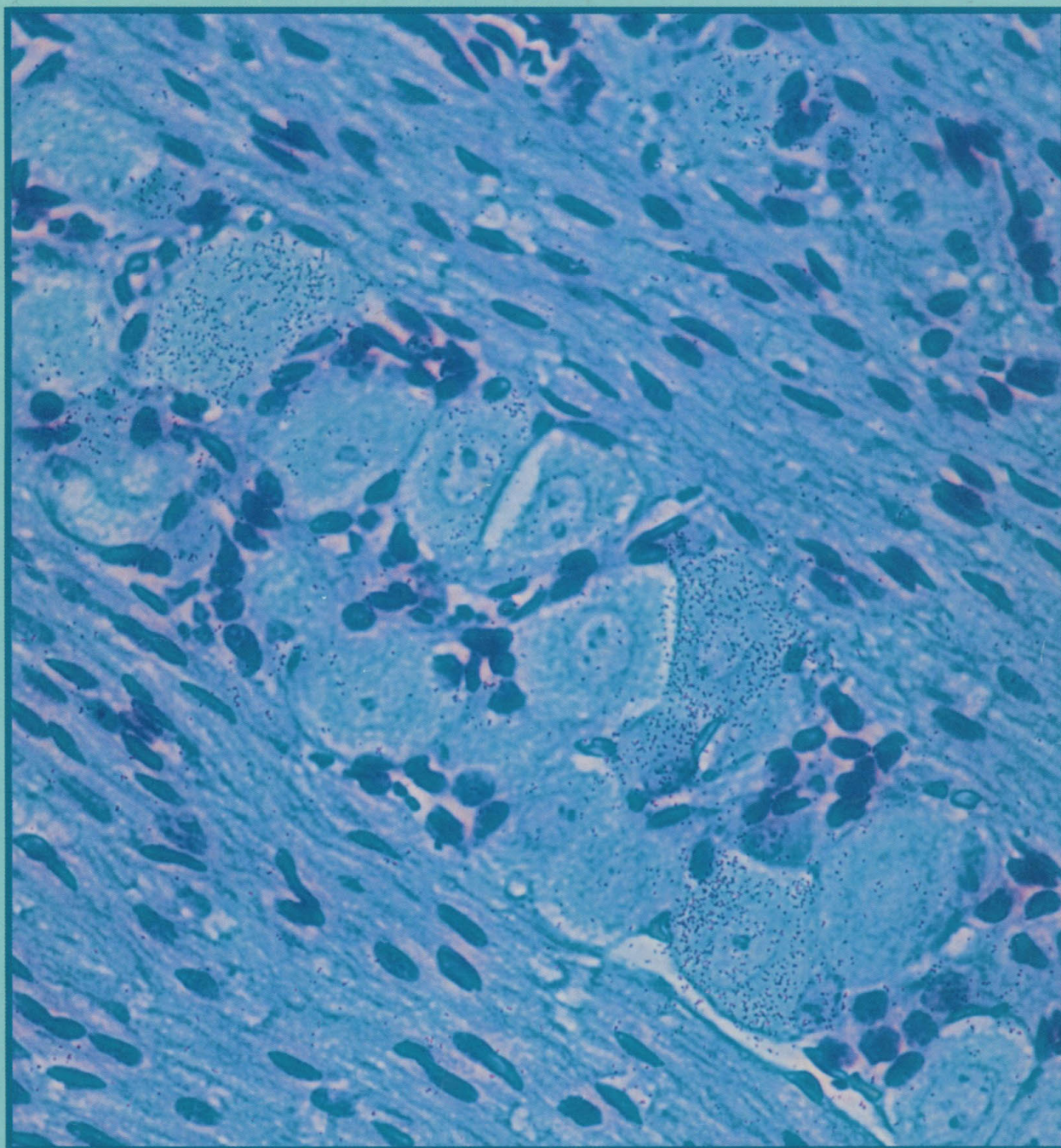


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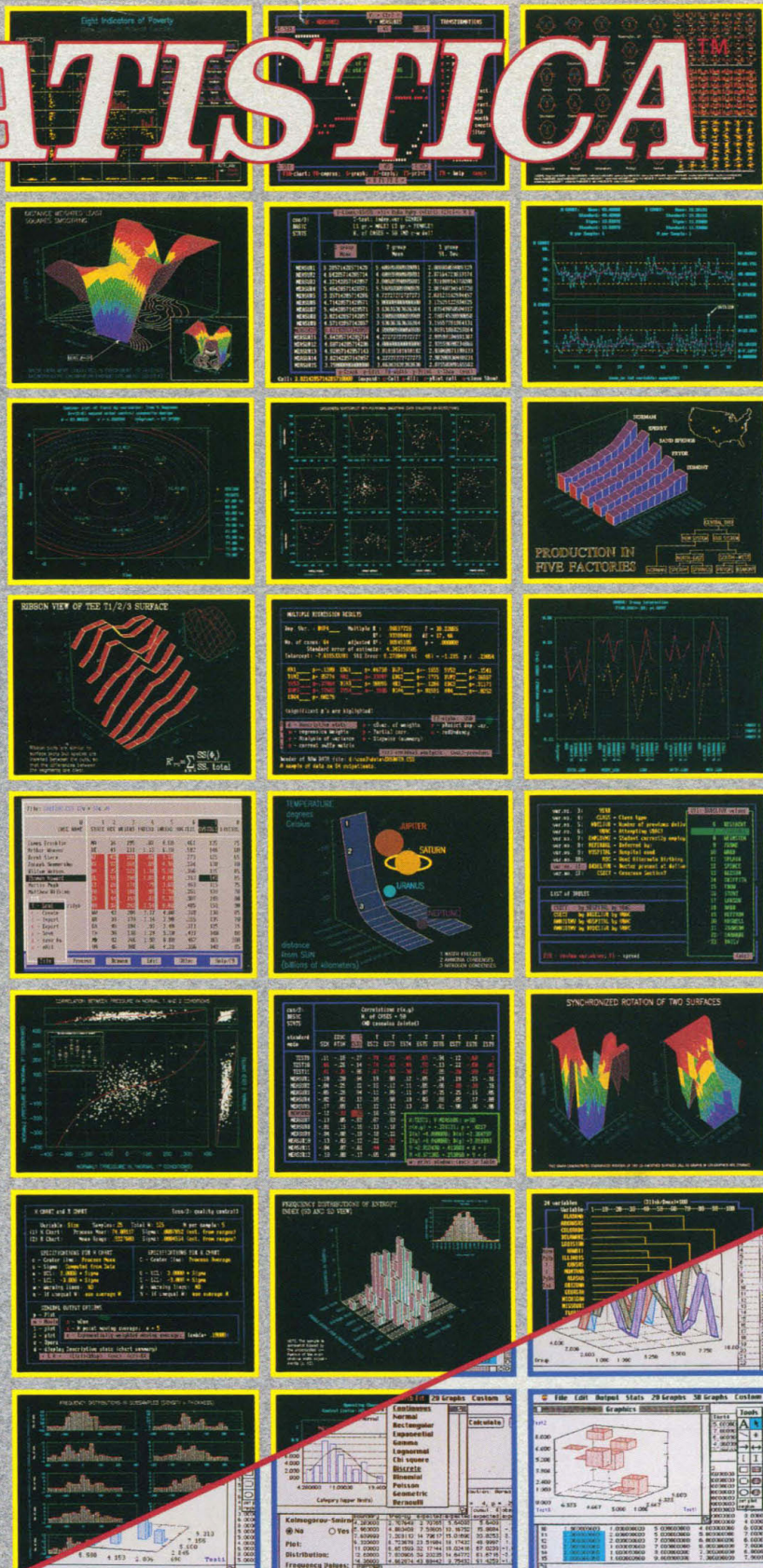
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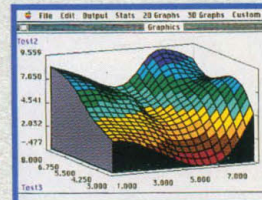
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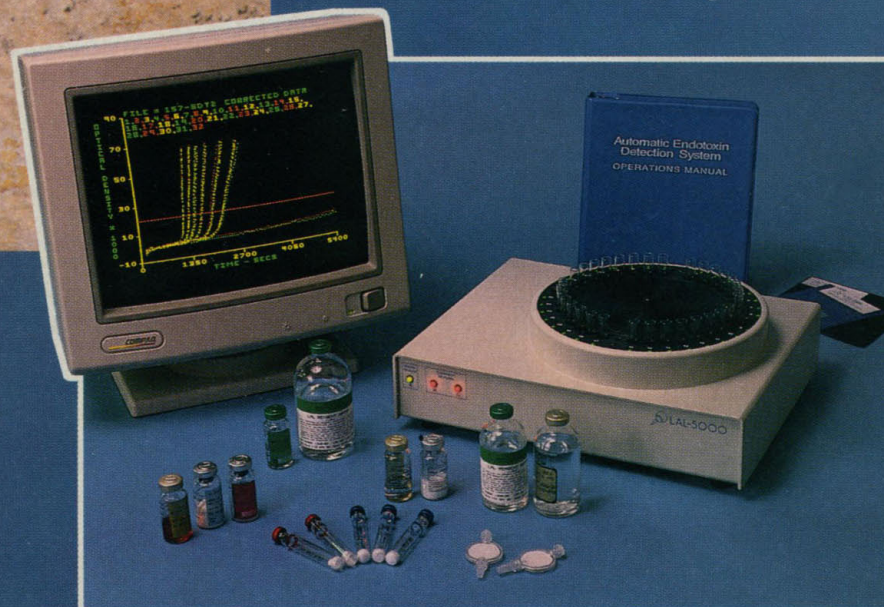
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COVER Expression of the *trk* proto-oncogene in neurons of the adult mouse trigeminal ganglion. This photomicrograph shows a toluidine blue-stained section of trigeminal ganglion that has been hybridized with an antisense *trk* complementary RNA probe. The grains that overlie the large, light blue neurons indicate *trk* expression. The smaller, dark blue, nonneuronal cells do not express *trk*. See page 554. [In situ hybridization and photomicroscopy by L. F. Parada]

