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31 MAY 1996
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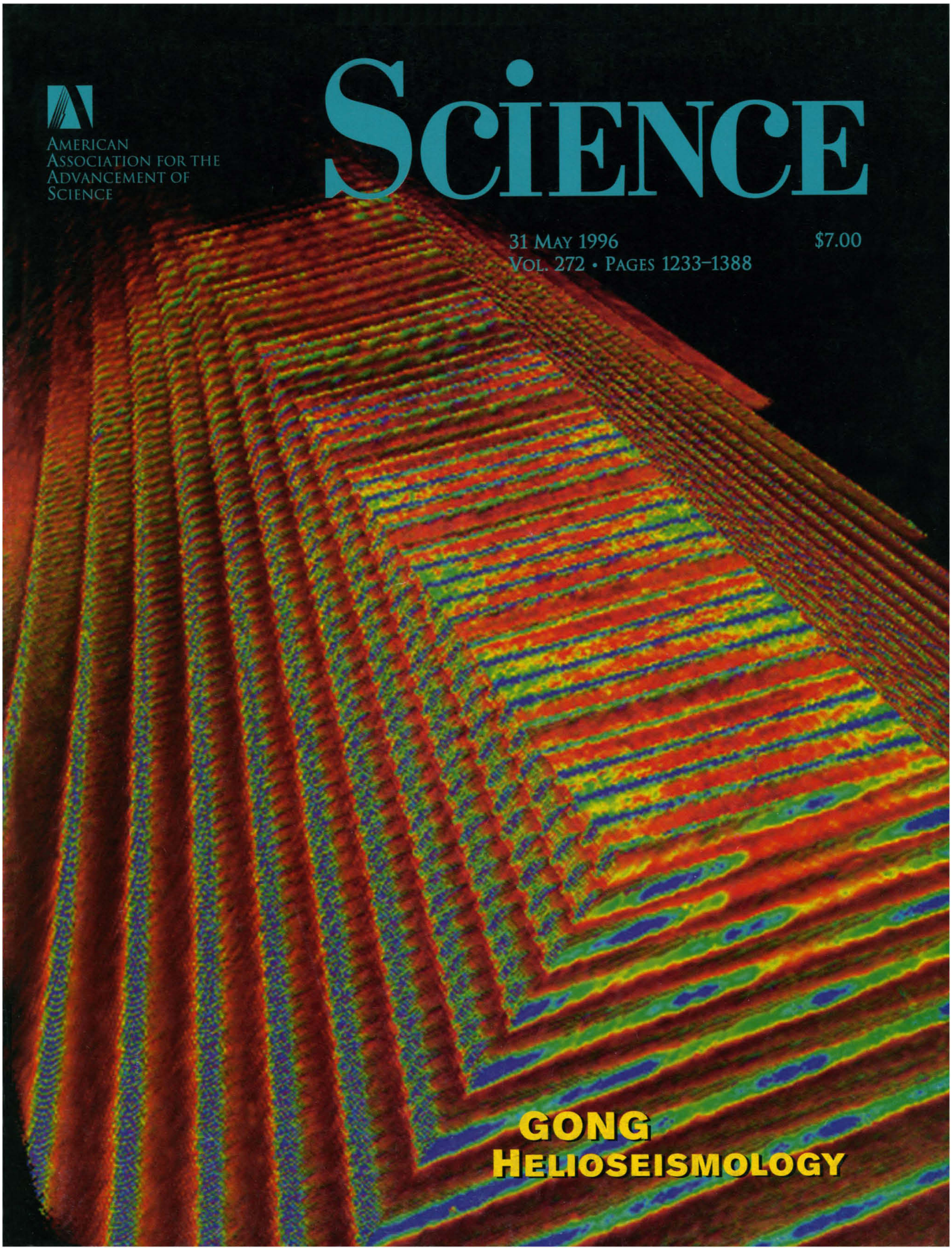

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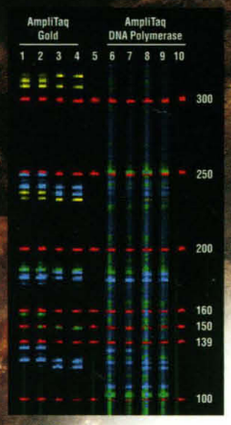

