American Association for the Advancement of Science

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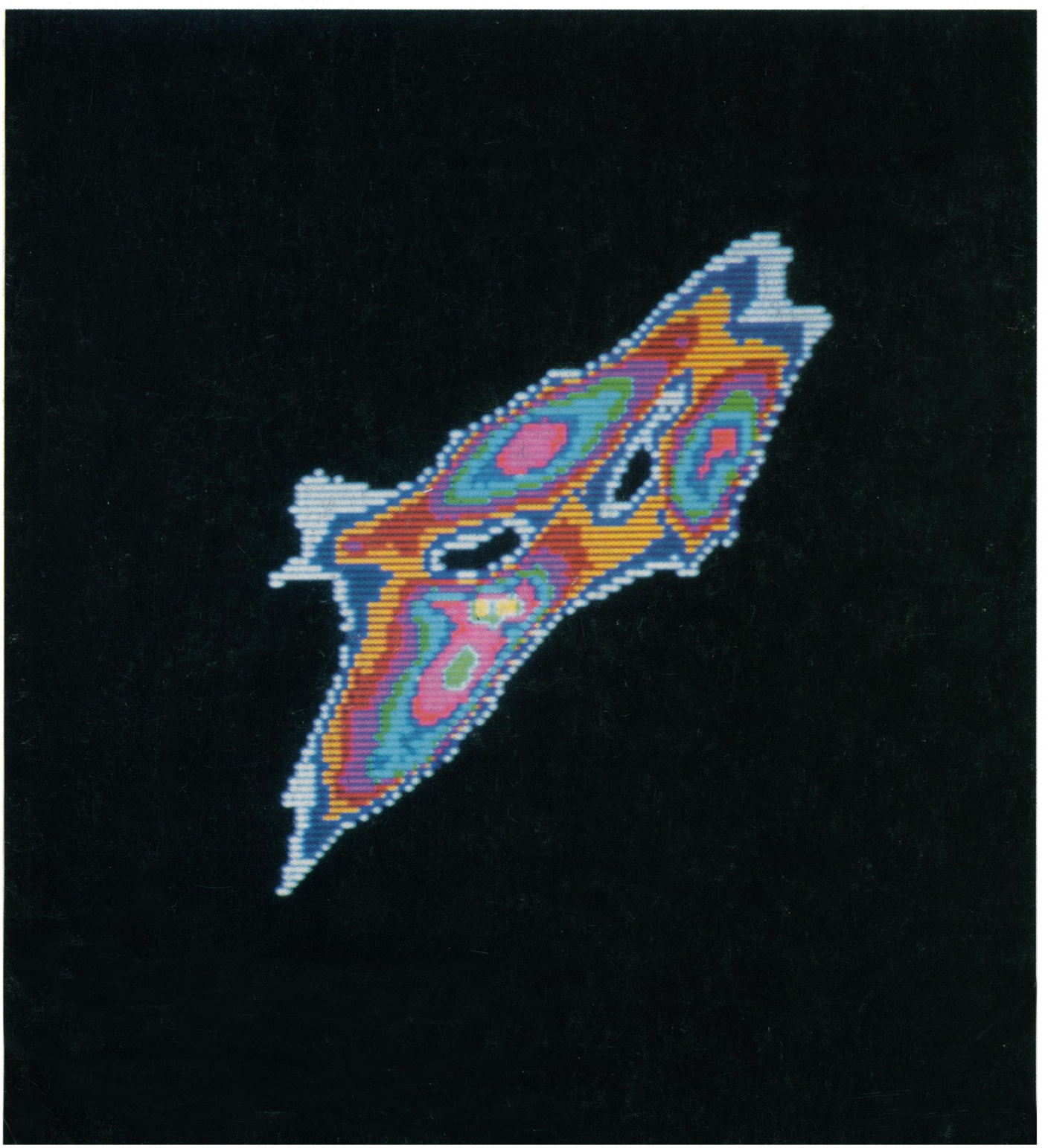

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SCIENCE

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■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

