



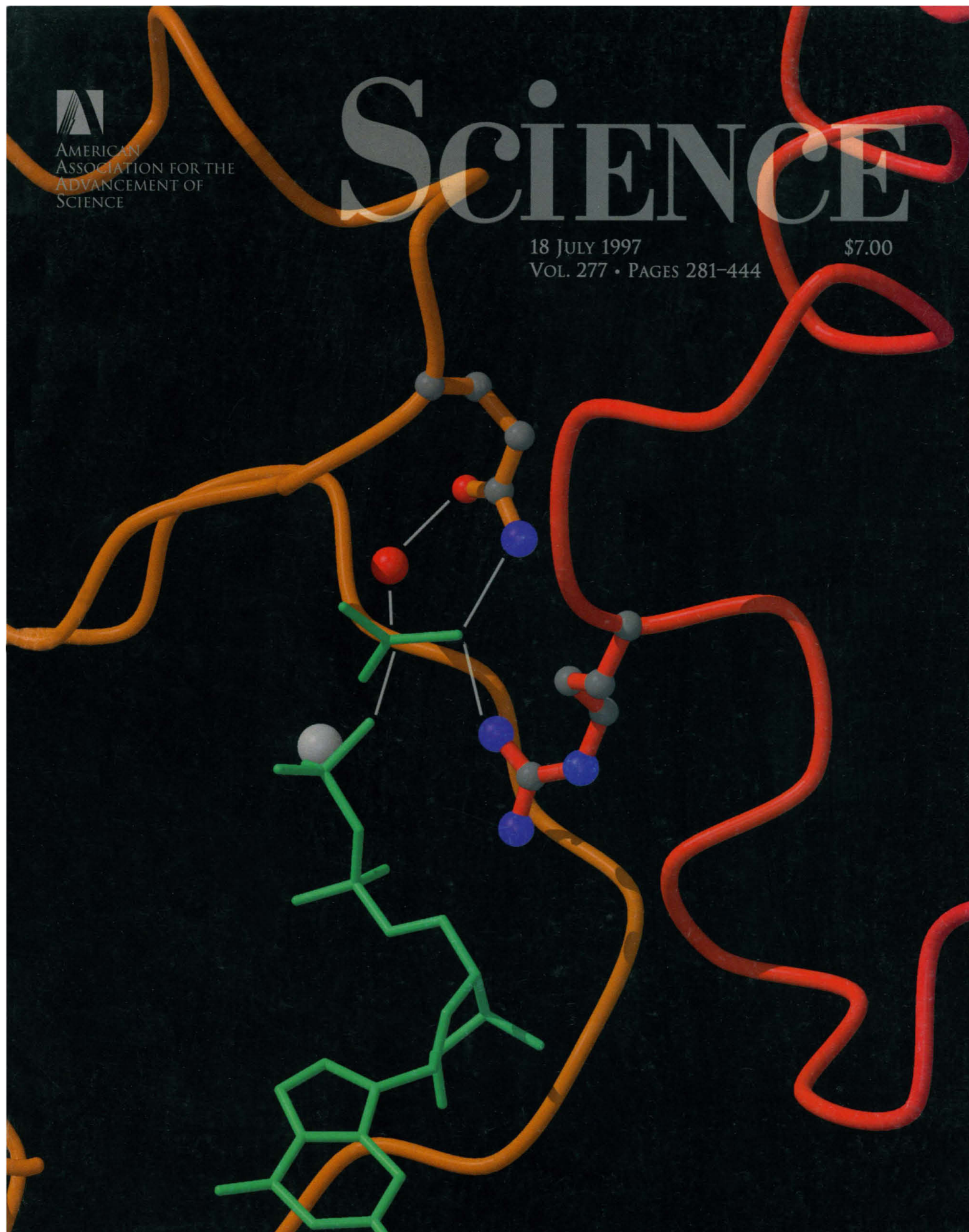
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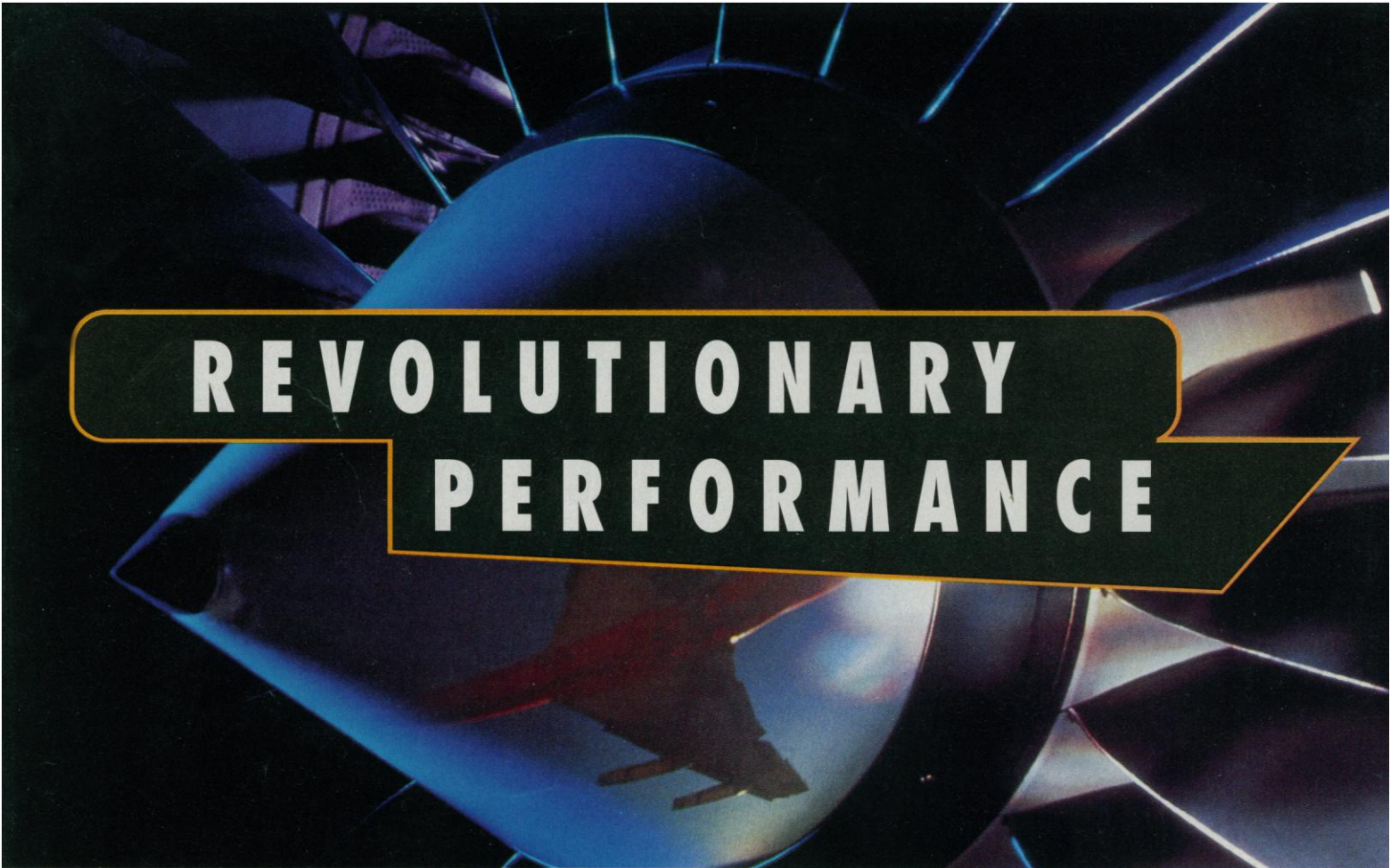
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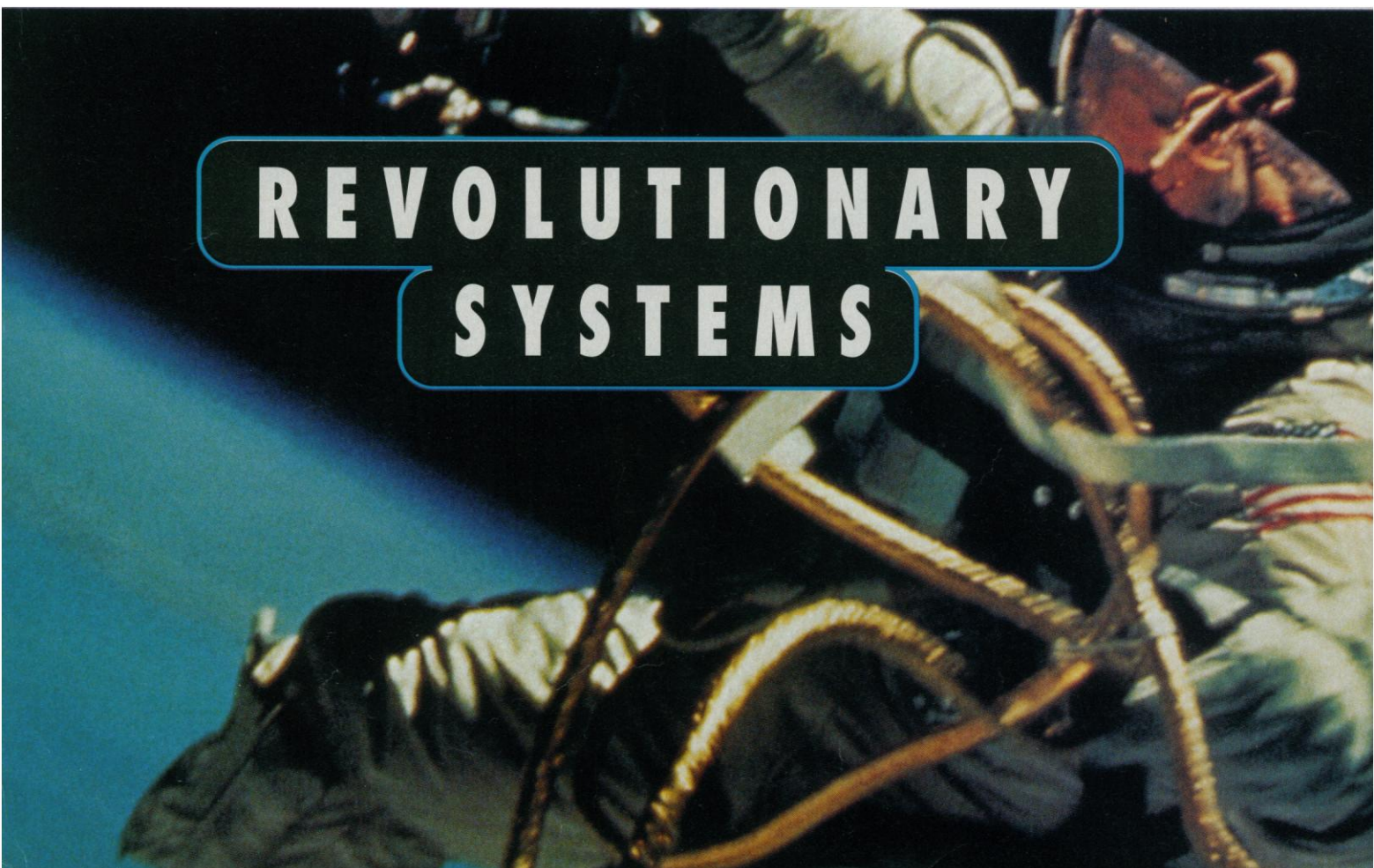
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A close-up, low-angle shot of a jet engine's compressor section. The image shows the complex arrangement of compressor blades, with a central hub and several rows of blades radiating outwards. The lighting is dramatic, with strong highlights on the metallic surfaces and deep shadows in the recessed areas, creating a sense of power and precision.

