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SCIENCE

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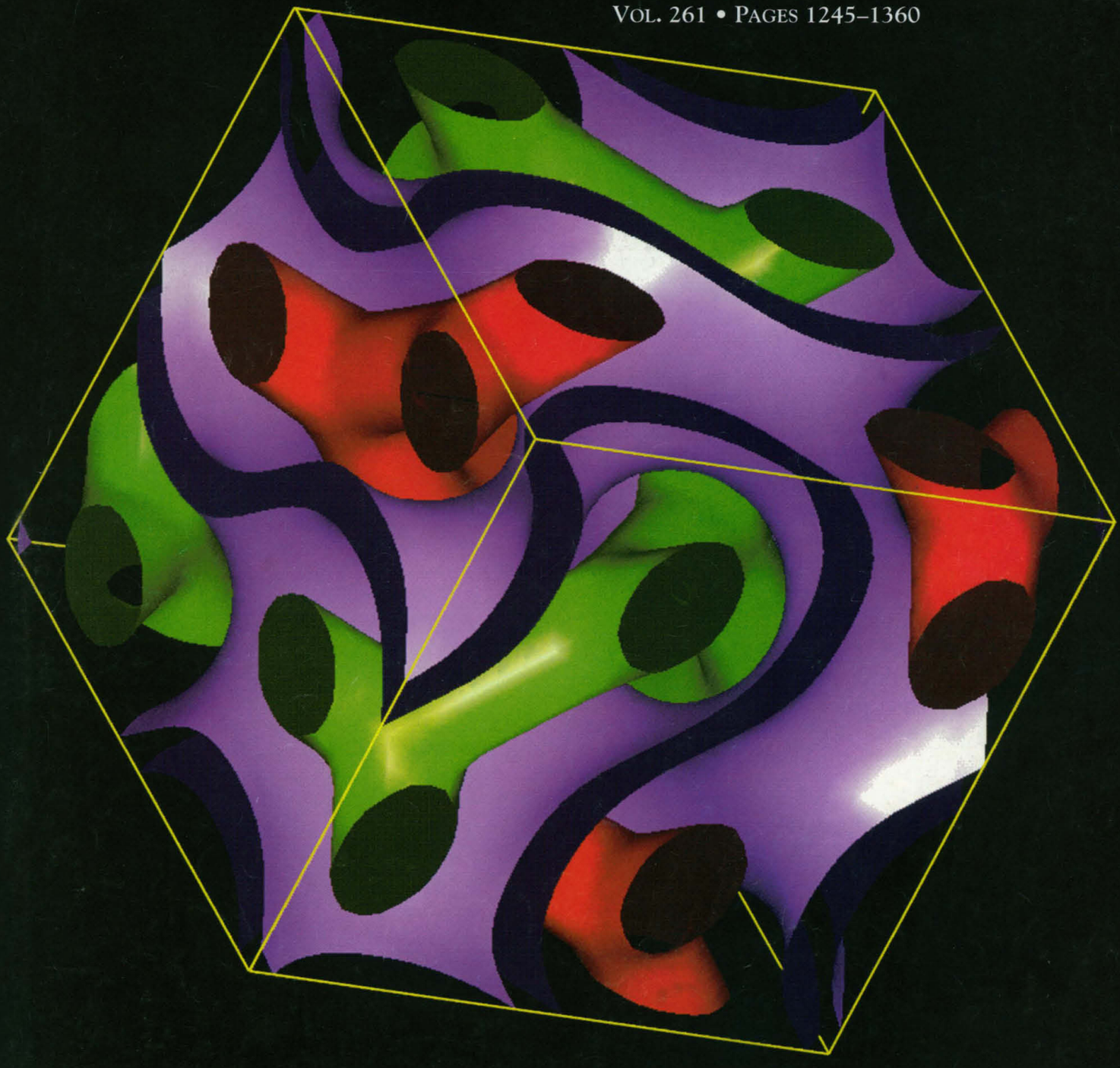

