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References

Aktuell

Dodds 2015

Peter Sheridan Dodds et al., *Common mistakes in measuring frequency-dependent word characteristics*, *Reply to Garcia et al.* PNAS **112** (2015), E2984–E2985.

Peter Sheridan Dodds, EricM. Clark, Suma Desu, Morgan R. Frank, Andrew J. Reagan, Jake Ryland Williams, Lewis Mitchell, Kameron Decker Harris, Isabel M. Kloumann, James P. Bagrow, Karine Megerdoomian, Matthew T. McMahon, Brian F. Tivnan & Christopher M. Danforth

Sampling issues aside, Garcia et al. (1) state that regression against frequency f is a better choice than using rank r because information is lost in moving from f to r. However, the general adherence of natural language to Zipf's law, $f \sim r^{-1}$, provides an immediate counterargument, even acknowledging the possibility of a scaling break (6). Fig. 1B shows how use rank is well suited for regression, and is the basis for the "jellyfish" plots we presented in our work (3). In Fig. 1C, we present how havg behaves as a function of 1/f, illustrating both the error in choosing log10 f and that our results will be essentially unchanged if we regress against 1/f.

Garcia 2015

David Garcia, Antonios Garas & Frank Schweitzer, *The language-dependent relationship between word happiness and frequency*. PNAS **112** (2015), E2983.

In summary, our reanalysis shows: (i) that the reported positivity bias is explained by a measurement bias rather than a universal feature of human language, and (ii) that the reported independence between word happiness and frequency is an artifact of the data processing. However, this does not subtract importance from themethodological contribution of Dodds et al. (1), namely a multilingual lexicon of happiness that will be of key importance for future studies of human emotions.

Haggerty 2015

Stephen E. Haggerty, *Discovery of a Kimberlite pipe and recognition of a diagnostic botanical indicator in NW Liberia*. Economic Geology **110** (2015), 851–856.

Diamond-bearing kimberlite dikes (fissures) are present in the deeply eroded Man Shield of West Africa. Small kimberlite pipes, generally less than 1 hectare in area, are known in Guinea, Sierra Leone, and Liberia. Exploration for larger bodies has been severely hampered by thick tropical vegetation, and the lack of distinct geophysical contrasts between weathered kimberlite and the nonresponsive nature of country-rock granites and granodioritic gneisses. Following several years of intense exploration in the highly active artisanal diamond district of northwestern Liberia (which was a major source of alluvial "blood diamonds") by several large companies and the present study, we report that an elusive diamond-bearing kimberlite pipe has finally been located. A bonus to the pipe location is that an

unusual botanical indicator, Pandanus candelabrum, is now recognized exclusively on the pipe and not in eluvium covering the adjacent kimberlite dikes. Plants (Lychnis alpina) have been widely used since medieval times for copper in Sweden, and with Haumaniastrum katangese, more recently in Africa. Other plants have evolved to physiologically stabilize heavy metals (U, Pb, Zn, Ni, Cr, Ba, Pb, Zn) in leaves and bark. Termite hills have been used in diamond exploration for kimberlitic indicator minerals (ilmenite, chromite, garnet, pyroxene) in Botswana, the United States, and Australia, but the identification of Pandanus candelabrum, with stilt-like aerial roots, is the first plant to be described that has a marked affinity for kimberlite pipes. This could dramatically change the exploration dynamics for diamonds in West Africa, as geobotanical mapping and sampling is cost-effective in tough terrain.

Ledford 2015

Heidi Ledford, *CRISPR, the disruptor*. nature **522** (2015), 20–24.

A powerful gene-editing technology is the biggest game changer to hit biology since PCR. But with its huge potential come pressing concerns.

Usually, a genetic change in one organism takes a long time to spread through a population. That is because a mutation carried on one of a pair of chromosomes is inherited by only half the offspring. But a gene drive allows a mutation made by CRISPR on one chromosome to copy itself to its partner in every generation, so that nearly all offspring will inherit the change. This means that it will speed through a population exponentially faster than normal (see 'Gene drive') — a mutation engineered into a mosquito could spread through a large population within a season. If that mutation reduced the number of offspring a mosquito produced, then the population could be wiped out, along with any malaria parasites it is carrying.

In April 2014, Church and a team of scientists and policy experts wrote a commentary in Science6 warning researchers about the risks and proposing ways to guard against accidental release of experimental gene drives. The issue is not black and white. Micky Eubanks, an insect ecologist at Texas A&M University in College Station, says that the idea of gene drives shocked him at first. "My initial gut reaction was 'Oh my god, this is terrible. It's so scary'," he says. "But when you give it more thought and weigh it against the environmental changes that we have already made and continue to make, it would be a drop in the ocean."

