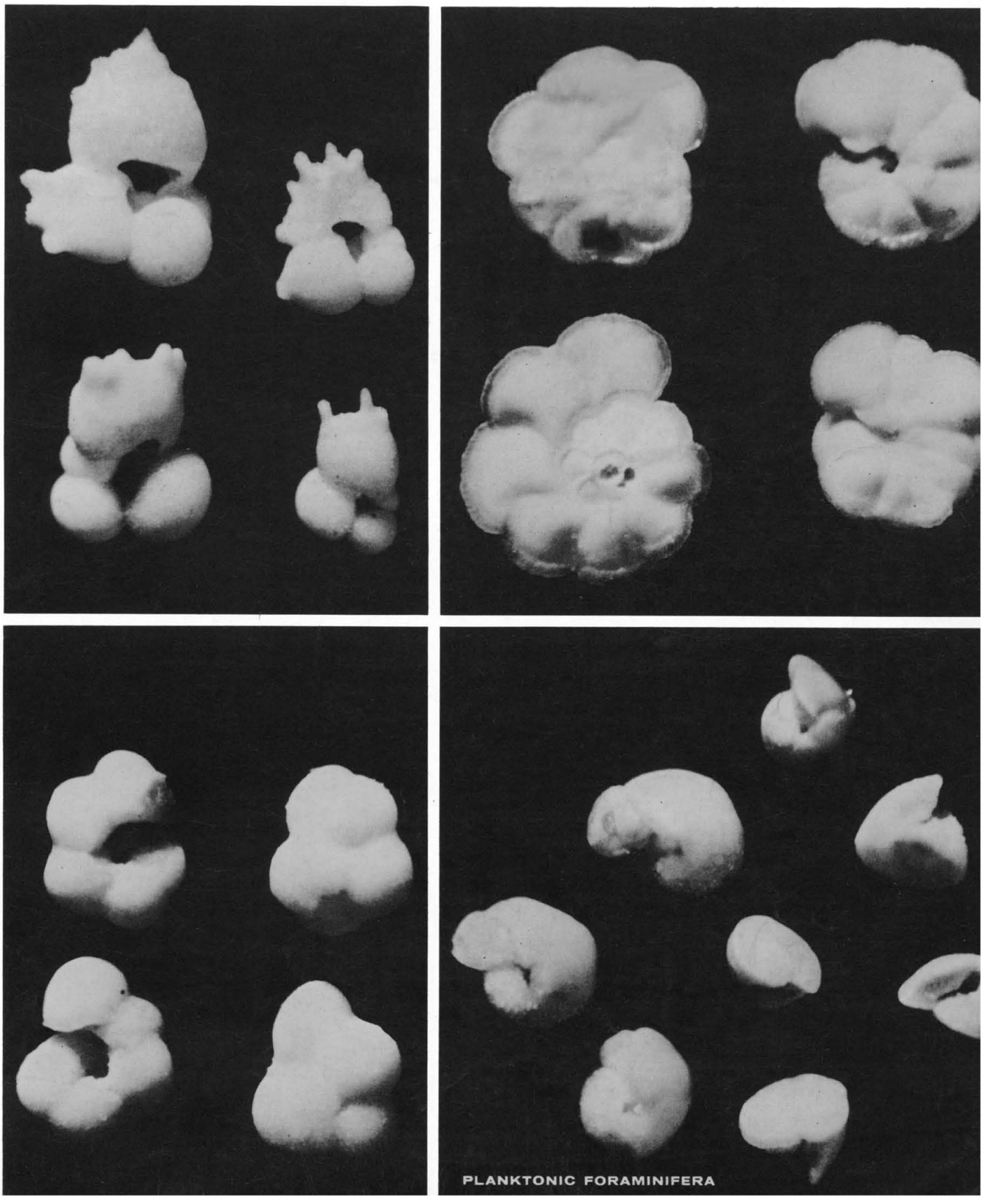
SCIENCE

22 February 1963

Vol. 139, No. 3556

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



PLANKTONIC FORAMINIFERA

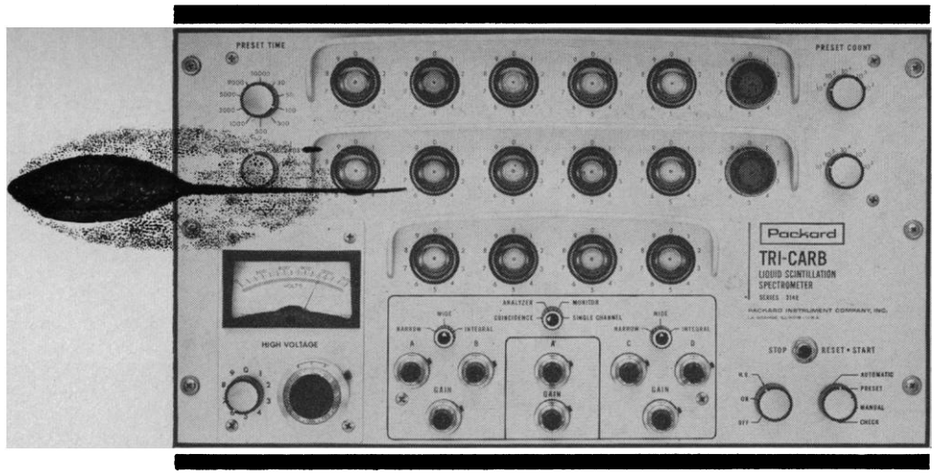
*

MUSIC TO A BIOCHEMIST'S EAR

The quiet hum of the Model L Preparative Ultracentrifuge is a familiar sound to biochemists: it tells of proteins spinning down under 200,000 g's force... a liter of bacteriophage at 60,000 g's in its first stage of purification... or the delicate separation of two DNA's in a cesium chloride gradient. □ For whatever the task, no matter how fast or how long the run, this ability to harness extreme centrifugal forces has made the Model L one of the biochemist's most useful, reliable tools. □ Today's Model L includes many refinements introduced during 12 years of manufacture: Model L's now go to 50,000 rpm instead of 40,000; diffusion pumps are available for higher vacuums; runs can be made below zero or at 100°C; rotors are available for many special purposes. □ To make sure your files contain the latest information on the Model L and its variety of accessories for special applications, write for Data File L-47.

Beckman® INSTRUMENTS, INC.
SPINCO DIVISION
Palo Alto, California

94-A INTERNATIONAL SUBSIDIARIES: GENEVA, SWITZERLAND; MUNICH, GERMANY; GLENROTHES, SCOTLAND



$\beta+\gamma=$ SUPERIOR COUNTING PERFORMANCE

IN NEW TRI-CARB® SPECTROMETERS

■ Solid-state circuits that meet the demanding requirements of gamma counting are an exclusive feature of new Tri-Carb Liquid Scintillation Spectrometers. Even if you work only with Betas, the accuracy and stability of operation which gamma analysis demands are your assurance of superior beta counting performance. If you also work with gamma emitters, you'll appreciate the versatility that allows you to perform simultaneous single channel analysis from two detectors or dual channel gamma counting from a single detector. ■ Other features of new Tri-Carb Spectrometers: Tritium counting efficiency greater than 40% • 200 sample capacity automatic changer with high speed indexing and reset • simultaneous visual data presentation for timer and both channels of pulse-height analysis • precise temperature control—accurate within ± ½°C • one year warranty (no exclusions) on parts and labor. ■ For more information call your Packard Sales Engineer or write for bulletin 1019.

Packard

PACKARD INSTRUMENT COMPANY, INC.

BOX 428 • LA GRANGE, ILLINOIS • HUNTER 5-6330

Sales offices in principal cities of the world.

22 February 1963
Vol. 139, No. 3556

SCIENCE

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., N.W., Washington 5, D.C. Now combined with **The Scientific Monthly** ®. Second-class postage paid at Washington, D.C.

