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SCIENCE

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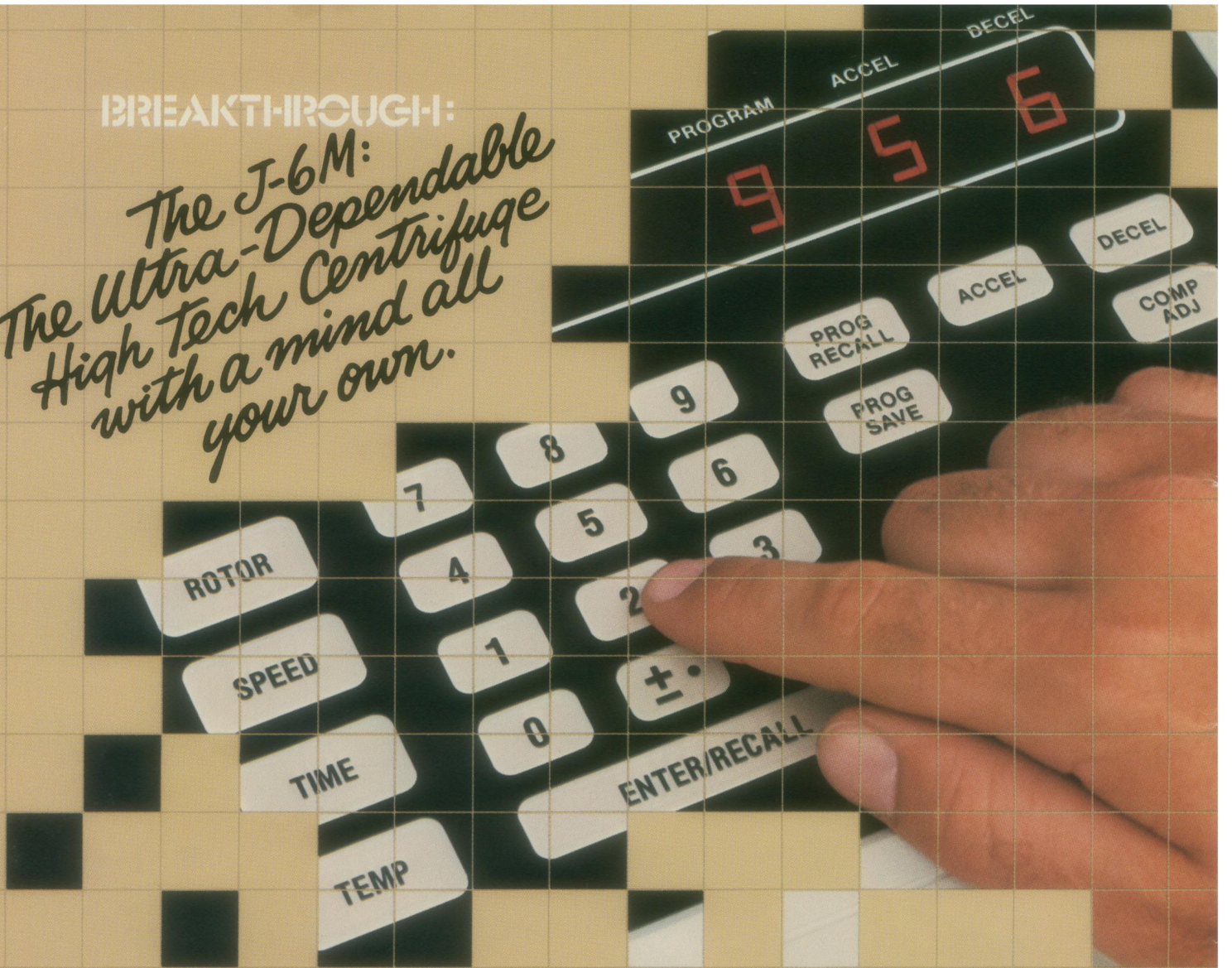

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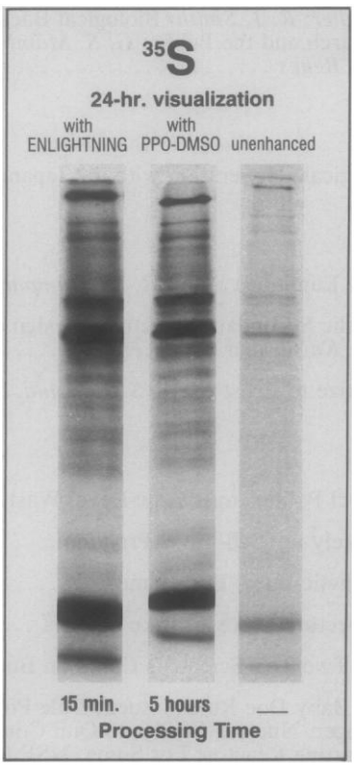

