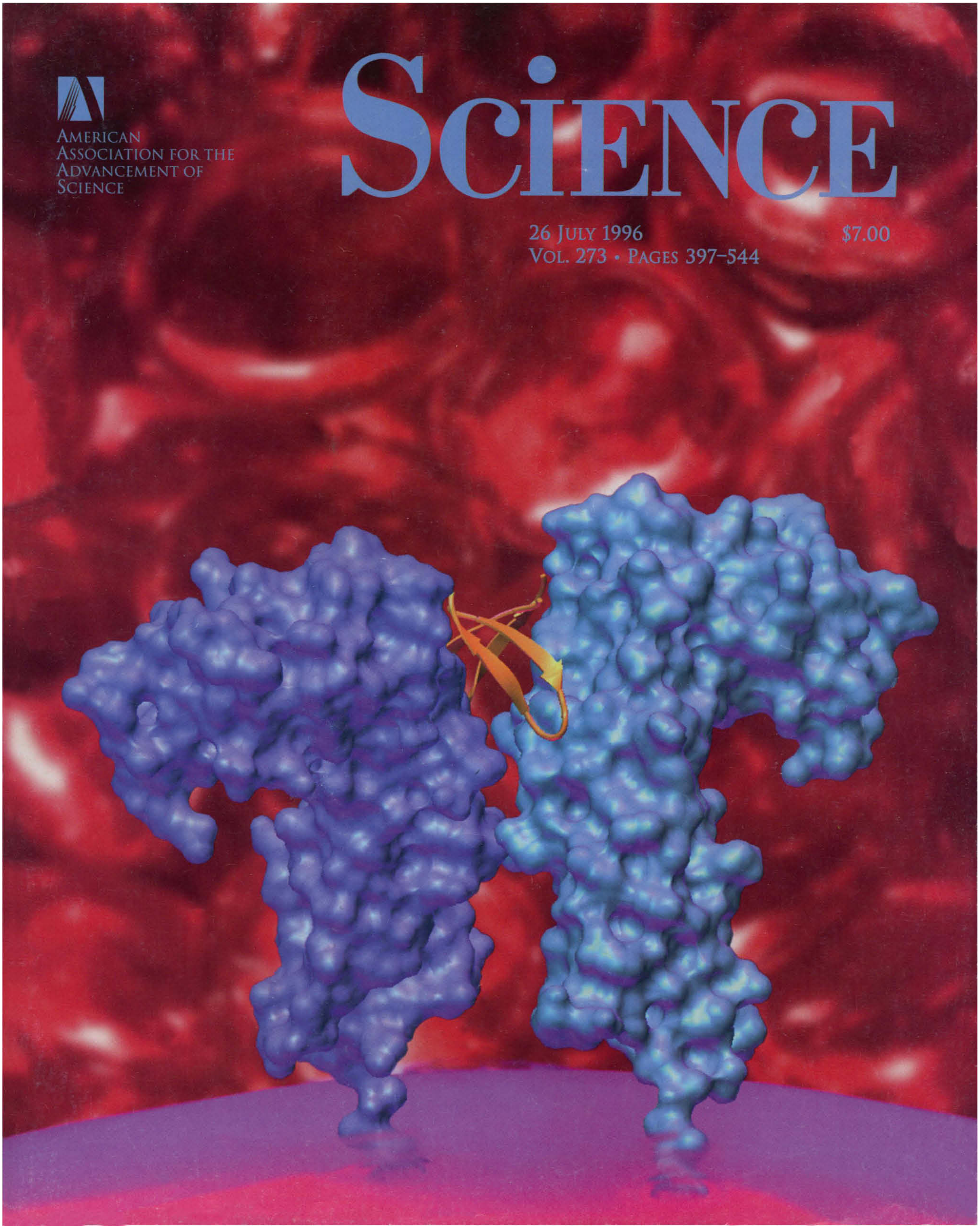

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# Science

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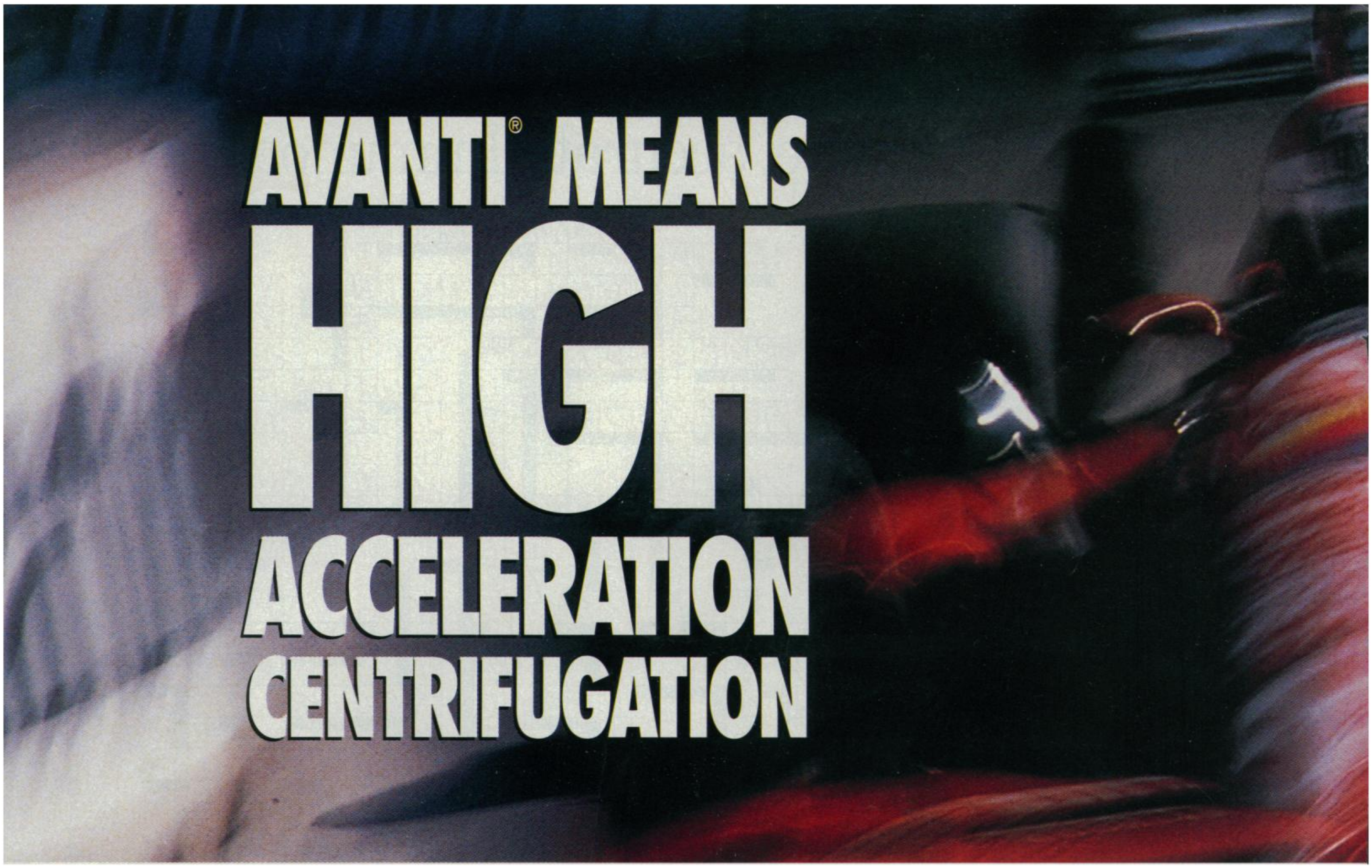