Nicholson 2015

Emily Nicholson, *Accounting for career breaks*. science **348** (2015), 830.

Early in my scientific career, I pursued research while remaining blissfully unaware of the difficulty of securing a permanent academic position, especially for women and mothers. I drifted happily through a Ph.D. and two postdocs abroad, guided by interesting science, people, and places—and a nonscientist husband with ideas about where he wanted to live. It wasn't until I had been a postdoc for several years, with two children and a third on the way, that I recognized the need to adopt a sound strategic approach to securing a tenured faculty position, particularly given my career breaks.

Here's an example: "Since 2009, I have worked the equivalent of approximately 3.3 full-time years, 55 % of full time. Yet it has been a highly productive period: 23 publications—including 12 as lead or last author—a research fellowship, and a major grant. On a pro-rata basis, that equates to about 42 publications in 6 years of full-time work."

van Noorden 2015

Richard van Noorden, *Retracted gay-marriage study debated at misconduct meet-up*. nature **522** (2015), 14–15.

Over rum cocktails at the World Conference on Research Integrity, experts discussed what can be learnt from the fallout of a flawed political-science paper.

Sabine Kleinert, a co-organizer of the research-integrity conference and senior executive editor at The Lancet, said: "The wider lessons are still the same as many of these cases throw up — that of the role of the co-authors in taking steps to be accountable for the data, and the role of institutions in safeguarding or having repositories for the data underlying research that is done there."

Rosenhek-Goldian 2015

Irit Rosenhek-Goldian, Nir Kampf, Arie Yeredor & Jacob Klein, *On the question of whether lubricants fluidize in stick–slip friction*. PNAS **112** (2015), 7117–7122.

Intermittent sliding (stick–slip motion) between solids is commonplace (e.g., squeaking hinges), even in the presence of lubricants, and is believed to occur by shear-induced fluidization of the lubricant film (slip), followed by its resolidification (stick). Using a surface force balance, we measure how the thickness of molecularly thin, model lubricant films (octamethylcyclotetrasiloxane) varies in stick–slip sliding between atomically smooth surfaces during the fleeting (ca. 20 ms) individual slip events. Shear fluidization of a film of five to six molecular layers during an individual slip event should result in film dilation of 0.4–0.5 nm, but our results show that, within our resolution of ca. 0.1 nm, slip of the surfaces is not correlated with any dilation of the intersurface gap. This reveals that, unlike what is commonly supposed, slip does not occur by such shear melting, and indicates that other mechanisms, such as intralayer slip within the lubricant film, or at its interface with the confining surfaces, may be the dominant dissipation modes.

Keywords: friction | lubrication | nanotribology | stick–slip friction | lubricant yield

Significance: The costs to developed economies of friction and wear in technology are some 4–6 % of their gross national product, so improved understanding of frictional dissipation can lead to substantial benefits. A widespread mode of friction is the intermittent motion (stick–slip) between sliding solid surfaces (such as the squeak of hinges, or a bow running over a cello string), which can persist even on adding lubricants, but its origins are not well understood. We now show directly, by capturing the fleeting, individual slip events at millisecond and subnanometer resolution, that, in contrast to accepted and long-standing belief, shear melting (fluidization) of thin lubricant layers does not occur in stick–slip sliding. This new insight may open the way to improved lubricant design.

Simpson 2015

Richard K. Simpson, Michele A. Johnson & Troy G. Murphy, *Migration and the evolution of sexual dichromatism, Evolutionary loss of female coloration with migration among wood-warblers*. Proc. Royal Society B **282** (2015), 20150375.

The mechanisms underlying evolutionary changes in sexual dimorphism have long been of interest to biologists. A striking gradient in sexual dichromatism exists among songbirds in North America, including the woodwarblers (Parulidae): males are generally more colourful than females at northern latitudes, while the sexes are similarly ornamented at lower latitudes. We use phylogenetically controlled comparative analysis to test three nonmutually exclusive hypotheses for

the evolution of sexual dichromatism among wood-warblers. The first two hypotheses focus on the loss of female coloration with the evolution of migration, either owing to the costs imposed by visual predators during migration, or owing to the relaxation of selection for female social signalling at higher latitudes. The third hypothesis focuses on whether sexual dichromatism evolved owing to changes in male ornamentation as the strength of sexual selection increases with breeding latitude. To test these hypotheses, we compared sexual dichromatism to three variables: the presence of migration, migration distance, and breeding latitude. We found that the presence of migration and migration distance were both positively correlated with sexual dichromatism, but models including breeding latitude alonewere not strongly supported. Ancestral state reconstruction supports the hypothesis that the ancestral wood-warblers were monochromatic, with both colourful males and females. Combined, these results are consistent with the hypotheses that the evolution of migration is associated with the relaxation of selection for social signalling among females and that there are increased predatory costs along longer migratory routes for colourful females. These results suggest that loss of female ornamentation can be a driver of sexual dichromatism and that social or natural selection may be a stronger contributor to variation in dichromatism than sexual selection.