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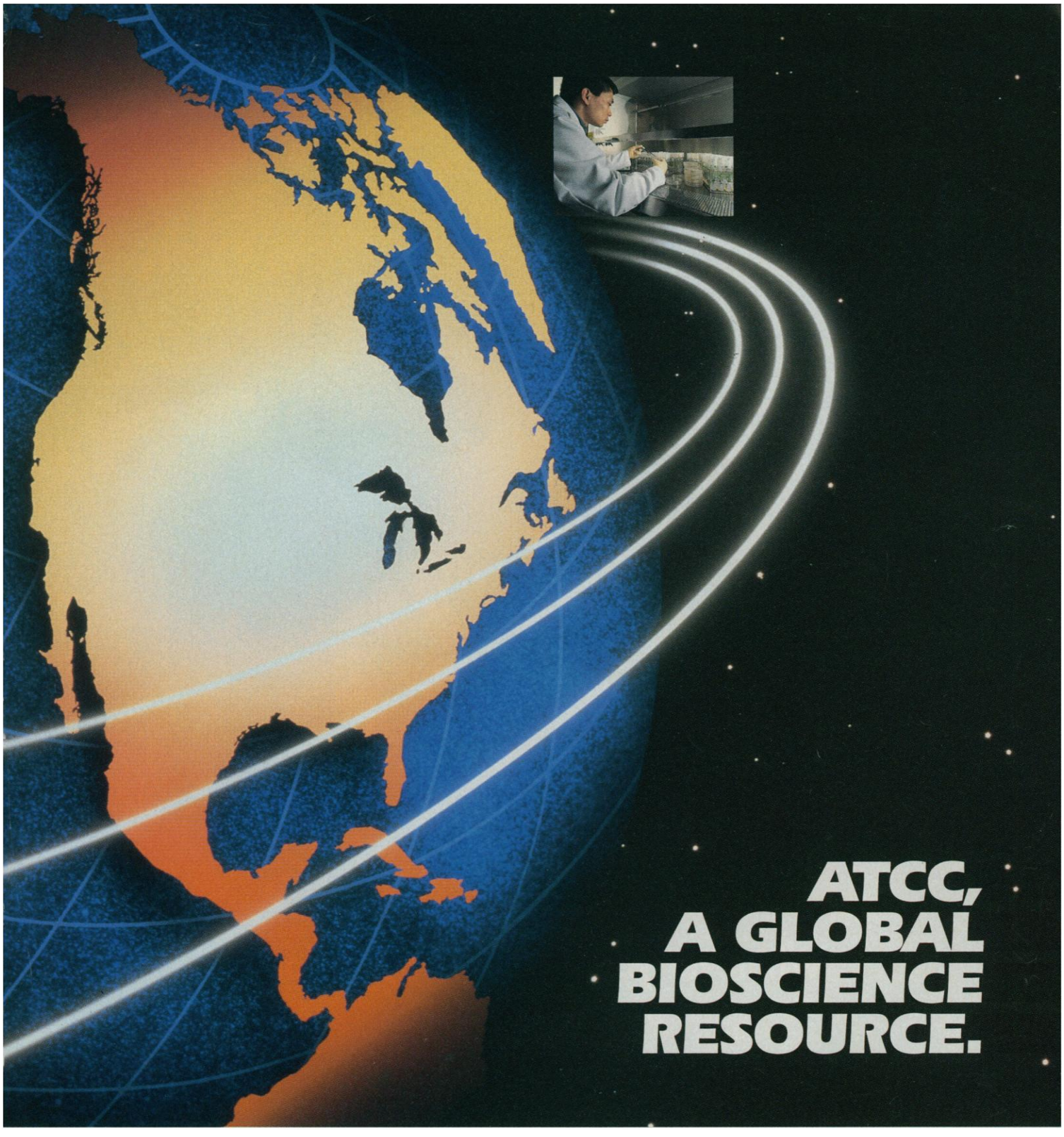

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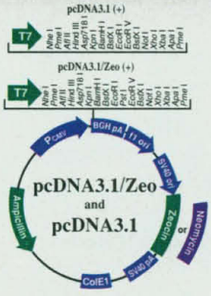

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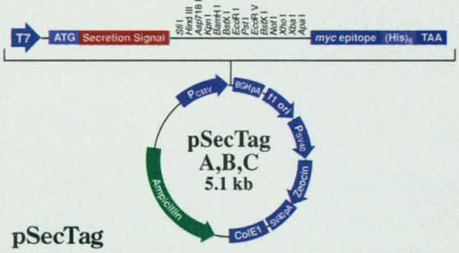

