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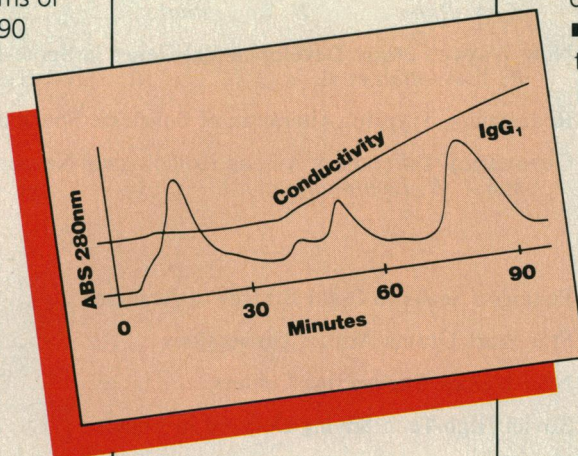
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COVER

Submerged rice leaves are never wetted. Continuous air layers, which appear silvery under water, are trapped between the hydrophobic surfaces of rice leaves and the surrounding water. They are open to the atmosphere and form a low-resistance pathway for gas movements. See page 327. [Benjamin R. Kende, Rochester Institute of Technology, School of Photographic Arts and Sciences, Rochester, New York 14623]

SCIENCE / SCOPE

The feasibility of turning sea water into electricity is being studied in fusion energy experiments at Kyoto University in Japan. The studies involve a Hughes Aircraft Company gyrotron, a microwave tube that uses a spiraling stream of electrons to produce extremely high power microwave frequencies. Fusion energy holds tremendous potential because its source of fuel (hydrogen) can be extracted from sea water. It could produce large amounts of power with little or no radioactive waste and no threat of meltdown or explosion. In fusion energy research, the gyrotron's high-power radio waves heat hydrogen particles (plasma) to temperatures of tens of millions of degrees. These particles fuse under pressure, causing a thermonuclear reaction that provides energy for driving steam turbines.

A third communications satellite is being built for Indonesia as a replacement for one rescued from an errant orbit last November by NASA's space shuttle. Palapa B-3, set for launch in 1986, is the third in a follow-on series of spacecraft designed and built by Hughes for Perumtel, Indonesia's government-owned telecommunications agency. The Palapa B model has more than twice the capacity of Palapa A, which in 1972 unified the world's largest archipelago electronically. It can carry 1,000 voice circuits or a color television transmission in each of its 24 transponders.

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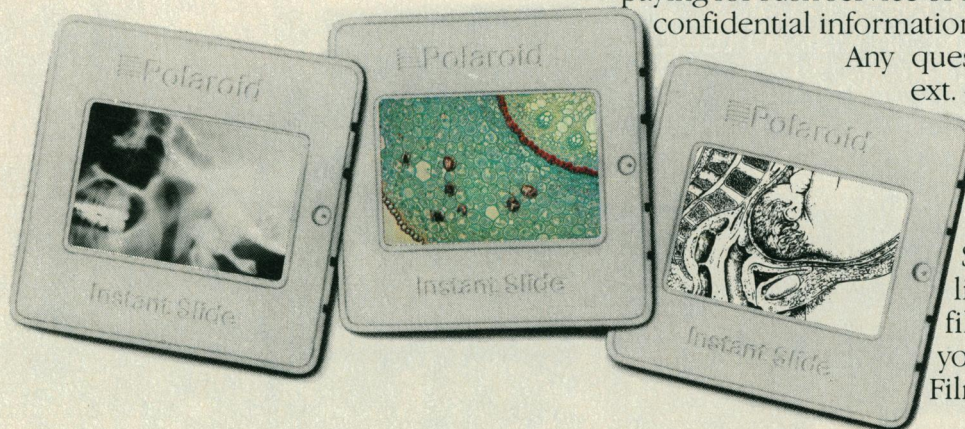
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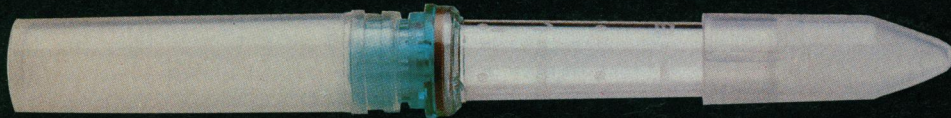
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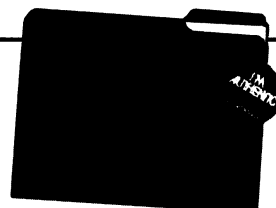
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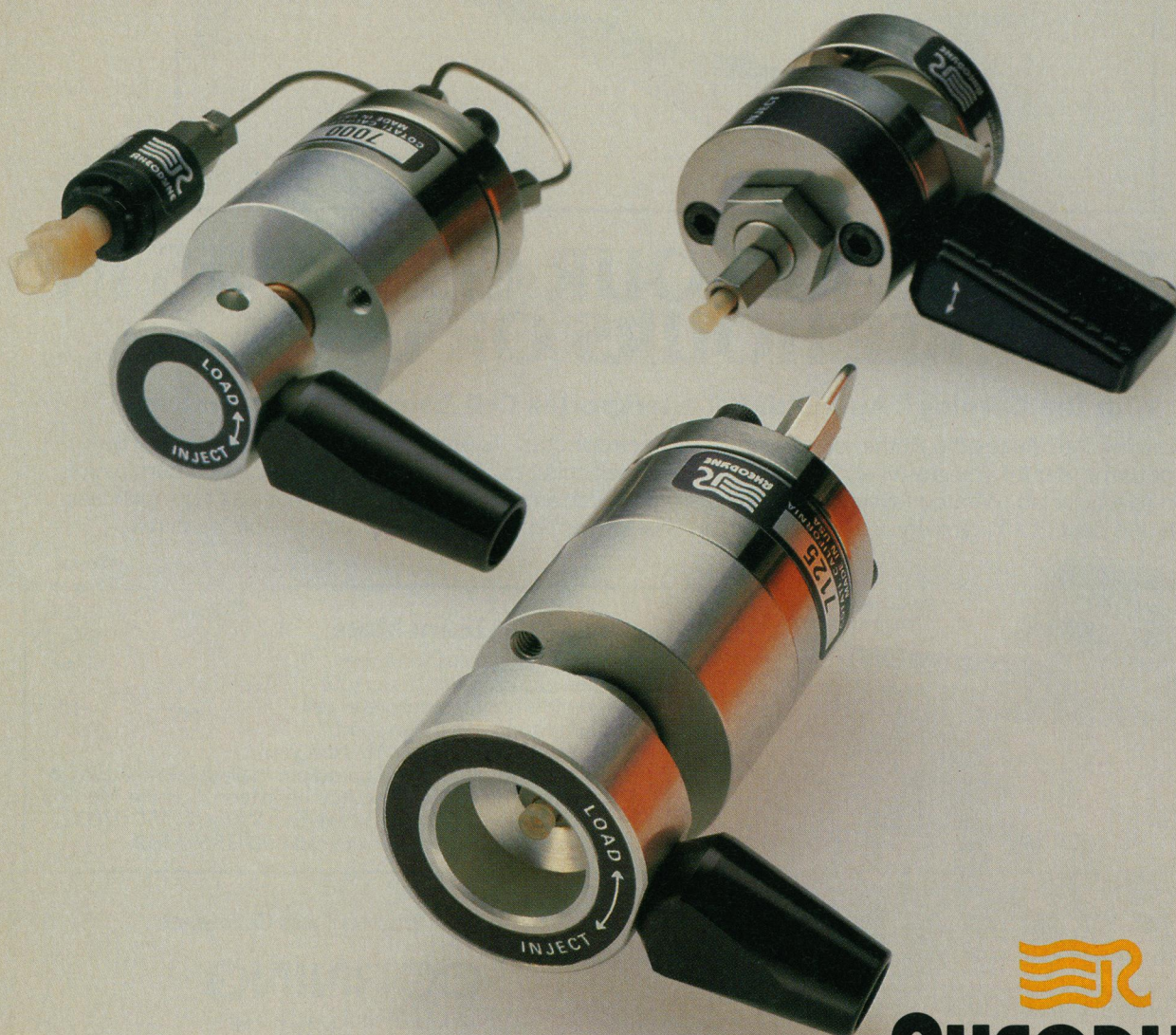
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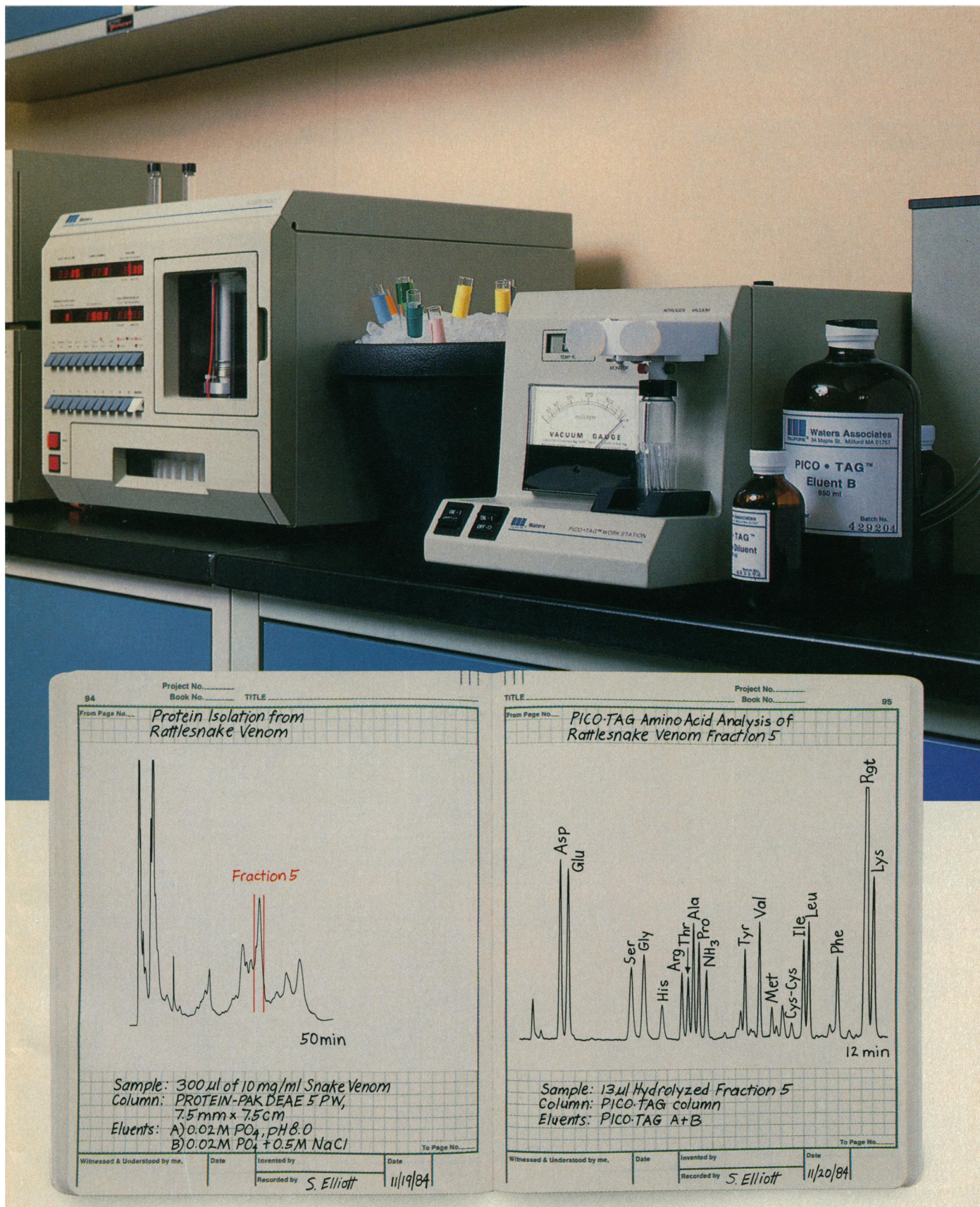
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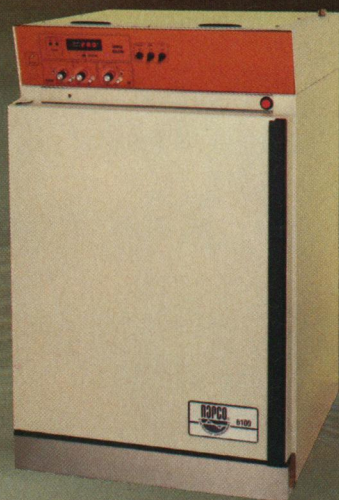


