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References

Aktuell

Banakou 2014

Domna Banakou & Mel Slater, *Body ownership causes illusory self-attribution of speaking and influences subsequent real speaking*. PNAS **111** (2014), 17678–17683.

pnas111-17678-Supplement.mp4

When we carry out an act, we typically attribute the action to ourselves, the sense of agency. Explanations for agency include conscious prior intention to act, followed by observation of the sensory consequences; brain activity that involves the feed-forward prediction of the consequences combined with rapid inverse motor prediction to fine-tune the action in real time; priming where there is, e.g., a prior command to perform the act; a cause (the intention to act) preceding the effect (the results of the action); and commonsense rules of attribution of physical causality satisfied. We describe an experiment where participants falsely attributed an act to themselves under conditions that apparently cannot be explained by these theories. A life-sized virtual body (VB) seen from the first-person perspective in 3D stereo, as if substituting the real body, was used to induce the illusion of ownership over the VB. Half of the 44 experimental participants experienced VB movements that were synchronous with their own movements (sync), and the other half asynchronous (async). The VB, seen in a mirror, spoke with corresponding lip movements, and for half of the participants this was accompanied by synchronous vibrotactile stimulation on the thyroid cartilage (Von) but this was not so for the other half. Participants experiencing sync misattributed the speaking to themselves and also shifted the fundamental frequency of their later utterances toward the stimulus voice. Von also contributed to these results. We show that these findings can be explained by current theories of agency, provided that the critical role of ownership over the VB is taken into account.

agency | body-ownership illusion | rubber-hand illusion | illusory speaking | vibrotactile stimulation

Inman 2014

Mason Inman, *The Fracking Fallacy*. nature **516** (2014), 28–30.

The United States is banking on decades of abundant natural gas to power its economic resurgence. That may be wishful thinking.

If natural-gas prices were to follow the scenario that the EIA used in its 2014 annual report, the Texas team forecasts that production from the big four plays would peak in 2020, and decline from then on. By 2030, these plays would be producing only about half as much as in the EIA's reference case. [...] Resolution matters because each play has sweet spots that yield a lot of gas, and large areas where wells are less productive. Companies try to target the sweet spots first, so wells drilled in the future may be less productive than current ones. The EIA's model so far has assumed that future wells will be at least as productive as past wells in the same county. But this approach, Patzek argues, "leads to results that are way too optimistic".

Mukherjee 2014

Ranjan Mukherjee, *The winding road*. science **346** (2014), 1026.

On a bright July day more than 3 decades ago, I turned up at the physics department of the University of Delaware (UD), Newark, hoping to meet my new research adviser. I was met instead with quizzical looks: The professor had died some months before I arrived. No one had told me.

I had come a long way. After finishing a master's degree in physics at the University of Calcutta, I had become interested in biophysics. I had decided to pursue a Ph.D. studying the physical properties of nucleic acids and had won admission to UD, with a teaching assistantship. I packed my bags, got my passport and tickets, and said farewell to family and friends. Half a world from home, I was left scratching my head, contemplating my next step. What would I do? I had student visa requirements and little money. I taught physics labs that summer as I pondered my future.

Navrotsky 2014

Alexandra Navrotsky, *Taking the measure of molten uranium oxide*. science **346** (2014), 916–917.

Levitated droplets of uranium oxide reveal a complex structure below and above the melting point.

Skinner et al. have shown that the UO2 liquid contains a variety of loosely connected polyhedra. It is reasonable to speculate that the liquid could readily incorporate other components. In the initial stages of an accident such as the Chernobyl event, in which rapid heating leads to fuel rod melting, the molten UO2 could rapidly incorporate polyhedra containing other tetravalent cations, for example, Zr4+ from oxidation of the cladding. Probably both excess oxygen and excess metal could be accommodated, because the parent molten UO2 structure is disordered and dynamic. Structural and simulation studies of such substitutions would be of great interest.

Wang 2014

Ping Wang, Dirk Scherler, Jing Liu-Zeng, Jürgen Mey, Jean-Philippe Avouac, Yunda Zhang & Dingguo Shi, *Tectonic control of Yarlung Tsangpo Gorge revealed by a buried canyon in Southern Tibet*. science **346** (2014), 978–981.

s346-0978-Supplement.pdf

The Himalayan mountains are dissected by some of the deepest and most impressive gorges on Earth. Constraining the interplay between river incision and rock uplift is important for understanding tectonic deformation in this region.We report here the discovery of a deeply incised canyon of the Yarlung Tsangpo River, at the eastern end of the Himalaya, which is now buried under more than 500 meters of sediments. By reconstructing the former valley bottom and dating sediments at the base of the valley fill, we show that steepening of the Tsangpo Gorge started at about 2 million to 2.5 million years ago as a consequence of an increase in rock uplift rates. The high erosion rates within the gorge are therefore a direct consequence of rapid rock uplift.

Whipple 2014

Kelin X. Whipple, *Can erosion drive tectonics?* science **346** (2014), 918–919.

Data from the eastern Himalaya challenge the idea that climate-driven erosion can control tectonics.