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20 January 1984

Volume 223, No. 4633

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COVER

Massive star Eta Carinae (center) and its surrounding cloud of dusty gas. The ejection of this gas from the central star was observed about 140 years ago. This is a logarithmic isophote map in red light; the outer contours are fainter than the central spot by a factor of roughly 2000 in surface brightness. The width of the picture is about 0.5 arc minute or 1.3 light years at the 9000-light-year distance of Eta Carinae. Recently it was discovered that the large outer condensation on the right side is nitrogen-rich. See page 243. [Data for image were obtained with a SIT vidicon and 60-inch telescope at Cerro Tololo Inter-American Observatory, La Serena, Chile]

The IBM 4341 super-mini at universities

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Dr. Glenn Ricart, Director of the Computer Science Center, remarks, "With the 4341's 'Help' command, students pick themselves up if they stumble. That's critical in how they'll relate to computers in the future."

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The Johns Hopkins University

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The 4341 is used in other areas at Johns Hopkins, including studies of cancer frequency and astrophysics applications in preparation for the launch of the space telescope. Vice Provost of the university, Richard Zdanis, says, "We decided on a 4341 because it's easy for inexperienced users and can support a variety of peripherals."

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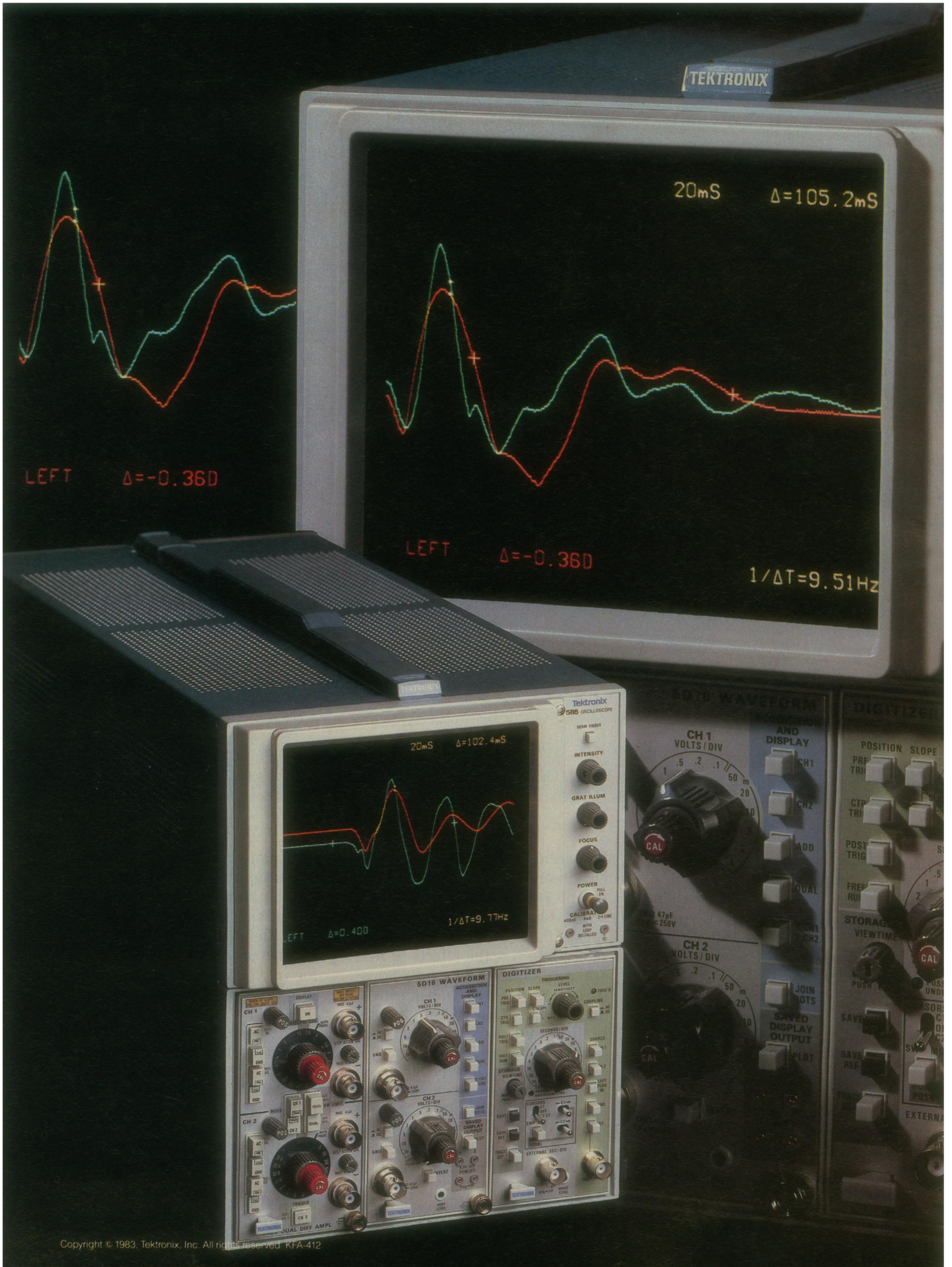

