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SCIENCE

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The digital AccuSpin centrifuge. It's setting new standards for tabletop centrifuges. For details ask your Beckman representative, or write: Beckman Instruments, Inc., P.O. Box 10200, Palo Alto, CA 94304.

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COVER

Icebergs, such as this dry dock in the Labrador Sea, present special concerns to marine shipping and hydrocarbon exploration along Canada's east coast. This photograph illustrates several phenomena: a smooth surface characteristic of previous underwater exposure, recent spalling of the front face, undercutting or notching by waves at the waterline, and the presence of underwater rams (seen on the right and inferred on the left). See page 1333. [Petro-Canada Resources, Calgary, Alberta T2P 3E3, Canada]

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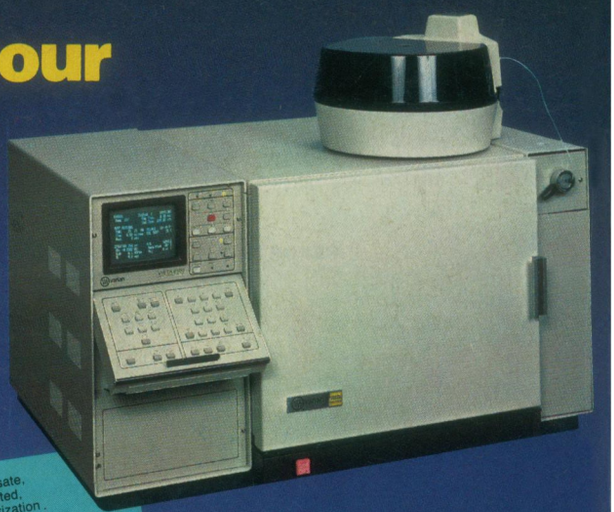