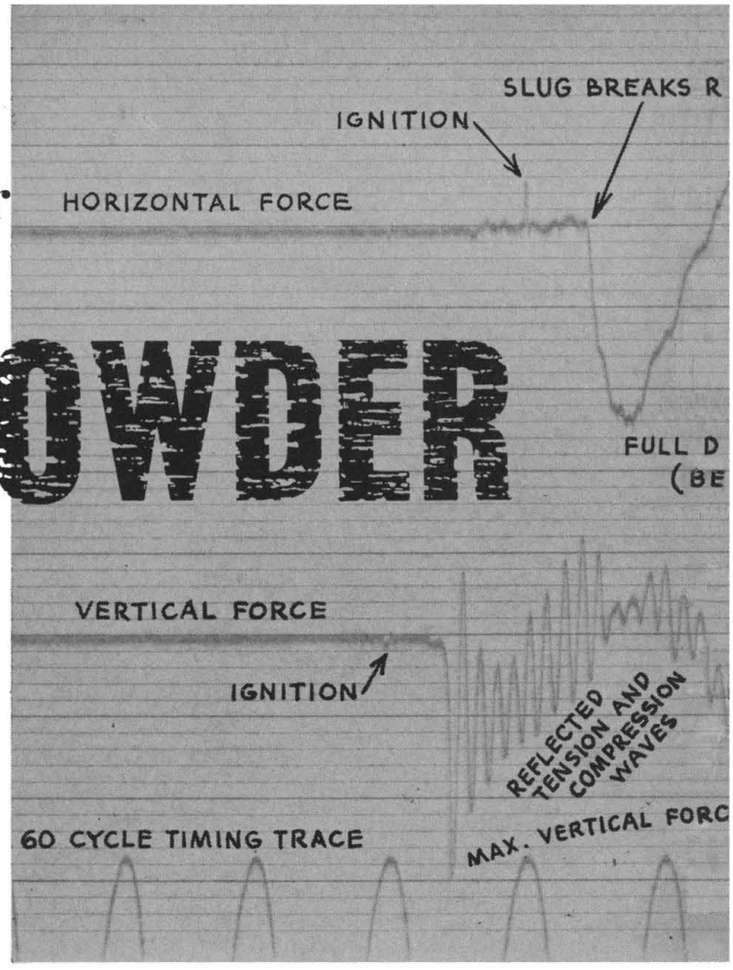
Annual subscriptions $8.50; foreign postage, $1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, $7; 10 months, $7.50. Provide 4 weeks' notice for change of address, giving new and old address and zone numbers. Send a recent address label. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. Indexed in the **Reader's Guide to Periodical Literature.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Four species of planktonic Foraminifera in cores taken from ocean sediments. Three occur in the older sediments but not in the younger ones. One occurs rarely in the older sediments but is abundant in the younger ones. The change in the faunal assemblage takes place within a sediment thickness of 10 to 15 centimeters and marks the Pliocene-Pleistocene boundary. *Globigerinoides fistulosa* (top left), *Globorotalia menardii multicamerata* (top right), and *Sphaeroidinella multiloba* (bottom left) survived from the Miocene through the Pliocene and became extinct at the onset of the first ice age of the Pleistocene. *Globorotalia truncatulinoides* (lower right) is abundant above the Pliocene-Pleistocene boundary (about × 27). See page 727.

The Honeywell Visicorder oscillograph & GUNPOWDER records forces in circuit breaker bushings



What forces are imposed on the bushings of oil-filled circuit breakers during operation —particularly during short circuit interruption? No one had been able to measure them until Ohio Brass engineers in Barberton, Ohio, developed a circuit that could be shielded from the high voltage and heavy currents during actual breaker tests.

The circuit connects the strain gages on the ground sleeve of the bushing in the breaker with a Honeywell 119 amplifier. Then, because of the extremely high speed, transient nature of the signals to be measured, O-B employed a Honeywell 906 Visicorder oscillograph to record the test data directly.

The high frequency response of the Visicorder (DC to 5,000 cps), its record speed range (.2″/hr. to 50″/sec.), and its fast writing speed (over 50,000″/sec.) produce clear, immediately readable traces of high resolution as shown in the record above, which was traveling at 50″/sec.