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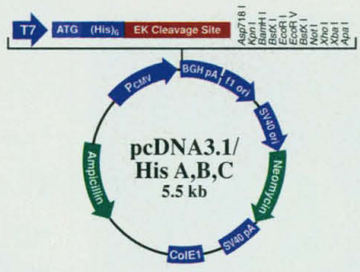

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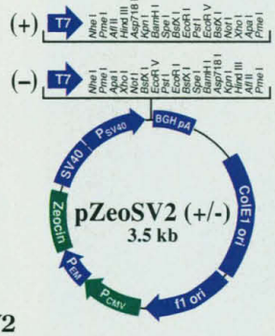

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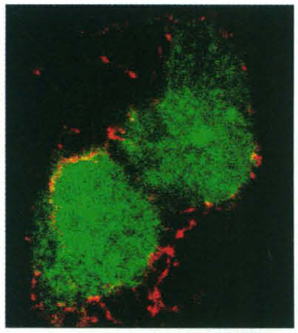


1261
Bacterial warfare

1343
RNA and the urea cycle

NEWS & COMMENT

RESEARCH NEWS

PERSPECTIVES

GONG HELIOSEISMOLOGY

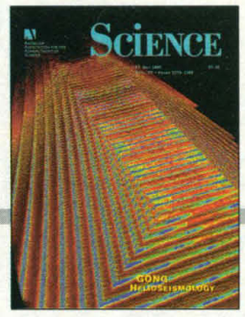
ARTICLES

REPORTS

DEPARTMENTS

COVER

Three-dimensional power spectrum of solar oscillations from observations by the Global Oscillation Network Group (GONG). These data are for sound waves with 30 to 150 wavelengths around the sun of varying latitudinal extent and periods of 4 to 12 minutes. Greater power is denoted by blue-green tones. The curved sheets represent distinct radial overtones of the oscillations. See the special section on helioseismology (pages 1281–1309) and a News story (page 1264). (GONG is an international project supported by the National Science Foundation.) [Image: N. Brummell and D. Haber]



TECHNICAL COMMENTS

A. Milani *et al.*

1263 & 1310
Hydrocarbons detected in Hyakutake

◩ Indicates accompanying feature

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THE MJ RESEARCH NOTEBOOK

Volume VI...No. 1b *A Bulletin of Technological Advance in Molecular Biology* *Spring 1996*

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Perhaps the most advanced feature of the DNA Engine line (i.e. the PTC-200 & 225) is the sophisticated networking software that is exclusive to MJ RESEARCH. Not only does the software offer three methods of thermal control, improved editing and filing features, and multi-tasking capability—it also allows up to 15 cyclers to operate on a single, computerized network. Full control can be effected by a computer through either a RS-232 or an IEEE-488 port, or the individual blocks can be programmed or controlled through use of a keypad and the LCD/LED displays on the cycler itself.

"What About the 384-Well Format?" Ask Scientists in the Human Genome Community

The Quest for Colossal Capacity

Now that thermal-cycle sequencing of M13 templates seems to have become the sequencing method of choice for the Human Genome Project (*Science* **267**, 783-4; *Nature* **375**, 93-4), investigators are faced with the engineering chore of scaling up equipment. Three billion bases in human DNA need decoding, and the older standard format of disposable vessel—96-well plates—is generally too small for this sort of large-scale investigation.

V-wells on 4.5mm centers *(actual size)*

Thus, a new 384-well format is in development. It shares the same basic V-well shape as the 0.2ml 96-well format, but density has been multiplied 4X by decreasing well-to-well distance from 9 to 4.5mm. This allows the use of the same multi-channel pipettors and automated dispensers as with the 96-well format; alternate wells are accessed in a back-and-forth fashion. MJ RESEARCH is working with others to develop disposables, and although vessels are not yet available, 384-well Alphas for PTC-200 & 225 cyclers can be ordered. Reactions must now be conducted in 96-well plates; these vessels fit the 384 block adequately, but useful reaction volume is decreased to 20µl per well.

THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Against the grains

Carbonaceous chondrites contain refractory aggregates of calcium-aluminum–rich inclusions that are thought to represent some of the earliest condensation products from the solar nebula. Greshake (p. 1316) found nanometer-sized oxide phases of MgO, TiO_2, CaO, and Al_2O_3 within and between grains of these refractory aggregates. These oxides may represent primary condensates, an origin that seems to require a more complicated early evolution for these inclusions.

■

Coulomb steps

Nanometer-sized metal particles can have electronic energy levels that more resemble the discrete states of atoms than the bands of bulk crystals. Devices can in principle be constructed that use these levels to control electron tunneling currents through barriers, thus providing a scheme for switching. In a step toward such a goal, Andres *et al.* (p. 1323) have built a nanostructure that exhibits "Coulomb staircase" behavior at room temperature. Gold nanoparticles are held on a gold surface by a self-assembled monolayer of alkane dithiols, which form a tunneling barrier. A scanning tunneling microscope tip provides the current source and the other tunneling barrier.

■

A welcome decline

The production of halocarbons, the main culprits in stratospheric ozone destruction, has been restricted by the Montreal Protocol and its adjustments and amendments, but much uncertainty surrounds their effectiveness. Montzka *et al.* (p. 1318) present evidence for an overall decline in the tropospheric abundance of halogen attributable to anthropogenic halocarbons by mid-1995, with chlorine declining since 1994 but bromine still increasing. These data suggest that if current trends continue, the abundance of reactive halogen in the stratosphere will peak between 1997 and 1999 and decline thereafter, and the ozone layer may begin to recover by the turn of the century.

Abundant ethane in comet Hyakutake

As comet C/1996 B2 Hyakutake made its closest approach to Earth, Mumma *et al.* (p. 1310; see the news story by Peterson, p. 1263) used the NASA Infrared Telescope to measure the volatiles sublimating from the cometary nucleus. High-resolution infrared spectroscopy focused on the water, carbon monoxide, and methane bands, but surprisingly ethane was also detected with an abundance just over half that of methane. The rare detection of relatively abundant ethane suggests that Hyakutake may have evolved through more complex interstellar ice processes.

■

More potent pollen

Cytoplasmic male sterility in plants results from mutation of a widely expressed gene encoded by the mitochondrion.

The pollen is particularly affected. Fertility can be restored by the combination of two nuclear-encoded genes. In cloning one of these genes from maize, *rf2*, Cui *et al.* (p. 1334; see the Perspective by Levings, p. 1279) show that it resembles an aldehyde dehydrogenase. The proposed function suggests certain insights into the metabolism of developing pollen.

Ties that unbind

Multiple families of transcription factors, such as the helix-loop-helix (HLH) proteins and the nuclear hormone receptor superfamily, function as homo- or heterodimers. The Id proteins, members of the HLH family, inhibit the function of a subset of HLH proteins when they heterodimerize with them because they lack a region necessary for DNA binding. Seol *et al.* (p. 1336) found a somewhat analogous inhibitor for some members of the nuclear hormone receptor superfamily. SHP (small heterodimer partner) lacks a DNA binding domain and inhibits the activity of retinoid receptors and thyroid hormone receptor when it heterodimerizes with them.

■

Kidney disease genes

Autosomal dominant polycystic kidney disease (ADPKD) affects 1 in 1000 individuals. Renal cysts develop that can lead to chronic renal failure. The *PKD1* gene, which accounts for about 85% of ADPKD cases, codes for a 4304-residue protein with a large extracellular domain and other motifs that suggest a role in cell-cell signaling. Mochizuki *et al.* (p. 1339) identified a second gene, *PKD2*, that accounts for the remaining cases of ADPKD. PKD2 is an integral membrane protein with sequence similarity to PKD1, but is significantly smaller (968 amino acids), lacks cell-cell signaling domains, and has similarity to voltage-activated calcium and sodium channels. PKD1 and PKD2 may function in the same signaling pathway.

