Liste erstellt am 2019-07-26

References

Afrika

Prendergast 2019

Mary E. Prendergast, Mark Lipson, Elizabeth A. Sawchuk & David Reich et al., *Ancient DNA reveals a multistep spread of the first herders into sub-Saharan Africa*. science **365** (2019), 44.

s365-0044-Supplement1.pdf, s365-0044-Supplement2.xlsx, s365-0044-Supplement3.gz

Mary E. Prendergast, Mark Lipson, Elizabeth A. Sawchuk, Iñigo Olalde, Christine A. Ogola, Nadin Rohland, Kendra A. Sirak, Nicole Adamski, Rebecca Bernardos, Nasreen Broomandkhoshbacht, Kimberly Callan, Brendan J. Culleton, Laurie Eccles, Thomas K. Harper, Ann Marie Lawson, Matthew Mah, Jonas Oppenheimer, Kristin Stewardson, Fatma Zalzala, Stanley H. Ambrose, George Ayodo, Henry Louis Gates Jr., Agness O. Gidna, Maggie Katongo, Amandus Kwekason, Audax Z. P. Mabulla, George S. Mudenda, Emmanuel K. Ndiema, Charles Nelson, Peter Robertshaw, Douglas J. Kennett, Fredrick K. Manthi & David Reich

How food production first entered eastern Africa ≈5000 years ago and the extent to which people moved with livestock is unclear. We present genome-wide data from 41 individuals associated with Later Stone Age, Pastoral Neolithic (PN), and Iron Age contexts in what are now Kenya and Tanzania to examine the genetic impacts of the spreads of herding and farming. Our results support a multiphase model in which admixture between northeastern African–related peoples and eastern African foragers formed multiple pastoralist groups, including a genetically homogeneous PN cluster. Additional admixture with northeastern and western African–related groups occurred by the Iron Age.These findings support several movements of food producers while rejecting models of minimal admixture with foragers and of genetic differentiation between makers of distinct PN artifacts.

Verdugo 2019

Marta Pereira Verdugo, Victoria E. Mullin, Amelie Scheu, Matthew D. Teasdale & Daniel G. Bradley et al., *Ancient cattle genomics, origins, and rapid turnover in the Fertile Crescent*. science **365** (2019), 173–176.

s365-0173-Supplement.pdf

Marta Pereira Verdugo, Victoria E. Mullin, Amelie Scheu, Valeria Mattiangeli, Kevin G. Daly, Pierpaolo Maisano Delser, Andrew J. Hare, Joachim Burger, Matthew J. Collins, Ron Kehati, Paula Hesse, Deirdre Fulton, Eberhard W. Sauer, Fatemeh A. Mohaseb, Hossein Davoudi, Roya Khazaeli, Johanna Lhuillier, Claude Rapin, Saeed Ebrahimi, Mutalib Khasanov, S. M. Farhad Vahidi, David E. MacHugh, Okan Ertuğrul, Chaido Koukouli-Chrysanthaki, Adamantios Sampson, George Kazantzis, Ioannis Kontopoulos, Jelena Bulatovic, Ivana Stojanovic, Abdesalam Mikdad, Norbert Benecke, Jörg Linstädter, Mikhail Sablin, Robin Bendrey, Lionel Gourichon, Benjamin S. Arbuckle, Marjan Mashkour, David Orton, Liora Kolska Horwitz, Matthew D. Teasdale & Daniel G. Bradley

Genome-wide analysis of 67 ancient Near Eastern cattle, Bos taurus, remains reveals regional variation that has since been obscured by admixture in modern populations. Comparisons of genomes of early domestic cattle to their aurochs

progenitors identify diverse origins with separate introgressions of wild stock. A later region-wide Bronze Age shift indicates rapid and widespread introgression of zebu, Bos indicus, from the Indus Valley. This process was likely stimulated at the onset of the current geological age, ≈4.2 thousand years ago, by a widespread multicentury drought. In contrast to genome-wide admixture, mitochondrial DNA stasis supports that this introgression was male-driven, suggesting that selection of arid-adapted zebu bulls enhanced herd survival. This human-mediated migration of zebu-derived genetics has continued through millennia, altering tropical herding on each continent.

