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References

Aktuell

Clist 2018

Bernard Clist et al., *Did human activity really trigger the late Holocene rainforest crisis in Central Africa?* PNAS **115** (2018), E4733–E4734.

Bernard Clist, Koen Bostoen, Pierre de Maret, Manfred K. H. Eggert, Alexa Höhn, Christophe Mbida Mindzié, Katharina Neumann & Dirk Seidensticker

A gradual but neat increase of dated sites in the period considered is observed throughout Central Africa, from Cameroon to Congo, with a distinctive peak after 2,350 cal y BP. However, contrary to what one would expect, there appears to be no marked density of sites that could have caused deforestation around 2,600 cal y BP. As acknowledged by Garcin et al. (1), there was a "sudden return to rainforest vegetation at 2,020 cal y BP," which contrasts with the fact that archaeologists have recorded the largest number of sites during that specific period.

Garcin 2018

Yannick Garcin et al., *Human activity is the most probable trigger of the late Holocene rainforest crisis in Western Central Africa*, *Reply to Clist et al.* PNAS **115** (2018), E4735–E4736.

Yannick Garcin, Pierre Deschamps, Guillemette Ménot, Geoffroy de Saulieu, Enno Schefuß, David Sebag, Lydie M. Dupont, Richard Oslisly, Brian Brademann, Kevin G. Mbusnum, Jean-Michel Onana, Andrew A. Ako, Laura S. Epp, Rik Tjallingii, Manfred R. Strecker, Achim Brauer & Dirk Sachse

The local return to nearly "full" C3 vegetation after the Lake Barombi LHRC (at ≈2,000 cal y BP) may either reflect a regeneration of the rainforest or a replacement of C4 crops by C3 crops, which is compatible with the pronounced coeval increase in oil palm (a C3 plant) use and human occupation in the region, contradicting the claim of Clist et al. Contrary to the study cited by Clist et al. to suggest that charcoal is absent at Lake Barombi, our pollen analysis on core B14 includes quantifiable amounts of charcoal, which indicate an up to fourfold increase in charcoal at the inception of the LHRC, together with an increase in sedimentation rate.

Schram 2018

Wouter L. Schram, Ioannis Lampropoulos & Wilfried G. J. H. M. van Sark, *Photovoltaic systems coupled with batteries that are optimally sized for household self-consumption*, *Assessment of peak shaving potential.* Applied Energy **223** (2018), 69–81.

As the share of renewable energy sources in the energy mix is increasing, new challenges arise regarding the grid integration. This research focuses on a solution for one of these challenges, namely the employment of batteries to address the mismatch in electrical power between electricity supply from photovoltaic systems and household electricity demand. Herein, the optimal sizing of batteries for household self-consumption is combined with peak shaving at district level, whereas previous studies only looked at these questions in isolation. Our analysis makes use of a unique set of power measurement data from 79 households in the Dutch city

of Amersfoort, in 295 evenly distributed days, with a resolution of 10 s. By using simulation of batteries and Net Present Value analysis, the average optimal storage size for self-consumption in the case of net metering abolishment for households with photovoltaic systems was determined to be 3.4 kWh. Large differences were observed between different households; photovoltaic system size, total net metered consumption and specific characteristics of load profiles resulted into optimal storage sizes in the range of 0.5–9 kWh. The impact of these optimally sized batteries on neighborhood peak demand was assessed and found to be limited, corresponding to a decrease of 5.7 %. The peak shaving potential was further assessed under different control strategies of the batteries. Results show that the impact could be amplified to a decrease of 22 % or 51 % when the batteries are controlled by using heuristics or by assuming perfect foresight together with a power minimization algorithm, respectively. The findings of this paper emphasize the importance of collaboration between households and other stakeholders, such as distributed system operators and retailers in transitioning to a sustainable power system.

