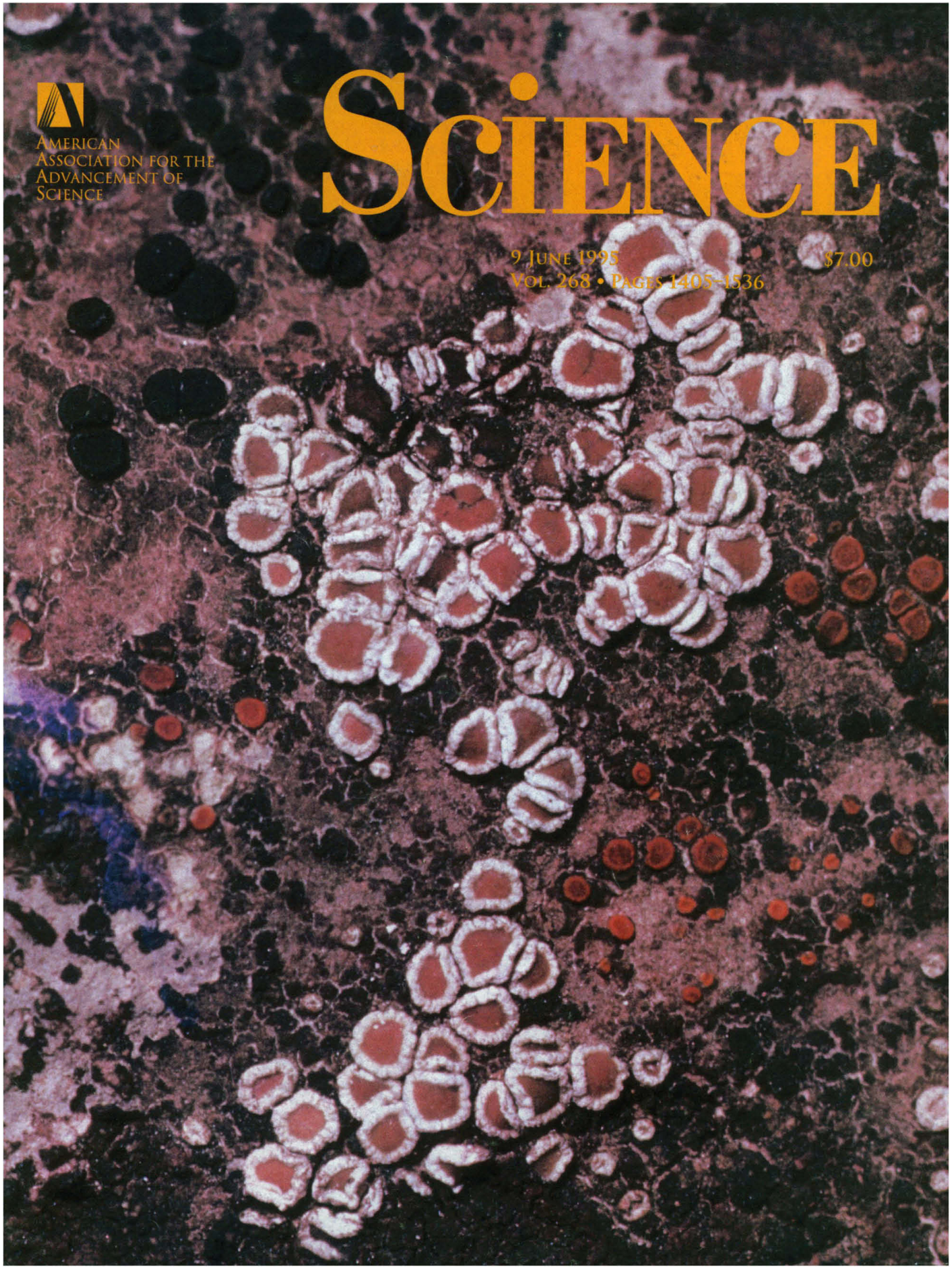

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9 June 1995 $7.00
Vol. 268 • Pages 1405–1536