Aktuell

Annis 2019

Sofia Annis et al., *Quasi-Mendelian paternal inheritance of mitochondrial DNA, A notorious artifact, or anticipated behavior?* PNAS **116** (2019), 14797–14798.

Sofia Annis, Zoe Fleischmann, Mark Khrapko, Melissa Franco, Kevin Wasko, Dori Woods, Wolfram S. Kunz, Peter Ellis & Konstantin Khrapko

We offer an alternative explanation based on our analysis of the intracellular population dynamics of paternal mtDNA. Because paternal inheritance includes reproducible, ≈1,000-times enrichment of paternal mtDNA, paternal mtDNA haplotype must have selective advantage. Competition between mtDNA haplotypes is well documented, and, as we show, is sufficiently strong to enrich the paternal haplotype to ≈100 % in the "seeded" cell lineages. Nonseeded lineages naturally remain 100 % maternal, so a mosaic of cells with mostly paternal and pure maternal mtDNA is created.

Bredbenner 2019

Kate Bredbenner, *One Ph.D., hold the pastries.* science **365** (2019), 94.

I never thought I would spend so much of my time and money setting up still-life–worthy displays of flaky croissants and shiny fruit for people who are judging my science, and that of my colleagues. Yet that's the expectation: At my university, and many others, students bring food to our thesis committee meetings and defenses, adding to the already sky-high pressure. My first taste of it came 5 years ago, for my first committee meeting. I prepared furiously. I meticulously proofread my written proposal and aligned all the figures. My slides all used the same font. I had even prepared some extra slides to address possible questions my judges might ask. Even so, I was sure the meeting was doomed—because I didn't know how to make coffee.

Castelvecchi 2019

Davide Castelvecchi, *Mystery deepens over speed of Universe's expansion.* nature **571** (2019), 458–459.

Technique fails to resolve disagreement over how fast cosmos is expanding — for now.

Cohn 2019

Alain Cohn, Michel André Maréchal, David Tannenbaum & Christian Lukas Zünd, *Civic honesty around the globe.* science **365** (2019), 70–73.

s365-0070-Supplement.pdf

Civic honesty is essential to social capital and economic development but is often in conflict with material self-interest. We examine the trade-off between honesty and self-interest using field experiments in 355 cities spanning 40 countries around the globe. In these experiments, we turned in more than 17,000 lost wallets containing varying amounts of money at public and private institutions and measured whether recipients contacted the owners to return the wallets. In virtually all countries, citizens were more likely to return wallets that contained more money. Neither nonexperts nor professional economists were able to predict this result. Additional data suggest that our main findings can be explained by a combination of altruistic concerns and an aversion to viewing oneself as a thief, both of which increase with the material benefits of dishonesty.

Norton 2019

Heather L. Norton, Ellen E. Quillen, Abigail W. Bigham, Laurel N. Pearson & Holly Dunsworth, *Human races are not like dog breeds, Refuting a racist analogy.* Evolution: Education and Outreach **12** (2019), 17, 1–20.

In 1956, evolutionary biologist J.B.S. Haldane posed a question to anthropologists: "Are the biological differences between human groups comparable with those between groups of domestic animals such as greyhounds and bulldogs. . . ?" It reads as if it were posted on social media today. The analogy comparing human races to dog breeds is not only widespread in history and pop culture, but also sounds like scientific justification for eschewing the social construction of race, or for holding racist beliefs about human nature. Here we answer Haldane's question in an effort to improve the public understanding of human biological variation and "race"—two phenomena that are not synonymous. Speaking to everyone without expert levels of familiarity with this material, we investigate whether the dog breed analogy for human race stands up to biology. It does not. Groups of humans that are culturally labeled as "races" differ in population structure, genotype–phenotype relationships, and phenotypic diversity from breeds of dogs in unsurprising ways, given how artificial selection has shaped the evolution of dogs, not humans. Our demonstration complements the vast body of existing knowledge about how human "races" differ in fundamental sociocultural, historical, and political ways from categories of nonhuman animals. By the end of this paper, readers will understand how the assumption that human races are the same as dog breeds is a racist strategy for justifying social, political, and economic inequality.

