American Association for the Advancement of Science

# Science

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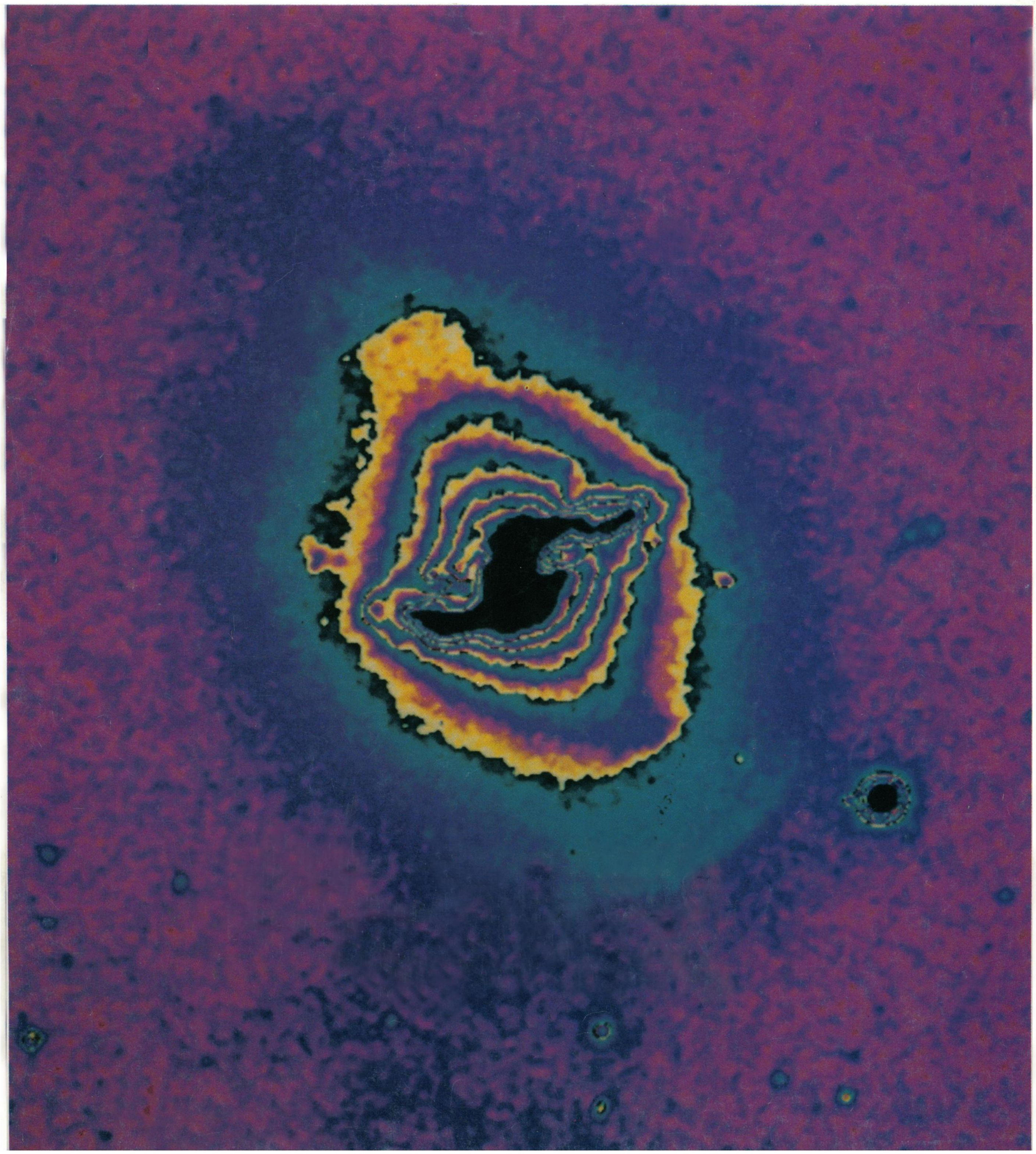

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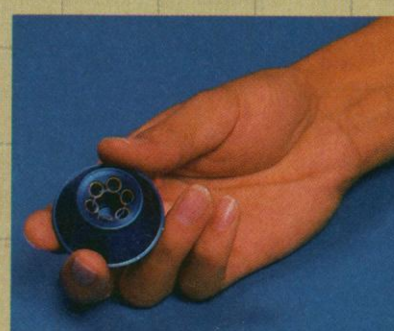

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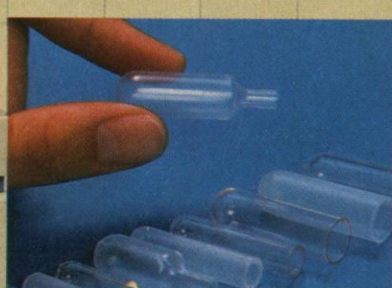
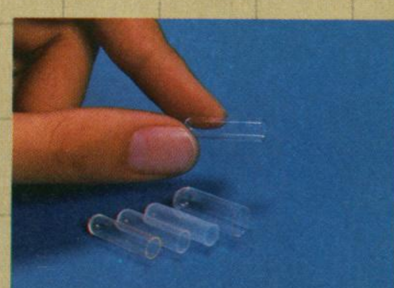


TL-100 milliliter-sized tubes. A choice of 10.



