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References

Aktuell

Asensio 2015

Omar I. Asensio & Magali A. Delmas, *Nonprice incentives and energy conservation*. PNAS **112** (2015), E510–E515.

In the electricity sector, energy conservation through technological and behavioral change is estimated to have a savings potential of 123 million metric tons of carbon per year, which represents 20 % of US household direct emissions in the United States. In this article, we investigate the effectiveness of nonprice information strategies to motivate conservation behavior. We introduce environment and health-based messaging as a behavioral strategy to reduce energy use in the home and promote energy conservation. In a randomized controlled trial with real-time appliancelevel energy metering, we find that environment and health-based information strategies, which communicate the environmental and public health externalities of electricity production, such as pounds of pollutants, childhood asthma, and cancer, outperform monetary savings information to drive behavioral change in the home. Environment and health-based information treatments motivated 8 % energy savings versus control and were particularly effective on families with children, who achieved up to 19 % energy savings. Our results are based on a panel of 3.4 million hourly appliance-level kilowatt–hour observations for 118 residences over 8 mo. We discuss the relative impacts of both cost-savings information and environmental health messaging strategies with residential consumers.

Keywords: energy conservation | decision making | health information disclosure | environmental behavior | randomized controlled trials

Significance: We investigate the effectiveness of nonprice incentives to motivate conservation behavior. We test whether tailored information about environmental and health damages produces behavior change in the residential electricity sector. In a randomized controlled trial with real-time appliance-level energy metering over 8 mo, we find that environment and healthbased information strategies outperform monetary savings information to drive energy conservation. Environment and health-based messages, which communicate the environmental and public health externalities of electricity production— such as pounds of pollutants, childhood asthma, and cancer— motivated 8 % energy savings versus control. This strategy was particularly effective on families with children, who achieved 19 % energy savings. However, we do not study the persistence of these behavioral changes after the conclusion of the study.

Beniston 2015

Martin Beniston, *Hot and hotter in Europe*. nature **518** (2015), 9.

Air temperatures in Europe are more likely to break record highs than to fall below record lows for any given day, thanks to climate change.

Martin Beniston of the University of Geneva in Switzerland analysed daily temperatures over the past 60 or so years from 30 climate observation stations across Europe. He found that the ratio of days per year with record high temperatures to days with record lows increased from about 1:1 in the 1950s to nearly 1.5:1 in 2013. The ratio has risen sharply since the turn of the millennium, despite the observed slowdown in the rate of warming over the past 15 years.

In an already warm climate, even a small shift in mean temperature leads to a marked rise in the number of extremely warm days, Beniston argues.

Climatic Change http://doi.org/zqr (2015)

Bradshaw 2015

Corey J. A. Bradshaw & Barry W. Brook, *Fertility reduction will help, but only in the long term, Reply to O'Neill et al. and O'Sullivan.* PNAS **112** (2015), E508–E509.

However, our main conclusion—which has not been altered by these critiques—is that over the next century at least, our largest and most immediate gains in sustainability will necessarily come from reductions in per capita consumption, whereas the benefits of fertility reduction will improve humanity's prospects cumulatively over the long term. It is all a question of where society can have the biggest sustainability bang for its social engineering buck in the near term.

Cai 2015

Wenju Cai et al., *Increased frequency of extreme La Niña events under greenhouse warming.* nature climate change **5** (2015), 132–137.

NatClimCh05-132-Supplement.pdf

Wenju Cai, Guojian Wang, Agus Santoso, Michael J. McPhaden, Lixin Wu, Fei-Fei Jin, Axel Timmermann, Mat Collins, Gabriel Vecchi, Matthieu Lengaigne, Matthew H. England, Dietmar Dommenget, Ken Takahashi & Eric Guilyardi