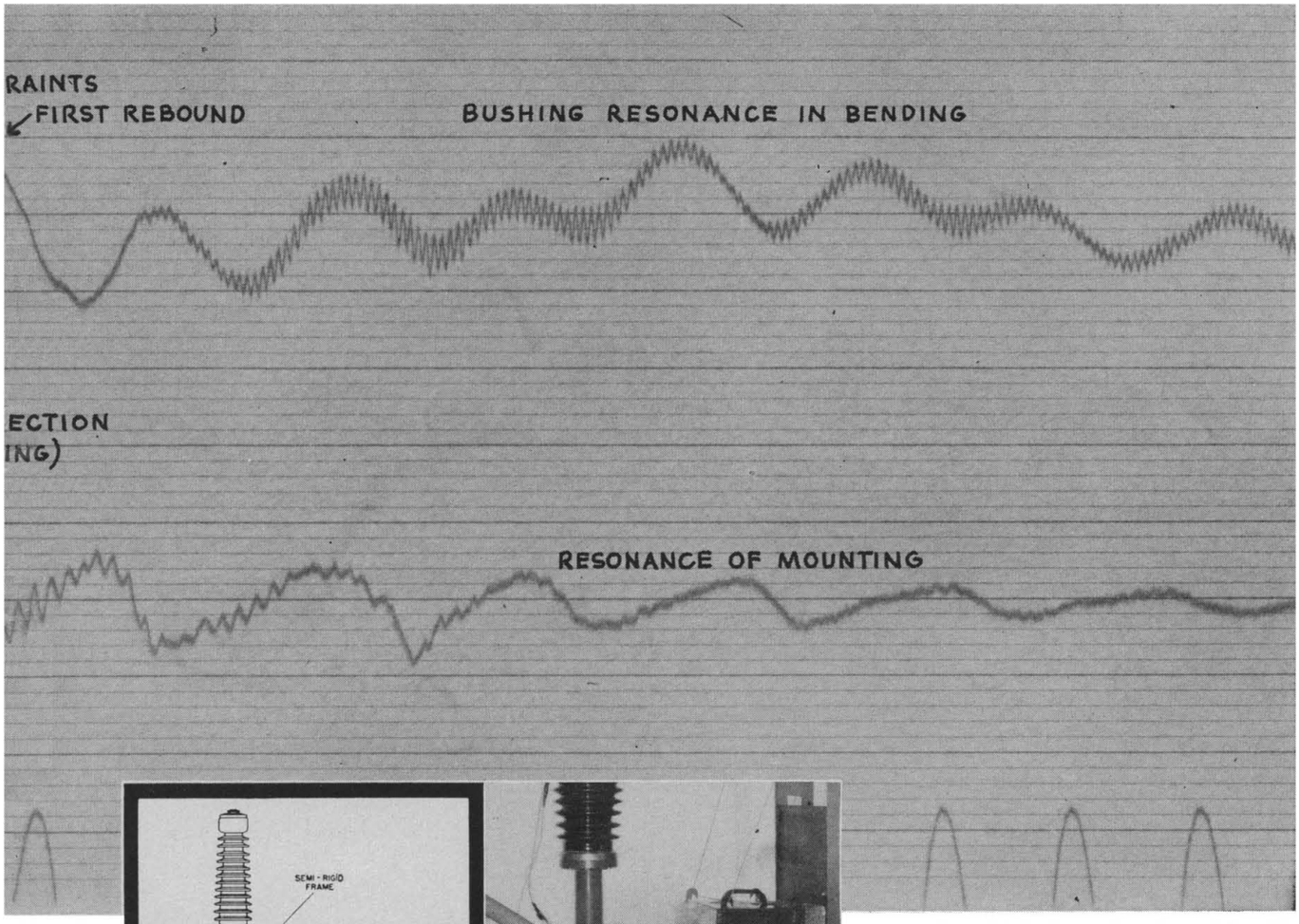
These circuit breaker tests can now be duplicated in the laboratory using gunpowder to fire projectiles from a dummy interrupter on the bushing. And the Honeywell 906 Visicorder produces the oscillograph record for comparison of the simulated forces to the ones found in actual operation.