COVER Pseudocolor digitized computer image of fluorescence intensity distribution in human fibroblasts stained with carboxyfluorescein diacetate. Fluorescence in a cell can be bleached with a laser and intercellular communication assayed by rapidly and repeatedly measuring the redistribution of carboxyfluorescein in bleached and unbleached cells. Addition of tumor promoting agents can block the intercellular communication. See page 525. [Margaret H. Wade, Meridian Instruments, Inc., Okemos, Michigan, and James E. Trosko and Melvin Schindler, Michigan State University, East Lansing 48824]

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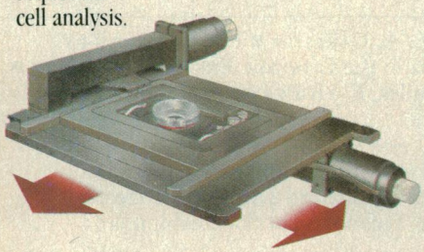

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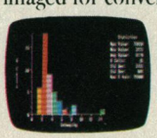

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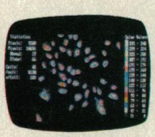

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Economic well-being of women

TWENTY-FIVE years of legislative efforts and societal changes, including the Equal Pay Act, the Civil Rights Act, the feminist movement, and others, have not improved the economic well-being (defined as access to goods, services, and leisure) of women in comparison to men (page 459). Fuchs reports that the percentage of women working outside their homes jumped from 34 to 54 and that total earnings more than doubled between 1959 and 1983; in the most recent period, women (particularly those under 40) enjoyed a substantial relative increase in hourly earnings (along with a substantial drop in the number of children in the family). Offsetting the economic gains are women's increased responsibilities (including economic responsibility) for their children, their loss of leisure from their need to juggle time spent with children and job, and their sacrifice of family (fewer marriages, fewer children) in order to succeed in the workplace or sacrifice of advances at work for advantages at home. For many individual women, the economic gains have been made at very high costs; the costs to society have yet to be addressed.

Infected grass harms cattle

SOMETIMES cattle grazing on tall fescue (common forage grass in the United States) develop fescue foot, a lameness in the hind feet that can progress to necrosis or gangrene; a milder condition but a more significant economic problem, summer syndrome (weight loss, increased temperature and respiration, a roughened coat), may develop even more frequently within the herd (page 487). These syndromes result when cows eat grass infected with a fungus that produces toxic compounds, the ergot alkaloids. Lyons *et al.* detected such alkaloids in infected but not in uninfected grazing fields. All aboveground parts of the plant contained the alkaloids; the sheaths, where the fungus grows, had the highest concentrations. Grasses fertilized with nitrogen contained more alkaloids than those not fertilized, suggesting that the fungi produce alkaloids best when a nitrogen source is provided. Ergot alkaloids cause vasoconstriction; they are used medicinally for treating migraines but, at high doses, can cause hallucinations and other neurologic effects (ergotism) such as those produced by the hallucinogen LSD. Therefore grass toxicity derives from fungal infection, not from the grass itself.

Current events in paramecia

CALMODULIN, a calcium-binding protein ubiquitous in eukaryotic cells, can restore to mutant paramecia proper regulation of ion flow out of the cell-membrane ion channels (page 503). Calcium, calmodulin, and their regulation affect many cell functions (secretion, division, detoxification, and movement). Now, ion current flow has been added to the list. Hinrichsen *et al.* show that, when a small, physiologic amount of calmodulin isolated from normal paramecia is injected into cells of mutant paramecia that have almost no measurable calcium-dependent potassium current, normal ion movement is restored within 2 hours and lasts for almost 30 hours. How calmodulin effects this restoration and where the mutations in the paramecia lie remain to be determined.

African diamonds: geochemical gems

ANALYSES of the minerals (garnet, olivine, and others) included in diamonds provide information about the composition of the earth at depths where diamonds formed billions of years ago and about the geochemical and geophysical history of the earth's mantle and crust (page 472). Boyd and Gurney describe the Kaapvaal craton region of southern Africa, one of the world's major sources of diamonds. The craton, the large, relatively immobile iceberg-like nucleus of the continent, had at its root (150 kilometers or more deep) the high pressure and high temperature needed for diamond crystallization; local minerals were included in the crystals, and subsequent volcanic eruptions brought the diamonds to the surface. Erosion by streams and rivers dispersed the diamonds away from the volcanic throats to sites where today the diamonds are mined. The distinctive regional distribution of diamonds containing different inclusions indicates that environments deep under the continents and beneath ocean basins differ from each other chemically.

