

## References

### Aktuell

#### BAIRES 2015

Sarah E. Baires, Melissa R. Baltus & Meghan E. Buchanan, *Correlation does not equal causation, Questioning the Great Cahokia Flood*. [PNAS \*\*112\*\* \(2015\), E3753](#).

Although we recognize that a flood event may have occurred, we do not agree with their hypothesis that this event (i) caused the collapse of the largest Pre-Columbian city north of Mexico and (ii) occurred ca. A.D. 1200. Cahokians did not vacate the floodplain until after the mid-14th century, preceded by new communities and social relationships during the 11th to 13th centuries.

#### LÓPEZ 2015

Héctor Matías López, Jérémie Gachelin, Carine Douarche, Harold Auradou & Eric Clément, *Turning Bacteria Suspensions into Superfluids*. [Physical Review Letters \*\*115\*\* \(2015\), 28301](#). 10.1103/PhysRevLett.115.028301.

[PhysRevLett115-028301-Supplement.pdf](#)

The rheological response under simple shear of an active suspension of *Escherichia coli* is determined in a large range of shear rates and concentrations. The effective viscosity and the time scales characterizing the bacterial organization under shear are obtained. In the dilute regime, we bring evidence for a low-shear Newtonian plateau characterized by a shear viscosity decreasing with concentration. In the semidilute regime, for particularly active bacteria, the suspension displays a “superfluidlike” transition where the viscous resistance to shear vanishes, thus showing that, macroscopically, the activity of pusher swimmers organized by shear is able to fully overcome the dissipative effects due to viscous loss.

#### MUNOZ 2015

Samuel E. Munoz, Kristine E. Gruley, David A. Fike, Sissel Schroeder & John W. Williams, *Shifts in Mississippi River flood regime remain a contributing factor to Cahokia’s emergence and decline, Reply to Baires et al.* [PNAS \*\*112\*\* \(2015\), E3754](#).

To the first point, our paper never attributes Cahokia’s “collapse” to a single flood event. Instead, we show a temporal correspondence among midcontinental aridity, reduced megaflood frequency, and Cahokia’s emergence. We discuss the potential effects of floods on prehistoric populations in the floodplain and conclude that extensive flooding could have temporarily or permanently transformed Cahokia’s sociopolitical system. We note several independent lines of evidence that point to population decreases at Cahokia and the reorganization of its sociopolitical structure around A.D. 1200. We do not argue that Cahokia collapsed at this time, nor do we argue against community persistence after A.D. 1200.

#### SPALDIN 2015

Nicola Spaldin, *Find your most interesting question*. [science \*\*349\*\* \(2015\), 110](#).

Around that time, though, I discovered a downside to having so much scientific fun: Solving difficult problems takes time, and my publication record wasn't strong enough, according to my pretenure review. Also, when you work in a field no one else works in, you don't garner a lot of citations. Kind mentors advised me to start doing something more mainstream—quickly.

Frighteningly, I have reached the stage in my career when young people often ask me for advice. My safe and sensible side tells me to pass along the same advice I received: Make a solid contribution to an established field and publish a lot to become known and respected by your community. Save the high-risk stuff until after tenure. But, deep down, I hope young scientists—you—will choose not to follow that advice. I hope instead you will find the question that for you is the most interesting in the world, go after its answer with all your youthful passion, and pioneer your own science revolution.

#### VOGEL 2015

Gretchen Vogel, *Narcolepsy link to pandemic flu vaccine becomes clearer, Pandemrix may have caused autoimmune reactions*. [science](#) **349** (2015), 17.

#### WALDROP 2015

M. Mitchell Waldrop, *The Science of Teaching Science*. [nature](#) **523** (2015), 272–274.

Active problem-solving confers a deeper understanding of science than does a standard lecture. But some university lecturers are reluctant to change tack.

“We find up to 20% better grades over usual methods,” says Tom Duff, a computer scientist who developed a team-based learning approach at the University of the West of Scotland in Paisley, UK. Other active learning proponents have found similar gains. Last year, a group led by biologist Scott Freeman at the University of Washington in Seattle published an analysis of 225 studies of active learning in science, technology, engineering and mathematics (STEM) and found that active learning cut course failure rates by around one-third<sup>1</sup>. “At this point it is unethical to teach any other way,” declares Clarissa Dirks, a microbiologist at the Evergreen State College in Olympia, Washington, and co-chair of the US National Academies Scientific Teaching Alliance, an initiative to reform undergraduate STEM education.

