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# SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

MATERIALS SCIENCE



**NEW FROM BECKMAN:**

*Digital accuracy  
in a tabletop centrifuge*



The AccuSpin™ centrifuge from Beckman. It brings today's technology to tabletop centrifugation.

Controls are digital for accuracy that can't be matched by analog models. Flashing diagnostics and digital displays let you know run conditions at a glance. A digital speed control system maintains set speed with no overshoot—accurate to 10 rpm.

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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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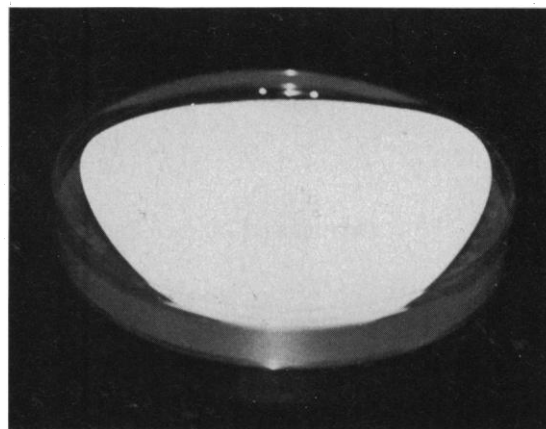
GeneScreenPlus™ is the new transfer membrane that gives you not only highest sensitivity and excellent band resolution, but trouble-free handling as well.

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Our Applications Laboratory is available to answer your questions about hybridization methods using either of these products. Meanwhile we'll be glad to send you detailed information on their performance characteristics. Simply call New England Nuclear or circle the Reader Service Number.

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## COVER

Polymeric structural materials such as composites of "Kevlar" aramid or carbon fiber and resins are replacing metals in many aerospace applications. The high strength of the fibers in these composites depends on a molecular morphology which takes maximum advantage of the strength of the individual polymeric molecules. See page 642. [E. I. duPont de Nemours and Company, Inc., Wilmington, Delaware 19898]

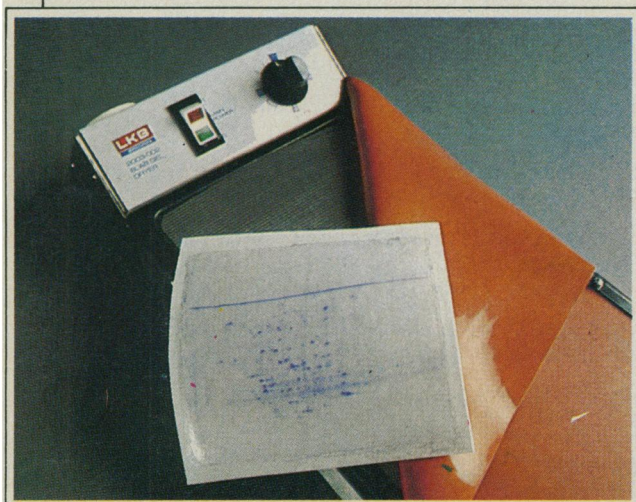


# LKB offers you a choice of two

# This one combines fi

If it's genuine versatility you're looking for, then you need look no further than the LKB Vertical Electrophoresis System. With a dual gel capacity that allows you to run up to 40 samples at a time, its design ensures that all gels are always run under uniform conditions, thereby guaranteeing superior reproducibility. And now we have further enhanced the already impressive versatility of this system by adding a 30 cm gel capability for even higher resolution, a tube gel kit for greater 2-D flexibility, and the new LKB Transphor Electroblotting Unit for improved visualization.

*This fine 2-D gel shows the use of the LKB Gel Dryer in preparing gels for storage, scanning or autoradiography ▼*



## No grease, no leaks, no mess

One clear benefit of using the LKB Vertical Electrophoresis System is the simplicity it brings to the job of gel casting. The basic system includes everything you need to cast and run perfect gels first time, every time. The gels are cast between glass plates, avoiding both the use of grease and the probability of leaks and turning gel casting into a clean and pleasant activity.

*The Tube Gel Kit allows the LKB system to perform both the first and second dimensions in 2-D applications ►*

## PAGE and gradient PAGE techniques

Conventional PAGE and SDS/PAGE techniques, using either continuous or discontinuous buffers, are fully catered for by the basic LKB system. The addition of our Gradient Gel Kit provides a quick and convenient method of casting both linear and exponential gradient polyacrylamide gels. Due to their relatively small pore size, these gels effectively limit diffusion. Linear gradients counteract band broadening effects, while exponential gradients are useful for resolving components with widely differing molecular weights.

