

Literatur

Aktuell

QIU 2014

Yifu Qiu et al., *Eosinophils and Type 2 Cytokine Signaling in Macrophages Orchestrate Development of Functional Beige Fat*. [Cell](#) **157** (2014), 1292–1308.

Yifu Qiu, Khoa D. Nguyen, Justin I. Odegaard, Xiaojin Cui, Xiaoyu Tian, Richard M. Locksley, Richard D. Palmiter & Ajay Chawla

Beige fat, which expresses the thermogenic protein UCP1, provides a defense against cold and obesity. Although a cold environment is the physiologic stimulus for inducing beige fat in mice and humans, the events that lead from the sensing of cold to the development of beige fat remain poorly understood. Here, we identify the efferent beige fat thermogenic circuit, consisting of eosinophils, type 2 cytokines interleukin (IL)-4/13, and alternatively activated macrophages. Genetic loss of eosinophils or IL-4/13 signaling impairs cold-induced biogenesis of beige fat. Mechanistically, macrophages recruited to cold-stressed subcutaneouswhite adipose tissue (scWAT) undergo alternative activation to induce tyrosine hydroxylase expression and catecholamine production, factors required for browning of scWAT. Conversely, administration of IL-4 to thermoneutral mice increases beige fat mass and thermogenic capacity to ameliorate pre-established obesity. Together, our findings have uncovered the efferent circuit controlling biogenesis of beige fat and provide support for its targeting to treat obesity.

SCHULTE-MECKLENBECK 2013

Michael Schulte-Mecklenbeck, Matthias Sohn, Emanuel de Bellis, Nathalie Martin & Ralph Hertwig, *A lack of appetite for information and computation. Simple heuristics in food choice*. [Appetite](#) **71** (2013), 242–251.

The predominant, but largely untested, assumption in research on food choice is that people obey the classic commandments of rational behavior: they carefully look up every piece of relevant information, weight each piece according to subjective importance, and then combine them into a judgment or choice. In real world situations, however, the available time, motivation, and computational resources may simply not suffice to keep these commandments. Indeed, there is a large body of research suggesting that human choice is often better accommodated by heuristics—simple rules that enable decision making on the basis of a few, but important, pieces of information. We investigated the prevalence of such heuristics in a computerized experiment that engaged participants in a series of choices between two lunch dishes. Employing MouseLabWeb, a process-tracing technique, we found that simple heuristics described an overwhelmingly large proportion of choices, whereas strategies traditionally deemed rational were barely apparent in our data. Replicating previous findings, we also observed that visual stimulus segments received a much larger proportion of attention than any nutritional values did. Our results suggest that, consistent with human behavior in other domains, people make their food choices on the basis of simple and informationally frugal heuristics.

Keywords: Food choice | Heuristics | Process tracing | Rational choice | MouselabWeb

STEINHARDT 2014

Paul Steinhardt, *Big Bang blunder bursts the multiverse bubble*. [nature](#) **510** (2014), 9.

Premature hype over gravitational waves highlights gaping holes in models for the origins and evolution of the Universe, argues Paul Steinhardt.

[T]he inflationary paradigm is so flexible that it is immune to experimental and observational tests. First, inflation is driven by a hypothetical scalar field, the inflaton, which has properties that can be adjusted to produce effectively any outcome. Second, inflation does not end with a universe with uniform properties, but almost inevitably leads to a multiverse with an infinite number of bubbles, in which the cosmic and physical properties vary from bubble to bubble. The part of the multiverse that we observe corresponds to a piece of just one such bubble. Scanning over all possible bubbles in the multiverse, every thing that can physically happen does happen an infinite number of times. No experiment can rule out a theory that allows for all possible outcomes. Hence, the paradigm of inflation is unfalsifiable.

Anthropologie

LANGBROEK 2014

Marco Langbroek, *Ice age mentalists, Debating neurological and behavioural perspectives on the Neandertal and modern mind*. [Journal of Anthropological Sciences](#) **92** (2014), 285–289.