The El Niño/Southern Oscillation is Earth's most prominent source of interannual climate variability, alternating irregularly between El Niño and La Niña, and resulting in global disruption of weather patterns, ecosystems, fisheries and agriculture1–5. The 1998–1999 extreme La Niña event that followed the 1997–1998 extreme El Niño event6 switched extreme El Niño-induced severe droughts to devastating floods in western Pacific countries, and vice versa in the southwestern United States4,7. During extreme La Niña events, cold sea surface conditions develop in the central Pacific8,9, creating an enhanced temperature gradient from the Maritime continent to the central Pacific. Recent studies have revealed robust changes in El Niño characteristics in response to simulated future greenhousewarming10–12, but howLa Niña will change remains unclear. Here we present climate modelling evidence, from simulations conducted for the Coupled Model Intercomparison Project phase 5 (ref. 13), for a near doubling in the frequency of future extreme La Niña events, from one in every 23 years to one in every 13 years. This occurs because projected faster mean warming of the Maritime continent than the central Pacific, enhanced upper ocean vertical temperature gradients, and increased frequency of extreme El Niño events are conducive to development of the extreme La Niña events. Approximately 75 % of the increase occurs in years following extreme El Niño events, thus projecting more frequent swings between opposite extremes from one year to the next.

Cai 2015

Yizhi Cai et al., *Intrinsic biocontainment, Multiplex genome safeguards combine transcriptional and recombinational control of essential yeast genes.* PNAS **112** (2015), 1803–1808.

Yizhi Cai, Neta Agmon, Woo Jin Choi, Alba Ubide, Giovanni Stracquadanio, Katrina Caravelli, Haiping Hao, Joel S. Bader & Jef D. Boeke

Biocontainment may be required in a wide variety of situations such as work with pathogens, field release applications of engineered organisms, and protection of intellectual properties. Here, we describe the control of growth of the brewer's

yeast, Saccharomyces cerevisiae, using both transcriptional and recombinational "safeguard" control of essential gene function. Practical biocontainment strategies dependent on the presence of small molecules require them to be active at very low concentrations, rendering them inexpensive and difficult to detect. Histone genes were controlled by an inducible promoter and controlled by 30 nM estradiol. The stability of the engineered genes was separately regulated by the expression of a site-specific recombinase. The combined frequency of generating viable derivat-iveswhen both systemswere active was below detection (<10-10), consistent with their orthogonal nature and the individual escape frequencies of <10-6. Evaluation of escaper mutants suggests strategies for reducing their emergence. Transcript profiling and growth test suggest high fitness of safeguarded strains, an important characteristic for wide acceptance.

Keywords: biotechnology | biosafety | Saccharomyces cerevisiae

Significance: The advance of biotechnology opens up greater possibilities of bioterror and bioerror. Here, we propose multiplexed safeguard switches rooted in the development of foundational genomic, regulatory, and metabolic technologies. Safeguard switches can be regulated by submicromolar small molecule(s) and combined in a modular fashion. The resulting safeguard strains show high fitness and low reversion rates. Moreover, two distinct classes of safeguard switches are orthogonal, providing a potential fail-safe mechanism. The safeguard technologies provide a practical and generic approach to containing engineered microbes within defined laboratory and/or industrial environments, and can in principle be used in the field as well.

Callaway 2015

Ewen Callaway, *Neanderthals gain human neighbour*. nature **517** (2015), 541.

Cranium discovery shows that Homo sapiens was living in Middle East 55,000 years ago.

Dietz 2015

Thomas Dietz, *Altruism, self-interest, and energy consumption*. PNAS **112** (2015), 1654–1655.

The results are intriguing. Households who received the air pollution message reduced their electrical consumption by 8.2 % over the 100-d experimental monitoring period. Those in this group who had children changed their behavior even more dramatically, achieving a 19 % reduction in consumption. Information about air pollution reductions reduced consumption in all but the 10 % of households with the smallest energy use. In contrast, the households that received the monetary messages actually increased their consumption, and that increase was greater for households with children and for those in the highest use categories.

Langin 2015

Kathryn M. Langin, T. Scott Sillett, W. Chris Funk, Scott A. Morrison, Michelle A. Desrosiers & Cameron K. Ghalambor, *Islands Within an Island, Repeated adaptive divergence in a single population*. Evolution (2015), preprint, 1–43. DOI:10.1111/evo.12610.