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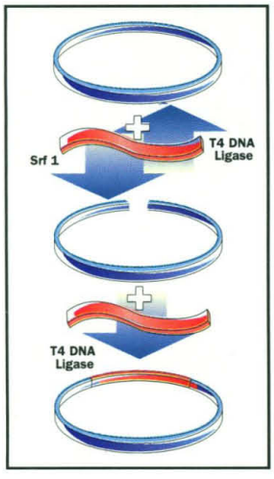

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1. Bauer, J., et al. (1992) *Stratagies* 5:2-64

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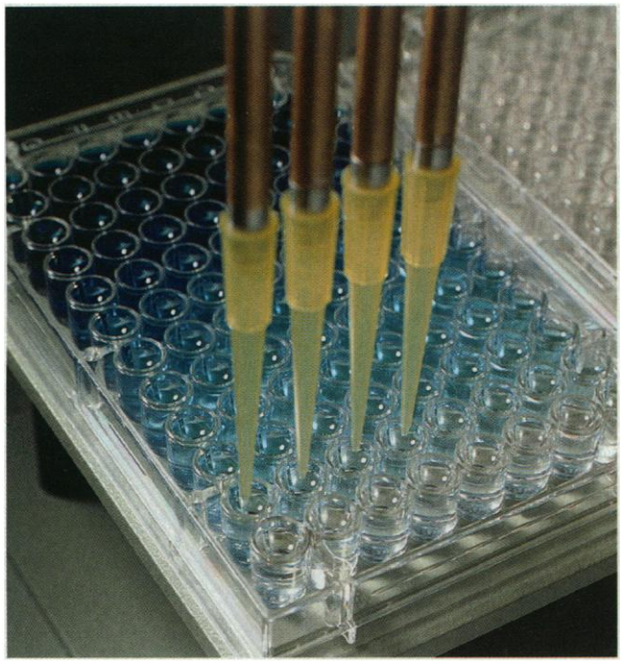

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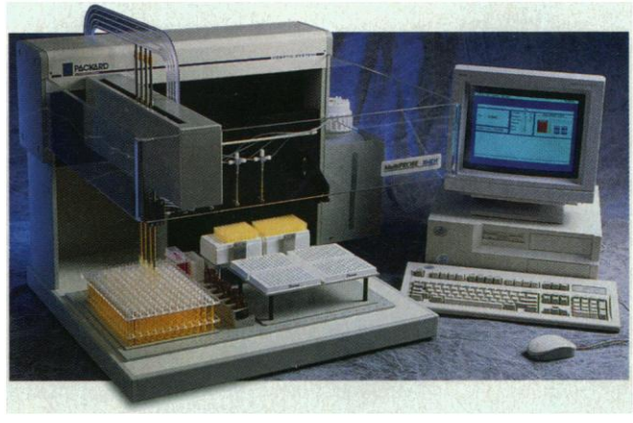

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SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

1276
Physicists dig for answers

NEWS & COMMENT

RESEARCH NEWS

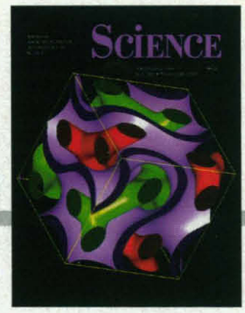
PERSPECTIVE

ARTICLES

DEPARTMENTS

COVER

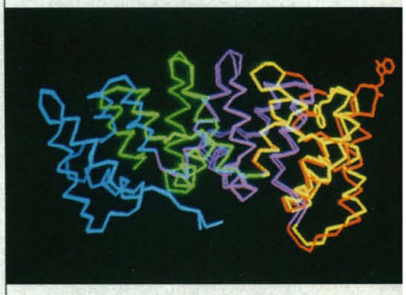
Computer-generated cubic unit cell (97.3 angstroms) of a silicate mesostructure; the lavender contours bound a periodic minimal surface along which silicate anions polymerize into an infinite sheet between two separate, bicontinuous surfactant volumes (green and red). Recent breakthroughs in the synthesis of mesoporous materials have permitted the exploration of liquid crystal–inorganic interface formation in surfactant-silicate mesophases. See page 1299. [Image: A. Monnier, using Insight II software (Biosym)]