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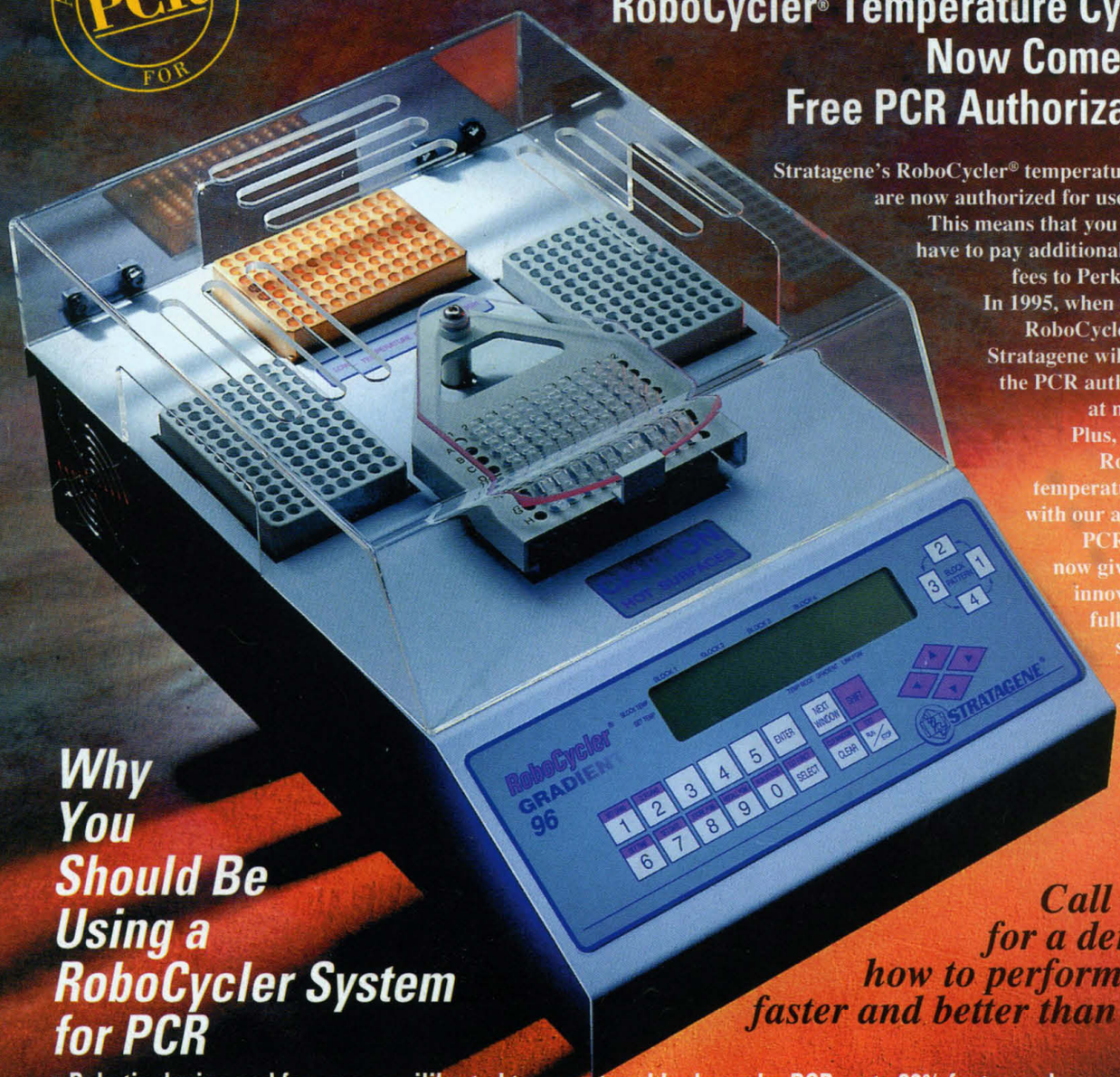

