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Literatur

Aktuell

Burkert 2014

Nathalie T. Burkert, Johanna Muckenhuber, Franziska Großschädl, Éva Rásky & Wolfgang Freidl, *Nutrition and Health – The Association between Eating Behavior and Various Health Parameters, A Matched Sample Study.* PLoS ONE **9** (2014), e88278. DOI:10.1371/journal.pone.0088278.

Population-based studies have consistently shown that our diet has an influence on health. Therefore, the aim of our study was to analyze differences between different dietary habit groups in terms of health-related variables. The sample used for this cross-sectional study was taken from the Austrian Health Interview Survey AT-HIS 2006/07. In a first step, subjects were matched according to their age, sex, and socioeconomic status (SES). After matching, the total number of subjects included in the analysis was 1320 (N = 330 for each form of diet – vegetarian, carnivorous diet rich in fruits and vegetables, carnivorous diet less rich in meat, and carnivorous diet rich in meat). Analyses of variance were conducted controlling for lifestyle factors in the following domains: health (self-assessed health, impairment, number of chronic conditions, vascular risk), health care (medical treatment, vaccinations, preventive check-ups), and quality of life. In addition, differences concerning the presence of 18 chronic conditions were analyzed by means of Chi-square tests. Overall, 76.4 % of all subjects were female. 40.0 % of the individuals were younger than 30 years, 35.4 % between 30 and 49 years, and 24.0 % older than 50 years. 30.3 % of the subjects had a low SES, 48.8 % a middle one, and 20.9 % had a high SES. Our results revealed that a vegetarian diet is related to a lower BMI and less frequent alcohol consumption. Moreover, our results showed that a vegetarian diet is associated with poorer health (higher incidences of cancer, allergies, and mental health disorders), a higher need for health care, and poorer quality of life. Therefore, public health programs are needed in order to reduce the health risk due to nutritional factors.

Georgescu 2014

Matei Georgescu, Philip E. Morefield, Britta G. Bierwagen & Christopher P. Weaver, *Urban adaptation can roll back warming of emerging megapolitan regions.* PNAS **111** (2014), 2909–2914.

Modeling results incorporating several distinct urban expansion futures for the United States in 2100 show that, in the absence of any adaptive urban design, megapolitan expansion, alone and separate from greenhouse gas-induced forcing, can be expected to raise near-surface temperatures 1–2 °C not just at the scale of individual cities but over large regional swaths of the country. This warming is a significant fraction of the 21st century greenhouse gas-induced climate change simulated by global climate models. Using a suite of regional climate simulations, we assessed the efficacy of commonly proposed urban adaptation strategies, such as green, cool roof, and hybrid approaches, to ameliorate the warming. Our results quantify how judicious choices in urban planning and design cannot only counteract the climatological impacts of the urban expansion itself but also, can, in fact, even offset a significant percentage of future greenhouse warming over large scales.

Our results also reveal tradeoffs among different adaptation options for some regions, showing the need for geographically appropriate strategies rather than one size fits all solutions.
sustainability | mitigation | land-use change | urbanization | urban climate

Heimsath 2014
Arjun M. Heimsath, *Limits of Soil Production?* science **343** (2014), 617–618.
Steep mountain regions can weather faster and produce soil more quickly than previously thought.

Herrmann 2014
Mark Herrmann, *A promising advance in nuclear fusion.* nature **506** (2014), 302–303.
Experiments conducted at the US National Ignition Facility have cleared a hurdle on the road to nuclear fusion in the laboratory, encouraging fusion scientists around the world.
The best highfoot experiment produced 17 kJ of fusion yield, which is greater than the energy invested in the fusion fuel during the implosion, and has $P\tau$ larger than 50 % of what is needed for ignition.
The NIF consists of 192 laser beams that can be focused onto a centimetrescale target containing a capsule filled with fusion fuel. The beams are capable of delivering more than 1.8 million joules of energy to the target in a carefully controlled laser pulse lasting less than 2×10–8 s. As extreme as this sounds, the pressure on the target is still 1,000 times lower than that needed to meet the Lawson criterion.

