20 August 1982 • Vol. 217 • No. 4561 $2.50

SCIENCE

You get real RPM only from Beckman: Reliability Plus Memory.

Start with a choice of speeds up to 80,000 rpm—forces to 600,000 *g*. Add the exclusive Ultra-Smooth frequency-controlled induction drive and a 16-billion revolution warranty.

Then add *true* microprocessor control with the exclusive, convenient Memory-Pac™ capability, and you have Reliability *Plus* Memory.

The Beckman L8 preparative ultracentrifuges deliver extraordinarily smooth, fast acceleration and energy-efficient high performance. You have ease of operation with touch-sensitive controls and Memory-Pac™ solid state modules to store your exact instructions for repeat runs.

From diagnostic indicators to $\omega^2 t$, the true microprocessor L8 gives you informed control during every phase of the run.

Choose from the largest variety of rotors available, plus tubes, accessories and chemicals, all from a single source—Beckman.

You can expect service to be as prompt as it is expert because there are nearly 500 trained Beckman service representatives in Canada and the U.S.A.

Combined with our 35 years of technical and applications experience, it's no wonder we're called the world leader in centrifuge technology.

Get real RPM. Call your Beckman representative or write: Beckman Instruments, Inc., Spinco Division, P.O. Box 10200, Palo Alto, California 94304.

BECKMAN

Circle No. 216 on Readers' Service Card

Monoclonal Antibody SCREENING SYSTEMS

for murine immunoglobulins

They save time —

The ELISA method employed yields a rapid and dramatic color development in the presence of positive clones. It's faster than conventional RIA and can be used with visual, manual spectrophotometric, or fully automated processing.

They avoid trouble —

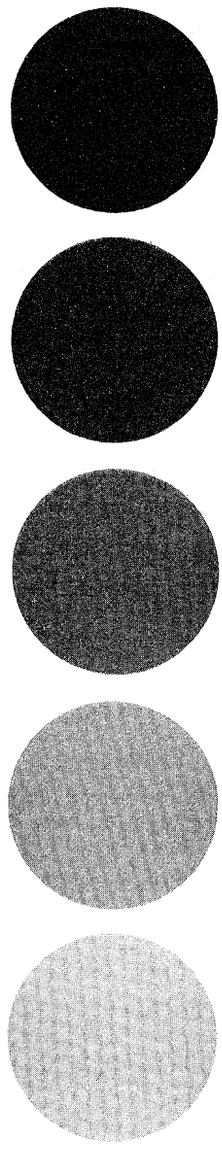
Our reagents are pretested and optimized in each screening system to prevent unwanted variables from spoiling your results.

They're complete and ready to use —

Detailed protocol and specific titer information are provided with the pretested components:

Enzyme-conjugated second antibody
Color development agent
Dilution buffer
Washing buffer
Substrate buffer

Our technical bulletin illustrates how easy it is to use the ELISA method. Send for it.



Horseradish Peroxidase

Protein A-HRP conjugate system *New*
NEI-608 (~20,000 assays)

Sheep F(ab')$_2$ anti-mouse Ig-conjugate system
NEI-601 (~10,000 assays)

Goat anti-mouse Ig-conjugate system
NEI-602 (~20,000 assays)

Alkaline Phosphatase

Sheep F(ab')$_2$ anti-mouse Ig-conjugate system
NEI-603 (~10,000 assays)

Sheep anti-mouse Ig-conjugate system
NEI-604 (~20,000 assays)

β-Galactosidase

Sheep F(ab')$_2$ anti-mouse Ig-conjugate system
NEI-606 (~10,000 assays)

Goat anti-mouse Ig-conjugate system
NEI-605 (~20,000 assays)

Not for use in humans or clinical diagnosis.

New England Nuclear, 549 Albany Street, Boston, MA 02118
Call toll free: 800-225-1572, Telex: 94-0996
Mass. and Internat'l: 617-482-9595
Europe: NEN Chemicals GmbH, D-6072, W. Germany
Postfach 401240, Tel. (06103) 803-0, Telex: 4-17993 NEN D
NEN Canada: 2453 46th Avenue, Lachine, Que. H8T 3C9
Tel. 514-636-4971, Telex: 05-821808

NEN New England Nuclear®
a Du Pont company

Circle No. 206 on Readers' Service Card

LEADER IN BIOTECHNOLOGY

ISSN 0036-8075

20 August 1982

Volume 217, No. 4561

SCIENCE

LETTERS

Academy Marijuana Report: *J. Kaplan, L. Lasagna*; Multiple Submission: *S. Epstein, P. Nadler, J. Lunney*; Missing Computers: *P. Connes*; Audit at the University of California: *E. F. Cheit*; Sources of Northeast Pollution: *K. A. Rahn* 686