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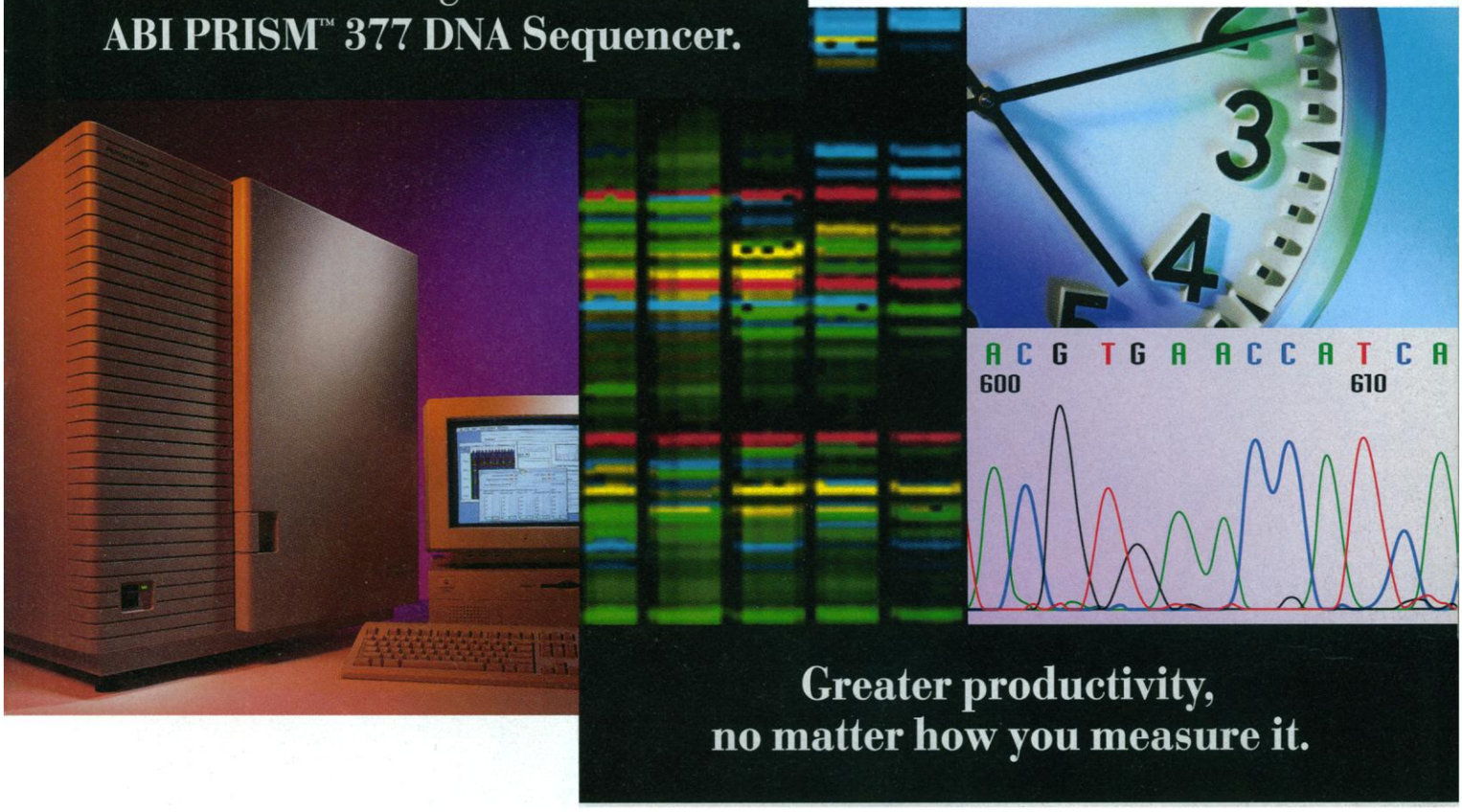

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References

1. Fodde, R., and Loosekoot, M., *Human Mutation*, **3**, 83, (1994).
2. Fischer, S.G. and Lerman, L.S., *Proc. Natl. Acad. Sci., U.S.A.*, **80**, 1579 (1983).
3. Borresen, A. L., *et al., Proc. Natl. Acad. Sci., U.S.A.*, **88**, 8405 (1991).