Airfuge microliter-sized tubes. A choice of 5.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COVER Peculiar galaxy Arp 230, believed to be the remnant of a recent merger of two galaxies. The striking, sharp-edged ripples on either side of the center consist mostly of old stars that may have belonged to an intruding disk galaxy. Model calculations suggest that this intruder plunged into the main galaxy on a near-radial orbit. Gaseous debris, dust, and young stars form a disk seen here as black oval near the center. See page 227. [Photograph taken by F. Schweizer with a 4-meter telescope at Cerro Tololo, Chile, and computer-enhanced with Astronomical Image Processing System, Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, DC 20015]

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## Annual Meeting



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# This Week in SCIENCE

## Galaxy dynamics

GALAXY formation is a continuing process (cover); its dynamics are becoming clearer through a combination of new space observations and computer-generated models (page 227). The complex orbits of galaxies apparently provide them with opportunities for close encounters with each other; they also interact with clouds of hot gases and satellites. Data gathered in 1983 by the Infrared Astronomy Satellite support the concept that collisions and mergers of galaxies, accompanied by star and quasar formation and the emission of great amounts of infrared energy, are regular and frequent events. Schweizer describes forces that may act during collisions and mergers, those which culminate in the "violent relaxation" that precedes the establishment of each new equilibrium configuration, and features of galaxies—such as tidal tails and ripples—that provide evidence for past merger events. These details of the origin, evolution, structure, and fate of galaxies suggest that not all galaxies were produced after a single Big Bang.

## Industries, universities, and biotechnology

BIOTECHNOLOGY companies invested about $120 million in university biotechnology research laboratories in 1984, about 20 percent of the total dollar investment that year; this contrasts with the contribution (about 3 to 4 percent annually) of industries to other types of university research (page 242). Blumenthal *et al.* analyzed the relations of 106 biotechnology companies with university laboratories. Nearly half the companies supported university research in 1984. Benefits to the companies were seen in the abundance of patent applications (two to four times as many applications per dollar invested in university as in in-house research) and trade secrets generated, which may translate into financial gain. Most arrangements were for 2 years or less and could have the long-range effect of shifting some university research from basic toward applied studies. Relations of university researchers with firms and with government sponsors differ. The generation of trade secrets may jeopardize a fundamental scientific and academic value, the free exchange of information. It is considered desirable that the government, which is the major sponsor of biotechnology research in universities, remain so.

## Acid fog

HYDROXYMETHANESULFONATE ion (HMSA) is a strong acid that can form in fog and cloud water in regions with sulfur dioxide air pollution (page 247). The fog and cloud droplets may then transport the pollutant to distant sites. HMSA forms when the *p*H of water droplets is at intermediate values and when sulfur dioxide is abundant; it is then best preserved in droplets by acidification and serves as an important reservoir of reduced sulfur. Munger *et al.* used ion-pairing chromatography to measure HMSA in fog droplets collected at two sites in the southern San Joaquin Valley of California. There the oil industry generates the precursors for HMSA formation, and the humidity is high enough for droplets to form. Concurrently, the agriculture industry generates ammonia, which neutralizes the droplets and promotes decay of HMSA. Droplets from the site closer to the source of sulfur dioxide pollution had more HMSA, formaldehyde, and reduced sulfur than droplets at the more distant site, but at both sites there was evidence for the pollution-generated compound.

## Ice and the martian terrain

FLOW of surface materials on Mars aided by ground ice may have led over time to the softening of the planet's terrain (page 249). Squyres and Carr used images collected by the Viking Orbiter to map landforms on Mars. Ground ice and water, generally thought to have once been widely distributed on Mars, appear to have migrated to higher, colder latitudes. Characteristic features called lobate debris aprons, concentric crater fill, and terrain softening formed as a result of ice. Their distribution supports the idea that ice creep varied with climate and that ice was unstable in the warmer equatorial regions but stable at higher latitudes where temperatures are below the frost point. Thus, with a cooling of the martian climate, desiccation has taken place at the equator while a stable ice layer has formed at the higher latitudes. Another explanation for the terrain softening—deposition of sediment by wind—is considered a less likely cause of the distinctive patterns observed in the martian terrain.

