References

Aktuell

CALABRESE 2019

Edward J. Calabrese, *Muller's Nobel Prize data, Getting the dose wrong and its significance.* Environmental Research (2019), preprint, 1–3. DOI:10.1016/j.envres.2019.108528.

NatClimCh02-539-Supplement.pdf

This paper evaluates the significant historical paper of Muller and Mott-Smith (1930), which successfully disputed the proposal of Olson and Lewis (1928) that background ionizing radiation is the driving mechanism of evolution. While the present analysis supports the general conclusion that background radiation is not a quantifiable factor affecting evolution, the paper reveals methodological errors and questionable conclusions in the Muller and Mott-Smith (1930) paper, which may have impacted the acceptance of the linear non-threshold (LNT) model. Most importantly, this paper reveals that in Muller's (1927) Nobel Prize research he used a treatment exposure (total dose) that was 95 million-fold greater than the average background exposure, a value far greater than the 200,000 fold reported by Muller and Mott-Smith (1930). Such a large exposure rate discrepancy may be historically important as it may have led to the over-reliance on Muller's research in support of the derivation and use of the LNT single-hit model.

Keywords: Mutation | Linear non-threshold (LNT) | Hermann Muller | Background radiation | Cancer risk assessment

O'CONNELL 2019

Tamsin C. O'Connell et al., *Living and dying at the Portus Romae.* Antiquity **93** (2019), 719–734.

Antiquity093-0719-Supplement.pdf

Tamsin C. O'Connell, Rachel M. Ballantyne, Sheila Hamilton-Dyer, Evi Margaritis, Samantha Oxford, Walter Pantano, Martin Millett & Simon J. Keay

The 'Portus Project' investigates the social and economic contexts of the maritime port of Imperial Rome. This article presents the results of analysis of plant, animal and human remains from the site, and evaluates their significance for the reconstruction of the diets and geographic origins of its inhabitants between the second and sixth centuries AD. Integrating this evidence with other material from the recent excavations, including ceramic data, the authors identify clear diachronic shifts in imported foods and diet that relate to the commercial and political changes following the breakdown of Roman control of the Mediterranean.

Keywords: Rome | Portus | diet | isotopic analysis | archaeobotany

FLETCHER 2019

Sara E. Mikaloff Fletcher & Hinrich Schaefer, *Rising methane: A new climate challenge.* science **364** (2019), 932–933.

The amount of the greenhouse gas methane in Earth's atmosphere is rising rapidly.

The 13C/12C ratio in CH4 depends on the sources of the CH4 emissions. Release from biogenic sources (such as wetlands and agriculture) reduces the pro-

portion of 13C in atmospheric CH4, whereas fossil emissions slightly increase this proportion and biomass burning emissions increase it strongly.

Hendriks 2019

Laura Hendriks et al., *Uncovering modern paint forgeries by radiocarbon dating.* PNAS **116** (2019), 13210–13214.

pnas116-13210-Supplement.pdf

Laura Hendriks, Irka Hajdas, Ester S. B. Ferreira, Nadim C. Scherrer, Stefan Zumbühl, Gregory D. Smith, Caroline Welte, Lukas Wacker, Hans-Arno Synal & Detlef Günther

Art forgeries have existed since antiquity, but with the recent rapidly expanding commercialization of art, the approach to art authentication has demanded increasingly sophisticated detection schemes. So far, the most conclusive criterion in the field of counterfeit detection is the scientific proof of material anachronisms. The establishment of the earliest possible date of realization of a painting, called the terminus post quem, is based on the comparison of materials present in an artwork with information on their earliest date of discovery or production. This approach provides relative age information only and thus may fail in proving a forgery. Radiocarbon (14C) dating is an attractive alternative, as it delivers absolute ages with a definite time frame for the materials used. The method, however, is invasive and in its early days required sampling tens of grams of material. With the advent of accelerator mass spectrometry (AMS) and further development of gas ion sources (GIS), a reduction of sample size down to microgram amounts of carbon became possible, opening the possibility to date individual paint layers in artworks. Here we discuss two microsamples taken from an artwork carrying the date of 1866: a canvas fiber and a paint chip (<200 µg), each delivering a different radiocarbon response. This discrepancy uncovers the specific strategy of the forger: Dating of the organic binder delivers clear evidence of a post-1950 creation on re-used canvas. This microscale 14C analysis technique is a powerful method to reveal technically complex forgery cases with hard facts at a minimal sampling impact.

Keywords: radiocarbon dating | forgery | microsample | organic binder

Significance: Can radiocarbon (14C) dating uncover modern forgeries? Radiocarbon dating has the potential to answer the question of when an artwork was created, by providing a time frame of the material used. In this study we show that with two microsamples (<500 µg), from both the canvas and the paint layer itself, a modern forgery could be identified. The canvas dating is consistent with the purported attribution to the 19th century; however, the 14C age gained on the paint contradicts this as it offers clear evidence for a post-1950 creation. Thus the additional dating of the paint reveals the forger's scheme where the repainting of an appropriately aged canvas was used to convey the illusion of authenticity.

Hodgins 2019

Gregory W. L. Hodgins, *Identifying art forgeries by radiocarbon dating microgram quantities of artists' paints.* PNAS **116** (2019), 13158–13160.

The unwitting inclusion of a marker pigment in a work of art purporting to be from a time before it was available has been the downfall of many a forgery. However, such giveaways can be avoided by scrupulous use of historically correct artists' materials. A few suppliers occupy this very niche.

