

## Literatur

### Aktuell

#### TER BOGT 2013

Tom F. M. ter Bogt, Loes Keijsers & Wim H. J. Meeus, *Early Adolescent Music Preferences and Minor Delinquency*. [Pediatrics 131 \(2013\), e380–e389](#).

OBJECTIVES: To test Music Marker Theory (MMT) positing that early adolescents' preferences for nonmainstream types of popular music indicate concurrent and later minor delinquency.

METHODS: MMT was tested in a 4-year longitudinal study (n = 309).

RESULTS: The results showed that early fans of different types of rock (eg, rock, heavy metal, gothic, punk), African American music (rhythm and blues, hip-hop), and electronic dance music (trance, techno/ hardhouse) showed elevated minor delinquency concurrently and longitudinally. Preferring conventional pop (chart pop) or highbrow music (classic music, jazz), in contrast, was not related to or was negatively related to minor delinquency.

CONCLUSIONS: Early music preferences emerged as more powerful indicators of later delinquency rather than early delinquency, indicating that music choice is a strong marker of later problem behavior. The mechanisms through which music preferences are linked to minor delinquency are discussed within the framework of MMT. [Pediatrics 2013;131:e380–e389](#)

KEY WORDS youth, adolescence, music, risk factors, juvenile delinquency

#### DICKS 2013

Lynn Dicks, *Bees, lies and evidence-based policy*. [nature 494 \(2013\), 283](#).

Misinformation forms an inevitable part of public debate, but scientists should always focus on informing the decision-makers, advises Lynn Dicks.

As a scientist involved in this debate, I find this misinformation deeply frustrating. Yet I also see that lies and exaggeration on both sides are a necessary part of the democratic process to trigger rapid policy change.

#### EGLOFF 2013

Boris Egloff, David Richter & Stefan C. Schmukle, *Need for conclusive evidence that positive and negative reciprocity are unrelated*. [PNAS 110 \(2013\), E786](#).

Fortunately, data from the Socio-Economic Panel (version 28) of the German Institute for Economic Research allow for a thorough examination of the research question under scrutiny. Thus, from only these data, it seems reasonably safe to conclude that positive and negative reciprocity vary independently of each other, providing a severe challenge to the strong reciprocity model of the evolution of human cooperation.

#### GIBB 2013

Gillian C. Gibb & Simon F. K. Hills, *Intergenerational mutation rate does not equal long-term evolutionary substitution rate*. [PNAS 110 \(2013\), E611](#).

Although it is generally accepted that the long-term rate of molecular evolution should equal the rate of neutral mutations over long time scales, this is frequently not observed for short time scales. New genomic intergenerational mutation rates are unexpectedly slower than previous long-term rate estimates (e.g., ref. 3), so it is unfortunate that the authors have used these slower intergenerational rates to recalibrate hominid divergence times without any discussion of the effects of biases in the inference of that rate.

MCCARTHY 2013

Claire McCarthy, *Pediatricians and Television: It's Time to Rethink Our Messaging and Our Efforts*. *Pediatrics* **131** (2013), 589–590.

PRÜFER 2013

Kay Prüfer, Kevin E. Langergraber, Svante Pääbo & Linda Vigilant, *Divergence times, generation lengths and mutation rates in great apes and humans, Reply to Gibb and Hills*. *PNAS* **110** (2013), E612.

ROBERTSON 2013

Lindsay A. Robertson, Helena M. McAnally & Robert J. Hancox, *Childhood and Adolescent Television Viewing and Antisocial Behavior in Early Adulthood*. *Pediatrics* **131** (2013), 439–446.

OBJECTIVE: To investigate whether excessive television viewing throughout childhood and adolescence is associated with increased antisocial behavior in early adulthood.

METHODS: We assessed a birth cohort of 1037 individuals born in Dunedin, New Zealand, in 1972–1973, at regular intervals from birth to age 26 years. We used regression analysis to investigate the associations between television viewing hours from ages 5 to 15 years and criminal convictions, violent convictions, diagnosis of antisocial personality disorder, and aggressive personality traits in early adulthood.