Keywords: evolutionary loss | female ornamentation | sexual dimorphism | latitudinal gradient | social selection | sexual selection

Anthropologie

Dyble 2015

M. Dyble, G. D. Salali, N. Chaudhary, A. Page, D. Smith, J. Thompson, L. Vinicius, R. Mace & A. B. Migliano, *Sex equality can explain the unique social structure of hunter-gatherer bands.* science **348** (2015), 796–798.

s348-0796-Supplement.pdf

The social organization of mobile hunter-gatherers has several derived features, including low within-camp relatedness and fluid meta-groups. Although these features have been proposed to have provided the selective context for the evolution of human hypercooperation and cumulative culture, how such a distinctive social system may have emerged remains unclear. We present an agent-based model suggesting that, even if all individuals in a community seek to live with as many kin as possible, within-camp relatedness is reduced if men and women have equal influence in selecting camp members. Our model closely approximates observed patterns of co-residence among Agta and Mbendjele BaYaka hunter-gatherers. Our results suggest that pair-bonding and increased sex egalitarianism in human evolutionary history may have had a transformative effect on human social organization.

Archäologie

Kristiansen 1982

Kristian Kristiansen, *The Formation of Tribal Systems in Later European Prehistory, Northern Europe, 4000–500 B.C.* In: Colin Renfrew, Michael J. Rowlands & Barbara Abbott Segraves (Hrsg.), *Theory and Explanation In Archaeology*,

The Southampton Conference of the Theoretical Archaeology Group, 1980. (New York 1982), 241–280.

It has been demonstrated that a specific theoretical model of cyclical tribal transformation can be applied to temperate Europe from 4000 to 500 B.C. Further, it has been shown that such long-term transformations can be explained as a function of the spatial and temporal distribution of production-reproduction cycles whose articulation may define local, regional, or even "global" systems. A regional system may eventually be composed of several local cycles of expansion and regression, as is exemplified by the Nordic Bronze Age. The balance between these opposing processes of evolution and devolution determines the course of development within the larger system.

It was further suggested that developments in tribal hierarchization from 4000–500 B.C. were closely linked to such regional cycles—generating an Early Neolithic-Middle Neolithic cycle of territorial chiefdoms that were dependent upon slash-and-burn agriculture and a Late Neolithic-Bronze Age cycle of prestige good systems that were based on a pastoral economy. These two cycles of tribal transformations constitute a general evolutionary sequence of economic intensification and population increase, which at the transition to the Iron Age reached a point that would not allow the tribal cycle to continue or to be repeated.

Datierung

Granger 2015

Darryl E. Granger, Ryan J. Gibbon, Kathleen Kuman, Ronald J. Clarke, Laurent Bruxelles & Marc W. Caffee, *New cosmogenic burial ages for Sterkfontein Member 2 Australopithecus and Member 5 Oldowan*. nature **522** (2015), 85–88.

The cave infills at Sterkfontein contain one of the richest assemblages of Australopithecus fossils in the world, including the nearly complete skeleton StW 573 ('Little Foot') in its lower section, as well as early stone tools in higher sections.However, the chronology of the site remains controversial owing to the complex history of cave infilling. Much of the existing chronology based on uranium–lead dating and palaeomagnetic stratigraphy has recently been called into question by the recognition that dated flowstones fill cavities formed within previously cemented breccias and therefore do not form a stratigraphic sequence. Earlier dating with cosmogenic nuclides suffered a high degree of uncertainty and has been questioned on grounds of sediment reworking. Here we use isochron burial dating with cosmogenic aluminium-26 and beryllium-10 to show that the breccia containing StW 573 did not undergo significant reworking, and that it was deposited 3.67 ± 0.16 million years ago, far earlier than the 2.2 million year flowstones found within it. The skeleton is thus coeval with early Australopithecus afarensis in eastern Africa. We also date the earliest stone tools at Sterkfontein to 2.18 ± 0.21 million years ago, placing them in the Oldowan at a time similar to that found elsewhere in South Africa at Swartkans and Wonderwerk.