For the present study, the gas ion source AMS system used at Eidgenossische Technische Hochschule Zurich measured 20 µg of carbon, another order-of-magnitude sample-size reduction. Raw sample sizes are larger because paints have

low carbon contents. Nevertheless, the required 100- to 200-µg sample size substantially increases the number of works that can be ethically sampled.

Hoskins 2019

Sally G. Hoskins, *Teaching ingenuity.* science **364** (2019), 1102.

After a fulfilling career as a college biology professor, I'm retiring. "What will you miss most?" a colleague asked. My answer was something that, 30 years ago, I would never have expected myself to say: "I will miss the creativity of teaching." When I was a new faculty member, I considered teaching a necessary evil that took me away from the lab bench. I wanted to focus on research, guiding graduate students in what I hoped would be groundbreaking studies on nerve growth. I believed imagination lived not in the classroom, but in the laboratory—to be used for inventing techniques, designing experiments, and interpreting data. But when my life took an unexpected turn, I realized how wrong I had been.

Isayev 2019

Olexandr Isayev, *Text mining facilitates materials discovery.* nature **571** (2019), 42–43.

Computer algorithms can be used to analyse text to find semantic relationships between words without human input. This method has now been adopted to identify unreported properties of materials in scientific papers.

Ker 2019

Dai Fei Elmer Ker & Yunzhi Peter Yang, *Ruminants: Evolutionary past and future impact.* science **364** (2019), 1130–1131.

The genomes of ruminant animals promise advances for agriculture, conservation, and biomedicine.

Chen et al.'s dataset also provides a window to the past. Using methods to infer ruminant demographics during the Pleistocene ($\approx$2.58 million to 12 thousand years ago), they found that major population declines coincided with increased human (effective) population size. This implies that humans may have contributed to ruminant declines during the late Pleistocene and holds important conservation lessons.

Keuschnigg 2019

Marc Keuschnigg, *Scaling trajectories of cities.* PNAS **116** (2019), 13759–13761.

Urban scaling research finds that agglomeration effects—the higher-than-expected outputs of larger cities—follow robust "superlinear" scaling relations in cross-sectional data. But the paradigm has predictive ambitions involving the dynamic scaling of individual cities over many time points and expects parallel superlinear growth trajectories as cities' populations grow. This prediction has not yet been rigorously tested. I use geocoded microdata to approximate the city-size effect on per capita wage in 73 Swedish labor market areas for 1990–2012. The data support a superlinear scaling regime for all Swedish agglomerations. Echoing the rich-get-richer process on the system level, however, trajectories of superlinear growth are highly robust only for cities assuming dominant positions in the urban hierarchy.

Keywords: dynamics of cities | spatial inequality | urban scaling | science of cities

Kuzawa 2019

Christopher W. Kuzawa & Clancy Blair, *A hypothesis linking the energy demand of the brain to obesity risk.* PNAS **116** (2019), 13266–13275.

The causes of obesity are complex and multifactorial. We propose that one unconsidered but likely important factor is the energetic demand of brain development, which could constrain energy available for body growth and other functions, including fat deposition. Humans are leanest during early childhood and regain body fat in later childhood. Children reaching this adiposity rebound (AR) early are at risk for adult obesity. In aggregate data, the developing brain consumes a lifetime peak of 66 % of resting energy expenditure in the years preceding the AR, and brain energy use is inversely related to body weight gain from infancy until puberty. Building on this finding, we hypothesize that individual variation in childhood brain energy expenditure will help explain variation in the timing of the AR and subsequent obesity risk. The idea that brain energetics constrain fat deposition is consistent with evidence that genes that elevate BMI are expressed in the brain and mediate a trade-off between the size of brain structures and BMI. Variability in energy expended on brain development and function could also help explain widely documented inverse relationships between the BMI and cognitive abilities. We estimate that variability in brain energetics could explain the weight differential separating children at the 50th and 70th BMI-for-age centiles immediately before the AR. Our model proposes a role for brain energetics as a driver of variation within a population's BMI distribution and suggests that educational interventions that boost global brain energy use during childhood could help reduce the burden of obesity.

Keywords: body composition | cerebral metabolic rate | childhood | neurology | energetics

Significance: We propose that variation in brain energy expenditure during childhood is an unexplored but important influence on obesity risk. This hypothesis is supported by evidence that the energy required by the developing brain decreases in later childhood as the rate of body weight gain is increasing. The hypothesis is further supported by findings of genetic and brain imaging research indicating a trade-off between the body mass index (BMI) and the volume of cortical and subcortical structures, and inverse associations between BMI and energetically costly executive cognitive functions. Efforts to quantify variability in brain energy use across children could inspire new educational strategies that increase brain energy demands and thereby reduce obesity risk.

Lee 2019

Joung-Hun Lee, Yoh Iwasa, Ulf Dieckmann & Karl Sigmund, *Social evolution leads to persistent corruption.* PNAS **116** (2019), 13276–13281.

pnas116-13276-Supplement.pdf

Cooperation can be sustained by institutions that punish free-riders. Such institutions, however, tend to be subverted by corruption if they are not closely watched. Monitoring can uphold the enforcement of binding agreements ensuring cooperation, but this usually comes at a price. The temptation to skip monitoring and take the institution's integrity for granted leads to outbreaks of corruption and the breakdown of cooperation. We model the corresponding mechanism by means of evolutionary game theory, using analytical Methods and numerical simulations, and find that it leads to sustained or damped oscillations. The results confirm the view that corruption is endemic and transparency a major factor in reducing it.