■

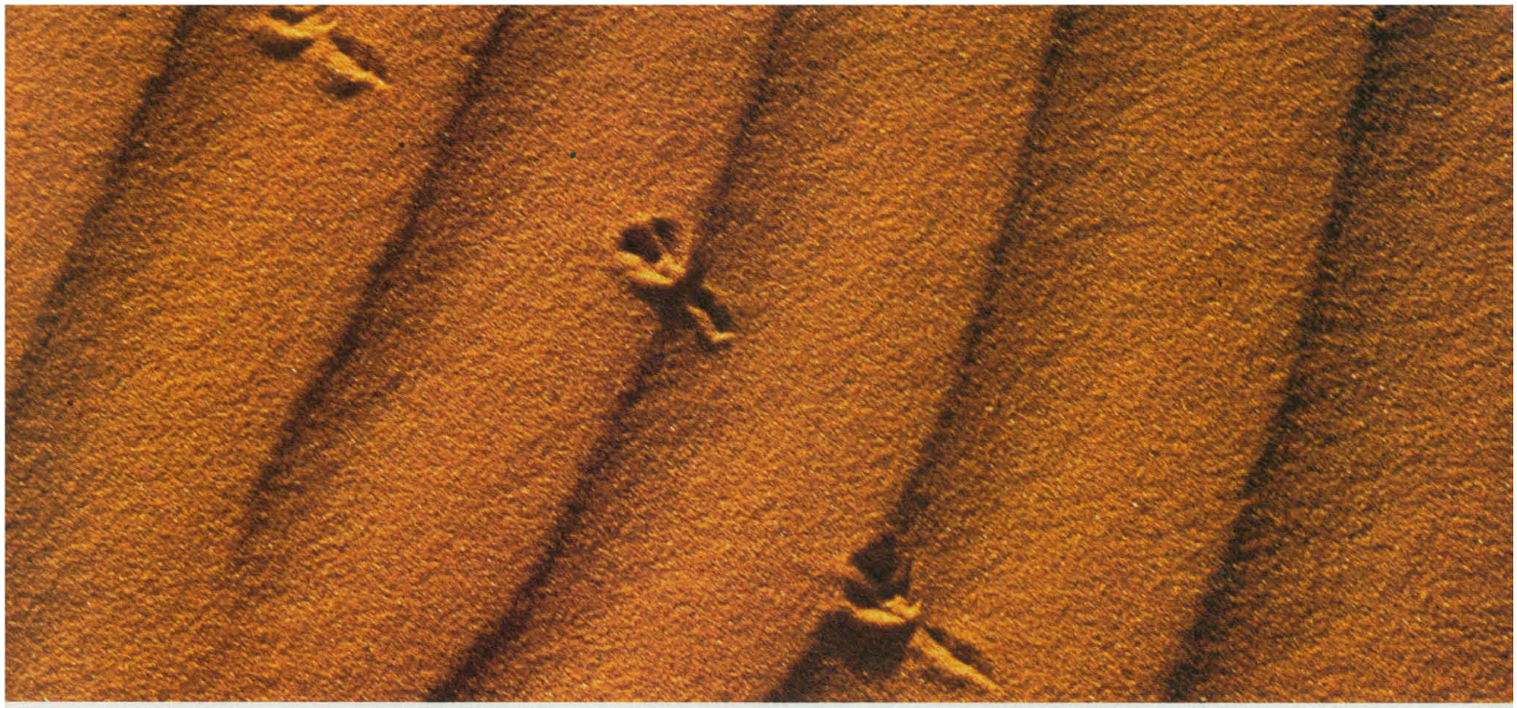
All wrapped up

In vitro selection methods have been used to obtain RNA molecules, or aptamers, that can recognize small molecules such as amino acids. Yang *et al.* (p. 1343) used nuclear magnetic resonance to determine the three-dimensional structure of two RNA aptamers that differ at only 3 out of 44 positions but that can differentiate between two similar amino acids, citrulline and arginine. The amino acids are an integral part of the structure and are held in a deep binding pocket through hydrogen bonds and nonpolar interactions, rather than by binding at the surface of the RNA.

■

Stress stimulation

Many metabolic stresses on cells induce the activation of a signaling pathway that results in activation of the mitogen-activated protein (MAP) kinase family member called p38. Wang and Ron (p. 1347) describe a mechanism by which stress-induced activation of p38 MAP kinase may influence cellular growth and differentiation. The p38 MAP kinase phosphorylates and increases the activity of the transcription factor CHOP. CHOP, in turn, influences the activity of members of the C/EBP family of transcription factors, which regulate expression of genes that influence growth and differentiation of some cell types.



