

Literatur

Aktuell

AYRES 2012

Janelle S Ayres, Norver J Trinidad & Russell E Vance, *Lethal inflammasome activation by a multidrug-resistant pathobiont upon antibiotic disruption of the microbiota*. [NatMed 18 \(2012\), 799–806](#).

[NatMed18-0799-Supplement.pdf](#)

The mammalian intestine harbors a complex microbial community that provides numerous benefits to its host. However, the microbiota can also include potentially virulent species, termed pathobiont, which can cause disease when intestinal homeostasis is disrupted. The molecular mechanisms by which pathobionts cause disease remain poorly understood. Here we describe a sepsis-like disease that occurs upon gut injury in antibiotic-treated mice. Sepsis was associated with the systemic spread of a specific multidrug-resistant *Escherichia coli* pathobiont that expanded markedly in the microbiota of antibiotic-treated mice. Rapid sepsis-like death required a component of the innate immune system, the Naip5-Nlrc4 inflammasome. In accordance with Koch's postulates, we found the *E. coli* pathobiont was sufficient to activate Naip5-Nlrc4 and cause disease when injected intravenously into unmanipulated mice. These findings reveal how sepsis-like disease can result from recognition of pathobionts by the innate immune system.

COLTICE 2012

N. Coltice, T. Rolf, P. J. Tackley & S. Labrosse, *Dynamic Causes of the Relation Between Area and Age of the Ocean Floor*. [science 336 \(2012\), 335–338](#).

[s336-0335-Supplement.pdf](#)

The distribution of seafloor ages determines fundamental characteristics of Earth such as sea level, ocean chemistry, tectonic forces, and heat loss from the mantle. The present-day distribution suggests that subduction affects lithosphere of all ages, but this is at odds with the theory of thermal convection that predicts that subduction should happen once a critical age has been reached. We used spherical models of mantle convection to show that plate-like behavior and continents cause the seafloor area-age distribution to be representative of present-day Earth. The distribution varies in time with the creation and destruction of new plate boundaries. Our simulations suggest that the ocean floor production rate previously reached peaks that were twice the present-day value.

HAILER 2012

Frank Hailer et al., *Nuclear Genomic Sequences Reveal that Polar Bears Are an Old and Distinct Bear Lineage*. [science 336 \(2012\), 344–347](#).

[s336-0344-Supplement.pdf](#), [s336-0344-Supplement1.xml](#), [s336-0344-Supplement2.txt](#)

Frank Hailer, Verena E. Kutschera, Björn M. Hallström, Denise Klassert, Steven R. Fain, Jennifer A. Leonard, Ulfur Arnason & Axel Janke

Recent studies have shown that the polar bear matriline (mitochondrial DNA) evolved from a brown bear lineage since the late Pleistocene, potentially indicating rapid speciation and adaptation to arctic conditions. Here, we present a high-resolution data set from multiple independent loci across the nuclear genomes of a broad sample of polar, brown, and black bears. Bayesian coalescent analyses place polar bears outside the brown bear clade and date the divergence much earlier, in the middle Pleistocene, about 600 (338 to

934) thousand years ago. This provides more time for polar bear evolution and confirms previous suggestions that polar bears carry introgressed brown bear mitochondrial DNA due to past hybridization. Our results highlight that multilocus genomic analyses are crucial for an accurate understanding of evolutionary history.

HAYDEN 2012

Erika Check Hayden, *RNA studies under fire*. [nature 484 \(2012\), 428](#).

High-profile results challenged over statistical analysis of sequence data.

Pachter says that another key problem is that high-profile papers in the field may be well reviewed for their biology but not their computational foundations. “The culture is not the same in biology as it is in statistics or math, where reviewers sit with a paper for months, check the statistics and the math, and run the programs and test them,” he says.

HERTWIG 2012

Ralph Hertwig, *Tapping into the Wisdom of the Crowd-with Confidence*. [science 336 \(2012\), 303–304](#).

The subjective confidence of individuals in groups can be a valid predictor of accuracy in decision-making tasks.