## Rearranged genes in leukemia

GENES for $\beta_1$ interferon and for a cellular proto-oncogene are among those repositioned on chromosomes of patients with acute monocytic leukemia (page 265). Hybridization techniques showed that the interferon genes, normally clustered on human chromosome 9, were split: the $\alpha$-gene cluster remained on chromosome 9, while the $\beta_1$ gene was translocated to chromosome 11. The c-*ets*-1 proto-oncogene, normally found on chromosome 11, was found on chromosome 9. Exactly how these genes in their new locations participate in the malignant transformation of acute monocytic leukemia is not known. Diaz *et al.* speculate that when the oncogene is translocated near the interferon cluster, regulatory sequences that activate the interferon genes may also activate the oncogene. Although proliferation of monocytic cells is not likely to represent overactive genes of the interferon system (since this system typically produces antiproliferative effects), proliferation could occur if the activated oncogene stimulates an alternative pathway that generates tumor cells.

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# The Social Process of Science

"Being well-informed about science is not the same thing as understanding science." Therewith, James Bryant Conant discounted the popular interest in science roused by the thunderclap that ended World War II. Now as then, in a world transformed by the application of scientific knowledge, people put that knowledge in the same category with what they know by revelation or other received authority. What needs to be understood is how, scientifically, we come to know what we know.

Scientists know nothing for certain. The advancement of science is a social process, a public process, and yet an intensely private one. Societies that would enjoy its material benefits must understand science in both its aspects.

"The truth of an idea," William James perceived at the turn of this century, "is not a stagnant property inherent in it. Truth happens to an idea . . .[by] the process of . . . its verification." In the private process, the scientist must face the singular loneliness of the sovereign. He can accept no authority but his own conscience and judgment.

The work proceeds in ways very different from that suggested by its impersonality in formal publication. "The process I want to call scientific," the physicist Percy Bridgman wrote, "is a process that involves the continual apprehension of meaning . . .accompanied by the running act of checking to be sure that I am doing what I want to do, and of judging correctness or incorrectness. This checking and judging and accepting . . . are done by me and can be done for me by no one else. They are as private as my toothache, and without them science is dead."

The intensity of this private process—its toothache—is raised by the fact that it is integrally public. It is intended for publication. Without publication, science is dead.

Upon publication, verification of the work proceeds. As the sociologist Robert Merton has observed, "Only after the originality and consequence of the work have been attested by significant others can the scientist feel reasonably comfortable about it." Merton's term for this public process is " 'Communism' . . . . The substantive findings of science are the product of social collaboration and are assigned to the community . . . . The scientist's claim to 'his' intellectual 'property' is limited to that recognition and esteem which, if the institution functions with a modicum of efficiency, are roughly commensurate with the significance of the increment brought to the common fund of knowledge."

The remarkable fact, established by the open public record of science, is that this social process functions with high efficiency. It is not that scientists are more dedicated, honest, and selfless than other citizens; they are disciplined to behave that way by their collaboration. Error and fraud are exposed sooner rather than later by the communal process of verification. With equal reliability the consensus of the community distinguishes the significant from the trivial. This is the more remarkable considering what Merton calls "the basic uncertainty of genuinely independent originality in science."

Thus Niels Bohr was once prompted to observe of a radical and baffling proposal by the aging Werner Heisenberg: "Yes, it is crazy, but it is not crazy enough!"

It has been said that science will flourish only in a society that cherishes its norms. The reason, openness, tolerance, and respect for the autonomy of the individual that distinguish the social process of science, however, are norms desirable in every human community. They describe a world in which, we can agree, all of us want to live.

Happily, the social process of science brings along the means to realize its values. For it finds convincing verification in the technologies it begets. During the past four centuries science has been liberating increasing numbers, now nearly one-third, of mankind from toil and want and even from submission to received authority. No national constitution written in this century has failed to hold out the promise, at least, of political and economic democracy. The people of the world—if nations can keep the peace—may see this revolution in the condition of man fulfill its promise in the next century.—GERARD PIEL,* Chairman, *Scientific American*, 415 Madison Avenue, New York 10017, and President, AAAS.

*This editorial is excerpted from a public lecture given at Moscow State (Lomonsov) University, Moscow, U.S.S.R., on 25 November 1985, on the occasion of the conferral by the university of the degree Doctor Honoris Causa.