Fruit fly lovesong

FRUIT FLY mating begins with a lovesong that the male produces by flapping his wings (page 494). The song is distinctive for each species, having both a characteristic rhythm and a characteristic interval (IPI) between pulses. Females prefer songs of males of their species; thus it is possible that the same sets of genes are involved in the sending and receiving of courting signals. Kyriacou and Hall show, using interspecies hybrid flies, that the rhythm of the hybrid male's lovesong is controlled by genes inherited from his mother on the X chromosome (in this feature of the song, male fruit flies want a girl just like the girl that married dear old dad). In contrast, autosomal chromosomes (not X or Y) control the IPI such that its value is intermediate between those in songs of the parental species. Interspecies hybrid females do not, however, respond best to the hybrid male's song: they prefer a song having rhythm and IPI coupled as in the song of their mothers' species or a song in which both rhythm and IPI are hybrids. Genetic control of courting behavior in fruit flies is thus not as simple as that in crickets or tree frogs whose hybrid males sing the songs to which hybrid females most lovingly respond.

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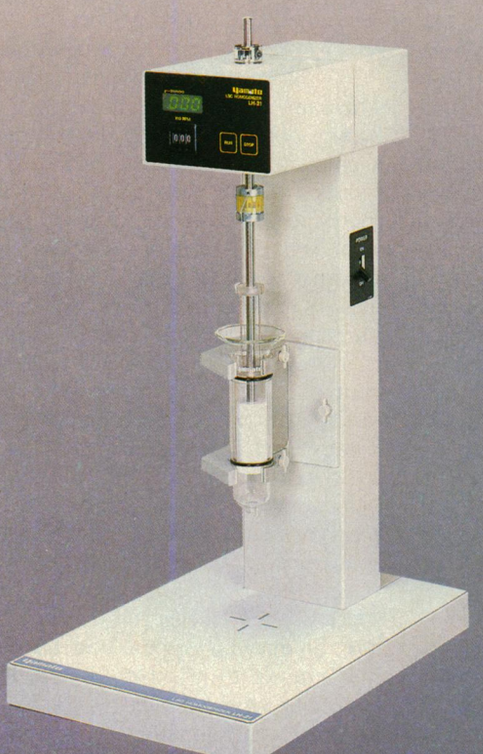

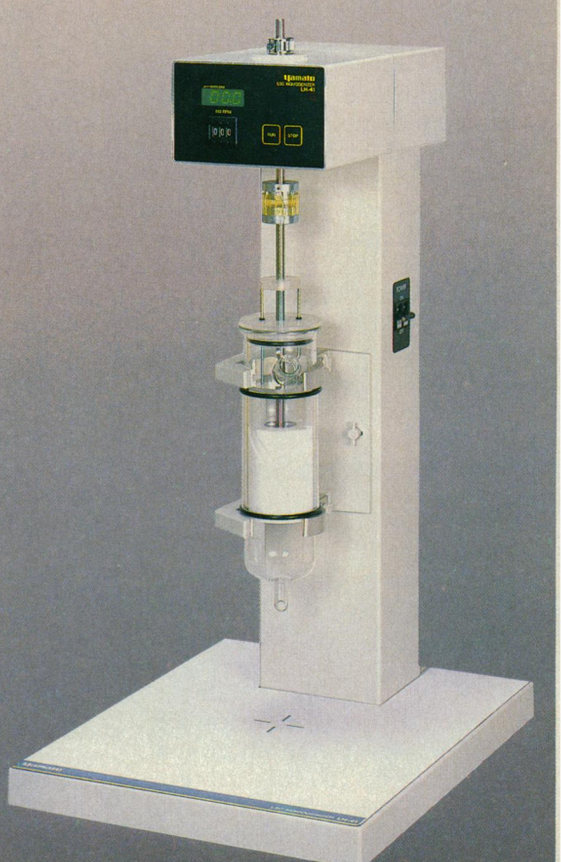

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SCIENCE

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A Time for Steadiness

Forty years ago Vannevar Bush challenged the nation to establish and maintain a peacetime science program on major university campuses. Congress responded with authorization, appropriation, and oversight. Since then we have been learning how to make that partnership work, with trust and mutual confidence. Now that partnership seems deeply periled. On 12 February, the Office of Management and Budget unilaterally issued a change in Circular A-21, the guidelines determining the recovery of research costs.