EDITORIAL

Astronomy and Astrophysics in the United States 691

ARTICLES

Melting of Two-Dimensional Solids: *W. F. Brinkman, D. S. Fisher, D. E. Moncton* 693

Critical Care at Tianjin's First Central Hospital and the Fourth Modernization: *R. C. Fox* and *J. P. Swazey* 700

Alternative Energy Futures: The Case for Electricity: *U. Colombo* 705

NEWS AND COMMENT

A $20-Million Test of Cooperation 710

A Turnabout on EPA Lead Rules 711

Briefing: Breeder Wins Exemption from Licensing Procedures; Stanford Patent Delayed; Mathematical Magic; Genex to Go Public 712

Love Canal Study Attracts Criticism 714

Reagan Alters Makeup of Ethics Panel 715

RESEARCH NEWS

Darwin Died at a Most Propitious Time 717

"Wolf and Lamb" Chemistry 719

Polymer Briefing: Stereoselective Synthesis of Amino Acids; Novel Materials from Telechelic Prepolymers; New Polymers by Blending; Biomimetic Phosphorus Condensing Agents 720

CERN Gives Nod to Four LEP Detectors 722

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 Science Monthly**® Domestic individual membership and subscription (51 issues): $48. Domestic institutional subscription (51 issues): $85. Foreign postage extra: Canada $24, other (surface mail) $27, air-surface via Amsterdam $55. First class, airmail, school-year, and student rates on request. Single copies $2.50 ($3 by mail); back issues $3 ($3.50 by mail); classroom rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. **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

BOOK REVIEWS

A Century of Chemical Engineering, *reviewed by J. J. Beer*; The Oceanic Lithosphere, *G. R. Heath*; Fossil and Recent Ostracods, *L. S. Kornicker*; Experiences in Biochemical Perception, *J. D. Lipscomb*; Books Received 723

REPORTS

Diving Depths and Energy Requirements of King Penguins: *G. L. Kooyman* et al. 726

Hypotensive Effect of Fasting: Possible Involvement of the Sympathetic Nervous System and Endogenous Opiates: *D. Einhorn, J. B. Young, L. Landsberg* 727

Events in the Evolution of Pre-Proinsulin: *R. J. Douthart* and *F. H. Norris* 729

Neurotoxin-Specific Immunoglobulins Accelerate Dissociation of the Neurotoxin–Acetylcholine Receptor Complex: *J.-C. Boulain* and *A. Ménez* 732

Psoralen Phototoxicity: Correlation with Serum and Epidermal 8-Methoxypsoralen and 5-Methoxypsoralen in the Guinea Pig: *A. Kornhauser, W. G. Wamer, A. L. Giles, Jr.* 733

Mucus Secretion–Stimulating Activity in Human Lymphoblastoid Cells: *H. Kulemann-Kloene, S. S. Krag, F. B. Bang* 736

Transformation of Human Leukocytes by Cocultivation with an Adult T Cell Leukemia Virus Producer Cell Line: *N. Yamamoto* et al. 737

Substance P: A Putative Sensory Transmitter in Mammalian Autonomic Ganglia: *Z.-G. Jiang, N. J. Dun, A. G. Karczmar* 739

Rabbit Hepatic Progesterone 21-Hydroxylase Exhibits a Bimodal Distribution of Activity: *H. H. Dieter, U. Muller-Eberhard, E. F. Johnson* 741

Abnormal Development of Kitten Retino-Geniculate Connectivity in the Absence of Action Potentials: *S. M. Archer, M. W. Dubin, L. A. Stark* 743

Prolactin and Growth Hormone Release by Morphine in the Rat: Different Receptor Mechanisms: *K. Spiegel, I. A. Kourides, G. W. Pasternak* 745

Mice Regrow the Tips of Their Foretoes: *R. B. Borgens* 747

Marmosets (*Saguinus fuscicollis*): Are Learning Sets Learned?: *E. W. Menzel, Jr.*, and *C. Juno* 750

Long-Term Consistency of Dominance Relations Among Female Baboons (*Papio cynocephalus*): *G. Hausfater, J. Altmann, S. Altmann* 752

Technical Comments: Uranium Series Ages of the Del Mar Man and Sunnyvale Skeletons: *J. L. Bada* and *R. Finkel*; *J. L. Bischoff* and *R. J. Rosenbauer* 755

COVER

King penguins (*Aptenodytes patagonica*) are the second largest penguin. Adults weigh about 15 kilograms. It requires about 12 months to fledge one chick, during which time the adult must make frequent trips to sea to forage. See page 726. [Gerald K. Kooyman, Scripps Institution of Oceanography, La Jolla, California 92093]

$699.
And it talks to computers.

