

## Literatur

### Aktuell

#### ARMSTRONG 2011

Jonathan B. Armstrong & Daniel E. Schindler, *Excess digestive capacity in predators reflects a life of feast and famine*. [nature 476 \(2011\), 84–87](#).  
n476-0084-Supplement.pdf

A central challenge for predators is achieving positive energy balance when prey are spatially and temporally heterogeneous. Ecological heterogeneity produces evolutionary trade-offs in the physiological design of predators; this is because the ability to capitalize on pulses of food abundance requires high capacity for food-processing, yet maintaining such capacity imposes energetic costs that are taxing during periods of food scarcity<sup>1,2</sup>. Recent advances in physiology show that when variation in foraging opportunities is predictable, animals may adjust energetic tradeoffs by rapidly modulating their digestive system to track variation in foraging opportunities<sup>1</sup>. However, it is increasingly recognized that foraging opportunities for animals are unpredictable<sup>3</sup>, which should favour animals that maintain a capacity for food-processing that exceeds average levels of consumption (loads)<sup>2,4</sup>. Despite this basic principle of quantitative evolutionary design, estimates of digestive load:capacity ratios in wild animals are virtually nonexistent<sup>1</sup>. Here we provide an extensive assessment of load:capacity ratios for the digestive systems of predators in the wild, compiling 639 estimates across 38 species of fish. We found that piscine predators typically maintain the physiological capacity to feed at daily rates 2-3 times higher than what they experience on average. A numerical simulation of the trade-off between food-processing capacity and metabolic cost suggests that the observed level of physiological opportunism is profitable only if predator-prey encounters, and thus predator energy budgets, are far more variable in nature than currently assumed.

#### BMA 1911

*The Birmingham meeting of the British Medical Association*. [nature 87 \(1911\), 156–158](#).

The diets of poor Orientals are not to be quoted as exemplifying the benefits of a low protein intake, since they are indigestible and dietetically insufficient in many ways. The low stamina and frequent anaemia of these races is due to the deficiency in absorbable nitrogen, and an improvement is noticeable so soon as these people are able to afford the more generous regime of the European.

According to Dr. Provan Cathcart, the quality, and not the quantity, of the protein is the important matter physiologically, for the nearer the composition as regards the constituent amino-acids approaches that of the tissue-protein of the animal being fed, the less will there be of nitrogenous waste from that animal. Thus dogs wasted less nitrogen when fed on dog-flesh than on any other kind of protein.

#### DAMBECK 2011

Thorsten Dambeck, *Mysteriöse Bremskräfte aufgedeckt*. [Spektrum der Wissenschaft 2011, vii, 19–21](#).

Die altgedienten Raumsonden Pioneer 10 und 11 werden von einer Kraft verlangsamt, über die Wissenschaftler lange gerätselt haben. Nun hat das Spekulieren über eine mögliche „Neue Physik“ ein Ende: Die Raumsonden strahlen lediglich ihre Wärme ungleichmäßig ab.

## EDITORIAL 1961

*Purpose in Publication.* [nature 191 \(1961\), 527–530.](#)

It should not be deduced from this that, his scientific training and proclivities apart, the good scientist of to-day is ignorant about or, even worse, unaware of, other branches of man's culture. In fact, the contrary is true; indeed, so far as the community of scientists is concerned, the so-called 'two cultures' (fashionably ascribed to C. P. Snow) scarcely exist. Many scientists are well read outside their own discipline, sometimes still within the ambit of science, but more often well beyond it – in philosophy, history, art, music, the theatre, literature, in fact, in the humanities generally. (Good scientists seldom make good politicians, which is probably understandable.)

In short, it is high time that the general opinion, still very extant, that the man of science is so wrapped up in his scientific literature and so confined to his laboratory that, apart from his calling, he is culturally unbalanced, be challenged. Indeed, the shoe is on the other foot; it is the student of, and savant among, the humanities, art, music and non-scientific literature (especially fiction) who are – and are often proud to admit they are – quite ignorant of science and its now 'jet-propelled' progress.

Nature itself now has a waiting list of biochemical, physiological and biological material in spite of the fact that the journal is becoming unbalanced because it is forced to contain so much on these subjects.