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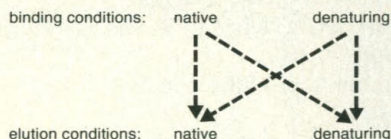
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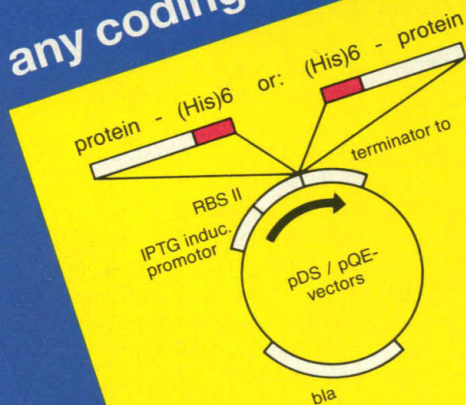
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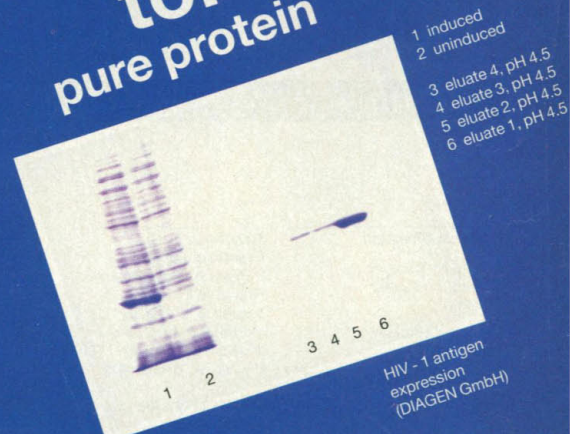
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# This Week in SCIENCE

## Jupiter's stratosphere

**F**OR the past decade, measurements of the thermal infrared (methane) emissions from Jupiter have been made with the NASA Infrared Telescope at Mauna Kea, Hawaii. In the Jovian stratosphere, any variations in the methane emissions arise from variations of temperature and not from variations in methane abundance. Orton *et al.* find that the Jovian stratosphere is as dynamically active as is Earth's stratosphere (page 537). Temperatures vary both spatially and temporally, with global-scale and local variations and short-lived and long-term variations being detectable. Composite profiles of the dynamic features of the Jovian stratosphere that will be based on the methane-emission data, on data that will be obtained by the Galileo spacecraft after it goes into orbit around Jupiter in 1995, and on data that will be collected at other infrared wavelengths by astronomical cameras that are now under development should lead to a better understanding of the Jovian stratosphere itself, the effects of the stratosphere on global circulation, and the interactions of the stratosphere with the troposphere.

## RNA as a transcription factor

**T**HE cellular machinery that brings about the transcription of genes is protein; or so it was thought. In a study by Young *et al.*, a transcription factor that is not protein but RNA has been identified (page 542). The heretical RNA factor assists the enzyme RNA polymerase III in its activity of transcribing class III genes of silkworms. What will this discovery reveal about the transcription process? Will it alter understanding of how the transcription machinery has evolved? How does a research laboratory discover something this unexpected? And what, in fact, might the RNA be doing? These are some of the questions addressed in a Research News story by Hoffman (page 506).

## Fullerenes

**H**OLLOW cage-like all-carbon molecules, fullerenes, are produced when carbon burns. Scanning tunneling microscope investigations by Li *et al.* show that when buckminsterfullerene ( $C_{60}$ ) is deposited on gallium arsenide surfaces, the strong interaction leads to large stable monolayer islands of  $C_{60}$ ; within each island the  $C_{60}$  molecules line up in ordered arrays in register with the substrate (page 547). Diederich *et al.* have identified four higher fullerenes,  $C_{76}$ ,  $C_{84}$ ,  $C_{90}$ , and  $C_{94}$ , and a stable oxide  $C_{70}O$  as common products of the heating of graphite (page 548). Like buckminsterfullerene, these larger molecules have cage-like structures. Future characterizations should provide insights into novel physical and electronic properties of the fullerenes and into the factors that might enhance stability and account for preferential production and survival of these stable species.

## Nerve growth factor and Trk

**N**ERVE growth factor (NGF) is vital to the differentiation and maintenance of nerve cells (cover). It binds to receptors at the cell surface, initiating intracellular events that result in neuronal differentiation. Many basic elements of this process have been unclear, including the nature of the receptor and the way in which signals are transduced. Three Reports this week provide new information on the role of the proto-oncogene product Trk in NGF actions (pages 554, 558, and 561). The potential significance of these studies and of other recently published data on NGF and Trk is discussed by Barinaga (page 505).

## Genome scanning

**A** NUMBER OF "REVERSE GENETICS" procedures have been devised for identifying mutant genes when a mutant phenotype is

known but gene products or linked markers are not. One such procedure, genome scanning, has led to the identification of the gene that causes the pink-eyed unstable mutation of mice (page 566). Mice with the normal allele  $p$  have heavily pigmented eyes and coats; those homozygous for the disease allele  $p^{un}$  have greatly reduced pigmentation. A repetitive DNA probe was used to detect differences between the genomic DNAs of inbred normal mice and affected mice that are coisogenic; between the two strains of mice only genes relating to sex and the disease are expected to differ. The  $p^{un}$  allele was found to be duplicated in affected mice; the duplication was lost when the phenotype reverted to the wild type. Brilliant *et al.* discuss how the duplication and its loss could be directly coupled to the unusually high reversion rate of this allele, the highest known in mammals.

