Liste erstellt am 2017-02-24

References

Afrika

Scerri 2017

Eleanor M. L. Scerri, James Blinkhorn, Khady Niang, Mark D. Bateman & Huw S. Groucutt, *Persistence of Middle Stone Age technology to the Pleistocene/Holocene transition supports a complex hominin evolutionary scenario in West Africa*. Journal of Archaeological Science: Reports **11** (2017), 639–646.

JASRep011-639-Supplement.docx

The evolutionary origins of Homo sapiens and associated behavioural changes are increasingly seen as complex processes, involvingmultiple regions of Africa. InWest Africa, Terminal Pleistocene/Holocene aged human fossils, demonstrating the late continuity of archaic morphological features in the region have been linked to models of surprisingly recent admixture processes between late archaic hominins and H. sapiens. However, the limited chronological resolution of the archaeological record has prevented evaluation of how these biological records relate to patterns of behaviour. Here, we provide a preliminary report of the first excavated and dated Stone Age site in northern Senegal which features the youngest Middle Stone Age (MSA) technology yet documented in Africa. Ndiayène Pendao features classic MSA core axes, basally thinned flakes, Levallois points and denticulatesmostlymade fromchert. Similar technological features characterise several, larger surface sites in the vicinity. From this, it is postulated that populations using 'anachronistic' technologies in the Lower Senegal Valley around the transition to the Holocene may have been widespread, in sharp contrast to other areas of Senegal andWest Africa. The chronology and technology of Ndiayène Pendao provides the first cultural evidence to support a complex evolutionary history inWest Africa. This is consistent with a persistently high degree of Pleistocene population substructure in Africa and the spatially and temporally complex character of behavioural and biological evolution.

Keywords: West Africa | Middle Stone Age archaeology | Lithic technology | Pleistocene-Holocene transition | Human evolution

Aktuell

Grossman 2017

Richard Grossman, *Are human heads getting larger?* PNAS **114** (2017), E1304.

Another reason for the increase in Caesarean section births is that doctors are no longer trained to perform forceps deliveries. This operative method to aid vaginal delivery of a "stuck" baby has fallen out of favor, partly because of medical–legal issues. Finally, an alternative to Caesarean section birth, subcutaneous symphysiotomy, has not been practiced in much of the world for decades.

Gumsley 2017

Ashley P. Gumsley et al., *Timing and tempo of the Great Oxidation Event*. PNAS **114** (2017), 1811–1816.

Ashley P. Gumsley, Kevin R. Chamberlain, Wouter Bleeker, Ulf Söderlund, Michiel O. de Kock, Emilie R. Larsson & Andrey Bekker

The first significant buildup in atmospheric oxygen, the Great Oxidation Event (GOE), began in the early Paleoproterozoic in association with global glaciations and continued until the end of the Lomagundi carbon isotope excursion ca. 2,060 Ma. The exact timing of and relationships among these events are debated because of poor age constraints and contradictory stratigraphic correlations. Here, we show that the first Paleoproterozoic global glaciation and the onset of the GOE occurred between ca. 2,460 and 2,426 Ma, ≈100 My earlier than previously estimated, based on an age of 2,426 ± 3 Ma for Ongeluk Formation magmatism from the Kaapvaal Craton of southern Africa. This age helps define a key paleomagnetic pole that positions the Kaapvaal Craton at equatorial latitudes of 11° ¡À 6° at this time. Furthermore, the rise of atmospheric oxygen was not monotonic, but was instead characterized by oscillations, which together with climatic instabilities may have continued over the next ≈200 My until ≤2,250–2,240 Ma. Ongeluk Formation volcanism at ca. 2,426 Ma was part of a large igneous province (LIP) and represents a waning stage in the emplacement of several temporally discrete LIPs across a large low-latitude continental landmass. These LIPs played critical, albeit complex, roles in the rise of oxygen and in both initiating and terminating global glaciations. This series of events invites comparison with the Neoproterozoic oxygen increase and Sturtian Snowball Earth glaciation, which accompanied emplacement of LIPs across supercontinent Rodinia, also positioned at low latitude.

Keywords: Great Oxidation Event | Snowball Earth | Paleoproterozoic | Kaapvaal Craton | Transvaal Supergroup

Significance: We present U-Pb ages for the extensive Ongeluk large igneous province, a large-scale magmatic event that took place near the equator in the Paleoproterozoic Transvaal basin of southern Africa at ca. 2,426 Ma. This magmatism also dates the oldest Paleoproterozoic global glaciation and the onset of significant atmospheric oxygenation. This result forces a significant reinterpretation of the iconic Transvaal basin stratigraphy and implies that the oxygenation involved several oscillations in oxygen levels across 10-5 present atmospheric levels before the irreversible oxygenation of the atmosphere. Data also indicate that the Paleoproterozoic glaciations and oxygenation were ushered in by assembly of a large continental mass, extensive magmatism, and continental migration to near-equatorial latitudes, mirroring a similar chain of events in the Neoproterozoic.

Kalbitzer 2017

Urs Kalbitzer et al., *Female sociality and sexual conflict shape offspring survival in a Neotropical primate*. PNAS **114** (2017), 1892–1897.

Urs Kalbitzer, Mackenzie L. Bergstrom, Sarah D. Carnegie, Eva C. Wikberg, Shoji Kawamura, Fernando A. Campos, Katharine M. Jack & Linda M. Fedigan

Most mammals live in social groups in which members form differentiated social relationships. Individuals may vary in their degree of sociality, and this variation can be associated with differential fitness. In some species, for example, female sociality has a positive effect on infant survival. However, investigations of such cases are still rare, and no previous study has considered how male infanticide might constrain effects of female sociality on infant survival. Infanticide is part of the male reproductive strategy in many mammals, and it has the potential to override, or even reverse, effects of female reproductive strategies, including sociality. Therefore, we investigated the relationships between female sociality, offspring survival, and infanticide risk in wild white-faced capuchin monkeys using long-term data from Santa Rosa, Costa Rica. Female capuchins formed differentiated bonds, and bond strength was predicted by kin relationship, rank difference, and the presence of female infants. Most females formed stable bonds with their top

social partners, although bond stability varied considerably. Offspring of highly social females, who were often high-ranking females, exhibited higher survivorship during stable periods compared with offspring of less social females. However, offspring of highly social females were more likely to die or disappear during periods of alpha male replacements, probably because new alpha males are central to the group, and therefore more likely to target the infants of highly social, central females. This study shows that female sociality in mammals can have negative fitness consequences that are imposed by male behavior.