Guérin 2015

Guillaume Guérin et al., *A multi-method luminescence dating of the Palaeolithic sequence of La Ferrassie based on new excavations adjacent to the La Ferrassie 1 and 2 skeletons*. Journal of Archaeological Science **58** (2015), 147–166.

JAS058-0147-Supplement1.pdf, JAS058-0147-Supplement2.jpg

Guillaume Guérin, Marine Frouin, Sahra Talamo, Vera Aldeias, Laurent Bruxelles, Laurent Chiotti, Harold L. Dibble, Paul Goldberg, Jean-Jacques Hublin, Mayank Jain, Christelle Lahaye, Stéphane Madelaine, Bruno Maureille, Shannon J. P. McPherron, Norbert Mercier, Andrew S. Murray, Dennis Sandgathe, Teresa E. Steele, Kristina J. Thomsen & Alain Turq

A new interdisciplinary projectwas initiated to excavate a portion of the Palaeolithic site of La Ferrassie left intact by earlier excavations. One of the aims of this projectwas to provide chronological information on the succession of Middle and Upper Palaeolithic layers, as well as on the skeletons unearthed by Capitan and Peyrony in the early 1900's. We report here preliminary results on the lithics, faunal remains, site formation processes, and on the stratigraphic context of the La Ferrassie 1 and 2 skeletons that were found adjacent to our excavations. Finally, results from luminescence dating of the sediments and a preliminary set of radiocarbon ages are presented. Quartz OSL, both at the multi-grain and single-grain levels of analysis, and post-IR IRSL of feldspar at various stimulation temperatures are compared. The quartz/feldspar comparison revealed a bleaching problem for the quartz OSL (and the feldspar pIRIR signals) from Layer 2; as a consequence, the age of this Layer was determined using a minimum age model.

A Mousterian industry with bifaces, at the base of the sequence, has been dated between 91 ± 9 and 44 ± 3 ka. The Ferrassie Mousterian layers are attributed to MIS 3, between 54 ± 3 and 40 ± 2 ka, and thus appear very late in the final Middle Palaeolithic of the region; furthermore, these ages constrain the chronology of the La Ferrassie 1 and 2 skeletons, which have been attributed to one of these Ferrassie Mousterian layers. The Châtelperronian layer is dated to 42 ± 3 ka and the Aurignacian to 37 ± 2 ka. Implications of the ages for the La Ferrassie 1 and 2 skeletons, and for the variability of late Mousterian, are discussed.

Keywords: OSL dating | Post-IR IRSL dating | Single grain | Middle Palaeolithic | Mousterian

Richter 2010

D. Richter, H. Dombrowski, S. Neumaier, P. Guibert & A. C. Zink, *Environmental gamma dosimetry with OSL of α-Al_2O_3:C for in situ sediment measurements*. Radiation Protection Dosimetry **141** (2010), 27–35.

The physical properties of a-Al2O3:C are very similar to that of quartz, which make it an attractive dosimetric material for geological and archaeological dating applications. Storage experiments in an ultra-low-radiation underground environment (UDO at PTB) and gamma-ray spectrometry show that the optically stimulated luminescence (OSL) signal of this material does neither suffer from a significant inherent background caused by traces of radionuclides (<6 mGy a21) nor from fading. After having performed a simple calibration procedure, gamma dosimetry based on a-Al2O3:C detectors, which were exposed in a brick block and a lead castle for different periods of time, provided concordant results with dose values derived from independent gamma-ray spectrometric measurements using high-purity germanium and NaI:Tl detectors. These investigations indirectly confirm both the absence of a significant inherent background and fading of the detector material. Small doses of a few micro gray accumulated in short exposure times to environmental radiation can be accurately measured, even when doses (i.e. transport dose) much larger than the actual environmental dose have to be subtracted. It is shown that the OSL signal caused by small transport doses can be easily and reproducibly reset even under difficult field conditions by illuminating the dosemeters with the blue light from Luxeon LEDs. Summarised, a-Al2O3:C

appears to be the material of choice for dosimetric dating applications of quartz or related materials, when analysed by using OSL.

Weninger 1992

Bernhard Paul Weninger, *Studien zur dendrochronologischen Kalibration von archäologischen ^{14}C-Daten*. Dissertation, Universität Frankfurt (Frankfurt 1992).

