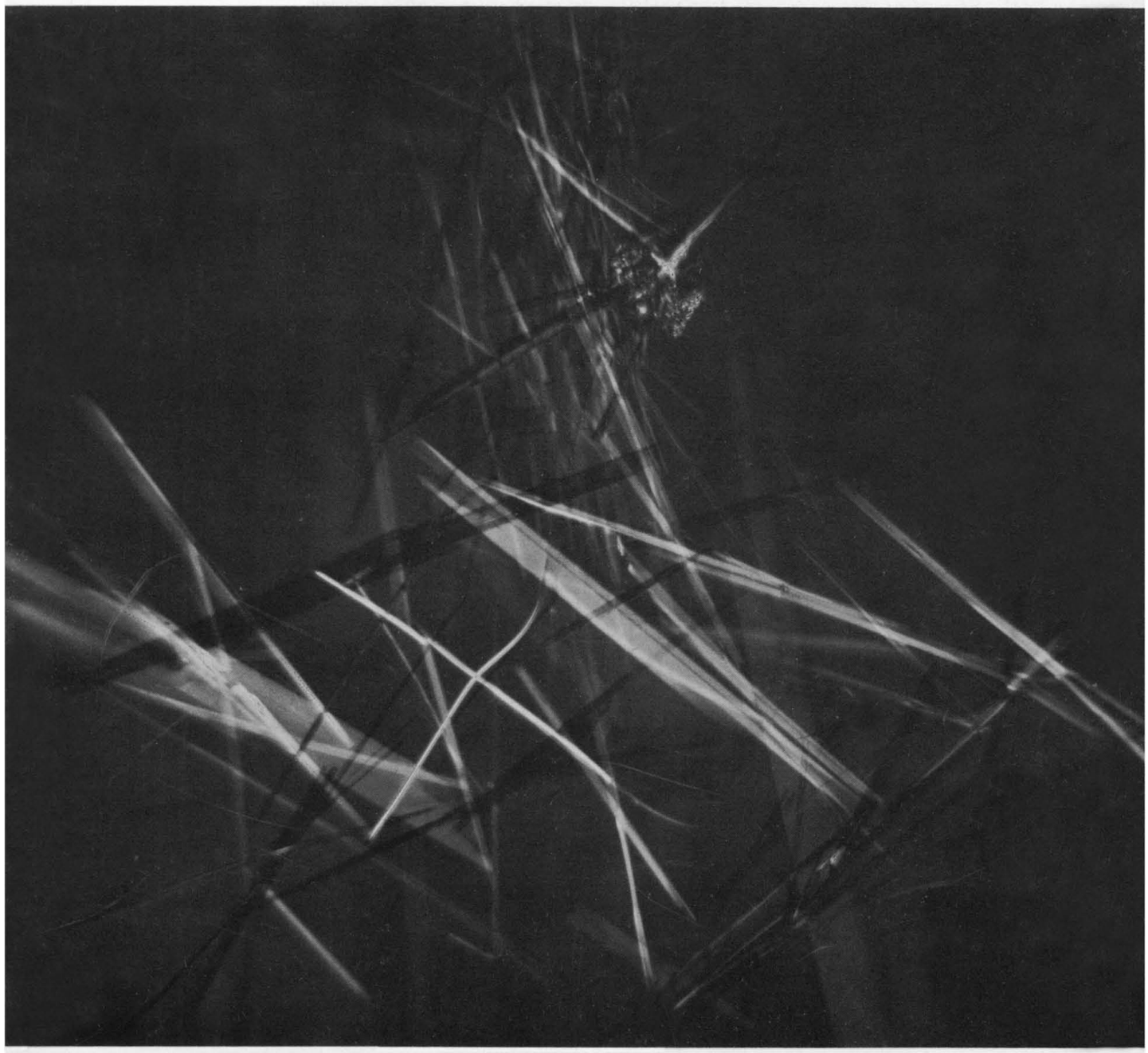
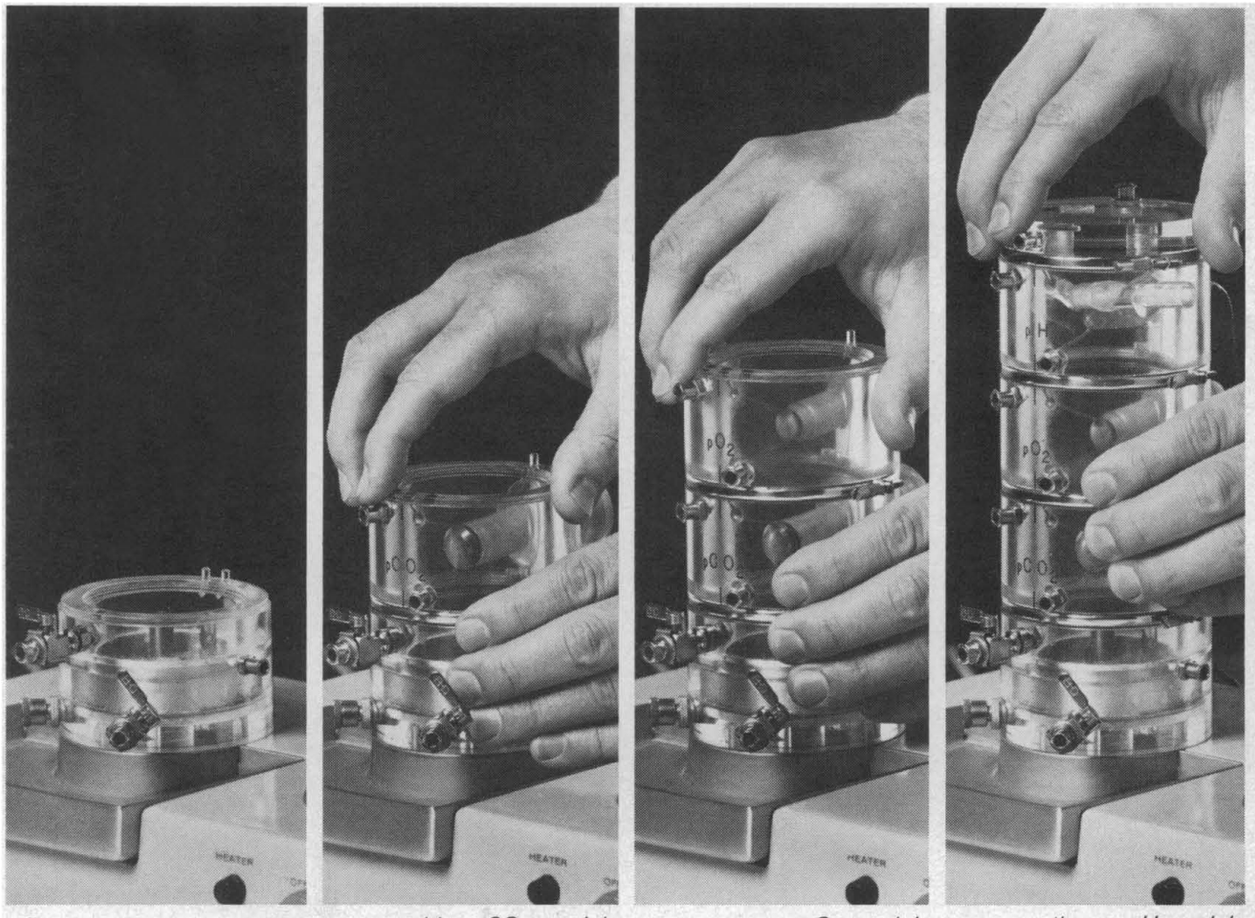
SCIENCE

30 October 1964
Vol. 146, No. 3644

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CARNIVAL OF CRYSTALS



To a constant temperature water bath | *. . . add a pCO_2 module* | *. . . a pO_2 module* | *. . . then a pH module*

HOW'S THAT FOR VERSATILITY IN A BLOOD GAS CUVETTE!