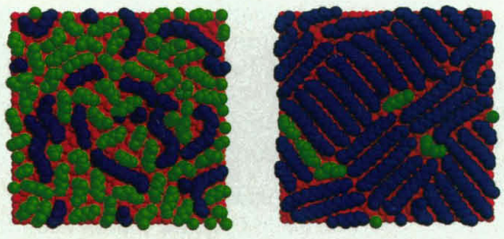
RESEARCH ARTICLE

REPORTS

TECHNICAL COMMENTS



1321
A calcium-triggered anchor



1310
Liquid simulations

Indicates accompanying feature

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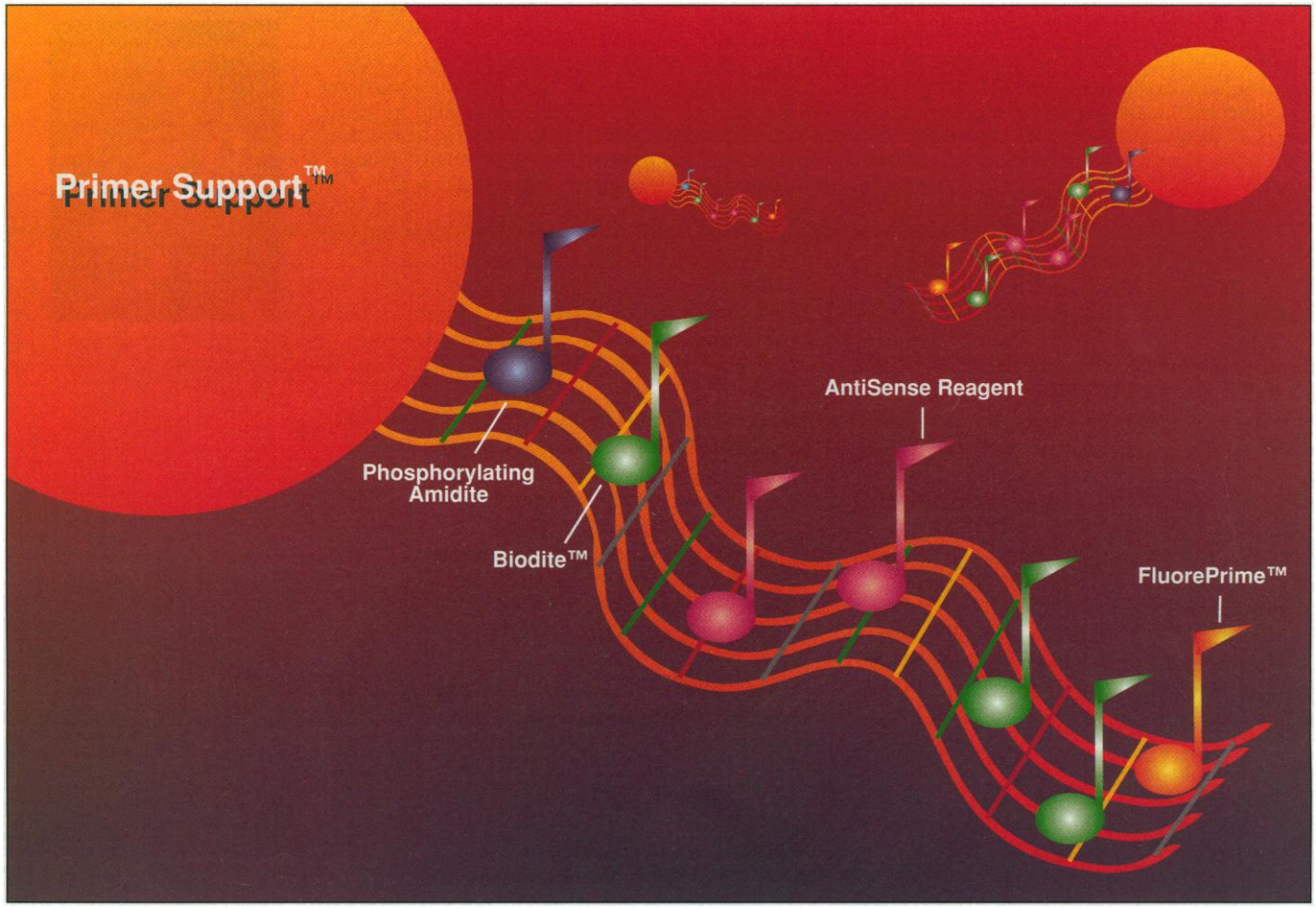

