

Literatur

Aktuell

VAN BUNNIK 2014

Bram A.D. van Bunnik et al., *Small distances can keep bacteria at bay for days*. [PNAS 111 \(2014\), 3556–3560](#).

Bram A.D. van Bunnik, Amos Ssematimba, Thomas J. Hagenaars, Gonnée Nodelijk, Manon R. Haverkate, Marc J.M. Bonten, Mary K. Hayden, Robert A. Weinstein, Martin C.J. Bootsma & Mart C.M. De Jong

Transmission of pathogens between spatially separated hosts, i.e., indirect transmission, is a commonly encountered phenomenon important for epidemic pathogen spread. The routes of indirect transmission often remain untraced, making it difficult to develop control strategies. Here we used a tailor-made design to study indirect transmission experimentally, using two different zoonotic bacteria in broilers. Previous experiments using a single bacterial species yielded a delay in the onset of transmission, which we hypothesized to result from the interplay between diffusive motion of infectious material and decay of infectivity in the environment. Indeed, a mathematical model of diffusive pathogen transfer predicts a delay in transmission that depends both on the distance between hosts and on the magnitude of the pathogen decay rate. Our experiments, carried out with two bacterial species with very different decay rates in the environment, confirm the difference in transmission delay predicted by the model. These results imply that for control of an infectious agent, the time between the distant exposure and the infection event is important. To illustrate how this can work we analyzed data observed on the spread of vancomycin-resistant *Enterococcus* in an intensive care unit. Indeed, a delayed vancomycin-resistant *Enterococcus* transmission component was identified in these data, and this component disappeared in a study period in which the environment was thoroughly cleaned. Therefore, we suggest that the impact of control strategies against indirect transmission can be assessed using our model by estimating the control measures' effects on the diffusion coefficient and the pathogen decay rate.

diffusion model | transmission experiment | *Campylobacter jejuni* | *Escherichia coli*

DING 2014

Yun Ding, Ali A. Hassanali & Michele Parrinello, *Anomalous water diffusion in salt solutions*. [PNAS 111 \(2014\), 3310–3315](#).

The dynamics of water exhibits anomalous behavior in the presence of different electrolytes. Recent experiments [Kim JS, Wu Z, Morrow AR, Yethiraj A, Yethiraj A (2012) *J Phys Chem B* 116(39): 12007–12013] have found that the self-diffusion of water (DW) can either be enhanced or suppressed around CsI and NaCl, respectively, relative to that of neat water. Here we show that unlike classical empirical potentials, ab initio molecular dynamics simulations successfully reproduce the qualitative trends observed experimentally. These types of phenomena have often been rationalized in terms of the “structure-making” or “structure-breaking” effects of different ions on the solvent, although the microscopic origins of these features have remained elusive. Rather than disrupting the network in a significant manner, the electrolytes studied here cause rather subtle changes in both structural and dynamical properties of water. In particular, we show that water in the ab

initio molecular dynamics simulations is characterized by dynamic heterogeneity, which turns out to be critical in reproducing the experimental trends.

ELLIOTT 2014

Joshua Elliott et al., *Constraints and potentials of future irrigation water availability on agricultural production under climate change.*

[PNAS 111 \(2014\), 3239–3244.](#)

Joshua Elliott, Delphine Deryng, Christoph Müller, Katja Frieler, Markus Konzmann, Dieter Gerten, Michael Glotter, Martina Flörke, Yoshihide Wada, Neil Best, Stephanie Eisner, Balázs M. Fekete, Christian Folberth, Ian Foster, Simon N. Gosling, Ingjerd Haddeland, Nikolay Khabarov, Fulco Ludwig, Yoshimitsu Masaki, Stefan Olin, Cynthia Rosenzweig, Alex C. Ruane, Yusuke Satoh, Erwin Schmid, Tobias Stacke, Qihong Tang & Dominik Wisser