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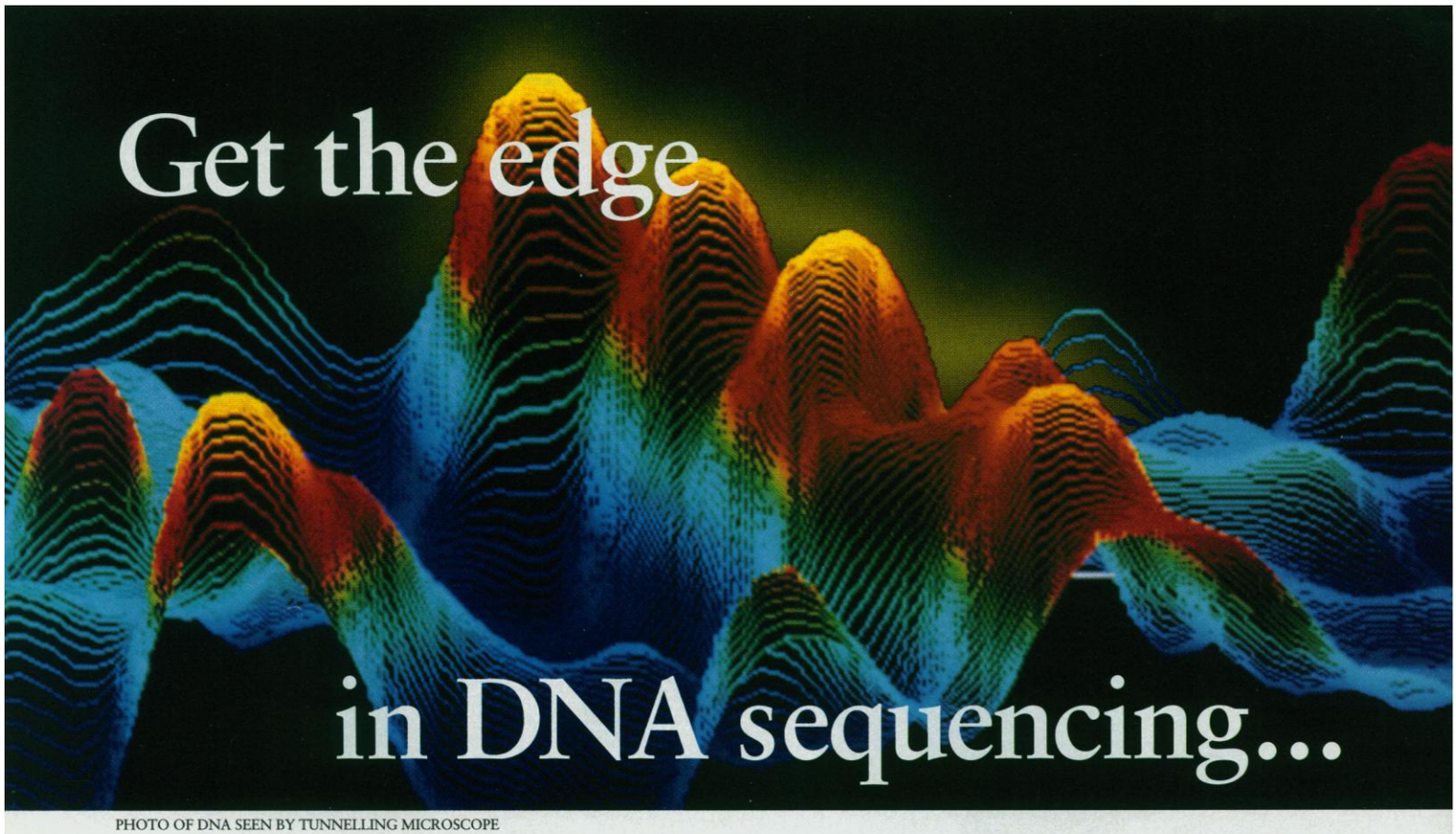

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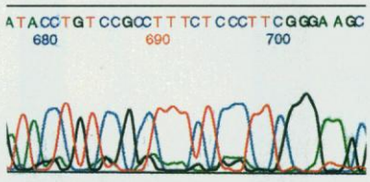

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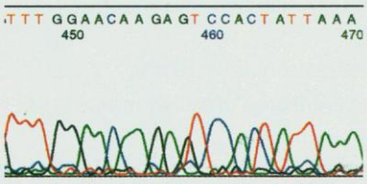

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2. *Proc. Natl. Acad. Sci., USA,* 92, pp. 4347-4351, (1995).