Keywords: social bond | reproductive success | mammal | capuchin | infanticide

Significance: In group-living mammals, infants of females with strong social relationships sometimes exhibit higher survivorship than infants of less social females, a finding that holds true in our study population of wild white-faced capuchin monkeys. However, as in many mammals, new alpha male capuchins often kill young infants sired by other males. Our long-term research shows that infants of highly social females are at greater risk of dying or disappearing during periods of alpha male replacements than infants of less social females. These findings indicate that new alpha males are more likely to target the infants of more social, and therefore central, females. Our study provides evidence that female sociality can negatively affect offspring survival by increasing the likelihood of infanticide.

Lynam 2017

Christopher Philip Lynam, Marcos Llope, Christian Möllmann, Pierre Helaouët, Georgia Anne Bayliss-Brown & Nils C. Stenseth, *Interaction between top-down and bottom-up control in marine food webs*. PNAS **114** (2017), 1952–1957.

Climate change and resource exploitation have been shown to modify the importance of bottom-up and top-down forces in ecosystems. However, the resulting pattern of trophic control in complex food webs is an emergent property of the system and thus unintuitive. We develop a statistical nondeterministic model, capable of modeling complex patterns of trophic control for the heavily impacted North Sea ecosystem. The model is driven solely by fishing mortality and climatic variables and based on timeseries data covering >40 y for six plankton and eight fish groups along with one bird group (>20 y). Simulations show the outstanding importance of top-down exploitation pressure for the dynamics of fish populations. Whereas fishing effects on predators indirectly altered plankton abundance, bottom-up climatic processes dominate plankton dynamics. Importantly, we show planktivorous fish to have a central role in the North Sea food web initiating complex cascading effects across and between trophic levels. Our linked model integrates bottom-up and top-down effects and is able to simulate complex long-term changes in ecosystem components under a combination of stressor scenarios. Our results suggest that in marine ecosystems, pathways for bottomup and top-down forces are not necessarily mutually exclusive and together can lead to the emergence of complex patterns of control.

Keywords: trophic control | ecosystem modeling | marine food web functioning | wasp-waist | regime shifts

Significance: Whether environmental conditions, harvesting, or predation pressure primarily regulate an ecosystem is still a question of much debate in marine ecology. Using a wealth of historical records, we describe how climate and fishing interact in a complex marine ecosystem. Through an integrative evidencebased approach, we demonstrate that indirect effects are key to understanding the system. Planktivorous forage fish provide an important role in the system, linking bottom-up and topdown processes such that fishing can indirectly impact the plankton and environmental effects can cascade up to impact demersal fish and predatory

seabirds. Cascading trophic interactions can be mediated by opposing bottom-up and top-down forces; this combination has the potential to avert regime wide shifts in community structure and functioning.

Ma 2017

Chao Ma, Stephen R. Meyers & Bradley B. Sageman, *Theory of chaotic orbital variations confirmed by Cretaceous geological evidence*. nature **542** (2017), 468–470.

n542-0468-Supplement1.xlsx, n542-0468-Supplement2.xlsx, n542-0468-Supplement3.pdf

Variations in the Earth's orbit and spin vector are a primary control on insolation and climate; their recognition in the geological record has revolutionized our understanding of palaeoclimate dynamics1, and has catalysed improvements in the accuracy and precision of the geological timescale2. Yet the secular evolution of the planetary orbits beyond 50 million years ago remains highly uncertain, and the chaotic dynamical nature of the Solar System predicted by theoretical models has yet to be rigorously confirmed by well constrained (radioisotopically calibrated and anchored) geological data2–4. Here we present geological evidence for a chaotic resonance transition associated with interactions between the orbits of Mars and the Earth, using an integrated radioisotopic and astronomical timescale from the Cretaceous Western Interior Basin of what is now North America5. This analysis confirms the predicted chaotic dynamical behaviour of the Solar System, and provides a constraint for refining numerical solutions for insolation, which will enable a more precise and accurate geological timescale to be produced.

Mayer 2017

Audrey L. Mayer, *A scientist on any schedule*. science **355** (2017), 426.

At times, my life as a scientist has resembled what many see as the archetype: available 24 hours a day, 7 days a week to go to the lab or out to the field, with no personal responsibilities that can't be sacrificed or taken care of by others. I have lived this life—and enjoyed it. But since becoming a single mother, I've realized that it is only one of many ways to be a scientist. Now, I have a satisfying career as a professor with a reasonable work schedule, and I've come to appreciate that there is no one schedule that best produces excellent science or demonstrates dedication to its practice.

Mitteroecker 2017

Philipp Mitteroecker, Simon M. Huttegger, Barbara Fischer & Mihaela Pavlicev, *The role of natural selection for the increase of Caesarean section rates, Reply to Grossman*. PNAS **114** (2017), E1305.

Importantly, our model is only about FPD rates, not C-section rates, which are much higher because of numerous medical, social, and legal reasons, partly enumerated by Grossman.

Every formal model is based on idealization; in fact, the exploration of key factors is the very purpose of modeling. We represent the disproportion of fetal and maternal dimensions by a single scalar quantity, D, whereas a comprehensive parameterization of pelvic shape requires a multivariate representation. The qualitative behavior of the evolutionary dynamics could still be shown by our model (1); numerical estimates of selection gradients and evolutionary changes, however, are meant to represent orders-of-magnitude only.

Pfenninger 2017

Stefan Pfenninger, *Energy scientists must show their workings*. nature **542** (2017), 393.

