

## References

### Aktuell

BOLNICK 2017

Daniel I. Bolnick & William E. Stutz, *Frequency dependence limits divergent evolution by favouring rare immigrants over residents*. [nature 546 \(2017\), 285–288](#).

[n546-0285-Supplement1.pdf](#), [n546-0285-Supplement2.zip](#)

Two distinct forms of natural selection promote adaptive biological diversity. Divergent selection occurs when different environments favour different phenotypes, leading to increased differences between populations<sup>1</sup>. Negative frequency-dependent selection occurs when rare variants within a population are favoured over common ones<sup>2</sup>, increasing diversity within populations<sup>3</sup>. These two diversifying forces promote genetic variation at different spatial scales, and may act in opposition, but their relative effects remain unclear because they are rarely measured concurrently. Here we show that negative frequency-dependent selection within populations can favor rare immigrants over locally adapted residents. We reciprocally transplanted lake and stream ecotypes of threespine stickleback<sup>4</sup> into lake and stream habitats, while manipulating the relative abundance of residents versus immigrants. We found negative frequency-dependence: survival was highest for the locally rare ecotype, rather than natives. Also, individuals with locally rare major histocompatibility complex (MHC) class IIb genotypes were infected by fewer parasites. This negative frequency-dependent selection will tend to favour rare immigrants over common residents, amplifying the effect of migration and undermining the efficacy of divergent natural selection to drive population differences. The only signal of divergent selection was a tendency for foreign fish to have higher parasite loads than residents, after controlling for MHC genotype rarity. Frequency-dependent ecological interactions have long been thought to promote speciation. Our results suggest a more nuanced view in which negative frequency dependence alters the fate of migrants to promote or constrain evolutionary divergence between populations.

HEYES 2017

Celia Heyes, Q & A. [Current Biology 23 \(2017\), R1–R3](#).

In the fields where I grew up as a student and postdoc — associative learning, evolutionary biology, parts of philosophy — vigorous critical debate is considered not just socially acceptable, but essential for real progress. For example, in associative learning, people with mutually competitive research programmes enjoy lifelong friendships. [...] In other fields [...] it is often regarded as unacceptably hostile to contrast one view with another, and to search for evidence or arguments that will tell us which of them is right.

JUN 2017

Youjung Jun, Rachel Meng & Gita Venkataramani Johar, *Perceived social presence reduces fact-checking*. [PNAS 114 \(2017\), 5976–5981](#).

Today's media landscape affords people access to richer information than ever before, with many individuals opting to consume content through social channels rather than traditional news sources. Although people frequent social platforms

for a variety of reasons, we understand little about the consequences of encountering new information in these contexts, particularly with respect to how content is scrutinized. This research tests how perceiving the presence of others (as on social media platforms) affects the way that individuals evaluate information—in particular, the extent to which they verify ambiguous claims. Eight experiments using incentivized real effort tasks found that people are less likely to fact-check statements when they feel that they are evaluating them in the presence of others compared with when they are evaluating them alone. Inducing vigilance immediately before evaluation increased fact-checking under social settings.

**Keywords:** fact-checking | information processing | social influence

**Significance:** The dissemination of unverified content (e.g., “fake” news) is a societal problem with influence that can acquire tremendous reach when propagated through social networks. This article examines how evaluating information in a social context affects factchecking behavior. Across eight experiments, people fact-checked less often when they evaluated claims in a collective (e.g., group or social media) compared with an individual setting. Inducing momentary vigilance increased the rate of fact-checking. These findings advance our understanding of whether and when people scrutinize information in social environments. In an era of rapid information diffusion, identifying the conditions under which people are less likely to verify the content that they consume is both conceptually important and practically relevant.

## MOMIGLIANO 2017

Paolo Momigliano, Henri Jokinen, Antoine Fraimout, Ann-Britt Florin, Alf Norkko & Juha Merilä, *Extraordinarily rapid speciation in a marine fish*. *PNAS* **114** (2017), 6074–6079.

Divergent selection may initiate ecological speciation extremely rapidly. How often and at what pace ecological speciation proceeds to yield strong reproductive isolation is more uncertain. Here, we document a case of extraordinarily rapid speciation associated with ecological selection in the postglacial Baltic Sea. European flounders (*Platichthys flesus*) in the Baltic exhibit two contrasting reproductive behaviors: pelagic and demersal spawning. Demersal spawning enables flounders to thrive in the low salinity of the Northern Baltic, where eggs cannot achieve neutral buoyancy. We show that demersal and pelagic flounders are a species pair arising from a recent event of speciation. Despite having a parapatric distribution with extensive overlap, the two species are reciprocally monophyletic and show strongly bimodal genotypic clustering and no evidence of contemporary migration, suggesting strong reproductive isolation. Divergence across the genome is weak but shows strong signatures of selection, a pattern suggestive of a recent ecological speciation event. We propose that spawning behavior in Baltic flounders is the trait under ecologically based selection causing reproductive isolation, directly implicating a process of ecological speciation. We evaluated different possible evolutionary scenarios under the approximate Bayesian computation framework and estimate that the speciation process started in allopatry  $\approx 2,400$  generations ago, following the colonization of the Baltic by the demersal lineage. This is faster than most known cases of ecological speciation and represents the most rapid event of speciation ever reported for any marine vertebrate.

