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Literatur

Aktuell

Ahuja 2011

Rajeev Ahuja, Andreas Blomqvist, Peter Larsson, Pekka Pyykkö & Patryk Zaleski-Ejgierd, *Relativity and the Lead-Acid Battery*. Physical Review Letters **106** (2011), 18301. <http://dx.doi.org/10.1103/PhysRevLett.106.018301>.

Theoretical physics: Relativity starts your car

Relativity is generally invoked in lofty thought experiments often involving fast-moving spacecraft, but new work shows that it also applies to the everyday automobile.

Cars are started using lead-acid batteries, which generate energy using electrochemical reactions between lead compounds and sulphuric acid. Rajeev Ahuja of Uppsala University in Sweden and his colleagues modelled the reactions and found that as electrons move at high speed around a lead nucleus, their energy levels change owing to relativity. The authors conclude that the change accounts for 1.7-1.8 volts of a standard 2.13-volt lead-acid cell.

Abstract:

The energies of the solid reactants in the lead-acid battery are calculated ab initio using two different basis sets at nonrelativistic, scalar-relativistic, and fully relativistic levels, and using several exchangecorrelation potentials. The average calculated standard voltage is 2.13 V, compared with the experimental value of 2.11 V. All calculations agree in that 1.7-1.8 V of this standard voltage arise from relativistic effects, mainly from PbO2 but also from PbSO4.

de Dreu 2011

Carsten K. W. De Dreu, Lindred L. Greer, Gerben A. Van Kleef, Shaul Shalvi & Michel J. J. Handgraaf, *Oxytocin promotes human ethnocentrism*. PNAS **108** (2011), 1262–1266.

Human ethnocentrism—the tendency to view one's group as centrally important and superior to other groups—creates intergroup bias that fuels prejudice, xenophobia, and intergroup violence. Grounded in the idea that ethnocentrism also facilitates withingroup trust, cooperation, and coordination, we conjecture that ethnocentrism may be modulated by brain oxytocin, a peptide shown to promote cooperation among in-group members. In double-blind, placebo-controlled designs, males self-administered oxytocin or placebo and privately performed computer-guided tasks to gauge different manifestations of ethnocentric in-group favoritism as well as out-group derogation. Experiments 1 and 2 used the Implicit Association Test to assess in-group favoritism and out-group derogation. Experiment 3 used the infrahumanization task to assess the extent to which humans ascribe secondary, uniquely human emotions to their in-group and to an out-group. Experiments 4 and 5 confronted participants with the option to save the life of a larger collective by sacrificing one individual, nominated as in-group or as out-group. Results show that oxytocin creates intergroup bias because oxytocin motivates in-group favoritism and, to a lesser extent, out-group derogation. These findings call into question the view of oxytocin as an indiscriminate "love drug" or "cuddle chemical" and suggest that oxytocin has a role in the emergence of intergroup conflict and violence.

hormones | social discrimination | evolution | moral dilemmas | endocrinology

Haldane 2011

Andrew G. Haldane & Robert M. May, *Systemic risk in banking ecosystems*. nature **469** (2011), 351–355.

In the run-up to the recent financial crisis, an increasingly elaborate set of financial instruments emerged, intended to optimize returns to individual institutions with seemingly minimal risk. Essentially no attention was given to their possible effects on the stability of the system as a whole. Drawing analogies with the dynamics of ecological food webs and with networks within which infectious diseases spread, we explore the interplay between complexity and stability in deliberately simplified models of financial networks. We suggest some policy lessons that can be drawn from such models, with the explicit aim of minimizing systemic risk.

IASS 1967

International Association for Shell Structures, D. Feder (Hrsg.), *Proceedings of the 1st International Colloquium on Pneumatic Structures, May 11 and 12, 1967, University of Stuttgart, Germany*. (Stuttgart 1967).

Johnson 2011

Neil Johnson & Thomas Lux, *Ecology and economics*. nature **469** (2011), 302–303.

A growing body of literature deals with the application of theories developed in other disciplines to financial institutions, to which a paper in this issue now adds. As outlined here, however, views differ as to its relevance.

Policy-makers may never fully appreciate a model's limitations, so policy suggestions are potentially dangerous unless accompanied by a quantified health warning of a model's robustness and underlying assumptions, based on rigorous statistical testing against stateofthe-art financial data sets. Otherwise we simply increase risk, rather than reduce it.

Can one really imagine the regulation of financial markets being based on their similarities to networks such as food webs? My answer, in a sense, is 'yes' - we should take these similarities seriously. This is not to say that we should equate banks, and their depositors and hedge funds, with some type of schematic predator-prey model. It is rather the potential similarities between the structural, system-wide properties of these very different areas of study that we should be interested in.

Lee 2011

Choongyeop Lee & Chang-Jin Kim, *Underwater Restoration and Retention of Gases on Superhydrophobic Surfaces for Drag Reduction*. Physical Review Letters **106** (2011), 14502. <http://dx.doi.org/10.1103/PhysRevLett.106.014502>.