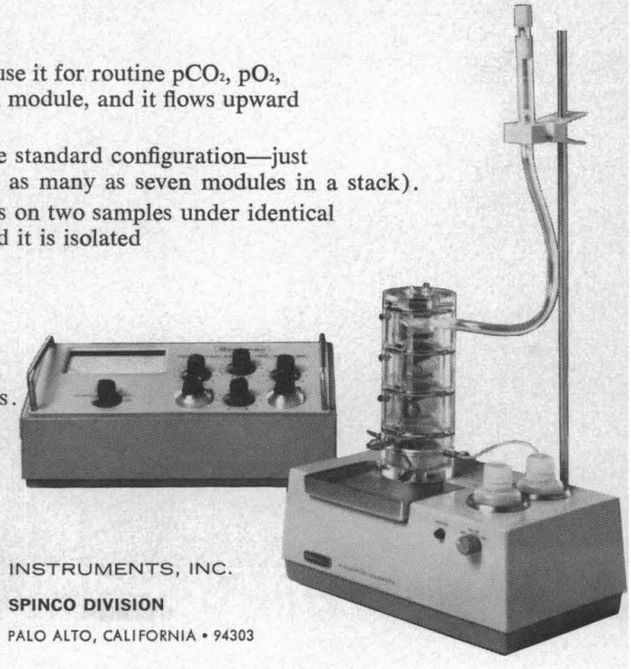
Above you see our new Modular Cuvette just as you would use it for routine pCO_2, pO_2, and pH measurements. Now inject a sample into the bottom module, and it flows upward to be measured simultaneously in all three modules.

But research needs vary, and there's no need to stay with the standard configuration—just rearrange modules, or add as many as you wish (we've had as many as seven modules in a stack).

Perhaps for a particular study you want to compare readings on two samples under identical conditions. Simple again—give any module a slight turn and it is isolated from the others for individual sampling.

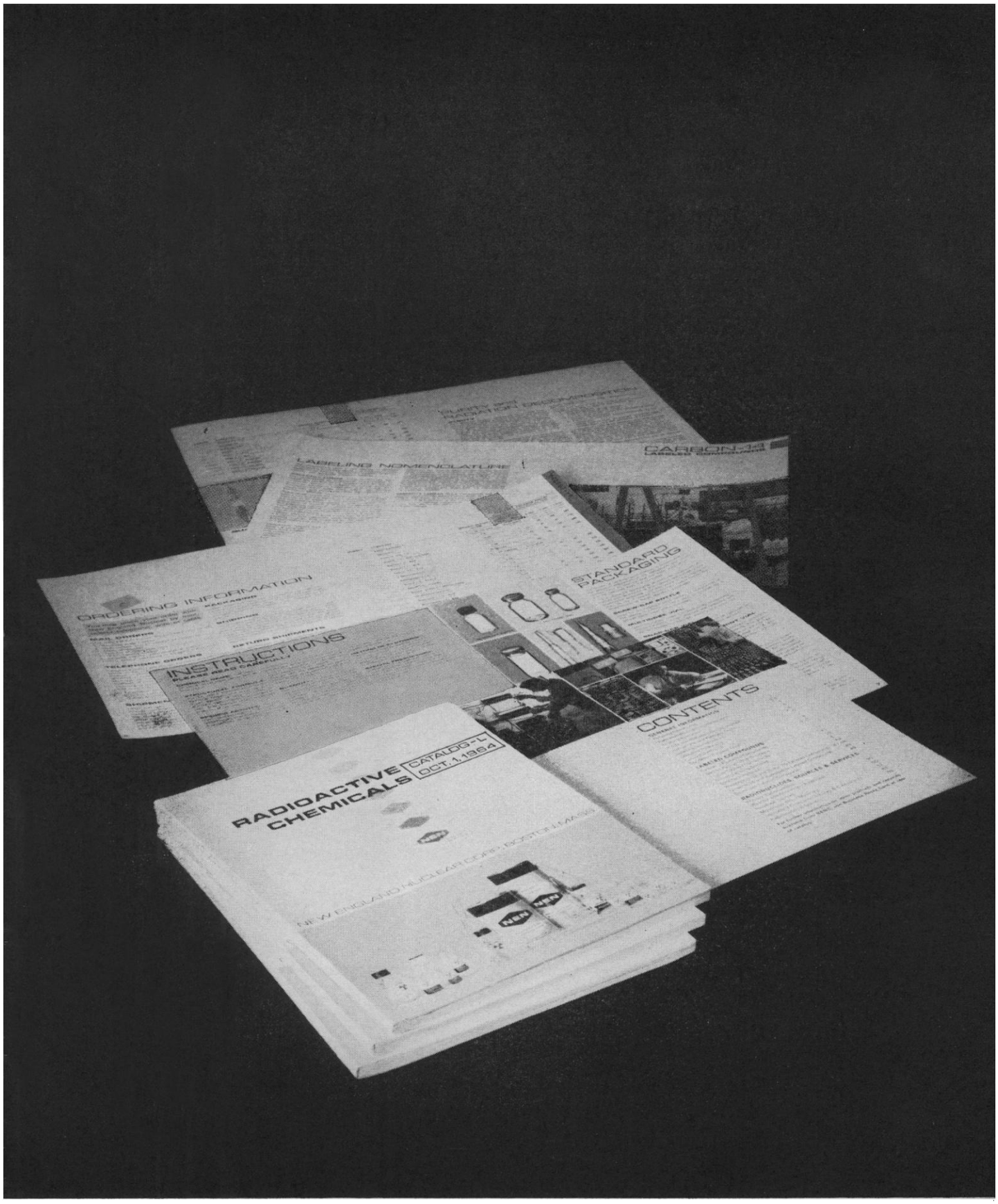
Happily, the performance of our Modular Cuvette is as impressive as its versatility. Precise temperature control to ±0.1°C is maintained by constant temperature water circulating through the centers of all modules. Sample size is small—less than a third of a cc fills all three standard modules.

The remarkable Modular Cuvette and its companion 160 Physiological Gas Analyzer are described in our new brochure on blood gas analysis; ask for Data File MC-5.



Beckman® INSTRUMENTS, INC.
SPINCO DIVISION
PALO ALTO, CALIFORNIA • 94303

International Subsidiaries: Geneva, Switzerland; Munich, Germany; Glenrothes, Scotland; Paris, France; Tokyo, Japan; Capetown, South Africa.



An all-new 72-page catalog.
Over 700 C^{14}, H^{3}, S^{35}, and P^{32} labeled chemicals with formulae, packaging data, and many lower prices; radionuclides; sources; and services.
Also, important data on ordering, licensing, purity, radio decomposition and labeling nomenclature.
If you have not received Catalog L, write: New England Nuclear Corp.
575 Albany Street, Boston, Mass. 02118 Phone (617) 426-7311

NEN
LABELED CHEMICALS

30 October 1964
Vol. 146, No. 3644

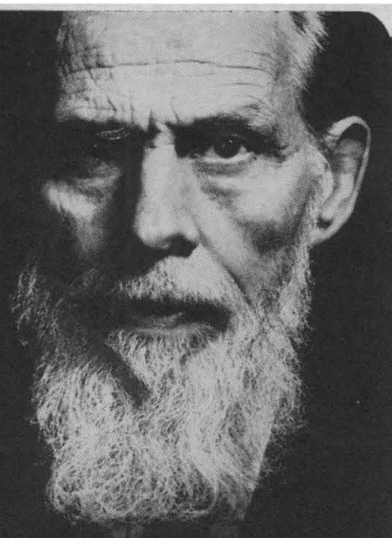
SCIENCE

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Now combined with **The Scientific Monthly®**. Second-class postage paid at Washington, D.C. Annual subscriptions $8.50; foreign postage, $1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, $7; 10 months, $7.50. Provide 4 weeks' notice for change of address, giving new and old address and zip numbers. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature**.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Crystal blades of a toxic and hemolytic lipoid isolated from *Pseudomonas pseudomallei*. This compound closely simulates the toxic activities of the homologous lipopolysaccharide in mice but is different enough not to be characterized in the traditional sense as endotoxin (Polarizing microscope, about × 75). See page 648. [J. Nicholas Schutz, Naval Biological Laboratory, Oakland, California]



EMBODIMENTS OF MIND

by Warren S. McCulloch

This volume offers selected writings of the distinguished American scientist Warren Sturgis McCulloch, doctor, philosopher, teacher, mathematician, poet, and "experimental epistemologist." After twelve years of research in psychiatry and neurology, Professor McCulloch turned to neurophysiology, mathematics, cybernetics, and the logical mechanics of physical machines. The selections in *Embodiments of Mind* express a unity derived from thinking of how brains work in terms of the circuit action of the brain. Seventeen papers, including *A Logical Calculus of the Ideas Imminent in Nervous Activity* and *How We Know Universals, The Perception of Auditory and Visual Forms* (both with Walter H. Pitts). 320 pages, $7.50