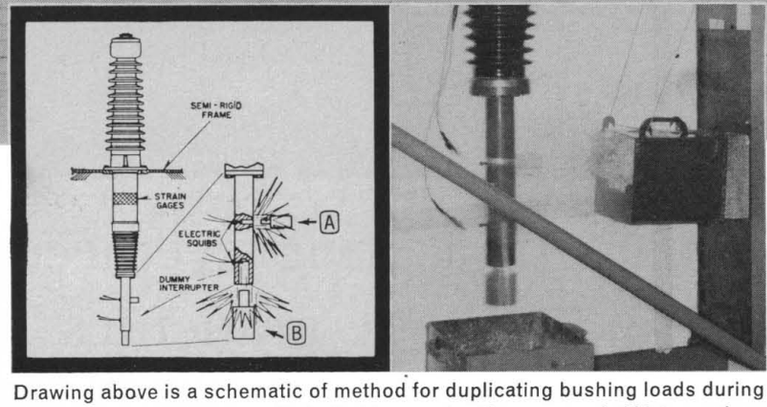
Thus the Visicorder helps to make possible the time- and money-saving evaluation of the mechanical performance of bushings without actual breaker tests. This test program has opened the way for standards of dynamic loads*—all of which can be recorded by Honeywell.

Your test program requirements may be far removed from this example, but the versatility of the Visicorder merits your consideration as a basic research, test and development tool. Six different models provide record capacity from 1 to 6 up to 1 to 36 data channels. Paper speeds from .1 inch per hour to 13 feet per second in the several models mean that data can be recorded and presented on the time base most meaningful to your test.

* For complete report see AIEE Papers No. 60-107 "Mechanical Loadings on Circuit Breaker Bushings by E. F. Huston and E. B. Rietz and No. 62-153 "Considerations in Establishing a Standard of Mechanical Loads on Oil Circuit-Breaker Bushings" by W. E. Harper and E. F. Huston.

For full details on all Visicorder Oscillographs, tape systems, and signal conditioning equipment, write Honeywell, Heiland Division, Denver 10, Colorado, or phone 303-794-4311.

