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References

Afrika

Grollemund 2015

Rebecca Grollemund, Simon Branford, Koen Bostoen, Andrew Meade, Chris Venditti & Mark Pagel, *Bantu expansion shows that habitat alters the route and pace of human dispersals.* PNAS **112** (2015), 13296–13301.

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Unlike most other biological species, humans can use cultural innovations to occupy a range of environments, raising the intriguing question of whether human migrations move relatively independently of habitat or show preferences for familiar ones. The Bantu expansion that swept out of West Central Africa beginning ≈5,000 y ago is one of the most influential cultural events of its kind, eventually spreading over a vast geographical area a new way of life in which farming played an increasingly important role. We use a new dated phylogeny of ≈400 Bantu languages to show that migrating Bantu-speaking populations did not expand from their ancestral homeland in a "random walk" but, rather, followed emerging savannah corridors, with rainforest habitats repeatedly imposing temporal barriers to movement. When populations did move from savannah into rainforest, rates of migration were slowed, delaying the occupation of the rainforest by on average 300 y, comparedwith similar migratorymovements exclusivelywithin savannah or within rainforest by established rainforest populations. Despite unmatched abilities to produce innovations culturally, unfamiliar habitats significantly alter the route and pace of human dispersals.

Keywords: human dispersal | phylogeography | phylogenetics | languages | Bantu

Significance: Humans are uniquely capable of using cultural innovations to occupy a range of environments, raising the intriguing question of whether historical human migrations have followed familiar habitats or moved relatively independently of them. Beginning ≈5,000 y ago, savannah-dwelling populations of Bantu-speaking peoples swept out of West Central Africa, eventually occupying a vast geographical area. We show that this expansion avoided unfamiliar rainforest habitats by following savannah corridors that emerged from the Congo rainforest, probably from climate change. When Bantu speakers did move into the rainforest, migration rates were delayed by on average 300 y compared with similar movements on the savannah. Despite unmatched abilities to produce innovations culturally, unfamiliar habitats significantly alter the route and pace of human dispersals.

Aktuell

Bacon 2015

Christine D. Bacon, Daniele Silvestro, Carlos Jaramillo, Brian Tilston Smith, Prosanta Chakrabarty & Alexandre Antonelli, *Early and progressive migration across the Isthmus of Panama is robust to missing data and biases*, *Reply to Lessios and Marko et al.* PNAS **112** (2015), E5767–E5768.

Handley 2015

Ian M. Handley, Elizabeth R. Brown, Corinne A. Moss-Racusin & Jessi L. Smith, *Quality of evidence revealing subtle gender biases in science is in the eye of the beholder*. PNAS **112** (2015), 13201–13206.

Scientists are trained to evaluate and interpret evidence without bias or subjectivity. Thus, growing evidence revealing a gender bias against women—or favoring men—within science, technology, engineering, and mathematics (STEM) settings is provocative and raises questions about the extent to which gender bias may contribute to women's underrepresentation within STEM fields. To the extent that research illustrating gender bias in STEM is viewed as convincing, the culture of science can begin to address the bias. However, are men and women equally receptive to this type of experimental evidence? This question was tested with three randomized, double-blind experiments—two involving samples from the general public (n = 205 and 303, respectively) and one involving a sample of university STEM and non-STEM faculty (n = 205). In all experiments, participants read an actual journal abstract reporting gender bias in a STEM context (or an altered abstract reporting no gender bias in experiment 3) and evaluated the overall quality of the research. Results across experiments showed that men evaluate the gender-bias research less favorably than women, and, of concern, this gender difference was especially prominent among STEM faculty (experiment 2). These results suggest a relative reluctance among men, especially faculty men within STEM, to accept evidence of gender biases in STEM. This finding is problematic because broadening the participation of underrepresented people in STEM, including women, necessarily requires a widespread willingness (particularly by those in the majority) to acknowledge that bias exists before transformation is possible.

Keywords: gender bias | science workforce | diversity | science education | sexism

Significance: Ever-growing empirical evidence documents a gender bias against women and their research—and favoring men—in science, technology, engineering, and mathematics (STEM) fields. Our research examined how receptive the scientific and public communities are to experimental evidence demonstrating this gender bias, which may contribute to women's underrepresentation within STEM. Results from our three experiments, using general-public and university faculty samples, demonstrated that men evaluate the quality of research unveiling this bias as less meritorious than do women. These findings may inform and fuel self-correction efforts within STEM to reduce gender bias, bolster objectivity and diversity in STEM workforces, and enhance discovery, education, and achievement.

