AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

# SCIENCE

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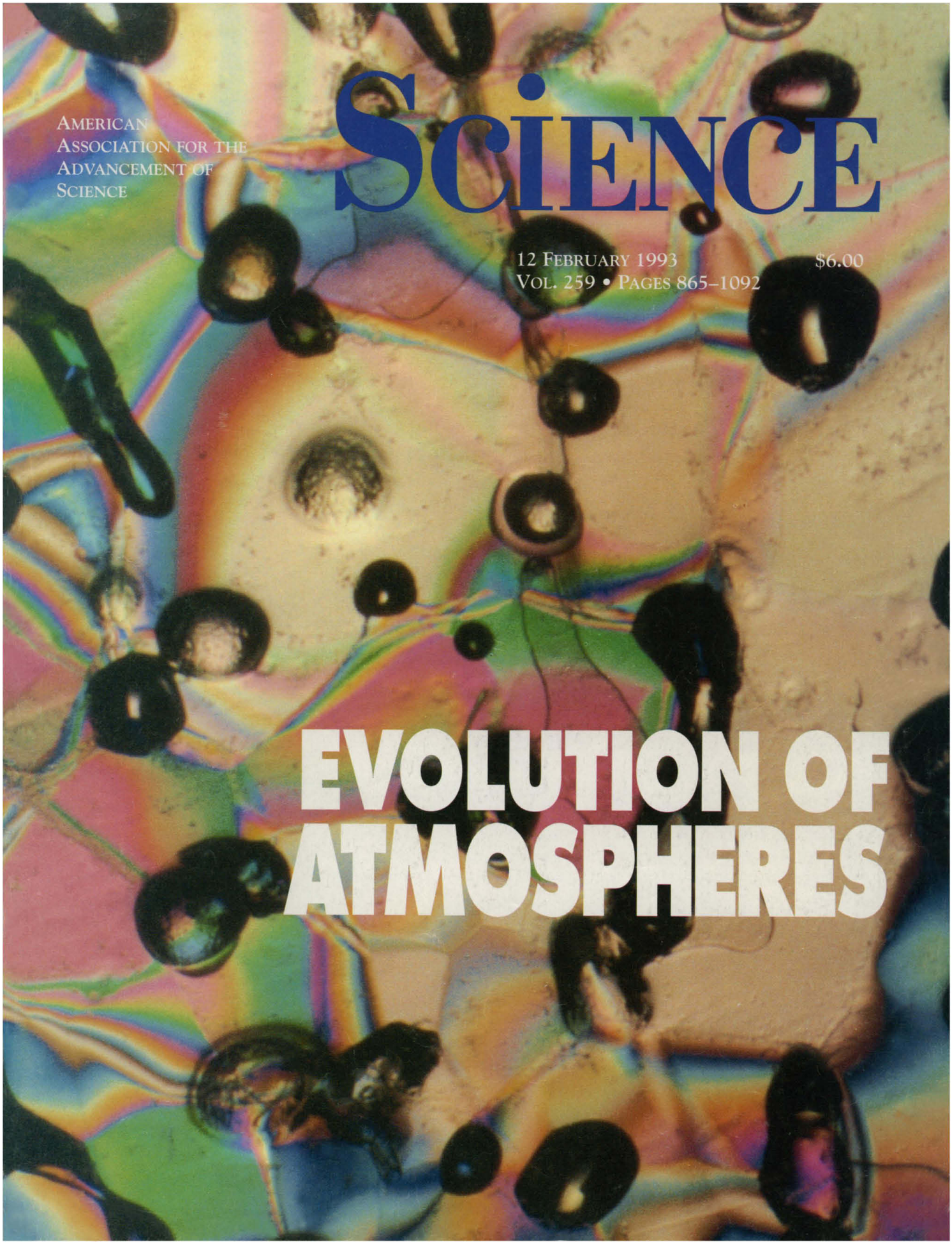