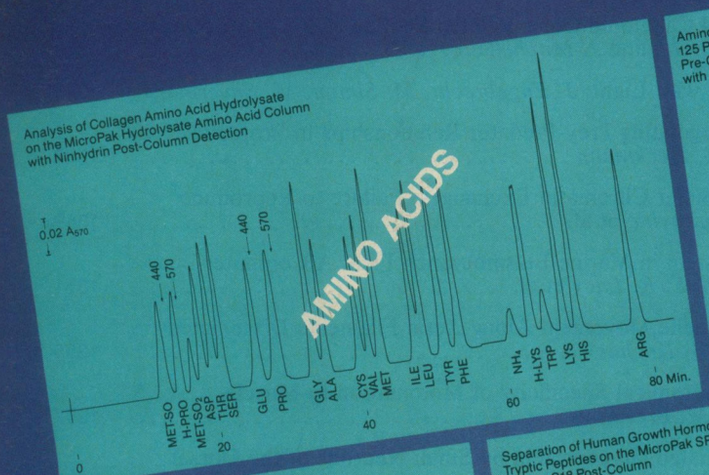

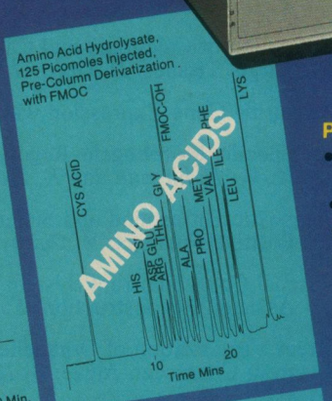

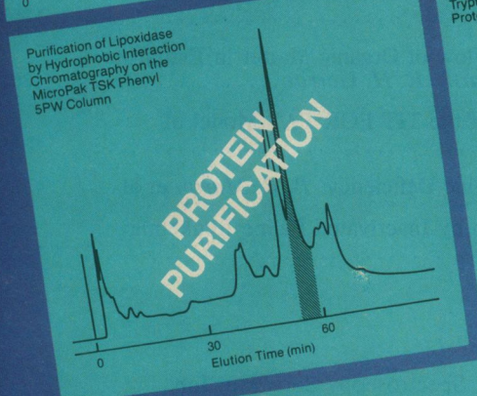

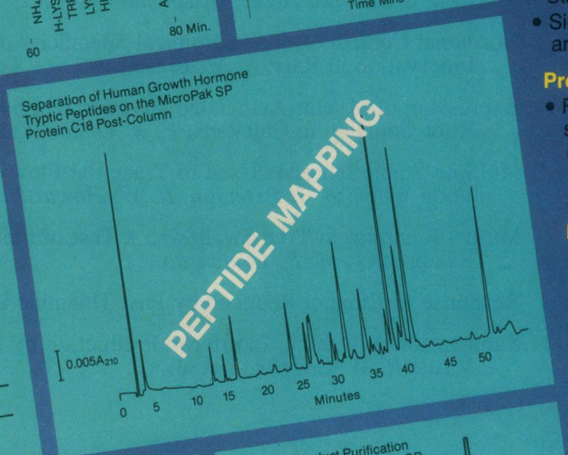

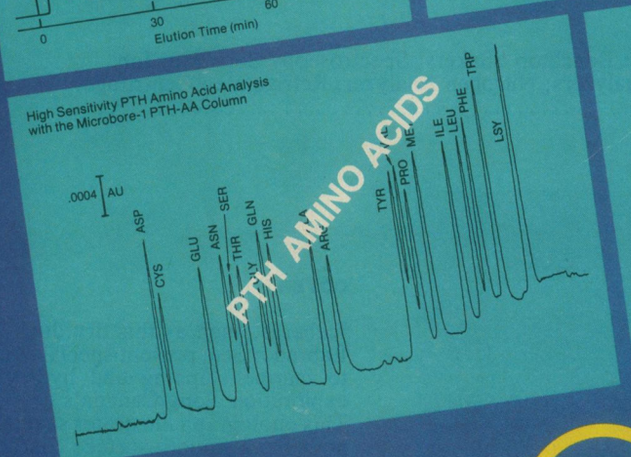

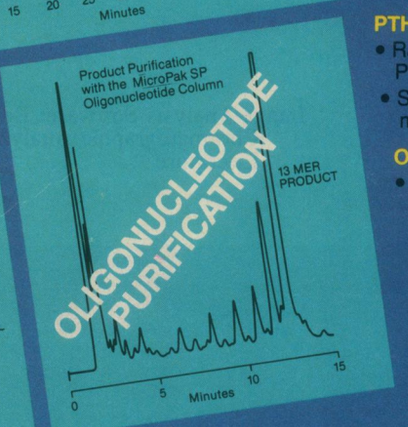

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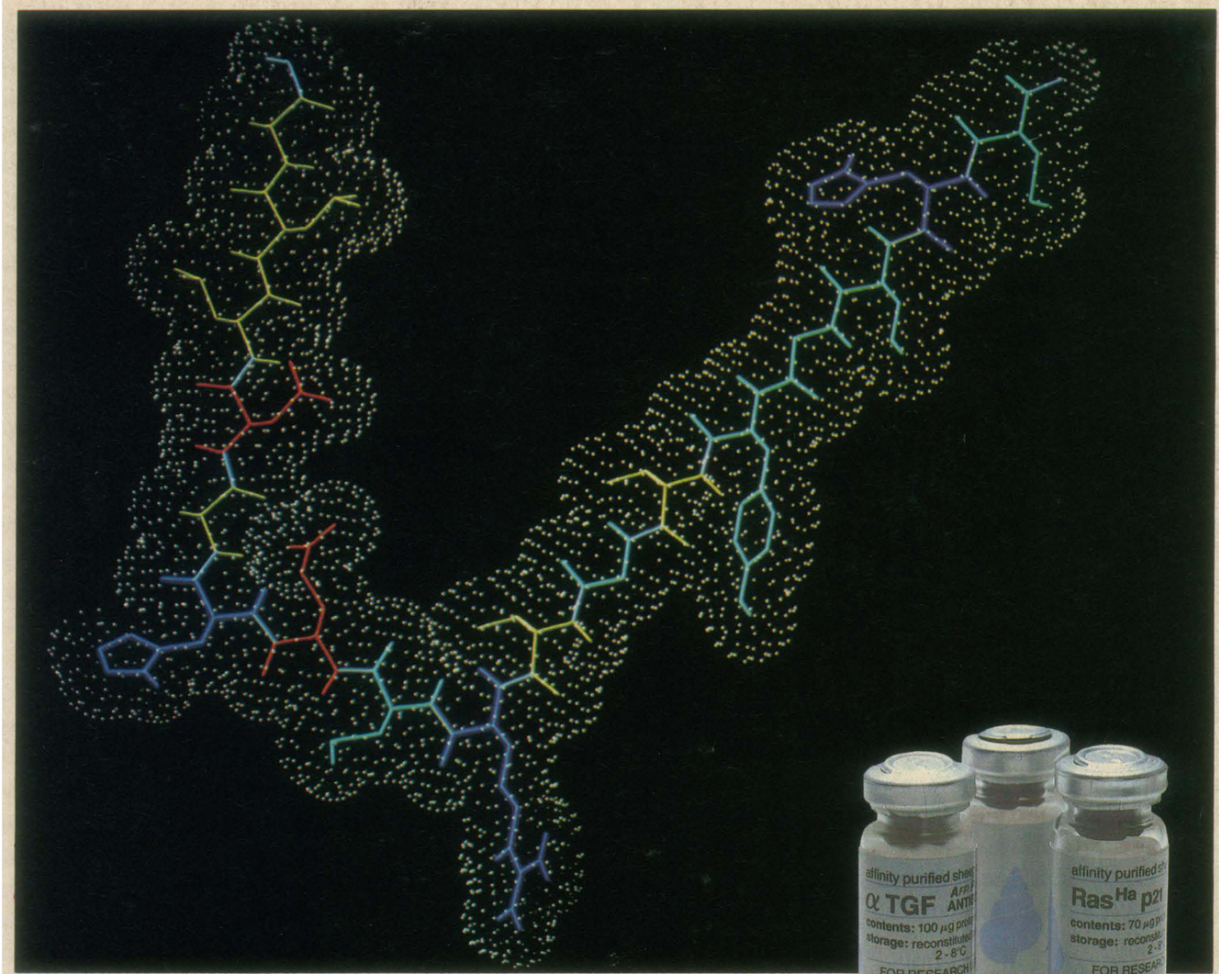

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SCIENCE/SCOPE

Two communications satellites rescued by NASA's space shuttle in November are being refurbished to be launched again. The spacecraft were brought back to Earth after shooting into wayward orbits nine months earlier when their rocket motors misfired. Spacecraft controllers at Hughes Aircraft Company spent months taming the satellites and bringing them into orbits low enough that they could be reached by the shuttle. Their efforts were the most sophisticated series of orbital maneuvers ever attempted. In addition, Hughes and NASA engineers worked tirelessly to develop hardware that permitted the actual recovery. The satellites emerged in good condition. Most of the electronics were never turned on, but certain items—batteries, thermal blankets, and thrusters—are being replaced.

An Air Force radar is helping customs officials detect drug smugglers along the southern border of the U.S. The radar, a current production version of the AN/APG-63 installed in the F-15 Eagle fighter, is carried by a Navy P-3A Orion long-range patrol aircraft. The APG-63 radar was adapted easily to the special requirements of the U.S. customs service by making small changes to its versatile software system. These special requirements include detecting and tracking slow, small low-flying aircraft of the type used to smuggle contraband into the country. The radar detects both airborne and surface moving targets and provides vectoring information to enable the U.S. Coast Guard or other government agencies to intercept suspects. The Customs Service plans to operate a fleet of six Orions equipped with the Hughes radar.