RESULTS: Young adults who had spent more time watching television during childhood and adolescence were significantly more likely to have a criminal conviction, a diagnosis of antisocial personality disorder, and more aggressive personality traits compared with those who viewed less television. The associations were statistically significant after controlling for sex IQ, socioeconomic status, previous antisocial behavior, and parental control. The associations were similar for both sexes, indicating that the relationship between television viewing and antisocial behavior is similar for male and female viewers.

CONCLUSIONS: Excessive television viewing in childhood and adolescence is associated with increased antisocial behavior in early adulthood. The findings are consistent with a causal association and support the American Academy of Pediatrics recommendation that children should watch no more than 1 to 2 hours of television each day. *Pediatrics* 2013;131:439–446

KEY WORDS television, antisocial behavior, media violence, longitudinal studies

YAMAGISHI 2013

Toshio Yamagishi, *On the relationship between positive and negative reciprocity, Reply to Egloff et al.* *PNAS* **110** (2013), E787.

ZHU 2013

Yong-Guan Zhu et al., *Diverse and abundant antibiotic resistance genes in Chinese swine farms*. *PNAS* **110** (2013), 3435–3440.

pnas110-03435-Supplement1.docx, pnas110-03435-Supplement2.docx,  
pnas110-03435-Supplement3.docx, pnas110-03435-Supplement4.docx,  
pnas110-03435-Supplement5.docx, pnas110-03435-Supplement6.docx

Yong-Guan Zhu, Timothy A. Johnson, Jian-Qiang Su, Min Qiao, Guang-Xia Guo,  
Robert D. Stedtfeld, Syed A. Hashsham and James M. Tiedje

Antibiotic resistance genes (ARGs) are emerging contaminants posing a potential worldwide human health risk. Intensive animal husbandry is believed to be a major contributor to the increased environmental burden of ARGs. Despite the volume of antibiotics used in China, little information is available regarding the corresponding ARGs associated with animal farms. We assessed type and concentrations of ARGs at three stages of manure processing to land disposal at three large-scale (10,000 animals per year) commercial swine farms in China. In-feed or therapeutic antibiotics used on these farms include all major classes of antibiotics except vancomycins. High-capacity quantitative PCR arrays detected 149 unique resistance genes among all of the farm samples, the top 63 ARGs being enriched 192-fold (median) up to 28,000-fold (maximum) compared with their respective antibiotic-free manure or soil controls. Antibiotics and heavy metals used as feed supplements were elevated in the manures, suggesting the potential for coselection of resistance traits. The potential for horizontal transfer of ARGs because of transposon-specific ARGs is implicated by the enrichment of transposases—the top six alleles being enriched 189-fold (median) up to 90,000-fold in manure—as well as the high correlation ( $r^2 = 0.96$ ) between ARG and transposase abundance. In addition, abundance of ARGs correlated directly with antibiotic and metal concentrations, indicating their importance in selection of resistance genes. Diverse, abundant, and potentially mobile ARGs in farm samples suggest that unmonitored use of antibiotics and metals is causing the emergence and release of ARGs to the environment.

concentrated animal feeding operations | horizontal gene transfer | growth-promoting antibiotics | tetracycline

## Anthropologie

BALTER 2013

Michael Balter, *Archaeologist Hammers Away At ‘Modern’ Behavior.* [science](#) **339** (2013), 642–643.

Stone tools suggest that the earliest modern humans were as smart as we are—they just had different problems to solve, an archaeologist argues. Many researchers had long perceived an apparent gap between when humans started to look modern in anatomy and when they started acting modern, as shown by their stone tools and other artifacts. But Shea was sitting at the site one day, looking at stone points the team had found, when he had an epiphany. The points “were very well made, nothing primitive about them at all—they were like what I would make to show off,” he recalls. “Suddenly it hit me right in the head. These were people just like me. They just had different challenges to face.” There was no sense trying to track these humans’ progression to modernity, Shea says, because they already were modern.