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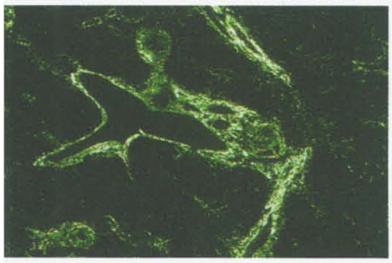
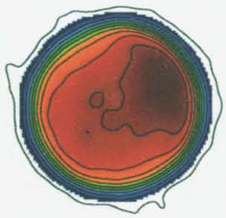


1432
A cytokine's remarkable powers



1455
Brightening Mercury's surface

NEWS & COMMENT

RESEARCH NEWS

PERSPECTIVES

ARTICLE

RESEARCH ARTICLE

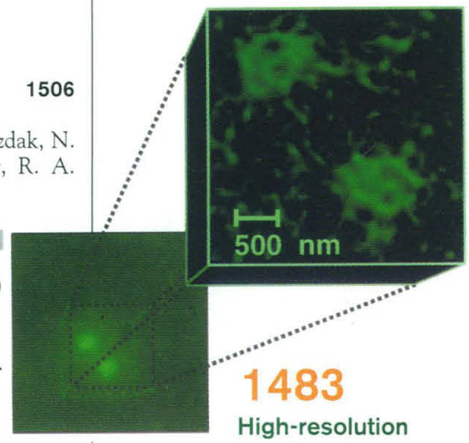
REPORTS

DEPARTMENTS

COVER

The crustose lichen *Lecanora dispersa*. Lichen symbioses, associations between fungi and algae, have originated multiple times during fungal evolution. At least one successful establishment of symbiosis led to the more than 6000 species of the order Lecanorales, represented here by *L. dispersa*. The white-rimmed cups (between 0.3 and 0.7 millimeter in diameter) emerging from the rock substrate produce the meiotic spores of this fungal symbiont. See page 1492 and the News story on page 1437. [Photo: V. Wirth]

TECHNICAL COMMENTS



1483
High-resolution imaging of cellular structure

◩ Indicates accompanying feature

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THIS WEEK IN SCIENCE

edited by DAVID LINDLEY

Keeping warm

Mercury has a weak magnetic field, presumably generated by dynamo action in a partly molten interior, but some models indicate that heat loss from the core by convection and volcanism should have frozen out the interior long ago. Jeanloz *et al.* (p. 1455) use microwave and infrared observations to infer that Mercury's surface is free of magmatic basalts, suggesting that, like the moon, Mercury is an inactive "one-plate" planet with inefficient heat transfer. A hot core can then have survived to the present day despite the planet's small size.

One molecule at a time

Many kinds of spectroscopies, notably optical techniques, are at the point where single atoms or molecules can be detected. Köhler *et al.* (p. 1457) now report electron paramagnetic resonance spectroscopy of a single organic molecule. Pentacene, dissolved in a *p*-terphenyl host crystal and cooled to 1.2 kelvins, was examined by fluorescence-detected magnetic resonance. Molecules kept in triplet states by a microwave field are revealed by a decrease in fluorescence. Tuning the microwave frequency makes it possible to map out the magnetic resonance transitions in the triplet states for very dilute pentacene, down to the level of individual molecules. Substitution of a carbon-13 nucleus in the pentacene gave rise to hyperfine splitting.

Double duty

Nanoscale metal clusters have potential applications in optics and electronics, but once formed they tend to have a high affinity for one another. Golden *et al.* (p. 1463) describe a strategy for preventing aggregation. They were able to disperse 1-nanometer hexamolybdenum clusters uniformly in a polymer host because the monomer that formed the polymer was also used as a ligand in the cluster, ensuring its solubility.