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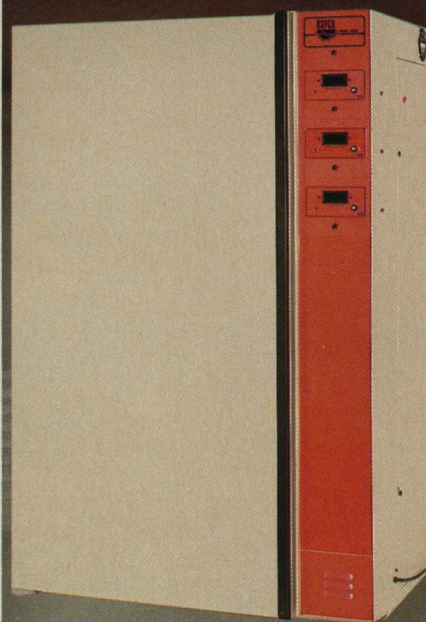
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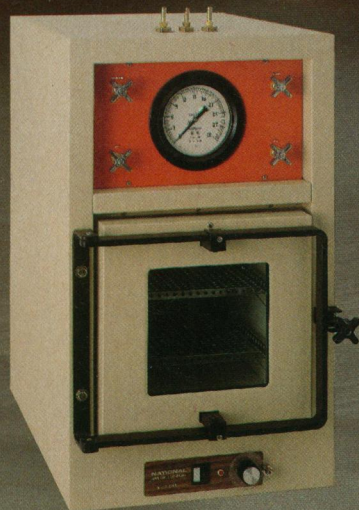


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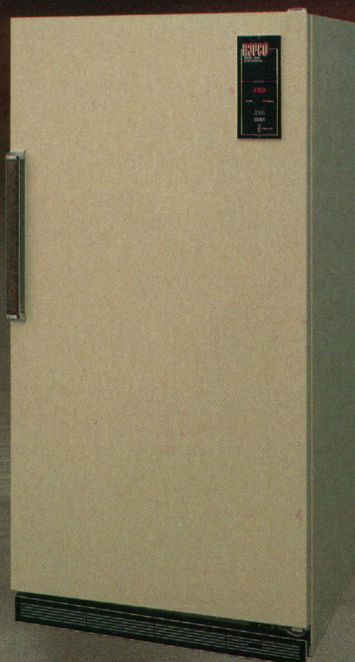
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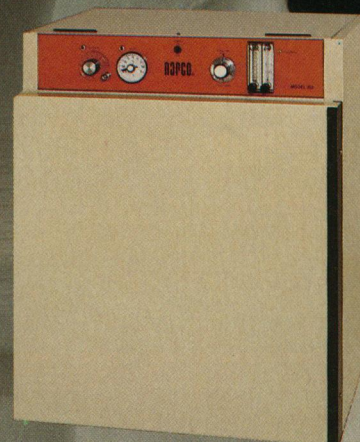
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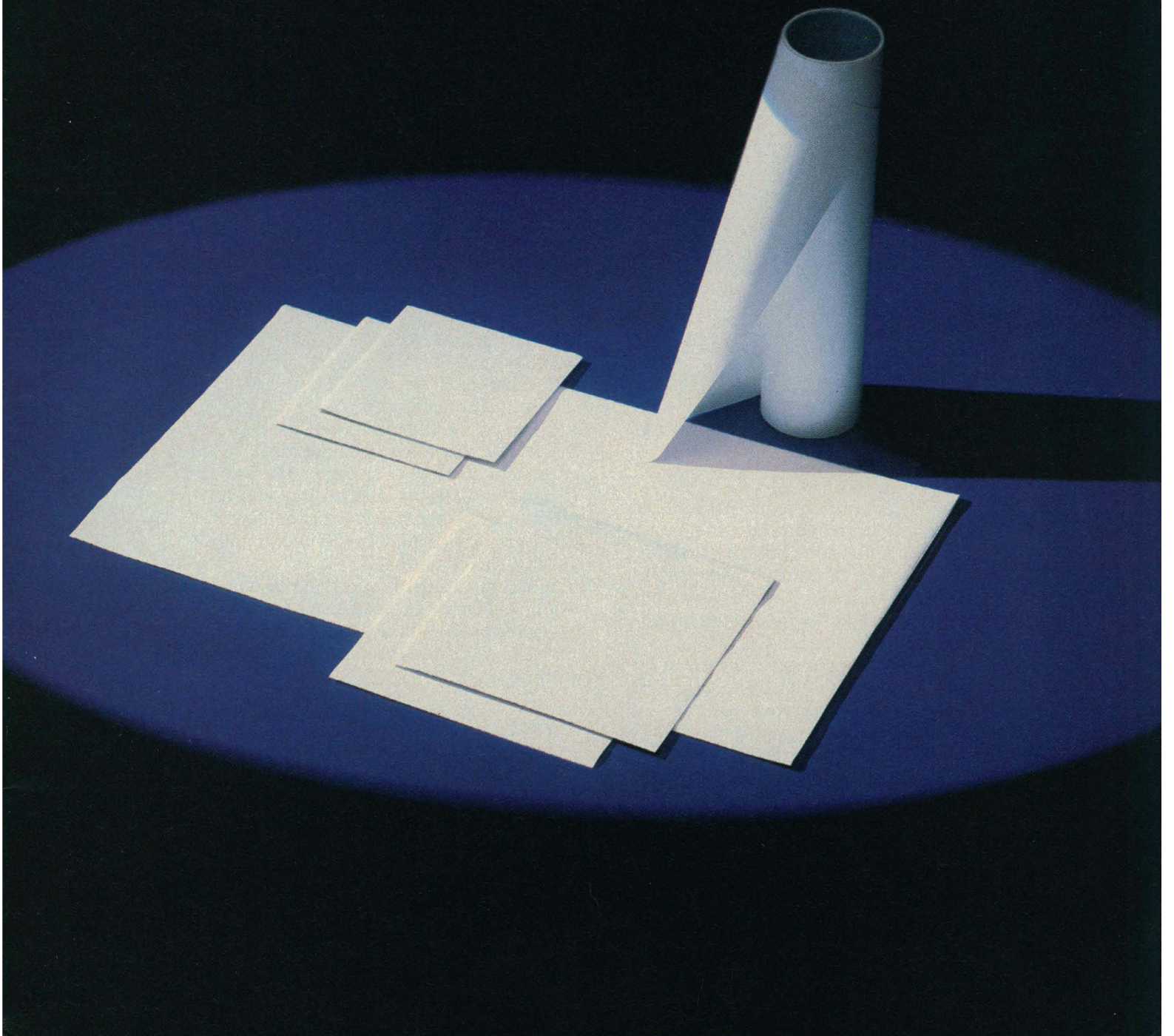
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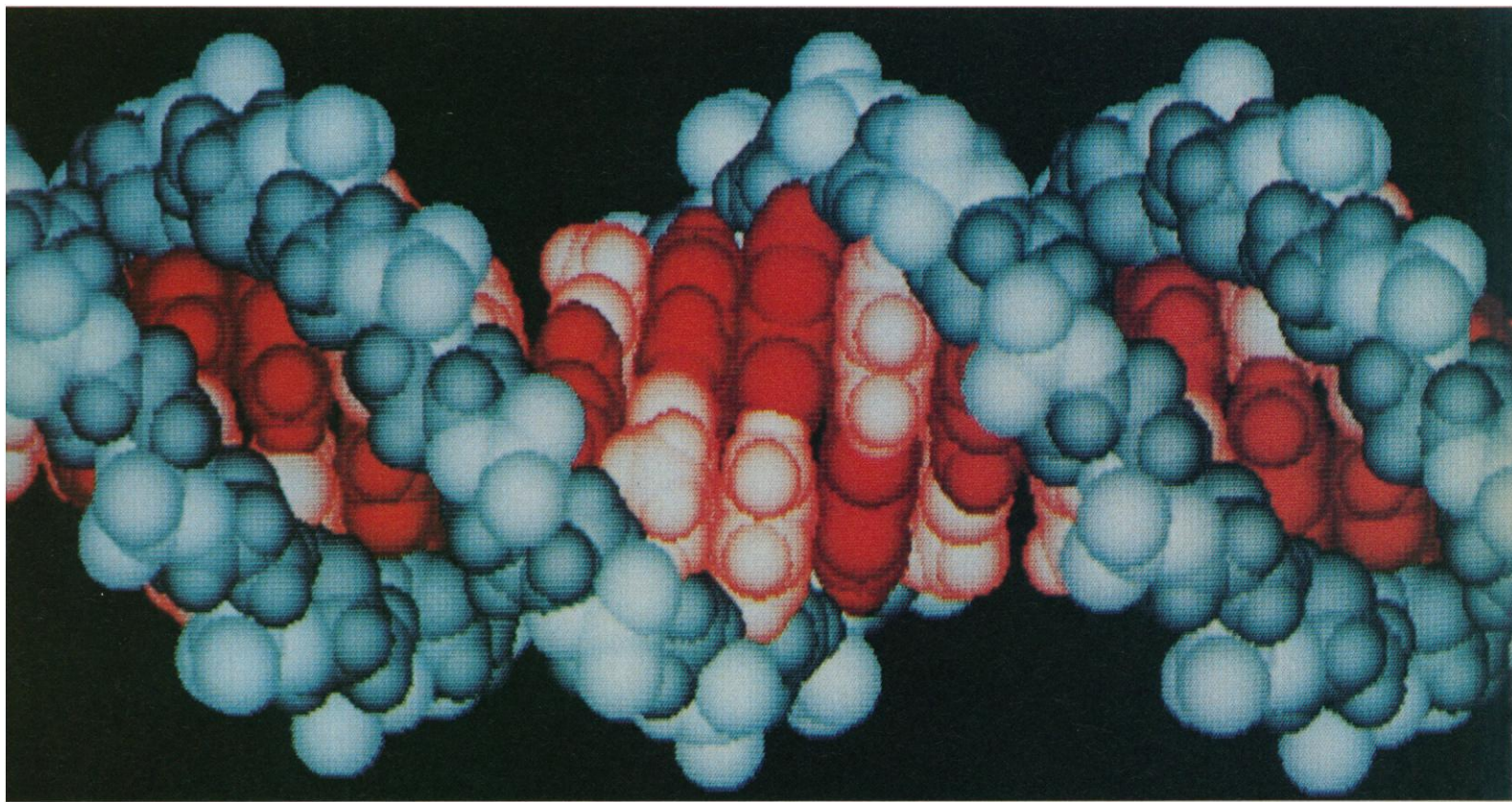
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Selecting columns to improve your HPLC results.

A new and practical approach.

We call it Optimal Chromatography. In theory, it applies to every HPLC application. In practice, it makes column selection easier and separations more effective. Here's how.

The tetrahedron illustrates the concept.

