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SCIENCE

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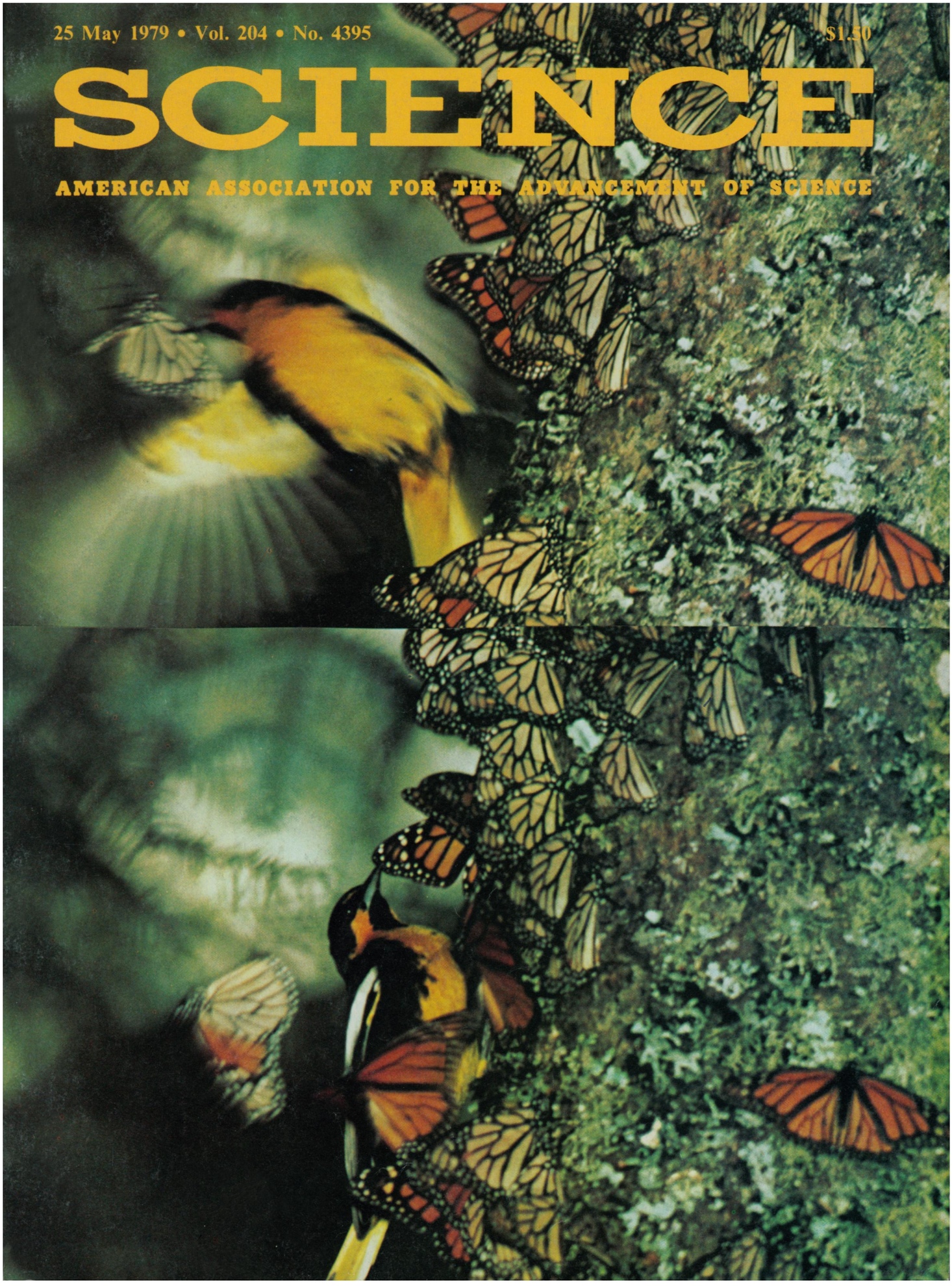