That makes it your smartest buy in balances.

The Fisher/Ainsworth MX-400: once you own it, you may never need another. Its bright LED display gives readout from 0.01 to 400 grams, in three seconds or less. Or alternative readout in ounces, grains or pounds. A single-chip microprocessor centralizes all built-in functions. Special circuitry and filters correct for ambient temperature and vibrations. And you get repetitive full-range taring, stability/mode indicator, polarity signs, negative readout too. All the features you expect in a $1500 balance — and more. For about $800 **less.**

Two-way interfacing lets this balance grow with your needs. A jack on the back lets the MX-400 hold two-way conversations with most any computer or terminal. Via a standard RS232 bi-directional interface. That means you can tare, weigh or change balance functions by remote control. Count parts. Determine weight gain or loss percentages. Even define your own units of measurement. Hook it up to a printer for automatic record-keeping. Weigh samples in pennyweight, scruple, troy ounce or dram units. This balance is ready for whatever you're into.

And it's the Guaranteed Weigh. Quite simply, we'll give you a brand new replacement for any MX-400 that fails within one year of purchase. Just so long as it hasn't been abused or operated under impossible conditions. Why? Our advanced design uses 40% fewer IC's for exceptional stability and reliability. Our computerized QC procedures have resulted in one of the lowest rates of failure in the industry. And our testing shows this is the most reliable electronic balance we've ever made.

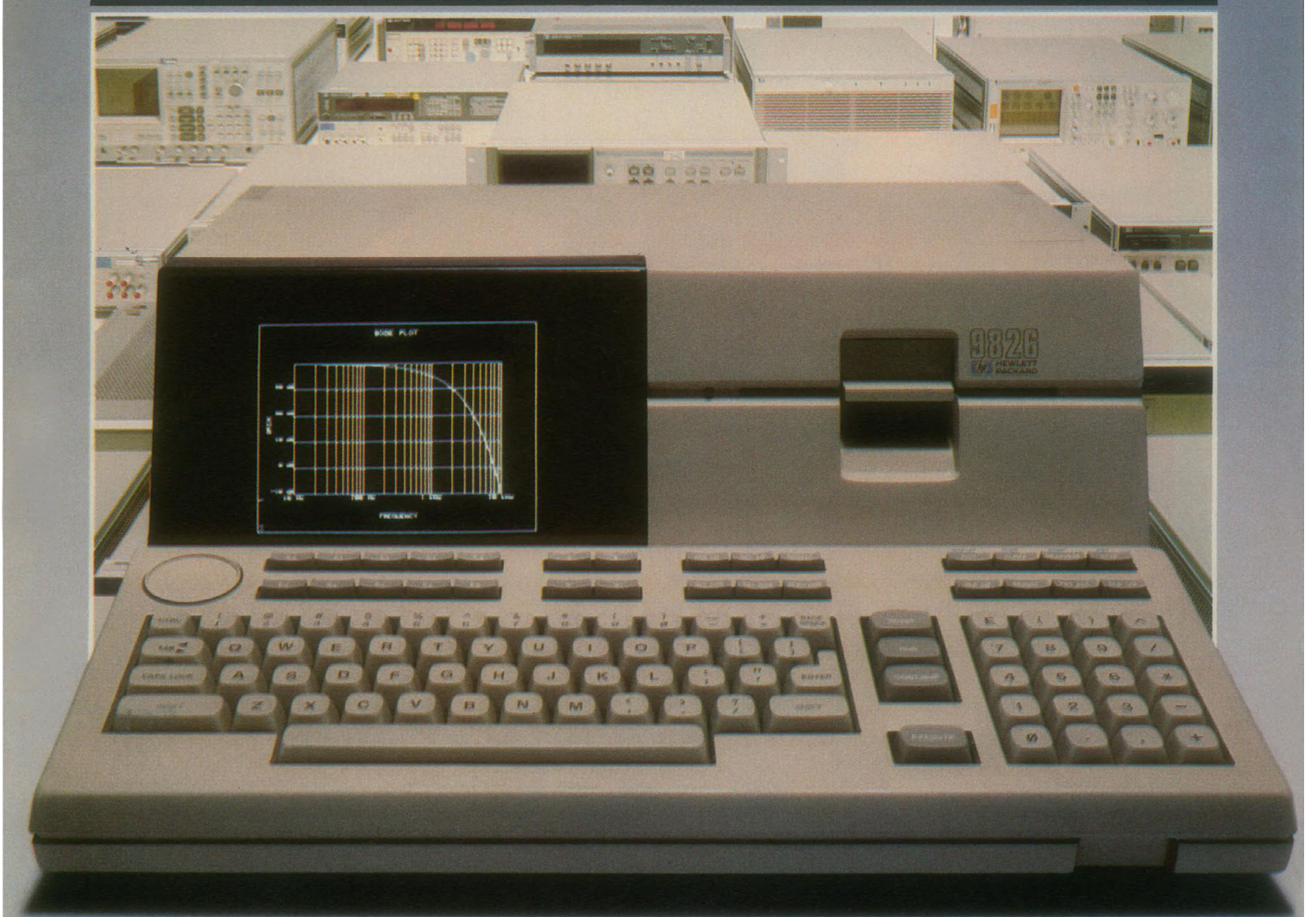
Want more details? Just check with your Fisher rep; circle our number on the reply card; or call (412) 562-8543.