Evolution2015-Langin-Supplement1.pdf, Evolution2015-Langin-Supplement2.pdf

Physical barriers to gene flow were once viewed as prerequisites for adaptive evolutionary divergence. However, a growing body of theoretical and empirical work suggests that divergence can proceed within a single population. Here we document genetic structure and spatially-replicated patterns of phenotypic divergence within a bird species endemic to 250 km2 Santa Cruz Island, California,

USA. Island scrub-jays (Aphelocoma insularis) in three separate stands of pine habitat had longer, shallower bills than jays in oak habitat, a pattern that mirrors adaptive differences between allopatric populations of the species' mainland congener. Variation in both bill measurements was heritable, and island scrub-jays mated non-randomly with respect to bill morphology. The population was not panmictic; instead, we found a continuous pattern of isolation by distance across the eastwest axis of the island, as well as a subtle genetic discontinuity across the boundary between the largest pine stand and adjacent oak habitat. The ecological factors that appear to have facilitated adaptive differentiation at such a fine scale—environmental heterogeneity and localized dispersal—are ubiquitous in nature. These findings support recent arguments that microgeographic patterns of adaptive divergence may be more common than currently appreciated, even in mobile taxonomic groups like birds.

Keywords: adaptation, Aphelocoma, gene flow, morphological evolution, natural selection, population structure

di Lernia 2015

Savino di Lernia, *Save Libyan archaeology*. nature **517** (2015), 547–549.

Until violence eases and fieldwork can resume, fund research in labs, museums and on computers, urges Savino di Lernia.

Fieldwork is vital to research and central to fundraising in archaeology. But in Libya — and other violence-wracked countries — archaeology as we have practised it has come to an end. Lengthy excavation campaigns will be impossible for years, if not generations. Researchers must imagine a different future based on other methods. International funding and attention must return to scientific studies of Libyan heritage. Research should focus on existing materials in museums and collections. Granting bodies should give greater priority to research that can be carried out on computers or in the laboratory. Without these steps, archaeological research in Libya, already moribund, will soon die. It would be gravely disappointing and paradoxical if after years of neglect under the Gaddafi regime Libyan archaeological heritage is once again be abandoned. As well as a failure of the 2011 revolution, it would be a missed opportunity for a generation of young Libyan archaeologists — and a tragedy for the safeguarding of monuments and sites of universal and outstanding value.

Mandell 2015

Daniel J. Mandell et al., *Biocontainment of genetically modified organisms by synthetic protein design*. nature **518** (2015), 55–60.

n518-0055-Supplement.pdf

Daniel J. Mandell, Marc J. Lajoie, Michael T. Mee, Ryo Takeuchi, Gleb Kuznetsov, Julie E. Norville, Christopher J. Gregg, Barry L. Stoddard & George M. Church

Genetically modified organisms (GMOs) are increasingly deployed at large scales and in open environments. Genetic biocontainment strategies are needed to prevent unintended proliferation of GMOs in natural ecosystems. Existing biocontainment methods are insufficient because they impose evolutionary pressure on the organism to eject the safeguard by spontaneous mutagenesis or horizontal gene transfer, or because they can be circumvented by environmentally available compounds. Here we computationally redesign essential enzymes in the first organism possessing an altered genetic code (Escherichia coli strain C321.DA) to confer metabolic dependence on non-standard amino acids for survival. The resulting GMOs cannot metabolically bypass their biocontainment mechanisms using known environmental compounds, and they exhibit unprecedented resistance to evolutionary escape through mutagenesis and horizontal gene transfer. This work provides a

foundation for safer GMOs that are isolated from natural ecosystems by a reliance on synthetic metabolites.

O'Neill 2015

Brian C. O'Neill, Leiwen Jiang & Patrick Gerland, *Plausible reductions in future population growth and implications for the environment*. PNAS **112** (2015), E506.

We have used such scenarios to conclude that although slowing population growth would not be the largest nor necessarily most important factor in reducing greenhouse gas emissions, it could make a significant contribution, particularly in the long run. We stand by that conclusion.

O'Sullivan 2015

Jane N. O'Sullivan, *Population stabilization potential benefits underestimated*. PNAS **112** (2015), E507.

Bradshaw and Brook claim that fertility reduction is a solution from which only "our great-great-great-great-grandchildren might ultimately benefit." This statement is belied by the enormous social and economic benefits that family-planning–adopting nations have experienced in one generation, compared with their nonadopting neighbors.

Perkel 2015

Jeffrey M. Perkel, *Pick up Python*. nature **518** (2015), 125–126.