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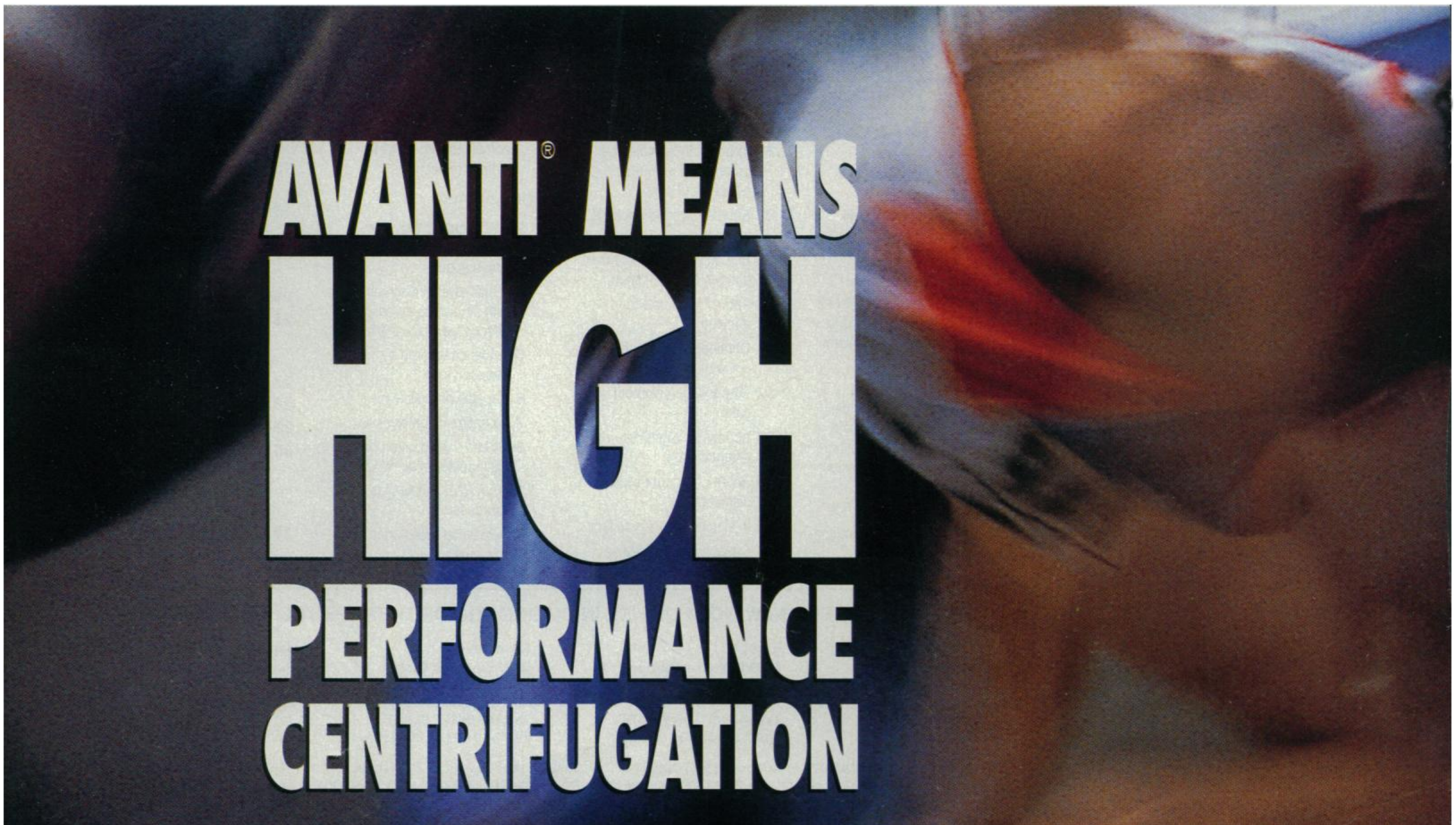
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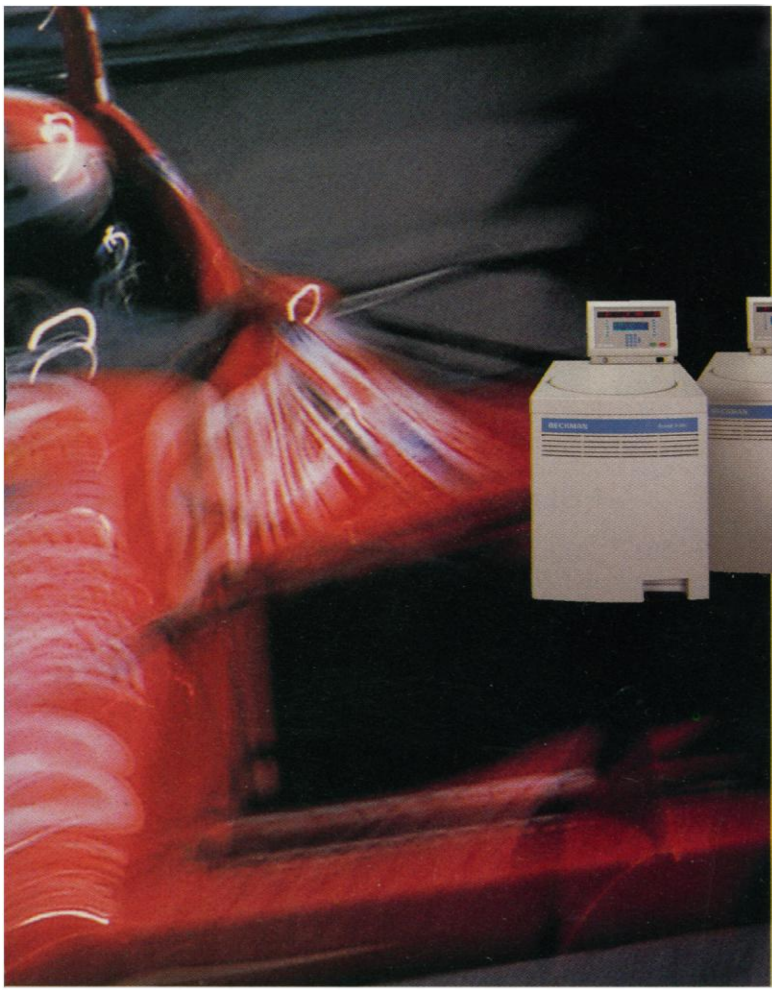