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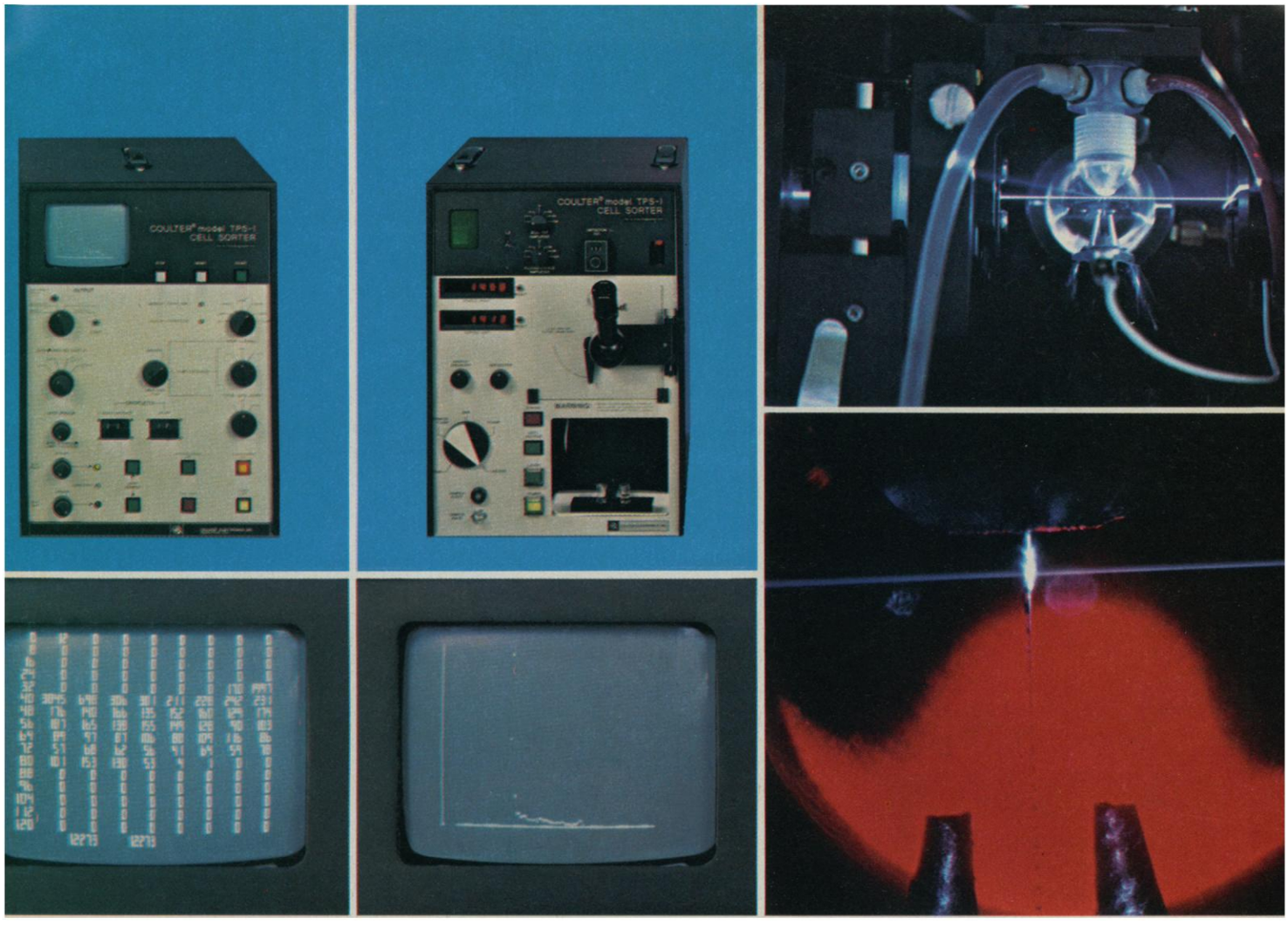

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25 May 1979

Volume 204, No. 4395

SCIENCE

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COVER

Predation of a monarch butterfly (*Danaus plexippus* L.) by a black-backed oriole (*Icterus abeillei*) from a cluster on a tree trunk at a recently discovered overwintering site of the monarch butterfly in Central Mexico. See page 847. [Photographs by George D. Lepp (Davis, California) at a 2-second interval using a Nikkor 400-millimeter lens, Norman telephoto strobe, and Kodachrome 64 film]

VAX Software. Ask any user.

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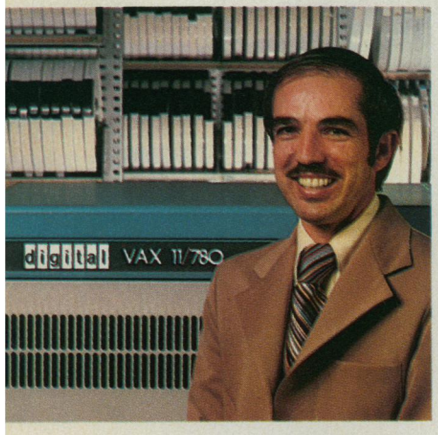

Dr. Herb Schwetman,
Assoc. Professor
Dept. of Computer Science
Purdue University
West Lafayette, Indiana

Purdue's Department of Computer Science is involved in researching operating system performance, programming languages, and computer system security.

Because their experimentation requires heavy interactive use, they needed an alternative system to augment time-sharing on a CDC 6500.

Dr. Herb Schwetman, Associate Professor, explains what made Digital's VAX-11/780 so attractive. "We were intrigued because VAX provided a lot of the features and performance of a central facility—but for a lot less money."

Since Purdue's research involves state-of-the-art technology, VAX's advanced architecture and software were especially appealing. "The operating system is set up very cleanly," says Dr. Schwetman, "Processes can operate independently. And that's a very good way to do it."

Also, VAX's 32-bit address space and large main memory give the Purdue researchers more flexibility. Dr. Schwetman says, "With VAX, we'll be able to double the size of the problems we can look at. In fact, VAX offers user programs more memory than is available on the big CDC 6500 downstairs."

"It's amazing," Dr. Schwetman concludes, "All this power—in a machine in this price range."

"We needed virtual memory software and fast real-time performance. VAX gives us both."

Gary Willis, Program Specialist
Advanced Technologies Engineering Laboratory
Ground Systems Department
General Electric Company
Daytona Beach, Florida

At the Advanced Technologies Engineering Laboratory of its Ground System Department, General Electric designs color visual systems for flight simulators, primarily for the military.

The application demanded operating system software that could handle static simulation; but real-time performance was important, too. After a number of tests and benchmarks, General Electric decided on VAX.

Gary Willis, Program Specialist, tells us, "If you can imagine emulating a roomful of simulation hardware, you can see why we needed a virtual memory operating system. But since we have to compute a new image every 30th of a second in our real-time application, we also needed a lot of number crunching. VAX gives us both."

The VAX/VMS operating system and real-time dynamic performance are only part of what impressed General Electric. Says Willis: "Most military contracts require FORTRAN, and we're very pleased with what VAX gives us—very fast, very efficient FORTRAN, with super execution times."

According to Willis, VAX software is also getting high marks on ease-of-use.

"Our people are very pleased with how easy it is to translate FORTRAN programs from the PDP-11 series to VAX. Also, our programmers like the HELP command—especially those who are just getting used to Digital equipment."

"We were very impressed with the maturity of the VAX operating system. Everything that's supposed to work, works."

Harry Hill, Program Manager
Ford Aerospace &
Communications Corp.
Western Development Laboratories
(WDL) Div.
Palo Alto, California

Ford Aerospace performs large double precision floating point scientific computing for a variety of government projects.

When it was time to move to a larger computer, WDL's Harry Hill, Program Manager, admits they were apprehensive about committing to a product as new as Digital's VAX-11/780.

