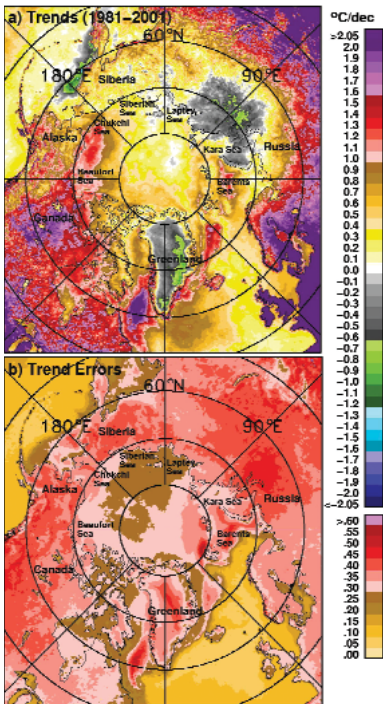
EDITORS' CHOICE

edited by Stella Hurtley



Map charting surface temperature changes over the Arctic with time.

(RIGHT) TOPPANI AND LIBOUREL, *GEOCHIM. COSMOCHIM. ACTA* **67**, 4621 (2003)

CLIMATE

Northern High-Latitude Warming

The high latitudes are particularly sensitive to climate change and are thus good regions in which to look for early signs of global warming. Comiso presents measurements of surface temperature for the whole Arctic from 1981 to 2001, made using satellite thermal infrared data. Large warming anomalies were seen over sea ice, Eurasia, and North America, but no change or a slight cooling was observed over Greenland. Temperature increases were steeper during the 1990s than during the 1980s. This warming increased the melt season by 10 to 17 days per decade and was eight times more rapid than the average for the previous 100 years. The substantial increase in the rate of warming in the Arctic may be associated with the recent change in the phase of the Arctic Oscillation or the increase of greenhouse gases in the atmosphere. — HJS

*J. Clim.***16**, 3498 (2003).

ECOLOGY

Survival in Patches

Tropical forests worldwide are being fragmented into smaller patches by human activity.

CREDITS: (TOP) COMISO, *J. CLIM.* **16**, 3498 (2003); (LEFT) THOMAS LOVEJOY, HEINZ CENTER

These fragments are of varying sizes and degrees of isolation from one another and are the only refuge for most of the tropics' wildlife. If conservation planning is to be effective, data and long-term projections are needed on the sizes of fragments that can support viable populations of organisms. For almost a quarter of a century, the Biological Dynamics of Forest Fragments Project, established in the Brazilian Amazon, has been following the fate of the habitat and inhabitants of forest fragments of varying sizes. Ferraz *et al*. have surveyed bird populations in sites of 1, 10, and 100 ha, and derive from their data a scaling rule relating rates of species loss to area of fragment. Not surprisingly, the smaller fragments lose species fastest, but even the 100-ha fragments lost 50% of their species in about 10 years. Thus a minimum fragment size of at least 10,000 ha appears to be required to reduce the loss of species to <50% over a century, and large protected areas in tropical forest will need to be maintained. — AMS

Proc. Natl. Acad. Sci. U.S.A. **24**, 14069 (2003).

MOLECULAR MEDICINE

On the Way to Breast Cancer

The *BRCA2* gene is mutated in a subset of families with an inherited susceptibility to breast and ovarian cancer. Intense efforts to understand how the BRCA2 protein prevents cancer development have focused attention on three critical processes in the cell nucleus: DNA repair, transcription, and chromatin remodeling. New support for the idea that BRCA2 participates in one or more of these processes is provided by Hughes-Davies *et al*., who identify a nuclear protein (EMSY) that binds to a region of BRCA2 that is deleted in cancer. EMSY represses the trans-activation domain of BRCA2, is localized to sites of DNA damage, and binds to proteins with sequence motifs characteristic of chromatin regulators. The *EMSY* gene is amplified in sporadic breast and ovarian cancers, which typically do not have mutations in *BRCA2*. Thus, *EMSY* amplification and *BRCA2* deletion may have similar effects on signaling pathway(s) critical to the pathogenesis of the rare inherited forms of these cancers as well as more common cancers. — PAK

Cell **115**, 523 (2003).

DEVELOPMENT

Same Difference: Sea Urchins or Starfish

Evolutionary forces are known to work on the gene at many levels, from sequence to organization. In the sea urchin, there have been extensive efforts to map the network responsible for endoderm formation. Despite their differences—including the ability of sea urchin larvae to form a skeleton during embryogenesis—endoderm formation shows similarities between sea urchins and starfish.

