ) and youth ( $n=122$ ; ages 12-17) across three villages that vary in degree of market integration and social change. We use a hierarchical Bayesian cultural consensus modeling approach to examine the relative influence of age, ethnicity, and village of residence on preferences for market-based goods, activities, and sharing-norms, as well as the degree of consensus/variation across these dimensions of individual/group difference. By integrating cognitive developmental and political economic perspectives on the dynamics of cultural change, our study advances method and theory in cultural evolution.

## Ethnographic and empirical studies of patterns and processes in cultural evolution

### Social Learning and Occupational Choice

Jeffrey Andrews

Empirical evidence on social learning in ecologically valid and existentially important contexts is rare. We develop and estimate a general-equilibrium model of occupational choice that integrates payoff and frequency-biased social learning in an informal economy. Data comes from Pemba, Tanzania, where livelihoods depend on low-capital occupations such as fishing, seaweed farming, construction, and petty trade, and where individuals decide which occupations to learn based on both economic conditions and social information. Using a high-frequency panel of roughly 2,000 individuals followed over four years, we show that occupational payoffs exhibit strong negative frequency dependence: as more people enter an occupation, earnings decline sharply. Individuals do not observe this payoff schedule directly, but instead rely on three noisy cues: (i) payoff information from current participants, (ii) the number of new learners entering each occupation, and (iii) the number of incumbent workers practicing it.

We quantify how people rely on these types of information when selecting occupations in a jointly estimated model linking (1) a structural earnings equation with crowding effects, (2) latent earnings and participation rates with measurement error, and (3) a multinomial choice rule that weights payoff and frequency information. We find that individuals underuse both payoff signals and frequency cues, and we detect no evidence of conformity. Over-represented occupations instead tend to be those with the lowest barriers to entry. These findings provide rare quantitative evidence on social learning in a subsistence economy and show how learning heuristics interact with ecological constraints to shape the cultural evolution of economic strategies.

## Ethnographic and empirical studies of patterns and processes in cultural evolution

### **Examining the roles of vertical, horizontal, and prestige-biased oblique transmission in the revitalization of a severely endangered language**

Cody T. Ross

Palenquero is the last surviving Spanish-African creole in South America. Proficiency-levels and usage rates, however, have declined sharply over the last century, with fewer than 200 proficient speakers remaining. This culture loss was driven in large part by widespread racial, cultural, and linguistic discrimination from non-Palenquero Colombians: Palenquero parents chose to refrain from teaching their children Palenquero so as to increase their perceived educational standing and employment opportunities outside of Palenque—fracturing inter-generation language transmission. In the mid-2000s, however, San Basilio de Palenque was declared a Masterpiece of the oral and intangible heritage of humanity by UNESCO, and local musicians Kombilesa Mi achieved tremendous domestic and international success by rapping in their local creole. Jointly, these events triggered a sharp transition in attitudes about Palenquero and a resurgence of interest in protecting the language. Our prospective longitudinal study tracks individual-level changes in Palenquero proficiency over time for a nearly-complete census of the entire population of potential speakers (~2,500 individuals). We link proficiency estimates to complete sociocentric network data to determine how much people are learning, and from whom. This allows us to disentangle the roles of vertical transmission, horizontal transmission, and prestige-biased oblique transmission (youth learning from high-status adults) in the linguistic revitalization of a severely endangered language.

## Ethnographic and empirical studies of patterns and processes in cultural evolution

### Escalating Social Norms: The Adaptative Advantages of Norm Psychology in a Pedestrian Traffic System.

Bret Beheim

Many social systems resemble coordination games in which there are incentives to synchronize behavior and assure partners of one's likely actions. A common framework for understanding such systems is rational choice: acultural, payoff-sensitive decision makers should attend to the behavior of others, regardless of their internal preferences or cultural traditions, leading to stable behavioral equilibria. Yet much of human social behavior appears governed by adherence to internalized social norms, regardless of instrumental advantage, a pattern often described as the 'norm psychology' hypothesis. Explaining this mismatch between theory and observed behavior remains a central challenge of cultural evolution.

Using high-throughput computational models and a longitudinal dataset of  $N \sim 20,000$  observational participants from cities across Germany and Japan, I examine the evolutionary dynamics of a norm psychology in a straightforward traffic-coordination system: escalator use. Different cities and countries exhibit different normative equilibria (standing only on the left, or the right, or no consistent rule), but the empirical data systematically deviates from predictions under rational choice. Using an agent-based model, I show plausible mechanisms by which a norm psychology can solve such coordination problems with less social monitoring and more efficiency. At the same time, the model illustrates that rational calculation remains essential to the emergence and structure of norms. This study provides one of the first explicit accounts of norm formation from first-principles mechanisms and offers a framework for understanding how norms interact with rational coordination more broadly.

# Lightning Talks

## Why the Evil Eye Endures: A Cultural Evolutionary Account of Supernatural Envy Management

**Mina Aryaie**

Belief in the evil eye, a supernatural curse cast through a mere glance, exists across diverse cultures but remains underexplored from cognitive and evolutionary perspectives. We propose that such beliefs persist through cultural evolutionary processes because they serve adaptive functions in competitive, zero-sum environments, where visible success can provoke malicious envy and social retaliation. These claims hinge on psychological parallels between beliefs about the evil eye and interpersonal envy, similarities that have not been sufficiently examined empirically. We conducted three studies (total N = 2,558) using religiously and ethnically diverse North American samples to test psychological similarities between evil eye beliefs and lay intuitions about interpersonal envy. In Studies 1–2, participants completed free-listing tasks about likely sources, targets, and outcomes of both envy and the evil eye. Participants described similar negative traits in those who cast the evil eye and those who feel envious, as well as in their victims. However, the evil eye was seen as causing more severe outcomes, such as illness and bad luck, beyond the emotional and interpersonal harm associated with envy. Study 3 replicated these findings using closed-ended measures and showed that participants assign more negative traits to both perpetrators and victims of the evil eye than to those of envy. These findings support the idea that evil eye beliefs are culturally transmitted adaptations that regulate social behaviour by extending the perceived costs of envy beyond interpersonal conflict to include supernatural harm.

## Pushing up ti plants: where death, religion, culture, and ecology meet in Tanna, Vanuatu

Patrick Baca · Siobhán Cully

Death is a human universal; however, the ways it is conceptualized and ritualized vary significantly across time, space, and culture. In anthropology, death has been conceptualized differently across the subdisciplines. Cultural anthropology tends to emphasize variation in cultural and religious perceptions, experiences, and meanings of death, while bio-archaeological anthropology has tended to focus on conditions impacting deposition and decomposition of human remains, related health implications, and what burials reveal about social organization. Of course, death reflects many axes of human experience and social organization and is usefully theorized using a multi-sub-disciplinary lens. We utilize qualitative interviews addressing perceptions of health, ecology, death, dying, and community in Tanna, Vanuatu, where religious, infrastructural, and ecological change offer opportunities to explore how variation in religious and ecological environments impacts mortuary practices. We supplement these findings with community-wide quantitative data about religious affiliation, perceptions of death and community, funeral attendance, and GPS burial data. Analysis reveals i) community and religion are central features of the ni-Vanuatu deathscape, fostering high levels of cohesion surrounding death; ii) materials and symbols associated with death are grounded in traditional ecological knowledge (TEK); and iii) cultural and ecological understandings of health, dying, and death have been impacted by ongoing market transition. Results highlight the importance of interdisciplinary studies of death, as globalization continues to drive rapid change in social, economic, and physical landscapes across the world.

## **Musical Instruments Across Civilisations: Cultural evolution in a comparative study on long-reeded aerophones from early medieval Ireland and the Brazilian Xingu**

**Brenda Barbosa**

Musical instruments emerged across human societies not only as tools for sound production but as adaptive technologies shaped by social needs, environmental constraints, and evolving symbolic systems. Focusing on innovation in instrument construction, functional adaptation, and generational transference of musical knowledge, this presentation explores a striking case of cross-cultural convergence between two long, end-blown reeded aerophones: the Early Medieval Began Horn, which was recovered during an archaeological excavation in Ireland, and the Uruá/Atangá “flutes,” still used in ritual contexts by the Kamaiurá and Kuikuro peoples of the Brazilian Xingu. Despite having no historical contact, both traditions developed remarkably similar acoustic solutions. In the context of these two woodwind instruments, we notice that they share extended tubular bodies, complex reed systems, and highly ritualised performance contexts, with which they are both associated. To discuss how people consistently develop comparable technologies in response to common problems, and musical instruments in this context as vehicles of communication, emotional experience, carrying a collective and religious identity, this paper examines the evolution of musical instruments within their ecosystems through organological investigation, ethnomusicological fieldwork, and phenomenological analysis, exemplifying how parallel evolutionary paths in instrument design are produced by material availability and social functions. The study demonstrates that musical instruments are living proof of profoundly human evolutionary logic: ingenuity, adaptability, and the universal quest for communication and meaningful sound.

## Cultural Evolutionary Theory in Comparative Politics: An Emerging School of Thought?

**Murat Bayar**

The major schools of thought in comparative politics, namely structuralism, culturalism, institutionalism and functionalism, have guided scholars into addressing puzzles in social sciences, including the great divergence, that is, how Western Europe managed to achieve unprecedented economic growth, scientific progress and democratization in the modern era, while other regions lagged behind. These schools suffer from a number of limitations, including determinism, reductionism, causality dilemmas and scientifically uninformed assumptions on “human nature,” whereas comparativists start the clock for their analyses with written history at most as if millions of years of biological and cultural evolution prior to the first civilizations were irrelevant to their puzzles. Furthermore, the comparative method, which constitutes the methodological pillar of comparative politics, stipulates that cases must be selected according to the most-similar or the most-different design: The cases should either begin similarly and end differently or vice versa so that alternative explanations can be eliminated to a maximum degree. To this end, however, comparativists typically take nations as their unit of analysis and overlook the fact that similar cultural variants were subject to diverging selective pressures in different environments around the same time periods. In this talk, I will argue that cultural evolutionary theory makes a viable alternative to the established schools of thought in comparative politics by taking ideas as the unit of analysis, incorporating cognitive biases into cultural selection within a coherent framework, and explaining why and how some beliefs come to fit their environments where others marginalize or disappear.

## Seasonal Cycles in Basic Human Values: Evidence from Over Thirteen Years of US Data on the Schwartz Value Survey

Radha Bazaz · Mark Schaller

Previous research revealed a bimodal seasonal cycle in Americans' endorsement of "binding" moral values (authority, loyalty, purity). We extended this work by examining seasonal patterns in human values more broadly, using data on the Schwartz Value Survey collected across more than 13 years from respondents in the United States (N=31,981). Of the 10 distinct values assessed, four values—pertaining to conformity, power, achievement, and benevolence—showed seasonal cycles that were consistent across years and robust across different analytic strategies. These seasonal cycles were bimodal—characterized by two peaks (periods of strong endorsement) and two valleys (periods of lower endorsement) over the course of a calendar year—but the specific timing of those peaks and valleys differed for different values. The bimodal seasonal cycle for the value of conformity was similar to the seasonal cycle in binding moral values and is interpreted as a partial conceptual replication of those previous findings. The seasonal cycles for the values of power, achievement, and benevolence resulted from exploratory analyses, and interpretations are more cautiously speculative.

## How do ni-Vanuatu children perceive their linguistic ecologies?

Anja Becker · Heidi Colleran

Recent publications suggest that Bislama, the creole and national language of Vanuatu, is becoming a threat to the multiple Indigenous languages that ni-Vanuatu tend to grow up with. It is now increasingly transferred as a vernacular and home-language in many local communities. Relying on a well-established methodology of language portraits - self-drawn visualizations of the linguistic repertoire of participants using colors and a body silhouette, accompanied by an interview - we study how children in both urban and rural contexts deploy their language repertoires and how they perceive the languages spoken around. This approach, combined with other qualitative and quantitative methods, helps us understand the dynamics of individual and societal multilingualism as well as cultural change. Preliminary evaluation on ~70 language portraits from school children aged 10-16 years from the capital, Port Vila, a nearby village of Pango, plus two more remote sites on Malakula in central Vanuatu, shows that all language portraits contain Bislama except one containing only English. The others contain up to 9 languages. 23 Indigenous languages were represented in total, alongside 3 non-Indigenous languages, and Bislama. A majority of our participants learned Bislama first, though this is not necessarily representative of the parental generation. Two children from the capital reported English as their first language. Language portraits explore emotional, biographical and ideological aspects of language use. We report differences in linguistic repertoires, perceptions and competences between children in urban and rural contexts, where the transmission of locally spoken languages and linguistic diversity are currently under threat.

## People Systematically Misjudge Reliability of Crowds

**Yahya Berrada** · Emile Servan-Schreiber · Cathal O'Madagain

Under the right conditions, the majority judgment of a crowd can outperform any of its members. Some theories of cultural evolution hold that deferring to the majority is one of the drivers of cumulative culture (Boyd and Richerson 1985). But this would only make sense if individuals defer to the crowd where the crowd is reliable, and avoid the crowd when it is not. This raises a basic question: do people recognise when a crowd is in a position to provide a more reliable answer than their own? Across three preregistered studies with 306 participants, we examined how people decide when to rely on a peer crowd. In a “Who Wants to Be a Millionaire?” style quiz, participants received four “Ask the Crowd” cards to allocate across twelve trivia questions. For medium-difficulty questions, collective accuracy was near 100 percent while individual accuracy averaged around 60 percent. For the hardest questions, both were close to chance. We found that participants appealed to the crowd primarily for the hardest questions, and mostly did not for the medium-difficulty questions. Prompts to estimate crowd reliability or view the crowd’s agreement produced only slight improvements. These findings suggest that people do not reliably identify when majority opinion is useful. Instead of asking the crowd when its accuracy was highest, participants asked when it was lowest. This result shows a limit in recognising when majority opinion is useful, while also highlighting that conformity aids cultural evolution only when the majority’s reliability can be detected.

## Do humans have an internal drive to share what is on their minds? An empirical approach to *Mitteilungsbedürfnis*

**Sabine Bluetgen** · Simon Kirby

Humans seem strongly inclined to share what is on their minds with others even in the absence of external motivations (*Mitteilungsbedürfnis*, MtB; Fitch, 2010), a behaviour which has not been observed in other apes. MtB has been argued to be crucial to the evolution of language, collaboration, and culture (Fitch, 2017, 2019; Tomasello et al., 2005); however, empirical evidence for it remains limited, is largely based on WEIRD populations, and is often confounded by external motivations (e.g. Jimenez et al., 2025; Tamir et al., 2015). Here, we report initial efforts to develop a methodology to test MtB in both WEIRD and non-WEIRD populations whilst minimising such confounds. Across two conditions, participants view a complex image and are either asked to discover something in it, or are presented with an element from the image (e.g. red grapes). They are then asked to indicate their desire to share the information they collected or were given, as well as justify their sharing decision. We test three predictions: (i) Participants will share information, even when sharing results in no tangible benefits to either them or others; (ii) Information collected by the potential sharer will be shared more readily than information that was given; and (iii) Collection effort (i.e., time spent collecting information) will be positively correlated with the likelihood of sharing. Together, these empirical contributions provide a framework for investigating MtB, highlight open questions, and offer new insights into our drive to share and its role in shaping human social behaviour and cultural development.

## The Effects of the Social Learning Strategy Space in Gene-Culture Coevolutionary Modeling

**Katelyn Bonner**

Understanding how individuals learn socially is central to explaining aggregate-level cultural evolution. Prior research has shown that even small heterogeneities in individual social learning strategy use can have outsized impacts on population-level cultural dynamics. Yet, most theoretical research has relied on assumptions that preclude the majority of possible strategies from ever arising in evolutionary models, potentially distorting our understanding of cultural evolution. This study aims to address this potential issue by comparing the evolutionary dynamics and stable strategies that emerge under two distinct modeling approaches. The first, Bayesian updating, imposes structured constraints on the social learning process, thereby limiting the strategy space under consideration. The second approach, using Finite State Machines, allows for an unrestricted exploration of all feasible strategies. By comparing these methods, we aim to uncover how strategy space restrictions may bias our understanding and to identify methods for safely restricting the strategy space under consideration without being subject to this bias.

## The Cultural Attraction of Witchcraft

**William Buckner**

Accusations of witchcraft are a well-known phenomenon across human societies. Historical cases such as the Salem witch trials are commonly taught in American schools, and the metaphor of a “witch-hunt” retains popular usage in the English language. Less widely discussed is the reality of witchcraft as a practice: in many cultures, people believe that supernatural harm can be inflicted through ordinary, seemingly mundane actions, and individuals engage in culturally stereotyped behaviors grounded in such notions. Using the electronic Human Relations Area Files (eHRAF) World Cultures database, I collected data on witchcraft practices for 77 primarily non-industrial societies around the world. Witchcraft beliefs are commonly predicated on sympathetic magic, in which an object that has previously been in contact with the intended target is obtained and used to supposedly cause them supernatural harm from a distance. The most widespread practice involves procuring some hair from the intended victim. The use of the victim’s clothing, fingernails, and feces is also common across cultures. I argue that witchcraft beliefs rooted in sympathetic magic represent a cultural attractor that resonates with our evolved psychology (see Frazer, 1890; Hong, 2022). Bayesian phylogenetic analyses will be performed to examine global variation in these practices and assess which elements are best explained by independent invention versus cultural diffusion.