FITCH 2013

W. Tecumseh Fitch, *Tuned to the rhythm.* [nature](#) **494** (2013), 434–435. Rhesus macaques’ responses to computer-animated images of lip-smacking monkey faces suggest that the jaw, tongue and lip oscillations that characterize human speech may have evolved from rhythmic primate facial expressions.

There are two main hypotheses for the evolutionary origin of human speech. The first and most widespread is that speech is derived from primate vocalizations, which were harnessed or co-opted to convey linguistic information. [...] The second, and less intuitive, hypothesis builds on the fact that the lips, jaws and tongue generate not just vocal, but also visual, signals — and, unlike the larynx, these articulators are under learned voluntary control in non-human primates. This led evolutionary neuroscientist Peter MacNeilage to suggest<sup>5</sup> that speech rhythms originated not in the vocal but in the visual domain. In a sense, he argued, speech starts out (in babies’ babbling, for example) as a lip-smacking oscillation superimposed on a vocal signal. This rhythmic stream is then differentially modified, by learned tongue and lip movements, into the vowels and consonants of speech. Support for this hypothesis comes from previous work demonstrating that the detailed kinematics of lip-smacking are strikingly similar to those of speech<sup>6</sup>. But Ghazanfar and colleagues’ work adds support from the domain of perception, indicating that perceptual tuning for the two signal classes is also consistent with MacNeilage’s hypothesis.

### GHAZANFAR 2013

Asif A. Ghazanfar, Ryan J. Morrill & Christoph Kayser, *Monkeys are perceptually tuned to facial expressions that exhibit a theta-like speech rhythm*. [PNAS 110 \(2013\), 1959–1963](#).

Human speech universally exhibits a 3- to 8-Hz rhythm, corresponding to the rate of syllable production, which is reflected in both the sound envelope and the visual mouth movements. Artificial perturbation of the speech rhythm outside the natural range reduces speech intelligibility, demonstrating a perceptual tuning to this frequency band. One theory posits that the mouth movements at the core of this speech rhythm evolved through modification of ancestral primate facial expressions. Recent evidence shows that one such communicative gesture in macaque monkeys, lip-smacking, has motor parallels with speech in its rhythmicity, its developmental trajectory, and the coordination of vocal tract structures. Whether monkeys also exhibit a perceptual tuning to the natural rhythms of lip-smacking is unknown. To investigate this, we tested rhesus monkeys in a preferential-looking procedure, measuring the time spent looking at each of two side-by-side computer-generated monkey avatars lip-smacking at natural versus sped-up or slowed-down rhythms. Monkeys showed an overall preference for the natural rhythm compared with the perturbed rhythms. This lends behavioral support for the hypothesis that perceptual processes in monkeys are similarly tuned to the natural frequencies of communication signals as they are in humans. Our data provide perceptual evidence for the theory that speech may have evolved from ancestral primate rhythmic facial expressions.

### MENDEZ 2013

Fernando L. Mendez et al., *An African American Paternal Lineage Adds an Extremely Ancient Root to the Human Y Chromosome Phylogenetic Tree*. [American Journal of Human Genetics 92 \(2013\), 454–459](#).

[AmJHumGen92-0454-Supplement.pdf](#)

Fernando L. Mendez, Thomas Krahn, Bonnie Schrack, Astrid-Maria Krahn, Krishna R. Veeramah, August E. Woerner, Forka Leypey Mathew Fomine, Neil Bradman, Mark G. Thomas, Tatiana M. Karafet and Michael F. Hammer