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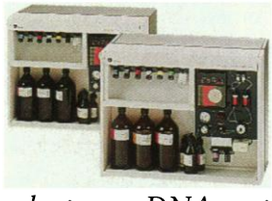

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(9306)

THIS WEEK IN SCIENCE

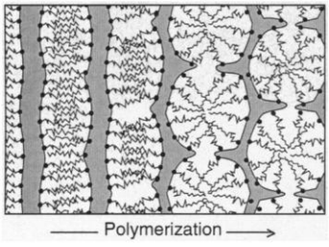
edited by PHIL SZUROMI

Biomineral interfaces

Biological processes such as the formation of bone and shells exert exquisite control over the growth of inorganic crystals. Mann *et al.* (p. 1286) review how lessons learned from biological systems can be used to control crystallization and synthesize new materials.

Making mesomaterials

The mechanistic steps for the formation of mesoporous silica materials, which can form ordered arrays of pores up to 100 angstroms in size, have been identified experimentally. Monnier *et al.* (p. 1299) examined



how oligomeric silicate anions serve as multidentate ligands and can bind several surfactant molecules to form lamellar structures. These oligomers then polymerize, which diminishes their charge density; the structure accommodates this change by increasing the area per head group to form a hexagonal phase.

Lunar M & M's

Lunar soil contains micrometer-sized mineral grains with thin amorphous shells or rims. It has long been thought that solar emission, both radiation and particles, had formed the rims. But now Keller and McKay (p. 1305) have used electron microscopy to show that the rims are chemically and structurally distinct from the host grains. They argue that the rims are deposits of material evaporated from the moon's surface by micrometorite impacts. The evident importance of evaporation and deposition complicates attempts to deduce the history of the moon's surface material and has implications for the evolution of the lunar atmosphere.

Ferroelectricity and superconductivity

As for high-temperature superconductivity, the mechanism of another condensed matter phenomenon—ferroelectricity—remains a puzzle. The phenomenon, in which some crystals hold a permanent electric moment, is so called because of the analogy with ferromagnetism, in which a material possesses a permanent magnetization. Egami *et al.* (p. 1307), in a study of ferroelectric transition metal oxides such as $BaTiO_3$, show that the interaction between electrons and the crystal lattice can be dramatically enhanced in the presence of strong electron correlations, owing to deformation-induced charge transfer. They conclude that similar effects may be important in high-temperature superconductivity.

Modeling the QBO

Although the goal of general circulation models (GCMs) is to simulate observed atmospheric dynamics to predict climate, the task is so computational-intensive that certain climate features are usually forced onto the model rather than evolve out of it. Cariolle *et al.* (p. 1313) have achieved some success in modeling a prominent feature of atmospheric circulation, the quasi-biennial oscillation (QBO). The QBO is the east-to-west shifting every 2 to 3 years of the mean wind direction in the lower stratosphere about the equator. It is thought to result from the interaction of equational waves that propagate vertically. Three 10-year simulations with three GCMs had sufficient resolution to develop the QBO signal without needing to resort to ad hoc paramaterizations.

