

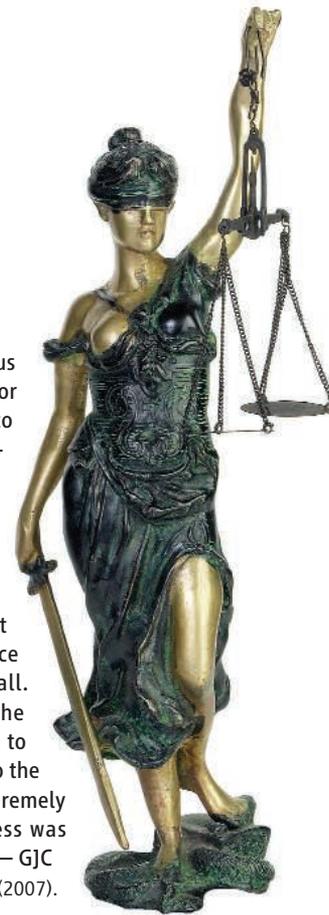
PSYCHOLOGY

Calibrating Confidence

One of the challenges in reasoning by means of a deliberative and conscious process is the weighting of evidence that is reported by other humans. For people sitting as jurors in a trial, this translates into deciding whether to believe what a witness says. Previous studies have demonstrated that confidently uttered statements are believed more often and that being accurate on other issues, even those peripheral to the adjudicated question, is conducive to being believed.

Tenney *et al.* show an interaction between these parameters in mock trials of civil (car accident) and criminal (burglary) cases. Two witnesses were equally confident in asserting their recollections of how the accident had occurred, yet one was uncertain about other events that had taken place on that day whereas the other professed a complete and accurate recall. Subsequently, both witnesses were shown to have been correct about the weather conditions at the time of the incident, but both were also shown to have been in error in placing a personal appointment (entirely unrelated to the accident) on that same day. Although, as expected, the credibility of the supremely confident witness was rated higher initially, the less confident witness was regarded as being more credible after their fallibility had been revealed. — GJC

Psychol. Sci. **18**, 46 (2007).

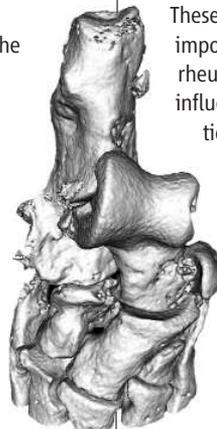


BIOMEDICINE

Remodeling the Joint

Rheumatoid arthritis is a debilitating autoimmune disorder that is characterized by a profound remodeling of tissue architecture at the joint, which results, most notably, in a permanent loss of bone. Therapies that reduce joint inflammation have been somewhat successful in delaying the onset and progression of the disease, but they have not been able to reverse joint damage once it has occurred. Because the recovery of joint function in rheumatoid arthritis will probably require therapeutic approaches that trigger the formation of new bone, there is growing interest in understanding the molecular mechanisms that regulate bone remodeling within the joint.

Following up on previous evidence that identified the Wnt signaling pathway as a determinant of bone mass, Diarra *et al.* investigated whether manipulation of this pathway would affect joint pathology in mice overexpressing the pro-inflammatory molecule tumor necrosis factor- α (TNF- α), a widely used animal model of human rheumatoid arthritis. They found that the antibody-mediated blockade of Dickkopf-1 (DKK-1), which is an endogenous inhibitor of Wnt signal-



ing, induced the formation of osteophytes (bone spurs) at the inflamed joints and also prevented the resorption of bone by specialized cells called osteoclasts. As was consistent with the mouse data, they observed that DKK-1 was expressed at aberrantly high levels in joint specimens from humans with rheumatoid arthritis and that in both species DKK-1 expression was induced by TNF- α .

These results identify the Wnt pathway as an important regulator of joint remodeling in rheumatoid arthritis. Because Wnt signals influence both the formation and the destruction of bone, future therapies targeting this pathway could in principle be

Bone erosion (pitted surfaces) in a mouse model of rheumatoid arthritis.

applied not only to rheumatoid arthritis, which is characterized by bone loss, but also to osteoarthritis and other diseases of the joint. — PAK

Nat. Med. **10**.1038/nm1538 (2007).

ECOLOGY/EVOLUTION

No End of History

Teasing apart the relative roles of historical and contemporary climatic elements in determining species richness is one of the core quests of bio-

geographical research. Hitherto, success has been limited because of the correlative nature of models used. Rahbek *et al.* have developed a new class of spatially explicit, mechanistic models that use individual species distributions as a basic currency. Application of these predictive models to the distributions of birds in South America shows that current climate explains the distributions only of the most widespread species. Their results indicate that historical factors and community assembly processes may be more important in determining the distributions of species with narrower ranges; these species are, of course, generally of greater relevance in terms of conservation efforts. In turn, this adds to growing appreciation of the importance of incorporating longer-term considerations in conservation planning. — AMS

Proc. R. Soc. B **274**, 165 (2007).