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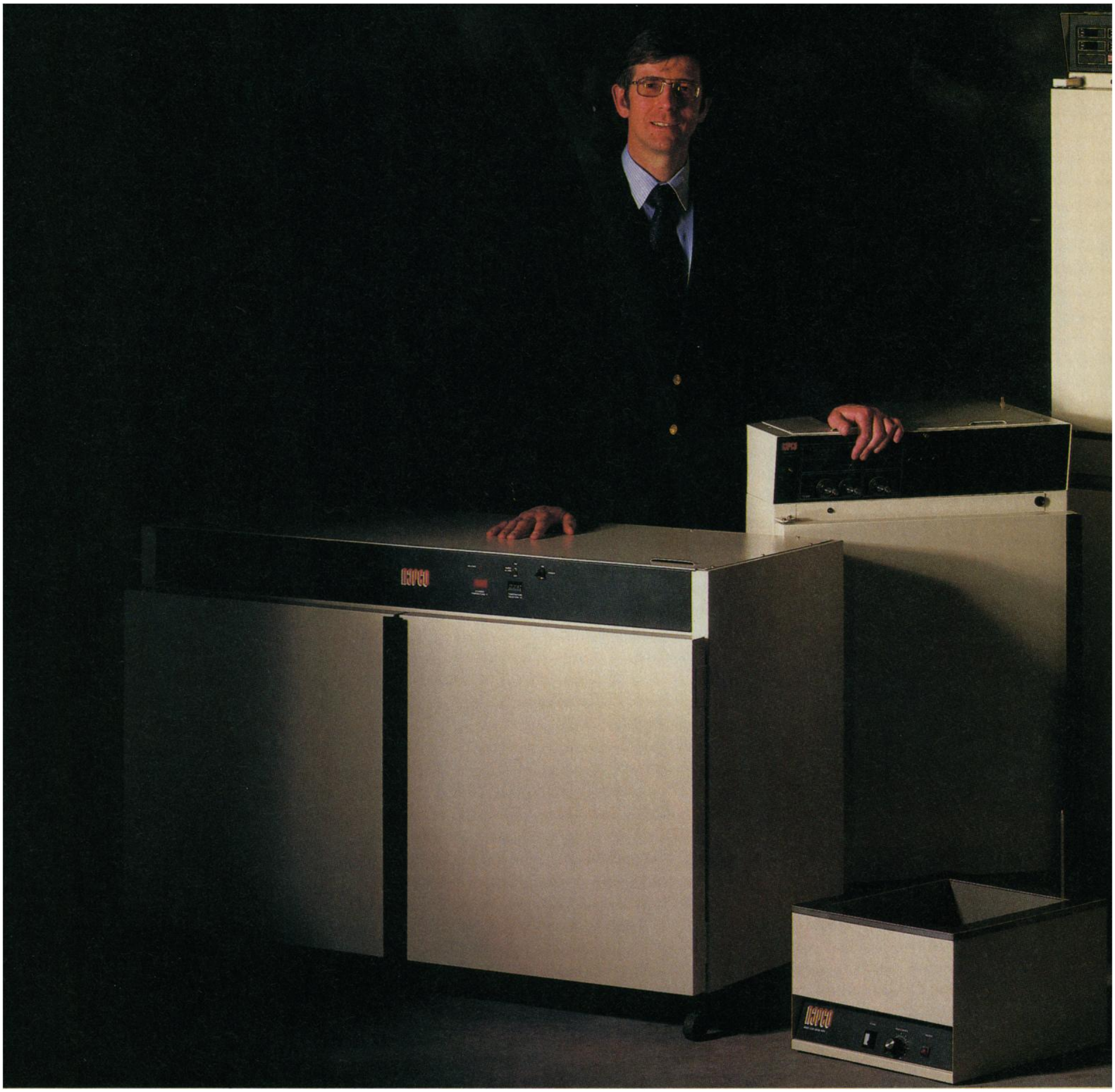

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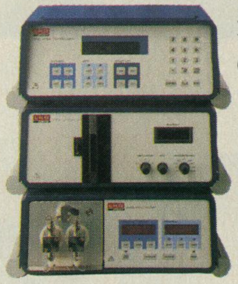

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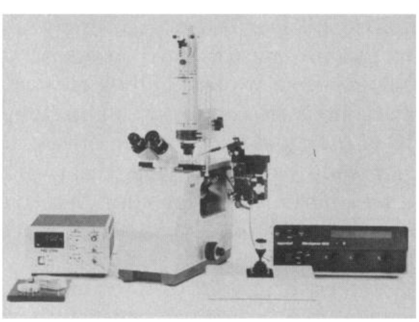

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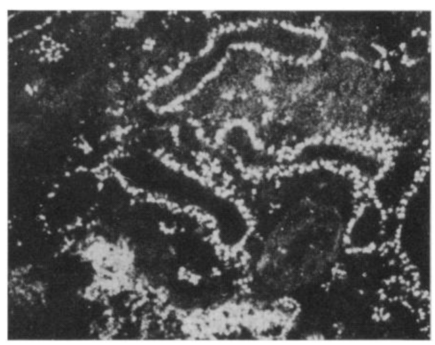

Extremely simple to operate, the EM 902 is suitable for research and routine applications. Besides the ESI technique, the EM 902 can be used for contrast enhancement on thin unstained sections, on thick sections up to 1 μm (the chromatic aberration equals that of a 1 million volt TEM), and for unlimited conventional electron microscopy.