## Can risk perception explain suboptimal use of social information?

**Patricio Cruz y Celis**

Despite the theorized benefits of social learning, participants in controlled experiments consistently copy less than is optimal—instead over-relying on individual exploration. This may be explained by humans' perception of risk behind social versus individual information. To test this hypothesis, I will recruit a well-balanced sample of adults to participate in an online experiment ('The Farming Game'), in which they can maximize payoffs by accurately choosing which of two crops to grow over variable-yet-learnable environments. To measure participants' risk-profiles, this research design will mirror lottery-choice experiments widely used in behavioral economics. Participants will be asked to choose between a 'risky lottery' and a 'sure gain' option. How the information is presented will vary across conditions (whether they are asked to 'copy socially' or 'explore individually'). However, the riskiness of the lottery choices will be constant for all, so any observed differences in risk-taking should speak to participants' underlying priors regarding that source of information.

## Open-ended cultural evolution and the construction of problems

**Mathieu Charbonneau**

Cumulative culture has proven central to our species' ecological success. While cumulative improvement explains how specific traditions can get increasingly better at solving pre-existing adaptive problems, it remains fundamentally a process which halts when an optimal solution is found. Yet, humans are also capable of open-ended or evolvable cultural change, i.e., we have the capacity for generating novel and useful solutions for an ever-expanding set of increasingly complex problems. How novel problems of increasing complexity are accessed, however, remains an open issue. The focus on solutions makes strong assumptions about the problems these solutions solve, importantly that the problems we face are exogenous to the cultural process and ultimately do not require any special explanations. Here we argue that human open-ended cultural evolution emerges from the construction of problems, i.e., problems that are represented, socially transmitted, and form evolving traditions. Constructed problems shape the search space of solutions, and when constructed problems are transmitted across generations so too are their search spaces. We identify two processes by which problem construction helps explain open-ended cultural evolution. First, problems and solutions coevolve in that solutions to constructed problems result in the emergence of new problems, which, in turn, affords the discovery of novel solutions. Second, constructed problems rarely emerge fully formed, in that early problematization is generally vague (ill-structured). Constructed problems can increase in clarity and structure cumulatively (to well-structured) and, over multiple generations, lead populations to expand their causal understanding and the complexity and diversity of solutions they produce.

## **Socialization and Digitalization as Determinants of Organizational Function, Behavior, and Structure**

**Christian Cordes**

Organizational socialization is a key instrument for firms to coordinate activities and align goals. By inducing cohesion within units, socialization fosters members' personal involvement with collective tasks and objectives as well as mutual trust and cooperation. In this article, we analyze the impact of socialization through peers and managerial leadership on cohesion. Both modes of group-bound socialization are assumed to be predicated on features of humans' social learning capacities. We also scrutinize how digital technology affecting intragroup communication contributes to cohesion. In addition, a substitutional relationship between peer-based and managerial socialization as to the inducement of cohesion is found. We show that these developments allow groups to adopt services and functions hitherto provided by managerial leadership. Resulting changes in organizational function, behavior, and structure facilitate more autonomous units, leaner hierarchies, and improved organizational performance. Our theoretical predictions are put to empirical test using data from the European Company Survey.

## **Different learning dynamics arise despite similar structural tolerance levels in captive rhesus macaques groups**

**Eythan Cousin**

Group-level contexts shape individuals' adaptive landscapes and may be paramount in the transmission of novel behaviours, thus influencing cultural dynamics in humans and non-human animals alike. Recent studies on intraspecific variation highlight social tolerance as both a central and flexible dimension of a group's sociality. While high social tolerance is thought to facilitate social learning and cultural transmission, this relationship remains empirically understudied in non-human primates. We aim to fill this gap by comparing two captive groups of rhesus macaques (*Macaca mulatta*) sharing similar housing conditions and demographics. We 1) assessed and compared key elements of structural social tolerance, namely dominance steepness, network cohesion, and cofeeding, through behavioural observations, Bayesian social network analyses and cofeeding experiments. We 2) conducted an open-diffusion experiment using a puzzle box to identify (social) learning dynamics using Network Based Diffusion Analysis. Our results show similar group-level tolerance in dominance steepness, affiliative networks cohesion, and cofeeding tendencies. Despite these similarities, we found significant differences in learning levels and efficiency. In one group, behaviours were socially transmitted through close observation, significantly increasing their behavioural acquisition speed. In contrast, the other group favoured asocial learning strategies, leading to significantly lower and slower acquisition. Our study reinforces the widely evolutionary shared importance of social learning in facilitating the acquisition of new behaviours, while empirically questioning the link between group-level social tolerance and social learning efficiency. It highlights how specific and often overlooked group-level contexts are central in cultural dynamics.

## The Evolution of Authorship: Moral Intuitions about Intellectual Property Track Reputational Fairness, Not Legal Ownership

Grégoire Darcy · Hugo Mercier

Modern Intellectual Property (IP) law represents a cultural institution designed to incentivize innovation, yet pervasive non-compliance suggests a functional mismatch between legal mandates and evolved human psychology. We propose that this divergence arises because human moral cognition does not track ideas as “property,” but rather as vehicles for reputation management : a mechanism evolved to facilitate partner choice by signaling competence and warmth. Consequently, moral outrage is driven by reputation misattribution: the corruption of social signals where rightful creators are denied credit while free-riders garner undue status. In Study 1, we experimentally manipulated key dimensions of reputational signaling within plagiarism scenarios, finding that moral judgments are highly sensitive to subtle distortions in credit allocation, independent of material harm. In Study 2, we tested these intuitions across diverse cultural transmission contexts (including pseudonymous publication, ghostwriting, and AI-generated content) demonstrating that reputation misallocation consistently predicts moral evaluations, often overriding the act’s legal status. These results clarify why specific IP violations are condemned or excused: our minds are adapted to police the integrity of social signals, not the ownership of non-rivalrous goods. We conclude that aligning IP governance with intrinsic expectations of reputational fairness is essential for resolving this evolutionary mismatch and enhancing institutional legitimacy. More broadly, this divergence underscores a methodological caution for cultural evolution: top-down norms are often imperfect proxies for underlying preferences, warning against the conflation of codified norms with the evolved psychology that actually sustains cooperation.

## Cultural Norms (in Humans), Genetic Norms (in Insects), and the Function of Norms in General

**Taylor Davis**

Many theorists claim that the function of norms is to promote cooperation, and a sophisticated comparative argument has recently been offered for this claim (Powell, 2023), based on the role of “institutional punishment” in suppressing free riding, in humans and insects alike. On this view, insects have norms too, because norms promote large-scale cooperation in the same way in both lineages. Yet dual-inheritance theorists have argued for decades that cooperation is not the function of norms, because “institutional” punishment allows all kinds of behavior to evolve, not just cooperation, specifically (Boyd & Richerson, 1992; Henrich & Muthukrishna, 2021). I argue that the comparison between humans with insects actually supports this opposing conclusion, but in a way that is deeply informative for understanding norms in general. Insects have genetic norms, while humans have cultural norms, but the function is the same either way: collective enforcement. Collective enforcement differs from dominance, or self-interested enforcement, in that it is produced by a selection process that does not depend on individual fitness. In ants and bees, selection favors enforcement more strongly for contributing to the queen’s reproduction than for contributing to an enforcer’s own reproduction. In humans, enforcement is inherited culturally, through learning, so enforcement practices spread without contributing to anyone’s reproductive fitness. Either way, selection acts on heritable enforcement behavior in a way that is decoupled from individual fitness. Thus, individuals pay fitness costs for enforcement that does not benefit them.

## Group level infanticide in humans and hymenopterans and its implications for other taxa

**Rayan Dequin**

The conceptualization of infanticide as an adaptive function at the group level—rather than solely at the level of the individual—was at the heart of the debates opposing Wynne-Edwards and George Williams, which ultimately led to the institutionalization of the Neo-Darwinian synthesis (Borrello, 2005). Since the second half of the twentieth century, infanticide has been studied primarily as an adaptive phenomenon at the individual level (that of the mother or the parents), and both anthropologists and biologists have largely overlooked its manifestations at the group level (Hausfater & Hrdy, 1984). Drawing on qualitative data from ethnographic and historical records, as well as case studies on hymenopterans (*Apis mellifera*; ants), we demonstrate the existence of infanticide selected at the group level through processes of group selection in invertebrates and of cultural group selection in humans. We show that, in the latter case, the phenomenon can be observed from amazonian horticulturalists to contemporary industrial capitalist states such as China. The role of social norms in the refunctionalization of infanticide as a group-level adaptive trait also has important implications for understanding reproductive suppression among cooperative breeders. Recent interests in social norms within biology (Westra et al., 2024; Andrews et al., 2024) combined with our data suggest that reproductive suppression among cooperative breeders may constitute a group-level trait in certain Carnivora (e.g., *Canis lupus*, *Heterocephalus glaber*) or certain bird species (e.g., *Corcorax melanorhamphos*). Reproductive suppression may thus manifest as infanticide functioning as a group-level trait in some taxa (e.g., *Helogale parvula*, *Homo sapiens*).

## Who should I touch? - The social partners for face touching behavior in capuchin monkeys, chimpanzees and humans

**Beatriz Felicio** · Carlene Gomes · Rafael Albuquerque · Kim Bard

Having access to different social partners affects the social development of primates. Chimpanzees, humans and capuchin monkeys have different social dynamics and infants may modulate their social network by touching the face of other individuals. We characterized the context of face touching of capuchin monkeys, chimpanzees, and humans in two studies. We analyzed 127 hours of video from a wild group of *Sapajus libidinosus* of Fazenda Boa Vista, Brazil. We coded all face touches displayed by eight infants from birth until the 3rd year of life. For great apes, we analyzed 36 hours of video from 1-year-olds living in diverse eco-cultural settings (chimpanzees: ChesterZoo, PRI, and Gombe; humans: UK, CAR, and Cameroon). In capuchin monkeys, there was no preference for partner kinship or age (in any GLMM model), but it is relevant that touching the mother represented just 7.5% of all occurrences (50.3% other levels of kinship; 42.2% non-kin). In terms of age, only 15.9% of the touches of capuchin infants were on adults (36.7% infants; 37% juveniles). Among chimpanzees and humans, in contrast, we found that 76.8% of touches were with adults, with a strong preference for adult females (MANOVA,  $p < .001$ ). The kinship of some of the human data was unknown, but in chimpanzees the mother received 66.4% of all infant touches. Face touching is an active touch; therefore, these results show that the tactile aspect of primates lives shapes and is shaped by different social networks across species, potentially affected by mother tolerance, alloparenting and aggression levels.

## **(Anti-)conformity in three dimensions: social learning in the big space between simple heuristics and general-purpose reasoning**

**Lukas von Fluee** · Charles Efferson

Do people flexibly adjust to social information or rely on rigid heuristics that weight others' behaviour by who they are and whether their goals align with their own? The answer matters because the ways individuals learn from others shape how culture changes. We ran an incentivised behavioural experiment with two roles. Demonstrators made initial choices based only on private information. Social learners then made the same choice after observing several demonstrators. Social learners encountered four informational contexts defined by two factors. One was whether the demonstrators belonged to the learner's own group or to another group. The other was whether this group relation implied that the learner and the demonstrators shared a similar incentive structure or were likely to benefit from different options. This combination of group membership and incentive alignment dictated whether copying the majority or the minority was optimal and success therefore required flexible adjustment rather than blind conformity. To probe the role of deliberation, half of the learners completed the task under cognitive load. Cognitive load had no measurable effect, which points to a deeply rooted learning bias that is too robust for load to alter, namely a tendency to process incentive aligned information more effectively, especially when it comes from ingroup members. We repeated the design with participant pools in Switzerland and Kenya to assess cultural generality. Both samples were sensitive to group identity and incentive alignment, yet they followed markedly different overall strategies, underscoring the importance of cultural diversity in research on social learning.

## I Belong to Glastonbury: The importance of belonging to Spiritual but not Religious individuals

**Kathryn Ford** · Aiyana Willard · Lora Adair · Matthew Gervais

**Aim:** Previous research on religion explains religious engagement as being due to adaptive benefits such as material and social support individuals gain through shared religious identity, or by theorizing that religion can increase cooperation among individuals with shared beliefs, and that belief in Big Gods can increase cooperation between strangers. The reported decrease in religious engagement in much of western Europe and the USA is explained as being due to governments providing social safety nets and legal systems thus eroding the need for religion. However, these theories do not offer explanations for the increase in individuals seeking spiritual fulfillment outside of the religious mainstream, nor do they shed light on the motivations of, or benefits to individuals who are spiritual but not religious (SBNR). This research starts to address this gap. **Method:** This qualitative project consists of 30 semi-structured interviews conducted with SBNR individuals in Glastonbury, UK. The interviews explore various aspects of their spiritual journeys, beliefs, and values. Interviews were transcribed and analyzed using thematic analysis. **Findings:** SBNR individuals do seek, find, build, and maintain social connections with other SBNR individuals. Furthermore, social connections, a sense of belonging, and identity exploration are important aspects of spirituality. Moreover, the wider culture of Glastonbury has been shaped by these values, and the town has many sources of peer support, most of which are set up and run by individuals with a wide variety of religious and spiritual beliefs, yet these services are open to anyone and everyone.

## Belief in Belief: Do Atheists in Secular Countries Intuitively Favour Religion?

**Will Gervais**

In our recent work, we find that (1) there's pretty intense intuitive moral distrust for atheists, even among atheists (2017: NHB), and (2) on tasks measuring intuitive (potentially moral) preferences, even atheists in secular countries might favour belief (2025: PNAS). At the same time, we find evidence that (3) people who don't believe in god(s) are reluctant to "out" themselves as atheists (2018: SPPS), even in majority nonreligious countries (RR2: NHB). In each case, self-report data alone would yield different conclusions about core constructs fundamental to theory in this area; thus, theory developed to explain patterns in self-reports is likely to miss crucial psychological and cultural dynamics. What gives? In this talk, I want to try (with everyone's help) to fit these findings together.

## Development and social dynamics of stone tool use in white-faced capuchin monkeys

**Zoë Goldsbrough** · Leonie S. Reetz · Margaret C. Crofoot · Brendan J. Barrett

Percussive tool use allows animals to access otherwise inaccessible resources, enhancing foraging efficiency and potentially fitness. The development of tool use proficiency is well-documented in nut-cracking chimpanzees and robust capuchins, and in shellfish-cracking long-tailed macaques, where mothers and proficient individuals serve as key models. However, little is known about how tool use develops in populations with limited social learning opportunities. White-faced capuchins (*Cebus capucinus imitator*) on Jicaron Island, Panama, provide a unique case: stone tool use is entirely male-biased, meaning juveniles cannot learn from their mothers, and reduced group cohesion further constrains social learning. We investigated the acquisition and development of stone tool proficiency in this population using a year-long camera-trap dataset from two experimental anvils. We assessed differences in proficiency between age classes, changes in proficiency over time, and patterns of social attention during tool use. Juveniles were less proficient than subadults and adults, and their proficiency remained stable over one year, suggesting that skill development may require prolonged practice or physical maturation. In contrast to other primates, social learning opportunities on Jicaron appear limited and scrounging is rare, when social attention occurs it follows clear patterns: it is primarily directed by juveniles too young to use tools themselves toward proficient subadults who tolerate scrounging. These findings advance our understanding of complex tool-use acquisition and maintenance in primates, illustrating that also in populations with limited social learning opportunities, such as the male-biased, low-cohesion capuchins on Jicaron, social tolerance plays a crucial role in the development of proficiency.

## Cross-cultural variation in the effect of incentives on prosocial behavior across 42 societies

**Caroline Graf** · Jörg Gross

Many global collective-action challenges rely on prosocial behavior, and incentives are a common tool to encourage such behavior. Yet evidence is mixed and largely based on WEIRD populations. Some studies find that incentives boost prosociality through extrinsic motivation; others report null or negative effects due to reputational concerns and “crowding out” of intrinsic motivation. Since reputational judgments depend on culturally transmitted norms, incentives should be more effective when they align with prevailing social norms. We examine how incentives affect prosocial behavior across diverse cultural environments and whether locally shared norms moderate this effect. Participants from 42 countries will complete an online task (N = 14,950; data collection: Nov–Dec 2025). Prosociality is measured as a binary choice to donate earned bonus points to international charities (e.g., UNICEF). In the incentive condition, donors receive additional points worth half the value of their donation. Participants also evaluate how altruistic and likable incentivized versus non-incentivized giving is perceived in their society. We preregistered our hypotheses and analytical strategy, predicting that incentives will increase prosocial behavior overall, but that their effectiveness will vary across cultural contexts. Specifically, we expect stronger incentive effects in countries where norms regarding incentivized prosociality are more positive. This research aims to clarify how the effectiveness of incentives is shaped by culturally shared norms. The findings will contribute to understanding how cooperative behaviors evolve and are maintained across populations.

## Gender differences in causes of union dissolution and marital status differences in household demographics among BaYaka foragers of the Congo Basin

Jessica Hlay · Sheina Lew-Levy · Sarah Pope-Caldwell · Ardain Dzabatou

Although cross-cultural accounts of union dissolution in smaller-scale societies have been compiled, few systematic data have been collected, particularly in foraging societies. Across societies, marriage serves a range of political, social, economic, and reproductive functions. Household demographics that may be linked to marriage therefore have potentially important implications for health, productivity, and support networks. Here, drawing on qualitative interview data, we examined the causes of union dissolution among BaYaka foragers in the Republic of the Congo (N=149; 93 women). Additionally, we assessed household demographics of married women compared to unmarried women, excluding men since there were few unmarried men in the sample. Across adults, the top three union dissolution causes were infidelity concerns (24.8%), widowhood (22.1%), and marital conflict (16.1%). However, there were gender differences, with women primarily reporting widowhood (30.1%) and violence (18.3%) and men primarily reporting infidelity concerns (39.3%) and marital conflict (17.9%). Unmarried women tended to live with their mothers more than married women ( $p=.08$ ). 47.1% of unmarried women lived with their mothers, compared to 29.4% for married women. Marital status did not predict the total number of adults, adult women, or dependent children in the household. These findings yield insight into the drivers of union dissolution in this setting, highlighting women's experiences of violence and widowhood. Women's marital status may be particularly relevant for mother-daughter co-residence, rather than other aspects of household composition. Mother-daughter co-residence for unmarried women likely reflects a critical source of support, including because most reproductive-aged women have dependent children in this setting.