"We were originally very leery of the new machine," says Hill, "Because it traditionally takes years to develop maturity. But the price was so good that we went ahead, and it's been very successful."

One feature that made VAX particularly attractive for Hill's application was the powerful virtual memory. He tells us: "By going to VAX, we were able to eliminate memory mapping and let the machine just sit there and crunch numbers. It saves time and cuts down on the chances of messing something up."

Hill is also impressed with VAX's interactive and batch capabilities. "The multi-stream, multi-queue batch is one of the best systems we've ever seen."

The programmers' reaction? Says Hill, "Everybody is amazed."

Digital's VAX-11/780 represents the first truly integrated approach to hardware and software architecture. The result is one of the most advanced systems on the market. Extremely powerful, yet extremely easy to use.

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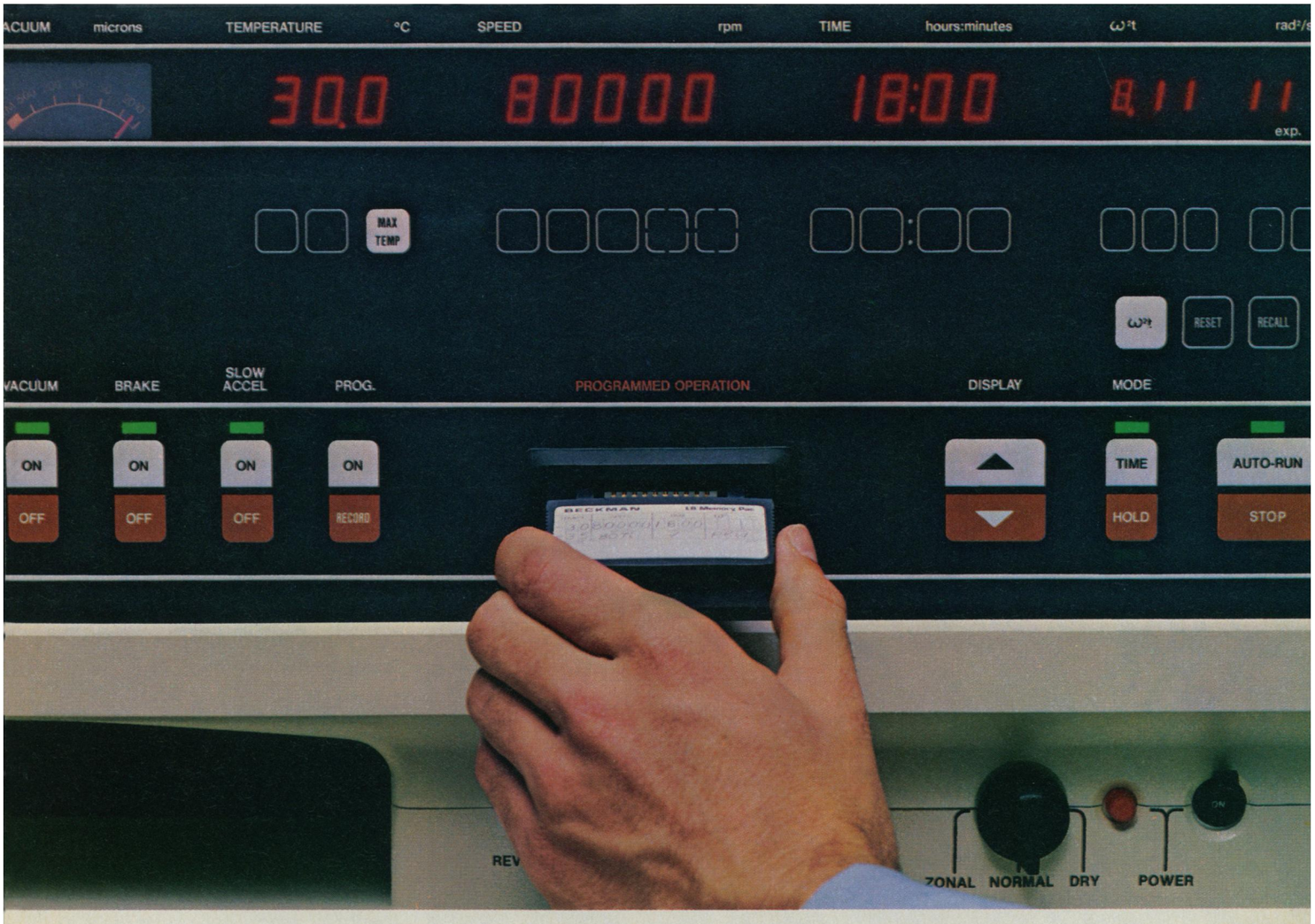

