EDITORS' CHOICE

edited by Stella Hurtley

GEOLOGY

Wearing Away Mountains

The High Himalaya.

The Himalayas are thought to be one of the most rapidly eroding regions on Earth. Knowledge of their erosion rate today and over the long term is needed for understanding the relations among climate, tectonics, and erosion. Weathering of silicate rocks also helps to remove carbon dioxide from the atmosphere. Most estimates of erosion in this region have been made from studies that average over several million years. An approach that provides a better estimate of current erosion rates is the study of cosmogenic nuclides—isotopes that are produced in rocks through bombardment with cosmic rays. Vance *et al*. examined several areas across the Himalayas and found erosion rates varying up to 2.7 mm per year in the High Himalaya. Comparison with other data suggests that erosion and exhumation rates have been balanced for the past several thousand to few million years. Current rates of erosion are higher than earlier rates, implying that there has been a fairly recent increase in the exhumation rate of the range. — BH

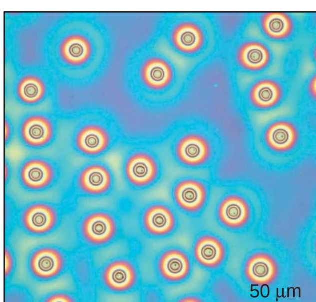
Earth Planet. Sci. Lett. **206**, 273 (2003).

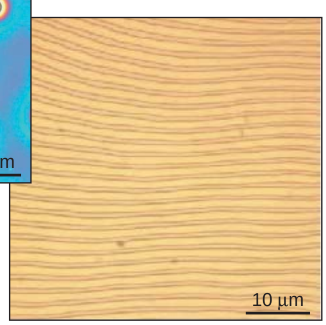
MATERIALS SCIENCE

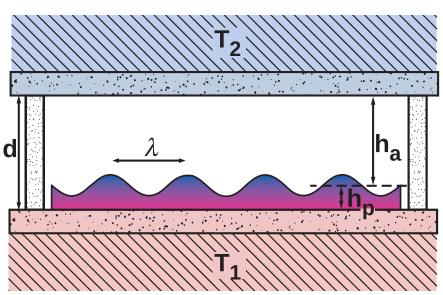
Unsteady As She Flows

Pattern formation caused by instabilities in thin fluid layers has attracted considerable interest because of the technological importance of thin films, and also because these systems allow for the detection and measurement of interfacial forces. In spinodal or spontaneous instability, pattern formation is driven by the relaxation from an unstable or metastable state once the thin film is heated above its melt or glass transition temperature. Schäffer *et al*. look at a very different case, where patterns are formed by the flow of heat between two surfaces held at different temperatures. Polymer films develop a characteristic wavelength as columns or stripes rise up to bridge between the two surfaces. Coating one of the substrates with gold led to a far greater change in the patterning than one would expect if surface forces were controlling the morphology. The key driving force appears to be the need for the system to maximize thermal conductivity between the two surfaces, which should only occur with high-molecular-weight polymers. — MSL

Macromolecules 10.1021/ma021080p (2003).







Experimental setup (left), columnar pattern (above left) and striped pattern (above right).

IMMUNOLOGY

Completing the SET

Lymphocytes with cytotoxic activity induce cell death by delivering pro-apoptotic granzymes to the cytosol of target cells. One of the two principle granzymes, granzyme A, operates independently of caspase activation and appears to disrupt nuclear integrity and damage single-stranded DNA.

Having already identified an endoplasmic reticulum–associated protein complex, called SET, as a target of granzyme A, Fan *et al*. provide further insight into how interference with this complex promotes apoptosis. Apurinic endonuclease-1 (Ape-1), a DNA binding protein possessing endonuclease and redox activities, was isolated from the SET complex and shown to be cleaved upon exposure to granzyme A. As a result, two putative anti-apoptotic processes of Ape-1 were disrupted: the repair of abasic sites in DNA and the ability to mediate oxidative repair of transcription factors. Disruption of Ape-1 expression in cell lines by RNA interference enhanced apoptosis, whereas transfection with a noncleavable form of Ape-1 protected cells from granzyme A–induced cell death. Granzyme A may thus operate through the combined effects of disrupting the cellular repair activities of Ape-1 and of other members of the SET complex. — SJS

Nature Immunol. **4**, 145 (2003).

ASTROPHYSICS

How Low Can You Go?