From an initial separation, most HPLC analyses can be improved for any one of four objectives: speed, resolution, load, or sensitivity. Each is represented by a vertex on the chromatographic tetrahedron. This reminds us that each objective requires a different combination of column and instrument conditions. The key is knowing which requirements you need to achieve your separation objective. That's where Beckman comes in.

Your optimal column source.

Beckman offers more than 100 columns to meet your specific application needs. For research, methods development, or quality control. From micro to semi-prep. And our proprietary stationary phase chemistries—21 in all—help you optimize sample selectivity, too. Whether it's for amino acid analysis or fast protein LC. Drug assays or carbohydrate separations.

Beckman/Altex columns give you reproducible, reliable results—as documented in hundreds of recent articles by independent scientists. And Beckman has over a decade of experience matching those columns to our customer's needs and objectives. Try us. You'll find that Beckman/Altex columns really can help optimize your chromatography.

Put Optimal Chromatography to work in your lab.

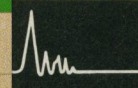
Columns are only one of the ways Beckman helps you get the most out of every separation. Our full line of HPLC systems, components, and accessories is designed with one goal in mind: to help you achieve optimal results.

For complete information on Optimal Chromatography and Beckman/Altex columns, send for your free catalog. And watch for other ads in our Optimal Chromatography Series.

Beckman Instruments, Inc., Altex Scientific Operations, 1716 Fourth St., Berkeley, CA 94710. Phone: 415/527-5900. Offices in major cities worldwide.

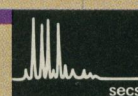
Optimize from the start.

For most initial analyses, select Beckman Ultrasphere™ 150 x 4.6mm columns. These columns feature a minimum count of 9750 plates! That's better efficiency than most 300mm columns—and you'll get twice the speed using 50% less solvent. Once your initial separation is complete, adjust your solvent so that the first peak of the critical pair has a $K' = 2-4$. Then, optimize for speed, resolution, load, or sensitivity.



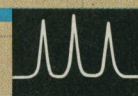
Optimize for speed.

When speed is of the essence, use Beckman 3 micron, 75 x 4.6mm Ultrasphere columns for simple isocratic separations. For faster methods development and scouting procedures, use repeated fast isocratic separations. Also, be sure your system has a fast time constant, otherwise apparent efficiency will decrease rapidly.



Optimize for resolution.

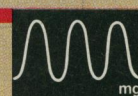
When resolution is more important than speed, use a longer column and a shallower gradient with a low dead-volume flow cell to minimize band broadening. Beckman 250 x 4.6mm Ultrasphere columns are ideal for high resolution separations. They give you a 29% increase in peak capacity compared to 150mm columns.



Optimize for load.

Laboratory prep-scale applications require increased column diameter.

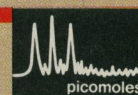
Beckman 10mm diameter columns are packed with exactly the same media as our analytical and micro columns. So you can easily scale-up your separation to semi-prep simply by equalizing the linear velocities.



Optimize for sensitivity.

For highest HPLC sensitivity, use microbore (≤ 2 mm) columns and a fine-tuned LC system. Beckman/Altex microbore columns consistently improve sensitivity up to 10X that of 4.6mm ID columns.

Microbore columns require highly stable, low flow rate conditions. To fine-tune your system for low flow rate operation, contact Beckman about their complete line of microbore columns, pumps, and detectors with flow cells optimized for high sensitivity HPLC.



BECKMAN

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The new MICRO-ISOLATOR™ System: A revolutionary breakthrough in animal housing.

A simple and versatile animal housing system that offers greater microbiological control than complex barrier rooms... but without the inconvenience and inefficiency that barrier rooms impose by limiting the movement of people and animals.

The Principle

In effect, the MICRO-ISOLATOR System involves the use of durable filter-topped cages that function as "giant Petri dishes," which are only opened within a Class 100 workbench by personnel who observe aseptic technique at all times*. There are many benefits to this unique miniaturization strategy. For example, animals from multiple sources with different microbiological profiles have been housed in the same room without cross contamination. Likewise, investigators can experimentally infect animals in different MICRO-ISOLATORS within the same room without interfering with one another's research... and all of this can be accomplished without the inconvenience of requiring personnel to shower into or out of the room. Also, since

all manipulations are conducted in a Class 100 workbench, individuals allergic to animals are protected from dander and therefore are able to work in comfort.

The complete MICRO-ISOLATOR System consists of the individual MICRO-ISOLATOR housing units, the STAY-CLEAN™ Laminar Flow Workbench, and the service cart.

The MICRO-ISOLATOR Units

This system consists of an autoclavable plastic cage and plastic filter frame with a static filter (now designed for rapid replacement of the filter material), plus the usual cage accessories. The plastic filter frame overlaps the bottom portion of the cage and effectively forms a giant Petri dish-like structure. Result: there is an effective protection against microbial contamination while still allowing for substantial gaseous interchange. The MICRO-ISOLATOR is, in other words, a protected microenvironment within any insect-controlled macroenvironment.

MICRO-ISOLATOR units, fabricated of autoclavable plastic material, are now available for mice, rats, hamsters, and guinea pigs.



* Please complete coupon for the MICRO-ISOLATOR System "Products, Principles, and Procedures Manual."



The STAY-CLEAN Laminar Flow Workbench

Whenever a MICRO-ISOLATOR unit is being serviced (that is, when animals or the contents of the unit are being manipulated), these activities must take place within a Class 100 environment. The STAY-CLEAN Laminar Flow Workbench is a specialized unit developed for such cage and animal manipulation. It has been designed to achieve two goals: (1) to prevent ambient contagion from entering the workbench and any of the components, and (2) to limit the escape of animal dander and other particulate matter from the work area.

The STAY-CLEAN Laminar Flow Workbench is compact, moveable, and includes state-of-the-art monitoring instrumentation to assure proper operation.

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Patents applied for on the MICRO-ISOLATOR units and other elements of the complete system.

MICRO-ISOLATOR and STAY-CLEAN are trademarks of Lab Products, Inc.

The Service Cart

The service cart completes the MICRO-ISOLATOR System by simplifying the movement of all necessary supplies to the laminar flow workbench for servicing the MICRO-ISOLATOR units.



For More Information

Write or call Lab Products, Inc.,
255 West Spring Valley Avenue, P.O. Box 808,
Maywood, New Jersey 07607 or complete the coupon.
Phone 201/843-4600 or 800/526-0469.

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a **bioMedic** company

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255 West Spring Valley Avenue
P.O. Box 808
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I would appreciate:

- ☐ Your new MICRO-ISOLATOR System "Products, Principles, and Procedures Manual."
- ☐ Information on your other environmental control products.
- ☐ Your comprehensive catalog of animal housing and care systems and accessories.
- ☐ Seeing your local representative. Please call and set up an appointment.

Area Code Number Ext.

Name _____

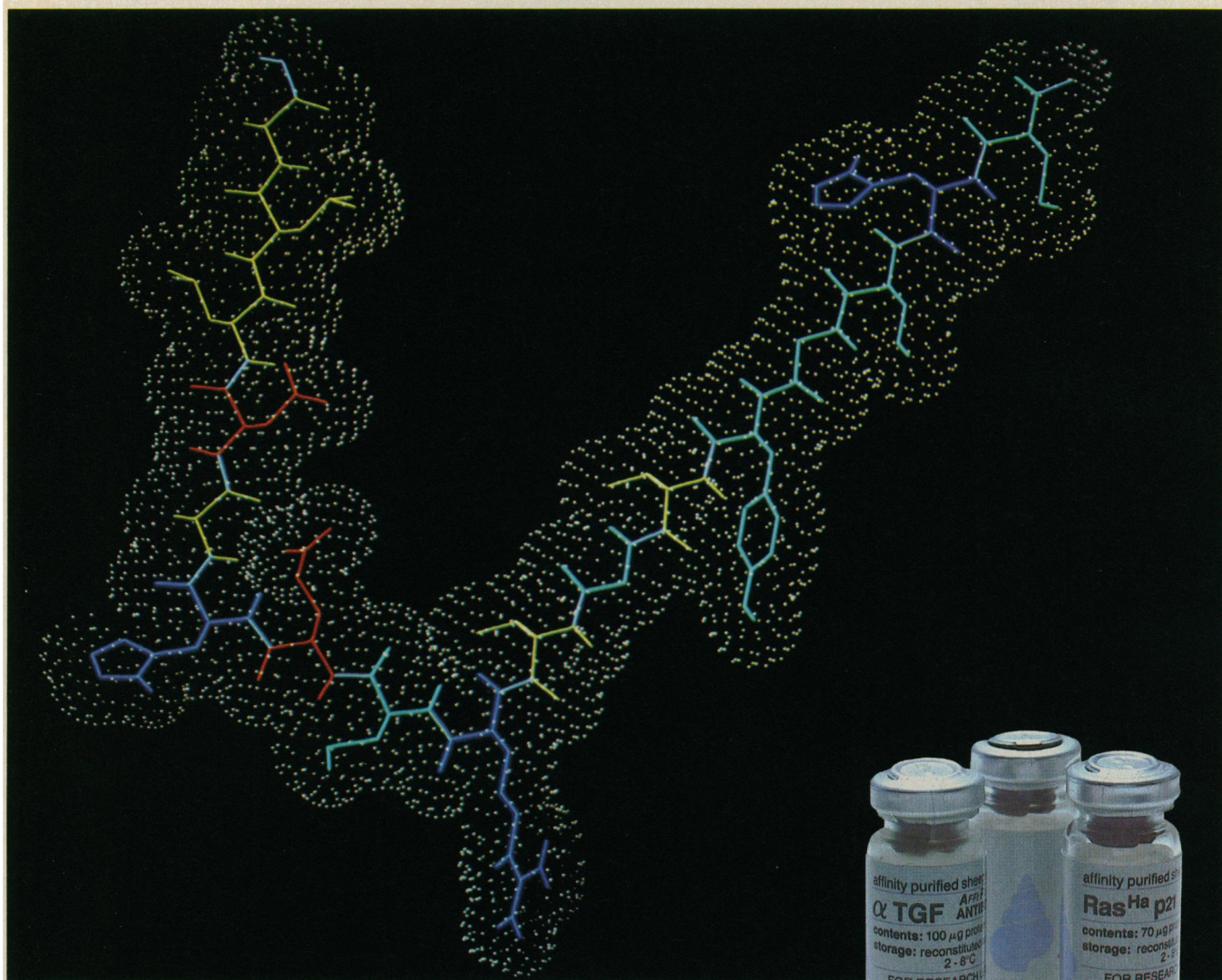
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Affinity-Purified Antibodies to Oncogene Proteins and Transforming Growth Factors.

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Each antibody is generated against a synthetic peptide corresponding to an amino acid sequence in the native protein. These antibodies are purified by affinity chromatography, thus reducing nonspecific reactions for clearer, faster results. Western blot and immunoprecipitation analyses are used to verify their reactivity and specificity.

Applications include: providing semi-quantitative data on oncogene and α TGF expression; localizing oncogene proteins and α TGF in cells using immunofluorescence; purifying antigens by antibody affinity

chromatography; and characterizing structure/function relationships.

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Our product development program is aggressively committed to providing a continuing source of biological reagents of the highest quality.

For additional information, contact Triton Biosciences Inc., 6900 Fannin, Dept. 270, Houston, Texas 77030. Tel. (713) 796-1227.



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Pour it on

and Clean It Up with PrepSep™ Solid Phase Extraction Columns

PrepSep column's unique conical shape lets you pour your sample directly into the large 10mL sample reservoir. Permits easy sample addition and large sample volume. Made of polypropylene, with 300mg of selected packing sandwiched between two 20 μ m pore size polyethylene frits.