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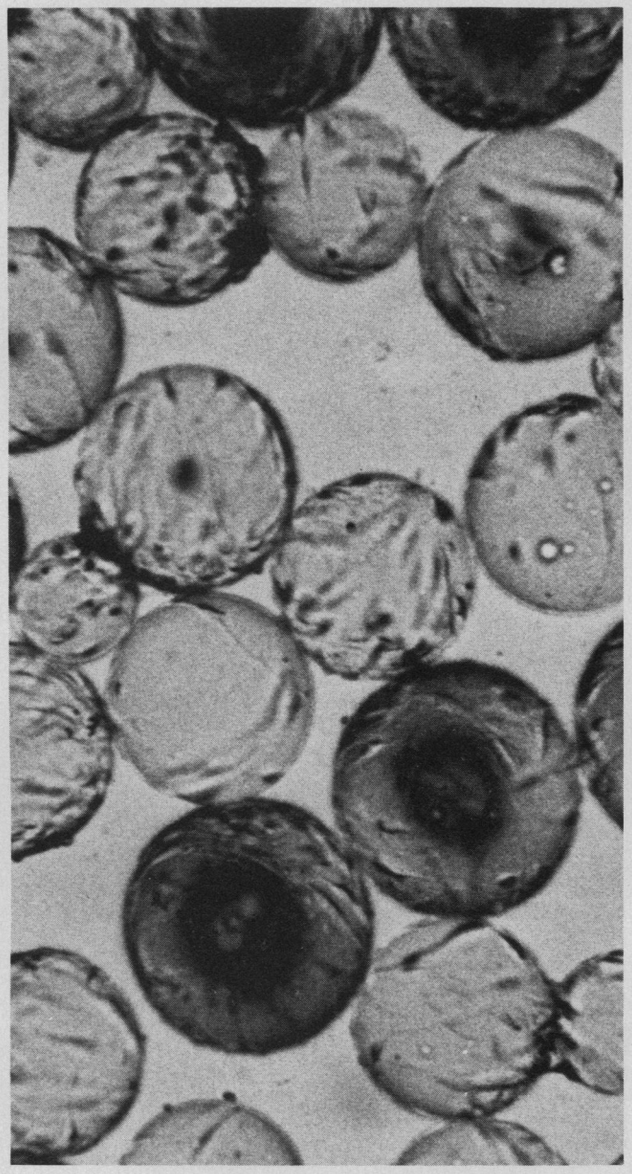

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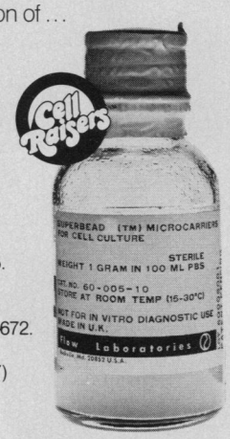

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1. Levine, D. W.; Wong, J. S.; Wang, D. I. C.; and Thilly, W. G., (1977) Somatic Cell Genetics, *3*:149-155.
2. Giard, D. J.; Thilly, W. G.; Wang, D. I. C.; and Levine, D. W., (1977) Appl. Environ. Microbiol., *34*:668-672.
3. ASM News (1977) *43*:524.
4. Chemical Week (August 10, 1977) pp. 34-35.

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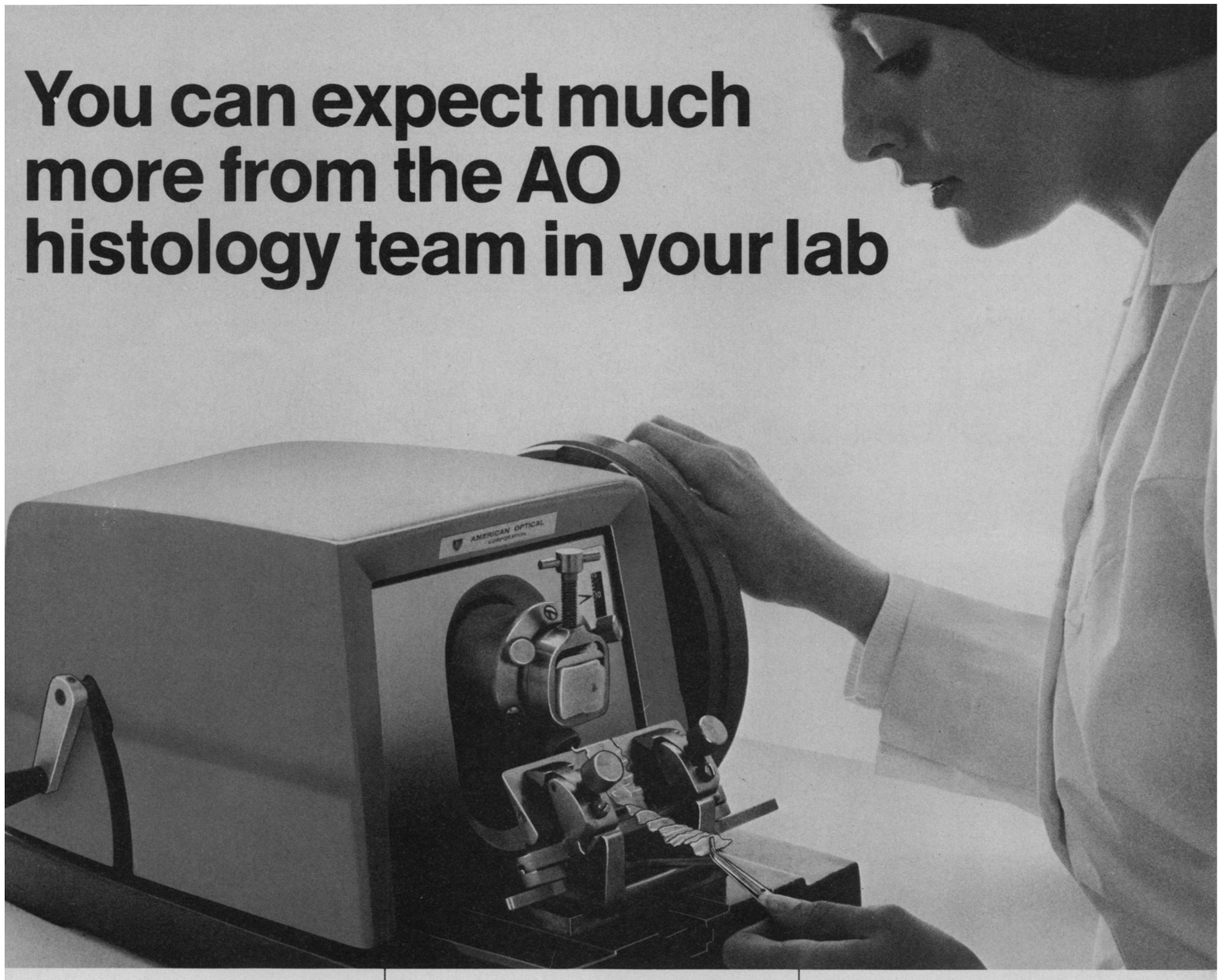