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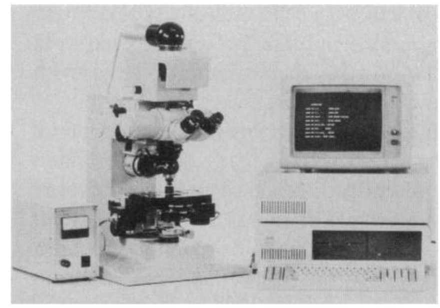

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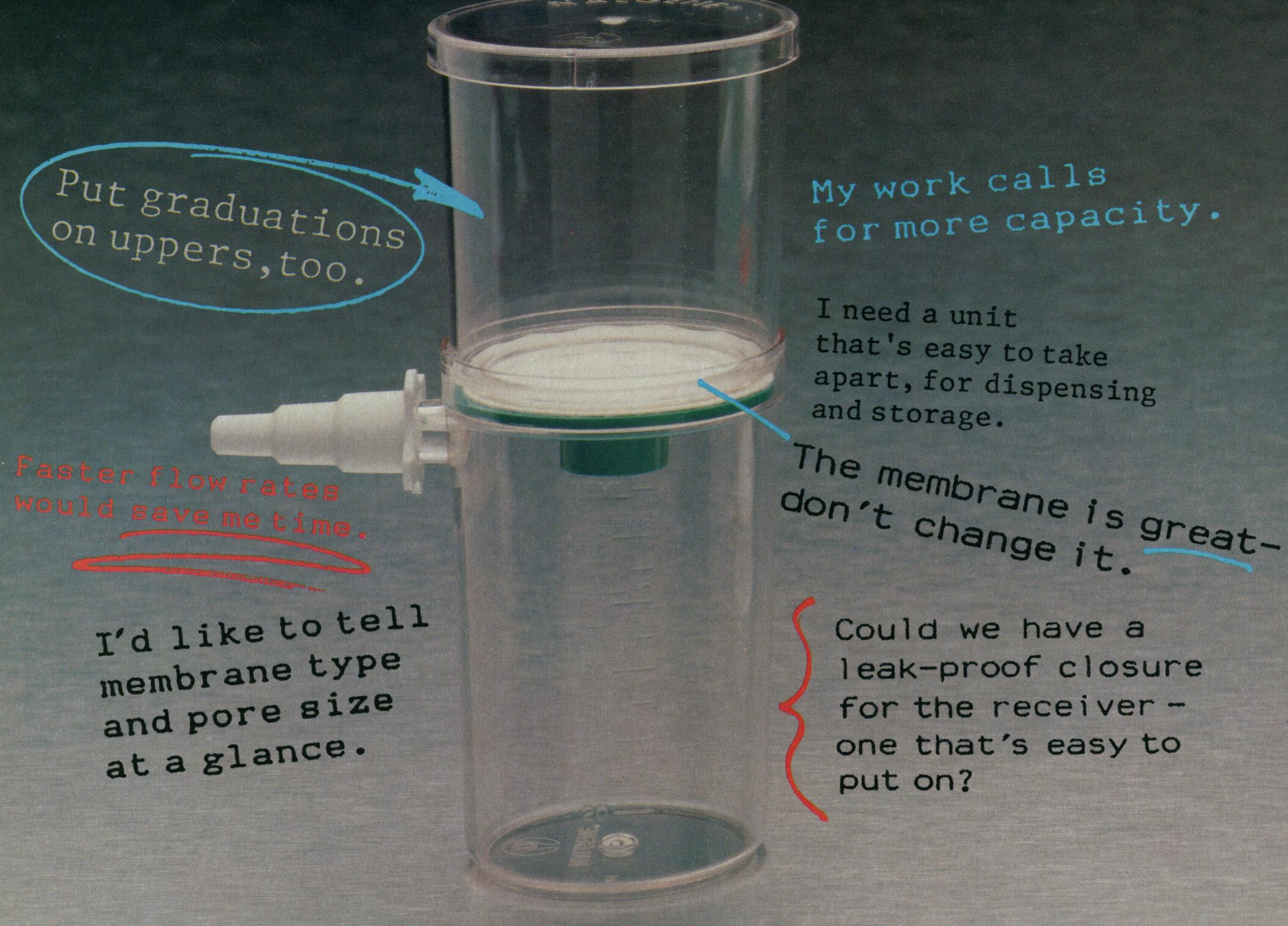


