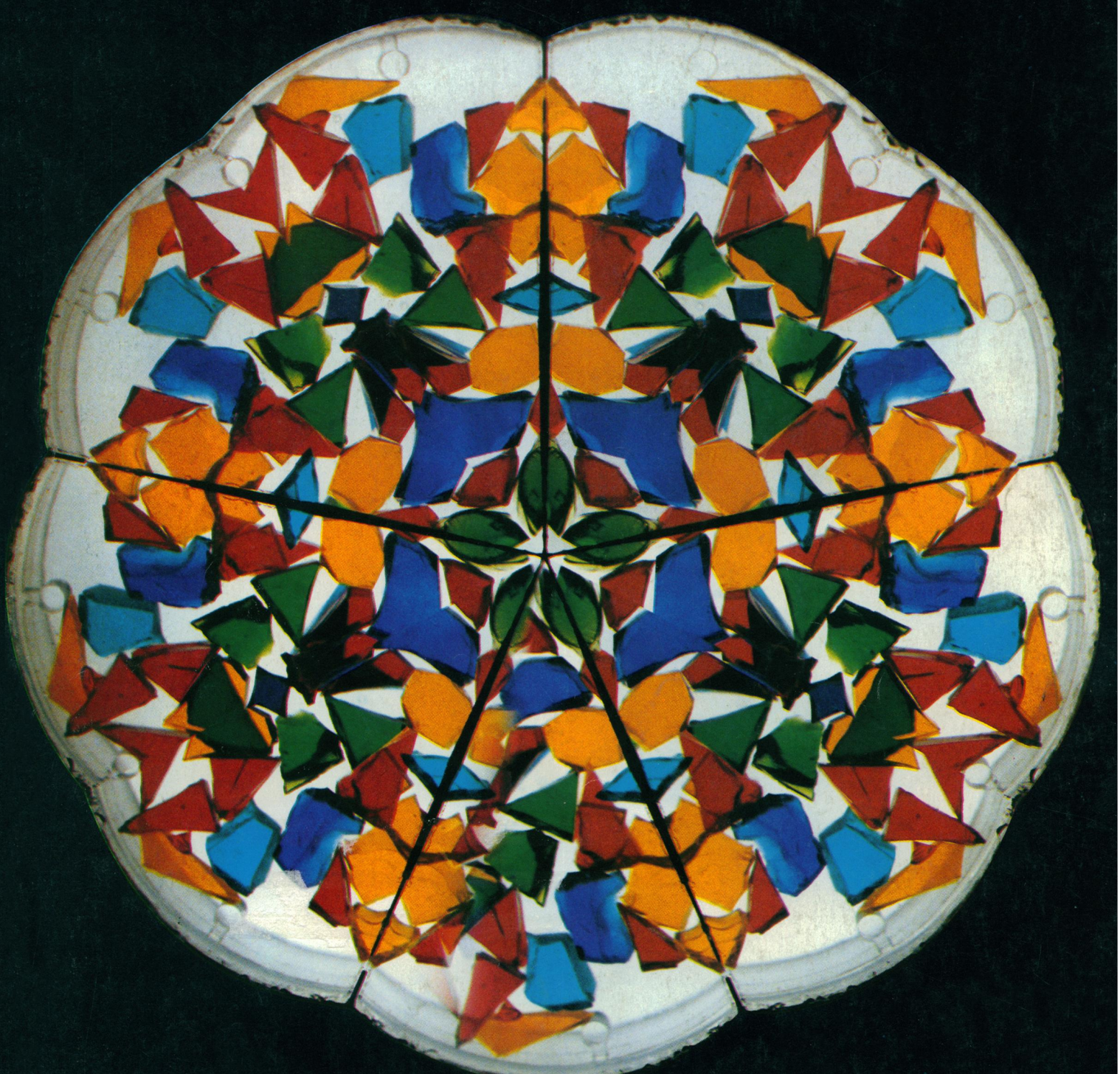
19 JULY 1985 · VOL. 229 · NO. 4710

$2.50

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



DNA Synthesis Made Easy

The System 1 Plus DNA Synthesizer is the latest advancement in DNA synthesis. It uses the popular IBM-PC as its interactive graphic controller, and makes the synthesis of single-stranded DNA easier than ever before. Even operators unfamiliar with DNA synthesis can move smoothly through the program.

Easy Sequence Entry

Computer keyboard or light pen can be used to quickly enter sequences in the 5′ to 3′ direction. As bases are selected they appear on the screen, color-coded and with proper codon breaks to simplify proofing and editing. Up to 102 bases can be programmed for long unattended operation.

Simple Interactive Graphics

If a sequence is entered that is too long for available reagents, the BOTTLE STATUS screen shows which reservoirs need to be filled. Pump flow rates can be changed and synthesis steps can be altered from the standard program using PROGRAM ADJUST. At any time SYSTEM STATUS can be accessed for real-time display of synthesis conditions.

Once synthesis has begun, you can use the IBM-PC for other applications, confident that synthesis will continue as desired. The Coupling Efficiency Monitor assures complete deblocking and coupling at every step.

Simple to Buy

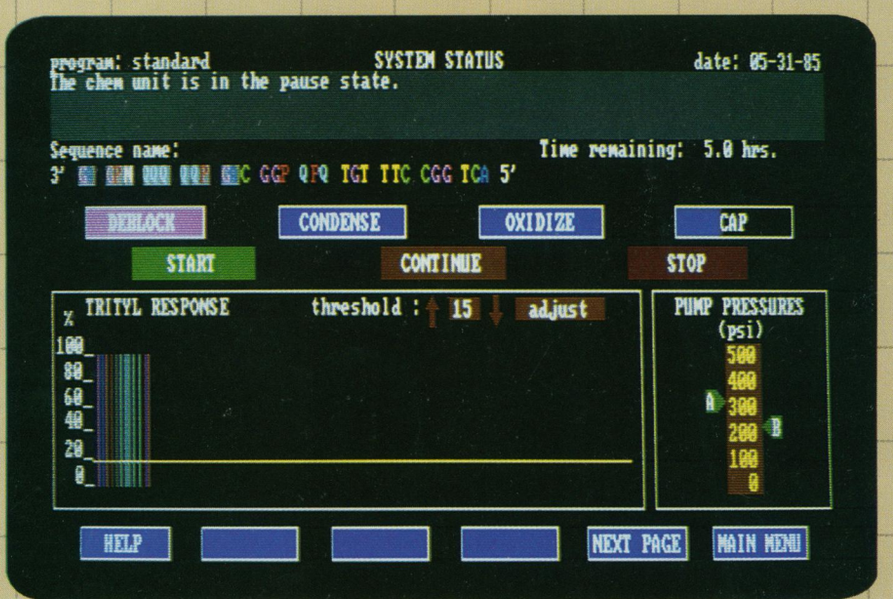
System 1 Plus makes DNA synthesis easy, with repetitive yields greater than 98%, less than 15-minute cycles, and low operating costs. Beckman makes it easy to purchase with an introductory package that will surprise you. Ask your Beckman representative for details, or write: Beckman Instruments, Inc., 1050 Page Mill Road, Palo Alto, CA 94304.