We report the discovery of an African American Y chromosome that carries the ancestral state of all SNPs that defined the basal portion of the Y chromosome

phylogenetic tree. We sequenced  $\approx 240$  kb of this chromosome to identify private, derived mutations on this lineage, which we named A00. We then estimated the time to the most recent common ancestor (TMRCA) for the Y tree as 338 thousand years ago (kya) (95 % confidence interval = 237–581 kya). Remarkably, this exceeds current estimates of the mtDNA TMRCA, as well as those of the age of the oldest anatomically modern human fossils. The extremely ancient age combined with the rarity of the A00 lineage, which we also find at very low frequency in central Africa, point to the importance of considering more complex models for the origin of Y chromosome diversity. These models include ancient population structure and the possibility of archaic introgression of Y chromosomes into anatomically modern humans. The A00 lineage was discovered in a large database of consumer samples of African Americans and has not been identified in traditional hunter-gatherer populations from sub-Saharan Africa. This underscores how the stochastic nature of the genealogical process can affect inference from a single locus and warrants caution during the interpretation of the geographic location of divergent branches of the Y chromosome phylogenetic tree for the elucidation of human origins.

## Biologie

MUELLER 2012

Nathaniel D. Mueller, James S. Gerber, Matt Johnston, Deepak K. Ray, Navin Ramankutty & Jonathan A. Foley, *Closing yield gaps through nutrient and water management*. *nature* **490** (2012), 254–257. n490-0254-Supplement1.pdf, n490-0254-Supplement2.xls

In the coming decades, a crucial challenge for humanity will be meeting future food demands without undermining further the integrity of the Earth's environmental systems<sup>1–6</sup>. Agricultural systems are already major forces of global environmental degradation<sup>4,7</sup>, but population growth and increasing consumption of calorie- and meat-intensive diets are expected to roughly double human food demand by 2050 (ref. 3). Responding to these pressures, there is increasing focus on 'sustainable intensification' as a means to increase yields on underperforming landscapes while simultaneously decreasing the environmental impacts of agricultural systems<sup>2–4,8–11</sup>. However, it is unclear what such efforts might entail for the future of global agricultural landscapes. Here we present a global-scale assessment of intensification prospects from closing 'yield gaps' (differences between observed yields and those attainable in a given region), the spatial patterns of agricultural management practices and yield limitation, and the management changes that may be necessary to achieve increased yields. We find that global yield variability is heavily controlled by fertilizer use, irrigation and climate. Large production increases (45 % to 70 % for most crops) are possible from closing yield gaps to 100 % of attainable yields, and the changes to management practices that are needed to close yield gaps vary considerably by region and current intensity. Furthermore, we find that there are large opportunities to reduce the environmental impact of agriculture by eliminating nutrient overuse, while still allowing an approximately 30 % increase in production of major cereals (maize, wheat and rice). Meeting the food security and sustainability challenges of the coming decades is possible, but will require considerable changes in nutrient and water management.

## Datierung

WOOD 2013

Rachel E. Wood et al., *Radiocarbon dating casts doubt on the late chronology of the Middle to Upper Palaeolithic transition in southern Iberia*. [PNAS 110 \(2013\), 2781–2786](#).

[pnas110-02781-Supplement1.docx](#), [pnas110-02781-Supplement2.docx](#),  
[pnas110-02781-Supplement3.docx](#), [pnas110-02781-Supplement4.docx](#),  
[pnas110-02781-Supplement5.docx](#), [pnas110-02781-Supplement6.pdf](#)

Rachel E. Wood, Cecilio Barroso-Ruiz, Miguel Caparrós, Jesús F. Jordá Pardo, Bertila Galván Santos and Thomas F. G. Higham

It is commonly accepted that some of the latest dates for Neanderthal fossils and Mousterian industries are found south of the Ebro valley in Iberia at ca. 36 ka calBP (calibrated radiocarbon date ranges). In contrast, to the north of the valley the Mousterian disappears shortly before the Proto-Aurignacian appears at ca. 42 ka calBP. The latter is most likely produced by anatomically modern humans. However, two-thirds of dates from the south are radiocarbon dates, a technique that is particularly sensitive to carbon contaminants of a younger age that can be difficult to remove using routine pretreatment protocols. We have attempted to test the reliability of chronologies of 11 southern Iberian Middle and early Upper Paleolithic sites. Only two, Jarama VI and Zafarraya, were found to contain material that could be reliably dated. In both sites, Middle Paleolithic contexts were previously dated by radiocarbon to less than 42 ka calBP. Using ultrafiltration to purify faunal bone collagen before radiocarbon dating, we obtain ages at least 10 ka <sup>14</sup>C years older, close to or beyond the limit of the radiocarbon method for the Mousterian at Jarama VI and Neanderthal fossils at Zafarraya. Unless rigorous pretreatment protocols have been used, radiocarbon dates should be assumed to be inaccurate until proven otherwise in this region. Evidence for the late survival of Neanderthals in southern Iberia is limited to one possible site, Cueva Antón, and alternative models of human occupation of the region should be considered.