## Measuring imitation from naturalistic behavioural observations of children across four cultures

**Eve Holden** · Sarah Wright · Thomas Huxtable · Lara Wood · Jing Xu · Bruce Rawlings · Kathleen Corriveau · Emma Flynn · Wouter van den Bos · Sheina Lew-Levy

Imitation is central to how children acquire instrumental behaviours and cultural conventions. However non-experimental methods measuring imitation within naturalistic contexts are sparse, and those that exist are with participants of limited cultural diversity and ages, thus challenging the ecological validity of our understanding of imitation. We developed a coding scheme to measure imitation from naturalistic videos of 311 children aged 3-17 across four cultural contexts: BaYaka forager children and Bandongo fisher-farmer children from the Republic of Congo, Chinese-American children from Seattle, and Scottish children from Tayside. These sites contrast in key cultural dimensions such as local ecology, economy, formal education participation, household structure, and socialisation norms and values. The coding scheme is designed to balance breadth and depth of detail, and to capture imitation with varied functions, such as for learning instrumental behaviours and for social goals, e.g. learning cultural norms and extending longevity of joint behaviours. Key variables in the scheme include behaviours being imitated, demonstrator characteristics, pedagogical behaviours, social environment, and behavioural context. I discuss how we approached designing the coding scheme to make it suitable for use across cultural settings and ages, and will cover challenges encountered and overcome during video coding. I will outline how the scheme allows us to explore questions on how age-based imitation bias is enabled and constrained by children's social settings and pedagogical interactions (including presenting preliminary

findings). Our coding scheme is a highly valuable tool for researchers to expand our understanding of imitation in ecologically valid contexts and across cultures.

## **Crowdsourced vs LLM Forecasting: Evidence for the Accuracy-Correlation Effect**

**Younes Jeddi · Emile Servan-Schreiber**

Collective intelligence (CI) in forecasting has traditionally emerged from aggregating diverse human judgments through prediction markets and tournaments. Now, large language models (LLMs)—which aggregate the products of human knowledge at massive scale—represent a novel form of machine collective intelligence. A critical question is whether this second-generation CI will replace the first, or whether the future belongs to hybrid systems that combine their strengths. We investigate this through the Accuracy-Correlation Effect (ACE), which posits that as algorithmic systems improve, they become more accurate and more correlated with human predictions, potentially diminishing human contributions. We analyzed 76 LLM configurations across 16 models (OpenAI, Anthropic, Google, Mistral AI, Meta) on 580 resolved ForecastBench questions, comparing performance against superforecasters and general public aggregates. Mixed-effects models revealed a robust positive relationship between LLM accuracy and human-AI correlation ( $\beta = 0.08$ ,  $p < 0.001$ ), providing empirical evidence for ACE. Critically, correlations were systematically lower for superforecasters than the general public ( $\beta = -0.06$ ,  $p < 0.001$ ), suggesting LLMs increasingly align with general crowd wisdom rather than expert reasoning strategies. This effect was stronger for data-rich questions than data-poor scenarios requiring contextual judgment. Our findings provide preliminary evidence that ACE may operate as a general property of human-AI forecasting systems. As LLMs achieve higher accuracy while converging with human

predictions, optimal weight for human input will decline for data-rich scenarios, while human judgment may retain value in data-poor cases requiring contextual reasoning.

### **“You aren’t’ supposed to be rewarded for bad behaviour in a folktale”:** Assessing the transmission of prosocial content in Indo-European Folktales using a novel transmission chain experiment.

**Emily Jeffries** · **Jamie Tehrani**

This study aims to investigate the co-evolution of cooperation and storytelling at the micro-level. Storytelling and cooperation are two human universals. Debates range on how cooperation can be maintained between so many unrelated individuals with limited reputational or reciprocal gain. Meanwhile, scholars have suggested that narrative has evolved as a ‘flight simulator’ to the social world. It can therefore be hypothesised that people would favour prosocial tales over individualistic tales to retell to others. Previous work on this project has examined the macro-level trends of Indo-European folktales using phylogenetic comparative analysis and a survey of categorising folktales as prosocial and anti-social. This current study aims to further this through a transmission chain experiment. This investigates how a folktale corpus changes over generations by using a novel design. To create this, identical ‘story pairs’ were constructed based on the ‘Tales of Magic’ folktales. Each story pair had either individualistic or a prosocial resolution but were otherwise identical. Of 22 stories, (11 story pairs), three stories were presented randomly to each participant. At each generation, participants chose one tale to preserve in the folktale corpus. Twenty chains of five generations were run. To fully investigate the co-evolutionary potential relationship between storytelling and cooperation, Two conditions of 10 chains each were implemented: Participants either sat in silence (Anti-social), or they played a cooperative game with their fellow participants

(Pro-social). This project aims to examine the composition of prosocial folktales left in the corpus as well individual choices using quantitative and qualitative analysis.

## **Does a common enemy unite rivals? An experimental assessment of cooperation between real-world groups interacting with a third party**

**Adam Kenny** · **Laura Fortunato**

Members of rival groups tend to not cooperate with each other. However, a “common enemy” may encourage cooperation between groups. We posited that a common enemy increases out-group cooperation, relative to in-group cooperation, when rival groups (i) are in an interaction with a third party, and (ii) share a “superordinate” identity. Here, we report a field-based experiment that assessed the effect of a common enemy on cooperation between real-world groups. We recruited 152 members from two rival neighbourhoods in the Italian city of Siena, who played public goods games. In the key treatment, we introduced social cues by presenting players with a target previously set by a third party, which was a common enemy in this setting. The study controlled for the potentially confounding effects of comparison and thresholds, while motivations assessed whether the expected increase in cooperation was via shared identity. Overall, the results are unable to confirm the hypothesis that interaction with a common enemy

unites rivals. We provide alternative explanations of the results alongside a discussion of study limitations and suggestions for future studies.

## **Child-like exploration decreases rewards but increases knowledge: an agent-based model**

**Aislinn Keogh** · Sheina Lew-Levy

Children are known to show more cognitive flexibility than adults in many tasks: while adults tend to exploit existing knowledge, children tend to explore more eagerly. However, the benefits of childhood exploration are currently poorly understood. On one view, children are primarily passive recipients of evolved culture, and exploration is merely the means by which they acquire the information and skills that will prepare them for a successful adulthood. An alternative view is emerging, however, which highlights children's role as active agents of cultural evolution; on this account, childhood exploration may be a source of variation and innovation that could have important consequences for population-level adaptation. Here, we use agent-based modelling to explore these hypotheses, testing how and when children might produce new cultural variants, and how and when these variants might spread through a population. In an initial proof-of-concept model, we simulate a static environment in which agents are tasked with finding resources through some combination of individual exploration and social learning. We show that, while child-like agents receive fewer immediate payoffs than adult-like agents, their exploratory nature results in broader knowledge of the environment. We also find that adult-like agents – for whom individual exploration is low – gain proportionally more knowledge of the environment through social learning than child-like agents. In future work, we will explore the conditions under which children's knowledge reserves might

spread beyond the peer group, enabling communities to effectively adapt to social and environmental change.

## **Evolving Human Cumulative Culture**

**Saira Khan**

Cultural artefacts and practices may be material, or immaterial, such as language. Cultural evolution occurs when such artefacts and practices are passed on to new individuals via social learning. Cumulative cultural evolution (CCE) occurs when modifications to artefacts and practices are preserved over generations, leading to successive improvement. Although there has been debate about whether animals exhibit CCE, human cumulative cultural evolution is certainly unique in its scope. It has been proposed that early humans, in contrast to other animals, possessed either unique forms of social cognition or unique forms of technical cognition that allow us to engage in our distinctive CCE. Such cognitive abilities have often been identified by way of experimental psychology studies. I argue that using experimental studies to discern the origins of uniquely human CCE presents methodological difficulties. In particular, these studies make mistaken inferences from the cognitive capacities of modern humans to our ancestors, and encourage “one-shot hypothesis” thinking. We cannot use humans already steeped in CCE to test for the capacities necessary to evolve CCE. I propose narrative explanations as an alternative methodology. I argue understanding of the distinctiveness of human cumulative culture would be much improved using evidence from the historical record concerning our environmental selection pressures. I briefly sketch a narrative evolutionary account of the origins of human cumulative culture that unifies the social cognition view and technical cognition view, and shows that the

uniqueness of human CCE is attributable to a coevolution of our cognitive capacities and our forms of culture.

## **Beyond behaviour. Reconceptualising nonhuman cultures as relational and situated ways of being**

**Agata Kowalewska**

Considering the time pressure imposed by habitat degradation and species loss, the question of how we define nonhuman culture as an object of conservation efforts is urgent. Drawing from decolonial philosophy of science and grounded in comparative fieldwork with long-tailed macaques (*Macaca fascicularis*) and urban pigeons (*Columba livia*), the paper proposes a theoretical shift in the definition of nonhuman cultures that goes beyond socially learned behavioural traditions. I argue that focus on behaviours obscures the dynamic interactions with the environment and other species that define cultures (human and not) and reproduces the anthropocentric bias, while at the same hollowing out the notion of culture. This theoretical move recognizes nonhuman cultures as distinct, situated and relational ways of being, which cannot be reduced to a list of traits easily observable by humans. Consequently, their protection cannot be achieved through the preservation of isolated behaviours alone, but requires the preservation of the broader ecosystem and relational web within which they exist, including their human elements. This reframing offers a more robust ethical foundation for the politics

of conservation, further integrating cultural evolution into biodiversity protection without imposing human benchmarks on nonhuman lives.

## **Formal schooling as a bridge between cultural evolution and cognitive-computational models of the mind**

**Ivan Kroupin** · Helen Elizabeth Davis · Joseph Henrich

Our understanding of the mind is constructed almost exclusively from populations which have undergone a historically-recent and intensive cognitive shaping from early childhood — namely the experience of formal schooling. In this talk we briefly summarize decades of cross-cultural research, overlooked by mainstream cognitive science, showing how “typical” human cognition may in many ways be the product of this culturally-evolved institution. We go on to review an accounts of why schooling evolved to have the structure it does — and how this structure can be understood as a core series of features grouped around training individuals to participate in standardized, recurring situations (like those in factories, bureaucracies, etc.). We then show that this core structure of schooling, what we will refer to as ‘solvable situations’, can be readily expressed in state-of-the-art cognitive computational models. This allows us to bridge cultural evolutionary dynamics with rigorous, computational cognitive science around the case study of formal schoolign — an institution fundamental both to recent cultural evolutionary dynamics, and to our understanding of the mind. We close with a discussion

of how the case of schooling can serve as a model for integrating cultural-evolutionary and cognitive-computational research programs more broadly.

## **Evidence of millennial movement in the Neolithic? Evolutionary spiritual response to culture crisis**

**Petr Kvetina**

Throughout human history, repeated instances of intercultural contact have generated profound cultural responses, often leading to the acculturation of one of the interacting groups. The era of European overseas exploration and subsequent colonial expansion provides a particularly well-documented example, offering valuable insights into the dynamics of acculturation processes. Among the most striking responses to such encounters were millenarian religious movements, phenomena that can be interpreted as evolutionary reactions to cultural and social disruption. The best-known examples are the cargo cults of Melanesia, which envisioned the imminent end of the existing social order and the arrival of a new golden age. Comparable spiritual movements have been documented across diverse regions, including Oceania, Africa, the Americas, China, Burma, and Indonesia. These movements generally emerge as intense reactions to crisis, share a common ideological foundation, and arise within similar types of societies: features that support their interpretation as an evolutionary phenomenon. Building on this framework, the present paper explores the possibility that analogous movements may have occurred in the distant past. Specifically, it seeks to identify archaeological

evidence of comparable millenarian responses within the context of the European Neolithic period.

## **When showing and telling convey different stories: modes of cultural knowledge transmission lead to different concept representations**

**Ariel Levy**

Social learning and teaching can take many forms. When trying to convey conceptual knowledge to others, we may either show examples of the concept and rely on learners' ability to generalize, or tell them explicitly by describing defining features of the concept. Recent ethnographic and historical accounts (eg., Maynard, Greenfield et al, 2024; Daston, 2022) suggest that cultures vary in the extent to which they emphasize each mode of knowledge transmission. Here, we ask whether the dominant mode of knowledge transmission in a society shapes how concepts are ultimately represented by its members. We use a cultural transmission chain experimental paradigm, where participants transmit information about an imaginary biological category from one person to another along a chain (N = 1200: eight generations of 150 participants). In the "tell" condition, participants are only allowed to use verbal descriptions of the concept, while in the "show" condition, they may only give examples of objects from the target concept. Between learning and teaching, participants complete a classification task that allows us to infer their concept representation. Even though both conditions began with the same initial concept, the mode of transmission led participants to develop strikingly different representations. "Tell" chains lead participants to overemphasize easily namable features, whereas "show" chains lead to over-emphasis on visually salient features. We develop a computational model based on the Rational Speech Act framework that

explains these transmission outcomes and generates novel predictions about how communication methods of a culture shape the evolution of its conceptual structure.

## **Shell Money and the Evolution of Numerical System: A Cross-Cultural Test of Co-Evolutionary Hypotheses**

**Cheng Liu · Damian Blasi · Russell Barlow · Václav Hrnčič**

In the Paleolithic, shell beads were exchanged over long distances, potentially suggesting that people quantified these items during transactions. Ethnographic evidence shows that in many non-industrial societies, shell beads functioned as a medium of exchange or “money”, a practice that requires quantification. They are unique as a material technology: they are naturally discrete, consistent (requiring little standardization), transportable, and have inherent aesthetic value. This study explores how these unique material properties might “spill over” into a linguistic technology: verbal numeral systems. The nature of this co-evolutionary relationship is theoretically ambiguous. The use of shell money could create a new functional demand for precise, extensible verbal counting to regulate social and economic transactions. Conversely, the material’s physical discreteness and visual consistency might reduce this pressure, allowing quantification to be “offloaded” onto the physical items themselves (e.g., standardized strings of beads). Given this puzzle, we conduct an exploratory analysis. Our study integrates cross-cultural ethnographic data with linguistic analysis. We systematically searched the eHRAF World Cultures database and identified 85 societies with explicit documentation regarding shell money. For the corresponding languages, we will extract data on numeral system structure from Numeralbank. We will evaluate the potential association using Bayesian regression models, treating shell money use as the independent variable and the structural properties of the numeral system as the dependent variables, while controlling for shared linguistic ancestry, spatial autocorrelation, socio-political complexity and shell

availability. The results will shed light on the complex feedback loop between material culture and the evolution of quantification systems.

## **Revealing Collective Understanding in Small-Scale Societies: A New Method for Measuring Local Knowledge**

**Cathal O'Madagain** · Ghizlane Goubraim · Alejandro Erut · george tetteh

In the study of human cultural evolution, many theorists hold that technologies are transmitted and improved more through imitation rather than causal understanding. This view stems from results of studies that ask individuals in isolation about technologies they use, appearing to reveal a lack of causal understanding. Here, we introduce a new method to assess the knowledge of a group, that allows individuals to view their neighbors' answers before deciding what the best answer might be from among those provided by the group. We asked individuals in three farming communities from Morocco (N = 203), Mali (N = 198), Ghana (N = 120) to explain the causal processes behind local technologies. Our method reveals that when participants can review the answers provided by their peers, the most popular final answer is more reliable than when individuals provide answers in isolation. This indicates a division of labor in how causal knowledge is stored in the community – while most individuals may have poor causal

knowledge, they recognize and defer to the best answer in the group. This shows that collectively the community is more knowledgeable than methods used up to now have indicated.

## **The evolution of good and evil: How ambiguous moral characters become polarised**

**Charul Maheshka**

Popular Western fictional narratives often feature archetypal heroes to cheer for and villains to root against, yet real-world moral conflicts are rarely that clear-cut. How do people process and transmit morally nuanced narratives? Prior research finds that people embedded in large-scale social networks tend to conceptualise morality along a single continuum ranging from 'good' to 'bad' (Jackson et al., 2023). As a result, when encountering a morally ambiguous character, individuals may spontaneously recast that figure as either relatively moral or immoral, and these individual-level biases may accumulate over generations, leading to a polarised view of the character as unambiguously good or evil. We conducted a pre-registered linear transmission study with American participants ( $n = 300$ ) to test this hypothesis. Grouped into transmission chains, participants sequentially reproduced and passed down a story about a morally complex protagonist. Text coding and analyses supported our prediction: the character became progressively more disambiguated with transmission. We further proposed that when presented with a morally ambiguous dyad in conflict, people would impose a binary 'good versus evil' cognitive template onto the story. A second transmission chain study with American participants ( $n = 300$ ) confirmed this pattern: the narrative systematically evolved over generations to differentiate the characters into heroes and

villains. Together, these patterns reflect a previously unexamined content bias in the cultural evolution of stories – moral disambiguation – which could help explain the moral polarisation of gossip, public discourse, and historical narratives over time.