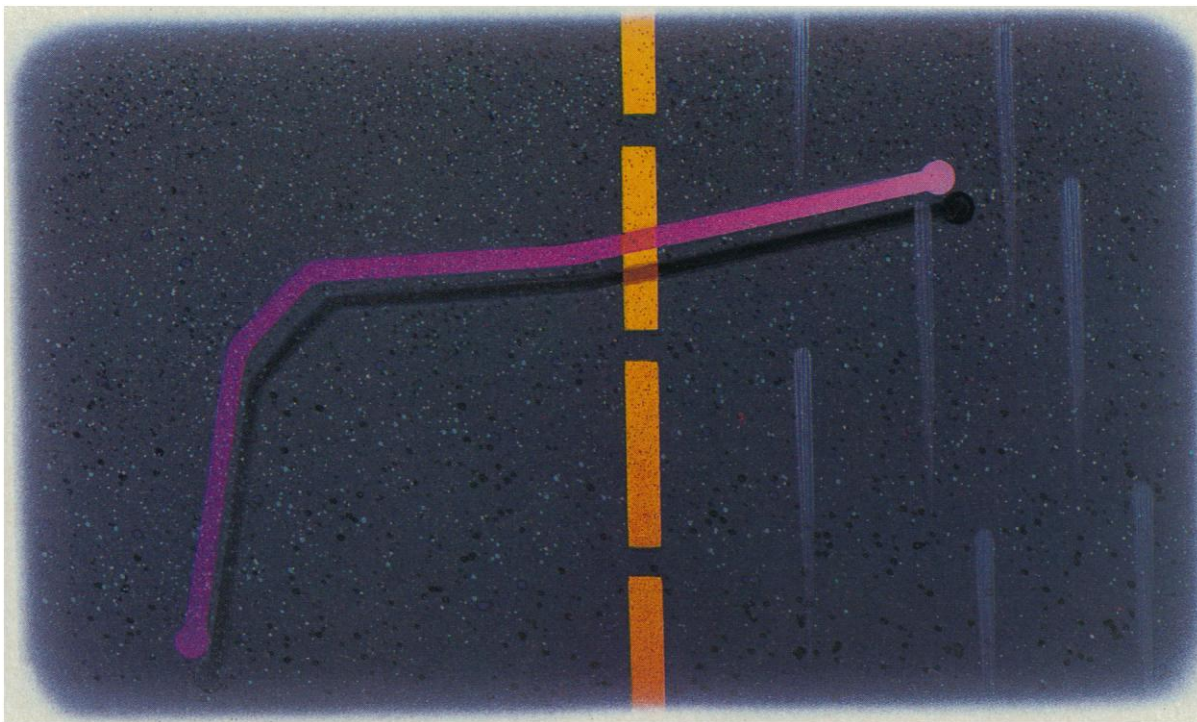
## Cellular plasticity

**W**HEN, during development, does the fate of a cell become fixed? Eisen has examined this issue as it pertains to primary motoneurons of zebrafish (page 569). These organisms have relatively fast-developing embryos, and their motoneurons, which innervate axial muscles, are large and distinctive. Single cells were moved to new spinal cord locations and development was then observed. If the cells were transplanted 2 to 3 hours before they typically reach the stage of axon development (some 18 hours after fertilization), the trajectories of the axons were appropriate to the new location; thus the cells were still responsive to local positional cues. If the cells were transplanted within an hour of axogenesis, the axons developed as would be appropriate for their old location, an indication that an irreversible stage of differentiation had been reached. This type of study helps to fix both the time when cell fate is decided and the stages leading up to it, such as when an embryonic cell is destined to become a generic versus a specific motoneuron.

■ RUTH LEVY GUYER



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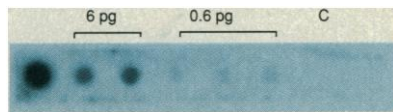


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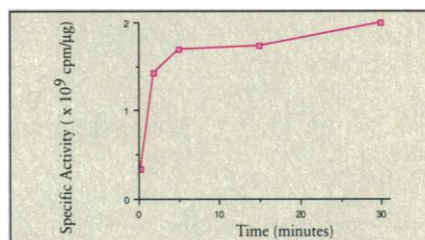
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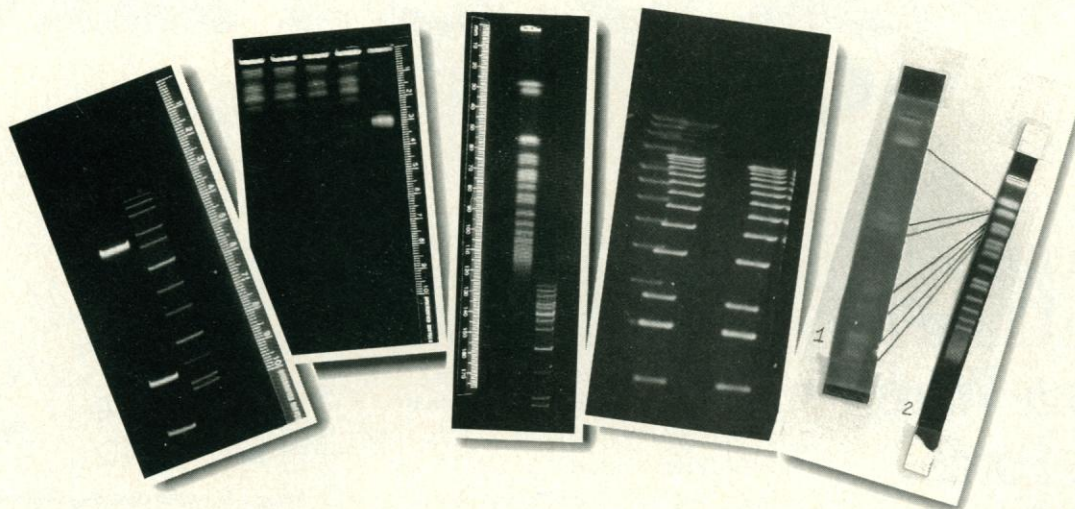
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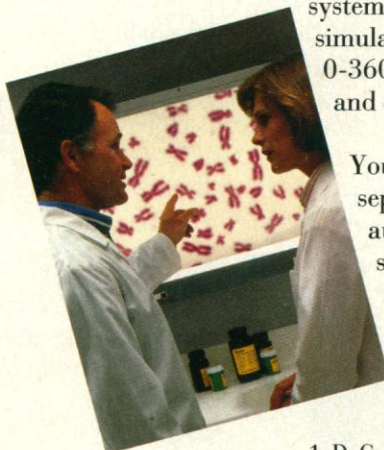
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1. D. C. Schwartz and C. R. Cantor. *Cell*, **67** (1984).
2. Programmed Autonomously Controlled Electrodes. See S. M. Clark, E. Lai, B. W. Birren and L. Hood. *Science*, **241**, 1203 (1988).

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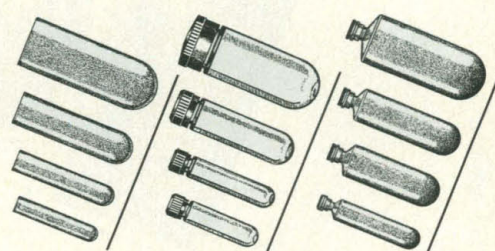
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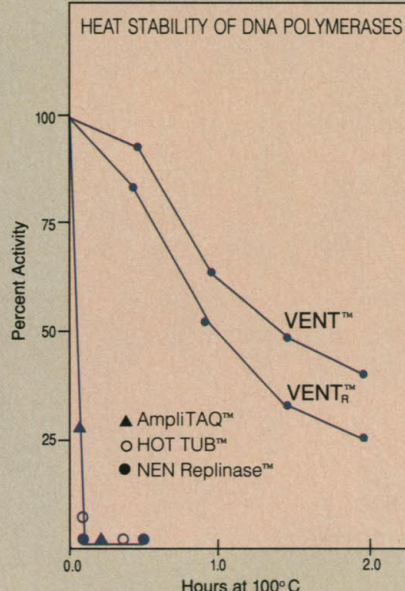
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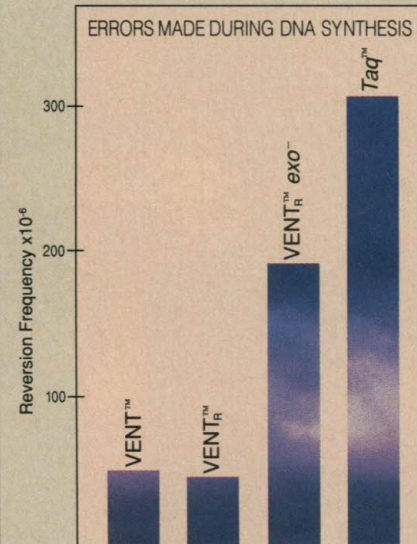
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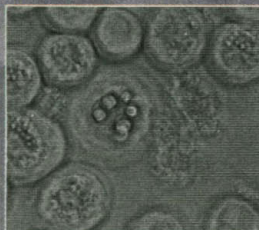


Figure 1. Infected Sf9 insect cells showing viral occlusions.

