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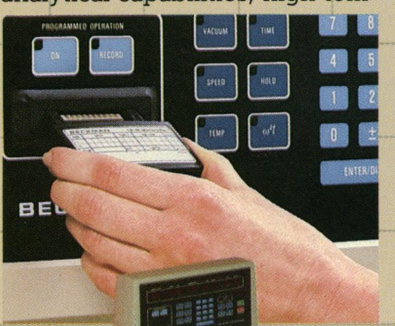

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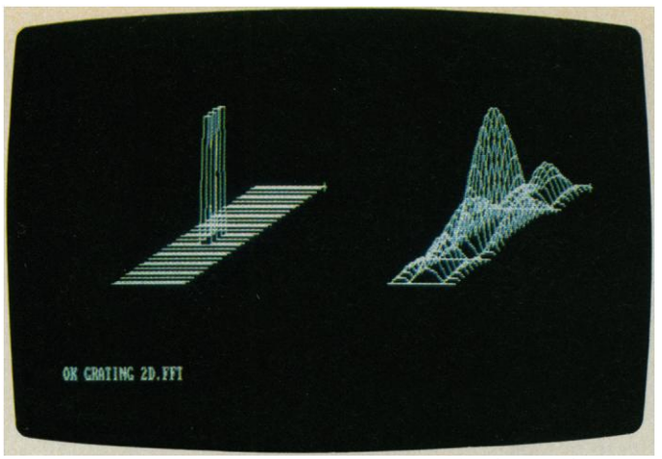
COVER

Sequence of mass spectra, obtained using Fourier transform mass spectrometry (FTMS), shows the in situ synthesis of the bare dimer ion $CoFe^+$ and its subsequent reactions with 1-pentene in the gas phase. Recent developments in FTMS, involving both software and hardware, now enable selected ions of interest to be stored on the order of seconds during which time they can be mixed with various reagents and their chemistries monitored through a series of more than eight reaction steps (all under computer control). See page 261. [Research by D. B. Jacobson and B. S. Freiser, Department of Chemistry, Purdue University, West Lafayette, Indiana 47907; illustration by J. Christenson and R. Cody, Nicolet Instrument Corp., Madison Wisconsin 53711]



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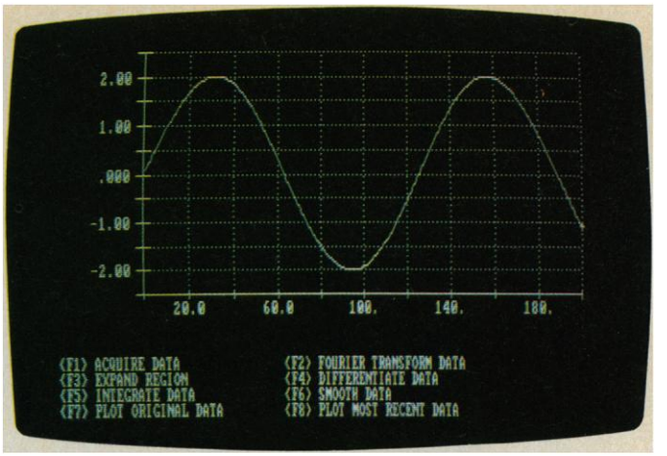

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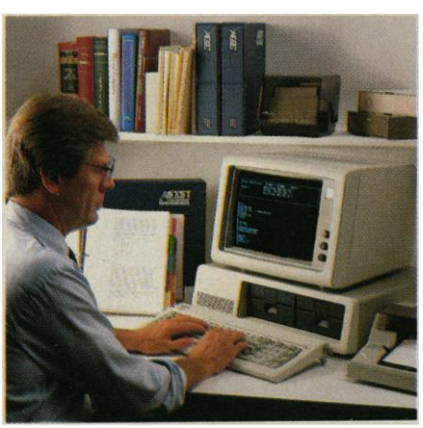

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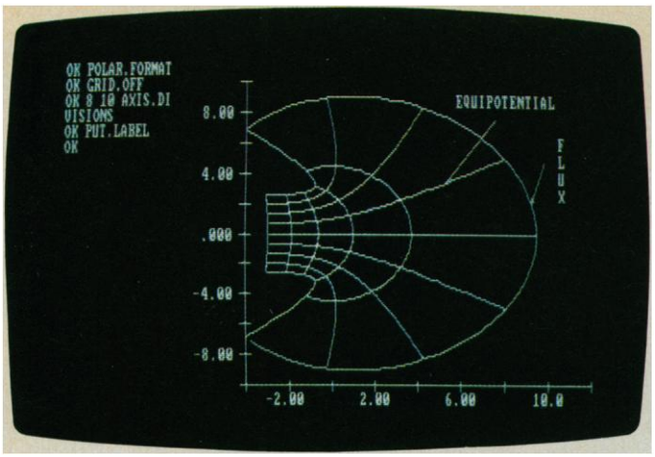

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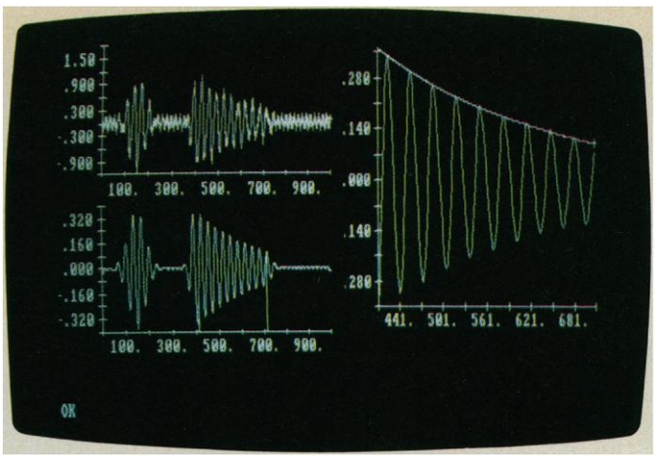