**Keywords:** ecological speciation | genomics | evolution | rapid speciation | Baltic Sea

**Significance:** Divergent selection can lead to the evolution of distinct species, a process known as ecological speciation. Evidence for ecological speciation in the marine environment is scarce, and the few known examples have happened within a time frame of hundreds of thousands to millions of years. We present

evidence that European flounders in the Baltic Sea exhibiting different breeding behaviors are a species pair arising from a recent event of ecological speciation. The two lineages diverged within less than 3,000 generations. This is the fastest event of speciation ever reported for any marine vertebrate. Extraordinarily rapid speciation driven by natural selection can therefore happen even in the marine environment.

REZNICK 2017

David N. Reznick & Joseph Travis, *Differences can hold populations together*. [nature](#) **546** (2017), 218–219.

Evolution favours the body form best adapted to the local environment, but it can also favour rare forms. Stickleback experiments reveal how these two selection forces can interact, and how this can limit population divergence.

## Anthropologie

ARGUE 2017

Debbie Argue, Colin P. Groves, Michael S. Y. Lee & William L. Jungers, *The affinities of Homo floresiensis based on phylogenetic analyses of cranial, dental, and postcranial characters*. [Journal of Human Evolution](#) **107** (2017), 107–133.

JHumEvo107-0107-Supplement1.doc, JHumEvo107-0107-Supplement2.xlsx, JHumEvo107-0107-Supplement3.pdf, JHumEvo107-0107-Supplement4.zip, JHumEvo107-0107-Supplement5.zip

Although the diminutive *Homo floresiensis* has been known for a decade, its phylogenetic status remains highly contentious. A broad range of potential explanations for the evolution of this species has been explored. One view is that *H. floresiensis* is derived from Asian *Homo erectus* that arrived on Flores and subsequently evolved a smaller body size, perhaps to survive the constrained resources they faced in a new island environment. Fossil remains of *H. erectus*, well known from Java, have not yet been discovered on Flores. The second hypothesis is that *H. floresiensis* is directly descended from an early *Homo* lineage with roots in Africa, such as *Homo habilis*; the third is that it is *Homo sapiens* with pathology. We use parsimony and Bayesian phylogenetic methods to test these hypotheses. Our phylogenetic data build upon those characters previously presented in support of these hypotheses by broadening the range of traits to include the crania, mandibles, dentition, and postcrania of *Homo* and *Australopithecus*. The new data and analyses support the hypothesis that *H. floresiensis* is an early *Homo* lineage: *H. floresiensis* is sister either to *H. habilis* alone or to a clade consisting of at least *H. habilis*, *H. erectus*, *Homo ergaster*, and *H. sapiens*. A close phylogenetic relationship between *H. floresiensis* and *H. erectus* or *H. sapiens* can be rejected; furthermore, most of the traits separating *H. floresiensis* from *H. sapiens* are not readily attributable to pathology (e.g., Down syndrome). The results suggest *H. floresiensis* is a long-surviving relict of an early (>1.75 Ma) hominin lineage and a hitherto unknown migration out of Africa, and not a recent derivative of either *H. erectus* or *H. sapiens*.

**Keywords:** *Homo floresiensis* | *Homo habilis* | *Homo erectus* | *Australopithecus* | Cladistic analysis | Flores hominins

BRICKLEY 2017

Megan B. Brickley, Lori D'Ortenzio, Bonnie Kahlon, Annabelle Schattmann, Isabelle Ribot, Emeline Raguin & Benoit Bertrand, *An-*

*cient Vitamin D Deficiency, Long-Term Trends. Current Anthropology* **58** (2017), 420–427.

Vitamin D deficiency is now widely recognized as one of the most common health conditions in the world, with important consequences for overall health. Levels of deficiency appear to be rising, but the extent to which past humans were affected by vitamin D deficiency and the roles of this hormone in past human health are currently unknown. The discovery that mineralization defects in tooth dentin reflect periods of deficiency and are preserved in our earliest ancestors offers a unique opportunity to provide information on past social and cultural organization and, with further work, to contribute to ongoing debates on change in skin pigmentation. Here we show that humans from some of the earliest Middle Eastern and European communities were affected by deficiency, but levels and severity appear to have increased notably through time. On a simple comparative scale, severity of deficiency was four times as high in Greek communities in 1948 CE as in early farming communities from ca. 3000 BCE; some individuals in the later periods would have had rickets. Research using interglobular dentin in humans and nonhuman primates has the potential to fill in many important gaps in understanding past and present aspects of vitamin D deficiency.

EVTEEV 2017

Andrej A. Evteev, Alla A. Movsesian & Alexandra N. Grosheva, *The association between mid-facial morphology and climate in northeast Europe differs from that in north Asia, Implications for understanding the morphology of Late Pleistocene Homo sapiens. Journal of Human Evolution* **107** (2017), 36–48.