Perhaps the most objectionable activity is that of the scientist who is determined that his light shall not be hidden under a bushel and therefore acts as his own press officer. Fortunately, in our experience such men are rare; but they are with us to-day, sometimes going so far as to notify the lay Press that they are about to publish in a scientific journal a communication in which the newspapers may be interested—even before they know whether the communication to the scientific journal has been accepted. Frequently succeeding in their endeavours, such scientific activities achieve publicity out of all proportion to their importance. There may be risks that ill-based claims are read and accepted by many readers.

The scientist most desirable to science and society is he who leaves the evaluation of his work to his fellow scientists, presenting his findings with that modesty and dignity which one should always be able to associate with the word 'science'.

## GOLDSTEIN 2011

David B. Goldstein, *Growth of genome screening needs debate.* [nature 476 \(2011\), 27–28.](#)

There could be unexpected consequences if greater understanding of disease genetics gives parents more choice in what they pass to their children, says David B. Goldstein.

Within the next few years, our ability to identify pathogenic and potentially pathogenic mutations – as well as the huge number of mutations that no one can vouch for as dangerous or safe – will almost certainly outstrip our ability to act on the information. For example, if parents using in vitro fertilization wanted to avoid transmitting five mutations, physicians would have to screen scores of embryos to have a reasonable chance of finding one that carried none of the mutations. Likewise, parents would have to terminate an unfeasible number of pregnancies to be assured that their fetus was unaffected. Such constraints are unlikely to apply indefinitely, however. It is already routine for researchers to selectively 'edit' DNA sequences in certain kinds of cell. This cannot yet be done in human sperm and eggs, but several technological advances that are generally expected would permit the effective editing of gamete DNA. This would allow a qualitatively different kind of screening.

## SHERWOOD 2011

Chet C. Sherwood et al., *Aging of the cerebral cortex differs between humans and chimpanzees.* [PNAS 108 \(2011\), 13029–13034.](#)

pnas108-13029-Supplement.xls

Chet C. Sherwood, Adam D. Gordon, John S. Allen, Kimberley A. Phillips, Joseph M. Erwin, Patrick R. Hof and William D. Hopkins

Several biological changes characterize normal brain aging in humans. Although some of these age-associated neural alterations are also found in other species, overt volumetric decline of particular brain structures, such as the hippocampus and frontal lobe, has only been observed in humans. However, comparable data on the effects of aging on regional brain volumes have not previously been available from our closest living relatives, the chimpanzees. In this study, we used MRI to measure the volume of the whole brain, total neocortical gray matter, total neocortical white matter, frontal lobe gray matter, frontal lobe white matter, and the hippocampus in a cross-sectional sample of 99 chimpanzee brains encompassing the adult lifespan from 10 to 51 y of age. We compared these data to brain structure volumes measured in 87 adult humans from 22 to 88 y of age. In contrast to humans, who showed a decrease in the volume of all brain structures over the lifespan, chimpanzees did not display significant age-related changes. Using an iterative age-range reduction procedure, we found that the significant aging effects in humans were because of the leverage of individuals that were older than the maximum longevity of chimpanzees. Thus, we conclude that the increased magnitude of brain structure shrinkage in human aging is evolutionarily novel and the result of an extended lifespan.

## Anthropologie

DELTON 2011

Andrew W. Delton, Max M. Krasnow, Leda Cosmides & John Tooby, *Evolution of direct reciprocity under uncertainty can explain human generosity in one-shot encounters*. [PNAS 108 \(2011\), 13335–13340](#).

Are humans too generous? The discovery that subjects choose to incur costs to allocate benefits to others in anonymous, one-shot economic games has posed an unsolved challenge to models of economic and evolutionary rationality. Using agent-based simulations, we show that such generosity is the necessary byproduct of selection on decision systems for regulating dyadic reciprocity under conditions of uncertainty. In deciding whether to engage in dyadic reciprocity, these systems must balance (i) the costs of mistaking a one-shot interaction for a repeated interaction (hence, risking a single chance of being exploited) with (ii) the far greater costs of mistaking a repeated interaction for a one-shot interaction (thereby precluding benefits from multiple future cooperative interactions). This asymmetry builds organisms naturally selected to cooperate even when exposed to cues that they are in oneshot interactions.

altruism | cooperation | ecological rationality | social evolution | evolutionary psychology

## Biologie

OUTLAW 2011

Diana C. Outlaw & Robert E. Ricklefs, *Rerooting the evolutionary tree of malaria parasites*. [PNAS 108 \(2011\), 13183–13187](#).