## Energie

HORNE 1982

Lee Horne, *Fuel For The Metal Worker, The Role of Charcoal and Charcoal Production in Ancient Metallurgy*. [Expedition 25 \(1982\), i, 6–13](#).

[Expedition25.1-006-Figures.pdf](#)

If this estimate of 20 to 1 for a charcoal to copper ratio is accurate (and there are only a few studies to substantiate it), then by all accounts iron uses much less charcoal for extraction than copper does. This may come as a surprise in view of our picture of the environmentally destructive consequences of the coming of iron. Nonetheless, a variety of ethnographic and experimental reports indicate that iron requires no more than 10 kg of charcoal for each kg of iron produced, counting in both smelting and forging. The reasons for this difference lie in the production technologies of the two metals. It is true that iron has a higher melting temperature than copper and needs a more reducing atmosphere. We saw, however, that iron is smelted below its melting temperature. Furthermore, copper slag, unlike iron slag, must remain melted during the process in order for the melted copper to pass through and sink to the bottom of the kiln. In these ways copper extraction appears to be the more fuel intensive of the two.

HUGHES. 2013

J. David Hughes, *A reality check on the shale revolution*. [nature 494 \(2013\), 307–308](#).

The production of shale gas and oil in the United States is overhyped and the costs are underestimated, says J. David Hughes.

## Isotope

BORIĆ 2013

Dušan Borić & T. Douglas Price, *Strontium isotopes document greater human mobility at the start of the Balkan Neolithic*. [PNAS 110 \(2013\), 3298–3303](#).

Questions about how farming and the Neolithic way of life spread across Europe have been hotly debated topics in archaeology for decades. For a very long time, two models have dominated the discussion: migrations of farming groups from southwestern Asia versus diffusion of domesticates and new ideas through the existing networks of local forager populations. New strontium isotope data from the Danube Gorges in the north-central Balkans, an area characterized by a rich burial record spanning the Mesolithic–Neolithic transition, show a significant increase in nonlocal individuals from  $\approx 6200$  calibrated B.C., with several waves of migrants into this region. These results are further enhanced by dietary evidence based on carbon and nitrogen isotopes and an increasingly high chronological resolution obtained on a large sample of directly dated individuals. This dataset provides robust evidence for a brief period of coexistence between indigenous groups and early farmers before farming communities absorbed the foragers completely in the first half of the sixth millennium B.C.

forager–farmer interaction | isotope analysis | the Balkans | Lepenski Vir | southeastern Europe

## Klima

MEIER 2012

Jürgen Meier, *Die Ursachen der pleistozänen Eiszeiten*. [Zeitschrift für geologische Wissenschaften 40 \(2012\), 157–194](#).

By comparison of the maximal extension of glaciation in Europe and North America as also of the high mountains ice sheets and the ice thickness is to see a certain pattern, what does not fit to astral cycles, which purport to be actuator of the Pleistocene ice ages. Searching for a model, that is fit approximately to explain the aperiodic abrupt climate changes, you come across geotopes in Lusatia, where took place over a long period aperiodic trench structures. The geologic/tectonic model of those trenches is transferred to climatic sensitive areas in the Atlantic. Thereby it is possible to localize three epicenters of the Pleistocene ice ages and explain the causes, which resulted in glaciations particularly the large number of ice advances in the glacial periods, stadials and steps. Among examples for the effects of the glacial periods, it is attempted to give answer if we live in an interglacial period.