Not everyone embraces the idea. Active learning can be a tough sell to faculty members who thrived on standard lectures during their own student years, and who wonder whether the benefits of active learning — which requires substantially more preparation than do standard lectures — could possibly justify the time that the approach would take away from their research.

“You’re innocently walking down the street when aliens zap away the sensory neurons in your legs. What happens?” What makes those questions special is that the students cannot answer them simply by reading the course material — although they are expected to have done that before attending class. Instead, they have to apply what they have learned, which they do by clustering around tables in small teams and arguing over the options. That struggle is the real pay-off, says Leupen, who eventually explains the right answer (in this case, d). And if a team gets it wrong, she says, “that’s usually a good thing — because then they really remember it”.

## Amerika

HART 2013

John P. Hart & William A. Lovis, *Reevaluating What We Know About the Histories of Maize in Northeastern North America, A Review of Current Evidence*. [Journal of Archaeological Research 21 \(2013\), 175–216](#).

The adoption of maize in northeastern North America is often seen as a catalyst for the development of settled village life. In this review we develop a theoretical framework centered on shifting-balance theory (SBT) and domesticated landscapes through which to understand the context for the adoption of maize agriculture in the Northeast. We review micro- and macrobotanical evidence and stable carbon isotope data from various sources to reevaluate maize histories and adoption trajectories. These data are coupled with contributions of subregionally significant predecessor plants, such as those constituting the Eastern Agricultural Complex, and wild rice. We find no evidence for rapid transitions to settled village life as a result of maize adoption. Maize was grown for centuries before settled village agricultural systems evolved. It was grown for a sufficiently long time that the potential for local selection leading to Northern Flint is a viable working hypothesis. We call for a refocusing of research questions and a systematic application of contemporary techniques as a means by which to strengthen future inferences based on comparative information sets.

Keywords: *Zea mays* ssp. *mays* | Domesticated landscapes | Shifting-balance | theory | Agricultural evolution | Paleoethnobotany

## Bibel

CLINES 2015

David J. A. Clines, *How Corrupt is the Text of the Hebrew Bible? An Empirical Approach from Ezra 2 || Nehemiah 7*. [unknown \(2015\), preprint, 1–23](#).

What can be said in general, then, about the state of the text of Ezra 2 || Nehemiah 7 || 1 Esdras 5? There plainly exists, in three versions, a Hebrew list of returning exiles including names and numbers, and containing some scores of names. Even if we can identify as many as c. 360 textual variants in the list of c. 60 verses, there is no doubt that there is a list. Its length in all the extant versions is roughly the same, its sequence is almost always identical, and the differences among the versions are often no greater than a single consonant or one digit in a numeral (although there are significant omissions of text from all three versions).

I would suggest that this general evaluation the state of the text of the list of exiles is comparable to what might be said of the state of the text of the Hebrew Bible as a whole. While there may be tens of thousands of verbal variants in its text, signalling tens of thousands of corruptions in the scribal transmission, the shape and overall content of the texts are not often brought into question. Where there are large—scale differences among Hebrew Bible texts, as in the Hebrew and the Greek Jeremiah, the differences stem from editorial decisions, not from scribal error.

Scribal error, however, during the period between the composition of the books of the Hebrew Bible and the advent of the Masoretes, has deeply corrupted the text of the Hebrew Bible, somewhere between 10,000 and 100,000 times, I would

suggest. The text is likely to contain a far greater number of errors than is generally recognized, and to require far more frequent emendation than is generally regarded as permissible.

#### MORENZ 1997

Ludwig D. Morenz & Stefan Schorch, *Der Seraph in der Hebräischen Bibel und in Altägypten*. *Orientalia Nova Series* **66** (1997), 365–386.