Among the host of computer-programming languages that scientists might choose to pick up, Python, first released in 1991 by Dutch programmer Guido van Rossum, is an increasingly popular (and free) recommendation. It combines simple syntax, abundant online resources and a rich ecosystem of scientifically focused toolkits with a heavy emphasis on community.

Amerika

Bhattacharya 2015

Tripti Bhattacharya, Roger Byrne, Harald Böhnel, Kurt Wogau, Ulrike Kienel, B. Lynn Ingram & Susan Zimmerman, *Cultural implications of late Holocene climate change in the Cuenca Oriental, Mexico*. PNAS **112** (2015), 1693–1698.

There is currently no consensus on the importance of climate change in Mesoamerican prehistory. Some invoke drought as a causal factor in major cultural transitions, including the abandonment of many sites at 900 CE, while others conclude that cultural factors were more important. This lack of agreement reflects the fact that the history of climate change in many regions of Mesoamerica is poorly understood. We present paleolimnological evidence suggesting that climate change was important in the abandonment of Cantona between 900 CE and 1050 CE. At its peak, Cantona was one of the largest cities in pre-Columbian Mesoamerica, with a population of 90,000 inhabitants. The site is located in the Cuenca Oriental, a semiarid basin east of Mexico City. We developed a subcentennial reconstruction of regional climate from a nearby maar lake, Aljojuca. The modern climatology of the region suggests that sediments record changes in summer monsoonal precipitation. Elemental geochemistry (X-ray fluorescence) and d18O from authigenic calcite indicate a centennial-scale arid interval between 500 CE and 1150 CE, overlaid on a long-term drying trend. Comparison of this record to

Cantona's chronology suggests that both the city's peak population and its abandonment occurred during this arid period. The human response to climate change most likely resulted from the interplay of environmental and political factors. During earlier periods of Cantona's history, increasing aridity and political unrest may have actually increased the city's importance. However, by 1050 CE, this extended arid period, possibly combined with regional political change, contributed to the city's abandonment.

Keywords: Mesoamerica | paleoclimate | late Holocene | Cantona | paleolimnology

Anthropologie

Skinner 2015

Matthew M. Skinner et al., *Human-like hand use in Australopithecus africanus*. science **347** (2015), 395–399.

s347-0395-Supplement.pdf

Matthew M. Skinner, Nicholas B. Stephens, Zewdi J. Tsegai, Alexandra C. Foote, N. Huynh Nguyen, Thomas Gross, Dieter H. Pahr, Jean-Jacques Hublin & Tracy L. Kivell

The distinctly human ability for forceful precision and power "squeeze" gripping is linked to two key evolutionary transitions in hand use: a reduction in arboreal climbing and the manufacture and use of tools. However, it is unclear when these locomotory and manipulative transitions occurred. Here we show that Australopithecus africanus (≈3 to 2 million years ago) and several Pleistocene hominins, traditionally considered not to have engaged in habitual tool manufacture, have a human-like trabecular bone pattern in the metacarpals consistent with forceful opposition of the thumb and fingers typically adopted during tool use. These results support archaeological evidence for stone tool use in australopiths and provide morphological evidence that Pliocene hominins achieved human-like hand postures much earlier and more frequently than previously considered.

Energie

Kim 2015

Sang-Heon Kim, Hansoo Kim & Nack J. Kim, *Brittle intermetallic compound makes ultrastrong low-density steel with large ductility*. nature **518** (2015), 77–79.

Although steel has been the workhorse of the automotive industry since the 1920s, the share by weight of steel and iron in an average light vehicle is now gradually decreasing, from68.1 per cent in 1995 to 60.1 per cent in 2011 (refs 1, 2). This has been driven by the low strength-to-weight ratio (specific strength) of iron and steel, and the desire to improve such mechanical properties with other materials. Recently, high-aluminium low-density steels have been actively studied as a means of increasing the specific strength of an alloy by reducing its density3–5. But with increasing aluminium content a problem is encountered: brittle intermetallic compounds can formin the resulting alloys, leading to poor ductility. Here we show that an FeAl-type brittle but hard intermetallic compound (B2) can be effectively used as a strengthening second phase in high-aluminiumlow-density steel, while alleviating its harmful effect on ductility by controlling its morphology and dispersion. The specific tensile strength and ductility of the developed steel improve on those of the lightest and strongest metallicmaterialsknown, titanium

alloys.We found that alloying of nickel catalyses the precipitation of nanometre-sized B2 particles in the face-centred cubicmatrix of high-aluminiumlow-density steel during heat treatment of cold-rolled sheet steel. Our results demonstrate how intermetallic compounds can be harnessed in the alloy design of lightweight steels for structural applications and others.