Key words: Pleistocene, stadials, interstadials, climate changes, causes of the glacial periods, epicenters of the glacial periods, continental glaciation, Minor Glacial Period, Greenland Basin, Trench of Weißwasser.

Bei dem Vergleich der Maximalausdehnung der Inlandeisschilde in Europa und Nordamerika sowie der Hochgebirgseisschilde und ihrer Eismächtigkeiten zeichnet

sich ein auffälliges Muster ab, das nicht zu astralen Zyklen passt, die Auslöser der pleistozänen Eiszeiten sein sollen. Auf der Suche nach einem Modell, welches geeignet ist, annähernd die aperiodischen Umschwünge des Klimas zu erklären, stößt man auf Geotope in der Lausitz, in denen über einen längeren Zeitraum aperiodisch Grabenbrüche stattfanden. Das geologisch/tektonische Modell dieser Gräben lässt sich auf die klimasensiblen Gebiete im Atlantik übertragen. Dadurch wird es möglich drei Herde der pleistozänen Eiszeiten zu lokalisieren und die Ursachen, die zu den Vereisungen führten, vor allem die Vielzahl der Eisvorstöße in den Glazialen, Stadialen und Staffeln zu erklären. Parallel dazu wird versucht, der Frage nachzugehen, ob wir in einer Zwischeneiszeit leben.

## Kultur

ADLER 2013

Christina J. Adler et al., *Sequencing ancient calcified dental plaque shows changes in oral microbiota with dietary shifts of the Neolithic and Industrial revolutions*. [nature genetics \(2013\), preprint, 1–6](#). DOI:10.1038/ng.2536.

NatGen2013-preprint-Supplement.pdf

Christina J. Adler, Keith Dobney, Laura S. Weyrich, John Kaidonis, Alan W. Walker, Wolfgang Haak, Corey J. A. Bradshaw, Grant Townsend, Arkadiusz Sołtysiak, Kurt W. Alt, Julian Parkhill & Alan Cooper

The importance of commensal microbes for human health is increasingly recognized<sup>1–5</sup>, yet the impacts of evolutionary changes in human diet and culture on commensal microbiota remain almost unknown. Two of the greatest dietary shifts in human evolution involved the adoption of carbohydrate-rich Neolithic (farming) diets<sup>6,7</sup> (beginning  $\approx 10,000$  years before the present<sup>6,8</sup>) and the more recent advent of industrially processed flour and sugar (in  $\approx 1850$ )<sup>9</sup>. Here, we show that calcified dental plaque (dental calculus) on ancient teeth preserves a detailed genetic record throughout this period. Data from 34 early European skeletons indicate that the transition from hunter-gatherer to farming shifted the oral microbial community to a disease-associated configuration. The composition of oral microbiota remained unexpectedly constant between Neolithic and medieval times, after which (the now ubiquitous) cariogenic bacteria became dominant, apparently during the Industrial Revolution. Modern oral microbiotic ecosystems are markedly less diverse than historic populations, which might be contributing to chronic oral (and other) disease in postindustrial lifestyles.

## Kupfer

CLEUZIQU 1982

Serge Cleuziou & Thierry Berthoud, *Early Tin in the Near East, A reassessment in the light of new evidence from western Afghanistan*. [Expedition 25 \(1982\), i, 14–19](#).

Expedition25.1-014-Figures.pdf

There are two possible routes from Afghanistan to Mesopotamia. One crosses the northern part of the Iranian plateau, along the Elburz Mountains, then through passes in the Zagros descends to Babylonia and Assyria. In the 1st millennium it was one of the principal supply routes of eastern goods to Assyria. In the 2nd millennium the tin that Assur exported to Anatolia might have followed this route. Along it are found such sites as Tepe Sialk (where the use of tin is attested in the