Fisher Scientific

Circle No. 236 on Readers' Service Card

We spent ten years fine-tuning our controllers to work with all these instruments.

It'll take you about ten minutes.



If you're building an automated test system, you've got hundreds of instruments and six interfaces to choose from. And when you try to put it all together, you're in for some long nights in the lab. Unless you use a controller that's been designed just for the job. The HP 9826.

This is the fourth generation controller we've developed just for test environments. And since we've had over a decade of input from our customers, we've given you the kind of features it takes to make your job nice and simple.

To begin with, we designed in an MC 68000 CPU. Which gives the 9826 the power to handle today's high-performance instruments.

Then we made it flexible. With six interfaces available, the 9826 can control almost every instrument made. So you can concentrate on finding the instruments you like best. And with our plug-in interface cards, this rack-mountable controller is about as simple to set up as a stereo system.

There's a rotary control knob that lets you calibrate your instruments with fast, precise analog inputs. A CRT screen and graphics output that help you interpret data with just a glance.

To make your job easier yet, we give you three powerful high-level languages to choose from: HPL, PASCAL or BASIC. And since our built-in I/O drivers automatically handle all the extensive formatting and communications with the interface card you won't have to worry about writing drivers or bother with low-level I/O commands.

So. Before you try to automate your testing, we think you should talk to us. Because we've spent 40 years building instruments. Ten years fine-tuning our controllers. And now you can have the benefit of all our experience. Neatly wrapped up in a package that's ready to run, right out of the box.

Just call your HP local sales office. Or write: Pat Welch, Dept. 35146, Hewlett-Packard, 3404 East Harmony Road, Fort Collins, CO 80525.

HEWLETT PACKARD

TCG-202

Circle No. 174 on Readers' Service Card

A new generation of microscopes with advanced optical engineering and ergonometric design: Olympus BH-2 System Series.

This could well be a most significant contribution to the science of microscopy and photomicrography.

The Olympus BH-2.

Fulfillment of operational, illumination and brightness control goals.

Unsurpassed totally new LB optics provide vastly superior image quality.

New operational superiority improves viewing comfort and offers a natural eyepoint position.

Low position focusing and stage movement knobs provide natural hand positioning.

Improved Koehler illumination is developed for ultra-low magnifications (1x to 4x); and standard magnifications (2x to 100x).

Add precision L.E.D. brightness controls and a host of accessories (phase contrast, Nomarski interference contrast, Hoffman modulation contrast, reflected and transmitted light fluorescence, polarized light and more) and you have today's state-of-the-art development inviting your examination.

Contact the Olympus Authorized Dealer listed in your Yellow Pages, or Precision Instrument Division, Olympus Corporation of America, 4 Nevada Drive, New Hyde Park, NY 11042.

In Canada, W. Carsen Co., Ltd., Ontario

OLYMPUS®
The Science Company

Circle No. 40 on Readers' Service Card

A simpler, more sensitive way to measure Collagenase activity.

Now you can achieve new levels of sensitivity and put your confidence in a proven system. New England Nuclear has developed an exclusive system for detecting and measuring bacterial and mammalian-like collagenases in biological samples.