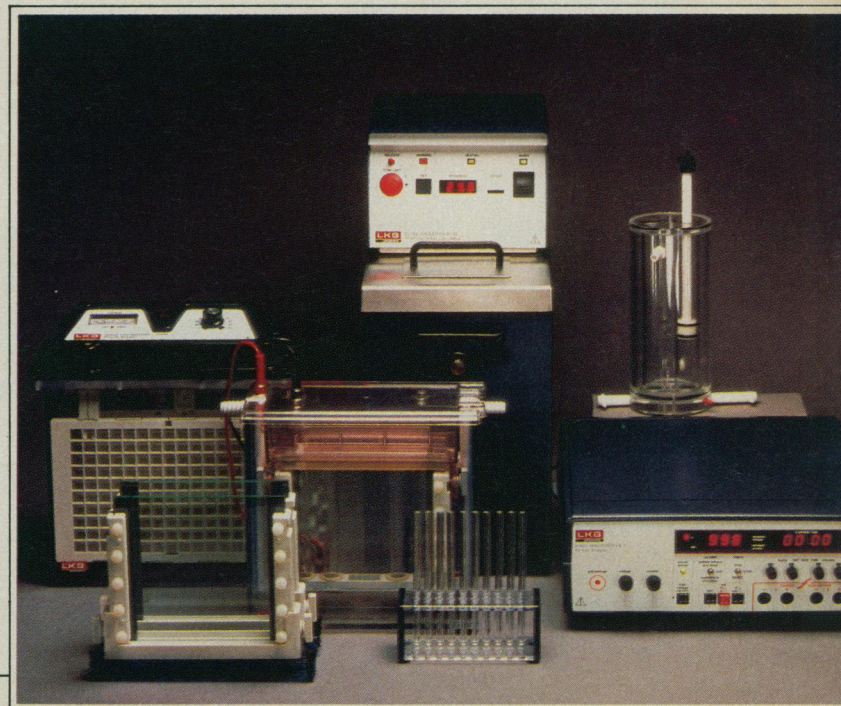
*The Vertical Electrophoresis System, based on the LKB 2001 Electrophoresis Unit, also includes a power supply, thermostatic circulator and all the necessary accessories, kits and quality chemicals ▼*



## THE LKB SYSTEMS APPROACH

At LKB we believe that we should be able to give you professional training, advice and support in the use and application of our products. And we should certainly be able to supply you with everything you need to perform your experiments, so you never have to worry about where each item comes from, how good it is, whether it will work properly with all the other pieces of apparatus, and who to turn to when you have problems. That is why we offer complete integrated systems, not merely a range of individual units. LKB systems contain all the instruments, kits, chemicals, accessories and supplies you will need in your laboratory. Every component of the system is designed to work together with and enhance the high performance of all the other components. Every item carries our name, and we take full responsibility for it.

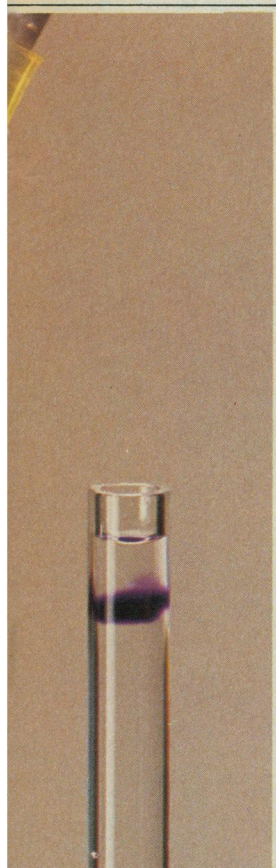
**LKB - the electrophoresis experts**





# Vertical Electrophoresis Systems

## ve different techniques



### Agarose gel techniques

For researchers who sometimes want to use agarose, there is a special kit to help you cast and run the 3 mm agarose gels on the LKB Vertical Electrophoresis System. The kit includes frosted glass plates to provide essential support for the gel.

