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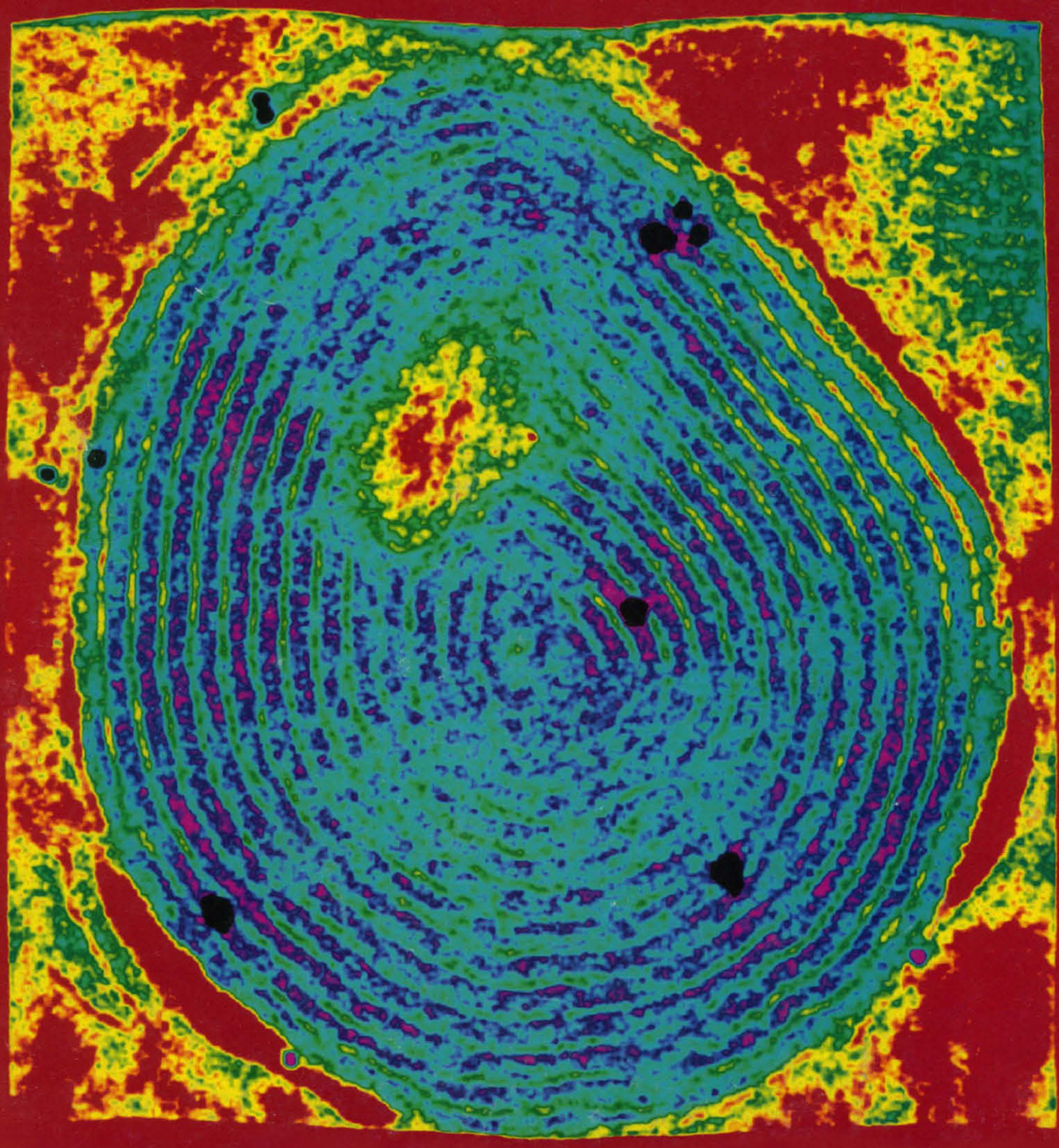