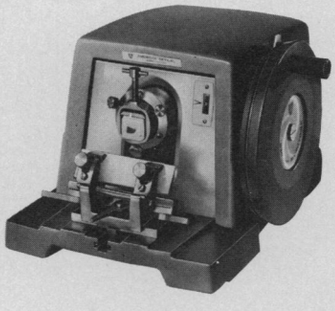

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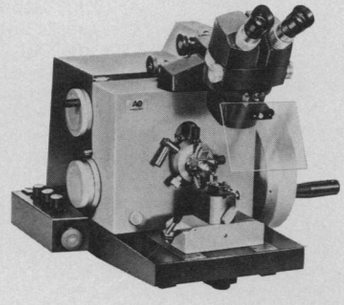

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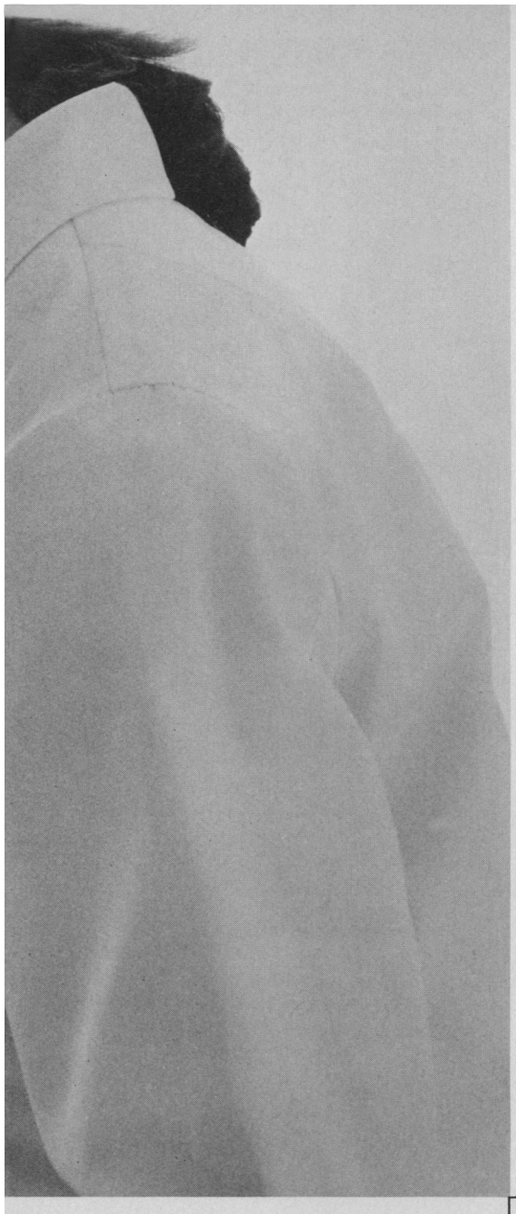

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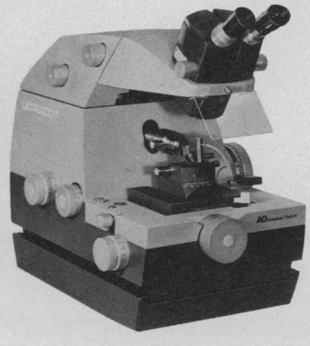

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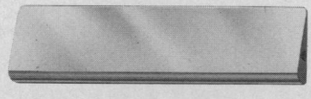

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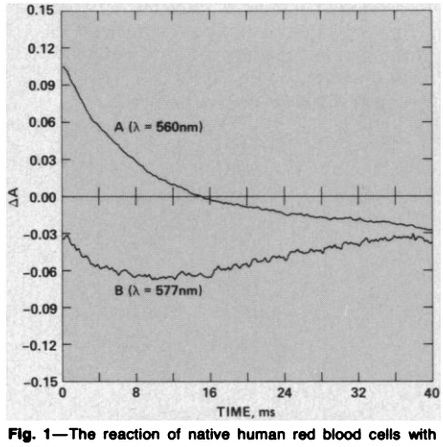

Fig. 1—The reaction of native human red blood cells with oxygen.

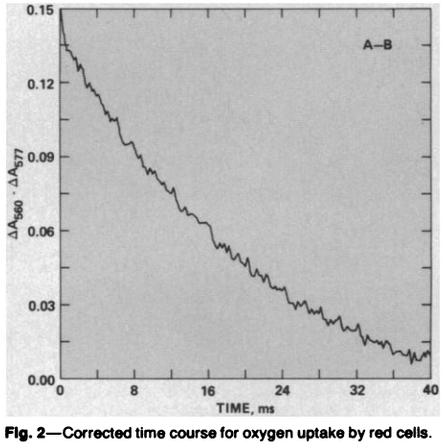

Fig. 2—Corrected time course for oxygen uptake by red cells.

AAAS Colloquium on

R&D Policy

19-20 June 1979

Mayflower Hotel
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"The budget analysis that the AAAS prepares for these meetings keeps getting better; the latest, third in a series, is a fine, item-by-item review of federal R&D spending and now qualifies as the best way of tracking the complexities of science and money in the US."