The system status screen is used to start a synthesis, and can be easily accessed at any time.

It displays the sequence entered, with the current base position highlighted.

Color-coded lines give an immediate graphic display of coupling efficiency and selected threshold level is indicated.

Help is always available simply by touching this box.



Time remaining in the synthesis is indicated to the minute.

As deblocking, condensation, oxidation, and capping occur, these boxes fill with color to match the base being added.

The screen indicates pressures of the time-proven, low-maintenance HPLC metering pumps, which are used for precise chemical delivery.

BECKMAN

Circle No. 142 on Readers' Service Card

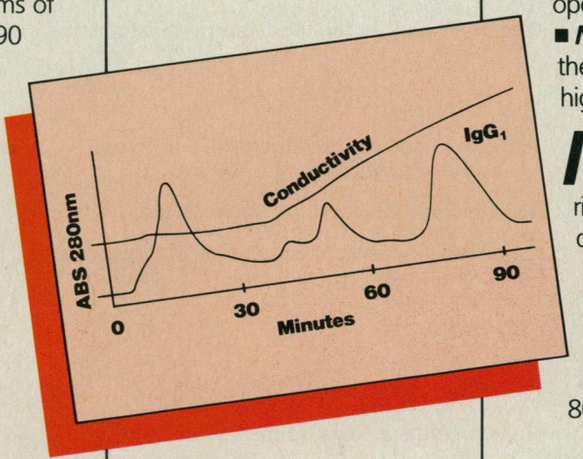
The monoclonal purification machine

Bio-Rad's new MAPS™ Preparative System 100.

It isn't quite correct to call it a machine. But the System 100 does churn out a lot of work in a short time. Specifically, it can purify up to 0.5 grams of monoclonal antibody in under 90 minutes. That adds up to several grams per day.

The MAPS Preparative System 100 also offers these indispensable advantages:

- ***Universal technique,*** allowing separation of all antibody classes, including IgG, IgM and IgA!
- ***Quantitative recovery*** of antibody activity at high levels of purity.
- ***Easy scale-up,*** using small amounts of sample for preparative methods development.
- ***Automated system*** for easy operation and high reproducibility.
- ***Non-pyrogenic system*** for therapeutic applications requiring high purity antibody.



In addition, the System 100 comes complete with all materials needed for methods development.

We think it's the ideal system for the large scale purification of monoclonals. But find out for yourself. Call 800-4-BIORAD or contact:

BIO-RAD

2200 Wright Avenue
Richmond, CA 94804
Telephone (415) 234-4130

BIO-RAD MAPS™ (Monoclonal Antibody Purification System) Preparative System 100. This complete, fully integrated system combines software controlled gradient HPLC with automatic sampling and preparative fraction collection.

Also in Rockville Centre, N.Y., Australia, Austria, Canada, Germany, Italy, Japan, The Netherlands, Switzerland and the United Kingdom.

ISSN 0036-8075

19 July 1985

Volume 229, No. 4710

SCIENCE

This Week in *Science* 223

LETTERS Trauma Research: *A. G. Lazen*; Ultrasound Effects: *A. O. Martin*; Computing and Sociology: *M. A. Tanner*; Crisis in Engineering: *D. C. Drucker* 227

EDITORIAL Modest Proposals for the Granting System 231

ARTICLES Pentagonal and Icosahedral Order in Rapidly Cooled Metals: *D. R. Nelson* and *B. I. Halperin* 233

Neurotrophic Factors: *H. Thoenen* and *D. Edgar* 238

A General Method for Saturation Mutagenesis of Cloned DNA Fragments: *R. M. Myers, L. S. Lerman, T. Maniatis* 242

NEWS AND COMMENT The Electricity Industry's Dilemma 248

Unique Anthropology Films Lie in Limbo 251

Briefing: Rifkin versus Gene Splicing: NIH Wins a Round; Education Research Reorganization Announced; Site Requirements Drawn Up for SSC; Physics Institute Will Not Restrict Meetings 252

A $750-Million Plan for Coal Research 254

RESEARCH NEWS Weather Satellites Coming of Age 255

Parkinson's Disease: An Environmental Cause? 257

AAAS NEWS Association Awards Presented at Annual Meeting in Los Angeles; Working Group

SCIENCE is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Second-class postage (publication No. 484460) paid at Washington, D.C., and at an additional entry. Now combined with **The Scientific Monthly®** Domestic individual membership and subscription (51 issues): $60. Domestic institutional subscription (51 issues): $98. Foreign postage extra: Canada $24, other (surface mail) $27, air-surface via Amsterdam $65. First class, airmail, school-year, and student rates on request. Single copies $2.50 ($3 by mail); back issues $3 ($3.50 by mail); Biotechnology issue, $5 ($5.50 by mail); classroom rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of $1 per copy plus $0.10 per page is paid directly to CCC, 21 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 $1 + .10. **Postmaster:** Send Form 3579 to *Science*, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Formed to Focus on Anthropology and Remote Sensing 259

BOOK REVIEWS

Insect Communication, reviewed by *G. C. Eickwort*; Feldspars and Feldspathoids, *J. R. Goldsmith*; Lake Sediments and Environmental History, *J. P. Smol*; Books Received 260

REPORTS

Radiative Properties of the Background Aerosol: Absorption Component of Extinction: *A. D. Clarke* and *R. J. Charlson* 263

Invasion and Extinction in the West Indian Ant Fauna: Evidence from the Dominican Amber: *E. O. Wilson* 265