Ziel der dendrochronologischen Kalibration von archäologischen 14C-Daten ist die Übertragung der gesamten, vom Laboratorium empirisch zu bestimmenden Datierungswahrscheinlichkeit von der BP-Meßskala über die Kalibrationskurve auf die Kalenderzeitskala. Dabei ist nach Vorschrift der klassischen Wahrscheinlichkeitstheorie von Kolmogorow eine Normierung der Datierungswahrscheinlichkeit auf einen Maximalwert p=l notwendig. Da die Kalibrationskurve zu jedem Datum nun aber eine Vielzahl von unterschiedlichen möglichen Ablesungen besitzt, die alle gleichberechtigt erscheinen, aber nur eine der Ablesungen das 'wahre Alter' der datierten Probe repräsentiert, ist eine korrekte Normierung der kalibrierten Datierungswahrscheinlichkeit nicht möglich. Daraus resultiert das eigenartige Phänomen, daß die kalibrierten Daten einer Quantisierung unterworfen sind.

Auf die Tatsache, daß 14C-Daten einer speziellen Logik unterliegen, so daß die traditionellen Verfahren ihrer statistischen Auswertung mit Hilfe von Ansätzen der klassischen Wahrscheinlichkeitstheorie schließlich versagen, ist die Forschung schon aufmerksam geworden (Aitchison et al., 1989). Die Frage, worin die Schwierigkeiten der Kalibration von 14C-Daten nun eigentlich liegen, wurde in der Fachliteratur aber bislang noch nicht näher behandelt. Die Ursache hierfür ist, daß die 14C-Daten einer nichtklassischen Wahrscheinlichkeitstheorie unterliegen.

Energie

Bloser 1993

Manfred H. Bloser, *Endlagerung radioaktiver Abfälle*. In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag*. Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 252–256.

Bonka 1993

Hans Bonka, *Die Folgen eines schweren Kernreaktorunfalls – Tschernobyl*. In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag*. Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 230–237.

Bonnenberg 1993

Heiner Bonnenberg, *Der Hochtemperaturreaktor – das Kernkraftwerk der Zukunft*. In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag*. Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 245–251.

Hansen 1993
Ulf Hansen, *Kernenergie – auch in Zukunft wirtschaftlich?* In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag.* Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 219–229.

Hicken 1993
Enno Hicken, *Leichtwasserreaktoren mit erhöhter Sicherheit.* In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag.* Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 238–244.

Kugeler 1993
Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik — für eine wirtschaftliche, umweltschonende und schadenbegrenzende Energieversorgung, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag.* Monographien des Forschungszentrums Jülich 8 (Jülich 1993).

Kugeler 1993
Kurt Kugeler, *Hat Kernenergie Zukunft? Neue Sicherheitsanforderungen und neue Lösungen.* In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag.* Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 209–218.

Katastrophenfreie Kernenergienutzung ist dadurch gekennzeichnet, daß bei Störfällen keine katastrophalen Folgen außerhalb der Anlagen durch Spaltproduktfreisetzung eintreten können. Ein Katastrophenschutzplan ist bei derartigen Anlagen nicht erforderlich. Im einzelnen sind für eine katastrophenfreie Kerntechnik folgende Forderungen zu erfüllen:
– es darf keine Soforttoten außerhalb der Anlage geben
– es darf keine nachweisbaren Spättoten außerhalb der Anlage geben
– Evakuierungen sind nicht notwendig
– Umsiedlungen sind nicht notwendig
– Änderungen der Verzehrgewohnheiten sind nicht erforderlich.

Die hierzu notwendige extrem gute Zurückhaltung der radioaktiven Spaltprodukte in der Anlage muß nachweislich immer gewährleistet sein und zwar:
– für alle Störfälle, die sich aus inneren Ursachen in der Anlage ableiten lassen, und
– für alle absehbaren Störfälle, die sich aus Einwirkungen auf die Anlage von außen her ergeben wie beispielsweise Flugzeugabsturz, Gaswolkenexplosion oder schwere Erdbeben.

Für Störungen von außen, die in Ursache und Wirkung über die letztgenannten noch hinausgehen könnten wie z.B. Krieg oder extremer Terrorismus sind gesonderte Überlegungen erforderlich. Hier helfen wahrscheinlich unterirdische Anordnungen der Anlagen oder die Überschüttung mit ausreichenden Mengen an Erdreich und Gestein.

Aufgabe der Forschung und Entwicklung der nächsten Jahre wird es sein, überzeugende Nachweise für die genannten Sicherheitseigenschaften zu erbringen und die notwendigen neuen Komponenten zu entwickeln.

Wenn diese Nachweise gelingen, was die bereits vorliegenden Kenntnisse erwarten lassen, wird eine kerntechnische Lösung zur Verfügung stehen, die die zu fordernde neue Sicherheitsqualitat nachweisbar besitzt und die praktisch allen Bedürfnissen des Strom- und Wärmemarktes gerecht werden kann.