Basically, OMB decided that this 40-year partnership between government and universities—a partnership that has taken us into space, conquered disease, defended us, improved our quality of life, and made us the food basket of the world—needed to be changed quickly, unilaterally, and fundamentally. The principles that costs are to be fully identified and reimbursed and that consultation over major changes should occur, are central to the partnership. By its action, OMB made clear that either it misunderstood or rejected these principles.

This is not a budget problem. We have lived with budget cuts before and can do so again. Nor is it a problem with indirect costs. All of us recognize and share with principal investigators the commitment to contain these costs wherever possible. The problem is the lack of consultation with the academic community on an issue that has major consequences for the conduct of research in this country.

It is not that our consultative relationships have been sundered. It is that they have been ignored. Discussions on these issues move ahead in the White House and Congress. The President's own White House Science Council Panel on the Health of U.S. Universities and Colleges, chaired by David Packard and D. Allan Bromley, has prepared an important and comprehensive report on these very matters, and this report has been circulating in draft for several months. And these arrangements are now being systematically examined by a task force on science policy of the House Committee on Science and Technology under the chairmanship of Don Fuqua. These are serious inquiries being conducted with impartiality and care.

The treatment by OMB of A-21 is not by any means the only critical issue. We have a broader problem. Rule changes are being proposed on many fronts in response to budgetary pressures. For example, in February, the director of the National Science Foundation advised the university community that science faculty salaries for research conducted during the 1987 summer term might be eliminated and that the NSF fellowship program might face a 12 percent cut given current budget pressures. Although his candid and timely report was appreciated, we certainly hope that any final changes will involve full consultation with our community. Similarly, we hope that the discussion of trade-offs between the number of new awards at the National Institutes of Health and their funding levels would follow the same kind of consultation.

As an analytical community we are prepared to cooperate fully in the accumulation of data and open evaluation leading to the rendering of judgments. Information collected by organizations like the Association of American Universities, the Council on Governmental Relations, OMB, NSF, the Defense Department, and the Department of Health and Human Services should be discussed around a common table where the issue is how to deal with the opportunities and problems of this partnership. Systematic and open review will be followed by appropriate change. At stake is the industrial competitiveness of the nation, which is based on and grew out of the vitality of our educational and scientific enterprise.

Four decades of fruitful sponsorship and execution of quality research programs on university campuses have not occurred by happenstance. Budgetary pressures and uncertainties have been known before and coped with; occasional management and audit problems have led to new controls and generally more efficient expenditure of funds; solutions have come from a mutual spirit of cooperation, hard work, and good will.

We do not have less need for knowledge and innovation or the productivity gains they foster. We must reestablish serious consultation. If that requires congressional action to achieve, then perhaps that should be explored. Steadiness is needed.—CORNELIUS J. PINGS, Provost, University of Southern California, Los Angeles, CA 90084–4019