Fast, easy extraction and elution of pesticides, dyes, parabens, phthalate esters, and many other organic compounds. Speed up sample cleanup for HPLC, GC, TLC, and UV analysis, without jeopardizing separations. They replace many preparative techniques, even tedious liquid-liquid extractions.

Six versatile packings: Five are bonded-phase silica: C₁, C₈, C₁₈, cyano, and amino. The sixth is pure uncoated silica gel. All are 40 μ m particle size. Packing type is conveniently marked on upper rim of each column.

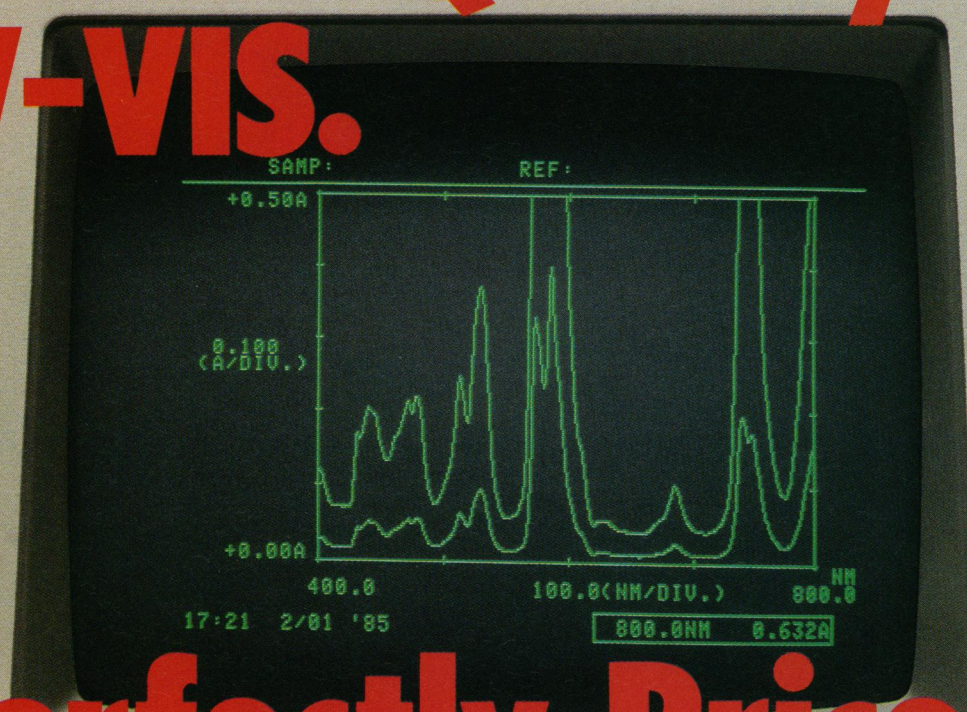
Three convenient ways to achieve fast flow: 1. Connect PrepSep column to a syringe via tubing and use the syringe's plunger to draw eluent through the packing. 2. Insert PrepSep column into a vacuum box to pull the eluent through the packing, into a test tube. 3. Place PrepSep column into a centrifuge tube. Use centrifuging speed and time to control rate and amount of sample flow through the packing.

Each PrepSep column is individually sealed for protection against contamination and moisture. They're inexpensive enough to be truly disposable, eliminating cross-contamination and messy cleanups.

For more information, including extraction procedures and analytical results using PrepSep columns, use Reader Service Number. Or write Fisher Scientific, 711 Forbes Ave., Pittsburgh, PA 15219.

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All three Series 2000 models are fully automatic, with either 200, 150, or 50g weighing capacity and 0.1mg accuracy. Accuracy automatically shifts to 1mg if either side door is open, preventing air current errors.



Model 2200, with 200g capacity, has an expanded weighing range. And, dual-range SenSelect™ Model 2250 has 200g capacity with 1mg sensitivity and

a 50g fine range with 0.1mg sensitivity. It automatically senses sample weight and selects the most sensitive range.

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BIOSYSTEMS UPDATE

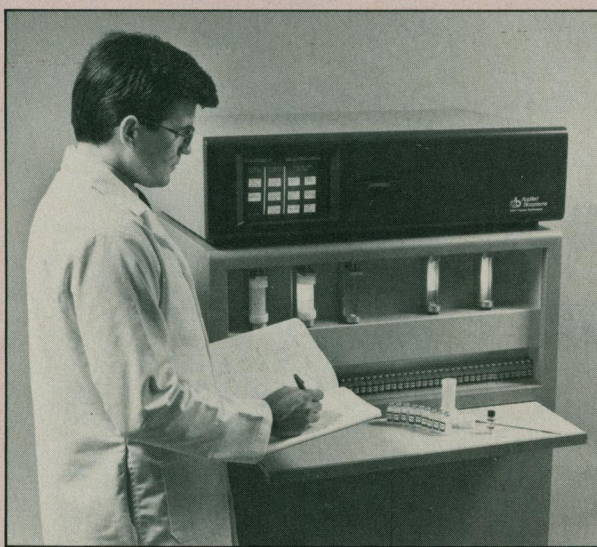
The advanced method for peptide synthesis: Pre-formed Symmetric Anhydrides

Fast, Economical, High Yields

The Model 430A Peptide Synthesizer consistently delivers unprecedented efficiency and economy. It is the first automated instrument-reagent system that optimally forms *t*-Boc amino acid symmetric anhydrides.

Symmetric anhydrides eliminate or suppress random and most non-random coupling failures. In addition, faster, more economical syntheses are achieved because the need to do double couplings for most amino acids is eliminated.

High stepwise yields are routine; complete cycles take less than an hour and typically consume less than 250 mL of reagents.



The Model 430A Peptide Synthesizer delivers consistently higher yields of far purer crude product at a substantially lower cost per cycle than instruments employing conventional methods which are not optimized for each amino acid.

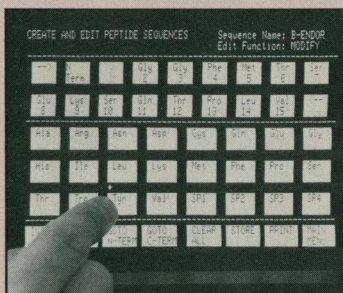
Unique, Optimized Chemistry

Each protected amino acid, sealed in powder form in an individual cartridge, is dissolved and activated automatically just before coupling. All functions of the synthe-

sis cycle are uniquely specified for the various amino acids. The Model 430A is available with three reaction vessels for sequential syntheses of different peptides.

Easy, Touchscreen Control

The Model 430A is simple to operate with its touchscreen control, yet can accommodate multiple methods for the experienced peptide chemist. There is no computer lan-



Peptide Sequence Editor—one of the convenient touchscreen menus that provides the user with complete control, plus the flexibility to modify existing protocols or write new ones to accommodate different pre-activation methods including FMOC.

guage to learn—no complicated control panel or keyboard to master. Pre-programmed algorithms automatically integrate each synthesis cycle for the shortest time, even when new protocols are created.

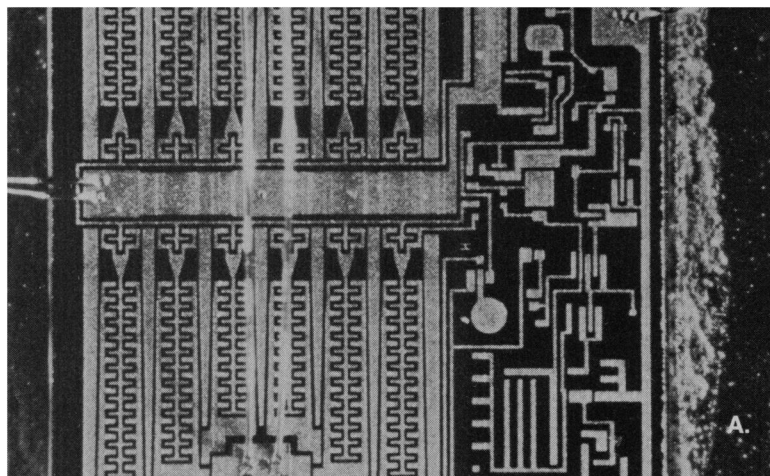
A Complete Instrument-Reagent System

High purity PAM and BHA resins, and a full line of quality amino acids, reagents and solvents are integral components of the 430A system for consistently superior performance. Complete user support includes the assistance of Applied Biosystems scientists and a worldwide network of trained service engineers.

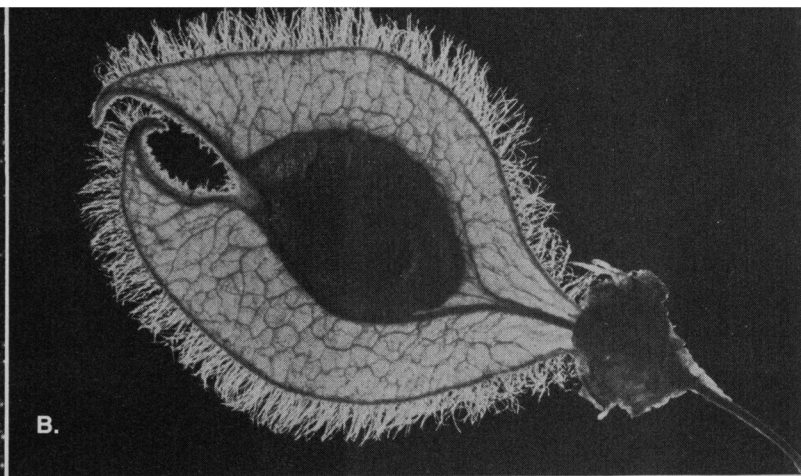
For More Information ...

Contact your local Applied Biosystems representative, one of the offices listed below or circle reader service number 32.