Materials science: Gas keeps drag low

The flow of water on solid surfaces is significantly impeded by frictional forces – which is bad news for, say, marine vehicles. A gas layer can be introduced at the solid-liquid interface as a lubricant, but even slight hydraulic pressure can destroy this layer. Choongyeop Lee and Chang-Jin Kim at the University of California, Los Angeles, have devised a way to keep the gas layer intact and cut drag even in underwater conditions.

The duo began with a highly hydrophobic surface studded with 50-micrometre-high pillars and gold-coated nanostructures (pictured), and submerged this in water. The gold coating allowed an electrolytic reaction to occur, generating gas at its surface when water made contact. Bubbles formed only in areas where there had been no gas before, and because of the surface's architecture, the bubbles spread uniformly across the surface.

Abstract:
Superhydrophobic (SHPo) surfaces have shown promise for passive drag reduction because their surface structures can hold a lubricating gas film between the solid surface and the liquid in contact with it. However, the types of SHPo surfaces that would produce any meaningful amount of reduction get wet under liquid pressure or at surface defects, both of which are unavoidable in the real world. In this Letter, we solve the above problem by (1) discovering surface structures that allow the restoration of a gas blanket from a wetted state while fully immersed underwater and (2) devising a self-controlled gas-generation mechanism that maintains the SHPo condition under high liquid pressures (tested up to 7 atm) as well as in the presence of surface defects, thus removing a fundamental barrier against the implementation of SHPo surfaces for drag reduction.

Paglieri 2011

Fabio Paglieri, *Confessions of a procrastinator*. nature **469** (2011), 435.
Everyone puts off big tasks with smaller ones, and the only solution is to fight fire with fire, says Fabio Paglieri.

Wang 2011

Xuhui Wang, Shilong Piao, Philippe Ciais, Junsheng Li, Pierre Friedlingstein, Charlie Koven & Anping Chen, *Spring temperature change and its implication in the change of vegetation growth in North America from 1982 to 2006*. PNAS **108** (2011), 1240–1245.
pnas108-01240-Supplement.pdf
Understanding how vegetation growth responds to climate change is a critical requirement for projecting future ecosystem dynamics. Parts of North America (NA) have experienced a spring cooling trend over the last three decades, but little is known about the response of vegetation growth to this change. Using observed climate data and satellite-derived Normalized Difference Vegetation Index (NDVI) data from 1982 to 2006, we investigated changes in spring (April-May) temperature trends and their impact on vegetation growth in NA. A piecewise linear regression approach shows that the trend in spring temperature is not continuous through the 25-year period. In the northwestern region of NA, spring temperature increased until the late 1980s or early 1990s, and stalled or decreased afterwards. In response, a spring vegetation greening trend, which was evident in this region during the 1980s, stalled or reversed recently. Conversely, an opposite phenomenon occurred in the northeastern region of NA due to different spring temperature trends. Additionally, the trends of summer vegetation growth vary between the periods before and after the turning point (TP) of spring temperature trends. This change cannot be fully explained by summer drought stress change alone and is partly explained by changes in the trends of spring temperature as well as those of summer temperature. As reported in previous studies, summer vegetation browning trends have occurred in the northwestern region of NA since the early 1990s, which is consistent with the spring and summer cooling trends in this region during this period.

Anthropologie

Trinkaus 2011

Erik Trinkaus, *Late Pleistocene adult mortality patterns and modern human establishment*. PNAS **108** (2011), 1267–1271.
pnas108-01267-Supplement.pdf
The establishment of modern humans in the Late Pleistocene, subsequent to their emergence in eastern Africa, is likely to have involved substantial population increases, during their initial dispersal across southern Asia and their subsequent expansions throughout

Africa and into more northern Eurasia. An assessment of younger (20-40 y) versus older (>40 y) adult mortality distributions for late archaic humans (principally Neandertals) and two samples of early modern humans (Middle Paleolithic and earlier Upper Paleolithic) provides little difference across the samples. All three Late Pleistocene samples have a dearth of older individuals compared with Holocene ethnographic/historical samples. They also lack older adults compared with Holocene paleodemographic profiles that have been critiqued for having too few older individuals for subsistence, social, and demographic viability. Although biased, probably through a combination of preservation, age assessment, and especially Pleistocene mobility requirements, these adult mortality distributions suggest low life expectancy and demographic instability across these Late Pleistocene human groups. They indicate only subtle and paleontologically invisible changes in human paleodemographics with the establishment of modern humans; they provide no support for a life history advantage among early modern humans.
paleodemography | age-at-death | teeth | postcrania | mandible

