

Literatur

Aktuell

BUTLER 2011

Declan Butler & Geoff Brumfiel, *Fukushima health risks scrutinized, Japan's long road ahead.* *nature* **472** (2011), 13–14.

Scientists are struggling to pick through radiation data. Vadim Chumak, a health physicist at the Research Center for Radiation Medicine at the Academy of Medical Sciences of Ukraine in Kiev, who has coordinated Chernobyl health studies, says that Japanese radiation researchers should heed a key lesson from that disaster. Dose data are fleeting, he warns, and if they are not collected now, any eventual research would be much more prone to uncertainty. Dosimetric monitoring after Chernobyl was sub-standard, he says, “so in our research we had to invest enormous time and effort in the retrospective estimation of doses”.

Isotopes hint at more than a decade of clean-up at Fukushima. It took 14 years to clear most of the fuel out of the reactor at Three Mile Island. Based on what he has seen so far, DeVine believes that decommissioning Fukushima will probably take longer.

CLÉMENT 2011

Raphaël Clément, Sylvain Courrech du Pont, Mehdi Ould-Hamouda, Donald Dureau & Stéphane Douady, *Penetration and Blown Air Effect in Granular Media.* *Physical Review Letters* **106** (2011), 98001. <<http://dx.doi.org/10.1103/PhysRevLett.106.098001>>.

Sand is known to oppose an increasing resistance to penetration with depth. This is different from what happens in liquids since granular media, usually nonthermal systems, oppose solid friction to the motion. We report another striking and “counterintuitive” difference between the penetration dynamics observed in sand and in liquids. When pushing a top-closed shell (e.g., an upside down glass) into a liquid, the trapped air increases the buoyancy and opposes the penetration. It is more difficult to push a top capped cylinder than an opened one vertically into liquids. In contrast, the penetration is considerably easier in dense sand when cylinders are top capped. In this discrete and biphasic medium, the trapped air escapes from the shell, fluidizes the sand, and eases the motion.

KEARNS 2011

Hugh Kearns & Maria Gardiner, *Waiting for the motivation fairy.* *nature* **472** (2011), 127.

It's easy to give in to procrastination – but Hugh Kearns and Maria Gardiner offer some tips for getting your drive back.

”I love deadlines. I love the whooshing sound they make as they go by.” – Douglas Adams

KROSS 2011

Ethan Kross, Marc G. Berman, Walter Mischel, Edward E. Smith & Tor D. Wager, *Social rejection shares somatosensory representations with physical pain.* *PNAS* **108** (2011), 6270–6275.

[pnas108-06270-Supplement.pdf](#)

How similar are the experiences of social rejection and physical pain? Extant research suggests that a network of brain regions that support the affective but not the sensory

components of physical pain underlie both experiences. Here we demonstrate that when rejection is powerfully elicited-by having people who recently experienced an unwanted break-up view a photograph of their ex-partner as they think about being rejected-areas that support the sensory components of physical pain (secondary somatosensory cortex; dorsal posterior insula) become active. We demonstrate the overlap between social rejection and physical pain in these areas by comparing both conditions in the same individuals using functional MRI. We further demonstrate the specificity of the secondary somatosensory cortex and dorsal posterior insula activity to physical pain by comparing activated locations in our study with a database of over 500 published studies. Activation in these regions was highly diagnostic of physical pain, with positive predictive values up to 88%. These results give new meaning to the idea that rejection “hurts.” They demonstrate that rejection and physical pain are similar not only in that they are both distressing-they share a common somatosensory representation as well.

emotion | social pain | affective neuroscience | neuroimaging | psychological distress

RAK 2011

Kimberly Rak & Daniel J. Rader, *The diet-microbe morbid union*. [nature 472 \(2011\), 40–41](#).

[n472-0057-Supplement.pdf](#)

A common dietary component that some people even take as a supplement is converted by the gut microbiota to harmful metabolites linked to heart disease. This finding has cautionary implications.

SHUKLA 2011

Mohinish Shukla, Katherine S. White & Richard N. Aslin, *Prosody guides the rapid mapping of auditory word forms onto visual objects in 6-mo-old infants*. [PNAS 108 \(2011\), 6038–6043](#).