### Two-dimensional techniques

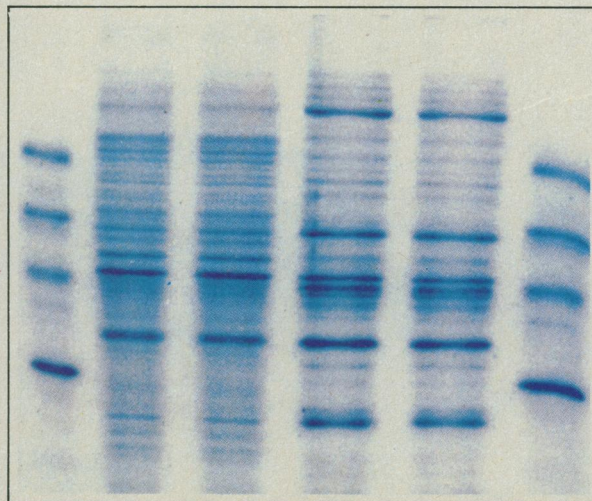
This is the only complete vertical electrophoresis system that can carry out both the first and second phases of 2-D electrophoresis in a single unit, and can offer the user a choice of either tube or slab gels for the first dimension. Our 2-D Kit includes a special cleaver for preparing slab gels, while tube gels are easily applied to the top of a standard slab gel by means of the trough built into the upper buffer chamber.

*LKB's new Transphor Electrophoresis Unit improves the sensitivity and resolution of detection procedures ►*

### Autoradiography techniques

Another kit, containing all the accessories you need to cast accurate gels only 0.75 mm thick, makes it easy for you to use the LKB Vertical Electrophoresis System for high resolution autoradiography using thin gels. The LKB Slab Gel Dryer, which combines dry heat and reduced pressure to rapidly dry and affix the gel onto paper or film for later analysis and storage, is ideal for drying down thin gels onto disposable plastic sheets prior to detection.

*The result of gradient gel electrophoresis of two crude extracts from Beneckeia harveyi on the LKB system ▼*

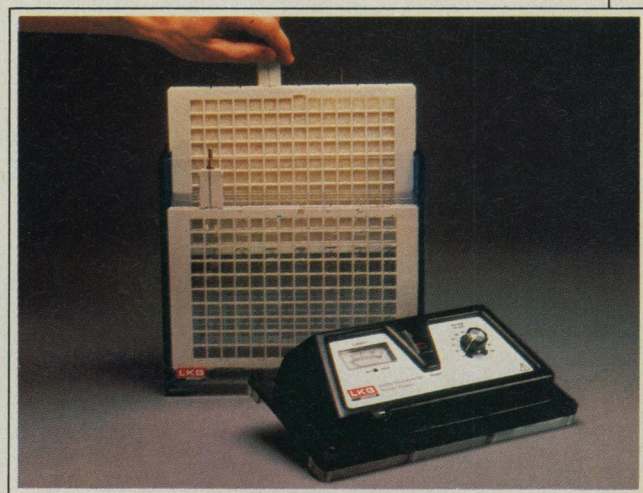


### Electroblotting techniques

The new LKB Transphor uses the principles of electrophoresis to transfer proteins or nucleic acids from polyacrylamide or agarose gels onto nitrocellulose or other immobilizing matrices. In this way the electrophoresis bands are made easily accessible for faster and more sensitive visualization than on the original gel. The resulting patterns can be stored for months without deteriorating and multiple analyses can be performed using just the one pattern.

### Want proof?

These may sound like extravagant claims, but just call us and we'll be happy to come and demonstrate the versatility of the LKB Vertical Electrophoresis System for you and your colleagues. At your convenience.