## **Unpredictable socio-ecology, supernatural beliefs and normative decision-making in Mauritius**

**Peter Maño**

Scientific studies have been consistently showing that certain religious beliefs and practices can improve human prosociality towards other co-religionists and even strangers. These studies are fundamental in framing the discussion regarding human cooperation – its scalability, limits, and specific features. Scholars of religion have thus been extensively researching the prosocial impacts of religions in recent decades, yet lately emphasizing the need to explain the specifics of these processes. For instance, evidence shows that the extent of the prosocial effects and their targets are dependent on the particular religious traditions, that they may be unevenly distributed even within single traditions, and that religious beliefs and behaviors tend to reflect and react to surrounding ecological, social, and cultural circumstances. We tested these assumptions by targeting Mauritian Christians of various denominations and socioeconomic backgrounds, presenting them with public good dilemmas via economic games. Specifically, we gave them a choice to donate money received from us to local charities and had them consider the local norms regarding public goods (how much they think people should donate), the local practices (how much they think people indeed donate), and measure their actual behavior (how much they personally donate). We predicted that participants' religiosity would increase the sum of donations (especially for people of lower socioeconomic standing) and make

them 1. more consistent with regards to reported normative beliefs, expectations, and recorded behaviors, and 2. more normatively tight – that is, parallel in opinions and behaviors to other participants who declare similar affiliation and levels of religiosity.

## **Cultural loss facilitates adaptation under environmental change**

**Elena Miu · Sheina Lew-Levy · Marc Malmdorf Andersen**

The field of cultural evolution has been tremendously productive in understanding the evolution of human adaptation, but the role of children learning has been underexplored. Evidence from psychology suggests that, broadly speaking, children are more exploratory and innovative than adults. In previous work we have shown, using an agent-based model that varied how children and adults explored a complex problem space, that children's exploratory nature is adaptive, leading both individuals and populations to find better solutions under interacting social learning and environmental change conditions. It has been suggested that childhood has evolved as adaptation to environmental change, but also that under frequent environmental change individuals should develop broad repertoires that they can use flexibly when their current knowledge is rendered inadequate. In this work we build on our previous model to focus on what kind of culture evolves under varying types of environmental change. We therefore investigate how children's exploration results in population-level adaptations, and how these adaptations vary under different environmental change regimes. Most cultural evolution models conceptualise environmental change as random, but here we explore different tempos and amplitudes of change, ranging from complete change and extreme events, to changes that only affect complex behaviours, and focus on the types of repertoires that evolve under these conditions. This allows us to assess 1. How the adaptive nature

of childhood exploration varies with different types of environmental change and 2. How different types of environmental change affect the diversity of culture both at the individual and population level.

## **Social information use across the lifespan**

**Lucas Molleman** · Wouter van den Bos · Andrea Gradassi · Wataru Toyokawa

Social information use is key to human success, boosting individual decision-making, group coordination, and knowledge accumulation across generations. Theoretical models predict that social information is most valuable in early life, when individuals can benefit most from more experienced others. However, it is largely unknown how social learning strategies change across the lifespan, as studies typically use narrow demographic samples. Across seven belief-updating experiments, using cross-sectional samples spanning ages 6-99, recruited from museums in Germany and Japan (N=32,707), we find a robust developmental trajectory of social learning: social information use was highest at age 6, strongly declined until late adolescence, and then slowly increased again into late adulthood. Interestingly, participants across the whole age range used social information most when it aligned with their own beliefs or with other social information, and when it was provided by young adults. Furthermore, social

information use was slightly higher in females than in males, and higher in Germany than in Japan. Our results reveal the early-life emergence of strategic social information use and help understand how adaptive information spreads in age-diverse populations.

## **Social learning can undermine technological evolution via social loafing under the exploration-exploitation trade-off**

**Yo Nakawake** · Yutaka Kobayashi

Social learning facilitates the diffusion of beneficial technologies; however, the costs associated with individual learning may foster social loafing, where individuals rely on others' efforts rather than innovating themselves. Such social loafing becomes particularly pronounced when the cost of exploration is high. Specifically, in the presence of an exploration-exploitation trade-off, individuals are likely to reduce exploration and increase their reliance on social learning. The present study empirically investigates social loafing behavior in the context of technological evolution under the aforementioned trade-off. We adopted a modified virtual arrowhead task in a laboratory experiment. Using a within-participants design, a total of 104 participants (26 groups of 4 participants) completed both a group condition and an individual condition. In each condition, participants conducted 30 trials, choosing between two options: 'enhancement' (exploration to improve technological efficiency) or 'hunting' (exploitation to earn rewards based on current efficiency). In the group condition, participants had the opportunity to copy the technology of the other three members at the end of each trial. Conversely, in the individual condition, such social learning opportunities were not available. We analyzed the data using the group as the unit. The results showed that the frequency of exploration was significantly lower in the group condition compared to the individual condition. Furthermore, the technological efficiency achieved in the group condition was significantly lower than that in the individual condition. These findings suggest that under the exploration-exploitation trade-off, social learning can undermine technological

evolution.

## Sensory Deprivation and the Evolution of Religious Practices

**Jana Nenadalová**

Humans across cultures engage in practices that deliberately induce experiences imbued with religious or spiritual significance. While unusual experiences can occur spontaneously, many traditions employ costly procedures to evoke them. Despite these costs, such practices are widespread and likely have deep evolutionary roots. This raises key questions: how and why did these practices emerge, and what conditions and adaptive changes enabled their stabilization, leading to their current persistence? We propose a processual framework addressing both proximate and ultimate explanations. Ecologically, the hominin shift from forested to savannah environments increased reliance on caves as shelters, where natural sensory deprivation occasionally triggered unusual perceptual experiences. Psychologically and socially, cognitive developments during the Pleistocene transformed these experiences into culturally meaningful events, which were accessible through narration, performance, artifacts, and specifically designed environments. Over time, these practices stabilized because they served adaptive functions: reducing uncertainty about uncontrollable events (e.g., hunting success, illness) and motivating commitment to shared, costly goals, thereby enhancing

cooperation. Our novel approach thus integrates ecological, cognitive, and social dimensions to explain the origins and stabilization of practices centered on spiritual, religious, and other special experiences.

## **Intergroup transmission of prehistoric knapping techniques likely required direct social learning mechanisms**

**Vincent Niochet**

During Prehistory, artefacts left behind by one group may have remained visible and accessible on the ground for a long time before being covered with sediment. The accessibility of artefacts from other cultural groups may have represented a “library of stones” (Hiscock, 2014), providing new manufacturing procedures for prehistoric stone tool artisans who might have attempted to reverse-engineer them—that is, to reconstruct other groups’ technologies solely through observation of their products. However, whether such reverse-engineering of manufacturing procedures was actually possible remains unclear. To examine this possibility, we conducted a reverse-engineering experiment involving 34 experienced knappers. Participants were asked to identify two common and one uncommon knapping techniques based solely on the examination of stone end-products. In nearly all successful tasks (90%), participants were already familiar with the technique they attempted to reverse-engineer, whereas in most unsuccessful tasks (67%), participants were unfamiliar with it. We found a positive correlation between participants’ performance and their years of knapping experience, archaeological training, the diversity of archaeological contexts they had studied, and the frequency of their knapping tool use. Overall, the results tend to contradict the “library of stones” hypothesis, as experienced knappers generally could not reverse-engineer techniques

with which they were unfamiliar. Consequently, new techniques were unlikely to be transmitted through reverse-engineering alone. The main implication is that direct social learning mechanisms were likely necessary for the transmission of new technologies between prehistoric cultural groups.

## **Mother-offspring food sharing as a mechanism of knowledge transmission in capuchin monkeys**

**Julia Omena** · Guilbert Araújo · Helena Lima · Patrícia Izar

Maternal food sharing with offspring may contribute not only to meeting offspring's nutritional needs but also to the social transmission of foraging knowledge, shaping the cultural repertoire of developing individuals. In this study, we investigated mother-offspring food sharing in a wild population bearded capuchin monkeys (*Sapajus libidinosus*) at northeastern Brazil. This population has a cultural repertoire of tool using for foraging. By using focal animal sampling, we analyzed 194 hours of footage of 10 infants during their first 18 months of life. Mothers shared food exclusively in response to infant solicitation, with solicitation occurring across 48 maternal feeding bouts. Infants successfully obtained food in 29 bouts and failed in 19. In 15 of the successful cases, mothers shared food only after repeated solicitations, indicating that sharing emerges through a negotiated mother-infant interaction rather than proactive provisioning. Infants preferentially solicited high-quality and hard-to-process items, although the probability of sharing rates did not differ across these categories. Mothers were less likely to share food if the item was a lizard and were also less likely to share with male infants. The likelihood

of successful sharing increased with infant age. Our findings suggest that maternal food sharing in capuchins is primarily driven by infant begging, such interactions provide repeated opportunities for infants to access diverse food items and potentially acquire foraging knowledge, offering a meaningful pathway for cultural transmission.

## The group dynamics of involution

### Xinyue Pan

The term “involution,” coined by Kant as the antonym of “evolution,” originally describes the situation where things do not reach their advanced state in the process of development, but are copied and complicated internally. Today, this word has regained prominence on social media, describing situations where people compete fiercely under resource constraints, which decreases everyone’s marginal return. Involution is a failure of coordination. Individuals pursue optimal decisions, but the group ends up in an unexpected and suboptimal state. In this paper, I develop an agent-based model to explore the group dynamics behind involution and propose interventions to break the dilemma. In the model, individuals are Q-learners who make decisions on how much effort to invest in a task. Their decisions are based on their own states, knowledge of others, and anticipated rewards. Individuals’ decisions influence each other in a repeated game. Simulations show that, the dynamics of involution is driven less by the total resources available but more by their distribution. Reward disparities between top and lower performers “polarize” competition: While high performers redouble their efforts, low performers tend to lose motivation and withdraw from the competition. The polarization

can be disrupted by information transmission and social learning. When people know each other's states and learn from other's Q-values, competition escalates and spreads to all tiers of performers. These findings suggest the roles of inequity and information availability in fueling social comparison and involution.

## The intergenerational game for language preservation

**Alejandra Ramirez** · Justyna Olko

Languages are among humanity's most important cultural inheritances. Their survival hinges on sustained intergenerational transmission: a single break in continuity can permanently deprive descendants of access. Here we develop a formal model of this process by combining sequential games with evolutionary cultural dynamics. In our framework, each generation chooses whether to sustain or abandon the language. Backward induction predicts premature abandonment despite the large cumulative benefit of sustaining the language. Evolutionary analysis reveals conditions under which sustaining strategies can persist: when the benefits to future generations outweigh the immediate private costs of maintenance. Our results formalize a paradox long noted in sociolinguistics: the fate of a language depends not on collective preference across

generations, but on whether any single generation chooses to defect, the so-called “missing generation” that breaks the language preservation chain.

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## Modeling, Explanation, and Interdisciplinarity in Cultural Evolutionary Science

**Mark Risjord**

This presentation argues that some critiques of the explanatory power or scope of models in cultural evolutionary science (CES) underappreciate the interdisciplinary character of modeling. CES models are “autonomous” in the sense that they are not direct applications or instantiations of theory, rather they loosely draw on background theories for resources in the construction of models from the ground up. The background theory provides both assumptions and constraints for models, a kind of “recipe” for their construction. When theories from one domain inform model development in another, the assumptions and constraints may be only partly satisfied. These modifications in assumptions and constraints may change the explanatory scope or force of the models. In addition, autonomous models may draw on the theoretical resources of multiple domains. The result is a hybrid model, which may have novel explanatory powers. In this presentation, we will examine models that draw on two disciplinary theories that inform CES: genetic biological evolution and evolutionary game theory. We will demonstrate how their explanatory targets differ, and that the force of these explanations is a product of the way in which they satisfy the assumptions and constraints of the background

theory. Hybrid models combining these two background theories inherit both strengths and weaknesses. We conclude that the critics of CES are responding to an interesting characteristic of CES—challenges arising from its interdisciplinarity—but that the force of the critiques is blunted by the way these novel models are being used.

## **Cultural Transmission in ‘Spiritual But Not Religious’ Families across the UK, India, and Mauritius**

**Nachita Rosun** · Pushkar Puryag · Myron Penner · Emily Burdett

Being ‘spiritual but not religious’ is often dismissed as too individualistic, too fluid, or too anti-institutional to be culturally inherited in similar ways to traditional religion. The dominant assumption is that if there’s no doctrine, no community, and no ritual structure, there’s nothing in particular for parents to pass on to their children. Our research challenges this view of the transmission pathways of modern day spiritualities by asking what forms of transmission are emerging within SBNR families without the typical institutional scaffolding, and how do they work? To investigate, we conducted a cross-cultural qualitative study of SBNR parenting with 45 SBNR parents in three cultural contexts: the UK, Mumbai, and Mauritius. The latter two sites are important for considering modern day spiritualities beyond Western, and particularly, post-Christian frames. Our analysis centres on (1) how spirituality is defined and lived within and across these cultural contexts and (2) how parents are (or are not) fostering spirituality in their homes. Preliminary findings suggest that cultural transmission among the SBNR is more focused on the transmission of values (e.g., openness) than that of supernatural beliefs and ritual practices. Costly signals are not absent but appear different to traditional forms

identify when external interventions can trigger endogenous social tipping points, leading to significant cultural shifts, and when such interventions are likely to be ineffective. This approach underscores the importance of harnessing internal social influence processes for successfully engineering desired cultural change, enabling leaders and scholars to trace and manage the complexities of organizational cultural change.

## **The cooperation ladder: Population dynamics and threshold rewards drive surges and stalls in cooperation**

**Eric Schnell** · Robin Schimmelpfennig

Human societies have expanded from small bands to large nation-states over the past 12,000 years. Yet, how groups scale up cooperation and why cooperation varies widely between societies, remains a central puzzle. We present a theoretical model that addresses these puzzles by extending the classic Stag Hunt game to having (a) multiple players, (b) multiple rewards (“stags”) of different sizes and (c) endogenous population growth. This creates a “cooperation ladder” where each rung corresponds to a communal reward that requires a threshold number of cooperators. As cooperation grows, larger rewards become reachable. Achieving larger rewards increases carrying capacity (e.g. via more food or energy), enabling subsequent population growth and unlocking further cooperative potential. But between these thresholds, cooperation can stagnate or regress and tolerated free-riding can be incentivized. Past cooperation and population can produce path-dependent outcomes. Our model yields multiple stable equilibria: surges near reachable thresholds and stalls when rewards are out of reach. The framework helps explain key patterns in cultural evolution: why cooperation can suddenly accelerate, why some societies get stuck at smaller scales, and how

seemingly selfish behaviour can persist in cooperative groups . These findings suggest that expanding the scale of cooperation depends not only on incentives but on whether the next collective reward is within reach. The model offers a new lens on historical transitions and provides guidance for how to address modern coordination problems such as climate change.

## **The evolution of zero-sum and positive-sum worldviews.**

### **Paul Seabright**

People and cultures differ in the extent to which they view the world as a zero-sum environment (where one person's gain is another's loss) or a positive-sum environment (where certain actions can benefit everyone). These beliefs shape individuals' willingness to work, invest, collaborate, or show hostility toward out-groups, and accept or reject various social policies. This presentation draws on an ongoing theoretical project with Sergey Gavrilets (University of Tennessee) in which we investigate how such beliefs can spread in a population in which stochastic dyadic interactions between individuals yield payoffs that enhance the probability of transmission of those individuals's beliefs to others. Beliefs may vary in their accuracy. A paper published in August 2025 in PNAS established results describing under what conditions which steady states are characterised by maximally accurate beliefs, and when instead less accurate beliefs

can drive out more accurate ones. This was in a relatively simple framework in which beliefs were about environmental parameters only. We are working on generalising the framework to settings in which beliefs are also about other agents' actions. We draw conclusions about the extent to which cultural authorities can influence people to adopt beliefs that track the external environment less accurately than do available alternatives.

## **War, famine, pestilence, and death: Challenges in responding to the Four Horsemen of climate change among Gabra camel pastoralists**

**Kristopher Smith** · Anne Pisor · M. Kariuki Njenga

Anthropogenic climate change is intensifying, and its impacts are already transforming livelihoods in communities worldwide. For underserved rural populations in low- and middle-income countries, locally innovated behavioral and technological adaptations will be essential for responding to climate-induced threats. Yet climate change is systemic: projections highlight disruptions to peace, food security, disease landscapes, and biodiversity. Adaptations that mitigate one threat may inadvertently exacerbate another. Drawing on 60 semi-structured interviews and 12 focus groups conducted with Gabra camel pastoralists in northern Kenya, we examine how locally generated adaptations interact—sometimes in mutually undermining ways. Although our study initially centered on responses to a climate-sensitive zoonotic virus, participants emphasized that rising conflict over shrinking grazing areas, increasing settlement around permanent water points, and restrictions associated with a nearby conservation area were limiting herd mobility. Because mobility is the Gabra's primary strategy for reducing mosquito exposure and protecting herds from vector-borne diseases, these constraints weakened their ability to respond to the very threats we set out to study. Moreover, while shifting toward camel herding is often promoted as an effective adaptation to decreasing precipitation,

participants reported that heightened disease risk was driving some households away from camels and toward less-susceptible small stock such as sheep and goats. We discuss the implications of these findings for a science of climate adaptation grounded in cultural evolution, emphasizing the importance of analyzing how adaptations co-evolve, interact, and compete under changing ecological and social conditions

## **Children's sustainability strategies in a cross-cultural common-pool resource dilemma**

**Kirsten Sutherland**

Common-pool resource (CPR) dilemmas are group-level resource sustainability problems that are sensitive to over-extraction. Understanding the conditions under which CPR management fails and succeeds has broad relevance for addressing real-world environmental issues. While adult human strategies for overcoming CPR dilemmas are well-studied, the developmental perspective has received little attention. This represents a significant gap in our knowledge of the social and cognitive skills that support cooperative sustainability. Here, we test children in groups of four using a novel experimental paradigm. We compare resource sustainability strategies of two age groups of children: five year olds ( $N \sim 240$ ) and seven year olds ( $N \sim 240$ ) in four

countries (Germany, Türkiye, Kenya, and Republic of Congo). We investigate how inequality of resource access at the group- and societal-level affect cooperation in the CPR dilemma. To our knowledge, there is currently no published study investigating strategies of human children in CPR dilemma in groups larger than 2, and no cross-cultural experiments on this topic in children. At the time of submission, data collection is underway, and is expected to finish by February 2026.