Keywords: PV self-consumption | PV-coupled batteries | Battery sizing | Peak shaving | Techno-economic analysis | Smart grids

Sun 2018

Jing Sun et al., *Importing food damages domestic environment, Evidence from global soybean trade.* PNAS **115** (2018), 5415–5419.

pnas115-05415-Supplement.pdf

Jing Sun, Harold Mooney, Wenbin Wu, Huajun Tang, Yuxin Tong, Zhenci Xu, Baorong Huang, Yeqing Cheng, Xinjun Yang, Dan Wei, Fusuo Zhang & Jianguo Liu

Protecting the environment and enhancing food security are among the world's Sustainable Development Goals and greatest challenges. International food trade is an important mechanism to enhance food security worldwide. Nonetheless, it is widely concluded that in international food trade importing countries gain environmental benefits, while exporting countries suffer environmental problems by using land and other resources to produce food for exports. Our study shows that international food trade can also lead to environmental pollution in importing countries. At the global level, our metaanalysis indicates that there was increased nitrogen (N) pollution after much farmland for domestically cultivated N-fixing soybeans in importing countries was converted to grow high N-demanding crops (wheat, corn, rice, and vegetables). The findings were further verified by an intensive study at the regional level in China, the largest soybean-importing country, where the conversion of soybean lands to corn fields and rice paddies has also led to N pollution. Our study provides a sharp contrast to the conventional wisdom that only exports contribute substantially to environmental woes. Our results suggest the need to evaluate environmental consequences of international trade of all other major goods and products in all importing countries, which have significant implications for fundamental rethinking in global policy-making and debates on environmental responsibilities among consumers, producers, and traders across the world.

Keywords: agriculture | environment | nitrogen | Sustainable Development Goals | telecoupling

Significance: Achieving global environmental sustainability and food security is among the world's biggest challenges. International food trade plays an important role in global food security. It is widely believed that importing countries benefit environmentally from international food trade at the environmental cost of exporting countries. Contrary to the conventional wisdom, our study reveals a major environmental problem in importing countries. The unexpected findings suggest the need to reevaluate environmental consequences of international trade in all

importing countries through discussions regarding environmental responsibilities among consumers and producers. There is an urgent need for innovative solutions for reducing environmental pollution and enhancing food security to offset the negative impacts of international trade globally.

Tanaka 2018

Kohei Tanaka et al., *Incubation behaviours of oviraptorosaur dinosaurs in relation to body size*. Biology Letters **14** (2018), 20180135.

Kohei Tanaka, Darla K. Zelenitsky, Junchang Lü, Christopher L. DeBuhr, Laiping Yi, Songhai Jia, Fang Ding, Mengli Xia, Di Liu, Caizhi Shen & Rongjun Chen

Most birds sit on their eggs during incubation, a behaviour that likely evolved among non-avian dinosaurs. Several 'brooding' specimens of smaller species of oviraptorosaurs and troodontids reveal these non-avian theropods sat on their eggs, although little is known of incubation behaviour in larger theropod species. Herewe examine egg clutches over a large body size range of oviraptorosaurs in order to understand the potential effect of body size on incubation behaviour. Eggshell porosity indicates that the eggs of all oviraptorosaurs were exposed in the nest, similar to brooding birds.Although all oviraptorosaur clutches consist of radially arranged eggs in a ring configuration, clutch morphology varies in that the central opening is small or absent in the smallest species, becomes significantly larger in larger species, and occupies most of the nest area in giant species. Our results suggest that the smallest oviraptorosaurs probably sat directly on the eggs, whereas with increasing body size more weight was likely carried by the central opening, reducing or eliminating the load on the eggs and still potentially allowing for some contact during incubation in giant species. This adaptation, not seen in birds, appears to remove the body size constraints of incubation behaviour in giant oviraptorosaurs.

Keywords: dinosaur | egg | incubation | nest | Oviraptorosauria | Theropoda

Anthropologie

Grolle 2018

Johann Grolle, *Invasion aus der Steppe*. Der Spiegel **2018**, 20, 104–108.

Vorgeschichte: Linguisten, Genetiker und Archäologen haben rekonstruiert, wie ein Volk einfacher Hirten die Welt veränderte – eine dramatische Erzählung aus der Bronzezeit über Völkerwanderungen, Eroberungskriege, Seuchenzüge und die Entstehung der Ureuropäer.