Human infants are predisposed to rapidly acquire their native language. The nature of these predispositions is poorly understood, but is crucial to our understanding of how infants unpack their speech input to recover the fundamental word-like units, assign them referential roles, and acquire the rules that govern their organization. Previous researchers have demonstrated the role of general distributional computations in prelinguistic infants’ parsing of continuous speech. We extend these findings to more naturalistic conditions, and find that 6-mo-old infants can simultaneously segment a nonce auditory word form from prosodically organized continuous speech and associate it to a visual referent. Crucially, however, this mapping occurs only when the word form is aligned with a prosodic phrase boundary. Our findings suggest that infants are predisposed very early in life to hypothesize that words are aligned with prosodic phrase boundaries, thus facilitating the word learning process. Further, and somewhat paradoxically, we observed successful learning in a more complex context than previously studied, suggesting that learning is enhanced when the language input is well matched to the learner’s expectations.

statistical learning | language acquisition | lexical development | intonational phrase

SMITH 2011

Jim Smith, *A long shadow over Fukushima*. [nature 472 \(2011\), 7](#).

One impact of Japan’s nuclear crisis is a dim but definite echo of Chernobyl, says Jim Smith – decades of caesium-137.

WANG 2011

Zeneng Wang et al., *Gut flora metabolism of phosphatidylcholine promotes cardiovascular disease*. [nature 472 \(2011\), 57–63](#).

Zeneng Wang, Elizabeth Klipfell, Brian J. Bennett, Robert Koeth, Bruce S. Levison, Brandon DuGar, Ariel E. Feldstein, Earl B. Britt, Xiaoming Fu, Yoon-Mi Chung, Yuping

Wu, Phil Schauer, Jonathan D. Smith, Hooman Allayee, W. H. Wilson Tang, Joseph A. DiDonato, Aldons J. Lulis & Stanley L. Hazen
Metabolomics studies hold promise for the discovery of pathways linked to disease processes. Cardiovascular disease (CVD) represents the leading cause of death and morbidity worldwide. Here we used a metabolomics approach to generate unbiased small-molecule metabolic profiles in plasma that predict risk for CVD. Three metabolites of the dietary lipid phosphatidylcholine—choline, trimethylamine N-oxide (TMAO) and betaine—were identified and then shown to predict risk for CVD in an independent large clinical cohort. Dietary supplementation of mice with choline, TMAO or betaine promoted upregulation of multiple macrophage scavenger receptors linked to atherosclerosis, and supplementation with choline or TMAO promoted atherosclerosis. Studies using germ-free mice confirmed a critical role for dietary choline and gut flora in TMAO production, augmented macrophage cholesterol accumulation and foam cell formation. Suppression of intestinal microflora in atherosclerosis-prone mice inhibited dietary-choline-enhanced atherosclerosis. Genetic variations controlling expression of flavin monooxygenases, an enzymatic source of TMAO, segregated with atherosclerosis in hyperlipidaemic mice. Discovery of a relationship between gut-flora-dependent metabolism of dietary phosphatidylcholine and CVD pathogenesis provides opportunities for the development of new diagnostic tests and therapeutic approaches for atherosclerotic heart disease.

ZAKAIB 2011

Gwyneth Dickey Zakaib, *US radiation study sparks debate.* [nature 472 \(2011\), 15.](#)

Researchers divided on how best to probe any possible link to cancer.

Anthropologie

D'ERRICO 2003

Francesco d'Errico, *The Invisible Frontier. A Multiple Species Model for the Origin of Behavioral Modernity.* [Evolutionary Anthropology 12 \(2003\), 188–202.](#)

Two contradictory theories of human cognitive evolution have been developed to model how, when, and among what hominid groups behavioral modernity emerged. The first model, which has long been the dominant paradigm, links these behavioral innovations to a cultural “revolution” by anatomically modern humans in Europe at around 40,000 years ago, coinciding with the first arrival of our species in this region. According to this model, the sudden and explosive character of this change is demonstrated by the appearance in the archeological record of previously unseen carvings, personal ornaments, musical instruments, depictions on cave walls, and new stone and bone technology. A variant of this model sees behavioral modernity resulting from a rapid biological change, a brain mutation producing no apparent change in skull anatomy, which occurred in Europe or, more probably, in Africa at ca. 50,000 years ago.

FOLEY 2003

Robert Foley & Marta Mirazón Lahr, *On Stony Ground: Lithic Technology, Human Evolution, and the Emergence of Culture.* [Evolutionary Anthropology 12 \(2003\), 109–122.](#)

Culture is the central concept of anthropology. Its centrality comes from the fact that all branches of the discipline use it, that it is in a way a shorthand for what makes humans unique, and therefore defines anthropology as a separate discipline. In recent years the major contributions to an evolutionary approach to culture have come either from primatologists

mapping the range of behaviors, among chimpanzees in particular, that can be referred to as cultural or “protocultural” or from evolutionary theorists who have developed models to account for the pattern and process of human cultural diversification and its impact on human adaptation.