Malaria parasites (*Plasmodium* spp.) have plagued humans for millennia. Less well known are related parasites (*Haemosporida*), with diverse life cycles and dipteran vectors that infect other vertebrates. Understanding the evolution of parasite life histories, including switches between hosts and vectors, depends on knowledge of evolutionary relationships among parasite lineages. In particular, inferences concerning time of origin and trait evolution require correct placement of the root of the evolutionary tree. Phylogenetic

reconstructions of the diversification of malaria parasites from DNA sequences have suffered from uncertainty concerning outgroup taxa, limited taxon sampling, and selection on genes used to assess relationships. As a result, inferred relationships among the Haemosporida have been unstable, and questions concerning evolutionary diversification and host switching remain unanswered. A recent phylogeny placed mammalian malaria parasites, as well as avian/reptilian Plasmodium, in a derived position relative to the avian parasite genera Leucocytozoon and Haemoproteus, implying that the ancestral forms lacked merogony in the blood and that their vectors were non-mosquito dipterans. Bayesian, outgroup-free phylogenetic reconstruction using relaxed molecular clocks with uncorrelated rates instead suggested that mammalian and avian/reptilian Plasmodium parasites, spread by mosquito vectors, are ancestral sister taxa, from which a variety of specialized parasite lineages with modified life histories have evolved.

Bayes factors | parasite diversification | Plasmodiidae

#### RICH 2011

Stephen M. Rich & Guang Xu, *Resolving the phylogeny of malaria parasites*. [PNAS](#) **108** (2011), 12973–12974.

One of the promises that evolutionary studies of malaria (and other pathogens) hold for public health and epidemiological relevance is that by establishing accurate phylogenies, we will be better able to determine how parasite host and vector preference has changed (or remained the same) throughout the course of evolution. Robust phylogenies allow us to test hypotheses about how parasites have moved from one species to another, and knowing how this might have happened in the past might inform us about the likelihood that similar movements will occur in the future. This has proven to be of great interest in looking at the origins of the hominid malaria parasite in particular. Outlaw and Ricklefs have offered an intriguing interpretation on the question of malarial origins that will likely stimulate much more work in the future.

#### RICKLEFS 2010

Robert E. Ricklefs & Diana C. Outlaw, *A Molecular Clock for Malaria Parasites*. [science](#) **329** (2010), 226–229.

[s329-0226-Supplement.pdf](#)

The evolutionary origins of new lineages of pathogens are fundamental to understanding emerging diseases. Phylogenetic reconstruction based on DNA sequences has revealed the sister taxa of human pathogens, but the timing of host-switching events, including the human malaria pathogen Plasmodium falciparum, remains controversial. Here, we establish a rate for cytochrome b evolution in avian malaria parasites relative to its rate in birds. We found that the parasite cytochrome b gene evolves about 60% as rapidly as that of host cytochrome b, corresponding to  $\approx 1.2\%$  sequence divergence per million years. This calibration puts the origin of P. falciparum at 2.5 million years ago (Ma), the initial radiation of mammalian Plasmodium at 12.8 Ma, and the contemporary global diversity of the Haemosporida across terrestrial vertebrates at 16.2 Ma.

## Energie

#### KUCZERA 2011

Bernhard Kuczera, Ludger Mohrbach, Walter Tromm & Joachim Knebel, *Fukushima auch in Deutschland?* [Spektrum der Wissenschaft](#) **2011**, viii, 76–83.

