



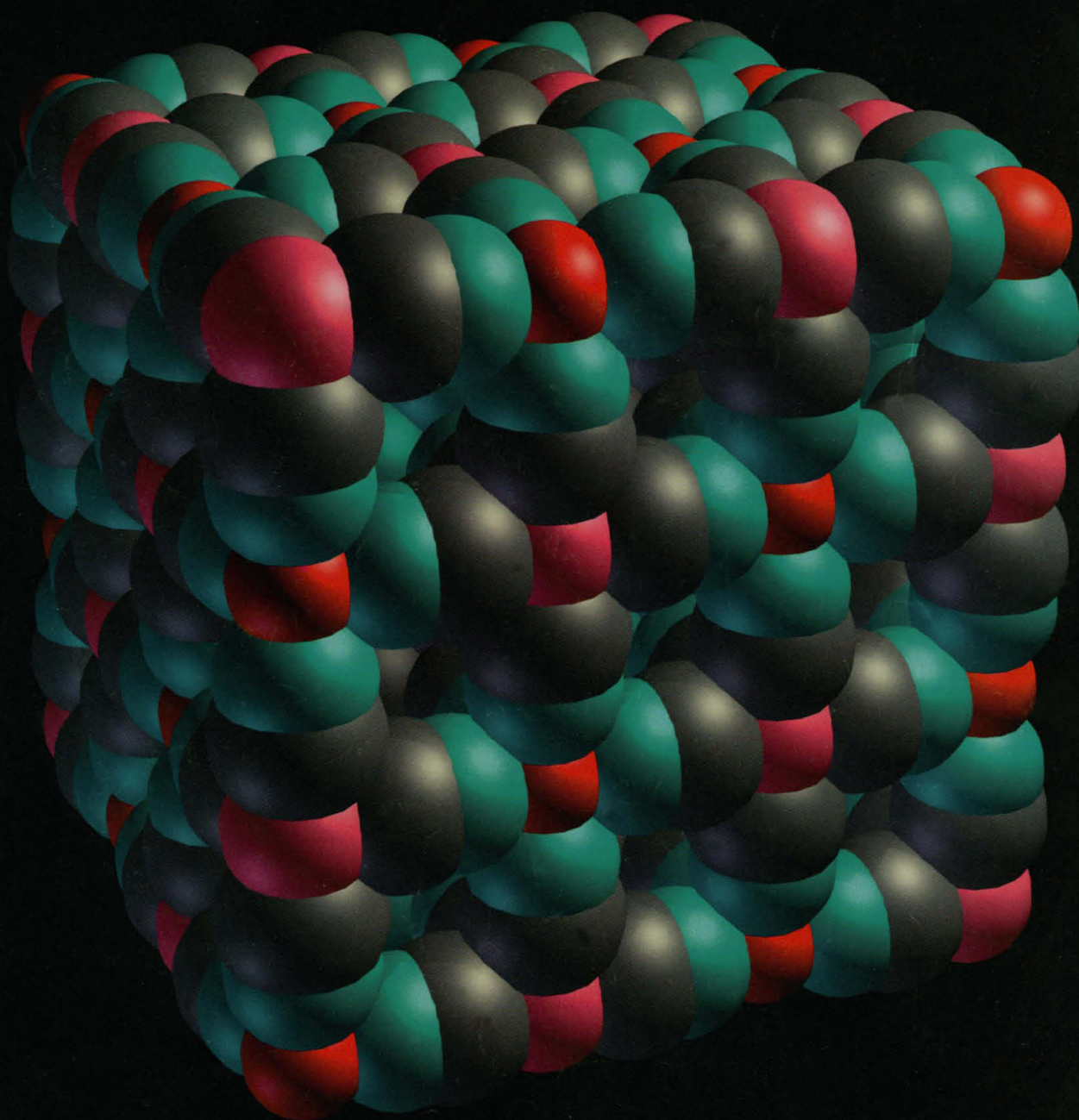
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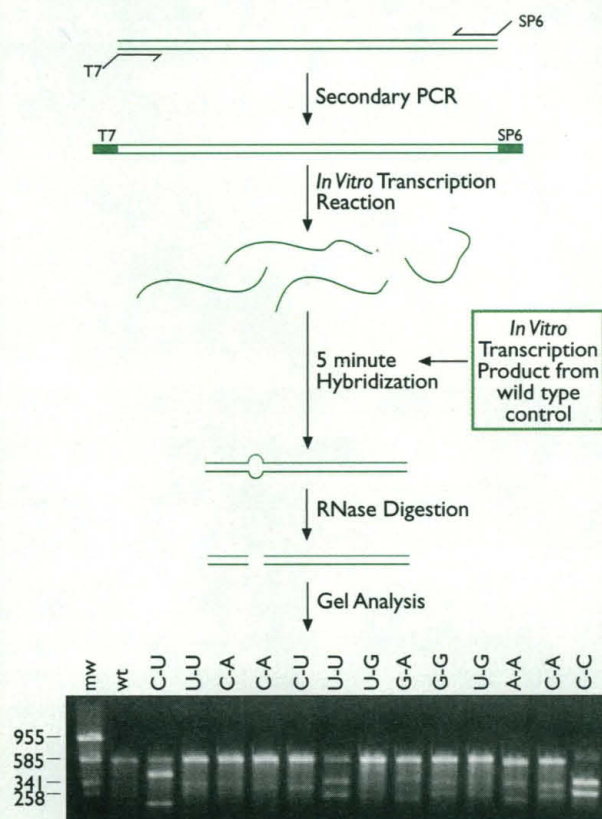
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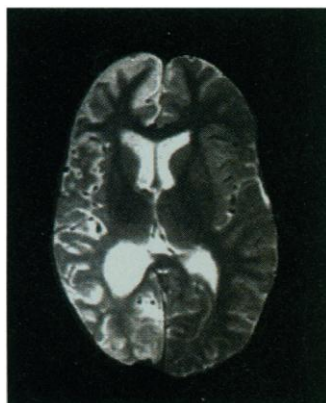
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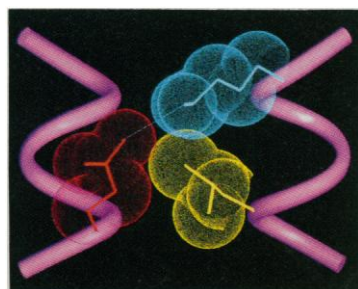
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Space-filling model of the molecular-based magnetic material $\text{Cs}_2\text{Mn}[\text{V}^{\text{II}}(\text{CN})_6]$, which orders ferrimagnetically at 125 kelvin in an external field of 25 gauss. The atoms are described by their van der Waals radii; manganese(II) centers are pink, vanadium(II) centers are red, carbon centers are gray, and nitrogen centers