Significance: Corruption is widely perceived as a major problem. Bribery of judicial institutions undermines the trust needed for joint efforts and economic investments. Transparency can reestablish trust, but at the cost of constant supervision of the institutions. Reducing such vigilance is advantageous in the short term. In the long run, it leads to more cheating and less cooperation. This can create cyclic outbursts of corruption or maintain corruption at a stable level.

Leslie 2019

Mitch Leslie, *The Mismeasure of Hands?* science **364** (2019), 923–925.

Some researchers say a simple ratio of finger lengths can predict personality and health. Others say that's wishful thinking.

Lin 2019

Zeshan Lin et al., *Biological adaptations in the Arctic cervid, the reindeer (Rangifer tarandus).* science **364** (2019), 1154. DOI:10.1126/science.aav6312.

s364-1154-Supplement.pdf

Zeshan Lin, Lei Chen, Xianqing Chen, Yingbin Zhong, Yue Yang, Wenhao Xia, Chang Liu, Wenbo Zhu, Han Wang, Biyao Yan, Yifeng Yang, Xing Liu, Kjersti Sternang Kvie, Knut Hakon Roed, Kun Wang, Wuhan Xiao, Haijun Wei, Guangyu Li, Rasmus Heller, M. Thomas P. Gilbert, Qiang Qiu, Wen Wang & Zhipeng Li

The reindeer is an Arctic species that exhibits distinctive biological characteristics, for which the underlying genetic basis remains largely unknown. We compared the genomes of reindeer against those of other ruminants and nonruminant mammals to reveal the genetic basis of light arrhythmicity, high vitamin D metabolic efficiency, the antler growth trait of females, and docility. We validate that two reindeer vitamin D metabolic genes (CYP27B1 and POR) show signs of positive selection and exhibit higher catalytic activity than those of other ruminants. A mutation upstream of the reindeer CCND1 gene endows an extra functional binding motif of the androgen receptor and thereby may result in female antlers. Furthermore, a mutation (proline-1172—threonine) in reindeer PER2 results in loss of binding ability with CRY1, which may explain circadian arrhythmicity in reindeer.

Mosovsky 2019

Kara Mosovsky, *Time to branch out.* science **364** (2019), 1002.

It seemed risky to try something new midway to my tenure review. Since I started my dream job as an assistant professor at a small liberal arts college, the gist of the advice I heard and read was to stick with what I know, and then I could branch out after tenure. I didn't necessarily disagree—it made sense that I could contribute most in my formal area of expertise. But as I chugged along on my research using the same old tried-and-true benchtop assays, my excitement about the work was fading. I needed something new to inspire me again.

Resende 2019

Pedro Resende, *Learning how to pivot.* science **364** (2019), 1202.

After 5 years as a postdoc and co–principal investigator in an academic research lab, I am about to start my own company. It's a big step, and I'm excited—and a little anxious—about how it will work out. I am very aware that things might not go the way I envision. But pivoting does not feel as intimidating as it could—because I've done it before, starting early in my career. In doing so, I've learned

that career changes should not be feared. Instead, they are valuable opportunities for professional development and growth.

O'Shea 2019

John M. O'Shea et al., *Social formation and collapse in the Tisza-Maros region, Dating the Maros Group and its Late Bronze Age successors.* Antiquity **93** (2019), 604–623.

John M. O'Shea, Györgyi Parditka, Amy Nicodemus, Kristian Kristiansen, Karl-Göran Sjögren, László Paja, György Pál. & Lidija Milašinović

Radiocarbon dating is paramount for chronologically defining the rise of polities in the Middle Bronze Age Carpathian Basin. This article presents a suite of new radiocarbon dates obtained from sites associated with the Early and Middle Bronze Age Maros Group, and its Late Bronze Age successors in the Tisza-Maros region of south-east Hungary, western Romania and northern Serbia. The results indicate tight chronological synchronisation of Middle Bronze Age settlements and cemeteries in the Maros region, while confirming the accuracy of ceramic-based relative chronology for the Szöreg cemetery.

Keywords: Hungary | Serbia | Romania | Bronze Age | Maros Group | Tumulus Culture

Steig 2019

Eric J. Steig, *How fast will the Antarctic ice sheet retreat?* science **364** (2019), 936–937.

Feedbacks between glacier retreat and the solid Earth may slow ice loss from Antarctica.

Tshitoyan 2019

Vahe Tshitoyan et al., *Unsupervised word embeddings capture latent knowledge from materials science literature.* nature **571** (2019), 95–98.

n571-0095-Supplement.pdf

Vahe Tshitoyan, John Dagdelen, Leigh Weston, Alexander Dunn, Ziqin Rong, Olga Kononova, Kristin A. Persson, Gerbrand Ceder,2 & Anubhav Jain

The overwhelming majority of scientific knowledge is published as text, which is difficult to analyse by either traditional statistical analysis or modern machine learning methods. By contrast, the main source of machine-interpretable data for the materials research community has come from structured property databases1,2, which encompass only a small fraction of the knowledge present in the research literature. Beyond property values, publications contain valuable knowledge regarding the connections and relationships between data items as interpreted by the authors. To improve the identification and use of this knowledge, several studies have focused on the retrieval of information from scientific literature using supervised natural language processing3–10, which requires large hand-labelled datasets for training. Here we show that materials science knowledge present in the published literature can be efficiently encoded as information-dense word embeddings11–13 (vector representations of words) without human labelling or supervision. Without any explicit insertion of chemical knowledge, these embeddings capture complex materials science concepts such as the underlying structure of the periodic table and structure– property relationships in materials. Furthermore, we demonstrate that an unsupervised method can recommend materials for functional applications several years before their discovery. This suggests that latent knowledge regarding future discoveries is to a large extent embedded in past publications. Our findings highlight the possibility of extracting knowledge and relationships from the

massive body of scientific literature in a collective manner, and point towards a generalized approach to the mining of scientific literature.

