13 MAY 1983 · VOL. 220 · NO. 4598

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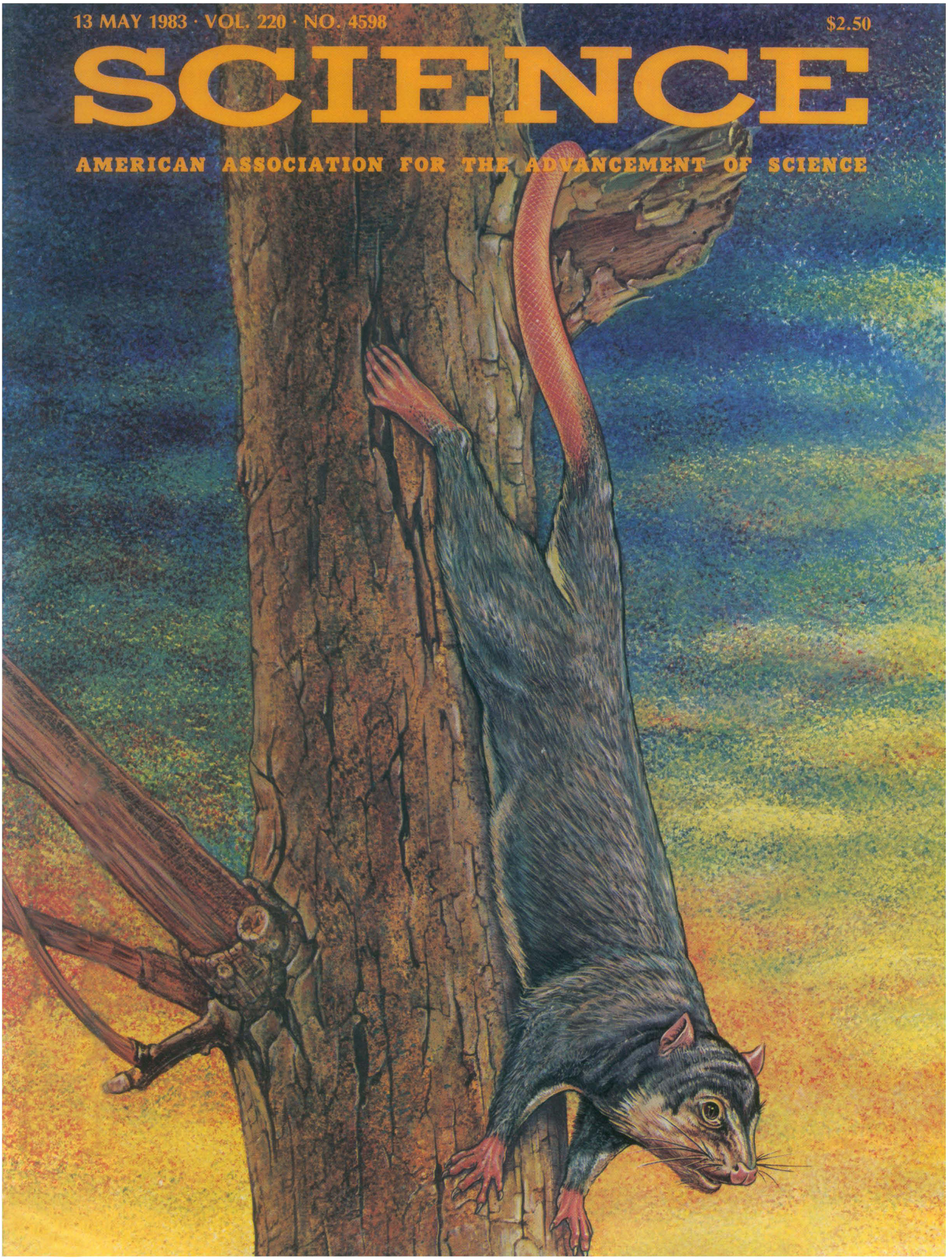
SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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The J-6M: The Ultra-Dependable High Tech Centrifuge with a mind all your own.

Beckman again leads the way. With the rugged J-6M, the world's first programmable, 6000-rpm, large capacity, refrigerated centrifuge. After you load the rotor and close the door, the J-6M's microprocessor is ready for *your* command.

You can store 10 programs in memory, so there's no chance for error on the runs you do most often. Or you can manually select run conditions with speed accurate to 10 rpm, time to 1/10 minute and temperature to 1°C. That's precision. And that's what the J-6M's digital logic gives you.

It also gives you an audible end-of-run signal, and a diagnostics readout that signals power failure, rotor imbalance, over-speed and over-temperature.

But all this electronic technology and ease of operation is only part of the story. *The J-6M is inexpensive to maintain.*

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The J-6M (and the analog J-6B version) can spin a total of 17 Beckman rotors, including six and four liter rotors and the new JS-2.9 rotor which holds up to 12 blood bags or 12 250-mL bottles. There's

an elutriator rotor, too, for living cell separations.

The J-6M. With 35 years of Beckman centrifuge expertise behind it. For full details, write: Beckman Instruments, Inc., Spinco Division, P.O. Box 10200, Palo Alto, CA 94304.

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Good news for prostaglandin researchers

We've put performance and convenience together so you can put your mind to research. All three of these new kits offer much higher sensitivity, as well as the convenience of gamma counting. And we've packaged everything you'll need, pretested the components in a complete assay before shipment, and included the assay results.

PGE_2 [^{125}I] RIA Kit

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The tritiated kits we introduced for these assays have been so well received we're adding iodinated versions to give you much higher sensitivity and direct gamma counting. In addition to the ease of single-tube assays, you'll be assured of antisera that have high affinity and specificity. Protocol is included.