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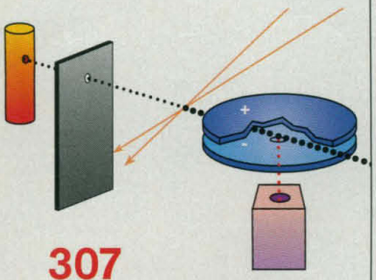

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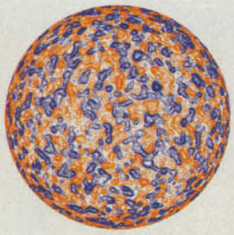

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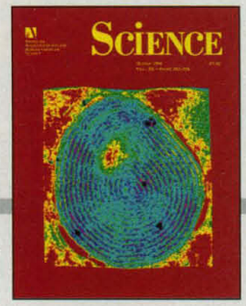
COVER

Endocytic compartment (~600 nanometers in diameter) of a human mononuclear phagocyte revealed by electron microscopy of thin cryosections. Major histocompatibility complex (MHC) class II molecules accumulate in these multilaminar compartments, which may be the major sites where endocytosed protein antigens are encountered. CD1b (smaller, black-stained dots), a non-MHC–encoded molecule that presents bacterial lipid antigens to T cells, also localizes to these compartments. See page 349. [Image: P. J. Peters, E. van Donselaar, M. Sugita, and S. A. Porcelli]



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THIS WEEK IN SCIENCE

edited by BROOKS HANSON

Superconducting gap

The mechanism for high-temperature superconductivity in copper oxides is not understood, nor are the properties of the normal states in these materials. Loeser *et al.* (p. 325) present electron photoemission data that indicate the presence of an energy gap in the normal state of the bismuth-strontium-calcium cuprate compound. As Ong describes in an accompanying Perspective (p. 321), these results may be consistent with a picture in which the singlet spins form pairs prior to the onset of superconductivity.

■

Feeling stressed out

How muscles and various sense organs perceive that they are being stretched or deformed has been poorly understood. Liu *et al.* (p. 361) have now shown that a putative sodium channel found in the worm *Caenorhabditis elegans* may provide the key to mechanosensitivity through an interaction with the extracellular matrix. Anchoring of channels to the extracellular matrix could provide the physical basis by which ions flow, for example, into a stretched muscle and thus stimulate contraction.

■

No longer on the fringe

Two families of secreted proteins—the fibroblast growth factor and transforming growth factor families—have been known to play a key role in the formation of the mesoderm in developing *Xenopus* embryos. Wu *et al.* (p. 355) now identify two additional molecules in a different family of proteins that also can induce mesoderm in early embryos. Named *lunatic Fringe* and *radical Fringe*, these genes are similar to those of the Fringe family in *Drosophila*, which is important in patterning the wing.

■

Planetary potpourri

Four papers in this issue focus on studies of the outer planets and their satellites. Cho and Polvani (p. 335) describe numerical simulations, using a shallow water model, that capture the enigmatic jets and eddies and strongly zonal atmospheric flow of the giant planets. These results are discussed further in a Perspective by Gierasch (p. 320). Kivelson *et al.* (p. 337) describe results from the Galileo probe implying that Jupiter's moon Io has a strong magnetic field, perhaps produced by dynamo action as on Earth and Mercury. These results complement earlier detection, through gravity data, of the presence of a large, presumably iron-rich core in Io (*Science*, 3 May 1996, p. 709). Finally, Noll *et al.* (p. 341) report the detection, using the Hubble Space Telescope, of ozone trapped in the surface ice of Jupiter's moon Ganymede.

Complex optics

Optical elements with complicated structures are often very difficult to fabricate by conventional means. Xia *et al.* (p. 347) report a method for creating patterned optical surfaces that uses an elastomeric master for replica molding. A pattern present on a rigid master is first replicated on the elastomeric surface. This surface is then deformed by compression, bending, or stretching. This deformed pattern is then replicated by application of an ultraviolet or thermally curable organic polymer. The technique allows creation of topologically complex patterned surfaces unavailable by other routes.