Wang 2019

Yu Wang et al., *Genetic basis of ruminant headgear and rapid antler regeneration.* science **364** (2019), 1153. DOI:10.1126/science.aav6335.

s364-1153-Supplement1.pdf, s364-1153-Supplement2.xlsx

Yu Wang, Chenzhou Zhang, Nini Wang, Zhipeng Li, Rasmus Heller, Rong Liu, Yue Zhao, Jiangang Han, Xiangyu Pan, Zhuqing Zheng, Xueqin Dai, Ceshi Chen, Mingle Dou, Shujun Peng, Xianqing Chen, Jing Liu, Ming Li, Kun Wang, Chang Liu, Zeshan Lin, Lei Chen, Fei Hao, Wenbo Zhu, Chengchuang Song, Chen Zhao, Chengli Zheng, Jianming Wang, Shengwei Hu, Cunyuan Li, Hui Yang, Lin Jiang, Guangyu Li, Mingjun Liu, Tad S. Sonstegard, Guojie Zhang, Yu Jiang, Wen Wang & Qiang Qiu

Ruminants are the only extant mammalian group possessing bony (osseous) headgear. We obtained 221 transcriptomes from bovids and cervids and sequenced three genomes representing the only two pecoran lineages that convergently lack headgear. Comparative analyses reveal that bovid horns and cervid antlers share similar gene expression profiles and a common cellular basis developed from neural crest stem cells. The rapid regenerative properties of antler tissue involve exploitation of oncogenetic pathways, and at the same time some tumor suppressor genes are under strong selection in deer. These Results provide insights into the evolutionary origin of ruminant headgear as well as mammalian organ regeneration and oncogenesis.

Amerika

Magnani 2019

Matthew Magnani et al., *Evaluating claims for an early peopling of the Americas*, *Experimental design and the Cerutti Mastodon site.* Antiquity **93** (2019), 789–795.

Antiquity093-0789-Comment1.pdf, Antiquity093-0789-Reply1.pdf, Antiquity093-0789-Comment2.pdf, Antiquity093-0789-Supplement1.pdf

Matthew Magnani, Dalyn Grindle, Sarah Loomis, Alexander M. Kim, Vera Egbers, Jon Clindaniel, Alexis Hartford, Eric Johnson, Sadie Weber & Wade Campbell

In a 2017 article, Holen and colleagues reported evidence for a 130 000-year-old archaeological site in California. Acceptance of the site would overturn current understanding of global human migrations. The authors here consider Holen et al.'s conclusions through critical evaluation of their replicative experiments. Drawing on best practice in experimental archaeology, and paying particular attention to the authors' chain of inference, Magnani et al. suggest that to argue convincingly for an early human presence at the Cerutti Mastodon site, Holen et al. must improve their analogical foundations, test alternative hypotheses, increase experimental control and quantify their results.

Keywords: North America | Cerutti Mastodon | experimental archaeology | human migration

Anthropologie

Zɪʀᴋʟᴇ 2019

Dexter Zirkle,b & C. Owen Lovejoy, *The hominid ilium is shaped by a synapomorphic growth mechanism that is unique within primates.* PNAS **116** (2019), 13915–13920.

pnas116-13915-Supplement.pdf

The human ilium is significantly shorter and broader than those of all other primates. In addition, it exhibits an anterior inferior iliac spine (AIIS) that emerges via a secondary center of ossification, which is unique to hominids (i.e., all taxa related to the human clade following their phyletic separation from the African apes). Here, we track the ontogeny of human and other primate ossa coxae. The human pattern is unique, from anlage to adulthood, and fusion of its AIIS is the capstone event in a repositioning of the anterior gluteals that maximizes control of pelvic drop during upright walking. It is therefore a hominid synapomorphy that can be used to assess the presence and age of bipedal locomotion in extinct taxa.

Keywords: Ardipithecus | Australopithecus | hominin | bipedality | human origins

Significance: The human ilium is unusually short and broad compared with those of all other primates. Its specialized shape facilitates pelvic control during upright walking. Our ilium also exhibits a unique developmental feature: Its anterior inferior spine forms via a secondary center of ossification. We surveyed iliac development in a wide range of fetal to adult nonhuman primates, and found that such specialized anterior inferior spine formation is unique to humans and our known ancestors. Because this derived iliac structure facilitates upright walking, its presence serves as a direct indicator of the adoption of terrestrial bipedality in the fossil record and as an indicator of the minimum age of that adoption.

Bibel

Dʏᴍᴀ 2018

Oliver Dyma, *Messianische Erwartungen im Alten Testament.* In: Kᴀʀʟʜᴇɪɴᴢ Rᴜʜsᴛᴏʀꜰᴇʀ (Hrsg.), *Christologie.* UTB 4942 (Paderborn 2018), 15–68.