4th millennium), Tepe Giyan and Tepe Hissar, where other finds (such as lapis lazuli at Hissar) implicate them in long-distance commerce in the 3rd millennium. The second route is by sea, along the Arabian coast of the Gulf, perhaps also going by land through southern Iran. It was at the time of Gudea of Lagash (2150-2111 B.C.) and earlier the great supply route of eastern commodities to southern Mesopotamia. It is by this route that the copper of Makkan came, copper which analysis has shown to have originated in the peninsula of Oman. It also brought the products of Meluhha, including lapis lazuli, carnelian, copper, ivory and various woods. Nothing, however, suggests the passage of tin through this area. For example, there is little tin in the artifacts recovered at Qala'at al Bahrain, dating between 2300 and 1800 B.C.

## Metallzeiten

### ANTHONY 2009

David W. Anthony, *The Sintashta Genesis: The Roles of Climate Change, Warfare, and Long-Distance Trade*. In: BRYAN K. HANKS & KATHERYN M. LINDUFF (Hrsg.), *Social Complexity in Prehistoric Eurasia, Monuments, Metals and Mobility*. (Cambridge 2010), 47–73. DOI:10.1017/CBO9780511605376.005.

Recent studies by Di Cosmo (1999, 2002) and Vehik (2002) have emphasized the transformational political effects of intertribal warfare in arid grasslands on two continents. Intensified warfare in both places encouraged greater political complexity, hierarchy, and elite-centered, distance-trading activities. This chapter argues that intensified warfare and long-distance trade played powerful roles in the origins of the Sintashta culture. Sintashta is defined by a group of fortified settlements and cemeteries dated about 2100–1800 bce (calibrated) in the northern Eurasian steppe between the upper Ural and upper Tobol rivers southeast of the Ural Mountains. Outside the settlements were cemeteries that yielded whole-horse sacrifices, chariots, and many weapons. Inside the settlements, almost every excavated house yielded copper slag and remains of furnaces or intensely burned hearths. The metal was copper or arsenical bronze, usually in alloys of 1–2.5% arsenic. Pieces of crucibles were placed in two graves at Krivoe Ozero (Vinogradov 2003: 172), and broken casting molds were recovered from the Arkaim settlement. An estimated 6,000 tons of quartzitic rock bearing 2–3% copper was mined from the single documented mining site of Vorovskaya Yama east of the upper Ural River (Grigoriev 2002: 84; Zaikov, Zdanovich, and Yuminov 1995). The surprising evidence for metallurgical production inside every excavated structure suggests that the Sintashta settlements were the focus of intense metalworking activities, although the scale and organization of metal production is not well understood either within or between them (see Hanks, Chapter 9 in this volume).

### BUCHWALD 2005

Vagn Fabritius Buchwald, *Iron and steel in ancient times*. Historisk-filosofiske Skrifter 29 (Copenhagen 2005).

The history of iron and steel is presented from the earliest known examples until 1200 A.D., when new methods of production were introduced. In an introductory chapter the utility of meteoritic iron for tools and weapons is discussed, and it is shown how the three iron types, meteoritic, telluric and man-made iron may be distinguished. The competition between copper, bronze and iron in the Mediterranean area is followed, and the transition from Bronze Age to Iron Age explained. Early centres of iron production, such as Elba, are examined in some detail. In

a chronological development, the Etruscan, Roman and Celtic handling of ores and metal is examined, and the success of Noric steel explained. The North European scene is explored, with emphasis on Norway, Sweden and Denmark, and it is shown that there were two steel-producing centres in Scandinavia, Valdres in the Iron Age and Viking Age, and Småland in early mediaeval times. The material has been examined from a metallurgical standpoint. The metal phases are analysed and tested for their hardness, and it is shown that ancient iron was usually a complex alloy of three elements, iron, carbon and phosphorus, the last one being an important component. The manufactured objects, whether nails, horseshoes or tools, were extremely heterogeneous, in the structure as well as in the hardness and the slag inclusions, but it is shown that there is a logical, metallurgical harmony between the heterogeneous zones. The furnace slags have been characterized by their morphology and composition, and the slag inclusions have been analysed in great detail and used to discriminate between artefacts of Danish origin and those of foreign origin. It turns out that a significant fraction of Danish Viking Age and early mediaeval artefacts have been imported from Norway, Scania and Halland. The special world of metallurgy is elucidated with discussions of furnace technology, forging, hardening, hammer-and pattern-welding. The war booty sacrifices, which are rich in pattern-welded swords, are treated with examples from Vimose, Nydarh and Illerup Ådal.