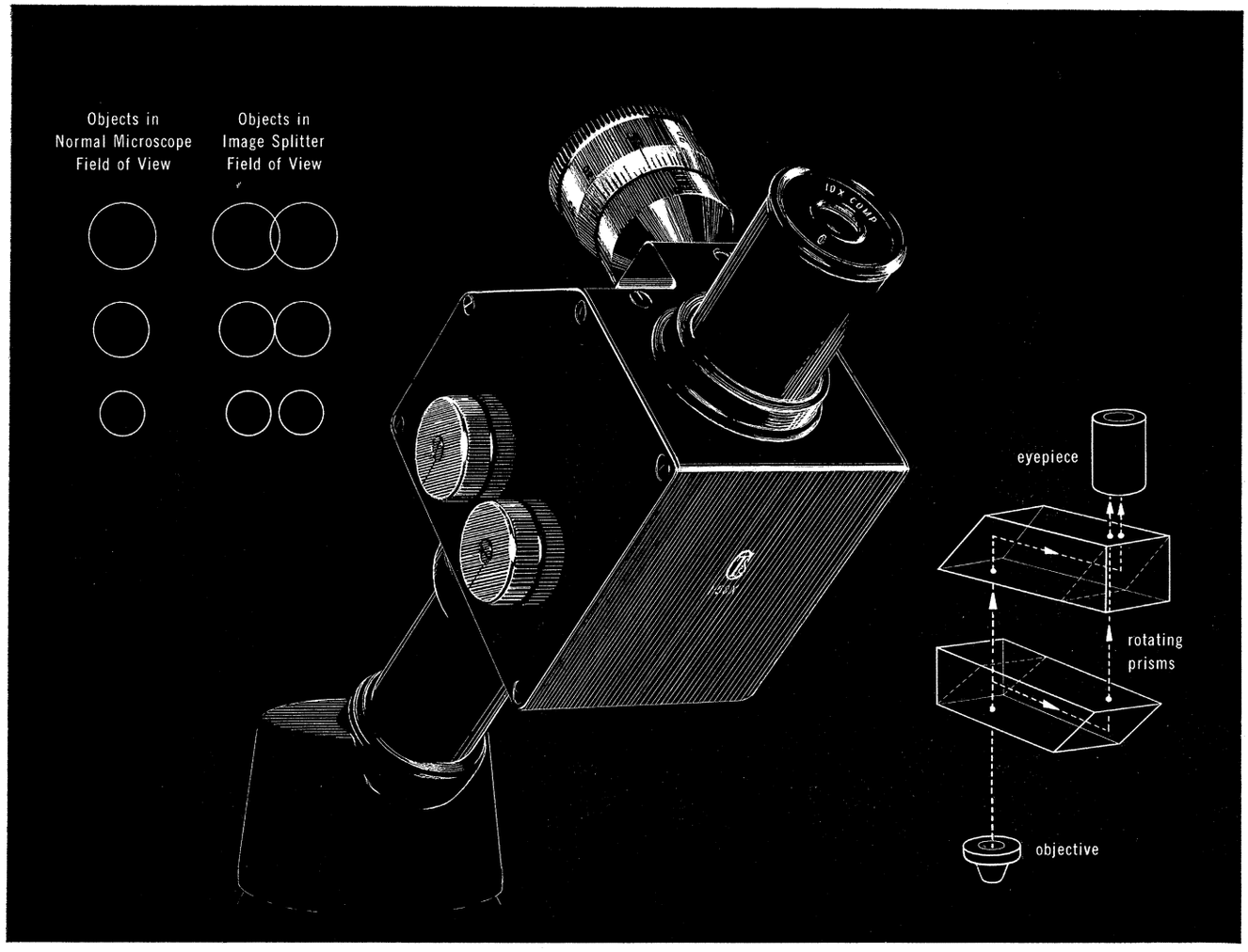




Drawing above is a schematic of method for duplicating bushing loads during short-circuit interruptions. Note that two projectiles are used: (A) to produce lateral forces at right angles to the bushing axis, and (B) to produce an axial load on the bushing terminal. In photo at right, electric squibs have just detonated charges which have propelled projectiles toward dashpot boxes. Below, the Honeywell Model 906 Visicorder Oscillograph—with a Honeywell Model 119 Amplifier—records circuit breaker bushing tests for Ohio Brass.

DATA
HANDLING
SYSTEMS

Honeywell



This is the revolutionary measuring eyepiece that has made most microscope graticules and filar micrometers obsolete

Here are the basic capabilities of the Cooke-A.E.I. Image Splitting Measuring Eyepiece* possessed by no other microscope measuring apparatus.

- Inexperienced laboratory personnel can measure *reproducibly* with accuracies up to 1/10,000 of a millimeter or 4/1,000,000 of an inch.
- Accuracies are obtained which are actually *greater* than the resolving power of objectives used.
- In effect, the object is induced to measure itself. No reference lines are used.
- Since measurements are made only in the specimen plane, measurements are free from possibility of parallax error and are unaffected by lack of instrument rigidity *or even by motion of the specimen.*
- Because all objects in the microscope field are sheared an equal amount, comparative measurements of the highest precision can be made *without measuring at all.* Exact sizes can be dialed in and the eyepiece used as a "go-no-go" gauge.
- Particle size analyses and checks on dimensional uniformity (of such things as vascular diameters, fibers, wires, platings and coatings) can be made without any measuring manipulation.
- Immediate and complete comparative measurements of complex structures (such as windings, grids, etc.) can be made.

Now you can measure, easily and reproducibly, to previously unattainable accuracies . . . powerful new types and techniques of measurement, previously impossible, are now available to you with the "Image Splitter." *PATENTED

Send for our technical literature (catalog CM011550). Better yet — let us show you in your laboratory how the Cooke-A.E.I. Image Splitting Measuring Eyepiece can be applied to the solution of your measuring problems.