Cyclic AMP Regulation of Eukaryotic Gene Transcription by Two Discrete Molecular Mechanisms: *M. Waterman, G. H. Murdoch, R. M. Evans, M. G. Rosenfeld* 267

Ca^{2+} and Ca^{2+}-Activated K^+ Currents in Mammalian Gastric Smooth Muscle Cells: *R. Mitra* and *M. Morad* 269

U1 Small Nuclear RNA Genes Are Subject to Dosage Compensation in Mouse Cells: *M. Mangin, M. Ares, Jr., A. M. Weiner* 272

Presence of Laminin Receptors in *Staphylococcus aureus*: *J. D. Lopes, M. dos Reis, R. R. Brentani* 275

Induced Expression of the Glucocorticoid Receptor in the Rat Intermediate Pituitary Lobe: *T. Antakly, A. Sasaki, A. S. Liotta, M. Palkovits, D. T. Krieger* 277

Auditory Responses in Avian Vocal Motor Neurons: A Motor Theory for Song Perception in Birds: *H. Williams* and *F. Nottebohm* 279

Sequence Homology Between Certain Viral Proteins and Proteins Related to Encephalomyelitis and Neuritis: *U. Jahnke, E. H. Fischer, E. C. Alvord, Jr.* 282

Choline Acetyltransferase Activity in Striatum of Neonatal Rats Increased by Nerve Growth Factor: *W. C. Mobley, J. L. Rutkowski, G. I. Tennekoon, K. Buchanan, M. V. Johnston* 284

Memory Processing of Serial Lists by Pigeons, Monkeys, and People: *A. A. Wright, H. C. Santiago, S. F. Sands, D. F. Kendrick, R. G. Cook* 287

Reduced Numbers of Somatostatin Receptors in the Cerebral Cortex in Alzheimer's Disease: *M. F. Beal* et al. 289

COVER

Kaleidoscope pattern used in testing human memory. Lists composed of kaleidoscope patterns were about as difficult for humans to recognize as were lists of travel pictures for pigeons and monkeys. They allowed for direct comparisons among species, and some striking similarities in list memory processing were revealed. See page 287. [Anthony A. Wright, University of Texas Health Science Center, Houston, Texas 77030]

BIOSYSTEMS UPDATE

Introducing the high performance, low cost, fully automated DNA Synthesizer.

The new Model 381A DNA Synthesizer optimizes the efficient phosphoramidite chemistry to reliably and economically produce high quality oligonucleotides.

Automatic rinsing and priming of reagent lines when new chemicals are added, menu-driven software and stable, prepackaged reagents make the 381A easy to use.

Results *and* Affordability

The new Model 381A produces high purity, defined-sequence oligonucleotides quickly and economically. It delivers routine coupling yields of 98–100% and the capability to synthesize oligonucleotides with more than 100 bases.

The 381A is a *complete* instrument-reagent system with the proven chemistry and precision design that have made Applied Biosystems the world leader in synthesis technology. Affordably priced, the 381A brings every researcher the speed and reproducibility of automated DNA synthesis with the convenience of an in-lab instrument.

Advanced Capabilities

The 381A can produce 50 to 100-mers providing greater flexibility in gene synthesis strategy by minimizing the number of purifications and ligations. With the efficient phosphoramidite chemistry, probes and primers can often be used without purification. Specific primers for Sanger dideoxy sequencing can be ready for use in less than 18 hours.

Production of mixed probes can be accomplished without any premixing of bases, and the addition of unusual bases can be completely automated. Small amounts of probes and primers or up to 10 mg of DNA for physical studies can be made economically and automatically with no hardware modifications.

Fully Programmable

The 381A can be operated with the standard synthesis cycle or used to develop and store new chemistry methodologies incorporating existing or user-defined functions. Users can optimize cycles for up to five different nucleotides or derivatives. Integral battery with automatic re-start preserves synthesis parameters and user-designed cycles when power is interrupted.

Immediate Delivery

Compare and you'll agree: The 381A is a remarkable performance/price value. Your local Applied Biosystems representative has all the information for immediate purchase and shipment. Contact us at one of the offices listed below or circle reader service number 96 .

Applied Biosystems

APPLIED BIOSYSTEMS, INC., 850 Lincoln Centre Drive, Foster City, CA 94404 • (800) 874-9868 • In California (800) 831-3582 Telex: 470052
IN EUROPE: APPLIED BIOSYSTEMS GMBH, Bergstrasse 104, D6102 Pfungstadt, West Germany • 06157-6036 Telex: 4191746

Soot in the troposphere

Particles in the troposphere (the atmospheric region extending upward from the ground for 10 to 20 kilometers) absorb four times as much light as expected; Clarke and Charlson suggest that the primary absorber is soot (page 263). At the Mauna Loa Observatory in Hawaii, where the background aerosol was expected to be relatively free of pollution, particles from the troposphere were collected and their light-absorbing and -scattering properties measured. Coarse particles consisted of Asian dust and other materials from the earth's crust. Fine particles included the light-absorbing species and the dominant (by mass) nonabsorbing sulfur-containing components. Hemispheric rather than local transport of combustion-derived particles into the troposphere may be occurring; the persistence of the particles must be taken into consideration in climate models.

Enhancer of bacterial virulence

Staphylococcus aureus—a bacterium that can cause severe infections, endocarditis, osteomyelitis, pneumonia, and arthritis—may share with metastasizing cancer cells and circulating cells of the immune system a mechanism for moving into and out of the bloodstream (page 275). Lopes *et al.* found that *S. aureus,* like those cells, has surface receptors for laminin, about 100 binding sites per organism. Laminin is an important protein of the membrane layer lining blood vessels and other epithelial tissues. If attachment to laminin helps cells move through the body to establish new sites for infection, disease, or immune responsiveness, the presence of laminin receptors on the *S. aureus* surface may contribute to this organism's extreme virulence. *Staphylococcus epidermidis*, a close relative of *S. aureus*, lacks laminin receptors and is not virulent.

Suppressed receptors in the pituitary

Steroid hormone receptors are found on cells of the pituitary gland's intermediate lobe only when normal suppressive factors are removed (page 277). The pituitary gland, situated at the base of the brain, is attached by a stalk to the hypothalamus from which it receives signals. The pituitary or "governing" endocrine gland of the body secretes hormones that regulate other endocrine organs; it is thus vital to growth, maturation, and reproduction. Antakly *et al.* showed that receptor expression on intermediate lobe cells developed only when cells were isolated from the influences of the hypothalamus. In contrast, cells of the anterior lobe have active surface receptors and are responsive even when in the pituitary. Studies of suppressed receptors in the pituitary may help explain mechanisms of hormone resistance in other normal and cancerous tissues that also have the required receptors.

