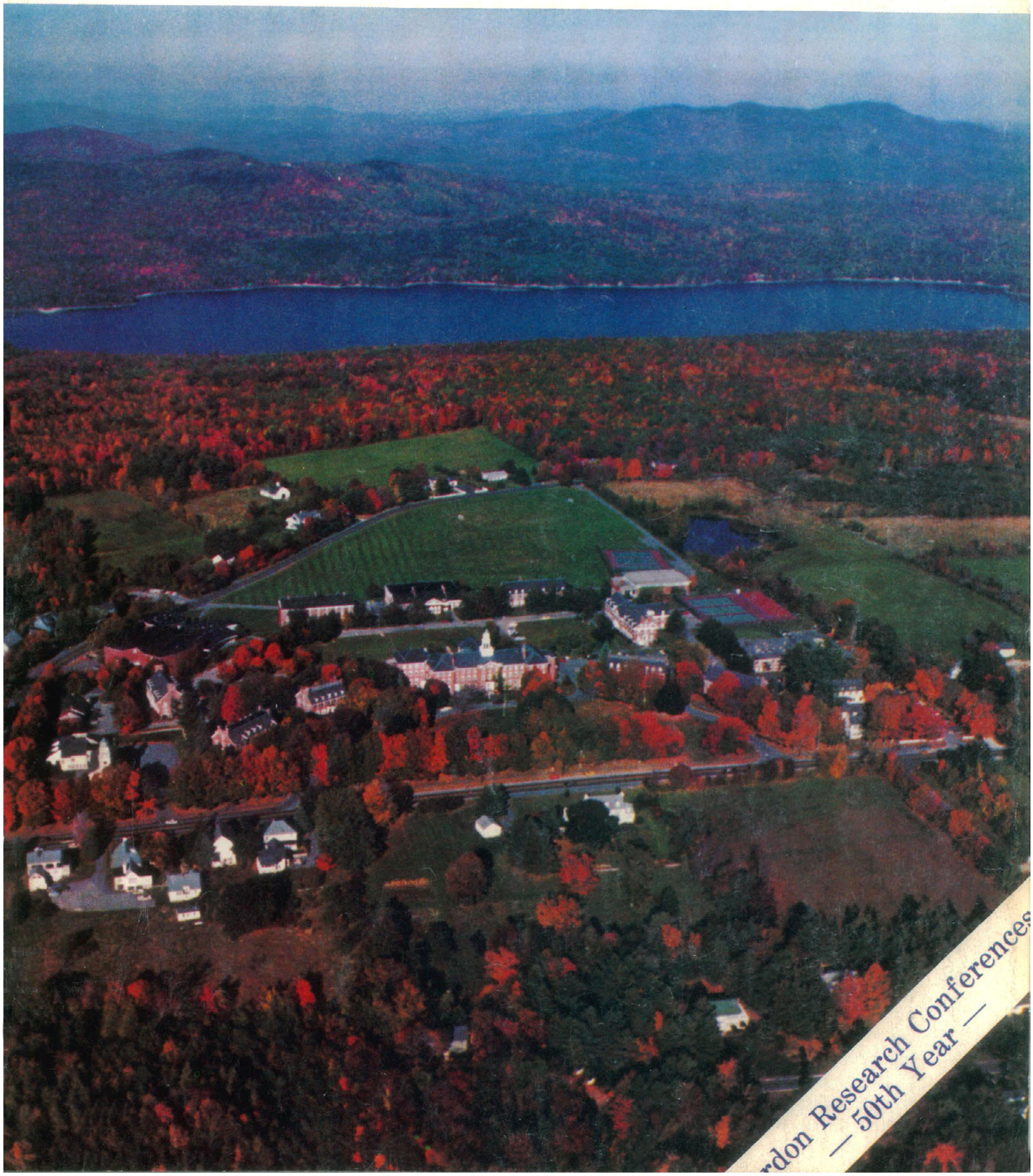
13 March 1981 • Vol. 211 • No. 4487 $2.00

SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Four years ago, we introduced the first quiet large-volume refrigerated centrifuge — the J-6. Today, no centrifuge matches the degree of reliability established by the J-6 and the current model J-6B. No other centrifuge of its type is UL listed. And no other is so appreciated for its quiet operation and its many features.

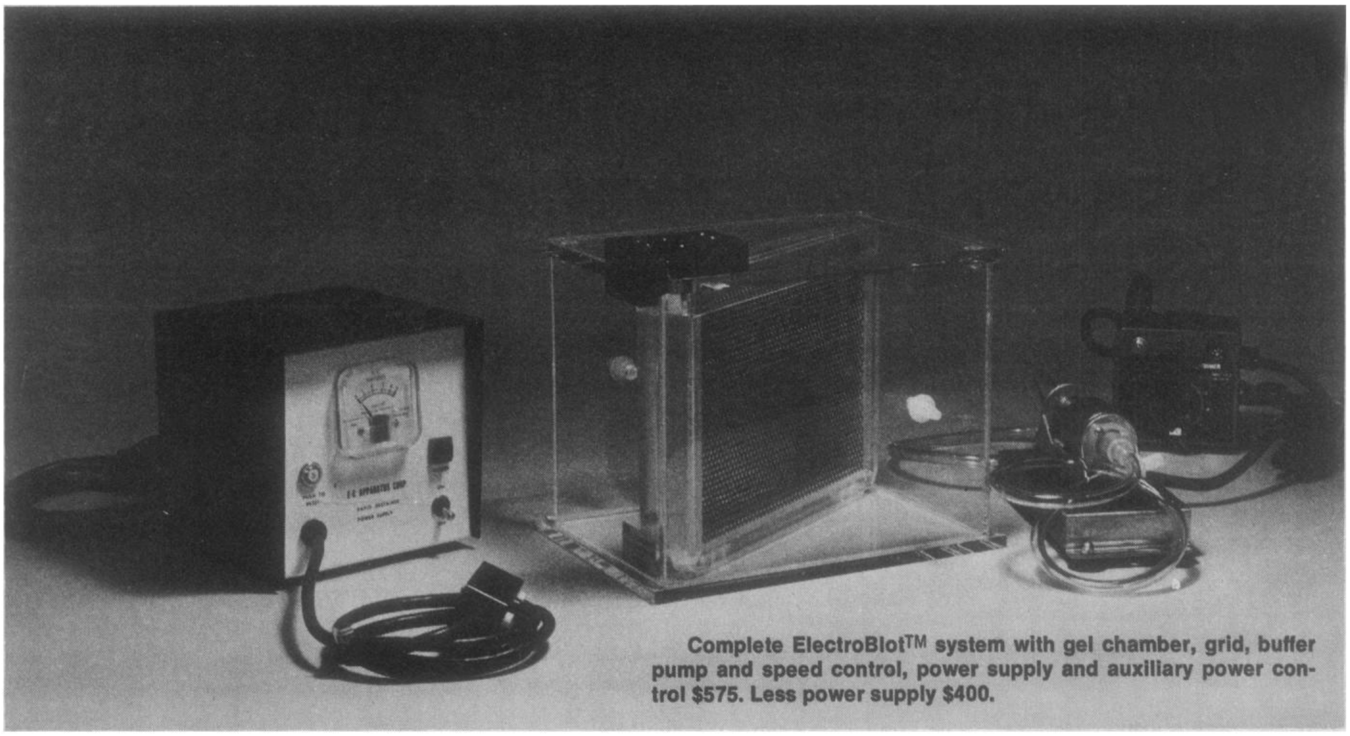
The J-6B is built for constant use. Its powerful DC motor gets rotors to speed fast, and its efficient braking cuts run times. The sturdy, proven rotors spin up to 6 liters or 6 blood bags. Color-coded Multi-Disc™ adapters hold large numbers of different sized tubes. The unique JR-3.2 rack rotor holds fully loaded gamma counter racks; a new Elutriator rotor provides a gentle means of separating cells. There's even a special model — the J-6B/P centrifuge — for blood component processing; it has automatic reset timer, optical calibration port, two-step braking, and end-of-run indicators.

And, should you ever require service, it's only a phone call away because there are over 400 Beckman Service Representatives in the U.S. and Canada alone.

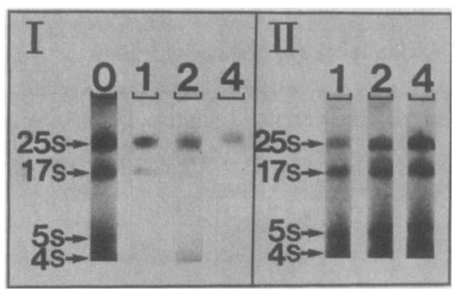
For full information, write Spinco Division, Beckman Instruments, Inc., 1117 California Ave., Palo Alto, CA 94304.

BECKMAN

Circle No. 308 on Readers' Service Card



Complete ElectroBlot™ system with gel chamber, grid, buffer pump and speed control, power supply and auxiliary power control $575. Less power supply $400.



Autoradiogram comparison shows rapid rate of RNA transfer from original gel I to DBM paper II. Numbers above gel and paper indicate hours of transfer.

See us at Faseb Booth L-13

ElectroBlot™ Transfers DNA, RNA, Proteins Faster and Better

E-C's new ElectroBlot™ surpasses ordinary blot transfer by electrophoretically transferring DNA, RNA, and proteins onto DBM paper and proteins onto nitrocellulose sheets.

Consider these advantages:

- transfers all size molecules easily
- transfer completed rapidly
- transfer is direct, no loss of resolution
- transfer efficiency 80% or better
- transfer may be conducted under cold room conditions

- Stellwag, E. J. and Dahlberg, A. E., *Nucleic Acias Res. 8:* 299, 1980
- Towbin et al., *Proc. Nat. Acad. Sci. (US) 76:* 4350, 1979

With ElectroBlot™, there is no messy handling, no diffusion, no damage losses. System utilizes unique high current, variable low voltage power supply. Doubles as a destainer.