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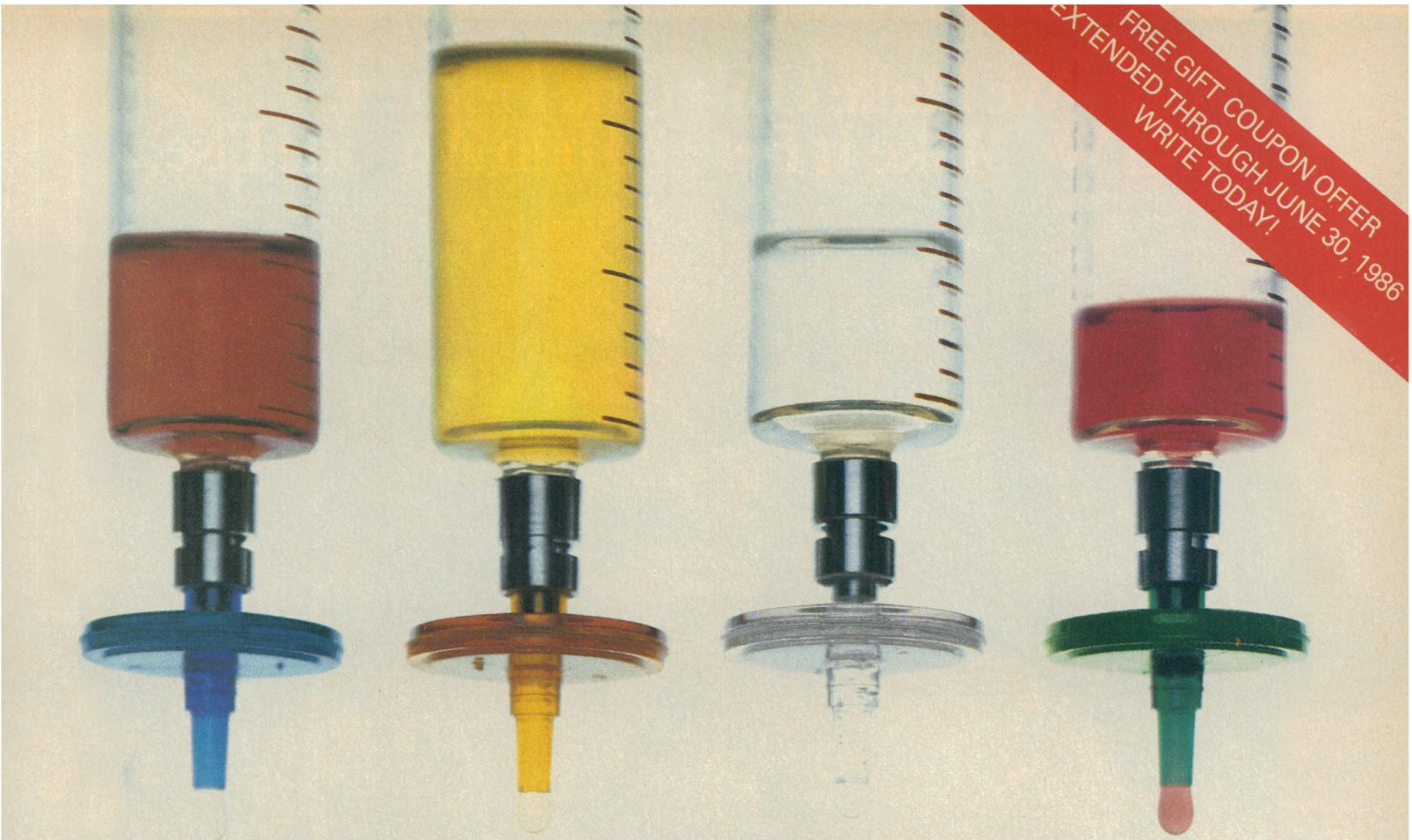