Public trust demands greater openness from those whose research is used to set policy, argues Stefan Pfenninger.

This secrecy is problematic, because it is well known that closed systems hide and perpetuate mistakes. A classic example is the spreadsheet error discovered in the influential Reinhart–Rogoff paper used to support economic policies of national austerity.

A change in journal policies would help to kick-start these discussions. In policy-focused research, where one 'truth' does not exist, one cannot assess whether a modelled scenario is 'correct', so the important yardstick is not truth, but trust. The arrival of the post-truth world shows that trust in experts is lower than ever — and surely this is partly the experts' fault.

Plagányi 2017

Éva Elizabeth Plagányi, *Getting to the bottom of global fishery catches*. PNAS **114** (2017), 1759–1761.

Their most parsimonious model also accounts for differences in trophic efficiencies between ecological regions at the bottom of the ocean, so-called benthic systems, versus pelagic systems that inhabit the overlying water column. Higher trophic transfer efficiencies in benthic systems are ascribed to lower foraging costs compared with searching the 3D pelagic environment. In this way, Stock et al. (3) achieve a correlation that explains 79 % of the variation between NPP and fish catch across most of the world's LMEs. This is notable, because reported fisheries catch across the LMEs varies by over five orders of magnitude, yet differences in catch are explained by the model to below a factor of 2.

Stock 2017

Charles A. Stock et al., *Reconciling fisheries catch and ocean productivity*. PNAS **114** (2017), E1441–E1449.

pnas114-E1441-Supplement.mov

Charles A. Stock, Jasmin G. John, Ryan R. Rykaczewski, Rebecca G. Asch, William W. L. Cheung, John P. Dunne, Kevin D. Friedland, Vicky W. Y. Lam, Jorge L. Sarmiento & Reg A. Watson

Photosynthesis fuels marine food webs, yet differences in fish catch across globally distributed marine ecosystems far exceed differences in net primary production (NPP). We consider the hypothesis that ecosystem-level variations in pelagic and benthic energy flows from phytoplankton to fish, trophic transfer efficiencies, and fishing effort can quantitatively reconcile this contrast in an energetically consistent manner. To test this hypothesis, we enlist global fish catch data that include previously neglected contributions from small-scale fisheries, a synthesis of global fishing effort, and plankton food web energy flux estimates from a prototype high-resolution global earth system model (ESM). After removing a small number of lightly fished ecosystems, stark interregional differences in fish catch per unit area can be explained ($r = 0.79$) with an energy-based model that (i) considers dynamic interregional differences in benthic and pelagic energy pathways connecting phytoplankton and fish, (ii) depresses trophic transfer efficiencies in the tropics and, less critically, (iii) associates elevated trophic transfer efficiencies with benthic-predominant systems. Model catch estimates are generally within a factor of 2 of values spanning two orders of magnitude. Climate change projections show that the same macroecological patterns explaining dramatic regional catch differences

in the contemporary ocean amplify catch trends, producing changes that may exceed 50 % in some regions by the end of the 21st century under high-emissions scenarios. Models failing to resolve these trophodynamic patterns may significantly underestimate regional fisheries catch trends and hinder adaptation to climate change.

Keywords: fisheries catch | primary production | ocean productivity | climate change | food webs

Significance: Phytoplankton provide the energy that sustains marine fish populations. The relationship between phytoplankton productivity and fisheries catch, however, is complicated by uncertainty in catch estimates, fishing effort, and marine food web dynamics. We enlist global data sources and a high-resolution earth system model to address these uncertainties. Results show that cross-ecosystem fisheries catch differences far exceeding differences in phytoplankton production can be reconciled with fishing effort and variations in marine food web structure and energy transfer efficiency. Food web variations explaining contemporary fisheries catch act to amplify projected catch trends under climate change, suggesting catch changes that may exceed a factor of 2 for some regions. Failing to account for this would hinder adaptation to climate change.

Sznycer 2017

Daniel Sznycer et al., *Cross-cultural regularities in the cognitive architecture of pride*. PNAS **114** (2017), 1874–1879.

Daniel Sznycer, Laith Al-Shawaf, Yoella Bereby-Meyer, Oliver Scott Curry, Delphine De Smet, Elsa Ermer, Sangin Kim, Sunhwa Kim, Norman P. Li, Maria Florencia Lopez Seal, Jennifer McClung, Jiaqing O, Yohsuke Ohtsubo, Tadeg Quillien, Max Schaub, Aaron Sell, Florian van Leeuwen, Leda Cosmides & John Tooby

Pride occurs in every known culture, appears early in development, is reliably triggered by achievements and formidability, and causes a characteristic display that is recognized everywhere. Here, we evaluate the theory that pride evolved to guide decisions relevant to pursuing actions that enhance valuation and respect for a person in the minds of others. By hypothesis, pride is a neurocomputational program tailored by selection to orchestrate cognition and behavior in the service of: (i) motivating the costeffective pursuit of courses of action that would increase others' valuations and respect of the individual, (ii) motivating the advertisement of acts or characteristics whose recognition by others would lead them to enhance their evaluations of the individual, and (iii) mobilizing the individual to take advantage of the resulting enhanced social landscape. To modulate how much to invest in actions that might lead to enhanced evaluations by others, the pride system must forecast the magnitude of the evaluations the action would evoke in the audience and calibrate its activation proportionally. We tested this prediction in 16 countries across 4 continents (n = 2,085), for 25 acts and traits. As predicted, the pride intensity for a given act or trait closely tracks the valuations of audiences, local (mean r = +0.82) and foreign (mean r = +0.75). This relationship is specific to pride and does not generalize to other positive emotions that coactivate with pride but lack its audience-recalibrating function.