Je nach geschichtlicher Situation konnte die Grundidee, dass Gott seine Herrschaft mit der Hilfe eines Messias durchsetzen wird, ganz unterschiedlich zum Ausdruck gebracht werden. Dabei stehen sich innerweltliche Restaurationshofnungen und apokalyptische Endzeiterwartungen gegenüber. Man konnte sich den Messias mit göttlichen Zügen, als präexistente Gestalt, die im Endgericht die Feinde besiegt, vorstellen oder aber als ziemlich weltlichen Herrscher, der die Fremdherrscher in dieser Welt hier vertreibt. Auch wird die Herrschaft ganz unterschiedlich beschrieben, sei es militant: "mit eisernem Stab" oder eher friedlich mit dem Hauch der Lippen, der aber auch zum Untergang der Frevler führt. Oder der König reitet auf dem Esel ein und verkündet den Frieden, nachdem JHWH das Kriegsgerät schon beseitigt hat.

Die Perspektive der verschiedenen Konzeptionen ist jeweils Gerechtigkeit und Frieden in einer neuen Heilszeit, sei es für das Volk Israel, die Auserwählten des Volkes oder die dem Gericht Entronnenen.

Feldman 2019

Michal Feldman et al., *Ancient DNA sheds light on the genetic origins of early Iron Age Philistines.* Science Advances **5** (2019), eaax0061. DOI:10.1126/sciadv.aax0061.

SciAdv05-eaax0061-Supplement.pdf

Michal Feldman, Daniel M. Master, Raffaela A. Bianco, Marta Burri, Philipp W. Stockhammer, Alissa Mittnik, Adam J. Aja, Choongwon Jeong & Johannes Krause

The ancient Mediterranean port city of Ashkelon, identified as "Philistine" during the Iron Age, underwent a marked cultural change between the Late Bronze and the early Iron Age. It has been long debated whether this change was driven by a substantial movement of people, possibly linked to a larger migration of the so-called "Sea Peoples." Here, we report genome-wide data of 10 Bronze and Iron Age individuals from Ashkelon. We find that the early Iron Age population was genetically distinct due to a European-related admixture. This genetic signal is no longer detectible in the later Iron Age population. Our results support that a migration event occurred during the Bronze to Iron Age transition in Ashkelon but did not leave a long-lasting genetic signature.

Biologie

Chen 2019

Lei Chen et al., *Large-scale ruminant genome sequencing provides insights into their evolution and distinct traits.* science **364** (2019), 1152. DOI:10.1126/science.aav6202.

s364-1152-Supplement.pdf

Lei Chen, Qiang Qiu, Yu Jiang, Kun Wang, Zeshan Lin, Zhipeng Li, Faysal Bib, Yongzhi Yan, Jinhuan Wan, Wenhui Ni, Weiting S, Guichun Li, Qiye L, Weiwei F, Xiangyu Pa, Chang Li, Jie Yan, Chenzhou Zhan, Yuan Yi, Yu Wan, Yue Zha, Chen Zhan, Zhongkai Wan, Yanli Qi, Wei Li, Bao Wan, Yandong Re, Ru Zhan, Yan Zen, Rute R. da Fonsec, Bin We, Ran L, Wenting Wa, Ruoping Zha, Wenbo Zh, Yutao Wan, Shengchang Dua, Yun Ga, Yong E. Zhan, Chunyan Che, Christina Hvilso, Clinton W. Epp, Leona G. Chemnic, Yang Don, Siavash Mirara, Hans Redlef Siegismun, Oliver A. Ryde, M. Thomas P. Gilber, Harris A. Lewi, Guojie Zhang, Rasmus Heller & Wen Wang

The ruminants are one of the most successful mammalian lineages, exhibiting morphological and habitat diversity and containing several key livestock species.To better understand their evolution, we generated and analyzed de novo assembled genomes of 44 ruminant species, representing all six Ruminantia families. We used these genomes to create a timecalibrated phylogeny to resolve topological controversies, overcoming the challenges of incomplete lineage sorting. Population dynamic analyses show that population declines commenced between 100,000 and 50,000 years ago, which is concomitant with expansion in human populations. We also reveal genes and regulatory elements that possibly contribute to the evolution of the digestive system, cranial appendages, immune system, metabolism, body size, cursorial locomotion, and dentition of the ruminants.

Grabung

Hansen 2008

Leif Hansen, *Die Goldfunde und Trachtbeigaben des späthallstattzeitlichen Fürstengrabes von Eberdingen-Hochdorf (Kr. Ludwigsburg).*

Dissertation Universität Kiel (Kiel 2008).

Wendt 2018

Karl Peter Wendt, Jutta Meurers-Balke & Heinz-Werner Dämmer, *Bronze- und Eisenzeitliche Besiedlung des Inde-Mündungsgebietes (Projekt BeBI)*. In: Jürgen Richter (Hrsg.), *111 Jahre Prähistorische Archäologie in Köln.* Kölner Studien zur Prähistorischen Archäologie 9 (Rahden 2018), 250–257.