Keywords: Domestication | Evolution | Human variation | Population genetics | Phenotype | Genotype | Racism | Anthropology | Biological anthropology | Anthropological genetics

Oransky 2019

Ivan Oransky, *Gravitational fields, silkworm excrement, and "putor" programs, How did this "pure, utter nonsense" get into in a peer-reviewed journal?* Retraction Watch **2019**, July 23, 1–4. <http://retractionwatch.com/2019/07/23/gravitational-fields-fish-excrement-and-putor-programs-how-did-this-pure-utter-nonsense->.

We asked the journal's editors, Una Ryan of Murdoch University in Australia and Julia Walochnik of the Medical University of Vienna, why it took post-publication peer review to determine that the paper was nonsense. In other words, what exactly were the peer reviewers, editors, and publisher — that's Springer

Nature — doing between March 5, 2018, when the paper was submitted, and July 6, 2018, when it was accepted?

Seo 2018

Jung-Soo Seo, Na-Young Kim, Eun-Ji Jeon, Nam-Sil Lee, En-Hye Lee, Myoung-Sug Kim, Hak-Je Kim & Sung-Hee Jung, *Development of a safe antiparasitic against scuticociliates (Miamiensis avidus) in olive flounders: new approach to reduce the toxicity of mebendazole by material remediation technology using full-overlapped gravitational field energy*. ParasitRes (2018), preprint, 1–18. DOI:10.1007/s00436-018-6010-8.

The olive flounder (Paralychthys olivaceus) is a representative farmed fish species in South Korea, which is cultured in land-based tanks and accounts for approximately 50 % of total fish farming production. However, farmed olive flounder are susceptible to infection with parasitic scuticociliates, which cause scuticociliatosis, a disease resulting in severe economic losses. Thus, there has been a longstanding imperative to develop a highly stable and effective antiparasitic drug that can be rapidly administered, both orally and by bath, upon infection with scuticociliates. Although the efficacy of commercially available mebendazole (MBZ) has previously been established, this compound cannot be used for olive flounder due to hematological, biochemical, and histopathological side effects. Thus, we produced material remediated mebendazole (MR MBZ), in which elements comprising the molecule were remediated by using full-overlapped gravitational field energy, thereby reducing the toxicity of the parent material. The antiparasitic effect of MR MBZ against scuticociliates in olive flounder was either similar to or higher than that of MBZ under the same conditions. Oral (100 and 500 mg/kg B. W.) and bath (100 and 500 mg/L) administrations of MBZ significantly ($p < 0.05$) increased the values of hematological and biochemical parameters, whereas these values showed no increase in the MR MBZ administration group. In addition, there were no histopathological side effects, such as atrophic degeneration or hyaline droplet degeneration, whereas these were observed when MBZ was administered. Thus, we report that the material remediation method using full-overlapped gravitational field energy can be used to reduce drug toxicity.

Keywords: Mebendazole | Parasite | Scuticociliate | Olive flounder | Material remediation technology

Service 2019

Robert F. Service, *Solar plus batteries is now cheaper than fossil power*. science **365** (2019), 108.

Falling prices help utilities start to decarbonize.

It would provide 7 % of the city's electricity beginning in 2023 at a cost of 1.997 cents per kilowatt hour (kWh) for the solar power and 1.3 cents per kWh for the battery. The cost of utility-scale lithium-ion batteries had fallen by 76 % since 2012, and by 35 % in just the past 18 months, to $ 187 per MWh.

The cost to decarbonize the U.S. grid alone would be $ 4.5 trillion, about half of which would go to installing 900 billion watts, or 900 gigawatts (GW), of batteries and other energy storage technologies. (Today, the world's battery storage capacity is just 5.5 GW.)

Shalvi 2019

Shaul Shalvi, *Financial temptation increases civic honesty*. science **365** (2019), 29–30.

Slone 2019

Jesse Slone, Shiyu Luo, Paldeep S. Atwal & Taosheng Huang, *Is quasi-MendelianmtDNA competition enough to drive transmission of paternalmtDNA? Reply to Annis et al.* PNAS **116** (2019), 14799–14800.