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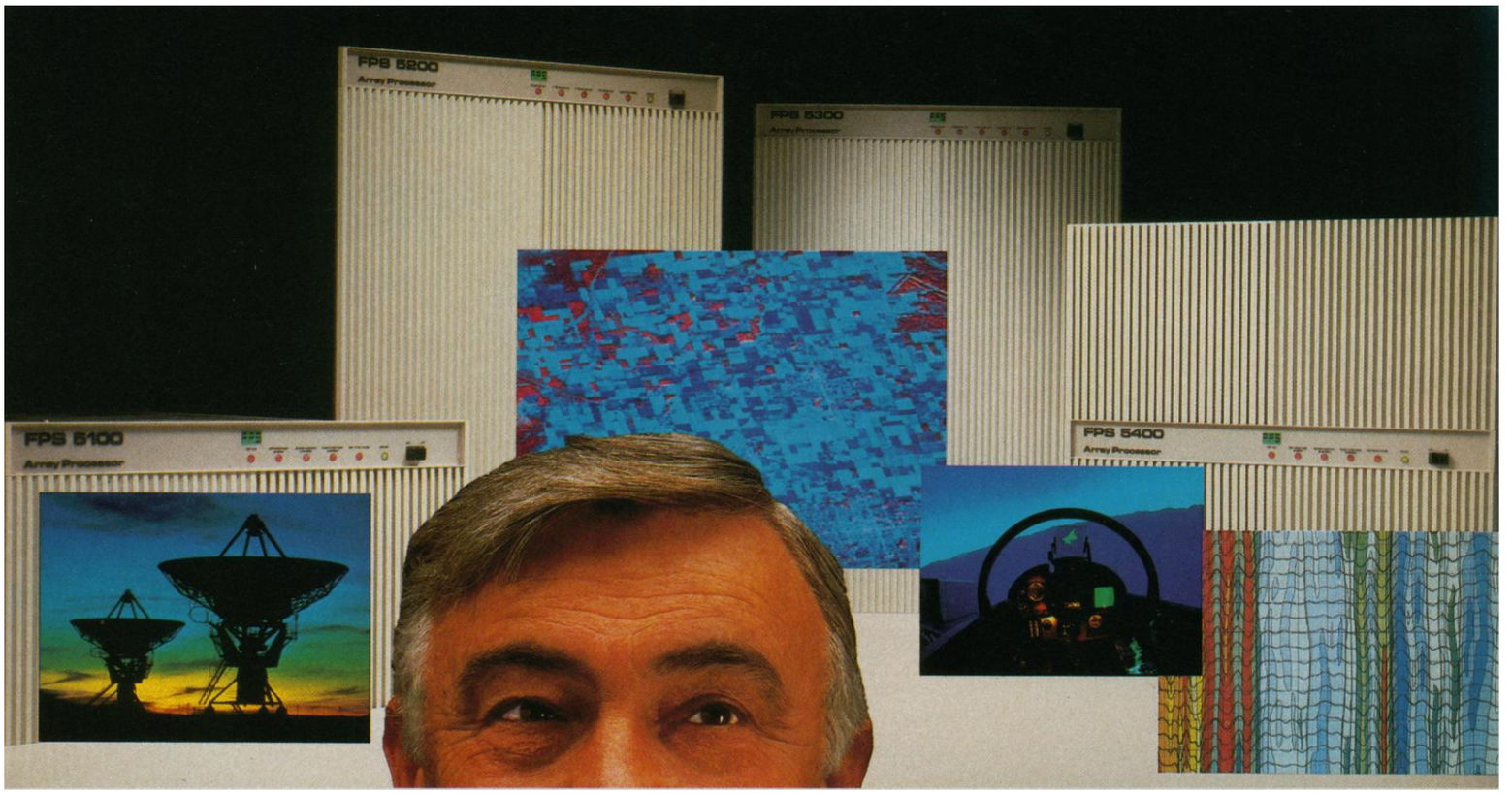

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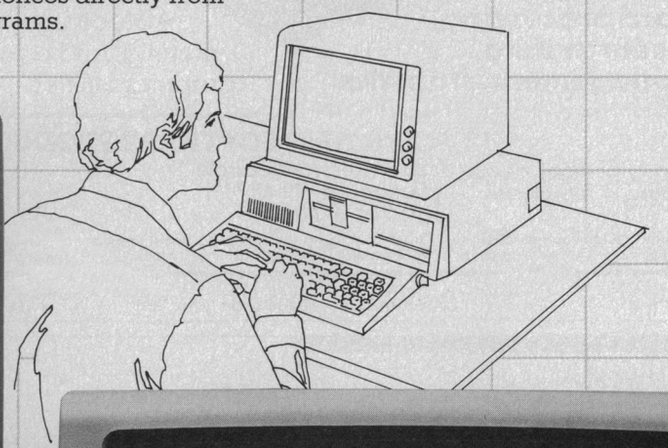

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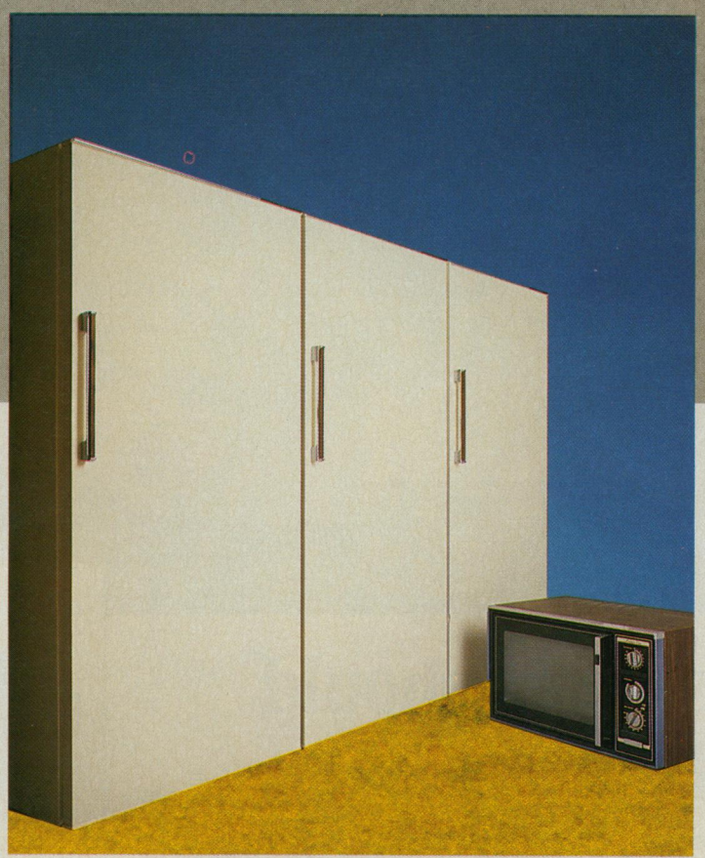

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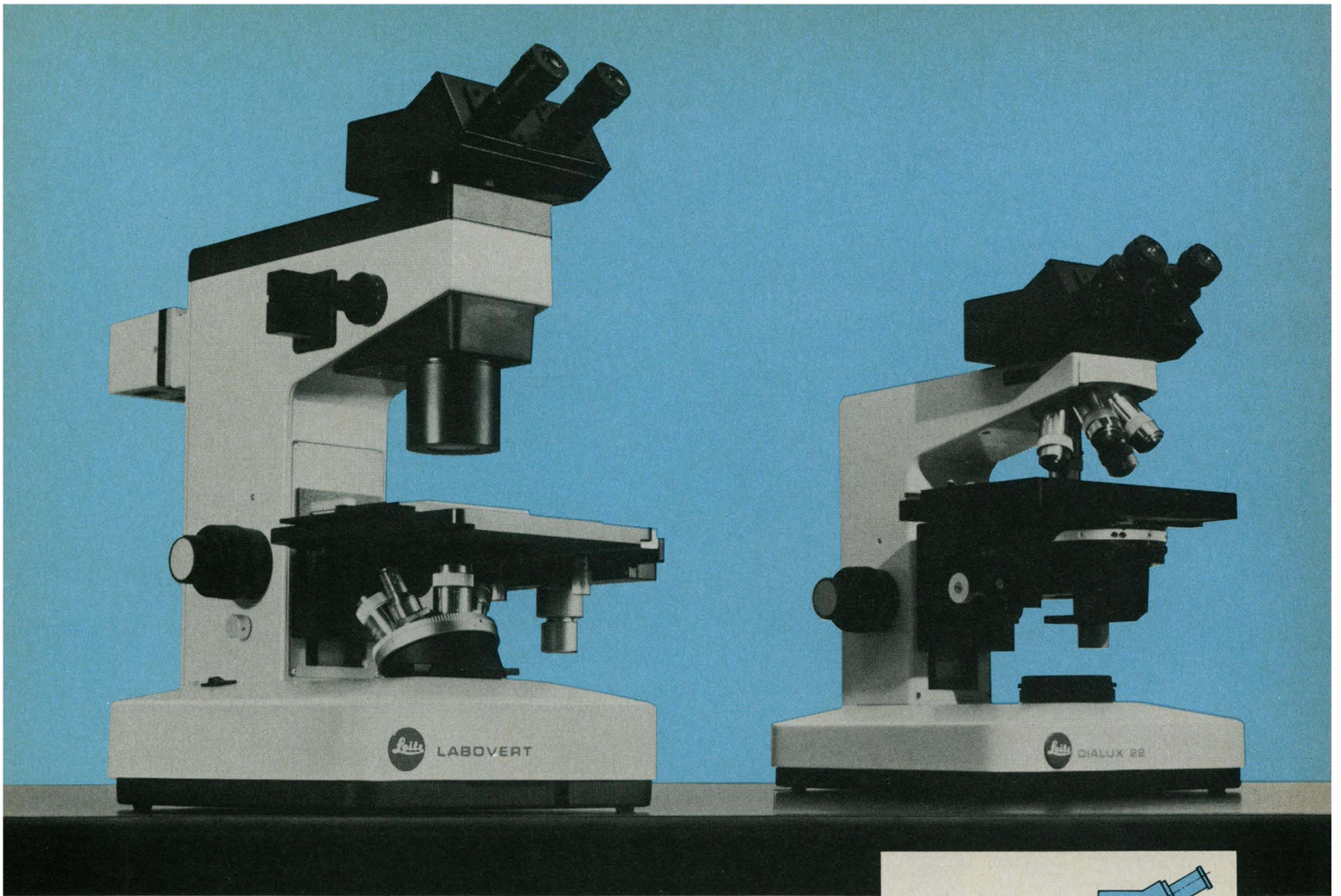