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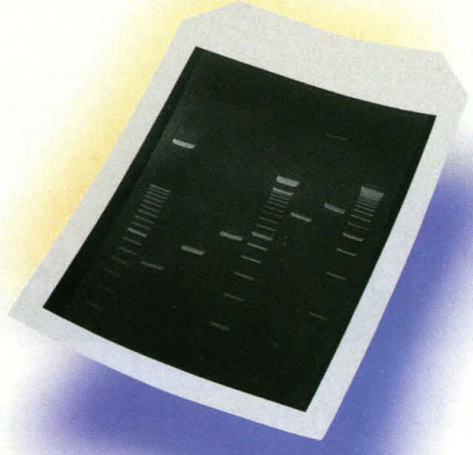

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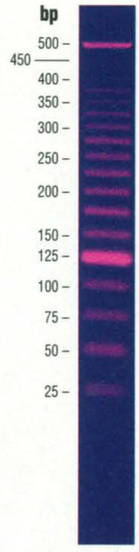

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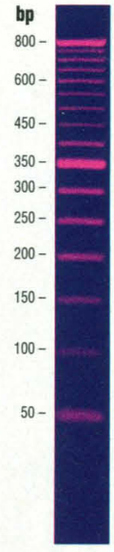

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600 ng/lane; 2% SEPARIDE™ in 1X TAE stained with ethidium bromide.

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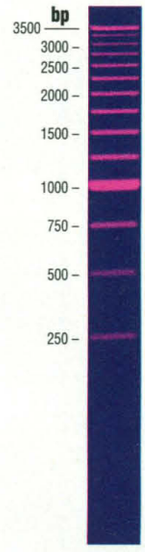
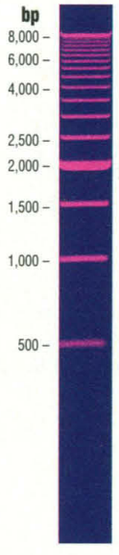


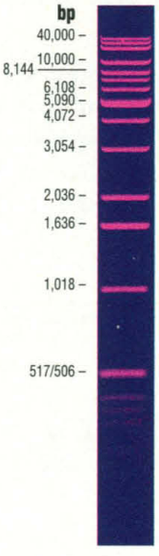
250 bp DNA Ladder
Cat. No. 10596-013 75 µg $84
1µg/lane; 1% agarose in 1X TAE stained with ethidium bromide.

NEW!



500 bp DNA Ladder
Cat. No. 10594-018 100 µg $84
750 ng/lane; 1% agarose in 1X TAE stained with ethidium bromide.

NEW!



1 Kb DNA Extension Ladder
Cat. No. 10511-012 100 µg $59
300 ng/lane; 1% agarose in 1X TAE stained with ethidium bromide.

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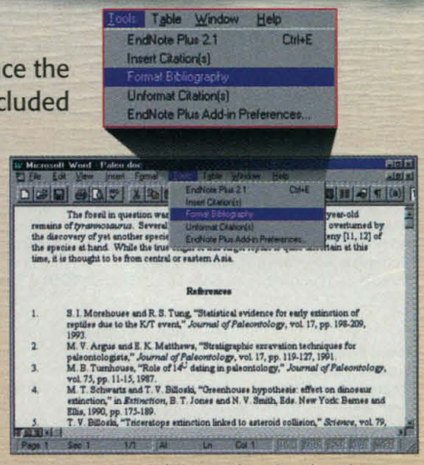