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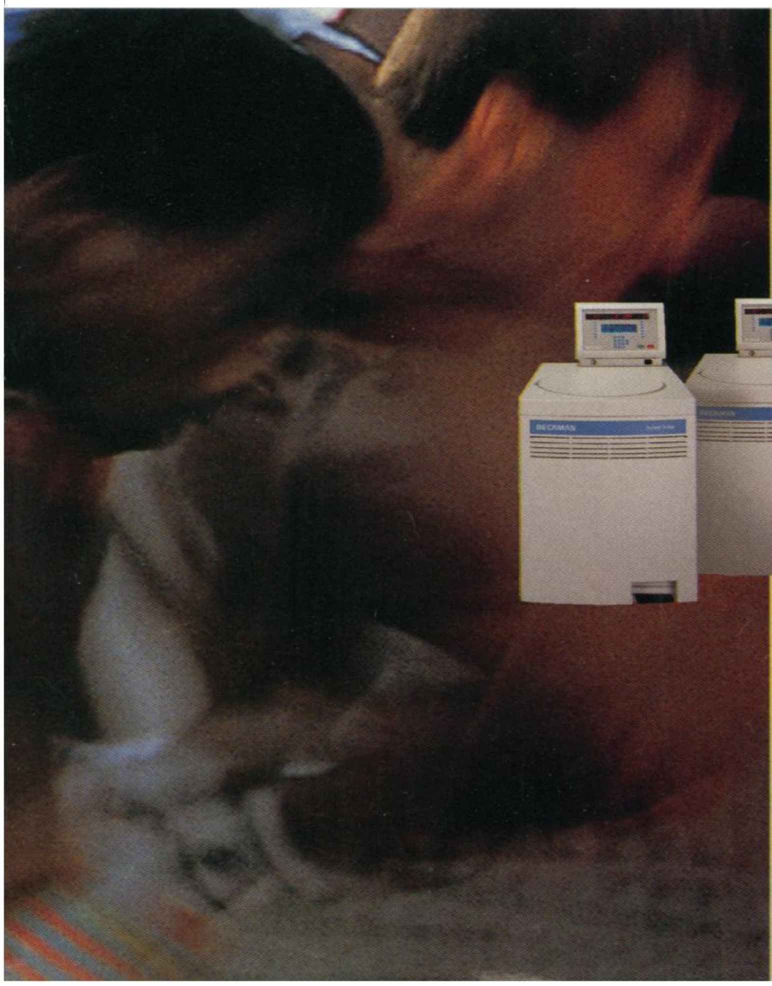

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# SCIENCE

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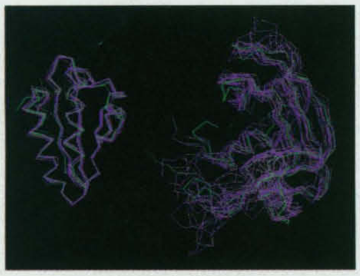
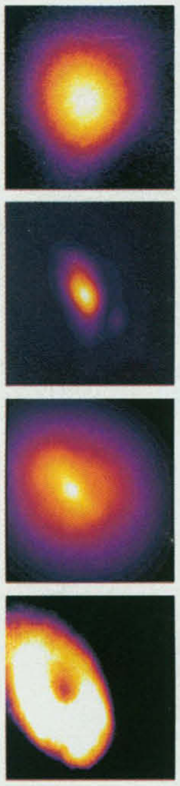


