American Association for the Advancement of Science

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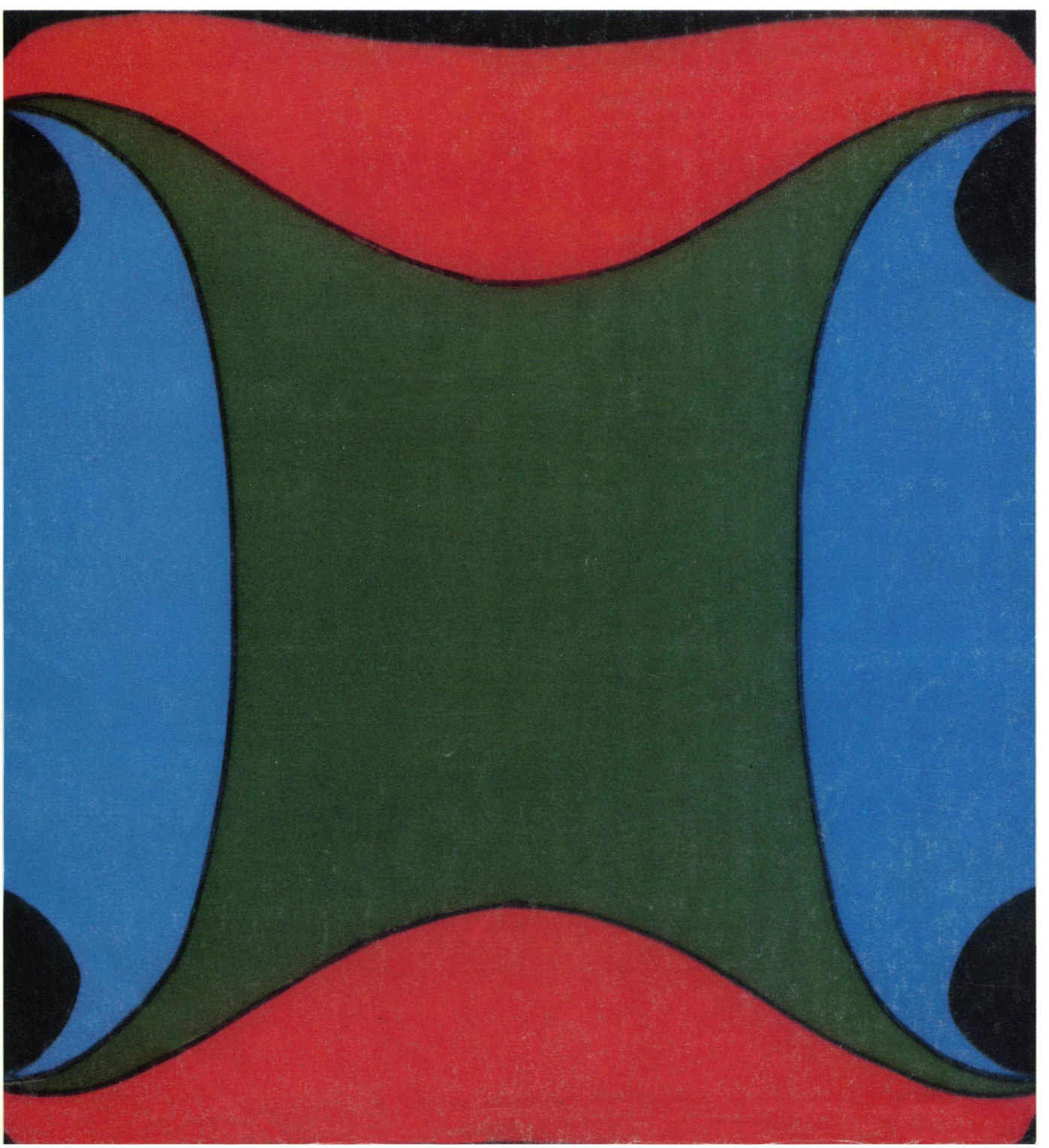