DEVELOPMENTS IN HEAT TRANSFER
edited by WARREN M. ROHSENOW
544 pages, $15.00

THERMAL CONDUCTIVITY OF GASES AND LIQUIDS
by N. V. TSEDERBERG
432 pages, $15.00

DEFORMATION AND FRACTURE AT ELEVATED TEMPERATURES
edited by NICHOLAS J. GRANT and ARTHUR W. MULLENDORE
256 pages, $6.00

TECHNOLOGY OF CERAMICS AND REFRACTORIES
by P. P. BUDNIKOV, translated from the Russian. 608 pages, $15.00

STRESS: A User's Manual
ix ± 51 pages, $3.75

STRESS: A Reference Manual
400 pages, 150 diagrams, $12.50
Both by STEVEN J. FENVES, ROBERT D. LOGCHER, and SAMUEL P. MAUCH

BIOCHEMICAL AND PHYSIOLOGICAL ASPECTS OF CARNITINE
edited by GEORGE WOLF, $6.00

THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY

Volume I: *Reactor Physics and Control;* Volume II: *Reactor Materials and Engineering.* Edited by T. J. THOMPSON and J. G. BECKERLY. *Published under the sponsorship of the Atomic Energy Commission.* December, Vol. I, 720 pages, $25.00. Vol. II, 752 pages, $25.00

SELECTED PAPERS OF NORBERT WIENER

with expository papers by Y. W. LEE and NORMAN LEVINSON. *Published by the M.I.T. Press and the Society of Industrial and Applied Mathematics.* The important mathematical and technical writings of Norbert Wiener, previously available only in journal form, now in one volume. Two of the works included — *Generalized Harmonic Analysis* and *Tauberian Theorems* — are virtually book-length. Both are classics. 480 pages, $10.00

RESEARCH IN GEOPHYSICS

Volume 1: *Sun, Upper Atmosphere, and Space;* Volume II: *Solid Earth and Interface Phenomena.* Edited by HUGH ODISHAW. This major work offers a critical review of research and progress in the prime areas of the geophysical sciences, with emphasis on the findings of the past decade. Each of the forty-three chapters is contributed by a recognized authority in his field. Vol. I: 592 pages, Vol. II: 608 pages; 530 illustrations and tables; $12.50 each volume, $25.00 the set

THE THREAT OF IMPENDING DISASTER:

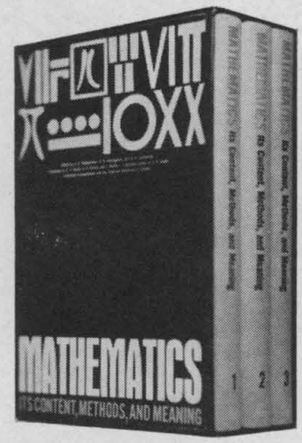
Contributions to the Psychology of Stress

Edited by GEORGE H. GROSSER, HENRY WECHSLER, and MILTON GREENBLATT. How do human beings react to the expectation of catastrophe? What is the range of their behavior in face of nuclear threat, space flight, flood, war, disease, death? This work assembles insights gained through more than a decade of empirical research, by investigators from different disciplines. 250 pages, $8.75

SOVIET RESEARCH AND DEVELOPMENT:

Its Organization, Personnel, and Funds

by ALEXANDER G. KOROL. This volume surveys the continual improvisation in the administrative framework of Soviet research and development and analyzes published data on its scale and growth rate. 480 pages, November, $11.00.



MATHEMATICS: Its Content, Methods, and Meaning

Published in cooperation with the American Mathematical Society

Edited by A. D. ALEKSANDROV, A. M. KOLMOGOROV, and M. A. LAVRENT'EV; translated by S. H. GOULD, K. A. HIRSCH, and T. BARTHA; translation edited by S. H. GOULD. Eighteen Soviet mathematicians cover twenty prime subject areas, from arithmetic to topology. *"This unique work . . . is the best answer in print to what mathematics contains both on the elementary and the advanced levels." —Professor Morris Kline.* 1152 pages in a 3-volume set, clothbound and handsomely boxed. Special offer: **Until Dec. 31, '64, $24.95; thereafter, $30.00 the set.**

New in the M.I.T. Monograph Series

THE PRINCIPLES AND APPLICATIONS OF VARIATIONAL METHODS
by MARTIN BECKER, 128 pages, $5.00

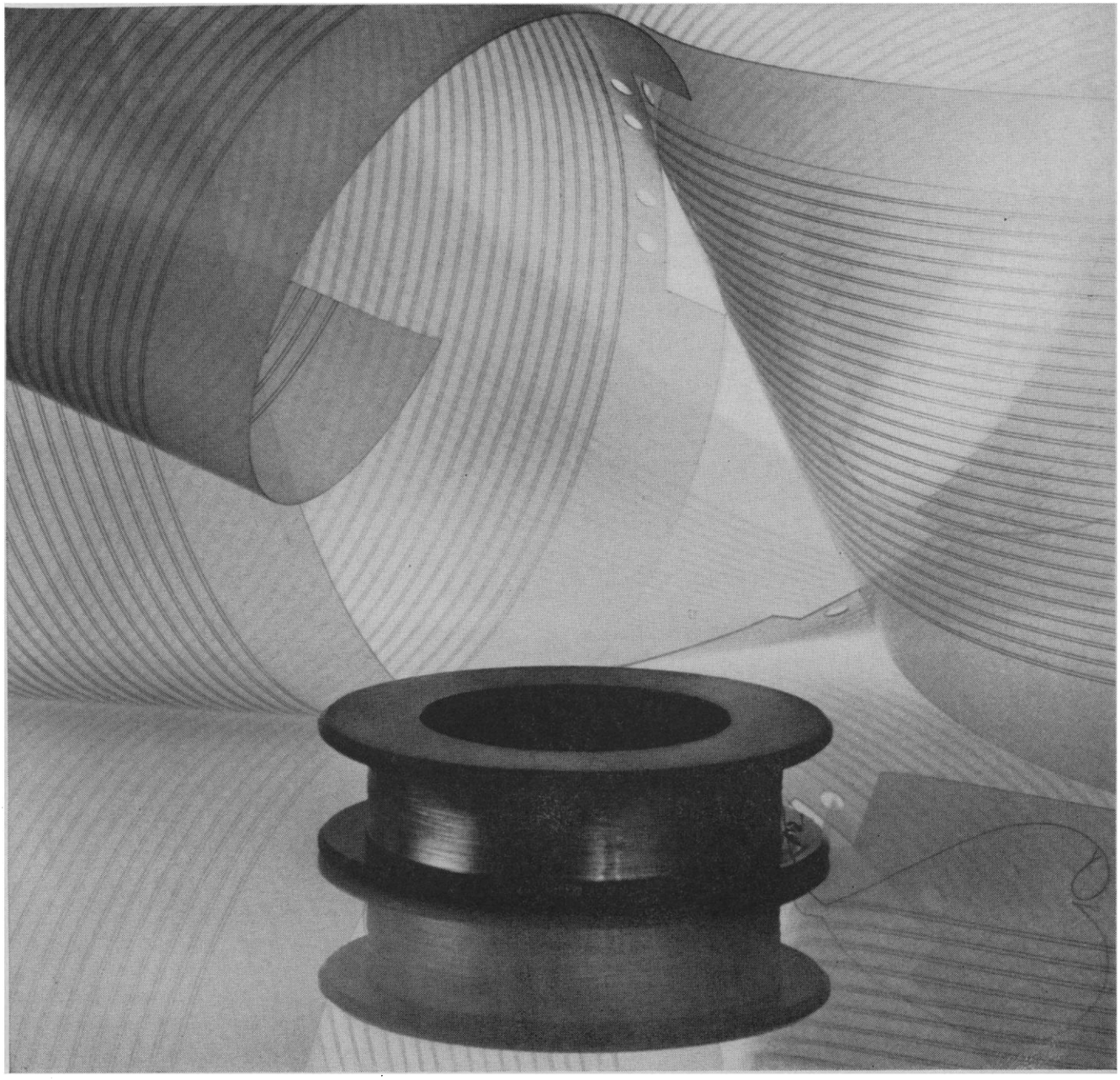
ELECTRON STREAM INTERACTION WITH PLASMAS
by RICHARD J. BRIGGS,
December, 300 pages, $7.50