Similarities of myelin and viral proteins

Neurologic complications that sometimes follow vaccinations against viral diseases (such as Guillain-Barré syndrome that paralyzed some people who had received swine flu shots) or viral infections (such as measles encephalitis) may occur because antibodies or immune cells made in response to the virus react with and damage proteins of the host's nervous system (page 282). Such immunologic cross-reactivities could occur if viral proteins and proteins of the nervous system have structural similarities. Jahnke, Fischer, and Alvord did a computer search of primary structures (amino acid sequences) to compare sequences in a library of almost 3000 proteins with those of the human myelin proteins that form part of the protective sheath around the nerves. Sequences of ten amino acids in length were studied since they are not too small to induce encephalitis experimentally and a number of immunologically important regions of myelin are contained in regions roughly this length. Measles, Epstein-Barr, influenza, and other viruses were found to have proteins with sequences homologous to portions of myelin.

Brain cells and nerve growth factor

Alzheimer's disease and Huntington's chorea, two degenerative diseases of the nervous system, are characterized by death or dysfunction of brain cells (page 284). Among the affected cells are cholinergic neurons that contain an enzyme, choline acetyltransferase (ChAT). A decrease in ChAT activity in the corpus striatum region of the brain has been a consistent marker of Huntington's chorea. Mobley *et al.* found that injection of nerve growth factor (NGF) led to increased ChAT activity in corpus striatum cholinergic neurons of rats. NGF, which also increases ChAT activity in brain regions altered in Alzheimer's disease, may be implicated in the functioning of cholinergic neurons as well as in degenerative disorders of these cells.

Memory

The easiest item to remember in a series is either the first or the last (page 287). The length of the interval between exposure to the series and the cue given to remember an item determines which will be the easiest to remember: if the interval is short, it is the last item (recency effect); if long, it is the first item (primacy effect); and for intermediate length intervals, both the primacy and recency effects operate. Wright *et al.* found that the memory process was the same in humans shown kaleidoscope patterns (cover) and monkeys and pigeons shown travel slides. The major difference among the species was the length of time—shortest for pigeons and longest for humans—required for the primacy effect to appear and the recency effect to disappear.

SCIENCE/SCOPE

A new technique may expand the use of lasers in commercial and military applications. The approach, called optical phase conjugation, is considered a major advance in optics because it offers a solution to distortion problems that have limited the use of lasers. When a laser beam passes through a turbulent atmosphere or a severely strained optical component, the beam is distorted and the information it carries is degraded. Hughes Aircraft Company's technique, however, forces the laser to retrace its path through the distorting medium so the beam emerges free of distortion. The method eliminates the need for complex electro-optical and mechanical components to correct the distortions.

A future generation of infrared "eyes" for space surveillance systems will be far more capable as the result of technology advances at Hughes. These systems will be able to see distant targets in space, in the air, or on the ground—and relay data instantly to ground stations. Advances are being made in focal plane design, signal processing architecture, and in the design of a unique sensor with very steady telescoping optics. By building modularity and programmability into the new technologies, researchers are making it possible for systems to use tailored combinations from a single family of hardware and software. For its advances, Hughes received an Award for Technical Achievement from the Strategic Technology Office of the Defense Advanced Research Projects Agency. This effort was sponsored by DARPA and monitored by the U.S. Air Force Space Technology Center.

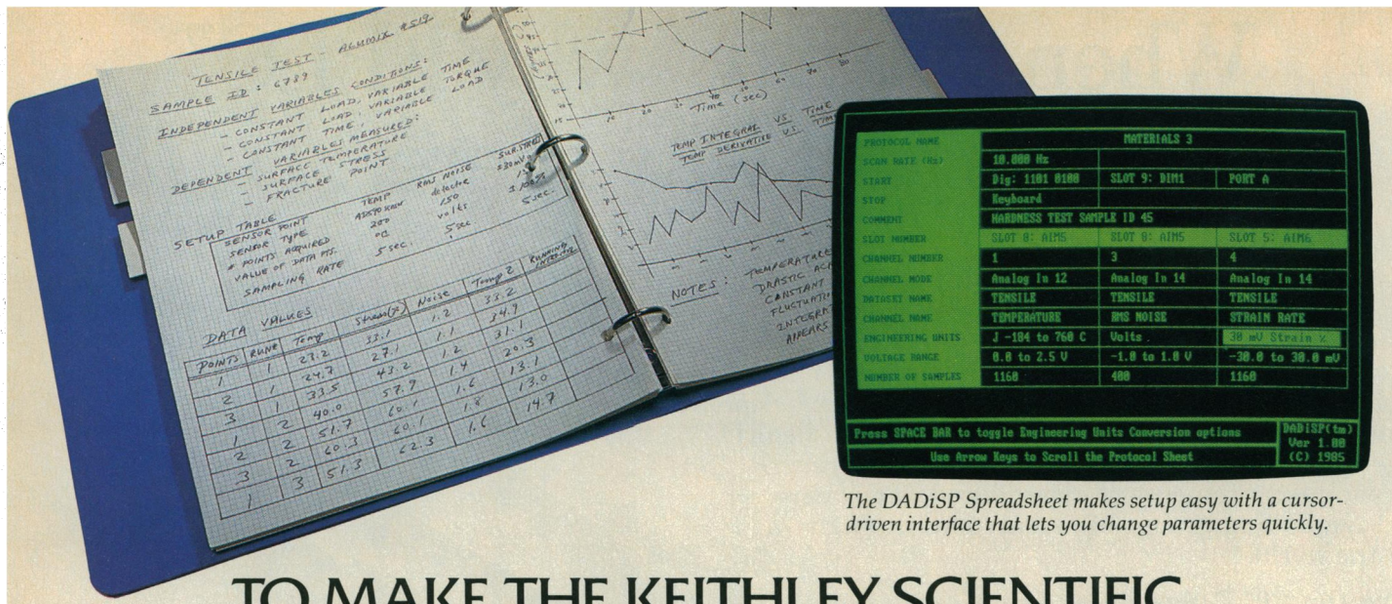
A laser that won't cause blindness or other eye injuries will be used in a rangefinder now under development by Hughes for the U.S. Army. The lightweight device, designated the AN/PVS-6 Mini Eyesafe Laser Infrared Observation Set (MELIOS), resembles a binocular case. Its neodymium yttrium aluminum garnet laser beam is sent through a chamber, or cell, filled with high-pressure methane gas. There the 1.06-micron wavelength is transformed into a wavelength of 1.54 microns. The new signal is safe because it never reaches the retina, but instead is absorbed in the vitreous humor, the white area of the eye between the retina and the lens. MELIOS is being developed under a competitive contract from the U.S. Army Night Vision and Electro-Optics Laboratory.