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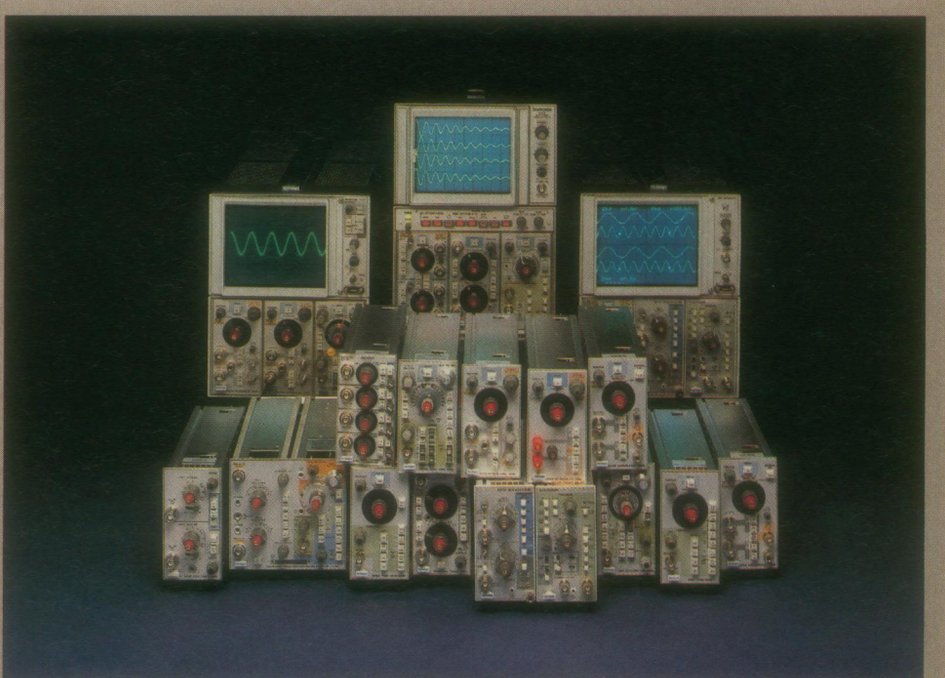

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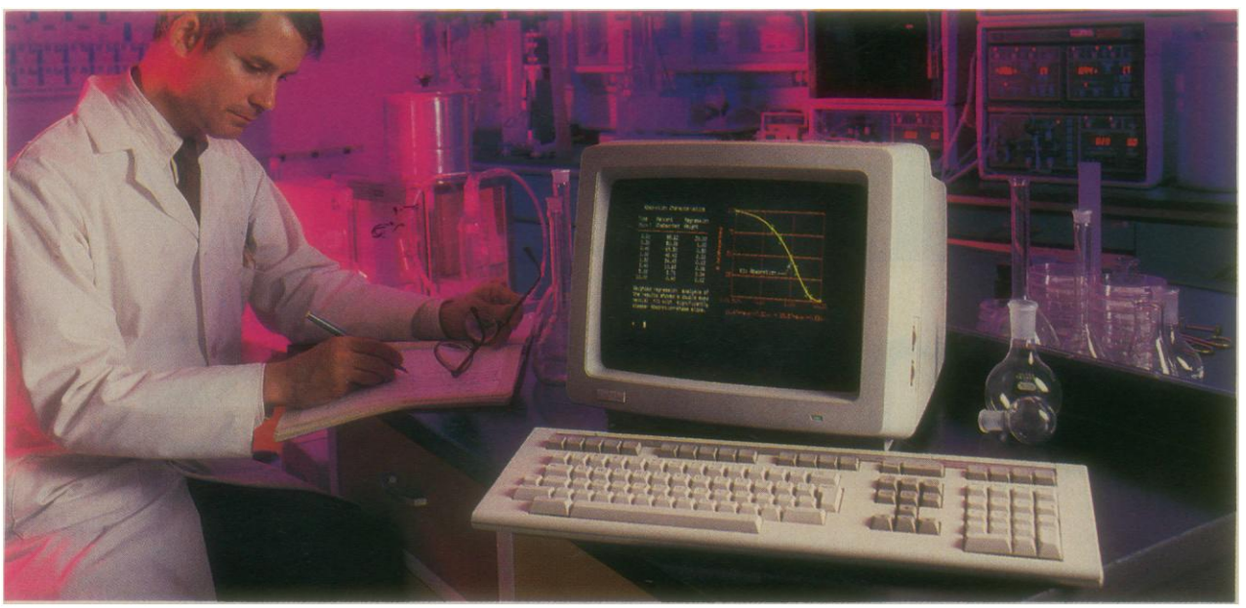