A computer center for improving productivity is one special feature of a new 500,000-square-foot facility at Hughes for manufacturing sophisticated electro-optical devices for the military. The computer-aided manufacturing center serves several purposes. It allows engineers to design tools and fixtures with the aid of computer graphics. It also lets them write specifications, planning procedures, and test procedures—and be checked automatically by computer. By gathering data from automatic test equipment, the center gives engineers insight into every facet of manufacturing, including production rates and quality.

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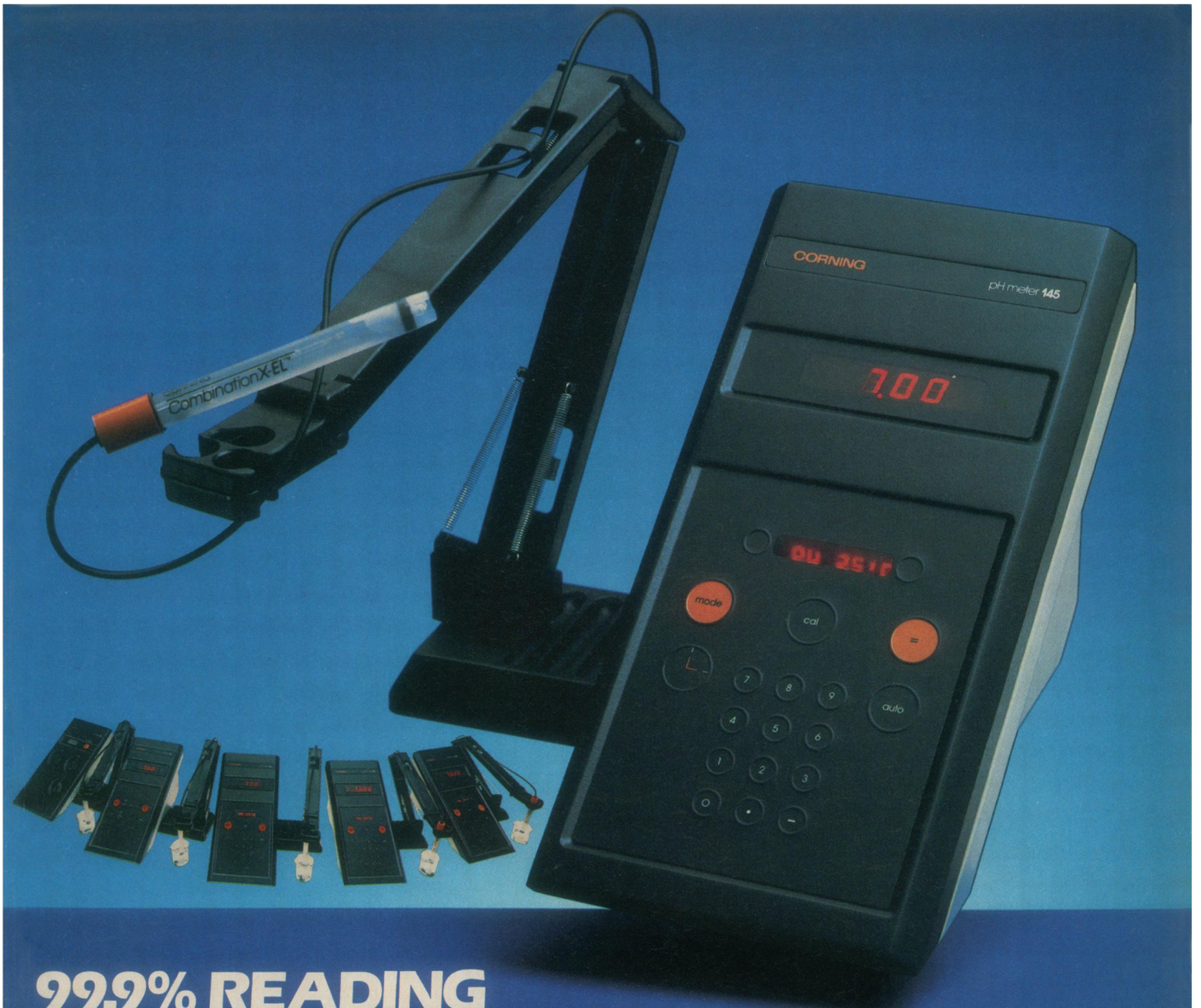