Normile 2015

Dennis Normile, *Japan's nuclear renaissance dogged by waste challenge.* science **347** (2015), 361.

Nuclear reprocessing is years late; repository is in limbo.

Japan now has 17,000 tons of spent nuclear fuel submerged in cooling pools at reactor sites across the country, and a planned reprocessing plant has suffered years of delays.

The process greatly reduces the volume of waste but leaves a highly radioactive residue that amounts to about 3 % of the original volume.

Klima

Lea 2015

David W. Lea, *Climate sensitivity in a warmer world.* nature **518** (2015), 46–47.

Comparison of climate records from the Pliocene and Pleistocene geological epochs of the past five million years suggests that positive climate feedbacks are not strengthened during warm climate intervals.

Palaeoclimate researchers have targeted the Pliocene epoch because it is the most recent time interval in which conditions were substantially warmer, about 2–3 °C warmer globally, than pre-industrial conditions. Proxy reconstructions indicate that the Arctic climate during the Pliocene was much warmer than it is today, about 8–19 °C warmer, depending on location and season (Fig. 1). But this extreme Arctic warmth seems to have coexisted, paradoxically, with atmospheric CO2 levels that are similar to the present ones, implying an extreme amplification of positive climate feedbacks in the Pliocene.

Martínez-Botí and colleagues challenge this existing hypothesis using a well-validated technique to reconstruct Pliocene atmospheric CO2 between 3.3 and 2.3 Myr ago at higher temporal resolution and with less variability than previous proxy reconstructions.

The authors find Pliocene climate sensitivity to be half as strong as that found for the cold Pleistocene. A repeat of the analysis after removing the forcing associated with glacial–interglacial changes in ice sheets reveals that Pliocene and Pleistocene climate sensitivities to atmospheric CO2 changes alone were essentially the same.

Marotzke 2015

Jochem Marotzke & Piers M. Forster, *Forcing, feedback and internal variability in global temperature trends.* nature **517** (2015), 565–570.

Most present-generation climate models simulate an increase in global-mean surface temperature (GMST) since 1998, whereas observations suggest a warming hiatus. It is unclear to what extent this mismatch is caused by incorrect model forcing, by incorrect model response to forcing or by random factors. Here we analyse simulations and observations of GMST from 1900 to 2012, and show that the distribution of simulated 15-year trends shows no systematic bias against the observations. Using a multiple regression approach that is physically motivated by

surface energy balance, we isolate the impact of radiative forcing, climate feedback and ocean heat uptake on GMST—with the regression residual interpreted as internal variability—and assess all possible 15- and 62-year trends. The differences between simulated and observed trends are dominated by random internal variability over the shorter timescale and by variations in the radiative forcings used to drive models over the longer timescale. For either trend length, spread in simulated climate feedback leaves no traceable imprint on GMST trends or, consequently, on the difference between simulations and observations. The claim that climate models systematically overestimate the response to radiative forcing from increasing greenhouse gas concentrations therefore seems to be unfounded.

Martínez-Botí 2015

M. A. Martínez-Botí et al., *Plio-Pleistocene climate sensitivity evaluated using high-resolution CO_2 records*. nature **518** (2015), 49–54.

n518-0049-Supplement.xlsx

M. A. Martínez-Botí, G. L. Foster, T. B. Chalk, E. J. Rohling, P. F. Sexton, D. J. Lunt, R. D. Pancost, M. P. S. Badger & D. N. Schmidt