Testing the boundary

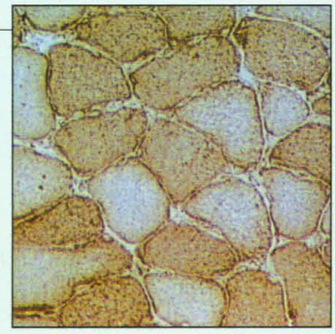
The Lehmann discontinuity is a postulated boundary, occurring globally at a depth of about 220 kilometers, to the low-velocity zone defined by seismic wave propagation. But its physical nature has been controversial, and the discontinuity fails to appear consistently in all seismic data. Gaherty and Jordan (p. 1468) have inverted seismic wave data from the western Pacific and Australia to discriminate between different models of the discontinuity, and conclude that it is best explained, at least beneath stable continents, as a transition from anisotropic to isotropic mineralogical structure.

Purple probed

The multiple oxidation states of transition metals and their coordination geometries are important to their versatility as catalytic centers. Metalloenzymes exploit these properties in the orientation and activation of substrates and active site groups. Sträter *et al.* (p. 1489) present the high-resolution structure of a purple acid phosphatase (PAP) that utilizes zinc and iron to effect phosphate ester hydrolysis. Unlike other proteins that use a dimetal center to activate dioxygen, the zinc and iron atoms combine to activate the attacking hydroxyl group in PAP.

Building up the nerves . . .

In comparison to the other three proteins of the neurotrophin group, neurotrophin-4 (NT-4) seems to maintain a more active role in the maintenance of adult vertebrate neuromusculature. Funakoshi *et al.* (p. 1495) showed that levels of NT-4 messenger RNA rose markedly a few hours after electrical muscle stimulation in rats, falling back to normal levels after 48 hours, and that the NT-4 expression was concentrated in type 1 "slow-twitch" muscle fibers, whose numbers are known to be increased by repeated exercise. Direct application of NT-4 to muscle fibers promoted sprouting of motor neurons, suggesting that the activity-dependent expression of NT-4 underlies the stimulation of neuromusculature through exercise.



. . . and restoring them

Axons in mouse sciatic nerve can regenerate and become myelinated following damage by cryolesion. Koenig *et al.* (p. 1500) demonstrate the involvement of progesterone in this process, both in vivo and in vitro. Progesterone is synthesized by Schwann cells, and its presence enhances myelin formation: Adding a progesterone inhibitor or blocking its synthesis obstructed the myelin repair process. These findings may aid the development of new therapies for diseases whose effects are due to myelin destruction.

Catnap chemical

The cerebrospinal fluid of sleep-deprived cats contains a molecule identified by Cravatt *et al.* (p. 1506) as the fatty acid *cis*-9,10-octadecenoamide. This and related compounds constitute a previously unrecognized class of brain lipids. Intraperitoneal injection of *cis*-9,10-octadecenoamide into rats in excess of a threshold of about 2 milligrams induced an apparently normal state of sleep; the *trans* version of the fatty acid and other slightly altered molecules had less or no effect, suggesting that the *cis* molecule has a specific, although as yet undefined, soporific action.

Not a minor problem

In graft versus host (GVH) disease that can follow bone marrow transplantation, donor bone marrow cells attack the host. Cytotoxic T lymphocytes (CTLs) target the recipient's minor histocompatibility antigens (mHags), even though the major human leukocyte antigens (HLAs) have been matched with the donor's. Starting with CTL clones derived from an HLA-matched patient with severe GVH disease, den Haan *et al.* (p. 1476) have identified the peptide corresponding to HA-2, one of a number of mHags implicated in GVH reactions. HA-2 appears with high frequency in those with the HLA make-up of this patient, making it a plausible target for therapeutic strategies against GVH disease.