Möglicherweise hat zum genetischen Erfolg der Steppenmenschen auch ein Verbündeter beigetragen, den sie aus ihrer Heimat mitgebracht zu haben scheinen: Yersinia pestis, das Pestbakterium. Dessen Gene fanden Jenaer Max-Planck-Forscher in europäischen Gräbern – und offenbar taucht es genau zu jener Zeit erstmals auf, als der Vorstoß der Jamnaja begann.

Nicht überall allerdings bestätigte die Analyse der Gene die Vorhersagen der Sprachgelehrten. Die größte Überraschung erwartete die Forscher in Anatolien. Denn gerade das Hethitische spielt eine zentrale Rolle im Theoriegebäude der Linguisten. Zum einen zählt dieses Idiom zu jenem Zweig der indoeuropäischen Sprachen, der sich als erster von den übrigen abgespalten hat. Zum anderen liefert das Hethitische die ersten schriftlichen Quellen dieser Sprachfamilie. Und ausgerechnet hier nun, wo sich Asien und Europa geografisch begegnen, fehlt jede Spur der Jamnaja-Gene.

Kotler 2018
Jennifer Kotler & David Haig, *The tempo of human childhood, A maternal foot on the accelerator, a paternal foot on the brake.* Evolutionary Anthropology **27** (2018), 80–91.
Relative to the life history of other great apes, that of humans is characterized by early weaning and short interbirth intervals (IBIs). We propose that in modern humans, birth until adrenarche, or the rise in adrenal androgens, developmentally corresponds to the period from birth until weaning in great apes and ancestral hominins. According to this hypothesis, humans achieved short IBIs by subdividing ancestral infancy into a nurseling phase, during which offspring fed at the breast, and a weanling phase, during which offspring fed specially prepared foods. Imprinted genes influence the timing of human weaning and adrenarche, with paternally expressed genes promoting delays in childhood maturation and maternally expressed genes promoting accelerated maturation. These observations suggest that the tempo of human development has been shaped by consequences for the fitness of kin, with faster development increasing maternal fitness at a cost to child fitness. The effects of imprinted genes suggest that the duration of the juvenile period (adrenarche until puberty) has also been shaped by evolutionary conflicts within the family.
Keywords: genomic imprinting | parent-offspring conflict | adrenarche | puberty | weaning

Islam

Endress 2006
Gerhard Endreß, *Der Islam in Daten.* (München 2006).

ibn Isḥāq ≈760
Muḥammad ibn Isḥāq, *Das Leben des Propheten – as-Sīra an-Nabawīya, Übersetzt und bearbeitet von Gernot Rotter.* (Kandern ^{2}2004).

Luxenberg 2000
Christoph Luxenberg, *Die Syro-Aramäische Lesart des Koran, Ein Beitrag zur Entschlüsselung der Koransprache.* (Berlin ^{2}2004).

Klima

Lembke-Jene 2018
Lester Lembke-Jene, Ralf Tiedemann, Dirk Nürnberg, Xun Gong & Gerrit Lohmann, *Rapid shift and millennial-scale variations in Holocene North Pacific Intermediate Water ventilation.* PNAS **115** (2018), 5365–5370.
pnas115-05365-Supplement.pdf
The Pacific hosts the largest oxygen minimum zones (OMZs) in the world ocean, which are thought to intensify and expand under future climate change, with significant consequences for marine ecosystems, biogeochemical cycles, and fisheries. At present, no deep ventilation occurs in the North Pacific due to a persistent halocline, but relatively better-oxygenated subsurface North Pacific Intermediate

Water (NPIW) mitigates OMZ development in lower latitudes. Over the past decades, instrumental data show decreasing oxygenation in NPIW; however, long-term variations in middepth ventilation are potentially large, obscuring anthropogenic influences against millennial-scale natural background shifts. Here, we use paleoceanographic proxy evidence from the Okhotsk Sea, the foremost North Pacific ventilation region, to show that itsmodern oxygenated pattern is a relatively recent feature, with little to no ventilation before six thousand years ago, constituting an apparent Early–Middle Holocene (EMH) threshold or "tipping point." Complementary paleomodeling results likewise indicate a warmer, saltier EMH NPIW, different from its modern conditions. During the EMH, the Okhotsk Sea switched from a modern oxygenation source to a sink, through a combination of sea ice loss, higher water temperatures, and remineralization rates, inhibiting ventilation. We estimate a strongly decreased EMH NPIW oxygenation of ≈30 to 50 %, and increased middepth Pacific nutrient concentrations and carbon storage. Our results (i) imply that under past or future warmerthanpresent conditions, oceanic biogeochemical feedbackmechanisms may change or even switch direction, and (ii) provide constraints on the high-latitude North Pacific's influence on mesopelagic ventilation dynamics, with consequences for large oceanic regions.