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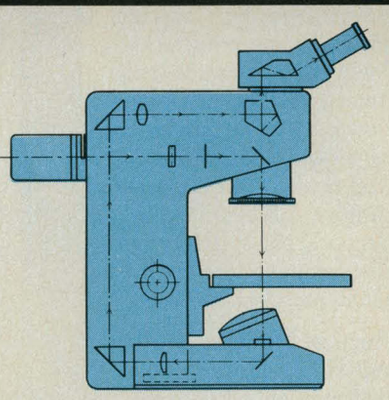

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A redesigned equipment rack for the F/A-18 strike fighter's radar will allow the U.S. Navy and Marine Corps to save millions of dollars on new radars over the life of the program. The original rack consisted of many honeycombed sections bonded together. The Value-Engineered rack is a single piece fabricated by an automatic, numerically controlled machine center. The changes stem from technology that was not available at the time the original contract was signed. Hughes Aircraft Company will share some of the savings with the Navy through the Department of Defense Value Engineering program. This program is designed to encourage employees to look at the functions of a product and develop alternatives that cost less, perform better, and are more reliable.

The first U.S. facility for making gallium arsenide solar cells on a standard production line is now under construction at Spectrolab, Inc., a Hughes subsidiary. Gallium arsenide cells, which are now being made on a prototype line at Hughes Research Laboratories, will help satellites and spacecraft become more efficient in converting sunlight into electricity. Compared to conventional silicon cells, gallium arsenide cells generate up to 30% more power and operate at much higher temperatures. The first cells are expected to come off the production line in mid-1985. Full-scale mass production at rates to 15,000 cells per year is scheduled for January 1986.

Two high-power communications satellites have been ordered by Advanced Business Communications Inc. (ABCI). The satellites are widebody HS 393 models, now being developed at Hughes for launch from the space shuttle. The drum-shaped spacecraft are designed to fill the width of the space shuttle's cargo bay in order to take advantage of launch pricing policies. Each satellite will operate over the Ku band and carry 16 channels designed for business communications, video distribution, and teleconferencing. The spacecraft's higher power will let users receive signals through small, low-cost earth terminals. Hughes Communications Inc., a Hughes subsidiary, will provide launch, tracking, telemetry, and control services for the Ku band system. Hughes Communications Galaxy Inc. will market 16 transponders.

A microwave/millimeter-wave radar cross-section measurement system, designed to take automated measurements on full-size or scale-model targets, joins the solid-state millimeter-wave product line at Hughes. The new Model 42260H system, originally built for Boeing Military Airplane Co., is the latest in coherent short-pulse instrumentation measurement systems. It is suitable for indoor and outdoor ranges as close as 50 feet and as far away as beyond 4,000 feet. The system uses a modular design concept that accommodates up to six separate radio-frequency transceivers.

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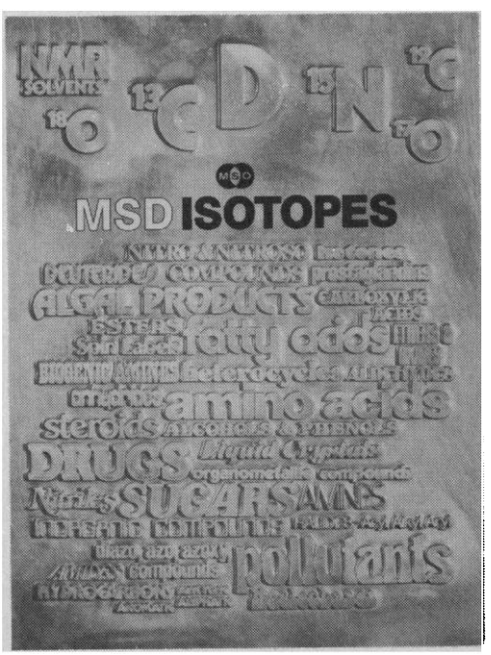

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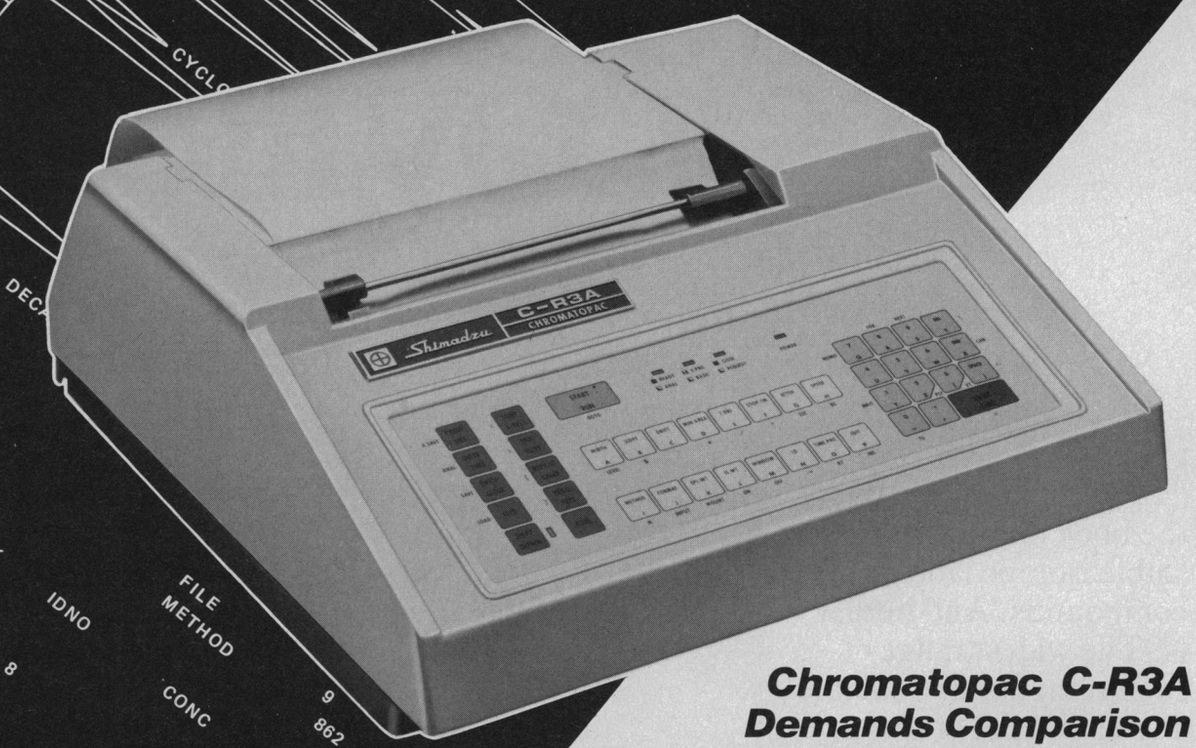