#### HARDING 2000

Anthony F. Harding, *European societies in the Bronze Age*. Cambridge World Archaeology (Cambridge 2000).

## Physik

#### ROPARS 2013

Guy Ropars, Gabriel Gorre, Albert le Floch, Jay Enoch & Vasudevan Lakshminarayanan, *A depolarizer as a possible precise sunstone for Viking navigation by polarized skylight*. [Proc. Royal Society A 468 \(2013\), 671–684](#).

Viking navigation from Norway to America in the northern latitudes remains a mystery for physicists, historians and archaeologists. Polarimetric methods using absorbing dichroic crystals as polarizers to detect a hidden Sun direction using the polarized skylight have led to controversies. Indeed, these techniques may lack in sensitivity, especially when the degree of polarization is low. Here, we demonstrate theoretically and experimentally that using the transparent common Iceland spar as a depolarizer, the Vikings could have performed a precise navigation under different conditions. Indeed, when simply rotated, such a birefringent crystal can completely depolarize, at the so-called isotropy point, any partially polarized state of light, allowing us to guess the direction of the Sun. By equalizing the intensities of the ordinary and extraordinary beams at the isotropy point, we show that the Sun direction can be determined easily, thanks to a simple sensitive differential two-image observation. A precision of a few degrees could be reached even under dark crepuscular conditions. The exciting recent discovery of such an Iceland spar in the Alderney Elizabethan ship that sank two centuries before the introduction of the polarization of light in optics may support the use of the calcite crystal for navigation purposes.

Keywords: Viking navigation; sky polarization; Iceland spar

## Story or Book

### CREASE 2013

Robert P. Crease, *Rebel without a pause*. [nature 494 \(2013\), 311](#).

Robert P. Crease delves into a life of Freeman Dyson, a theoretical physicist who chose a non-conformist path.

Maverick Genius: The Pioneering Odyssey of Freeman Dyson. Phillip F. Schewe. Thomas Dunne Books: 2013. 352 pp. \$27.99

Dyson's career is marked by equally sharp contrasts. He has made significant contributions to technical areas of mathematical physics and quantum electrodynamics — but also to speculative fields such as space travel and astrobiology. His writings mix science and poetry. He is not religious, yet won the Templeton Prize for “progress in religion”. He crusades against nuclear weapons, but engages in defence research. And he is known for taking heretical positions on subjects such as extrasensory perception and climate change. Yet his most eccentric facet is that he became an eminent theoretical physicist without having a PhD — a feat for which Richard Feynman, that other famous nonconformist of physics, much envied him.

Schewe doesn't shy away from the personal, such as who slept with whom in Princeton's intense, tightly knit community. Yet avoiding technical details sometimes inhibits his focus. From today's perspective, was TRIGA safe or risky? Was Orion realistic or foolhardy? Surely the answers matter and reveal aspects of Dyson the man, but Schewe doesn't give us enough information to judge.

### HUME 2013

Douglas William Hume, *Tribal warfare*. [nature 494 \(2013\), 310](#).

Douglas William Hume assesses a first-hand account of controversial work with the Yanomami people.

Noble Savages: My Life Among Two Dangerous Tribes — the Yanomamö and the Anthropologists. Napoleon A. Chagnon. Simon & Schuster: 2013. 544 pp. £23.20/\$32.50  
Noble Savages is the story of a man who for decades has tried to bring evolutionary theory and scientific methods to the study of humanity in anthropology. In short, it is Chagnon's philosophy-of-science case study, as he struggles against anthropology's retreat from science.