— Dan Greenberg, New Scientist, 29 June 1978

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- *International Aspects of R&D* • R&D and international competitiveness • R&D and international cooperation and assistance • R&D and U.S. foreign policy
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Melvin Kranzberg, Callaway Professor of the History of Technology, Georgia Institute of Technology, and Chairman, AAAS Committee on Science, Engineering, and Public Policy (COSEPP)

Hugh F. Loweth, Deputy Associate Director, Science and Energy Technology, Office of Management and Budget

Robert P. Morgan, Chairman, Department of Technology and Human Affairs, Washington University, and Member, COSEPP

Richard Nelson, Department of Economics, Yale University, and Member, COSEPP

Rodney W. Nichols, Executive Vice President, The Rockefeller University, and Member, COSEPP

Thomas R. Pickering, Assistant Secretary of State, Bureau of Oceans and International Environmental and Scientific Affairs

Frank Press, Director, Office of Science and Technology Policy, Executive Office of the President

Nathan Rosenberg, Department of Economics, Stanford University

Dorothy M. Simon, Vice President for Research, AVCO Corporation

Senior OMB Official

Research and Development: AAAS Report IV covering R&D in the federal budget for FY 1980, data on R&D in industry, international aspects of R&D, and other topics related to R&D and public policy is being prepared by Willis H. Shapley and Don I. Phillips and will be available in advance to Colloquium registrants. Registrants will also receive the published proceedings of the Colloquium.

4th R&D Colloquium Washington 19-20 June 1979

The fourth AAAS R&D Policy Colloquium will be held on Tuesday and Wednesday, 19 and 20 June 1979 at the MAYFLOWER HOTEL, 1127 Connecticut Ave., NW, Washington, DC 20036. [Although commercial parking is available in the vicinity of the Mayflower, the Hotel is a short walk from the Farragut North (Red Line) and Farragut West (Blue Line—connecting to National Airport) Metro stops.]

AAAS Colloquium (19-20 June) Advance Registration—enclosed is:

- ☐ **$85** Full Registration (includes lunch on both days, dinner on Tuesday, the R&D: FY 80 Report, and the Colloquium Proceedings)
- ☐ **$48** Partial Registration (includes Report and Proceedings only)
- ☐ **$25** Student Registration (includes Report and Proceedings only; available to full-time graduate or undergraduate students only)

Separate Meal Tickets (lunches at **$12** and dinner at **$17**):
☐ Lunch on Tues., 19th; ☐ Dinner on Tues., 19th; ☐ Lunch on Wed., 20th

Previous Reports and Proceedings (at **$5** each):
☐ R&D FY 79; ☐ R&D: FY 78; ☐ R&D: FY 77
☐ Proc. 78 Col.; ☐ Proc. 77 Col.; ☐ Proc. 76 Col.

Program, badge, meal tickets, and R&D: FY 80 Report will be sent about 8 June. Registrations received after 8 June will be held at the AAAS Registration Desk at the Mayflower Hotel. Previous reports ordered will be sent as soon as possible. Proceedings of 79 Colloquium will be sent as soon as available.

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(Reservations received after 4 June cannot be guaranteed)

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Be sure to list definite arrival and departure date and time. Hotel reservations will be held only until 6 p.m. unless otherwise specified. Check out time is 3:00 p.m.

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LETTERS

Three Mile Island

Eliot Marshall (News and Comment, 20 Apr., p. 281) perpetuates misinformation about the health effects of the radiation released from the Three Mile Island nuclear plant when he states that "the radioactive isotopes of these gases [krypton and xenon] have brief half-lives, so that they decay within days," This is true for xenon, *but not* for krypton. One of the major products of nuclear fission is the radioactive isotope krypton-85, which has a half-life of 10.76 years. Thus, krypton-85 can affect not only the local and downwind population over a period of time depending on how fast it is dispersed in the atmosphere, but also, because the isotope can accumulate in the atmosphere, the general population is exposed to higher levels of radiation. The effects of krypton-85, which is essentially a pure β-emitter, are primarily limited to the skin and superficial tissues. However, when the isotope is inhaled, the lungs and blood-forming system become the critical organs.

The release of krypton-85 from the Three Mile Island plant can be added to the already significant quantities being released by nuclear fuel reprocessing plants. It has been postulated that the continued release of this isotope could lead to inadvertent weather modification as well as other environmental effects (*1*). Thus, the people of Harrisburg and the rest of us may be in for more than originally anticipated.

GARY C. THOM
Department of Chemistry,
American University,
Washington, D.C. 20016

References

1. W. L. Boeck, *Science* **193**, 195 (1976).

In the first News and Comment report (13 Apr., p. 152) on the Three Mile Island incident, misstatements regarding the foreseeability of the hydrogen bubble that appeared elsewhere are repeated. The problem of hydrogen accumulation inside the containment structure was foreseen and considered to be a potential problem by the Advisory Committee on Reactor Safeguards (ACRS) in 1969 (*1*):

> The applicant has discussed . . . the question of post-accident production of hydrogen in the containment atmosphere due to radiolysis and metal-water reactions. The Committee believes that further consideration should be given to providing means for coping with additional hydrogen which might be generated

by Zircaloy-water reactions in a postulated loss-of-coolant accident. . . . This matter should be resolved between the applicant and the AEC Regulatory Staff.

In 1971, the ACRS said:

The Committee has commented in previous reports on the development of systems to control the build-up of hydrogen in the containment that might follow . . . a loss-of-coolant accident. . . . The Committee believes that purging capability should be retained, but that the primary protection in this regard should utilize a method of hydrogen control other than purging. The applicant should submit . . . a proposed design for hydrogen control, including provisions for inerting. . . . The Committee wishes to be kept informed of the resolution of this matter.

As the above demonstrates, the possibility of hydrogen accumulation inside the containment was anticipated. The moral is clear—the licensing process should be changed to give the ACRS some direct control over the outcome.

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1. Advisory Committee on Reactor Safeguards, "Report on Calvert Cliff nuclear power plant, units 1 and 2," in *Safety Evaluation by the Division of Reactor Licensing U.S. Atomic Energy Commission* (Docket Nos. 50-317/318, Atomic Energy Commission, Washington, D.C., 9 April 1969), appendix B.
2. ——, "Report on Enrico Fermi atomic power plant, unit No. 2," in *Safety Evaluation By The Division of Reactor Licensing U.S. Atomic Energy Commission* (Docket No. 50-341, Atomic Energy Commission, Washington, D.C., 17 May 1971), appendix B.