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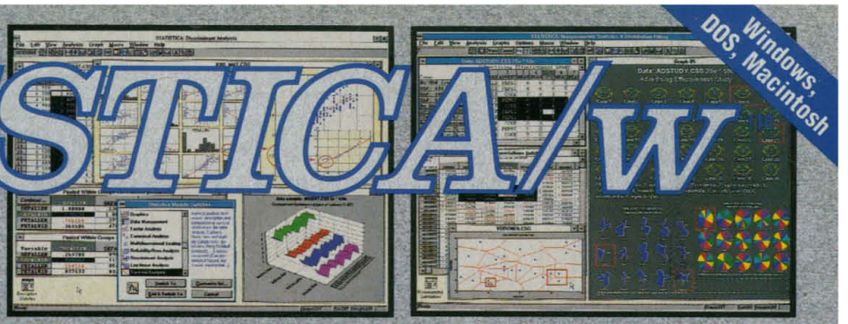

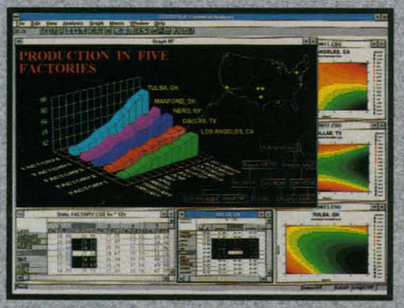


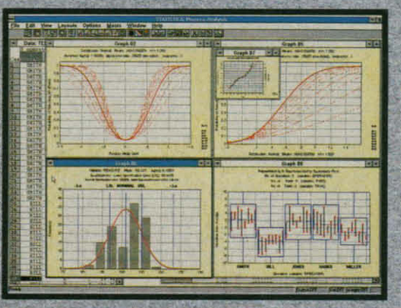

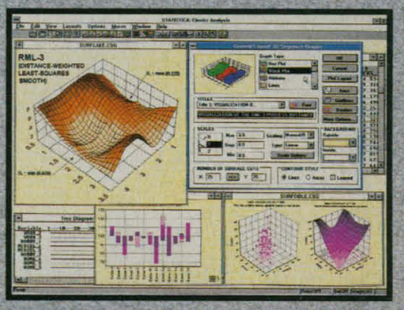


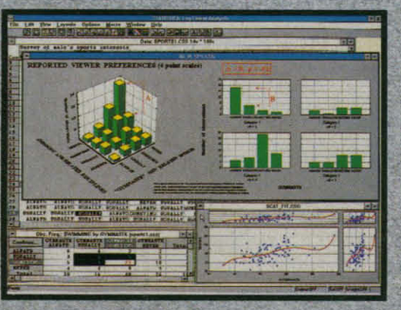