Der Reaktorunfall von Fukushima war nicht nur eine Katastrophe für die Japaner, er hatte auch einschneidende Auswirkungen auf die deutsche Politik. Unter der Einwirkung der Hiobsbotschaften aus Japan beschloss der Bundestag am 30. Juni den sukzessiven

Ausstieg aus der Atomenergie bis 2022. Kein anderes Land der Welt beabsichtigt derartige Maßnahmen. Doch auf welcher wissenschaftlichen Basis beruht der Beschluss? Vier Experten für Reaktorsicherheit analysieren, wie es zur Katastrophe kam und inwiefern sich die Ereignisse von Fukushima in Deutschland wiederholen könnten.

Inzwischen liegen hinreichende Informationen für eine Zwischenbilanz vor. Als der entscheidende Faktor für den Unfall in Fukushima-Daiichi kristallisiert sich heraus, dass die Anlagen schlicht nicht gegen große, aber in Japan immer wieder vorkommende Tsunamis ausgelegt waren. Damit fällt die Katastrophe nicht in den Bereich des anlagentechnischen Restrisikos, sondern betrifft die Gestaltung der Basisauslegung. Diese bot gegenüber durchaus absehbaren Einwirkungen von außen kaum Schutz. Die Hochwasserauslegung für Fukushima-Daiichi betrug zehn Meter. Im Schnitt trifft alle 30 Jahre ein Tsunami von mindestens zehn Meter Wellenhöhe einen japanischen Küstenabschnitt.

Deutsche Kernkraftwerke sind so ausgelegt, dass sie einem Hochwasser standhalten, wie es statistisch nur alle 10 000 Jahre auftritt, sowie einem Erdbeben einer Stärke, wie es im Mittel lediglich alle 100 000 Jahre vorkommt. Zu den Absicherungen gehören verbunkerte, das heißt gegen alle Einwirkungen von außen wie etwa Überflutungen geschützte Notstromeinrichtungen. Die Kernkraftwerke in Fukushima weichen auch im Detail von der sicherheitstechnischen Auslegung deutscher Kernkraftwerke ab: zum Beispiel bei der Anzahl der redundant (mehrfach) und diversitär (mit unterschiedlicher Technik) gestalteten Systeme zur Nachwärmeabfuhr und Notkühlung sowie der Notstromsysteme. So waren in Fukushima-Daiichi jeweils nur zwei Notstromdieselaggregate pro Block und ein 13. als Reserve für den gesamten Standort vorhanden. In Deutschland gibt es dagegen pro Block in der Regel vier Notstromdiesel plus mindestens zwei (bis zu vier) weitere diversitäre Systeme. In Deutschland werden die benötigten Treibstoffvorräte zudem zusammen mit den Notstromsystemen in verbunkerten Gebäuden untergebracht. Die Dieselmotoren können somit autark betrieben werden.

## Klima

### BALLU 2011

Valérie Ballu, *Comparing the role of absolute sea-level rise and vertical tectonic motions in coastal flooding, Torres Islands (Vanuatu)*. [PNAS 108 \(2011\), 13019–13022](#).

Valérie Ballu, Marie-Noëlle Bouin, Patricia Siméoni, Wayne C. Crawford, Stephane Calmant, Jean-Michel Boré, Tony Kanas and Bernard Pelletier

Since the late 1990s, rising sea levels around the Torres Islands (north Vanuatu, southwest Pacific) have caused strong local and international concern. In 2002–2004, a village was displaced due to increasing sea incursions, and in 2005 a United Nations Environment Programme press release referred to the displaced village as perhaps the world’s first climate change “refugees.” We show here that vertical motions of the Torres Islands themselves dominate the apparent sea-level rise observed on the islands. From 1997 to 2009, the absolute sea level rose by  $150 \pm 20$  mm. But GPS data reveal that the islands subsided by  $117 \pm 30$  mm over the same time period, almost doubling the apparent gradual sealevel rise. Moreover, large earthquakes that occurred just before and after this period caused several hundreds of mm of sudden vertical motion, generating larger apparent sea-level changes than those observed during the entire intervening period. Our results show that vertical ground motions must be accounted for when evaluating sea-level change hazards in active tectonic regions. These data are needed to help communities and governments understand environmental changes and make the best decisions for their future.

geodesy | seismic cycle | island arcs | vertical motion

## CERLING 2011

Thure E. Cerling et al., *Woody cover and hominin environments in the past 6 million years*. [nature 476 \(2011\), 51–56](#).