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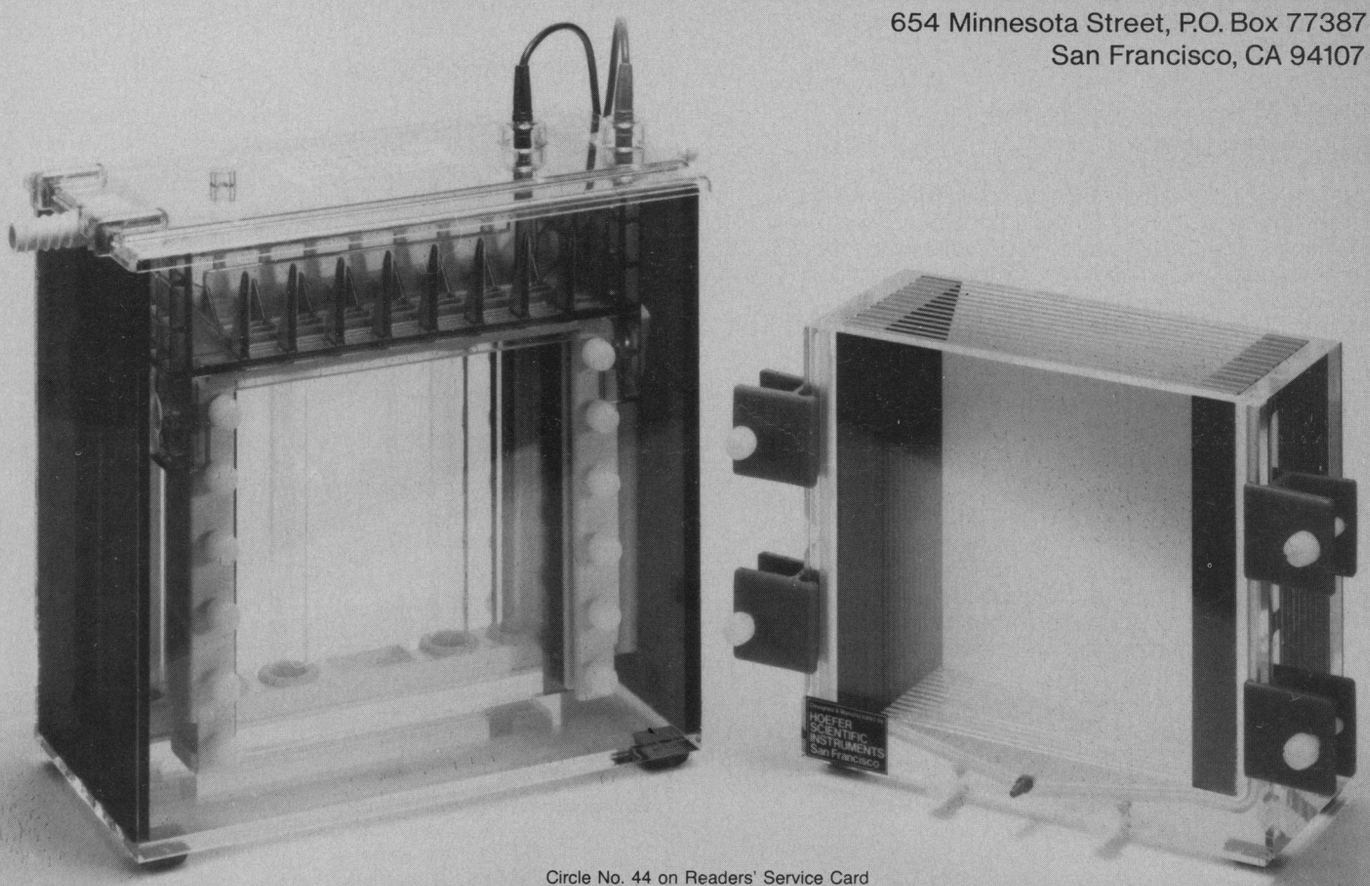

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The Ventilated Animal Rack:

Some day soon most research animals, personnel, and research programs will be protected this way.*

What is a "Ventilated Animal Rack"?

It is a portable, totally enclosed animal rack with four separate, independent, isolated-from-each-other chambers. Low velocity air enters each chamber, makes a single pass over the cages, and is exhausted by negative pressure directly to the main exhaust system. This special rack (VR-1) most effectively isolates the animals from the animal room... and the research personnel from the animals.

What are the benefits to the animals?

There are many. Cross-contamination is substantially decreased because air from an infected animal goes to the exhaust system with an absolute minimal exposure of the other animals. Animal stress is also significantly reduced: the enclosed environment is quiet; drafts and thermal and humidity fluctuations are greatly minimized; and animals can be easily observed without inducing stress. The success of this environment is attested to by the fact that the total number of animals born to a species that breeds poorly (DBA/2J mice) is increased and the percent survival is also appreciably higher. Additional evidence: judging by acceleration of weight gain, newly arrived animals housed in this system become acclimated more rapidly. Further evidence? Even multiple species can be successfully housed in the same rack.

What are the benefits to the research workers?

Since the air in the rack is exhausted into the main exhaust system and does *not* re-enter the animal room itself, research workers are effectively isolated from animal dander or other allergens, odor, pheromones, microorganisms, and food and bedding dust. Even with the doors of the unit open, the direction of air flow tends to be *from* the room and *into* the unit which helps to contain contaminated air *within* the unit. Result: virtual elimination of allergic reactions and generally, a cleaner, safer, odor-free work environment for the research people.

What are the benefits to research programs?

Because this system greatly reduces the chance of cross-contamination, and because it provides a much less stressful environment generally (e.g., it tends to reduce the amount of animal handling required), the chances of jeopardizing expensive research programs are substantially minimized.

*Many of these systems are already installed in major research institutions... and conversion to these ventilated animal racks is accelerating.

Are there other benefits?

The air velocity is variable and is separately adjustable for *each* shelf. The system offers a choice of bottle watering or a specially designed upfeed serpentine automatic watering configuration that eliminates stagnant water, permits flushing during the day, and significantly minimizes contamination. This rack also permits excellent space utilization since multiple species can be safely housed in the same room. Cleaning is easy; VR-1 can be handled by most standard rack washers. The unit is quiet. And, in summary, it is a most effective isolation system *that can actually divide a room into multiple separate, isolated environments.*

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The VR-1 is the subject of one or more pending patents.

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28 October - 1 November 1984

Washington Hilton, Washington DC

Chairman: Stephen R. Heller
Environmental Protection Agency, Washington DC 20460

THEME: Workstations for the Scientist

OPENING ADDRESS

Computer Education/Literacy for the Scientists – C.D. Martin, George Washington University, Washington, D.C.