Theory and climate modelling suggest that the sensitivity of Earth's climate to changes in radiative forcing could depend on the background climate. However, palaeoclimate data have thus far been insufficient to provide a conclusive test of this prediction. Here we present atmospheric carbon dioxide (CO2) reconstructions based on multi-site boron-isotope records from the late Pliocene epoch (3.3 to 2.3 million years ago). We find that Earth's climate sensitivity to CO2-based radiative forcing (Earth system sensitivity) was half as strong during the warm Pliocene as during the cold late Pleistocene epoch (0.8 to 0.01 million years ago).We attribute this difference to the radiative impacts of continental ice-volume changes (the ice–albedo feedback) during the late Pleistocene, because equilibrium climate sensitivity is identical for the two intervals when we account for such impacts using sea-level reconstructions. We conclude that, on a global scale, no unexpected climate feedbacks operated during the warm Pliocene, and that predictions of equilibrium climate sensitivity (excluding long-term ice-albedo feedbacks) for our Pliocene-like future (with CO2 levels up to maximum Pliocene levels of 450 parts permillion) are well described by the currently accepted range of an increase of 1.5 K to 4.5 K per doubling of CO2.

Risbey 2015

James Risbey, *Free and forced climate variations*. nature **517** (2015), 562–563.

A combination of simulations and data shows that short-term climate trends are dominated by natural internal variations, providing a basis for climate forecasting, but not for assessing sensitivity to forced changes.

Some of these address the issue that a single 15-year period in the real world is not by design synchronized with the same 15 years in model projections. The free variations in the latter are not, and cannot be, synchronized with the real world. This means that neither a single model run, nor the average of many model runs, is expected to match a given observed 15-year trend. However, by selecting model runs according to criteria that effectively phase-lock the model free variation to the observed free variation, the models provide good representations of observed 15-year trends.

Mathematik

Hoffman 2015

Moshe Hoffman, Erez Yoeli & Martin A. Nowak, *Cooperate without looking*, *Why we care what people think and not just what they do.* PNAS **112** (2015), 1727–1732.

Evolutionary game theory typically focuses on actions but ignores motives. Here, we introduce a model that takes into account the motive behind the action. A crucial question is why do we trust people more who cooperate without calculating the costs? We propose a game theory model to explain this phenomenon. One player has the option to "look" at the costs of cooperation, and the other player chooses whether to continue the interaction. If it is occasionally very costly for player 1 to cooperate, but defection is harmful for player 2, then cooperation without looking is a subgame perfect equilibrium. This behavior also emerges in population-based processes of learning or evolution. Our theory illuminates a number of key phenomena of human interactions: authentic altruism, why people cooperate intuitively, one-shot cooperation, why friends do not keep track of favors, why we admire principled people, Kant's second formulation of the Categorical Imperative, taboos, and love.

Keywords: game theory | evolution | emotion | motive | cooperation

Significance: Why do we trust people more when they do good without considering in detail the cost to themselves? People who avoid "looking" at the costs of good acts can be trusted to cooperate in important situations, whereas those who look cannot. We find that evolutionary dynamics can lead to cooperation without looking at costs. Our results illuminate why we attend closely to people's motivations for doing good, as prescribed by deontological ethicists such as Kant, and, also, why we admire principled people, adhere to taboos, and fall in love.

Methoden

Pernicka 2014

Ernst Pernicka, *On the authenticity of the gold finds from Bernstorf, community of Kranzberg, Freising district, Bavaria.* Jahresschrift für mitteldeutsche Vorgeschichte **94** (2014), 517–526.

At the hamlet of Bernstorf near the small town of Kranzberg, Freising district, in Bavaria a number of finds made from gold foil were found near a Late Bronze Age structure in 1998. They were interpreted as clear evidence for contacts between Mycenae and Bavaria in the Late Bronze Age. Furthermore, it was suggested that the gold derives from Egypt based on comparison with gold foil from an Egyptian sarcophagus supposedly belonging to Akhenaten (KV 55, a tomb in the Valley of the Kings in Egypt). However, since this conclusion was at variance with previously published data on the composition of the gold from KV 55, it was reanalysed with LA-ICP-MS together with the gold finds from Bernstorf. It turned out that the Bernstorf gold is exceptionally pure which is not only unknown in natural gold but also in all prehistoric gold objects hitherto analysed. It is therefore concluded that the finds from Bernstorf were made from modern gold foil which is supported by radiocarbon dates of adhering resin and organic debris in the soil coating in which the objects were found.