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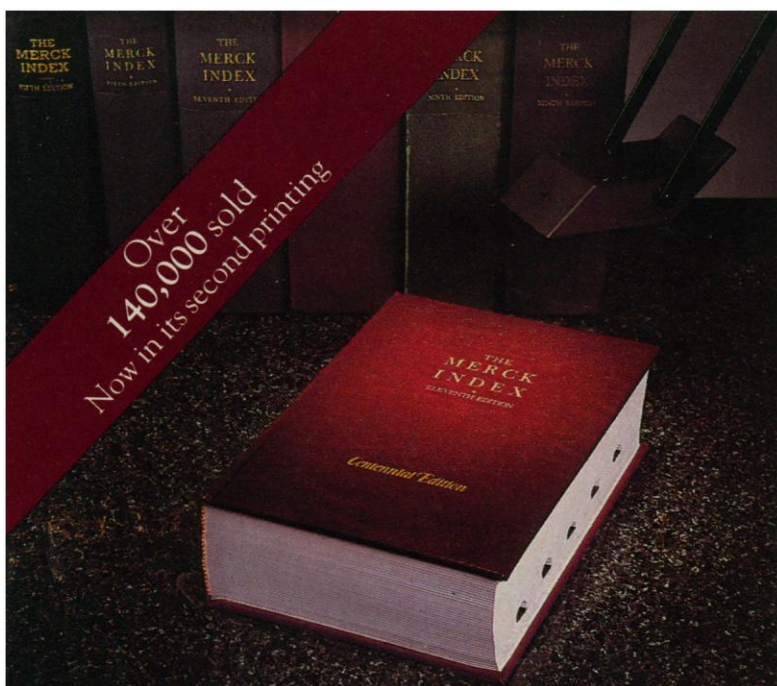
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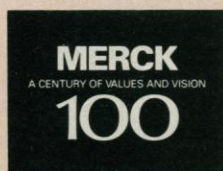
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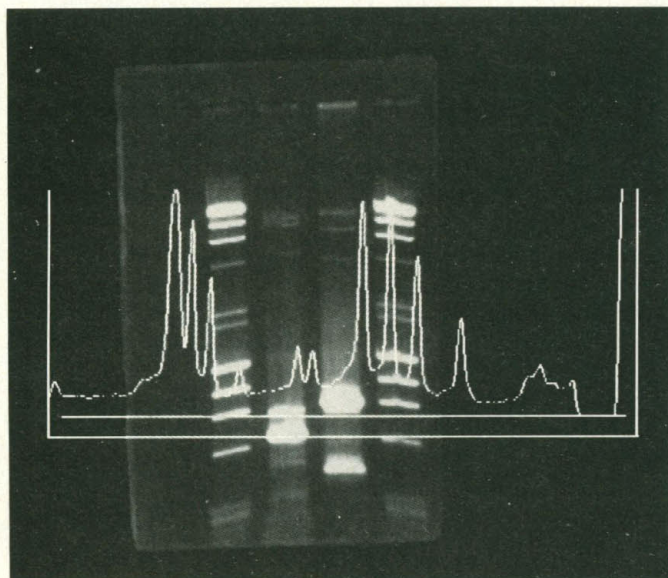


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#### ***PCR: A revolution in molecular biology***

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This novel method for amplifying gene sequences was developed by scientists at Cetus Corporation. Using PCR, investigators can use extremely small amounts of biological material in the amplification process. Fully automated *in vitro* PCR performs in a few hours what used to take days or weeks.

Recently, PCR technology was made even more specific, more flexible, and more cost-effective. That's because it has been improved by replacing heat-sensitive DNA polymerase from *E. coli* with *Taq*, a patented thermostable enzyme isolated from the bacterium, *Thermus aquaticus*.\*

#### ***Plus BSA: A breakthrough in archaeology.***

A key advantage of PCR is its ability to amplify a specific DNA fragment of defined length and sequence from small amounts of a complex template. This feature recently facilitated a major breakthrough in our knowledge of New World colonization.

This unique application of PCR came from the field of molecular archaeology. Bovine serum albumin in tandem with PCR made it pos-

sible to copy and reproduce in large quantities some of a very few pieces of DNA left intact in a 7,000 year-old brain excavated from a Florida spring. Investigators used bovine serum albumin with the heat-resistant DNA polymerase to amplify small numbers of informative DNA sequences. In doing so, DNA from the ancient cranium revealed first-time evidence of a previously unknown maternal lineage for Native Americans.

#### ***Svante Paabo on albumin in PCR...***

*"The basis for using albumin was it's ability to take care of enzyme inhibitors. Regarding other applications of albumin with PCR, it also takes care of heme, a molecule from hemoglobin. Heme is a strong inhibitor of DNA polymerase and often contaminates preparation of DNA from blood."*

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Paabo S, Gifford JA, Wilson AC: Mitochondrial DNA sequences from a 7000-year-old brain. *Nucleic Acids Research* 1988; 16(20):9775-87.

Saiki RK, Gelfand DH, Stoffel S, et al: Primer-directed enzymatic amplification of DNA with a thermostable DNA polymerase. *Science* 1988;239:487-91.

White TJ, Arnheim N, Erlich HA: The polymerase chain reaction. *Trends in Genetics* 1989;5(6):185-9.

\*In 1989 Cetus Corporation received a patent on purified thermostable *Thermus aquaticus* DNA polymerase either isolated from *T. aquaticus* or derived from a genetically engineered organism containing a gene that codes for production of enzymes. Patent number 4,889,818.



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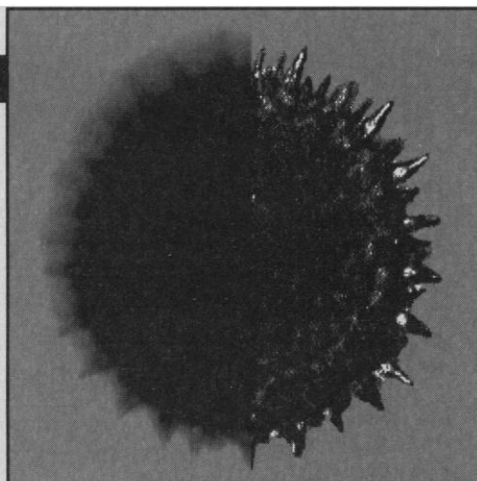


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Micro-Tome will deconvolve images from any standard research microscope. Just capture a stack of optical slices onto your IBM or Macintosh computer with a video camera, then run Micro-Tome. It mathematically removes haze from the images and produces results comparable to expensive laser scanning confocal microscopes.

**FOR MORE INFORMATION CALL: John Kesterson, Ph.D., VayTek, Inc. 515/472-2227**

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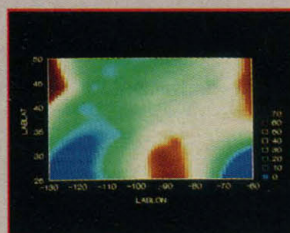
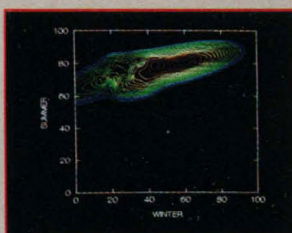
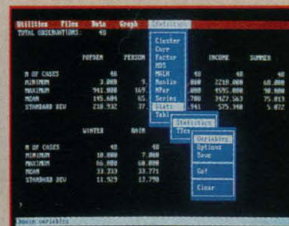
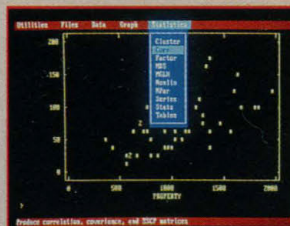
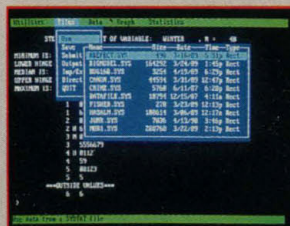
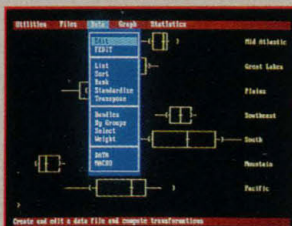
**SYSTAT 5.0's new menus make the top-rated statistical program even easier to use.**



V 41



SYSTAT is the *only* package to receive these three awards.



## New Features

**New Features** Menus or commands — your choice ■ Rewritten documentation includes statistics tutorials ■ Fast, built-in drivers for SYGRAPH ■ Global mapping and many new plots ■ Multi way repeated measures ■ Means model for missing cells designs ■ Post-hoc tests ■ Interactive stepwise regression.