## **Evolving Ritual Ecologies: The Transformation of Human–Nonhuman Relations in Maghrebian Festivals**

**Latifa Talbi**

This paper explores the evolution of Maghrebian ritual festivals — particularly Boujloud and Tbourida — as dynamic cultural systems that adapt to modern contexts while maintaining ancestral cosmologies. These celebrations, where humans and animals interact through performance, costume, and sacred temporality, reveal how ritual ecologies transform under the pressures of tourism, media visibility, and economic change. Drawing on ethnographic research and visual documentation conducted between Morocco and Italy, this study examines how the symbolic boundaries between human and nonhuman agents are constantly reconfigured. The animal mask of Boujloud and the horse of Tbourida act as mediating presences, embodying shifting notions of identity, heritage, and moral community. Through a multispecies and posthuman anthropological lens, this work argues that such rituals exemplify processes of cultural evolution: they persist not as static traditions, but as living assemblages capable of integrating new materials, audiences, and meanings. By tracing these transformations,

the paper highlights how Maghrebian communities reinterpret their relationships with both human and nonhuman actors, generating innovative cultural forms that challenge Western dichotomies of nature and culture. Ultimately, the study contributes to broader discussions on cultural adaptation, ritual resilience, and multispecies coexistence in the Anthropocene.

## **Reconstructing Transmission Routes of Pottery in the Neolithic Japanese Archipelago: A Quantitative 3D Shape Analysis**

**Kohei Tamura** · Tomomi Nakagawa · Akihiro Kaneda · Hisashi Nakao

Reconstructing routes of cultural transmission based on similarities in material culture benefits from a cultural evolutionary framework grounded in the concept of descent with modification. Although a large body of work on this topic has been based on typological coding by experts, recent technological developments in three-dimensional (3D) measurements can allow us to obtain more detailed data in a more reproducible way. In such studies, the spread of agriculture and its associated material culture have been a central theme: the emergence of agriculture was a major watershed in human history that eventually triggered population growth and other social transformations. As a case study, we analyzed Ongagawa-style pottery in the Neolithic Japanese archipelago, long treated as a proxy for the spread of wet-rice agriculture. Moreover, because this type of pottery was widely distributed across the western part of the Japanese archipelago and has a relatively simple form and thus quantitative analysis rather than typological classification can be useful to capture its morphological variation. We quantified 2D outlines by elliptic Fourier analysis and 3D surfaces by spherical harmonics. The resulting shape variation

is spatially and temporally structured, consistent with two principal spreading routes while also indicating interaction and reticulation between pathways. Overall, the study shows how combining 3D measurement with quantitative shape analysis enables data-driven reconstruction of transmission pathways, linking the morphologies of artifacts to the expansion of agriculture.

## **The Synchrony of Group Singing: How The Sacred Harp shapes community**

**Simon Thomas**

The Sacred Harp tradition has been thriving since the mid-1700s in New England, sustained by a unique combination of participatory music-making, communal ritual, and deeply embodied vocal practice. Unlike performance-based musical cultures, Sacred Harp emphasizes collective sound over individual virtuosity, creating an environment where singers, regardless of training, contribute equally to a powerful, resonant whole. In Spring 2026, I plan to investigate this tradition through a mixed-methods study that combines qualitative interviews with quantitative measures, including EEG recordings and physiological synchrony data captured during live singing events. By pairing ethnographic insight with cognitive data, my goal is to explore the relationship between musical synchrony—the alignment of breath, rhythm, neural patterns, and vocal production—and the felt sense of community reported by participants. This project sits at the intersection of music, culture, cognitive psychology, and anthropology. Sacred Harp offers a compelling case study because it fosters community not through explicit ideology, but through embodied experience: the shared act of singing in a hollow square, the intentional rotation of song leaders, and the physical resonance of sound in a collective space. Understanding how neural and physiological synchrony emerges in such settings may shed light on broader questions about how humans form social bonds. In an era marked by declining civic engagement and weakened communal ties, research on participatory music-making has the potential to illuminate pathways for rebuilding

connection. If musical synchrony strengthens community in Sacred Harp settings, it may offer clues for revitalizing collective life in other cultural and social contexts.

## **Semantic knowledge guides innovation and drives cultural evolution**

**Shen Tian**

Cultural evolution allows ideas and technologies to accumulate across generations, reaching their most complex and open-ended form in humans. While social learning enables the transmission of such innovations, the cognitive processes that generate them remain poorly understood. Classical theories typically treat innovation as random variation, a simplification insufficient for explaining the complexity of human cultural evolution. We propose that semantic knowledge—the associations linking concepts to their properties and functions—guides human innovation and drives cumulative culture. To test this, we combined an agent-based model, which examines how semantic knowledge shapes cultural evolutionary dynamics, with a large-scale behavioral experiment (N = 1,243) testing its role in human innovation. Across both approaches, we found that semantic knowledge directed exploration toward meaningful solutions, enhanced innovation success, and enabled generalization from prior discoveries. Moreover, semantic knowledge interacted synergistically with social learning to amplify innovation and accelerate cumulative cultural change. In contrast, experimental participants lacking access to semantic knowledge performed no better than chance, even when social learning was possible, and relied on shallow exploration strategies for

innovation. Together, these findings suggest that semantic knowledge is a key cognitive process underpinning human cumulative culture.

## Learning to reach consensus and how consensus can shape learning

**Henri vandendriessche** · Wataru Toyokawa

Consensus decision making is central to group behavior across ecological, social, organizational, and political contexts. Classic theories assume individuals begin with clear prior preferences, yet real-world decisions often require trial-and-error learning through which preferences are formed. How consensus emerges when individuals simultaneously learn and decide remains poorly understood. Reinforcement learning (RL) provides a powerful framework for modeling experience-based decisions, capturing how agents update value representations to guide future actions. We examined a population of RL agents performing a multi-armed “consensus bandit” task, where agents earn bonus rewards when they unanimously choose the same option. This design creates a tension between exploring better alternatives and coordinating for a consensus bonus. Agents can learn by weighting environmental feedback (choices/rewards) and/or social cues (others’ choices and consensus bonuses). By varying model parameters, we asked: (1) Which environmental and structural factors—such as group size, payoff profiles, and consensus bonus magnitude—facilitate or hinder consensus? (2) How do individual differences in cognitive parameters, biases, and learning strategies influence convergence dynamics? Results show that agents flexibly combine individual and social learning depending on task structure. Higher consensus bonuses increase attention to social information, whereas low discriminability between options impairs optimal consensus formation and can instead produce convergent toward suboptimal choices.

Consensus emergence strongly depends on interactions between agents' learning rates, exploration tendencies, and weighting of social versus environmental information. Lastly, higher standard deviation of these parameters' distribution significantly slows the emergence of consensus, highlighting the importance of incorporating learning dynamics when modeling consensus formation.

## **From Conflict to Social Complexity: the Evolution of Legal Pluralism and Multiple Moralities**

**Ona Wang**

Conflict management and resolution is a focal point of evolutionary theory, and an increasingly evident concern for humankind. The need to manage disputes catalyzed the evolution of social complexity, and the increasingly complex demands of social and moral coordination propagated legal pluralism. Early humans evolved socio-cognitive mechanisms such as signaling, memory, and reinforcement to facilitate effective communication, resolve conflict, and cooperate. The need to manage social relations and resolve disputes led to the emergence of institutions to reinforce cultural norms, moral systems, and social hierarchies. Small-scale societies relied on informal practices such as kinship networks, reciprocity, and customary law to manage social disputes and conflicting interests over resources. These mechanisms not only reduced conflict in the community but also laid the groundwork for more durable institutions. Through integration and colonization, societies grew and developed legal pluralism as a layered system of accountability and hierarchy. Under legal pluralism, customary and formal laws operate simultaneously, both competing and cooperating to govern social hierarchies, collective norms, and morality. The coexistence of multiple systems allows individuals to select approaches to conflict resolution based on which they believe will meet their fundamental

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needs. The trajectory from conflict management to social complexity and ultimately to legal pluralism reflects the tension between human needs for order, cooperation, and flexibility. By considering legal pluralism within an evolutionary framework, we can gain insights not only for understanding past social relations but also for addressing contemporary challenges of governance, multiculturalism, and justice.

## **From the 2016 Hirak to Gen Z: Tracing the Cultural Evolution of Moroccan Youth Activism**

**Omayma El Achak**

This paper tackles the trajectory of Moroccan youth activism by examining the 2016 Hirak movement and its influence on the emerging generation known as Gen Z. The Hirak Movement of 2016 came as a response to the death of a fish vendor, Mouhsine Fikri. A police officer confiscated 500 kg of swordfish that Mouhsine Fikri had purchased from Al Hoceima port, the city where he used to work. The video footage of Mouhsine's death was widely played on social media platforms in Morocco, which led to protests in Al Hoceima, and spread across Morocco. Mouhsine climbed into the back of a rubbish truck to retrieve the confiscated fish, the police officer ordered the crusher to be activated, leading to the man's death. This tragic incident activated public anger, and took different forms of social movements online and offline. What happened in 2016 in the Rif was extended by Gen Z in all parts of Morocco in 2025. The study explores how the 2016 Hirak motivated cultural and political awareness among Moroccan youth, and how it fostered new modes of expression with social issues, especially health and education.

It examines how Gen Z, shaped by digital connectivity, and how it continues this legacy of social activism. By encompassing cultural studies, cultural evolution theory, social theory, and generational analysis, the paper sheds light on the ongoing cultural evolution within Moroccan society and highlights the role of youth in shaping contemporary civic identity and social change.

## **Learning and the Concepts of Cultural Traits**

**Madeleine Ammar**

The study of behavior requires multidirectional approaches that consider the mutual influence of genetic, epigenetic, developmental, and cultural factors. A recent illustration of such a multidirectional feedback system involves the development of cultural repertoires and the evolution of learning strategies: Memory and forgetting were shown to shape the information that individuals gather throughout their lifetime. The evolution of forgetting, in turn, is shaped by the success rate of innovation, which affects the benefit of (vertical) social learning. These findings demonstrate the interplay between development, culture and evolutionary dynamics. Specifically, they point to a feedback between the content and mechanisms of learning. Zooming into individuals' cultural repertoires and describing cultural traits with greater detail may unravel this feedback further. Different trait concepts may generate distinct hypotheses about the mechanisms underlying learning. For example, traits can be described in terms of their functions, their relation to other traits, or the actions required for their expression, and any such conceptualization may come with different predictions about the kinds of information learners need to acquire. Some trait concepts may suggest that social and individual learners rely on

distinct information, and feedback between the content and the mechanisms necessary to retrieve it may consequently predict the reinforcement of distinct learning mechanisms for social and individual learning. The goal of this research is to understand the interplay between learning and its content and how this changes our predictions about the forces that shape it.

## **A Representational Analysis of Signed Numerals: Insights into Cultural-Cognitive Evolution**

**Chiara Anceschi**

Numeration systems are paradigmatic examples of culturally evolved cognitive tools: They are invented, transmitted, modified across generations, and they evolve in response to cognitive and cultural pressures. To understand their evolution, representational analysis is crucial, as it enables systematic comparison of how numbers are represented across different modalities, formats, and cultural contexts, and it reveals the cognitive implications of these representations. Representational analyses have been carried out for numerical notations, spoken languages, and body-based systems, but sign languages have received little attention. This is a significant gap, as examining numeration systems in sign languages can yield insights not only into modality-specific affordances and constraints, but also into the effects of socio-cultural and developmental contexts. Comparing numerals in sign languages allows us to investigate how the contexts of emergence and the needs for representing higher numbers shape the evolution of numerical representation. To address this, we have conducted the first representational analysis dedicated entirely to signed numeration systems. The analysis of over 60 typologically diverse sign languages reveals clear differences between urban sign

languages and rural and home-sign systems, but it also reveals significant differences with other formats: unlike notations, for example, sign languages tend to adopt multiple representational strategies across numerical ranges, reflecting the balance between the need to represent large values and the need to keep systems cognitively manageable. By documenting this diversity, our work offers insights into the adaptive interplay between embodiment, cognition, and cultural evolution.

## **Narrative Cognition and the Achuelean Handaxe**

### **Robert Ashby**

The role of narrative in the cognition, communication and culture system of hominins as reflected in the archaeological record of Achuelean handaxes in the Palaeolithic period. Prehistoric stone tools form the main archaeological record of the evolution of the cognition, communication and culture system (CCCS) of Homo species. From 2.5 million to 5,000 years ago hominins developed increasingly complex technologies for making stone tools, with commensurate increases in brain size and cognitive ability. Strong evidence from extant human neurology and non-human primate tool use, from child communication ontology, and from cultural evolutionary research, indicates that CCCS content works in a “narrative” format. Narrative format probably provides the memory coding and decoding process for our experiences. Thus it formats predictions of outcomes for ecological sensory information and is the basis of cognitive projections of stone tool-making actions and outcomes. Story-telling is a very powerful way for humans

to communicate, but narrative may have been the format of event cognition before the evolution of language. The very gestural nature of stone tool knapping may have been a communications precursor for cultural transmission of the tool making technology. My PhD research project investigates whether narrative features of sequence, syntax and structure are present in making biface handaxes, as written in surface flake scars from the flint knapping process, by looking at event processing models of cognition.

## **Governing Complexity in a Post-Globalised World: Applying CAS and Chaos Theory to Emerging Security Challenges**

**Somaya Bahji**

In a post-globalised international system, multiple non-state actors, including individuals, transnational communities, financial institutions, and new age technology-driven entities, have emerged to interact with long-established traditional institutions in a reciprocal, agent-structure fashion. These complex interactions have given rise to a new understanding of individual and collective identities, political agency, the nation-state, and national belonging. Equally, they have generated new behavioural patterns in the international system as well as unprecedented security challenges that extend beyond the traditional sectors of military and economic performance. These challenges range from financial and geopolitical risks to environmental, social, and cybersecurity threats, potentially triggering systemic cascades of instability. The application of Complex Adaptive Systems (CAS) and Chaos Theory in governance enables scholars and decision-makers to analyse and interpret the behavioural patterns of complex phenomena such as hybrid warfare, hybrid governance structures, global financial networks, international alliances, multinational corporations, and AI-driven systems, to cite a few. Some of the advantages of the implementation of Complex Adaptive Systems and Chaos

theory in governance paradigms include the improved anticipation, resilience-building, and potential containment of complex security challenges. CAS/Chaos governance and policy-building frameworks can be particularly useful in such domains as conflict prevention and advanced bioengineering for food and water security, especially in the Global South. Keywords: Complex Adaptive Systems (CAS), Chaos theory, hybrid warfare, Copenhagen School, post-globalisation, Global South, predictability.

## **A cultural history of virtuality in musical performance**

**Joshua Bamford**

Musicality, the capacity to make music, appears to be a human universal and may serve an adaptive function within the context of complex human societies. Nevertheless, there is great cultural diversity in the production of music. Not only do musical features differ between cultures—in terms of the variety of rhythmic, melodic and harmonic patterns within the music—but also the manner of musical performance. The contexts in which music is made and heard have evolved over time: from songs sung around campfires, to thousands of virtual avatars attending a metaverse concert inside a video game. This presentation will outline a taxonomy of musical performance modes. Through reviewing historical and ethnographic literature, it will attempt to capture the diversity of performance modes and discuss their social properties. Performance modes may differ across various dimensions, such as embodiment, interactivity and virtuality. Therefore, each mode may serve slightly different functions or be optimised for different group sizes. The relatively recent phenomenon of virtual performances by avatars, holograms or AI-agents may

represent a trend towards virtuality, where the performer is increasingly distanced from the audience, which began with recorded music and amplification technologies. As societies have become larger, it is possible that different modes of musical performance have adapted to reach more people efficiently, although it should not be assumed that this is a strictly linear progression. The taxonomy presented here will be used for future work comparing audience experiences in different performance modes.

## **Cognosis: A New Paradigm Approach to the Process of Cultural Evolution**

### **Ken Baskin**

Over the last 50 years, it has become clear that what Edgar Moran called “the master paradigm of Western civilization” is undergoing a Kuhnian shift. In disciplines ranging from evolutionary biology to quantum physics, the model for our civilization’s paradigm is moving from Newtonian physics to complexity science. This presentation will explore the beginnings of a new paradigm approach to cultural evolution. I call it “cognosis,” a positive feedback loop by which human communities address survival challenges that seem insoluble by opening new domains of cognition, which they eventually become so hypnotized to that they begin to mistake those domains for the reality they were

created to explain. When new survival challenges emerge, they are plunged into another cycle of cognosis. The presentation will begin with an examination of the neurobiology of perception and learning, which explains why these new paradigms can have such a powerful effect. After that, it will treat two examples -- that of the Greek Axial Age transformation and that of Modernity. Finally, it will examine the implications of this theory as a way of seeing the facts of cultural evolution from a surprisingly different perspective.

## **Organizational Principles and Cultural Evolution of Societies as Systems of Institutions**

**Dmitri Bondarenko**

Societies are complex dynamic systems of interacting and intersecting elements – social institutions. Sociocultural evolution is essentially a process of meaningful transformation (structural change) of the system of institutions. Any system of institutions is formed in specific, sometimes even unique sociocultural and historical conditions. This determines specificity of its structure and mechanisms of functioning, i.e. of the institution interaction. The way institutions are interconnected determines the basic principle of society's organization. That a society will acquire its general shape and design following a basic organizational principle is beyond individual or collective social imagination (at least in its entirety), as these basic principles are outcomes of multiple underlying processes not obvious to contemporaries. We distinguish two basic principles of societies' organization which pass through the entire history of humankind: heterarchical, at which institutions interact being unranked with respect to one another or can be ranked in different ways, and the opposite principle, homoarchical, at which institutions interact being rigidly ranked in the only way and have no or very limited potential for being unranked or ranked

in other ways As a rule, any society embodies one of these principles, and can change it for the other raising, lowering or not changing its level of cultural complexity. This means that we are talking not about evolutionary stages, or evolutionary lines, or sociopolitical forms but rather about two different (although intersecting, even complementary in sociohistorical reality) basic organizational principles on which societies of all complexity levels as systems of institutions are based.