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A photograph of an astronaut in a white spacesuit floating in the void of space. The astronaut is positioned diagonally across the frame, with their body and limbs visible against the dark background. The suit is detailed with various straps, hoses, and equipment. The lighting is soft, highlighting the texture of the suit and the contours of the astronaut's body.

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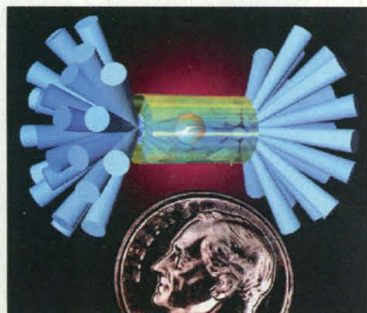
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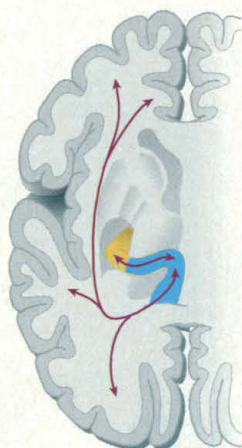


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COVER

Complex between the guanosine triphosphate (GTP)-binding protein Ras and the GTPase-activating protein GAP, showing an arginine residue from GAP (red chain) complementing the active site of Ras (brown chains) with its essential glutamine residue. This "arginine-fin-

ger" in the active site stabilizes the transition state of the GTP hydrolysis reaction, mimicked by guanosine diphosphate and aluminum fluoride (green), and enhances the reaction rate by several orders of magnitude. See p. 333 and the Perspective on p. 329. [Graphics: Frank Schmitz]



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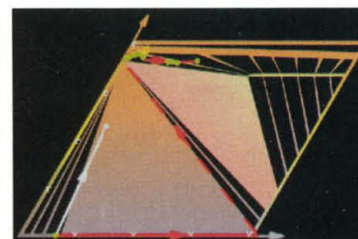
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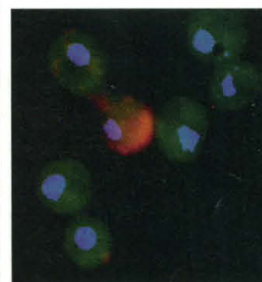
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A message to daughters

Indicates accompanying feature

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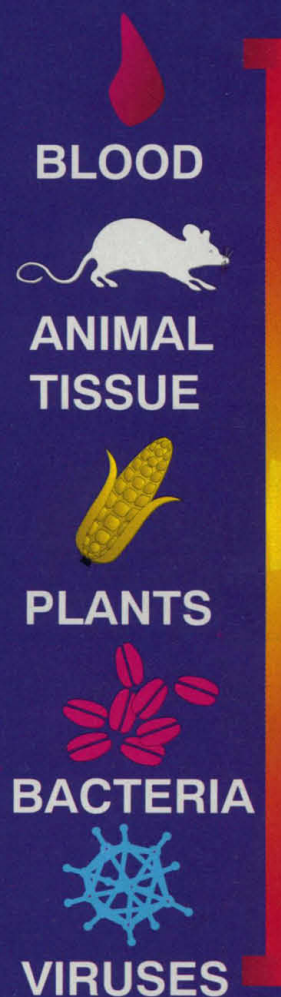
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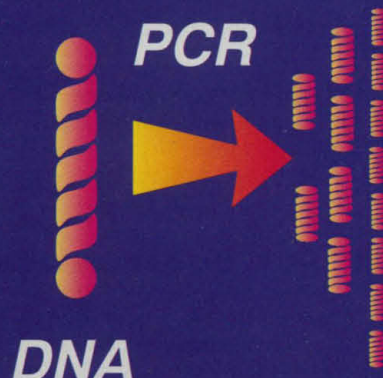
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THIS WEEK IN SCIENCE

edited by PHIL SZUROMI

Too hot to handle easily

At high temperatures, the spectra of water and other molecules can no longer be interpreted by using standard perturbation methods for spectroscopic analysis, which can present problems, for example, in assigning astronomical spectra. Polyansky *et al.* (p. 346; see the Perspective by Oka, p. 328) show that by using an accurate variational method, hot water spectra, such as those that have been observed for water in a sunspot, can be assigned with high accuracy and allow the identification of many previously unidentified bands.