KORIAT 2012

Asher Koriat, *When Are Two Heads Better than One and Why?* [science 336 \(2012\), 360–360](#).

[s336-0360-Supplement.pdf](#)

A recent study, using a perceptual task, indicated that two heads were better than one provided that the members could communicate freely, presumably sharing their confidence in their judgments. Capitalizing on recent work on subjective confidence, I replicated this effect in the absence of any dyadic interaction by selecting on each trial the decision of the more confident member of a virtual dyad. However, because subjective confidence monitors the consensuality rather than the accuracy of a decision, when most participants were in error, reliance on the more confident member yielded worse decisions than those of the better individual. Assuming that for each issue group decisions are dominated by the more confident member, these results help specify when groups will be more or less accurate than individuals.

PISTON 2012

David W. Piston, *Understand how it works*. [nature 484 \(2012\), 440–441](#).

Over-reliance on automated tools is hurting science, says David W. Piston.

Twenty years ago, a scientist wanting to computerize a procedure had to write his or her own program, which forced them to understand every detail. If using a microscope, he or she had to know how to make every adjustment. Today, however, biological science is replete with tools that allow young scientists simply to press a button, send off samples or plug in data – and have a result pop out.

SHARP 2012

Nathaniel P. Sharp & Aneil F. Agrawal, *Evidence for elevated mutation rates in low-quality genotypes*. [PNAS 109 \(2012\), 6142–6146](#).

The deleterious mutation rate plays a key role in a number of important topics in biology, from mating system evolution to human health. Despite this broad significance, the nature and causes of variation in mutation rate are poorly understood, especially in multicellular organisms. We test whether genetic quality, the presence or absence of deleterious alleles, affects the mutation rate in *Drosophila melanogaster* by using a modified mutation accumulation approach. We find evidence that genotypes constructed to

carry deleterious “treatment” alleles on one chromosome during mutation accumulation experience an elevated mutation rate on a different chromosome. Further, this elevation is correlated with the effect of the treatment alleles on phenotypic condition, measured as body mass. Treatment alleles that reduce mass by 10 % cause a doubling in the rate of mutational decline. Our results show that mutation rates are sensitive to genetic stress, such that individuals with low-quality genotypes will produce offspring of even lower genetic quality, in a mutational positive feedback loop. This type of variation in mutation rate is expected to alter a variety of predictions based on mutation load theory and accelerate adaptation to new environments. Positive mutational feedback could affect human health by increasing the rate of germline mutation, and possibly somatic mutation, in individuals of poor health because of genetic or environmental stress.
genetic load | mutational meltdown

Klima

JAWOROWSKI 2012

Z. Jaworowski, T. V. Segalstad & N. Ono, *Do glaciers tell a true atmospheric CO₂ story?* [Science of the Total Environment 114 \(2012\), 227–284.](#)

Until 1985 most studies of CO₂ in gas inclusions in pre-industrial ice indicated that CO₂ concentrations (up to 2450 ppm) were higher than the current atmospheric level. After 1985, lower pre-industrial CO₂ values were reported, and used as evidence for a recent man-made CO₂ increase. The errors in these revised values, however, are of a similar magnitude to the apparent increase in atmospheric CO₂ level. The assumptions used in estimating lower CO₂ values in past atmospheres have been: no liquid phase in polar ice; younger age of air than of ice due to free gas exchange between deep firn and the atmosphere; and no change in composition of air inclusions. These assumptions are shown to be invalid. Liquid saline water exists in ice at low temperatures, even below -70°C; airtight ice layers are ubiquitous in Antarctic firn; and more than 20 physico-chemical processes operating in situ and in ice cores contribute to the alteration of the chemical composition of air inclusions. The permeable ice sheet with its capillary liquid network acts as a sieve which redistributes elements, isotopes, and micro-particles. Thirty-six to 100 % of air recovered from old ice is contaminated by recent atmospheric air during field and laboratory operations. The value of -290 ppm, widely accepted from glacier studies for the pre-industrial atmospheric CO₂ level, apparently results from: invalid assumptions; processes in ice sheets; artifacts in ice cores; and arbitrary rejection of high readings. To date, glaciological studies are not able to provide a reliable reconstruction of either the CO₂ level in pre-industrial and ancient atmospheres or paleoclimates. Instead these studies have led to a widely accepted false dogma of man-made climatic warming. This dogma may have enormous negative impact on our common future.