## **Understanding human-AI cultural relations in terms of host-parasite coevolution**

**Robert Brooks**

Technologies are fruitfully viewed as extensions of the mind. They can enhance user capacities for computation, memory and recall, communication, and cooperation, and thus shape cultural transmission and evolution. Many technologies that incorporate Artificial Intelligence, however, have the capacity to learn and thus to change their

evolution models using Approximate Bayesian Computation to estimate the factors influencing LLMs' content creation and selection, and the population dynamics such behaviours produce. By employing standard methods already widely used to examine human behaviour, we provide a framework where cultural evolution driven by both human and artificial agents can be analyzed and compared, with relevance to the potential dynamics of hybrid environments.

## **Intergroup Conflict and Belief in a Punishing God: A Natural Experiment from Ukraine**

**Radim Chvaja** · Alisa Lapyhina

Belief in moralizing gods and supernatural punishment is thought to have facilitated the growth and stability of large-scale societies by promoting cooperation among both close and distant group members. Yet, the evolutionary pathways through which these beliefs emerged remain debated. Cultural evolutionary models suggest that intergroup conflict, including lethal warfare, played a central role in the rise of prosocial religions, but empirical evidence remains limited and indirect. This project examines how exposure to war influences representations of God as moralizing and punitive. We investigate the impact of Russian military and missile attacks on Ukrainians' perceptions of God's moral concern and punitive nature. We integrate data from the Armed Conflict Location & Event Data Project (ACLED), which provides precise geolocations of violent events and civilian casualties, with an original representative survey among Ukrainians residing in government-controlled areas. This design enables estimation of the causal effects of both objective and subjective exposure to intergroup violence and existential uncertainty on belief in moralizing and punishing gods, while accounting for the endogeneity of religiosity to conflict exposure. We further examine whether war exposure affects belief in

a loving and forgiving God and, exploratively, whether it increases willingness to donate participants' show-up fee to Ukrainian charity. By the time of the conference, we will present analyses from approximately 2,000 respondents. Our findings will provide new insight into how extreme intergroup conflict shapes the cognitive and cultural foundations of religious belief, contributing to broader debates on the coevolution of religion, morality, and social complexity.

## **Who cares about reputation? Socioeconomic status and reputational investment**

**Benoît de Courson**

Reputation is recognized as a key driver of cooperation, and a major motive of human actions. However, it is also clear that the reputational consequences of a person's actions vary based on who the person is: the same action may be judged differently, and lead to different outcomes, for different people. Crucially, people of low socioeconomic status (SES) may face particular hurdles (whether from being overlooked, misjudged, or actively discriminated against) in building their reputational standing. How should such people handle such an uphill battle? A large theoretical literature pertains to this question but gives contradictory predictions. Low SES people may see a greater need to build up their reputation, or they may equally see little point in trying, if it is likely to come to naught. A closer look at the empirical record actually suggests that both reactions – higher and lower reputational investment in situations of low SES - exist in human societies. Therefore, we propose a formal model reconciling the two perspectives, and predicting under which conditions either of the two emerge. In our model, agents choose how much

to invest in their reputation, based on their current reputation and economic resources, which in turn influence how their actions impact their reputation. We explore the effect of several mechanisms: status advantage, observability, a desperation threshold and reputation-independent cooperation.

## **Detecting seasonality preference in marriage and birth timing using population-level data and simulation modeling**

**Connor Davis**

Across cultural settings, individuals frequently report seasonal preferences on key reproductive decisions such as when to get married and in which season to conceive and subsequently give birth. Cultural evolution and life history theory predict that these preferences should be subject to strong selection pressure according to cultural and ecological context. However, it is unclear if these preferences are detectable in empirical behavior or whether they help explain the consistent patterns of birth cohort seasonality we observe globally. To answer these questions, I detail a workflow that leverages population-scale datasets from civic and medical records to investigate seasonality patterns in Mexico from 1985-2023. Seasonality in preference is not only identifiable in this dataset, but smoothly transitions from an existing profile into a new, stable pattern across the study period. I then compare these empirical patterns to various simulated

counterfactuals of reproductive decision-making. This approach allows us to specify how likely it is that cultural preferences, rather than ecological constraints alone, generate observed birth cohort seasonality. I end by evaluating the potential consequences of these results on long-term demographic patterns in the region and discuss implications for our current assumptions about human reproductive biology and birth seasonality generally.

## **The impact of cultural regimes via cohort differences on the reproductive outcomes of women from Malakula, Vanuatu**

**Pablo Varas Enríquez**

Cohorts are data constructions that are usually used to control for unmeasured confounds in time trends. But they can also be understood as a proxy for differences in cultural and economic exposures over time. Here, we make use of rich demographic and anthropological data to examine three distinctive cultural shifts in the recent history of Vanuatu, and explore their impacts on demography. Three `cohorts' represent: (a) the time-period when `traditional' cultural regimes were intact (up to the 1970s in some cases), (b) a middle cohort experiencing the exponential expansion of Christianisation, and (c) the neo-colonial cultural regime under which life is increasingly economised. By comparing quantitative differences in the number of children, age at first and last birth, average interbirth intervals, and length of reproductive career across the different cohort we are able to evaluate possible impacts of cultural regimes on the reproductive behaviour of women. The changes in cultural regimes in the Vanuatu context had

dramatic effects on household composition and living arrangements, marital relations, kinship connections and ultimately reproductive outcomes. The ability to examine these shifts in such fine-grained detail highlights the reciprocal dependence of short-term demography and cultural transformation on each other. It also invites us to examine in more detail both continuities and discontinuities in the construction of kinship, marriage and reproduction.

## Consciousness as Cultural Evolution Engine

**Joshua Fisher**

This presentation covers a function-first account of social and individual consciousness as the engine of cumulative cultural evolution. At the social level, joint attention (a We-mode) objectifies shared scenes and compels coordination; at the individual level, consciousness is modeled as an internalized listener that selectively admits thoughts bearing familiarity/affiliative markers. This selection compresses the meaning space and steers learning toward culturally alignable content, enabling rapid acquisition of language and shared meanings in children and scalable coordination in pre-linguistic populations. Together, these mechanisms convert cheap, noisy variation—random thoughts, gestures, proto-utterances—into high-fidelity, transmissible representations, powering cultural accumulation across distance and time. The account accommodates known results: (i) conversational asymmetries that privilege listener selectivity across cultures;

(ii) developmental universals in early joint attention and fast learning under sparse input; and (iii) unconscious-to-conscious latency signatures consistent with filtering dynamics. By treating consciousness primarily as a selection-and-alignment device for human-relevant meanings, the view reframes qualia as the felt aftermath of acceptance by the internal listener and explains how social and individual consciousness jointly function as a cultural-evolution engine rather than as mere by-products.

### **Three problems of memetics and sixty-six solutions from semiotics. On the definitional options of (re)-conceptualizing memes as signs**

**Ivan Fomin**

The paper aims to apply semiotics to address conceptual issues in memetics and to explore which kinds of signs memes can be considered to be. Semiotics offers several insights relevant to three core difficulties in memetics: the “form/content problem” (memes as “forms of behavior” vs. “information-packets”), the “interpretation problem” (copying vs. meaning-making), and the “agency problem” (memes as actually agentive vs. metaphorically agentive). First, the form/content problem can be reframed through a semiotic perspective: by viewing signs as a cooperation among sign vehicle, interpretant, and object, the substantialist tension between memetic externalism and internalism becomes a relational analytic distinction. Second, the concepts of logonomic sign, tardo-sign, and emonic sign enable stricter definitions of memes that can emphasize different aspects of “memetic” semiosis and, thus, suggest different ways to address the “interpretation problem”. Thirdly, with the conceptual toolkit of biosemiotics, the problem of whether memes are “actually” agents can be transformed into a question of “what kind” of agents they are. While not all cultural signs have to be agents, contemporary

biosemiotics does theorize a particular kind of meme-like “secondary subagents” in cultural semiosis. Overall, by combining various definitional options, one can argue that there are at least sixty-six different ways in which memes can be defined in semiotic terms. In particular, if memes are defined extremely loosely, any cultural signs can be referred to as memes. Alternatively, in the strictest sense, memes can be defined as agentive tardo-signs of cultural semiosis.

## From preference to dominance: The reinforcing and regressing effects of social influence

**Alexandros Gelastopoulos** · Alexander Jochim · Peter Steiglechner · Leonie Steinbrinker

When adopting a behavior, humans (and other species) often rely on social information and are more likely to copy behaviors that are demonstrated by many other individuals. Despite numerous empirical demonstrations of such effects, the literature on social influence in binary choice remains disjoint, and there is a lack of a unifying framework for mapping the micro- and macro-level consequences of social influence. In this contribution, we propose a parsimonious and interpretable mathematical model of social influence and use it to reanalyze  $N$  choices by  $N_{ind}$  individuals from an exhaustive collection of experiments on binary choice under social-influence for humans and other species. In addition, we define two new metrics that predict the possible macro-level consequences of social influence:  $\text{preference amplification}$ , expressing the

reinforcement of the dominant behavior, and  $\text{reversal potential}$  expressing the degree of bistability in the system, and the propensity of the inferior option to prevail. We show that in almost all settings social influence can lead to substantial amplification of the dominant preferences, whereas bistability appears to be possible in a subset of settings. Our approach can be used to contrast old and new work on social influence and to better understand the reinforcing or regressing effects of behavior change interventions.

## The Cultural Evolution of Peace

### Luke Glowacki

While some species have affiliative and cooperative interactions between different social groups, humans are unusual in having durable, positive-sum, interdependent relationships across unrelated social groups. Our capacity to these kinds of relationships enables cumulative cultural evolution. Knowledge about the conditions required for peaceful intergroup relationships is critical for understanding the success of our species. Understanding when and how peace developed in the human lineage requires considering the costs and benefits of both intergroup aggression and cooperation, for oneself, one's group, and one's neighbor. I explore the conditions required for peace,

why they are so difficult to achieve, and when we expect peace to have emerged in the human lineage. Peace is more than just cooperation at a larger scale. It requires the ability to manage disputes, resolve conflicts, and signal future cooperative intent. Humans rely on cultural technologies, including rituals, synchronous activities, and sanctions, to do so that themselves are the product of cultural evolution. I argue that although intergroup cooperation was a selective force in our species history in the past 300 thousand years the preconditions for peace only emerged in the past 100 thousand years.

## **The cultural evolution of color terms: Universal patterning and environmental influences**

**Patricia Greenfield** · Ashley E. Maynard

Berlin and Kay (1969) identified 11 basic color terms and seven stages of color evolution, with the last stage containing all 11 terms. Based on synchronic cross-cultural evidence, they posited that the historical order of the seven stages was a universal one. Our first goal was to use diachronic evidence to test this historical claim. Our second goal was to explore whether environmental factors could explain the historical expansion of the color lexicon. Method We asked three generations of young people (N= 335) living in a Tzotzil Maya community in Chiapas, Mexico to respond to identical color stimuli at two-decade intervals: 1969-70, 1991, and 2012. Results Goal 1: Basic color terms increased in each successive generation; and they did so in the order predicted by Berlin and Kay's stage model. Goal 2: Multiple linear regression showed that greater participation in commercial activities and higher levels of formal education predicted a larger number of basic color

terms. However, these environmental variables did not shift the evolutionary order in which color terms emerged. Conclusion Our diachronic data confirm Berlin and Kay's historical inferences from synchronic data, thus adding force to the claim of a universal sequence of color term evolution. However, we go beyond Berlin and Kay to show what factors move the color lexicon from one stage to the next. Our results imply that adapting to the task demands of commercial and educational environments leads to an expanded set of basic color terms.

## Cooperative sustainability: Not all inequality is created equally

**Richardt Hansen** · Kelly Kirkland · Michael Muthukrishna · Rebecca Koomen

**Introduction** Little research has explored the causal relationship between social forms of inequality, such as gender inequality, and cooperation across diverse social contexts. This cross-cultural study examined whether experimentally manipulated inequality at the group level, allocated ascriptively by gender or stochastically by random number generation, influenced cooperation in a common-pool resource (CPR) dilemma across eight countries with varying levels of gender inequality (GII), economic inequality (Gini), human development (HDI), and cultural distance from the US (CFst). We hypothesised that all forms of manipulated inequality would reduce cooperation, with the greatest reduction in the male-advantaged inequality condition. Moreover, we hypothesised that country-level gender inequality would moderate this effect. **Methods** Participants (N=1745) were randomly allocated to one of four experimental conditions (no-inequality, random-advantaged, female-advantaged, male-advantaged) manipulating the systemic inequality of payoffs in an online CPR dilemma played alongside three bots. **Results** We found no differences in cooperative sustainability as a function of experimentally manipulated inequality. Nevertheless, cooperative sustainability differed considerably between countries, varying systematically with GII and HDI, but not Gini or CFst. Countries with greater gender equality and human development achieved greater

cooperative sustainability. Conclusions Findings suggest that operationalising outcome inequality ascriptively by gender in an experimental CPR dilemma had no effect on cooperative sustainability. It may be the inequality was not sufficiently salient to elicit behavioural differences. Nevertheless, we find strong (correlational) evidence that GII and HDI influenced cooperative sustainability, while Gini and CFst did not. Future research should consider factors beyond economic inequality when examining how inequality affects cooperation.

## **Higher reliance on social cues actively decreases capacity for guided variation (experimental findings from a trivia-guessing game)**

**Pavlina Hillerova**

Tip for Science is a trivia guessing game in which participants estimate numerical values while being shown the answers given by previous players. This simple setup allows us to observe decision-making of individual participants: reliance on one's own judgement and/or use of social information. We developed a model that estimates four key parameters involved in this process: independent exploration (constant standard deviation), variance proportionality (standard deviation proportional to SD of presented previous guesses), conformity, and guided variation (the tendency to move closer to the correct answer). In this study, we examine how these four parameters co-vary across individuals, revealing systematic patterns in how people make use of and integrate social information. The results show a clear trade-off between the two variance components: some participants consistently modify the parental mean by a constant amount on the logarithmic scale, while others do pay attention to the spread of the presented values.

Importantly, stronger inclination toward independent variation is associated with a more pronounced movement toward the optimum, suggesting that independence reflects competence rather than random noise. We also conducted a follow-up analysis to compare two cohorts – one playing for free and another financially incentivised based on their score. Preliminary results also show that financially incentivised participants tended to rely more on social cues and showed higher conformity, which lowered their capacity for guided variation.

## **SocioMap's Ethnicity Mapping Project: documenting over 20,000 ethnic groups across 550 datasets worldwide**

**Daniel Hruschka · Sharon Hsiao · Harsha Kasi · Robert Bischoff · Matt Peoples**

Studies of cultural evolution often use cultural or ethnic groups as units of analysis. Today, more than a thousand public use datasets provide valuable social, demographic, and cultural data on these groups, presenting new opportunities for examining the roots of cultural diversity and change. However, bringing data on these cultural and ethnic groups together across these disparate datasets poses serious challenges. To address these challenges, SocioMap's Ethnicity Mapping Project provides a web-based application (<https://catmapper.org/sociomap>) for researchers to find where data is available on over 20,000 ethnic groups worldwide and to bring that data together across more than 500 datasets transparently and reliably. By providing a comprehensive

map of known ethnic groups globally, the project also reveals systematic biases in existing cross-cultural corpuses (e.g. Standard Cross-Cultural Sample, Ethnographic Atlas), with most commonly used databases severely under-representing groups in certain geographic regions (e.g., South Asia, Southeast Asia and Oceania) and with certain profiles (e.g., small groups, groups defined by religion, caste or race instead of language). We conclude by discussing: (1) the implications of these biases and (2) potential ways to resolve them in comparative, cultural evolutionary studies

## **Does social support improve health? A test using social networks and health in Vanuatu**

**Lyeba Jadun**

Human sociality is unparalleled among mammals and highly complex, including nested layers of interaction, support from kin and non-kin, and support within and across group boundaries. It is thus unsurprising that sociality is a key regulator of human health, with frameworks such as embodiment and social determinants of health underscoring how external social and cultural environments get “under the skin”. Operationalizing key features of social interaction that may impact health is still in its infancy; social network analysis offers a powerful means of inspecting how various features of social embeddedness may map onto health. Further, while human behavioral ecology has shown links between social networks and reproductive success, especially for females, there are few papers demonstrating objectively links between health and measures of social networks. This undergraduate-led project investigates key features of social networks to explore whether and how cooperative ties map onto health. It analyzes

social network and health data that were collected in the summer of 2024 within a small village on Tanna, Vanuatu, where community has long been emphasized as a key feature among other relational concepts of human existence. Although the sample size is small and results not significant, we find expected trends between greater social support and lower risk of hypertension when looking at support across a range of cooperative domains. These results offer tentative support for the importance of social support to human health and well-being.