Large ceramic circuit boards will be built into the Amraam missile to help keep the missile reliable, lightweight, and low in cost. These boards, measuring 5x7 inches, are used instead of standard printed wiring boards where many components must be crammed into a small space and where a lot of heat must be dissipated. The cost of these circuit boards has been lowered significantly by replacing gold circuits with copper. The boards are manufactured by a thick film process in which layers of copper and glass dielectric are alternately applied to provide a multilayer circuit board. Hughes designed and developed the advanced medium-range air-to-air missile for the U.S. Air Force and Navy. The manufacturing facility is located in Tucson, Arizona.

Excellence in communications systems engineering has placed Hughes in a leading position in many of the major U.S. Air Force, Army, Navy, and Marine Corps communications programs, including PLRS, PJH, MILSTAR, and JTIDS. Our Communications Systems Division is committed to meeting the strategic and tactical communications requirements of the 1990s and beyond. We have a continuing need for qualified engineers in all communications systems disciplines at all levels. If your career goals include design of advanced antijam communications systems or HF through millimeter-wave radios, please send your resume to Hughes Ground Systems Group, Professional Employment, P.O. Box 4275, Dept. S2, Fullerton, CA 92634. Equal opportunity employer. U.S. citizenship required.

For more information write to: P.O. Box 45068, Dept. 71-10, Los Angeles, CA 90045-0068

HUGHES
AIRCRAFT COMPANY



The DADiSP Spreadsheet makes setup easy with a cursor-driven interface that lets you change parameters quickly.

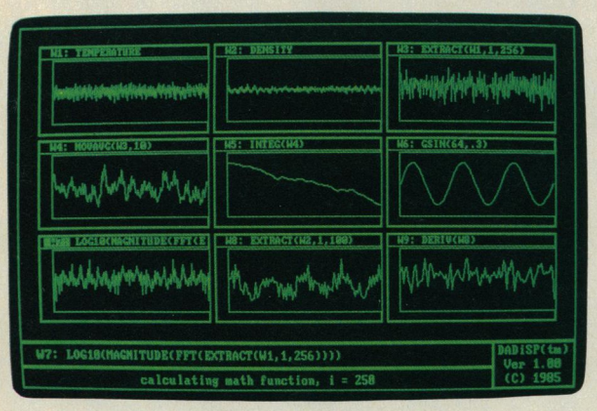
TO MAKE THE KEITHLEY SCIENTIFIC WORKSTATION EVEN EASIER TO USE, WE TOOK A PAGE OUT OF YOUR BOOK.

Your scientific lab book. Introducing DADiSP (Data Acquisition and Digital Signal Processing), a new graphics-driven software package for data acquisition and analysis with Keithley's Series 500 IBM PC-based Scientific Workstation.

DADiSP parallels the way any scientist or researcher normally records and analyzes data in a scientific lab book.

Using a spreadsheet for setup, windows for analysis and zoom graphics for display, DADiSP takes you through the steps to acquire, record and analyze data from your Series 500.

And you don't have to be a programming professional to do it.



DADiSP graphic analysis makes it easy to define each window as raw data or a function of another window. Results are quickly generated for easy interpretation.

■ DADiSP IS EASY TO UNDERSTAND AND EASIER TO USE.

Simply insert the DADiSP diskette into your IBM PC. To set up a test, begin by moving the cursor to the parameters you want to change, such as engineering units. Next, toggle the space bar to select the test conditions, e.g., volts, °C. If you make a mistake, such as calling for a test condition the system does not support, DADiSP identifies your error. It's that easy.

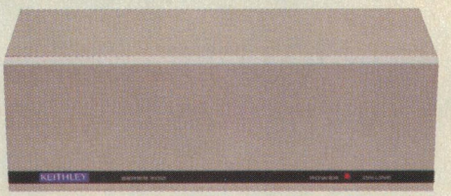
■ DADiSP IS FRIENDLY AND FLEXIBLE.

DADiSP consists of two software modules: the DADiSP I Spreadsheet Module is used for test setups, data acquisition and graphic presentation, including dynamic zoom/cursor capability to let you examine the data more closely. For example, use this module for data monitoring, open loop control and to verify Series 500 operation.

The DADiSP II Worksheet Module uses multiple graphic windows, for analysis, display and manipulation of data. With a single keystroke, DADiSP lets you do extensive data analysis, including FFTs (Fast Fourier Transforms), max/min, integration and differentiation. You can analyze data obtained from Soft500, our standard realtime measurement and control software, or from any ASCII or Lotus 1-2-3 compatible file.

$1975 BUYS THE SERIES 500.

Turn your PC into a powerful realtime data acquisition and control system for only $1975. The System 501 is a complete system consisting of Soft500 software and a mainframe with 8 analog inputs, 12-bit A/D conversion, 32 digital I/O channels and 8 additional slots for expansion. To expand your system, choose from our library of over 20 modules for input, output and signal conditioning. The result: a flexible system at board-level prices.



■ IT'S AN EASY CHOICE BECAUSE IT'S KEITHLEY QUALITY.

Behind the Series 500 is Keithley's 40-year reputation for engineering excellence and low-level measurement expertise. Your Series 500 comes with a one-year full warranty and 90-day free software support. We even provide a toll-free applications hot line. What could be easier?

For more information on the Series 500 and DADiSP software, ask for our new brochure. Call us, toll-free: 1-800-552-1115. (In Massachusetts, call 617-423-7780.) Or write, Keithley Data Acquisition and Control, Inc., 210 Lincoln Street, Boston, MA 02111.

KEITHLEY

Circle No. 67 on Readers' Service Card

When you say "why FPLC" you are half way there...