Key words: CO₂; isotopes; glaciers; greenhouse warming

STEINHILBER 2012

Friedhelm Steinhilber et al., *9,400 years of cosmic radiation and solar activity from ice cores and tree rings.* [PNAS 109 \(2012\), 5967–5971.](#)

Friedhelm Steinhilber, Jose A. Abreu, Jürg Beer, Irene Brunner, Marcus Christl, Hubertus Fischer, Ulla Heikkilä, Peter W. Kubik, Mathias Mann, Ken G. McCracken, Heinrich Miller, Hiroko Miyahara, Hans Oerter and Frank Wilhelms

Understanding the temporal variation of cosmic radiation and solar activity during the Holocene is essential for studies of the solar-terrestrial relationship. Cosmic-ray produced radionuclides, such as ¹⁰Be and ¹⁴C which are stored in polar ice cores and tree rings, offer the unique opportunity to reconstruct the history of cosmic radiation and solar activity over many millennia. Although records from different archives basically agree, they

also show some deviations during certain periods. So far most reconstructions were based on only one single radionuclide record, which makes detection and correction of these deviations impossible. Here we combine different ^{10}Be ice core records from Greenland and Antarctica with the global ^{14}C tree ring record using principal component analysis. This approach is only possible due to a new high-resolution ^{10}Be record from Dronning Maud Land obtained within the European Project for Ice Coring in Antarctica in Antarctica. The new cosmic radiation record enables us to derive total solar irradiance, which is then used as a proxy of solar activity to identify the solar imprint in an Asian climate record. Though generally the agreement between solar forcing and Asian climate is good, there are also periods without any coherence, pointing to other forcings like volcanoes and greenhouse gases and their corresponding feedbacks. The newly derived records have the potential to improve our understanding of the solar dynamics and to quantify the solar influence on climate.

cosmogenic radionuclides | cosmic rays | solar modulation

Physik

BIDIN 2012

C. Moni Bidin, G. Carraro, R. A. Méndez & R. Smith, *Kinematical and chemical vertical structure of the Galactic thick disk, II. A lack of dark matter in the solar neighborhood*. [The Astrophysical Journal \(2012\) preprint](#), 1–35.

We estimated the dynamical surface mass density Σ at the solar position between $Z=1.5$ and 4 kpc from the Galactic plane, as inferred from the kinematics of thick disk stars. The formulation is exact within the limit of validity of a few basic assumptions. The resulting trend of $\Sigma(Z)$ matches the expectations of visible mass alone, and no dark component is required to account for the observations. We extrapolate a dark matter (DM) density in the solar neighborhood of $0\pm 1 \text{ mMS pc}^{-3}$, and all the current models of a spherical DM halo are excluded at a confidence level higher than 4σ . A detailed analysis reveals that a small amount of DM is allowed in the volume under study by the change of some input parameter or hypothesis, but not enough to match the expectations of the models, except under an exotic combination of non-standard assumptions. Identical results are obtained when repeating the calculation with kinematical measurements available in the literature. We demonstrate that a DM halo would be detected by our method, and therefore the results have no straightforward interpretation. Only the presence of a highly prolate (flattening $q > 2$) DM halo can be reconciled with the observations, but this is highly unlikely in ΛCDM models. The results challenge the current understanding of the spatial distribution and nature of the Galactic DM. In particular, our results may indicate that any direct DM detection experiment is doomed to fail, if the local density of the target particles is negligible.

Subject headings: Galaxy: kinematics and dynamics – dark matter – Galaxy: structure – Galaxy: general