For more information call Technical Service collect at 813-344-1644 or write:

E-C Apparatus Corporation
3831 Tyrone Blvd. N.
St. Petersburg, Florida
33709

Circle No. 284 on Readers' Service Card

ISSN 0036-8075
13 March 1981
Volume 211, No. 4487

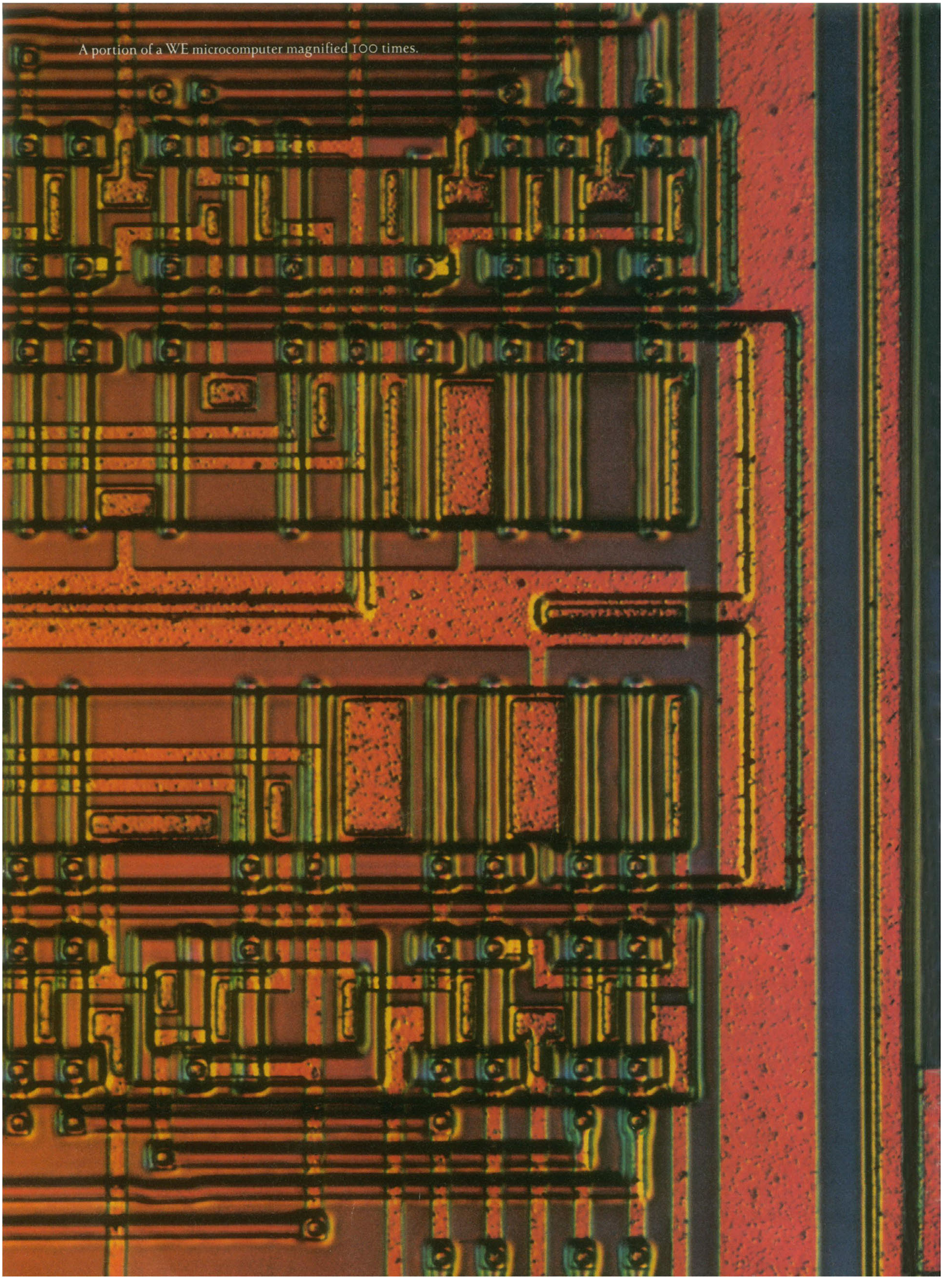
SCIENCE

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®** Copyright © 1981 by the American Association for the Advancement of Science. Domestic individual membership and subscription (51 issues): $38. Domestic institutional subscription (51 issues): $76. 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 ($2.50 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.

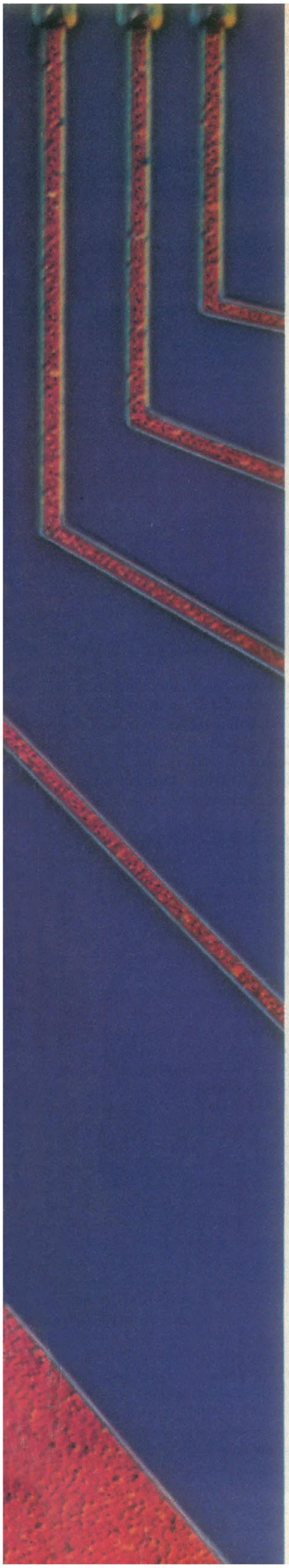
The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

COVER

Aerial view of Colby-Sawyer College, New London, New Hampshire, summer headquarters of the Gordon Research Conferences located in the heart of the Lake Sunapee–Dartmouth region. In the background can be seen the Pleasant Lake and the Ragged Mountains—a panorama for the enjoyment of the conferees. See page 1191. [Photography Unlimited, New London, New Hampshire 03257]



A portion of a WE microcomputer magnified 100 times.



Can you find the four mistakes in this microcomputer?

WE will. You're looking at a microcomputer smaller than your thumbnail. It has more than 30,000 parts, and performs complex tasks that once required a room-sized computer. Yet, if there's even the tiniest flaw, WE will find it.

We're Western Electric. And in less than a minute, we can put a microcomputer through more than 100,000 separate checks. Components that don't measure up, don't make it into your phone system.

Microelectronics technology helps the Bell System keep down the cost of your phone service today. It will make dozens of new services possible in the future.

Western Electric products have helped to make your communications system the best in the world. And we're working hard to keep it that way.

Western Electric

Lanier introduces the No Problem™ typewriter for your technical typing.

Want to get your typing back faster than ever before? **NO PROBLEM**

Want to type Greek and math symbols right on the screen? **NO PROBLEM**

Want to type and edit multi-level equations with typewriter simplicity? **NO PROBLEM**

Want to add line drawings and charts to the page? **NO PROBLEM**

Most typewriters – even many of the latest electronic models – are limited to basic typing.

But the Lanier No Problem Electronic Typewriter is multi-use, with extraordinary powers for technical and scientific typing.

No Problem typing – a better way to type.

The No Problem concept

To begin with, the No Problem typewriter speeds up the typing of your proposals, manuals, and reports like no ordinary typewriter can.

It eliminates typing rough drafts on paper. Pages are prepared on a TV-like screen instead.

Changes and corrections are made right on the screen. So no whiteouts. No retyping. No false starts. Whole paragraphs can be moved with the touch of a few keys.

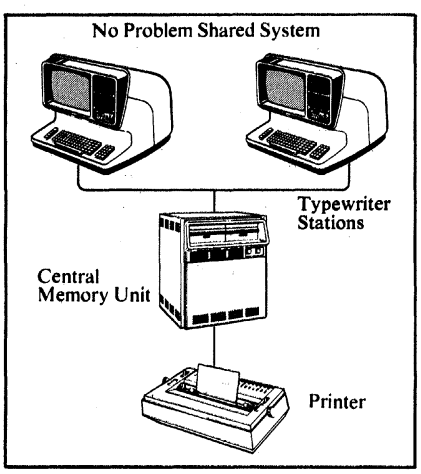
Letter quality printing is done at up to 540 words per minute.

With the No Problem typewriter, one typist can now do work as fast as 3 or 4 people using ordinary electric typewriters.

Plus, the basic intelligence for the No Problem typewriter is contained on No Problem Smart Discs.™ So future functions and improvements can be added with new Smart Discs as they are developed.

One typewriter or a shared system

The No Problem Shared System™ offers you even greater typing capabilities.



The No Problem Shared System™ adds new capabilities to the already versatile No Problem concept.

The heart of the system is the Central Memory Unit. It can store up to 30,000 pages, giving you lower storage costs per page, and eliminating the need for typists to handle numerous discs.

You can start with one or two typewriter stations connected to the Central Memory Unit, and add typewriter stations or printers as your needs increase.

There is also an attractive economic factor in sharing printers and other equipment.

Advanced features

Consider the old method of incorporating complex mathematical equations into your copy: leave the space blank, then hand letter them in after the page was typed. Or, you could run to the photocopier, then "cut and paste."

With the No Problem Shared System, you can incorporate *and edit* virtually any equation you may encounter—*right on the screen.* It will display *256 different characters,* including Greek and math symbols.

Line drawings can be constructed on the No Problem screen, too.

The No Problem Shared System automatically selects left, right or center page position for numbers, and chapter names on even and odd pages. Repagination automatically updates section numbers to accommodate your additions and deletions.

Advanced editing automatically positions footnotes on the proper page.