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PRODUCTS AND MATERIALS

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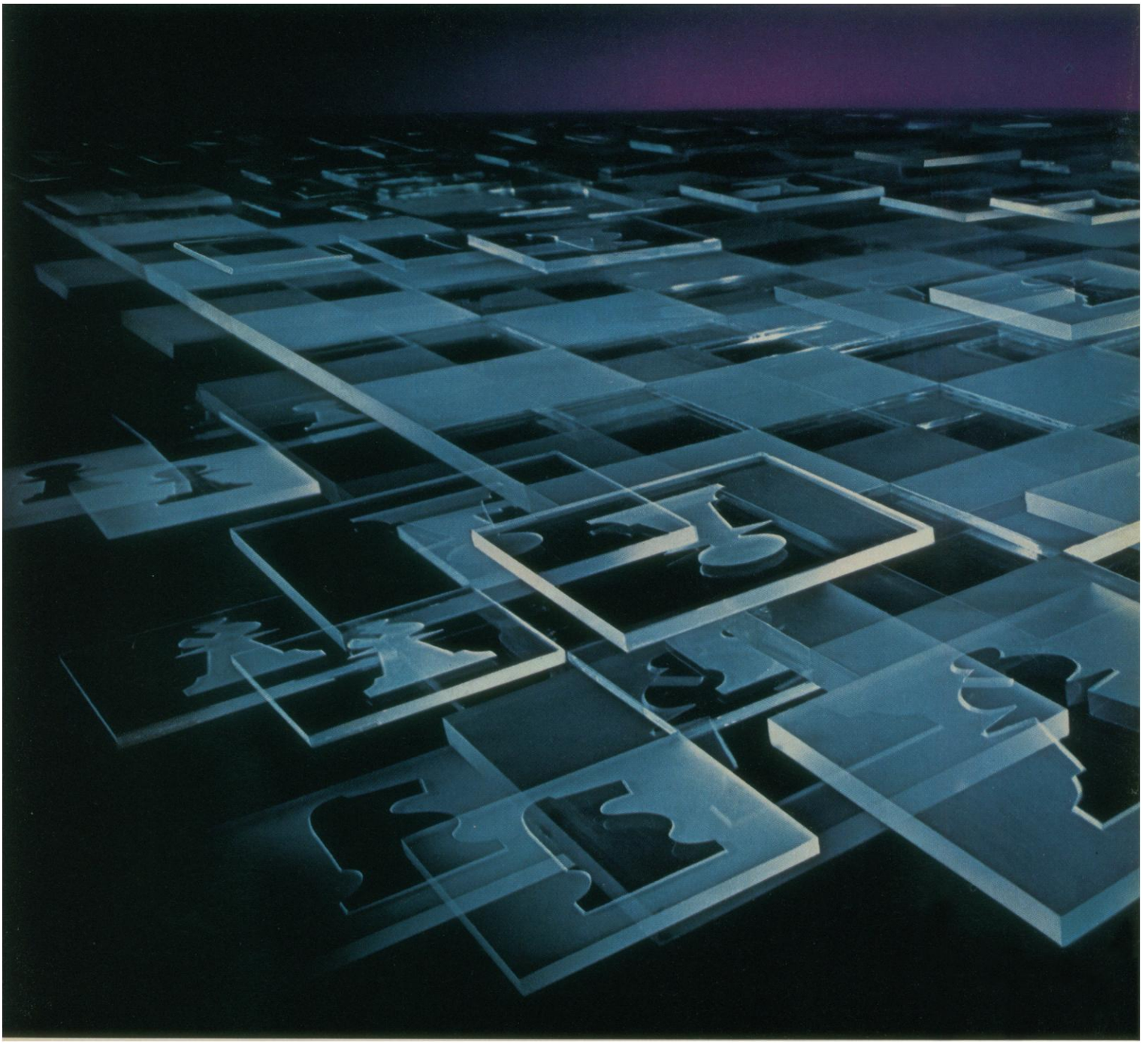
COVER

Restoration of a multituberculate based principally on a specimen of *Ptilodus kummae* from the late Paleocene of western North America. *Ptilodus kummae* possessed several specializations for climbing, including an unusual range of tarsal mobility characteristic of arboreal mammals that descend trees headfirst, a divergent, grasping hallux, and a prehensile tail. See page 712. [L. L. Sadler, Biomedical Communications, University of Texas Health Center at Dallas 75235]

