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ANTHROPOLOGY

King Solomon's copper mines

In the "Golden Age" of biblical archaeology, between approximately 1925 and 1948, archaeologists sought to fit their findings in the Middle East into the framework of the Hebrew bible. Later, after the discovery that the Bible was substantially edited in the 5th century before the common era (BCE), this trend was reversed. In the 1970s and 1980s, excavations in Jordan's Edom highlands appeared to provide evidence that the Iron Age did not begin there until the 7th century BCE. Ancient copper mines and smelting at Khirbat en-Nahas in the Edom lowlands were thus decoupled from the 10th century BCE reign of King Solomon. But Thomas Levy *et al.* now report that radiocarbon dating of artifacts from Khirbat en-Nahas places the copper works back in the biblical narrative. Sticks of tamarisk, date seeds, and other woody materials used for charcoal in the smelting process were dated with subcentury precision from the 10th to 9th centuries BCE. In addition, an Egyptian amulet and a scarab found at the site tie Khirbat en-Nahas to a well-known military incursion by Pharaoh Sheshonq I. To provide a comprehensive picture of the site, the authors used digital measurements and a geographic information system to generate a 3D model. — K.M.

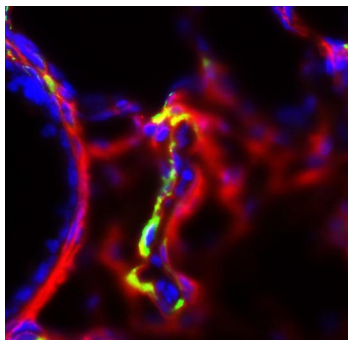
Industrial copper slag mound excavated at Khirbat en-Nahas.

"High-precision radiocarbon dating and historical biblical archaeology in southern Jordan" by Thomas E. Levy, Thomas Higham, Christopher Bronk Ramsey, Neil G. Smith, Erez Ben-Yosef, Mark Robinson, Stefan Münger, Kyle Knabb, Jürgen P. Schulze, Mohammad Najjar, and Lisa Tauxe (see pages 16460–16465)

DEVELOPMENTAL BIOLOGY

Mesothelium layer contributes to pulmonary blood vessels

The embryonic mesoderm contributes to the body's internal organs and skeletal system during development. It also gives rise to the mesothelium—a thin layer of cells that lines, lubricates, and protects the body's cavities and organs, including the heart, intestines, and lungs. Jianwen Que *et al.* demonstrate that cells derived from the mesothelium serve as a source of vascular smooth muscle cells as the lungs develop. The authors say their findings, together with those of previous studies in the heart and gut, suggest that a conserved mechanism underlies the development of blood vessels from this layer in all internal organs. The authors lineage-labeled mesothelial cells in three mouse lines and tracked the cells' fate from embryo to adult. These cells appeared in the walls of blood vessels in both the proximal and distal lung; on average, one-third of the smooth muscle cells in these vessels originated in the mesothelium. Some mesenchymal cells, which form much of the body's connective tissues—including interstitial fibroblasts, myofibroblasts in the alveoli, and endothelial cells—may also be derived from the mesothelium, potentially giving it a wide role in development. The authors say their findings may help researchers understand developmental defects in the lung, as well as pathological conditions like idiopathic pulmonary fibrosis, a chronic, debilitating disease. — F.A.



Mesothelial-derived cells (green) in the mouse lung.

"Mesothelium contributes to vascular smooth muscle and mesenchyme during lung development" by Jianwen Que, Bettina Wilm, Hiroshi Hasegawa, Fan Wang, David Bader, and Brigid L. M. Hogan (see pages 16626–16630)

MEDICAL SCIENCES

Well-exercised muscle is inefficient at rest

Endurance exercise, such as long-distance running, changes the composition of muscle fiber. More mitochondria are added, but of the subsarcolemmal type rather than the intermyofibrillar type. The respiration profiles of the two types differ, but the reason is not well understood. Douglas Befroy *et al.* report that endurance

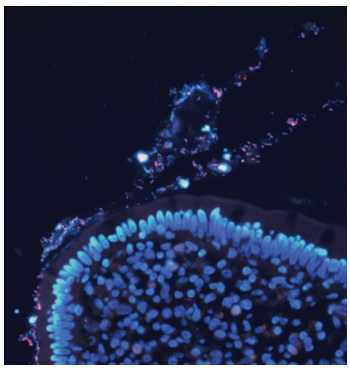
training helps living muscle at rest decouple the consumption of fatty acids from the production of ATP. Using magnetic resonance spectroscopy, the authors compared the tricarboxylic acid flux and rate of ATP synthesis in the calf muscle of endurance runners and sedentary subjects. Although the fatty acid flux was 54% higher in the athletes, the rate of ATP synthesis was similar in all subjects. (Subjects matched in age, height, weight, and body-mass index require the same amount of ATP.) The authors conclude that resting runners lose power as heat, possibly because of inefficiency arising from the known increase in expression of adenine nucleotide translocase that results from exercise. Previous research had found similar results in isolated muscle fibers, and the authors say their work confirms the phenomenon *in vivo*. They further suggest that in certain cases of diabetes, endurance exercise could help patients regain a more normal sensitivity to insulin. — K.M.