... because Superose™ from Pharmacia is the peak of evolution in high performance gel filtration for the separation of labile biomolecules.

Over the past 25 years, Pharmacia has developed a broad range of chromatography media, including Sephadex®, Sepharose®, Sephacryl®, MonoBeads™, ProRPC™, and PepRPC™, together with the FPLC System, to meet the ever-growing requirements of experienced, innovative and demanding groups of researchers throughout the world.

Now, the FPLC System and Superose from Pharmacia allow you to use high performance gel filtration without the limitations imposed by silica and stainless steel.

With the introduction of Superose, the Pharmacia range of high performance chromtography media, including MonoBeads, ProRPC and PepRPC, has been extended to provide you with gel filtration media for fast, high resolution separations of biomolecules, from small peptides to large proteins and DNA-fragments.

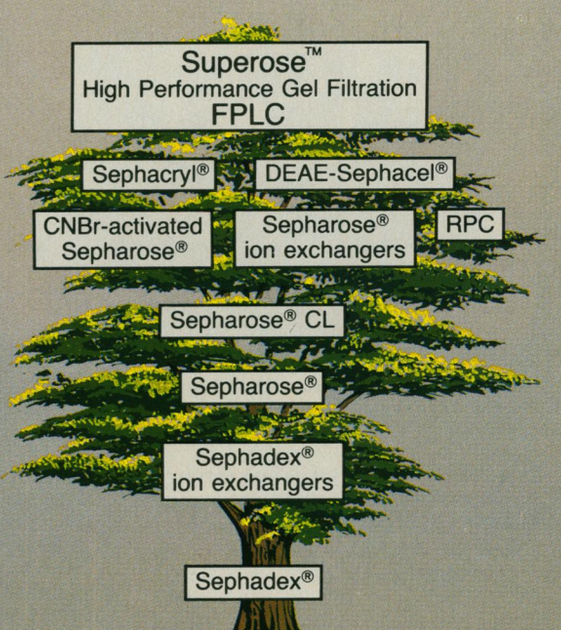
- High performance prepacked glass columns
- Reproducible results
- High recovery of biological activity
- pH stability (1–14)
- Extended column life
- Pharmacia know-how

... so go all the way

Superose pre-packed glass columns with high chemical and pH stability, up to pH 14, provide you with unequalled flexibility in your choice of eluents and greatly simplify your column cleaning routines.

Superose allows you to perform rapid separations (20–60 min) while obtaining high resolution and high recovery, facilitating and improving your work in research, quality control or process development.

Superose has been especially developed for bioscientists and is optimized for high performance separation of proteins, DNA-fragments, peptides and other biomolecules.



Pharmacia

Laboratory Separation Division
Piscataway, New Jersey 08854
Information: (800) 526-3618
In NJ: (201) 457-8000

Circle No. 122 on Readers' Service Card

The natural selection ...
... for the separation of biomolecules.

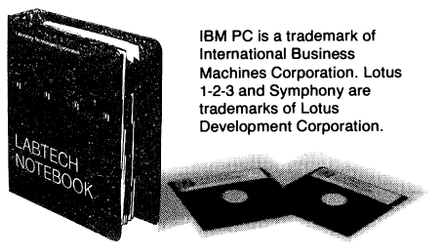
LABTECH NOTEBOOK™: IBM PC™ data acquisition without programming.

LABTECH NOTEBOOK™ is the remarkable new program that collects data directly from your laboratory instruments, analyzes it, and produces charts, graphs and printouts—all without programming!

It's even compatible with Lotus 1-2-3™ and Symphony™ so you can perform enhanced data manipulation, modeling, graphics and even word processing. Imagine going from raw data to a printed final report in minutes.

LABTECH NOTEBOOK supports Acrosystems, Burr-Brown, Cyborg, Data Translation, IBM, Keithley DAS, Metrabyte, National Instruments, Taurus and Tecmar hardware.

Call or write today for a **free 30-day trial,** or to **get more information.**



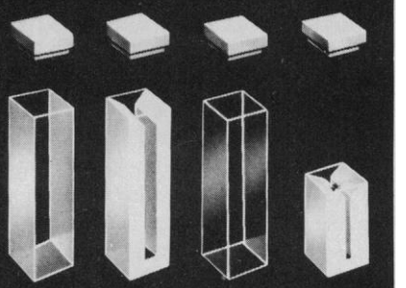
IBM PC is a trademark of International Business Machines Corporation. Lotus 1-2-3 and Symphony are trademarks of Lotus Development Corporation.

LABORATORY TECHNOLOGIES CORPORATION
255 Ballardvale St., Wilmington, MA 01887 • (617) 657-5400

Circle No. 105 on Readers' Service Card

Special discounts on popular cells

THROUGH SEPTEMBER 30, 1985



Type 100H	Type 104H	Type 101H	Type 105H
DISCOUNT PRICE $34.00	DISCOUNT PRICE $46.00	DISCOUNT PRICE $56.00	DISCOUNT PRICE $38.00

All cells have a 10 mm light path.
SEND FOR FREE CATALOG!

QUARACELL PRODUCTS, INC.
P.O. BOX 147
BALDWIN, NY 11510
(516) 249-7533

Circle No. 97 on Readers' Service Card

BURN YOUR REFERENCE CARDS!

REF-11™

Computerizes your REFERENCES and prepares your BIBLIOGRAPHIES

- ☐ Maintains a data base of references
- ☐ Searches for any combination of authors, years of publication, reference title (or any words in the title), and topics covered by the reference
- ☐ Formats bibliographies exactly as you want them
- ☐ Alphabetizes references
- ☐ Abbreviates journal titles
- ☐ Runs on any video terminal and printer
- ☐ Menu driven dialogue
- ☐ Compact storage format
- ☐ 20 lines of comments for each reference

IBM PC/XT/AT, MS-DOS, CP/M 80 ... $195.00

RT-11, TSX-Plus, RSX-11, P/OS $250.00

VAX/VMS (native mode) $350.00

DG™ SYSTEMS

ANY MANUAL $15.00 ANY MANUAL & DEMO $20.00

322 Prospect Ave., Hartford, CT 06106
(203) 247-8500

Connecticut residents add 7½% sales tax.