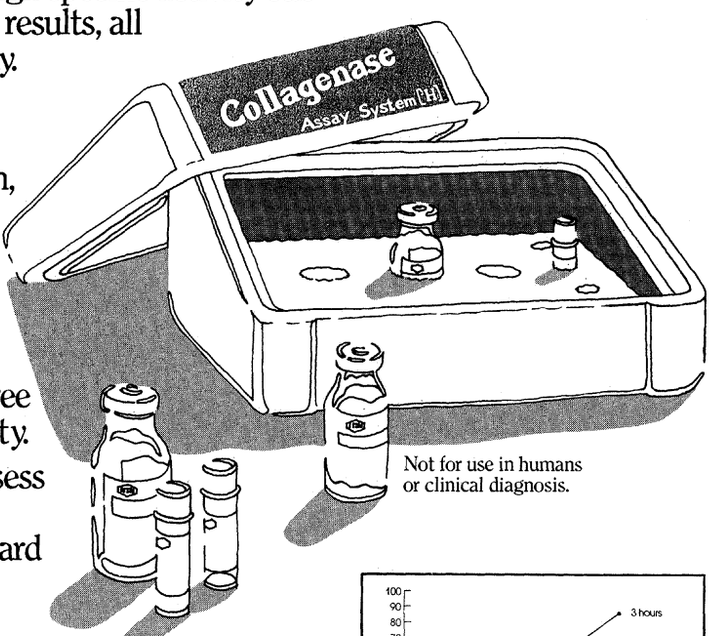
The highly sensitive assay is based on quantitation of soluble radioactive products released by collagenase digestion of NEN's high specific activity substrate. To assure you of reliable, reproducible results, all components are pretested in a complete assay.

Collagenase System [^{3}H]

The system includes tritiated Type I collagen, an optimized buffer containing calcium, as well as control bacterial and vertebrate collagenases. The control enzymes are provided to verify proper functioning of the system and permit construction of standard curves. Both cleave native collagen and are free of contaminating non-specific protease activity.

With each lot of systems our biochemists assess collagenolytic activity in a control reaction. Copies of the resulting gel analysis and standard curves accompany each system.

Reader Service #247

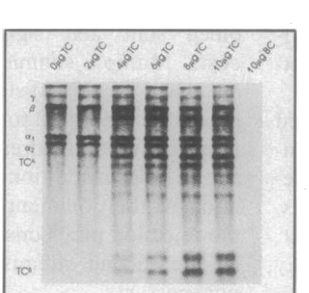


Not for use in humans or clinical diagnosis.

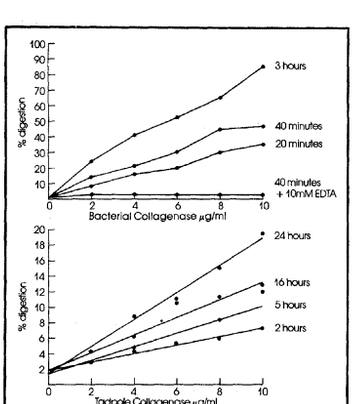
Other pretested systems from NEN

Calmodulin [^{125}I] RIA Kit
β-Endorphin [^{125}I] RIA Kit
β-Lipotropin [^{125}I] RIA Kit
6-Keto-Prostaglandin $F_{1\alpha}$ [^{3}H] RIA Kit
Thromboxane B_2 [^{3}H] RIA Kit
Promegestone [^{3}H] RIA Pak

Reader Service #248



Gel analysis showing products released from tritiated collagen after 24 hours of incubation with either tadpole (TC) or bacterial (BC) collagenase.



Digestion of tritiated collagen by varying quantities of purified bacterial and tadpole collagenases.

New England Nuclear
549 Albany Street, Boston, MA 02118
Call toll free: 800-225-1572, Telex: 94-0996
Mass. and Internat'l: 617-482-9595
Europe: NEN Chemicals GmbH, D-6072, W. Germany
Postfach 401240, Tel. (06103) 803-0, Telex 4-17993 NEN D
NEN Canada: 2453 46th Avenue, Lachine, Que H8T 3C9
Tel. 514-636-4971, Telex 05-821808

NEN New England Nuclear®
a Du Pont company

Zonax

The next step in microscopy!

ZONAX: so smart, it's simple!

You can use ZONAX from the moment you set it up. No programming to learn! Data analysis at your fingertips.

ZONAX respects optics!

ZONAX, with Zeiss optics, is the only system that lets you use microscope optics to the fullest. All measurements are made on the optical axis. The specimen moves, not the optics. You take advantage of the maximum resolution of the microscope.

Because the optics are Zeiss, they're the best in the world. They're accompanied by the finest selection of accessories. You get everything that the Great Name in Optics can offer: engineering of the highest precision and expert service nationwide from factory-trained personnel.

For a demonstration, call your local Zeiss dealer, or contact any Zeiss office.