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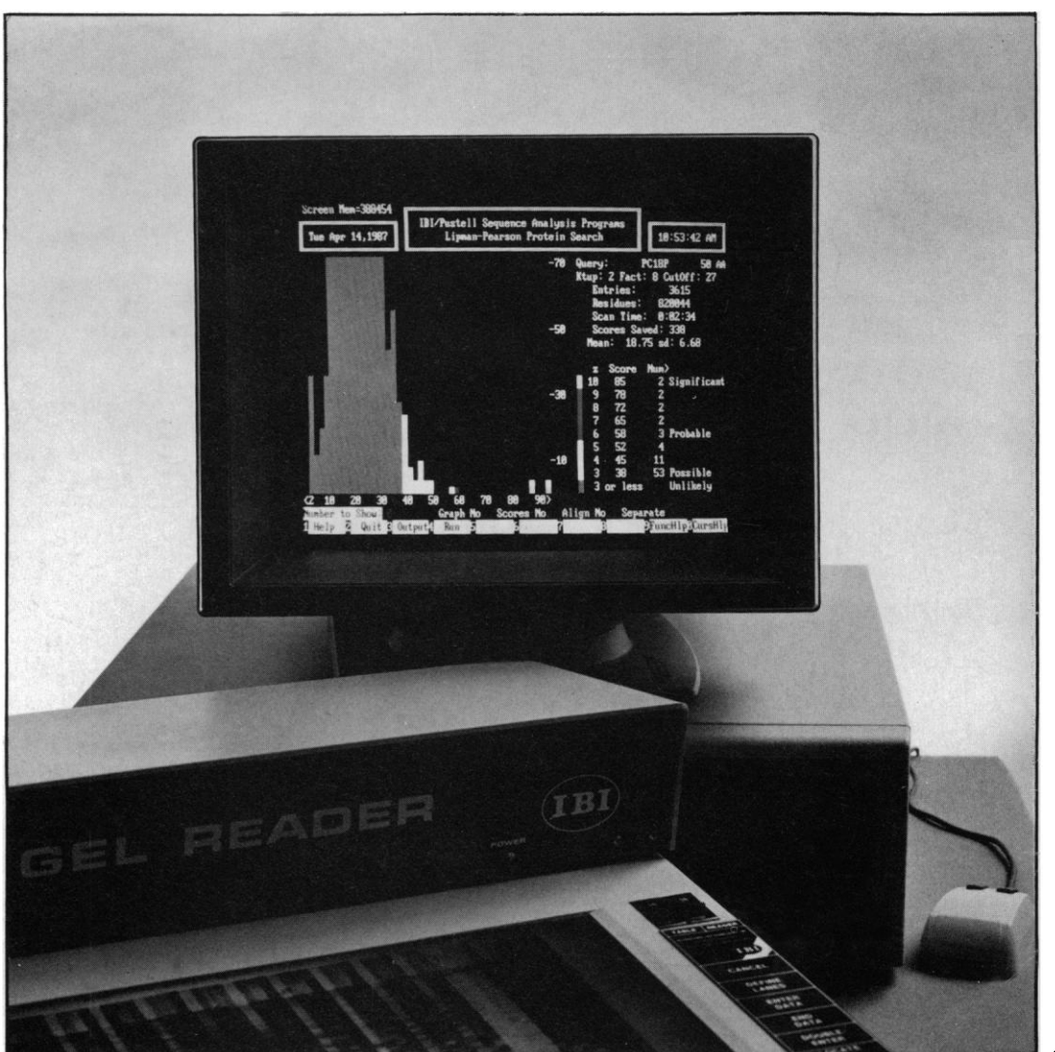