Die eisenzeitliche Nutzung des Indetals kann durch ein schema veranschaulicht werden (Abb. 7). die östliche talseite bot auf einer distanz von 1,5 km den siedlern der eisenzeit unterschiedliche Nutzungsmöglichkeiten: Fischereigründe und Viehweiden im tal, überflutungssichere siedlungsstandorte und Ackerflächen am hang des güldenbergs. ein intensiver Ackerbau auf den lössflächen wird durch die Bildung der mächtigen Auelehme in dieser Zeit bestätigt. In der folgenden römischen Periode wurde die Aue als Wirtschaftsraum nicht mehr als grünland genutzt, wie die wieder einsetzende Bewaldung anzeigt.

Die ergebnisse aller untersuchungen entwerfen das Bild einer differenzierten landwirtschaft. die speziellen standortfaktoren führten zur herausbildung eines speziellen, den landschaftlichen gegebenheiten angepassten Wirtschaftssystems. die im tal vorwiegend auf Viehwirtschaft basierende Nutzung unterscheidet sich signifikant von den eher durch Ackerbau geprägten Verhältnissen auf den lösshochflächen.

Das Projekt endete 2002, nicht jedoch die archäologischen untersuchungen, die im Indetal mit dem Projekt lANu (Beiträge zur urgeschichtlichen landschaftsnutzung im rheinischen Braunkohlenrevier) der universität zu Köln und dem rheinischen Amt für Bodendenkmalpflege fortgesetzt wurden und weitere wichtige erkenntnisse zur Besiedlung der talauen erbrachten (z.B. FIscheR et al. 2009; geIleNBRügge 2010).

Klima

Caves Rugenstein 2019

Jeremy K. Caves Rugenstein, Daniel E. Ibarra & Friedhelm von Blanckenburg, *Neogene cooling driven by land surface reactivity rather than increased weathering fluxes.* nature **571** (2019), 99–102.

n571-0099-Supplement1.xlsx, n571-0099-Supplement2.zip

The long-term cooling, decline in the partial pressure of carbon dioxide, and the establishment of permanent polar ice sheets during the Neogene period[1,2] have frequently been attributed to increased uplift and erosion of mountains and consequent increases in silicate weathering, which removes atmospheric carbon dioxide[3,4]. However, geological records of erosion rates are potentially subject to averaging biases[5,6], and the magnitude of the increase in weathering fluxes—and even its existence—remain debated[7–9]. Moreover, an increase in weathering scaled to the proposed erosional increase would have removed nearly all carbon from the atmosphere[10], which has led to suggestions of compensatory carbon fluxes[11–13] in order to preserve mass balance in the carbon cycle. Alternatively, an increase in land surface reactivity—resulting from greater fresh-mineral surface area or an increase in the supply of reactive minerals—rather than an increase in the weathering flux, has been proposed to reconcile these disparate views[8,9]. Here we use a parsimonious carbon cycle model that tracks two weathering-sensitive isotopic tracers (stable $^7Li/^6Li$ and cosmogenic $^{10}Be/^9Be$) to show that an increase in

land surface reactivity is necessary to simultaneously decrease atmospheric carbon dioxide, increase seawater 7Li/6Li and retain constant seawater 10Be/9Be over the past 16 million years. We find that the global silicate weathering flux remained constant, even as the global silicate weathering intensity—the fraction of the total denudation flux that is derived from silicate weathering—decreased, sustained by an increase in erosion. Long-term cooling during the Neogene thus reflects a change in the partitioning of denudation into weathering and erosion. Variable partitioning of denudation and consequent changes in silicate weathering intensity reconcile marine isotope and erosion records with the need to maintain mass balance in the carbon cycle and without requiring increases in the silicate weathering flux.

Zhou 2012

Liming Zhou, Yuhong Tian, Somnath Baidya Roy, Chris Thorncroft, Lance F. Bosart & Yuanlong Hu, *Impacts of wind farms on land surface temperature.* nature climate change **2** (2012), 539–543.

The wind industry in the United States has experienced a remarkably rapid expansion of capacity in recent years and this fast growth is expected to continue in the future1–3. While converting wind's kinetic energy into electricity, wind turbines modify surface–atmosphere exchanges and the transfer of energy, momentum, mass and moisture within the atmosphere4–6. These changes, if spatially large enough, may have noticeable impacts on local to regional weather and climate. Here we present observational evidence for such impacts based on analyses of satellite data for the period of 2003–2011 over a region in west-central Texas, where four of the world's largest wind farms are located7. Our results show a significant warming trend of up to 0:72 .C per decade, particularly at night-time, over wind farms relative to nearby non-wind-farm regions. We attribute this warming primarily to wind farms as its spatial pattern and magnitude couples very well with the geographic distribution of wind turbines.

Kultur

Lawler 2019

Andrew Lawler, *Mountain high, Oldest clear signs of pot use.* science **364** (2019), 1018.

THC levels in braziers show psychoactive marijuana use along ancient Silk Road.

Ren 2019

Meng Ren, Zihua Tang, Xinhua Wu, Robert Spengler, Hongen Jiang, Yimin Yang & Nicole Boivin, *The origins of cannabis smoking, Chemical residue evidence from the first millennium BCE in the Pamirs.* Science Advances **5** (2019), eaaw1391. DOI:10.1126/sciadv.aaw1391.