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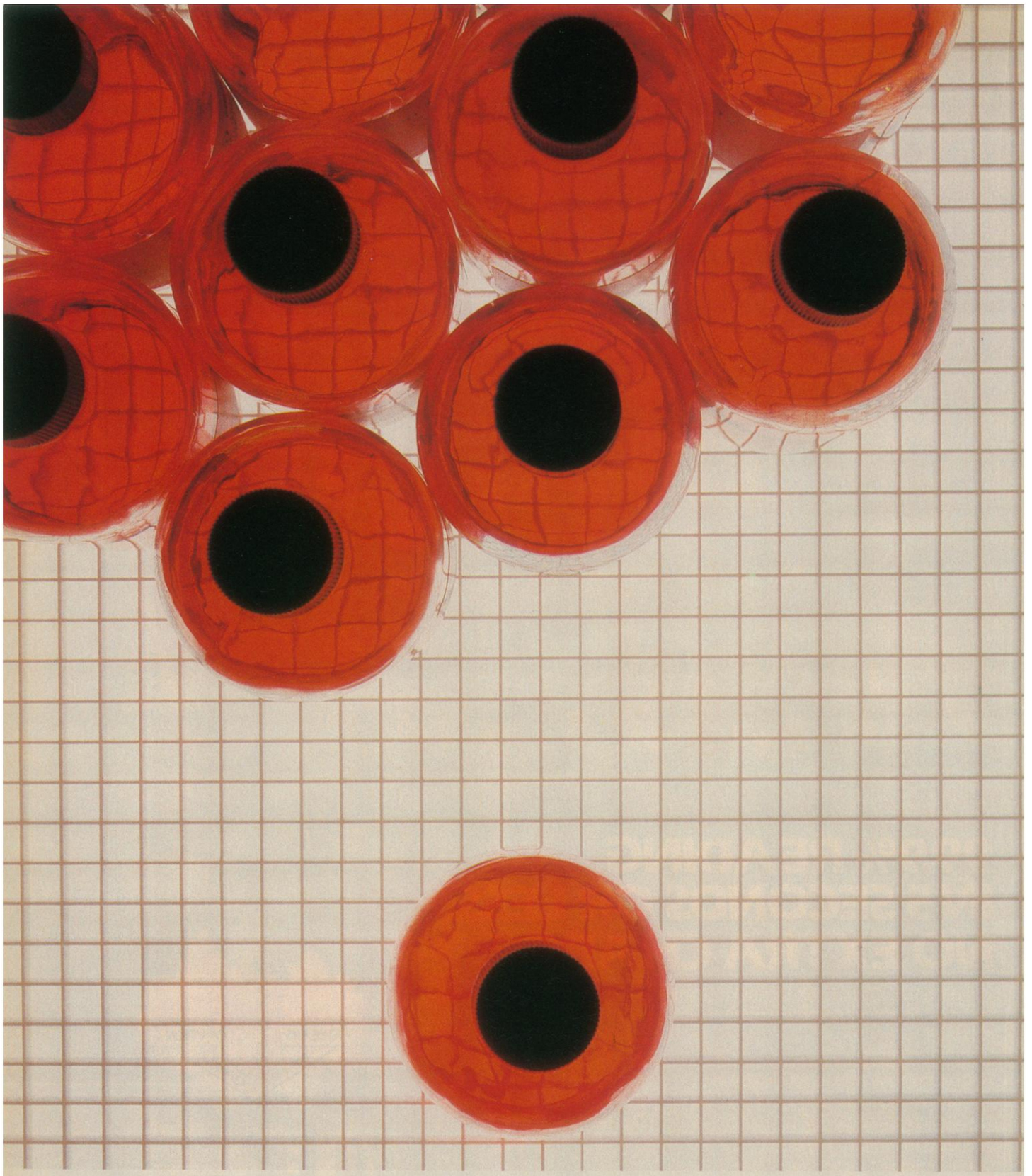