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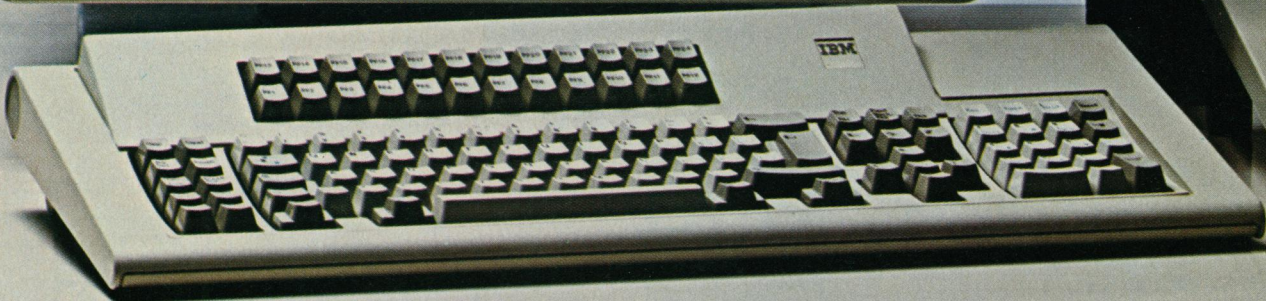
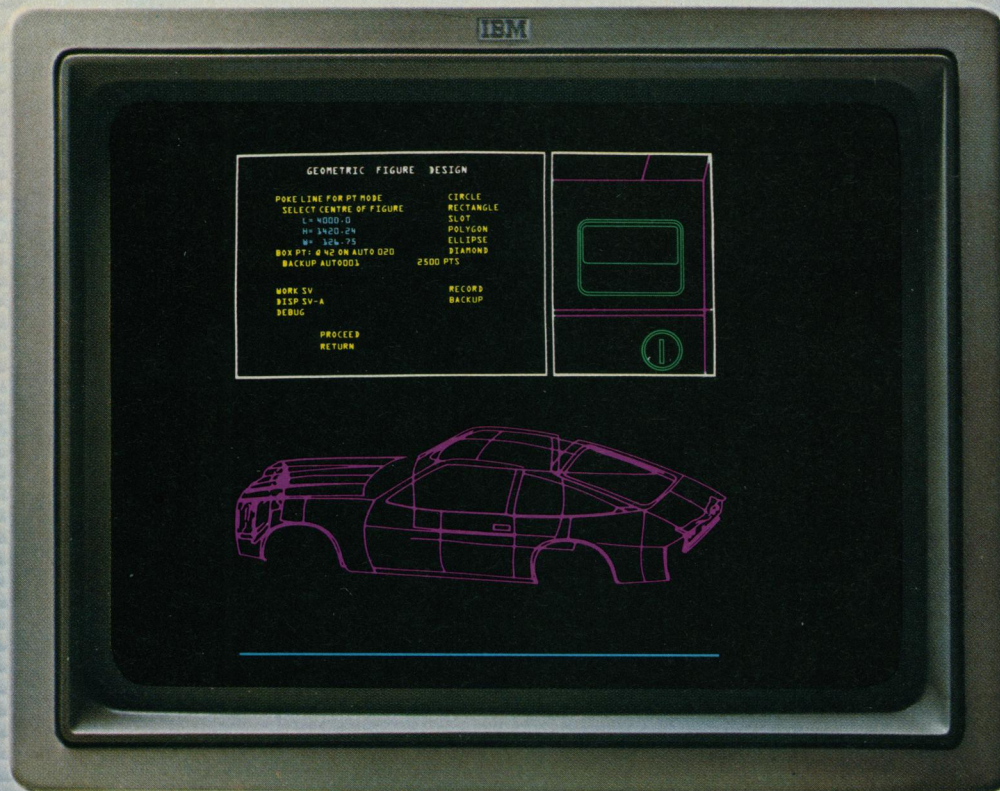
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## The Smart Desk from IBM