## **Community-Wide Transmission of Foraging Knowledge among BaYaka Hunter-Gatherers in the Republic of the Congo**

**Haneul Jang**

The multi-stage learning model posits that children initially learn from their parents during infancy and later expand their knowledge through interactions with peers and skilled adults. Among hunter-gatherers, children acquire subsistence skills from an early age by joining their mothers on foraging trips and interacting with both peers and older individuals. To examine the transmission of foraging knowledge in relation to age class, kinship, and social network characteristics—such as reciprocity—we analyze the structure of BaYaka women’s subsistence networks and community-wide knowledge transmission networks in the Republic of the Congo. We draw on two data sources: (1) 230 days of focal-follow observations of BaYaka women’s subsistence trips and (2) self-reported interviews with all members of a BaYaka community aged over four years (n=181). Using a stochastic block model, we find that during women’s subsistence trips,

children frequently co-forage with peers—particularly with non-kin peers during middle childhood and adolescence—indicating opportunities for horizontal learning. A latent network model of knowledge transmission further reveals that these networks are shaped by kinship, marital partnerships, and gender homophily. Notably, knowledge about food locations is shared more reciprocally than knowledge about foraging techniques and skills. These findings provide insight into how social networks facilitate cultural learning in a real-world foraging population.

## **Indigenous People and Artificial Intelligence Use by Post-Secondary Students**

### **Leta Kingfisher**

Since 2022, I have been on the front lines of AI teaching 500 students in an introductory class to Indigenous Studies. The students began using Chat GBT in the winter of 2023. Since that time, AI use has become endemic. In the field of Indigenous Studies, AI accesses already published works and creates a research paper for the student. Much of the published work about Indigenous people has been disparaging, patronizing and inaccurate. If AI cannot find enough information for a student on a specific Indigenous nation, it will borrow from published works of another Indigenous nation. Indigenous people are one ethnicity to AI, as they are to many people. At times when pictures were included by students, AI created an image combining no less than four Indigenous nations

based on what millions of AI users found most appealing. Feathers featured prominently. In academia AI continues to hallucinate and add to the literature on Indigenous people based on how users are training it. Students using AI believe they have access to everything ever published about Indigenous people, not realizing AI has systematically removed unpopular works. The decades-long struggle by Indigenous scholars to publish work that contradicts popular social and cultural opinion, is quickly being silenced. AI will eliminate Indigenous voices based on what its users want and have trained it to do.

## **Mate-Guarding Compliance and Patrilineal Investment in a Heterogeneous Religious Context**

**Eva Kundtová Klocová · Radek Kundt**

Human children rely heavily on support from individuals beyond their primary caregivers, making access to a stable network of allomothers essential for mothers. Because paternal and patrilineal investment are strongly influenced by perceived paternity certainty, practices that regulate or restrict women's sexuality may function to secure support from fathers and their kin. We examine how culturally specific mate-guarding practices relate to paternal and patrilineal investment in Mauritius, a country that is highly religious yet globally connected. In Study 1 (N = 359), we employed free-list methods to identify locally meaningful concepts associated with chastity, serving as an operationalisation of compliance with mate-guarding norms. In Study 2 (N = 252), we used the most salient strategies as quantitative indicators of mate-guarding compliance and analysed their

association with received patrilineal assistance with childcare as reported by mothers. Mothers' compliance with mate-guarding norms is associated with increased paternal investment and, to a lesser extent, support from fathers' relatives. However, further analyses indicate that only certain strategies reliably predict patrilineal support. We interpret these behaviours as potential strategic signals of pro-familial values and sexual fidelity that may improve mothers' child-rearing strategies by strengthening access to paternal and patrilineal resources.

## **Minimally-Counterintuitiveness and popularity of modern fictional characters: quantitative analysis on Pokémon**

**Mao Koshimizu** · Yo Nakawake

This study explores the applicability of the Minimally Counter-intuitive (MCI) theory to modern fictional characters. According to the MCI theory, concepts or characters that minimally violate intuitive expectations are more memorable and widely transmitted. Supernatural concepts, such as humans who can teleport (violating physical laws) or animals made of stone (violating biological laws), are common in global folklore, and prior research suggests these entities often contain only one or two counter-intuitive elements. While this minimally counter-intuitive bias has been observed in characters from folklore and religious texts, its effectiveness concerning contemporary fictional characters has not been established. We analyzed the original 151 "Pokémon" characters, a popular series first released in 1996. Each Pokémon was coded using Barrett (2008)'s method, where a counter-intuitive property was defined as a characteristic violating intuitive assumptions

on ontological categories (e.g., a non-living substance possessing biological life). Popularity was measured using the results of the competitive, fan-voted “Pokémon of the Year” worldwide poll conducted in 2020 , which included species from series beyond the original generation. The results indicate that popular characters (Pokémon ranked highly in the poll) tend to possess minimally counter-intuitive properties. This suggests the MCI theory can be utilized to understand the popularity of modern fictional characters, demonstrating that cognitive biases influence what makes a character appealing.

## Should Researchers Imitate More?

Peter Kutsos · Petr Chlup · Slawomir Wacewicz

Across comparative psychology and cultural evolution, researchers routinely distinguish between “imitation” and “emulation.” Despite their centrality, these terms are used inconsistently, with dozens of partially overlapping definitions circulating in the literature. As a result, claims about species differences, cognitive mechanisms, or the evolutionary origins of cultural behavior are often grounded in terminological ambiguity. Rather than proposing yet another definition, we introduce a unified, theoretically grounded coding framework that classifies what exactly participants copied in any social-learning experiment. We propose a binary coding scheme capturing both the behavioral aspect copied (e.g., sequence of actions, irrelevant actions) and the information sources available to the learner (e.g., access to goals or process). The tool produces a compact code (e.g., 011010001–00110) that enables systematic comparison across experiments and species. Pilot analyses of classic studies demonstrate that many theoretical debates

collapse when 'acts of copying' are reframed in terms of their coded features rather than the interpretive labels assigned by authors. The framework also uncovers substantial undocumented variability in experimental designs. Ongoing work includes independent coding by both multiple human reviewers and LLMs, to evaluate inter-rater reliability and explore automated large-scale literature analysis. In the long term there is potential for this tool to be generalized beyond the terminology of copying and applied to other ambiguous terms across fields.

## The Secret of Cassava's Success

**Anis LAKHDAR** · Basma Farrah · Mathieu Charbonneau

Cassava (*Manihot esculenta*) is a starchy tuber consumed daily by over a billion people. Despite its nutritional and agricultural advantages, consumption of its cyanide content can cause debilitating diseases in the long run. While this causal relation is opaque, communities have developed elaborate, multistep techniques that detoxify cassava. This raises a central question: how and why did such complex and efficient detoxification techniques evolve and spread in the absence of explicit knowledge of their detoxifying capacity? While the South American origins of the techniques are now lost, the more recent adoption of cassava and the historical re-evolution of detoxifying techniques in Africa offers a potential model to answer this question. Drawing on the literature in anthropology, food science, and toxicology, we are building a structured database encoding cassava-processing techniques, their impact on cassava-based products, and their geographical spread in order to distinguish and test three hypotheses. First is the claim that these practices emerged from a "blind" process of cultural transmission and selection, where groups with effective detoxification techniques were more successful

in transmitted them (Henrich, 2016). Second is the “phenomenological hypothesis” (Mercier and Morin, 2019) according to which desirable phenomenological changes in processed cassava (such as better taste, texture, or preservation) are correlated with the elimination of toxins and were subjectively selected for, making detoxification an incidental benefit. Third, the “transfer hypothesis” takes that techniques are generally transmitted as interconnected bundles, and that techniques having gradually evolved for processing other foods were repurposed for cassava, making detoxification an exaptation.

## How Children Use Expectations About Ability When Judging Moral Responsibility

Junyu Li · Daniel Haun · Manuel Bohn

Children encounter others who differ in their abilities, particularly across age. When a harmful outcome occurs, judging whether someone deserves blame requires understanding both how likely a person is to perform the harmful action and how responsible they are for it. We examined how 5- and 7-year-old German children evaluate harmful acts when the agent’s age varies, and whether expectations about ability shape their responsibility judgments. Children heard two stories in which an agent caused harm either due to lack of inhibitory control or lack of physical strength. For each scenario, children rated (1) how likely individuals of different ages (small children, peers, teenagers, adults) would behave the same way, and (2) how much the agent should be blamed. Across both ages, children expected younger characters to be more likely to commit the

harmful act and older characters less likely, indicating that they do hold age-based ability beliefs. However, only 7-year-olds used these expectations to modulate blame: they blamed older agents more when the act was unexpected for someone their age, and blamed young children less. Five-year-olds, by contrast, showed little differentiation and blamed across ages more uniformly. These findings suggest that the link between factual beliefs about others' capacities and evaluative standards for blame emerges gradually in middle childhood. Younger children appear sensitive to differences in ability but do not yet consistently apply these differences when assigning moral responsibility.

## Evolution of cooperation in the division of labour on networks

**Md Sams Afif Nirjhor** · Fangyue Liu

In a division of labour (DOL), a large task is divided into smaller subtasks allocated to different experts. Such systems can have complex network structures, an arbitrary number of subtasks, and asymmetric interactions among expert subtask-holder groups. Cooperation among these experts is essential. Our studies are the first to examine the evolution of cooperation in DOL as a network of groups with asymmetric interactions. We discuss three studies forming a hierarchical generalization of network complexity. Subtask-holder groups are initially composed of cooperators or defectors, whose strategies evolve over time through payoff comparison within their groups, following replicator dynamics. In first two studies, a defector stops the process of DOL in a finite linear or general tree network. Cooperators pay a cost for improving a product and pass it downstream, while defectors neither pay nor pass, halting the process, causing loss for everyone. Two punishment systems are examined: punishment of detected defectors,

and punishment of a scapegoat during defection. Punishment of detected defectors works better in promoting the evolution of cooperation. In the final study, defectors do not stop the process on a general complex network with a single output. Defectors are punished. Everyone is rewarded with a bonus that depends on the number of cooperators, and it dictates whether the size of the DOL affects cooperation. In general, the evolution of cooperation is influenced by costs, not benefits. Punishment always promotes the evolution of cooperation, and co-existence of cooperators and defectors. Network structure influences dynamics only when defection halts DOL.

## **Cultural evolution of facial shapes of Buddha statues across Asia**

**Yuri Nishikawa** · Mayu Kamoshita · Yo Nakawake · Yuta Nakashima · Yutaka Fujioka · Hiromi Matsumae

Religious art reflects the cultural identity of human societies. Buddha statues originated around the 1st century in India and have been created in diverse regional styles across Asia. A previous study suggests that facial shapes of Buddha statues resemble those of local groups, suggesting that regional variation may have been formed by local biological and psychological factors. To explore drivers of cultural evolution of the Buddha statues, we focus on an integrated analysis including images of the Buddha faces, biological factors (genes and facial shapes), psychological factors, and other drivers of cultural evolution (geography and language). First, we performed morphometric analyses of approximately 200 Buddha faces with 189 landmarks from seven countries. PERMANOVA results showed that the facial shapes differed significantly across countries and historical periods, while the influence of material was limited. Before looking at the influence of genes, geography, and language on Buddha faces, we overviewed relationships

between Asian populations through MRM analysis of GeLaTo database. We found that the Himalayan barrier had the strongest influence on genetic differentiation in Asians, in consistent with a previous study. We will investigate the influence of the Himalayas on variation in Buddha faces. Additionally, we plan (1) collecting facial images of Asians, and (2) surveys to test a psychological effect that humans tend to trust faces similar to their ingroup also applies to Buddha statues. The facial diversity of Buddha statues could provide us powerful insight for understanding the cultural evolution of religion and art in Asia.

## **Mate-choice copying in *Drosophila* – A comparative approach**

**Sabine Noebel**

Mate-choice copying is a form of social learning, in which females learn to prefer males with the phenotype preferred by their conspecifics. It has been reported in many taxa from to humans, where it plays an important role in cultural evolution. However, its evolutionary roots are unknown. To identify the ecological context favoring the evolution of mate-choice copying, I test and compare a range of *Drosophila* species with varying ecologies and mating strategies. Some species can mate multiple times in a short period of time, while others usually mate only once in their lifetime, the latter strategy putting high selective pressure on female choosiness for their first and probably only mating. By using social information, females are can learn to prefer males of the locally preferred male phenotype, hence producing socially-sexu sons in that they are preferred by

local females of the next generation. In species, where females can mate with several males, costs of bad mating decision can be compensated by further matings, leading me to predict lower female choosiness and that females should rely more on individual learning than on social information. Here, I show preliminary results from *D. simulans*, *D. biarmipes*, which have a low remating frequency, and *D. hydei* which remates frequently. This ongoing comparative study will provide novel insights into the eco-evolutionary origins and adaptive importance of mate copying, but also into social learning in general, which is the most basic process underlying cultural evolution.

## **The social learning and development of intra- and inter-ethnic sharing norms in the Congo Basin**

**Francy Kiabiya Ntamboudila** · Luke Maurits · Adam Boyette · Kate Ellis-Davies

Human cooperation is unique in that we coordinate with non-kin from within and across our own communities. Such cooperation is maintained by social norms. While there is extensive research on the acquisition of in-group norms, far less is known regarding learning out-group norms, despite the fact inter-ethnic cooperation globally is widespread. Here, we investigate the development of intra- and inter-ethnic sharing norms among Congolese BaYaka hunter-gatherers and Bandongo fisher-farmers who regularly cooperate in their subsistence activities. We interviewed 66 adults and 119 children about how they share, how they learned to share, when they learned to share, whom they learned to share from, and what changes have occurred in sharing, both within and across ethnicity. We found that, despite economic specialization, BaYaka and Bandongo relationships are historically based on sharing and mutual help, regulated

through fictive kin. For both communities, intra- and inter-ethnic sharing is mostly learned from parents and peers during early childhood. While Bandongo learn mainly through instruction, BaYaka learn from observation and imitation, reflecting cross-cultural variation in social ecologies. Further, BaYaka and Bandongo acquire intra- and inter-ethnic sharing norms at similar timelines. With growing market integration, sharing became more transactional. This weakened fictive kin as well as changed the nature of conflicts and of their resolution. These results suggest that, when children are exposed to social contexts in which collaboration with out-groups is frequent, both intra- and inter-ethnic norms are learned simultaneously.

## **Reconstructing Space-Time Network of Lithic Assemblages during the Middle-to-Upper Paleolithic Transition in the Levant**

**Kenji Okubo** · Kohei Tamura

Network-based approaches provide powerful tools for understanding cultural diversity and transmission across space and time. As a case study, we focus on the Middle-to-Upper Paleolithic (MP–UP) transition in the Levant—a crucial region in the dispersal of *Homo sapiens* and a key contact zone with Neanderthals. During this period, the emergence of small blade and bladelet production has often been regarded as a major technological innovation associated with *Homo sapiens*. However, even within the Levant, stone tool technologies exhibit substantial regional variation, and such cultural traits are not always associated with *Homo sapiens*. These observations highlight the need for a quantitative reconstruction of technological change and cultural transmission processes, beyond simple replacement or classification. To address this issue, we applied network-based approaches to lithic type frequencies in combination with multiple archaeological

datasets—radiometric dates, stratigraphic sequences, artifact shape metrics, and geographic information. By quantifying similarities among cultural layers across sites, we estimated directional relationships, inferring possible pathways of cultural influence and technological transformation. This network-based framework enables a systematic reconstruction of relationships among lithic assemblages that cannot be derived from chronology or morphology alone. By combining statistical modeling with archaeological and environmental data, this study demonstrates how quantitative network analysis can contribute to a broader understanding of technological diversification and cultural dynamics during the MP–UP transition in the Levant.

### **“Peering” and Socially Biased Learning in tufted capuchin monkeys (*Sapajus* spp)**

**Eduardo Ottoni**

“Habitual” or “customary” forms of tool use by nonhuman primates, especially if they vary between populations, with no genetic or ecological explanations for such variation, tend to be considered behavioural traditions, dependent on socially biased learning - not always effectively demonstrated. Conceptual categories of social learning aim to be clearly defined and mutually exclusive, but behavioural repertoire changes tend to be complex events. Well-designed experiments may disentangle them, but real-life, naturalistically observed behavioural acquisition events potentially involve the combined – and hard to tell apart - effects of multiple learning mechanisms. Under such circumstances, a simple and observable behaviour, “peering”, as proposed by Schuppli & van Schaik (2019), may enhance the evidence of social learning in tufted capuchins. The “avid visual attention”

(Whiten 2019) exhibited by young capuchins towards proficient adult nutcrackers – supported by the extreme tolerance, by those tool users, to close observation, occasional tool handling and scrounging, is clearly a key component of percussive tool use learning, along with the “cultural niche construction” of lasting nutcracking sites. The use of probe tools (mostly employed to dislodge prey from hiding places), on the other hand, does not leave such lasting environmental changes, so social influences are restricted to direct observation. Measuring sex differences in “peering” helped to solve the previously unexplained sex bias in capuchin monkeys’ probe use, a behaviour almost exclusively performed by males.

### **Cultural group selection and the evolution of human cooperation: Exploring the implications of cumulative culture in an agent-based model**

**Lachlan von Pein**

Explaining how humans evolved the capacity for large-scale cooperation remains a key challenge within the evolutionary social sciences. While hypotheses relying solely on genetic group selection are typically considered untenable, the case is less clear once the potential for human cultural evolution enters the equation. For instance, aspects of ancestral populations which impede genetic group selection (i.e., large migration rates and group sizes) do not impede cultural group selection, and the cumulative, open-ended nature of cultural traits allows between-group variation to readily accumulate. From these observations, some have argued that cultural group selection was likely strong throughout ancestral history and, through culture-led gene-culture coevolution, played an essential role in the evolution of human cooperation. Using an agent-based model, we tested this possibility by investigating the capacity for group-level selection to

drive the evolution of cooperation in a population capable of cumulative culture. Agents in the model possess a genetic trait governing their propensity to cooperatively generate and maintain group-level cultural innovations. Possessing this trait causes agents to be less competitive within their groups, but having many cultural cooperators allows groups to be successful in between-group competition. Crucially, our model is the first to capture the cumulative aspect of human culture: groups continuously build on the cultural innovations developed by previous generations, meaning that group-level power asymmetries can rapidly develop within the model. Results will be discussed outlining how strong a selective force culture-led gene-culture coevolution was likely to have been in the context of human cooperation and between-group competition.