are blue-green. The cesium cations, which occupy the interiors of every cube, have been omitted. See page 397. [Image: K. Llewellyn, Beckman Institute Visualization Laboratory, and M. Rosenblatt and D. White, University of Illinois at Urbana-Champaign]



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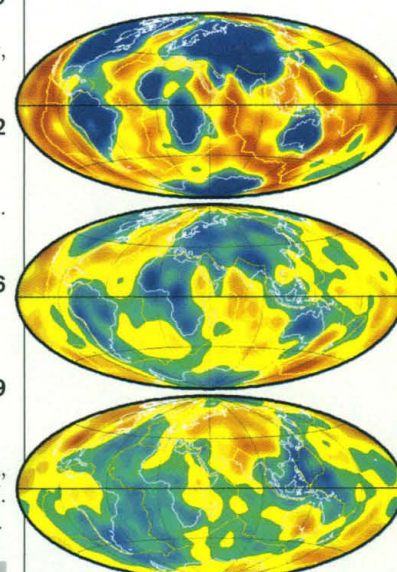
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THIS WEEK IN SCIENCE

edited by DAVID LINDLEY

Silicic cycling

Silicon passes through the world's oceans in a geological-biological cycle. Reviewing global sinks and sources, Tréguer *et al.* (p. 375) find that almost 200 million tons of silicon enter the oceans each year, mainly as silicic acid weathered from rocks and carried by rivers. Dissolved silica is taken up by diatoms, silicoflagellates, and radiolarians, and a few percent of their skeletal material eventually ends up as sediment on the seafloor, whence it returns to the geological half of the cycle.

Trace element

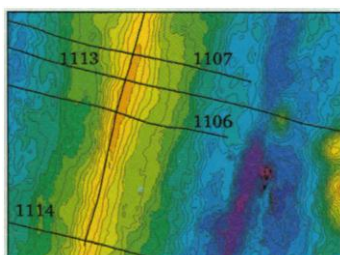
The abundant isotope mercury-199 can be used in nuclear magnetic resonance, but it had been thought that its linewidths would be too broad to provide useful spectra of metal recognition sites in proteins. Utschig *et al.* (p. 380) show, however, that one- and two-dimensional ^{199}Hg spectra can resolve structural aspects of mercury coordination in its main receptor, the MerR protein, in both its uncomplexed and DNA-bound forms. Mercury substitution would allow other metalloproteins, such as zinc finger transcription factors and iron and copper enzymes, to be studied by this method.