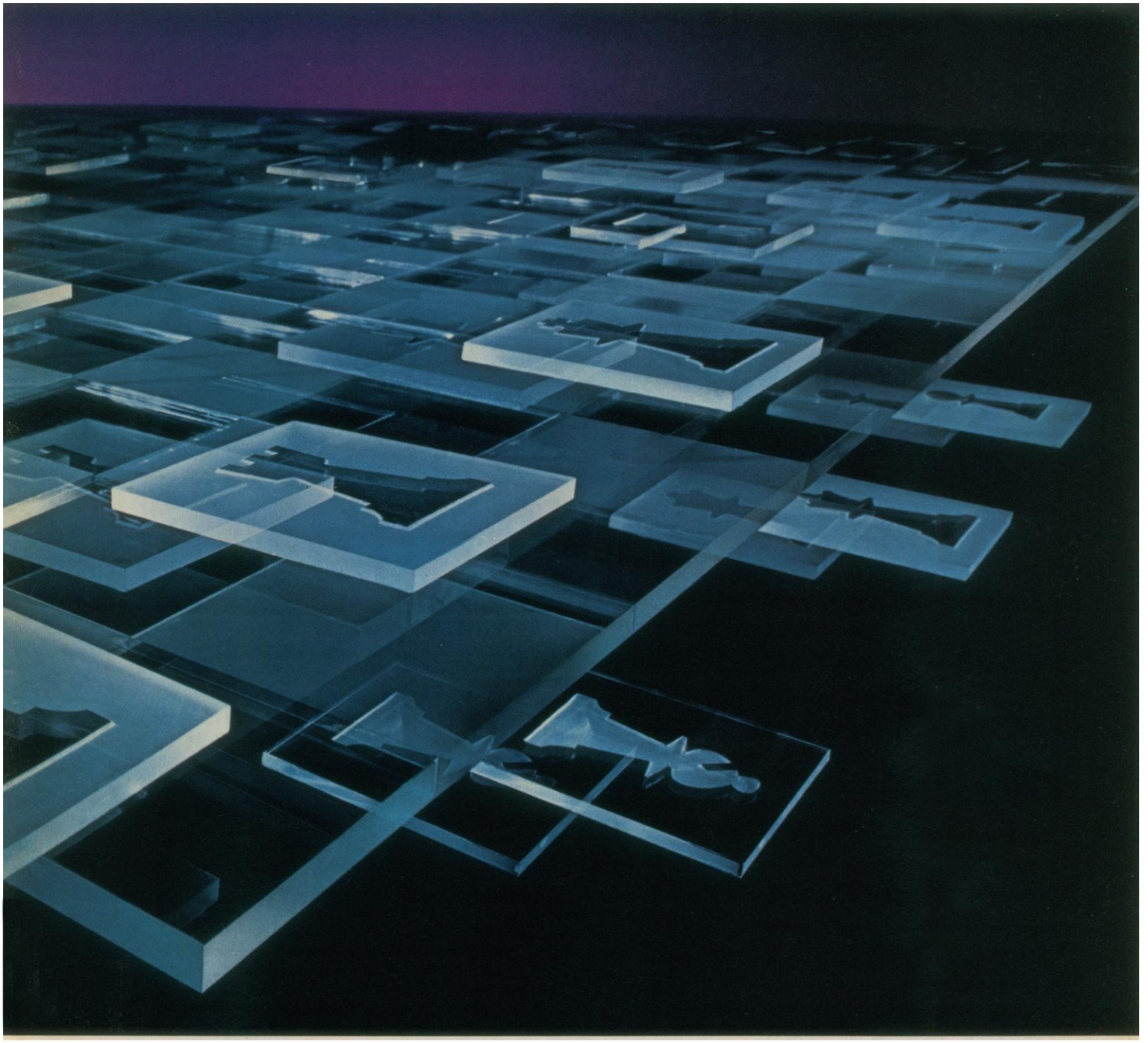


An IBM 4341 super-mini: chip design at Hughes

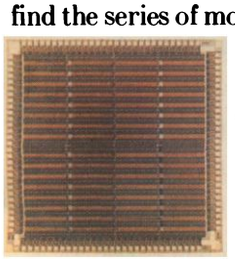
The board's half the size of a thumbnail, with 100,000 pieces. And it's your move.

Finding paths for new interconnections on an integrated circuit is like no chess game you have ever seen. The first few moves are easy, but with up to 100,000 electronic devices crammed onto a minuscule silicon chip, the possibilities soon become astronomical. That's why engineers at Hughes Solid State Products in Newport Beach, California use an IBM 4341 super-mini.

Brian Tien, head of design automation, says, "Without the IBM 4341 we couldn't get this much function on a chip. With it, we can finish a circuit in a few weeks instead of many months."



The engineers work interactively with the system, assigning logical functions to devices on the chip. Then, using software, they route conductors—deposited strips of metal—to connect the logic gates. If a pathway becomes too crowded, another layout is automatically provided. And another. Until they find the series of moves that works.



This Hughes integrated circuit is a high-density gate array with two-level metal interconnections. Actual size is only 0.3 inches square.

They can think about the problem, and not worry about the computer, with microcode-assisted IBM software called VM/CMS. "Our people find VM ideal for interactive computing," Tien says. "As many as 40 design engineers make demanding use of the 4341 at once. Response time is excellent. The full-screen editor speeds up programming. And the executive language is simple, yet powerful."

The 4341 is an excellent example of IBM technological leadership. Internal data paths, and the arithmetic and logic unit, are 64-bits wide, built of 64K-bit chips that IBM has been mass producing since 1978. Real memory goes to 16 megabytes. The multiple, semi-autonomous processing units use high-density, large-scale-integration technology.

IBM offers engineering and scientific users extensive support: consultants, education and access to professionals. Tap into our many years of experience.

For an informative brochure, write Dr. Jack W. Hugus, IBM Engineering and Scientific Marketing, 1133 Westchester Avenue, White Plains, NY 10604.

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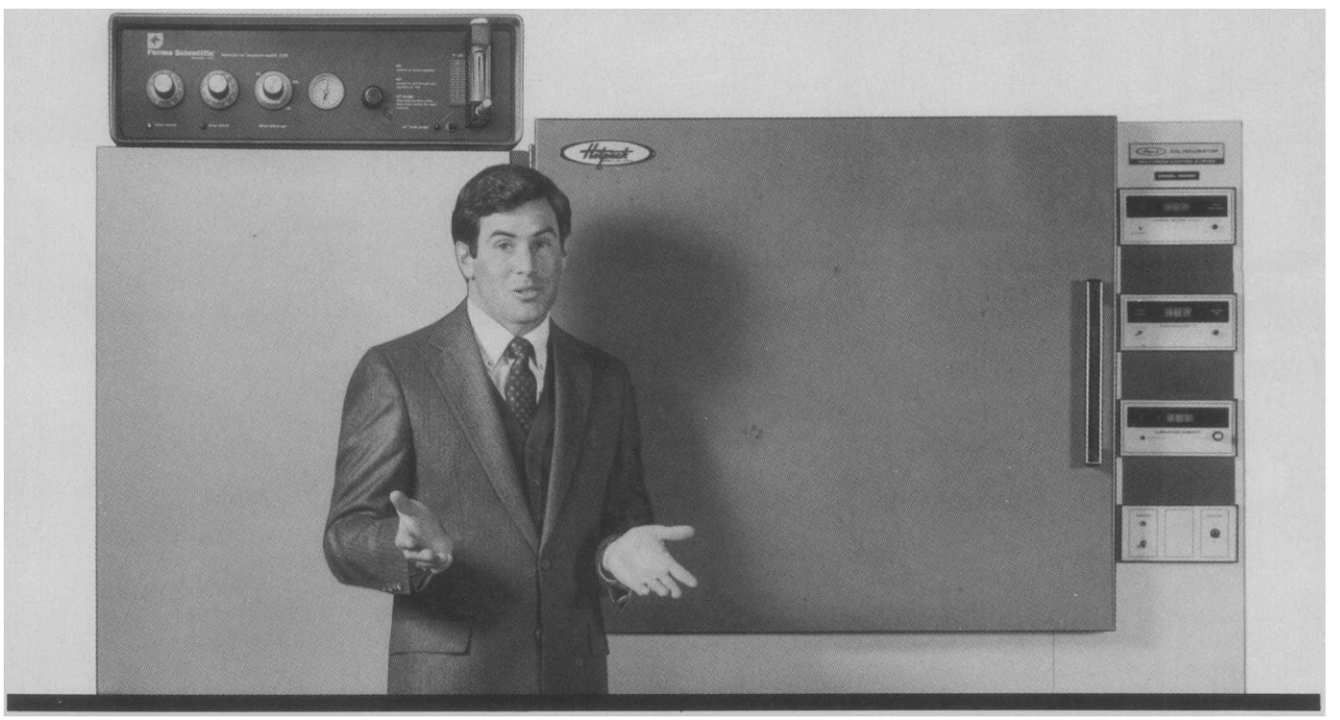

MECHANICALLY CONVECTED OR WATER-JACKETED INCUBATORS. WHICH IS BETTER?

Feature for feature, users agree Hotpack automatic mechanical convection CO_2 incubators are superior to water-jacketed incubators for their work. And tests prove it!

Compare recovery times, for example. With sensor and thermometer bulb exposed to the same air that flows through the chamber, the mechanical convection incubator's sensor immediately reflects any chamber temperature change that results from door openings. In water-jacketed units, where sensor and bulb are suspended within the water jacket or in a metal well that projects into the chamber and *not* exposed directly to the chamber air, there's a considerable time lag in registering any change after the door's been opened.