SESSION TOPICS

Scientific Data Bases – L. Gevantman, National Bureau of Standards, Washington, D.C.
Computer Aided Molecular Design – R. Potenzone Jr., American Cyanamid Co., Stamford, Conn.
Artificial Intelligence – P. Friedland, Stanford University, Stanford, CA.
Biological Workstations – P. Armstrong, Intelligenetics, Inc., Palo Alto, CA.
Management of the Electronic Laboratory – R. Dessy, Virginia Polytechnic Institute, Blacksburg, VA.
Laboratory Automation and Robotics – J. Lemanowicz, Exxon Research and Engineering, Annadale, N.J.
Workshops – Joseph L. Modelevsky, Lilly Research Labs.
Molecular Biology Software: Conventions, distribution and exchange
Molecular Biology Computing: Perils, prospects, and payoffs
* Other Workshops to be announced

POSTER SESSIONS: WORKSTATION APPLICATIONS

Participants are invited to submit abstracts for the poster sessions. These abstracts will be reviewed up until the time of the meeting; however, only those accepted by 15 September 1984 will be listed in the conference program. For abstract forms contact address listed below.

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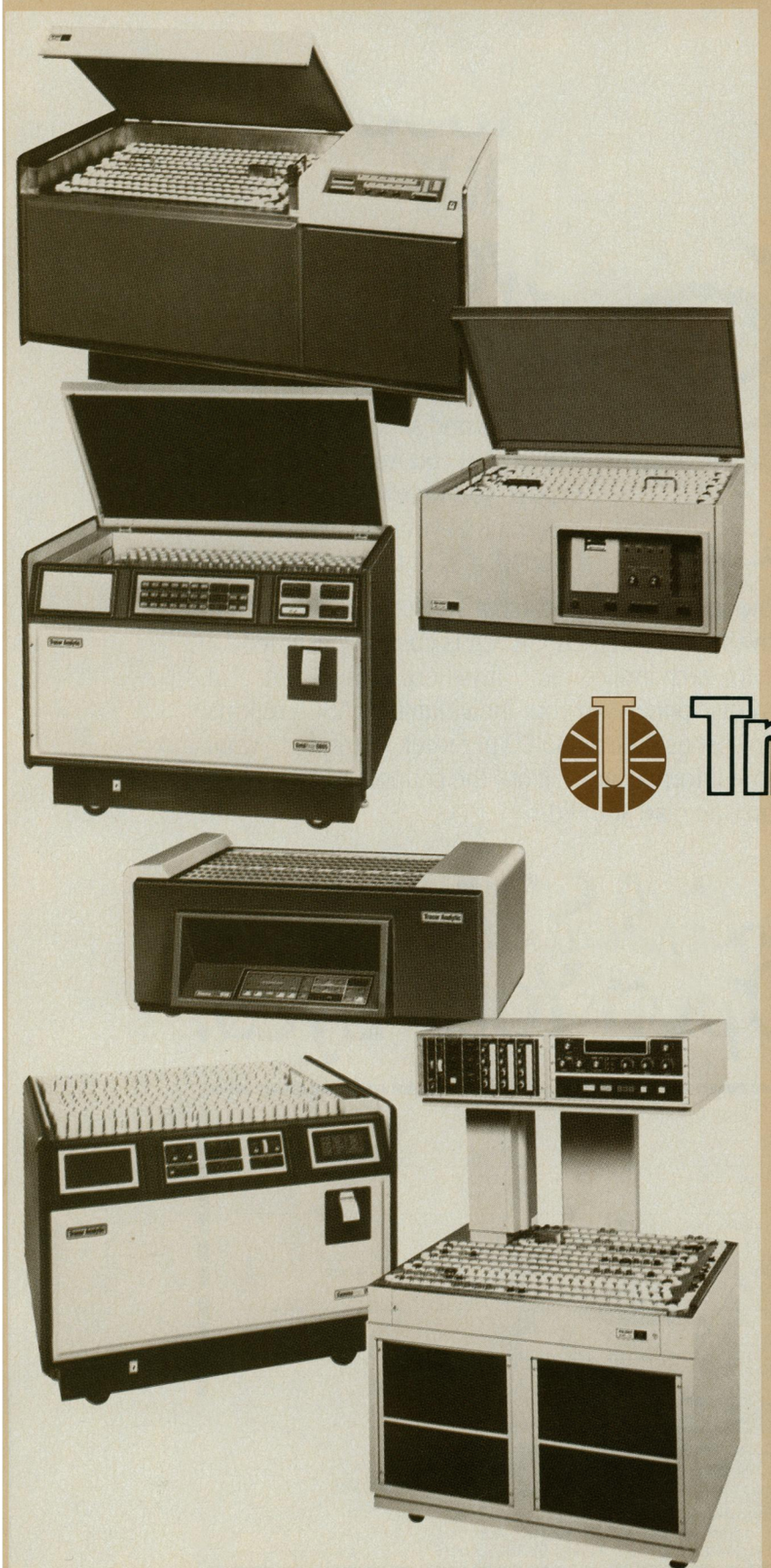

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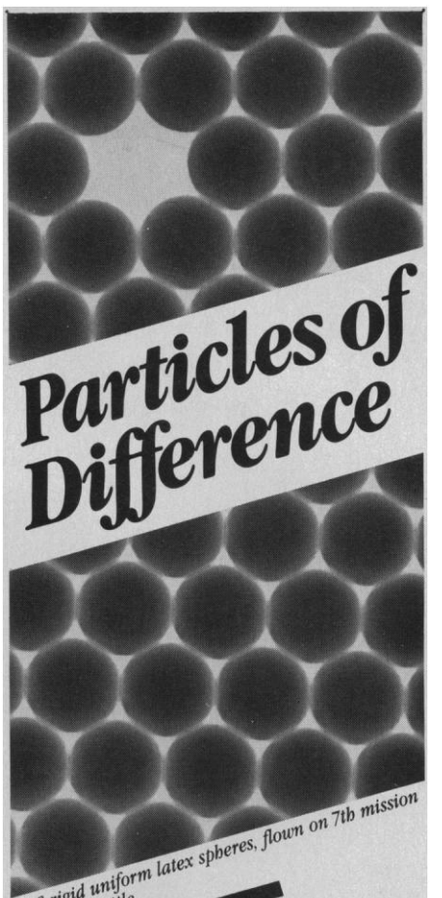

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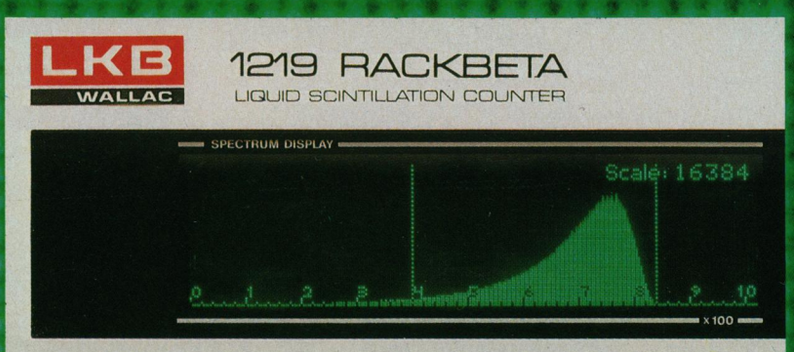