Keywords: pride | valuation | decision-making | emotion | culture

Significance: Cross-cultural tests from 16 nations were performed to evaluate the hypothesis that the emotion of pride evolved to guide behavior to elicit valuation and respect from others. Ancestrally, enhanced evaluations would have led to increased assistance and deference from others. To incline choice, the pride system must compute for a potential action an anticipated pride intensity that tracks the magnitude of the approval or respect that the action would generate in the local audience. All tests demonstrated that pride intensities measured in each location

closely track the magnitudes of others' positive evaluations. Moreover, different cultures echo each other both in what causes pride and in what elicits positive evaluations, suggesting that the underlying valuation systems are universal.

Tieman 2017

Denise Tieman et al., *A chemical genetic roadmap to improved tomato flavor*. science **355** (2017), 391–394.

s355-0391-Supplement1.pdf, s355-0391-Supplement2.xlsx

Denise Tieman, Guangtao Zhu, Marcio F. R. Resende Jr., Tao Lin, Cuong Nguyen, Dawn Bies, Jose Luis Rambla, Kristty Stephanie Ortiz Beltran, Mark Taylor, Bo Zhang, Hiroki Ikeda, Zhongyuan Liu, Josef Fisher, Itay Zemach, Antonio Monforte, Dani Zamir, Antonio Granell, Matias Kirst, Sanwen Huang & Harry Klee

Modern commercial tomato varieties are substantially less flavorful than heirloom varieties. To understand and ultimately correct this deficiency, we quantified flavorassociated chemicals in 398 modern, heirloom, and wild accessions. A subset of these accessions was evaluated in consumer panels, identifying the chemicals that made the most important contributions to flavor and consumer liking. We found that modern commercial varieties contain significantly lower amounts of many of these important flavor chemicals than older varieties. Whole-genome sequencing and a genome-wide association study permitted identification of genetic loci that affect most of the target flavor chemicals, including sugars, acids, and volatiles. Together, these results provide an understanding of the flavor deficiencies in modern commercial varieties and the information necessary for the recovery of good flavor through molecular breeding.

Zerkle 2017

Aubrey L. Zerkle et al., *Onset of the aerobic nitrogen cycle during the Great Oxidation Event*. nature **542** (2017), 465–467.

Aubrey L. Zerkle, Simon W. Poulton, Robert J. Newton, Colin Mettam, Mark W. Claire, Andrey Bekker & Christopher K. Junium

The rise of oxygen on the early Earth (about 2.4 billion years ago)1 caused a reorganization of marine nutrient cycles2,3, including that of nitrogen, which is important for controlling global primary productivity. However, current geochemical records4 lack the temporal resolution to address the nature and timing of the biogeochemical response to oxygenation directly. Here we couple records of ocean redox chemistry with nitrogen isotope (15N/14N) values from approximately 2.31-billion-year-old shales5 of the Rooihoogte and Timeball Hill formations in South Africa, deposited during the early stages of the first rise in atmospheric oxygen on the Earth (the Great Oxidation Event)6. Our data fill a gap of about 400 million years in the temporal 15N/14N record4 and provide evidence for the emergence of a pervasive aerobic marine nitrogen cycle. The interpretation of our nitrogen isotope data in the context of iron speciation and carbon isotope data suggests biogeochemical cycling across a dynamic redox boundary, with primary productivity fuelled by chemoautotrophic production and a nitrogen cycle dominated by nitrogen loss processes using newly available marine oxidants. This chemostratigraphic trend constrains the onset of widespread nitrate availability associated with ocean oxygenation. The rise of marine nitrate could have allowed for the rapid diversification and proliferation of nitrate-using cyanobacteria and, potentially, eukaryotic phytoplankton.

Zhang 2017

Guijie Zhang et al., *Redox chemistry changes in the Panthalassic Ocean linked to the end-Permian mass extinction and delayed Early Triassic biotic recovery*. PNAS **114** (2017), 1806–1810.

Guijie Zhang, Xiaolin Zhang, Dongping Hu, Dandan Li, Thomas J. Algeo, James Farquhar, Charles M. Henderson, Liping Qin, Megan Shen, Danielle Shen, Shane D. Schoepfer, Kefan Chen & Yanan Shen

The end-Permian mass extinction represents the most severe biotic crisis for the last 540 million years, and the marine ecosystem recovery from this extinction was protracted, spanning the entirety of the Early Triassic and possibly longer. Numerous studies from the low-latitude Paleotethys and high-latitude Boreal oceans have examined the possible link between ocean chemistry changes and the end-Permian mass extinction. However, redox chemistry changes in the Panthalassic Ocean, comprising ≈85–90 % of the global ocean area, remain under debate. Here, we report multiple S-isotopic data of pyrite from Upper Permian–Lower Triassic deepsea sediments of the Panthalassic Ocean, nowpresent in outcrops of western Canada and Japan. We find a sulfur isotope signal of negative d33S with either positive d34S or negative d34S that implies mixing of sulfide sulfur with different d34S before, during, and after the end-Permian mass extinction. The precise coincidence of the negative d33S anomaly with the extinction horizon in western Canada suggests that shoaling of H2S-rich waters may have driven the end-Permian mass extinction. Our data also imply episodic euxinia and oscillations between sulfidic and oxic conditions during the earliest Triassic, providing evidence of a causal link between incursion of sulfidic waters and the delayed recovery of the marine ecosystem.

Keywords: end-Permian mass extinction | Panthalassic Ocean | multiple sulfur isotopes | sulfidic waters

Significance: To understand how most life on Earth went extinct 250 million years ago, we used multiple sulfur isotopes to investigate redox chemistry changes in the Panthalassic Ocean, comprising ≈85–90 % of the contemporaneous global ocean. The S-isotopic anomalies from Canada and Japan provide evidence for the timing of the onset of euxinia and mixing of sulfidic and oxic waters. Our data suggest that shoaling of H2S-rich waters may have driven the mass extinction and delayed the recovery of the marine ecosystem. This study illustrates how environmental changes could have had a devastating effect on Earth's early biosphere, and may have present-day relevance because global warming and eutrophication are causing development of sulfidic zones on modern continental shelves, threatening indigenous marine life.

Zhao 2017

Zheng-Dong Zhao et al., *A hypothalamic circuit that controls body temperature*. PNAS **114** (2017), 2042–2047.