**426**
Predicting three-dimensional protein structures



**472**
High-power pulses

## NEWS & COMMENT



## RESEARCH NEWS



## POLICY FORUM



## PERSPECTIVES



## ARTICLE



## DEPARTMENTS





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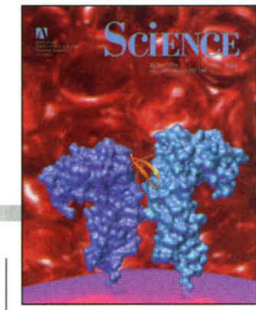
## Cover

A peptide dimer (orange) that mimics erythropoietin hormone (EPO) binds two equivalent EPO receptor extracellular domains (blue) and produces the signal necessary to stimulate production of red blood cells. The crystal structure of the complex identifies one functional mode of receptor dimerization. The peptide interaction with a functional epitope on each receptor is a basis for the design of small-molecule EPO mimetics. See page 464 and the related Research Article (page 458) and Perspective (page 449). [Image: M. Pique, O. Livnah, and I. A. Wilson]

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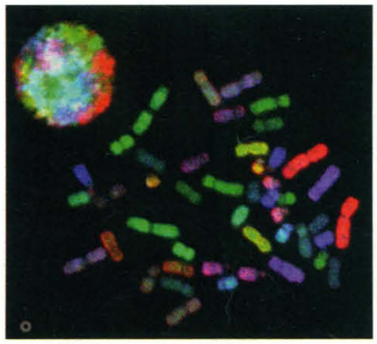

**430 & 494**
A paint box of chromosomes

**475**
Going the distance in DNA

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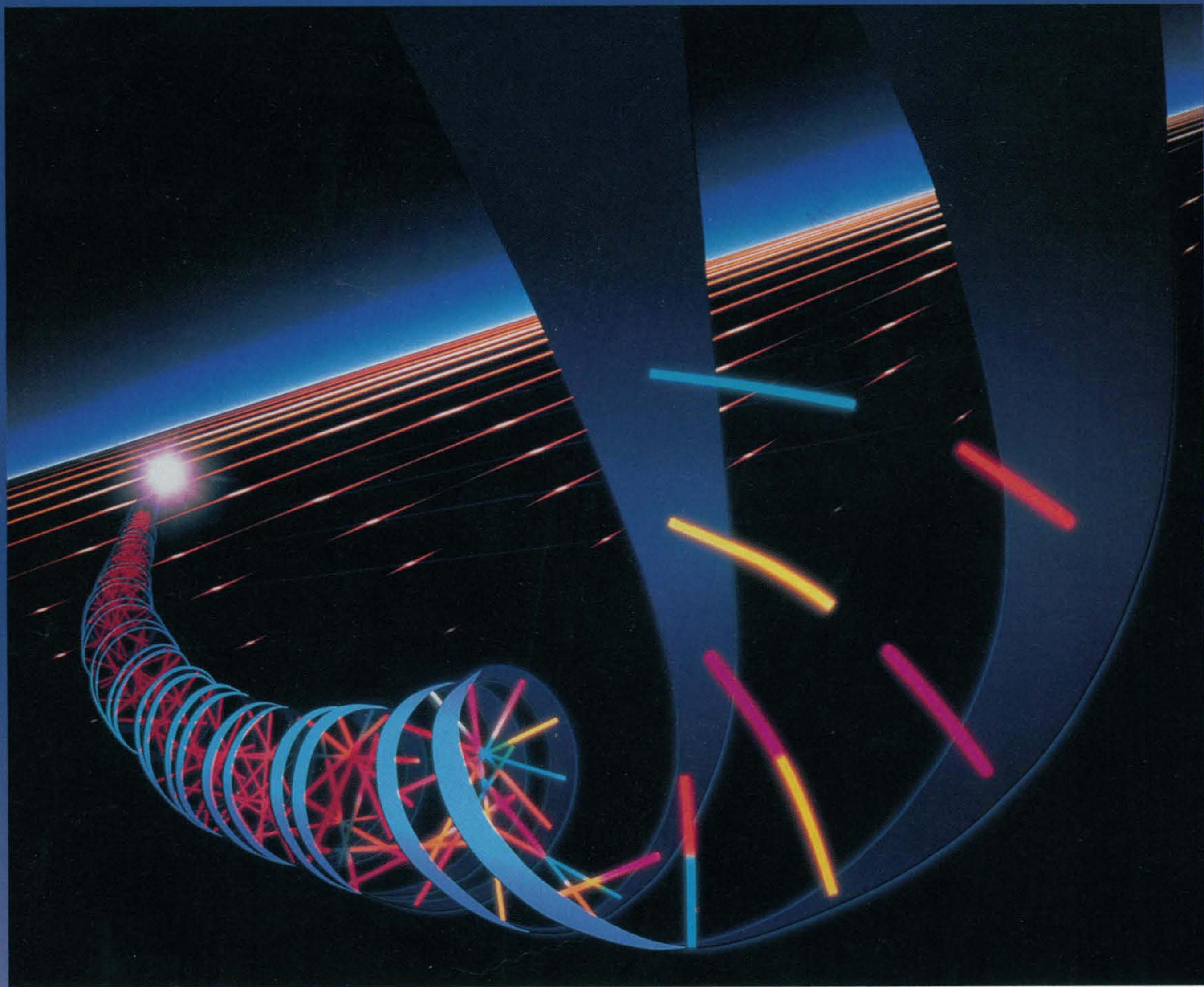




edited by PHIL SZUROMI

## Uniform ropes of carbon nanotubes

One goal in the synthesis of carbon nanotubes is to create long, defect-free structures. Thess *et al.* (p. 483) have optimized the laser vaporization of graphite (in the presence of a cobalt-nickel catalyst) to produce bundles of hundreds of single-wall carbon nanotubes in high yield (>70%). These "ropes," which can be several hundred micrometers in length, exhibit high metallic conductivity. The rapid movement of catalytic metal atoms is proposed to explain the uniformity of these structures.