It has been difficult to find the M dwarfs, which are the lowest mass, lowest temperature, and lowest luminosity stars that populate the darker corner of stellar life on the main sequence. Nonetheless, astronomers armed with bigger telescopes with better instruments and automated and efficient star surveys have found many M dwarfs over the past several years. Lepine *et al*. have now found the lowest of the lowly M dwarfs, a star named LSR 1425+7102. The star was originally observed in the Digitized Sky Survey, and follow-up spectroscopic observations show that the star has stronger CaH bands and weaker TiO bands, putting it

CONTINUED ON PAGE 1153

CREDITS: (TOP) MIKE BICKLE, UNIV. CAMBRIDGE DEPT. EARTH SCIENCE; (BOTTOM) SCHÄFFER *ET AL. MACROMOLECULES* 10.1021/MA021080P (2003)

in the M-subdwarf spectral class with a subtype index of 8.0. The star is extremely poor in metals, extremely cool, and has an estimated mass of only 0.09 times the mass of the Sun, the lowest-mass star found on the main sequence so far. Finding more of these meek M dwarfs will be important for understanding the origin and evolution of stars at the lower limits of their physically plausible masses. — LR

Astrophys. J. **585**, L69 (2003).

MICROBIOLOGY

Bacterial Multiplication

Even though bacteria live their lives as single-celled entities, they still need to keep up to date with what their neighbors, friendly and otherwise, are doing. In a process called quorum sensing, *Vibrio harveyi* monitors its surroundings via two protein phosphorylation pathways that produce and detect autoinducers 1 and 2 (AI-1 and AI-2). The first is restricted to *V. harveyi* and a close relative, whereas the second is found in a wide variety of both Gram-negative and Gram-positive species. Mok *et al.* identify a number of target genes whose expression is regulated by AI-2. From an analysis of the responses of these genes to combinations of AI-1 and AI-2, they propose that this pair of pathways may serve as a coincidence detector, primarily designed to signal the presence of both inducers and, in essence, acting as an AND gate. — GJC

EMBO J. **22**, 870 (2003).

APPLIED PHYSICS

The Ups and Ups of Silicon

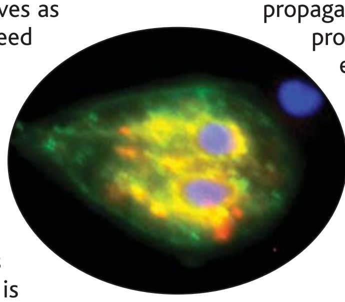
The preparation of large areas of a substrate with periodic structures usually requires several steps of processing and patterning and can be a time-consuming part of the fabrication process. Removing the need for a patterning process altogether, Wysocki *et al*. show that a self-assembled layer of silica microspheres can be used to form a periodic array of silicon cones in a single step. The microspheres focus light from a single shot of a high-power laser onto the silicon surface and melt it. As the molten silicon cools, it begins to solidify, starting farthest away from the focal point directly under the microspheres and then toward the center. Because of the thermal properties of silicon, the volume of silicon expands as it cools, and so the center region is pushed up into a well-defined cone shape. The technique should prove particularly useful for the fabrication of field emission displays. — ISO

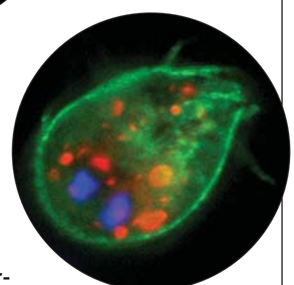
Appl. Phys. Lett. **82**, 692 (2003).

CELL BIOLOGY

Ancient Protein Sorting

The protozoan parasite *Giardia intestinalis* is a representative of a family of ancient eukaryotes. The parasite multiplies within the intestine and in order to propagate further must produce an infectious encysted form that can resist the external environment. During cyst formation, the parasite produces cyst wall proteins





At 15°C (top), export from the endoplasmic reticulum is blocked and cyst wall proteins (red) accumulate together with surface proteins (green); after shifting to 37°C (bottom), proteins are sorted to encystation-specific vesicles and the membrane.

that are synthesized in the endoplasmic reticulum and are sorted to specialized secretory vesicles, the encystation-specific vesicles. Marti *et al*. examined the protein sorting mechanisms employed by the parasite. During encystation, cells package proteins destined for the cyst wall and variant-specific surface proteins separately. The parasites lack an easily identifiable Golgi complex—the secretory sorting organelle used to package regulated secretory granules in higher eukaryotic cells. Instead, *Giardia* appears to sort secretory proteins earlier in the secretory pathway, immediately after exit from the endoplasmic reticulum, so that the encystation-specific vesicles themselves subserve some of the functions that in higher eukaryotes are performed by the Golgi complex. — SMH

MBC in Press 10.1091/mbc.E02-05-0467 (2003).

CREDITS: MARTI *ET AL., MBC* IN PRESS 10.1091/MBC.E02-05-0467 (2003)

Science

Ancient Protein Sorting

Stella M. Hurtley

Science **299** (5610), 1153.
DOI: 10.1126/science.299.5610.1153c

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title *Science* is a registered trademark of AAAS.