## Statistics

## Statistics

Basic statistics, frequencies, *t*-tests, post-hoc tests

- Multi way crosstabs with log-linear modeling, association coefficients, PRE statistics, Mantel-Haenszel, asymptotic standard errors
- Nonparametric statistics (sign, runs, Wilcoxon, Kruskal-Wallis, Friedman two-way ANOVA, Mann-Whitney U, Kolmogorov-Smirnov, Lilliefors, Kendall coefficient of concordance)
- Pairwise/listwise deletion of missing values, Pearson correlation, SSCP, covariance, Spearman, Gamma, Kendall Tau, Euclidean distances, binary similarities
- Linear, polynomial, multiple, stepwise, weighted regression with extended diagnostics
- Multivariate general linear model includes multi way ANOVA, ANCOVA, MANOVA, repeated measures, canonical correlation
- Principal components, factor analysis, rotations, components scores
- Multidimensional scaling
- Multiple and canonical discriminant analysis, Bayesian classification
- Cluster analysis (hierarchical, single, average, complete, median, centroid linkage, k-means, cases, variables)
- Time series (smoothers, exponential smoothing, seasonal and nonseasonal ARIMA, ACF, PACF, CCF, transformations, Fourier analysis)
- Nonlinear estimation (nonlinear regression, maximum likelihood estimation, and more).

## Graphics

## Graphics

Overlay plots ■ Drivers for most graphics devices

■ **Two-dimensional:** Error bars ■ Scatterplots ■ Line and vector graphs

■ Vector, dot, bubble and quantile plots ■ Bar graphs (single, multiple, stacked, range) ■ Box plots (single and grouped) ■ Stem-and-leaf diagrams ■ Linear, quadratic, step, spline, polynomial, LOWESS, exponential smoothing ■ Confidence intervals and ellipses (any alpha value) ■ Smooth mathematical functions ■ Rectangular or polar coordinates ■ Log and power scales ■ ANOVA interaction plots

■ Histograms (regular, cumulative, fuzzy) ■ Stripe and jitter plots

■ Gaussian histogram smoothing ■ Scatterplot matrices ■ Voronoi

tessellations ■ Minimum spanning tree ■ Maps with geographic projections (U.S. state boundary file included, county and world boundary files available) ■ Chernoff faces ■ Star plots ■ Fourier plots ■ Pie charts ■ Contour plots on regularly and irregularly spaced points ■ Control charts and limits ■ *Three-dimensional*: Data plots ■ Smooth function plots ■ Vector plots ■ Linear, quadratic, spline, least squares surface smoothing ■ Typefaces that print in perspective.

## Data Management

## Data Management

Import/export Lotus, dBase, and DIF files  
Full screen data editor  
Full screen text editor  
Unlimited cases  
Missing data, arrays, character variables  
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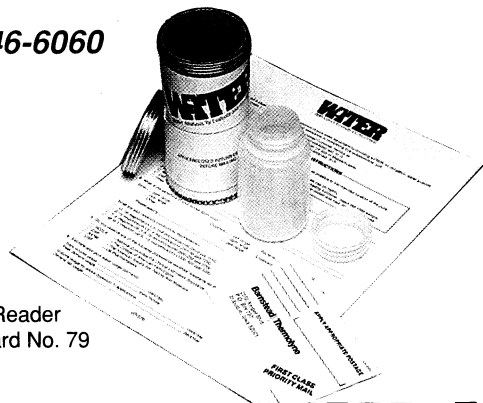
Do you really know the quality of your feedwater? Barnstead's free W.A.T.E.R. (Water Analysis to Evaluate and Recommend) analysis program provides you with the most comprehensive water analysis and recommendation service available. It's free, it's easy, and there's no obligation on your part.

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- Then fill out and return your postage paid "IN THE BOOK" Contest entry form located at the back of each catalog for a FREE GIFT and the chance to win a 46" T.V., a Camcorder or a VCR.
- Void in states where prohibited.

SSB2010

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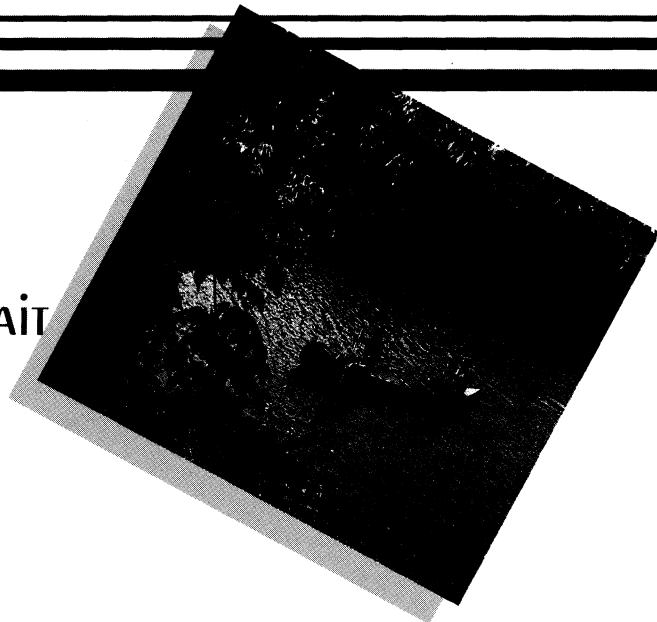
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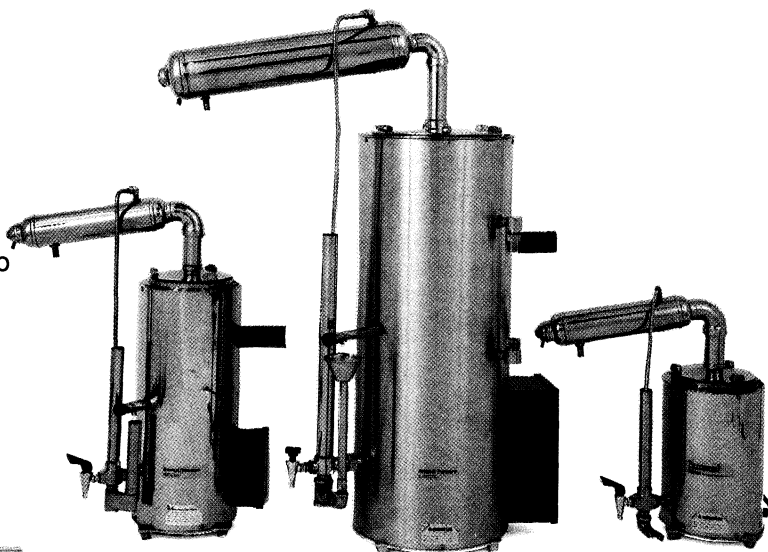


### **Classic Stills**

Reliable, durable and economical are three fitting descriptions for Barnstead Classic Stills. The pure tin lined Classic Stills typically last many years, providing high quality distilled water in ranges from 1/2 gph up to 10 gph, utilizing either electric or steam heat. Barnstead Classic Stills are flexible and can be used for most applications requiring distilled water.

Barnstead Classic Stills offer...

- Durable design for years of reliability
- Economical operation



Circle Reader Service Card No. 77



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Barnstead Fully Automatic Glass Stills assure you of...

- High purity distilled water
- Simple operation and cleaning
- Double protection against low water conditions
- Space saving design

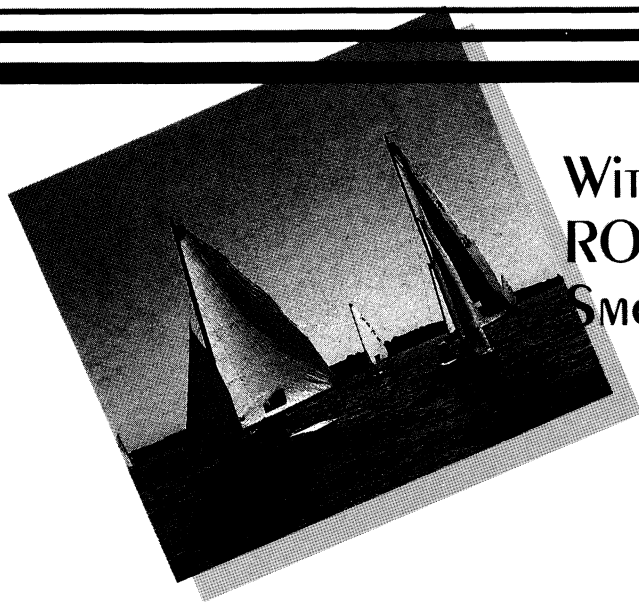
### **Glass Stills**

Barnstead Fistream II™ fully automatic Glass Stills provide laboratories with high purity distilled water. All glass components assure virtually no leaching of impurities into the distilled water. The microprocessor controls allow simple operation and cleaning of the stills. Barnstead's Glass Stills have unique, double protection against low water conditions. The Barnstead Glass Stills' flexibility make them the most convenient and reliable glass still for general laboratory applications.