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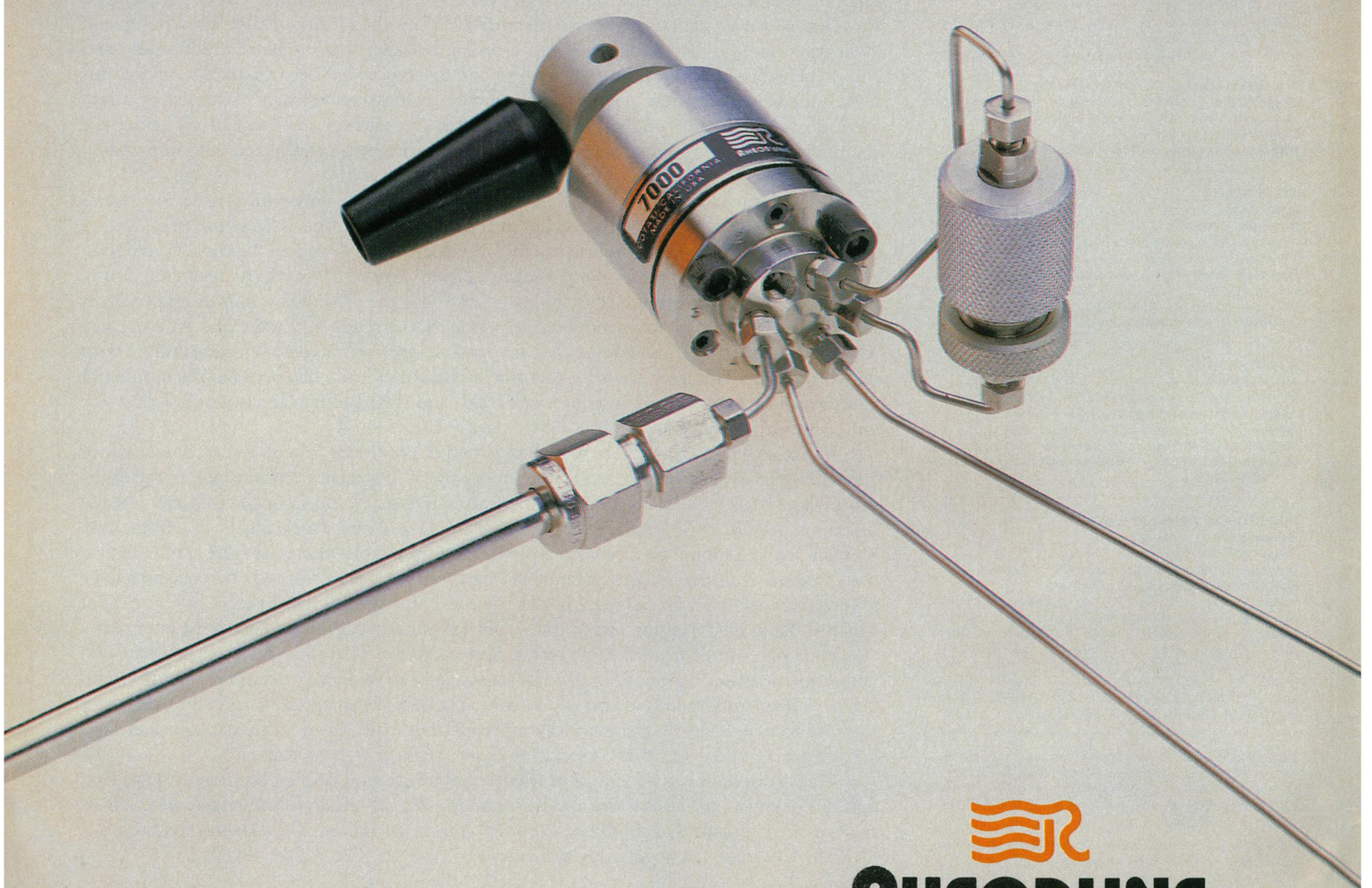