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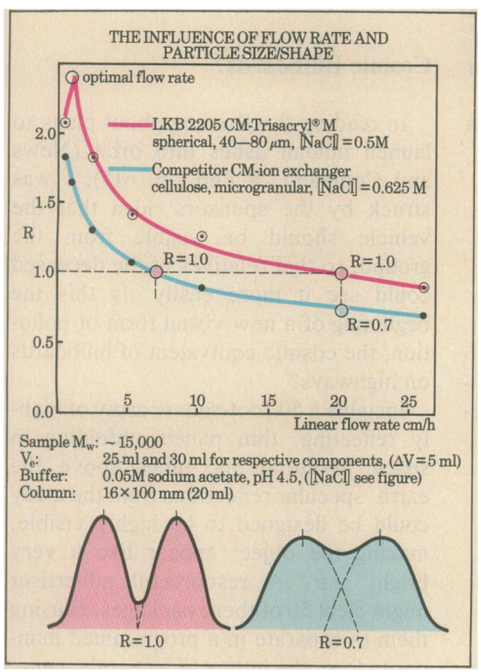

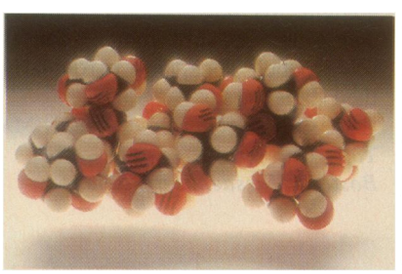

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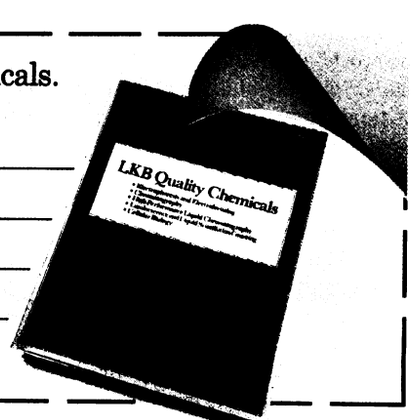

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BIOSYSTEMS UPDATE

Workshops on Peptide Synthesis

Applied Biosystems will conduct nine workshops on the latest methods in peptide synthesis. Cleavage, deprotection, characterization and purification techniques will also be surveyed. If you use or plan to use synthetic peptides, attending one of these workshops will be a unique opportunity to consult with scientists from the world leader in protein-peptide instrument-reagent systems.

Each workshop will include discussions of new approaches, instrumentation and software that make peptide synthesis more practical and affordable. In the past, synthesizing peptides required an in-depth understanding of the chemistry and tedious manipulations during the synthesis process. Today, peptides can be easily and routinely synthesized in any laboratory with unprecedented efficiency, speed and economy.

These workshops are free, but attendance is limited and advanced registration is required. To reserve a place, please telephone Heather Block at any of the U.S.A. telephone numbers listed below.

TOPICS TO BE REVIEWED WILL INCLUDE:

Organic Chemistry of Solid Phase Peptide Synthesis;
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Automation of Pre-Activation Protocols;
Cleavage and Final Deprotection Strategies for the Resin-Bound Peptide;
Choosing the Most Suitable Tools and Methods for Characterization and Purification; and
Analytical and Preparative HPLC Methods

LOCATIONS and DATES

Boston, Massachusetts	**Monday, May 6, 1985**
New York, New York	**Wednesday, May 8, 1985**
Philadelphia, Pennsylvania	**Monday, May 13, 1985**
Washington, D. C.	**Wednesday, May 15, 1985**
Raleigh-Durham, North Carolina	**Friday, May 17, 1985**
Houston, Texas	**Tuesday, May 21, 1985**
Chicago, Illinois	**Friday, May 24, 1985**
San Diego, California	**Wednesday, May 29, 1985**
San Francisco, California	**Friday, May 31, 1985**

Each workshop will be from 9:00 a.m. to 4:00 p.m.; the Applied Biosystems Model 430A Peptide Synthesizer will be available for demonstration. To ensure a place at one of these workshops, telephone your reservation to Heather Block as soon as possible.