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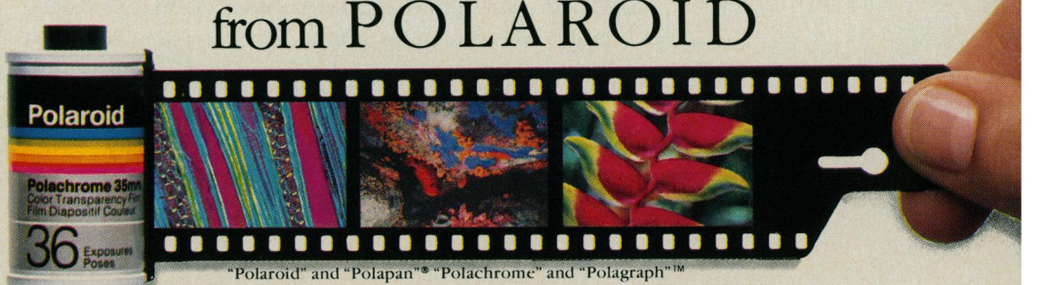

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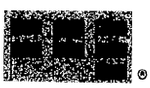

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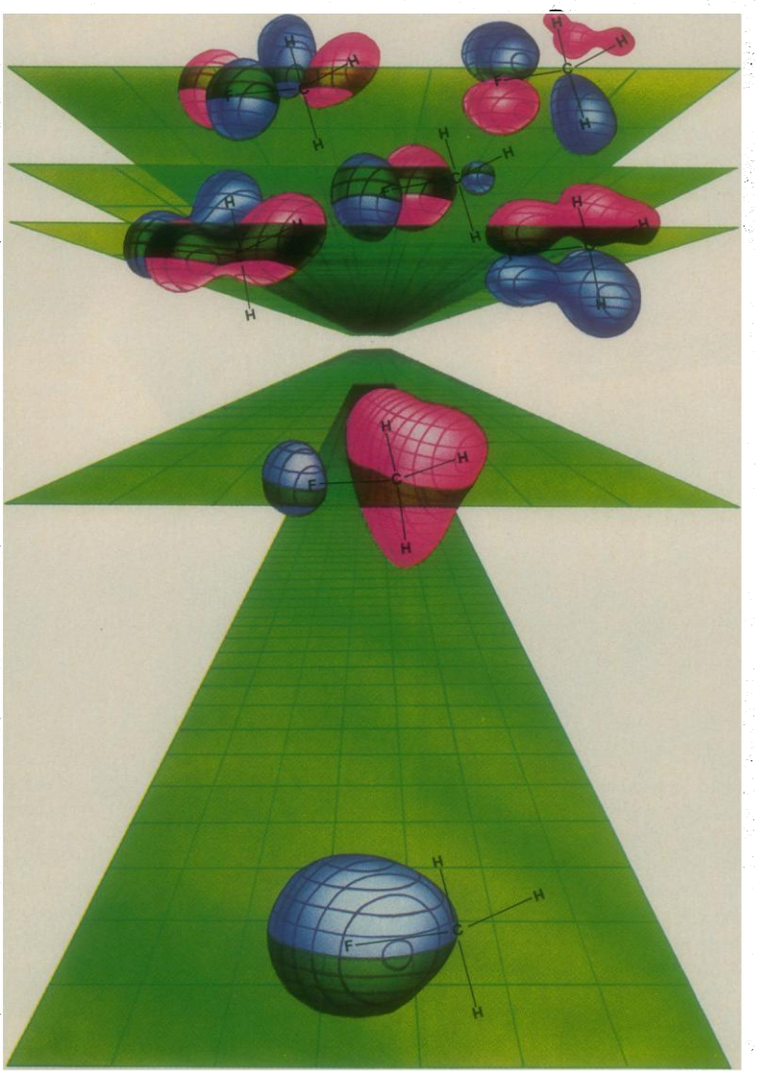