Biological • Metallurgical • Polarizing — **MICROSCOPES** — Student • Routine • Research • Special Research

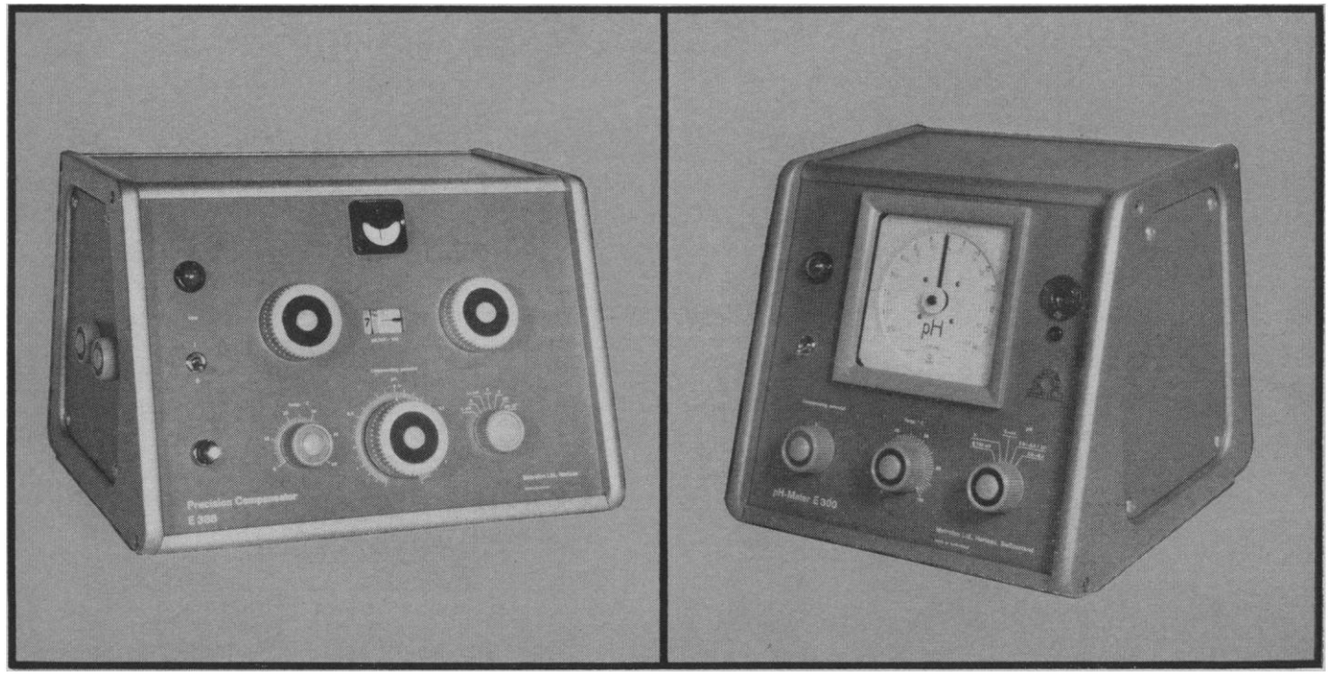
COOKE, TROUGHTON & SIMMS, INCORPORATED

91 WAITE STREET, MALDEN 48, MASSACHUSETTS • IN CANADA: DON MILLS, ONTARIO

Metallographs • Thermobalances • Dilatometers • Particle Counting and Sizing Equipment

FOR pH (or mV)

...two exceptional line-operated instruments for maximum accuracy and stability.



E 388—ACCURACY (0.001 pH)

EFFECTIVE SCALE LENGTH 25" PER pH

The new Precision Compensator Model E388 is the most accurate research pH and mV meter currently available. It features a null-balancing system which reads directly to 0.001 pH (0.1 mV). All values are read in a single read-out window and are digital to the second pH decimal place. Recommended for any work requiring maximum accuracy.