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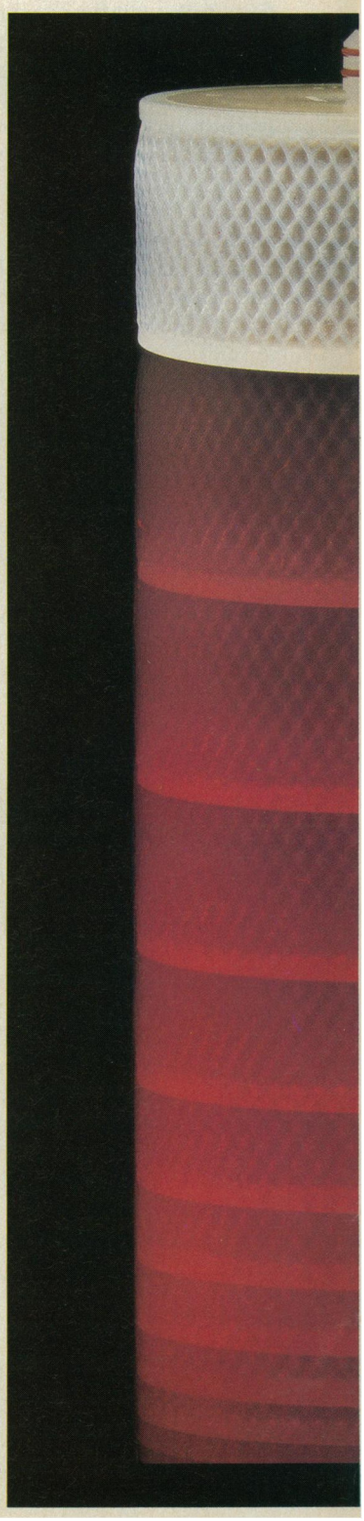

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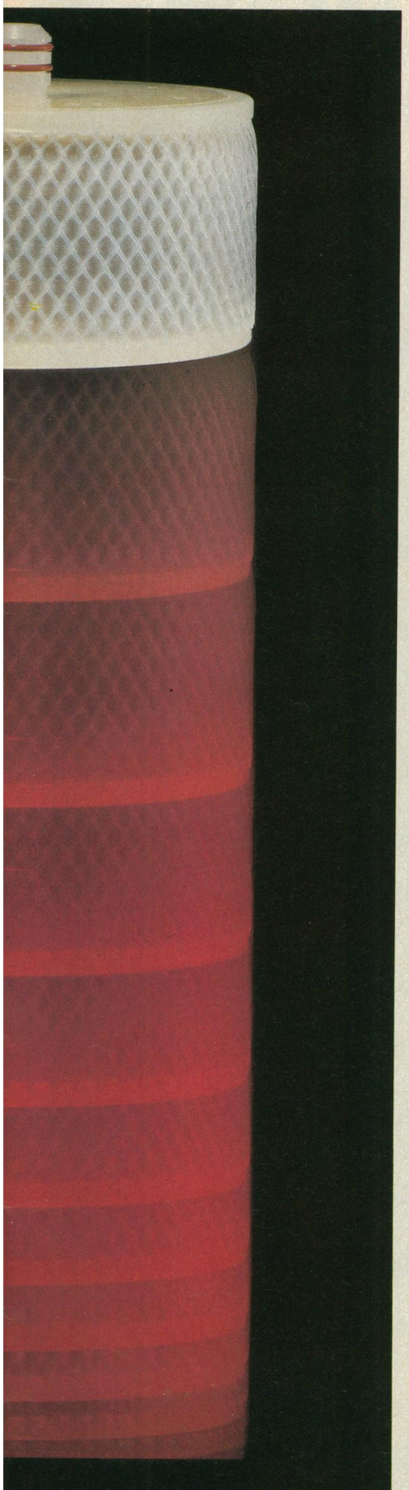

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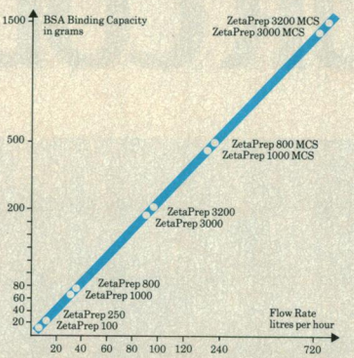

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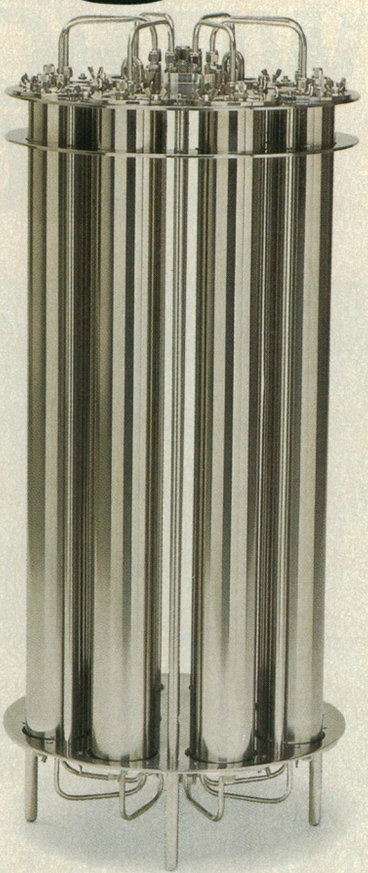