And the printing of the No Problem Shared System approaches typeset quality and flexibility. Proportional and bold printing, to fit any format or width, is easily done. Even in two typestyles and two colors on the same page at the same time.

Most of all, the No Problem Shared System can improve your cost/performance ratio dramatically with its increased workpower.

Modular design protects your investment

You can add Shared System typewriter stations, standalone No Problem typewriters, printers and Smart Discs to your office at will.

So your investment will *continue* to be a money-making problem solver as long as you own the equipment.

The No Problem demonstration

Your Lanier representative won't waste your time with a memorized sales pitch.

We would rather show you how No Problem typing can solve *your* problems.

Send us this coupon and we'll call immediately to set up an appointment. Or call toll free **(800) 241-1706.**

Except in Alaska or Hawaii. In Georgia, call collect (404) 321-1244.

The No Problem Electronic Typewriter from LANIER®

LANIER BUSINESS PRODUCTS, INC.

It does more than just type.

Want to see Lanier No Problem typing in action? NO PROBLEM.

Send us the information below and a Lanier representative will call for an appointment.

Name________ Title________

Phone________

Best Time To Call________

Firm Name________

Address________ County________

City________ State________ Zip________

What kind of typing or word processing system are you using now?________

Lanier Business Products, Inc.
1700 Chantilly Dr. NE, Atlanta, GA 30324

Circle No. 266 on Readers' Service Card

^{32}P nucleotides you simply open and use

Our >600Ci/mmol dNTPs,[α - ^{32}P] - are now also available concentrated to ~10mCi/ml in an aqueous solution, ready to pipet directly into your reaction mixture. No need to remove or concentrate the packaging solution. No unnecessary handling.

What's more, we've extended their radiochemical stability significantly with 10mM Tricine, a buffer known to be compatible in research systems. Biological testing by nick translation verifies their biological activity and assures you of reliable performance.

NEG-012A dATP,[α - ^{32}P] - NEG-014A dGTP,[α - ^{32}P] -
NEG-013A dCTP,[α - ^{32}P] - NEG-005A dTTP,[α - ^{32}P] -
>600Ci/mmol, ~10mCi/ml, in 10mM aqueous Tricine buffer solution (pH 7.6), Combi-V-Vial

Produced weekly and shipped daily. Send for complete ordering information on these and our standard concentration dNTPs,[α - ^{32}P] - .

Not for use in humans or clinical diagnosis

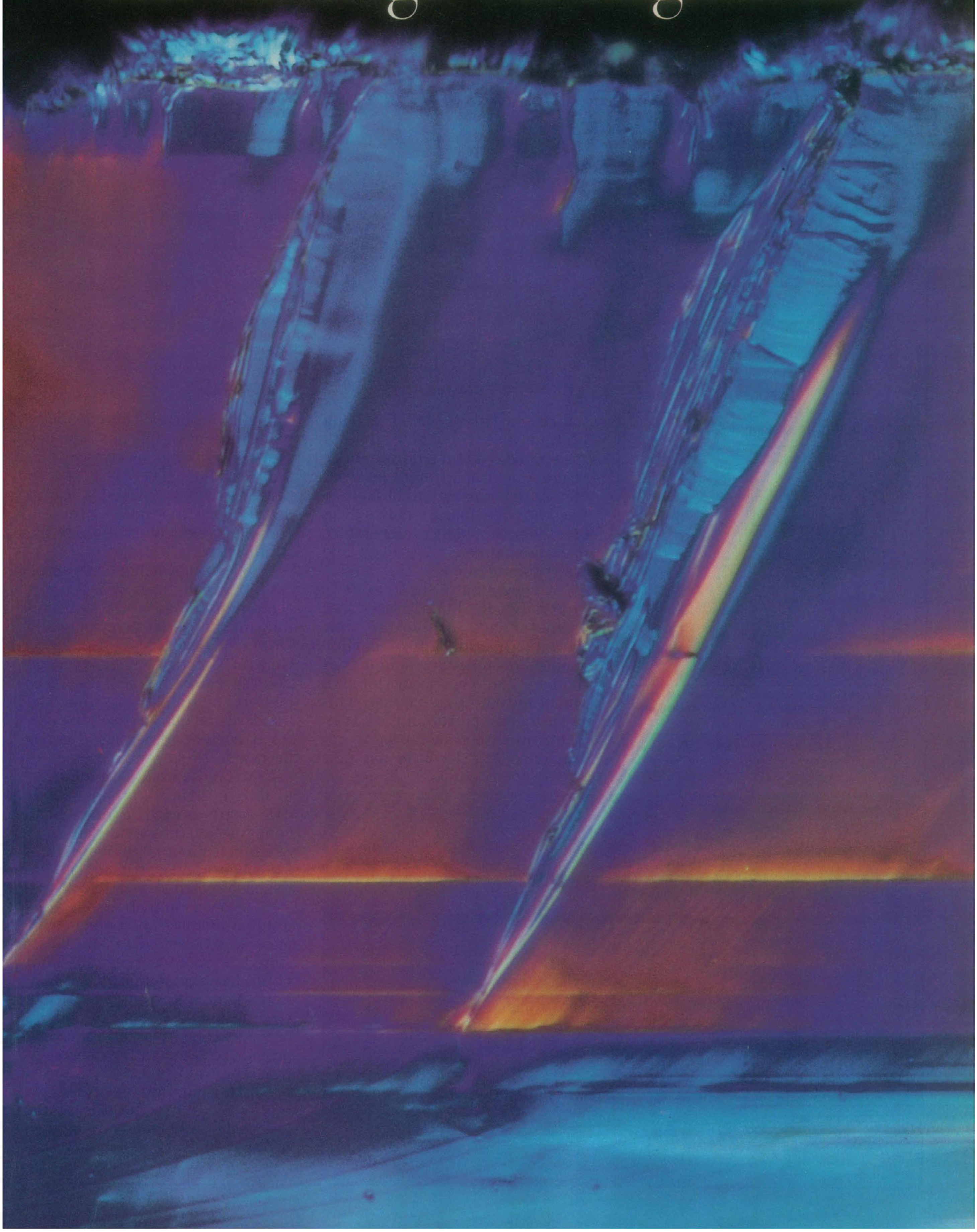
NEN New England Nuclear
®

549 Albany Street, Boston, Massachusetts 02118
Call toll free: 800-225-1572
(In Massachusetts and International: 617-482-9595)

NEN Chemicals GmbH: D-6072 Dreieich, W. Germany, Postfach 401240, Tel. (06103) 85034, Telex 4-17993 NEN D
NEN Canada: 2453 46th Avenue, Lachine, Que. H8T 3C9, Tel. 514-636-4971, Telex 05-821808

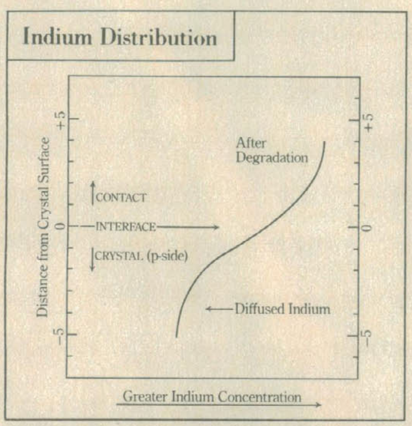
Circle No. 351 on Readers' Service Card

The Strategic Misalignment



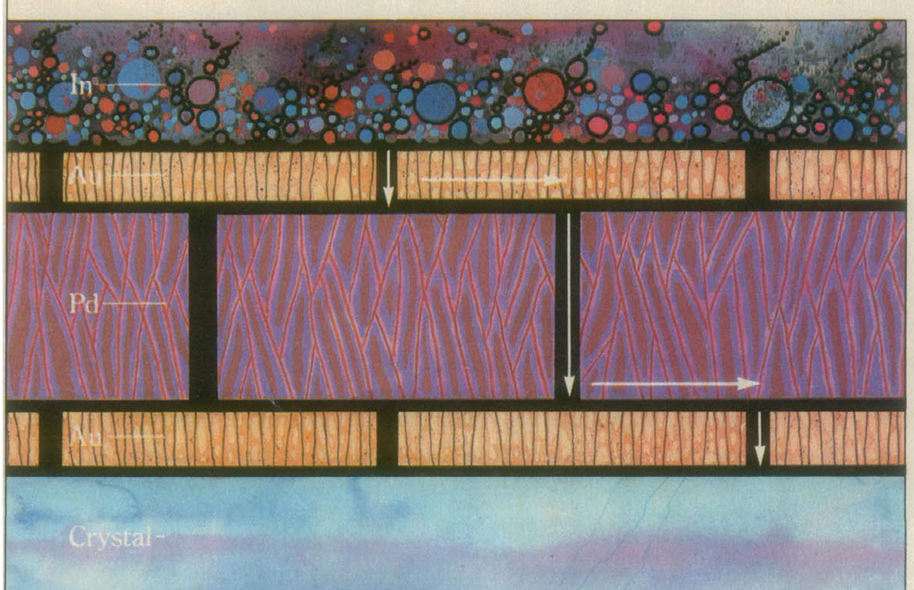
The Strategic Misalignment

Tunable semiconductor lasers can now measure specific gases in automotive exhaust with 25-millisecond response time. A successful strategy for improving laser reliability developed at the General Motors Research Laboratories makes this and other new spectroscopy capabilities practical realities.



Electron microprobe analysis of a crystal-contact interface, indicating indium penetration into the PbSnTe crystal.

Diagram of hypothetical indium diffusion paths for a three-layer contact structure of Au-Pd-Au.



THE ACHIEVEMENT of long lifetime and frequency stability makes the lead-tin-telluride diode laser a practical infrared spectrometer. Earlier innovations brought to this laser the characteristics of increased power, higher temperature operation, greater efficiency and wider tuning range.