Higuera 2015

Philip E. Higuera, *Taking time to consider the causes and consequences of large wildfires*. PNAS **112** (2015), 13137–13138.

Wildfires in these forests typically occur every one to several centuries at a given point on a landscape, making them literally a once-in-a-lifetime experience when witnessed by humans. The extreme fire behavior and extensive tree mortality associated with these events makes them genuinely dramatic. When combined with their immediate and often negative impacts on human health and livelihood, it's easy to view any single wildfire as a disaster or harbinger of change. [...] However, as research following the 1988 fires in Yellowstone National Park has shown, when viewed over decades, centuries, and millennia, events that appear devastating in the moment are "business as usual" for many subalpine forest ecosystems.

The work by Calder et al. (4) thus provides further paleoecological evidence that hints at intriguing feedbacks among climate, fire, and vegetation that could limit fire activity under climatic warming. The potential for such stabilizing feedbacks to limit fire activity under a warming climate is critical to understand in more

detail, because it is increasingly clear that for much of the globe, 21st century climate will be highly conducive to burning.

Lessios 2015

Harilaos A. Lessios, *Appearance of an early closure of the Isthmus of Panama is the product of biased inclusion of data in the metaanalysis.* PNAS **112** (2015), E5765.

Unfortunately, Bacon et al.'s (1) metaanalysis of separations of marine organisms contains unexplained omissions of data and mistakes. Nine of the fossil calibrated divergence values are wrong, and three are omitted (though present in publications used to derive other dates).

The omission of 50 comparisons has caused a definite skew in the distributions of marine separations toward older dates, because 34 of the missing data points produce estimated dates younger than 7 Ma when the 2 % per million year calibration is applied.

Marko 2015

Peter B. Marko, Ron I. Eytan & Nancy Knowlton, *Do large molecular sequence divergences imply an early closure of the Isthmus of Panama?* PNAS **112** (2015), E5766.

The critical assumption used by Bacon et al., that the temporal distribution of divergence times across the Isthmus reflects the tempo of speciation driven by the Isthmus, is naive to the fact that as many as 70 % of Caribbean taxa were lost to extinction after seaway closure (ref. 2 and references therein). The loss of one member of a geminate pair will cause the erroneous assignment of the next most closely related species as a sister-species, but with an older molecular divergence.

Robinson 2015

Andrew Robinson, *Cracking the Indus script.* nature **526** (2015), 499–501.

Andrew Robinson reflects on the most tantalizing of all the undeciphered scripts — that used in the civilization of the Indus valley in the third millennium BC.

Sina 2015

Naser Sina, Sayyad Nasiri & Vahid Karkhaneh, *Effects of resistive loads and tire inflation pressure on tire power losses and CO_2 emissions in real-world conditions.* Applied Energy **157** (2015), 974–983.

Considerable portion of energy losses in a vehicle traced to tire. Energy losses in a tire are due to tire longitudinal slip as well as rolling resistance. Hence, both of aforementioned factors must take into the consideration to study the tire energy loss. Present paper aims to investigate the power losses in tires and to examine influence of road conditions and tire inflation pressure on them. To cover the real-world conditions, experiments were done on a gasoline-fueled passenger vehicle on an urban highway along two routes with same length and opposite gradients to comprise the change of road conditions. Then, by use of engine performance model which is prepared in dynamometer laboratory, the power losses in drive and driven wheels are conducted separately. According to the results, either in driven wheels or when cruising in negative gradient, the power loss due to rolling resistance is primary and as a result the tire power losses would be decreased as inflation pressure increases. But when the tractive force is significant, for instance in positive gradient, the role of slip power loss becomes substantial in drive wheels so that the sum of rolling resistance and tire slip losses must be evaluated. Results

show that in positive gradient, the least tire power losses in drive wheels would be obtained when the tire is under inflated. In addition, CO2 emissions during the tests obtained and it is seen that a reduction in tire power losses leads to decrease of CO2 emissions.

Keywords: Tire power loss | Tire longitudinal slip | Rolling resistance | CO2 emissions | Tire inflation pressure

Klima

Calder 2015

W. John Calder, Dusty Parker, Cody J. Stopka, Gonzalo Jiménez-Moreno & Bryan N. Shuman, *Medieval warming initiated exceptionally large wildfire outbreaks in the Rocky Mountains*. PNAS **112** (2015), 13261–13266.