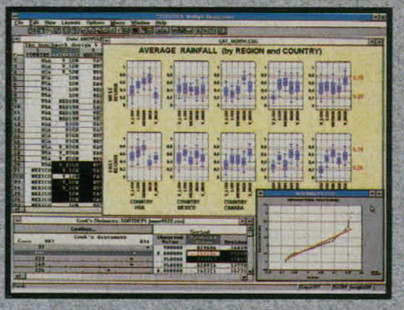


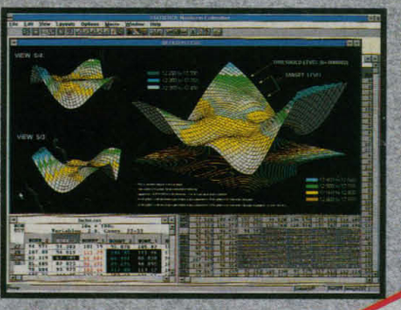

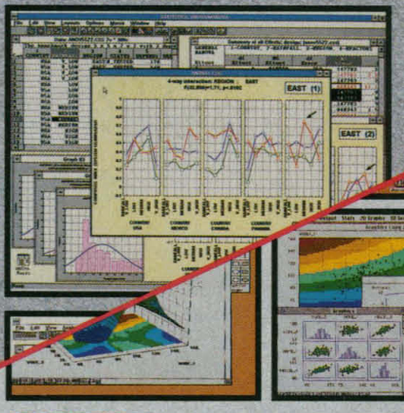

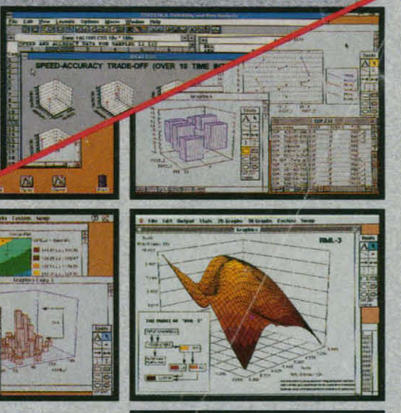

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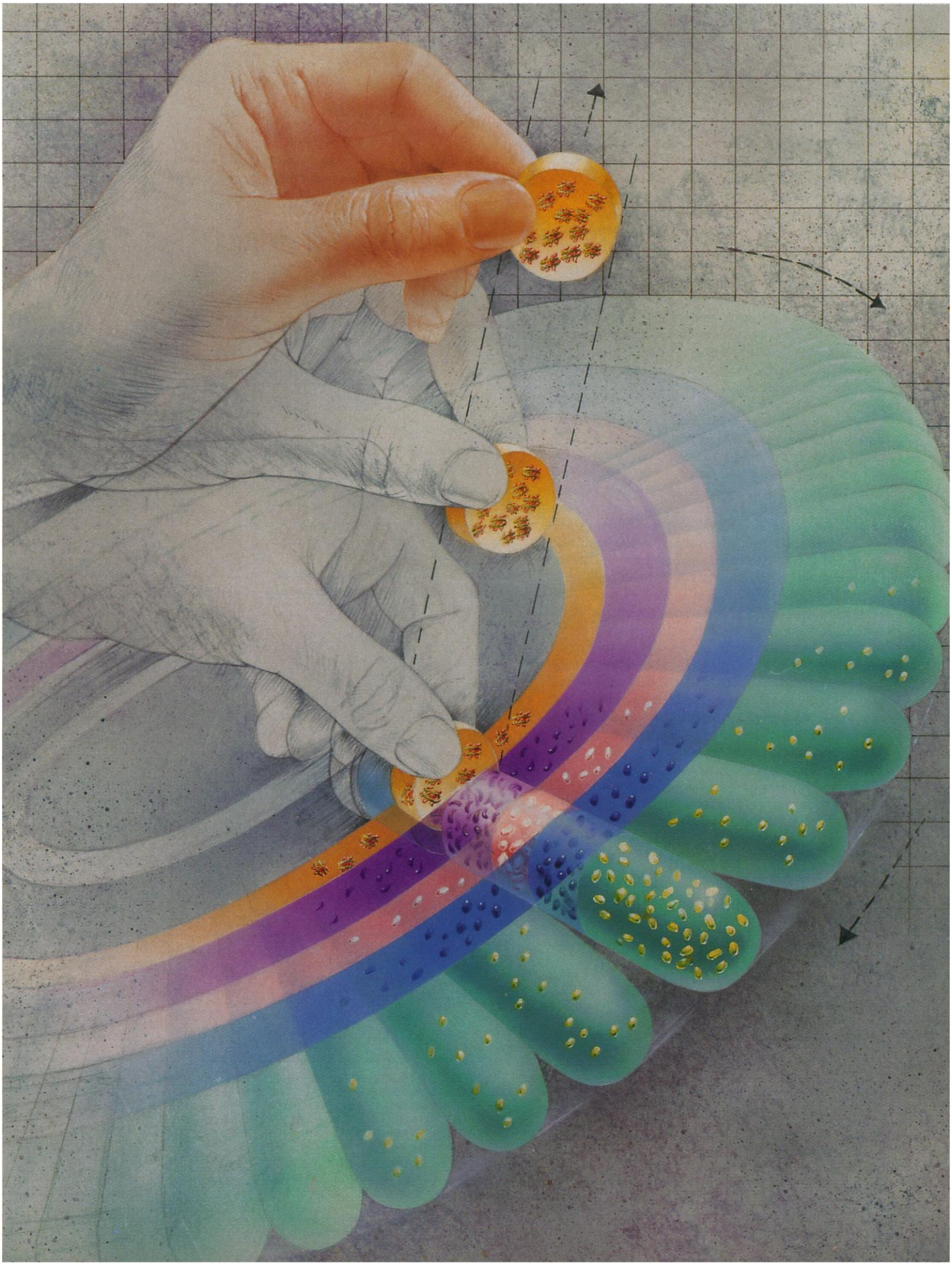