RELIABILITY OF SHELL BUCKLING PREDICTIONS
by WILLIAM A. LITLE,
192 pages, $10.00

Available at your bookstore or write to

the M.I.T. Press, Cambridge, Massachusetts 02142

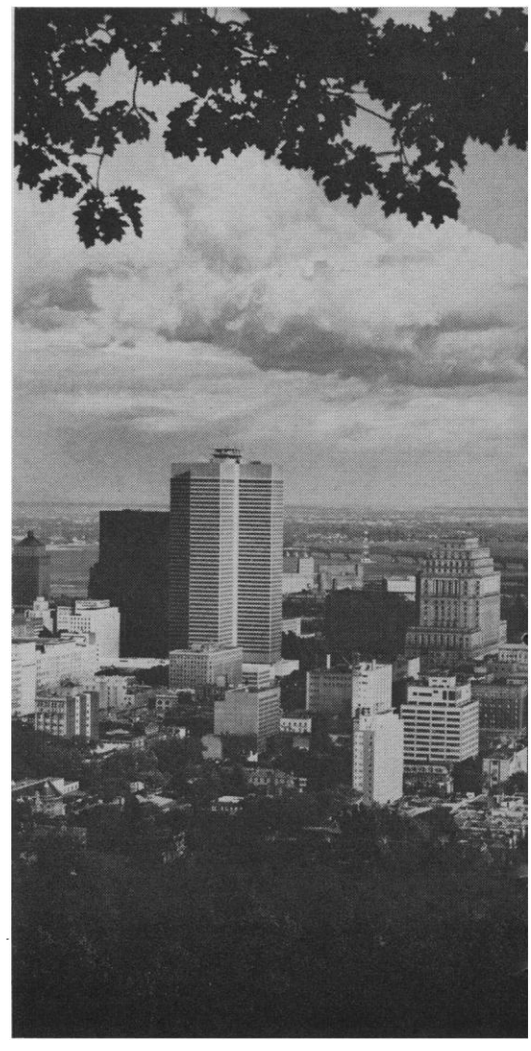
TWISTOR. The new computer memory component known as the twistor is a hair-like copper wire on which is wound a spiral of molybdenum-permalloy tape, giving the device the required magnetic properties. Developed by Bell Telephone Laboratories, the twistor is manufactured by Western Electric as the primary component of digital-computer memory modules that direct missiles and electronic switching systems. Measuring only four thousandths of an inch in diameter, this new device presented many manufacturing difficulties. One such problem involved the lamination of parallel twistors between polyethylene and Mylar tape. In order to place the units in the laminate with a variation of no more than one thousandth of an inch per inch of width, a totally new concept was evolved of guiding and placing the wires at the very point of lamination. With the solution of this problem, Western Electric provided another unique manufacturing contribution to America's growth in communications and space. **WESTERN ELECTRIC**



MONTREAL • 131st AAAS

Order Your General Program

It provides complete, detailed information about all the sessions and symposia scheduled, the Annual Exposition of Science and Industry, and the Science Theatre.



Program Highlights

Moving Frontiers of Science V. C. Wynne-Edwards on self-regulating systems in animal populations; J. M. Harrison on nonrenewable world resources; Philip Morrison, "New Channels in Astronomy"; and Clement L. Markert on role of genes in embryonic development.

Interdisciplinary Symposia Possible meteoric or lunar influences on meteorological phenomena; basic concepts of biochemical differentiation; medical geology and geography; history of the popularization of science.

Special Sessions AAAS Presidential Address by Alan T. Waterman; the Joint Address of Sigma Xi and Phi Beta Kappa by René Dubos; the George Sarton Memorial Address by Lloyd G. Stevenson; the National Geographic Society Illustrated Lecture; and the AAAS Distinguished Lecture by Lord Brain, retiring president, British AAS.

International Conference on Primate Behavior Three AAAS sections and the combined ESA and ASZ Section on Animal Behavior and Sociobiology are sponsors. Six sessions, open to the public, will include 37 speakers from four continents.

AAAS Committees Sessions of the AAAS Committee on Meetings, including two sessions on the sociology of science arranged and chaired by Robert K. Merton; and the Commission on Science Education.

Sections and Societies The 20 AAAS Sections and some 76 participating societies are scheduling specialized symposia; some have sessions for contributed papers.

AAAS Science Theatre The latest foreign and domestic films.

Exposition The Annual Exposition of Science and Industry is adjacent to all session rooms on the convention floor of the Queen Elizabeth Hotel.

Advance Registration By registering in advance, you avoid delay at the Registration Center on arrival, you receive the *General Program* in time to plan your days at the meeting, and your name is posted in the Visible Directory of Registrants when the meeting opens. Use the coupon below.

AAAS
1515 Massachusetts Ave., NW
Washington, D.C. 20005

(Check 1a or 1b)

1a. ☐—Enclosed is $5.00 Advance Registration Fee. This brings me the **General Program** and a **Convention Badge.**

1b. ☐—Enclosed is $3.00 for the **General Program.** (If I attend the meeting, the Badge, which I need to obtain the privileges of the meeting, will cost me $2.00 more.)

2. FULL NAME (Dr., Miss, etc.) .....
(Please print or typewrite) (Last) (First) (Initial)

3. OFFICE ☐ OR HOME ☐ ADDRESS .....
(For receipt of General Program)

CITY .....STATE/PROVINCE ..... ZIP CODE/ZONE .....

4. ACADEMIC, PROFESSIONAL, OR BUSINESS CONNECTION .....

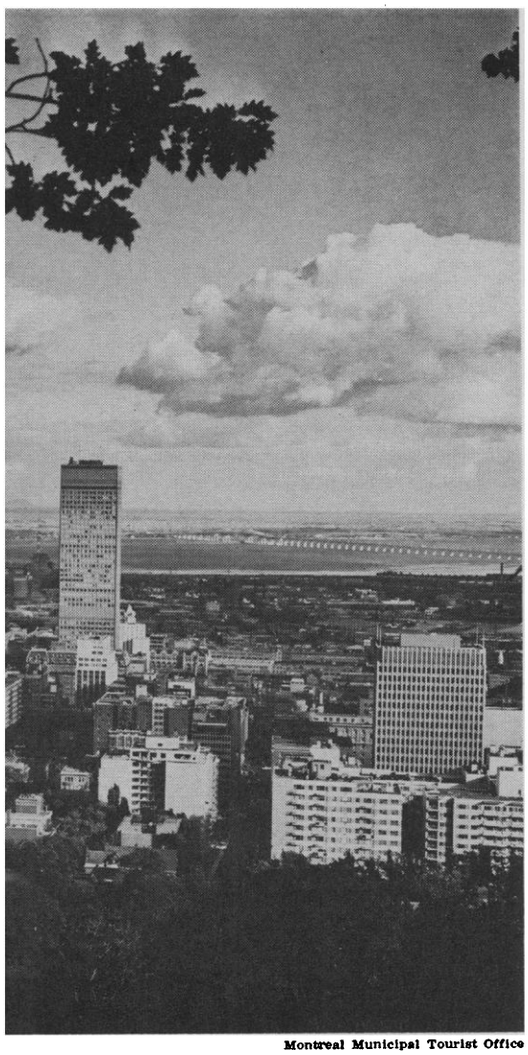
5. FIELD OF INTEREST .....

6. CONVENTION ADDRESS .....
(May be added later, after arrival)

Please mail this coupon and your check or money order for the total amount to the AAAS in Washington, D.C. (address as shown)

MEETING • 26–31 DECEMBER

Reserve Your Hotel Room



Montreal Municipal Tourist Office

Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 299, 17 July, SCIENCE. The AAAS headquarters is the Queen Elizabeth.

The hotels for the AAAS Montreal meeting have established special, low rates and have reserved large blocks of rooms for the meeting.