Schenk 1993

Werner Schenk, Heinz Nabielek, Günter Port & Hubertus Nickel, *Die Spaltproduktrückhaltung im Kugelbrennelement.* In: Kurt Kugeler, Helmut Neis & Günter Ballensiefen (Hrsg.), *Fortschritte in der Energietechnik, Festschrift für Prof. Dr. Rudolf Schulten zum 70. Geburtstag.* Monographien des Forschungszentrums Jülich 8 (Jülich 1993), 321–328.

Judentum

Hezser 2015

Catherine Hezser, *Crossing Enemy Lines, Network Connections Between Palestinian and Babylonian Sages in Late Antiquity.* Journal for the Study of Judaism **46** (2015), 224–250.

The Palestinian and Babylonian Talmuds transmit stories about sages who crossed the boundaries between the Roman and Persian empires in late antiquity to sojourn in the "enemy" territory for a certain amount of time. These sages, who were members of local rabbinic networks, established inter-regional network connections among Palestinian and Babylonian scholars which reached across political boundaries. This paper will investigate how these connections were established and maintained. What was the role of place and mobility in an intellectual network "without propinquity"? Which segments of the respective local rabbinic networks maintained inter-regional contacts? Or more specifically: which sages are presented as the main nodal points within these networks and what were their roles within Palestinian and Babylonian Jewish society? How did network centrality and power shift from Palestine to Babylonia between the fourth and sixth centuries C.E.?

Keywords: rabbis | late antiquity | Roman Palestine | Sasanian Babylonia | Talmud | network – mobility | travel

Jungpaläolithikum

Benazzi 2015

S. Benazzi et al., *The makers of the Protoaurignacian and implications for Neandertal extinction.* science **348** (2015), 793–796.

s348-0793-Supplement.pdf

S. Benazzi, V. Slon, S. Talamo, F. Negrino, M. Peresani, S. E. Bailey, S. Sawyer, D. Panetta, G. Vicino, E. Starnini, M. A. Mannino, P. A. Salvadori, M. Meyer, S. Pääbo & J.-J. Hublin

The Protoaurignacian culture is pivotal to the debate about the timing of the arrival of modern humans in western Europe and the demise of Neandertals. However, which group is responsible for this culture remains uncertain. We investigated dental remains associated with the Protoaurignacian. The lower deciduous incisor

from Riparo Bombrini is modern human, based on its morphology. The upper deciduous incisor from Grotta di Fumane contains ancient mitochondrial DNA of a modern human type. These teeth are the oldest human remains in an Aurignacian-related archaeological context, confirming that by 41,000 calendar years before the present, modern humans bearing Protoaurignacian culture spread into southern Europe. Because the last Neandertals date to 41,030 to 39,260 calendar years before the present, we suggest that the Protoaurignacian triggered the demise of Neandertals in this area.

Conard 2015

Nicholas J. Conard & Michael Bolus, *Chronicling modern human's arrival in Europe, Dental remains elucidate the demise of the Neandertals*. science **348** (2015), 754–756.

Critics may question the stratigraphic contexts of the finds, as has been the case at other sites. Indeed, at many sites, isolated finds of all classes of materials have been attributed to layers much older than the objects themselves. This was, for example, the case with the famous human remains from Vogelherd, which for 70 years were viewed as belonging to the Aurignacian, but were ultimately demonstrated to be intrusive bones from the Neolithic. Skeptics thus need to be taken seriously. Nonetheless, the results look reliable.

Gautney 2015

Joanna R. Gautney & Trenton W. Holliday, *New estimations of habitable land area and human population size at the Last Glacial Maximum*. Journal of Archaeological Science **58** (2015), 103–112.

The estimation of human population size during the Pleistocene is complex, and one which has been dealt with extensively in the literature. However, because many of these previous estimations are based in part on archaeological site distributions, they are more a reflection of present-day geography than of what the Earth looked like in the past. We address this issue by calculating an estimation of habitable land area during the Last Glacial Maximum (between 22 and 19 kya) when sea level was 120 m lower than today using the polygon creation function in Google Earth. We then subtract areas of land that were likely uninhabitable during the LGM – either due to glacier cover, extreme aridity, elevation, or areas at high latitudes. From this, the combined habitable land areas of Eurasia, Africa and the Australian landmass are estimated as 76,959,712.4 km2. This estimation is then coupled with population density data for medium-to large-bodied carnivores, and ethnographic population density data for hunteregatherers culled from the literature. Total human census population size in the Old World during the Last Glacial Maximum is estimated at 2,117,000–2,955,000 based on carnivore densities and 3,046,000–8,307,000 for hunteregatherer densities.