We compare ensembles of water supply and demand projections from 10 global hydrological models and six global gridded crop models. These are produced as part of the Inter-Sectoral Impacts Model Intercomparison Project, with coordination from the Agricultural Model Intercomparison and Improvement Project, and driven by outputs of general circulation models run under representative concentration pathway 8.5 as part of the Fifth Coupled Model Intercomparison Project. Models project that direct climate impacts to maize, soybean, wheat, and rice involve losses of 400–1,400 Pcal (8–24% of present-day total) when CO₂ fertilization effects are accounted for or 1,400–2,600 Pcal (24–43%) otherwise. Freshwater limitations in some irrigated regions (western United States; China; and West, South, and Central Asia) could necessitate the reversion of 20–60 Mha of cropland from irrigated to rainfed management by end-of-century, and a further loss of 600–2,900 Pcal of food production. In other regions (northern/eastern United States, parts of South America, much of Europe, and South East Asia) surplus water supply could in principle support a net increase in irrigation, although substantial investments in irrigation infrastructure would be required.

adaptation | agriculture | hydrology | uncertainty

STURM 2014

S. Sturm, F. Köhler, J. Zatorski, A. Wagner, Z. Harman, G. Werth, W. Quint, C. H. Keitel & K. Blaum, *High-precision measurement of the atomic mass of the electron.* [nature 506 \(2014\), 467–470.](#)

[n506-0467-Supplement.pdf](#)

The quest for the value of the electron’s atomic mass has been the subject of continuing efforts over the past few decades. Among the seemingly fundamental constants that parameterize the Standard Model of physics and which are thus responsible for its predictive power, the electron mass m_e is prominent, being responsible for the structure and properties of atoms and molecules. It is closely linked to other fundamental constants, such as the Rydberg constant R_∞ and the fine-structure constant α (ref. 6). However, the low mass of the electron considerably complicates its precise determination. Here we combine a very precise measurement of the magnetic moment of a single electron bound to a carbon nucleus with a state-of-the-art calculation in the framework of bound-state quantum electrodynamics. The precision of the resulting value for the atomic mass of the electron surpasses the current literature value of the Committee on Data for Science and Technology (CODATA6) by a factor of 13. This result lays the foundation for future fundamental physics experiments and precision tests of the Standard Model.

Amerika

STANFORD 2012

Dennis J. Stanford & Bruce A. Bradley, *Across Atlantic ice, The origin of America's Clovis culture*. (Berkeley 2012).

Anthropologie

D'ANASTASIO 2014

Ruggero D'Anastasio et al., *Micro-Biomechanics of the Kebara 2 Hyoid and Its Implications for Speech in Neanderthals*. [PLoS ONE 8 \(2014\), e82261](#). DOI:10.1371/journal.pone.0082261.

Ruggero D'Anastasio, Stephen Wroe, Claudio Tuniz, Lucia Mancini, Deneb T. Cesana, Diego Dreossi, Mayoorendra Ravichandiran, Marie Attard, William C. H. Parr, Anne Agur & Luigi Capasso

The description of a Neanderthal hyoid from Kebara Cave (Israel) in 1989 fuelled scientific debate on the evolution of speech and complex language. Gross anatomy of the Kebara 2 hyoid differs little from that of modern humans. However, whether *Homo neanderthalensis* could use speech or complex language remains controversial. Similarity in overall shape does not necessarily demonstrate that the Kebara 2 hyoid was used in the same way as that of *Homo sapiens*. The mechanical performance of whole bones is partly controlled by internal trabecular geometries, regulated by bone-remodelling in response to the forces applied. Here we show that the Neanderthal and modern human hyoids also present very similar internal architectures and micro-biomechanical behaviours. Our study incorporates detailed analysis of histology, meticulous reconstruction of musculature, and computational biomechanical analysis with models incorporating internal micro-geometry. Because internal architecture reflects the loadings to which a bone is routinely subjected, our findings are consistent with a capacity for speech in the Neanderthals.