No wonder tests show it takes 24 times longer for a water-jacketed incubator to recover after each 15-second door opening than it does for a mechanically convected unit to recover. Actual recovery times: 45 seconds for the mechanically convected incubator vs. 18 minutes for the water-jacketed incubator!

When it comes to contamination, Hotpack automatic mechanical convection incubators are a breed apart, too. By utilizing external vapor generators to humidify the air instead of internal water reservoirs, the favorite breeding ground for chamber contaminants has been eliminated.

And with Decon, our one-step automatic, electronic self-decontamination feature, decontamination can be done easily and more frequently to prevent cross contamination. Shelves, sidewalls and chamber floor are also easily removed to clean up spills, saving you time and money on manual clean ups.

Feature for feature, it's an open and shut case. And Hotpack, whose 75-year reputation was built on building superior controlled environmental equipment, has more models of mechanically convected incubators than any other manufacturer. To find out more about their advantages, send for our free comparison folder or give us a call toll free at 800-523-3608. In Pennsylvania, call 215-824-1700. Hotpack Corporation, 10940 Dutton Road, Philadelphia, PA 19154.

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BIOSYSTEMS UPDATE

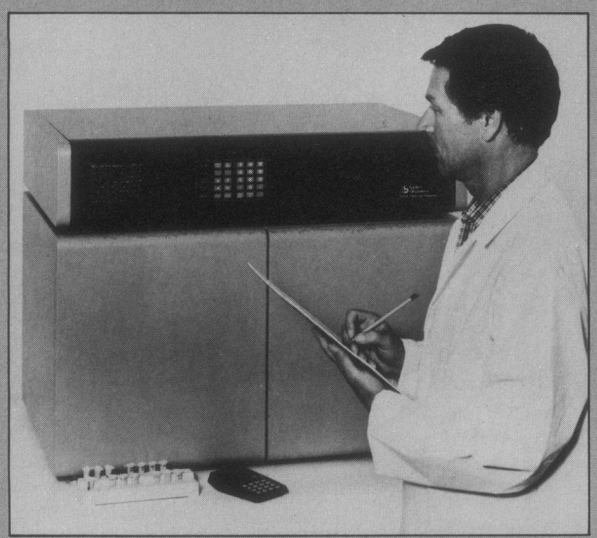
A New DNA Synthesizer with Unique Capabilities

Applied Biosystems is pleased to announce the successful conclusion of an eight-instrument field evaluation program of the Model 380A DNA Synthesizer[1]. Commercial deliveries have now begun. The Model 380A is the only instrument of its kind to address all the elements of automated syntheses:

- **Built-in programs for licensed phosphoramidite[2] reagents.**
- **Efficient use of highly pure and stable reagents for low operating costs.**
- **Automatic deprotection of the synthesized DNA.**
- **Automatic cleavage from the solid support.**
- **Memory option to allow programmability of other chemistries.**

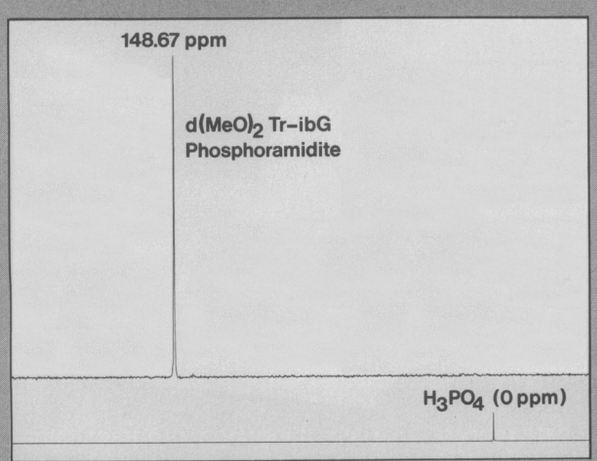
AND COMING SOON

- **Expandability of the basic instrument to accept up to three columns for simultaneous and independent syntheses.**



The Model 380A features automatic phosphate deprotection and removal of the DNA from the solid support. With optional memory, the unit can also be reprogrammed by the user to accommodate other chemistries.

[1]Test results available upon request.
[2]Patent pending.



No DNA synthesizer is better than its reagents. Our phosphoramidite nucleosides are synthesized to exacting purity standards: each lot is ^{31}P NMR quality-assured and a copy of the spectrum is included in every shipment.

Analytical autoradiogram of the crude isolates of three automated syntheses with their corresponding purified oligonucleotides.

For more information circle #200.

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TIAA announces

MOD ONE...

a brand new concept in personal life insurance protection for families in the academic community that

- cuts first-year premiums up to 50%
- gives discounts of 33⅓% to 40% on large policies

Is digging up that first premium stopping you from providing all the financial protection your family deserves? Then here's really good news. With the introduction of MOD ONE* October 1, 1982, Teachers Insurance has cut up to 50% from initial premiums on term policies of $100,000 to $249,000. And we've trimmed off even more for policies of $250,000 and above. This means you now need only about half as much premium money "up front" to start a large new TIAA policy. Putting it another way, for roughly the same outlay as before you can now begin a new policy that provides twice as much immediate protection for your family!

Here's what men and women aged 35, for example, now pay for 5-Year Renewable Term policies of different amounts:

First-Year Premiums for TIAA 5-Year Renewable Term Policies

Policy Amount ▶	$50,000	$100,000	$150,000	$200,000	$250,000
Issued to men aged 35					
First-year premium	$126.75	$169.00	$253.50	$338.00	$380.25
Premium per $1,000	$2.53	$1.69	$1.69	$1.69	$1.52
Issued to women aged 35					
First-year premium	$110.25	$147.00	$220.50	$294.00	$330.75
Premium per $1,000	$2.20	$1.47	$1.47	$1.47	$1.32

As you can see, premium rates for policies of $100,000 to $249,000 are ⅓ less than those for smaller policies, and for policies of $250,000 or more, they're 40% less. Substantially lower first-year premiums for all ages and big discounts for larger policies encourage everyone to consider the higher levels of family protection they may have felt they just couldn't afford until now.

Premiums for MOD ONE policies increase beginning with the second year, but generous dividends, credited concurrently, will automatically reduce those premiums. Under the present dividend scale, expected payments for the second and subsequent years of the 5-year policy period in the examples above will be identical to the premium for the first year shown. While dividends cannot be guaranteed for the future, of course, TIAA has paid dividends on life insurance each year since 1918.