Carl Zeiss, Inc., One Zeiss Drive, Thornwood, NY 10594
(914) 747-1800. Branches: Atlanta, Boston, Chicago, Houston, Los Angeles, San Francisco, Washington, D.C.

All measurements are made on the optical axis.

The great name in optics

ZEISS

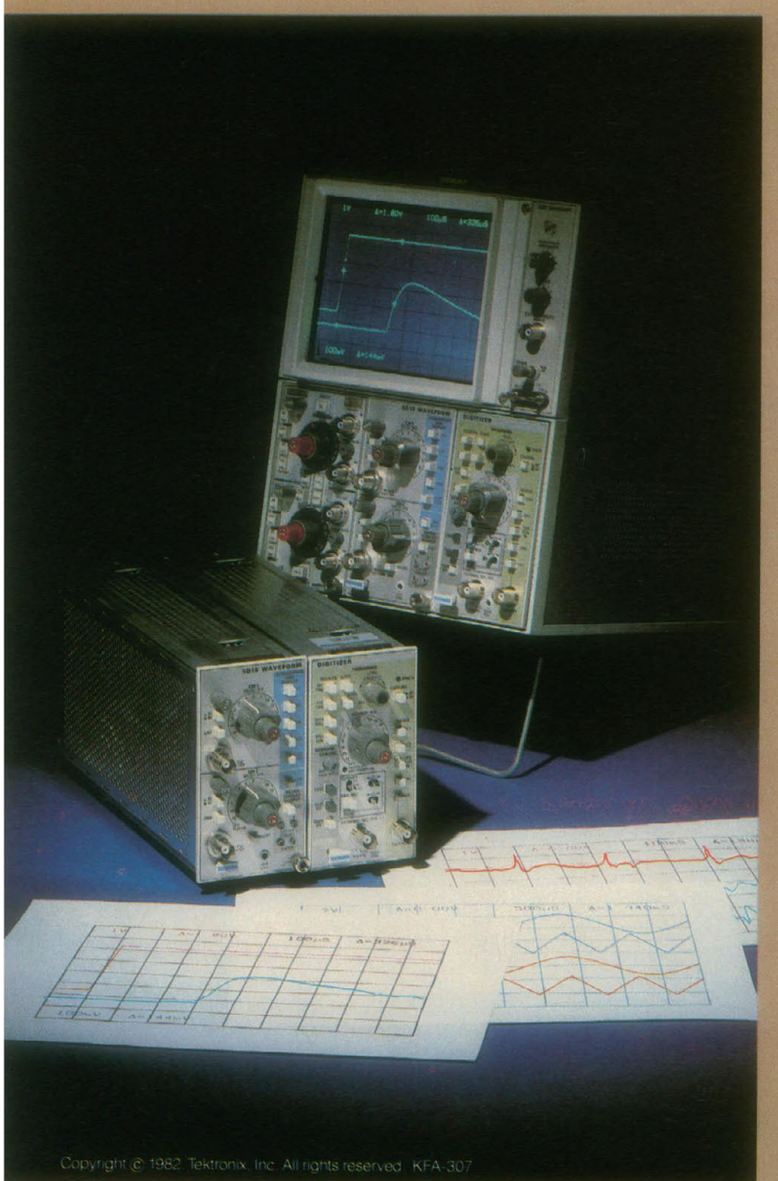
West Germany

ZONAX does what the eye and the camera cannot do—it quantifies your microscopic image, making full use of Zeiss optics.

For Literature circle reader service number 222
For a demonstration circle reader service number 225

TEK 5D10 WAVEFORM DIGITIZER

Introducing a digital storage plug-in for Tek 5000 Series scopes.



Now you can have the benefits of digital storage by the simple addition of the Tek 5D10 plug-in to any Tek 5000 Series scope. The 5D10 is powerful testimony to the long-term value of Tek's unique plug-in concept: nothing else gives you so much capability at an affordable price.

With the 5D10, all critical information is alpha-numerically displayed on the CRT, including instrument settings, cursor values and trigger point. Results are accurate to ±1%. Storage is automatic, for as long as you like. Features such as cursors, pre-trigger and stored reference waveforms help make short work of your measurement tasks.

The 5D10 is a boost to biofeedback analysis. To Visual Evoked Response. To microelectrode based testing. And to scores of other applications. You can record and store multiple waveforms. A choice of nine different amplifiers assures proper signal conditioning. You enjoy automatic measurement while using the familiar Tek 5000 Series scope.