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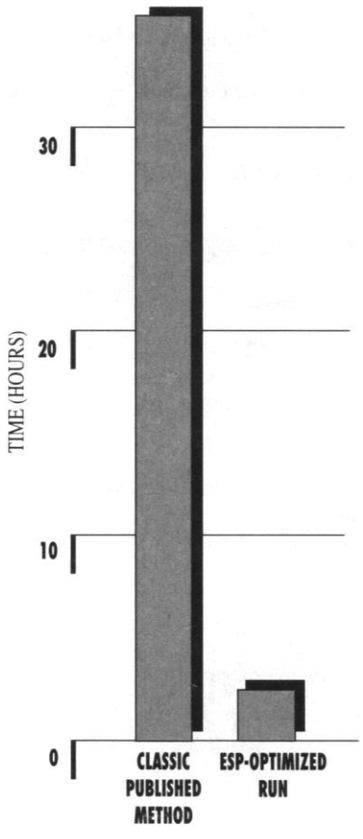


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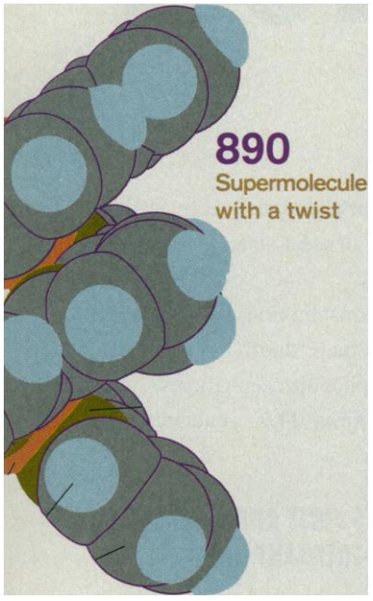


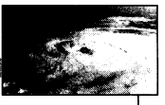

## NEWS & COMMENT



## RESEARCH NEWS



## SPECIAL SECTION



Evolution of Atmospheres

### NEWS



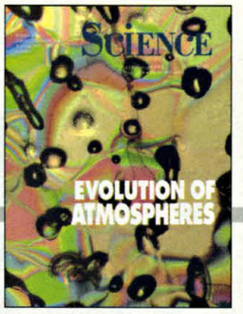
### ARTICLES



## DEPARTMENTS

COVER

Thin section of Antarctic ice (from a depth of 87 meters) observed under polarized light; the variety of colors reflects different orientations of the ice crystals. Air bubbles (black, about 1 millimeter across) provide a tiny record of ancient atmospheres that can be preserved in the ice for more than 100,000 years. See page 926. Other aspects of atmospheric evolution are discussed in the special section beginning on page 905. [Photograph: Michel Creseveur]