### **The cultural evolution of human goals: How individuals generate, select, and transmit goals**

**Jérémy Perez** · Gaia Molinaro · Pierre-Yves Oudeyer · Maxime Derex

Humans pursue goals that are remarkably diverse and vary over time and cultures. These goals shape which behaviors are explored, valued, and socially transmitted, yet most theories of cultural evolution focus on how behaviors evolve while leaving the origins of goals unexamined. We argue that a complete understanding of cultural evolution requires explaining how goals themselves emerge, vary, and persist across generations. Building on studies of motivation and curiosity in cognitive science and artificial intelligence, we introduce the notion of cultural autotelic agents – agents that combine individual and social learning to represent, generate, select, and transmit their own goals. This

view departs from historical conceptualizations of individuals as mere problem-solvers, and allows to ground the study of goal evolution in individual cognition. We discuss the implications of this perspective toward understanding the open-endedness of human culture, focusing in particular on the potential of curiosity-driven goal exploration for increasing opportunities for exaptation and recombination. We conclude by outlining methodological approaches for empirically studying the cultural evolution of human goals, taking inspiration from existing experimental paradigms in cognitive science and artificial intelligence. By highlighting the cognitive and motivational mechanisms that drive goal formation and selection, this framework extends existing models of cultural evolution and helps explain the open-ended character of human culture.

## **Mapping Cultural Transmission in Human and Non-Human Primates: A Comparative Framework**

**Chiara Pertile · Mathilde Lequin · Solange Rigaud**

Our understanding of ancestral hominin cognitive capacities and cultural transmission mechanisms is entirely reconstructed through inferential interpretation of archaeological evidence. An emergent and complementary approach lies in the comparative observation of technological and cultural behaviors in our closest living relatives, non-human primates. However, these two crucial lines of evidence, the hominin archaeological record and primatological data, remain fragmented, lacking a unified analytical framework for systematic comparison. This project, grounded in an epistemology of comparative and inferential reasoning, bridges this gap by extending the methodological framework of Colagè and d'Errico (2025) – which operationalizes cultural transmission along spatial, temporal, and social dimensions in the human lineage – to non-human primate behavior. This poster presents the initial development of a standardized comparative database that systematically integrates data from archaeology and contemporary primatological research. The expected contribution is twofold: (i) to generate a comparative map of transmission modes, identifying key invariances and discontinuities; and (ii) to provide an empirical foundation for explicit comparisons across the archaeological record of

human and non-human primates, with a specific focus on early hominin technologies such as the Oldowan. Constructing this baseline can provide the essential framework for testing how ecological pressures, social dynamics, and cognitive constraints interact to shape transmission mechanisms. Ultimately, this project seeks to identify the evolutionary thresholds marking the emergence of complex transmission strategies, refining our understanding of human cumulative culture's origins and establishing a shared framework for interdisciplinary research.

## Survival Analysis of Pronoun Use in Datooga Conversation

**Peter Racz**

Survival Analysis of Pronoun Use in Datooga Conversation Cultural evolution frequently borrows phylogenetic comparative methods from biology, yet other quantitative tools remain underutilised. Survival analysis, which models time-to-event data accounting for censoring, has seen use in modelling long-term shifts in vocabulary. It also offers particular promise for examining temporal dynamics in linguistic interaction. We applied discrete-time survival analysis to examine pronoun distribution patterns in Datooga, a Nilotic language of northern Tanzania. Like Spanish, Datooga has pronoun drop. Overt pronouns signal specific referential or discourse functions. We treated each speech act pronoun as a trigger event and measured elapsed time (in turns) until the next pronoun, testing whether pronouns prime subsequent pronoun use within and across speakers. We used eight conversations recorded in Datooga-speaking communities between May 2013 and April 2017. Conversations were 29-37 minutes, with 2,600-14,000 words.

The baseline probability of pronoun use was 3.5% per turn. Following a pronoun, the same speaker's probability of producing another in the immediate next turn rose to approximately 5%. This elevated probability decayed slowly: after 50 turns, it remained at roughly 4%, substantially above baseline. We found no evidence for cross-speaker effects. Our results show that survival analysis can expose dependencies in discourse behaviour that remain invisible to aggregate frequency measures. The slow decay suggests that pronoun use reflects not only immediate discourse context but also longer-term activation states within individuals. This approach generalises straightforwardly to other interactional phenomena where event timing is relevant, breaking new ground in examining cultural transmission through conversation.

## **A gene–culture co-evolutionary perspective on the puzzle of human twinship**

**Augusto Dalla Ragione** · Daniel Redhead

Natural selection should favour litter sizes that optimise trade-offs between brood-size and offspring viability. Across the primate order, the modal litter size is one, suggesting a deep history of selection favouring minimal litters in primates. Humans, however – despite having the longest juvenile period and slowest life-history of all primates – still produce twin births at appreciable rates, even though such births are costly. This presents an evolutionary puzzle. Why is twinning still expressed in humans despite its cost? More puzzling still is the discordance between the principal explanations for human

twinning and extant empirical data. Such explanations propose that twinning is regulated by phenotypic plasticity in polyovulation, permitting the production of larger sib sets if and when resources are abundant. However, comparative data suggest that twinning rates are actually highest in poorer economies and lowest in richer, more developed economies. We propose that a historical dynamic of gene–culture co-evolution might better explain this geographic patterning. Our explanation distinguishes geminophilous and geminophobic cultural contexts, as those celebrating twins (e.g. through material support) and those hostile to twins (e.g. through sanction of twin-infanticide). Geminophilous institutions, in particular, may buffer the fitness cost associated with twinning, potentially reducing selection pressures against polyovulation.

## **Stable reciprocity without cultural group selection**

### **Gilbert Roberts**

Human cooperation among non-kin has long been accepted as being based on reciprocity – the idea that we return help from individuals that we re-meet. However, this paradigm has recently been challenged by Efferson et al. who make the bold claim that repeated interaction is insufficient to support cooperation. The authors base their conclusion on a model in which cooperative partners use a novel function to determine their response. In their system, cooperation through repeated interaction breaks down unless there is a second process such as between-group competition. It has then been suggested that the reason humans differ from other animals in cooperating with non-

kin is that cultural group selection stabilizes reciprocity. However, I point out here that the collapse of cooperation in Efferson et al.'s models is not the result of their novel strategy set. Rather, it is a standard modelling result in which a cooperative environment allows drift towards unstable, indiscriminating strategies. Efferson et al.'s simulations are unusual in not allowing mutation from always cooperating to always defecting. As I show here, allowing full defectors into a cooperative environment provides selection for discriminating strategies which resist invasion by strategies that exploit indiscriminating cooperation. In consequence, cooperation is stabilized. Whether or not cultural group selection has played a role in the evolution of human sociality, it is clear that repeated interaction is sufficient to support cooperation.

## **The 'other' Pan ape in cultural evolution: why bonobos are a key (yet overlooked) comparative model**

**Lou Savigny**

Cumulative cultural evolution is widely seen as a pivotal process in human evolutionary success. Chimpanzees (*Pan troglodytes*) are a prevalent model species for exploring the evolutionary origins of human culture, yet bonobos (*Pan paniscus*), despite being equally close relatives of humans, remain largely absent from this discourse. We argue that bonobos are in fact an ideal comparative model for studying cultural evolution. First, their tolerant social structure, strong social attention, and sophisticated socio-cognitive skills create conditions that could foster innovation, transmission, and potentially cumulative culture. The ways bonobos diverge from chimpanzees make them essential for understanding how such variation shapes cultural processes across Pan. Second, bonobos form a necessary phylogenetic benchmark, alongside chimpanzees, to recalibrate our inferences about ancestral capacities and retrace the evolutionary onset of human cultural capacities. Third, moving beyond the traditional phylogenetic

reasoning, we highlight the importance of group-specific socio-ecological and demographic parameters in nurturing cultural capacities. Building on Heyes' 'cognitive gadgets' framework, we consider the possibility that the mechanisms supporting cultural learning may themselves be socially constructed during ontogeny, not only in humans but also in our close living relatives. Integrating this perspective with recent evidence that chimpanzee and bonobo groups vary widely and overlap in certain social patterns, we position bonobos as essential for identifying a continuum of cultural expression within Pan. A focused research programme on bonobo culture is urgently needed before the species' decline closes a unique window onto the evolution of the human cultural phenomenon.

## **An evolutionary perspective in archaeology**

### **Vivian Scheinsohn**

The evolution of artifacts is an ever-expanding field that should be approached interdisciplinarily and from a relational perspective. One of the disciplines that should be involved in its study is archaeology. At its core, archaeology is based on the special bond humans have with things (Scheinsohn 2020). Since we are not the only animal species that uses and creates objects, we are the one that has taken this relationship to such a level that it has warranted a concept like culture. In this presentation, I will discuss the essential concepts that an evolutionary perspective in archaeology will require, drawing on anthropology, archaeology, and cultural evolution in general. I will begin with the origins

of culture in animals (Lestelle 2001) and then examine biology and culture as complex systems (Kauffman 1995). Both biology and culture are selective systems (Ziman 2000) that start with a large population with a superabundance of variants and have mechanisms for both variant production and the retention, transmission, and replication of specific variants (Campbell). However, culture also has its own mechanisms, such as combinatorial evolution (Arthur 1990, 2009), predominant in the cultural sphere. Another key concept is that of lock-in (Arthur 2009), which happens when a solution becomes more common and, thus, more likely to be embraced and enhanced by others. Finally, I will discuss the importance of exaptation in cultural evolution, which has been underappreciated due to the high visibility of design-based technological innovation.

## **Towards Cultural Evidence**

### **Gérard Sensevy**

In this paper, we present a specific conception of culture. We then use this to derive implications for a theory of evidence. First, we describe culture as a complex of 'arts of doing'. By 'arts of doing', we mean the way in which people act in a skilled manner (Coleman, 1998), whether in their profession (e.g. woodworker, choreographer, or surgeon) or in their daily activities (e.g. the art of walking or raising children). It is a conception of culture as a craft accomplished by practical connoisseurs. The second part briefly explains how different genres of evidence can be conceived, including statistical evidence and, in connection with the first part, cultural evidence. Then we focus on this notion of cultural evidence. Drawing on concrete examples that we consider to be possible

exemplars (Kuhn, 1974), we describe two species of evidence: 'common evidence', and 'evidence from practical connoisseurs'. The fourth part studies two empirical examples of cultural evidence from educational research (Sensevy & Le Hénaff, 2025). In the conclusion, we demonstrate how the category of cultural evidence can contribute to the development of new sciences of culture (Lassègue, 2020). Coleman, R. (1988). *The art of work : An epitaph to skill*. Pluto Press. Kuhn, T. (1979). *The Essential Tension*. University of Chicago Press. Lassègue, J. (2020). *Cassirer's transformation : From a transcendental to a semiotic philosophy of forms*. Springer. Sensevy, G., & Le Hénaff, C. (2025). A cultural turn in educational action and research. *Journal of Curriculum Studies*, 1-25. <https://doi.org/10.1080/00220272.2025.2476953>

## Online posting behavior as a social reinforcement learning process

**Oromia G. Sero**

People's posting choices on social media shape not only what others see, but also the cultural evolutionary dynamics that determine which ideas, beliefs, and behaviours spread online. While prior research has examined what content tends to be shared, far less is known about how individuals learn what to post over time through reward signals (e.g., likes) and social influence. We modelled posting behaviour as a reward-based social learning process using the Social Feature Learning (SFL) model. SFL describes how individuals weigh social and non-social features of their environment to maximise rewards, providing a mechanistic account of social learning. Although SFL has previously been evaluated in controlled experiments, here we test whether it also explains naturalistic behaviour. We analysed 3.3 million posts from 978 Bluesky users. Each post was represented as a probability distribution over 100 topics derived using transformer-based topic modelling. To capture social learning, we extracted multiple

features from each user's feed, including average popularity, user popularity and topic engagement. We compared an asocial reinforcement learning model with the SFL model. Across users, the SFL model provided a superior account of posting decisions (mean BIC weight = 0.83), indicating that people adjust their posting choices not only based on their own content preferences but also by learning from multiple sources of social information. These findings show that social learning plays a central role in how individuals learn what to post online and that SFL offers a powerful framework for modelling human behaviour in real-world online environments.

## Why You Should Believe in Free Will

### Theodore Seto

In science, there is no place for choice, autonomy, or free will. And yet most of us believe in free will, or at least act as if we do. Why? I am developing a theory of ethics, metaethics, and epistemology founded in cultural evolutionary theory. This paper outlines the portions of my theory most immediately relevant to the question I have just posed and provides a tentative answer. A genetic capacity for normativity is adaptive because it facilitates the evolution of nonobviously adaptive learned behaviors by enabling their transmission without requiring that anyone understand their adaptivity. Goodness is the

optimal solution to a variation of the repeat prisoner's dilemma. We are motivated to be good because doing so is nonobviously adaptive. The most important feature of truth is that we should believe it. This means that truth can be defined as that which it is adaptive to believe. Predictive truth consists of world of everyday perceptions as modified by scientific theory. Non-predictive truth consists of all other adaptive beliefs. The concepts of choice, autonomy, and free will are not consistent with science and are therefore not predictively true. We nevertheless should and do believe in free will because doing so is adaptive. Internally, a belief in our own agency leads us to undertake adaptive behaviors that fatalistic determinism might not trigger. Externally, a belief in individual responsibility allows us to hold ourselves and others accountable, which may be necessary to allow goodness to dominate the population of behaviors.

## **From Ecological Pressures to Literary Themes: Modeling Psychological Adaptation in Historical French Fiction (1500–1999) Using Large Language Models**

**Estebe Sylvain**

Cultural products serve as a fossil record of human psychology, potentially reflecting how societies adapt to changing ecological and economic environments. This study

investigates the evolution of psychological traits and sociocultural themes in French fiction over five centuries (1500–1999 CE). We used a comprehensive corpus of novels from Gallica, HathiTrust, and Google Books. To analyze this vast archive, we use a computational pipeline utilizing a Large Language Model to annotate texts across ten distinct thematic domains. We hypothesize a divergent trajectory: themes predicted to align with affluent environments (e.g., Romantic Love, Child Development, Imagination) are expected to increase in frequency alongside economic growth (GNP), whereas themes associated with resource-scarce environments (e.g., Honor, Discipline, Intensive Kinship) are expected to decline. By combining computational humanities with behavioral ecology, this research contributes to the study of quantifying cultural change and examining the ecological drivers of psychological adaptation

## **Evolutionary and Developmental Aspects of Cultural Evolution: The Example of Science**

### **Burton Voorhees**

This presentation contrasts evolutionary and developmental processes of cultural change, using science as an example. Much of the research on cultural change has focused on evolutionary models, often using methods adapted from population biology. Less attention has been given to development. Evolutionary models of cultural change and transmission offer many insights, but cultural change differs in significant ways from the evolution of biological species. When it comes to development, this distinction is pronounced. Evolutionary processes are driven by environmental contingencies, are open ended, and will be progressive or regressive, depending on these contingencies.

Developmental sequences are finite, pre-determined, and progressive. In biological organisms, development is the sequential playing out of a genetic program. Barring accident this leads to a mature reproductive adult. In social and cultural evolution there is no genetic code guiding development. Rather, social institutions are teleological and the goals they serves set fundamental constraints on, and patterns for their development. In the development of science each stage is characterized by different assumptions about what constitutes science, how it is to function as a knowledge generating enterprise, and the sort of knowledge that is produced. In this regard, study of the history of science indicates that science today is in a crisis of transition into its final mature stage. This is not the “end of science,” rather with entry into this final stage science will become mature as an epistemic instrument.

## **Designing and validating a novel measure of innovation in adults**

**Robin Watson** · Bruce Rawlings

Innovation, defined as the exploration of novel solutions, is a key driver of human cultural evolution and the success of human societies. However, as previous research has almost exclusively focused on young children, we know very little about the predictors of innovation in adults. Partly, this is due to a lack of established methods for measuring innovation, particularly in adults. This project (funded by the British Academy) will address these two important gaps by developing and validating a novel simplified measure of innovation that can be easily administered online and exploring several predictors of innovation in adults. This talk will describe the progress made in designing the measure thus far, including any pilot data, and invites discussions and feedback around the proposed measure.

## **Investigating the cognitive processes and educational experiences supporting tool innovation development**

**Charlotte Wilks** · Sarah Wright · Bruce Rawlings

Innovation is a vital component of cumulative culture. Tool innovation— designing new tools and using old tools in novel ways to solve problems— allows the repeated generation of new, complex technologies and is critical to cumulative technological progress. Despite its importance, we know little about the development of tool innovation: children, across diverse populations, are poor at solving tool innovation problems until mid-late childhood. Involvement of a suite of cognitive processes (including creativity, planning, causal/spatial reasoning, and executive functions)— the developmental trajectory of which coincides with that of tool innovation— has been proposed. Educational access and experiences markedly impact these cognitive processes thus may also affect tool innovation development. We will collect data from eight urban populations, with diverse cultural and educational profiles, using a battery of cognitive tasks to determine whether individual differences in cognitive processes explain the developmental trajectory of 5-11-year-old children's innovation task performance. Moreover, we will examine the impact of variation in participation in formal education, and markers of school quality, on the development of tool innovation and cognitive processes across cultures. This project is underway, and we aim to collect data from 150 children per site (N=1200). Our piloted test battery includes cognitive tasks that are simple to administer and score, validated for our age range, and used cross-culturally. We predict that across populations, individual differences in performance on cognitive measures will correlate with age-related improvements on tool innovation tasks and that better-quality education will positively correlate with tool innovation and cognitive performance.



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