Surface processes however, have likely influenced the evolution of the Namche Barwa massif, and the Himalaya in general, regardless of the debate over erosional

triggering of uplift. Simple physics dictates that rock uplift rates of 5 to 10 km per million years could not be sustained over millions of years as observed without vigorous erosional removal; vertical movement of rock would otherwise slow and the zone of deformation would broaden in response to the increasing work against gravity involved in uplifting the massif. Thus, even if erosion did not trigger the increase in uplift 2.5 million years ago, erosion was critical for sustaining the extreme rate of uplift to the present.

Anthropologie

Pegado 2014

Felipe Pegado et al., *Timing the impact of literacy on visual processing*. PNAS **111** (2014), E5233–E5242.

Felipe Pegado, Enio Comerlato, Fabricio Ventura, Antoinette Jobert, Kimihiro Nakamura, Marco Buiatti, Paulo Ventura, Ghislaine Dehaene-Lambertz, Régine Kolinsky, José Morais, Lucia W. Braga, Laurent Cohen & Stanislas Dehaene

Learning to read requires the acquisition of an efficient visual procedure for quickly recognizing fine print. Thus, reading practice could induce a perceptual learning effect in early vision. Using functional magnetic resonance imaging (fMRI) in literate and illiterate adults, we previously demonstrated an impact of reading acquisition on both high- and low-level occipitotemporal visual areas, but could not resolve the time course of these effects. To clarify whether literacy affects early vs. late stages of visual processing, we measured event-related potentials to various categories of visual stimuli in healthy adults with variable levels of literacy, including completely illiterate subjects, early-schooled literate subjects, and subjects who learned to read in adulthood (ex-illiterates). The stimuli included written letter strings forming pseudowords, on which literacy is expected to have a major impact, as well as faces, houses, tools, checkerboards, and false fonts. To evaluate the precision with which these stimuli were encoded, we studied repetition effects by presenting the stimuli in pairs composed of repeated, mirrored, or unrelated pictures from the same category. The results indicate that reading ability is correlated with a broad enhancement of early visual processing, including increased repetition suppression, suggesting better exemplar discrimination, and increased mirror discrimination, as early as ≈100–150 ms in the left occipitotemporal region. These effects were found with letter strings and false fonts, but also were partially generalized to other visual categories. Thus, learning to read affects the magnitude, precision, and invariance of early visual processing.

reading | brain plasticity | education

Klima

Freeman 2014

Katherine H. Freeman, *Controls on isotopic gradients in rain*. nature **516** (2014), 41–42.

Concentrations of heavy isotopes of hydrogen and oxygen decrease in rain as storms cross land. A model examines the transport of water vapour that causes this effect, and provides insight into past and present climates.

Transpiration—the evaporation of plant water—occurs through leaf stomata, which act like the tips of small capillaries. The narrow plumbing in leaves prevents backmixing of evaporated water, and so the water vapour that exits from plants has the same isotopic composition as water taken up by their roots.

Winnick 2014

Matthew J. Winnick, C. Page Chamberlain, Jeremy K. Caves & Jeffrey M. Welker, *Quantifying the isotopic 'continental effect'*. Earth and Planetary Science Letters **406** (2014), 123–133.

Since the establishment of the IAEA-WMO precipitation-monitoring network in 1961, it has been observed that isotope ratios in precipitation (d2H and d18O) generally decrease from coastal to inland locations, an observation described as the 'continental effect.' While discussed frequently in the literature, there have been few attempts to quantify the variables controlling this effect despite the fact that isotopic gradients over continents can vary by orders of magnitude. In a number of studies, traditional Rayleigh fractionation has proven inadequate in describing the global variability of isotopic gradients due to its simplified treatment of moisture transport and its lack of moisture recycling processes. In this study, we use a one-dimensional idealized model of water vapor transport along a storm track to investigate the dominant variables controlling isotopic gradients in precipitation across terrestrial environments. We find that the sensitivity of these gradients to progressive rainout is controlled by a combination of the amount of evapotranspiration and the ratio of transport by advection to transport by eddy diffusion, with these variables becoming increasingly important with decreasing length scales of specific humidity. A comparison of modeled gradients with global precipitation isotope data indicates that these variables can account for the majority of variability in observed isotopic gradients between coastal and inland locations. Furthermore, the dependence of the 'continental effect' on moisture recycling allows for the quantification of evapotranspiration fluxes from measured isotopic gradients, with implications for both paleoclimate reconstructions and large-scale monitoring efforts in the context of global warming and a changing hydrologic cycle.

Keywords: water stable isotopes | continental effect | evapotranspiration | altitude effect | paleoclimate

Kultur

Cohn 2014

Alain Cohn, Ernst Fehr & Michel André Maréchal, *Business culture and dishonesty in the banking industry*. nature **516** (2014), 86–89.

n516-0086-Supplement.pdf

Trust in others' honesty is a key component of the long-term performance of firms, industries, and evenwhole countries. However, in recent years, numerous scandals involving fraud have undermined confidence in the financial industry. Contemporary commentators have attributed these scandals to the financial sector's business culture, but no scientific evidence supports this claim. Here we show that employees of a large, international bank behave, on average, honestly in a control condition. However, when their professional identity as bank employees is rendered salient, a significant proportion of them become dishonest. This effect is specific to bank employees because control experiments with employees from other industries and with students showthat they do not become more dishonest when their professional identity or bank-related items are rendered salient. Our results thus suggest that the prevailing business culture in the banking industry weakens and undermines the honesty norm, implying that measures to re-establish an honest culture are very important.