Many of the largestwildfires in US history burned in recent decades, and climate change explains much of the increase in area burned. The frequency of extreme wildfire weather will increase with continued warming, but many uncertainties still exist about future fire regimes, including how the risk of large fires will persist as vegetation changes. Past fire-climate relationships provide an opportunity to constrain the related uncertainties, and reveal widespread burning across large regions of western North America during past warm intervals. Whether such episodes also burned large portions of individual landscapes has been difficult to determine, however, because uncertainties with the ages of past fires and limited spatial resolution often prohibit specific estimates of past area burned. Accounting for these challenges in a subalpine landscape in Colorado, we estimated century-scale fire synchroneity across 12 lakesediment charcoal records spanning the past 2,000 y. The percentage of sites burned only deviated from the historic range of variability during the Medieval Climate Anomaly (MCA) between 1,200 and 850 y B.P., when temperatures were similar to recent decades. Between 1,130 and 1,030 y B.P., 83 % (median estimate) of our sites burned when temperatures increased ≈0.5 °C relative to the preceding centuries. Lake-based fire rotation during the MCA decreased to an estimated 120 y, representing a 260 % higher rate of burning than during the period of dendroecological sampling (360 to 60 y B.P.). Increased burning, however, did not persist throughout the MCA. Burning declined abruptly before temperatures cooled, indicating possible fuel limitations to continued burning.

Keywords: wildfire | climate change | Medieval Climate Anomaly

Significance: In the western United States and other forested regions, climate change may increase both the frequency of wildfires and the amount of area burned. Studies of past climate changes and their effects on wildfires can provide constraints on potential future wildfire risks. Here, we reconstruct the history of wildfire across a representative subalpine forest landscape in northern Colorado over the past two millennia. Warming of ≈0.5 °C ≈1,000 years ago increased the percentage of our study sites burned per century by ≈260 % relative to the past ≈400 y. The large increase in the number of sites burned by fires highlights the risk that large portions of individual landscapes may burn as climates continue to warm today.

Clarke 2015

Joanne Clarke et al., *Climatic changes and social transformations in the Near East and North Africa during the 'long' 4th millennium BC, A comparative study of environmental and archaeolo-*

gical evidence. Quaternary Science Reviews (2015), preprint, 1–26. DOI:10.1016/j.quascirev.2015.10.003.

Joanne Clarke, Nick Brooks, Edward B. Banning, Miryam Bar-Matthews, Stuart Campbell, Lee Clare, Mauro Cremaschi, Savino di Lernia, Nick Drake, Marina Gallinaro, Sturt Manning, Kathleen Nicoll, Graham Philip, Steve Rosen, Ulf-Dietrich Schoop, Mary Anne Tafuri, Bernhard Weninger & Andrea Zerboni

This paper explores the possible links between rapid climate change (RCC) and social change in the Near East and surrounding regions (Anatolia, central Syria, southern Israel, Mesopotamia, Cyprus and eastern and central Sahara) during the 'long' 4th millennium (≈4500–3000) BC. Twenty terrestrial and 20 marine climate proxies are used to identify long-term trends in humidity involving transitions from humid to arid conditions and vice versa. The frequency distribution of episodes of relative aridity across these records is calculated for the period 6300–2000 BC, so that the results may be interpreted in the context of the established arid episodes associated with RCC around 6200 and 2200 BC (the 8.2 and 4.2 kyr events). We identify two distinct episodes of heightened aridity in the early-mid 4th, and late 4th millennium BC. These episodes cluster strongly at 3600–3700 and 3100–3300 BC. There is also evidence of localised aridity spikes in the 5th and 6th millennia BC. These results are used as context for the interpretation of regional and local archaeological records with a particular focus on case studies from western Syria, the middle Euphrates, southern Israel and Cyprus. Interpretation of the records involves the construction of plausible narratives of humaneclimate interaction informed by concepts of adaptation and resilience from the literature on contemporary (i.e. 21st century) climate change and adaptation. The results are presented alongside well-documented examples of climatically-influenced societal change in the central and eastern Sahara, where detailed geomorphological studies of ancient environments have been undertaken in tandem with archaeological research. While the narratives for the Near East and Eastern Mediterranean remain somewhat speculative, the use of resilience and adaptation frameworks allows for a more nuanced treatment of humaneclimate interactions and recognises the diversity and context-specificity of human responses to climatic and environmental change. Our results demonstrate that there is a need for more local environmental data to be collected 'at source' during archaeological excavations.