GOEBEL 1999

Ted Goebel, *Pleistocene Human Colonization of Siberia and Peopling of the Americas: An Ecological Approach*. [Evolutionary Anthropology 8 \(1999\), 208–2227](#).

To conclude, the ecological model of the human colonization of Siberia presented here favors a relatively late peopling of the Americas. Colonization of the northern mammoth-steppe of Siberia, a prerequisite for colonization of the Americas, appears to have occurred about 25 kya. However, ecological factors during the last glacial maximum (20 to 18 kya) may have severely limited the northern range of human populations, so that it was not until the late glacial (sometime after 17 kya), that humans initially colonized Beringia. This model can accommodate a site like Monte Verde in South America, which is just one or two millennia older than Clovis. However, it certainly does not support linguists’ claims of a colonization of the Americas before 35 kya.

HARRIS 1999

Eugene E. Harris & Jody Hey, *Human Demography in the Pleistocene: Do Mitochondrial and Nuclear Genes Tell the Same Story?* [Evolutionary Anthropology 8 \(1999\), 81–85](#).

The finding that most nuclear genes harbor a wealth of old genetic variation that well predates the origin of modern humans raises hope for further research on the genetic basis of the transformation to modern humans. As human genes are discovered through the efforts of the Human Genome Project, it might well become possible to identify the genes that make us modern. How will we know these “modern” genes when we find them? If these genes carried mutations that were beneficial and that arose in our archaic ancestors, then necessarily they must have experienced a selective sweep within the past 200,000 years. These “modern” genes should show a unique evolutionary history—a history with a very recent coalescence, resembling a bottleneck, with a time that coincides with the earliest modern human fossils. These genes should also show a history of increased gene flow among human populations.

HERRIES 2011

Andy I. R. Herries & John Shaw, *Palaeomagnetic analysis of the Sterkfontein palaeocave deposits: Implications for the age of the hominin fossils and stone tool industries*. [Journal of Human Evolution 60 \(2011\), 523–539](#).

JHumEvo60-0523-Supplement.doc

Palaeomagnetic analysis was conducted on speleothems from Members 1-5 at Sterkfontein Cave, South Africa. Palaeomagnetic analysis of siltstone and speleothem from the bulk of Member 4 indicate a reversed magnetic polarity that dates the deposits and its *Australopithecus africanus* fossils to between 2.58 and ≈ 2.16 Ma. Further confirmation of this age comes in the form of two short normal polarity events correlated to the Réunion (≈ 2.16 Ma) and Huckleberry Ridge (≈ 2.05 Ma) events in speleothem capping the bulk of Member 4 and coeval with deposition of the final phase of Member 4, including *A. africanus* fossil Sts 5. At ≈ 2.16 -2.05 Ma, Sts 5 is the youngest representative of *A. africanus* yet discovered. Palaeomagnetic analysis of the Silberberg Grotto deposits identifies a single short geomagnetic field event in flowstone overlying the StW573 *Australopithecus* fossil, which is suggested to represent the Réunion event at ≈ 2.16 Ma. This further supports the uranium lead age estimates of 2.3-2.2 Ma for the StW 573 fossil. Based on a reversed

polarity for the deposits below the skeleton it cannot be older than 2.58 Ma. If StW 573 is considered to be a second species of *Australopithecus* then this indicates that two species of *Australopithecus* are present at Sterkfontein between 2.6 and 2.0 Ma. All of the Member 5 deposits date to less than 1.8 Ma based on a comparison of palaeomagnetic, faunal, and electron spin resonance age estimates. The StW53 fossil bearing infill (M5A) is intermediate in age between Member 4 and the rest of Member 5 (B-C) at around 1.78-1.49 Ma. The rest of Member 5 (B-C) containing Oldowan and Acheulian stone tools and *Homo* and *Paranthropus* fossils was deposited gradually between 1.40 and 1.07 Ma, much younger than previously suggested.

Keywords: Magnetostratigraphy; *Australopithecus africanus*; Acheulian; Oldowan; Early *Homo*; *Paranthropus*

KLEIN 2008

Richard G. Klein, *Out of Africa and the Evolution of Human Behavior*. *Evolutionary Anthropology* **17** (2008), 267–281.