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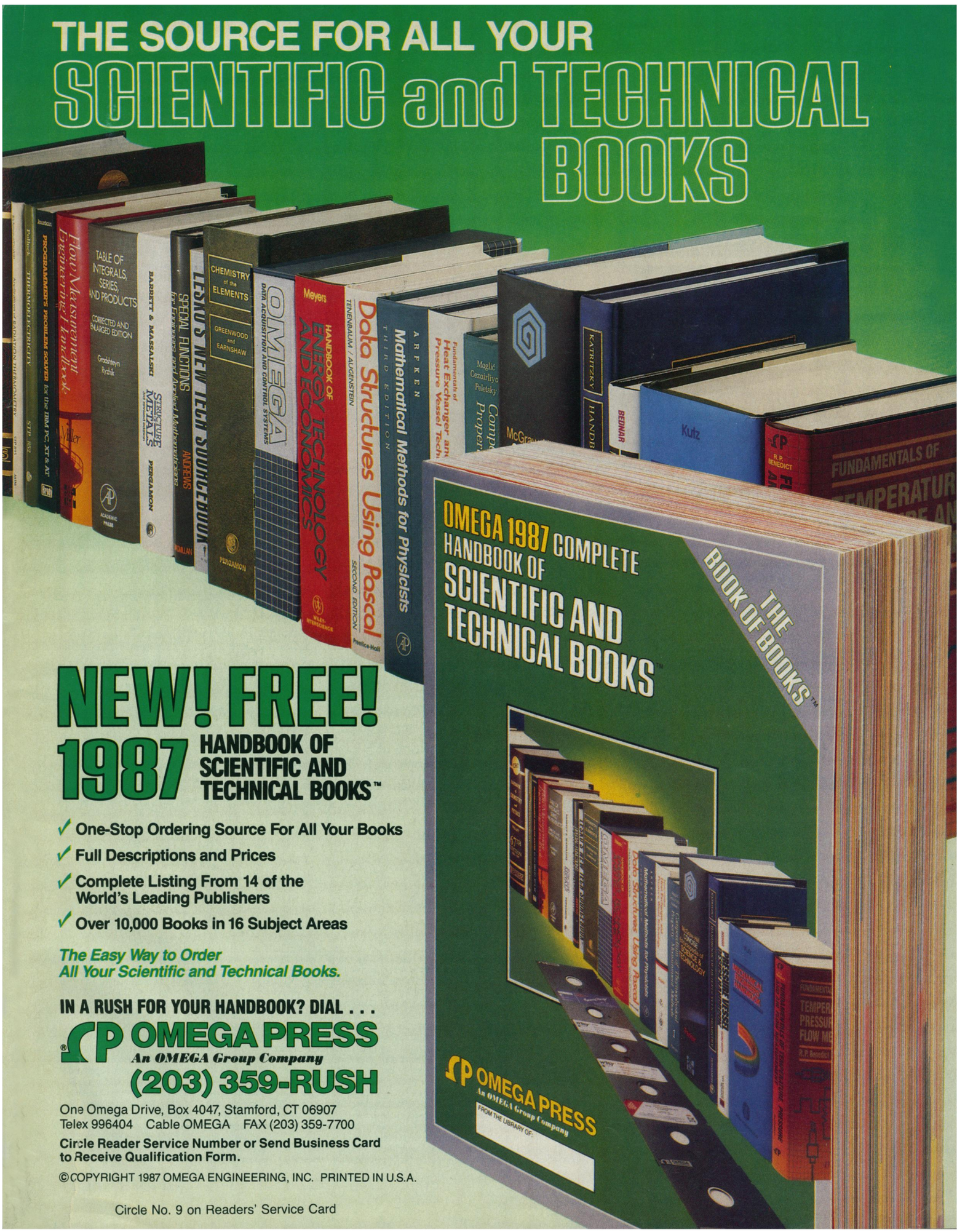

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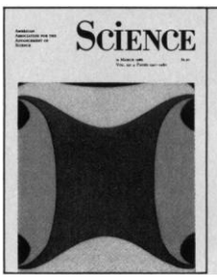

COVER Electric power dissipation levels in a vertical slit with finite electrodes. Joule heating is greatest near the electrode tips (black semicircles) and decreases by roughly half with each color change, from blue to green to red. Temperature gradients produced by Joule heating drive unstable nature convection. The picture was generated numerically using Laplace's equation for the potential. See page 58. [William A. Gobie, Department of Chemical Engineering, Washington State University, Pullman, WA 99164]