Use the coupon below to make your hotel reservation in Montreal. **Send your application to the AAAS Housing Bureau in Montreal, not to any hotel.** Give a definite date and estimated hour of arrival, and also probable date of departure. The Housing Bureau will make the assignment and send you a confirmation promptly.

A rollaway bed can be added to any room at $3.00 per night. Mail your application now to secure your first choice of accommodations.

Hotels with asterisks have unlimited free parking for guests. The Windsor has overnight free parking for guests, but not between the hours of 9 A.M. and 4 P.M.

HOTEL RATES

For a list of the headquarters of each participating society and section, see page 299, 17 July, SCIENCE.

Hotel	Single	Double	Twin	Suite
*Queen Elizabeth	$ 8.50, 10.00	$15.00	$15.00	$30.00–$50.00
*Sheraton-Mount Royal	8.50, 10.00	15.00	15.00	25.00– 45.00
Windsor	8.50	15.00	15.00	25.00– 45.00
*Laurentien (Sheraton)	7.50	12.00	12.00	21.00– 30.00
Ritz Carlton	10.00	15.00	15.00	35.00
Berkeley	7.00	10.00	10.00	17.50

AAAS Housing Bureau
2055 Peel St., Suite 525
Montreal 2, Que., Canada

Date of Application .....

Please reserve the following accommodations for the 131st Meeting of the AAAS in Montreal, 26–31 December 1964

First Choice Hotel ..... **Second Choice Hotel** ..... **Third Choice Hotel** .....

Type of room: Single ☐ Double ☐ Double, twin beds ☐ Suite ☐ Rates: Desired ..... Maximum .....

Number in party ..... Sharing this room will be: .....

(List name and address of each person, including yourself. Attach list if space is insufficient.)

.....

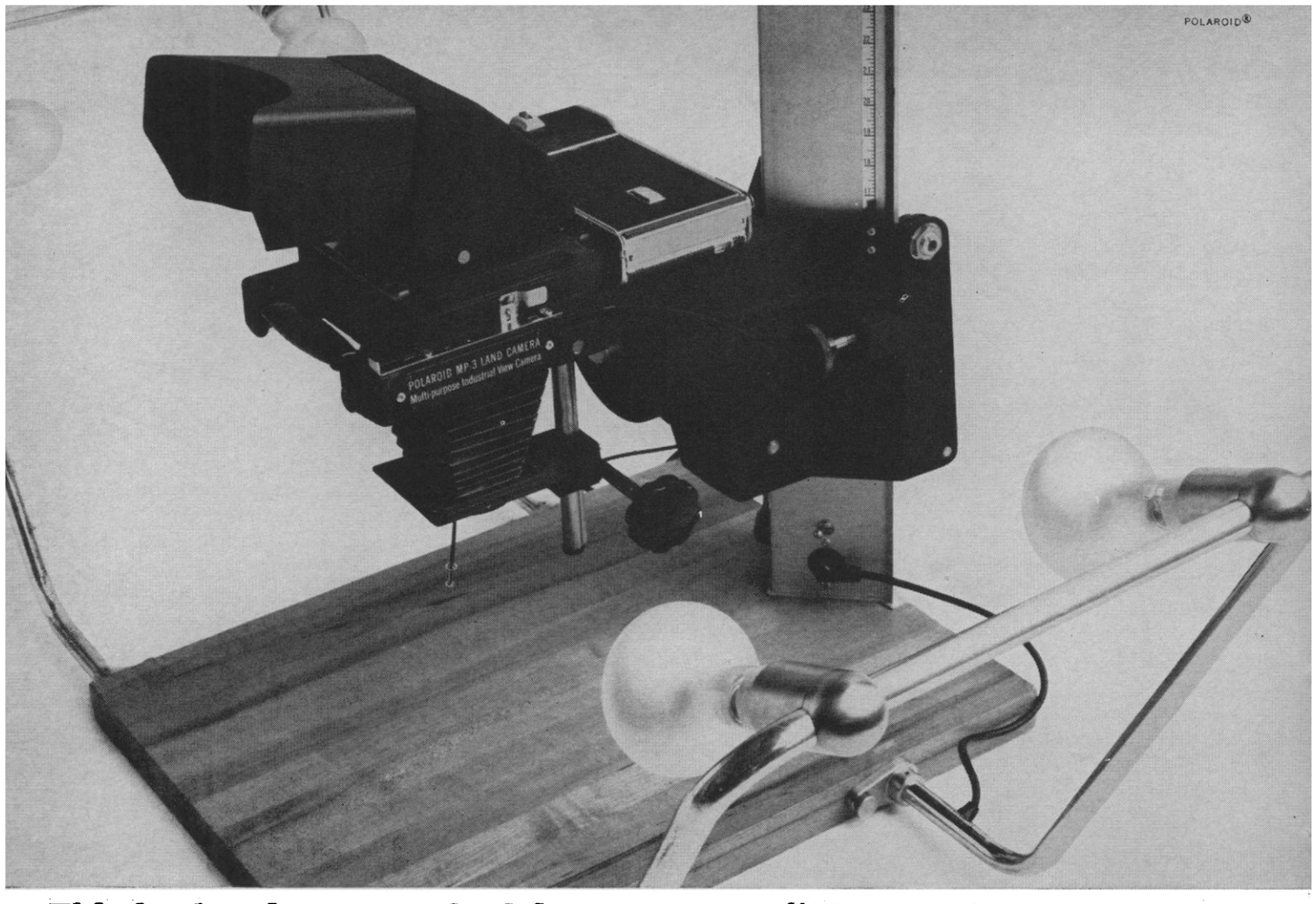
.....

DATES: ARRIVAL ..... A.M. ..... P.M. ..... DEPARTURE .....
(These must be indicated—add approximate hour, A.M. or P.M.)

NAME .....
(Individual requesting reservation) (Please print or type)

ADDRESS .....
(Street) (City) (State/Province) (ZIP Code/Zone)

Mail this coupon now to the Housing Bureau. Rooms will be assigned and confirmed in order of receipt of reservation.



This is the closest anybody's come to an "ideal" industrial camera.

Here's why:

The Polaroid MP-3 Industrial View Camera is so versatile that it is virtually a self-contained studio. It can *finish* jobs ranging from photomicrographs to big maps and wall charts in times ranging from 10 seconds to two minutes. The end product can be a print, a print and negative, or a slide-mounted transparency, as you choose. All from one self-contained rig. All without using a darkroom.

Physically, the MP-3 is a rigid stand on a laminated wood base. A counterbalanced camera body rides easily up and down the stand and swings to a horizontal position for bigger work mounted on a wall. Prepositioned floodlights illuminate regular size work on the base.

Optically, the MP-3 is even more sophisticated. You can work with four interchangeable lens and shutter combinations plus a lensless shutter for photomicrography. In all cases you work with an eye-level, ground-glass reflex viewer for fast, easy, hairline focusing.

But it's the film systems that give the MP-3 such speed and versatility. It uses thirteen different Polaroid Land films plus conventional 4x5 b&w and color films.

Many jobs call for just a print. You can get a black and white in 10 seconds with 3¼ x 4¼ roll film or three speeds of 4 x 5 film (one is A.S.A. 3,200!). And full color prints in 60 seconds are now available. If you need a negative to work with, another 4 x 5 Polaroid Land Film will supply a fully developed fine-grain negative and a matching positive print, in just 20 seconds.

Then there are two kinds of transparency film (one for line work, one for continuous tone) which can be mounted and ready for projection in seconds. And, you can use any conventional 4 x 5 black & white or color film.

The MP-3 is a precision instrument. It can meet the demands of skilled professional photographers. It is also an extremely simple camera to use. Inexperienced personnel can easily use it to record results of their regular work.

More details on this new camera are contained in our free, 8-page brochure, which we'll be happy to send you. Even if you are satisfied with your present photographic set-up, it makes fascinating reading. Write: Technical Sales Dept., Polaroid Corp., Cambridge 39, Mass. Today.

Here's everything you'll ever need in a low background planchet counting system

There's probably no finer wide-range, planchet counting instrument than the new WIDEBETA II from Beckman. And there probably won't be for a long time.

WIDEBETA II is extremely versatile, with the low background and wide range necessary for advanced radiochemical, biomedical and environmental studies. It handles any sample: weak, micro, hot, even colored. Live timing permits counting rates to 1,000,000 cpm, with less than 0.5 cpm background. It discriminates between Alpha and Beta particles, and even between different Beta energies with automatic absorbers, calculating ratios for sample identification. As a result, you get accurate quantitative measurement of the isotopes present.