Europa's tenuous ionosphere

The Galileo spacecraft, on its tour of the jovian system, has also been used in three occultations with Europa, the second Galilean satellite orbiting Jupiter, to look for any signs of an atmosphere around the satellite. Kliore *et al.* (p. 355) measured a tenuous ionosphere that they believe to be produced by particle impact on Europa's water ice surface. If the atmosphere is rich in O₂ or H₂O, then the atmospheric temperature may be as high as 340 kelvin, much higher than the icy surface. Thus, the satellite's atmosphere may be externally heated by Jupiter's magnetosphere.

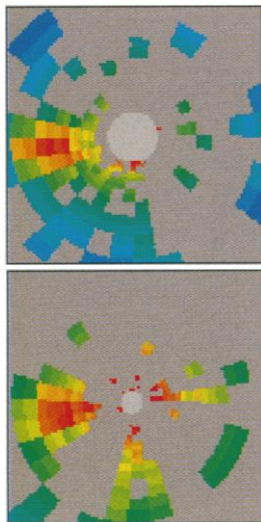
Invisible polar wind

The polar wind is the outflow of plasma along magnetic field lines from Earth's poles into the near-Earth plasma sheet (the magnetosphere). The low density of ions in the polar wind has made it difficult to measure their distribution and origin, but the POLAR spacecraft, which orbits the poles, has overcome that difficulty with a specially designed plasma ion counter. Moore *et al.* (p. 349) have found that O⁺ is

Structural clues to Ras activation

The small guanosine triphosphatase (GTPase) Ras is a critical component of signaling pathways that control cell growth, and oncogenic mutations of Ras are found in many human tumors. Inactivation of Ras requires hydrolysis of bound GTP to guanosine diphosphate (GDP), a reaction that is stimulated by proteins called GAPs (GTPase-activating proteins). Scheffzek *et al.* (p. 333; see the cover and the Perspective by Sprang, p. 329) present the three-dimensional crystal structure of human H-Ras-GDP bound to the GTPase-activating domain of the GAP known as p120^{GAP}. The structure reveals the mechanism by which GAP enhances hydrolysis of GTP by Ras. Analysis of the structure shows why oncogenic mutations of Ras are insensitive to GAP and thus remain in an active state that leads to uncontrolled cell growth.

more abundant and has a higher flux rate and temperature than was predicted. These measurements will require re-analysis of



the models used to understand the origin of the plasma flow into the magnetosphere and its effects on magnetospheric storms and auroras.

Forget not the south

The pattern of increases in surface air temperatures during the last century provide information on the relative effects of different causes—such as an increase in greenhouse gases and the effects of aerosols, volcanic eruptions, and increased urbanization. Easterling *et al.* (p. 364)

expand the analysis of trends in minimum and maximum daily temperatures by including records from much of the Southern Hemisphere. The analysis shows that the daily range in temperatures (maximum minus minimum) decreased from 1950 to 1993, primarily because minimum temperatures have risen faster than maximum ones. The data also imply that urbanization has had a minimal effect on the temperature records.

Prion-like propagation in yeast

Prions are thought to be proteins that take on an abnormal conformation which they can then confer onto other molecules of the same type that are in a normal conformation. Such propagation of a pathogenic conformation of certain proteins appears to cause diseases in man and other animals. Yeast have a protein known as Sup35 that participates in termination of translation and behaves genetically like a prion. Paushkin *et al.* (p. 381; see the news story by Vogel, p. 314) report that the altered conformational form of Sup35 can be propagated in vitro through several cycles. The results show similarities of prion characteristics from yeast and mammals and support the "protein only" hypothesis for propagation of such agents.

A daughter's message

How do cells acquire distinct phenotypes after cell division? One well-studied example occurs in yeast, where mother cells are distinguished from daughter cells by their ability to switch mating types. At the molecular level, this difference is due to selective transcription of the HO endonuclease in mother cells, which in turn is due to selective accumulation of a transcriptional repressor of HO, Ash1p, in daughter cells. Long *et al.* (p. 383) now show that the accumulation of Ash1p protein arises because Ash1p messenger RNA is asymmetrically distributed to daughter cells. Until now, asymmetric messenger RNA distribution has been observed only in cells of higher eukaryotes, so these observations with yeast suggest that this mechanism of gene regulation may have ancient origins.

Apoptosis and Alzheimer's

Evidence from a variety of sources has linked apoptosis (programmed cell death) to Alzheimer's disease. Early onset familial Alzheimer's disease is associated with mutations in presenilins 1 and 2 (PS1 and PS2). If apoptosis is induced in neuroblastoma and neuroglioma cell lines or if PS1 and PS2 are overexpressed, these genes are cleaved at unusual sites. Kim *et al.* (p. 373) have shown that this alternative cleavage can be blocked by inhibitors of the caspase-3 family of proteases. Higher levels of the abnormal products were found in cells expressing the mutant forms of PS1 and PS2. These abnormal cleavage products could, in turn, make cells more susceptible to apoptosis or could increase production of amyloid precursors that would promote apoptosis and thus lead to the pathology of Alzheimer's disease.