Zheng-Dong Zhao, Wen Z. Yang, Cuicui Gao, Xin Fu, Wen Zhang, Qian Zhou, Wanpeng Chen, Xinyan Ni, Jun-Kai Lin, Juan Yang, Xiao-Hong Xu & Wei L. Shen

The homeostatic control of body temperature is essential for survival in mammals and is known to be regulated in part by temperaturesensitive neurons in the hypothalamus. However, the specific neural pathways and corresponding neural populations have not been fully elucidated. To identify these pathways, we used cFos staining to identify neurons that are activated by a thermal challenge and found induced expression in subsets of neurons within the ventral part of the lateral preoptic nucleus (vLPO) and the dorsal part of the dorsomedial hypothalamus (DMD). Activation of GABAergic neurons in the vLPO using optogenetics reduced body temperature, along with a decrease in physical activity. Optogenetic

inhibition of these neurons resulted in fever-level hyperthermia. These GABAergic neurons project from the vLPO to the DMD and optogenetic stimulation of the nerve terminals in the DMD also reduced body temperature and activity. Electrophysiological recording revealed that the vLPO GABAergic neurons suppressed neural activity in DMD neurons, and fiber photometry of calcium transients revealed that DMD neurons were activated by cold. Accordingly, activation of DMD neurons using designer receptors exclusively activated by designer drugs (DREADDs) or optogenetics increased body temperature with a strong increase in energy expenditure and activity. Finally, optogenetic inhibition of DMD neurons triggered hypothermia, similar to stimulation of the GABAergic neurons in the vLPO. Thus, vLPO GABAergic neurons suppressed the thermogenic effect of DMD neurons. In aggregate, our data identify vLPO-DMD neural pathways that reduce core temperature in response to a thermal challenge, and we show that outputs from the DMD can induce activity-induced thermogenesis.

Keywords: thermoregulation | preoptic area | dorsomedial hypothalamus | fiber photometry | energy expenditure

Significance: Thermal homeostasis is essential for survival in mammals. Although it is known that temperature-sensitive neurons in the hypothalamus can control body temperature, the precise neural types and dynamics of neurons responding to changes in environmental temperature are not well defined. In this study, we identified subsets of temperature-activated neurons in two hypothalamic nuclei, the preoptic area (POA) and the dorsomedial hypothalamus (DMH), and showed that modulating their activity can lead to alterations in core temperature. The data further suggest that heat-activated GABAergic neurons in the POA reduce the activity of cold-activated neurons in the DMH, which function to increase thermogenesis and physical activity. These data identify a neural circuit that controls core temperature and thermogenesis.

Amerika

Watling 2017

Jennifer Watling et al., *Impact of pre-Columbian "geoglyph" builders on Amazonian forests*. PNAS **114** (2017), 1868–1873.

Jennifer Watling, José Iriarte, Francis E. Mayle, Denise Schaan, Luiz C. R. Pessenda, Neil J. Loader, F. Alayne Street-Perrott, Ruth E. Dickau, Antonia Damasceno & Alceu Ranzi

Over 450 pre-Columbian (pre-AD 1492) geometric ditched enclosures ("geoglyphs") occupy ≈13,000 km2 of Acre state, Brazil, representing a key discovery of Amazonian archaeology. These huge earthworks were concealed for centuries under terra firme (upland interfluvial) rainforest, directly challenging the "pristine" status of this ecosystem and its perceived vulnerability to human impacts. We reconstruct the environmental context of geoglyph construction and the nature, extent, and legacy of associated human impacts. We show that bamboo forest dominated the region for ≥6,000 y and that only small, temporary clearings were made to build the geoglyphs; however, construction occurred within anthropogenic forest that had been actively managed for millennia. In the absence of widespread deforestation, exploitation of forest products shaped a largely forested landscape that survived intact until the late 20th century.

Keywords: Amazonian archaeology | Amazonian rainforest | paleoecology | pre-Columbian land use

Significance: Amazonian rainforests once thought to be pristine wildernesses are increasingly known to have been inhabited by large populations before European contact. How and to what extent these societies impacted their landscape through

deforestation and forest management is still controversial, particularly in the vast interfluvial uplands that have been little studied. In Brazil, the groundbreaking discovery of hundreds of geometric earthworks by modern deforestation would seem to imply that this region was also deforested to a large extent in the past, challenging the apparent vulnerability of Amazonian forests to human land use. We reconstructed environmental evidence from the geoglyph region and found that earthworks were built within man-made forests that had been previously managed for millennia. In contrast, long-term, regional-scale deforestation is strictly a modern phenomenon.

Anthropologie

Halsey 2017

Lewis G. Halsey, Samuel R. L. Coward, Robin H. Crompton & Susannah K. S. Thorpe, *Practice makes perfect, Performance optimisation in 'arboreal' parkour athletes illuminates the evolutionary ecology of great ape anatomy.* Journal of Human Evolution **103** (2017), 45–52.

JHumEvo103-0045-Supplement.docx

An animal's size is central to its ecology, yet remarkably little is known about the selective pressures that drive this trait. A particularly compelling example is how ancestral apes evolved large body mass in such a physically and energetically challenging environment as the forest canopy, where weight-bearing branches and lianas are flexible, irregular and discontinuous, and the majority of preferred foods are situated on the most flexible branches at the periphery of tree crowns. To date the issue has been intractable due to a lack of relevant fossil material, the limited capacity of the fossil record to reconstruct an animal's behavioural ecology and the inability to measure energy consumption in freely moving apes. We studied the oxygen consumption of parkour athletes while they traversed an arboreal-like course as an elite model ape, to test the ecomorphological and behavioural mechanisms by which a large-bodied ape could optimize its energetic performance during tree-based locomotion. Our results show that familiarity with the arboreal-like course allowed the athletes to substantially reduce their energy expenditure. Furthermore, athletes with larger arm spans and shorter legs were particularly adept at finding energetic savings. Our results flesh out the scanty fossil record to offer evidence that long, strong arms, broad chests and a strong axial system, combined with the frequent use of uniform branch-tobranch arboreal pathways, were critical to off-setting the mechanical and energetic demands of large mass in ancestral apes.