## PERSPECTIVES



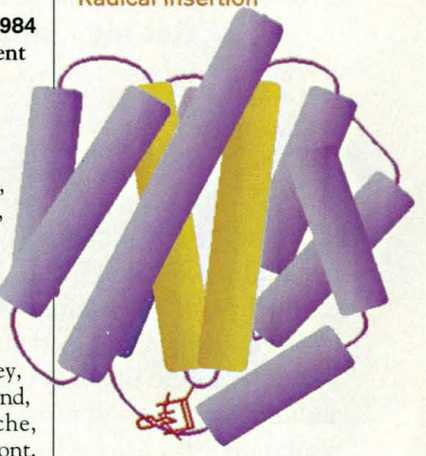
## RESEARCH ARTICLE



## REPORTS



**960**
Radical insertion



Indicates accompanying feature

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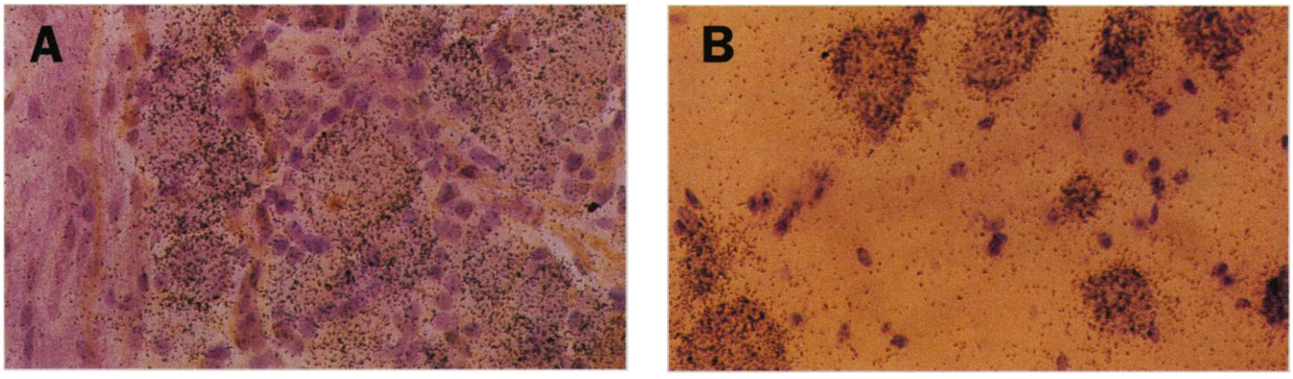


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[α-$^{33}$P]dATP (Cat. No. NEG-312H) was used to nick translate cDNA restriction fragments of various tubulin mRNAs. The resulting probes were hybridized to 10 µm sections of rat dorsal root ganglia and frozen brain sections as described by Oblinger and Pickett (*DuPont Biotech Update*, October 1992) and subsequently visualized with NTB2 emulsion.

**A** Rat dorsal root ganglia were hybridized to a $^{33}$P-labeled ß-tubulin cDNA probe. Only the neurons (stained yellow) show labeling. The glia cells (stained purple) display no apparent expression of ß-tubulin mRNA. Exposure time: 1 day.

**B** A $^{33}$P-labeled ß-tubulin cDNA probe was used to detect presence of ß-tubulin mRNA in neurons from rat facial motor nucleus brain stem (heavily labeled large cells). The smaller, purple stained glia cells do not show any apparent labeling. Exposure time: 2 days. Data courtesy Dr. Monica Oblinger, Chicago Medical School.

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DUPONT

edited by PHIL SZUROMI

## Flat membranes

Two-dimensional polymer membranes exhibit a variety of phase transitions. A flat phase has been predicted in numerical simulations to have enhanced stiffness because it is roughened by thermal fluctuations, much like the way corrugations strengthen sheet metal. Schmidt *et al.* (p. 952) used small-angle x-ray and light scattering to study the flat phase in a system that models the classic tethered membrane—the spectrin skeletons of red blood cells. The calculated roughness of the skeletons from computer simulations agreed well with the experimental values.

■

## Bucky polymers

Individual buckyballs may be joined in a polymer network by irradiating thin films of $C_{60}$ with ultraviolet light. Rao *et al.* (p. 955) used several probes, including mass spectroscopy, Raman scattering, and scanning electron microscopy, to observe an irreversible transformation of the films into a different solid phase. Vacuum-deposited films of $C_{60}$ were exposed to light from a mercury arc lamp or an argon-ion laser. Changes in vibrational modes were consistent with photopolymerization of the films. The $C_{60}$ molecules may be connected by photochemically created =C=C= bridges.