## Last gasps

The mass extinction at the end of the Permian (about 250 million years ago) was the largest in the last 600 million years; more than half of the marine families disappeared along with many plants. Knoll *et al.* (p. 452) point out that many aspects of Late Permian geology—including the condition of the oceans—were similar to those in the last part of the Proterozoic (about 800 to 550 million years ago). They suggest that the extinction was caused by rapid overturn of deep anoxic oceans, which would have released toxic amounts of $CO_2$ into the atmosphere.

■

## Electrons through DNA

Electron transfer through DNA can occur if the electron donors and acceptors are intercalated into the DNA helix. Arkin *et al.* (p. 475) measured the rates of forward and back electron transfer by using ultrafast emission and absorption spectroscopy and observed extremely rapid electron transfer rates with only a very shallow dependence on distance between the metal centers. These results suggest that the mechanism for electron transfer between these complexes intercalated into DNA differs from that seen in proteins.

■

## Dueling volcanoes

In 1994, two volcanic vents on opposite sides of the partially seawater-filled Rabaul Volcano caldera in Papua New Guinea erupted almost simultaneously with different eruptive styles. Roggensack *et al.* (p. 490) sampled the volatile gases in the plumes above the vents and the volatiles found in silicic and mafic inclusions from the erupted lavas in order to trace the magma dynamics below the surface. Seawater interactions were likely significant at one vent, while the volatiles found in the mafic inclusions from the other vent indicate that the eruption was initiated by the emplacement of a mafic dike intrusion below the shallow magma reservoir.

■

## Ancient recipes

Insight into food preparation is vital for understanding ancient cultures. However, because of natural decay, ancient food remains are rare except in dry climates; current understanding is often based largely on artistic evidence and written sources. Samuel (p. 488; see the news story by Williams, p. 432) studied Egyptian beer and bread remains dated from 2000 to 1200 B.C. by optical and scanning electron microscopy. Their preparation was surprisingly complex and not always in agreement with current beliefs.

■

## Glassy ordering

Low-frequency vibrations and fast relaxation processes are important signatures of supercooled liquids, but the former cannot be explained by standard theoretical models. It has been suggested that the medium-range order in the materials is the source of these vibrations. Uchino and Yoko (p. 480) performed ab initio calculations on glycerol trimers to show that localized collective motions of the hydrogen-bonded molecules can lead to such low-frequency modes and that translational motions of the molecules within the trimer may be the origin of such fast relaxation processes.

■

## Path to destruction

Lysosomes degrade misfolded, damaged, or unneeded proteins within the cell, and both bulk and selective pathways operate for protein uptake. The selective pathway, which is especially active in certain cell types that have been starved or deprived of growth factors, resembles pathways for the transport of precursor proteins across cell membranes. Cuervo and Dice (p. 501) identified a lysosomal membrane glycoprotein, LGP96, that binds substrates for this pathway. Overexpression of LGP96 in Chinese hamster ovary cells increased the activity of the selective pathway, suggesting that this receptor may be one of the rate-limiting components for this pathway.