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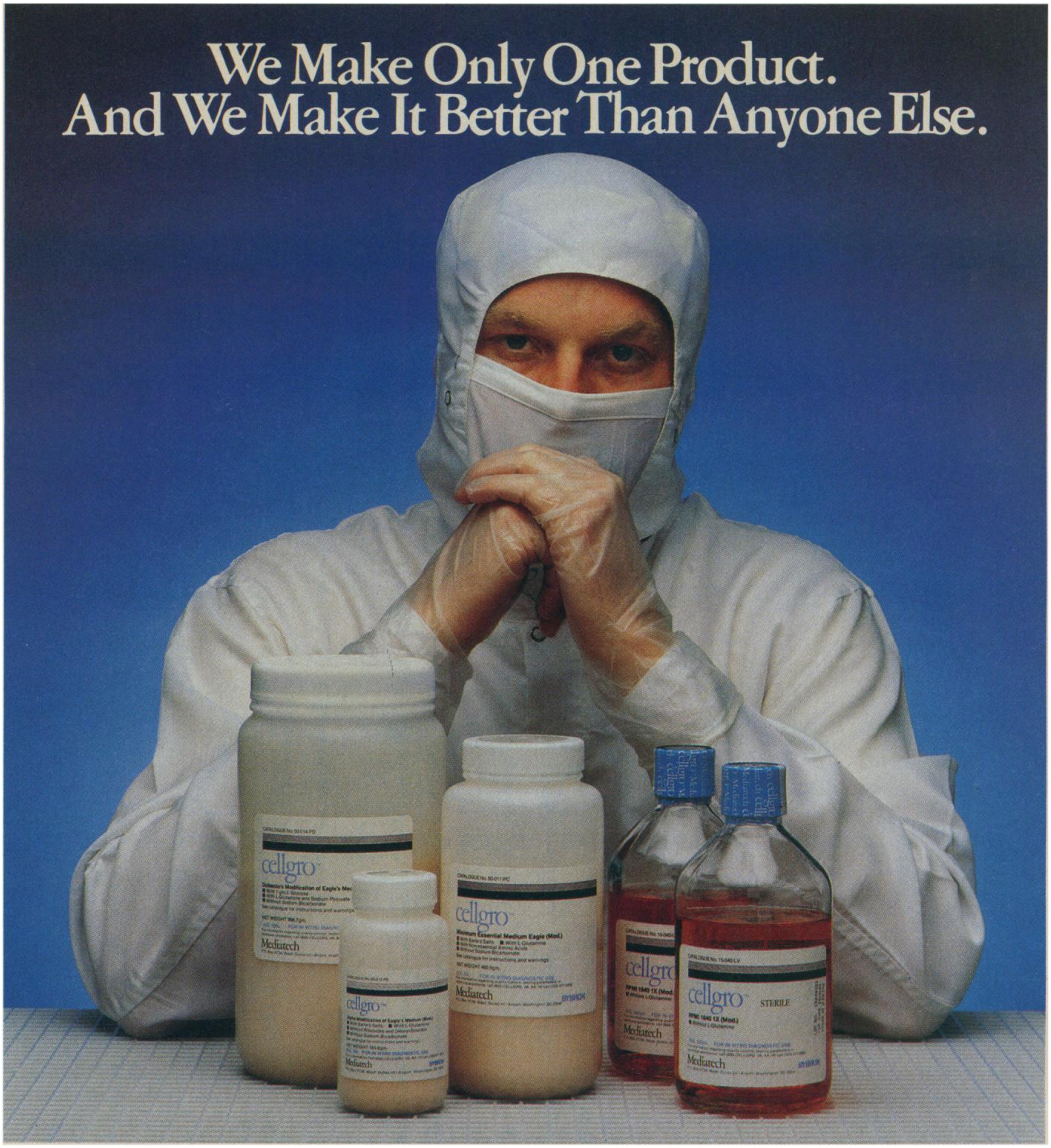


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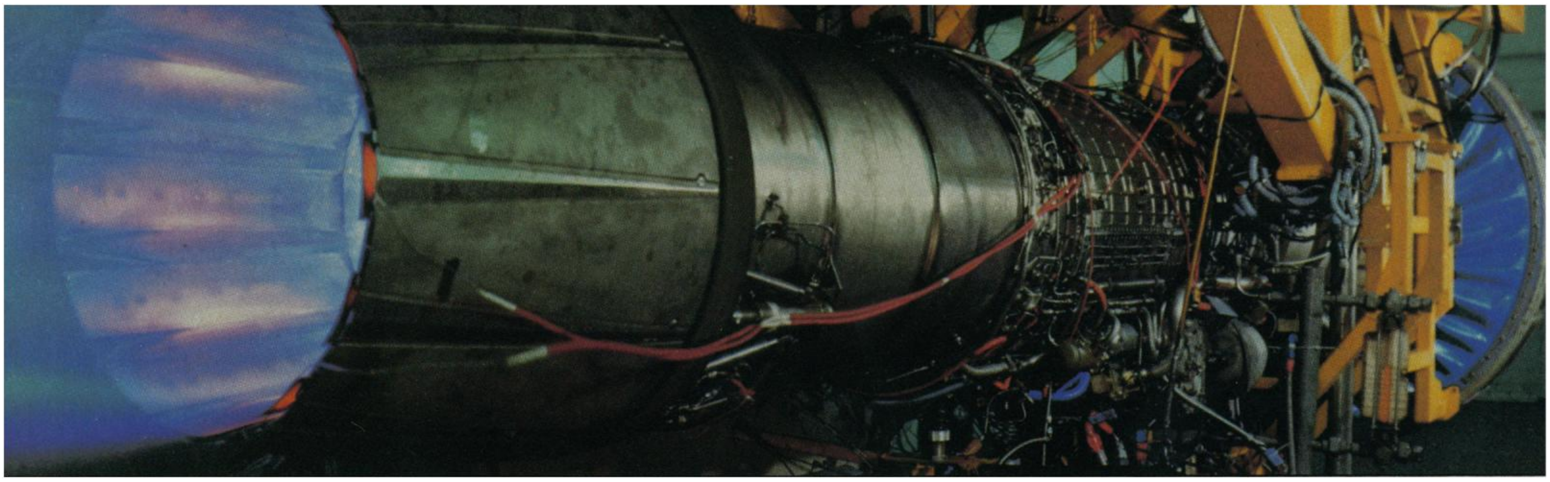

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# Call for Symposium Proposals

## Chicago Meeting ● 14–19 February 1987

AAAS members are invited to submit symposium proposals for the next Annual Meeting in Chicago, 14–19 February 1987. Please complete the form below, attach a "Synopsis of Objectives" (about 200 words), and send it to us **not later than 15 April 1986.**

We are particularly interested in symposia dealing with the latest developments in science and technology, and the implications of these developments for society. Coordinated contributed paper sessions are also welcome; inquire for details with this submission.