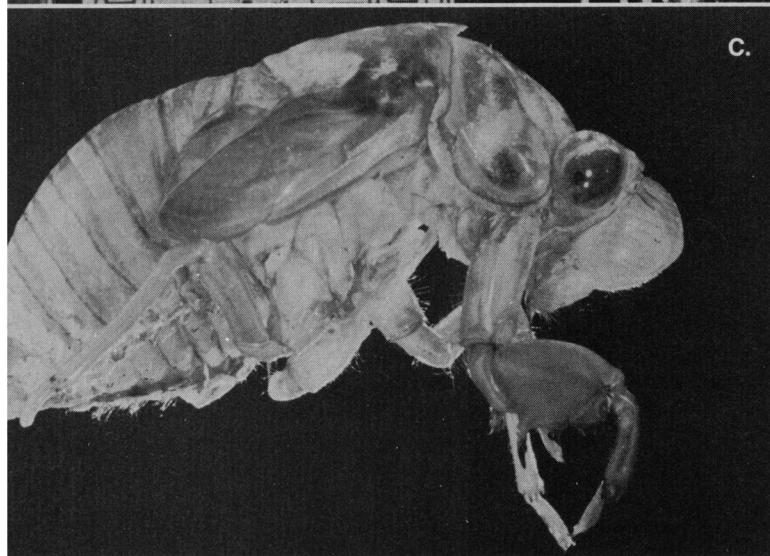




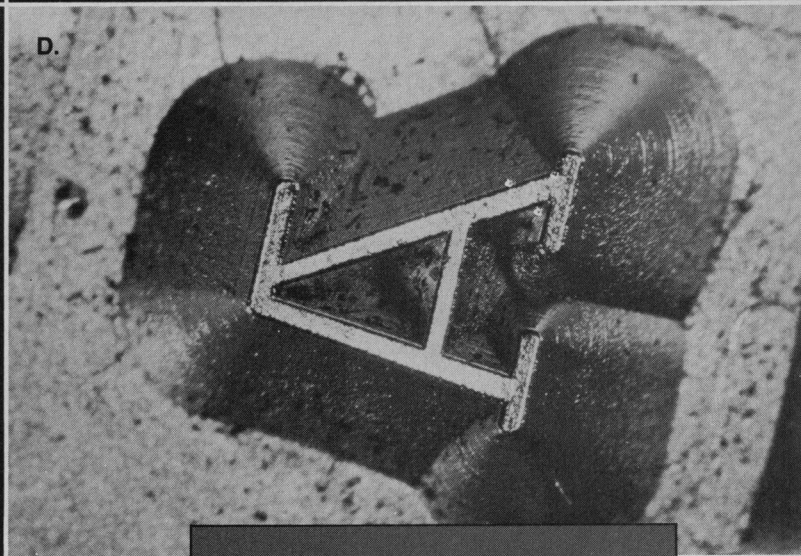
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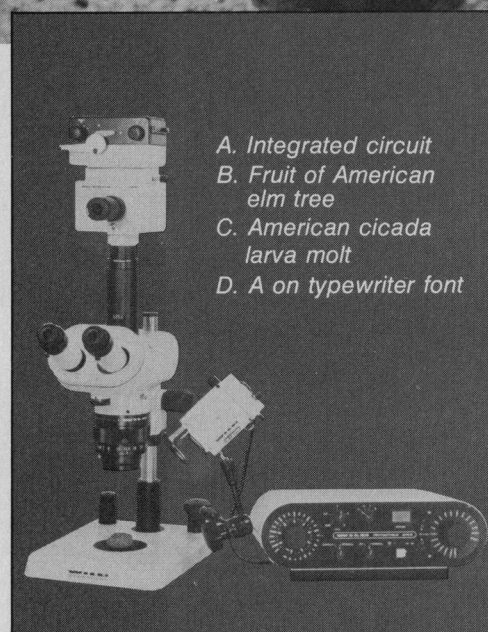
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A wide variety of accessories is available.

Call or write E. Leitz, Inc., Rockleigh, NJ 07647. (201) 767-1100.



- A. Integrated circuit
- B. Fruit of American elm tree
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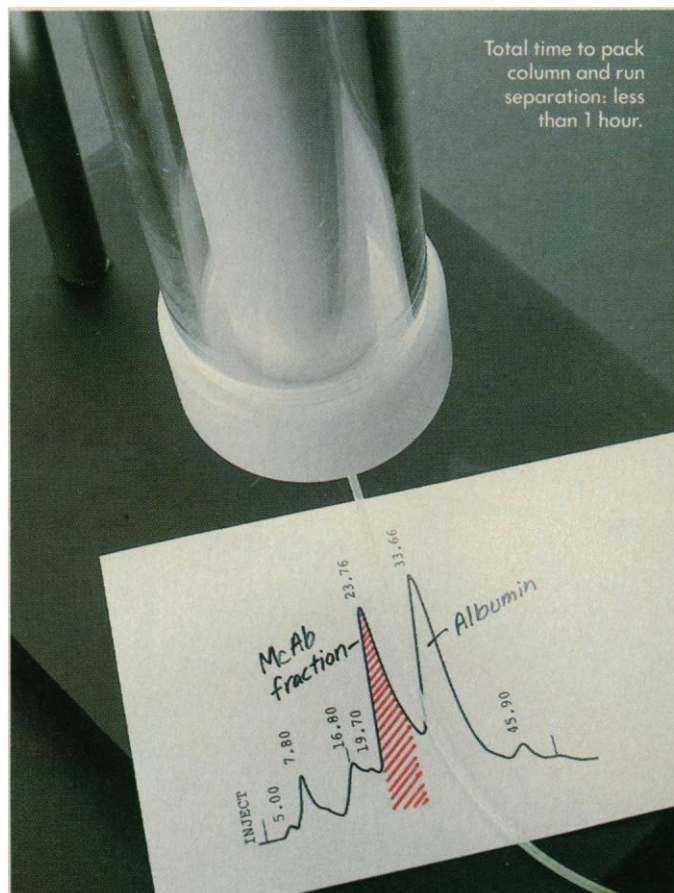
Wild M420 photo macroscope

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HPLC

HPLC (High Pressure Liquid Chromatography) is a...
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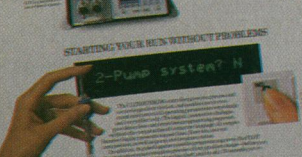
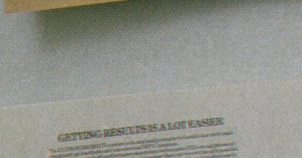
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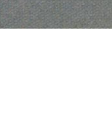
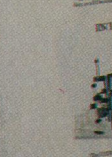
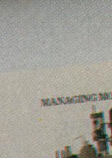
High resolution