Circle No. 43 on Readers' Service Card

VENTURE DRUG DEVELOPMENT

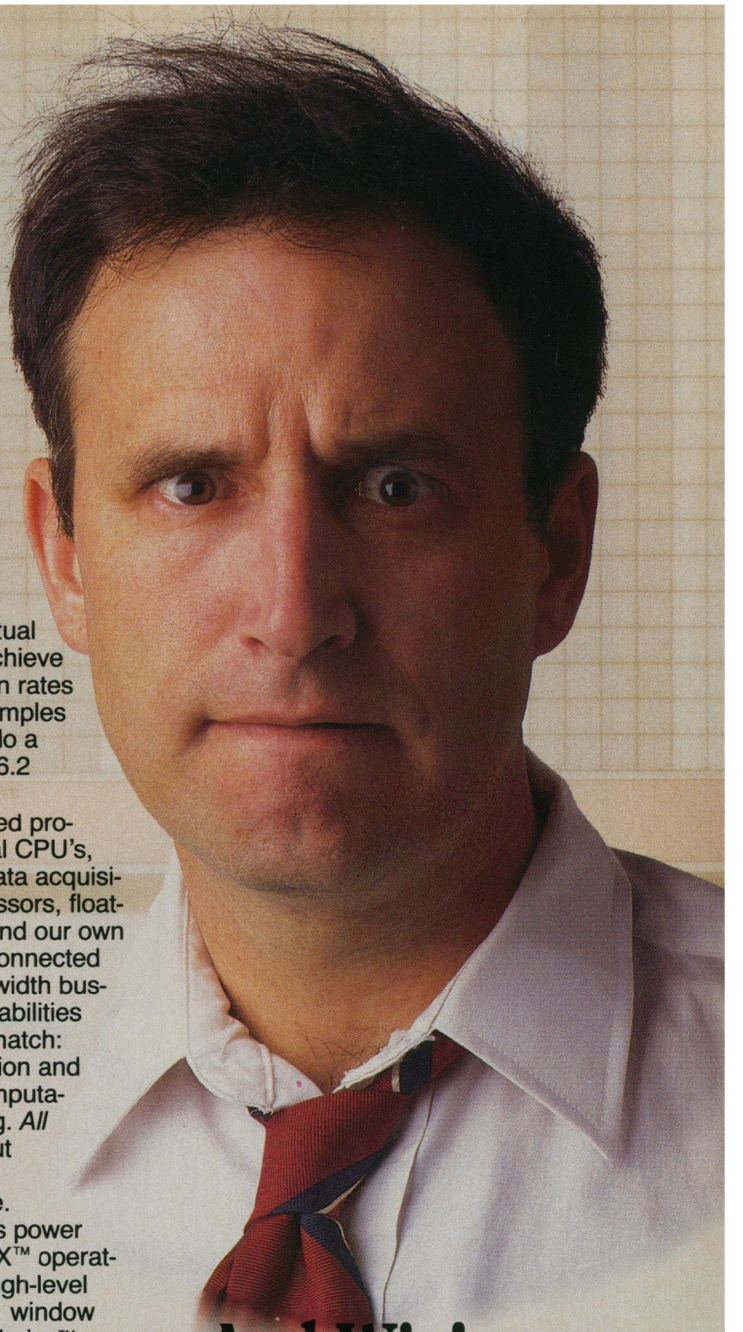
CAPITAL OPPORTUNITIES

Available to develop potential new drugs discovered by independent investigators in academic, government or private institutions.
We are a Swiss development and financial institution and would be pleased to consider preliminary non-confidential proposals on novel chemical or biological compounds which have already shown evidence of therapeutic potential. For further information write to:

DEBIOPHARM S.A.
Rue du Petit-Chêne 38
1003 Lausanne - SWITZERLAND

Circle No. 28 on Readers' Service Card

How to play "You Bet Your Job."



You're faced with a complex, difficult project. An impossible deadline. The computer will be an indispensable tool that either makes or breaks the whole effort.

That expensive supermini from the "big" manufacturer requires costly add-on hardware for real-time processing. Other manufacturers want you to change your applications to fit within the limits of their system's capabilities. You need power, you need flexibility, and you're probably thinking you need a miracle.

Welcome to "You Bet Your Job."

Masscomp's family of scientific and engineering computer systems can help you win. Built around our unique Performance Architecture™, Masscomp's 32-bit virtual memory computers achieve analog data acquisition rates of up to one million samples per second, and can do a complex 1024 FFT in 6.2 milliseconds.

Multiple high speed processors (including dual CPU's, graphic processors, data acquisition and control processors, floating point processors and our own array processor) are connected by multiple high-bandwidth busses. They provide capabilities no other system can match: real-time data acquisition and analysis, scientific computation, graphics, imaging. *All simultaneously.* Without one task degrading another's performance.

You control all this power with our real-time UNIX™ operating system. Multiple high-level languages, Ethernet™, window manager and Quick-Choice™ menu system make this the most complete engineering and scientific computing package available.

And Win!

As one satisfied customer put it, "Using a Masscomp system means never having to say you can't do it all!" But find out for yourself and send for our free 16-page, full-color brochure. You'll see that it's a lot smarter to get a Masscomp system than actually bet your job—and everything that goes with it—on the wrong computer.

Call 800-451-1824; in Massachusetts (617) 692-6200. Telex: 704353; Cable: *MASSCOMP.*

MASSCOMP
One Technology Park
Westford, MA 01886

Help me win.
Please send me your Free Masscomp brochure.

NAME _____ TITLE _____

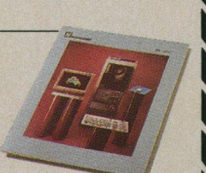
COMPANY _____ TEL. _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

SCI719



MASSCOMP One Technology Park, Westford, MA 01886 Att: Marketing

Performance Architecture and RTU are trademarks of the Massachusetts Computer Corp.
UNIX is a trade mark of AT&T Bell Labs.