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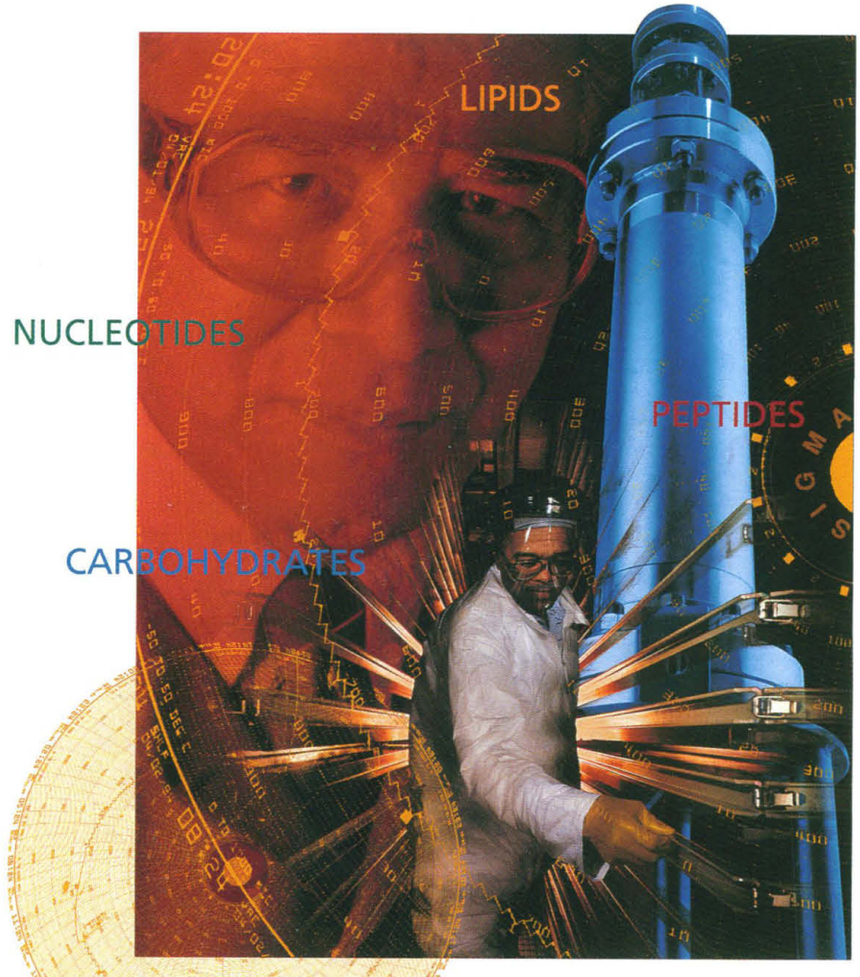

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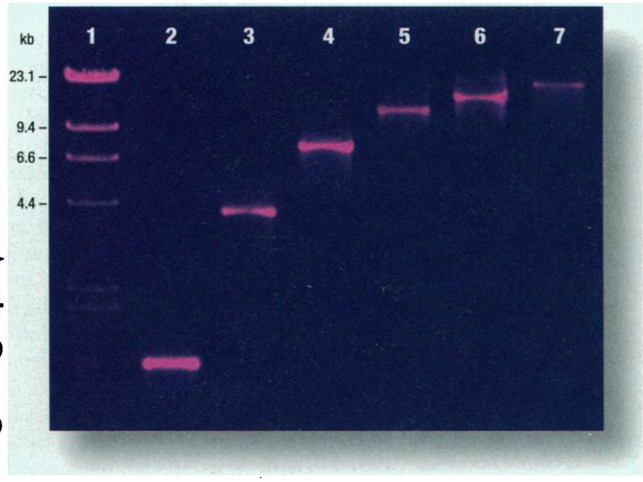

choose the best way to get there.

Human Genomic DNA K562 DNA (100 ng) was amplified with ELONGASE Reagent for 35 cycles in a 50 µl volume. Lane 1 is lambda DNA/Hind III Fragments. Lanes 2-4 are amplifications of 1.3 kb, 4.1 kb and 7.5 kb β-globin targets, respectively. Lane 5 is an amplification of a 12.4 kb serum albumin target. Lanes 6 and 7 are amplifications of 15.1 kb and 20 kb Factor IX targets, respectively. Sample loads range from 4-10 µl.

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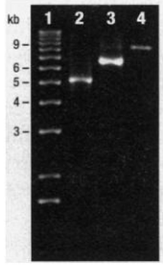

RT-PCR cDNA was synthesized from HeLa RNA (500 µg) with the SUPERSCRIPT™ Preamplification System using oligo dT. A portion of the reaction was amplified with ELONGASE Reagent. Lane 1 is the 1 Kb DNA Ladder. Lanes 2-4, respectively, are amplifications of 5.3 kb tuberous sclerosis II, 6.8 kb DNA polymerase ε and 8.9 kb adenomatous polyposis coli full length cDNAs.