# simple approach to graphics.

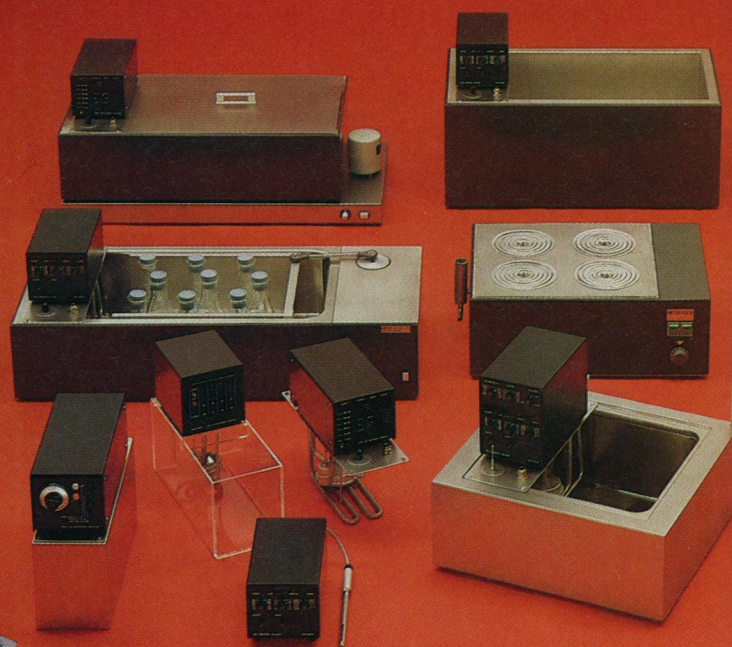




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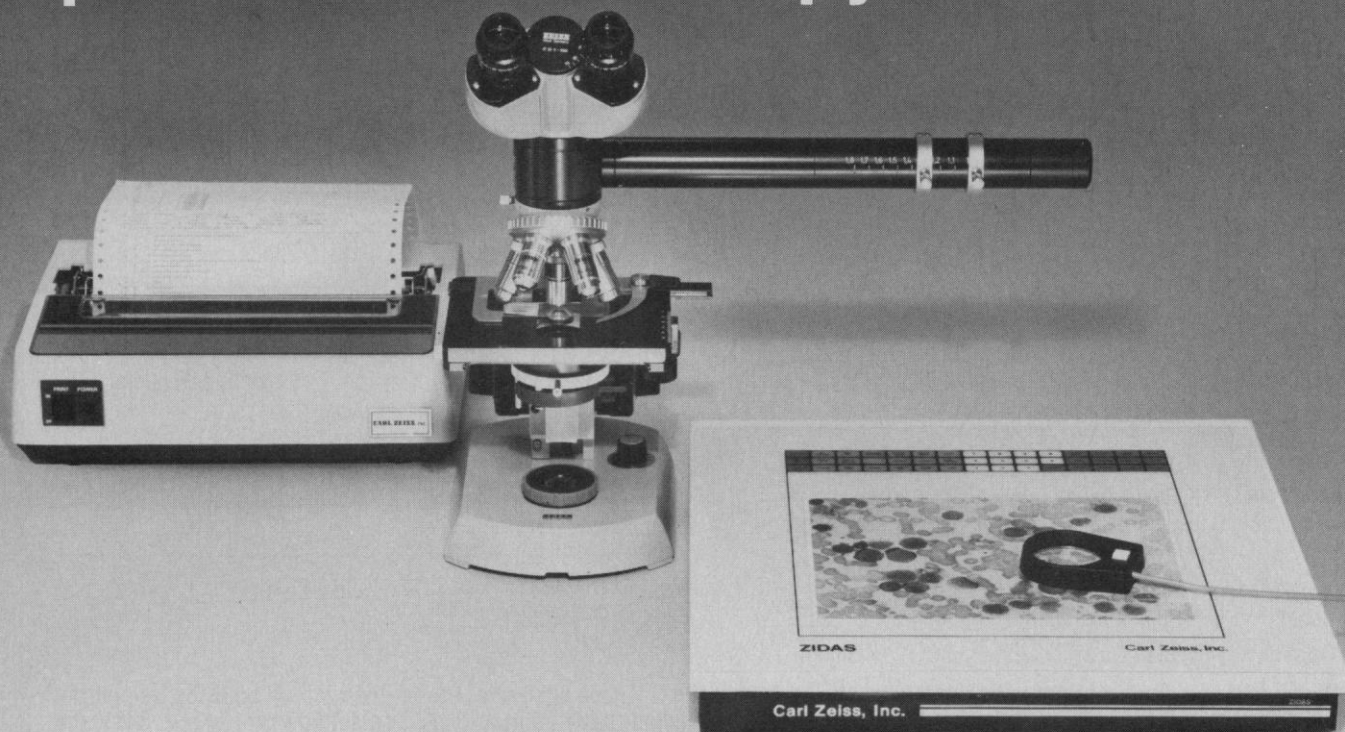
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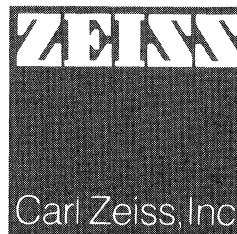
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**Participants are invited to submit abstracts for the poster sessions. These abstracts will be reviewed up until the time of the meeting; however, only those accepted by Dec. 15 will be published in the journal, DNA. Contact Edward Ruffing, Scherago Associates, Inc., (212) 730-1050.**

