

et al. found that thorny *Acacia* trees are more common in areas where impala experience a low risk of predation by wild dogs. A related *Acacia*, without thorns, is most abundant in areas where risk of predation is high, and so the number of hungry impala is low. — SNV

Science, this issue p. 346

QUANTUM ELECTRONICS Complex light and matter interactions

When electrons are confined to a plane, lowered in temperature, and subjected to a magnetic field, they can interact and organize themselves into so-called many-body states and exhibit complex quantum electronic behavior. However, discerning the underlying interactions can be difficult. Adding light to the mix, Smolka *et al.* now show that these self-organized electronic states can be controlled and manipulated to unravel the details of the exotic electronic behavior. — ISO

Science, this issue p. 332

STRATEGIC REASONING Smart monkeys can outwit a computer

What happens in the brain when we are learning to compete against an opponent? Seo *et al.* observed monkeys competing against a computer that can adapt to the monkey's behavior. The monkeys switched their learning strategies when they worked out that their opponent was reacting to their behavior. The responses of the dorsomedial prefrontal cortex cells in the monkey brains predicted their

choices and switches in strategies. — PRS

Science, this issue p. 340

ION CHANNELS Ions knock each other across the membrane

Potassium channels play a key role in regulating a cell's membrane potential, which in turn affects diverse processes. The channels contain four potassium binding sites that are thought to be alternately occupied by potassium and water. Starting from high-resolution crystal structures, Köpfer *et al.* simulated over a thousand potassium ions crossing the channel (see the Perspective by Hummer). They found that ions are in direct contact rather than being separated by water as previously assumed. It seems that repulsion between the ions is the key to their efficient movement through the channel. — VV

Science, this issue p. 352; see also p. 303

AUTOIMMUNITY Finding the targets of T cells gone bad

Autoimmune diseases such as rheumatoid arthritis can result when the immune system attacks its own body. If we could identify the specific proteins targeted by autoimmune T cells, we might then be able to block this interaction, which might be useful therapeutically. Ito *et al.* identified one such target in mice that develop a disease similar to rheumatoid arthritis. Disease-causing T cells recognized a protein that is part of the ribosome, a large

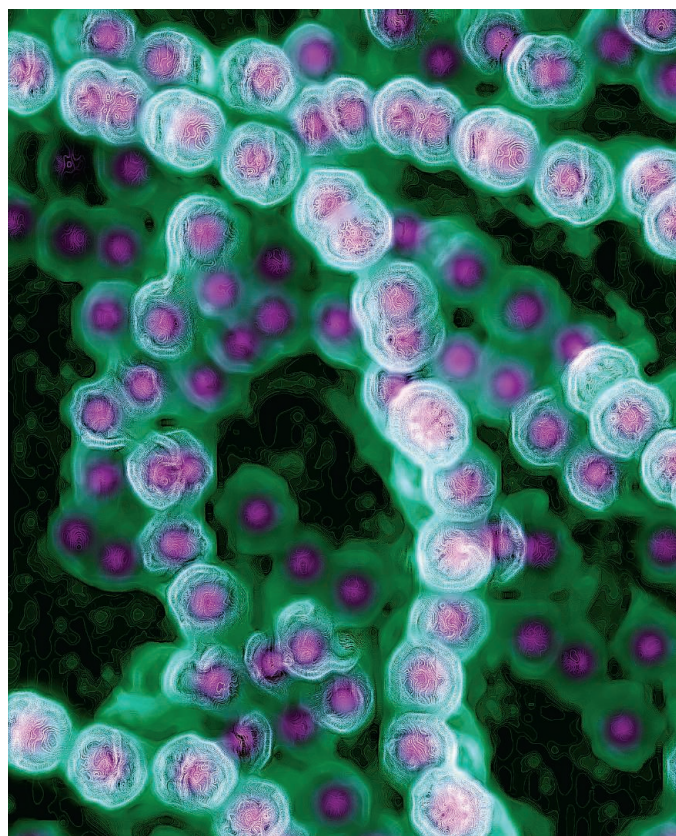
protein complex that catalyzes protein synthesis. They also found T cells specific for this protein in people with rheumatoid arthritis. — KLM

Science, this issue p. 363



IN OTHER JOURNALS

Edited by Kristen Mueller and Jesse Smith



ANTIBIOTICS

Charting the course of antibiotic failure

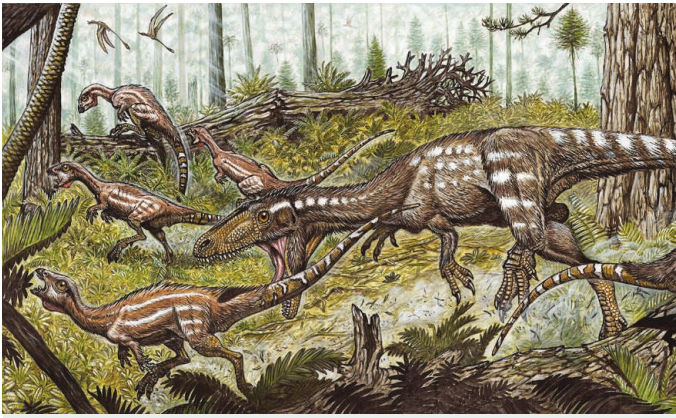
Bacterial resistance to antibiotics is a major public health problem. To better understand this in a clinical setting, Currie *et al.* analyzed a 20-year prescribing history of antibiotics by UK primary care practitioners and report a 12% increase in treatment failure (when a specific antibiotic fails to cure an infection). The authors found only small decreases in the ability of frontline drugs, such as penicillins and macrolides, to control respiratory tract and soft tissue infections. More worryingly, however, second-line antibiotics, such as cephalosporins and quinolones, often used to treat elderly and frail patients with pneumonia, showed higher failure rates since 1991. — CA

BMJ 10.1136/bmj.g5493 (2014).