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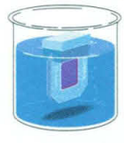

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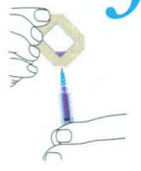

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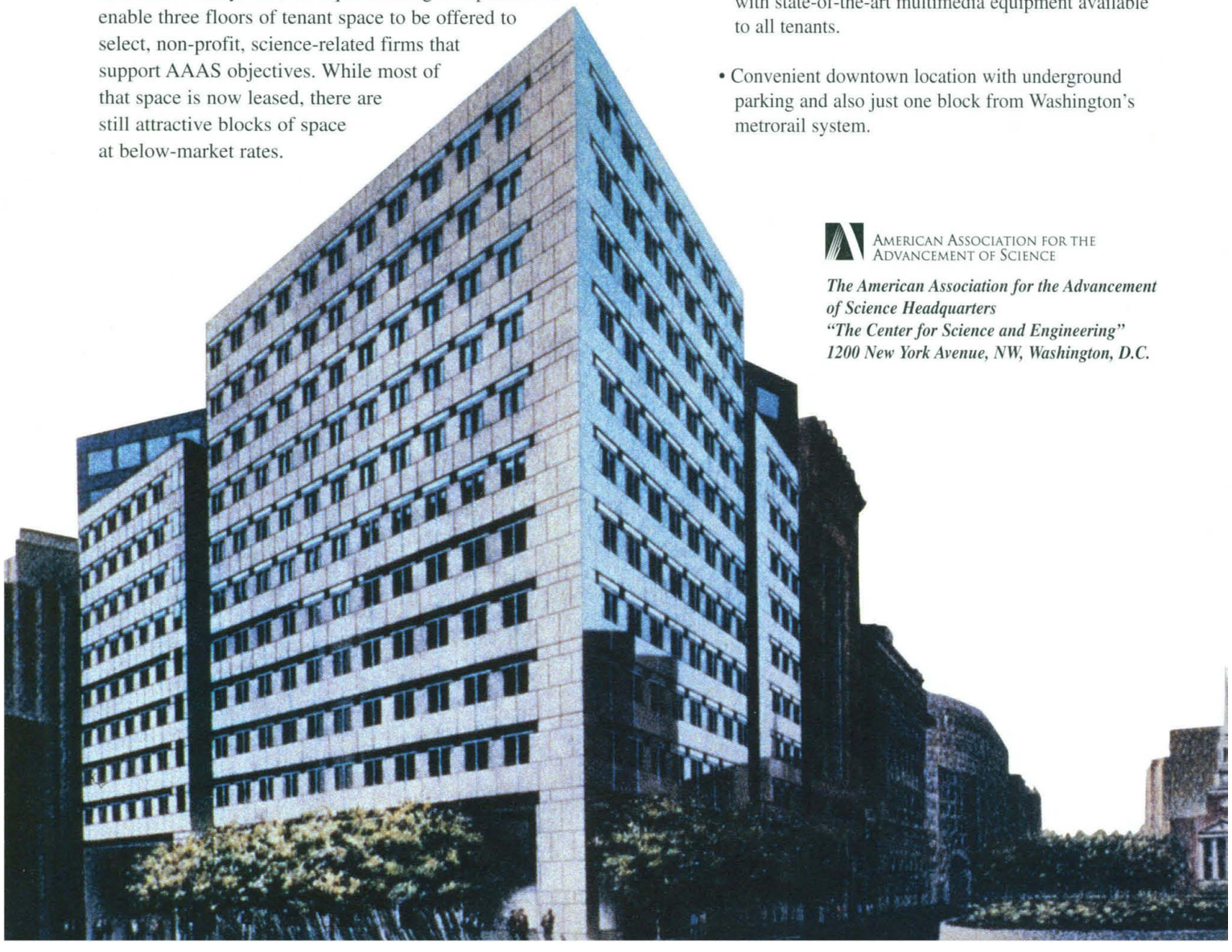

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