■

## Electrochemical polymer processing

Conducting polymers, such as polyaniline and polypyrrole, have potential applications that include use in lightweight batteries and in display devices. Most of these materials are difficult to process in that they are insoluble and tend to decompose rather than melt. Li *et al.* (p. 957) show that fibers of poly(3-methylthiophene) can be grown electrochemically by using a capillary tube to flow a solution containing the monomer past the electrode. By changing the capillary geometry, fibers of different shapes could be formed.

■

## Balancing act in tumor suppression

Interferons (IFNs) are proteins that can inhibit cell growth. The expression of IFNs is controlled by two mutually antagonistic transcription factors, interferon regulatory factors–1 and –2 (IRF-1 and IRF-2). Harada *et al.* (p. 971) show that a balanced expression of these two factors is critical to the maintenance of normal cell growth. When IRF-2 is overexpressed in NIH 3T3 cells, the cells become transformed and exhibit increased tumorigenicity in mice; simultaneous overexpression of IRF-1, however, causes the cells to revert to a more normal phenotype. The anti-oncogenic activity of IRF-1 is supported by the cytogenetic studies of Willman *et al.* (p. 968), who show that the gene for IRF-1 maps to human chromosome 5q31.1, a region that is frequently deleted in leukemia and preleukemic myelodysplasia.

## Moving into the membrane

Steps in the adsorption and unfolding of a protein at a membrane surface were followed by time-resolved electron paramagnetic resonance experiments. Shin *et al.* (p. 960) selectively spin-labeled the 20-kilodalton channel-forming fragment of a bacterial cytotoxin, colicin E1, with nitroxide compounds. The fragment likely consists of eight amphipathic α helices that surround two very hydrophobic α helices. The signal from spin-labeled residues in solvent-exposed surface loops of colicin E1 was attenuated within a few seconds after mixing with phospholipid vesicles, reflecting the loss of rotational mobility after adsorption. In contrast, the signal from a residue within one of the buried hydrophobic helices had a time constant greater than 100 seconds, reflecting the rate-limiting insertion of the helix into the membrane.

■

## Cofactor binding in pyruvate oxidation

Pyruvate plays a central role in both aerobic and anaerobic metabolism. Muller and Schulz (p. 965) describe the structure of the tetrameric enzyme pyruvate oxidase from *Lactobacillus*, which oxidatively decarboxylates pyruvate to produce the energy-storage metabolite acetylphosphate. One of the cofactors, thiamine pyrophosphate (TPP), is bound by a metal ion and a βαaβ unit. The spatial relation between the TPP cofactor and the flavin adenine dinucleotide (FAD) cofactor suggests that oxidation proceeds through a two-step transfer of two electrons.

■

## Ras relations

Posttranslational modifications of Ras-related proteins are required to target these proteins to the plasma membrane where they function in signal transduction. Philips *et al.* (p. 977) find that the carboxyl methylation of Ras-related low molecular weight GTP-binding proteins is stimulated after the activation of neutrophils with the chemoattractant FMLP. Blockage of neutrophil response to FMLP by inhibitors of prenyl cysteine carboxyl methylation suggests that receptor-mediated signal transduction is linked to carboxyl methylation of Ras-related proteins.

■

## Regulating switching

During B cell development, the antigen-binding variable part of the immunoglobulin gene can bind to different constant regions, a process known as class switching. Two reports provide insights into factors controlling switching. Allen *et al.* show that (p. 990) defects in a T cell protein block switching in B cells and induce an inherited immunodeficiency disease (see also news report by Marx, p. 896). Jung *et al.* (p. 984) used mutant mice to identify a DNA sequence that regulates a particular switch combination.

■

## Gene transfer in the brain

Viral vectors can be used to transfer genes into differentiated cells that no longer undergo cell division, but in the case of cells in the nervous system, expression from transferred genes often declines within a few weeks. Le Gal La Salle *et al.* (p. 988) show that a replication-defective adenovirus vector can be used to introduce a gene encoding β-galactosidase into the brain. Injection of the vector into the hippocampus and substantia nigra of the rat-infected neurons, microglial cells, and astrocytes without apparent cytotoxic effects. Neuronal expression of β-galactosidase was stable for 2 months.