Opie 2014

Christopher Opie, Susanne Shultz, Quentin D. Atkinson, Thomas Currie & Ruth Mace, *Phylogenetic reconstruction of Bantu kinship challenges Main Sequence Theory of human social evolution*. PNAS **111** (2014), 17414–17419.

Kinship provides the fundamental structure of human society: descent determines the inheritance pattern between generations, whereas residence rules govern the location a couple moves to after they marry. In turn, descent and residence patterns determine other key relationships such as alliance, trade, and marriage partners. Hunter-gatherer kinship patterns are viewed as flexible, whereas agricultural societies are thought to have developed much more stable kinship patterns as they expanded during the Holocene. Among the Bantu farmers of sub-Saharan Africa, the ancestral kinship patterns present at the beginning of the expansion are hotly contested, with some arguing for matrilineal and matrilocal patterns, whereas others maintain that any kind of lineality or sex-biased dispersal only emerged much later. Here, we use Bayesian phylogenetic methods to uncover the history of Bantu kinship patterns and trace the interplay between descent and residence systems. The results suggest a number of switches in both descent and residence patterns as Bantu farming spread, but that the first Bantu populations were patrilocal with patrilineal descent. Across the phylogeny, a change in descent triggered a switch away from patrifocal kinship, whereas a change in residence triggered a switch back from matrifocal kinship. These results challenge "Main Sequence Theory," which maintains that changes in residence rules precede change in other social structures. We also indicate the trajectory of kinship change, shedding new light on how this fundamental structure of society developed as farming spread across the globe during the Neolithic.

kinship | Bantu | phylogenetics | Bayesian | Neolithic

Villeval 2014

Marie Claire Villeval, *Professional identity can increase dishonesty*. nature **516** (2014), 48–49.

An experiment shows that although bank employees behave honestly on average, their dishonesty increases when they make decisions after having been primed to think about their professional identity.

Mathematik

Stewart 2014

Alexander J. Stewart & Joshua B. Plotkin, *Collapse of cooperation in evolving games*. PNAS **111** (2014), 17558–17563.

Game theory provides a quantitative framework for analyzing the behavior of rational agents. The Iterated Prisoner's Dilemma in particular has become a standard model for studying cooperation and cheating, with cooperation often emerging as a robust outcome in evolving populations. Here we extend evolutionary game theory by allowing players' payoffs as well as their strategies to evolve in response to selection on heritable mutations. In nature, many organisms engage in mutually beneficial interactions and individuals may seek to change the ratio of risk to reward for cooperation by altering the resources they commit to cooperative interactions. To study this, we construct a general framework for the coevolution of strategies and payoffs in arbitrary iterated games. We show that, when there is a tradeoff between the benefits and costs of cooperation, coevolution often leads

to a dramatic loss of cooperation in the Iterated Prisoner's Dilemma. The collapse of cooperation is so extreme that the average payoff in a population can decline even as the potential reward for mutual cooperation increases. Depending upon the form of tradeoffs, evolution may even move away from the Iterated Prisoner's Dilemma game altogether. Our work offers a new perspective on the Prisoner's Dilemma and its predictions for cooperation in natural populations; and it provides a general framework to understand the coevolution of strategies and payoffs in iterated interactions.

cooperation | game theory | evolution | Prisoner's Dilemma | iterated games

Ostasien

Xiang 2014

Hai Xiang et al., *Early Holocene chicken domestication in northern China*. PNAS **111** (2014), 17564–17569.

pnas111-17564-Supplement.zip

Hai Xiang, Jianqiang Gao, Baoquan Yu, Hui Zhou, Dawei Cai, Youwen Zhang, Xiaoyong Chen, Xi Wang, Michael Hofreiter & Xingbo Zhao

Chickens represent by far the most important poultry species, yet the number, locations, and timings of their domestication have remained controversial for more than a century. Here we report ancient mitochondrial DNA sequences from the earliest archaeological chicken bones from China, dating back to ≈10,000 B.P. The results clearly show that all investigated bones, including the oldest from the Nanzhuangtou site, are derived from the genus Gallus, rather than any other related genus, such as Phasianus. Our analyses also suggest that northern China represents one region of the earliest chicken domestication, possibly dating as early as 10,000 y B.P. Similar to the evidence from pig domestication, our results suggest that these early domesticated chickens contributed to the gene pool of modern chicken populations. Moreover, our results support the idea that multiple members of the genus Gallus, specifically Gallus gallus and Gallus sonneratii contributed to the gene pool of the modern domestic chicken. Our results provide further support for the growing evidence of an early mixed agricultural complex in northern China.

ancient DNA | chicken | domestication | species origin