If one is willing to look for it, many aspects of behaviour and cognition typically associated with *Homo sapiens* appear to rely heavily on direct visual anchors, suggesting inefficiencies in mental virtualization skills, perhaps because of their smaller occipital lobes. *Homo sapiens* apparently needs [...] physical, visualized anchors to cognitively relate itself to its surroundings. Similar to yellow post-it notes on an office wall, they act as cognitive anchors when mentally structuring the surrounding physical, spatio-temporal and social environment and the place of the self in all of this. Could art, the deliberate visual structuring of space and deliberate visual structuring of social connections be the result of a deficiency in the spatial virtualization system of the brain of *Homo sapiens*, when compared to Neandertals? Could a stronger reliance on visual symbols be their solution to an incomplete cognitive ability to mentally model connections? If this is true, it has profound implications in other behavioural and cognitive domains. Notable implications for Neandertals involve the transfer of knowledge. With regard to tool technologies, a capacity for complex conceptual virtualizations in the mind of Neandertals strongly argues in favour of the existence of complex mental templates in tool technologies. When such capacities are used in tool technologies, communication is necessary to pass these mental templates on to other generations. A primary vehicle to express such mental virtualizations would be language. From genetic information we have on Neandertals (the presence of the *FOXP2* gene) and recent investigations of their hyoid bone, little precludes language capacities in Neandertals. Language in turn is a good virtual vehicle to express social structure, and the need to virtually structure social space indeed might have been the origins of language. Neandertals, while lousy painters, therefore might have been excellent storytellers given their skills for virtualizing situations in their minds. Such a trait is beneficial for long term survival in harsh, risky, erratic environments such as

those of glacial Eurasia, as stories can encode and pass on vital information on how to deal with subsistence crisis over generations.

STINER 1999

Mary C. Stiner, Natalie D. Munro, Todd A. Surovell, Eitan Tchernov & Ofer Bar-Yosef, *Paleolithic Population Growth Pulses Evidenced by Small Animal Exploitation*. *science* **283** (1999), 190–194.

Variations in small game hunting along the northern and eastern rims of the Mediterranean Sea and results from predator-prey simulation modeling indicate that human population densities increased abruptly during the late Middle Paleolithic and again during the Upper and Epi-Paleolithic periods. The demographic pulses are evidenced by increasing reliance on agile, fast-reproducing partridges, hares, and rabbits at the expense of slow-reproducing but easily caught tortoises and marine shellfish and, concurrently, climate-independent size diminution in tortoises and shellfish. The results indicate that human populations of the early Middle Paleolithic were exceptionally small and highly dispersed.

Biologie

GIFFORD 2000

Roger M. Gifford, Damian J. Barrett & Jason L. Lutze, *The effects of elevated [CO₂] on the C:N and C:P mass ratios of plant tissues*. *Plant & Soil* **224** (2000), 1–14.

The influence of elevated CO₂ concentration ([CO₂]) during plant growth on the carbon:nutrient ratios of tissues depends in part on the time and space scales considered. Most evidence relates to individual plants examined over weeks to just a few years. The C:N ratio of live tissues is found to increase, decrease or remain the same under elevated [CO₂]. On average it increases by about 15% under a doubled [CO₂]. A testable hypothesis is proposed to explain why it increases in some situations and decreases in others. It includes the notion that only in the intermediate range of N-availability will C:N of live tissues increase under elevated [CO₂]. Five hypotheses to explain the mechanism of such increase in C:N are discussed; none of these options explains all the published results. Where elevated [CO₂] did increase the C:N of green leaves, that response was not necessarily expressed as a higher C:N of senesced leaves. An hypothesis is explored to explain the observed range in the degree of propagation of a CO₂ effect on live tissues through to the litter derived from them. Data on C:P ratios under elevated [CO₂] are sparse and also variable. They do not yet suggest a generalising-hypothesis of responses. Although, unlike for C:N, there is no theoretical expectation that C:P of plants would increase under elevated [CO₂], the average trend in the data is of such an increase. The processes determining the C:P response to elevated [CO₂] seem to be largely independent of those for C:N. Research to advance the topic should be structured to examine the components of the hypotheses to explain effects on C:N. This involves experiments in which plants are grown over the full range of N and of P availability from extreme limitation to beyond saturation. Measurements need to: distinguish structural from non-structural dry matter; organic from inorganic forms of the nutrient in the tissues; involve all parts of the plant to evaluate nutrient and C allocation changes with treatments; determine resorption factors during tissue senescence; and be made with cognisance of the temporal and spatial aspects of the phenomena involved.

Keywords: climate change, CO₂, decomposition, leaf, root, litter, nutrient concentration, nutrient cycle

MYERS 2014

Samuel S. Myers et al., *Increasing CO₂ threatens human nutrition*. [nature 510 \(2014\), 139–142](#).