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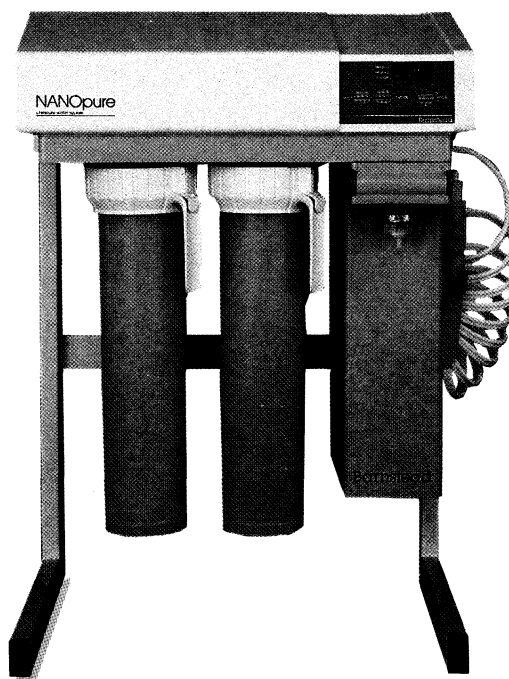
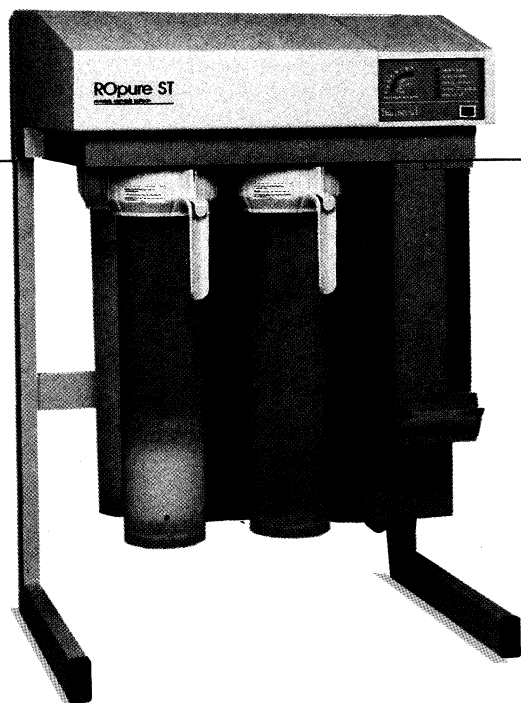


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- Space saving quad design
- Virgin polypropylene water pathways
- Choice of bench or wall mounting
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- Analytical grade and Bioresearch grade (including ultra filter) models available



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The convenient Remote Dispenser with cross flow 0.2 micron filtration brings the water to your work with drop by drop, spray or stream delivery.

**NEW!**

### **The New ROpure ST™ with Integral Storage Tank**

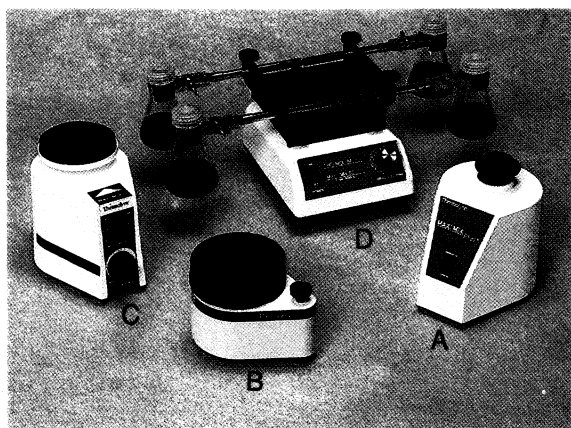
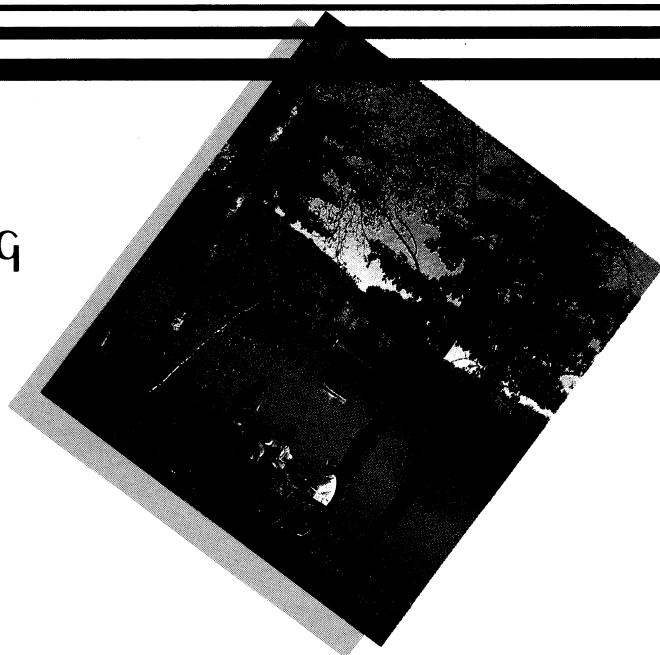
If the need exists to pretreat water to your NANOpure Water Purification System or your purity requirements are less demanding, Barnstead is pleased to provide the ROpure ST Reverse Osmosis System. The ROpure ST is more than a conventional reverse osmosis system.

- Space-saving, integral, economical, 30 liter storage reservoir
- Optional mixed bed cartridge produces a minimum resistivity of 1 megohm - cm water to the tank
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- Superior flexibility in feedwater specifications and product water volumes

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Thermolyne's durable Maxi-Mix line offers you the convenience of automatic 'Touch On' one-handed operation or 'Constant On' for unattended mixing. Built to provide maximum stability during use. There's a Maxi Mix for every job and every budget...

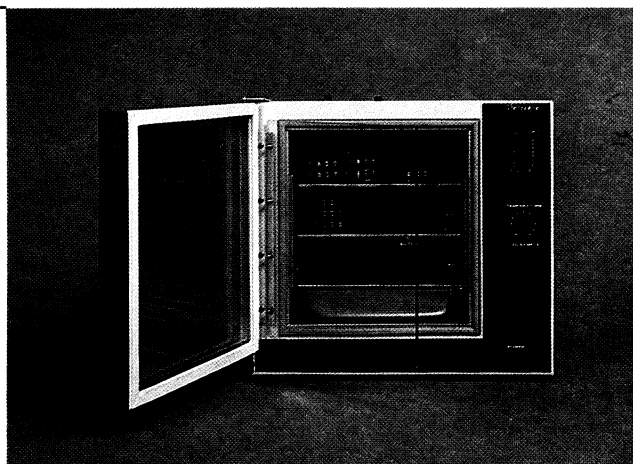
**NEW!**

- A **NEW! Economical Maxi Mix Plus™** with single speed vortex accuracy and rugged cast aluminum case
- B **Reliable Maxi Mix I** with powerful 3000 rpm motor for fast, thorough vortex mixing of four or more test tubes
- C **Versatile Maxi Mix II** with two interchangeable mixing surfaces and variable speed control
- D **The Maxi Mix III Rotary Shaker** offers four interchangeable accessories to handle everything from test tubes to four 250ml flasks with precise speed control from 100 to 2200 RPM's.

## **Compact CO<sub>2</sub> Incubator**

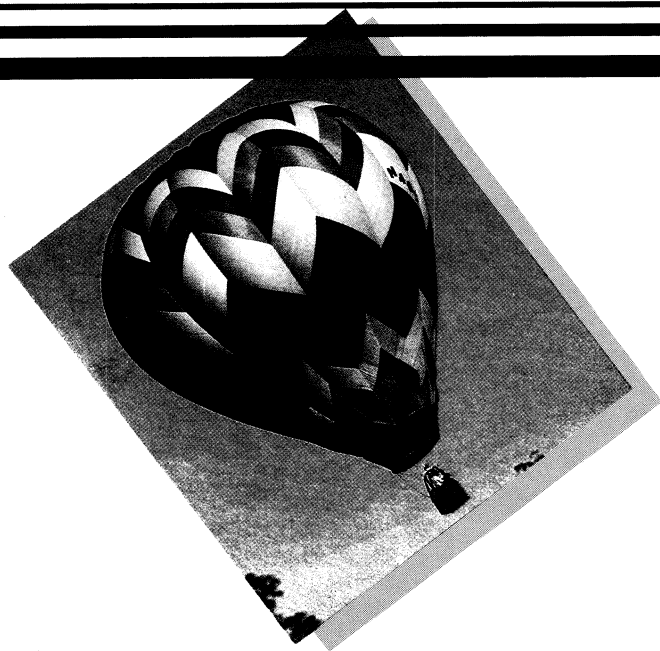
The economical, space-saving design of Thermolyne's CO<sub>2</sub> Incubator is ideal for specialized tissue culture applications or as an isolation incubator.

