

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 $\text{FeO}/\text{Fe}_2\text{O}_3$ 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

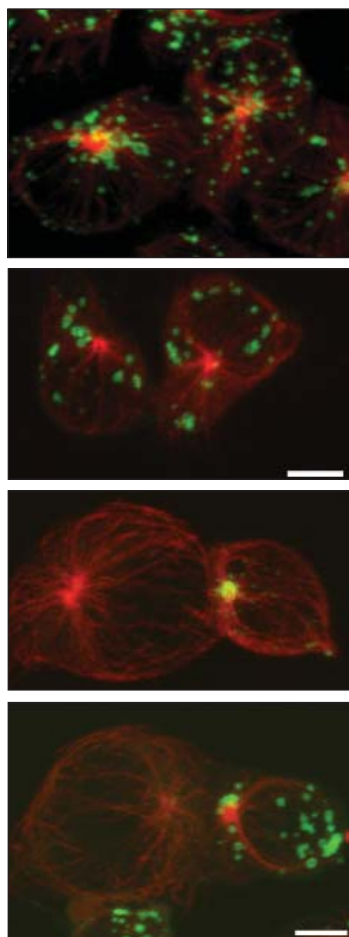
Geochim. Cosmochim. Acta **67**, 4621 (2003).

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—

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.



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

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).