"Increased substrate oxidation and mitochondrial uncoupling in skeletal muscle of endurance-trained individuals" by Douglas E. Befroy, Kitt Falk Petersen, Sylvie Dufour, Graeme F. Mason, Douglas L. Rothman, and Gerald I. Shulman (see pages 16701–16706)

MICROBIOLOGY

Bacteria strain may be key to Crohn disease

Crohn disease is a form of inflammatory bowel disorder in which the immune system of the patient's mucosa is activated by an imbalance in the intestinal biota. In previous research, Philippe Langella, Philippe Seksik, and colleagues showed that human patients with Crohn disease host a less diverse microbiota, with a marked deficiency in the *Clostridium leptum* group. Harry Sokol *et al.* now show that a major component of the *C. leptum* group, *Faecalibacterium prausnitzii*, accounts for a large part of the deficit, secreting undetermined factors—possibly defensins—that reduce known markers of inflammation. In a mouse model of colitis, oral or i.p. doses of *F. prausnitzii* or the secreted factors significantly improved the bacteria's survival. Sokol *et al.* drew data from a larger ongoing study and found that human Crohn patients who underwent bowel surgery were more likely to experience a recurrence of the condition if they hosted reduced numbers of *F. prausnitzii* compared with healthy individuals. In culture experiments, the authors showed that supernatant drawn from *F. prausnitzii* provided an anti-inflammatory effect. On the basis of subsequent animal trials, the authors suggest that human patients could benefit from a probiotic treatment with *F. prausnitzii* or other bacteria. — K.M.



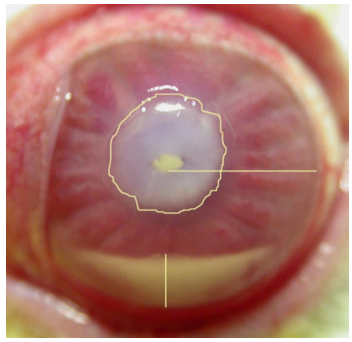
Ileal mucosa of Crohn disease patient.

*"*Faecalibacterium prausnitzii *is an anti-inflammatory commensal bacterium identified by gut microbiota analysis of Crohn disease patients" by Harry Sokol, Bénédicte Pigneur, Laurie Watterlot, Omar Lakhdari, Luis G. Bermúdez-Humarán, Jean-Jacques Gratadoux, Sébastien Blugeon, Chantal Bridonneau, Jean-Pierre Furet, Gérard Corthier, Corinne Grangette, Nadia Vasquez, Philippe Pochart, Germain Trugnan, Ginette Thomas, Hervé M. Blottière, Joël Doré, Philippe Marteau, Philippe Seksik, and Philippe Langella* (see pages 16731–16736)

MICROBIOLOGY

New treatment for biofilm infections

A bacterium can live independently or in a community known as a biofilm, in which the bacteria grow on a surface embedded in an extracellular matrix that they secrete. In the latter state, bacteria are often resistant to antibiotics, making biofilm infections particularly difficult to treat. *Pseudomonas aeruginosa* is a known opportunistic bacterium that infects immunocompromised individuals and requires iron to form biofilms. Ehud Banin *et al.* show that exposing bacteria to desferrioxamine-gallium (DFO-Ga)—a compound that blocks access to iron—prevents biofilm formation. When the authors used DFO-Ga together with the antibiotic gentamicin, the combination was effective in killing both free and biofilm-dwelling *P. aeruginosa*. Banin *et al.* also tested the combination on a *P. aeruginosa* rabbit corneal infection and found that in animals that received DFO-Ga and gentamicin together, the corneal scar was 50% smaller than in animals that received the antibiotic alone. The authors suggest that DFO-Ga may represent an effective strategy for treating *P. aeruginosa* infections as well as other biofilm infections. — B.P.T.



Photographic measure for grade of corneal infection process.

*"The potential of desferrioxamine-gallium as an anti-*Pseudomonas *therapeutic agent" by Ehud Banin, Alina Lozinski, Keith M. Brady, Eduard Berenshtein, Phillip W. Butterfield, Maya Moshe, Mordechai Chevion, Everett Peter Greenberg, and Eyal Banin* (see pages 16761–16766)