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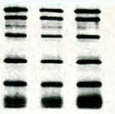

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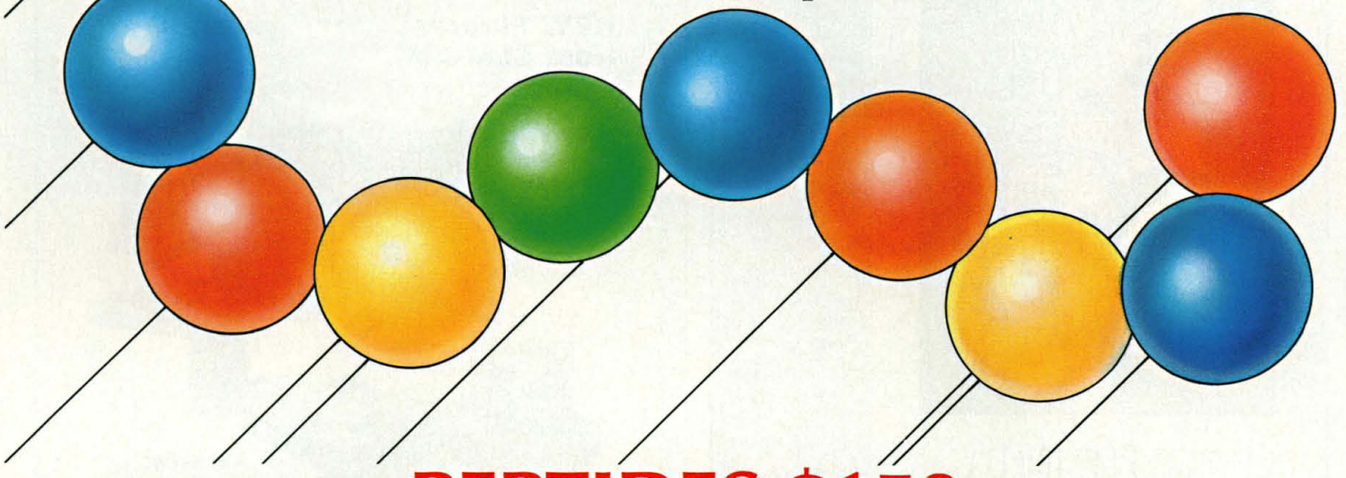

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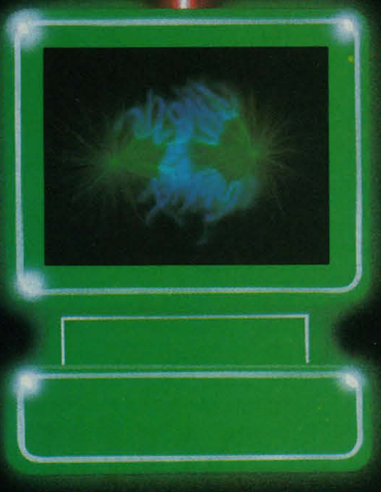

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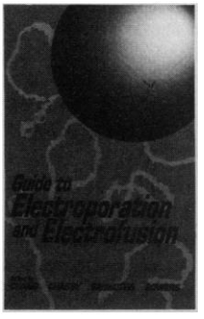


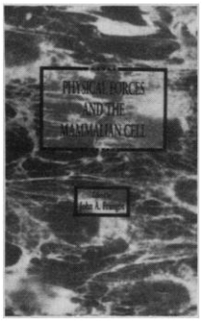


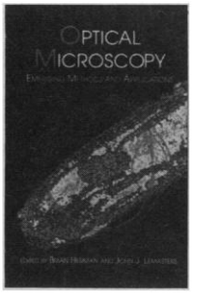


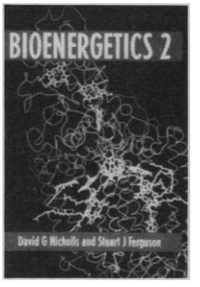


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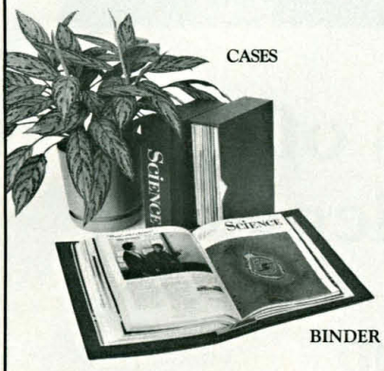