IZAGIRRE 1999

N. Izagirre & C. de la Rúa, *An mtDNA Analysis in Ancient Basque Populations, Implications for Haplogroup V as a Marker for a Major Paleolithic Expansion from Southwestern Europe*. [American Journal of Human Genetics 65 \(1999\), 199–207](#).

mtDNA sequence variation was studied in 121 dental samples from four Basque prehistoric sites, by high-resolution RFLP analysis. The results of this study are corroborated by (1) parallel analysis of 92 bone samples, (2) the use of controls during extraction and amplification, and (3) typing by both positive and negative restriction of the linked sites that characterize each haplogroup. The absence of haplogroup V in the prehistoric samples analyzed conflicts with the hypothesis proposed by Torroni et al., in which haplogroup V is considered as an mtDNA marker for a major Paleolithic population expansion from southwestern Europe, occurring $\approx 10,000$ – $15,000$ years before the present (YBP). Our samples from the Basque Country provide a valuable tool for checking the previous hypothesis, which is based on genetic data from present-day populations. In light of the available data, the most realistic scenario to explain the origin and distribution of haplogroup V suggests that the mutation defining that haplogroup (4577 N1aIII) appeared at a time when the effective population size was small enough to allow genetic drift to act—and that such drift is responsible for the heterogeneity observed in Basques, with regard to the frequency of haplogroup V (0%–20%). This is compatible with

the attributed date for the origin of that mutation (10,000–15,000 YBP), because during the postglacial period (the Mesolithic, ≈11,000 YBP) there was a major demographic change in the Basque Country, which minimized the effect of genetic drift. This interpretation does not rely on migratory movements to explain the distribution of haplogroup V in present-day Indo-European populations.

REIDLA 2003

Maere Reidla et al., *Origin and Diffusion of mtDNA Haplogroup X*. [American Journal of Human Genetics](#) **73** (2003), 1178–1190.

Maere Reidla, Toomas Kivisild, Ene Metspalu, Katrin Kaldma, Kristiina Tambets, Helle-Viivi Tolk, Jüri Parik, Eva-Liis Loogväli, Miroslava Derenko, Boris Malyarchuk, Marina Bermisheva, Sergey Zhadanov, Erwan Pennarun, Marina Gubina, Maria Golubenko, Larisa Damba, Sardana Fedorova, Vladislava Gusar, Elena Grechanina, Ilia Mikerezi, Jean-Paul Moisan, AndréChaventré, Elsa Khusnutdinova, Ludmila Osipova, Vadim Stepanov, Mikhail Voevoda, Alessandro Achilli, Chiara Rengo, Olga Rickards, Gian Franco De Stefano, Surinder Papiha, Lars Beckman, Branka Janicijevic, Pavao Rudan, Nicholas Anagnou, Emmanuel Michalodimitrakis, Slawomir Koziel, Esien Usanga, Tarekegn Geberhiwot, Corinna Herrnschadt, Neil Howell, Antonio Torroni & Richard Villems

A maximum parsimony tree of 21 complete mitochondrial DNA (mtDNA) sequences belonging to haplogroup X and the survey of the haplogroup-associated polymorphisms in 13,589 mtDNAs from Eurasia and Africa revealed that haplogroup X is subdivided into two major branches, here defined as “X1” and “X2.” The first is restricted to the populations of North and East Africa and the Near East, whereas X2 encompasses all X mtDNAs from Europe, western and Central Asia, Siberia, and the great majority of the Near East, as well as some North African samples. Subhaplogroup X1 diversity indicates an early coalescence time, whereas X2 has apparently undergone a more recent population expansion in Eurasia, most likely around or after the last glacial maximum. It is notable that X2 includes the two complete Native American X sequences that constitute the distinctive X2a clade, a clade that lacks close relatives in the entire Old World, including Siberia. The position of X2a in the phylogenetic tree suggests an early split from the other X2 clades, likely at the very beginning of their expansion and spread from the Near East.

Bibel

FAUST 2011

Avraham Faust, *The Interests of the Assyrian Empire in the West, Olive Oil Production as a Test-Case*. [Journal of the Economic and Social History of the Orient](#) **54** (2011), 62–86.

The 7th century BCE in Philistia and Judah is characterized by economic prosperity, which is usually regarded as resulting from the “Assyrian Peace”, and from a policy of the Assyrian empire that aimed at maximizing production. The large center for the production of olive oil that was unearthed at Ekron in southern Israel is regarded as the best example of this policy. The present paper questions this scholarly consensus regarding the role of Assyria in the economy of the southern Levant, through a closer look at the olive oil industry in the region.