Samuel S. Myers, Antonella Zanobetti, Itai Kloog, Peter Huybers, Andrew D. B. Leakey, Arnold J. Bloom, Eli Carlisle, Lee H. Dietterich, Glenn Fitzgerald, Toshihiro Hasegawa, N. Michele Holbrook, Randall L. Nelson, Michael J. Ottman, Victor Raboy, Hidemitsu Sakai, Karla A. Sartor, Joel Schwartz, Saman Seneweera, Michael Tausz & Yasuhiro Usui

Dietary deficiencies of zinc and iron are a substantial global public health problem. An estimated two billion people suffer these deficiencies¹, causing a loss of 63 million life-years annually^{2,3}. Most of these people depend on C3 grains and legumes as their primary dietary source of zinc and iron. Here we report that C3 grains and legumes have lower concentrations of zinc and iron when grown under field conditions at the elevated atmospheric CO₂ concentration predicted for the middle of this century. C3 crops other than legumes also have lower concentrations of protein, whereas C4 crops seem to be less affected. Differences between cultivars of a single crop suggest that breeding for decreased sensitivity to atmospheric CO₂ concentration could partly address these new challenges to global health.

REARDON 2014

Sara Reardon, *Phage therapy gets revitalized*. [nature 510 \(2014\), 15–16](#).

The rise of antibiotic resistance rekindles interest in a century-old virus treatment.

Because phage therapy is nearly a century old, it would be difficult for a company to claim a treatment as intellectual property, and therefore recoup its costs. Young says it is likely that a 2013 ruling by the US Supreme Court against the patenting of natural genes would also apply to phages isolated from nature. Jérôme Gabard, chief executive of Pherecydes, says that the company is banking on hopes that developing and characterizing precise combinations of natural phages to target particular bacteria will be patentable.

Grundlagen

BETTINGER 2006

Robert L. Bettinger, Bruce Winterhalder & Richard McElreath, *A simple model of technological intensification*. [Journal of Archaeological Science 33 \(2006\), 538–545](#).

Ugan, Bright and Rogers [When is technology worth the trouble? *Journal of Archaeological Science* 30 (10) (2003) 1315–1329] develop procurement and processing versions of an optimization model, termed the tech investment model, to formalize the conditions that favor investing time in the manufacture of more productive but more costly technologies. Their approach captures the tradeoffs that occur as less costly versions are supplanted by more costly versions of the same category of technology (e.g., fishhooks), but not the tradeoffs that occur when more costly categories of technology supplant different but less costly categories used for the same purpose (e.g., hook and line vs. spear). We (i) propose an alternative model in which different categories of technology are characterized by separate cost-benefit curves, (ii) develop point-estimate and curve-estimate versions on this model, and (iii) show how they might be applied using the development of weaponry in aboriginal California as an example.

Keywords: Technology; Technological investment; Bow; Atlatl; Human behavioral ecology; Foraging theory; Marginal analysis

Klima

WEBER 2014

M. E. Weber et al., *Millennial-scale variability in Antarctic ice-sheet discharge during the last deglaciation*. [nature 510 \(2014\), 134–138](#).

M. E. Weber, P. U. Clark, G. Kuhn, A. Timmermann, D. Sprenk, R. Gladstone, X. Zhang, G. Lohmann, L. Menviel, M. O. Chikamoto, T. Friedrich & C. Ohlwein

Our understanding of the deglacial evolution of the Antarctic Ice Sheet (AIS) following the Last Glacial Maximum (26,000–19,000 years ago) is based largely on a few well-dated but temporally and geographically restricted terrestrial and shallow-marine sequences. This sparseness limits our understanding of the dominant feedbacks between the AIS, Southern Hemisphere climate and global sea level. Marine records of iceberg-rafted debris (IBRD) provide a nearly continuous signal of ice-sheet dynamics and variability. IBRD records from the North Atlantic Ocean have been widely used to reconstruct variability in Northern Hemisphere ice sheets, but comparable records from the Southern Ocean of the AIS are lacking because of the low resolution and large dating uncertainties in existing sediment cores. Here we present two well-dated, high-resolution IBRD records that capture a spatially integrated signal of AIS variability during the last deglaciation. We document eight events of increased iceberg flux from various parts of the AIS between 20,000 and 9,000 years ago, in marked contrast to previous scenarios which identified the main AIS retreat as occurring after meltwater pulse 1A and continuing into the late Holocene epoch. The highest IBRD flux occurred 14,600 years ago, providing the first direct evidence for an Antarctic contribution to meltwater pulse 1A. Climate model simulations with AIS freshwater forcing identify a positive feedback between poleward transport of Circumpolar Deep Water, subsurface warming and AIS melt, suggesting that small perturbations to the icesheet can be substantially enhanced, providing a possible mechanism for rapid sea-level rise.