- Overall size - 23"W X 21"H X 17"D. (1.3 cu. ft. chamber).
- Excellent stability and uniformity at 37°C - ± 1°C.
- Built-in flowmeters for CO<sub>2</sub> and air provide convenience and precise gas flow to chamber.
- Tempered glass door is heated to prevent condensation.
- Shelves, water reservoir are easily removed for convenient decontamination.



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## THERMOLYNE MAKES Efficient INVENTORYING A BREEZE

### **Guarantee Precise Incubation and Save Time Transferring Tubes**

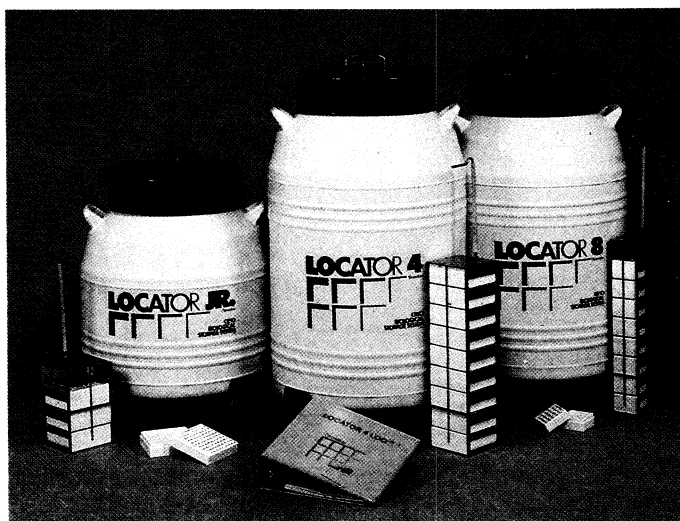
If you've ever calculated the time you spend loading or unloading tubes from your dri-bath, or transferring those tubes from incubator to ice bath then you'll appreciate the convenience of the EASY BLOCK™ System's portable transfer rack and holder.



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### **The EASY BLOCK™ System Matches the Standard 96 Well Plate Configuration.**

- Alpha-numeric well identification simplifies inventorying.
- Uniformly incubates 96 12mm test tubes.
- Transfer rack and holder are autoclavable.
- Temperature range of ambient to 110°C.
- Electronic controller ensures  $\pm 0.5^\circ\text{C}$  stability.



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### **Locator® Storage System**

The unique Locator inventory storage system allows for complete tracking and easy retrieval of each individual sample being stored.

- Available in three sizes from large capacity Locators '4' and '8' to the small, compact Locator Jr.
- Unbeatable temperature uniformity ensures that all samples are below  $-190^\circ\text{C}$ .

**NEW!** To safeguard your precious samples, a Liquid Nitrogen Level Monitor is now available for all Locator Systems.



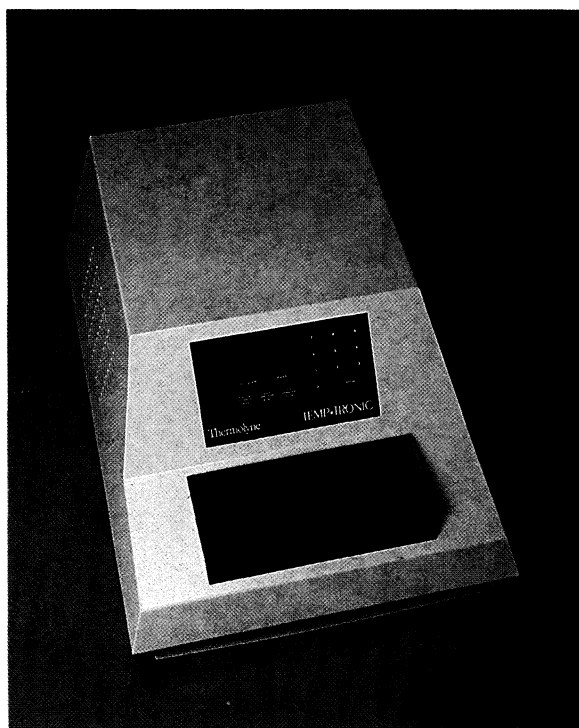
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- Rapid temperature cycling from 0°C to 100°C
- 36-well block facilitates even heat transfer with wells precisely matched to .5ml tubes
- Convenient print-out capability



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## **Convenience**

*"I thought the unit I bought would cool down to 0°C. What they didn't tell me was that I needed a separate and expensive chiller. They also didn't tell me that to refrigerate at all I'd have to connect to a water line and locate my unit near a sink in a very inconvenient location."*

The TEMP•TRONIC has fully integrated heating and cooling capabilities which do not require expensive or inconvenient chillers, water or drain lines.

## **Performance**

*"I had a problem with well to well uniformity, and I wasn't happy with the ability of the unit I purchased to heat or cool fast enough."*

We put Thermolyne's years of expertise in precise temperature control into each TEMP•TRONIC, assuring you of superior accuracy, uniformity and cycling speed.

## **Reliability**

*"I need a reliable unit. The last one I bought was nothing but headaches!"*

We designed the TEMP•TRONIC to be a workhorse. We've used proven heating and mechanical refrigeration technology to give you years of trouble-free operation.

## **Ease of Use**

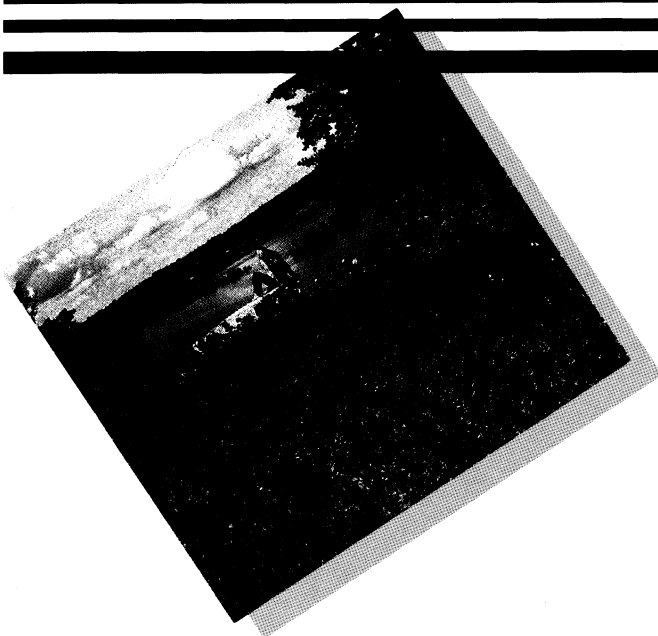
*"Every time I tried to use my other unit, I had to re-study the instruction manual because it was so complicated."*

We designed the TEMP•TRONIC with our own interactive microprocessor control which guides you step by step through programming functions. Its so easy, you'll be able to operate the TEMP•TRONIC the first time you use it.

Whether your needs are for DNA and gene amplification, cell culture studies, enzyme restriction, or any other molecular process requiring temperature cycling, the TEMP•TRONIC will make your life easier at a very affordable price!

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### ***ROSI 500 and 1000 Shaking Incubators***

With Thermolyne's Rosi 500 and 1000 shaking incubators you'll be able to select from a wide range of operating speeds and shaking actions while maintaining outstanding temperature uniformity and stability.

**NEW!**

#### ***ROSI 500™ (Rotating Orbital Shaking Incubator)***

- Autoclavable chamber is ideal for biohazardous applications.
- Temperatures from ambient + 5°C to 60°C in .1°C increments.
- Control provides digital readout of temperature, speed and cycle time.

#### ***ROSI 1000™ (Reciprocating/Orbital Shaking Incubator)***

- Easily adjustable orbit diameters and reciprocating stroke lengths.
- Temperature range from ambient +5°C to 70°C in .1°C increments.
- Combined uniformity and stability better than  $\pm 0.5^\circ\text{C}$ .
- Easy changing of platforms and flask holders allows for use of different types and sizes of vessels.