Operating in the 5- to 10-micron range, the PbSnTe laser spectrometer can resolve the time-dependent emission of carbon monoxide, sulfuric acid vapor, methane and other species of interest in automotive exhaust. This permits measurement of transients in carbon monoxide to carbon dioxide gas conversion in a catalytic converter. This capability represents a significant advance over conventional spectroscopy instrumentation. The laser is also being tested by NASA for use in detecting the molecular species involved in chemical reactions in the stratosphere.

New knowledge of the process by which laser reliability is compromised has been revealed in fundamental studies conducted by Dr. Wayne Lo and his colleagues at General Motors. Dr. Lo's investigations have demonstrated that laser lifetime and stability are limited by the development of excessive electrical contact resistance. He has been able to stop increases in resistance by devising a multilayer ohmic contact consisting of different metal films. This configuration has extended laser operating lifetime to more than 1,000 hours and increased shelf-life to an estimated 25 years.

Slow degradation due to a gradual increase in contact resistance was observed in idle lasers stored at room temperature, but not in lasers maintained at a maximum temperature of 77 K, despite several hundred hours of continuous operation. These results suggested the temperature-dependent process of diffusion.

Degradation occurred primarily on the p-type side of the laser, where the contact consisted of a thin layer of gold followed by a layer of indium. Electron microprobe analyses revealed that indium, a semiconductor donor, was diffusing through the gold layer into the crystal, apparently causing a reduction in hole carrier concentration near the p-surface. This effect was counteracted to a great degree by sandwiching a thin layer of platinum between the layers of indium and gold. Laser reliability reached a full year.

When degradation was still observed, although to a reduced extent, Dr. Lo advanced the hypothesis that diffusion and transport were taking place along grain boundaries in the polycrystalline contact layers. He proposed replacing the Pt-Au barrier with a three-layer structure. Since palladium film structures have fewer grain boundaries than those of platinum, providing fewer leakage paths for the indium, Pd was tested in place of Pt.

DIODE LASERS composed of $Pb_{0.86}Sn_{0.14}Te$ and fabricated with a variety of contacts were maintained at 60°C in order to accelerate aging, with periodic interruptions for testing. The results showed that a multilayer structure of In-Au-Pd-Au, in which the grain boundaries tend to be misaligned, provides maximal reduction of indium penetration, confirming Dr. Lo's hypothesis.

The misaligned boundaries force diffusion to take place laterally, which slows transport into the crystal. The additional layer slows the process even further.

Solving the contact problem represents the culmination of efforts that began at General Motors with the development of an "ingot-nucleation" vapor transport method for growing crystals. The resulting crystals are of high purity, with a dislocation density of less than 1000 cm.$^{-2}$ Lasers made from these crystals incorporate a low temperature cadmium-diffused p-n junction. This process, invented by Dr. Lo, increases the laser's output to five milliwatts.

A tuning range of 500 cm^{-1} and pulsed operating temperatures of up to 140 K are achieved by a two-step annealing process. This technique induces a graded carrier concentration that increases infrared light confinement in the laser structure, thus reducing losses and increasing output.

"These innovations," says Dr. Lo, "combine to produce a laser that allows us to make measurements previously impossible."

THE MAN BEHIND THE WORK

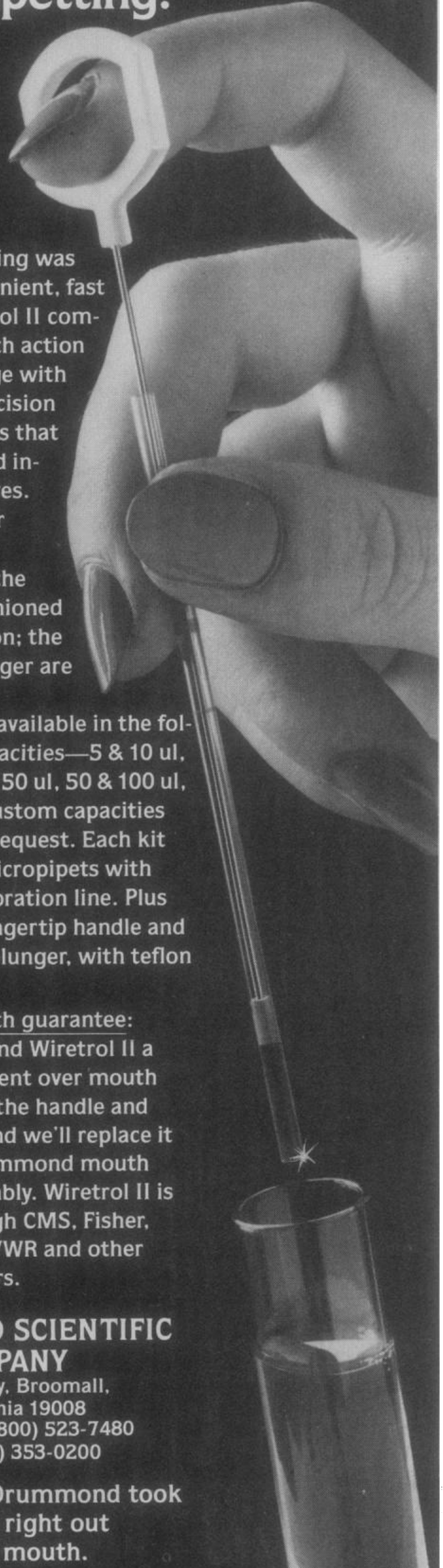
Dr. Wayne Lo is a Senior Research Scientist in the Physics Department at the General Motors Research Laboratories.

Dr. Lo was born in Hupei, China. He did his undergraduate work at Cheng-Kung University in Taiwan. He received an M.S. from the University of Rhode Island and a Ph. D. in electrical engineering from Columbia University in 1972. His doctoral thesis concerned the characterization of deep-level states and carrier lifetimes in gallium arsenide light-emitting diodes.

Before undertaking graduate studies, Dr. Lo was instrumental in setting up the first American transistor production plant in Taiwan. In 1973, he joined General Motors, where he is currently in charge of semiconductor laser and spectroscopy research.

Wiretrol II®. Only $17.^{50}

The latest innovation in disposable positive displacement micropipetting.



Mouth pipetting was never this convenient, fast and safe. Wiretrol II combines the smooth action of a microsyringe with Drummond precision bore glass pipets that accept any liquid including corrosives. Accuracy: Better than ± 1%.

Cost? About the same as old fashioned mouth aspiration; the handle and plunger are reusable.

Wiretrol II is available in the following dual capacities—5 & 10 ul, 10 & 20 ul, 25 & 50 ul, 50 & 100 ul, 100 & 200 ul. Custom capacities available upon request. Each kit contains 250 micropipets with permanent calibration line. Plus Drummond's fingertip handle and stainless steel plunger, with teflon tip.

A hand-to-mouth guarantee:

If you don't find Wiretrol II a total improvement over mouth pipetting, mail the handle and plunger to us and we'll replace it free with a Drummond mouth aspirator assembly. Wiretrol II is available through CMS, Fisher, A. H. Thomas, VWR and other leading suppliers.

DRUMMOND SCIENTIFIC COMPANY
500 Parkway, Broomall, Pennsylvania 19008
Call toll-free: (800) 523-7480
In Pa.: (215) 353-0200

For pipetting, Drummond took the work right out of your mouth.

Circle No. 324 on Readers' Service Card

Miles-Made

Alkaline Phosphatase, Labeling Grade, Available from Miles

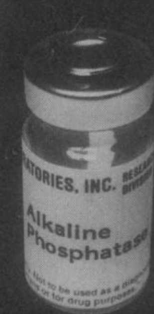
Our high-grade alkaline phosphatase, from calf intestine, is intended for use in the preparation of enzyme immunoassay reagents. It is available as a chromatographically purified, stable, freeze-dried powder at ≥ 1000 U/mg protein, Code No. 36-484.

Conjugated Antisera

Miles offers several antisera conjugated with alkaline phosphatase for use in enzyme immunoassays. These are prepared from IgG fractions and conjugated with Alkaline Phosphatase, Labeling Grade.

Alkaline Phosphatase Conjugates	Host	Code No.
Anti-Goat IgG (H + L)	Rabbit	61-276-1
Anti-Human IgG (H + L)	Goat	61-270-1
Anti-Human IgM (μ chain)	Goat	61-271-1
Anti-Mouse IgG (H + L)	Rabbit	61-278-1
Anti-Rabbit IgG (H + L)	Goat	61-275-1