PHYSICS

Looking for Lorentz Violations

Although symmetries underlie deep principles in physics (such as the conservation of momentum), ultraprecise measurements have revealed slight exceptions such as the CP (charge-parity) violation in some radioactive decays. Lorentz symmetry, which dictates that experimental measurements should not depend on whether the apparatus is moving at steady velocity or

standing still, is a cornerstone of special relativity. However, some researchers believe that there may be extremely small violations of Lorentz symmetry which, if measured, could provide tests of string theory and quantum gravity.

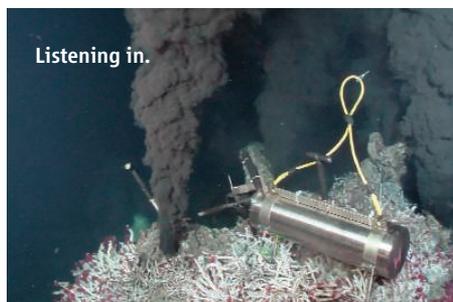
Experiments are now underway to search for Lorentz violations by trapping antihydrogen atoms. Altschul has calculated the properties of another possible experimental test known as vacuum Čerenkov emission. High-energy charged particles passing through matter give off light, such as the eerie blue glow of radioactive waste in a storage pool. If Lorentz symmetry is violated, particles moving through empty space may also emit Čerenkov light. Observing such emission would be extremely difficult but could serve as a valuable complement to the antimatter experiments. — DV

Phys. Rev. Lett. **98**, 041603 (2007).

OCEAN SCIENCE

Singing Vents

Mid-ocean ridges are dotted with hydrothermal vents termed black smokers. From these towers, dark streams of mineral-laced hot water bubble out to enrich the deep ocean and provide niche environments for many organisms. Little is



known, however, about the patterns of hydrothermal flow from individual vents. As a means of monitoring the flow, Crone *et al.* have recorded the sounds of two black smokers, "Sully" and "Puffer," on the Juan de Fuca ridge 2200 m below the ocean surface. Submerged acoustic sensors provided close to 200 hours of recorded data. Both vents proved noisy, exceeding the ambient level by 10 to 30 dB. Broadband acoustic signals were measured at frequencies up to 500 Hz, possibly generated from a combination of volume changes in the flow, turbulence enhanced by fluid heterogeneity, and chimney vibration. Single tones sang out over the top, perhaps indicating resonant frequencies of the cavities. The authors speculate that such sounds could be used by organisms living near black smokers for navigation and to avoid the scorching water. — JB

PLoS ONE **1**, e133 (2006).

CHEMISTRY

Resolving More with Less

Appending homogeneous catalysts to an oligomeric or dendritic support can concentrate active sites close to one another and thereby enhance the efficiency of cooperative processes. This approach has shown particular promise with the cobalt(III)-salen-catalyzed hydrolytic kinetic resolution of chiral epoxides, a highly selective reaction of interest because of the versatility of epoxides as precursors to pharmaceutically important targets. Mechanistic studies have indicated that two metal centers act cooperatively in this system, and catalysts with multiple Co-salen centers assembled as part of the backbone of a cyclic symmetrical oligomer have proven effective. Zheng *et al.* extend this strategy by preparing salen ligands substituted with cyclooctene and then using Ru-catalyzed ring-expanding olefin metathesis to create macrocycles with Co-salen moieties as pendant groups. The resulting compounds catalyze highly selective resolution of a range of alkyl- and aryl-substituted chiral epoxides at Co loadings as low as 0.01 mol %. The authors attribute the efficiency of this system to the spatial flexibility of the tethered metal centers. — PDS

J. Am. Chem. Soc. **129**, 10.1021/ja0641406 (2007).

PHYSIOLOGY

Obesity: in the Brain or the Gut?

Although some blame high-fat foods for the global spread of obesity, the mechanistic connection is not solid. The hormone leptin regulates body weight by binding to receptors in the hypothalamus and initiating signaling via JAK2, STAT3, and PI3K transducer molecules. JAK2 is a cytoplasmic tyrosine kinase and is the target of several regulators, including the SH2-B family. Mice whose SH2B1 is systemically knocked out become leptin-resistant and obese and develop type 2 diabetes. Ren *et al.* have found that if SH2B1 is restored specifically to neural tissues, the obese mice stop overeating, the hyperlipidemia is corrected, the leptin sensitivity is restored, and the obesity reverses. Nevertheless, therapeutic targeting of this signal may not be a simple matter if, as suggested by Ley *et al.* and Turnbaugh *et al.*, obesity can be mediated by members of the gut flora. It appears that obese mice and humans have a greater proportion of Firmicutes in their gut flora and that they extract energy from food more efficiently (because of the bacterial capacity for breaking down indigestible polysaccharides) than the Bacteroidetes group that dominates the flora of lean mice and people. Moreover, obesity in mice can be induced by infection. — CA

J. Clin. Invest. **10.1172/JCI29417** (2007); *Nature* **444**, 1022; 1027 (2007).

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