Twenty-one years ago, a landmark exploration of mitochondrial DNA diversity popularized the idea of a recent African origin for all living humans. The ancestral African population was estimated to have existed 200 ka (thousands of years ago) plus or minus a few tens of thousands of years. A corollary was that at some later date the fully modern African descendants of that population expanded to swamp or replace the Neanderthals and other nonmodern Eurasians. The basic concept soon became known as “Out of Africa,” after the Academy Award winning film (1985) that took its title, in turn, from Isak Dinesen’s classic autobiography (1937). Many subsequent genetic analyses, including those of Ingman and coworkers and Underhill and coworkers, have reaffirmed the fundamental Out of Africa model. The fossil and archeological records also support it strongly. The fossil record implies that anatomically modern or near-modern humans were present in Africa by 150 ka; the fossil and archeological records together indicate that modern Africans expanded to Eurasia beginning about 50 ka.

MELLARS 2005

Paul Mellars, *The Impossible Coincidence, A Single-Species Model for the Origins of Modern Human Behavior in Europe*. *Evolutionary Anthropology* **14** (2005), 12–27.

Few topics in palaeoanthropology have generated more recent debate than the nature and causes of the remarkable transformation in human behavioral patterns that marked the transition from the Middle to the Upper Paleolithic in Europe. Those of us who have argued for an effective technological and cultural “revolution” at this point in the Paleolithic sequence have emphasized three main dimensions: the wide range of different aspects of behavior that appear to have been affected (Fig. 1); the relative speed and abruptness with which most of these changes can be documented in the archeological records from the different regions of Europe; and the potentially profound social and cognitive implications of many of the innovations involved. Most striking of all in this context is the abrupt appearance and proliferation of various forms of perforated animal teeth, shells, beads, and other personal ornaments, and the even more dramatic eruption of remarkably varied and sophisticated forms of art, ranging from representations of male and female sex organs, through the highly stylized animal and combined animal-human figures from southern Germany, to the striking wall paintings of the Chauvet Cave. One might add to this the similar proliferation of more enigmatic but potentially equally significant abstract “notation” systems on bone and ivory artifacts. To describe the Upper Paleolithic revolution in Europe as reflecting preeminently an explosion in explicitly symbolic behavior and expression is in no sense an exaggeration, as most prehistorians would now agree. We are probably on safe ground in assuming that symbolic behavior

and expression of this level of complexity would be inconceivable in the absence of highly structured language systems and brains closely similar, if not identical to, our own.

MELLARS 2006

Paul Mellars, *Archeology and the Dispersal of Modern Humans in Europe: Deconstructing the “Aurignacian”*. *Evolutionary Anthropology* **15** (2006), 167–182.

Few would now dispute the reality of a major dispersal of anatomically and genetically modern human populations across Europe and western Asia centered broadly within the period from ca. 45,000 to 35,000 BP in terms of conventional radiocarbon dating, or between ca. 47,000 and 41,000 BP in terms of the most recent calibration of the radiocarbon timescale. This can be supported equally from the direct skeletal evidence recovered from European and Near Eastern sites and from the closely similar conclusions drawn from studies of both the mitochondrial and Y-chromosome DNA evidence in modern European populations. How far these new anatomically and genetically modern populations may or may not have interbred with the preceding Neanderthal populations in the different regions of Europe remains a matter of lively debate. But the reality of this modern human population dispersal itself is now almost universally accepted.

SHEA 2003

John J. Shea, *Neandertals, Competition, and the Origin of Modern Human Behavior in the Levant*. *Evolutionary Anthropology* **12** (2003), 173–187.

The East Mediterranean Levant is a small region, but its paleoanthropological record looms large in debates about the origin of modern humans and the fate of the Neandertals. For most of the twentieth century, the Levantine paleoanthropological record supported models of continuity and evolutionary transition between Neandertals and early modern humans. Recent advances in radiometric dating have challenged these models by reversing the chronological relationship between Levantine Neandertals and early modern humans. This revised chronostratigraphy for Levantine Middle Paleolithic human fossils raises interesting questions about the evolutionary relationship between Neandertals and early modern humans. A reconsideration of this relationship moves us closer to understanding the long delay between the origin of morphologically modern-looking humans during the Middle Paleolithic (>130 Kyr) and the adaptive radiation of modern humans into Eurasia around the time of the transition from the Middle to Upper Paleolithic (50 to 30 Kyr).