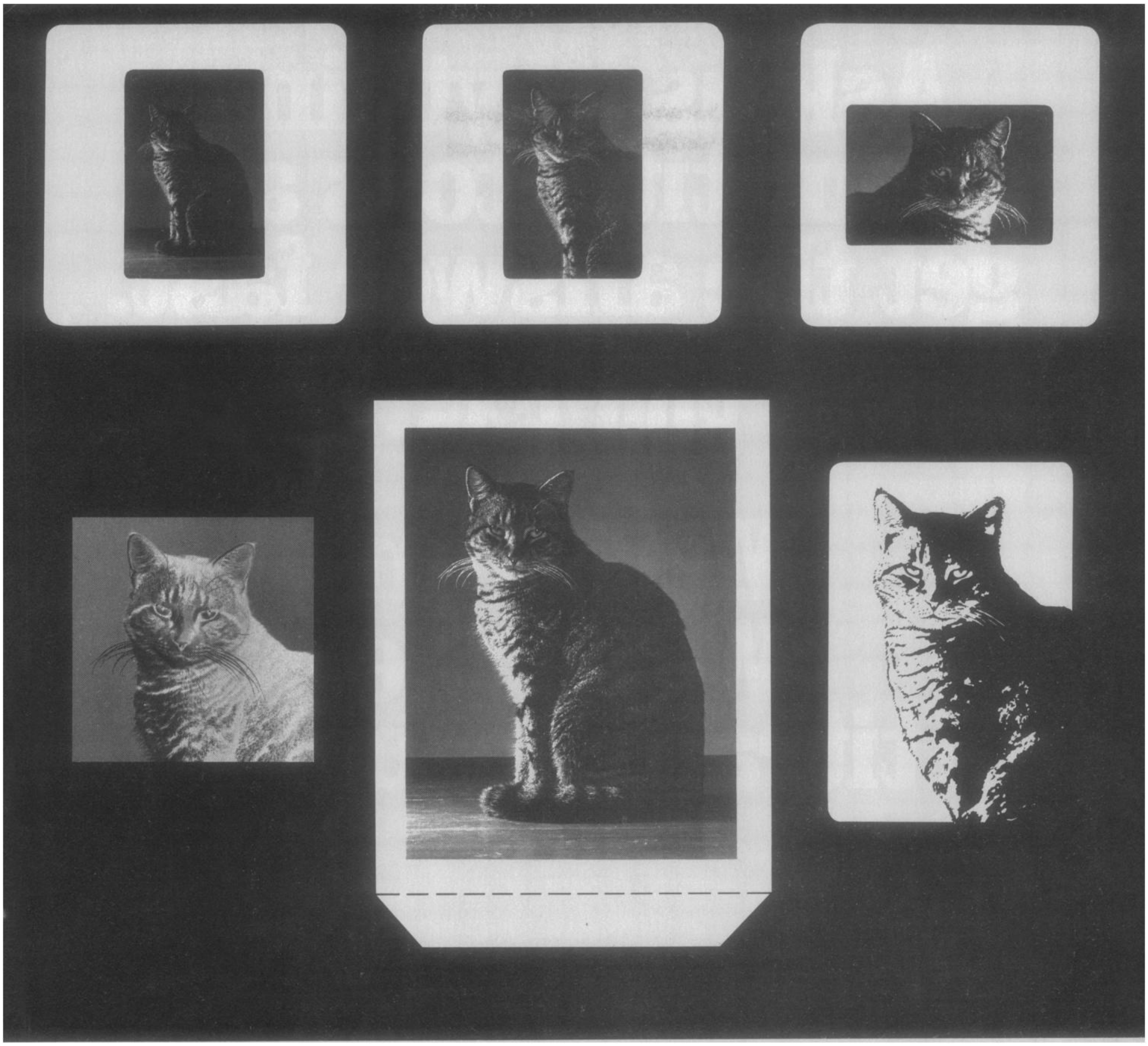
To find out more about Miles-made alkaline phosphatase conjugates and Alkaline Phosphatase, Labeling Grade, call toll-free 800-348-7465 (in Indiana, call 219-264-8804) or write Research Products Division, Miles Laboratories, Inc., P.O. Box 2000, Elkhart, IN 46515.



Research Products Division MILES
Research/Response/Responsibility

 MRP-5065880

Circle No. 280 on Readers' Service Card



The Bowens Illumitran. More than just another copy cat.

Dupe a slide? Simple.

But crop, flop, enlarge, reduce, increase or decrease contrast, vary shadow coloration or correct color balance, add special effects or titles, create montages or superimpositions, salvage under or over-exposed originals, make inter-negatives, use daylight or tungsten-balanced film?

It's only simple with the Illumitran 3C featuring exclusive contrast control.

With the remarkable Illumitran, your original slide can be duped or used as a starting point for creative enhancement.

Versatile? Flexible? The Illumitran is that and more. Far from the same old copy cat. You might call it the most creative slide duplicator you can own. There's much more that the Illumitran can do for you than we can show you here. Please write for brochure.

Bogen Photo Corp.,
100 So. Van Brunt St., P.O. Box 448, Englewood, N.J. 07631.

Please send me complete information on the Bowens Illumitran.

Name ____________________

Address ____________________

City ________ State ________ Zip ________

SC 3/81

Lester Bogen doesn't sell anything he wouldn't buy himself.

bogen

Circle No. 235 on Readers' Service Card

Where biological problems find answers,

Two new instruments from Varian: the VISTA Chromatography Series with the 401 Data System and the DMS 90 UV-Vis Spectrophotometer.

Life scientists have trusted Varian instruments for decades—and for good reasons.

First, Varian offers the widest range of research and analytical instrumentation available today; so you can select state-of-the-art performance to suit the needs of your laboratory. Second, Varian puts the operator first by making ease and speed of operation a design commitment; you benefit from the increased productivity. Most important of all, you can rely on the accuracy of your results; they carry the authority of long-standing leadership in scientific instrumentation.

In other words, we've earned the trust. And intend to keep earning it.

The results you see here are examples of answers found to problems in the biosciences—from instruments designed to make them all seem routine.

❶ LC: Analyze nucleic acid constituents
The separation of nucleotides, nucleosides, and bases shown was achieved in a single run in less than 90 minutes. The three-solvent capability of the *Model 5000 Liquid Chromatograph* was used to sequentially program two gradients. Flow programming was used to separate bases and nucleosides at a reduced flow during initial solvent gradient.

The Model 5000 is fully compatible with the new *VISTA 401 Chromatography Data System*.
Circle No. **63**.

❷ LC: Identify and purify peptides
With the *Model 5000,* peptide species differing in only a single amino acid are sharply separated by reverse-phase chromatography. Circle No. **64**.

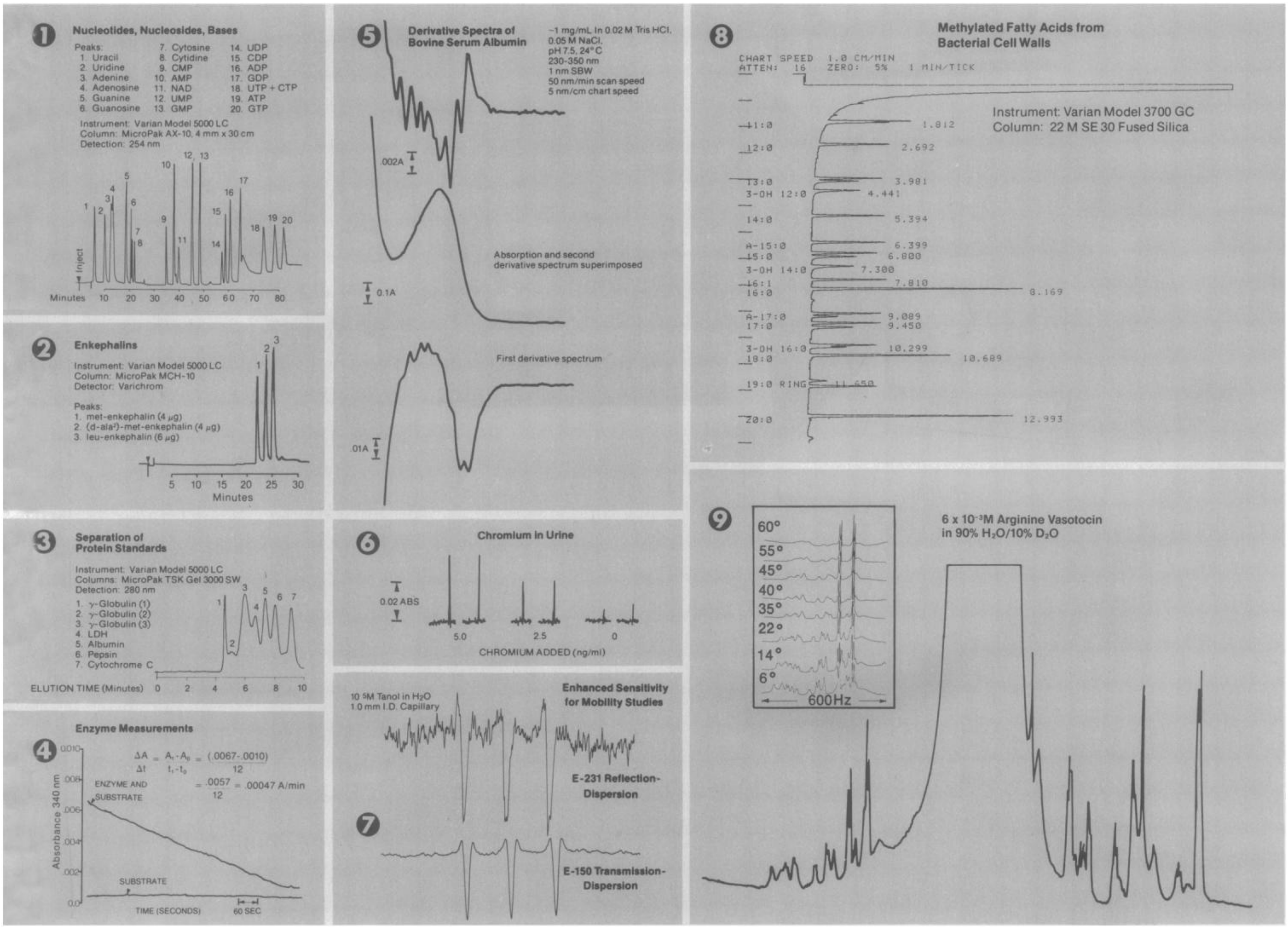
❸ LC: Separate proteins by molecular size
The new Varian *HPLC System* for protein and peptide chromatography gives you complete molecular-size exclusion, anion exchange, and reverse-phase capabilities. For example, you can separate proteins with a wide MW-range in minutes, with excellent recovery of protein mass and enzyme activity. Circle No. **65**.

❹ UV-Vis: Measure enzyme activity at 0.0005 A/min
The new easy-to-operate *Cary 219/210-PLUS Spectrophotometer/ Computer System* offers fully computerized spectrophotometry. All experimental data are accurately collected, processed, and reduced to give you final results automatically. The superior optical performance that's part of the Cary tradition accommodates low enzyme activities just as easily as highly turbid samples. Circle No. **66**.

❺ UV-Vis: Do derivative spectrophotometry at the touch of a button
A derivative spectrum enhances spectral detail like the shoulders on this BSA spectrum, and they are easy to do with the low-cost *DMS 90 UV-Vis Spectrophotometer!* Just touch a button, and the microcomputer calculates true wavelength derivative data—both first and second derivative. Circle No. **67**.