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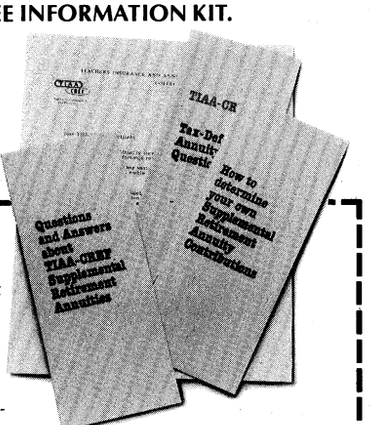

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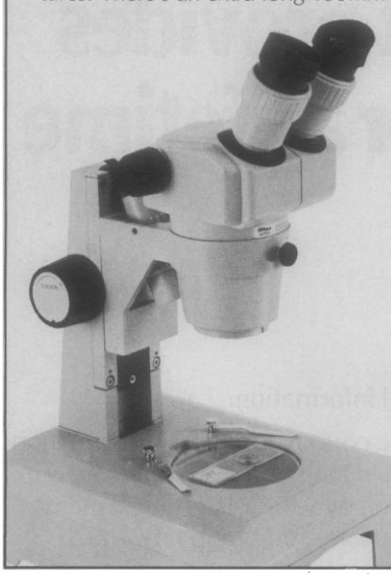

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SCIENCE/SCOPE

The U.S. Navy will save $24 million on the F/A-18 program in the next nine years as a result of a redesigned electrical equipment rack for the strike fighter's radar. The new rack is far simpler to make and helps improve the aircraft's center of gravity distribution. Bulkheads made of bonded honeycomb panels were replaced with machined aluminum panels, and wraparound honeycomb panels with a riveted aluminum assembly. The rack rail pan's riveted sheet assembly, with its numerous parts, has been replaced by a cast assembly. The modifications reduce costs by $24,000 per unit. Hughes Aircraft Company builds the AN/APG-65 radar under contract to McDonnell Douglas for the Navy and Marine Corps aircraft.

Tests of a prototype ducted rocket engine hold promise of increased range and velocity for future tactical missiles. In milestone demonstrations for the U.S. Air Force, Hughes solid-propellant ducted rocket engines were fired successfully in a wind tunnel simulating supersonic missile speeds at a variety of altitudes. Whereas conventional air-launched motors contain all the fuel and oxidizer they need for combustion, the ducted rocket obtains a large portion of its oxygen from the atmosphere. An important benefit is that the ducted rocket motor can contain more fuel for a given weight.

Space shuttle crews will soon be able to rendezvous with satellites in low orbit in order to repair or recover them, thanks to a new integrated radar and communications subsystem that passed its first tests on the shuttle last June and August. The Hughes subsystem, also called a Ku band radar, has an antenna dish at the front of the cargo bay. It can pinpoint objects as small as 1 square yard from up to 14 miles away. If the object is equipped with an electronic signal enhancer, the range increases to 345 miles.

NATO early-warning aircraft are being equipped with a communications system that uses four primary encoding techniques to hamper enemy eavesdropping or jamming. The Joint Tactical Information Distribution System (JTIDS) provides E3A AWACS aircraft and NATO ground command centers with secure voice and digital communications. One JTIDS encryption technique is spread spectrum, in which a signal is expanded over a large bandwidth. With frequency hopping, a second method, frequencies are changed many times a second. Another technique, time division multiple access, assigns certain users to specific time slots no longer than a fraction of a second. Finally, to verify messages, JTIDS repeats messages automatically. Hughes is supplying JTIDS to NATO and the U.S. Air Force.

A system that provides three-dimensional positioning information to military field commanders is in production. The Position Location Reporting System (PLRS) gives commanders continuously updated information on the location of troops, vehicles, helicopters, fixed-wing aircraft, and weapons. The system links small portable radios into a network controlled by microprocessors. Users can locate their positions, navigate to predetermined positions, and be informed when nearing or crossing boundaries. Join our high-tech team. Send your resume to Hughes Ground Systems Group, Employment Dept. SE, P.O. Box 4275, Fullerton, CA 92634.

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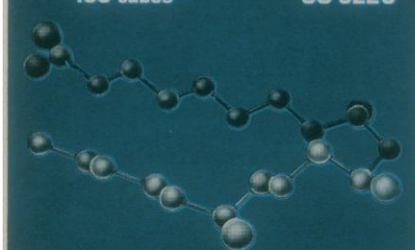

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some questions: Is it possible to identify the characteristics and the properties for a weapon to be considered clearly of defensive nature as opposite to offensive? Second: Is it true that an advanced defense system produces destabilizing effects? And if so, why and how? Third: Why not study new ways out of the present equilibrium of terror?