Bronstein's point is that the officials—forewarned about the dangers of a hydrogen buildup in the containment—also should have been aware of the dangers of a hydrogen buildup in the reactor core. Alas, they were not, according to Harold Denton. When Denton arrived on the scene, he said the unexpected danger was not the risk of an explosion, but the possibility that the bubble might expand and incapacitate the coolant pumps. One hardly imagines he dissembled in this matter, for it is at least as damning to confess ignorance as negligence.—E.M.

Marshall's generally informative article on the Three Mile Island incident needs a correction. The rem is a unit of biological damage *per gram of exposed tissue*; thus the implication that a chest x-ray of 25 millirems is equivalent to the (presumably whole-body) exposure received in 25 hours by a person who, standing in a radiation field, receives 1 millirem per hour, is misleading. The discrepancy amounts to something like the factor by which the mass of a person's body exceeds that of a person's chest. If one assumes that gonadal shielding is provided in the case of the chest x-ray, the comparison is perhaps even more inappropriate.

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I was very pleased with *Science*'s coverage of the Three Mile Island reactor incident. I believe the real quality of any publication can be best judged by how well it covers a spot news item. *Science* responded quickly and effectively to Three Mile Island.

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"Strategy"

Gideon Louw (Letters, 9 Mar., p. 955) laments the widespread biological use of the word "strategy" because of the implication of rational choice where none exists. Perhaps the term is "semantically incorrect," but it is a necessary evil; there is no simpler way to label possible evolutionary designs. Unconventional uses of the language may be necessary to accommodate new or unwieldy ideas; consider the physicists' "flavor," the feeding "preference" of a predator (that may exert no active choice at all), and natural "selection" (what is doing the selecting?). It is easier to talk about selection than about differential perpetuation; as long as these minor bendings of conventional usage are introduced conservatively and explained to the uninitiated, they are acceptable and even desirable.

I suggest that we select a strategy to pass over these semantic dilemmas and concentrate instead on the many more insidious and easily corrected abuses of the language, including incorrect or hackneyed words and phrases like "predate," "utilize," "interface" (as a verb), "it is the case that," "due to the fact that," and so forth.

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Erratum: The second author of the report "Immunocompetence in the lowest Metazoan phylum: Transplantation immunity in sponges" (27 Apr., p. 420) was Ian S. Johnston, not Johnson.

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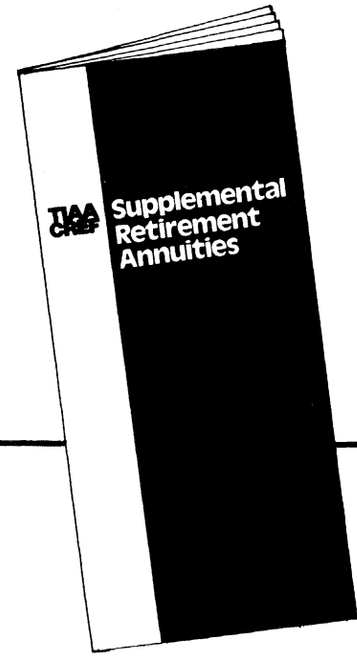

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25 May 1979, Volume 204, Number 4395 **SCIENCE**

Science and Public Understanding

When tens of thousands of troubled Americans swarm into Washington on a magnificent May morning to register a civil protest against nuclear power technology, the First Amendment becomes a powerful factor influencing the future course of science and its applications. Choice is very much alive in the land. This is as it should be, and we can hope that it will not always take a Harrisburg scare to awaken public interest in science and its uses. But the right of choice is not sufficient, standing alone. The *quality* of the choice is at the heart of the matter, and a media event is not necessarily the best instrument for informing the act of choosing.

The risk is that public opinion may come to equate scientific progress and discovery with "ugly" technology and leave it at that. The matter arises not just from a sense of brooding uncertainty about nuclear power, but just as much from polarized debates about the strategic weapons balance, the rumor of dark doings involving the particle beam weapon, a credibility gap concerning petroleum shortages, alarms accompanied by reassurances regarding the impacts of carbon dioxide buildup in the atmosphere, and the increasing man-machine interface that goes along with advancing telecommunications sophistication. It is a difficult business to project, above this noise level, an awareness of man's leaping understanding of his universe—of its behavior, its resources, its possibilities, and its wonders. The joys of research and discovery, the glimpse of creativity, and the meanings of the quickening journey to knowledge take second place to the trumpeting of technological crisis, real or apparent.

For more than a decade, the constitution of the AAAS has mandated the responsibility "to increase public understanding and appreciation of the importance and promise of the methods of science in human progress." That is a large and perplexing assignment, and the AAAS to date has tried to meet it with the tools at its disposal: *Science*, the Annual Meeting, regional seminars on problems of science and society, Media Fellows and Congressional Fellows, and ad hoc projects. It has not been enough. The universe to be reached is large, and the exuberance of science and technology outpaces the effective reach of these limited initiatives. The time has come to do more.

At its spring meeting, the Board of Directors unanimously approved a major new effort by the AAAS to advance public understanding of science and technology. It takes the form of a new kind of magazine, to be called initially *Science 80*, for an educated public readership. Grounded on the reputation and credibility of AAAS, and with exacting standards of editorial responsibility, *Science 80* will cover important and exciting developments and discoveries in all the sciences as well as medicine and technology, and present them in clear and readable language. It will go beyond the reporting of science and technology to examine impacts on people, nations, and cultures. It will cover the controversies and public policies that involve science, and it will describe the process by which new science is created: how scientists work, and where they get their ideas. At the same time, it will be neither an imitation nor a substitute for *Science*, which has a very different role in reporting advances at the frontiers of science and in analyzing the trends and directions that affect the scientific enterprise.

This new venture would not be possible if the AAAS were not a nonprofit association with an implicit social responsibility, or if it were not fortified with the editorial and technical strengths to do the job well. The undertaking will not be easy, and there are risks that the AAAS understands and accepts. But the response to a large mail test has been very strong indeed, indicating that a magazine of this kind published by the AAAS will get a very good reception.