❻ AA: Measure electrolytes in tissue, cells, and fluids
With the new Varian *AA-875 Atomic Absorption Spectrophotometer,* you can study toxicity, nutrient and metabolic activities, and the therapeutic effects of some 67 elements. This AA spectrum shows a typical determination of chromium in urine, using the Carbon Rod Atomizer accessory. Sample volume is 20 μl. Sensitivity: 6 pg Cr in the urine matrix; precision: 10–20% RSD at 1 μg/24 hr sample level. Circle No. **68**.

you'll find Varian instruments



7 EPR: Study RBC internal viscosity

In spin label studies of slow molecular motion, like investigations of red-blood-cell internal viscosity and the effects of chemotherapy on membrane fluidity, the saturation-transfer EPR (ST-EPR) experiment has been proven extremely useful.

The Varian *E-150 Induction EPR Accessory* now brings high sensitivity to dispersion ST-EPR, which makes it possible to use 90°-out-of-phase first-harmonic (μ') detection. This technique offers easier interpretation and simulation and makes spectrometer adjustment less critical.

Using the E-150 accessory, the full range of reflection and induction EPR experiments become available at the flick of a switch, allowing the scientist to select those parameters that optimize spectral sensitivity to slow molecular motions (10^{-3} sec $\geq \tau_c \geq 10^{-8}$ sec). Circle No. 69.

8 GC: Identify bacteria by methylated fatty acids

Superb resolution achieved with the fused-silica capillary column on the *Model 3700 Capillary Gas Chromatograph* and the data presentation capabilities of the *VISTA 401 Chromatography Data System* make bacteria fingerprinting a routine procedure.

The easy-to-read printout includes peak names, run conditions, and quantitative chromatographic data. All can be stored on a floppy disk for instant retrieval and precise reproduction of the analysis. Circle No. 70.

9 NMR: Elucidate peptide structure

The exceptionally sophisticated software of the *XL-200 Superconducting NMR Spectrometer* gives the researcher a high dynamic range and unsurpassed data processing capabilities.

The XL-200 proton spectrum shows 6 x 10^{-3}M arginine vasotocin in 90% H_2O/10% D_2O, using 32-bit double-precision acquisition and floating-point Fourier transform. Direct time averaging allows automated variable-temperature experiments to be performed without resorting to organic solvents or presaturation of H_2O. You can observe temperature dependence of NH proton shifts and determine vicinal NH-CH spin couplings—information which can help you determine peptide structure in aqueous solution. Circle No. 71.

GC/MS: Mass spectra of L-DOPA, catecholamines, and their metabolites

Send for this easy-to-use spectra catalog, grouped by types of catecholamine derivatives, and find out more about the powerful Varian *MAT 212/SS200 System*. Circle No. 72.

To have a representative contact you about *any* Varian instrument, Circle No. 312.

varian

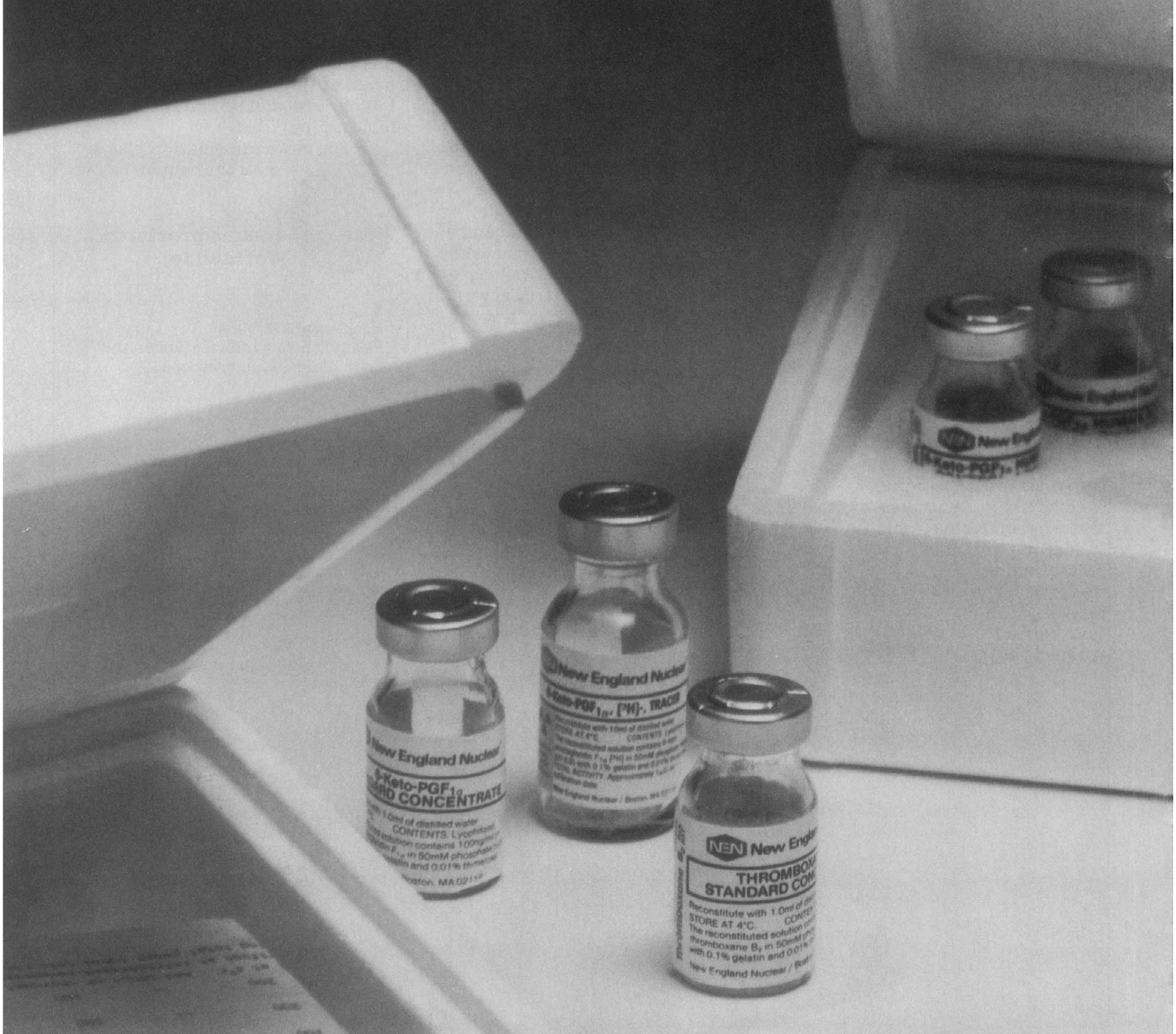
For immediate assistance contact: • Florham Park, NJ (201) 822-3700 • Park Ridge, IL (312) 825-7772 • Houston, TX (713) 783-1800
Los Altos, CA (415) 968-8141 • Or write 611 Hansen Way, Palo Alto, CA 94303. In Europe: Steinhauserstrasse, CH-6300 Zug, Switzerland.

6-Keto-Prostaglandin $F_{1\alpha}$ Thromboxane B_2 [^{3}H] RIA Kits

These kits are the first of their kind, and they have outstanding features not easily duplicated in the laboratory.

In each, the antibody demonstrates high affinity and specificity with low cross reactivity. The tracer has high specific activity and purity. The kit as a whole allows you to perform sensitive and reproducible assays without all the time and trouble of preparing your own components.

To reassure you of all of the above, we conduct complete assays with every lot prior to shipment. The resulting standard curves and detailed instructions are included with the kits. Ask us to send you the technical brochure.