JHumEvo107-0036-Supplement1.docx, JHumEvo107-0036-Supplement2.xlsx

The climate of northeastern Europe is likely to resemble in many ways Late Pleistocene periglacial conditions in Europe, but there have been relatively few studies exploring the association between climate and morphology in the mid-face of modern northeastern European populations. To fill this gap, we sampled 540 male skulls from 22 European and Near Eastern groups, including 314 skulls from 11 populations from northeastern Europe, to test for possible climate-morphology association at the continental scale. Our results found a moderate and highly significant association ( $R = 0.48$ ,  $p = 0.0013$ , Mantel test) between sets of 23 mid-facial measurements and eight climatic variables. A partial least squares analysis revealed this association to be mostly driven by differences between groups from northeastern Europe and populations from the Mediterranean and the Caucasus. Matrices of between-group genetic distances based on Y-chromosome and mtDNA markers, as well as cranial non-metric and geographic distance matrices, were used to control for the possible influence of shared population history. Irrespective of which measure of neutral between-population distances is taken into account, the association between cranial variables and climate remains significant. The pattern of association between climate and morphology of the mid-face in western Eurasia was then compared to that in east and north Asia. Although differences between the two were found, there were also similarities that support existing functional interpretations of morphology for the bony parts of the upper airways. Last, in a preliminary analysis using a reduced set of measurements, mid-facial morphology of several Upper Paleolithic European *Homo sapiens* specimens was found to be more similar to groups from northern and northeastern Europe than to southern European populations. Thus, the population of northeastern Europe rather than east and north Asian groups should be used as a model when studying climate-mediated mid-facial morphology of Upper Paleolithic European *H. sapiens*.

Keywords: Respiratory adaptation | Climatic adaptation | Population genetics

## HUBLIN 2017

Jean-Jacques Hublin et al., *New fossils from Jebel Irhoud, Morocco and the pan-African origin of Homo sapiens*. [nature 546 \(2017\), 289–292](#).

Jean-Jacques Hublin, Abdelouahed Ben-Ncer, Shara E. Bailey, Sarah E. Freidline, Simon Neubauer, Matthew M. Skinner, Inga Bergmann, Adeline Le Cabec, Stefano Benazzi, Katerina Harvati & Philipp Gunz

Fossil evidence points to an African origin of *Homo sapiens* from a group called either *H. heidelbergensis* or *H. rhodesiensis*. However, the exact place and time of emergence of *H. sapiens* remain obscure because the fossil record is scarce and the chronological age of many key specimens remains uncertain. In particular, it is unclear whether the present day ‘modern’ morphology rapidly emerged approximately 200 thousand years ago (ka) among earlier representatives of *H. sapiens*1 or evolved gradually over the last 400 thousand years2. Here we report newly discovered human fossils from Jebel Irhoud, Morocco, and interpret the affinities of the hominins from this site with other archaic and recent human groups. We identified a mosaic of features including facial, mandibular and dental morphology that aligns the Jebel Irhoud material with early or recent anatomically modern humans and more primitive neurocranial and endocranial morphology. In combination with an age of  $315 \pm 34$  thousand years (as determined by thermoluminescence dating)3, this evidence makes Jebel Irhoud the oldest and richest African Middle Stone Age hominin site that documents early stages of the *H. sapiens* clade in which key features of modern morphology were established. Furthermore, it shows that the evolutionary processes behind the emergence of *H. sapiens* involved the whole African continent.

## KIMBEL 2017

William H. Kimbel & Yoel Rak, *Australopithecus sediba and the emergence of Homo, Questionable evidence from the cranium of the juvenile holotype MH 1*. [Journal of Human Evolution 107 \(2017\), 94–106](#).

Malapa Hominin (MH) 1, an immature individual whose second permanent molars had recently reached occlusion at the time of death, is the holotype of *Australopithecus sediba*, a 2-myr-old South African taxon that has been hypothesized to link phylogenetically australopith-grade hominins to the *Homo* clade. Given the existence of 2.8 myr-old fossils of *Homo* in eastern Africa, this hypothesis implies a ghost lineage spanning at least 800 kyr. An alternative hypothesis posits a unique relationship between *A. sediba* and *Australopithecus africanus*, which predates the Malapa hominins in southern Africa and whose phylogenetic relationships remain ambiguous. The craniofacial morphology of MH 1 looms large in the framing of the two hypotheses. We evaluated these alternatives in two ways. First, we investigated whether the craniofacial morphology of MH 1 was ontogenetically stable at death. Based on data from a late-growth series of chimpanzee, gorilla, and modern human crania, we found that key aspects of MH 1’s resemblance to *Homo* can be accounted for by its immaturity. Second, we studied MH 1 with an eye to identifying craniofacial synapomorphies shared with *A. africanus*. In this case, MH 1 shows unambiguous affinities in its zygomaticomaxillary and supraorbital morphology to crania from Sterkfontein Member 4, which we found to exhibit unusual derived morphology compared to *Homo* and other australopiths. We argue that MH 1 provides clear evidence that *A. sediba* was uniquely related to *A. africanus* and that the hypothesis of an extensive ghost lineage connecting *A. sediba* to the root of the *Homo* clade is unwarranted.

**Keywords:** *Australopithecus sediba* | Malapa | *Australopithecus africanus* | Early *Homo* | Craniofacial growth

## STRINGER 2017

Chris Stringer & Julia Galway-Witham, *On the origin of our species. nature* **546** (2017), 212–214.