Keywords: Energy expenditure | Performance optimisation | Crown hominoids | Ecomorphology | Arboreal locomotion

Datierung

Paige 2017

Jonathan Paige, Kostalena Michelaki, Christopher Campisano, Michael Barton & Arjun Heimsath, *Are the intensities and durations of small-scale pottery firings sufficient to completely dehydroxylate clays? Testing a key assumption underlying ceramic rehydroxylation dating.* Journal of Archaeological Science **79** (2017), 44–52.

JAS079-0044-Supplement.pdf

Rehydroxylation (RHX) dating was recently suggested as a simple, cheap, and accurate method for dating ceramics. It depends on the constant rate of rehydroxylation (the slow reintroduction of OH) of clays after they are fired and dehydroxylated (purged of OH) during the production of pots, bricks, or other ceramics. The original firing of the ceramic artifact should set the dating clock to zero by driving all hydroxyls out of the clay chemical structure. To examine whether this assumption holds, especially for pot firings of short duration and low intensity, as those in small-scale traditional settings, we performed thermogravimetric analysis of clay samples of known mineralogy at temperatures and for durations reported from traditional sub-Saharan, American, and South Asian pottery firings. Results demonstrate that in the majority of samples, complete dehydroxylation (DHX) did not occur within, or even beyond, the conditions common in traditional firings. Consequently, between 0.01 and 1.5 % of a sample's mass in residual OH may remain after firings analogous to those observed in the ethnographic record. Lack of complete DHX at the scales we have observed can result in the over-estimation of ceramic ages by decades to tens of thousands of years, depending largely on the age of the sample, and the amount of residual OH present. Thus, in many cases, a key assumption underlying current RHX dating methods is unlikely to have been met, introducing considerable error in dates.

Keywords: Ceramics | Rehydroxylation | Dating | Ceramic firing | TGA

Energie

Janssen 2017

Ellen Janssen, Jeroen Poblome, Johan Claeys, Vincent Kint, Patrick Degryse, Elena Marinova & BartMuys, *Fuel for debating ancient economies, Calculating wood consumption at urban scale in Roman Imperial times.* Journal of Archaeological Science: Reports **11** (2017), 592–599.

JASRep011-592-Supplement1.pdf, JASRep011-592-Supplement2.pdf, JASRep011-592-Supplement3.pdf, JASRep011-592-Supplement4.pdf, JASRep011-592-Supplement5.xlsx

Estimating wood extraction rates from forests based on archaeological and historical evidence is an important step in evaluating the sustainability of past social-ecological systems. In this paper, we present a calculation tool to estimate human wood resource use for a selected location during a defined period in the past. We illustrate the method by its application to the ancient town of Sagalassos (South-west Anatolia, Turkey) during the Roman Imperial period, with a focus on pottery production and the Roman Baths. Based on archaeological data, thermodynamic formulas and calorific values, an estimation is provided of the amount ofwood usedwithin a time step of one year. Because quantitative information on ancient technology and lifestyle is rather scarce and uncertain, input values consist of ranges. In order to take this uncertainty into account, aMonte Carlo procedure is included, offering a probability distribution of possible outcomes. Our results indicate thatwood consumption in 2nd century Sagalassos was quite high,with a lifestyle including frequent hot bathing, export driven pottery production and a climate that required heating during winter months. Based on the available woodland area, we conclude that the community of Sagalassos was intensively using the surrounding forests.

Keywords: Human impact | Sustainable use | Forest resources | Pottery production | Roman baths | XylArch | Sagalassos

Mighall 2017

T. Mighall, S. Timberlake, Antonio Martínez-Cortizas, Noemí Silva-Sánchez & I. D. L. Foster, *Did prehistoric and Roman mining and metallurgy have a significant impact on vegetation?* Journal of Archaeological Science: Reports **11** (2017), 613–625.

To develop our understanding of the relationship between vegetation change and past mining and metallurgy new approaches and further studies are required to ascertain the significance of the environmental impacts of themetallurgical industry. Using newpollen and geochemical data fromCors Fochno (Borth Bog), Wales, we examine whether prehistoric and Roman mining and metallurgy had a significant impact on the development of vegetation and compare the findings with previous studies across Europe on contamination and vegetation change to develop a conceptual model. The evidence suggests that early mining and metallurgy had a minimal impact on vegetation, especially woodlands, with small-scale, non-permanent phases of woodland clearance. The impactwasmore severe during Roman times, normally characterised bywoodland clearance followed by regeneration. Records do suggest that woodlands underwent compositional changes in tandemwith increased atmospheric pollution, possibly in part as a result of demands for wood fuel for mining and metallurgy, but otherwise woodlands show a degree of resilience. The results from Cors Fochno suggest that vegetation changes that occurred during periods ofmining and metallurgy, as inferred fromchangepoint analysis,were insignificant compared to later periods, including Roman times.

Keywords: Mining | Metallurgy | Pollen | Changepoint analysis | Bronze age | Roman | Woodlands

Judentum

Goodacre 2013

Mark Goodacre, *How Reliable is the Story of the Nag Hammadi Discovery?* Journal for the Study of the New Testament **35** (2013), iv, 303–322.

James Robinson's narrative of how the Nag Hammadi codices were discovered is popular and compelling, a piece of fine investigative journalism that includes intrigue and blood vengeance. But there are several different, conflicting versions of the story, including two-person (1977), seven-person (1979) and eight-person (1981) versions. Disagreements include the name of the person who first found the jar. Martin Krause and Rodolphe Kasser both questioned these stories in 1984, and their scepticism is corroborated by the Channel 4 (UK) series, The Gnostics (1987), which features Muhammad 'Ali himself, in his only known appearance in front of camera, offering his account of the discovery. Several major points of divergence from the earlier reports raise questions about the reliability of 'Ali's testimony. It may be safest to conclude that the earlier account of the discovery offered by Jean Doresse in 1958 is more reliable than the later, more detailed, more vivid versions that are so frequently retold.