Keywords: North Pacific | intermediate water | oxygen minimum zone | stable isotopes | Holocene

Significance: The North Pacific hosts extensive oxygen minimum zones. Ventilation of North Pacific Intermediate Water mitigates hypoxia in thermocline waters not under influence of ocean–atmosphere processes. Instrumental datasets show recent decadal decreases in O2, but millennial-scale natural variations in mesopelagic ventilation might be large and are not understood well. We reconstruct Holocene ventilation changes in a key region (Okhotsk Sea). Modern ventilation and O2 levels are a relatively recent feature. In the warmer-than-present Early Holocene, middepth O2 concentrations were 25 to 50 % reduced, with significant millennial-scale variations. A sudden ventilation decrease six thousand years ago is linked to higher ocean temperatures, sea ice loss, and higher remineralization, corroborated by results from paleoclimate modeling, providing constraints for future warming scenarios.

Metallzeiten

Monroe 2010

Christopher M. Monroe, *Sunk Costs at Late Bronze Age Uluburun*. Bulletin of the American Schools of Oriental Research **357** (2010), 19–33.

This study gauges the economic loss represented by the 14th-century b.c.e. shipwreck at Uluburun, Turkey. Textual evidence for commodity values are used to calculate a minimum cost for the main cargoes and ship. Values are converted to silver shekels of Ugarit's standard. The approximate sum of 12,000 shekels is contextualized by contemporaneous indicators found in Akkadian and Ugaritic business documents, treaties, decrees, Hittite laws, and Ramesside prices. It is hoped that this provisional estimate will inform and stimulate continued investigation into the sort of institution capable of outfitting such a rich venture, and provide a means to gauge the loss suffered by communities most likely affected.

Neolithikum

Johnson 2018

Emily V. Johnson, Adrian Timpson, Mark G. Thomas & Alan K. Outram, *Reduced intensity of bone fat exploitation correlates with increased potential access to dairy fats in early Neolithic Europe*. Journal of Archaeological Science **94** (2018), 60–69.

Important nutritional resources can be acquired by breaking bone shafts to access marrow, whereas heavy comminution and boiling of cancellous bone is required to extract bone grease. Since labour and fuel costs of these processes differ considerably, the relative intensities of these activities provide a possible proxy for nutritional stress or elevated fat requirements in the context of an overall subsistence strategy. We investigated faunal material from eleven early Neolithic sites in central Europe for bone fracture and fragmentation patterns to ascertain the intensity of bone marrow and grease exploitation. These data indicate that bone grease processing was practised rarely if at all during the early Neolithic, likely made unnecessary by ample access to crop carbohydrates. Bone marrow was exploited at all sites, but with varying intensity that exhibited a significant negative correlation with the proportion of milk-producing domestic ruminants. This observation is consistent with the hypothesis that fats obtained from dairy products reduced requirements for intensive marrow exploitation.

Keywords: Bone fats | Bone fracture analysis | LBK | European Neolithic | Subsistence stress | Nutrition | Bone marrow | Bone grease | Dairying

Physik

Weber 2018

Bart Weber et al., *Molecular Insight into the Slipperiness of Ice*. Journal of Physical Chemistry Letters **9** (2018), 2838–2842.