Gaps in the fossil record have limited our understanding of how *Homo sapiens* evolved. The discovery in Morocco of the earliest known *H. sapiens* fossils might revise our ideas about human evolution in Africa.

## WARD 2017

Carol V. Ward, Tierra K. Nalley, Fred Spoor, Paul Tafforeau & Zeresenay Alemseged, *Thoracic vertebral count and thoracolumbar transition in *Australopithecus afarensis**. *PNAS* **114** (2017), 6000–6004.

The evolution of the human pattern of axial segmentation has been the focus of considerable discussion in paleoanthropology. Although several complete lumbar vertebral columns are known for early hominins, to date, no complete cervical or thoracic series has been recovered. Several partial skeletons have revealed that the thoracolumbar transition in early hominins differed from that of most extant apes and humans. *Australopithecus africanus*, *Australopithecus sediba*, and *Homo erectus* all had zygapophyseal facets that shift from thoracic-like to lumbar-like at the penultimate rib-bearing level, rather than the ultimate rib-bearing level, as in most humans and extant African apes. What has not been clear is whether *Australopithecus* had 12 thoracic vertebrae as in most humans, or 13 as in most African apes, and where the position of the thoracolumbar transitional element was. The discovery, preparation, and synchrotron scanning of the *Australopithecus afarensis* partial skeleton DIK-1-1, from Dikika, Ethiopia, provides the only known complete hominin cervical and thoracic vertebral column before 60,000 years ago. DIK-1-1 is the only known *Australopithecus* skeleton to preserve all seven cervical vertebrae and provides evidence for 12 thoracic vertebrae with a transition in facet morphology at the 11th thoracic level. The location of this transition, one segment cranial to the ultimate rib-bearing vertebra, also occurs in all other early hominins and is higher than in most humans or extant apes. At 3.3 million years ago, the DIK-1-1 skeleton is the earliest example of this distinctive and unusual pattern of axial segmentation.

**Keywords:** *Australopithecus afarensis* | vertebrae | Dikika | segmentation | thoracic

**Significance:** The discovery of a 3.3 million-year-old partial skeleton of *Australopithecus afarensis*, from Dikika, Ethiopia, preserved all seven cervical (neck) vertebrae and provided the only known evidence for the presence of 12 thoracic (rib-bearing) vertebrae in hominins prior to 60,000 years ago. This skeleton has seven cervical and only 12 thoracic vertebrae like humans, rather than 13 like African apes. However, the anatomical transition from thoracic to lumbar (lower back) vertebral form occurs at the 11th thoracic segment. This distinctive pattern of vertebral segmentation, rare in modern apes and humans, is also seen in the three other early hominins for which this area is known, with the Dikika skeleton providing the earliest and most complete example.

## Datierung

## JACOBS 2017

Zenobia Jacobs & Richard G. Roberts, *Single-grain OSL chronologies for the Still Bay and Howieson's Poort industries and the transition between them, Further analyses and statistical modelling. Journal of Human Evolution* **107** (2017), 1–13.

JHumEvo107-0001-Supplement.docx

The chronology of the Still Bay (SB) and Howieson's Poort (HP) lithic industries remains an issue of keen interest because of the central role of these two phases of technological and behavioural innovation within the Middle Stone Age of southern Africa. Several dating studies have been conducted on SB and HP sites, including a pair published by the present authors and our colleagues in 2008 and 2013. These reported the results of systematically applying single-grain optically stimulated luminescence (OSL) dating procedures to 10 sites in South Africa, Lesotho and Namibia to constrain the timing of the start and end of the SB and HP and reveal the existence of a gap of several millennia between them. Alternative ages for these two industries have since been proposed by others for one of these South African sites (Diepkloof Rockshelter) and some concerns have been raised about the procedures used in our earlier studies to estimate the beta dose rates for a small number of samples. Here, we provide an update on our chronology for the SB and HP and address the issues raised about the methods that we used previously to estimate the beta dose rates and their associated uncertainties. To test the sensitivity of our new SB and HP ages to different underlying assumptions, we have run the same statistical model as that used in our 2008 and 2013 studies under three different scenarios. We show that the ages for the different samples are insensitive to how we analytically process or statistically model our data, and that our earlier conclusions about timing of the start and end of the SB and the HP and the probability of a gap between them remain true for two of the three scenarios. We conclude by bringing our study into the context of additional chronometric, stratigraphic and lithic technology studies that have been conducted in the intervening decade.

Keywords: Middle Stone Age | South Africa | Optical dating | Luminescence dating

## RICHTER 2017

Daniel Richter et al., *The age of the hominin fossils from Jebel Irhoud, Morocco, and the origins of the Middle Stone Age.* [nature 546 \(2017\), 293–296.](#)

n546-0293-Supplement.pdf

Daniel Richter, Rainer Grün, Renaud Joannes-Boyau, Teresa E. Steele, Fethi Amani, Mathieu Rué, Paul Fernandes, Jean-Paul Raynal, Denis Geraads, Abdelouahed Ben-Ncer, Jean-Jacques Hublin & Shannon P. McPherron