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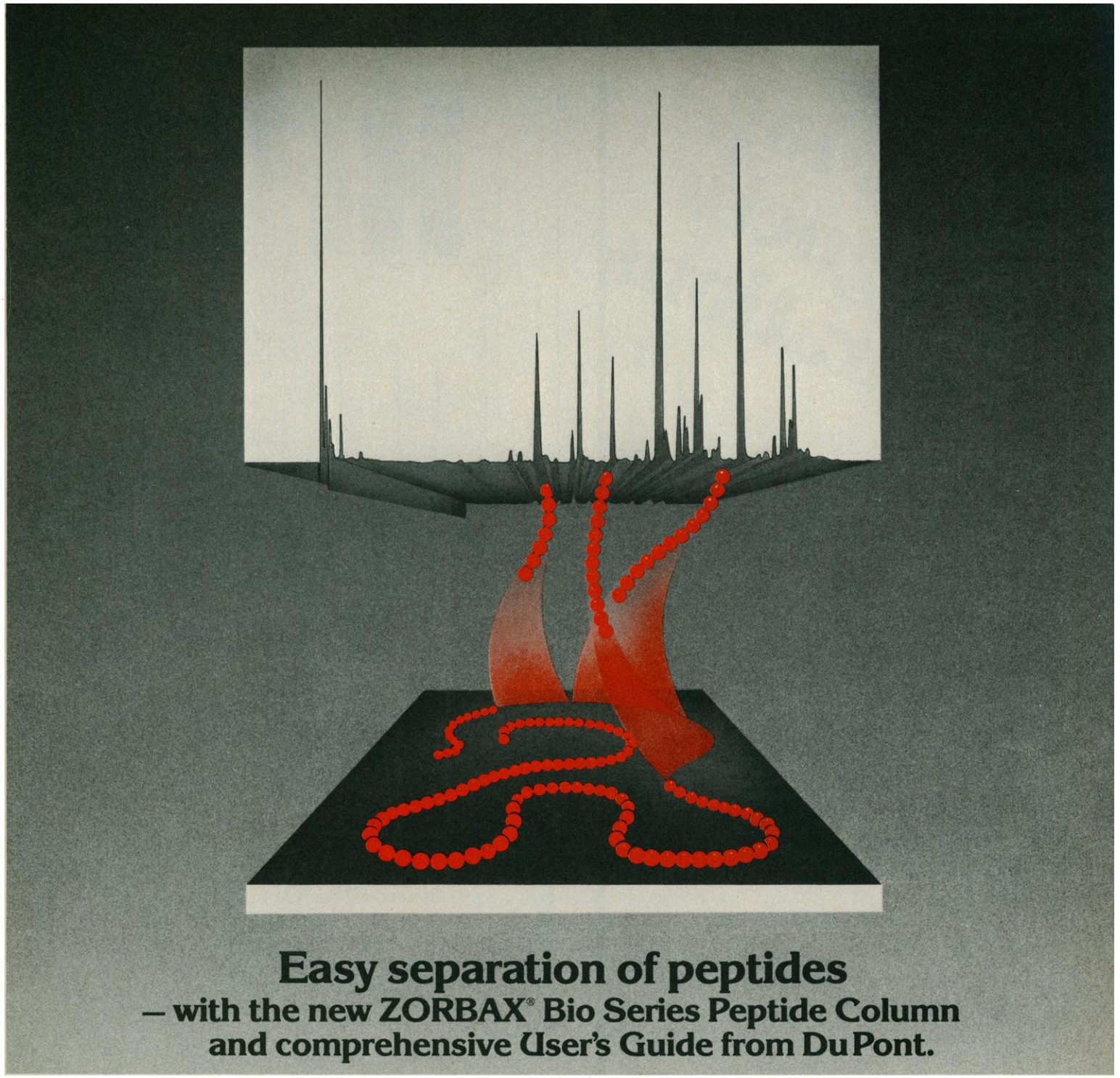

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quired characteristics, is more precisely the stable inheritance of *adaptive* changes induced in an individual organism by an altered environment. In other words, the acquired characteristics that are inherited must be adaptive with respect to the environmental change that induced them if the inheritance is to be considered Lamarckian. So far as I know, no authenticated evidence for this type of heredity exists, although many false claims have been made.

In the cases described by Marx, the phenotypic changes seem to have had no *adaptive* relation to the altered environments that provoked them and therefore have nothing whatever to do with Lamarckian evolution. They are, to me, not "reminiscent" of Lamarckism, but of a number of misguided attempts to use experimental results showing nonadaptive hereditary change induced by an environmental alteration as evidence for the Lamarckian model of evolution; these experiments, like those cited by Marx, are interesting and important, but do not constitute evidence for, or even bear on, "the Lamarckian concept of evolution."

J. GORDIN KAPLAN

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On Making Comparisons: Reminded Again

As scientists we frequently make comparisons: between arbitrarily defined groups, between species, between countries, between ideas, theories, or whatever else takes our fancy. Yet, in making these comparisons, we are frequently guilty of a gross illiteracy. I refer to the common, almost universal, practice of comparing one thing *to* another. The verb *to compare* may be used with either the preposition *with* or *to*, but the two uses carry almost opposite meanings. If one thing is *compared with* another, the two are set side by side and the degree to which they differ is determined. This is the meaning usually implied in scientific writings. If one thing is *compared to* another, however, the two things are being likened and their similarities emphasized, as, for example, in "Shall I compare thee to a summer's day?"

It could be argued perhaps that the common usage of *to compare to* is sanctioned, by the frequency of its use, as an acceptable alternative to the less common (but correct) usage of *to compare with*. At the risk of being pedantic, I do not think this argument can be accepted even for common American parlance; the latest edition of *Webster's Unabridged Dictionary* clearly reiterates the above distinctions.

Scientists pride themselves on their clarity and precision of thought. We should be no less concerned about the clarity and precision of what we write. This applies not only to authors of scientific works but more important to their editors, who have a particular responsibility to ensure the accuracy of the written word; the latter could surely afford the extra two ems to make comparisons *with* instead of *to*.

IAN A. GREAVES

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Recombinant RNA Research

I would like to offer supplementary information about the article "The birth of recombinant RNA technology" by Roger Lewin (23 Dec. 1983, p. 1313). First, in vitro recombinant RNA has been practiced in many laboratories for several years, thanks to the pioneering work of Uhlenbeck, Gumport, and their co-workers at the University of Illinois. Lewin's article attributes this technology to E. Miele, D. Mills, and F. R. Kramer (*1*). It is clear in Lewin's article that the major impact of the work by Miele *et al.* is the in vitro amplification of RNA with biological function by the introduction of foreign RNA into a vector derived from $Q\beta$ RNA. However, in a similar article published in May 1982, Shen Tongjian and Jiang Meiyan reported the introduction of poly(A) into $Q\beta$ RNA, which was subsequently used to infect and thereby amplify the RNA insert. Although characterization of both the in vitro recombinant RNA and the product of replication in vivo was not fully described, it appears that the Chinese scientists have achieved the in vivo amplification of recombinant RNA.