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The joint research group is composed of scientists from US, USSR, Europe (and possibly other countries) chosen by the three parties.

—R. JEFFREY SMITH

Biological Backwaters?

I suggest that you consider publishing a "Biological Backwaters" issue. This is intended to complement your recent "Biological Frontiers" issue (18 Nov.), which contained no articles pertaining to ecology, ethology, population genetics, plant or animal taxonomy, evolutionary biology, whole-plant or whole-animal anatomy, physiology or morphology, the biology of any major plant or animal group, and a variety of other disciplines. Those of us who work in what appear to be the diverticula of a great science would appreciate an opportunity to discover what other backward spirits are up to.

STEVEN A. KOLMES
Department of Zoology,
University of Wisconsin,
Madison 53706

Basic Research and the Public

Recently, two very different groups (*1*) were independently given the same message: those involved in the research enterprise must make their results known to the public-at-large. If the public is not convinced of the usefulness of basic scientific research, there will be a further, potentially disastrous, drop in funding for such activities.

Many scientific societies look askance at persons who are consistently in the public eye, whose lists of publications include numerous books and articles for popular consumption. There is, however, a small step that those of us in graduate education might consider. We could require of each of our doctoral candidates that, before receiving a degree, a lecture emphasizing the significance of their particular piece of research to the development of the field as a whole be presented to a general audience and that a written exposition be made available for publication in an appropriate popular outlet. If, at an early stage, we could foster in this manner a feeling among our graduates of their indebtedness to the general public for directly or indirectly supporting their reknow the results, it might become traditional for them to proceed in such a way throughout a career.

GEORGE S. MUMFORD
Graduate School of Arts and Sciences,
Tufts University,
Medford, Massachusetts 02155

Notes

1. The Council for Advancement and Support of Education promoted a conference on the theme of communicating university research. Attendees included science writers, public information specialists and directors, and staff writers. Two days after this Washington, D.C., meeting, the Council of Graduate Schools in the United States convened a workshop in Toronto entitled "Graduate education: Courses and programs for practicing professionals." Here the audience consisted mainly of graduate deans.

Dissolution of Kroc Foundation

Gina Kolata, in her article of 11 November (News and Comment, p. 596), writes about the dissolution of the Kroc Foundation. In particular, the statement that the foundation assets will be assigned "to a new foundation to support research on alcoholism and drug abuse" has prompted numerous inquiries.

The new foundation has a very broad charter, but the only activity to which it is now committed is Operation Cork, the alcoholism education program which Joan Kroc founded in 1976. No decision has been made as to whether any kind of research will be funded.

ELIZABETH E. BENES
Joan B. Kroc Foundation,
8939 Villa La Jolla Drive,
La Jolla, California 92037

Erratum: In the report "Malaria parasites adopt host cell superoxide dismutase" by A. S. Fairchild *et al.* (19 Aug., p. 764), the caption for figure 2 on page 765 was incorrect and should read as follows: "Comparison of host and parasite SOD's (*9*) by (A) polyacrylamide gel electrophoresis (*8*) and (B) isoelectric focusing (*7*). Gels were stained for SOD activity (*10*), and bovine erythrocyte SOD (Sigma, type 1) was used as a reference [*p*I = 4.95 (*13*)]. Lane 1, rat-derived *P. berghei* SOD; lane 2, rat erythrocyte SOD (*p*I = 5.1); lane 3, mouse-derived *P. berghei* SOD; lane 4, mouse erythrocyte SOD (*p*I = 5.7); lane 5, bovine erythrocyte SOD." The *p*I's of mouse and rat erythrocyte SOD's cited in the text should also be corrected to the values given above.

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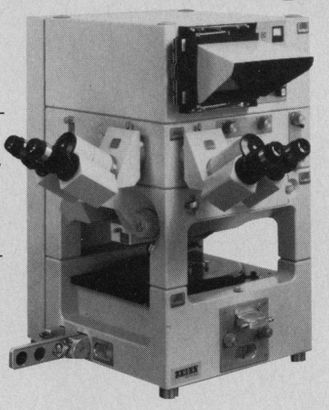