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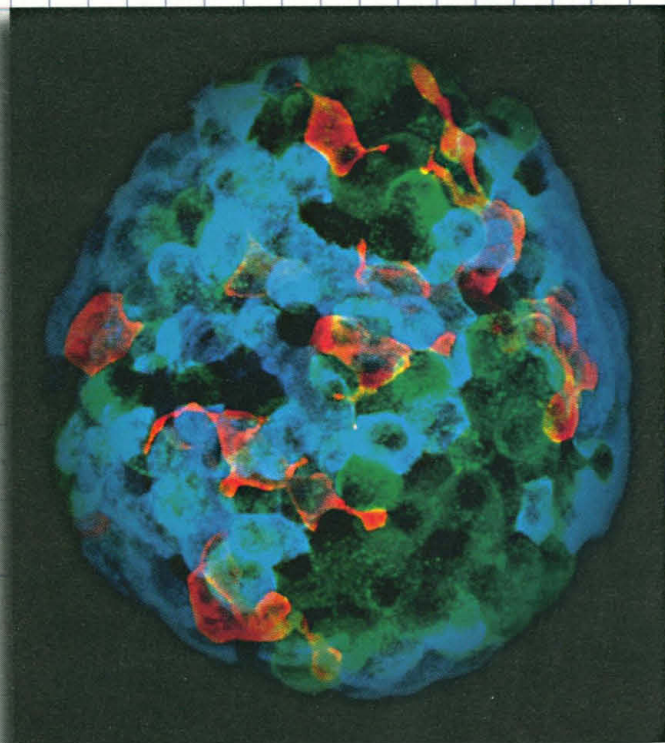
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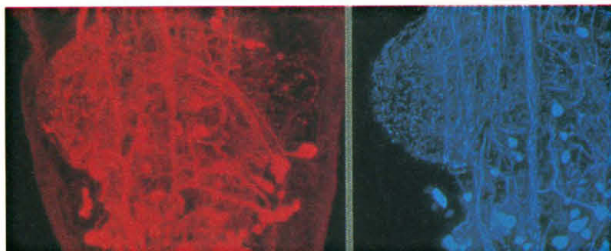
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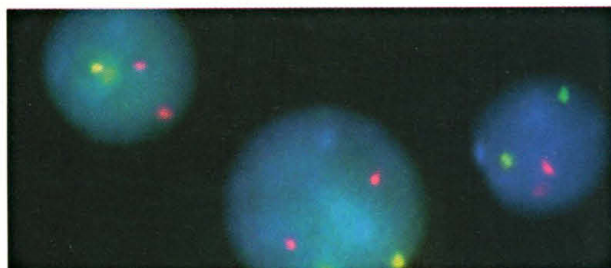
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Three colour confocal laser scanning microscope analysis of islet from neonatal rat pancreas. FITC anti-insulin (green), Cy³ anti-somatostatin (red), and Cy5 anti-glucagon (blue).



Whole insect embryos directly labelled with Cy3 dye (red) and Cy5 dye (blue). Image courtesy of Dr. T.C. Brelje, University of Minnesota Medical School.



FISH image of DNA probes binding to centromeric α -satellite repeat sequences in interphase nuclei. Chromosome Y (green), chromosome X (yellow), and chromosome 17 (red). DAPI counterstain.