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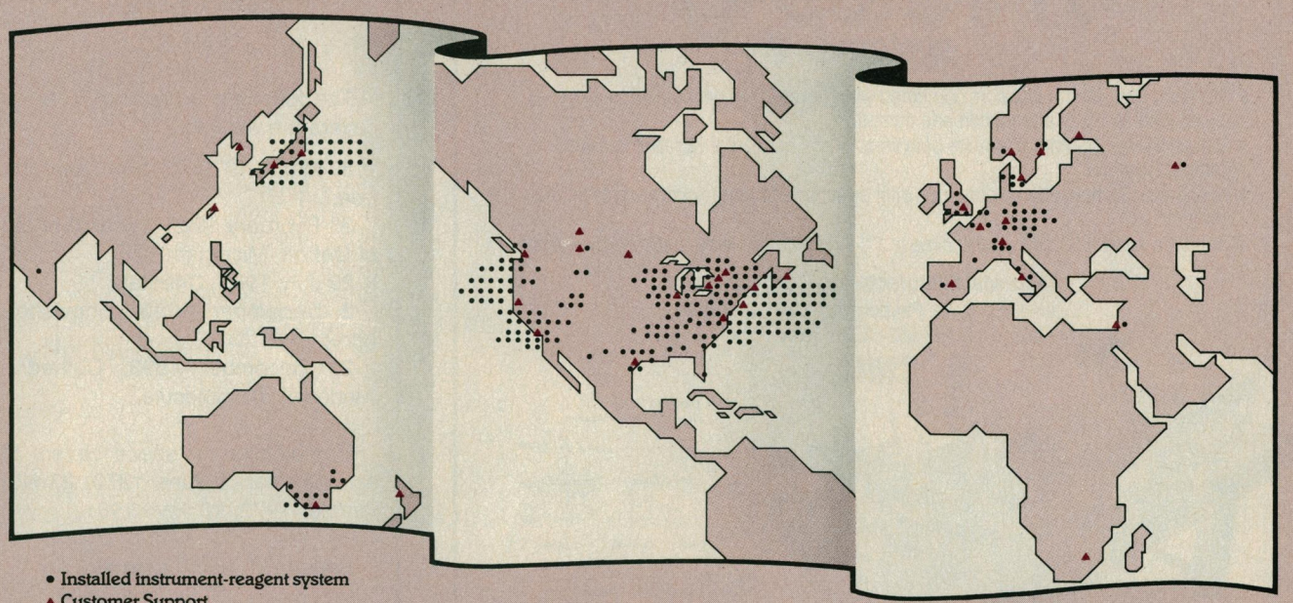
References and Notes

1. E. Miele, D. Mills, F. R. Kraker, *J. Mol. Biol.* **171**, 281 (1983).

Erratum: In the last paragraph of Arthur L. Robinson's Research News article "High spatial resolution ion microprobe" (14 Sept., p. 1137), J. Ronald Hass' name was misspelled.

BIOSYSTEMS UPDATE



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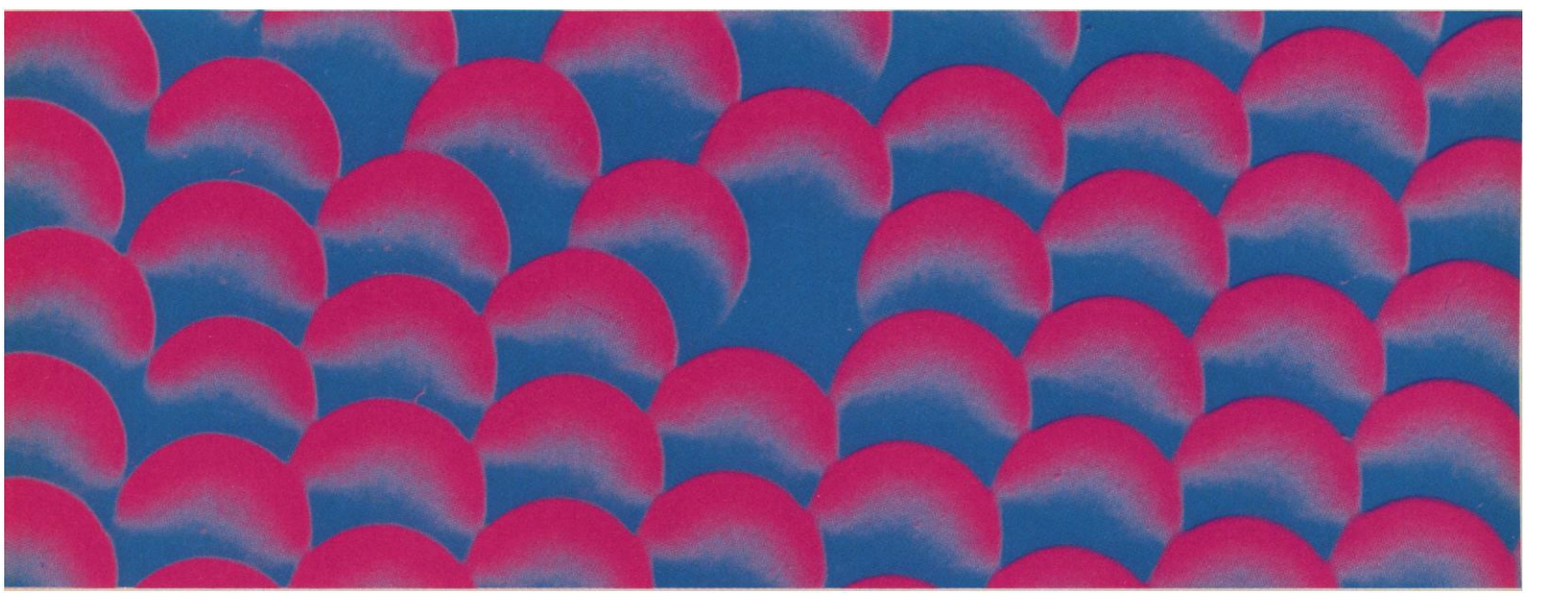

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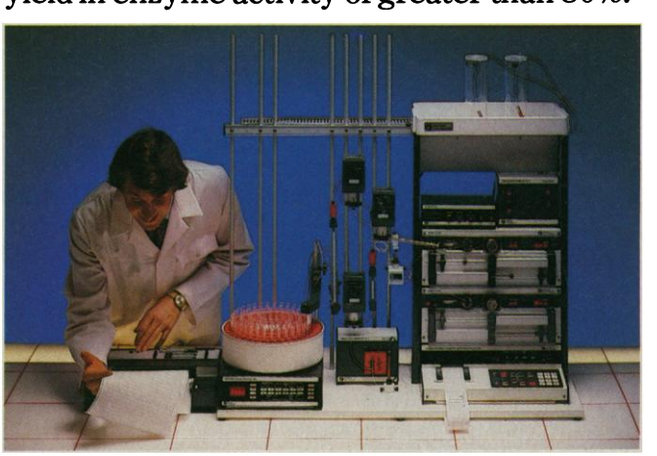