The timing and location of the emergence of our species and of associated behavioural changes are crucial for our understanding of human evolution. The earliest fossil attributed to a modern form of *Homo sapiens* comes from eastern Africa and is approximately 195 thousand years old<sup>1,2</sup>, therefore the emergence of modern human biology is commonly placed at around 200 thousand years ago<sup>3,4</sup>. The earliest Middle Stone Age assemblages come from eastern and southern Africa but date much earlier<sup>5–7</sup>. Here we report the ages, determined by thermoluminescence dating, of fire-heated flint artefacts obtained from new excavations at the Middle Stone Age site of Jebel Irhoud, Morocco, which are directly associated with newly discovered remains of *H. sapiens*<sup>8</sup>. A weighted average age places these Middle Stone Age artefacts and fossils at  $315 \pm 34$  thousand years ago. Support is obtained through the recalculated uranium series with electron spin resonance date of  $286 \pm 32$  thousand years ago for a tooth from the Irhoud 3 hominin mandible. These ages are also consistent with the faunal and microfaunal<sup>9</sup> assemblages and almost double the previous age estimates for the lower part of the deposits<sup>10,11</sup>. The north African site of Jebel Irhoud contains one of the earliest directly dated Middle Stone Age assemblages, and its associated human remains are the oldest

reported for *H. sapiens*. The emergence of our species and of the Middle Stone Age appear to be close in time, and these data suggest a larger scale, potentially pan-African, origin for both.

## Energie Kupfer

BEN-YOSEF 2012

Erez Ben-Yosef, *Environmental Constraints on Ancient Copper Production in the Arava Valley, Implications of the Newly Discovered Site of Khirbet Mana'iyah in Southern Jordan*. [Tel Aviv: Archaeology 39 \(2012\), 186–202](#).

The paper presents the recently discovered copper smelting site of Khirbet Mana'iyah and its relations to the copper ore deposits and ancient production systems in the nearby Timna Valley. The unique location of the site, in the foothills of southern Edom and away from the ore sources, sheds light on the environmental factors that shaped and limited the production of copper in this region through the millennia. The site is one of the largest ancient smelting camps in the southern Arava known today, containing several hundred tons of slag. Thus, it was probably the search for fuel sources that dictated its location—near an extensive spread of acacia trees that grew on the alluvial fans on the eastern side of the Arava. It is also suggested that the site, whose smelting technology cannot date earlier than the late 10th century BCE, represents an Iron IIA activity related to the transformation in smelting technology that followed the campaign of Pharaoh Shoshenq I to the southern Levant.

Keywords: Timna | Faynan | Copper production | Iron Age | Khirbet Mana'iyah

## Klima

DANGENDORF 2017

Sönke Dangendorf, Marta Marcos, Guy Wöppelmann, Clinton P. Conrad, Thomas Frederikse & Riccardo Riva, *Reassessment of 20th century global mean sea level rise*. [PNAS 114 \(2017\), 5946–5951](#).

The rate at which global mean sea level (GMSL) rose during the 20th century is uncertain, with little consensus between various reconstructions that indicate rates of rise ranging from 1.3 to 2 mm/a. Here we present a 20th-century GMSL reconstruction computed using an area-weighting technique for averaging tide gauge records that both incorporates up-to-date observations of vertical land motion (VLM) and corrections for local geoid changes resulting from ice melting and terrestrial freshwater storage and allows for the identification of possible differences compared with earlier attempts. Our reconstructed GMSL trend of  $1.1 \pm 0.3$  mm/a (1s) before 1990 falls below previous estimates, whereas our estimate of  $3.1 \pm 1.4$  mm/a from 1993 to 2012 is consistent with independent estimates from satellite altimetry, leading to overall acceleration larger than previously suggested. This feature is geographically dominated by the Indian Ocean–Southern Pacific region, marking a transition from lower-than-average rates before 1990 toward unprecedented high rates in recent decades. We demonstrate that VLM corrections, area weighting, and our use of a common reference datum for tide gauges may explain the lower rates compared with earlier GMSL estimates in approximately equal proportion. The trends and multidecadal variability of our GMSL curve also compare well to the sum of individual contributions obtained from historical outputs of the Coupled Model Intercomparison Project Phase 5. This, in turn, increases our

confidence in process-based projections presented in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

**Keywords:** global mean sea level | tide gauges | vertical land motion | fingerprints | climate change

**Significance:** Estimates of global mean sea level (GMSL) before the advent of satellite altimetry vary widely, mainly because of the uneven coverage and limited temporal sampling of tide gauge records, which track local sea level rather than the global mean. Here we introduce an approach that combines recent advances in solid Earth and geoid corrections for individual tide gauges with improved knowledge about their geographical representation of ocean internal variability. Our assessment yields smaller trends before 1990 than previously reported, leading to a larger overall acceleration; identifies three major explanations for differences with previous estimates; and reconciles observational GMSL estimates with the sum of individually modeled contributions from the Coupled Model Intercomparison Project 5 database for the entire 20th century.

## EREN 2012

METIN I. EREN (Hrsg.), *Hunter-Gatherer Behavior, Human Response during the Younger Dryas*. (Walnut Creek 2012).

## LECAVALIER 2017

Benoit S. Lecavalier et al., *High Arctic Holocene temperature record from the Agassiz ice cap and Greenland ice sheet evolution*. [PNAS 114 \(2017\), 5952–5957](#).