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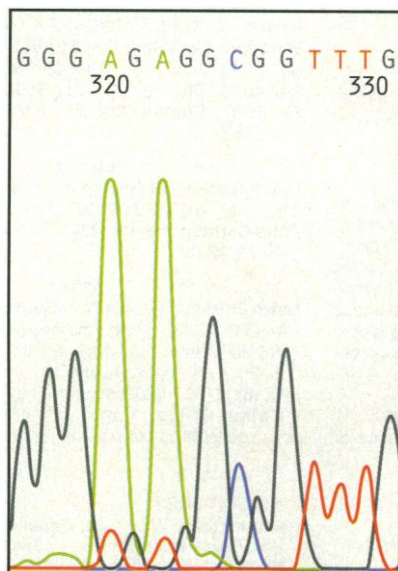
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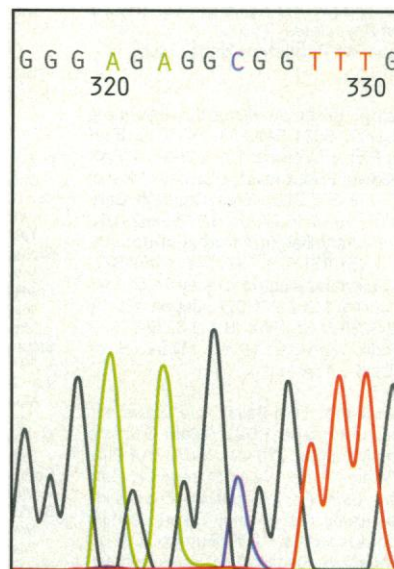
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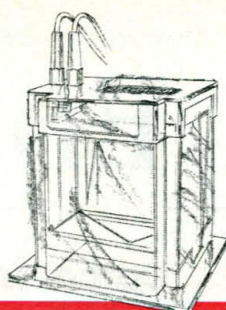
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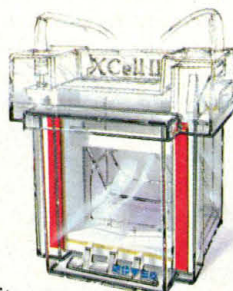
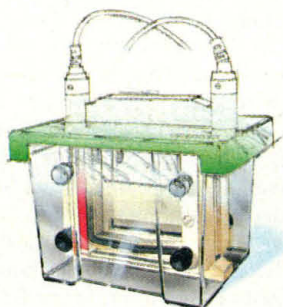
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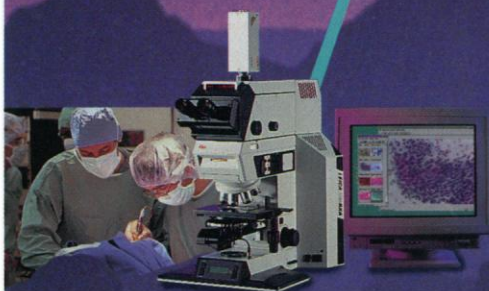