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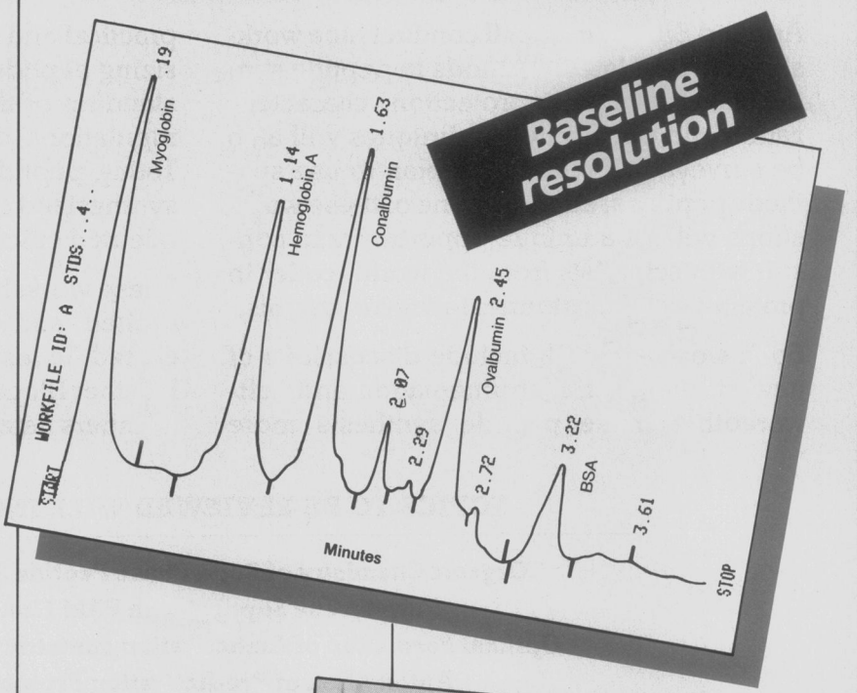

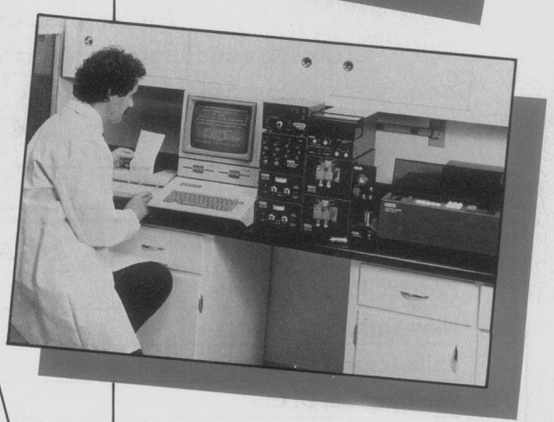

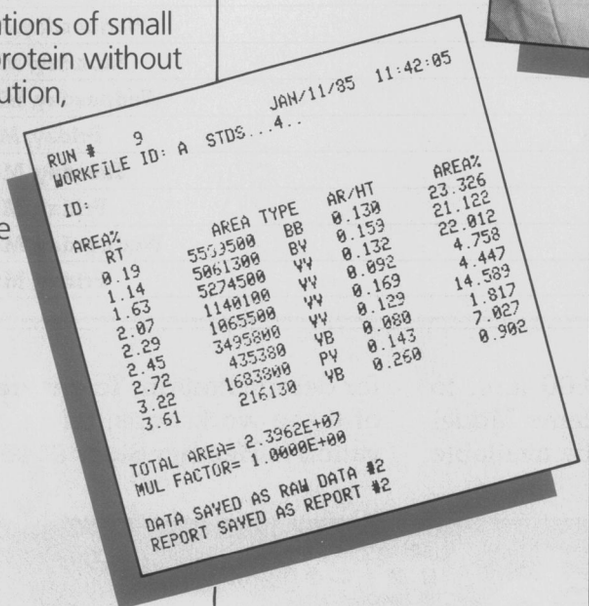

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The Case of the Tax-Perplexed Professor