To receive personal illustrations of new MOD ONE policies, mail the coupon; or phone the TIAA Life Insurance Advisory Center Toll Free at 800-223-1200 (in New York, call collect 212-490-9000). No one will call on you as a result of your inquiry.

Eligibility to apply for TIAA life insurance is extended to employees of colleges, universities, private schools, and certain other nonprofit educational and research institutions. The employee's spouse is also eligible provided more than half of their combined earned income is from a qualifying institution.

Note to present TIAA policyowners: MOD ONE premium rates apply only to policies issued on or after October 1, 1982, but cash dividends payable in accordance with the 1982 scale will continue to provide equitable treatment for policies issued prior to that date.

*Modified first-year premium.

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S305

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Teachers Insurance and Annuity Association
730 Third Avenue, New York, NY 10017

Please mail me the facts about new TIAA MOD ONE life insurance policies with personal illustrations of low-cost Term policies for my age.

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Title/Position _____

Home Address _____

City _____ State _____ Zip _____

Nonprofit educational or scientific employer (college, university, private school, etc.) _____

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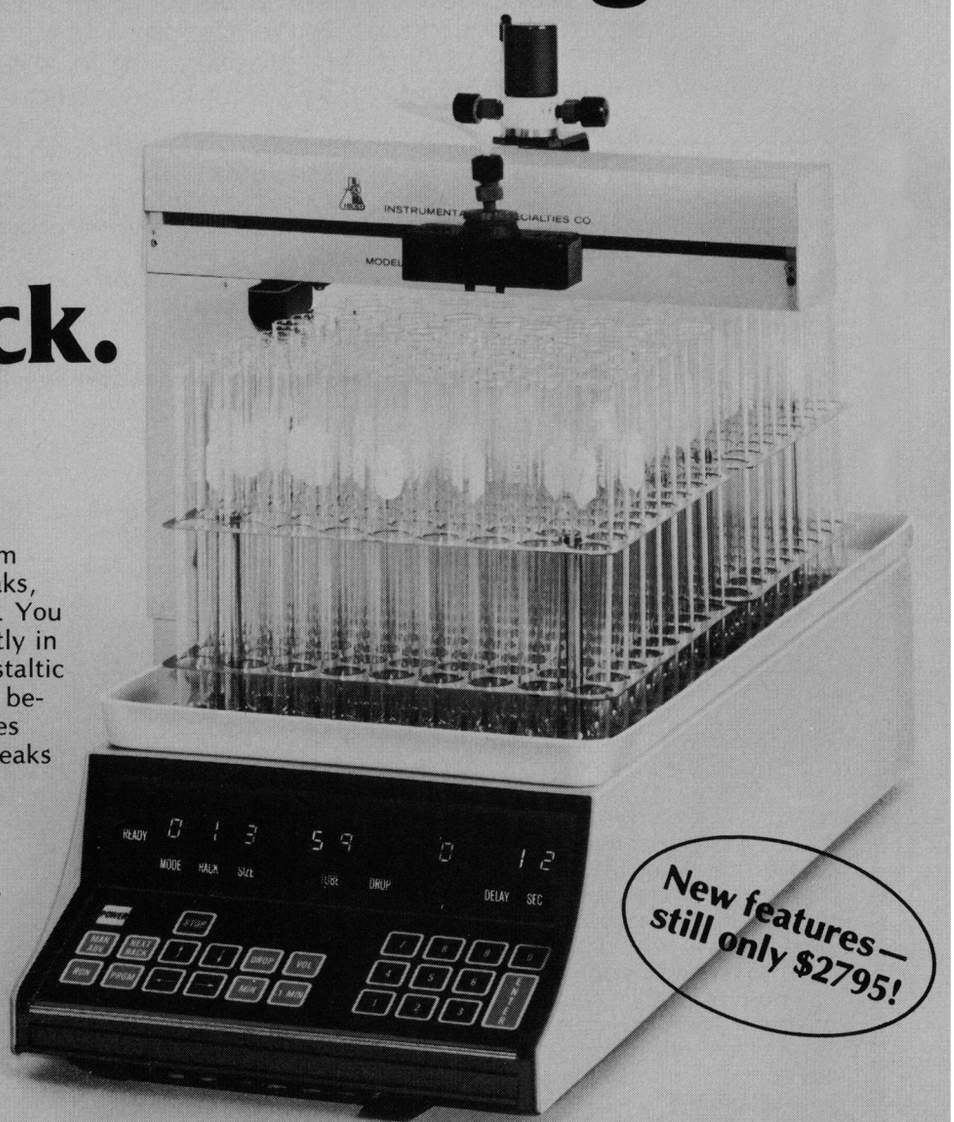

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Easy to use. FOXY's sloped, splashproof keyboard is the handiest made. A 12-digit display prompts step-by-step programming and gives you continuous information including current tube number and time or drop count.

Even though FOXY is by far the most capable fraction collector you can buy, it still costs a lot less than the competition. Call toll-free [**800**] **228-4250.** Or write ISCO, Box 5347, Lincoln, Nebraska 68505.