MAMMAL DIGIT NUMBER Protein sorting sets digit number

Like human fingers and toes, mice have five digits on their front and back paws. To better understand the molecular mechanism behind this,

Handschuh *et al.* studied mice with extra or fused digits caused by a mutation that leads to reduced expression of the protein Vps25. Vps25 helps to sort proteins at the cell surface in a process called endosomal protein trafficking. Such sorting ensures that cells express just



PALEONTOLOGY

Meat-eater lived in extinction's wake

A newly described dinosaur unearthed in Venezuela is a close relative of creatures that later evolved into giant meat-eaters such as *Allosaurus* and *Tyrannosaurus rex*. Langer *et al.* examined two lower leg bones from two different individuals of *Tachiraptor admirabilis*. The two bones were different enough from those of known species to mark the creature as new. *T. admirabilis* was a theropod, measuring 1.5 meters from nose to tail. The bones were found in an ancient flood plain, in sediments deposited 200.7 million years ago—less than 1 million years after the mass extinction that marked the end of the Triassic period and the beginning of the Jurassic. — SP

Roy. Soc. Open Sci. 10.1098/rsos.140184(2014).

the right amount of particular proteins, so things such as tissue development go off without a hitch. In *Vps25* mutant mice, cells divided more in hindlimbs, and fewer cells in the spaces between digits died, which suggests that digit development requires that cells sort their proteins properly. — BAP

Cell Reports

10.1016/j.celrep.2014.09.019 (2014).

MINERAL PHYSICS

Unraveling ringwoodite hydration in mantle

Certain high-pressure minerals in Earth's mantle are likely to contain oceans' worth of water dissolved into their crystal structures. Exactly how water dissolves into ringwoodite, an important mineral in the mantle transition zone, influences our ability to detect mantle water using geophysical tools. Purevjav

et al. tackle this problem by using a powerful beam of neutrons to determine the location of hydrogen atoms in the ringwoodite structure. They found that hydrogen substitutes for any of the major cations, dramatically lowering the speed of seismic waves in the mineral. This discovery may make it possible to map important water content variations in the transition zone of Earth's mantle. — BG

Geophys. Res. Lett.

10.1002/2014GL0614488 (2014).

BEHAVIORAL SCIENCE

A costly reluctance to speak out

Decision-making in groups depends not only on whether any of the group members knows the right answer but also on whether the most informed members actually speak up. Coffman examined the propensity to

contribute one's ideas in a pared-down laboratory knowledge test in which other factors, such as discrimination and argumentativeness, do not play a role by design. She found that undergraduate women contribute their answer to the group less often than undergraduate men. The authors observed that this was subject area-dependent: women showed the least amount of reluctance for the most female-stereotyped subject area, arts, and the greatest amount for the most male-stereotyped subject, sports. — GJC

Quart. J. Econ. 129, 10.1093/qje/qju023 (2014).

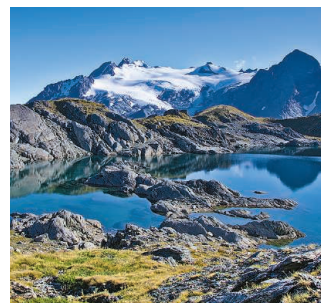
LIMNOLOGY

How many lakes are there on Earth?

Most maps or databases of global lakes either omit small lakes or estimate their numbers, leaving accurate calculations of their net subaerial coverage uncertain. This makes it difficult to determine the role of lakes in Earth's carbon cycle. Verpoorter *et al.* use high-resolution satellite images to create a database of all lakes with surface areas greater than 2000 square meters. The interpretation of satellite images can be hampered by the presence of features such as dark forests or mountain shadows, so the authors developed a special algorithm to overcome these problems. They conclude that there are 117 million lakes, covering 3.7% of Earth's land area not covered by ice. They conclude that there are fewer lakes, but that those lakes cover more area, than previous estimates have indicated. — JFU

Geophys. Res. Lett.

10.1002/2014GL060641 (2014).



INFECTIOUS DISEASE

Taking the temperature of virulence

Cholera kills more than 100,000 people yearly and results from consuming food or water contaminated with *Vibrio cholerae*. The bacterium only expresses virulence factors, proteins that cause disease, when it infects people. Weber *et al.* investigated how this occurs at a molecular level and discovered that the bacteria possess an "RNA thermometer," which turns on expression of these virulence factors. At low temperatures, as found in water inhabited by the bacteria, a sequence from the bacterium's *toxT* messenger RNA (*toxT* encodes a protein that turns on virulence gene expression) folds into a structure that prevents its translation. However, at human body temperature, the structure opens up and the bacterium can express its virulence factor genes. — BJ

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1411570111 (2014).

THEORETICAL BIOLOGY

Finding ways to reach the right endpoint

Most complex systems have an element of randomness: Even if we can describe them exactly at one point in time, we don't know for certain where they will be next. Scientists use stochastic equations to compute the many possible trajectories these systems can take. If we constrain both end points of such trajectories, the usual approach of calculating all trajectories and rejecting those that do not end at the desired final point can be very inefficient. Zhao *et al.* introduced an approach in which they modified the probabilities for moving from one state to the next, so that the system was guaranteed to reach the set final state. The authors used examples from population genetics to illustrate the power of the method. — JS

J. Theor. Biol. 363, 419 (2014).

Science

Taking the temperature of virulence

Barbara R. Jasny

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