WILLIAMS 2014

Trevor Williams, *How Antarctic ice retreats*. [nature 510 \(2014\), 39–40](#).

New records of iceberg-rafted debris from the Scotia Sea reveal episodic retreat of the Antarctic Ice Sheet since the peak of the last glacial period, in step with changes in climate and global sea level.

During the last interglacial period, about 125,000 years ago, sea levels reached 6–9 m higher than today, much of this attributable to an Antarctic meltwater source, at global temperatures only 1–2 °C warmer than those of today. The planet is on course for a temperature rise exceeding this value, so we can expect similar icesheet instability and retreat to that described by Weber et al. in the future.

Kultur

FREEMAN 2014

Scott Freeman, Sarah L. Eddy, Miles McDonough, Michelle K. Smith, Nnadozie Okoroafor, Hannah Jordt & Mary Pat Wenderoth, *Active learning increases student performance in science, engineering, and mathematics*. [PNAS 111 \(2014\), 8410–8415](#).

pnas111-08410-Supplement1.docx, pnas111-08410-Supplement2.docx, pnas111-08410-Supplement3.docx, pnas111-08410-Supplement4.docx

To test the hypothesis that lecturing maximizes learning and course performance, we metaanalyzed 225 studies that reported data on examination scores or failure rates when comparing student performance in undergraduate science, technology, engineering, and mathematics (STEM) courses under traditional lecturing versus active learning. The effect sizes indicate that on average, student performance on examinations and concept inventories increased by 0.47 SDs under active learning ($n = 158$ studies), and that the odds ratio for failing was 1.95 under traditional lecturing ($n = 67$ studies). These results indicate that average examination scores improved by about 6% in active learning sections, and that students in classes with traditional lecturing were 1.5 times more likely to fail than were students in classes with active learning. Heterogeneity analyses indicated that both results hold across the STEM disciplines, that active learning increases scores on concept inventories more than on course examinations, and that active learning appears effective across all class sizes—although the greatest effects are in small ($n \leq 50$) classes. Trim and fill analyses and fail-safe n calculations suggest that the results are not due to publication bias. The results also appear robust to variation in the methodological rigor of the included studies, based on the quality of controls over student quality and instructor identity. This is the largest and most comprehensive metaanalysis of undergraduate STEM education published to date. The results raise questions about the continued use of traditional lecturing as a control in research studies, and support active learning as the preferred, empirically validated teaching practice in regular classrooms.

constructivism | undergraduate education | evidence-based teaching | scientific teaching

HSIN 2014

Amy Hsin & Yu Xie, *Explaining Asian Americans' academic advantage over whites*. [PNAS 111 \(2014\), 8416–8421](#).

The superior academic achievement of Asian Americans is a well-documented phenomenon that lacks a widely accepted explanation. Asian Americans' advantage in this respect has been attributed to three groups of factors: (i) socio-demographic characteristics, (ii) cognitive ability, and (iii) academic effort as measured by characteristics such as attentiveness and work ethic. We combine data from two nationally representative cohort longitudinal surveys to compare Asian-American and white students in their educational trajectories from kindergarten through high school. We find that the Asian-American educational advantage is attributable mainly to Asian students exerting greater academic effort and not to advantages in tested cognitive abilities or socio-demographics. We test explanations for the Asian–white gap in academic effort and find that the gap can be further attributed to (i) cultural differences in beliefs regarding the connection between effort and achievement and (ii) immigration status. Finally, we highlight the potential psychological and social costs associated with Asian-American achievement success.

noncognitive skills | model minority | Asian advantage

WIEMAN 2014

Carl E. Wieman, *Large-scale comparison of science teaching methods sends clear message*. [PNAS 111 \(2014\), 8319–8320](#).

They found the average failure rate decreased from 34% with traditional lecturing to 22% with active learning, whereas performance on identical or comparable tests increased by nearly half the SD of the test scores (an effect size of 0.47).

These benefits of active learning were consistent across all of the different STEM disciplines.