Hurricane 2014
O. A. Hurricane et al., *Fuel gain exceeding unity in an inertially confined fusion implosion.* nature **506** (2014), 343–348.
O. A. Hurricane, D. A. Callahan, D. T. Casey, P. M. Celliers, C. Cerjan, E. L. Dewald, T. R. Dittrich, T. Döppner, D. E. Hinkel, L. F. Berzak Hopkins, J. L. Kline, S. Le Pape, T. Ma, A. G. MacPhee, J. L. Milovich, A. Pak, H.-S. Park, P. K. Patel, B. A. Remington, J. D. Salmonson, P. T. Springer & R. Tommasini
Ignition is needed to make fusion energy a viable alternative energy source, but has yet to be achieved1.Akey step on the way to ignition is to have the energy generated through fusion reactions in an inertially confined fusion plasma exceed the amount of energy deposited into the deuterium–tritium fusion fuel and hotspot during the implosion process, resulting in a fuel gain greater than unity. Here we report the achievement of fusion fuel gains exceeding unity on the US National Ignition Facility using a 'high-foot' implosion method2,3, which is a manipulation of the laser pulse shape in a way that reduces instability in the implosion. These experiments show an order-of-magnitude improvement in yield performance over past deuterium–tritium implosion experiments. We also see a significant contribution to the yield from a-particle self-heating and evidence for the 'bootstrapping' required to accelerate the deuterium–tritium fusion burn to eventually 'run away' and ignite.

Larsen 2014
Isaac J. Larsen, Peter C. Almond, Andre Eger, John O. Stone, David R. Montgomery & Brendon Malcolm, *Rapid Soil Production and Weathering in the Southern Alps, New Zealand.* science **343** (2014), 637–640.

s343-0637-Supplement.pdf
Evaluating conflicting theories about the influence of mountains on carbon dioxide cycling and climate requires understanding weathering fluxes from tectonically uplifting landscapes. The lack of soil production and weathering rate measurements in Earth's most rapidly uplifting mountains has made it difficult to determine whether weathering rates increase or decline in response to rapid erosion. Beryllium-10 concentrations in soils from the western Southern Alps, New Zealand, demonstrate that soil is produced from bedrock more rapidly than previously recognized, at rates up to 2.5 millimeters per year. Weathering intensity data further indicate that soil chemical denudation rates increase proportionally with erosion rates. These high weathering rates support the view that mountains play a key role in global-scale chemical weathering and thus have potentially important implications for the global carbon cycle.

Palyulin 2014

Vladimir V. Palyulin, Aleksei V. Chechkin & Ralf Metzler, *Lévy flights do not always optimize random blind search for sparse targets.* PNAS **111** (2014), 2931–2936.

It is generally believed that random search processes based on scalefree, Levy stable jump length distributions (Levy flights) optimize the search for sparse targets. Here we show that this popular search advantage is less universal than commonly assumed. We study the efficiency of a minimalist search model based on Levy flights in the absence and presence of an external drift (underwater current, atmospheric wind, a preference of the walker owing to prior experience, or a general bias in an abstract search space) based on two different optimization criteria with respect to minimal search time and search reliability (cumulative arrival probability). Although Levy flights turn out to be efficient search processes when the target is far from the starting point, or when relative to the starting point the target is upstream,we showthat for close targets and for downstreamtarget positioning regular Brownian motion turns out to be the advantageous search strategy. Contrary to claims that Levy flightswith a critical exponent $\alpha = 1$ are optimal for the search of sparse targets in different settings, based on our optimization parameters the optimal α may range in the entire interval (1, 2) and especially include Brownian motion as the overall most efficient search strategy.
search optimization | stochastic processes | Levy foraging hypothesis

Amerika

Kistler 2014

Logan Kistler, Álvaro Montenegro, Bruce D. Smith, John A. Gifford, Richard E. Green, Lee A. Newsom & Beth Shapiro, *Transoceanic drift and the domestication of African bottle gourds in the Americas.* PNAS **111** (2014), 2937–2941.

Bottle gourd (Lagenaria siceraria) was one of the first domesticated plants, and the only one with a global distribution during pre-Columbian times. Although native to Africa, bottle gourd was in use by humans in east Asia, possibly as early as 11,000 y ago (BP) and in the Americas by 10,000 BP. Despite its utilitarian importance to diverse human populations, it remains unresolved how the bottle gourd came to be so widely distributed, and in particular how and when it arrived in the New World. A previous study using ancient DNA concluded that Paleoindians transported already domesticated gourds to the Americas from Asia when colonizing the New World [Erickson et al. (2005) Proc Natl Acad Sci USA 102

(51):18315–18320]. However, this scenario requires the propagation of tropical-adapted bottle gourds across the Arctic. Here, we isolate 86,000 base pairs of plastid DNA from a geographically broad sample of archaeological and living bottle gourds. In contrast to the earlier results, we find that all pre-Columbian bottle gourds are most closely related to African gourds, not Asian gourds. Ocean-current drift modeling shows that wild African gourds could have simply floated across the Atlantic during the Late Pleistocene. Once they arrived in the New World, naturalized gourd populations likely became established in the Neotropics via dispersal by megafaunal mammals. These wild populations were domesticated in several distinct New World locales, most likely near established centers of food crop domestication.
long-distance dispersal | New World domestication | archaeogenomics