WEAVER 2008

Timothy D. Weaver & Charles C. Roseman, *New Developments in the Genetic Evidence for Modern Human Origins*. *Evolutionary Anthropology* **17** (2008), 69–80.

The genetic evidence for modern human origins was reviewed recently in *Evolutionary Anthropology* by Pearson, so our goal is to highlight new developments rather than attempt a comprehensive review. For years, polarized Multiregional and Out-of-Africa models for modern human origins were debated vigorously, but today there is substantial agreement among specialists. One area of broad consensus is that Africa or, more accurately, sub-Saharan Africa, played a predominant role in the origins of modern humans. This view is found even among researchers who argue against complete replacement of nonmodern Eurasians. The importance of Africa is clear not only from genetics, but also from the fossil record. On the other hand, most researchers also agree that, at least in principle, modern humans and nonmodern Eurasians, such as Neandertals, could have interbred with each other. The fossil record suggests that Neandertals and modern humans constituted independent evolutionary lineages, but their recent common ancestry leaves open the possibility of admixture. The open question is whether there is any evidence of admixture.

Datierung

HEDGES 1996

R. E. M. Hedges, R. A. Housley, P. B. Pettitt, C. Bronk Ramsey & G. J. van Klinken, *Radiocarbon dates from the Oxford AMS system: Archaeometry datelist 21*. *Archaeometry* **38** (1996), 181–207.

Klima

BEHL 2011

Richard J. Behl, *Glacial demise and methane's rise*. *PNAS* **108** (2011), 5925–5926.

KINGSTON 2007

John D. Kingston, *Shifting Adaptive Landscapes: Progress and Challenges in Reconstructing Early Hominid Environments*. *Yearbook of Physical Anthropology* **50** (2007), 20–58.

Since Darwin situated humans in an evolutionary framework, much discussion has focused on environmental factors that may have shaped or influenced the course of human evolution. Developing adaptive or causal perspectives on the morphological and behavioral variability documented in the human fossil record requires establishing a comprehensive paleoenvironmental context. Reconstructing environments in the past, however, is a complex undertaking, requiring assimilation of diverse datasets of varying quality, scale, and relevance. In response to these difficulties, human evolution has traditionally been interpreted in a somewhat generalized framework, characterized primarily by increasing aridity and seasonality periodically punctuated by pulses or intervals of environmental change, inferred largely from global climatic records. Although these broad paradigms provide useful heuristic approaches for interpreting human evolution, the spatiotemporal resolution remains far too coarse to develop unambiguous causal links. This challenge has become more acute as the emerging paleoenvironmental evidence from equatorial Africa is revealing a complex pattern of habitat heterogeneity and persistent ecological flux throughout the interval of human evolution. In addition, recent discoveries have revealed significant taxonomic diversity and substantially increased the geographic and temporal range of early hominids. These findings raise further questions regarding the role of the environment in mediating or directing the course of human evolution. As a consequence, it is imperative to critically assess the environmental criteria on which many theories and hypotheses of human evolution hinge. The goals here are to 1) compile, review, and evaluate relevant paleoecological datasets from equatorial Africa spanning the last 10 Ma, 2) develop a hierarchical perspective for developing and evaluating hypotheses linking paleoecology to patterns and processes in early hominid evolution, and 3) suggest a conceptual framework for modeling and interpreting environmental data relevant to human evolution in equatorial Africa.

KEY WORDS human evolution; paleoecology; paleoenvironment; Africa

RYNER 2008

Maria Ryner, Karin Holmgren & David Taylor, *A record of vegetation dynamics and lake level changes from Lake Emakat, northern Tanzania, during the last c. 1200 years*. *Journal of Paleolimnology* **40** (2008), 583–601.

Analyses of down-core variations in pollen and charcoal in two short cores of lake sediment and wood samples taken from the in situ remains of *Nuxia congesta* from Lake Emakat, a

hydrologically closed volcanic crater lake occupying the Empakaai Crater in northern Tanzania, have generated evidence of past vegetation change and lake level fluctuations. Eight AMS radiocarbon (^{14}C) dates on bulk samples of lake sediment provide a chronological framework for the two cores and indicate that the sediment record analysed incorporates the last c. 1200 years. The in situ remains of a *Nuxia congesta* tree, now standing in deep water, were dated with three additional AMS ^{14}C dates, suggesting tree growth within the interval ≈ 1500 -1670 AD. Down-core variations in pollen from terrestrial taxa, particularly the montane forest trees *Hagenia abyssinica* and *Nuxia congesta*, indicate a broad period of generally more arid conditions in the catchment to c. 1200 AD and at a prolonged period between c. 1420 and 1680 AD. Variations in pollen from plants in lake margin vegetation indicate low lake levels, presumably as a result of reduced effective precipitation, contemporary with indications of relatively dry conditions mentioned above, but also during the late 18th and the late 19th centuries. The presence of charcoal throughout both cores indicates the frequent occurrence of vegetation fires. An increase in burning, evident in the charcoal data and dated to the early to mid second millennium AD, could relate to an expansion of human population levels and agricultural activity in the region.