Documentation is easy and complete. Connect the 5D10 to an X-Y recorder or use your existing camera: either way, you automatically obtain vital waveform and CRT readout as part of your records.

Call the toll-free number below for more information on the 5D10. Or talk to your Tek Sales Representative soon. Count on Tektronix to keep you current, at the most reasonable cost, now and in the future.

For further information, contact:

U.S.A., Asia, Australia, Central & South America, Japan
Tektronix, Inc.
P.O. Box 4828
Portland, OR 97208
Phone: 800/547-1512
Oregon only: 800/452-1877

Europe, Africa, Middle East
Tektronix Europe B.V.
Post Box 827
1180 AV Amstelveen
The Netherlands
Telex: 18312

Canada
Tektronix Canada Inc.
P.O. Box 6500
Barrie, Ontario L4M 4V3
Phone: 705/737-2700

The Answer By Any Measure

Tektronix
COMMITTED TO EXCELLENCE

Circle No. 211 on Readers' Service Card

20 August 1982, Volume 217, Number 4561 **SCIENCE**

Astronomy and Astrophysics in the United States

A recently issued report* on astronomy begins: "Nature offers no greater splendor than the starry sky on a clear, dark night. Silent, timeless, jeweled with the constellations of ancient myth and legend, the night sky has inspired wonder throughout the ages."

For most of human history, leadership in studying the heavens has resided elsewhere, but during the 20th century the United States has been the world center of astronomy. This preeminence has been due to good financial support and the imaginative creation of innovative observing equipment. The capabilities of excellent optical telescopes, developed during the first half of this century, were later extended by equipment designed for observing throughout the electromagnetic spectrum. Leading supporters of the development of optical telescopes were the Carnegie Institution of Washington, with its 2.5-meter telescope at Mount Wilson, and the Rockefeller Foundation, which gave the California Institute of Technology funds to build the 5-meter telescope at Mount Palomar. More recently, the National Science Foundation has become a major funder of ground-based astronomy, while NASA has provided excellent facilities in space. The United States has led in exploration of the solar system. In addition, it has launched space vehicles that have permitted observations which could not be achieved from the earth because of absorption of radiation in the atmosphere. The Space Telescope, to be launched in 1985, will be free from atmospheric inhomogeneities that blur sources of light and will be capable of high resolution of objects.

By 1970, generous support of American astronomy had led to many discoveries, including Hubble's expanding universe, time and celestial distance scales, quasars, x-ray sources, high-energy celestial gamma rays, the cosmic microwave background radiation, and polyatomic molecules in interstellar clouds. Discoveries during the 1970's included neutron stars accreting matter from nearby companion stars, hot intergalactic gas whose mass rivals that of the galaxies themselves, vast regions of interstellar gas heated to hundreds of thousands of degrees by shock waves from supernova explosions, and a gravitational lens effect observed as the splitting of light from a distant quasar as the light passed through an intervening galaxy.

The contributions of American astronomy are important and impressive. However, leadership cannot be maintained by resting on our laurels. Continuing preeminence of the United States will be dependent on well-trained people, who are provided with superior equipment.

The astronomical community has made a careful and searching study of opportunities and needs for support for the 1980's. Through extensive consultation and deliberation, a consensus has been achieved. The major new equipment recommended includes (i) an advanced X-ray Astrophysics Facility operated in space; (ii) a Very-Long-Baseline Array of radio telescopes; (iii) a New Technology Telescope, 15 meters in diameter, for ground-based studies in the optical and infrared regions of the spectrum; and (iv) a Large Deployable Reflector in space. All of these proposals would substantially extend the capabilities of astronomy. For example, the Very-Long-Baseline Array would have an angular resolution 100 times better than that of any other image-forming telescope at any wavelength. It would yield detailed radio images of quasars, the nuclei of galaxies, and features of interstellar molecular clouds and other astronomical objects. The first and third items above would be important for many studies, perhaps the most interesting being the examination of extremely distant objects whose radiation was emitted early in the history of the universe.

The report is well constructed and readable. It states well the case for additional expenditures for astronomy. Because of current budgetary problems, its recommendations may not be quickly accepted. However, it is designed to be relevant to the 1980's and at least part of it will surely be ultimately implemented.—PHILIP H. ABELSON

**Astronomy and Astrophysics for the 1980's*, volume 1, *Report of the Astronomy Survey Committee* (National Academy Press, Washington, D.C., 1982).

NEW U.L. LISTED EPPENDORF® 5414 MICRO CENTRIFUGE WITH MOMENTARY SWITCH AND TIMING LIGHT.