Keywords: Nag Hammadi | discovery | James Robinson | Jean Doresse | the Gnostics

Maeir 2011

Aren Maeir, Jodi Magness & Lawrence Schiffman (Hrsg.), *'Go out and study the Land' (Judg 18:2), Archaeological,*

Historical and Textual Studies in Honor of Hanan Eshel Supplements to the Journal for the Study of Judaism 148 (Leiden 2011).

The volume contains the 22 papers presented to Hanan Eshel before his death, covering topics in archaeology, history, and textual studies, with a particular emphasis on aspects relating to the Dead Sea Scrolls, spanning the late Iron Age through late Antiquity.

Niehoff 2013

Maren R. Niehoff, *A Jewish Critique of Christianity from Second-Century Alexandria, Revisiting the Jew Mentioned in Contra Celsum.* Journal of Early Christian Studies **21** (2013), 151–175.

This article proposes to read all the fragments that Origen identified as belonging to the section of "Celsus's Jew" in The True Doctrine as deriving from a written document composed by an Alexandrian Jew in the mid-second century. The author of these fragments emerges as an educated and highly scholarly writer with an Alexandrian background, who was alarmed by the situation of the Jewish community following a significant spread of Christianity, which was accompanied by separatist theology. The anonymous Jewish author thus produced the first literary critique of the Gospels, which is of significant value for our understanding of the "parting of the ways." Moreover, I suggest that these fragments should be interpreted in light of both earlier forms of Alexandrian Judaism as well as the Letter of Barnabas.

Reading all the fragments, which Origen identified as belonging to the section of "Celsus's Jew" in The True Doctrine, one gets the impression of a coherent treatise against early Christianity. The author of these fragments emerges as an educated and highly scholarly writer with an Alexandrian background, who was alarmed by the situation of the Jewish community following a significant spread of Christianity, which was accompanied by separatist theology. The anonymous Jewish author thus produced the first literary critique of the Gospels, which is of significant value for our understanding of the "parting of the ways." We have suggested both earlier forms of Alexandrian Judaism as well as the Letter of Barnabas as a meaningful background for our anonymous Jewish author. While he continued scholarly Jewish traditions, such as those preserved by Philo, he seems to have reacted against forms of Christianity such as those formulated in the Letter of Barnabas.

The treatise by the anonymous Jewish author in Celsus's The True Doctrine moreover indicates that at least some part of the Jewish community had recuperated after the Diaspora Revolt and reached a high level of material as well as intellectual wealth. Our study suggested that Christianity was perceived by such educated Jews in the mid-second century as a different religion, which prompted responses and new self-definitions on the part of the Jewish community in Alexandria.

Taylor 2011

Joan E. Taylor, *Buried Manuscripts and Empty Tombs, The Qumran Genizah Theory Revisited.* In: Aren Maeir, Jodi Magness & Lawrence Schiffman (Hrsg.), *'Go out and study the Land' (Judg 18:2), Archaeological, Historical and Textual Studies in Honor of Hanan Eshel* Supplements to the Journal for the Study of Judaism 148 (Leiden 2011), 269–316.

This paper explores theories about why the Dead Sea Scrolls were hidden, and in particular reviews the 'genizah' hypothesis. The suggestion is made that the Scrolls were in fact buried in order to preserve them for a long time, after they

were no longer used. They were not quickly secreted away from the small site of Qumran, but were brought to this location for preservation-burial.

Klima

Goldsmith 2017

Yonaton Goldsmit et al., *Northward extent of East Asian monsoon covaries with intensity on orbital and millennial timescales*. PNAS **114** (2017), 1817–1821.

Yonaton Goldsmith, Wallace S. Broecker, Hai Xu, Pratigya J. Polissar, Peter B. deMenocal, Naomi Porat, Jianghu Lan, Peng Cheng, Weijian Zhou & Zhisheng An

The magnitude, rate, and extent of past and future East Asian monsoon (EAM) rainfall fluctuations remain unresolved. Here, late Pleistocene–Holocene EAM rainfall intensity is reconstructed using a well-dated northeastern China closed-basin lake area record located at the modern northwestern fringe of the EAM. The EAM intensity and northern extent alternated rapidly between wet and dry periods on time scales of centuries. Lake levels were 60 m higher than present during the early andmiddle Holocene, requiring a twofold increase in annual rainfall, which, based on modern rainfall distribution, requires a ≈400 km northward expansion/migration of the EAM. The lake record is highly correlated with both northern and southern Chinese cave deposit isotope records, supporting rainfall "intensity based" interpretations of these deposits as opposed to an alternative "water vapor sourcing" interpretation. These results indicate that EAM intensity and the northward extent covary on orbital and millennial timescales. The termination of wet conditions at 5.5 ka BP (≈35 m lake drop) triggered a large cultural collapse of Early Neolithic cultures in north China, and possibly promoted the emergence of complex societies of the Late Neolithic.

Keywords: East Asian monsoon | closed-basin lake | paleo-rainfall | Chinese cave record | northward expansion

Significance: The magnitude, rate, and extent of past and future East Asian monsoon (EAM) rainfall fluctuations remain unresolved. Here, we present a rainfall reconstruction based on the surface area of a closed-basin lake located at the modern northwestern boundary of the EAM. Our record shows that fluctuations of EAM intensity and spatial extent covaried over the past 125 ka. This record contributes to the resolution of a current controversy concerning the response of the EAM to external climatic forcings. We propose that a substantial decrease in rainfall at 5.5 ka was a major factor leading to a large cultural collapse of the Early Neolithic culture in north China.

Paillard 2017

Didier Paillard, *Predictable ice ages on a chaotic planet*. nature **542** (2017), 419–420.

Statistical analysis has revealed a simple rule for the occurrence of warm periods during the Quaternary, whereas on much longer timescales geological data have confirmed that the Solar System is chaotic.