All symposium proposals are subject to review. If the information submitted is inadequate for reviewing, the proposal will be returned. Endorsement (sponsorship) by a AAAS Section Committee expedites the review process. It is therefore in the interest of the proposer to send a *copy* of the proposal to the appropriate Section Secretary (see "AAAS News" section in *Science* for names) for endorsement at the same time the original is sent to the AAAS Meetings Office.

Speakers should *not* be confirmed at this time; however, sufficient information about probable speakers and their topics should be provided to allow for evaluation of the proposal. Please note that AAAS does not pay honoraria to speakers.

### Some Deadlines

**June:** You will be notified about acceptance, conditional acceptance, or non-acceptance of your proposal. Further information will be provided at that time.

**July:** Preliminary programs with confirmed speakers are due.

**October:** Final program copy, suitable for publication, is due.

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| AAAS **ANNUAL MEETING** **Chicago** **14–19 February 1987** | **PROPOSED SYMPOSIUM** Submit not later than 15 April 1986 | **Return this form to:** AAAS Meetings Office 1333 H Street, N.W. Washington, D.C. 20005 Telephone: (202)326-6450 |
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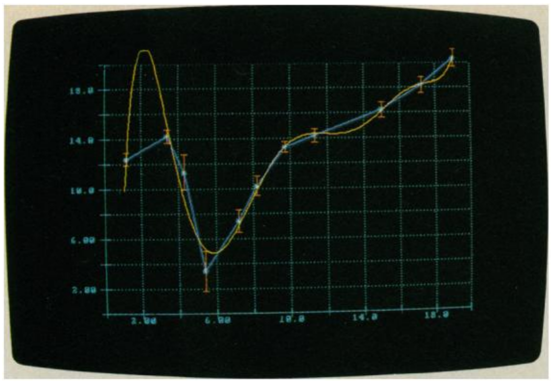
**PLEASE ATTACH SYNOPSIS OF OBJECTIVES OF PROPOSED SYMPOSIUM (APPROXIMATELY 200 WORDS).**



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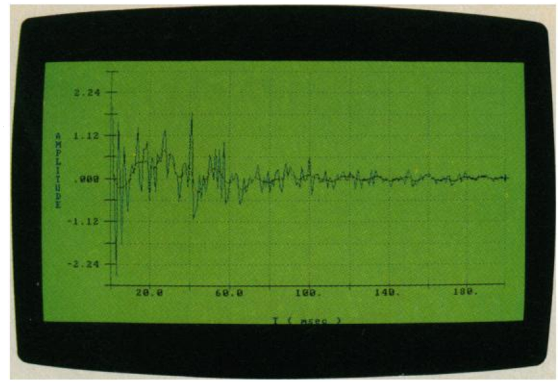

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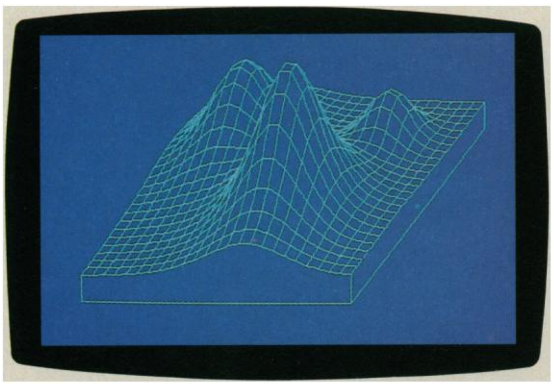

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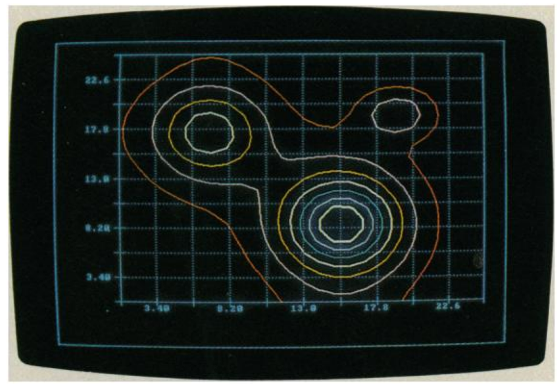

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