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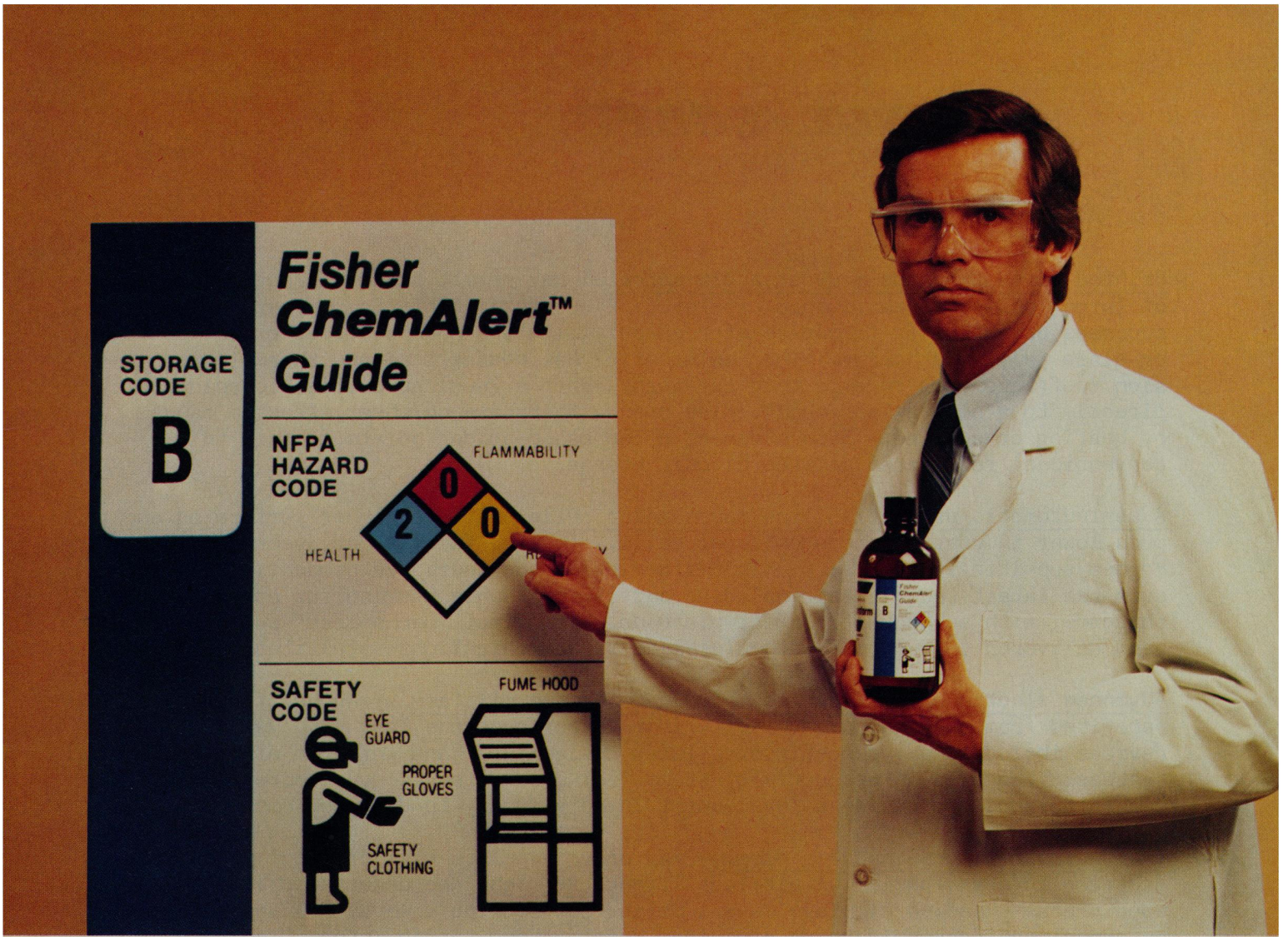

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SCIENCE/SCOPE

Printed circuit boards made of a new material may permit better direct soldering of large leadless ceramic chip-carriers. A Hughes Aircraft Company study proposes using quartz-fabric-reinforced polyimide resin in place of glass-epoxy or glass-polyimide boards. The new material has nearly the same thermal expansion coefficient as ceramic chip carriers. When a leadless carrier is soldered directly to a quartz-fabric polyimide board, there are no shear stresses caused by heating or cooling. Such stresses often cause solder joints to fail on conventional reinforced printed circuit boards.

A semiautomatic production line makes solar cells that are higher performing and much lower in cost than conventional cells. The new facility at Spectrolab, a Hughes subsidiary, creates highly uniform cells and increases productivity. It uses the latest techniques, including photolithographic masking for contact patterns, with subsequent contact plate-up. The first "mechanized" cells have been delivered to Hughes for the Intelsat VI communications satellites.

Advanced electro-optical devices produced for the military by Hughes today have benefited from a 7-to-1 productivity improvement over the last five years. These devices include laser rangefinders, laser designators, and infrared night vision systems. The rise in productivity stems from more automation, computer-aided manufacturing, and employee involvement in solving day-to-day problems.

A wide-field-of-view head-up display can provide pilots with critical sensor and steering information in low-altitude flights at night and under poor visibility conditions. Head-up displays save a pilot from looking down at his instruments by superimposing such data as airspeed, heading, and target information on a glass-like combiner mounted at the pilot's eye level. Hughes pioneered the technology used in its HUD, which incorporates diffraction optics made through a process involving holographic techniques and lasers. In addition to providing the wide field of view, the display is brighter, more transparent, and doesn't obstruct the pilot's forward vision. The display resists glare, reflections, and hot spots caused by the sun. Another important advantage is its ability to display wide-field-of-view scenes from infrared sensors. Test pilots praised the display during evaluation flights in a U.S. Navy F/A-18 Hornet.

Hughes is seeking engineers to develop advanced systems and components for many different weather and communications satellites, plus the Galileo Jupiter Probe. Immediate openings exist in applications software development, data processing, digital subsystems test, microwave/RF circuit design, power supply design, digital communications, signal processing, spacecraft antenna design, system integration test and evaluation, and TELCO interconnection. Send your resume to Ray Bevacqua, Hughes Space & Communications Group, Dept. SE, Bldg. S/41, M.S. A300, P.O. Box 92919, Los Angeles, CA 90009. Equal opportunity employer.

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When large-scale scientific and engineering problems overload the capacity of your computer, you may wish you could afford a supercomputer.