■

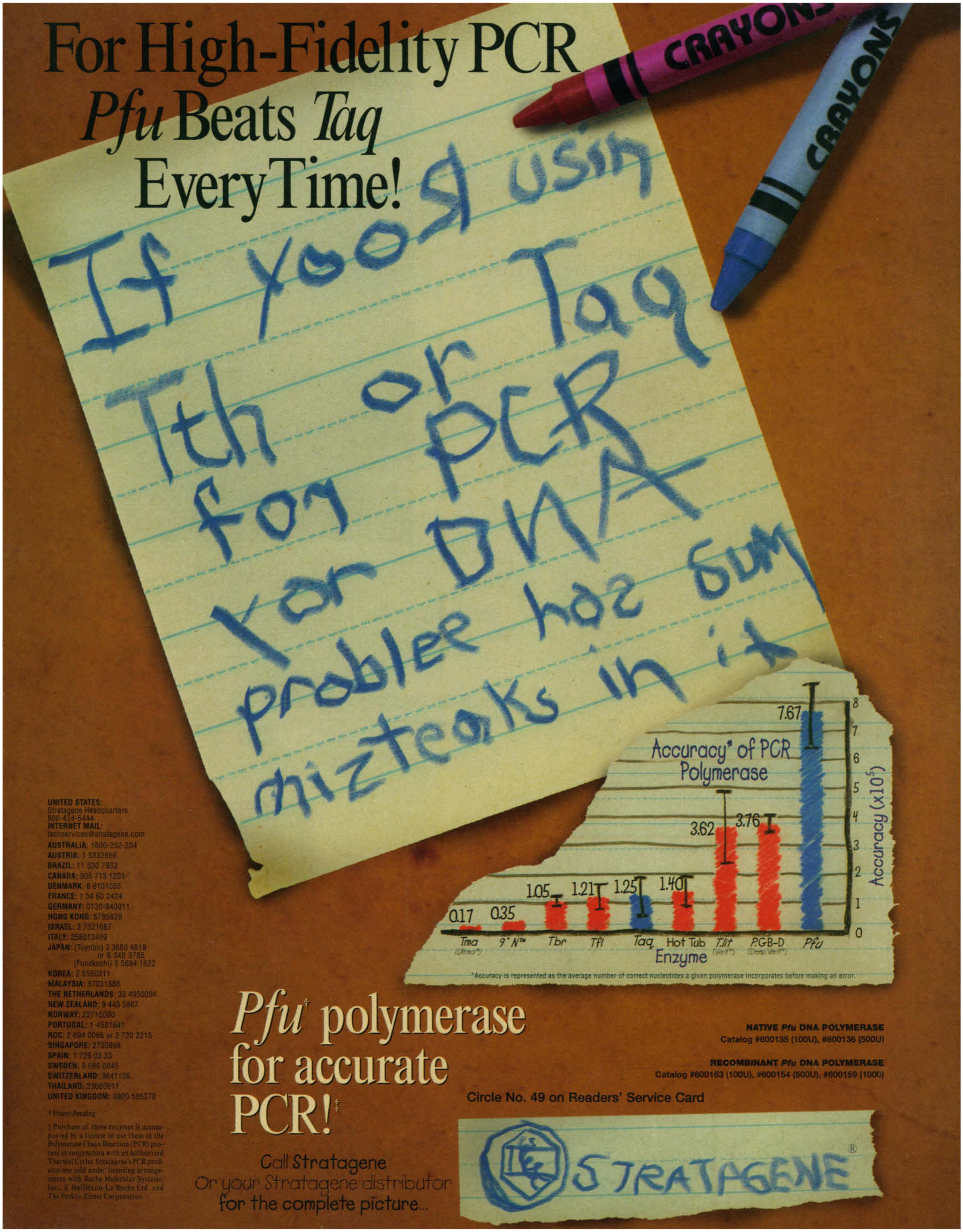
## Getting on the nerve

Schwann cells, a type of glial cell, differentiate to form the protective myelin sheath that surrounds the nerve axon and promotes long-distance propagation of the action potential. It has been thought that the POU domain transcription factor Oct-6 acted to repress myelin genes in Schwann cells until differentiation was complete. Jaegle *et al.* (p. 507) studied Oct-6 knockout mice and show that Oct-6 is in fact needed for promyelin cells to progress to the myelinating stage. However, after that point Oct-6 is no longer needed for myelin expression.

■

## Hooking up the nerve

Spinal cord injuries can lead to tragic consequences, and the search for successful medical treatment is being vigorously pursued. Cheng and Olson (p. 510; see the Perspective by Young, p. 451) demonstrate a partial repair strategy. Multiple fine nerves were used to form bridges across the gap of completely transected spinal cords in adult rats. A treatment that combined these nerve bridges with growth factor and mechanical stabilization allowed a certain limited recovery of hind limb function.



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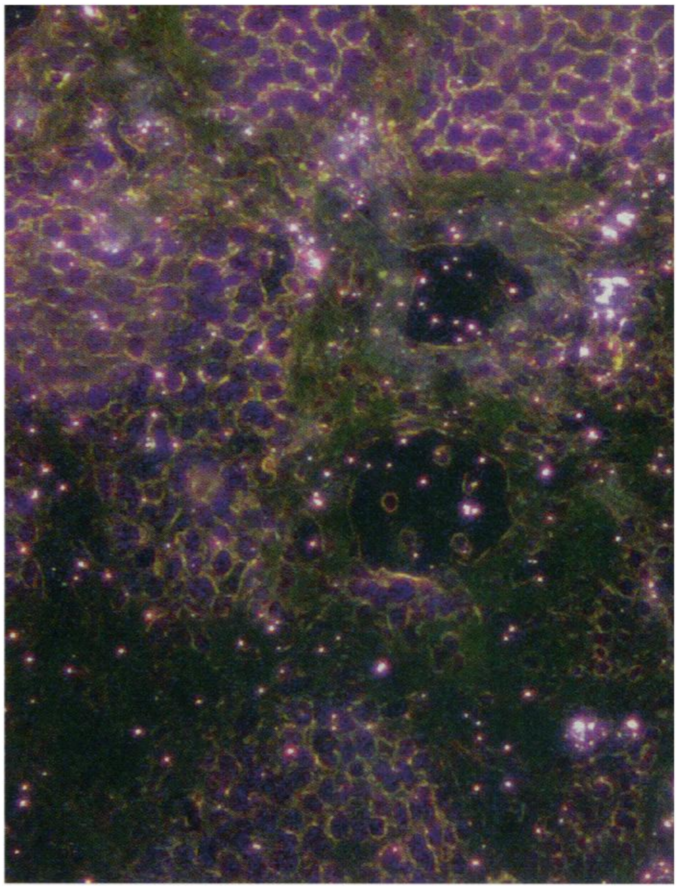