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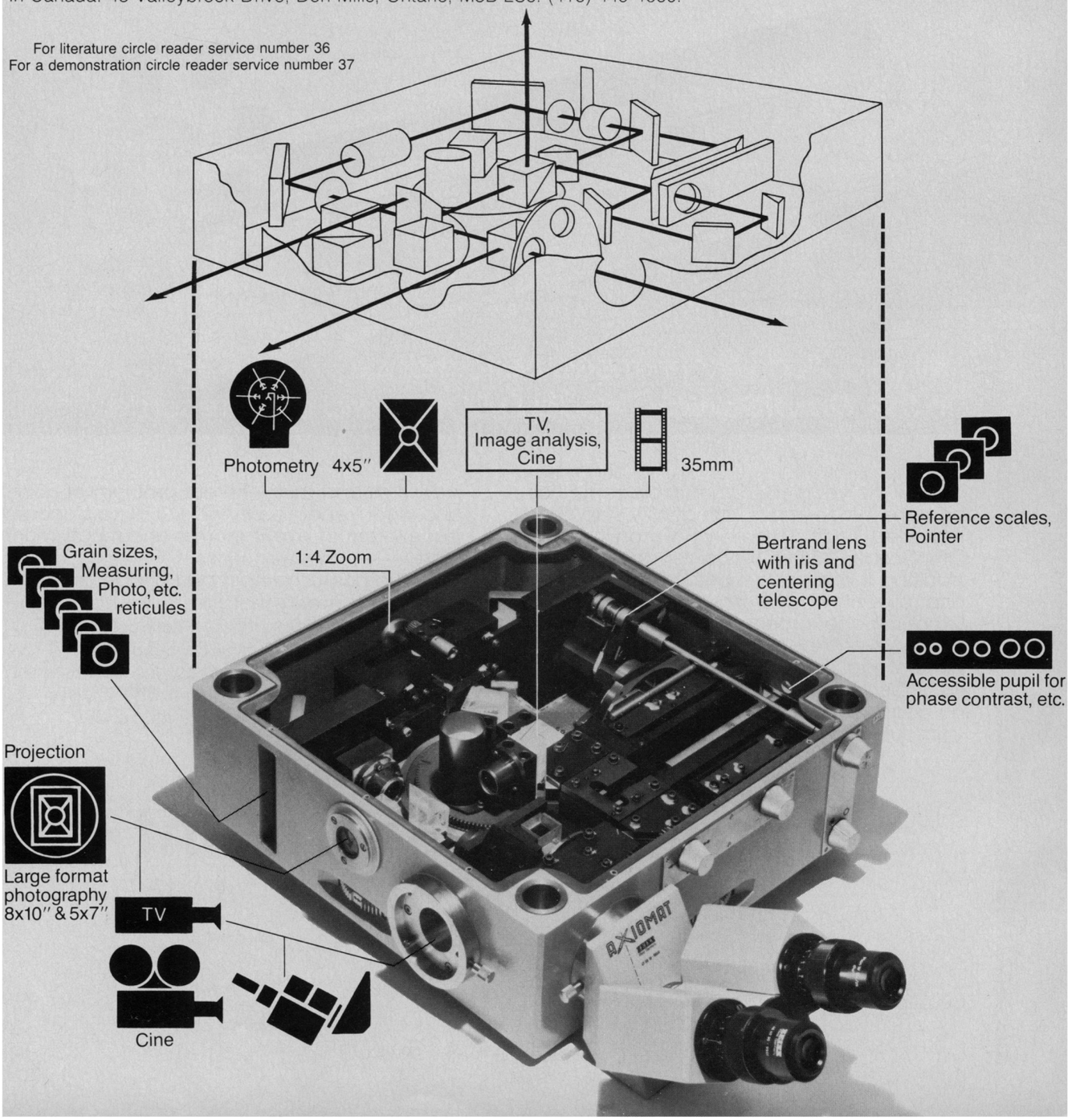

20 January 1984, Volume 223, Number 4633 **SCIENCE**

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Technological Cooperation with the Japanese

Current debate about future directions for U.S. industrial policy includes concern over the relatively free flow of U.S. technology to other nations. Japan is usually singled out as a prime example of how technology exports can be turned against us and used to damage our position in the marketplace. Protectionist measures that constrict the free flow of technology interchange might temporarily impede technology transfer abroad, but such a policy is shortsighted. Reciprocal reaction would certainly deny us rapid access to foreign-initiated advances.

Japan is a good illustration. There is a general lack of appreciation of the growing strength and vigor of Japanese R & D. The future trend is indicated by a survey conducted by the *Japan Economic Journal* of 638 companies listed on the Tokyo, Osaka, and Nagoya stock exchanges; for fiscal year 1980, technology sales (royalties and other technical service fees) for these companies exceeded the costs of imported technology by around $100 million, whereas there was a deficit in 1975. The top ten net earners from overseas technology transfers, which include transfers to the United States, accounted for income of $160 million. On balance, however, for the Japanese economy as a whole, the technology balance of payments is still in heavy deficit, with payments 1.8 times higher than earnings.