SciAdv05-eaaw1391-Supplement.pdf

Cannabis is one of the oldest cultivated plants in East Asia, grown for grain and fiber as well as for recreational, medical, and ritual purposes. It is one of the most widely used psychoactive drugs in the world today, but little is known about its early psychoactive use or when plants under cultivation evolved the phenotypical trait of increased specialized compound production. The archaeological evidence for ritualized consumption of cannabis is limited and contentious. Here, we present some of the earliest directly dated and scientifically verified evidence for ritual

cannabis smoking. This phytochemical analysis indicates that cannabis plants were burned in wooden braziers during mortuary ceremonies at the Jirzankal Cemetery (ca. 500 BCE) in the eastern Pamirs region. This suggests cannabis was smoked as part of ritual and/or religious activities in western China by at least 2500 years ago and that the cannabis plants produced high levels of psychoactive compounds.

Methoden

HILPERT 2018

Johanna Hilpert, Karl Peter Wendt & Andreas Zimmermann, *Das Projekt Rhein-Lucifs (Bevölkerungsdichte und Landnutzung vom Neolithikum bis zum Ende des präindustriellen Zeitalters), Landschaftsarchäologische Forschungen der Kölner Schule.* In: JÜRGEN RICHTER (Hrsg.), *111 Jahre Prähistorische Archäologie in Köln.* Kölner Studien zur Prähistorischen Archäologie 9 (Rahden 2018), 303–309.

Die Berechnung der landwirtschaftlichen nutzflächen als messbare größe des menschlichen einflusses ermöglicht eine gegenüberstellung mit Umweltveränderungen, die durch Pollendiagramme und sedimentologische Unter suchungen belegt sind. Das modell standardisiert den Wissensstand zu den verschiedenen Zeitscheiben und stellt so vergleichbarkeit her (Abb. 7). es lassen sich erkenntnisse in Bezug auf die durchschnittliche ernährung und den Flächenbedarf pro Person gewinnen (s. Abb. 5; 6). Daraus lassen sich aber auch Rückschlüsse auf den Ausnutzungsgrad der ökologischen tragfähigkeiten ableiten. Dies erlaubt u. a. das erkennen von Zusammenhängen zwischen Demografie, mobilität und Ausbreitungsmechanismen und bildet gleichzeitig eine grundlage zur öko nometrischen Untersuchung der entsprechenden Bevöl kerungen. so kann z.B. die Bedeutung verschiedener Wirtschaftssektoren in Relation zum subsistenzbereich bewertet werden (s. Kap. 21, in diesem Band).

JUNG 2006

Matthias Jung, *Zur Logik archäologischer Deutung – Interpretation, Modellbildung und Theorieentwicklung am Fallbeispiel des späthallstattzeitlichen ‚Fürstengrabes' von Eberdingen-Hochdorf, Kr. Ludwigsburg.* Universitätsforschungen zur prähistorischen Archäologie 138 (Bonn 2006).

JUNG 2007

Matthias Jung, *Kline oder Thron? Zu den Fragmenten eines griechischen Möbelpfostens aus dem späthallstattzeitlichen Fürstengrab Grafenbühl.* Germania **85** (2007), 95–107.

According to the reconstruction proposed by J. Fischer in 1990, which is based on a find from the Athens Kerameikos, the small bone, ivory and amber plates from the plundered central burial chamber of the Grafenbühl in Asperg (Ludwigsburg District) originally decorated the post of a Greek kline. This reconstruction, which is viewed as evidence for the assumption of an alignment of habits in the West Hallstatt circle with Mediterranean models in general and for the adoption of the culture of the symposion in particular, will be compared in this article with the alternative interpretation of the post as belonging to a piece of seating furniture: a throne.

Nach dem von J. Fischer 1990 vorgelegten, an einem Fund aus dem Athener Kerameikos orientierten Rekonstruktionsvorschlag für die Bein-, Elfenbein- und Bernsteinplättchen aus der beraubten zentralen Grabkammer des Grafenbühls in Asperg (Kr. Ludwigsburg) stammen diese von dem Belag des Pfostens einer griechischen Kline. Dieser Rekonstruktion, die als Beleg für die Annahme einer Angleichung der Lebensgewohnheiten im Westhallstattkreis an mediterrane Vorbilder im allgemeinen und einer Übernahme der Kultur des Symposions im besonderen gewertet wird, soll in dem Beitrag die alternative Deutung des Pfostens als zu einem Sitzmöbel, einem Thron, zugehörig gegenübergestellt werden.

Keywords: Asperg Grafenbühl, Kr. Ludwigsburg | Späthallstatt | Prunkgrab | Fernbeziehungen | Importe | Kline | Möbel

Magnani 2019

Matthew Magnani et al., *Experimental futures in archaeology.* Antiquity **93** (2019), 808–810.

Matthew Magnani, Dalyn Grindle, Sarah Loomis, Alexander M. Kim, Vera Egbers, Jon Clindaniel, Alexis Hartford, Eric Johnson, Sadie Weber & Wade Campbell

This discussion might sound axiomatic or commonsensical, but we have encountered archaeologists who think that the mere act of 'busting rocks' or using a stone tool to butcher an animal constitutes publishable research. This may have been the case at one time in the same way that the act of dissecting a mollusk would have resulted in a published biology paper 150 years ago (Eren et al. 2016: 108).

Neolithikum

Ledger 2019

Marissa L. Ledger et al., *Parasite infection at the early farming community of Çatalhöyük.* Antiquity **93** (2019), 573–587.