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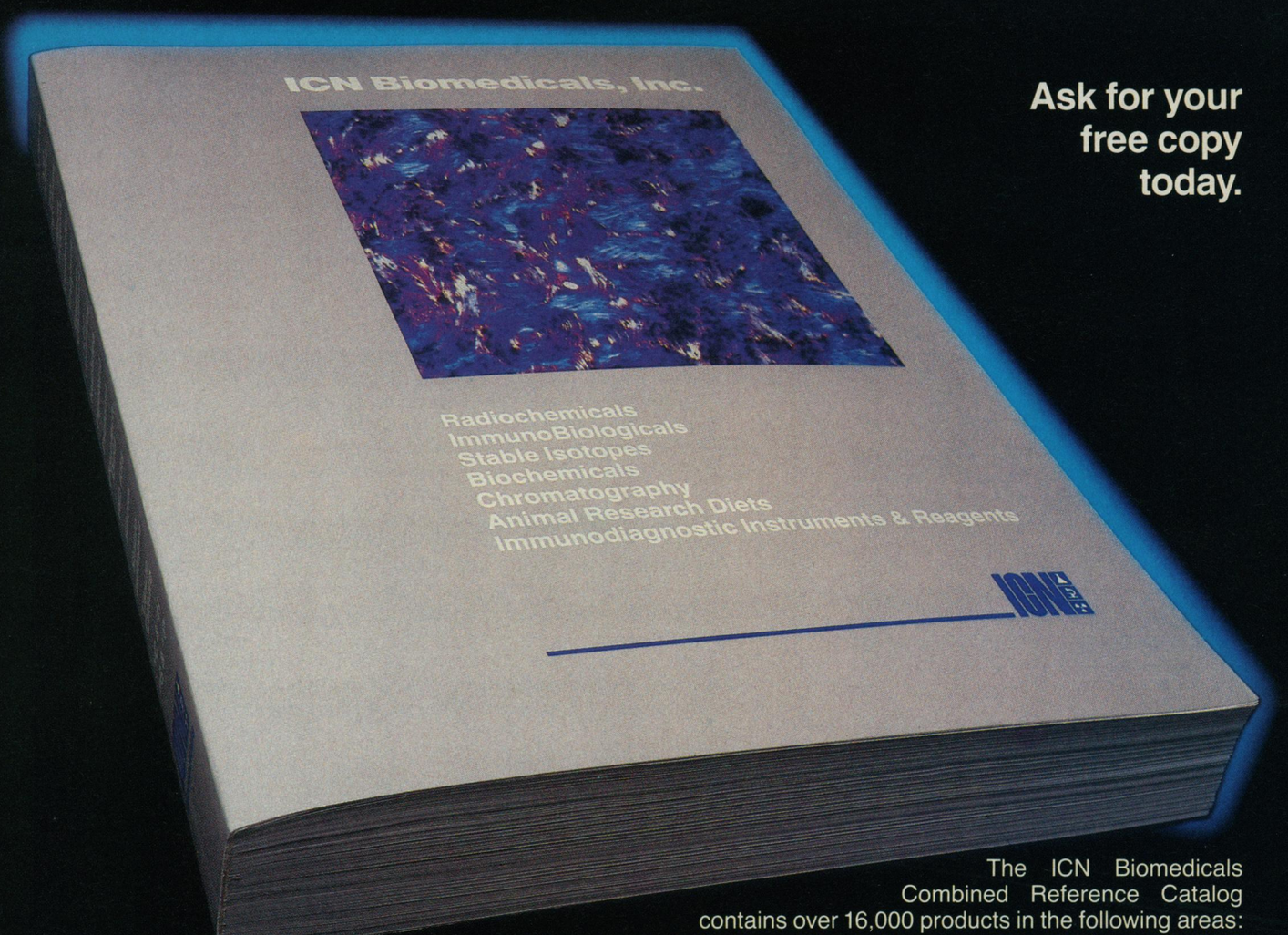