Keywords: Assyria, Israel, Phoenicia, economy, Olive oil

FAUST 2014

Avraham Faust & Justin Lev-Tov, *Philistia and the Philistines in the Iron Age I, Interaction, Ethnic Dynamics and Boundary Maintenance*. [HIPHIL Novum 1 \(2014\), 1–24](#).

Until recently, the scholarly consensus held that the Philistines, whatever their origins were, assimilated into the local Levantine cultures in the early Iron Age II. Following Stone (1995), however, it is clear today that the while Philistine culture changed and the settlers ceased to use most of their unique, foreign traits in the Iron II, the Philistines still maintained their unique identity, and did not assimilate. In 2011 we drew attention to the fact that the decline in the use of these “unique” traits was not gradual, as one might expect from a slow process of culture change. Instead, the Philistines increased their usage of some of their most distinct traits during the first 150-200 years of their settlement, before abandoning many of their significant traits in the Iron Age II. We explained this “increased” usage of foreign traits (and to a more limited extent also its subsequent “decline”) as part of the Philistines’ interaction with their neighbors. Maeir et al. (2013) have recently attempted to refute our arguments and conclusions. While we are happy that the Philistines are again at the center of scholarly discussion, it is unfortunate that their article suffers from some major drawbacks, in terms of both theory and data. In light of the recent discussion, this article will revisit the processes that followed the Philistine settlement in Canaan, and especially the nature of their interaction with their neighbors.

Keywords: Philistia, Philistines, Ethnicity, Identity, Boundary Maintenance

Biologie

MCKECHNIE 2014

Iain McKechnie et al., *Archaeological data provide alternative hypotheses on Pacific herring (*Clupea pallasii*) distribution, abundance, and variability*. [PNAS 111 \(2014\), E807–E816](#).

[pnas111-E0807-Supplement1.docx](#), [pnas111-E0807-Supplement2.docx](#), [pnas111-E0807-Supplement3.docx](#)

Iain McKechnie, Dana Lepofsky, Madonna L. Moss, Virginia L. Butler, Trevor J. Orchard, Gary Coupland, Fredrick Foster, Megan Caldwell & Ken Lertzman Pacific herring (*Clupea pallasii*), a foundation of coastal socialecological systems, is in decline throughout much of its range. We assembled data on fish bones from 171 archaeological sites from Alaska, British Columbia, and Washington to provide proxy measures of past herring distribution and abundance. The dataset represents 435,777 fish bones, dating throughout the Holocene, but primarily to the last 2,500 y. Herring is the single-most ubiquitous fish taxon (99% ubiquity) and among the two most abundant taxa in 80% of individual assemblages. Herring bones are archaeologically abundant in all regions, but are superabundant in the northern Salish Sea and southwestern Vancouver Island areas. Analyses of temporal variability in 50 well-sampled sites reveals that herring exhibits consistently high abundance (>20% of fish bones) and consistently low variance (<10%) within the majority of sites (88% and 96%, respectively). We pose three alternative hypotheses to account for the disjunction between modern and archaeological herring populations. We reject the first hypothesis that the archaeological data overestimate past abundance and underestimate past variability. We are unable to distinguish between the second two hypotheses, which both assert that the archaeological data reflect a higher mean abundance of herring in the past, but differ in whether variability was similar to or less than that observed recently. In either case, sufficient herring was

consistently available to meet the needs of harvesters, even if variability is damped in the archaeological record. These results provide baseline information prior to herring depletion and can inform modern management.
historical ecology | fisheries | forage fish | Northwest Coast | archaeology

Klima

BROECKER 1994

Wallace S. Broecker, *Massive iceberg discharges as triggers for global climate change*. [nature 372 \(1994\), 421–424](#).

Observations of large and abrupt climate changes recorded in Greenland ice cores have spurred a search for clues to their cause. This search has revealed that at six times during the last glaciation, huge armadas of icebergs launched from Canada spread across the northern Atlantic Ocean, each triggering a climate response of global extent.