Nanomagnets

Large arrays of ferromagnetic nanowires have been fabricated by electrochemical methods. Whitney *et al.* (p. 1316) etched nanometer-sized pores into polycarbonate membranes, which served as templates during the electrochemical deposition of nickel or cobalt. Arrays of ferromagnetic wires were produced perpendicular to a copper film that have high coercivities and remnant magnetizations. Such structures may find application in perpendicular magnetic recording and in testing predictions for systems confined in one dimension.

Calcium changes

Annexin proteins, which are involved in a number of processes at cell membranes such as secretion and ion transport, bind to membrane phospholipids in the presence of calcium. Concha *et al.* (p. 1321) present an x-ray structure of rat annexin V that differs from previously solved structures in that calcium ions are bound in all four domains. Comparison to the previously solved annexin structures suggests that the calcium binding loop of domain 3 undergoes a large conformational change to expose a single tryptophan residue that may interact with phospholipids.

Joint efforts

Signaling between T and B cells in the development of thymus-dependent immunity may play a role in the induction of autoimmune diseases such as rheumatoid arthritis. The ligand for CD40, a receptor expressed on mature B cells, is gp39, which is expressed mainly on activated $CD4^+$ cells. Durie *et al.* (p. 1328) show that the development of collagen-induced arthritis (CIA) in mice could be blocked with a monoclonal antibody to gp39. Mice that received the antibody did not develop CIA symptoms, which include joint inflammation and erosion of bone and cartilage.

Fueling the Cambrian explosion

About 550 million years ago, in what is known as the Cambrian explosion, marine invertebrates evolved mineralized skeletons and fossil diversity increased markedly. The timing and pace of this event have been uncertain because of poor age control on the fossil boundaries of Lower Cambrian rocks. Bowring *et al.* (p. 1293) present uranium-lead ages from volcanic rocks and breccias interbedded with fossiliferous Cambrian rocks from Siberia that are correlative with the type Cambrian sections. The dates indicate that the Cambrian period began 544 million years ago, younger than most earlier estimates, and that the first stage of the Cambrian lasted only 10 to 15 million years. The implications of the apparent rapidity of the Cambrian explosion are highlighted by Kerr in a news story (p. 1274).