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This Week in
SCIENCE

DNA methylation in fungi

BEFORE a piece of DNA becomes functional in eukaryotes, certain of its cytosine residues are methylated; the methylation alters the DNA's physical properties and affects its interactions with proteins (page 48). Although methylation is considered important for gene expression, the exact biologic sequelae of methylation and of the process by which methylation occurs are undefined. In a piece of DNA called the zeta-eta region from the fungus *Neurospora crassa*, methylation is unusually heavy; this region formed from an imperfect duplication of a segment of DNA. Methyl groups were stripped from ζ–η by propagation in bacteria; when ζ–η was later reintroduced into *N. crassa*, cytosines were faithfully remethylated no matter where the ζ–η region integrated into the host genome. Methylation rarely extended beyond the insert to DNA sequences from the host; the ζ–η region thus appears to be equipped with its own methylation signal. According to the model proposed by Selker *et al.*, the signal is most likely to be contained in a structural feature of the region, probably a feature related to the rearrangement that occurred when the region was originally duplicated.

Advance in x-ray astronomy

AN x-ray image of the sun's corona has been recorded with a new type of telescope, the normal-incidence multilayer reflector telescope (page 61). The multilayer materials efficiently reflect x-ray wavelengths at normal incidence; x-rays have in the past been difficult to focus onto film plates when more complicated—grazing incidence—optical systems were used. The equipment described by Underwood *et al.* flew as part of a solar-experiment rocket payload; the rocket was launched hours after a solar flare in October 1985 and ascended 290 kilometers above the earth. Images at 44.16 angstroms were recorded; this radiation is emitted by ionized silicon in the sun's high temperature (between 1×10^6 and 10×10^6 kelvin) plasma. Computer-enhanced images and x-ray spectra taken by another instrument on board the rocket indicated that plasma in the active regions of the corona was contained in large and small loops outlining the magnetic fields emanating from the sun. The loop pattern was confirmed with an ultraviolet imager on the rocket and by instruments on the Solar Maximum Mission satellite. Further improvements in the optical system of the multilayer telescope should provide even higher resolution than is possible with other existing optical systems.

Bats strike out

KATYDIDS are generally among the most acoustically active of insects; the males typically sing to attract females of their species, but their songs also can attract predatory bats (page 64). In forests in Panama where such bats are common, Belwood and Morris observed that katydids have substituted tremulation—vigorous shaking of their bodies—for much of their singing. When male katydids tremulate on plants, female katydids feeding elsewhere on the plant feel the shaking and respond; the bats do not detect the shaking. Although tremulation probably involves greater output of energy than does loud singing, it is an apparently successful adaptive response by the katydids in the presence of acoustically orienting—and not the usual echolocating—bat predators. The katydids are thus like a variety of other insects—moths, green lacewings, crickets, and mantids—that have adapted their behavior to counter the threat of bat predators.

Climate and chlorophyll a in the ocean

CHLOROPHYLL a, which is produced by phytoplankton in the ocean, has doubled in abundance during summertime; this change has occurred in the last 20 years in a 15-million-square-kilometer area—the central North Pacific Ocean (page 70). Venrick *et al.* attribute the increase to a long-term change in the climate that is most prominently expressed in winter. Chlorophyll a is considered to be an indicator of the amount of phytoplankton in the ocean; changes in its abundance reflect changes in the abundances of the carbon and nitrogen that are contained in the phytoplankton. The stronger winter winds and colder temperatures over the ocean have stressed and cooled the sea surface; this, in turn, could enhance the vertical mixing in the water column such that nutrients would be transported more fully to upper regions where the phytoplankton grow. This sizable increase in chlorophyl a could have effects not only on the local ecosystem but also on the global carbon cycle.