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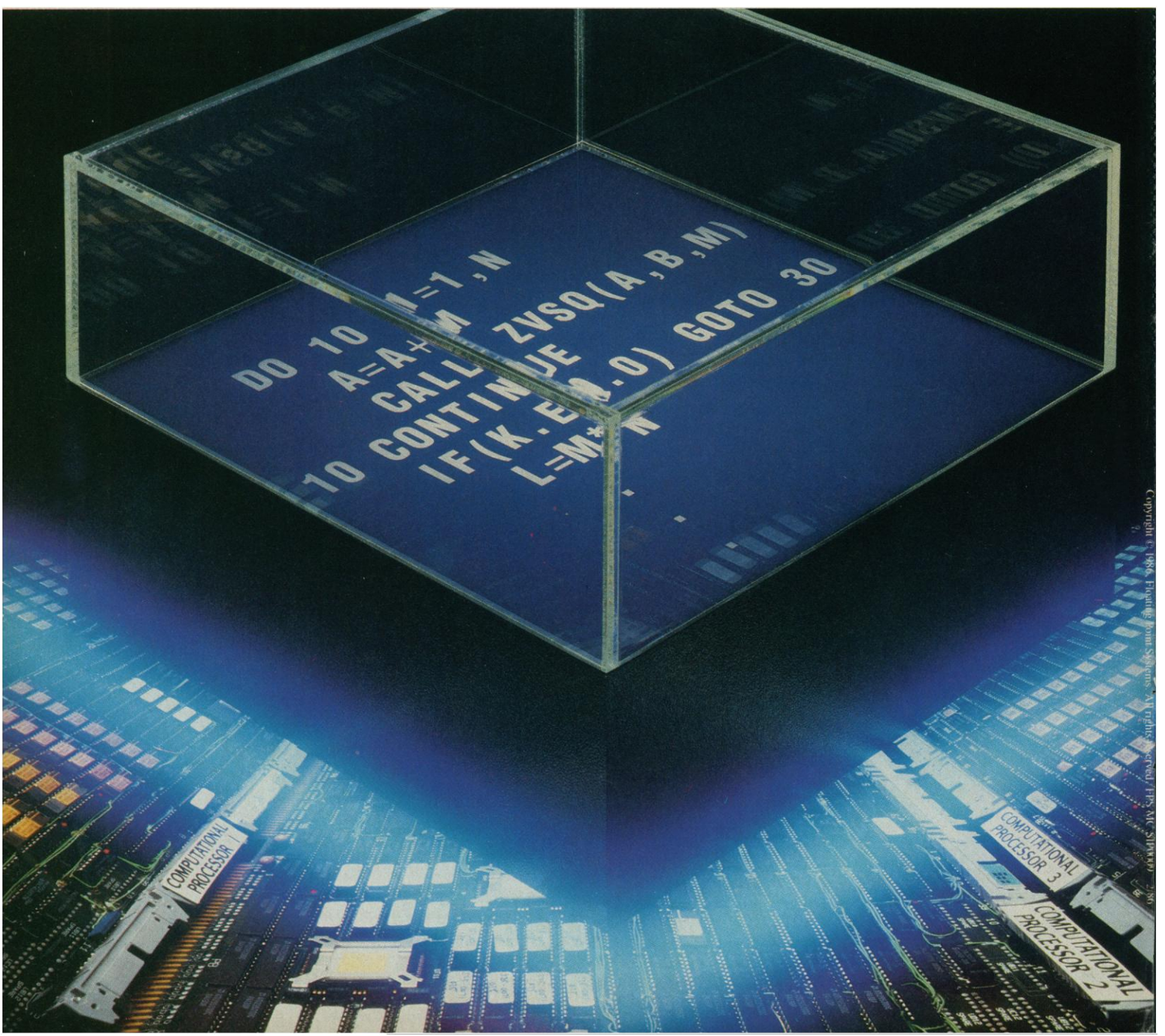