The first issue of *Science 80*, which will initially be issued bimonthly, is planned for the fall of 1979. We hope and believe that the members of the AAAS will have reason to be proud of it and view it as worthy company to *Science*, which remains the flagship of the AAAS as it approaches its 100th year of publication.—WILLIAM D. CAREY

Centrifugal Freeze Dryer

Spin-Freeze freezes and lyophilizes samples (up to 60 ml) without refrigeration or the use of a desiccant. The device is connected to a vacuum pump and relies on evaporative cooling as specimens are spun at 1600 rpm. The instrument's rotor has 1/2-inch and 3/8-inch holes to accommodate several sizes of sample tubes. There is a 0- to 60-minute timer and the operator can activate a brake at any time to stop the device. Labconco. Circle 796.

Liquid Chromatography Module

The Radial Compression Separatory system eliminates column voiding, allows 5000 plates to be processed per 10 centimeters of column, and increases productivity. Cartridge dimensions (10 centimeters by 8 millimeters, inside diameter) allow high flow rates with low back pressure. The system comprises the RCM-100 module and Radial-PAK cartridges. When a cartridge is inserted in the module, hydraulic pressure is applied uniformly to the outer surfaces of the cartridge to produce a homogeneous bed that is free of channels and voids. Cartridges are easily interchanged. Waters Associates. Circle 783.

VideoChart Recorder

The VideoChart recorder combines the features of a chart recorder, digital data acquisition system, and scientific calculator with a video data display. The instrument accepts voltage or pulse inputs directly and records up to 4096 data points of five-digit resolution. Recording speeds are selected from seconds, milliseconds, or microseconds per data point. Graphic and digital data may be manipulated on the display. Parts of charts may be expanded, and superimposition of one record on another allows for comparison or correction for background. VideoChart. Circle 784.

Radioiodination for Proteins

A system is available for performing radioiodination (iodine-125) in the laboratory. Reagents include approximately 2 millicuries of sodium iodine (iodine-125) tracer, purified and verified; iodination reagent with precise quantities of lactoperoxidase and glucose oxidase on uniform, inert, solid support; sodium phosphate buffer that is protein-free and sterile; and 1 percent β-D-glucose that is also sterile and protein-free to activate the reaction. A complete protocol is included with the four-vial system. The system provides mild enzymatic iodination at a controllable rate and the results are reproducible. New England Nuclear. Circle 788.

Spectrophotometer

The 8450A is a microprocessor-controlled ultraviolet-visible spectrophotometer. It measures and displays a spectrum from 200 to 800 nanometers in 1 second. The 8450A disperses the light that has passed through a sample across two parallel arrays of detectors simultaneously. Over its entire range, the instrument can quantify up to seven components at a time. Over a limited range, up to 12 compounds may be identified in one measurement. Sensitivity is 0.0003 absorbance units. The microprocessor is a 16-bit unit with 88,000 bytes of memory. The 8450A is compatible with accessories such as a printer/plotter and an autosampler. Internal diagnostics simplify maintenance. Hewlett-Packard. Circle 782.

Methods Processor for Liquid Chromatography

The Methods Processor enables the user to conduct liquid chromatography from sample injection to printed result automatically. The processor may be programmed for analysis of up to 42 consecutive samples via a tape cassette. The keyboard may be used to modify programs. The operator programs the pump method, means of data processing, sample selection, sample sequence, and changes of wavelength. Software includes error messages and promptings for nonvalid entries. The Methods Processor is compatible with analytic and preparatory systems already in use. Perkin-Elmer, Instrument Division. Circle 786.

Ultrasonic Cleaner for Pipettes and Glassware

The Sonifier consists of an ultrasonic generator and a stainless steel tank. The generator converts line current to electrical energy at 40 kilohertz. This energy is transmitted to lead zirconate titanate transducers where it is converted to mechanical energy. These transducers are connected to the bottom of the tank where they vibrate longitudinally and transfer motion to the cleaning solution which causes the liquid to cavitate. Cavitation breaks down soiling substances and effectively scrubs surfaces clean. Temperature in the tank may be controlled up to 88°C. Branson Sonic Power. Circle 787.

Literature

HPLC lists components for upgrading systems or creating new ones. Schoeffel Instrument Division, Kratos, Circle 797.

SPDP describes a heterobifunctional reagent used to reversibly cross-link proteins and to thiolate proteins without denaturation. Pharmacia Fine Chemicals. Circle 789.

Immersion Oil and the Microscope is available as part of a program that uses optic aids free of polychlorinated biphenyls. R. P. Cargille Laboratories. Circle 790.

Laboratory Furniture and Fume Hoods are described in a catalog devoted to the Exemplar line. Sargent-Welch Scientific. Circle 793.

Gas Chromatography Biochemicals and Standards lists reagents for separatory techniques. Applied Science Laboratories. Circle 795.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Reader Service Card (on pages 790A and 886E) and placing it in the mailbox. Postage is free.

—RICHARD G. SOMMER

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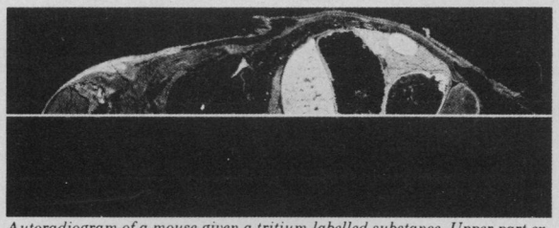

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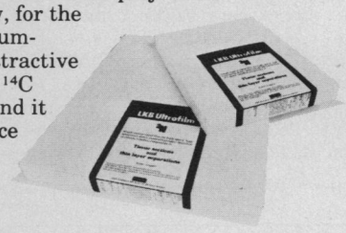

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