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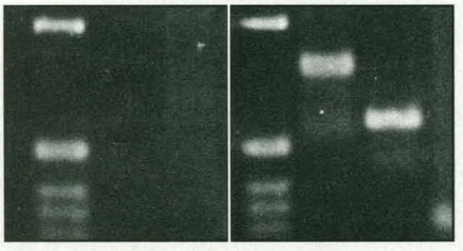

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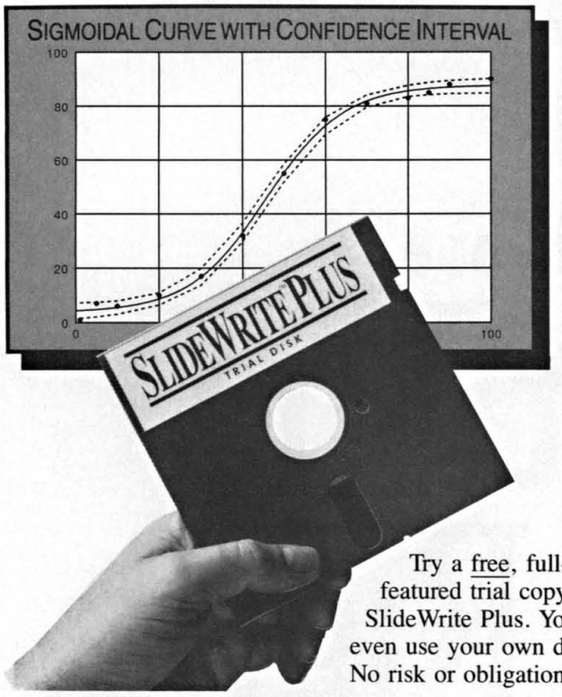


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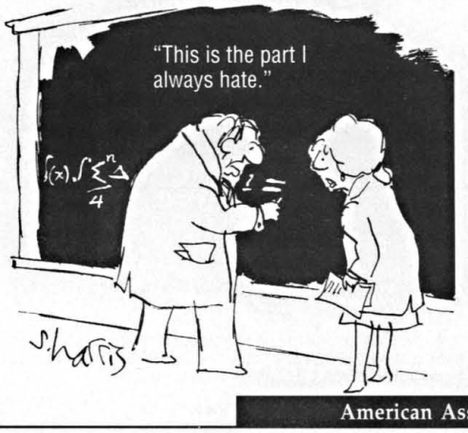


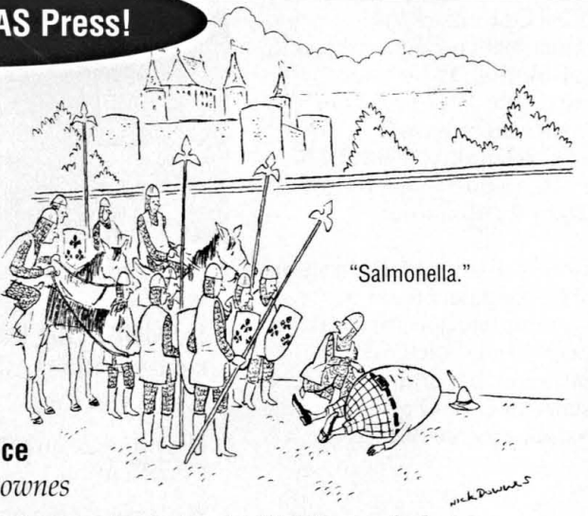


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