SANCETTA 1992

Constance Sancetta, *Primary production in the glacial North Atlantic and North Pacific oceans*. [nature 360 \(1992\), 249–251](#).

The conditions controlling primary production are very different in the modern North Atlantic and North Pacific oceans, a difference that is reflected in the composition of diatom fossils in surface sediments. By contrast, I report here evidence that during the last glacial interval the diatom assemblage, and by extrapolation the primary production, was very similar in the two regions. The modern analogues of these assemblages occur in sediments of Baffin Bay and the Sea of Okhotsk, both highly productive seas where ice is present. I infer that during the last glacial interval plankton biomass was at least as high as it is today in the North Atlantic, and was as much as an order of magnitude higher in the North Pacific. The glacial assemblage occurs in lithologies dominated by ice-rafted detritus, which is generally believed to indicate the presence of icebergs. I hypothesize that the presence of numerous icebergs, possibly associated with sea ice, supported high production by physical mechanisms (such as turbulent mixing and enhanced density stratification) and/or biogeochemical ones (such as supply of major or trace nutrients).

Kultur

DIAMOND 2013

Jared Diamond, *Vermächtnis – Was wir von traditionellen Gesellschaften lernen können, Original: The World Until Yesterday – What can we learn from traditional societies?* (Frankfurt, M. 2013).

Methoden

HENRICH 2010

Joseph Henrich, Steven J. Heine & Ara Norenzayan, *The weirdest people in the world?* [Behavioral and Brain Sciences 33 \(2010\), 61–135](#). Behavioral scientists routinely publish broad claims about human psychology and behavior in the world's top journals based on samples drawn entirely from

Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies. Researchers – often implicitly – assume that either there is little variation across human populations, or that these “standard subjects” are as representative of the species as any other population. Are these assumptions justified? Here, our review of the comparative database from across the behavioral sciences suggests both that there is substantial variability in experimental results across populations and that WEIRD subjects are particularly unusual compared with the rest of the species – frequent outliers. The domains reviewed include visual perception, fairness, cooperation, spatial reasoning, categorization and inferential induction, moral reasoning, reasoning styles, self-concepts and related motivations, and the heritability of IQ. The findings suggest that members of WEIRD societies, including young children, are among the least representative populations one could find for generalizing about humans. Many of these findings involve domains that are associated with fundamental aspects of psychology, motivation, and behavior – hence, there are no obvious a priori grounds for claiming that a particular behavioral phenomenon is universal based on sampling from a single subpopulation. Overall, these empirical patterns suggests that we need to be less cavalier in addressing questions of human nature on the basis of data drawn from this particularly thin, and rather unusual, slice of humanity. We close by proposing ways to structurally re-organize the behavioral sciences to best tackle these challenges.

Keywords: behavioral economics; cross-cultural research; cultural psychology; culture; evolutionary psychology; experiments; external validity; generalizability; human universals; population variability

Physik

O’RAIFEARTAIGH 2014

Cormac O’Raifeartaigh Brendan McCann, Werner Nahm & Simon Mitton, *Einstein’s exploration of a steady-state model of the universe*. arXiv (2014), 1402.0132. <http://arxiv.org/pdf/1402.0132>.

We present a translation and analysis of an unpublished manuscript by Albert Einstein in which he explored a ‘steady-state’ model of the universe. The manuscript, which appears to have been written in early 1931, demonstrates that Einstein once considered an expanding cosmos in which the mean density of matter is maintained constant by a continuous formation of matter from empty space. This model is very different to previously known Einsteinian models of the cosmos (both static and dynamic) but anticipates the later steady-state cosmology of Hoyle, Bondi and Gold in some ways. We find that Einstein’s steady-state model contained a fundamental flaw and suggest that it was discarded for this reason. We also suggest that he declined to try again because he realised that a successful steady-state model would require an amendment to the field equations. The abandoned model is of historical significance because it reveals that Einstein debated between steady-state and evolving models of the cosmos decades before a similar debate took place in the cosmological community.