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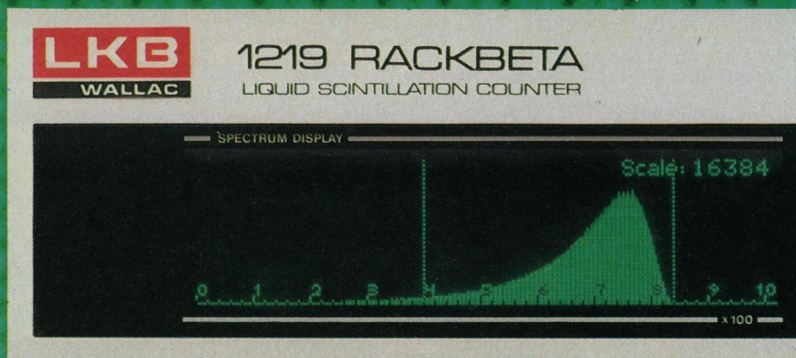
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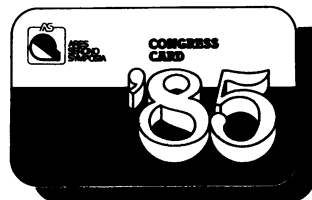
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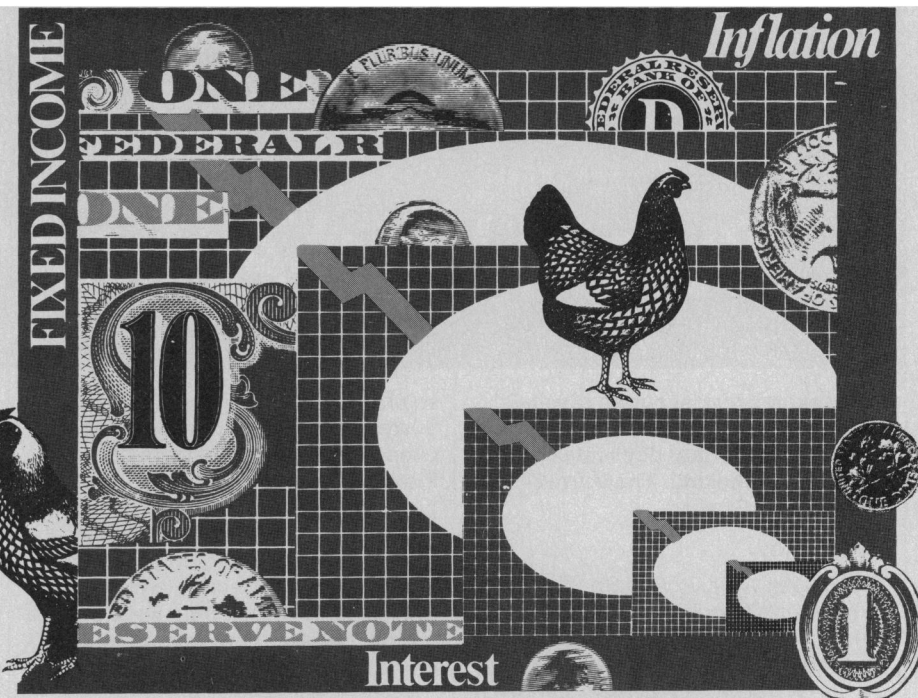