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**NEW!**

### ***Two Shakers in One!***

Thermolyne's space-saving AROS Shaker (A Adjustable Reciprocating Orbital Shaker) provides you flexibility to easily change from an orbital motion to a reciprocating motion. Utilizing numerous possible combinations of the orbit sizes in conjunction with varying speeds allows you to simulate any action from very slow, gentle agitation to vortexing.

- Low power consumption allows shaker to be used in incubator, cold room or environmental chamber.
- Easy changing of platforms and flask holders
- Digital LED readout provides easy viewing of speed.



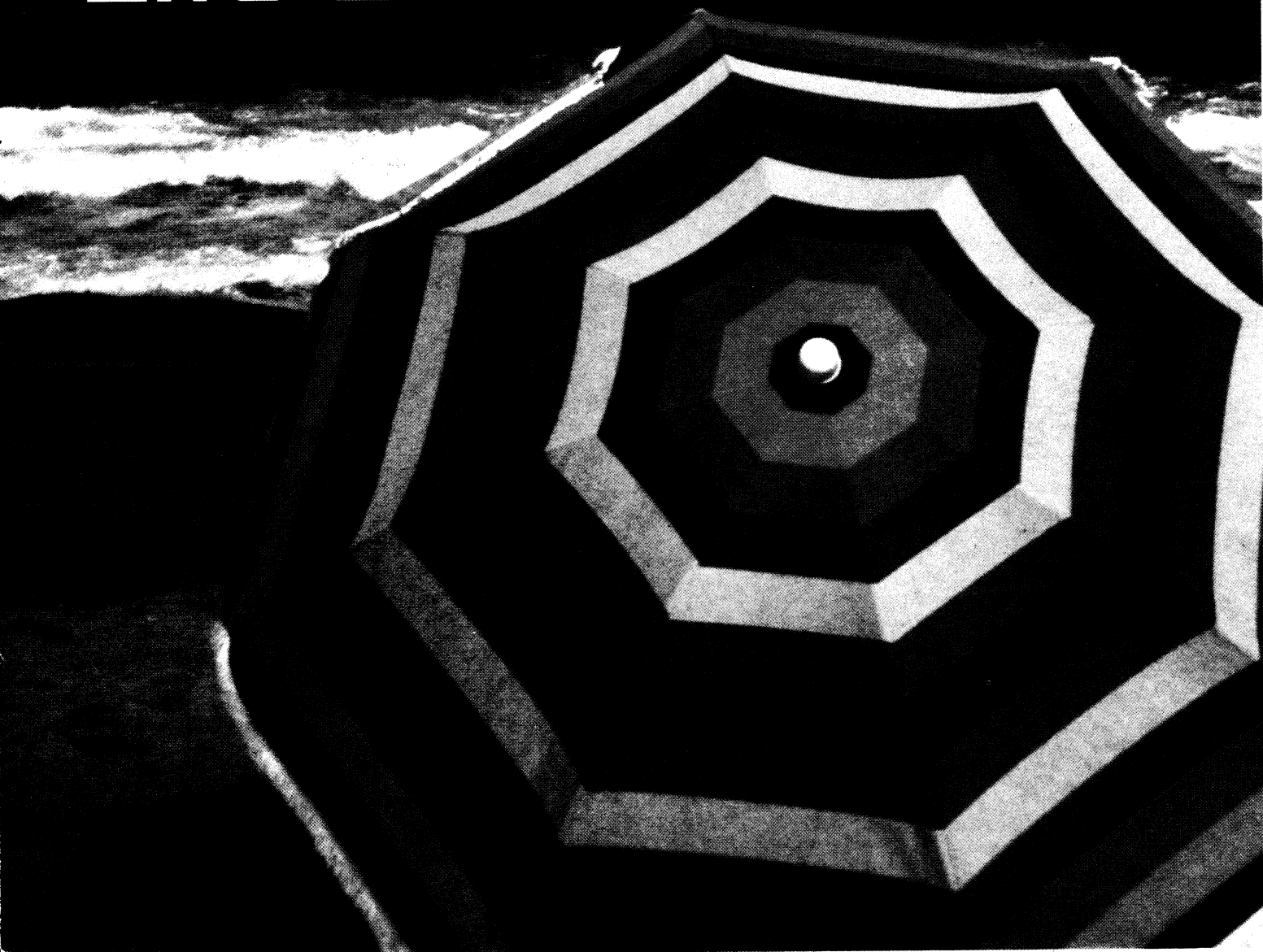
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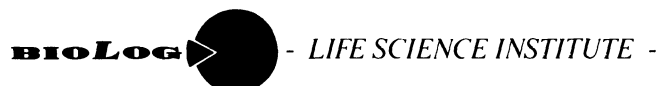
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# The only thing that should come between you and your work.

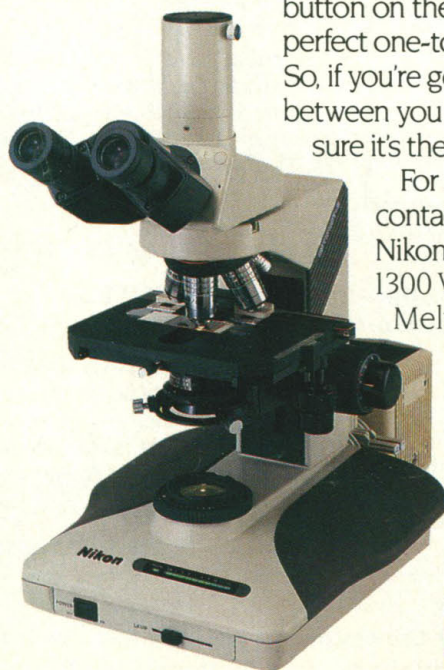
## The New Nikon Optiphot-2 Research Microscope

Beyond the theoretical limit of microscopy lies the performance of the Nikon Optiphot-2. With diffraction-limited, aberration-free Nikon CF optics, and a light path that is free of relay lenses, it introduces a new level of image resolution. The first time you use the Optiphot-2, you'll know it was designed with the researcher in mind.

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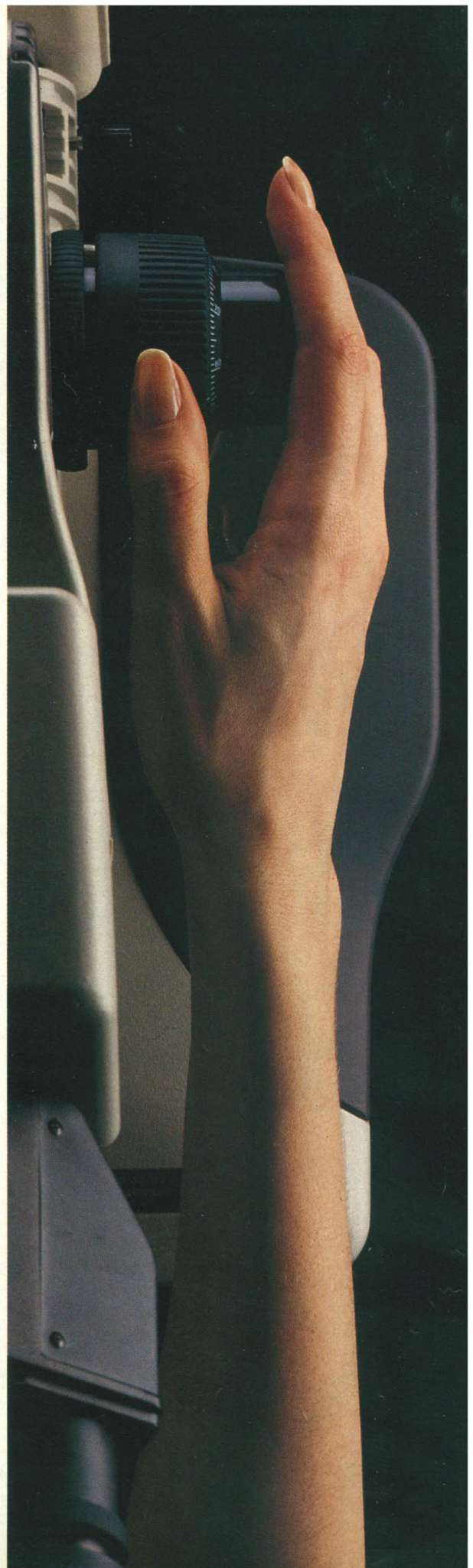
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