Bart Weber, Yuki Nagata, Stefania Ketzetzi, Fujie Tang, Wilbert J. Smit, Huib J. Bakker, Ellen H. G. Backus, Mischa Bonn, and Daniel Bonn

Measurements of the friction coefficient of steel-on-ice over a large temperature range reveal very high friction at low temperatures (-100 °C) and a steep decrease in the friction coefficient with increasing temperature. Very low friction is only found over the limited temperature range typical for ice skating. The strong decrease in the friction coefficient with increasing temperature exhibits Arrhenius behavior with an activation energy of Ea ÿ 11.5 kJ mol-1. Remarkably, molecular dynamics simulations of the ice-air interface reveal a very similar activation energy for the mobility of surface molecules. Weakly hydrogen-bonded surface molecules diffuse over the surface in a rolling motion, their number and mobility increasing with increasing temperature. This correlation between macroscopic friction and microscopic molecular mobility indicates that slippery ice arises from the high mobility of its surface molecules, making the ice surface smooth and the shearing of the weakly bonded surface molecules easy.

Story or Book

Kiser 2018

Barbara Kiser, *Chernobyl*. nature **557** (2018), 491.

Chernobyl: The History of a Nuclear Catastrophe. Serhii Plokhy. BASIC (2018)

Soon after midnight on 26 April 1986, a turbine test at Ukraine's Chernobyl nuclear power plant went stupendously wrong. The explosion released 14 exabecquerels of radiation; the fallout contaminated 20 % of neighbouring Belarus and crossed more than half of Europe. Historian Serhii Plokhy's deft, richly detailed account draws on newly opened archives and weaves in stories of players such as Chernobyl director Viktor Briukhanov. The disaster's roots, he asserts, were a toxic tangle of shoddy construction, human error, flawed governance and complacency in the Soviet nuclear industry.

Lane 2018

Nick Lane, *Beyond the gene*. nature **557** (2018), 489–490.

Nick Lane relishes Carl Zimmer's history of heredity in all its messiness, from genes and culture to epigenetics.

She Has Her Mother's Laugh: The Powers, Perversions, and Potential of Heredity. Carl Zimmer. Dutton (2018)

By acknowledging the ambiguous way in which genes actually work, and by embracing all these other factors that shape our lives, we make CRISPR less threatening because it is less definitive. In She Has Her Mother's Laugh, Zimmer has built a subtle, multifaceted and deep understanding of heredity, grounded in revelatory insights from genome sequencing. And he shows that we will need it to face our uncertain future.

Zündung

Li 2018

Yangtao Li, Amir Khajepour & Cécile Devaud, *Realization of variable Otto-Atkinson cycle using variable timing hydraulic actuated valve train for performance and efficiency improvements in unthrottled gasoline engines*. Applied Energy **222** (2018), 199–215.

Variety of technologies along with the mechanisms for their implementations have been developed in order to pursue possible improvements in the performance and efficiency of gasoline engines. However, most of the commonly used techniques, such as the cam-based variable valve timings (VVT) and variable compression ratio (VCR), are realized by different kinds of complicated mechanisms, providing an extended but still relatively limited adjustability for attaining improved valve timings and different engine cycles according to the varying working conditions of the engine. In this research, by using the flexibility offered by the hydraulic actuated valve train (HAVT), a set of new valve motion strategies is developed for realizing a newly introduced engine cycle, the variable Otto-Atkinson cycle (VOAC), to achieve an unthrottled engine load control. The demonstrative VOAC test engine in this research is a converted baseline single-cylinder engine that is able to carry out a variable Otto cycle (VOC) at full load operations for achieving higher power performance while realizing a variable Atkinson cycle (VAC) at partial load operations for gaining better fuel economy without having any further modifications or attaching additional components to the engine. The baseline single-cylinder engine is modeled in GT-Suite and carefully calibrated by a series of experiments. Benefited from the HAVT features, the tunings of the VOAC engine can be realized easily to fulfill any requirements towards different desired engine characteristics. By adopting the proposed VOAC with optimized parameters, a 13.5 % average improvement in the engine's output can be achieved under full load operations across the entire speed range. On top of that, it also shows that the resulted BSFC

could be lowered by 16.1 g/kW • h on average over the sampled speed-load map of the engine running at partial load operations.

Keywords: Unthrottled gasoline engine | Variable Otto-Atkinson cycle | Hydraulic variable valve train | Genetic algorithm | Effective compression/expansion ratio | Engine power and fuel efficiency improvements