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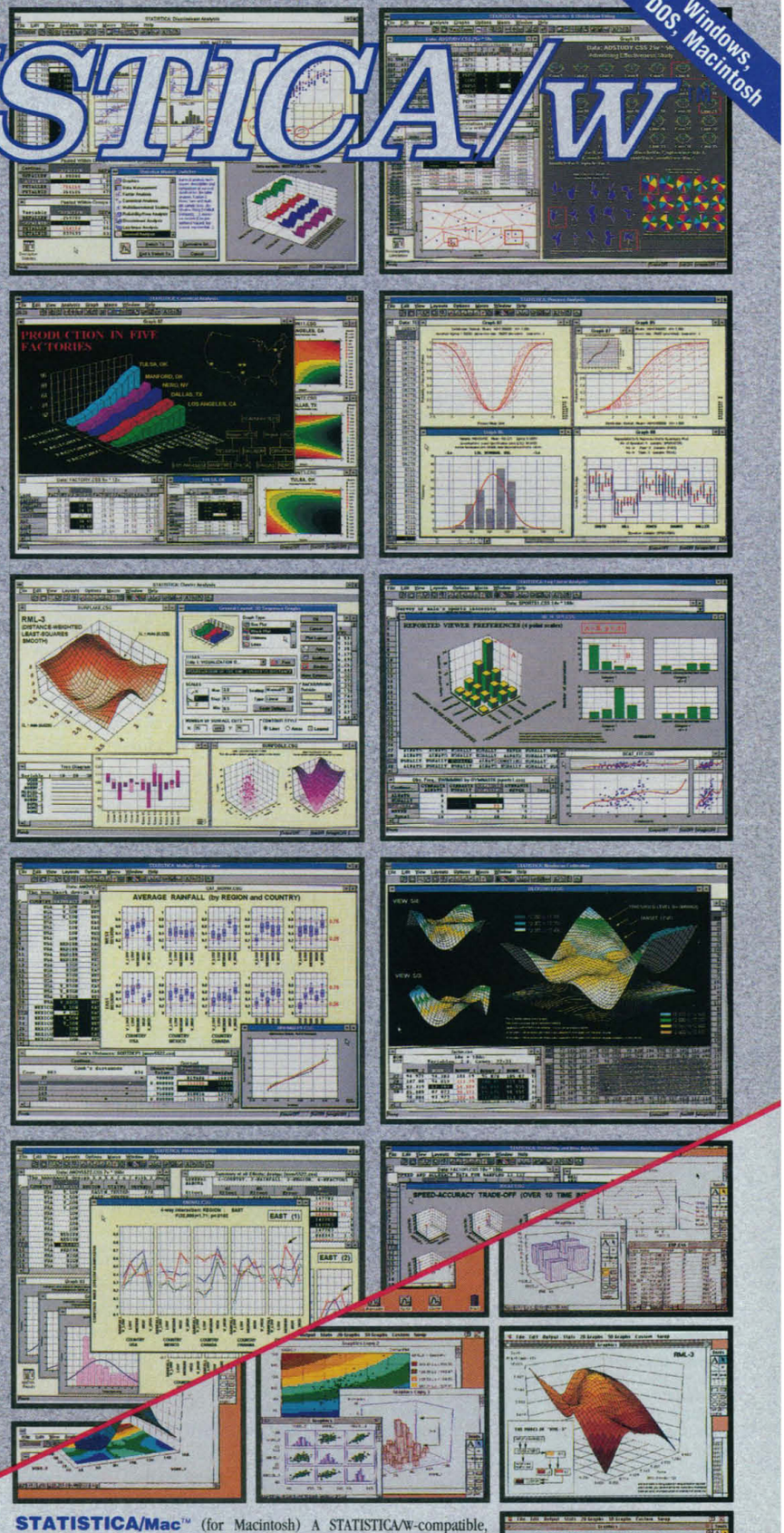

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AAAS 1993 Mentor Awards
Call for Nominations

The American Association for the Advancement of Science (AAAS) invites nominations for the 1993 Mentor Awards. The two categories are *Lifetime Mentor Award* and *Mentor Award.* These annual awards honor individuals who, during their careers, demonstrate extraordinary leadership to increase the participation of women of all racial/ethnic groups; African American, American Indian, and Hispanic men; and/or people with disabilities in science and engineering fields and careers.

A prize of $5000 and a commemorative plaque for the *Lifetime Mentor Award* will recognize an individual who has mentored and guided significant numbers of students from these underrepresented groups to the completion of doctoral studies and/or who has impacted the climate of a department, college, or institution to significantly increase the ethnic diversity of students pursuing and completing doctoral studies. This individual will have served in such a role for 10 years or longer.

The *Mentor Award*, a prize of $2,500 and a commemorative plaque, will recognize an individual who has mentored a significant number of students over a period of less than 10 years.

Such commitment and extraordinary effort may be demonstrated by:

- the number and diversity of students mentored.
- assisting students to present and publish their work, to find financial aid, and to provide career guidance.
- providing psychological support, encouragement, and essential strategies for life in the scholarly community.
- continued interest in the individual's professional advancement.

The 1992 AAAS Mentor Award recipient was Dr. Abdulalim A. Shabazz, Professor and Chair of the Mathematical Sciences Department of Clark Atlanta University.

For more information or an application, please contact Yolanda S. George at AAAS, telephone (202) 326-6670.