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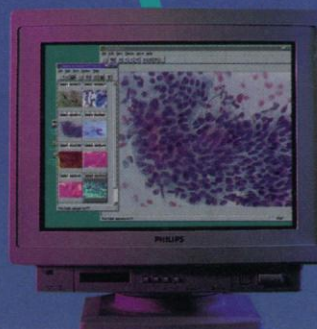
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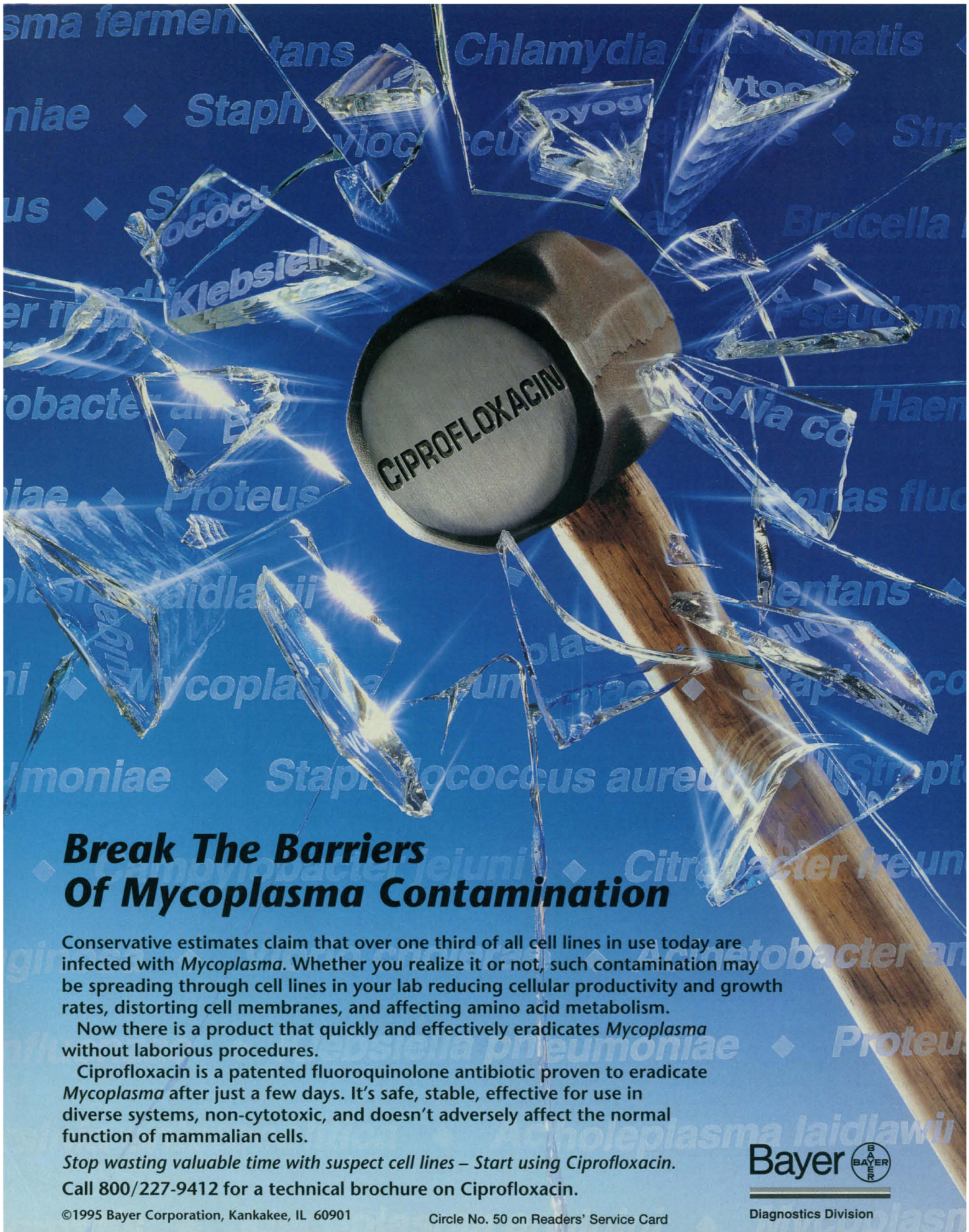
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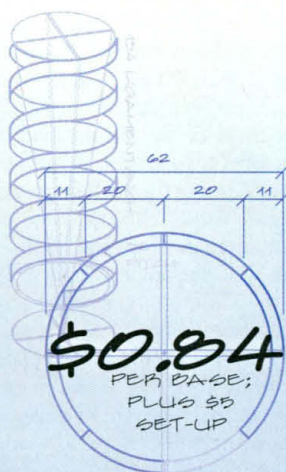
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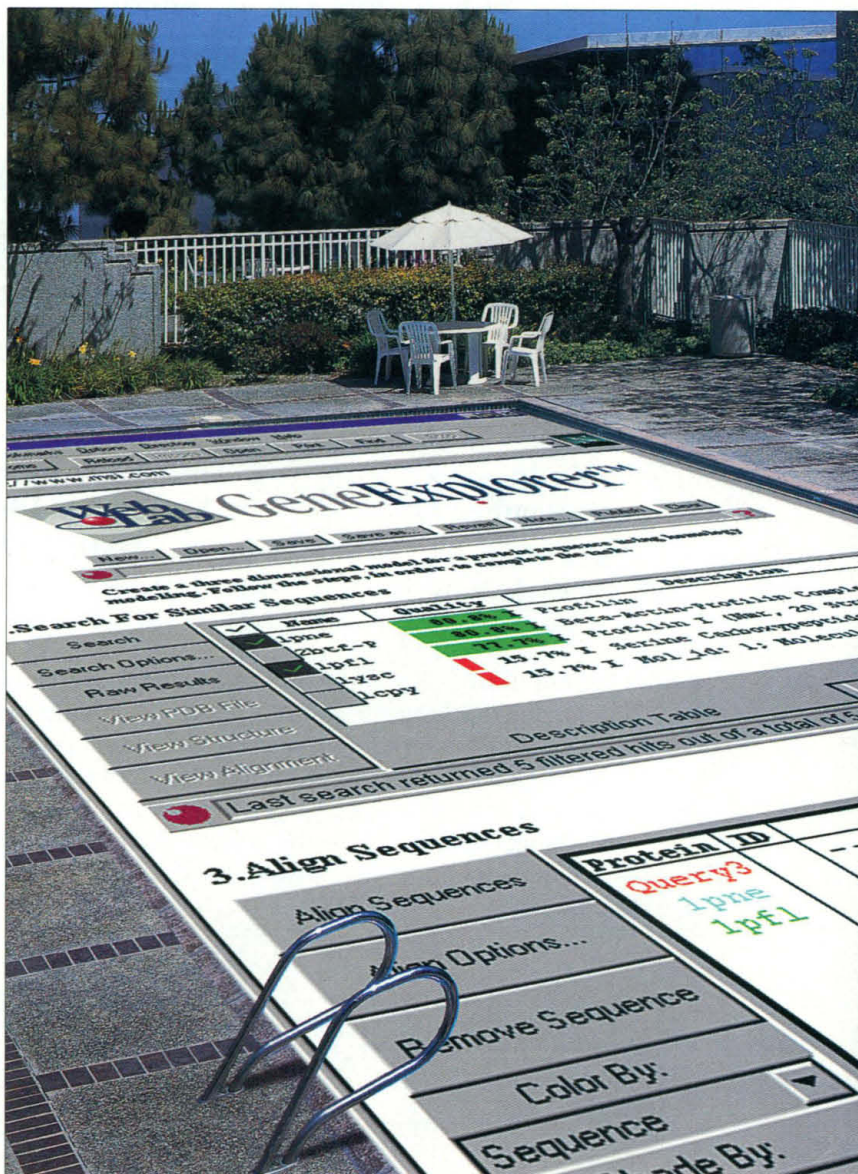
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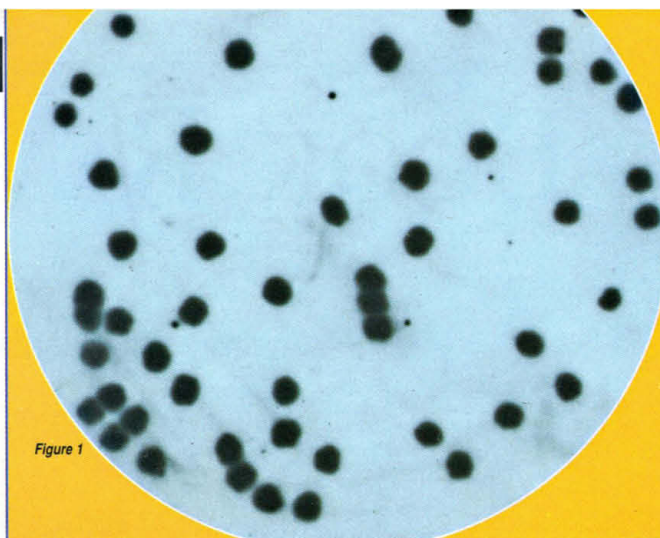
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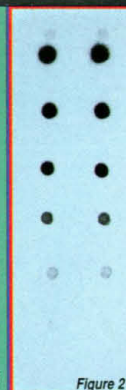