Keywords: Africa; Climate change; Palaeoecology; Lake level change; Tanzania

WYNN 2004

Jonathan Guy Wynn, *Influence of Plio-Pleistocene Aridification on Human Evolution: Evidence From Paleosols of the Turkana Basin, Kenya*. [American Journal of Physical Anthropology](#) **123** (2004), 106–118.

New stable carbon isotope measurements, coupled with paleoprecipitation estimates, both from Plio-Pleistocene paleosols of the Turkana Basin, Kenya, provide a high-resolution record of aridification and increasing C_4 biomass during the past 4.3 Ma. This aridification trend is marked by several punctuations at 3.58-3.35, 2.52-2, and 1.81-1.58 Ma, during which the running mean and variance of $\delta^{13}\text{C}$ and paleoaridity estimates increase, suggesting that the proportion of C_4 biomass increases in savanna mosaics during periods of heightened aridity. Increase in C_4 biomass during these aridification events not only increases the proportion of open habitats, but increases the spatial neg-entropy, or heterogeneity of the ecosystem. The aridification events identified correspond to intervals of increased turnover, but more importantly, increased diversity of bovids. Although the record of hominins from the Turkana Basin lacks the temporal resolution and diversity of the bovid record, the aridification intervals identified are marked by similar increases in the diversity and turnover of hominins. These results support the hypothesis that hominins evolved in savanna mosaics that changed through time, and suggest that the evolution of bovids and hominins was driven by shifts in climatic instability and habitat variability, both diachronic and synchronic.

KEY WORDS environmental change; aridity; Pliocene; Pleistocene; East Africa; carbon isotope; paleohabitat

Kultur

SCHUNN 2010

Isabel Maria Schunn, *Doing gender oder Un/doing „career“: Aspekte des vorberuflichen Laufbahntwicklungsprozesses von Studierenden, Eine empirische Untersuchung des Einflusses von unterschiedlichen Parametern auf studentische Karriereorientierung*. Dissertation, Universität Bielefeld (Bielefeld 2010).

Neolithikum

GIGNOUX 2011

Christopher R. Gignoux, Brenna M. Henn & Joanna L. Mountain, *Rapid, global demographic expansions after the origins of agriculture*. [PNAS 108 \(2011\), 6044–6049](#).

The invention of agriculture is widely assumed to have driven recent human population growth. However, direct genetic evidence for population growth after independent agricultural origins has been elusive. We estimated population sizes through time from a set of globally distributed whole mitochondrial genomes, after separating lineages associated with agricultural populations from those associated with hunter-gatherers. The coalescent-based analysis revealed strong evidence for distinct demographic expansions in Europe, southeastern Asia, and sub-Saharan Africa within the past 10,000 y. Estimates of the timing of population growth based on genetic data correspond neatly to dates for the initial origins of agriculture derived from archaeological evidence. Comparisons of rates of population growth through time reveal that the invention of agriculture facilitated a fivefold increase in population growth relative to more ancient expansions of hunter-gatherers.

Holocene | Neolithic | Phylogenetics

Physik

WILL 2011

Clifford M. Will, *On the unreasonable effectiveness of the post-Newtonian approximation in gravitational physics*. [PNAS 108 \(2011\), 5938–5945](#).

The post-Newtonian approximation is a method for solving Einstein's field equations for physical systems in which motions are slow compared to the speed of light and where gravitational fields are weak. Yet it has proven to be remarkably effective in describing certain strong-field, fast-motion systems, including binary pulsars containing dense neutron stars and binary black hole systems inspiraling toward a final merger. The reasons for this effectiveness are largely unknown. When carried to high orders in the post-Newtonian sequence, predictions for the gravitational-wave signal from inspiraling compact binaries will play a key role in gravitational-wave detection by laser-interferometric observatories.

general relativity | gravitational radiation