You have fully automatic readout of sample number, time-of-day, counting time, counts, counts-per-minute, as well as continually available presentation of percentage counting error. Readout can be on a calculator, lister-printer, punched tape, typewriter, or even teletype. The automatic sample changer allows random access to the samples and is adaptable to three different detector sizes, 1¾", 2¾", and 5". You can even add a second manual detector.

Preset count and preset time modes overriding one on the other, first minute count reject, automatic background subtraction, and windowless tritium detectors, provide performance available with no other instrument.

To learn more about WIDEBETA II contact your local Beckman Sales Engineer. He'll gladly explain the many operating and maintenance advantages carefully human-engineered into this unusual instrument. Or write direct for Data File LWB-165.

Beckman INSTRUMENTS, INC.
SCIENTIFIC AND PROCESS INSTRUMENTS DIVISION
FULLERTON, CALIFORNIA • 92634

INTERNATIONAL SUBSIDIARIES: GENEVA, SWITZERLAND; MUNICH, GERMANY; GLENROTHES, SCOTLAND; PARIS, FRANCE; TOKYO, JAPAN; CAPETOWN, SOUTH AFRICA

CHARGED PARTICLES

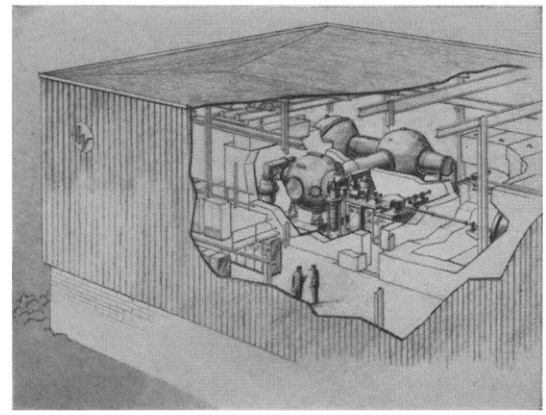
ACCELERATOR AUXILIARIES:
how HVEC research programs broaden the versatility of particle accelerators

New HVEC Tandem Research Laboratory

Expanding the versatility and flexibility of particle accelerator systems requires a continuing research and development effort. HVEC's new Tandem Research Laboratory will be an outstanding contribution to this effort.

This new $1.5 million laboratory will have five important missions:

(1) To examine basic acceleration processes, ion beam formation and handling, and voltage handling and stabilization in the presence of intense ion beams;
(2) To develop single-stage tandem injectors and two-stage tandem accelerators capable of proton and negative hydrogen currents in the tens-of-milliampere range;
(3) To develop high proton current capabilities of 3-stage tandem accelerators;
(4) To enable tandems to handle all the heavy ions that can be generated;
(5) To develop neutral-beam tandem injector technology.

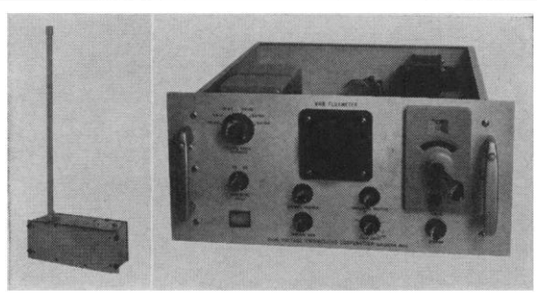


A 3-MV ICT-powered Tandem Accelerator and another higher energy machine to allow complete testing of 3-stage tandem operation will be housed in the new 20,000 square-foot laboratory which will be staffed by 20 research personnel.

New High-Transmission System

Analyzed proton currents in the order of 10 to 15μA can be achieved over the entire energy range of Model EN and FN Tandem Accelerators equipped with inclined field tubes by the use of a newly developed high-transmission system. The system is now available from High Voltage and can be installed in the field or delivered with new machines.

New Single-Probe Fluxmeter

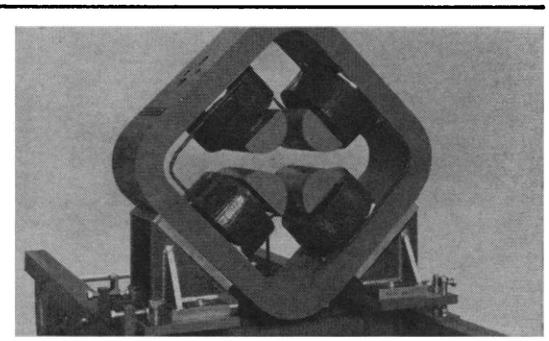


This new NMR fluxmeter allows convenient and accurate determination of magnetic field strengths over a range of 900 gauss to 19 kilogauss. A single probe covers the entire range; there is no need for probe changing and/or shunting. Accuracy is one part in 10^5 and signal-to-noise ratio is 20 db, making the unit easily tunable. At magnetic fields exceeding 10 kilogauss, the proton probe is at least one hundred times more sensitive then deuterium or lithium.

New Magnetic Auxiliaries

A new multiport switching magnet, Model 70-88, is available for use with HVEC Tandem Accelerators. The new switching system will deflect a 77 MeV proton through an angle of 70°.

The new HVEC Quadrupole Lens Model QMD 2.5-360 has been designed for use with the Model 70-88 Switching Magnet beam tube extension. The lens aperture is 2.5 in. and the field at the pole tip center is 2.25 kg/in. Shown at right: new 5-in. aperture Quadrupole Lens Model QMS-5-1100.



HVEC accelerator auxiliaries are all designed to enhance the versatility and flexibility of HVEC accelerator systems.

For detailed information, please write to Technical Sales, High Voltage Engineering Corporation, Burlington, Massachusetts.

HIGH VOLTAGE ENGINEERING

30 October 1964, Volume 146, Number 3644

SCIENCE

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office.
ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

The Chinese A-Bomb

The first official Washington comment on the significance of the recent Chinese detonation correctly indicates that new short-term hazards have not greatly increased, but it does not adequately recognize some longer-term problems.

Only a few facts are available to help one in evaluating the significance of the Chinese detonation. The Atomic Energy Commission has stated, "Additional evidence on the Chinese Communist test of October 16 indicates it was a fission device employing U^{235} . . .," and, "U.S. intelligence has always led us to estimate that the Chinese Communists were constructing both plutonium production reactors and gaseous diffusion isotope separation facilities."