Bucking the trend

Seismic imaging by Mutter *et al.* (p. 391) of the East Pacific Rise, a fast-spreading ocean ridge, shows that the underlying magma chamber is broadest where it is shallowest, presumably indicative of a faster spreading rate where there is stronger upwelling. In one spot, however, where observations from a submersible have revealed active

Natural born inhibitors

Natural killer (NK) cells have some receptors that activate cytotoxic activity and others, which bind to major histocompatibility (MHC) class I molecules, that inhibit cytotoxicity. Colonna and Samaridis (p. 405) found four related complementary DNAs (cDNAs) in NK cells that encode transmembrane proteins of the immunoglobulin superfamily. Correlation between these proteins and the inhibition of NK cells by different class I molecules suggests that the cDNAs might encode the corresponding receptors. The potential importance of MHC-reactive inhibitory receptors is demonstrated by Phillips *et al.* (p. 403), who have identified, on $\text{TCR}\alpha\beta^+$ cytotoxic T cell clones, a receptor that inhibits cytotoxicity against targets cells coated with a superantigen. Again, the target cells must also carry certain MHC molecules. How these inhibitory signals are collated with the activating ones will become a major focus of research (see also news by Barinaga, p. 367).



volcanism, the linear inverse trend between depth and width fails to hold, suggesting that departures from the general trend are diagnostic of current magmatic activity.

Spinning and rolling

Organically doped fullerenes have interesting and potentially useful magnetic properties, and the rotational freedom of each buckyball leads to unusual orientational ordering effects. Mihailovic *et al.* (p. 400) have uncovered a connection between the two phenomena: spin-ordering in the low temperature phase of C_{60} doped with tetrakis(dimethylamino)ethylene seems to be directly linked to the orientational ordering, and the link perhaps constitutes the microscopic mechanism that causes spin glass behavior of the magnetic material.

Lactose tolerance

The neo-Darwinian premise that mutations occur spontaneously without regard to fitness has been seriously challenged by the phenomenon of adaptive or directed mutation. Two reports (Radicella *et al.*, p. 418; Galitski and Roth, p. 421; see also Perspective by Shapiro, p. 373) examine an adaptive mutation that leads to reversion of a lactose-utilization deficiency in a strain of *Escherichia coli* when lactose is the only source of carbon. The RecA and RecBCD homologous recombination functions are known to be necessary for adaptive mutation, and both reports now show that functions associated with plasmid transfer are also involved. The results of Radicella *et al.* suggest that the act of transfer (conjugation) is necessary.

SUR feat

The molecular target of sulfonylureas, which release insulin from cells of the pancreas and are used to treat patients with non-insulin-dependent diabetes mellitus, has now been identified. Aguilar-Bryan *et al.* (p. 423) have cloned the sulfo-

nylurea receptor (SUR) from hamster, and find that it belongs to a family of proteins that contain adenosine triphosphate (ATP)-binding cassettes. Thomas *et al.* (p. 426) provide evidence that mutations in the SUR cause inappropriate insulin secretion and hypoglycemia in a disease known as familial persistent hyperinsulinemic hypoglycemia. Philipson and Steiner discuss these findings in a Perspective (p. 372).

Tagged by Tat

Infection by human immunodeficiency virus is accompanied by a progressive depletion of CD4^+ T cells, leading to deterioration of immune function. Loss of these T cells is thought to occur through apoptosis, or programmed cell death, but the precise role of the virus in this process is unknown. Cell culture studies by Li *et al.* (p. 429) show that the virally encoded Tat protein, known as a key regulator of viral gene expression, may be a molecular trigger for T cell apoptosis. Tat-induced apoptosis shares features with other forms of apoptosis, including an association with activation of cyclin-dependent kinases.

Bad connection

Some transcription factors bind to DNA as homo- or heterodimers by means of a dimerization region constructed of coiled helices. It has been thought, on the basis of crystal structures, that electrostatic interactions between side chains of opposite charge favor the formation of dimers, but Lumb and Kim (p. 436) demonstrate that these electrostatic interactions are neutral or actually unfavorable for proteins in solution.



Did she just say 'Big Bang' or 'Big Bird'?

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