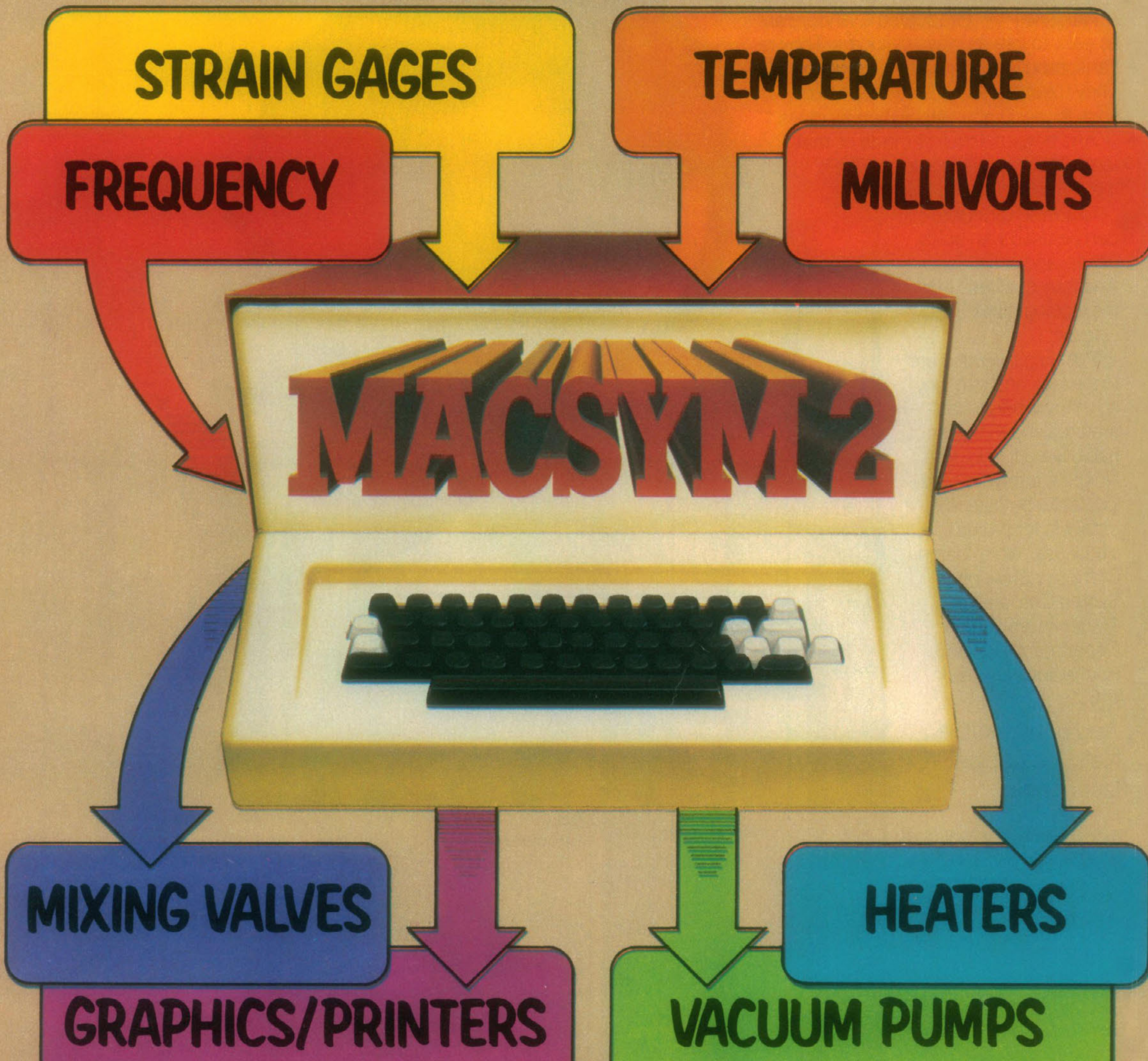


NEN New England Nuclear®

549 Albany Street, Boston, Massachusetts 02118
Call toll free: 800-225-1572 (In Massachusetts and International: 617-482-9595)
NEN Chemicals GmbH: D-6072 Dreieich, W. Germany, Postfach 401240, Tel. (06103) 85034, Telex 4-17993 NEN D
NEN Canada: 2453 46th Avenue, Lachine, Que. H8T 3C9, Tel. 514-636-4971, Telex 05-821808

THE EASIEST WAY TO

MEASUREMENTS



OUTPUTS


nature

For Liquid Chromatographers who are

PICKY, PICKY, PICKY

LDC Liquid Chromatographs by LABORATORY DATA CONTROL

Pick an HPLC Pump

ConstaMetric I — low cost, single module pump with pulse free, adjustable solvent flow. For stand alone isocratic LC or in conjunction with IIG or III for gradient chromatography.

ConstaMetric IIG — dual module high pressure pump featuring over pressure protection, digital display of pumping conditions and auxiliary pump shut-down for gradient applications.

ConstaMetric III — single modular unit offering high flow rate repeatability and pulse free stability. Offers automatic shut-down control if user selected limits are exceeded. The ideal partner to the ConstaMetric I for two-pump gradient HPLC systems.

Pick an HPLC Detector

UV III Fixed Wavelength Detector — wide choice of fixed wavelength settings including 214nm. Sensitivity range to 0.001 AUFS. Digital display of differential UV absorbance. Plug-in flow cell and optics for easy servicing and maintenance.

SpectroMonitor III Variable Wavelength Detector — dual beam optical system assures detector stability and linearity in 195 – 350nm ultraviolet range. Convenient wavelength selection from front panel. A removable, low dead volume flow cell allows for easy servicing.

RefractoMonitor III — a truly new RI detector designed to exceed state of the art performance specifications. This detector is optimized for easy servicing, operational simplicity, high sensitivity, short warm-up and low baseline drift.

FluoroMonitor III Filter Fluorometer-- used in ultra sensitive HPLC applications. Unit is a single compact module containing interchangeable excitation sources, filters, flow cell and photomultiplier detector. Highly efficient flow geometry with self-compensating optical system thus assuring uniform detector response.

Pick HPLC Gradient Formers, Computing Integrators and Automated Systems

Gradient Master — a low cost gradient pump controller featuring 9 selectable gradient exponents, completion times from 1 to 1100 minutes and flow rate control up to 10 ml/min. Unit continuously displays a percent of gradient time elapsed and percent of second solvent concentration. Upon completion of run the unit automatically initiates an accelerated reverse gradient in order to minimize column degradation from solvent shock.

Model 308 Computing Integrator — space saving, vertical design offers continuous visual display of run progress, automatic data integration with printout on built in printer. Device can correct for shifting baseline as well as normalize up to 80 peaks. Available with remote output connectors to other data recording devices.

Chromatograph Control Module -CCM — liquid chromatograph control module capable of automating HPLC operation and 2 channels of data acquisition. Features an easy-to-read 9" CRT screen, ROM resident BASIC, magnetic tape cassette and 2 pen printer/plotter which reports integrated results along with the chromatography.

LDC also offers integrated HPLC systems comprised of the full array of pumps, detectors and controllers shown above.

LDC LIQUID CHROMATOGRAPHS

LABORATORY DATA CONTROL, DIV. OF MILTON ROY CO.
P.O. Box 10235, Riviera Beach, Florida 33404
Tel: (305) 844-5241 Telex: 513479

13 March 1981, Volume 211, Number 4487 **SCIENCE**

The Mission of the National Science Foundation

For 30 years the National Science Foundation (NSF) has demonstrated a remarkable ability to address the nation's concern for the support of the sciences. Although to those in the field funds have never appeared adequate, there is no question that today, by any measure, the scientific effort in the United States stands at the forefront of the world. The NSF has played a significant role in making this happen, and I see no indication that the foundation's interest in or commitment to this role has diminished.

Recently there has been increasing concern about the problems developing in engineering and the vitality of the U.S. technological enterprise. In these areas, too, the NSF has long played a role. The foundation has supported basic engineering research and engineering education as part of its program from its inception. Further, since its organic act was amended in 1968, the NSF has experimented with a variety of modes of support for applied research. Plans for a reorganization recently announced by the foundation are intended, it appears to me, not to diminish the emphasis on fundamental science but to recognize the importance of maintaining a strong basic engineering program as well. At the same time, there is once again the opportunity to recognize the blurred, often artificial, distinction between basic and applied research and to strengthen the foundation's overall support for programs in basic engineering and in the natural and social sciences. The reorganization will also strengthen unified programs of disciplinary support.

Engineering is in some ways unique. It deals with a broad spectrum of activities ranging from fundamental research to product design and development. The principal difference between engineering and science, as they are usually understood, is that engineering is basically oriented toward the environment created by man. A close linkage exists between fundamental engineering research and traditional scientific research, for example, in biology, chemistry, mathematics, and physics. And new relationships have developed, as in bioengineering.

The programs of the proposed NSF Directorate for Engineering would support engineering activities that span the spectrum from fundamental research to applied research to experiments in technology transfer with industry. At the same time, under this plan it is clear that the responsibility for conducting applied research would rest in all NSF basic research directorates, including the Directorate for Engineering. This is intended to encourage closer links between basic research developments and focused research, while preserving the special funding and management techniques required to support applied research.

This concern for engineering reflects a maturation process at the NSF which has always recognized the importance of engineering as an integral and essential part of our nation's scientific fabric. It also reflects a concern that, while America's innovative and productive spirit is lagging, the foundation, under its broad mandate from Congress, can further stimulate first steps in the innovation chain that leads from the library and the laboratory into the marketplace.

The NSF's proposed realignment of responsibilities is neither a cosmetic nor a quick response to recent concerns expressed by all those interested in the future role of engineering. It is intended to provide a workable structure for timely and mutual support of activities in all NSF directorates.

—NORMAN HACKERMAN, *President, Rice University, Houston, Texas*

tors in heavy metal intoxication"; R. Hall, "Safe at the plate."

31 July. Evaluation of ultrastructural toxicological changes: (J. Campbell, discussion leader): P. Lea, "Present technology and developments for the future"; F. de la Iglesia, "Specific models used in evaluating drugs and chemicals."

Transport Phenomena in Lipid Bilayers and Biological Membranes

Tilton School

Sally Krasne, chairperson; Alan Finkelstein, vice chairperson.

17 August. Fusion in artificial lipid membranes (A. Parsegian, chairperson): Nejat Duzgunes, "The effect of composition on membrane fusion"; Peter Cullis, "Non-bilayer lipid structure and lipid fusion processes." Fusion in cell membranes (A. Finkelstein, chairperson): R. Pagano, D. Hockstra, "Studies of membrane fusion using energy transfer between fluorescent phospholipid analogues"; R. Ornberg, "Electron microscopic studies of the kinetics of membrane fusion in *Limulus* amebocytes."

18 August. Protein mobility and migration in membranes (S. McLaughlin, chairperson): E. Elson, "Cytoskeletal control of membrane protein mobility"; M. Poo, "Lateral migration of cell membrane components induced by electric field." Protein insertion into membranes (P. Mueller, chairperson): H. Schindler, "Incorporation of the acetylcholine-activated channel into planar bilayer membranes"; W. Wickner, "Protein insertion into cell membranes."

19 August. Recording from single ionic channels in cell membranes (E. Neher, chairperson): R. Horn, "Analysis of single sodium channel currents in muscle"; G. Yellen, "Properties of single-channel currents in sympathetic ganglion cells." Biophysics of visual transduction processes (W. Hagins, chairperson): J. Korenbrot, "Light-activated release of calcium from intact retinal rods"; W. Hubbell, "Charge movements in disk membranes"; S. Yoshikami, "Interface between biochemistry and biophysics in visual transduction."

20 August. Ion and water movements across epithelial membranes (E. Wright, chairperson): K. Spring, "Water movements across epithelial membranes"; T. Zeuthen, "Ion movements across epithelial membrane." Poster session—7:30 p.m.

21 August. Anion transport kinetics across red blood cell membranes (R. Gunn, chairperson): P. Knauf, "Niflumic acid interactions with the anion

PERCENT TRANSMITTANCE
ABSORBANCE
Filter Selector
POWER
CHEMTRIX 20A
COLORIMETER

No other laboratory shaker is more accurate or provides faster results than the Burrell Wrist-Action® Shaker.