Enzyme for the anchor

SURFACE proteins of a variety of eukaryotic cells are anchored into cell membranes by phosphatidylinositol (PI), a glycolipid (page 81). Among the proteins that have such anchors are the decay-accelerating factor found on blood and endothelial cells (and involved in the complement cascade) and the variant surface glycoprotein of African trypanosomes, which are the agents of sleeping sickness. The membrane anchor appears to facilitate the lateral movement of the protein attached to it, and it may serve as a recognition site for enzymes that cleave glycoproteins from cell surfaces. Davitz *et al.* found that one such enzyme, phospholipase D, is a component of human serum; it cleaves the decay-accelerating factor and the variant surface glycoprotein but does not react with a number of similar related substrates; it also differs from several other previously described phospholipases, all of which have been cell-associated, by a number of criteria. Because this enzyme generates phosphatidic acid (which has growth factor–like effects) from PI on the surface of a cell, it may be crucial for the proper transduction of signals into cells bearing certain types of (cleavable) receptors.

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SCIENCE

2 OCTOBER 1987
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Arms and the Men

The news of the arms control agreement shone like the proverbial candle in the night. It was not the end of the arms race—only a few thousand missiles removed in a sea of many thousands more—but the symbolism was enormous. At least the direction was down, not up; and the manner in which the agreement was concluded had a degree of professionalism as well as an absence of the political grandstanding that had marred previous attempts. Each of the two national leaders could rightfully claim substantial credit and, at the same time, each was pushed by historical forces to adjust to positions that were a long way from what he had initially demanded.

No one will claim that this first step will by itself bring permanent peace, but it is reassuring that the two leaders are not talking just about this agreement but also about the next steps needed to exploit the positive atmosphere. In this development, however, some realism in regard to the limitations of arms control and the true causes of wars had better be introduced.

One horror in the nuclear age, improbable but realistic enough to cause millions of dollars to be spent and to require eternal vigilance, is the preemptive strike. A plethora of arms widely dispersed decreases the likelihood of success for a first strike; therefore, one could argue that reducing arms increases the temptation for such an act. However, there are still so many arms so widely deployed that the surgical strike is likely to fail. Even the most hardened military professional could not expect his glistening hardware to operate perfectly when a German youth flies into Red Square or the U.S.S. *Stark* fails to defend itself against a routine attack.

The second and more probable scenario is a step-by-step escalation to Armageddon. The Falklands war was a model and warning of this danger: Country A grabs a little real estate, reasoning that Country B could not possibly care about some acres of farmland and a few sheep; Country B replies with diplomatic thunder, "Get out or else!" reasoning that tiny Country A will buckle under to threatening words from a larger military power. From that point on, the rhetoric becomes louder and fleets mobilize until both sides discover to their horror that they must act out their words or lose all credibility at home and with allies. Such an escalation could easily occur in the Middle East, Europe, or Central America. The fact that it has not happened so far between major powers may be because of the prospect of a nuclear holocaust, which has kept the peace among such powers for the longest period of modern times. Those living on a precipice become more cautious about a misstep. Ironically, arms control may enhance the chance of war if nations conclude that they can be more reckless now that we have returned to what might be called the comfortable old world of conventional warfare.

Arms control, therefore, offers a step back from the precipice that we cannot afford to waste. It will be valuable only if we seek to understand and defuse the causes of war. One of the problems of our times is the fact that designing military hardware presents such intriguing intellectual challenges: cruise missiles, satellite photography, submarine detection—marvelous scientific challenges with elegant solutions. Understanding aggressive behavior, global economic pressure, and nationalistic pride is far more difficult and less likely to lead to clean, brilliant solutions. Yet studies on those topics must be attempted if we are to maintain and enlarge our fragile peace.

A penetrating economic analysis might well show that mutual reduction in the number of troops together with a guarantee of open markets gives a far better bottom-line return than any conquest of territories. In-depth psychological studies could possibly tell us that proper education can direct national pride from jingoistic competition to constructive cooperation. A treaty of the future, therefore, might require the exchange of information between peoples, perhaps through television programs, just as the countries of the world now exchange ambassadors.

Utopian? Yes. But no more fantastic than sending photographs back from Mars, synthesizing cholesterol in the laboratory, or diagramming genes. We might even learn to understand ourselves, once it becomes clear that it is the only way that we are going to survive.—DANIEL E. KOSHLAND, JR.