The concept of stochastic resonance was invented to explain how small external oscillations (such as those associated with orbital eccentricity) could be amplified by a noisy process (such as climate) to eventually become the dominant periodicity of a system. It was even suggested that there might be no link between eccentricity and ice ages at all — instead, the observations could be explained by statistical fluctuations around multiples of obliquity cycles.

Furthermore, during the most recent deglaciation, atmospheric CO2 levels and global temperatures increased a few millennia before the melting of the northern ice sheets. This effect could be linked to abrupt oceancirculation changes, suggesting that such abrupt variability had a role in the deglaciation process. Therefore, although astronomical forcing played a crucial part in the evolution of the Quaternary ice ages, this is not the whole story.

In the earlier part of the Quaternary, interglacials occurred when the amount of summer solar radiation was above a given threshold; in the later part, this threshold was a linearly decreasing function of the time elapsed since the previous interglacial.

Tzedakis 2017

P. C. Tzedakis, M. Crucifix, T. Mitsui & E. W. Wolff, *A simple rule to determine which insolation cycles lead to interglacials*. nature **542** (2017), 427–432.

n542-0427-Supplement.xlsx

The pacing of glacial–interglacial cycles during the Quaternary period (the past 2.6 million years) is attributed to astronomically driven changes in high-latitude insolation. However, it has not been clear how astronomical forcing translates into the observed sequence of interglacials. Here we show that before one million years ago interglacials occurred when the energy related to summer insolation exceeded a simple threshold, about every 41,000 years. Over the past one million years, fewer of these insolation peaks resulted in deglaciation (that is, more insolation peaks were 'skipped'), implying that the energy threshold for deglaciation had risen, which led to longer glacials. However, as a glacial lengthens, the energy needed for deglaciation decreases. A statistical model that combines these observations correctly predicts every complete deglaciation of the past million years and shows that the sequence of interglacials that has occurred is one of a small set of possibilities. The model accounts for the dominance of obliquity-paced glacial–interglacial cycles early in the Quaternary and for the change in their frequency about one million years ago. We propose that the appearance of larger ice sheets over the past million years was a consequence of an increase in the deglaciation threshold and in the number of skipped insolation peaks.

Kultur

Bian 2017

Lin Bian, Sarah-Jane Leslie & Andrei Cimpian, *Gender stereotypes about intellectual ability emerge early and influence children's interests*. science **355** (2017), 389–391.

s355-0389-Supplement.pdf

Common stereotypes associate high-level intellectual ability (brilliance, genius, etc.) with men more than women. These stereotypes discourage women's pursuit of many prestigious careers; that is, women are underrepresented in fields whose members cherish brilliance (such as physics and philosophy). Here we show that these stereotypes are endorsed by, and influence the interests of, children as young as 6. Specifically, 6-year-old girls are less likely than boys to believe that members of their gender are "really, really smart." Also at age 6, girls begin to avoid activities said to be for children who are "really, really smart." These findings suggest that gendered notions of brilliance are acquired early and have an immediate effect on children's interests.

Till 2017

Rupert Till, *An archaeoacoustic study of the Ħal Saflieni Hypogeum on Malta*. Antiquity **91** (2017), 74–89.

Antiquity091-0074-Supplement1.mp3, Antiquity091-0074-Supplement2.m4a

The remarkable subterranean architecture of the Hal Saflieni Hypogeum on Malta has generated many claims about its dramatic acoustic effects, but previous studies have lacked rigour. A systematic, methodical approach has now been applied to measure the acoustic properties of the site, and to test earlier assertions. The results confirm some, but not all, prior observations, and demonstrate how a sound-based approach can contribute to an understanding of the archaeological context. It is argued that for the people who created the Hypogeum, the acoustics must have had particular significance and ritual power.

Keywords: Malta | Hypogeum | archaeoacoustics | acoustics | resonance | reverberation

Kupfer

Radivojević 2015

M. Radivojević, *Inventing Metallurgy in Western Eurasia, A Look Through the Microscope Lens*. Cambridge Archaeological Journal **25** (2015), 321–338.

The quest for the 'when' and 'where' of the world's earliest metallurgy has been dominating scholarly research on this topic for decades. This paper looks beyond the question of origins by discussing 'how' and 'why'metallurgywas invented. It looks into choices and skills involved in selection, experimentation and processing of distinctively coloured copper minerals and ores throughout c. 2000 years in the Balkans. The body of evidence is built around the currently earliest evidence for copper smelting, dated at c. 5000 bc and discovered in the Serbian Vin¡ca culture site of Belovode. The 'microstructure' of a metal invention process is explored through optical and compositional analyses of a selection of copper minerals and metal production evidence: ores, slags, slagged sherds and metal droplets recovered from seven settlements in Serbia and Bosnia and Herzegovina, altogether dated between the late seventh and the late fifth millennia bc. This research suggests an independent technological trajectory of the emergence of metallurgy in the Balkans based on a unique technological meme, black and green mineral, which follows the evolution of early metallurgy from monoto polymetallic within the fifth millennium bc.

Metallzeiten

Krausse 2017

Dirk Krausse, Nicole Ebinger-Rist, Sebastian Million, Andre Billamboz, Joachim Wahl & Elisabeth Stephan, *The 'Keltenblock' project, Discovery and excavation of a rich Hallstatt grave at the Heuneburg, Germany*. Antiquity **91** (2017), 108–123.

A richly furnished grave of an elite woman from the Hallstatt period was discovered close to the Heuneburg, the earliest proto-urban settlement north of the Alps. Dendrochronological analysis of timbers from the grave chamber dates the burial to 583 BC, the earliest of a series of such burials north of the Alps and a

key anchor in the absolute chronology of the Early Iron Age in Europe. The woman was adorned with gold, bronze, jet and amber jewellery; gold filigree objects, amber fibulae and items of horse-head armour suggest close connections south of the Alps. An infant female burial close to the main grave included gold jewellery made for a child but similar to that of the woman.

Keywords: Germany | Iron Age | Hallstatt | grave goods | jewellery | gold | dendrochronology