Keywords: Last Glacial Maximum | Human population size | Human biogeography | Paleogeography | Sea level change

Klima

Farrior 2015

Caroline E. Farrior, Ignacio Rodriguez-Iturbe, Ray Dybzinski, Simon A. Levin & Stephen W. Pacala, *Decreased water limitation under elevated CO_2 amplifies potential for forest carbon sinks*. PNAS **112** (2015), 7213–7218.

Increasing atmospheric CO2 concentrations and changing rainfall regimes are creating novel environments for plant communities around the world. The resulting changes in plant productivity and allocation among tissues will have significant impacts on forest carbon storage and the global carbon cycle, yet these effects may depend on mechanisms not included in global models. Here we focus on the role of individual-level competition for water and light in forest carbon allocation and storage across rainfall regimes. We find that the complexity of plant responses to rainfall regimes in experiments can be explained by individual-based competition for water and light within a continuously varying soil moisture environment. Further, we find that elevated CO2 leads to large amplifications of carbon storage when it alleviates competition for water by incentivizing competitive plants to divert carbon from short-lived fine roots to long-lived woody biomass. Overall, we find that plant dependence on rainfall regimes and plant responses to added CO2 are complex, but understandable. The insights developed here will serve as an important foundation as we work to predict the responses of plants to the full, multidimensional reality of climate change, which involves not only changes in rainfall and CO2 but also changes in temperature, nutrient availability, and disturbance rates, among others.

Keywords: rainfall | forest dynamics | plant allocation | carbon storage | evolutionarily stable strategy

Significance: With increasing atmospheric CO2 and a changing climate come changes in both plant water use efficiency and rainfall regimes. The effects of these changes on forests, including feedbacks to the carbon cycle, are complex. Through a theoretical analysis combining CO2, soil moisture dynamics, and individual-based competition in forests, we find that (i) carbon storage has a complex and significant dependence on rainfall amount and timing and (ii) the main effect of increasing CO2 in water-limited forests is a decrease in the amount of time trees spend in water limitation. This main effect is predicted to reduce competitive overinvestment in fine roots, drive competitive trees to increase investment in woody biomass, and greatly increase forest carbon storage in live biomass.

Methoden

Coster 2015

Adelle C. F. Coster & Judith H. Field, *What starch grain is that? A geometric morphometric approach to determining plant species origin.* Journal of Archaeological Science **58** (2015), 9–25.

Many economically important plants produce starch grains that, if distinctive in form, can be used as identifiers for particular taxa. The identification of starch to species or genera has become increasingly important in studies exploring plant use in ancient societies and also in the verification of plant origin for some plant-based medicines. However, identification of starch can be problematic, because of the considerable variability in the morphology of starch grains. As a result there has always been an element of subjective judgement when it comes to identifying a sample of grains. Here we present a novel system for identifying the plant species origin of unknown starch grains using image analysis of light micrographs. After manually obtaining a mask of the two-dimensional maximum-projection-area grain shape, features for each starch grain were determined automatically including the size metrics, circularity and Fourier transform signature. The starch grain features analysed were used to create classifiers for the grains. The relative performance of the different classifiers was evaluated, based on different combinations of the predictor variables (e.g. area, perimeter etc.), and the optimal classifier determined.

The method was applied to a database of 1032 grains representing 8 geographically co-located known economic plant species. A classification tree using shape metrics and the Fourier signature produced the best separations. The morphological features were sufficient to obtain a high level of accuracy in attributing individual starch grains to plant species. The method enables the creation of effective classifiers to undertake a quantitative evaluation of starch grain morphologies, thereby reducing the need for subjective qualitative determinations. The system provides a robust framework in which plant microfossils of unknown species origin can be compared with reference grains for effecting identifications. The method is potentially useful not just for starch, but other microfossils of morphometric interest.

Keywords: Starch grains | Identification | Geometric analysis | Morphometric analysis

Discamps 2015

Emmanuel Discamps & Sandrine Costamagno, *Improving mortality profile analysis in zooarchaeology, A revised zoning for ternary diagrams.* Journal of Archaeological Science **58** (2015), 62–76.

Mortality profiles have figured prominently among tools used by zooarchaeologists to investigate relationships between hominids and prey species. Their analysis and interpretation have been considerably influenced by M.C. Stiner's approach based on ternary diagrams. Part of this method included the demarcation of "zones" in ternary diagrams identifying specific mortality patterns (e.g. attritional, catastrophic, prime-dominated, etc.). Since its introduction some twenty-five years ago, this zoning has, however, received little critical attention. Mathematical modelling as well as a reassessment of the ecological data used to define these zones reveal several problems that may bias interpretations of mortality profiles on ternary diagrams.