■

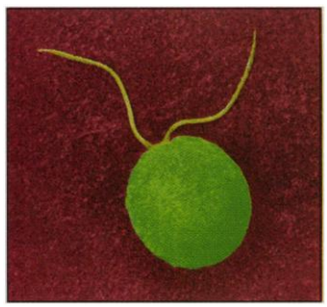
Plants I: Signaling more

Small peptides are known to serve as signals in a variety of physiological processes in animals but as yet are relatively unknown in plants. Van de Sande *et al.* (p. 370) have identified an oligopeptide encoded by one of the plant genes in legumes that responds to nodulation. Investigation of the related gene in tobacco suggests that the oligopeptide alters responses to phytohormones.

■

Plants II: Growing with less

It has long been thought that successful photosynthesis requires the sequential function of two pigment-protein complexes, photosystems I and II, to boost the energy of an electron



using light. Lee *et al.* (p. 364) show that mutants of the alga *Chlamydomonas* lacking photosystem I are able to grow photoautotrophically in an aerobic atmosphere. Thus, in these algae, and perhaps in higher plants, there may be more than one way to harvest the energy of the photon. See also the news story on page 310.

■

Liquid-gas dyanamics

Direct study of gas-liquid interfaces, which are central to many chemical processes, is experimentally very demanding. When a gas molecule hits a liquid surface, several processes can occur, such as scattering, trapping, reaction, or desorption of the molecule. Klassen and Nathanson (p. 333) studied the interaction of monoenergetic beams of formic acid monomers and dimers with sulfuric acid surfaces; they show that inelastic scattering and trapping followed by thermal desorption can be distinguished in time-of-flight spectra of the scattered molecules. Trapped molecules almost always undergo sufficient solvation for protonation and hydrogen bond breaking to occur prior to thermal desorption.

■

Rid-a-pest

Bubonic plague is known to be transmitted by the bite of starved fleas whose foreguts are blocked by a mass of the bacillus *Yersinia pestis*. The molecular and genetic mechanisms in *Y. pestis* that lead to this blockage have been uncertain. Hinnebusch *et al.* (p. 367) show, using *Y. pestis* mutants, that blockage of the fleas' foregut by the bacillus mass is dependent on the presence of the hemin storage (*hms*) locus gene. The mutants in which this gene is knocked out are evidently less cohesive and are efficiently flushed back into the midgut of the flea and not transmitted.

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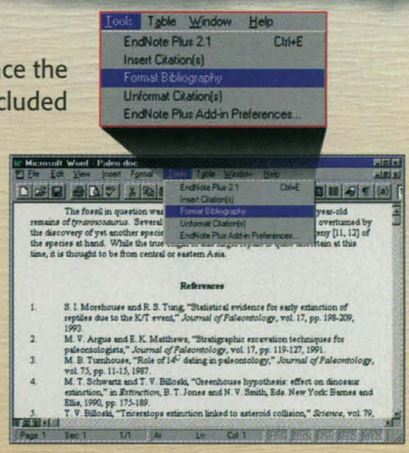

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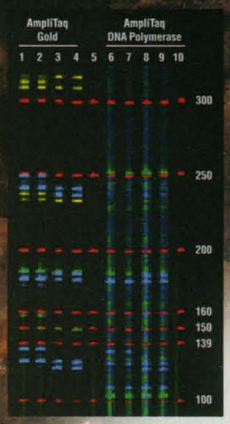

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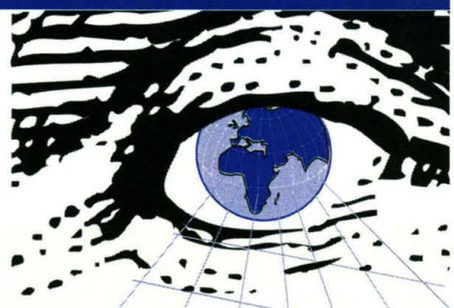

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