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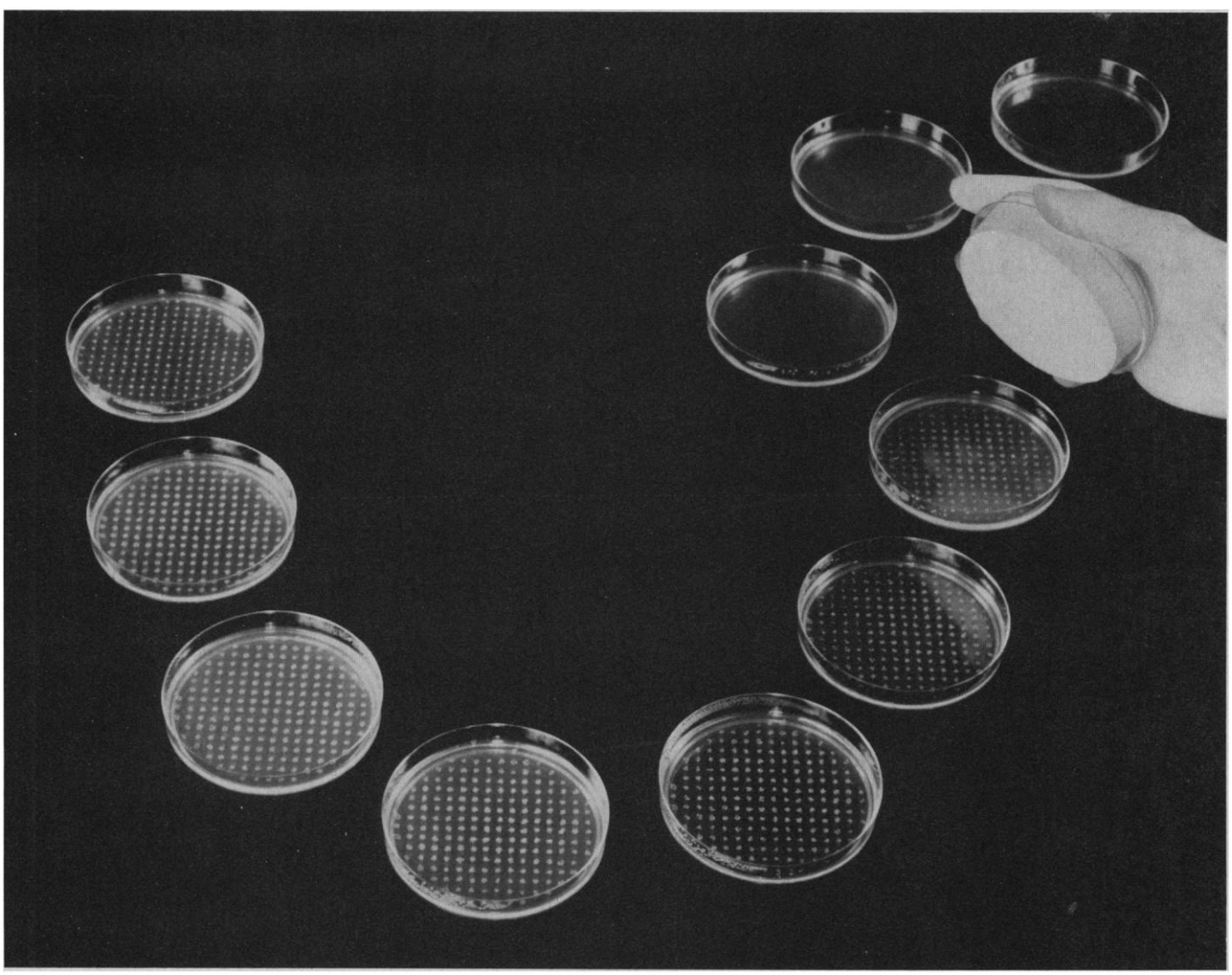

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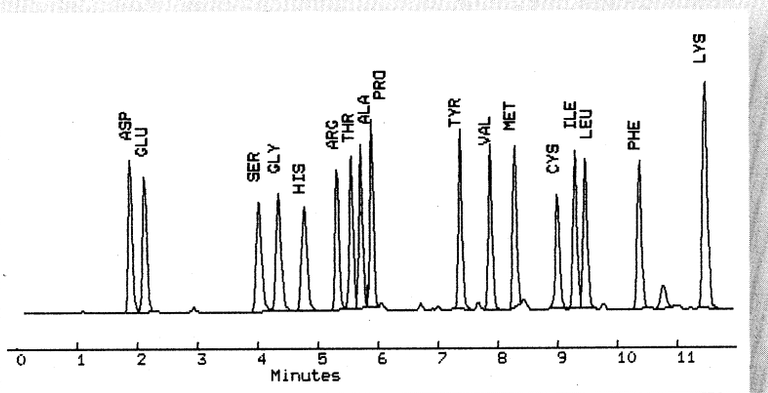

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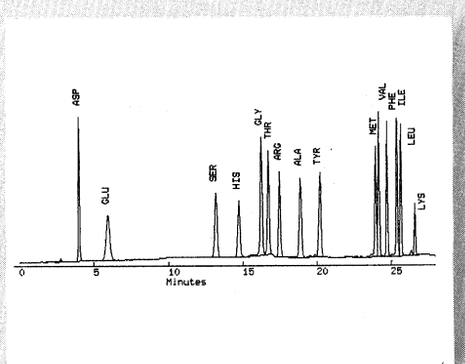

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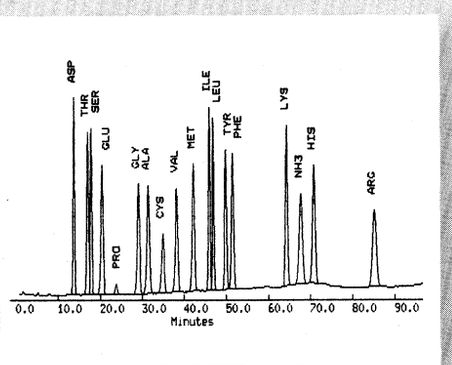

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19 October 1984, Volume 226, Number 4672 **SCIENCE**

Analytical Instruments

Continued improvements in analytical instrumentation are perhaps the most crucial factor in the vitality of scientific research. This issue presents a sampling of further advances in analytical capabilities. In recent years the kinds of substances that can be studied have increased. Sensitivity of detection has been enhanced. Abilities to isolate minor constituents of complex mixtures have been improved. The time required for analytical procedures has diminished.

Gas chromatography coupled with mass spectrometry has been for some time the analytical method of choice for volatile substances. Even so, it continues to be improved, for example, through the introduction of durable, coated capillary columns. With such a device it has been possible to separate a mixture of 100 plant hydrocarbons in only 6 minutes.

Liquid chromatography is especially useful in dealing with hydrophilic substances, including many large molecules of biological importance. Resolution and speed of liquid chromatography columns have been improved. However, the usefulness of liquid chromatography has been less than ideal. The bottleneck has been detector systems. In special cases spectrophotometry, electrophoresis, or fluorescence may be employed, but these methods lack the power and versatility of mass spectrometry. Earlier when mass spectrometry was employed, the usual practice was to collect a peak, evaporate off the eluting liquid, and coat part of the residue on an electrode that was subsequently inserted into the mass spectrometer. The solid was then subjected to a high electric field, fast atom ion bombardment, or other excitation that created ions. New techniques now permit better interfacing of liquid chromatography with mass spectrometry. A thermospray method described in this issue facilitates removal of the eluting liquid and ionization of the eluted substances. Thus the fluid from the liquid chromatography can be injected directly into the mass spectrometer. The molecular weights of undegraded molecules can be determined as well as the weights of fragments.

The mass spectrometer can be used to provide information about solids that ordinarily cannot be analyzed by liquid chromatography. A small portion of the material is subjected to practically instantaneous pyrolysis within the mass spectrometer. The fragments produced give a good representation of the nature of the parent substances.

Mass spectrometers have been undergoing development with, for example, new ion sources and the tandem configuration. An interesting version is the Fourier transform mass spectrometer. The crucial volume in the device is a cube 2.54 centimeters on a side, bounded by electrodes, and maintained in a magnetic field. The device is operated as an ion trap with decay times of as much as half a day. Within the trap a series of operations is conducted, including ion formation, storage, manipulation, and detection. Resolution at a mass to charge ratio of 18 is 100,000,000.

The value of applications of nuclear magnetic resonance continues to increase. Organic chemists find it almost indispensable in the determination of structure of compounds present in a liquid phase. It is being applied increasingly to study of solids, and the earlier emphasis on observations of protons has been supplemented by measurements of other nuclides. One dynamic application is use in noninvasive imaging in medicine. For many tissues nuclear magnetic resonance is superior to the CAT scan.

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