Here we propose new, mathematically supported definitions for the zoning of ternary diagrams combined with species-specific age class boundaries based on ethological and ontological data for seven of the most common hominid prey (bison, red deer, reindeer, horse, zebras, African buffalo and common eland). We advocate for the use of new areas (JPO, JOP, O and P zones) that produce more valid interpretations of the relative abundance of juveniles, prime and old adults in an assemblage. These results contribute to the improvement of the commonly used method of mortality profile analysis first advanced by M.C. Stiner.

Keywords: Zooarchaeology | Mortality profile | Hunting tactics | Subsistence strategies | Palaeolithic | Stone Age | Age structure

Neolithikum

Ruff 2015

Christopher B. Ruff et al., *Gradual decline in mobility with the adoption of food production in Europe.* PNAS **112** (2015), 7147–7152.

pnas112-07147-Supplement.pdf

Christopher B. Ruff, Brigitte Holt, Markku Niskanen, Vladimir Sladek, Margit Berner, Evan Garofalo, Heather M. Garvin, Martin Hora, Juho-Antti Junno, Eliska Schuplerova, Rosa Vilkama & Erin Whittey

Increased sedentism during the Holocene has been proposed as a major cause of decreased skeletal robusticity (bone strength relative to body size) in modern humans. When and why declining mobility occurred has profound implications for reconstructing past population history and health, but it has proven difficult to characterize archaeologically. In this study we evaluate temporal trends in relative

strength of the upper and lower limb bones in a sample of 1,842 individuals from across Europe extending from the Upper Paleolithic [11,000–33,000 calibrated years (Cal y) B.P.] through the 20th century. A large decline in anteroposterior bending strength of the femur and tibia occurs beginning in the Neolithic (≈4,000–7,000 Cal y B.P.) and continues through the Iron/Roman period (≈2,000 Cal y B.P.), with no subsequent directional change. Declines in mediolateral bending strength of the lower limb bones and strength of the humerus are much smaller and less consistent. Together these results strongly implicate declining mobility as the specific behavioral factor underlying these changes. Mobility levels first declined at the onset of food production, but the transition to a more sedentary lifestyle was gradual, extending through later agricultural intensification. This finding only partially supports models that tie increased sedentism to a relatively abrupt Neolithic Demographic Transition in Europe. The lack of subsequent change in relative bone strength indicates that increasing mechanization and urbanization had only relatively small effects on skeletal robusticity, suggesting that moderate changes in activity level are not sufficient stimuli for bone deposition or resorption.

Keywords: mobility | Europe | Neolithic | bone strength

Significance: Declining mobility levels following the Pleistocene had profound effects on human demography, social organization, and health, but the exact timing and pace of this critical change are unknown. Here we examine direct evidence for changing mobility levels from limb bone structural characteristics in a large sample of European skeletons spanning the past 30,000 y. Our results show that mobility first declined during the Neolithic, at the onset of food production, but that the decline was gradual, continuing for several thousand years as agriculture intensified. No change in relative limb strength occurred during the past 2,000 y. Thus, the more gracile modern human skeleton is a result of increased sedentism tied to food production, not subsequent mechanization and industrialization.

Religion

Watkins 2015

Trevor Watkins, *Ritual performance and religion in early Neolithic societies*. In: Nicola Laneri (Hrsg.), *Defining the Sacred, Approaches to the Archaeology of Religion in the Near East*. (Oxford 2015), 153–160.

I have been careful not to make an automatic link between ritual practices and religious belief. In fact, I am sure that many of the repeated rituals and occasional ceremonies had little or nothing to do with service to any supernatural agents, as is the case in our own lives today. There are examples of the representation of unnatural phenomena, but that is not the same as saying that they are supernatural phenomena. [...] The complex sculpture found at Göbekli Tepe, and now in the Urfa Museum, which Schmidt has nicknamed the 'totem-pole', is another example.

There is evidence of the practice of rituals, as we have seen, for example, in the careful practices concerned with the maintenance of houses, and in the treatments of selected bodies and their skulls. But there is no evidence for rituals that could be deined as religious in purpose.

In the same way, I suggest that the creation of the Göbekli Tepe monoliths and their erection in their formal places within the enclosures should be understood as the ritual making of the gods. In this way, the rituals were literally make-believe, the actions that were the making of beliefs about the supernatural beings. Religious practice, in fact, was the creating of religious belief.