Es zeigt sich daher insgesamt, daß die dargestellten Verbindungen zwischen ägyptischem srf und alttestamentlichem Seraph sich in das bereits bekannte Beziehungsnetz zwischen Vorstellungen der JHWH-Religion und des Sonnenkultes gut einfügen lassen und es um interessante Verknüpfungen bereichern. Dabei führt die vermutliche Datierung von Jes 6,1 annähernd in eine Zeit, für die solare Züge der JHWH-Verehrung explizit bezeugt sind: Ausweislich seines Siegels trägt einer der Minister des judäischen Königs Hiskia den Namen יהוורה JHWH ist aufgestrahlt, ungefähr gleichzeitig sind judäische Königsstempel mit solarer Symbolik belegt. Diesem Befund inhaltlich korrespondierende alttestamentliche Texte finden sich in 2 Kön 23,1 ff. (Sonnenpferde und -wagen; Dachaltäre), Jes 38, 8 (Sonnenuhr des Ahas) sowie Jes 18,4. Zugleich aber ist deutlich, daß die Quellen der Seraphen-Vorstellungen in eine viel weiter zurückliegende Zeit verweisen, Angesichts der vielfältigen Berührungen von Sonnengott und Königsideologie, welche sich in der Umwelt der Hebräischen Bibel nachweisen lassen, erscheint es weiterhin nicht unwichtig, daß sich die besprochenen Relikte solarer Vorstellungen in Jes 6 und mithin in einem Text finden, der als das älteste Zeugnis für die Rezeption von Königsvorstellungen in die JHWH-Verehrung gilt.

#### PIOSKE 2013

Daniel D. Pioske, *David's Jerusalem, A Sense of Place*. *Near Eastern Archaeology* **76** (2013), 4–15.

The history of the southern Levant in the early tenth century b.c.e. has been at the heart of well-known debates for more than a generation. Sharp disagreements concerning the affairs of the period reflect both the importance of this transformative time in the region's political and cultural development and the dearth and ambiguity of the evidence that might illuminate this past. The history of "David's Jerusalem" has been a point of intense interpretive divisiveness within these wider disputes. Yet lost amid arguments regarding Jerusalem's early Iron Age past have been moments of muted consensus. One of these areas of agreement is that Jerusalem was an inhabited highland site at the turn of the first millennium b.c.e.

#### PIOSKE 2014

Daniel Pioske, *David's Jerusalem*. *The ASOR Blog* **2014**, Aug. 12. <<http://asorblog.org/?p=7660>>.

There is wide agreement about three features of Jerusalem's settlement during the early 10th Century BCE, the period associated with the biblical figure of David. The first is that this Jerusalem was an inhabited site whose material culture corresponded to other highland settlements of the late Iron I / early Iron IIA era. Second, the archaeological remains of ancient Jerusalem indicate that this late Iron I/early Iron MA community occupied a location that had been inhabited since at least the Early Bronze Age. A series of Amarna letters sent from the ruler of Jerusalem Abdi-Heba to the Egyptian king Amenhotep III (El-Amarna 285-290) illustrate that Jerusalem was an important center. The third point of consensus surrounding David's Jerusalem is that the late Iron I / early Iron IIA location was of a modest size and stature.

## Biologie

BELTRÁN-SÁNCHEZ 2015

Hiram Beltrán-Sánchez, Caleb E. Finch & Eileen M. Crimmins, *Twentieth century surge of excess adult male mortality*. [PNAS 112 \(2015\), 8993–8998](#).

Using historical data from 1,763 birth cohorts from 1800 to 1935 in 13 developed countries, we show that what is now seen as normal—a large excess of female life expectancy in adulthood—is a demographic phenomenon that emerged among people born in the late 1800s. We show that excess adult male mortality is clearly rooted in specific age groups, 50–70, and that the sex asymmetry emerged in cohorts born after 1880 when male:female mortality ratios increased by as much as 50 % from a baseline of about 1.1. Heart disease is the main condition associated with increased excess male mortality for those born after 1900. We further show that smoking-attributable deaths account for about 30 % of excess male mortality at ages 50–70 for cohorts born in 1900–1935. However, after accounting for smoking, substantial excess male mortality at ages 50–70 remained, particularly from cardiovascular disease. The greater male vulnerability to cardiovascular conditions emerged with the reduction in infectious mortality and changes in health-related behaviors.