Keywords: Eastern Mediterranean | Middle Holocene | Near East | North Africa | Rapid climate change | Societal change

Drijfhout 2015

Sybren Drijfhout et al., *Catalogue of abrupt shifts in Intergovernmental Panel on Climate Change climate models*. PNAS **112** (2015), E5777–E5786.

Sybren Drijfhout, Sebastian Bathiany, Claudie Beaulieu, Victor Brovkin, Martin Claussen, Chris Huntingford, Marten Scheffer, Giovanni Sgubin & Didier Swingedouw

Abrupt transitions of regional climate in response to the gradual rise in atmospheric greenhouse gas concentrations are notoriously difficult to foresee. However, such events could be particularly challenging in view of the capacity required for society and ecosystems to adapt to them. We present, to our knowledge, the first systematic screening of the massive climate model ensemble informing the recent Intergovernmental Panel on Climate Change report, and reveal evidence of 37 forced regional abrupt changes in the ocean, sea ice, snow cover, permafrost, and terrestrial biosphere that arise after a certain global temperature increase. Eighteen out of 37 events occur for global warming levels of less than 2°, a threshold sometimes presented as a safe limit. Although most models predict one or more

such events, any specific occurrence typically appears in only a few models. We find no compelling evidence for a general relation between the overall number of abrupt shifts and the level of global warming. However, we do note that abrupt changes in ocean circulation occur more often for moderate warming (less than 2°), whereas over land they occurmore often forwarming larger than 2°. Using a basic proportion test, however, we find that the number of abrupt shifts identified in Representative Concentration Pathway (RCP) 8.5 scenarios is significantly larger than in other scenarios of lower radiative forcing. This suggests the potential for a gradual trend of destabilization of the climate with respect to such shifts, due to increasing global mean temperature change.

Keywords: abrupt climate change | critical transitions | CMIP5 | IPCC | climate change

Significance: One of the most concerning consequences of human-induced increases in atmospheric greenhouse gas concentrations is the potential for rapid regional transitions in the climate system. Yet, despite much public awareness of how "tipping points" may be crossed, little information is available as to exactly what may be expected in the coming centuries. We assess all Earth System Models underpinning the recent 5th Intergovernmental Panel on Climate Change report and systematically search for evidence of abrupt changes. We do find abrupt changes in sea ice, oceanic flows, land ice, and terrestrial ecosystem response, although with little consistency among the models. A particularly large number is projected for warming levels below 2°. We discuss mechanisms and include methods to objectively classify abrupt climate change.

Metallzeiten

Stockhammer 2015

Philipp W. Stockhammer et al., *Rewriting the Central European Early Bronze Age Chronology: Evidence from Large-Scale Radiocarbon Dating*. PLoS ONE **10** (2015), e139705. DOI:10.1371/journal.pone.0139705.

Philipp W. Stockhammer, Ken Massy, Corina Knipper, Ronny Friedrich, Bernd Kromer, Susanne Lindauer, Jelena Radosavljevi, Fabian Wittenborn & Johannes Krause

The transition from the Neolithic to the Early Bronze Age in Central Europe has often been considered as a supra-regional uniform process, which led to the growing mastery of the new bronze technology. Since the 1920s, archaeologists have divided the Early Bronze Age into two chronological phases (Bronze A1 and A2), which were also seen as stages of technical progress. On the basis of the early radiocarbon dates from the cemetery of Singen, southern Germany, the beginning of the Early Bronze Age in Central Europe was originally dated around 2300/2200 BC and the transition to more complex casting techniques (i.e., Bronze A2) around 2000 BC. On the basis of 140 newly radiocarbon dated human remains from Final Neolithic, Early and Middle Bronze Age cemeteries south of Augsburg (Bavaria) and a re-dating of ten graves from the cemetery of Singen, we propose a significantly different dating range, which forces us to re-think the traditional relative and absolute chronologies as well as the narrative of technical development. We are now able to date the beginning of the Early Bronze Age to around 2150 BC and its end to around 1700 BC. Moreover, there is no transition between Bronze (Bz) A1 and Bronze (Bz) A2, but a complete overlap between the type objects of the two phases from 1900–1700 BC. We thus present a revised chronology of the assumed diagnostic type objects of the Early Bronze Age and recommend a radiocarbon-based view on the development of the material culture.