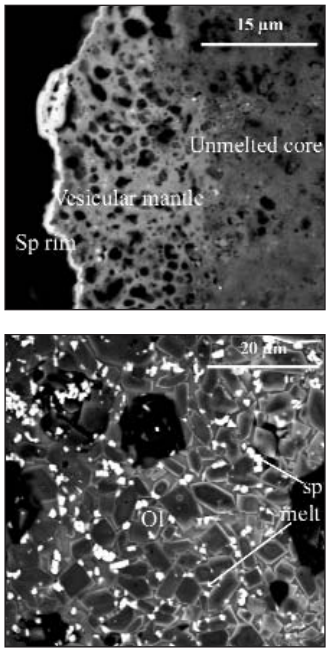
Hinman *et al*. studied the conservation and changes in embryonic gene regulatory networks during the course of metazoan evolution. They compared the expression patterns of genes involved in endoderm formation in embryo development and the effects of perturbing expression profiles. A crucial feedback loop involving three transcription factors was found to be almost identical in both of these evolutionarily distant species. — BJ

Proc. Natl. Acad. Sci. U.S.A. **100**, 13356 (2003).

PLANETARY SCIENCE

Cosmic Crystal Kinetics

Fragments of extraterrestrial space debris experience different degrees of heating in the



Spinel rim on a micrometeorite.

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atmosphere. Spinel crystals with different compositions and shapes are ubiquitous products found in most space debris. Spinel grains can rapidly crystallize at high temperatures from space debris that melts on its way through the atmosphere.

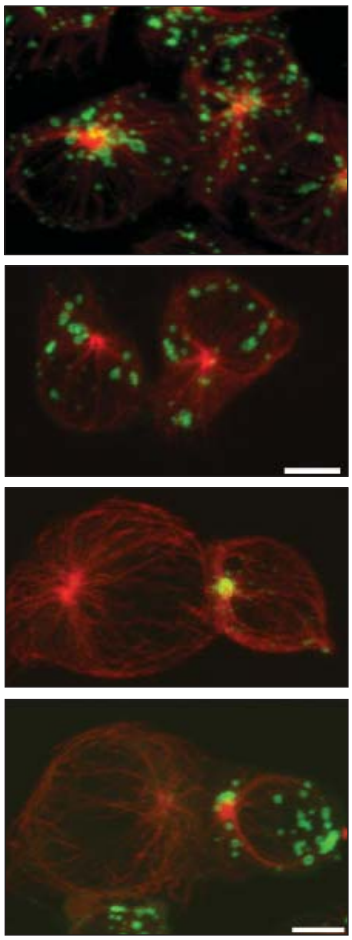
Toppani and Libourel produced about 300 different spinels in pulse heating experiments with samples of the Orgueil meteorite and compared these synthetic products with over 130 debris particles. Using the Al_2O_3 content and FeO/Fe_2O_3 ratio of the spinels and the composition of the atmosphere, they estimated the entry velocity, angle of entry, duration of the fall, and the altitude at which the spinel formed. From this thermal history they can potentially eliminate the atmospheric effects to estimate the pristine extraterrestrial condition of space debris. — LR

Geochim. Cosmochim. Acta **67**, 4621 (2003).

CELLULAR IMMUNOLOGY

Incompetent Killers

In the immune system, cytotoxic T cells (CTLs) destroy target cells by binding to them and fusing the contents of cytolytic granules—a specialized form of secretory lysosome—with the target cell membrane, causing cell lysis and death. The cell-cell contact site is known as the immunological synapse. Clark *et al*. examined CTLs from patients with Hermansky Pudlak syndrome—a rare autosomal recessive disease linked to platelet defects and albinism. They discovered that the CTLs from these patients lacked a protein complex known as AP3—previously implicated in membrane trafficking to the lysosome. The patients' CTLs could bind to target cells but could not appropriately polarize and transport their lytic granules to the immunological synapse. Feldmann *et al*. studied CTLs from a subset of patients with a different disorder: familial hemophagocytic lymphohistiocytosis. In this case, CTLs formed normal-looking immunological synapses with target cells, complete with focused lytic granules, but the granules failed to fuse because of the absence of functional Munc13-4—a protein involved in vesicle priming. Both studies highlight how CTLs modify existing membrane trafficking mechanisms to perform specialized cellular functions. — SMH



In normal CTLs (top and third), lytic granules (green) focus at the immunological synapse, but in CTLs from Hermansky Pudlak syndrome patients (second and bottom), the granules remain distributed around the cells.

CREDITS: FELDMAN *ET AL.*, *NATURE IMMUNOL.* **4**, 1111 (2003)

Nature Immunol. **4**, 1111 (2003); *Cell* **115**, 461 (2003).

PHYSICS

An Amber Light for Photonic Crystals?

It is possible to tailor and tune the optical properties of photonic crystals (PXs) by controlling the fabrication details of these composite, spatially periodic structures of varying refractive index. The ability to design such optical functionality has raised the possibility of developing low-loss optical networks and devices. However, it is impossible to fabricate a perfect PX—thermodynamics prohibits it. Koenderink and Vos investigated the effect of disorder on the optical properties of PXs. Scattering of photons from defects within the PX leads to the diffuse scattering of transmitted light, even in state-of-the-art PXs. Because this scattering is an intrinsic feature, certain tolerances will need to be met in developing new techniques for PX fabrication if they are to be appropriate for their planned applications. — ISO

Phys. Rev. Lett. **91**, 213902 (2003).

MOLECULAR MEDICINE: On the Way to Breast Cancer

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