Finally, while Annis et al. (2) largely ignore the critiques described in the bioRxiv preprint from Salas et al. (3), we would like to address those criticisms directly here.

St. George 2019

Scott St. George, *Aberrant synchrony of present-day warming*. nature **571** (2019), 483–484.

Were extended warm or cold periods in the past worldwide, or only regional? Efforts to reconstruct Earth's climate history suggest that the near-global extent of ongoing warming is unparalleled over the past 2,000 years.

Tanaka 2019

Kazumasa Z. Tanaka, *A father's odyssey*. science **365** (2019), 194.

The human resources representatives were amazed when I requested parental leave. I was one of the first male postdocs to ask in the 100-year history of the institution, they told me. The response didn't surprise me. Here in Japan, where roughly 85 % of academic scientists are men and most have stay-at-home spouses, it's rare for fathers to take leave from work after a baby is born. But the real surprise came later, as I learned how hard it was to secure the leave—in spite of careful planning and my supervisor's support.

Amerika

Waters 2019

Michael R. Waters, *Late Pleistocene exploration and settlement of the Americas by modern humans*. science **365** (2019), 138.

North and South America were the last continents to be explored and settled by modern humans at the end of the Pleistocene. Genetic data, derived from contemporary populations and ancient individuals, show that the first Americans originated from Asia and after several population splits moved south of the continental ice sheets that covered Canada sometime between ≈17.5 and ≈14.6 thousand years (ka) ago. Archaeological evidence shows that geographically dispersed populations lived successfully, using biface, blade, and osseous technologies, in multiple places in North and South America between ≈15.5 and ≈14 ka ago. Regional archaeological complexes emerged by at least ≈13 ka ago in North America and ≈12.9 ka ago in South America. Current genetic and archaeological data do not support an earlier (pre–17.5 ka ago) occupation of the Americas.

Anthropologie

Bailey 2019

Shara E. Bailey, Jean-Jacques Hublin & Susan C. Antón, *Rare dental trait provides morphological evidence of archaic introgression in Asian fossil record*. PNAS **116** (2019), 14806–14807.

The recently described Denisovan hemimandible from Xiahe, China [F. Chen et al., (2019) Nature 569, 409–412], possesses an unusual dental feature: a 3-rooted lower second molar. A survey of the clinical and bioarchaeological literature demonstrates that the 3-rooted lower molar is rare (less than 3.5 % occurrence) in non-Asian Homo sapiens. In contrast, its presence in Asian-derived populations can exceed 40 % in China and the New World. It has long been thought that the prevalence of 3-rooted lower molars in Asia is a relatively late acquisition occurring well after the origin and dispersal of H. sapiens. However, the presence of a 3-rooted lower second molar in this 160,000-y-old fossil hominin suggests greater antiquity for the trait. Importantly, it also provides morphological evidence of a strong link between archaic and recent Asian H. sapiens populations. This link provides compelling evidence that modern Asian lineages acquired the 3-rooted lower molar via introgression from Denisovans.

Keywords: Denisovan | introgression | dental anthropology | root morphology | Pleistocene Homo

Delson 2019

Eric Delson, *An early modern human outside Africa.* nature **571** (2019), 487–488.

Analysis of two fossils from a Greek cave has shed light on early hominins in Eurasia. One fossil is the earliest known specimen of Homo sapiens found outside Africa; the other is a Neanderthal who lived 40,000 years later.