Finally, we propose that the traditional phases Bz A1 and Bz A2 do not represent a chronological sequence, but regionally different social phenomena connected to the willingness of local actors to appropriate the new bronze technology.

Politik

El-Mouchan 2015

Alain El-Mouchan, *The Twilight of French Jewry, the Twilight of France*. Mosaic Monthly Essays **2015**, Oct. 7.

A month later, after the massive desecration of a Jewish cemetery in Alsace, the president was still assiduously "balancing" one form of fanaticism with another by citing the need to oppose equally both anti-Jewish and anti-Islamic sentiments, despite the documented fact that, up until January 2015, anti-Muslim activity had been continually decreasing in France, while anti-Jewish violence has skyrocketed.

This refusal to identify either the culprits or their victims by their proper names—a refusal typical also of the Obama administration—has perversely combined with the swift posting of police and military guards at Jewish institutions to make Jews feel that at best they have become "protected citizens" in their own country, reinforcing the idea that they are no longer at home in France but are rather a new kind of dhimmi. And this, too, has contributed to swelling the wave of aliyah.

For one thing, to celebrate Charlie Hebdo as a beacon of free journalism is to celebrate a publication less irreverent than obscene and, at the margins, anti-Semitic. For another thing, many of those loudly proclaiming "Je suis Charlie" had only yesterday been decrying the publication of cartoons mocking Muhammad and demanding that the press exercise self-censorship. Nor is it true that what was under threat in France was freedom of expression per se. Cartoonists were targeted only for what Muslims considered blasphemous, and for nothing else. Finally, self-censorship remained alive and well—not only, as we saw earlier, in the response by President Hollande and others to the January attacks but also in the unreconstructed press itself, which, in the immediate aftermath of the killings, hastened to downplay the Jewishness of the Jewish victims and to elide or delete the killers' Islamist identity and beliefs by rebranding them as "mad extremists."

Religion

Teufel 2015

Christoph Teufel et al., *Shift toward prior knowledge confers a perceptual advantage in early psychosis and psychosis-prone healthy individuals*. PNAS **112** (2015), 13401–13406.

Christoph Teufel, Naresh Subramaniam, Veronika Dobler, Jesus Perez, Johanna Finnemann, Puja R. Mehta, Ian M. Goodyer & Paul C. Fletcher

Many neuropsychiatric illnesses are associated with psychosis, i.e., hallucinations (perceptions in the absence of causative stimuli) and delusions (irrational, often bizarre beliefs). Current models of brain function view perception as a combination of two distinct sources of information: bottom-up sensory input and top-down influences from prior knowledge. This framework may explain hallucinations and delusions. Here, we characterized the balance between visual bottom-up and top-down processing in people with early psychosis (study 1) and in psychosis-prone, healthy individuals (study 2) to elucidate the mechanisms that might contribute to

the emergence of psychotic experiences. Through a specialized mental-health service, we identified unmedicated individuals who experience early psychotic symptoms but fall below the threshold for a categorical diagnosis. We observed that, in early psychosis, there was a shift in information processing favoring prior knowledge over incoming sensory evidence. In the complementary study, we capitalized on subtle variations in perception and belief in the general population that exhibit graded similarity with psychotic experiences (schizotypy). We observed that the degree of psychosis proneness in healthy individuals, and, specifically, the presence of subtle perceptual alterations, is also associated with stronger reliance on prior knowledge. Although, in the current experimental studies, this shift conferred a performance benefit, under most natural viewing situations, it may provoke anomalous perceptual experiences. Overall, we show that early psychosis and psychosis proneness both entail a basic shift in visual information processing, favoring prior knowledge over incoming sensory evidence. The studies provide complementary insights to a mechanism by which psychotic symptoms may emerge.

Keywords: visual perception | psychosis | top-down processing | predictive coding | schizophrenia

Significance: Perceiving things that are not there and holding unfounded, bizarre beliefs (hallucinations and delusions, respectively) are psychotic symptoms that occur in particular syndromes including affective psychoses, paranoid states, and schizophrenia. We studied the emergence of this loss of contact with reality based on current models of normal brain function. Working with clinical individuals experiencing early psychosis and nonclinical individuals with high levels of psychosis proneness, we show that their visual perception is characterized by a shift that favors prior knowledge over incoming sensory evidence. Given that these alterations in information processing are evident early on in psychosis and even in association with subtle perceptual changes indicating psychosis proneness, they may be important factors contributing to the emergence of severe mental illnesses.