Klima

Büntgen 2011

Ulf Büntgen et al., *2500 Years of European Climate Variability and Human Susceptibility*. sciencexpress (2011), 1197175. <http://dx.doi.org/10.1126/science.1197175>.
se-1197175-Supplement.pdf
Ulf Büntgen, Willy Tegel, Kurt Nicolussi, Michael McCormick, David Frank, Valerie Trouet, Jed O. Kaplan, Franz Herzig, Karl-Uwe Heussner, Heinz Wanner, Jürg Luterbacher & Jan Esper
Climate variations have influenced the agricultural productivity, health risk and conflict level of preindustrial societies. Discrimination between environmental and anthropogenic impacts on past civilizations, however, remains difficult because of the paucity of high-resolution palaeoclimatic evidence. Here we present tree ring-based reconstructions of Central European summer precipitation and temperature variability over the past 2500 years. Recent warming is unprecedented, but modern hydroclimatic variations may have at times been exceeded in magnitude and duration. Wet and warm summers occurred during periods of Roman and Medieval prosperity. Increased climate variability from ≈AD 250-600 coincided with the demise of the Western Roman Empire and the turmoil of the Migration Period. Historical circumstances may challenge recent political and fiscal reluctance to mitigate projected climate change.

Kiehl 2011

Jeffrey Kiehl, *Lessons from Earth's Past*. science **331** (2011), 158–159.
What can be learned from Earth's past to guide our understanding of life in a warming world?
Some basic conclusions can be drawn. Earth's CO2 concentration is rapidly rising to a level not seen in ≈30 to 100 million years, and Earth's climate was extremely warm at these levels of CO2. If the world reaches such concentrations of atmospheric CO2, positive feedback processes can amplify global warming beyond current modeling estimates. The human species and global ecosystems will be placed in a climate state never before experienced in their evolutionary history and at an unprecedented rate. Note that these conclusions arise from observations from Earth's past and not specifically from climate models. Will we, as a species, listen to these messages from the past in order to avoid repeating history?

Lawler 2011

Andrew Lawler, *Did the First Cities Grow From Marshes?* science **331** (2011), 141.

The world's earliest large settlements may owe their existence as much to the swamps of southern Iraq as to irrigation and agriculture.

Sarnthein 2011

Michael Sarnthein, *Northern Meltwater Pulses, CO_2, and Changes in Atlantic Convection.* science **331** (2011), 156–158.

Detailed evidence of how the North Atlantic Meridional Overturning Circulation behaved after the last ice age.

In addition, they found that the ventilation ages of past surface waters could vary by as much as 2100 years, which agrees with results of other methods and challenges a common, but little-substantiated dogma: that past surface waters had ventilation ages of ≈400 years, similar to a current age average.

Thornalley 2011

David J. R. Thornalley, Stephen Barker, Wallace S. Broecker, Henry Elderfield & I. Nick McCave, *The Deglacial Evolution of North Atlantic Deep Convection.* science **331** (2011), 202–205.

s331-0202-Supplement.pdf

Deepwater formation in the North Atlantic by open-ocean convection is an essential component of the overturning circulation of the Atlantic Ocean, which helps regulate global climate. We use water-column radiocarbon reconstructions to examine changes in northeast Atlantic convection since the Last Glacial Maximum. During cold intervals, we infer a reduction in open-ocean convection and an associated incursion of an extremely radiocarbon (14C)-depleted watermass, interpreted to be Antarctic Intermediate Water. Comparing the timing of deep convection changes in the northeast and northwest Atlantic, we suggest that, despite a strong control on Greenland temperature by northeast Atlantic convection, reduced open-ocean convection in both the northwest and northeast Atlantic is necessary to account for contemporaneous perturbations in atmospheric circulation.

Kultur

Bohannon 2011

John Bohannon, *Google Books, Wikipedia, and the Future of Culturomics.* science **331** (2011), 135.

When they first heard about the "culturomics" approach to the humanities, many scholars reacted "as if this were the coming of the antichrist," says Grafton. "But my reaction is, God look at this new tool!"

Michel 2011

Jean-Baptiste Michel et al., *Quantitative Analysis of Culture Using Millions of Digitized Books.* science **331** (2011), 176–182.

s331-0176-Supplement.pdf

Jean-Baptiste Michel, Yuan Kui Shen, Aviva Presser Aiden, Adrian Veres, Matthew K. Gray, The Google Books Team, Joseph P. Pickett, Dale Hoiberg, Dan Clancy, Peter Norvig, Jon Orwant, Steven Pinker, Martin A. Nowak & Erez Lieberman Aiden

We constructed a corpus of digitized texts containing about 4 % of all books ever printed. Analysis of this corpus enables us to investigate cultural trends quantitatively. We survey the vast terrain of 'culturomics,' focusing on linguistic and cultural phenomena that were

reflected in the English language between 1800 and 2000. We show how this approach can provide insights about fields as diverse as lexicography, the evolution of grammar, collective memory, the adoption of technology, the pursuit of fame, censorship, and historical epidemiology. Culturomics extends the boundaries of rigorous quantitative inquiry to a wide array of new phenomena spanning the social sciences and the humanities.

Zündung

LEHMANN 1995

Axel Lehmann, *Experimentelle Untersuchung und Modifikation eines Plasmastrahl-Zündsystems mit niedriger Energie zur Verbesserung des ottomotorischen Verbrennungsprozesses*. Dissertation, RWTH Aachen (Aachen 1995).