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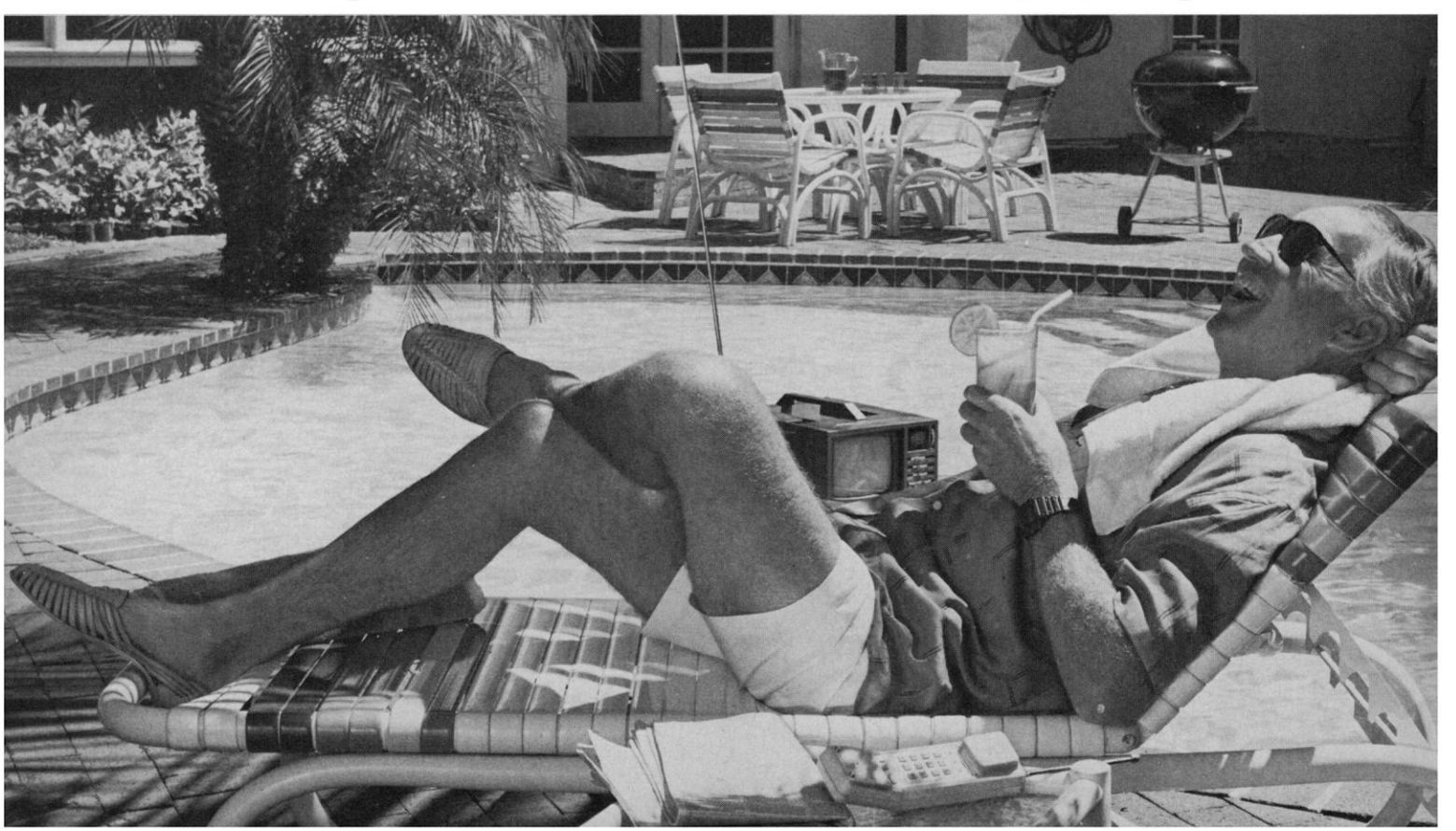

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Scientific Organization: M. Maggi (I) and C.J. Johnston (USA)