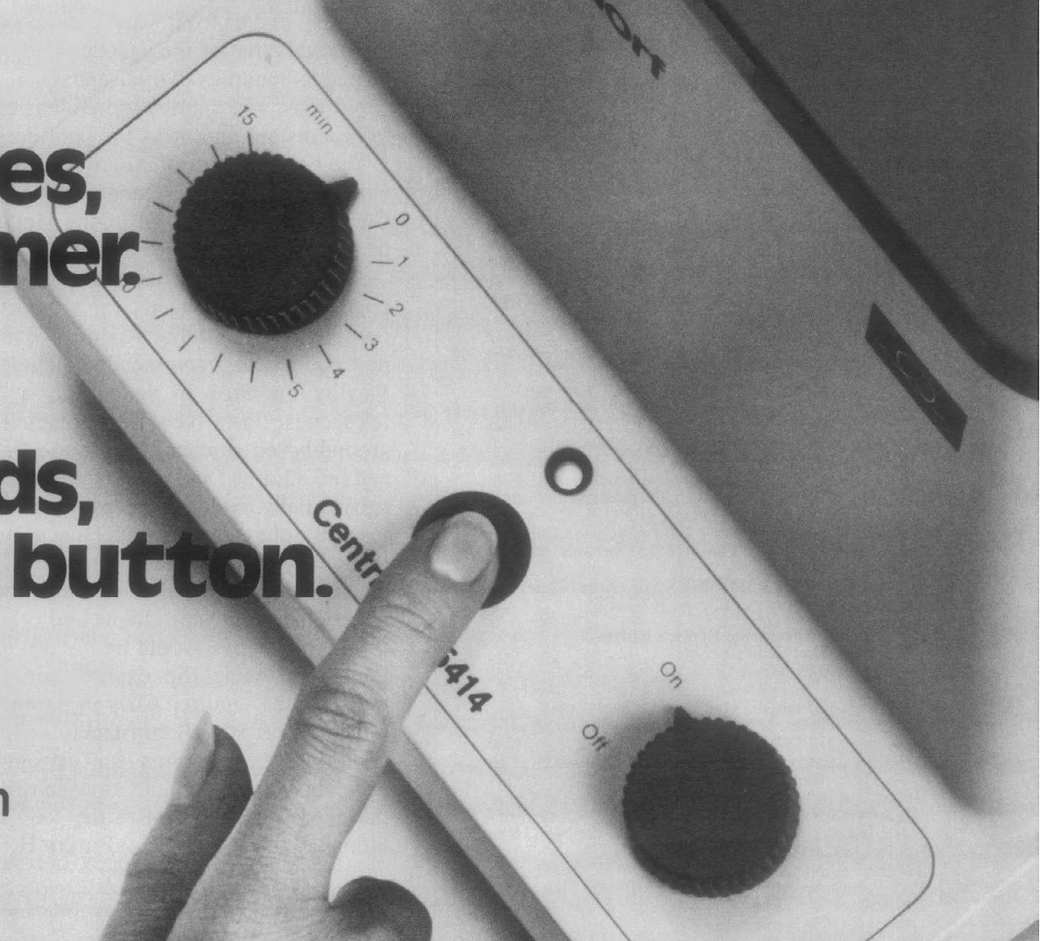
This is the centrifuge that lets you spin a sample without spinning the timer dial. For spins of 60 seconds or less, simply hold down the Momentary Switch as long as necessary; a lighted diode flashes at 1-second intervals to let you time the spin. Longer centrifuging is controlled by the built-in 15- or 30-minute timer with automatic shut-off.

More convenient and more efficient than previous models, the 5414 reaches maximum speed in just 5 seconds, regardless of load. RCF has been increased to 15,600xG at 15,000 rpm for faster separations. The angled rotor head accepts twelve standard 1.5 ml Eppendorf Test Tubes, or 500 µl, 400 µl and 250 µl tubes using adapters. (For larger loads, Model 5413 spins up to forty tubes horizontally in four vertical carriers holding up to ten 1.5 ml, 400 µl or 250 µl tubes each. Maximum RCF is 8,800xG at 11,500 rpm.) On both models, a safety lid lock prevents operation with the top open.

For literature, write: Eppendorf Division, Brinkmann Instruments, Inc., Subsidiary of Sybron Corporation, Cantiague Road, Westbury, NY 11590; or call 516/334-7500. In Canada: Brinkmann Instruments (Canada), Ltd.

To spin for minutes, set the timer.

To spin for seconds, touch the button.



SYBRON | Brinkmann

For literature circle reader service number 108
For demonstration circle reader service number 109