Harvati 2019

Katerina Harvati et al., *Apidima Cave fossils provide earliest evidence of Homo sapiens in Eurasia.* nature **571** (2019), 500–504.

n571-0500-Supplement.pdf

Katerina Harvati, Carolin Röding, Abel M. Bosman, Fotios A. Karakostis, Rainer Grün, Chris Stringer, Panagiotis Karkanas, Nicholas C. Thompson, Vassilis Koutoulidis, Lia A. Moulopoulos, Vassilis G. Gorgoulis & Mirsini Kouloukoussa

Two fossilized human crania (Apidima 1 and Apidima 2) from Apidima Cave, southern Greece, were discovered in the late 1970s but have remained enigmatic owing to their incomplete nature, taphonomic distortion and lack of archaeological context and chronology. Here we virtually reconstruct both crania, provide detailed comparative descriptions and analyses, and date them using U-series radiometric methods. Apidima 2 dates to more than 170 thousand years ago and has a Neanderthal-like morphological pattern. By contrast, Apidima 1 dates to more than 210 thousand years ago and presents a mixture of modern human and primitive features. These results suggest that two late Middle Pleistocene human groups were present at this site—an early Homo sapiens population, followed by a Neanderthal population. Our findings support multiple dispersals of early modern humans out of Africa, and highlight the complex demographic processes that characterized Pleistocene human evolution and modern human presence in southeast Europe.

Wade 2019

Lizzie Wade, *Was our species in Europe 210,000 years ago?* science **365** (2019), 111.

Skepticism greets startling conclusion from skull fragment found in Greek cave.

Warren Sharp, a uranium dating expert at the University of California, Berkeley, points out that the Apidima 1 samples actually returned dates ranging from more than 300,000 years old to less than 40,000 years old. “It’s not a well-behaved

sample," he says. "You have this huge spread of apparent ages, and you don't know if any of them are any good."

In ancient humans, the shape of the back of the skull doesn't always predict the shape of the face, she says. The Jebel Irhoud skull, for example, has an archaic, elongated back but a distinctly modern face. Zollikofer adds that the Neanderthal lineage may encompass more anatomical variations than researchers yet realize.

"The evidence is very weak."

Bibel

Finkelstein 2017

Israel Finkelstein, *A Corpus of North Israelite Texts in the Days of Jeroboam II?* Hebrew Bible and Ancient Israel **6** (2017), 262–289.

In this article, I suggest that Jeroboam II assembled Northern origin, royal and heroic oral traditions and committed them to writing. I refer to the Jacob and Exodus tales; Saul, Jeroboam I and Jehu narratives (possibly embedded in a Northern History); savior stories in Judges; and perhaps Northern conquest traditions. Jeroboam II reigned at the peak of the Northern kingdom's prosperity territorially, demographically, economically and culturally. In his time, the scribal infrastructure necessary for composing literary texts already existed in Israel. The proposed Jeroboam II corpus dealt with the issue of identity and core territory of Israel and expressed early panIsraelite ("United Monarchy") views. It arrived in Judah after 720 b.c.e. and became the basis for biblical historiography, including the later Judahite use of "history" to promote ideology related to matters of identity and territory.

Keywords: Northern kingdom | North Israelite texts | Jeroboam II | Saul | Jeroboam I | Jehu | Jacob Cycle | Exodus | Savior stories in Judges | Conquest traditions in Joshua | United Monarchy

Gibbons 2019

Ann Gibbons, *DNA reveals European roots of the ancient Philistines.* science **365** (2019), 17.

3000-year-old burials identify the enemies of the biblical Israelites and shore up legends of Bronze Age migration.

Römer 2009

Thomas Römer, *The Exodus Narrative According to the Priestly Document.* In: Sarah Shectman & Joel S. Baden (Hrsg.), *The Strata of the Priestly Writings, Contemponry Debate and Future Directions.* Abhandlungen zur Theologie des Alten und Neuen Testaments 95 (Zürich 2009), 157–174.

Our investigation of the three major P texts in the exodus story (Exodus 115*) – the revelation of the divine name (Exod 6,2-8), the miracles by which Moses and Aaron compete with the Egyptian magicians (Exodus 7-9*), and the passage through the sea (Exodus 14) – confirms some major issues of the current debate about the Priestly texts in the Pentateuch. First of all, it seems quite clear that Pg was not interested in relating Israel's entry into the land after the exodus, since for P, Israel's relation to the land after the exodus will be basically the same as was the relation of the ancestors to their land: the Israelites remain gerim, the only owner of the land being Yhwh. It seems plausible, therefore, that the original P account, which combined (for the first time?) the ancestral narratives with the