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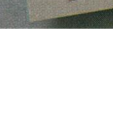
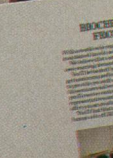
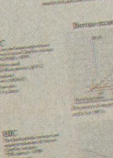
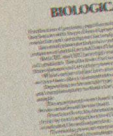
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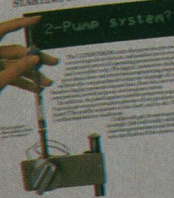
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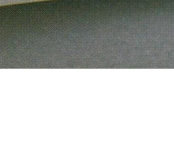
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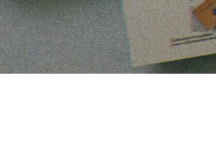
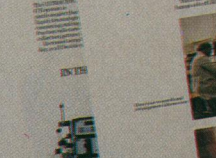
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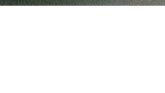
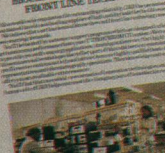
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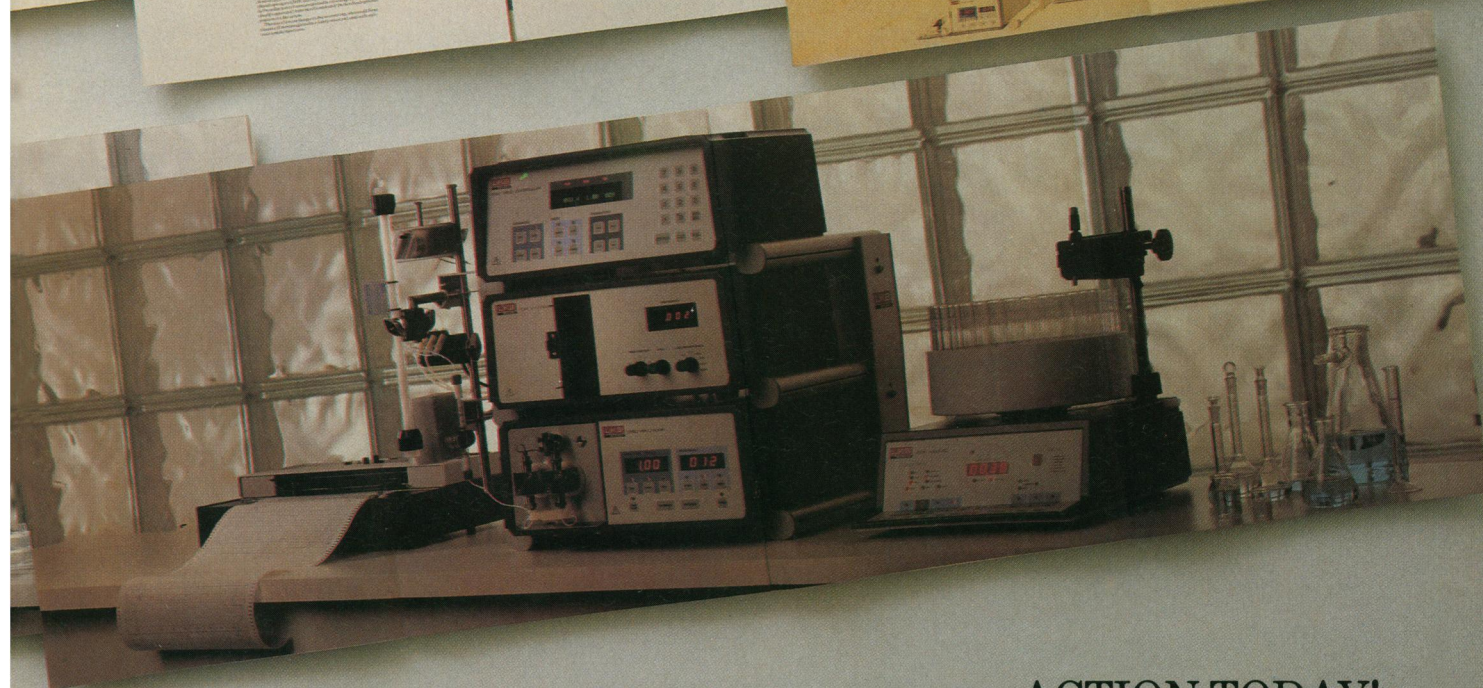
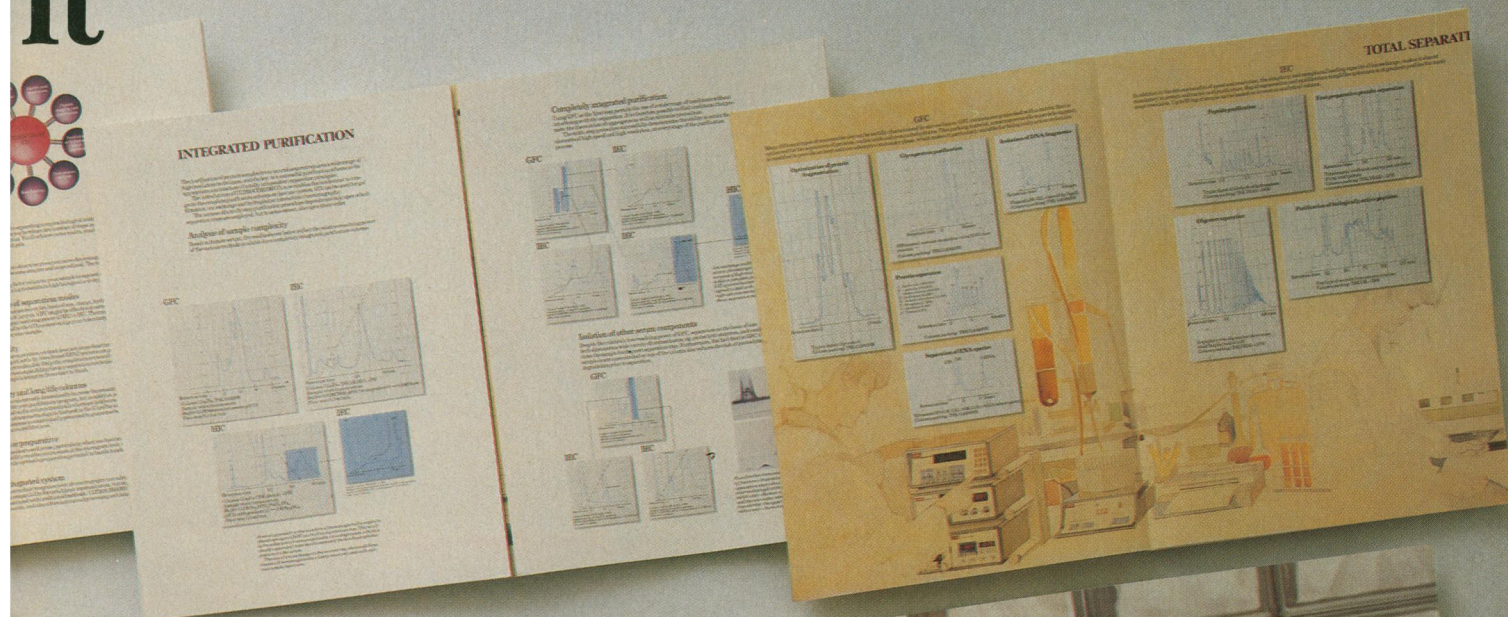
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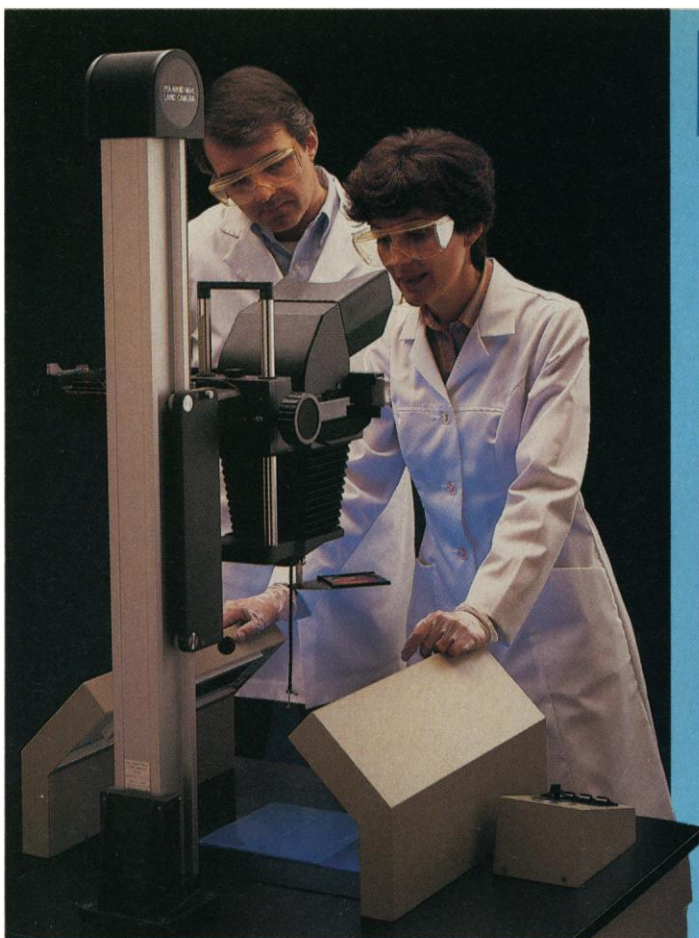
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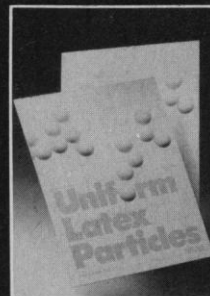
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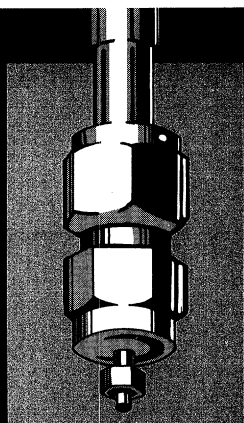
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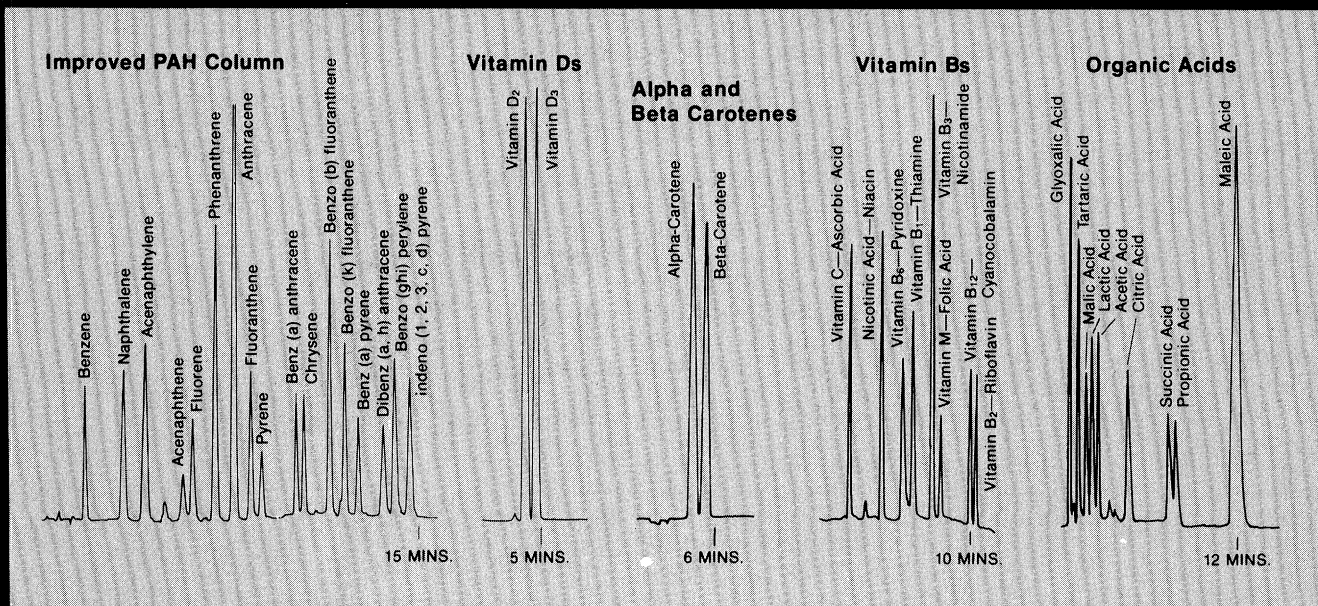