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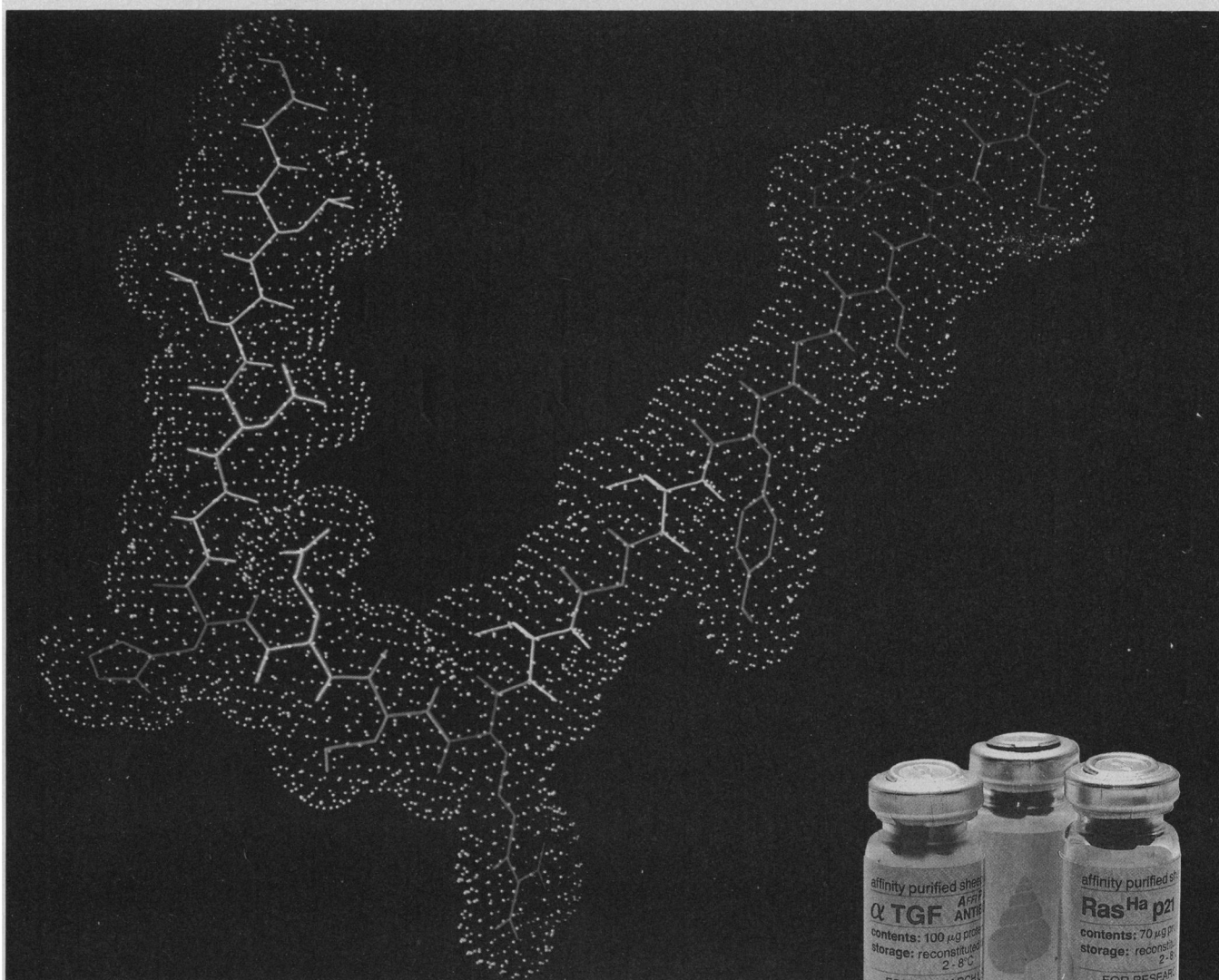
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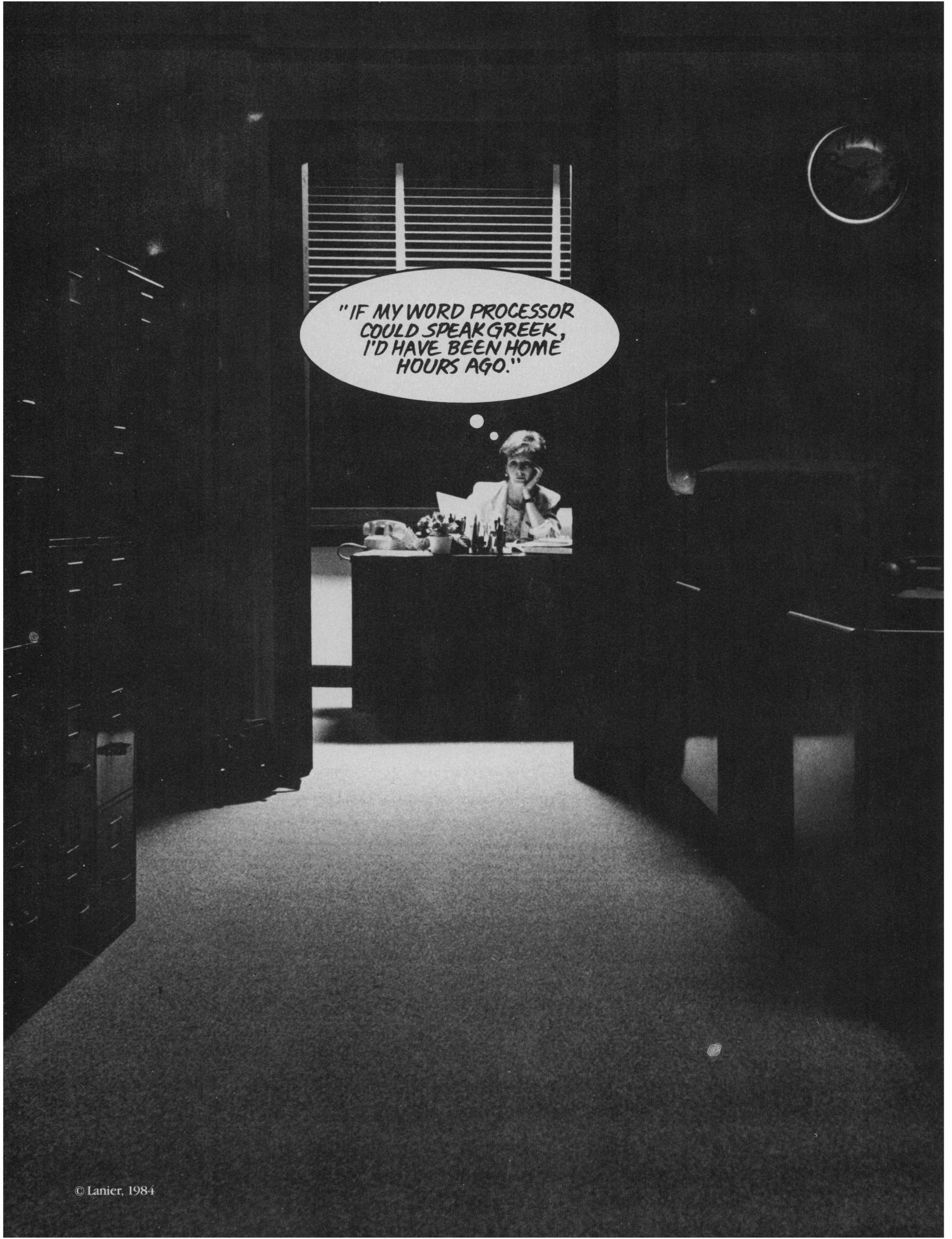
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Ability to compete in high technology will be an important determinant of success in the competition between nations and regions. In turn, success in technology is crucially linked to leadership in materials science. The development of new or improved materials permits the creation of new technologies, better quality control, less costly products, and, in some instances, less dependence on imports of scarce elements. To advance materials science requires close collaboration of physicists, chemists, and engineers. Laboratory experimentation is stimulated by theoretical physicists or chemists. Scientific advances also come as a result of stimuli generated by engineering needs. Interesting developments in materials science are occurring; some of these are portrayed in this issue of *Science*.