Marissa L. Ledger, Evilena Anastasiou, Lisa-Marie Shillito, Helen Mackay, Ian D. Bull, Scott D. Haddow, Christopher J. Knüsel & Piers D. Mitchell

The early village at Çatalhöyük (7100–6150 BC) provides important evidence for the Neolithic and Chalcolithic people of central Anatolia. This article reports on the use of lipid biomarker analysis to identify human coprolites from midden deposits, and microscopy to analyse these coprolites and soil samples from human burials. Whipworm (Trichuris trichiura) eggs are identified in two coprolites, but the pelvic soil samples are negative for parasites. Çatalhöyük is one of the earliest Eurasian sites to undergo palaeoparasitological analysis to date. The results inform how intestinal parasitic infection changed as humans modified their subsistence strategies from hunting and gathering to settled farming.

Keywords: Anatolia | Çatalhöyük | Neolithic | palaeoparasitology | coprolite

Milner 2019

George R. Milner, *Early agriculture's toll on human health.* PNAS **116** (2019), 13721–13723.

It is, of course, by necessity that bioarchaeologists focus their attention on skeletons. However, skeletons, a mortality sample, are not really what are of interest. Instead, one wants to understand the characteristics of living people, the communities that might be visited if one could somehow be transported back in time. The difficulty is essentially a sampling issue. People who died at each age are a

biased sample of all who were once alive at that particular age. The skeletons examined tend to be from individuals who suffered from diseases or malnutrition, or who took part in hazardous activities. That bias makes the transition from counts of skeletal lesions in a mortality sample to the characterization of a living population an exceedingly difficult problem, although progress is being made to resolve this issue.

We really do not know what took place that favored overall population growth once agricultural economies were established, even though many people were ill or disabled for lengthy periods before they died. Perhaps having sick people around was not as bad as might be imagined if they could still contribute to the community's welfare, and their lives were not much shorter than other villagers. Or maybe these people could be supported for long periods, at least during good times, by sedentary groups that had the capacity to produce and store food surpluses. All that can be said with certainty is that the situation was far more complicated, and at this point unknown, than the rather simplistic stepwise decline-in-health model would have us believe.

Ostasien

Qin 2019

Zhen Qin, Michael Storozum, Hao Zhao, Haiwang Liu, Kui Fu & Tristram R. Kidder, *Cereals, soils and iron at Sanyangzhuang, Western Han agricultural production in the Central Plains.* Antiquity **93** (2019), 685–701.

Antiquity093-0685-Supplement.pdf

Archaeological research on food-production systems has focused heavily on the origins of agriculture and animal domestication; the agricultural practices of early states are comparatively less well understood. This article explores archaeological evidence for crop cultivation, field-management practices and the use of farming implements at the Western Han (202 BC–AD 8) village of Sanyangzhuang in Henan Province, China. The authors analyse the implications of these practices for the newly developed smallholder mode of production. By combining diverse strands of evidence, this investigation provides new insights into the status of agricultural production in the Central Plains during the Western Han Dynasty.

Keywords: China | Sanyangzhuang,Western Han agriculture | smallholder | micromorphology

Politik

Starr 2019

Douglas Starr, *The Confession.* science **364** (2019), 1022–1026.

A psychologist has shown how police questioning can get innocent people to condemn themselves.

He showed the videos to college students and police. Neither group did particularly well at truth detection (the average person is right about half the time), but the students performed better than the police. Yet the police felt more certain about their conclusions. "That's a bad combination," Kassin says. "Their training makes them less accurate and more confident at the same time."

After his confession, the police disregarded all other evidence. Neighbors who offered alibis for Laughman were told they must be mistaken. His blood was type

B, but the only blood at the crime scene was type A. So the forensic expert proposed a novel theory: that bacterial degradation could have changed the blood type from B to A. Laughman spent 16 years in prison until DNA evidence finally cleared him. (Kassin later testified when Laughman sued the state.)

Story or Book

van Driel 2019

Martine van Driel, *Because Internet*. science **364** (2019), 929.

In her new book, Because Internet, Gretchen McCulloch divides inhabitants of the internet into five groups, arguing that "[y]our experience of the internet and the language therein is shaped by who you were and who else was around at the time you joined."

Because Internet: Understanding the New Rules of Language, Gretchen McCulloch, Riverhead Books, 2019. 336 pp.

Although it probably will not provide any novel insights for new media linguists, the breadth of topics covered—from conversation analysis to meme culture to the development of texting as we now know it—makes this book useful, engaging, and enjoyable.

Marlin 2019

Bianca Jones Marlin, *Fall*. science **364** (2019), 931.

Fall; or, Dodge in Hell, Neal Stephenson, William Morrow, 2019. 890 pp.

But Dodge's quest to create a more perfect life after death is challenged by the arrival of competing tech guru Elmo Shepherd, who seeks to impose his own version of eternity on the afterlife. Shepherd enters Bitworld with superior programming algorithms, acquired and refined after Dodge's death. He trades Dodge's lifelike renderings of uploaded souls for winged avatars, enslaved by his new algorithm. Dodge and his host of early Bitworld settlers retreat to an alternate plane described as the "lake of fire," waiting for an opportunity to reestablish their rule.

Eventually, Stevenson introduces the birth of new souls that are native to Bitworld, evoking a central question: Whence comes life and afterlife? Meatspace clientele struggle against the children of Bitworld for dwindling virtual resources. The children are faced with a moral conundrum, facing the prospect that their reality is filtered by the elite ruling class Shepherd has installed.