exodus story, ended with the installation of the sanctuary and the sacrificial cult on Mt Sinai (Leviticus 9 or 16). According to Pg, Israel's specificity lies in its knowledge of God's "real" name. That means that Israel has to respond to this knowledge with the appropriate worship of Yhwh. The focus on the sanctuary reflects P's understanding of Israel as a temple-centered community. P's "theory" of God's revelation in three stages (Elohim, El Shadday, Yhwh) reflects an "inclusive monotheism" which takes into account the fact that the Persian kings were apparently willing to authorize different cults inside their empire. The openness to other people is also expressed in the story of Moses and Aaron competing with Egyptian culture. This reflects Pg's political agenda: in the first decades of the Persian period, Israel had to live together inside and outside the land with different ethnic groups. The link between the exodus and the ancestors in Exodus 6, where the land given to Israel is labelled a morasha (v. 8) should be understood as an attempt to state that the land has to be shared between the former exiles and those who had not been deported. If these Conclusions are right, the original priestly account of the exodus should be understood as a contribution to political and religious ecumenism at the beginning of the Persian period.

Datierung

Weninger 2002

Bernhard Weninger, *Pottery Seriation dating at Troy in the Early Bronze Age, based on the Cincinnati Classiication System.* In: R. Aslan, S. Blum, G. Kastl, F. Schweizer & D. Thumm (Hrsg.), *Mauerschau, Festschrift für Manfred Korfmann I.* (Remshalden-Grunbach 2002), 1035–1062.

In conclusion, despite some unexplained properties of the pottery seriation, we have successfully performed the first independent check of the overall integrity of the in total ca. 20 m deep and ca. 1000-year long Early Bronze Age stratigraphy at Troy. It is quite apparent that the seriation results agree well – both with regard to major historical events and in many details of everyday life at Troy – with the Cincinnati studies. The CA technique, furthermore, enables us to study some more specific details of the architectural and ceramic history at Troy, which have been deeply hidden by the sedimentational processes, and even partly destroyed by the substantial reworking of materials encountered in the stratigraphy.

Energie

McConnell 2019

Joseph R. McConnell et al., *Pervasive Arctic lead pollution suggests substantial growth in medieval silver production modulated by plague, climate, and conflict.* PNAS **116** (2019), 14910–14915.

pnas116-14910-Supplement1.pdf, pnas116-14910-Supplement2.xlsx

Joseph R. McConnell, Nathan J. Chellman, Andrew I. Wilson, Andreas Stohl, Monica M. Arienzo, Sabine Eckhardt, Diedrich Fritzsche, Sepp Kipfstuhl, Thomas Opel, Philip F. Place & Jørgen Peder Steffensen

Lead pollution in Arctic ice reflects large-scale historical changes in midlatitude industrial activities such as ancient lead/silver production and recent fossil fuel burning. Here we used measurements in a broad array of 13 accurately dated ice cores from Greenland and Severnaya Zemlya to document spatial and temporal

changes in Arctic lead pollution from 200 BCE to 2010 CE, with interpretation focused on 500 to 2010 CE. Atmospheric transport modeling indicates that Arctic lead pollution was primarily from European emissions before the 19th-century Industrial Revolution. Temporal variability was surprisingly similar across the large swath of the Arctic represented by the array, with 250- to 300-fold increases in lead pollution observed from the Early Middle Ages to the 1970s industrial peak. Superimposed on these exponential changes were pronounced,multiannual tomultidecadal variations, marked by increases coincident with exploitation of new mining regions, improved technologies, and periods of economic prosperity; and decreases coincident with climate disruptions, famines, major wars, and plagues. Results suggest substantial overall growth in lead/silver mining and smelting emissions—and so silver production—from the Early through High Middle Ages, particularly in northern Europe, with lower growth during the Late Middle Ages into the Early Modern Period. Near the end of the second plague pandemic (1348 to ≈1700 CE), lead pollution increased sharply through the Industrial Revolution. North American and European pollution abatement policies have reduced Arctic lead pollution by >80 % since the 1970s, but recent levels remain ≈60-fold higher than at the start of the Middle Ages.