[n476-0051-Supplement.pdf](#)

Thure E. Cerling, Jonathan G. Wynn, Samuel A. Andanje, Michael I. Bird, David Kimutai Korir, Naomi E. Levin, William Mace, Anthony N. Macharia, Jay Quade & Christopher H. Remien

The role of African savannahs in the evolution of early hominins has been debated for nearly a century. Resolution of this issue has been hindered by difficulty in quantifying the fraction of woody cover in the fossil record. Here we show that the fraction of woody cover in tropical ecosystems can be quantified using stable carbon isotopes in soils. Furthermore, we use fossil soils from hominin sites in the Awash and Omo-Turkana basins in eastern Africa to reconstruct the fraction of woody cover since the Late Miocene epoch (about 7 million years ago).  $^{13}\text{C}/^{12}\text{C}$  ratio data from 1,300 palaeosols at or adjacent to hominin sites dating to at least 6 million years ago show that woody cover was predominantly less than 40% at most sites. These data point to the prevalence of open environments at the majority of hominin fossil sites in eastern Africa over the past 6 million years.

## FEIBEL 2011

Craig S. Feibel, *Shades of the savannah*. [nature 476 \(2011\), 39–40](#).

Whether African savannahs had an impact on the evolution of our early ancestors has been a matter of debate. A study of carbon isotopes from ancient soils provides fresh clues.

Intriguing questions remain. The material Cerling et al. used for most of their analyses is soil carbonate – minerals precipitated within the soil and which integrated the isotopic signal of carbon dioxide found there. These nodules form primarily where evaporation greatly exceeds precipitation. But many ancient soils lack these carbonate nodules, reflecting wetter times or moister areas in the landscape. How well this proxy reflects the overall temporal and spatial variability in ancient vegetation is unclear.

## Physik

### MARTIN 1961

A. E. Martin, *Dimensions of Electrical and Magnetic Quantities*. [nature 191 \(1961\), 588–589](#).

### RIEVERS 2011

Benny Rievers & Claus Lämmerzahl, *High precision thermal modeling of complex systems with application to the flyby and Pioneer anomaly*. [Ann-Phys 523 \(2011\), 439–449](#).

Thermal modeling of complex systems faces the problems of an effective digitalization of the detailed geometry and properties of the system, calculation of the thermal flows and temperature maps, treatment of the thermal radiation including possible multiple reflections, inclusion of additional external influences, extraction of the radiation pressure from calculated surface data as well as computational effectiveness. In previous publications [1, 2] the solution to these problems have been outlined and a first application to the Pioneer spacecraft have been shown. Here we like to present the application of our thermal modeling to the Rosetta flyby anomaly as well as to the Pioneer anomaly. The analysis outlines that thermal recoil pressure is not the cause of the Rosetta flyby anomaly but likely resolves the anomalous acceleration observed for Pioneer 10.

Key words Pioneer anomaly, thermal modeling, thermal recoil pressure.

## Story or Book

RICHERSON 2011

Peter Richerson, *Not so selfish*. [nature 476 \(2011\), 29–30](#).

A prescription for how human cooperation evolved will provoke much-needed debate about the origins of society, finds Peter Richerson.

*A Cooperative Species: Human Reciprocity and Its Evolution*. Samuel Bowles and Herbert Gintis. Princeton University Press: 2011. 288 pp. \$35, £24.95

Although *A Cooperative Species* is broadly representative of the gene–culture co-evolutionary approach to human cooperation, I beg to differ on some points. In my view, the critical late-Pleistocene groups in which altruism should be explained are the larger tribes composed of many bands. These have the crucial feature of substantial cooperation between genetically unrelated individuals, on which the evolution of complex societies is based. Although bands do sometimes have violent conflicts, intratribal relations are usually more peaceful than intertribal ones. In my opinion, the authors also accept too high a value for the genetic differences between neighbouring populations in their simulations. However, such a discussion illustrates the book’s strength. By presenting clear models that are tied tightly to empirically derived parameters, Bowles and Gintis encourage much-needed debate on the origins of human cooperation.