If you expect fast, accurate results from your laboratory shaker, there's only one shaker that duplicates true wrist-action shaking. The Burrell Wrist-Action Shaker.

Here's why.

The Burrell Wrist-Action Shaker duplicates a hand mixing swirl for as long as necessary, at the speed and shaking angle you select. The swirling motion is the key . . . all the contents are in continuous motion, assuring faster, more complete mixing. The swirling motion is consistant at every speed, so you can replicate exact operations . . . every time.

Flexible and versatile.

Flexibility and versatility are what make the Burrell Wrist-Action Shaker so popular. We call it the Build-Up® System. With it you can add on or interchange side-arms and platforms so the capacity of your Burrell Shaker grows and changes with your needs. The Burrell Shaker can accommodate from four to twenty-four Erlenmeyer flasks, and with special clamps a Burrell platform can hold up to eight 250 ml flasks, as well as separatory funnels as large as 2000 ml.

Who uses the Burrell Wrist-Action Shaker?

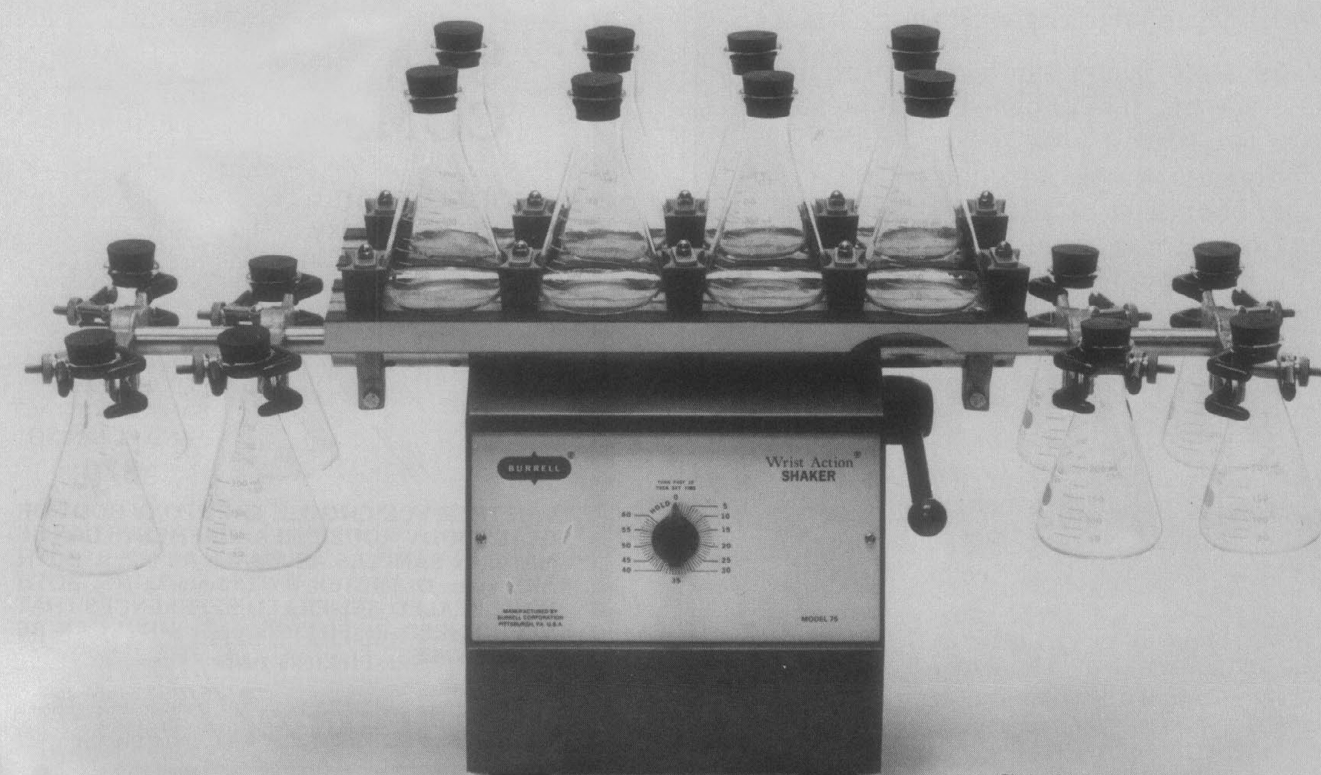
The Burrell Shaker is working accurately in hundreds of industrial and clinical laboratories; government research departments; universities, colleges and technical schools. For more than forty years, the Burrell Shaker has been working hard in laboratories around the world. It's a proven, quality, indispensable piece of laboratory equipment.

Get the whole story.

We want you to know all the facts. Write or call Burrell Corporation and we'll send you our brochure describing the only true wrist-action shaker available.

BURRELL

BURRELL CORPORATION
SCIENTIFIC INSTRUMENTS
AND LABORATORY SUPPLIES
2223 FIFTH AVENUE, PITTSBURGH, PA 15219
Telephone 412/471-2527



Circle No. 267 on Readers' Service Card

ALL THE FEATURES OF THE BURRELL WRIST-ACTION SHAKER ADD UP TO THE MOST VERSATILE SHAKER AVAILABLE.

transporter"; M. Jennings, "Single turnovers of the chloride transporter"; M. Milanick, "Proton sulfate co-transport."

Vibration Intensities

Plymouth State College

Willis B. Person, chairperson; William T. King and John Overend, vice chairpersons.

8 June. Modern experimental aspects (W. T. King, chairperson): Bryce Crawford, Jr., "Infrared intensities: Past and present"; S. Kondo, "Recent experimental studies of infrared intensities." The normal coordinate problem (I. Mills, chairperson): H. F. Schaeffer, "Quantum mechanical calculation of potential functions"; D. C. McKean, "An experimentalist's evaluation of force fields from quantum mechanical calculations."

9 June. Quantum mechanical calculations of accurate dipole moment functions (H. F. Schaeffer, III, chairperson): N. S. Hush, "Rigorous calculations: The effect of configuration interaction"; P. Pulay, "Rigorous intensity calculations for medium-sized molecules." Slightly more approximate quantum mechanical calculations of intensities (J. Boggs, chairperson): A. Komornicki, "Gradient methods for ab initio prediction of vibrational intensities for small molecules"; D. Dixon, "Ab initio calculations of infrared intensities by finite difference methods."

10 June. Prediction of vibrational intensitites by transfer of intensity parameters (G. Zerbi, chairperson): L. A. Gribov, "Electrooptical parameters"; M. Gussoni, "Transferability of intensity parameters"; W. B. Person, "Atomic polar tensors." Chemical interpretation of intensity results (W. J. Orville-Thomas, chairperson): J. C. Decius, "The charge, charge-flux model for interpretation of intensities"; K. Wiberg, "Chemical significance of intensities."

11 June. Intensities of combination of bands and overtones (J. Overend, chairperson): D. Whiffen, "Theory of intensities of higher overtones"; R. L. Swofford, "Experimental measurements of intensities of high overtones." Intensity measurements with diode lasers (R. McDowell, chairperson): A. Mantz, "Line intensity measurements with tunable diode lasers"; M. Mumma, "Measurements on planetary atmospheres."

12 June. Infrared intensitites and infrared lasers (K. Fox, chairperson): J. Steinfeld, "Application of vibrational intensities to studies of IR laser induced photochemistry"; D. Dows, "High intensity spectroscopy and laser chemistry."

GORDON RESEARCH CONFERENCES

"FRONTIERS OF SCIENCE"

APPLICATION

Please complete this application and mail (**in duplicate**) to the Director.

Office Use Only:
Received:
Sent to Chairman:
Waiting List Letter:
Registration Mailed:
Registration Returned:

Conference on ______________________________ Date: ______________
(Name of Conference — Please Print)

Name: (Please Print) ______________________________ Location ______________

Organization: ______________________________

Business Address: ______________________________

(inc. dept., street & no.) ______________________________

City and State: ______________________________
Zip Code

(Children must be at least 12 years of age to be accommodated at the Host site.)

Accomodations (Room & Meals) For:
Applicant ______
Spouse ______
Child(ren) ______
Total ______

IMPORTANT

Indicate your particular activities which justify favorable consideration of you as a participant in and contributor to this Conference. (Not required of speakers.) Applications are referred to the Conference Committee for review in accordance with the established regulations, and this information is essential.

FIXED CONFERENCE FEES - 1981

New Hampshire		California	
Conferee (double occupancy)	$220.00	Conferee (double occupancy)	$280.00
Non-resident Conferee (meals, no room)	$180.00	Conferee (single occupancy)	$350.00
Guest (room, meals)	$160.00	Guest (double occupancy)	$220.00
		Guest (single occupancy)	$290.00

PAYMENT: The full fixed fee will be required IN ADVANCE OF ALL PARTICIPANTS AND GUESTS. Attendance and/or accomodations will NOT be reserved unless this fee is paid 3 weeks prior to the Conference. Foreign participants will also be required to pay Gordon Research Conferences in advance in U.S. dollars payable through a U.S. Bank. The fixed fee cannot be prorated or reduced for anyone (speakers, discussion leaders, conferees) and is charged to all regardless of the length of stay at a Conference.

Please return to:

Dr. Alexander M. Cruickshank, Director
Gordon Research Conferences
Pastore Chemical Laboratory
University of Rhode Island
Kingston, Rhode Island 02881
Tel: (401) 783-4011 or (401) 783-3372

Office — Summer Schedule

Colby-Sawyer College
New London, N.H. 03257
(603) 526-2870

The recording of lectures by tapes, etc. and the photography of slide material are prohibited. Printed reference to Gordon Research Conference papers and discussion is not permitted. Authors are requested to omit references to the Conference in any publication. Guests are not permitted to attend the conference lectures and discussion sessions. Each member of the Conference agrees to these regulations when registration is accepted.

Signature ______________________________

Date ______________________________

Telephone: Business ________ ______________

Home ________ ______________

RECEIPT OF THIS APPLICATION WILL NOT BE ACKNOWLEDGED