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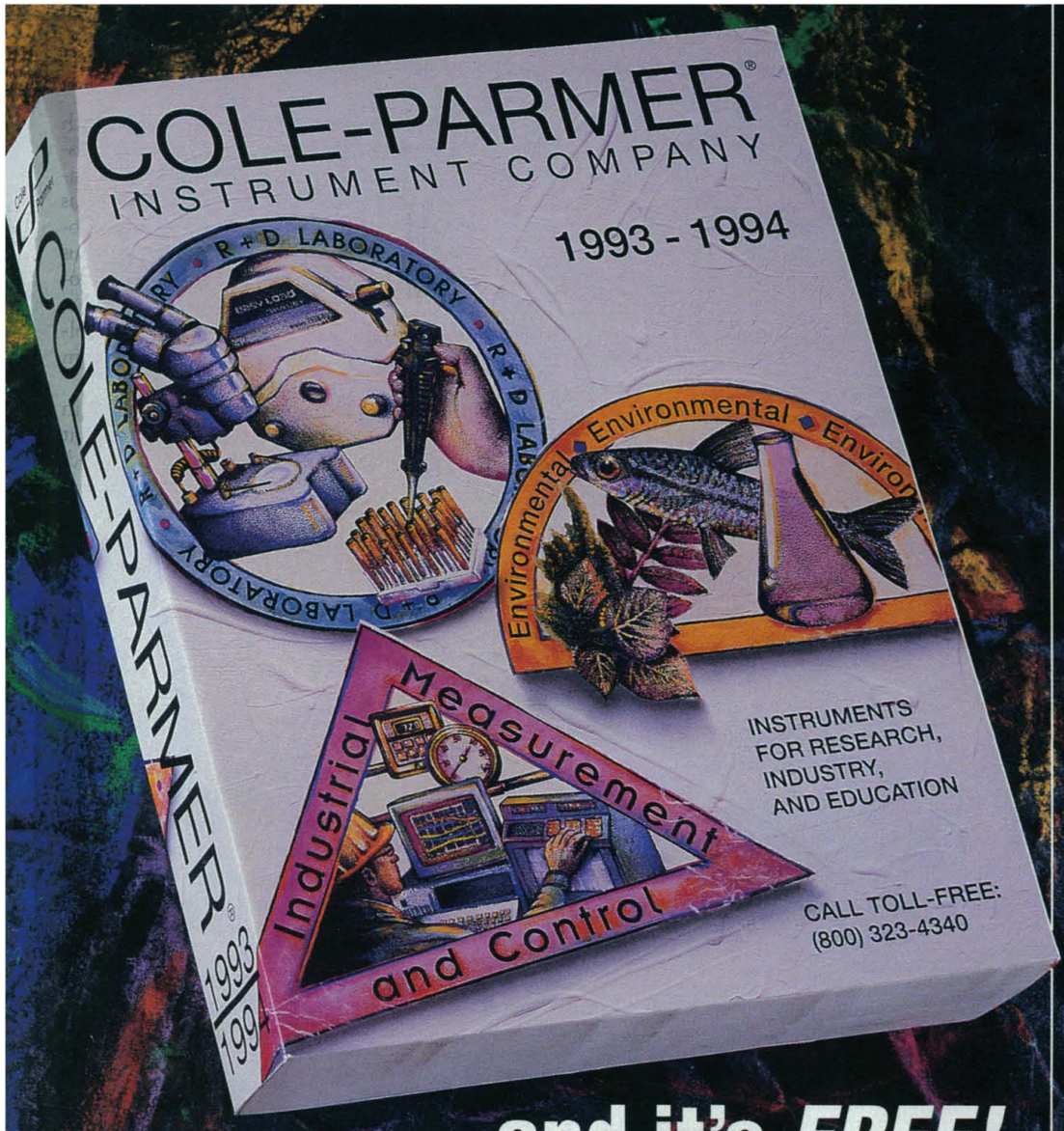

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