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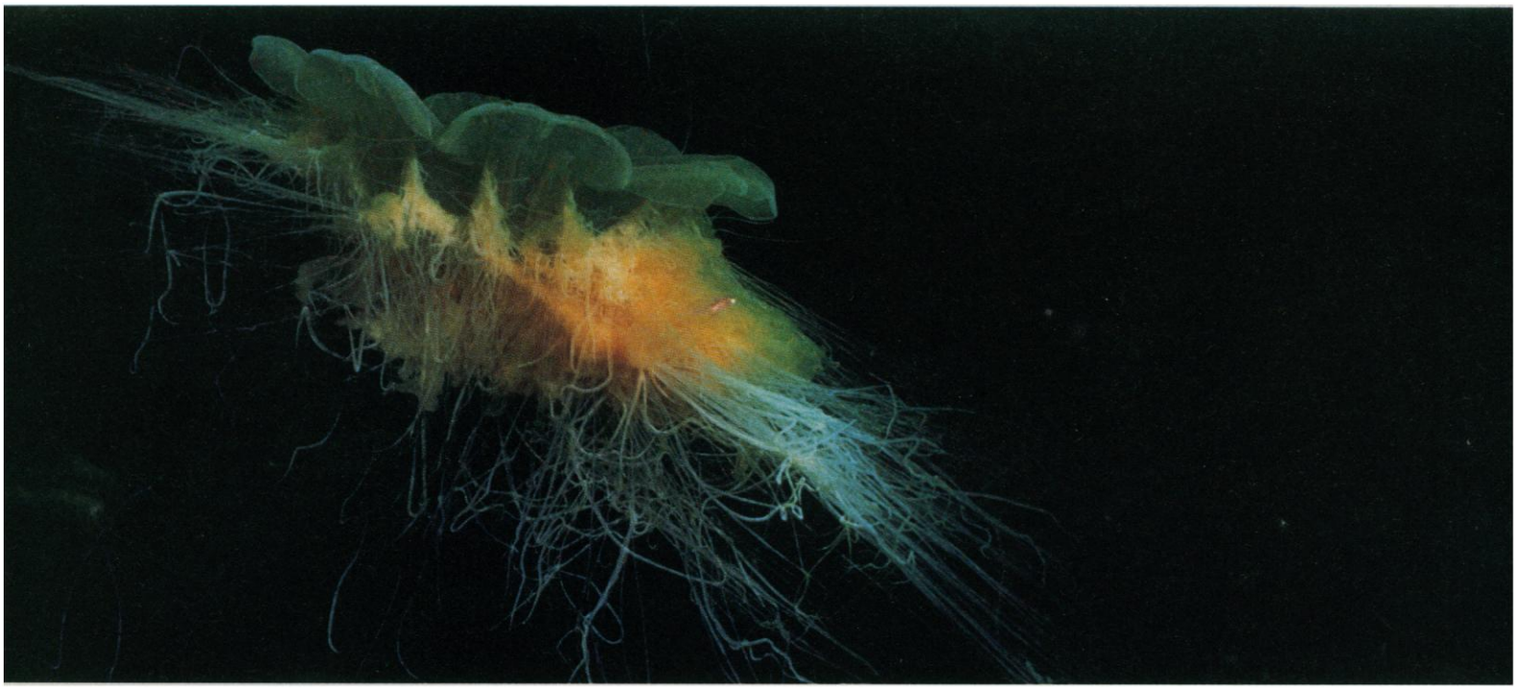

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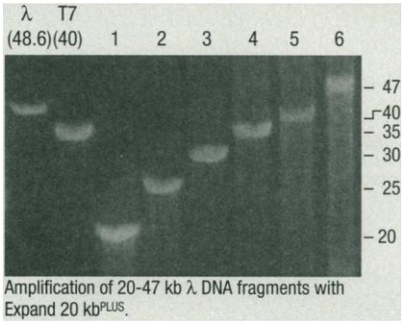

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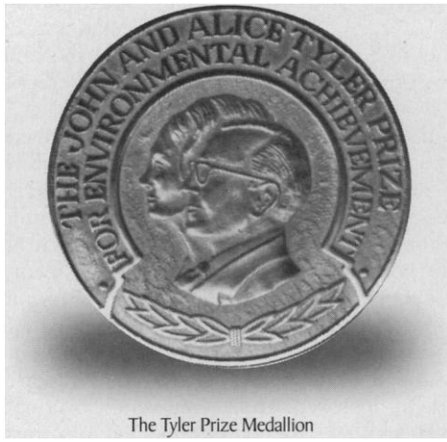

The Tyler Prize Medallion

Dr. Willi Dansgaard
University of Copenhagen

Dr. Hans Oeschger
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Dr. Claude Lorius
French Institute of Polar Research and Technology

For Pioneering Research on the Evolution of the Earth's Climate

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Tyler Prize

The Tyler Prize was established in 1973 by the late Alice and John Tyler as an international award honoring significant scientific achievements in all disciplines of environmental research and environmental protection. The Tyler Prize is in the annual sum of $150,000, to be divided equally among the three 1996 Tyler Prize Laureates.

The Tyler Prize is administered by the University of Southern California