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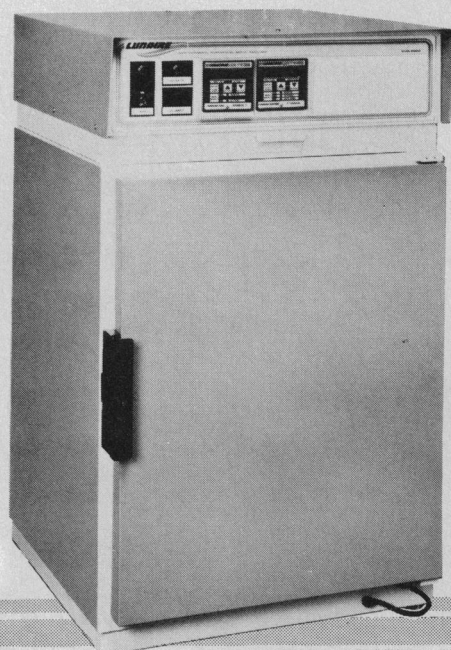
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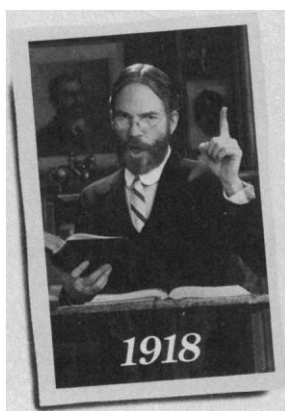
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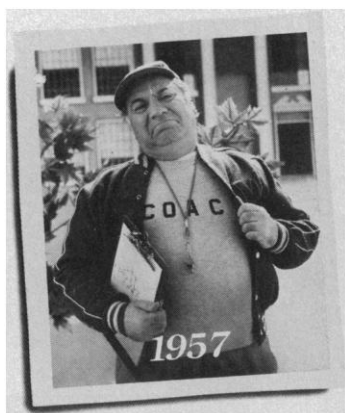
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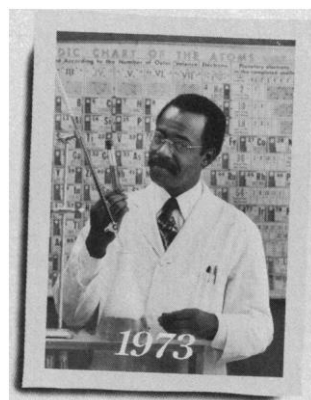
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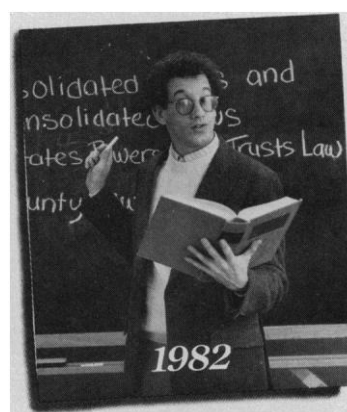
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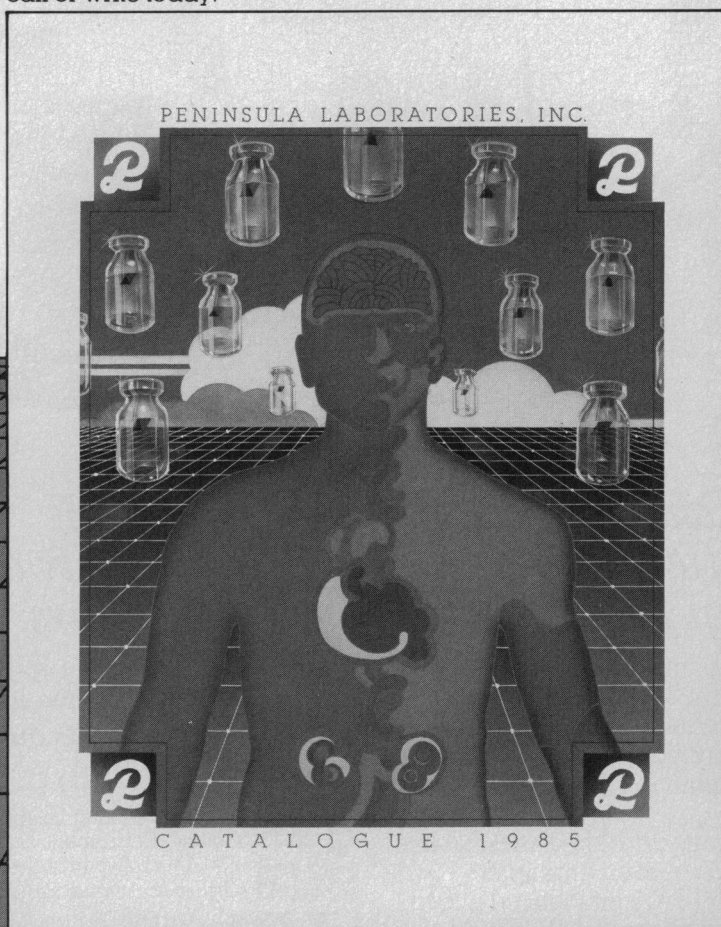
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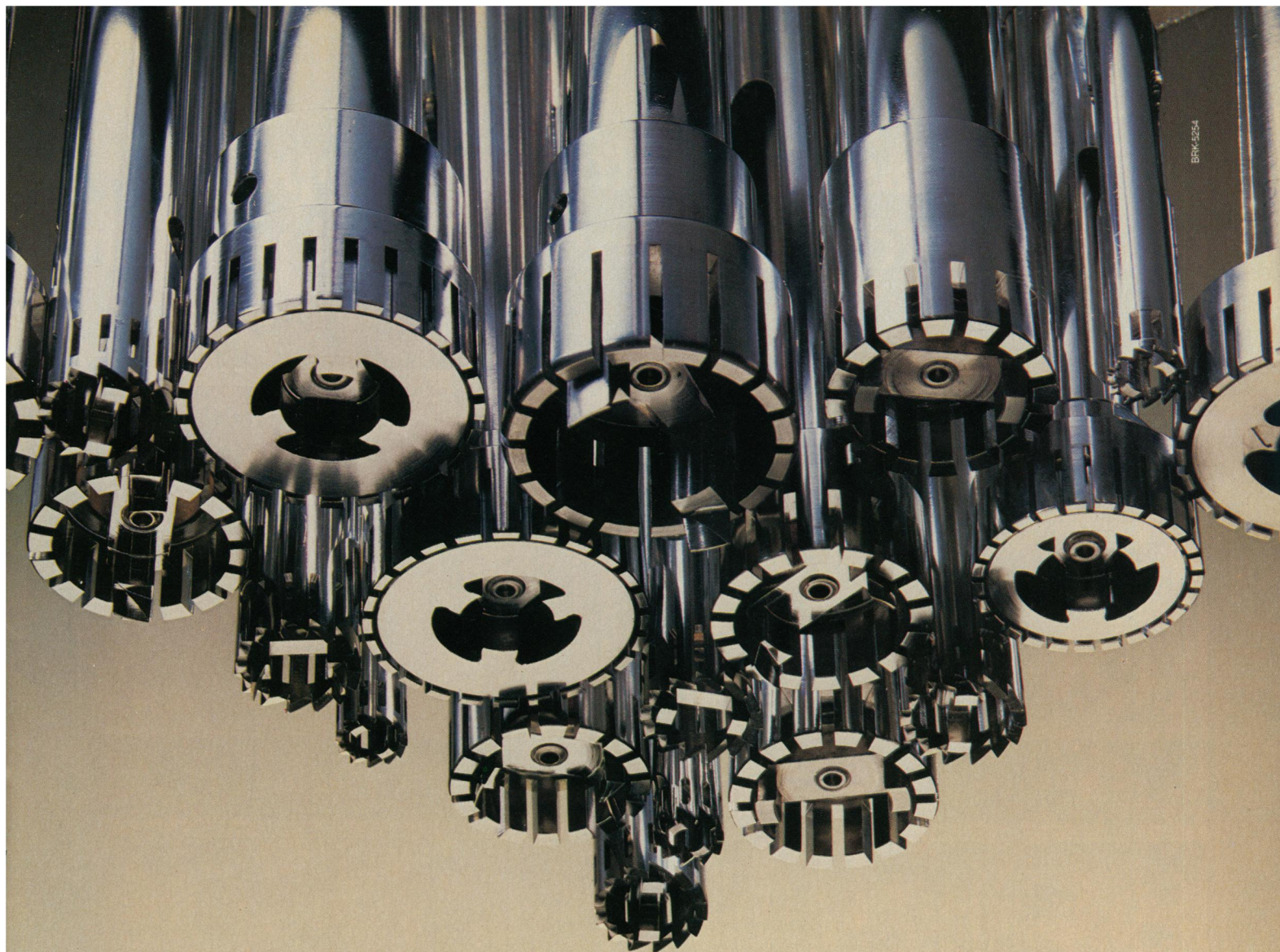
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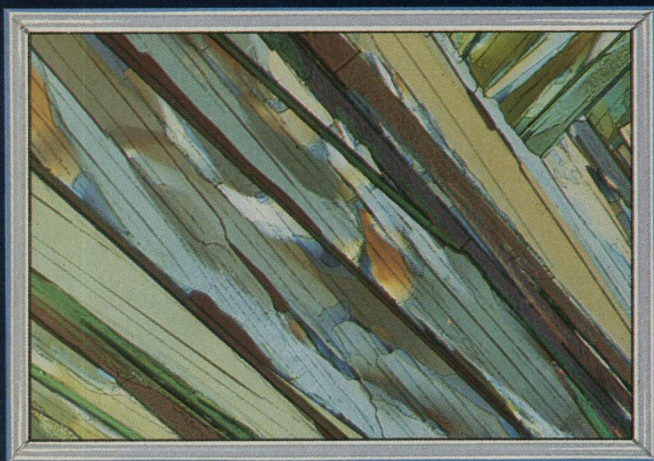
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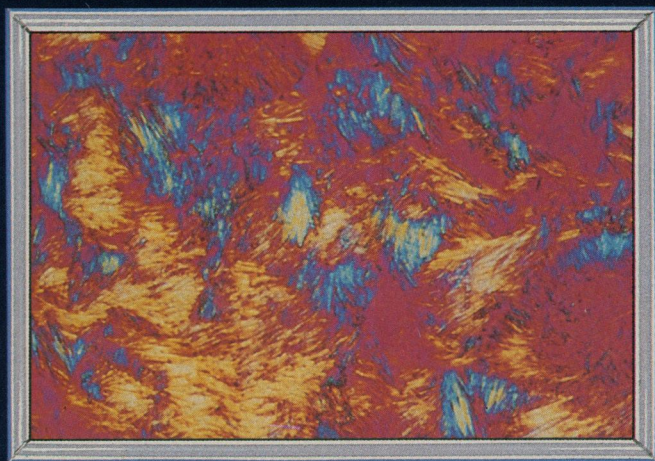
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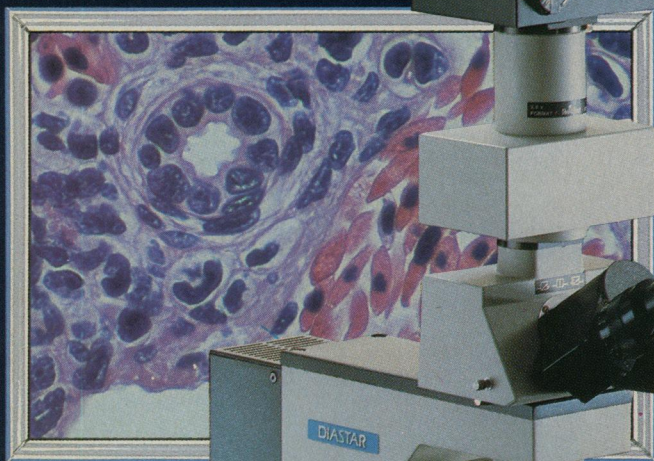
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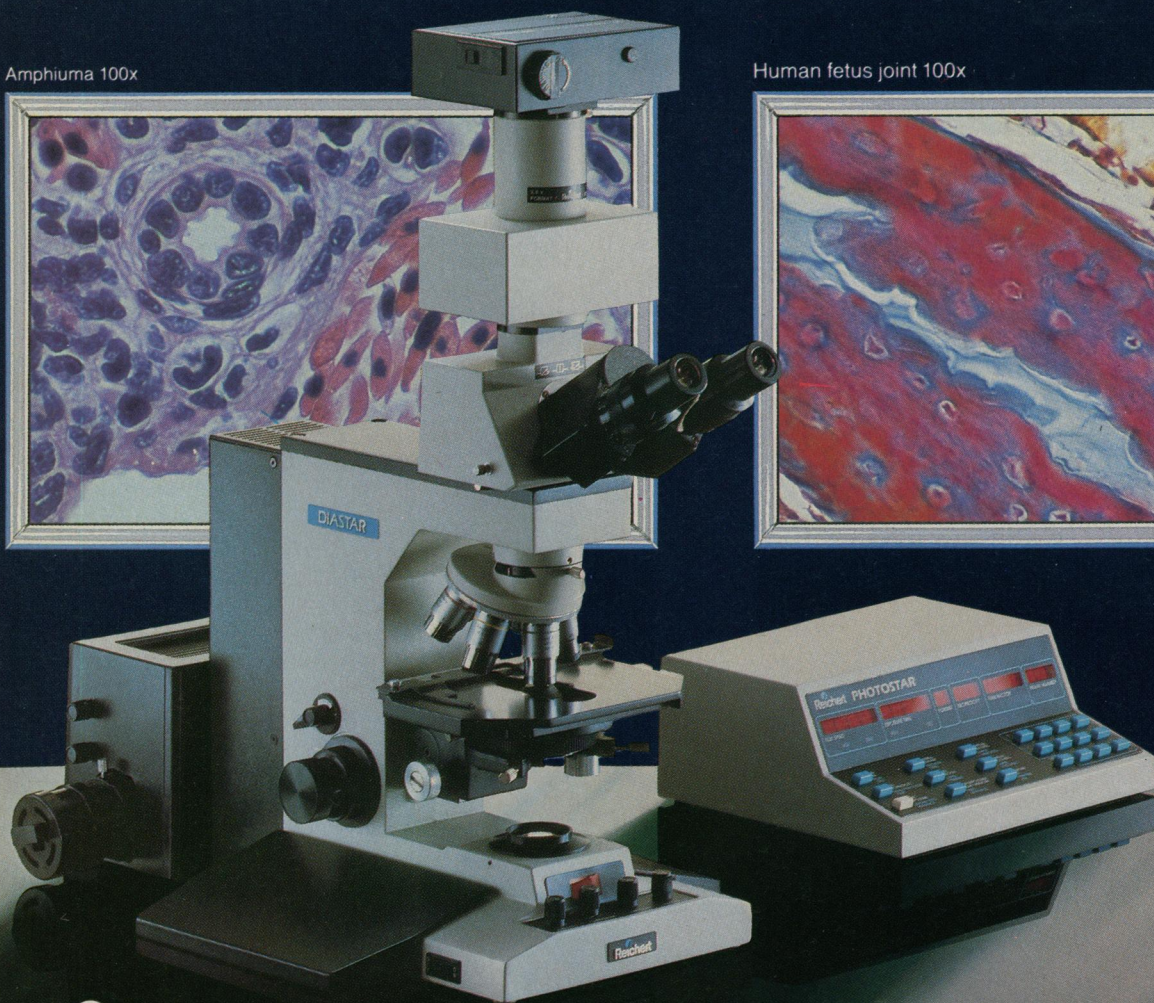
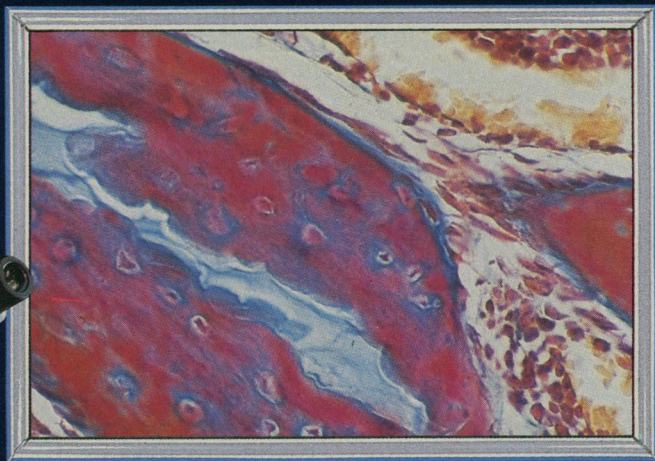
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LETTERS