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Figure 1. Colonies were screened for the TGF-β1 gene with a fluorescein-labeled oligonucleotide probe and Enhanced Luminol. This film demonstrates results obtained using the Renaissance 3'-End Labeling Fluorescein Kit with Antifluorescein-HRP (NEL823) and the detection substrate Enhanced Luminol (NEL201). Discs were exposed to Reflection film for 15 minutes.

Figure 2. Mouse β-actin was detected using a fluorescein-labeled ssRNA probe and ready-to-use CDP-Star. This film demonstrates results obtained using Renaissance RNA Fluorescein Labeling Kit with Antifluorescein-AP (NEL633) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.

Figure 2



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Figure 3

Figure 3. The v-Fos gene was detected in 125 ng of blotted mouse genomic DNA in less than 5 minutes using CDP-Star. This film demonstrates results obtained using the Renaissance Random Primer Biotin Labeling Kit with Streptavidin-AP (NEL604) in conjunction with ready-to-use CDP-Star (NEL601). Blots were exposed to Reflection film for 5 minutes.



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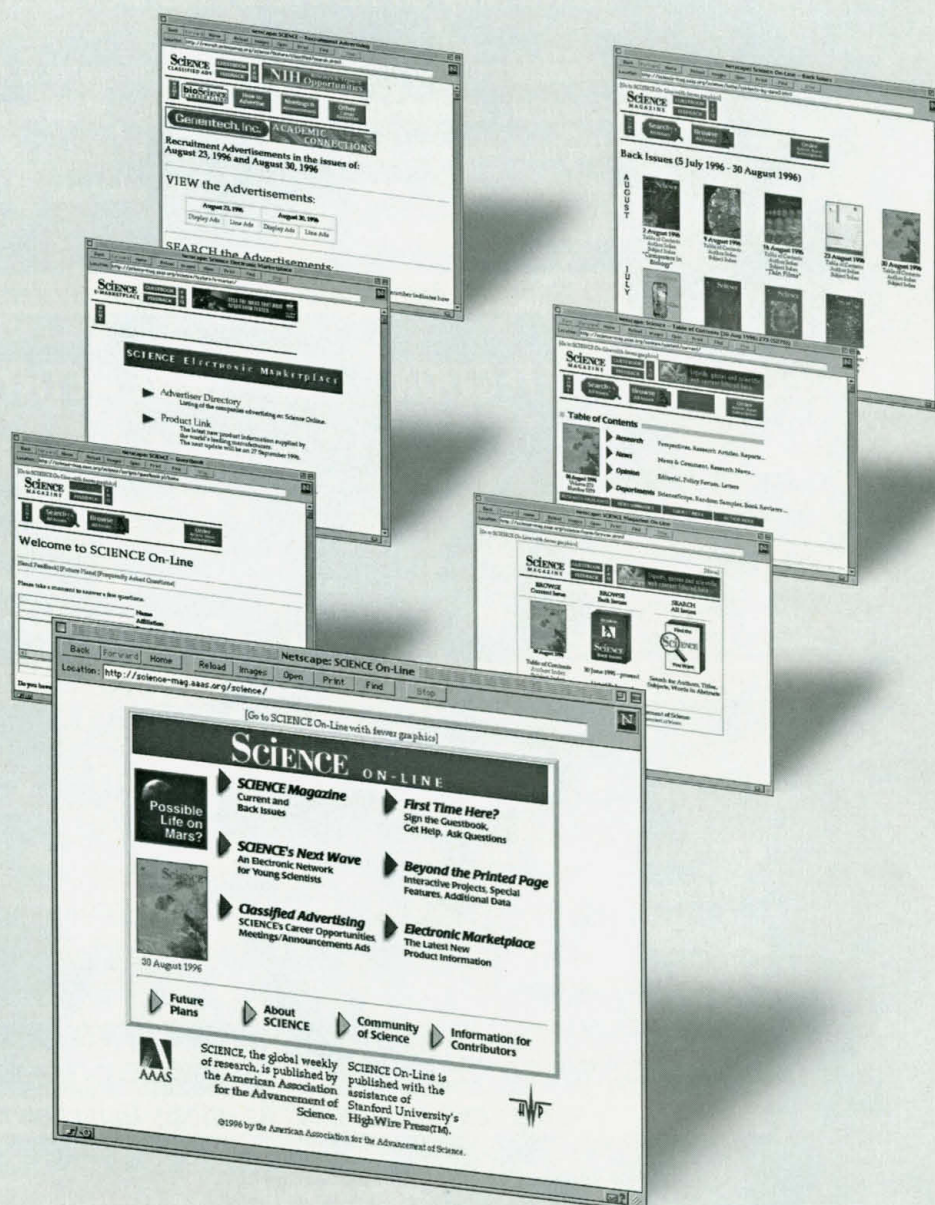
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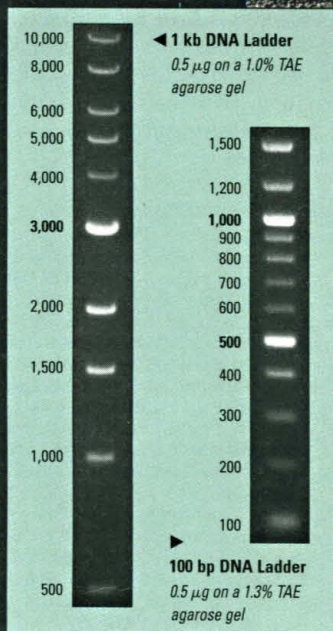
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