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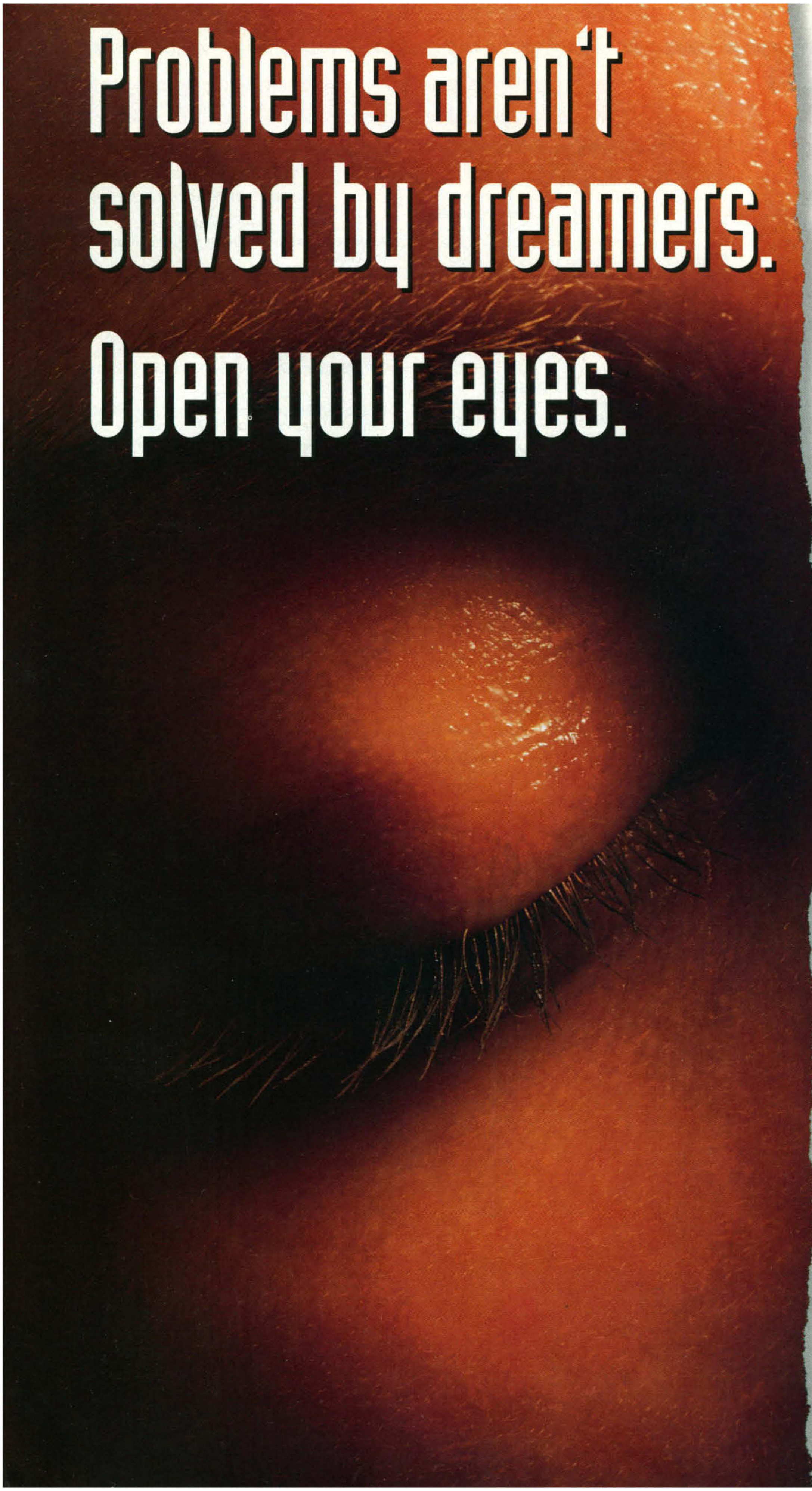
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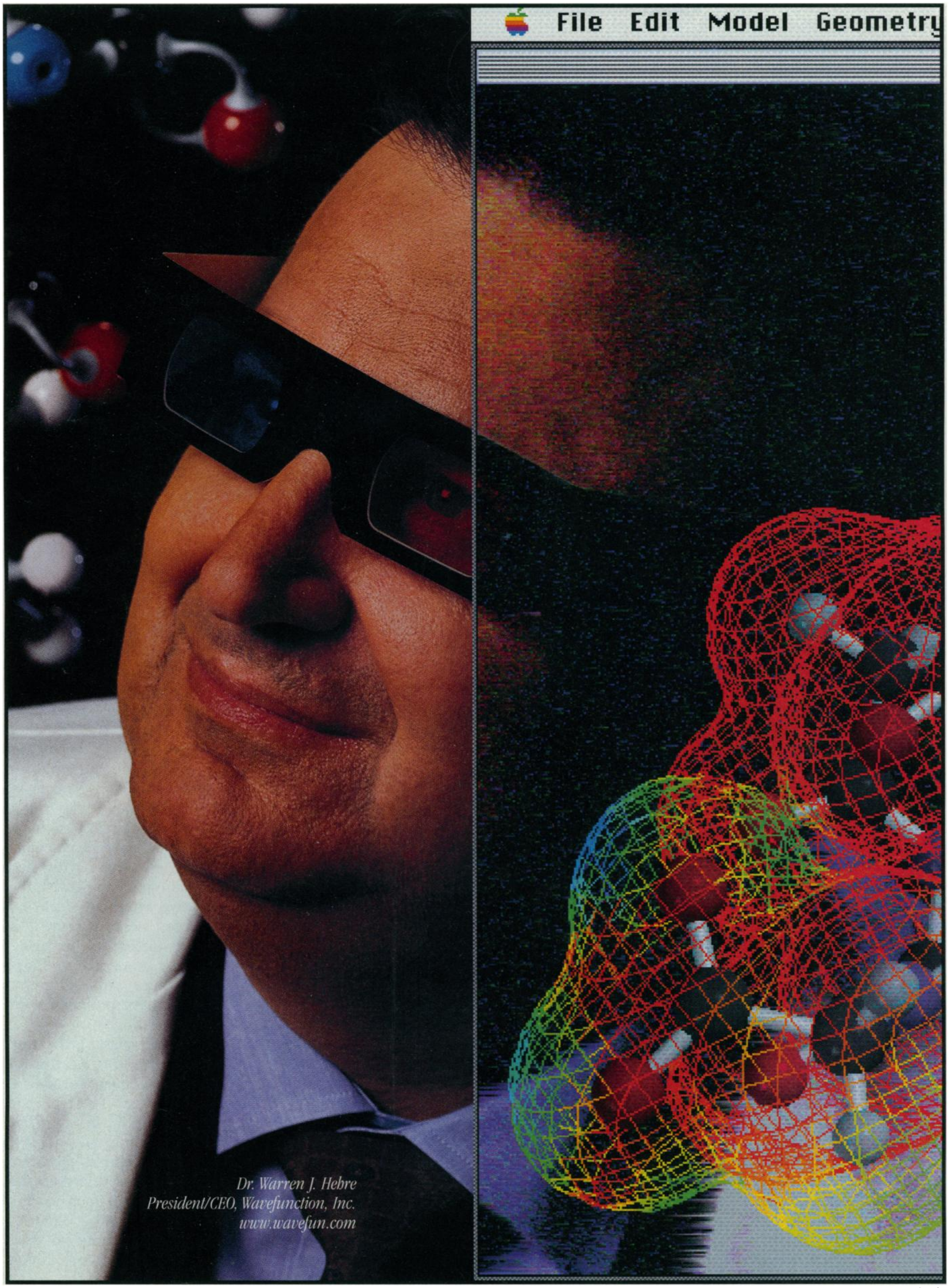
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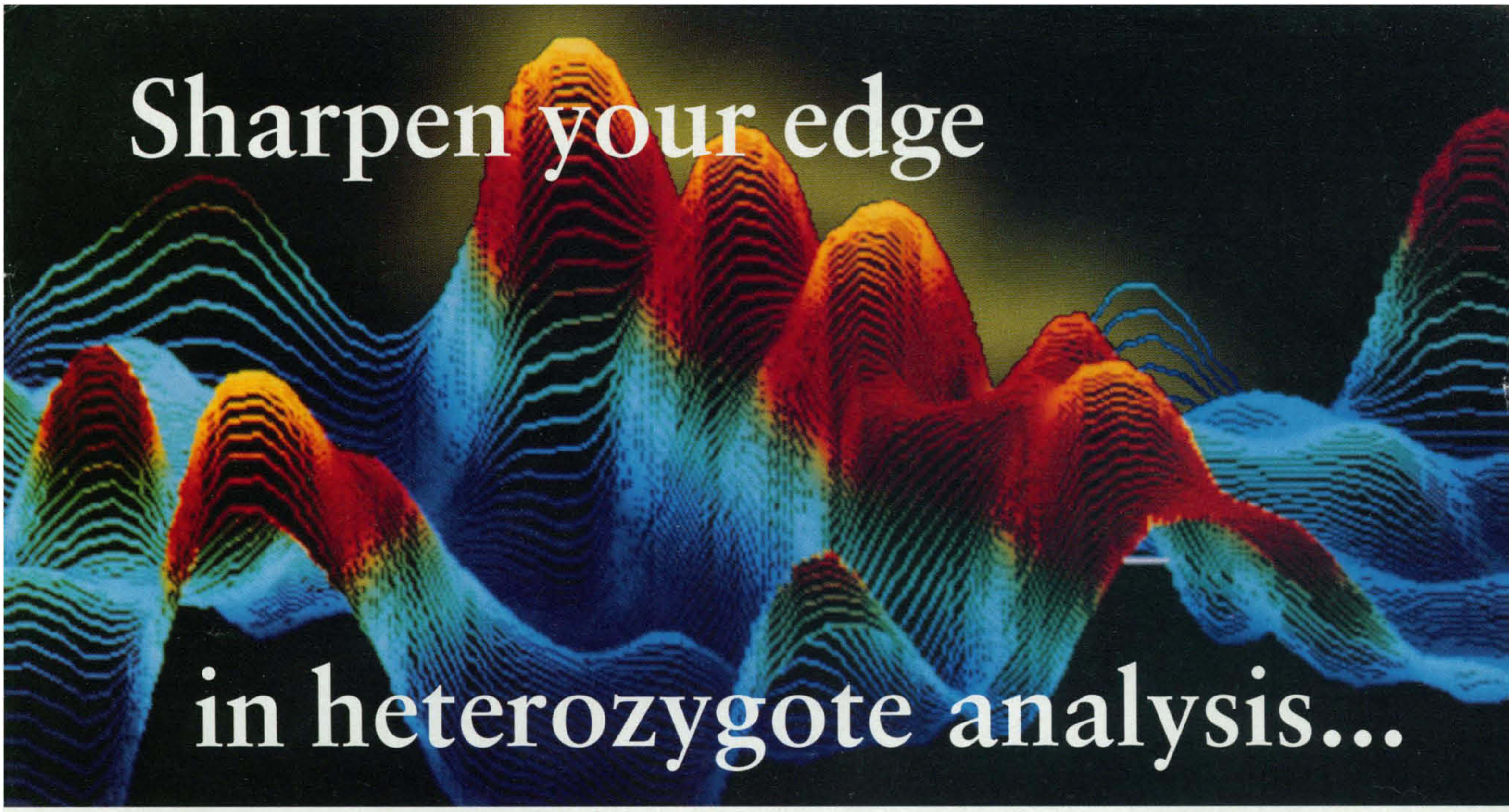


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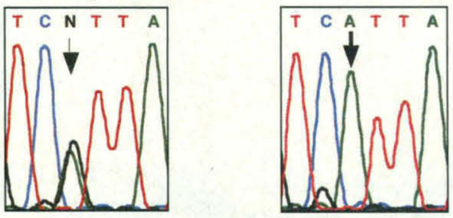


Heterozygous A and G    Homozygous A

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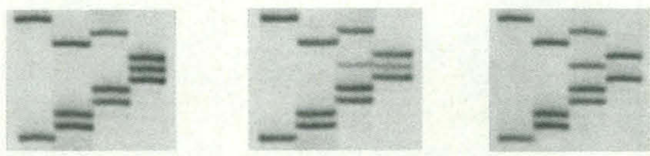
**Low background allows detection of mixed sequence**

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