African Drought

Garrett Hardin (Letters, 15 Mar., p. 1284) states that bad years occur as a matter of course in Africa and therefore "[i]t is only prudent to define the carrying capacity as being well below any momentary maximum attainable in a good year." What is needed, he argues, is radical population control and prudent management; without population control, he says, the technological solutions listed by Jean Mayer (Editorial, 15 Feb., p. 707) to help Africans predict droughts and ride them out are "useless."

This is temperate zone science in which the "wisdom" of Western resource management is transferred inappropriately to the rest of the world. The tropics, indeed, are characterized by resource fluctuations. The economical way to exploit such environments is to track the fluctuations opportunistically, as traditional populations long have done (1). African pastoralists, for example, have habitually exploited forage variations by moving their herds to the good places each year and season, and they have developed various mechanisms of stock redistribution within the society to recover rapidly from a drought.

Population control must be exercised in Africa as anywhere in the world, but perhaps the most pragmatic solutions to the modern problems of African food production will lie in the direction of enabling people to carry out their management adaptations in a timely and efficient way. Obvious improvements along these lines are better transportation, the development of markets, and livestock and seed banks.

Better weather monitoring is also needed to enable a response to be made to drought as soon as it develops. Unlike Joseph in Egypt (Genesis 41), we will never be able to predict a drought 7 years before it begins. But the modern technology and traditional knowledge is already available to allow planners to emulate Joseph's program as Pharaoh's overseer: to take advantage of production during times of plenty to tide the people through times of famine.

A. ENDRE NYERGES

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References

1. S. Sandford, in *Desertification and Development: Dryland Ecology in Social Perspective*, B. Spooner and H. S. Mann, Eds. (Academic Press, London, 1982); R. T. Wilson, *Arid Environ.* 1, 327 (1978).

Automobile Fuel Efficiency

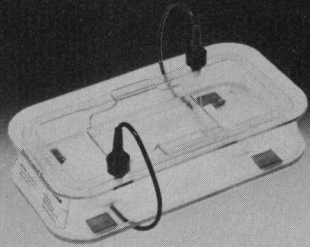
In their article "Technological trends in automobiles" (10 Aug., p. 587), Emmett J. Horton and W. Dale Compton of the Ford Motor Company described automobiles with fuel economies "in excess of 100 miles per gallon (mpg) on the highway" as being potentially the "'average' vehicle of the late 1990's." (One hundred mpg would correspond to 2.35 liters of fuel consumed per 100 kilometers). This is technically correct. Volkswagen and Volvo have already demonstrated attractive prototypes that achieve about 65 mpg on the Environmental Protection Agency's (EPA's) composite (55 percent urban and 45 percent highway) driving cycle and more than 70 mpg on the highway. These prototypes do not include such technologies as wide-range, continuously variable transmissions, or turbo-compounded adiabatic diesels (1), which should allow further dramatic fuel efficiency improvements.

Tom Bull, A. Alic, and L. L. Jenny (Letters, 8 Mar., p. 1156) are also correct when they state that such "very fuel-efficient automobiles... may not appear until well into the 21st century." Indeed, at the current rate we will never get there. The trend toward improved fuel economy in new U.S. automobiles has been essentially stalled since 1981 (2), Ford and General Motors are not meeting the federally mandated Corporate Average Fuel Economy standard of 27.5 mpg for model year 1985, and these same companies are requesting (3) that the Department of Transportation lower the standards for subsequent years to 26 mpg. Currently, 26 mpg as measured by the EPA test used to monitor compliance with the standards corresponds to about 22 mpg for average on-the-road driving (4).

How then are the nation and the world to realize the enormous technological potential for automotive fuel savings? The only suggestion made in the Horton-Compton article and the letter by Bull *et al.* is that future increases in oil prices will eventually encourage further increases in automobile fuel economy. But, even with quite large increases in fuel prices, it is unlikely that "the invisible hand" of the market will result in the realization of more than a small fraction of the potential fuel savings (5).

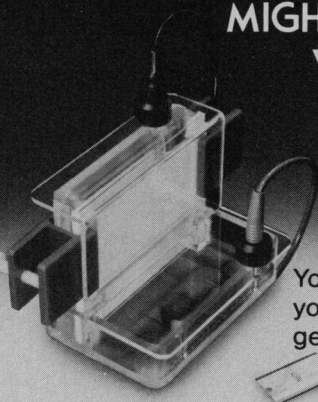
According to auto manufacturers, new car buyers will only invest in fuel economy improvements that pay for themselves within the first 2 to 3 years of ownership—typically about 30,000 vehicle-miles. Over this distance, a fuel economy improvement from 14 mpg [the

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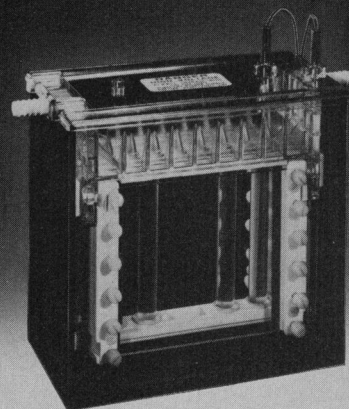
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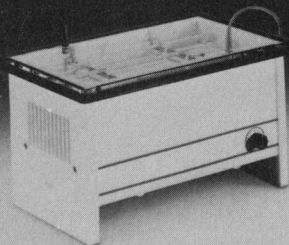
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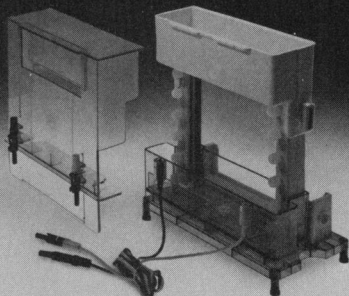
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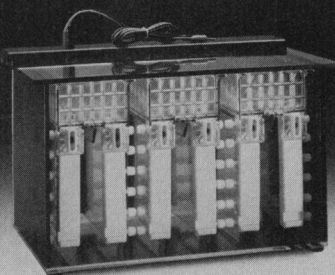
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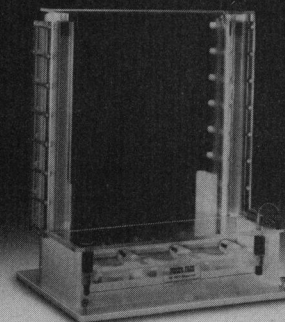
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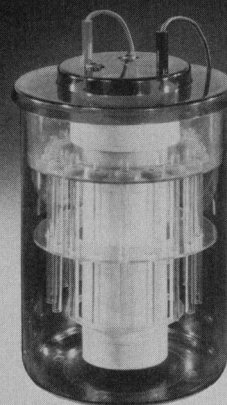
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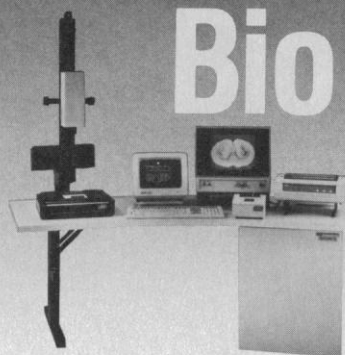
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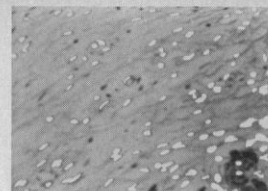
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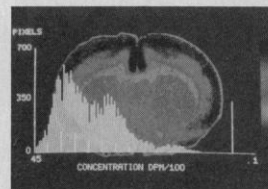
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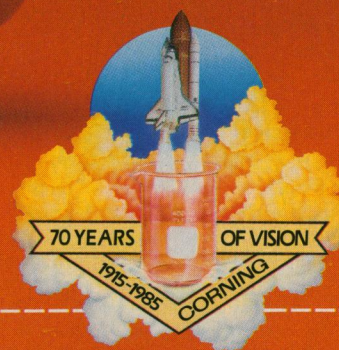
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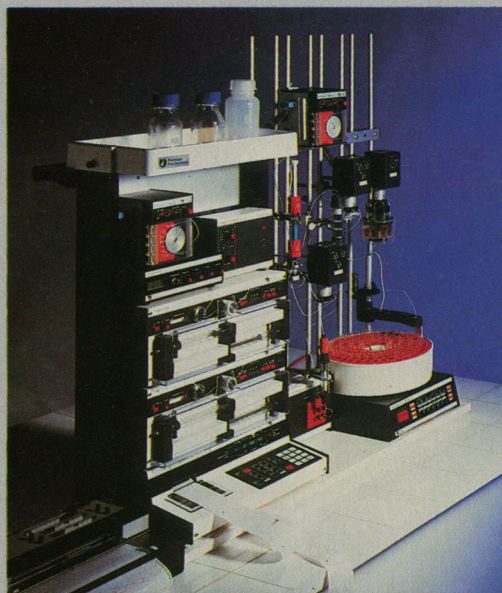
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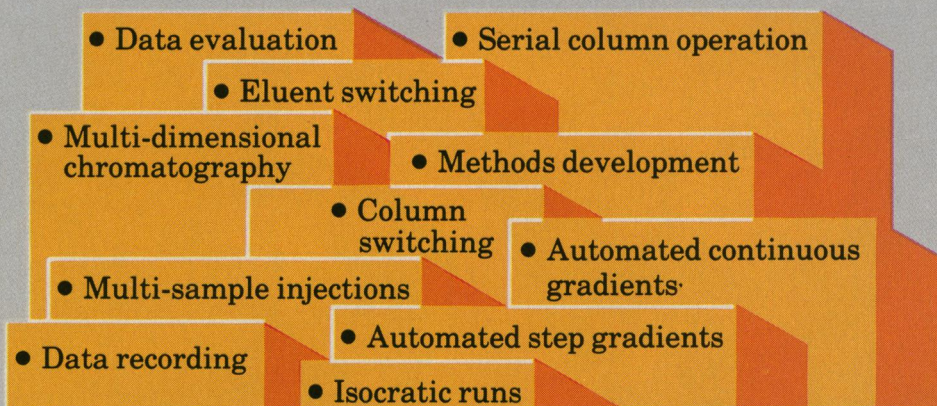


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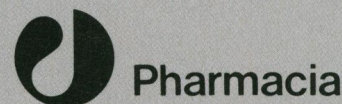
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The training and promotion of young scientists is one of the principal aims—and a statutory requirement—of the Deutsche Forschungsgemeinschaft (DFG). As an institution, the DFG can provide only a skeletal framework for the education of the next generation of scientists. Its activities, however, play an important part in initiating and maintaining the personal contacts, relationships, and experiences that must add the flesh to the bones.

Our estimate is that approximately 55 percent of the DFG's total budget in 1983 (898 million deutsche marks) went directly to the benefit of young scientists. Of the more than 10,000 research assistants working in DFG-funded projects, 90 percent or more were students, graduates, or post-doctorate research scientists. They were employed full time or part time in projects directed by experienced scientists who assumed responsibility for the project, its funds and, consequently, its participants.

This is an important point. Doing good research requires more than knowledge. Initiative, willingness to work hard and long, and the ability to cooperate and communicate one's ideas are just as crucial. In this respect, research is similar to a trade—it should be learned from a master. Many of the scientists from all disciplines who contributed to the DFG's report "Forschung in der Bundesrepublik Deutschland" acknowledge how important for them were the examples of their teachers, together with their hints, ideas, criticism, and encouragement.

Senior scientists have a special responsibility. Personal contacts with students—in spite of the almost insurmountable problems caused by the overcrowding of our universities—are the necessary beginning. Later, a researcher's graduate student and post-doctorate research scientist must be carefully and responsibly guided, their inclinations and opportunities being given priority over one's own particular research interests. The best academic teachers are those whose students surpass them, and Sir Howard Florey, whose name will always be linked with the benefits of penicillin, held the training and promotion of younger scientists to be the most important task of their older colleagues.

Among the programs that the DFG offers to young scientists, I think the Heisenberg Program is the most notable. These are fellowships that are granted to researchers after their habilitation for a maximum of 5 years; they enable the young scientists to continue their research at a place of their own choice (at home or abroad), unhampered by other duties in what is hopefully one of the most productive phases of their career. Intended to alleviate the difficult situation caused by the abrupt termination of the rapid increase in the number of university jobs, the Heisenberg Program has so far proven very successful and has been widely acknowledged. Thanks to the high standards of the selection committee, Heisenberg fellows enjoy a high reputation and have very good chances of finding satisfactory positions.

The DFG's efforts on behalf of young scientists, varied as they are, make sense only if scientists who take the risk of entering a research career have reasonable prospects of attaining a permanent position. Public and private institutions have a part to play here. With a little effort and imagination, the creative potential of a whole generation of scientists can surely be put to good use in research, industry, or trade. Encouraging the development of the abilities and the initiative of these young scientists is one of the soundest investments in the future that we can make.—EUGEN SIEBOLD, *President, Deutsche Forschungsgemeinschaft, Kennedyallee 40, D-5300 Bonn 2, Federal Republic of Germany*

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