Platelets and Vascular Occlusion
Rome, Italy / June 1-3
Scientific Organization: G.A. FitzGerald (USA) and C. Patrono (I)

Advances in Biotechnology of Membrane Ion Transport
L'Aquila, Italy / September 19-20
Scientific Organization: R. Verna (I), P.L. Jörgensen (DK) and R.P. Garay (F)

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Scientific Organization: G.B. Rossi (I), F. Takaku (J) and S. Waxman (USA)

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Forum '87: Students and Science Learning

20-21 November 1987
Hyatt Regency Crystal City
(Adjacent to National Airport, Washington, DC)

The **National Forum for School Science** provides an annual opportunity for teachers, scientists, science educators, and other individuals to analyze and discuss key issues, and to focus attention on the most enduring concerns and most promising new directions in science education.

Forum '87 Program

Friday, 20 November:

7:30 a.m. REGISTRATION

8:30 a.m. WELCOME AND INTRODUCTION TO FORUM '87

8:45 a.m. OPENING ADDRESS: **What Do We Want Students To Learn?** — (Speaker to be Announced)

9:15 a.m. PANEL: **Perspectives on Science Learners**

The speakers in this session will present some of the different ways of thinking about learners: as constructors of knowledge, as processors of information, and as products of social and cultural influences. How these different perspectives affect science education policy and practice will be the topic of the ensuing discussion.

A. Constructivist View — **Rosalind Driver**, *Center for Studies in Science and Mathematics Education, University of Leeds.*

B. Perspectives from Cognitive Science — **Terry Winograd**, *Computer Science Department, Stanford University.*

C. Social Influences — **Jacquelynne Eccles**, *Department of Psychology, University of Michigan.*

D. Discussion

12:15 p.m. LUNCHEON AND ADDRESS: **Facing Our Fears: The New Diversity in Our Classrooms** — **Arturo Madrid**, *Tomás Rivera Center, Claremont, CA.*

(continued on next page)

Forum '87: Students and Science Learning

(continued from previous page)

2:30 p.m. PANEL: **What Information is Needed for Practice and Policy?**

Following a brief analysis by educators and policymakers, Forum participants will break into groups to discuss the types of information they need about students and learning. The focus will be on identifying research (such as demographic data, science aptitude, etc.) that will enable them to make informed policy and practice decisions.

A. Analysis — **Forbis Jordan**, *Division of Educational Leadership and Policy Studies, Arizona State University*; **Jim Minstrell**, *Mercer Island (WA) High School*; **Ramsay Selden**, *Council of Chief State School Officers.*

B. Discussion in Small Groups.

5:30 p.m. RECEPTION

Saturday, 21 November:

9:00 a.m. PANEL: **Environments and Strategies for Effective Science Learning**

The environments and strategies for science learning can be based on our conceptions of science, or on our knowledge about how people learn. This panel will explore the differences and similarities between these designs, and ask if there are optimal systems. Particular attention will be paid to the practical considerations imposed by school structures.

A. Classroom Practice Based on Conceptions of Science — **Kathryn Olesko**, *Department of History, Georgetown University.*

B. Classroom Practice Based on Learning Research — **Roger Johnson**, *Cooperative Learning Center, University of Minnesota.*

C. Real-World Perspective: Working Within Established School Structures — **Sally Crissman**, *Shady Hill School, Cambridge, MA.*

D. Discussion

12:00 noon LUNCHEON AND SUMMARY DISCUSSION: **Developing Practice and Policy That Adapt to Goals for Science Learning**

2:30 p.m. ADJOURNMENT

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Advance Registration Form

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☐ American Express ☐ Diner's Club Number _____ Expiration Date _____

☐ Carte Blanche ☐ MasterCard Cardholder's signature _____

☐ Deposit (check) for $ _____ enclosed. Make check payable to Hyatt Regency Crystal City.

Mail bottom half (reservation form) to: Reservations, Hyatt Regency Crystal City
2799 Jefferson Davis Hwy., Arlington, VA 22202