Isotope

Vaiglova 2014

Petra Vaiglova et al., *An integrated stable isotope study of plants and animals from Kouphovouno, southern Greece, A new look at Neolithic farming*. Journal of Archaeological Science **42** (2014), 201–215.
JArchSci42-0201-Supplement.pdf
Petra Vaiglova, Amy Bogaard, Matthew Collins, William Cavanagh, Christopher Mee, Josette Renard, Angela Lamb, Armelle Gardeisen & Rebecca Fraser
This paper presents the first study that combines the use of ancient crop and animal stable isotopes (carbon and nitrogen) and Zooarchaeology Mass Spectrometry species identification (ZooMS) for reconstructing early farming practices at Kouphovouno, a Middle-Late Neolithic village in southern Greece (c. 5950–4500 cal. BC). Debate surrounding the nature of early farming predominantly revolves around the intensity of crop cultivation: did early farmers move around the landscape while practicing temporary farming methods such as slash and burn agriculture or did they create more permanent fields by investing high labor inputs into smaller pieces of land that produced higher crop yields? The need to address these questions using a direct assessment of the intensity and scale of cultivation is apparent, and an integrated stable isotope approach provides such an opportunity. The results of this study support the model of small-scale mixed farming, where crop cultivation and animal husbandry are closely integrated. The farmers directed their intensive management towards crops grown for human consumption (free-threshing wheat), while growing fodder crop (hulled barley) more extensively. Pulses were cultivated under a high-manuring/high-watering regime, likely in garden plots in rotation with free-threshing wheat. The diets of the livestock enable us to investigate which parts of the landscape were used for browsing and grazing and indicate that animal management changed in the Late Neolithic. The sheep and goats were now kept in smaller numbers and grazed together and new pasture grasses may have been sought for the grazing of cattle. This study demonstrates that beyond its applicability for palaeodietary reconstruction, analysis of stable isotopes of archaeological crop and animal remains has important implications for understanding the relationship between humans, plants and animals in an archaeological context.
Keywords: Stable isotopes | Carbon | Nitrogen | ZooMS | Archaeobotany | Archaeozoology | Aegean | Neolithic

Klima

Peng 2014

Shu-Shi Peng et al., *Afforestation in China cools local land surface temperature*. PNAS **111** (2014), 2915–2919.

Shu-Shi Peng, Shilong Piao, Zhenzhong Zeng, Philippe Ciais, Liming Zhou, Laurent Z. X. Li, Ranga B. Myneni, Yi Yin & Hui Zeng

China has the largest afforested area in the world (≈62 million hectares in 2008), and these forests are carbon sinks. The climatic effect of these new forests depends on how radiant and turbulent energy fluxes over these plantations modify surface temperature. For instance, a lower albedo may cause warming, which negates the climatic benefits of carbon sequestration. Here, we used satellite measurements of land surface temperature (LST) from planted forests and adjacent grasslands or croplands in China to understand how afforestation affects LST. Afforestation is found to decrease daytime LST by about 1.1 ± 0.5 °C (mean ± 1 SD) and to increase nighttime LST by about 0.2 ± 0.5 °C, on average. The observed daytime cooling is a result of increased evapotranspiration. The nighttime warming is found to increase with latitude and decrease with average rainfall. Afforestation in dry regions therefore leads to net warming, as daytime cooling is offset by nighttime warming. Thus, it is necessary to carefully consider where to plant trees to realize potential climatic benefits in future afforestation projects.

vegetation feedback | climate change mitigation | plantation effects | surface cooling

Yang 2014

Bao Yang, Chun Qin, Jianglin Wang, Minhui He, Thomas M. Melvin, Timothy J. Osborn & Keith R. Briffa, *A 3,500-year tree-ring record of annual precipitation on the northeastern Tibetan Plateau*. PNAS **111** (2014), 2903–2908.

An annually resolved and absolutely dated ring-width chronology spanning 4,500 y has been constructed using subfossil, archaeological, and living-tree juniper samples from the northeastern Tibetan Plateau. The chronology represents changing mean annual precipitation and is most reliable after 1500 B.C. Reconstructed precipitation for this period displays a trend toward more moist conditions: the last 10-, 25-, and 50-y periods all appear to be the wettest in at least three and a half millennia. Notable historical dry periods occurred in the 4th century BCE and in the second half of the 15th century CE. The driest individual year reconstructed (since 1500 B.C.) is 1048 B.C., whereas the wettest is 2010. Precipitation variability in this region appears not to be associated with inferred changes in Asian monsoon intensity during recent millennia. The chronology displays a statistical association with the multidecadal and longer-term variability of reconstructed mean Northern Hemisphere temperatures over the last two millennia. This suggests that any further large-scale warming might be associated with even greater moisture supply in this region.