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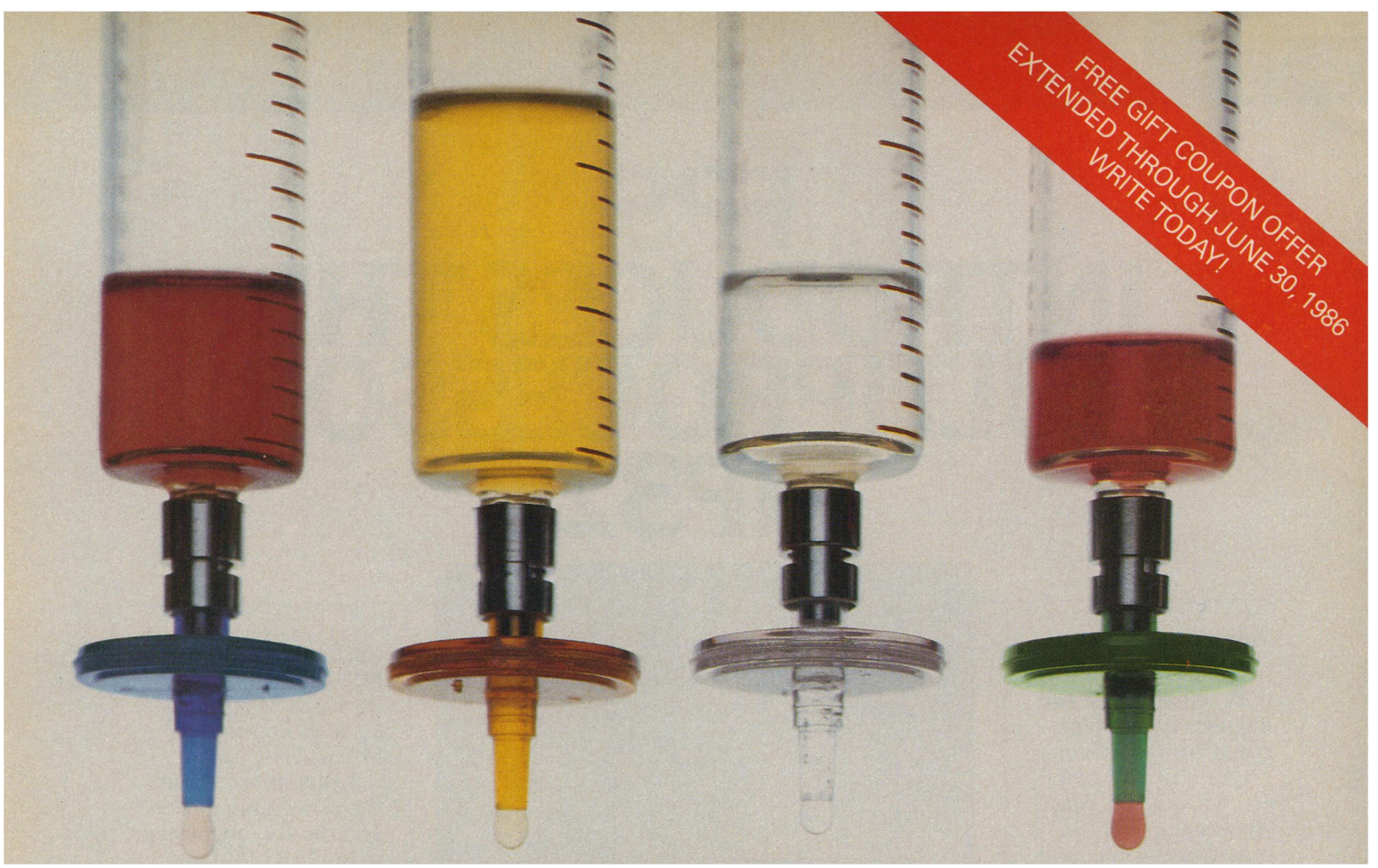
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