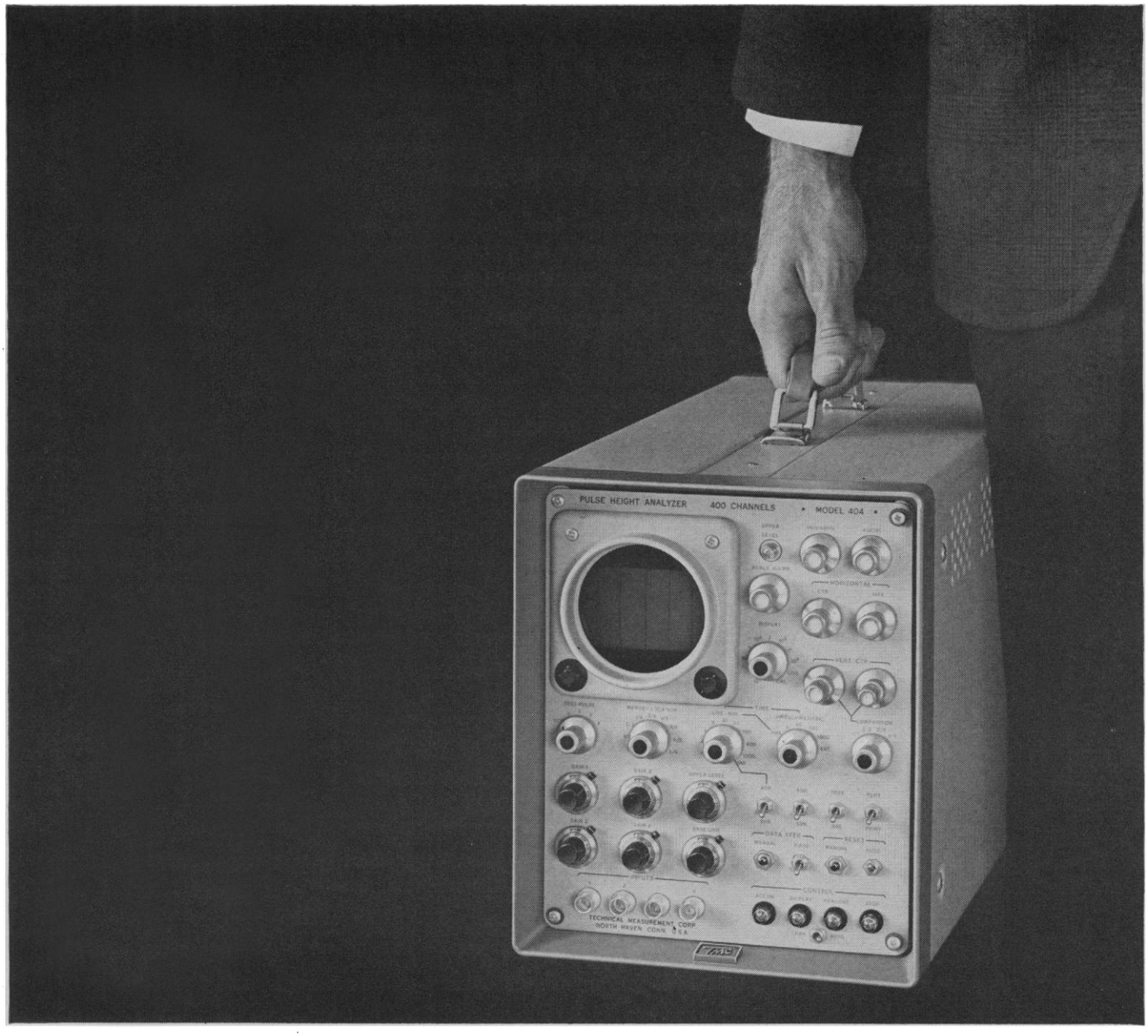
Production of weapons-grade uranium-235 is an impressive technological achievement indicative of considerable industrial capability. Successful construction and operation of a gaseous diffusion plant capable of producing substantial quantities of weapons-grade U^{235} requires both materiel and skill. Such a plant contains more than a thousand individual units connected in series. Each unit must be constructed with precision—small imperfections can destroy their effectiveness. Moreover, special metallurgical techniques must be available. After the units are assembled their performance must be monitored, controlled, and integrated. This requires a great deal of electronic instrumentation.

A technically incompetent people could not have succeeded in producing weapons-grade U^{235} without massive help; the French, after 6 years, have not yet announced production of highly enriched uranium. Nevertheless, the new accomplishment was not surprising to many U.S. scientists who have had contact with individuals of Chinese extraction and have known of their first-class aptitude for science and technology.

When a nation builds a successful gaseous diffusion plant it gains great flexibility in nuclear technology. A plant which can produce weapons-grade U^{235} can be tapped to yield uranium having almost any U^{235} content. In this country our nuclear power reactors often utilize material containing U^{235} in the range of 1.5 to 4 percent. The Chinese have the option of producing such uranium. Problems of constructing a reactor are greatly simplified when enriched uranium is available. When ordinary uranium is used, together with graphite, great care must be taken to avoid loss of neutrons either to nuclear poisons or through escape from the reactor to the shielding. With enriched uranium, reactors may be smaller and a wider variety of construction materials can be used. Thus, with enriched uranium, the Chinese have available more options in designing reactors for efficient plutonium production or other purposes than they would otherwise have.

More serious is a greatly enhanced capability of producing tritium, a key constituent of thermonuclear bombs. Tritium is often produced by the reaction of neutrons with lithium-6. Introduction of lithium into an ordinary reactor tends to stop the chain reaction. This tendency can be overcome by introducing enriched uranium. If the Chinese do not now possess quantities of tritium, they can obtain it. In view of the Chinese achievement thus far there is no basis for hoping that they will not achieve a hydrogen bomb—perhaps in the latter part of this decade.

Another member has joined the nuclear club. He already has impressive credentials, and his long-term potentialities should not be underestimated.—PHILIP H. ABELSON



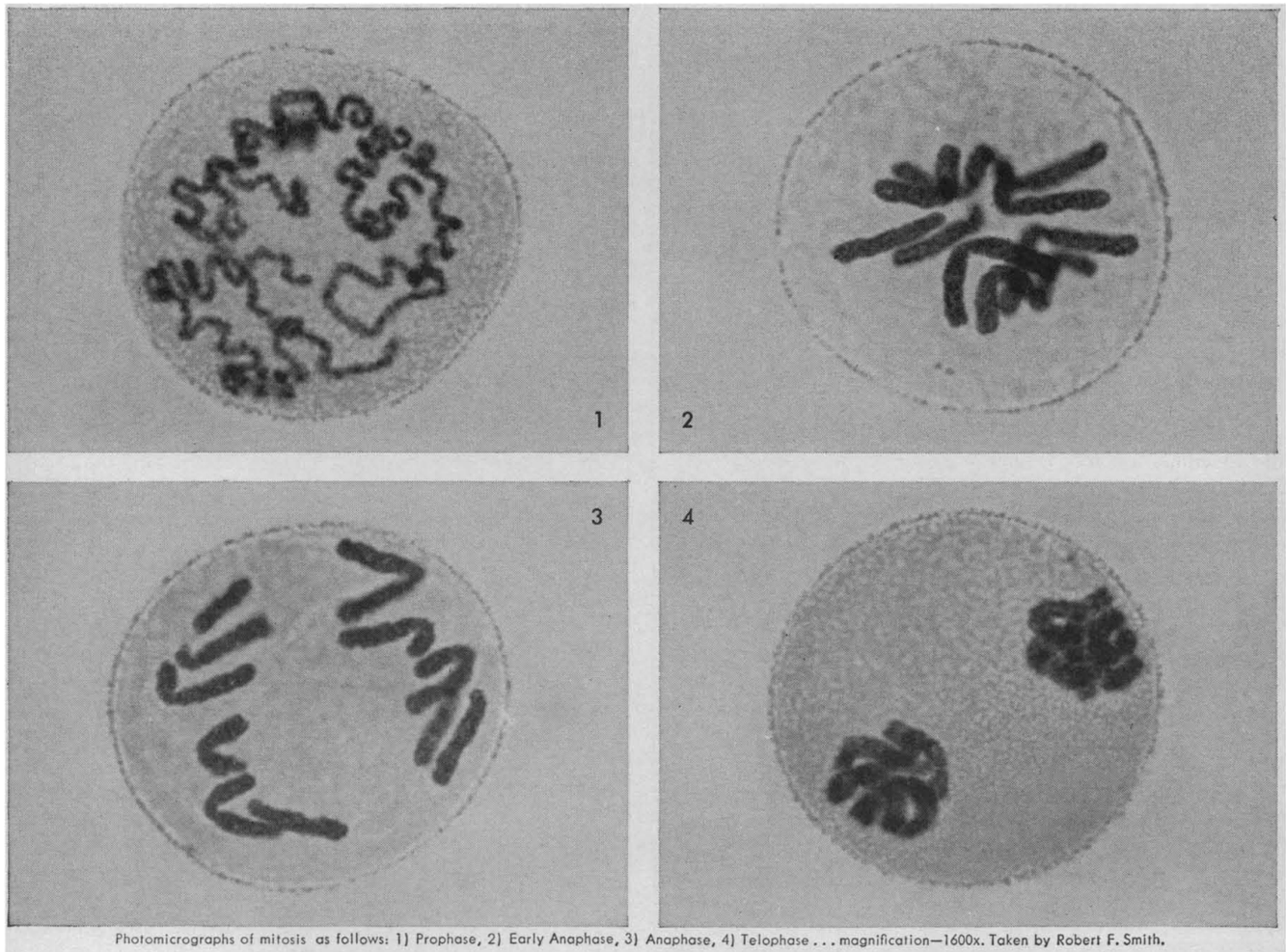
Take it and use it anywhere

It is true that the TMC Model 404 is the most portable pulse height analyzer you can own. But it offers a lot more than portability. Built-in CRT, four detector inputs, multiscaling mode, push button data transfer and display overlap are a few examples of the 404's capabilities. It requires a mere 36 watts of power. Analog and digital outputs permit readout on an X-Y plotter, paper tape printer, paper tape punch, IBM typewriter or computer compatible magnetic tape.