**Keywords:** excess male mortality | cohort | smoking | life expectancy | aging

**Significance:** Female life expectancy now exceeds that of males in all countries. Although this gender difference has become accepted as normal, it is a relatively recent demographic phenomenon that emerged with the reduction of infections and the increase in the share of adult mortality attributed to cancer and cardiovascular disease. Heart disease is the main condition associated with increased excess male mortality, making the strongest contributions in birth cohorts of 1900–1935. Smoking behavior accounts for about 30 % of male excess mortality at ages 50–70 for those born in 1900–1935. The remaining excess male mortality may be explained by underlying traits of vulnerability to cardiovascular disease that emerged with the reduction of infections and changes in diet and other lifestyle factors.

HINDE 2015

Katie Hinde & Zachery T. Lewis, *Mother’s littlest helpers, Breastmilk nourishes the microbes colonizing the neonatal intestinal tract*. [science 348 \(2015\), 1427–1428](#).

Investigations of the structure of milk oligosaccharides reveal that human milk has a greater diversity (>200 isomers), more complexity, and higher abundance than the milk of other primates, including all of the great apes. Importantly, certain oligosaccharides that dominate human milk, but are absent or rare in other primates, are the preferred food of *Bifidobacterium*, the most prevalent microbial clade in the healthy infant gut.

The infant intestinal microbiota’s ability to metabolize, and the adaptive capacity of mothers to synthesize, human milk glycans possibly coevolved in response to selective regimes that exerted new pressures on immunity and digestion in human evolutionary history. Key candidates for such selective pressures are transitions to subsistence agriculture and animal domestication. These cultural practices are associated with increased sedentism and population density, altered dietary nutrition, and intensified zoonotic and communicable disease transmission.

## Energie

### NEMET 2010

G. F. Nemet, T. Holloway & P. Meier, *Implications of incorporating air-quality co-benefits into climate change policymaking*. [Environmental Research Letters](#) **5** (2010), 14007. DOI:10.1088/1748-9326/5/1/014007.

We present an analysis of the barriers and opportunities for incorporating air quality co-benefits into climate policy assessments. It is well known that many strategies for reducing greenhouse gas emissions also decrease emissions of health-damaging air pollutants and precursor species, including particulate matter, nitrogen oxides, and sulfur dioxide. In a survey of previous studies we found a range of estimates for the air quality co-benefits of climate change mitigation of \$2-196/tCO<sub>2</sub> with a mean of \$49/tCO<sub>2</sub>, and the highest co-benefits found in developing countries. These values, although of a similar order of magnitude to abatement cost estimates, are only rarely included in integrated assessments of climate policy. Full inclusion of these co-benefits would have pervasive implications for climate policy in areas including: optimal policy stringency, overall costs, distributional effects, robustness to discount rates, incentives for international cooperation, and the value of adaptation, forests, and climate engineering relative to mitigation. Under-valuation results in part from uncertainty in climatic damages, valuation inconsistency, and institutional barriers. Because policy debates are framed in terms of cost minimization, policy makers are unlikely to fully value air quality co-benefits unless they can be compared on an equivalent basis with the benefits of avoided climatic damages. While air quality co-benefits have been prominently portrayed as a hedge against uncertainty in the benefits of climate change abatement, this assessment finds that full inclusion of co-benefits depends on—rather than substitutes for—better valuation of climate damages.

Keywords: co-benefits | climate policy | air pollution | health

### STECKEL 2015

Jan Christoph Steckel, Ottmar Edenhofer & Michael Jakob, *Drivers for the renaissance of coal*. [PNAS](#) **112** (2015), E3775–E3781.

Coal was central to the industrial revolution, but in the 20th century it increasingly was superseded by oil and gas. However, in recent years coal again has become the predominant source of global carbon emissions. We show that this trend of rapidly increasing coal-based emissions is not restricted to a few individual countries such as China. Rather, we are witnessing a global renaissance of coal majorly driven by poor, fast-growing countries that increasingly rely on coal to satisfy their growing energy demand. The low price of coal relative to gas and oil has played an important role in accelerating coal consumption since the end of the 1990s. In this article, we show that in the increasingly integrated global coal market the availability of a domestic coal resource does not have a statistically significant impact on the use of coal and related emissions. These findings have important implications for climate change mitigation: If future economic growth of poor countries is fueled mainly by coal, ambitious mitigation targets very likely will become infeasible. Building new coal power plant capacities will lead to lock-in effects for the next few decades. If that lock-in is to be avoided, international climate policy must find ways to offer viable alternatives to coal for developing countries.