For the most part, the chemistry of the substances available for use as materials is well known. However, the behavior of substances at surfaces and interfaces is not well understood. Microstructures, both in the interior and at the surface, can have a large effect on properties. One method of markedly altering a surface is ion implantation, which is widely used in the semiconductor industry. It is also increasingly being used in other applications to provide surfaces that differ radically in composition from the bulk of an object. Intense, but short-period, laser irradiation can almost instantaneously melt a shallow layer at a surface; this is followed by a comparably fast solidification. This treatment can freeze into place microstructures with superior resistance to friction, wear, and corrosion. Laser treatment of engine parts is now widely used in the automobile industry.

Research on the surficial interactions between living tissue and prosthetic devices has led to potentially improved performance of the millions of implants that are done each year. Particularly useful are glasses or ceramics containing some calcium phosphate. At the surface of the prosthetic device in the presence of body fluids, hydroxyapatite is formed. Cells recognize this substance, are compatible with it, and form connections to it.

In many applications, engineers seek materials that maintain their tensile strength at high temperatures and that are resistant to corrosion. Many of the alloys now in use contain imported chromium as an essential constituent. Research reported in this issue discusses the properties of Ni<sub>3</sub>Al. Ordinarily this intermetallic alloy is brittle and unworkable. However, with the addition of boron (200 parts per million), it becomes ductile. Its strength actually increases with temperatures up to 900°C, and it is comparatively free from corrosion.

Plastic composites seem destined for very large-scale applications in the aircraft and automobile industries. Already one manufacturer of airplanes has announced a new model to consist largely of plastics. There will be great savings in weight as well as fewer parts to assemble. A large fraction of the Pontiac Fiero will consist of composites. Intrinsically, some polymer molecules are extremely strong. To use them advantageously requires a knowledge of their behavior during processing. Once strong fibers are formed, composites may be created to meet engineering specifications.

Two of the articles in this issue describe theoretical studies and research aimed at revolutionizing computers and data transmission. The impetus for part of this work comes from the successful development of optical means of communication with the use of glass fibers. It also is based on the development of lasers that are capable of delivering extremely short pulses. In principle, computers based on photon processing could operate much faster than the current semiconductor devices.

Efforts to advance materials science will continue to be driven by opportunities and international competition. Students who have an aptitude for the physical sciences and a desire to participate in research with obvious payoffs in meeting societal needs will find work in the materials sciences rewarding.—PHILIP H. ABELSON





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