Keywords: ice core | lead pollution | Arctic | plague | Middle Ages

Significance: Detailed lead pollution measurements in an array of 13 ice cores spanning nearly half the Arctic showed surprisingly similar temporal variability during the past 2 millennia until the Industrial Revolution. Lead pollution increased by 250- to 300-fold from the Early Middle Ages to the 1970s industrial peak, reflecting large-scale emissions changes from ancient European silver production, recent fossil fuel burning, and other industrial activities. Pronounced decadal-scale increases coincided with exploitation of new mining districts, technology development, and periods of economic prosperity, while decreases coincided with climate disruptions, famines, major wars, and plagues. Despite midlatitude pollution abatement policies that reduced Arctic lead pollution by >80 % since the 1970s, recent levels remain 60-fold higher than at the start of the Middle Ages.

Klima

Baggenstos 2019

Daniel Baggenstos et al., *Earth's radiative imbalance from the Last Glacial Maximum to the present*. PNAS **116** (2019), 14881–14886.

pnas116-14881-Supplement1.pdf, pnas116-14881-Supplement2.xlsx

Daniel Baggenstos, Marcel Häberli, Jochen Schmitt, Sarah A. Shackleton, Benjamin Birner, Jeffrey P. Severinghaus, Thomas Kellerhals & Hubertus Fischer

The energy imbalance at the top of the atmosphere determines the temporal evolution of the global climate, and vice versa changes in the climate system can alter the planetary energy fluxes. This interplay is fundamental to our understanding of Earth's heat budget and the climate system. However, even today, the direct measurement of global radiative fluxes is difficult, such that most assessments are based on changes in the total energy content of the climate system. We apply the same approach to estimate the long-term evolution of Earth's radiative imbalance in the past. New measurements of noble gas-derived mean ocean temperature from the European Project for Ice Coring in Antarctica Dome C ice core covering the last 40,000 y, combined with recent results from the West Antarctic Ice Sheet Divide ice core and the sea-level record, allow us to quantitatively reconstruct the history of the climate system energy budget. The temporal derivative of this quantity must be equal to the planetary radiative imbalance. During the deglaciation, a positive imbalance of typically +0.2 W/m-2 is maintained for ≈10,000 y, however,

with two distinct peaks that reach up to 0.4 W/m-2 during times of substantially reduced Atlantic Meridional Overturning Circulation. We conclude that these peaks are related to net changes in ocean heat uptake, likely due to rapid changes in North Atlantic deepwater formation and their impact on the global radiative balance, while changes in cloud coverage, albeit uncertain, may also factor into the picture.

Keywords: paleoclimate | deglaciation | noble gases | energy budget | ice cores

Significance: Earth's radiative imbalance determines whether energy is flowing into or out of the ocean–atmosphere system. The present, anthropogenic, positive imbalance drives global warming. This study reconstructs the radiative imbalance for the last deglaciation, ≈20,000 to 10,000 y ago. During the deglaciation, a positive imbalance was maintained for several thousand years, which brought the climate system from the last ice age into the Holocene warm period. We show that the imbalance varied significantly during this time, possibly due to changes in ocean circulation that affect the radiative energy fluxes, highlighting the importance of internal variability in Earth's energy budget.

Neukom 2019

Raphael Neukom, Nathan Steiger, Juan José Gómez-Navarro, Jianghao Wang & Johannes P. Werner, *No evidence for globally coherent warm and cold periods over the preindustrial Common Era.* nature **571** (2019), 550–554.