Mittelalter

Boldsen 2015

Jesper L. Boldsen, George R. Milner & Svenja Weise, *Cranial vault trauma and selective mortality in medieval to early modern Denmark.* PNAS **112** (2015), 1721–1726.

To date, no estimates of the long-term effect of cranial vault fractures on the risk of dying have been generated from historical or prehistoric skeletons. Excess mortality provides a perspective on the efficacy of modern treatment, as well as the human cost of cranial injuries largely related to interpersonal violence in past populations. Three medieval to early modern Danish skeletal samples are used to estimate the effect of selective mortality on males with cranial vault injuries who survived long enough for bones to heal. The risk of dying for these men was 6.2 times higher than it was for their uninjured counterparts, estimated through a simulation study based on skeletal observations. That is about twice the increased risk of dying experienced by modern people with traumatic brain injuries. The mortality data indicate the initial trauma was probably often accompanied by brain injury. Although the latter cannot be directly observed in skeletal remains, it can be inferred through the relative risks of dying. The ability to identify the effects of selective mortality in this skeletal sample indicates it must be taken into account in paleopathological research. The problem is analogous to extrapolating from death register data to modern communities, so epidemiological studies based on mortality data have the same inherent possibility of biases as analyses of ancient skeletons.

Keywords: selective mortality | cranial trauma survival | violence | premodern Denmark

Neolithikum

Pinhasi 2015

Ron Pinhasi, Vered Eshed & Noreen von Cramon-Taubadel, *Incongruity between Affinity Patterns Based on Mandibular and Lower Dental Dimensions following the Transition to Agriculture in the Near East, Anatolia and Europe.* PLoS ONE **10** (2015), e117301. DOI:10.1371/journal.pone.0117301.

pone10-e0117301-Supplement1.pdf, pone10-e0117301-Supplement2.XLS

While it has been suggested that malocclusion is linked with urbanisation, it remains unclear as to whether its high prevalence began 8,000 years earlier concomitant with the transition to agriculture. Here we investigate the extent to which patterns of affinity (i.e., amongpopulation distances), based on mandibular form and dental dimensions, respectively, match across Epipalaeolithic, Mesolithic, and Neolithic samples from the Near East/Anatolia and Europe. Analyses were conducted using morphological distance matrices reflecting dental and mandibular form for the same 292 individuals across 21 archaeological populations. Thereafter, statistical analyses were undertaken on four sample aggregates defined on the basis of their subsistence strategy, geography, and chronology to test for potential differences in dental and mandibular form across and within groups. Results show a clear separation based on mandibular morphology between European hunter-gatherers, European farmers, and Near Eastern transitional farmers and semi-sedentary hunter-gatherers. In contrast, the dental dimensions show no such pattern and no clear association between the position of samples and their temporal or geographic attributes. Although later farming groups have, on average,

smaller teeth and mandibles, shape analyses show that the mandibles of farmers are not simply size-reduced versions of earlier hunter-gatherer mandibles. Instead, it appears that mandibular form underwent a complex series of shape changes commensurate with the transition to agriculture that are not reflected in affinity patterns based on dental dimensions. In the case of hunter-gatherers there is a correlation between inter-individual mandibular and dental distances, suggesting an equilibrium between these two closely associated morphological units. However, in the case of semi-sedentary hunter-gatherers and farming groups, no such correlation was found, suggesting that the incongruity between dental and mandibular form began with the shift towards sedentism and agricultural subsistence practices in the core region of the Near East and Anatolia.

Story or Book

Kiser 2015

Barbara Kiser, *Finding Zero*. nature **518** (2015), 33.

A Mathematician's Odyssey to Uncover the Origins of Numbers.

Amir D. Aczel, Finding Zero, Palgrave Macmillan (2015)

Mathematician Amir Aczel was obsessed from childhood with the origins of numerals. This bracing mathematical detective story reveals how he cracked the puzzle: by homing in on zero. Close readings of classical texts convinced him that this subtle concept emanated from the East. He treks through the findings of archaeological scholar George C£dès, the surprising nexus of sex and mathematics, and much of southeast Asia before hitting pay dirt with a seventh-century artefact in a dusty Cambodian shed.