We think it is the record of reliable performance and large capabilities of this small instrument (just over 1 cubic foot) that explain why TMC 400 Series Analyzers are occupying less bench space in more laboratories than any other pulse height analyzer made. And why it was chosen for airborne monitoring of radioactivity . . . or monitoring sea water samples aboard submarines . . . or radioactivity measurements on cattle out on the range . . . or whole body counts in medical research laboratories.

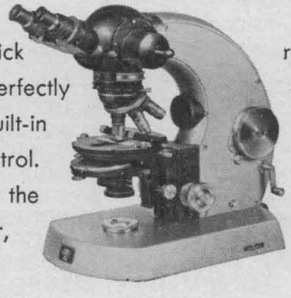
Other TMC Multi-Channel Analyzers include 100, 256, 1024, 4096 and 16,384 Channel Models. One of them is probably right for your application. Contact any TMC office for more information or write Technical Measurement Corporation, 441 Washington Ave., North Haven, Conn., U.S.A. 06473.

TMC **TECHNICAL MEASUREMENT CORPORATION**



Photomicrographs of mitosis as follows: 1) Prophase, 2) Early Anaphase, 3) Anaphase, 4) Telophase . . . magnification—1600x. Taken by Robert F. Smith.

Make a sequence like this by touching a button



With the Carl Zeiss Photomicroscope you can click off a whole series of photomicrographs, each perfectly exposed and in focus. The microscope has a built-in automatic camera with photoelectric exposure control. The touch of a button opens the shutter, exposes the film the proper length of time, closes the shutter, transports the film one frame, actuates a film counter . . . ready for the next exposure. You can take an entire series of photomicrographs rapidly in color or black-and-white.

This large universal microscope provides the full versatility of a fine Zeiss instrument. It can be equipped for transmitted or reflected light (Epi-illumination). It is also available as a polarizing microscope.

The inclined binocular is provided with an adjustment to maintain tube length regardless of interpupillary setting. Interchangeable stages and interchangeable condensers, for bright field, dark field and phase contrast work, are also available.

A 6-volt light source is built in, but a 12-volt light source is available as well as a base plate for carbon arc or high-pressure mercury burner illumination. Write Dept. SC for further details and literature on the Carl Zeiss Photomicroscope. **Complete service facilities available.**

CARL ZEISS, INC.
444 Fifth Avenue, New York, N. Y. 10018
BRANCH OFFICES IN ATLANTA, CHICAGO, LOS ANGELES, SAN FRANCISCO, SEATTLE IN CANADA: TORONTO, MONTREAL, WINNIPEG, VANCOUVER

CARL ZEISS WEST GERMANY

The Great Name in Optics

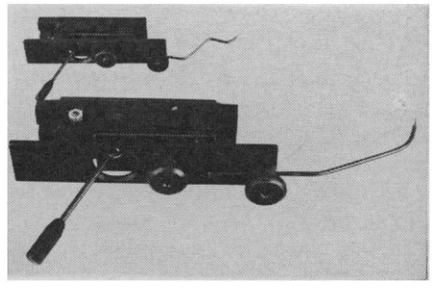
New Products

Microcell positioner and cell holder for the Beckman DU Spectrophotometer provides positive positioning and secure locking so that cells may be positioned reproducibly and stably. The carrier mechanism consists of a machined aluminum block, sliding on two precision-ground steel rods. The aluminum frame is interchangeable with that of the standard DU. The cell holder is a separate aluminum block positioned on the top of the carrier with two stainless-steel dowel pins. The cells, themselves, are held between steel posts and spring clips. Set screws adjust the vertical position of the cuvettes. Because both horizontal and vertical cell adjustments are provided, a fixed pinhole diaphragm is located in the side plate, instead of an adjustable one. The four standard cell positions are provided with solid positive positioning adjustments for each one. The reproducibility of positioning in each of these four stations is claimed to be good to within $\pm$ 0.5 μ (standard deviation).—D.J.P. (Microtech Services Co., Dept. S349, 775 Sunshine Drive, Los Altos, Calif.)

Miniature valves and associated accessories allow the assembly of a variety of laboratory systems which are small volume, gastight, and inert. The basic units are a series of three steel-jacketed, Teflon-Kel-F valves weighing less than 1 oz. The first valve is two-way for simple on-off control of straight through flow. Second is a three-way valve with possible porting arrangements allowing flow through any two adjacent ports or through all three at once. The four-way valve can be arranged to allow flow through any two adjacent ports, any three adjacent ports, or any two pairs of adjacent ports. Each of these has a standard port size of 0.076 inch, and the largest valve, the four-port unit, measures only 1-3/16 by 1 by 1-3/16 inches. Standard fittings for these models are male and/or female luer connectors. Two operational fittings, a male luer fitting with luer lock and a 22-gauge, 2-inch steel needle with 22° joint, can be specified. The ported plugs in these valves are of Teflon; other wetted surfaces are Kel-F. To complete the line is a series of Kel-F connectors consisting of all variations of male, female, and locking luer joints, and 0.076-inch (inside diameter) Teflon tubing supplied with female luer fittings on both ends and available in 1-ft increments up to 100 ft.—D.J.P. (Hamilton Co., Dept. S344, P.O. Box 307, Whittier, Calif. 90608)

Nitrogen dioxide detector senses and records concentrations of nitrogen dioxide (nitrogen tetroxide) in the range from 0 to 5000 ppm. This gas is emitted as an unwanted contaminant in the exhaust of automobiles and other internal combustion engines and is now produced commercially for use in industrial processes and in the field of missile propellants. Because nitrogen dioxide at toxic levels can be a hazard to health and safety, a means of continuously monitoring its concentration is often desirable. The model 725-11 nitrogen dioxide recorder is designed to provide both instantaneous readings on a panel meter and permanent, continuous readings on a strip-chart recorder which may be located at a distance from the sensor. The instrument consists of two basic units, the nitrogen dioxide meter, and the strip-chart recorder, connected by a single cable. Determination of the gas concentration takes place within a Brewer-type microcoulomb sensor within the meter unit. The gas sample is continuously drawn through the sensor at a rate of 140 cc/min $\pm$ 1 percent. The basic principle of the sensor in this application is the oxidation-reduction of a modified bromide or iodine-sensing solution to achieve the standard model meter range of approximately 0 to 500 ppm/vol. Reactions within the sensor are electrochemical in nature and take place at the polarized electrodes which are covered by the sensing solution. The measurement of the electron flow or current through the external circuit is directly proportional to mass per unit time of nitrogen dioxide entering the sensor. A microammeter in series with the electrode-battery circuit provides readings which are translated to nitrogen dioxide concentrations. The strip-chart recorder replaces the microammeter in the circuit when permanent recordings are needed. Connecting the strip-chart recorder has the added advantage of extending the operating range from a low range of 0 to 10 to a range of 0 to 500 ppm/vol or higher, by using appropriate plug-in range resistors. The sensing solution affects directly the operating range of the meter. For example, a potassium iodide solution can be used in the standard model for efficiency at lower concentrations. The operating range is extended upward to 5000 ppm/vol by using a potassium bromide sensing solution in the instrument. The latter range is particularly applicable to auto exhaust studies when catalytic or other oxidation processes are used to convert the nitric oxide exhaust emission to nitrogen dioxide for measurement. The nitrogen dioxide meter can be purchased separately for single range visual concentration readings where permanent records are not required. It weighs 10½ lb and measures 7½ by 11½ by 6 inches deep. The strip-chart recorder weighs 14½ lb with dimensions of 8 by 8½ by 10⅝ inches deep.—D.J.P. (Mast Development Co., Dept. S346, 2212 E. Twelfth St., Davenport, Iowa 52803)

Micro-manipulators developed for electrical probing of minute areas of semiconductor crystals utilize a joystick to drive a probe over an area of either 0.032 or 0.062 inches in diameter with a 40-to-1 fixed reduction



ratio. A variable-ratio model covers an area up to 0.1 inch diameter. These manipulators may be of value in biological applications.—R.L.B. (Affiliated Manufacturers, Inc., Dept. S331, Whitehouse, N.J.)