Benoit S. Lecavalier, David A. Fisher, Glenn A. Milne, Bo M. Vinther, Lev Tarasov, Philippe Huybrechts, Denis Lacelle, Brittany Main, James Zheng, Jocelyne Bourgeois & Arthur S. Dyke

We present a revised and extended high Arctic air temperature reconstruction from a single proxy that spans the past  $\approx 12,000$  y (up to 2009 CE). Our reconstruction from the Agassiz ice cap (Ellesmere Island, Canada) indicates an earlier and warmer Holocene thermal maximum with early Holocene temperatures that are 4–5 °C warmer compared with a previous reconstruction, and regularly exceed contemporary values for a period of  $\approx 3,000$  y. Our results show that air temperatures in this region are now at their warmest in the past 6,800–7,800 y, and that the recent rate of temperature change is unprecedented over the entire Holocene. The warmer early Holocene inferred from the Agassiz ice core leads to an estimated  $\approx 1$  km of ice thinning in northwest Greenland during the early Holocene using the Camp Century ice core. Ice modeling results show that this large thinning is consistent with our air temperature reconstruction. The modeling results also demonstrate the broader significance of the enhanced warming, with a retreat of the northern ice margin behind its present position in the mid Holocene and a  $\approx 25\%$  increase in total Greenland ice sheet mass loss ( $\approx 1.4$  m sea-level equivalent) during the last deglaciation, both of which have implications for interpreting geodetic measurements of land uplift and gravity changes in northern Greenland.

**Keywords:** ice core | temperature reconstruction | Holocene climate | Greenland ice sheet

**Significance:** Reconstructions of past environmental changes are important for placing recent climate change in context and testing climate models. Periods of past climates warmer than today provide insight on how components of the climate system might respond in the future. Here, we report on an Arctic climate record from the Agassiz ice cap. Our results show that early Holocene air temperatures exceed present values by a few degrees Celsius, and that industrial era rates of temperature change are unprecedented over the Holocene period ( $\approx 12,000$  y).

We also demonstrate that the enhanced warming leads to a large response of the Greenland ice sheet; providing information on the ice sheet's sensitivity to elevated temperatures and thus helping to better estimate its future evolution.

#### MELTZER 2012

David J. Meltzer & Ofer Bar-Yosef, *Looking for the Younger Dryas*. In: METIN I. EREN (Hrsg.), *Hunter-Gatherer Behavior, Human Response during the Younger Dryas*. (Walnut Creek 2012), 249–267.

To amplify Dillehay's point, environments by the end of the YDC were in many places very different than they had been at the outset, and humans ultimately had to adjust to those changes: but is a cumulative adaptation over forty generations a response to the YDC? Or is it just humans doing what they do? Unless YDC changes were truly abrupt, severe, and presented conditions and adaptive challenges well outside the range that these groups had to cope with previously, which they apparently were not for much of the earth's inhabited regions, it is unlikely that responses to it were likewise abrupt or significant.

#### MEYERS 2017

Stephen Meyers, *Cracking the palaeoclimate code*. *nature* **546** (2017), 219–220.

The geological record contains evidence of how Earth's climate responded to periodic changes in our planet's orbit and rotation. An investigation reveals how this record can be leveraged to constrain estimates of past climate dynamics.

#### PASQUIER 2017

Virgil Pasquier, Pierre Sansjofre, Marina Rabineau, Sidonie Revillon, Jennifer Houghton & David A. Fike, *Pyrite sulfur isotopes reveal glacial-interglacial environmental changes*. *PNAS* **114** (2017), 5941–5945.

The sulfur biogeochemical cycle plays a key role in regulating Earth's surface redox through diverse abiotic and biological reactions that have distinctive stable isotopic fractionations. As such, variations in the sulfur isotopic composition ( $\delta^{34}\text{S}$ ) of sedimentary sulfate and sulfide phases over Earth history can be used to infer substantive changes to the Earth's surface environment, including the rise of atmospheric oxygen. Such inferences assume that individual  $\delta^{34}\text{S}$  records reflect temporal changes in the global sulfur cycle; this assumption may be well grounded for sulfate-bearing minerals but is less well established for pyrite-based records. Here, we investigate alternative controls on the sedimentary sulfur isotopic composition of marine pyrite by examining a 300-m drill core of Mediterranean sediments deposited over the past 500,000 y and spanning the last five glacial–interglacial periods. Because this interval is far shorter than the residence time of marine sulfate, any change in the sulfur isotopic record preserved in pyrite ( $\delta^{34}\text{S}_{\text{pyr}}$ ) necessarily corresponds to local environmental changes. The stratigraphic variations ( $>76\text{‰}$ ) in the isotopic data reported here are among the largest ever observed in pyrite, and are in phase with glacial–interglacial sea level and temperature changes. In this case, the dominant control appears to be glacial–interglacial variations in sedimentation rates. These results suggest that there exist important but previously overlooked depositional controls on sedimentary sulfur isotope records, especially associated with intervals of substantial sea level change. This work provides an important perspective on the origin of variability in such records and suggests meaningful paleoenvironmental information can be derived from pyrite  $\delta^{34}\text{S}$  records.