Kultur

McCoy 2014

Mark D. McCoy, Thegn N. Ladefoged, Maria Codlin & Douglas G. Sutton, *Does Carneiro's circumscription theory help us understand Maori history? An analysis of the obsidian assemblage from Pouerua*

Pa, New Zealand (Aotearoa). Journal of Archaeological Science **42** (2014), 467–475.
JArchSci42-0467-Supplement.xls
Circumscription theory, originally proposed to explain the rise of state society, is appealing in that it gives us an elegant, straightforward way to account for warfare among farming communities in the transition to complex societies. It predicts that as populations increase, groups will come in to conflict over limited prime land, and thus explain why we see a spatial correlation between good farmland and fortifications; as has been noted in New Zealand (Aotearoa). But, to date we do not have strong data to support the notion that conflict between Maori was primarily about access to farmland, and counter to circumscription theory, ethnography suggests exclusive ownership was discouraged. Here we test the efficacy of circumscription for understanding Maori history using obsidian artefact data from Pouerua Pa, a fortification in the heart of Ngā Puhi's tribal territory. New geochemical sourcing clears up ambiguities in source assignments and shows shifts in access to local sources and long distance exchange. We interpret these changes as being consistent with circumscription having been a factor in the earliest stage of fortification construction, and easing over time as the area was largely confederated under a single tribal identity in the early post-contact period.
Keywords: Circumscription theory | Obsidian sourcing | Trade and exchange | Warfare | New Zealand

Sorensen 2014

Andrew Sorensen, Wil Roebroeks & Annelou van Gijn, *Fire production in the deep past? The expedient strike-a-light model.* Journal of Archaeological Science **42** (2014), 476–486.
JArchSci42-0476-Supplement.pdf
Clear examples of tools used to artificially ignite fire are virtually absent in the archaeological record until the late Upper Palaeolithic. One explanation is that, until this point, hominins were (by and large) simply fire users dependent on the environment to provide conflagrations for exploitation, as opposed to fire producers. An alternate scenario is that the tools they used to perform this task are difficult to recognise in artefact assemblages. To account for this, we propose the 'expedient strike-a-light model', a concept that draws inspiration from the apparent ad hoc nature of many hunter-gatherer lithic technologies, especially those of the Middle Palaeolithic. The model contends early flint strike-a-lights were not formalised or specialised tools used to kindle multiple fires, as seen in later time periods. Instead, we postulate that flakes, retouched implements or other fragments made from siliceous lithic raw materials were utilised on a very short-term basis in conjunction with the minerals marcasite or pyrite (sulphuric iron) to generate fire. Building on previous research and our own experimental data, we establish criteria to identify expedient fire-lighting tools, and discuss the testing of our research model on five Middle Palaeolithic assemblages. Although results were negative from this limited data set, this research offers an alternative view of early fire production and a protocol for recognising expedient strike-a-light technology.
Keywords: Strike-a-light | Fire | Microwear analysis | Experiments | Middle Palaeolithic | Neandertals | Upper Palaeolithic

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

Story or Book

Peplow 2014

Mark Peplow, *Fukushima: The Story of a Nuclear Disaster*. nature **506** (2014), 292–293.
Two accounts take contrasting lessons from nuclear accidents, finds Mark Peplow.
Atomic Accidents: A History of Nuclear Meltdowns and Disasters from the Ozark Mountains to Fukushima. James Mahaffey. Pegasus Books: 2014.
Fukushima: The Story of a Nuclear Disaster. David Lochbaum, Edwin Lyman and Susan Q. Stranahan. The New Press: 2014.
In Atomic Accidents, James Mahaffey tries to persuade us that the mighty atom is our friend by showing how much nuclear engineers (he is one) have learned from the industry's mistakes. Whereas he puts accidents under the microscope to pinpoint where things turned nasty, in Fukushima, David Lochbaum, Edwin Lyman and Susan Q. Stranahan blame the entire nuclear establishment.
According to Fukushima, the NRC refused to learn from Three Mile Island, and failed to mandate that the industry prepare for similar events. The commission, the book claims, had run simulations showing that Mark 1 boiling-water reactors, designed by General Electric and installed at Fukushima, were vulnerable to meltdown in a power blackout. If the NRC had been bolder about improving safety at home, in the authors' opinion, other countries would have followed — and Japan might not be facing a US$100-billion nuclear clean-up.
Both polemics offer thought-provoking analyses. However much they differ, they are both right: if nuclear power is to have a future, it needs better science and better regulation.

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