ZHOU 2014

Min Zhou & Jennifer Lee, *Assessing what is cultural about Asian Americans' academic advantage*. *PNAS* **111** (2014), 8321–8322.

Because Chinese and Vietnamese Americans use high-achieving coethnics (rather than native-born whites or the average coethnic) as their reference group, those who do not meet its strict tenets feel like ethnic outliers or failures and, as a result, they distance themselves from coethnics and from their ethnic identities. This finding has broader implications for theories of assimilation; today's non-white second generation do not turn to native-born whites as their reference group or their model for success.

Neolithikum

FERNÁNDEZ 2014

Eva Fernández et al., *Ancient DNA Analysis of 8000 B.C. Near Eastern Farmers Supports an Early Neolithic Pioneer Maritime Colonization of Mainland Europe through Cyprus and the Aegean Islands*. *PLoS Genetics* **10** (2014), e1004401. DOI:10.1371/journal.pgen.1004401.

Eva Fernández, Alejandro Pérez-Pérez, Cristina Gamba, Eva Prats, Pedro Cuesta, Josep Anfruns, Miquel Molist, Eduardo Arroyo-Pardo & Daniel Turbón

The genetic impact associated to the Neolithic spread in Europe has been widely debated over the last 20 years. Within this context, ancient DNA studies have provided a more reliable picture by directly analyzing the protagonist populations at different regions in Europe. However, the lack of available data from the original Near Eastern farmers has limited the achieved conclusions, preventing the formulation of continental models of Neolithic expansion. Here we address this issue by presenting mitochondrial DNA data of the original Near-Eastern Neolithic communities with the aim of providing the adequate background for the interpretation of Neolithic genetic data from European samples. Sixty-three skeletons from the Pre Pottery Neolithic B (PPNB) sites of Tell Halula, Tell Ramad and Dja'de El Mughara dating between 8,700–6,600 cal. B.C. were analyzed, and 15 validated mitochondrial DNA profiles were recovered. In order to estimate the demographic contribution of the first farmers to both Central European and Western Mediterranean Neolithic cultures, haplotype and haplogroup diversities in the PPNB sample were compared using phylogeographic and population genetic analyses to available ancient DNA data from human remains belonging to the Linearbandkeramik-Alföldi Vonaldiszes Kera'mia and Cardial/Epicardial cultures. We also searched for possible signatures of the original Neolithic expansion over the modern Near Eastern and South European genetic pools, and tried to infer possible routes of expansion by comparing the obtained results to a database of 60 modern populations from both regions. Comparisons performed among the 3 ancient datasets allowed us to identify K and N-derived mitochondrial DNA haplogroups as potential markers of the Neolithic expansion, whose genetic signature would have reached both the Iberian coasts and the Central European plain. Moreover, the observed genetic affinities between the PPNB samples and the modern populations of Cyprus and Crete seem to suggest that the Neolithic was first introduced into Europe through pioneer seafaring colonization.

STINER 2014

Mary C. Stiner et al., *A forager–herder trade-off, from broad-spectrum hunting to sheep management at Aşıklı Höyük, Turkey*. [PNAS 111 \(2014\), 8404–8409](#).

Mary C. Stiner, Hylke Buitenhuis, GüneşDuru, Steven L. Kuhn, Susan M. Mentzer, Natalie D. Munro, Nadja Pöllath, Jay Quade, Georgia Tsartsidou & Mihriban Özbaşaran

Aşıklı Höyük is the earliest known preceramic Neolithic mound site in Central Anatolia. The oldest Levels, 4 and 5, spanning 8,200 to approximately 9,000 cal B.C., associate with round-house architecture and arguably represent the birth of the Pre-Pottery Neolithic in the region. Results from upper Level 4, reported here, indicate a broad meat diet that consisted of diverse wild ungulate and small animal species. The meat diet shifted gradually over just a few centuries to an exceptional emphasis on caprines (mainly sheep). Age-sex distributions of the caprines in upper Level 4 indicate selective manipulation by humans by or before 8,200 cal B.C. Primary dung accumulations between the structures demonstrate that ruminants were held captive inside the settlement at this time. Taken together, the zooarchaeological and geoarchaeological evidence demonstrate an emergent process of caprine management that was highly experimental in nature and oriented to quick returns. Stabling was one of the early mechanisms of caprine population isolation, a precondition to domestication.

caprine domestication | zooarchaeology | stabling deposits