Keywords: pyrite sulfur isotopes | glacial | interglacial | sedimentation rate | local environment changes

Significance: Changes in sulfur isotope ratios ( $^{34}\text{S}/^{32}\text{S}$ ) of marine sulfur phases are often attributed to global biogeochemical perturbations. Sediments collected on the shelf of the Gulf of Lion revealed remarkable sulfur isotopic fluctuations in sedimentary pyrite over the last 500,000 years, ranging between  $-44.0\text{‰}$  and  $32.3\text{‰}$ . We suggest this pattern is related to changes in the local environmental deposition, specifically, sedimentation modulating connectivity with the overlying water column and resulting microbial activity. Besides providing new understanding of an important and poorly constrained aspect of past glacial-interglacial transitions, our results are critically important because they question the degree to which changes in sulfur isotopes in pyrite reflect global biogeochemical processes versus local depositional conditions.

## Kultur

HAYDEN 2017

Brian Hayden, *Are Burials Socially Integrative? The Natufian Case*. [Current Anthropology](#) **58** (2017), 410–411.

This brings up the possibility that the Hilazon Tachtit primary burial was of a high-ranking member of a secret society. Secret societies begin to appear with complex hunter-gatherers and often buried their high-ranking members in remote, secret locations and/or under large rocks (which was the case with the Hilazon Tachtit burial) so that they could not be disturbed (Hayden, forthcoming).

## Kupfer

BEN-YOSEF 2012

Erez Ben-Yosef, Ron Shaar, Lisa Tauxe & Hagai Ron, *A New Chronological Framework for Iron Age Copper Production at Timna (Israel)*. [Bulletin of the American Schools of Oriental Research](#) **367** (2012), 31–71.

This paper presents the results of the 2009 excavations at Site 30 in the Timna Valley, Israel. The results, coupled with a suite of 11 new radiocarbon dates, fix the chronology of the site between the 11th and 9th centuries B.C.E. and challenge the previous chronological framework of the copper production activities in the southern Arabah Valley. The paper also presents a striking correlation between Site 30 and the recently reported archaeological record of Iron Age Faynan, indicating technological and social unity between the two regions. In light of the new results and reexamination of previously published materials, we suggest that the peak in copper production in the southern Arabah occurred after the Egyptians had left their small outpost at Timna; this activity was an offshoot of the more elaborate enterprise at Faynan. The well-organized Iron Age copper production in the Arabah Valley was based on local initiatives and conducted by local seminomadic tribes, probably belonging to the Edomite polity.

## Mathematik

GAVRILETS 2017

Sergey Gavrillets & Peter J. Richerson, *Collective action and the evolution of social norm internalization*. [PNAS](#) **114** (2017), 6068–6073.

Human behavior is strongly affected by culturally transmitted norms and values. Certain norms are internalized (i.e., acting according to a norm becomes an end in itself rather than merely a tool in achieving certain goals or avoiding social sanctions). Humans' capacity to internalize norms likely evolved in our ancestors to simplify solving certain challenges—including social ones. Here we study theoretically the evolutionary origins of the capacity to internalize norms. In our models, individuals can choose to participate in collective actions as well as punish free riders. In making their decisions, individuals attempt to maximize a utility function in which normative values are initially irrelevant but play an increasingly important role if the ability to internalize norms emerges. Using agent-based simulations, we show that norm internalization evolves under a wide range of conditions so that cooperation becomes “instinctive.” Norm internalization evolves much more easily and has much larger effects on behavior if groups promote peer punishment of free riders. Promoting only participation in collective actions is not effective. Typically, intermediate levels of norm internalization are most frequent but there are also cases with relatively small frequencies of “oversocialized” individuals willing to make extreme sacrifices for their groups no matter material costs, as well as “undersocialized” individuals completely immune to social norms. Evolving the ability to internalize norms was likely a crucial step on the path to large-scale human cooperation.

**Keywords:** cooperation | conflict | modeling | evolution | values

**Significance:** People often ignore material costs they incur when following existing social norms. Some individuals and groups are often willing to pay extremely high costs to enact, defend, or promulgate specific values and norms that they consider important. Such behaviors, often decreasing biological fitness, represent an evolutionary puzzle. We study theoretically the evolutionary origins of human capacity to internalize and follow social norms. We focus on two general types of collective actions our ancestors were regularly involved in: cooperation to overcome nature's challenges and conflicts with neighboring groups. We show that norm internalization evolves under a wide range of conditions, making cooperation “instinctive.” We make testable predictions about individual and group behavior.

## Methoden

CARLISLE 2017

J. B. Carlisle, *Data fabrication and other reasons for non-random sampling in 5087 randomised, controlled trials in anaesthetic and general medical journals.* [Anaesthesia \(2017\), preprint, 1–9.](#)  
[DOI:10.1111/anae.13938.](#)

Randomised, controlled trials have been retracted after publication because of data fabrication and inadequate ethical approval. Fabricated data have included baseline variables, for instance, age, height or weight. Statistical tests can determine the probability of the distribution of means, given their standard deviation and the number of participants in each group. Randomised, controlled trials have been retracted after the data distributions have been calculated as improbable. Most retracted trials have been written by anaesthetists and published by specialist anaesthetic journals. I wanted to explore whether the distribution of baseline data in trials was consistent with the expected distribution. I wanted to determine whether trials retracted after publication had distributions different to trials that have not been retracted. I wanted to determine whether data distributions in trials published in specialist anaesthetic journals have been different to distributions in non-specialist medical journals. I analysed the distribution of 72,261 means of