Financial statistics fail to convey the intensity with which the very competitive Japanese companies are strengthening their R & D resources. Government laboratories and the universities are also diligently expanding their generic research activities. A review of 2 years of recent publications of the Society of Automotive Engineers shows that 10 percent were by Japanese authors, and about 30 percent of them deal with fundamental research topics. Fields in which Japanese technology equals or leads that available in other advanced nations are well publicized and include steelmaking, vehicle and engine design, manufacturing processes and techniques, high-speed rail transport, fiber and ceramic technologies, and nuclear power plant operations. The list will grow.

Our experiences with Japanese clients range across many industrial sectors, and we find the relationships rewarding. New ideas are readily accepted, there is a noticeable absence of the not-invented-here syndrome, contacts between staffs are close (despite the geographic separation) and mutually supportive, and a special effort is made to explain how our research results will help realize company objectives. Publication of findings is encouraged whenever marketplace strategies permit.

As an example, a program comes to mind involving development of an advanced diesel engine based on a spark-assisted combustion cycle; in principle, such an engine has several significant advantages. After our presentation of the concept, we initiated R & D to develop the combustion cycle and refine performance estimates. As our results emerged, the client began development of a multicylinder engine, and soon after our research was completed a prototype engine was delivered for evaluation. Throughout the program, both staffs freely exchanged ideas and information, and a paper on our results was published in a peer review journal.

In nuclear power plant operations, the Japanese are leaders in achieving high plant availability factors; here they are helped by a steady stream of technical information exchange with other countries, to which they are also active contributors. More important, for the future, are the large resources Japan is committing to the development of advanced light water and breeder reactors. As partners in several international consortia (with U.S. participation) one result will be the emergence of Japanese industry as a substantial factor in future reactor designs.

In sum, my message is that Japan is emerging as a powerful R & D entity. By adopting protectionist attitudes on technology transfer toward Japan and other nations, our ultimate loss will certainly equal theirs, and the overall progress of science and technology will be retarded.—MARTIN GOLAND, *President, Southwest Research Institute, San Antonio, Texas 78284*

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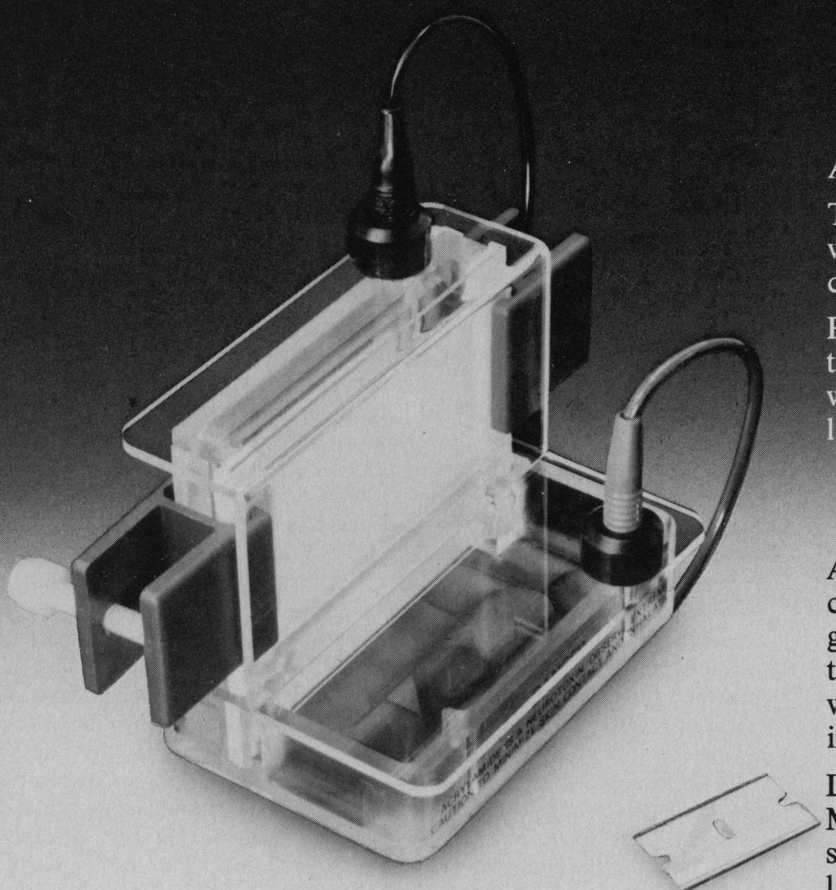

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