Keywords: climate change mitigation | Kaya decomposition | developing countries | coal

Significance: The current carbonization of the global energy system poses a severe challenge for efforts to reduce carbon emissions. Here we show that the increase in the carbon intensity of energy production is caused mainly by the

increased use of coal, not only in China and India but also across a broad range of developing countries, especially poor, fast-growing countries mainly in Asia. The (relatively) low coal prices are an important reason countries choose coal to satisfy their energy needs. This result underlines the importance of cheaply available energy for economic growth and suggests that viable alternatives to cheap coal will be required to ensure the participation of developing countries in global climate change mitigation.

## Jungpaläolithikum

OXILIA 2015

Gregorio Oxilia et al., *Earliest evidence of dental caries manipulation in the Late Upper Palaeolithic*. [Scientific Reports 5 \(2015\), 12150](#).

[DOI:10.1038/srep12150](#).

[SciRep05-12150-Supplement1.pdf](#), [SciRep05-12150-Supplement2.avi](#), [SciRep05-12150-Supplement3.avi](#)

Gregorio Oxilia, Marco Peresani, Matteo Romandini, Chiara Matteucci, Cynthia Debono Spiteri, Amanda G. Henry, Dieter Schulz, Will Archer, Jacopo Crezzini, Francesco Boschin, Paolo Boscato, Klervia Jaouen, Tamara Dogandzic, Alberto Broglio, Jacopo Moggi-Cecchi, Luca Fiorenza, Jean- Jacques Hublin, Ottmar Kullmer & Stefano Benazzi

Prehistoric dental treatments were extremely rare, and the few documented cases are known from the Neolithic, when the adoption of early farming culture caused an increase of carious lesions. Here we report the earliest evidence of dental caries intervention on a Late Upper Palaeolithic modern human specimen (Villabruna) from a burial in Northern Italy. Using Scanning Electron Microscopy we show the presence of striations deriving from the manipulation of a large occlusal carious cavity of the lower right third molar. The striations have a “V”-shaped transverse section and several parallel micro-scratches at their base, as typically displayed by cutmarks on teeth. Based on in vitro experimental replication and a complete functional reconstruction of the Villabruna dental arches, we confirm that the identified striations and the associated extensive enamel chipping on the mesial wall of the cavity were produced ante-mortem by pointed flint tools during scratching and levering activities. The Villabruna specimen is therefore the oldest known evidence of dental caries intervention, suggesting at least some knowledge of disease treatment well before the Neolithic. This study suggests that primitive forms of carious treatment in human evolution entail an adaptation of the well-known toothpicking for levering and scratching rather than drilling practices.

## Klima

KARL 2015

Thomas R. Karl et al., *Possible artifacts of data biases in the recent global surface warming hiatus*. [science 348 \(2015\), 1469–1472](#).

[s348-1469-Supplement.pdf](#)

Thomas R. Karl, Anthony Arguez, Boyin Huang, Jay H. Lawrimore, James R. McMahan, Matthew J. Menne, Thomas C. Peterson, Russell S. Vose & Huai-Min Zhang

Much study has been devoted to the possible causes of an apparent decrease in the upward trend of global surface temperatures since 1998, a phenomenon that has been dubbed the global warming “hiatus.” Here, we present an updated global

surface temperature analysis that reveals that global trends are higher than those reported by the Intergovernmental Panel on Climate Change, especially in recent decades, and that the central estimate for the rate of warming during the first 15 years of the 21st century is at least as great as the last half of the 20th century. These results do not support the notion of a “slowdown” in the increase of global surface temperature.

#### MEREDITH 2015

Edmund P. Meredith, Vladimir A. Semenov, Douglas Maraun, Wonsun Park & Alexander V. Chernokulsky, *Crucial role of Black Sea warming in amplifying the 2012 Krymsk precipitation extreme*. *Nature Geoscience* (2015), preprint, 1–6. DOI:10.1038/NGEO2483.