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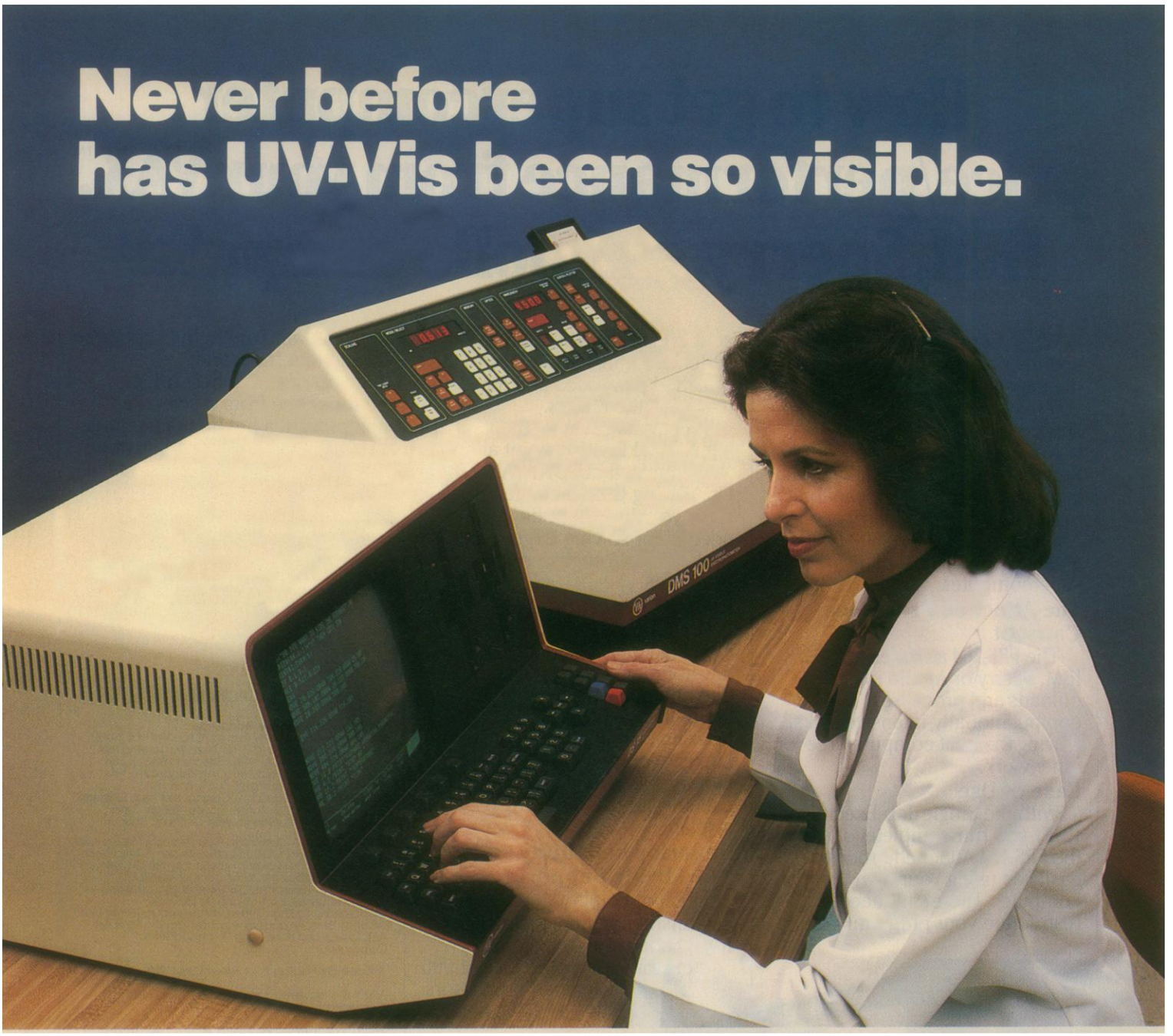

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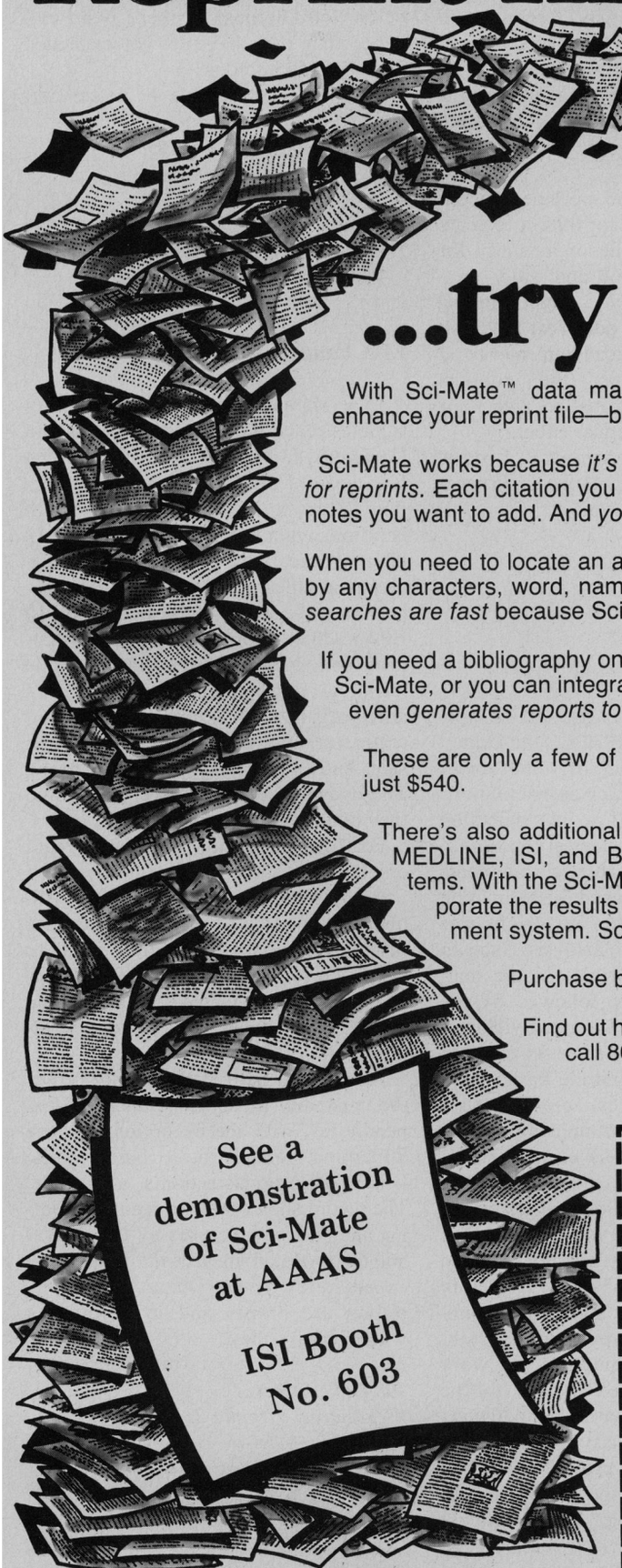

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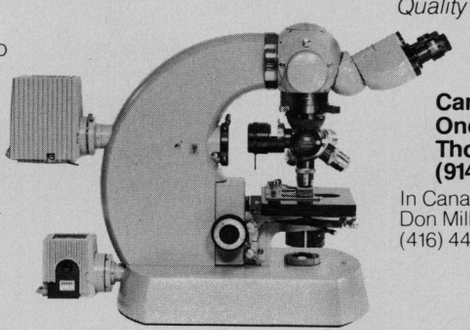

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13 May 1983, Volume 220, Number 4598 **SCIENCE**

Scientists and Engineers in the World of Lawyers, Legislators, and Regulators

In a technological society, the professional roles of many scientists and engineers become inextricably intertwined with those of lawyers, legislators, and regulators. As the use of technology, particularly high technology, expands, increasing numbers of scientists and engineers will become professionally involved in the legal, legislative, and regulatory affairs of the nation. Advances in science and technology raise societal issues related to the quality of life of this and succeeding generations and to the fundamental rights of individuals.