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15 March 1985, Volume 227, Number 4692 **SCIENCE**

Benefits, Risks, Vaccines, and the Courts

The hero of the 1500's was an explorer who blazed trails through hostile terrain to discover new worlds and wealth. The "hero" of the 1900's is a victim who blazes trails through hostile lower courts to establish a new precedent for lawsuits and wealth.

The high cost of such thinking is that few manufacturers want to make vaccines any more (see *Science*, 1 March, p. 1012). The profits are small; the risk of lawsuits very great. The country may soon be in the ludicrous position of developing a vaccine for AIDS and of not being able to find a manufacturer to produce it.

How have we strayed so far from the days of the 1700's when Zabdiel Boylston inoculated his son and friends to protect them against smallpox? Boylston inoculated 247 people with live pox, of whom 6 died—that is, 1 in 41. He was reviled by the medical profession and others. Then an epidemic occurred in which the remaining 241 survived while 1 in 7 of the general population died. Today Boylston is considered a pioneer, and the risk in vaccination is 1 in 100,000. Yet a lawsuit settlement in the millions of dollars for the one victim removes the incentive to protect the 99,999.

Boylston's heroic experiment had a risk ratio that would not be acceptable under today's regulatory codes. Those codes—considered too lenient by some, too strict by others—are at least based on some rational and statistical design. The lawsuit, however, is usually decided on highly emotional grounds, the poor victim against the infinitely wealthy government or corporation. Who would be so cruel as to deny a few millions here or there to a crippled victim or a bereaved family? Yet the result of such compassion is to deny protection to the many.

The dilemmas are large, and real. A probability of 50 children getting permanent brain damage after receiving vaccine against diphtheria, pertussis, and tetanus (DPT) is heartbreaking, even weighed against 3.5 million children inoculated. The control experiment has been done, however. When the DPT vaccine fell into disuse in England and Japan during the 1970's the death rate shot up (for example, during one 2-year period in England 36 children died per 100,000 who were infected with whooping cough). Various forms of legislation are being considered, but the approach of having the government subsidize whatever the courts allow, either to companies or to victims, seems unworkable. If a federal judge can order a drug company to pay $10 million to a single victim, $8 million punitive damages, what will the judgments be when the federal government is the ultimate underwriter?

It is not appropriate to shield companies or the federal government from punishment for lax or incompetent procedures. It is appropriate, however, to face the reality that a conscientiously executed procedure for making vaccines will still produce some tragic side effects. Do we continue to act out a play in which any bad result must have a villain, or do we face the reality that modern vaccines have great benefits and some built-in risks?

At some point the judicial system will have to face the most inexorable of all laws, the law of probability. Risks of diseases and harmful side effects from vaccines are steadily being reduced, but they will never be absolutely zero. Damage from industrial accidents involved lengthy court battles until the Workmen's Compensation Act was passed. With drugs and vaccines, some national compensation system in which medical costs, lost pay, and so on are calculated on an appropriate statistical basis will need to be enacted. The law would of necessity exclude extra compensation for emotional trauma and the life-style to which the lawyer has become accustomed. Such a law could allow moderately priced vaccines to be produced with appropriate compensation calculated into the price on an actuarial basis. Then we may be able to introduce into government the concept of a statistical morality as the foundation of a more rational approach toward all compensation situations. The next hero may be the statistics advocate who has the courage to say, "The healthy can afford to help the sick, but we do not live in a risk-free world."—DANIEL E. KOSHLAND, JR.

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