29,789 variables in 5087 randomised, controlled trials published in eight journals between January 2000 and December 2015: Anaesthesia (399); Anesthesia and Analgesia (1288); Anesthesiology (541); British Journal of Anaesthesia (618); Canadian Journal of Anesthesia (384); European Journal of Anaesthesiology (404); Journal of the American Medical Association (518) and New England Journal of Medicine (935). I chose these journals as I had electronic access to the full text. Trial p values were distorted by an excess of baseline means that were similar and an excess that were dissimilar: 763/ 5015 (15.2 %) trials that had not been retracted from publication had p values that were within 0.05 of 0 or 1 (expected 10 %), that is, a 5.2 % excess,  $p = 1.29 \times 10^{-7}$ . The p values of 31/72 (43 %) trials that had been retracted after publication were within 0.05 of 0 or 1, a rate different to that for unretracted trials,  $p = 1.039 \times 10^{-10}$ . The difference between the distributions of these two subgroups was confirmed by comparison of their overall distributions,  $p = 5.39 \times 10^{-15}$ . Each journal exhibited the same abnormal distribution of baseline means. There was no difference in distributions of baseline means for 1453 trials in non-anaesthetic journals and 3634 trials in anaesthetic journals,  $p = 0.30$ . The rate of retractions from JAMA and NEJM, 6/1453 or 1 in 242, was one-quarter the rate from the six anaesthetic journals, 66/ 3634 or 1 in 55, relative risk (99 %CI) 0.23 (0.08–0.68),  $p = 0.00022$ . A probability threshold of 1 in 10,000 identified 8/72 (11 %) retracted trials (7 by Fujii et al.) and 82/5015 (1.6 %) unretracted trials. Some p values were so extreme that the baseline data could not be correct: for instance, for 43/5015 unretracted trials the probability was less than 1 in 1015 (equivalent to one drop of water in 20,000 Olympic-sized swimming pools). A probability threshold of 1 in 100 for two or more trials by the same author identified three authors of retracted trials (Boldt, Fujii and Reuben) and 21 first or corresponding authors of 65 unretracted trials. Fraud, unintentional error, correlation, stratified allocation and poor methodology might have contributed to the excess of randomised, controlled trials with similar or dissimilar means, a pattern that was common to all the surveyed journals. It is likely that this work will lead to the identification, correction and retraction of hitherto unretracted randomised, controlled trials.

Keywords: data error | fraud | randomised | controlled trials

## LOADSMAN 2017

J. A. Loadsman & T. J. McCulloch, *Widening the search for suspect data – is the flood of retractions about to become a tsunami?* *Editorial. Anaesthesia* (2017), preprint, 1–5. DOI:10.1111/anae.13962.

The reason baseline data in fabricated RCTs deviate from the expected distribution is probably because humans are very poor at simulating randomness, but if Carlisle’s method is adopted routinely for screening, dishonest authors could employ techniques to produce data that would avoid detection. We believe this would be quite easy to achieve although, for obvious reasons, we prefer not to describe the likely methodology here. It already appears that people are using software to reword text in order to circumvent plagiarism detection tools and there is no reason to think miscreants would not employ similar avoidance techniques when it comes to data. A stochastic arms-race could quickly render the Carlisle method ineffective.

As already noted, we are concerned the Carlisle method lacks the sensitivity and specificity required for prospective screening of newly submitted RCTs, and the possibility of circumvention remains, but if one in every 50 or so new papers continue to fall into the more extreme category then perhaps Klein is justified in exhorting all journals to follow suit.

Keywords: controlled trials | data error | fraud | randomised

## Neolithikum

STYRING 2017

Amy K. Styring et al., *Isotope evidence for agricultural extensification reveals how the world's first cities were fed*. [Nature Plants](#) **3** (2017), [17076](#).

Amy K. Styring, Michael Charles, Federica Fantone, Mette Marie Hald, Augusta McMahon, Richard H. Meadow, Geoff K. Nicholls, Ajita K. Patel, Mindy C. Pitre, Alexia Smith, Arkadiusz Soltysiak, Gil Stein, Jill A. Weber, Harvey Weiss & Amy Bogaard

This study sheds light on the agricultural economy that underpinned the emergence of the first urban centres in northern Mesopotamia. Using  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values of crop remains from the sites of Tell Sabi Abyad, Tell Zeidan, Hamoukar, Tell Brak and Tell Leilan (6500–2000 cal BC), we reveal that labour-intensive practices such as manuring/middening and water management formed an integral part of the agricultural strategy from the seventh millennium BC. Increased agricultural production to support growing urban populations was achieved by cultivation of larger areas of land, entailing lower manure/ midden inputs per unit area—extensification. Our findings paint a nuanced picture of the role of agricultural production in new forms of political centralization. The shift towards lower-input farming most plausibly developed gradually at a household level, but the increased importance of land-based wealth constituted a key potential source of political power, providing the possibility for greater bureaucratic control and contributing to the wider societal changes that accompanied urbanization.