NatGeo2015-Meredith-Supplement1.pdf, NatGeo2015-Meredith-Supplement2.gif, NatGeo2015-Meredith-Supplement3.avi

Over the past 60 years, both average daily precipitation intensity and extreme precipitation have increased in many regions<sup>1–3</sup>. Part of these changes, or even individual events<sup>4,5</sup>, have been attributed to anthropogenic warming<sup>6,7</sup>. Over the Black Sea and Mediterranean region, the potential for extreme summertime convective precipitation has grown<sup>8</sup> alongside substantial sea surface temperature increase. A particularly devastating convective event experienced in that region was the July 2012 precipitation extreme near the Black Sea town of Krymsk<sup>9</sup>. Here we study the effect of sea surface temperature (SST) increase on convective extremes within the region, taking the Krymsk event as a showcase example. We carry out ensemble sensitivity simulations with a convection-permitting atmospheric model and show the crucial role of SST increase in the extremeness of the event. The enhancement of lower tropospheric instability due to the current warmer Black Sea allows deep convection to be triggered, increasing simulated precipitation by more than 300% relative to simulations with SSTs characteristic of the early 1980s. A highly nonlinear precipitation response to incremental SST increase suggests that the Black Sea has exceeded a regional threshold for the intensification of convective extremes. The physical mechanism we identify indicates that Black Sea and Mediterranean coastal regions may face abrupt amplifications of convective precipitation under continued SST increase, and illustrates the limitations of thermodynamical bounds for estimating the temperature scaling of convective extremes.

## Kultur

#### CURRIE 2015

Thomas E. Currie et al., *Agricultural Productivity in Past Societies, Toward an Empirically Informed Model for Testing Cultural Evolutionary Hypotheses*. *Cliodynamics* 6 (2015), 24–56.

Thomas E. Currie, Amy Bogaard, Rudolf Cesaretti, Neil R. Edwards, Pieter Francois, Phillip B. Holden, Daniel Hoyer, Andrey Korotayev, Joe Manning, Juan Carlos Moreno Garcia, Oluwole K. Oyebamiji, Cameron Petrie, Peter Turchin, Harvey Whitehouse & Alice Williams

Agricultural productivity, and its variation in space and time, plays a fundamental role in many theories of human social evolution. However, we often lack systematic information about the productivity of past agricultural systems on a scale large enough to test these theories properly. The effect of climate on crop yields has received a great deal of attention resulting in a range of empirical and



process-based models, yet the focus has primarily been on current or future conditions. In this paper, we argue for a “bottom-up” approach that estimates potential productivity based on information about the agricultural practices and technologies used in past societies. Of key theoretical interest is using this information to estimate the carrying capacity of a given region independently of estimates of population size. We outline how explicit crop yield models can be combined with high quality historical and archaeological information about past societies in order to infer the temporal and geographic patterns of change in agricultural productivity and potential. We discuss information we need to collect about past agricultural techniques and practices, and introduce a new databank initiative that we have developed for collating the best available historical and archaeological evidence. A key benefit of our approach lies in making explicit the steps in the estimation of past productivities and carrying capacities, and in being able to assess the effects of different modelling assumptions. This is undoubtedly an ambitious task, yet promises to provide important insights into fundamental aspects of past societies, enabling us to test more rigorously key hypotheses about human socio-cultural evolution.

WILL 2015

Manuel Will, Alex Mackay & Natasha Phillips, *Implications of Nubian-Like Core Reduction Systems in Southern Africa for the Identification of Early Modern Human Dispersals*. [PLoS ONE 10 \(2015\), e131824](#). [DOI:10.1371/journal.pone.0131824](#).

Lithic technologies have been used to trace dispersals of early human populations within and beyond Africa. Convergence in lithic systems has the potential to confound such interpretations, implying connections between unrelated groups. Due to their reductive nature, stone artefacts are unusually prone to this chance appearance of similar forms in unrelated populations. Here we present data from the South African Middle Stone Age sites Uitpanskraal 7 and Mertenhof suggesting that Nubian core reduction systems associated with Late Pleistocene populations in North Africa and potentially with early human migrations out of Africa in MIS 5 also occur in southern Africa during early MIS 3 and with no clear connection to the North African occurrence. The timing and spatial distribution of their appearance in southern and northern Africa implies technological convergence, rather than diffusion or dispersal. While lithic technologies can be a critical guide to human population flux, their utility in tracing early human dispersals at large spatial and temporal scales with stone artefact types remains questionable.