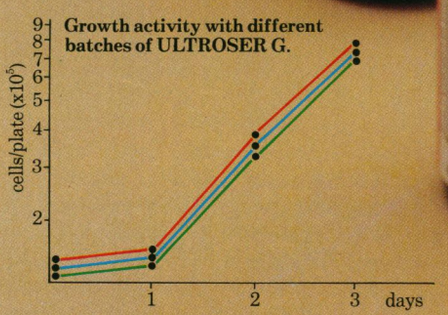
Circle No. 101 on Readers' Service Card

Serum free cell growth with new ULTROSER G

batch, after batch, after batch

ULTROSER G is a serum free synthetic growth support for multi-purpose cell culture—and cuts out the pretesting needed for fetal calf and other alternatives. As a true serum substitute, its well defined composition guarantees you batch uniformity to consistently give you regular cell development and reliable control over tissue culture variability. You'll soon find out how ULTROSER G saves you time, is easy to use, simple to store and gets you results—batch after batch after batch. With 5 times less protein than FCS to simplify purification and bioassays, and the minimal amounts needed (1—3%), you'll know why so many labs like it even more. And when you discover that it comes lyophilized, ready for use and can be kept outside a freezer, you'll want to check it yourself. Get in touch with LKB, and we'll send you the latest on how to grow cells without serum—and without problems.

Trials performed with Vero cells in HAM'S F12 culture medium supplemented with 2% ULTROSER™ G. Tests carried out by Dr. E. Boschetti at Réactifs IBF, France.



Developed and manufactured by

IBF

LKB BROMMA

Head office: LKB-Produkter AB, Box 305, S-161 26 Bromma, Sweden
Tel +46 (8) 98 00 40, telex 10492
Antwerp (03) 218 93 35
Athens-Middle East +30 (1) 894 73 96
Copenhagen (01) 29 50 44 · **Hongkong** (852) 5-555555
London (01) 657 88 22 · **Lucerne** (041) 57 44 57
Madras (044) 45 28 74 · **Moscow** (095) 256-9002
Munich (089) 85 830 · **Paris** (06) 928 65 07
Rome (06) 39 90 33 · **Stockholm** (08) 98 00 40
Tokyo (03) 293-5141 · **Turku** (021) 678 111
Vienna +43 (222) 92 16 07 · **Washington** (301) 963 3200
Zoetermeer (079) 31 92 01
Over 60 qualified representatives throughout the world.

19 July 1985, Volume 229, Number 4710 SCIENCE

Modest Proposals for the Granting System

I have already commented on the importance of peer review and the fact that reviewers are, in some cases, blamed for problems that are outside their control. Now I want to suggest some ways in which the granting system might be improved. I will focus on the National Institutes of Health and examine other agencies at a later time.

One problem at NIH which has raised alarm is the high priority rating that is required for funding. Increased competition for funding is a fact, but priority scores are not always a true indicator of the level of competition because there is "priority score inflation," an infectious disease akin to grade inflation. Between 1975 and 1985, for example, the average percentage of grants funded (per total grant applications) has dropped from 46 to 35 percent. Yet, during that same period, the priority score required for funding has changed even more abruptly in some reviewing panels. This apparently has been caused by members of these panels who attempt to outguess the system and help their fellow scientists. In the long run such efforts are counter-productive because administrators are forced to normalize priority scores to obtain correct readings. The sooner the peer panels return to realistic evaluations, the better. A backup system in which administrators or councils can decide to fund a grant that receives a score just below the cut-off line—because it is the sole support of an investigator—and deny the *n*th grant of a more distinguished individual, with a score just above the cut-off line, has been used in some institutes and should be extended, with caution.

The fraction of the total research funding that is assigned to overhead costs deserves a systematic study. The increase in overhead is not alarming per se because the average figure for overhead is 31 percent of direct costs, but it has been increasing at a rate of 0.5 percent per year. One of the built-in dangers here is the competition among university administrators to indulge in "creative financing" for their own institutions. Busy scientists, not wanting to get involved in such arrangements, frequently go along, assuming that since "University X is getting 90 percent overhead—why shouldn't we?" Moreover, some outside agency that has little knowledge of the specific research or the appropriate charges is involved in negotiating with campus administrators. (The Defense Department evaluates overhead for NIH in certain areas of the country, for example.) An examination of this system by an independent team of accountants might reveal that a national average overhead cost would be fair, with some allowances made for special circumstances.

Another possible improvement would be to emphasize the track record of a seasoned investigator in preference to the evaluation of the specific proposal. The chance that an investigator will lose grant support during the first three renewal periods is 50 percent. The chance of losing support after the third renewal is less than 10 percent. Focusing on track records and using a short grant form might reduce paperwork and be a more humane and efficient system for peer evaluation of proven investigators.

Finally, there is the difficult question of salary. It is the most vexing single item to NIH officials. Any drastic reduction in salaries would threaten the viability of the smaller institutions, yet salaries of principal investigators are increasingly eroding research dollars. Peer reviewers are told that they have no jurisdiction over salaries, but inflated salaries should be their concern. Should we not establish more rational guidelines and apply them gradually over the years to lessen withdrawal pains?

Only with constant vigilance will our granting system maintain the respect that it has earned and deserves from the recipients of its decisions and the outsiders who ask that scientists run their affairs well.

—DANIEL E. KOSHLAND, JR.

The repeater.

Eppendorf Repeater™ Pipette

Reliable, repetitive pipetting.
With the Eppendorf Repeater* Pipette, dispensing up to 48 samples without a refill is a snap. Just set the selection dial for the volume you need and your choice is locked in place to prevent errors. That means the last sample will be as accurate and precise as the first. And the unique Combitip™ polypropylene/polyethylene reservoir eliminates cleaning, contamination, and carryover because it's disposable.

1-second delivery.
The Repeater makes serial pipetting procedures faster than ever before. Simply press the lever to deliver your samples at 1-second intervals. The volume range is wide enough to accommodate almost any procedure. With six Combitip sizes and five dial settings, you choose from 22 different volumes between 10 µL and 5 mL.

*U.S. Pat. No. 4406170

Six Combitip sizes

A wide variety of applications.
The Repeater can handle any liquid easily. Even difficult or hazardous liquids aren't a problem, since the liquid contacts only the Combitip—not the instrument itself. The Combitip is available in nonsterile or sterile packaging for microbiologic and tissue culture techniques. And it can be refilled and reused as long as the same liquid is being pipetted.

For literature on the Repeater or other Eppendorf pipettes, write: Brinkmann Instruments Co., Division of Sybron Corporation, Cantiague Road, Westbury, NY 11590, or call 800-645-3050; in New York, 516-334-7500. In Canada: 50 Galaxy Blvd., Rexdale, Ont. M9W 4Y5, or call 416-675-7911.

eppendorf

Brinkmann
DIVISION OF SYBRON

BRK-5235

For literature circle reader service number 53.
For a demonstration circle reader service number 54.