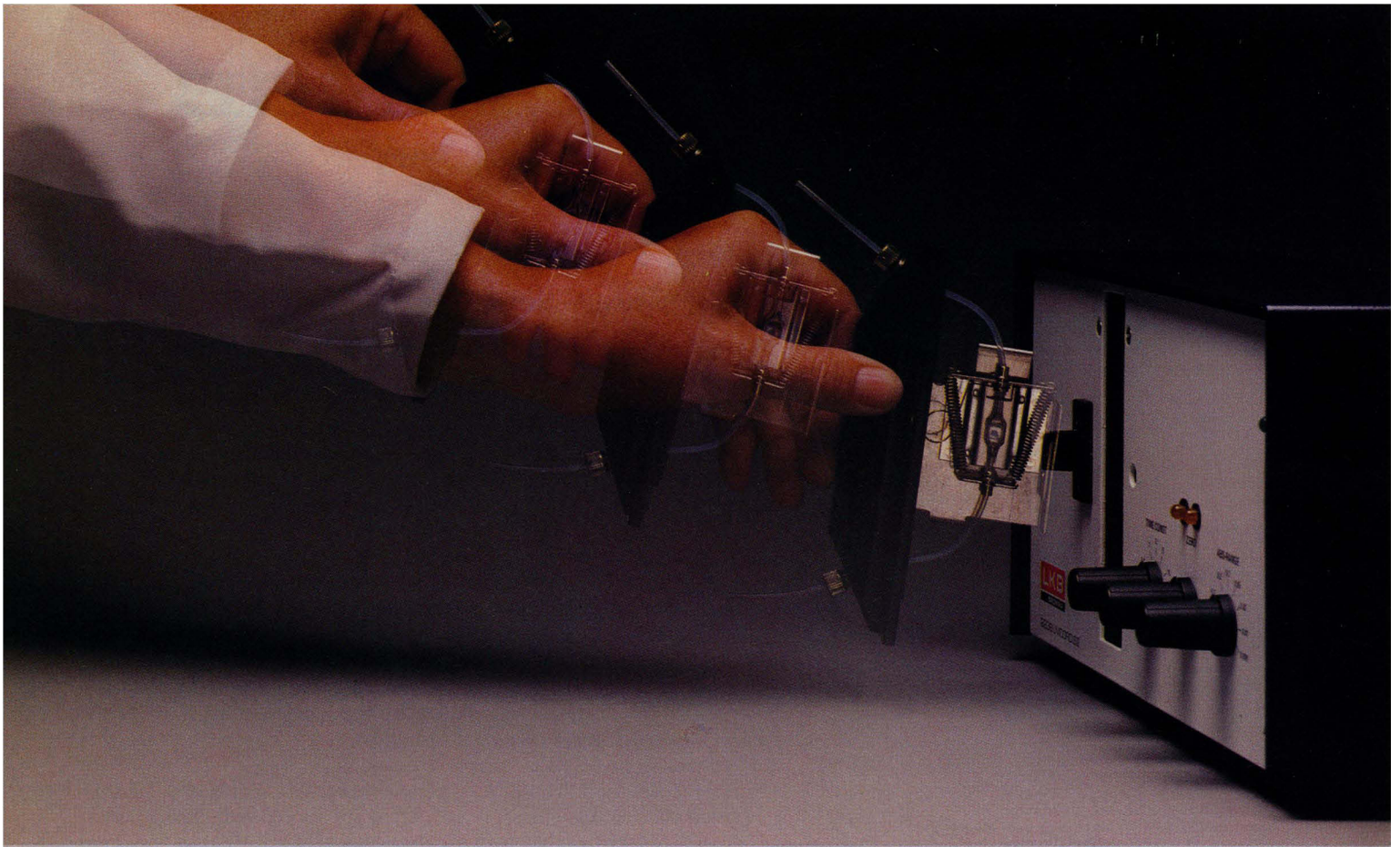
Society depends on scientists and engineers to carry on the investigations that lead to an enhanced understanding of ourselves and our physical, biological, social, economic, and political environment, and to enhanced capabilities for developing technological options and developing or modifying social, economic, and political systems. Society also depends on them to provide specific scientific and technological information essential for legislative, regulatory, and legal actions. I share the concern of many scientists, engineers, lawyers, legislators, and regulators that scientists and engineers who become so involved be prepared to fulfill the responsibilities of the roles they accept, and that lawyers, congressmen, and regulators endeavor to cast scientists and engineers in roles that are appropriate. The counterpart of this concern is that lawyers, legislators, and regulators have the background to understand the nature of scientific knowledge and the process from which it is derived.

These are, of course, not new concerns. AAAS national meetings frequently include symposia on related issues. At the annual meeting held this year in Detroit there will be at least three such symposia: The Role of Scientific Evidence in Policy-Making (27 May), Expert Claims and Social Decisions (27 May), and Science and the Federal Rules of Evidence (31 May). The first, arranged by Jurgen Schmandt, from the Lyndon B. Johnson School of Public Affairs, University of Texas at Austin, will address the use of evidence derived from the natural sciences. The second, arranged by Rachelle D. Hollander, National Science Foundation, and Theodor D. Sterling, Simon Fraser University, will emphasize issues of professional ethics and accountability. The third symposium has been arranged by the National Conference of Lawyers and Scientists, an organization established in 1974 by the AAAS and the American Bar Association to facilitate communication among lawyers, scientists, and engineers.

I have been involved with the American Chemical Society (ACS) in activities related to the implementation of the Toxic Substances Control Act. The ACS participation is designed to assist the Environmental Protection Agency in evolving regulations that are consistent with available knowledge, and it involves bringing together scientists and engineers with the expertise to provide scientific and technological information and critically evaluate proposed regulations. In this low-profile involvement, scientists and engineers are comfortable and effective.

The adversarial environment of courts and some hearings is a different matter. In these high-profile roles, scientists and engineers are frequently uncomfortable and sometimes ineffective. Misadventures do occur. The barriers to effective participation in such situations are not well understood, and it might be worthwhile considering the formation of a section of AAAS devoted to the analysis of this and related matters.

Misadventures in the utilization of expert witnesses deprive society of the contribution these witnesses could make and may contribute to a negative public image of scientists, engineers, science, engineering, and technology. The scientific and technological community cannot walk away from its responsibility to participate in the resolution of societal issues.—ANNA J. HARRISON, *Mount Holyoke College, South Hadley, Massachusetts 01075*



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