## Mathematik

JONES 2015

James Holland Jones & Shripad Tuljapurkar, *Measuring selective constraint on fertility in human life histories*. [PNAS 112 \(2015\), 8982–8986](#).

Human life histories combine late age at first reproduction, long reproductive span, relatively high fertility, and substantial postreproductive survival. However, even among the most fecund populations, human fertility falls far below its theoretical maximum. The extent of parental care required for successful offspring recruitment and widespread fertility decline under proper economic conditions suggest that selection on fertility is constrained by trade-offs with recruitment. Here we measure the trade-offs between life history traits under selection by approximating the slope of the selective constraint curve on two traits at the observed

values. Using a selection of populations that span human demographic space, we find that the substitution elasticity of fertility for infant survival shows age-related patterns, with minimum substitution elasticities ranging from 14 to 22 for the four populations. The age of this minimum occurs earlier in the high-mortality populations relative to generation time than it does in the low-mortality populations. The human curves are qualitatively similar to one of two comparable nonhuman primate agespecific substitution elasticity curves. The curve for rhesus macaques has a similar shape but is shifted down, meaning that the threshold for switching from investing in survival to fertility is lower at all ages. The magnitude of the substitution elasticities is similar between chimpanzees and humans but the shape is quite different, rising more slowly for a longer fraction of the chimpanzee life cycle. The steeply rising substitution elasticities with age in humans has clear implications for the evolution of reproductive senescence.

**Keywords:** demography | life history theory | human evolution

**Significance:** Trade-offs, or constraints, play a substantial role in shaping the ability of organisms to respond adaptively to selection. We derive a simple means for measuring constraints in demographic rates like fertility and survival that builds on commonly used evolutionary demographic measures. We apply this measure to a hypothesized trade-off between fertility and infant survival and show that a 1% reduction in infant mortality would have to be balanced by an approximately 20% increase in fertility to be favored by selection. Our paper should have an important impact on shaping future empirical studies of human life histories and parental investment as it identifies key measures that we expect should be quite variable with respect to ecology, technology, and social systems.

## Neolithikum

KRAUSS 2014

Raiko Krauß, Nedko Elenski, Bernhard Weninger, Lee Clare, Canan Cakırlar & Petăr Zidarov, *Beginnings of the Neolithic in South-east Europe, The Early Neolithic sequence and absolute dates from Dŭljunica-Smărdeš (Bulgaria)*. [Documenta Praehistorica 41 \(2014\), 51–77](#).

Investigations of a balk in the centre of the prehistoric settlement of Duljunica-Smardes comprised a sequence of archaeological deposits from the very onset of Neolithisation in Southeastern Europe throughout the end of the Early Neolithic. The arrival of Neolithic lifeways in the region coincides with the end of a period for which palaeoclimate proxies attest to considerable climate fluctuation. In connection with these investigations, the zoological finds were examined, which provide insight into the economy of this key settlement for the entire Balkan region.

**Keywords:** Neolithisation | Bulgaria | painted pottery | “Rapid Climate Change”

## Religion

ATKINSON 2011

Quentin D. Atkinson & Harvey Whitehouse, *The cultural morphospace of ritual form, Examining modes of religiosity cross-culturally*. [Evolution and Human Behavior 32 \(2011\), 50–62](#).

EvolHumBehav32-050-Supplement1.xls, EvolHumBehav32-050-Supplement2.xls

Ethnographic, historical, archaeological and experimental work suggests the existence of two basic clusters of ritual dynamics or ‘modes of religiosity’ — a low-frequency, high-arousal cluster linked to the formation of small cohesive communities (imagistic mode) and high-frequency, low-arousal cluster associated with larger, more centralized social morphology (doctrinal mode). Currently, however, we lack a large-scale survey of ritual variation on which to test such predictions. Here, we compile data on 645 religious rituals from 74 cultures around the globe, extracted from the Human Relations Area Files, revealing that the cultural morphospace of ritual form favours rituals that are indeed either low-frequency and highly dysphorically arousing or high-frequency with lower arousal and that these ritual dynamics are linked to group size and structure. These data also suggest that low dysphoric arousal, high-frequency rituals may have been tied to the advent of agriculture and subsequent emergence of the first large-scale civilizations.

**Keywords:** Cultural evolution; Ritual; Religion; Agriculture; Modes of religiosity; Costly signalling; Human Relations Area Files