Earth's climate history is often understood by breaking it down into constituent climatic epochs1. Over the Common Era (the past 2,000 years) these epochs, such as the Little Ice Age2–4, have been characterized as having occurred at the same time across extensive spatial scales5. Although the rapid global warming seen in observations over the past 150 years does show nearly global coherence6, the spatiotemporal coherence of climate epochs earlier in the Common Era has yet to be robustly tested. Here we use global palaeoclimate reconstructions for the past 2,000 years, and find no evidence for preindustrial globally coherent cold and warm epochs. In particular, we find that the coldest epoch of the last millennium—the putative Little Ice Age—is most likely to have experienced the coldest temperatures during the fifteenth century in the central and eastern Pacific Ocean, during the seventeenth century in northwestern Europe and southeastern North America, and during the mid-nineteenth century over most of the remaining regions. Furthermore, the spatial coherence that does exist over the preindustrial Common Era is consistent with the spatial coherence of stochastic climatic variability. This lack of spatiotemporal coherence indicates that preindustrial forcing was not sufficient to produce globally synchronous extreme temperatures at multidecadal and centennial timescales. By contrast, we find that the warmest period of the past two millennia occurred during the twentieth century for more than 98 per cent of the globe. This provides strong evidence that anthropogenic global warming is not only unparalleled in terms of absolute temperatures5, but also unprecedented in spatial consistency within the context of the past 2,000 years.

PAGES 2019

PAGES 2k Consortium, *Consistent multidecadal variability in global temperature reconstructions and simulations over the Common Era.* Nature Geoscience (2019), preprint, 1–11. DOI:10.1038/s41561-019-0400-0.

NatGeo2019.07-PAGES-Supplement.pdf

Multidecadal surface temperature changes may be forced by natural as well as anthropogenic factors, or arise unforced from the climate system. Distinguishing

these factors is essential for estimating sensitivity to multiple climatic forcings and the amplitude of the unforced variability. Here we present 2,000-year-long global mean temperature reconstructions using seven different statistical methods that draw from a global collection of temperature-sensitive palaeoclimate records. Our reconstructions display synchronous multidecadal temperature fluctuations that are coherent with one another and with fully forced millennial model simulations from the Coupled Model Intercomparison Project Phase 5 across the Common Era. A substantial portion of pre-industrial (1300–1800 ce) variability at multi-decadal timescales is attributed to volcanic aerosol forcing. Reconstructions and simulations qualitatively agree on the amplitude of the unforced global mean multi-decadal temperature variability, thereby increasing confidence in future projections of climate change on these timescales. The largest warming trends at timescales of 20 years and longer occur during the second half of the twentieth century, highlighting the unusual character of the warming in recent decades.

Raphael Neukom, Luis A. Barboza, Michael P. Erb, Feng Shi, Julien Emile-Geay, Michael N. Evans, Jörg Franke, Darrell S. Kaufman, Lucie Lücke, Kira Rehfeld, Andrew Schurer, Feng Zhu, Stefan Brönnimann, Gregory J. Hakim, Benjamin J. Henley, Fredrik Charpentier Ljungqvist, Nicholas McKay, Veronika Valler & Lucien von Gunten

Kupfer

Weeks 1999

Lloyd Weeks, *Lead isotope analyses from Tell Abraq, United Arab Emirates, New data regarding the 'tin problem' in Western Asia.* Antiquity **73** (1999), 49–64.

The 'tin problem'forms the focus for discussion on the earliest use of tin and bronze in western Asia and the Aegean. New research on lead isotope data from Tell Abraq in the UAE has important implications for the advent of bronze in the region.

Keywords: western Asia | Arabia | Tell Abraq | tin | bronze | lead isotope analysis | prehistory

Politik

Goldberg 2019

Matthew H. Goldberg, Sander van der Linden, Edward Maibach & Anthony Leiserowitz, *Discussing global warming leads to greater acceptance of climate science.* PNAS **116** (2019), 14804–14805.

Climate change is an urgent global issue, with demands for personal, collective, and governmental action. Although a large body of research has investigated the influence of communication on public engagement with climate change, few studies have investigated the role of interpersonal discussion. Here we use panel data with 2 time points to investigate the role of climate conversations in shaping beliefs and feelings about global warming. We find evidence of reciprocal causality. That is, discussing global warming with friends and family leads people to learn influential facts, such as the scientific consensus that human-caused global warming is happening. In turn, stronger perceptions of scientific agreement increase beliefs that climate change is happening and human-caused, as well as worry about climate change. When assessing the reverse causal direction, we find that knowing the scientific consensus further leads to increases in global warming discussion. These

findings suggest that climate conversations with friends and family enter people into a proclimate social feedback loop.

Keywords: climate change | discussion | scientific consensus | self-persuasion | climate change communication