E 300—DIRECT READING

FULL SCALE 0-14 pH OR 2.8 p.H
ALSO FOR RECORDING

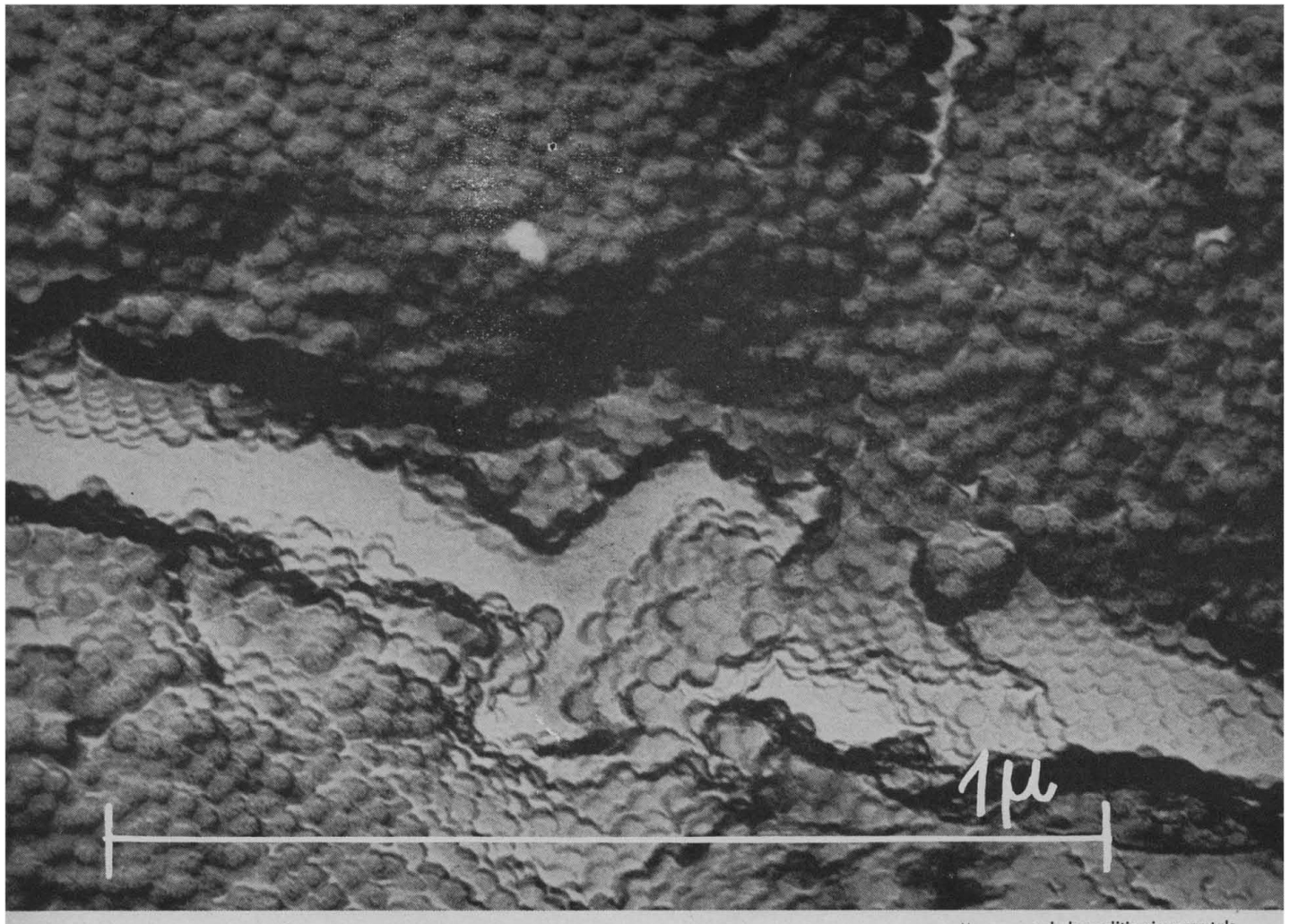
The E300 is a direct reading, simple-to-operate, expanded scale instrument for a full-scale deflection of 0-14 pH or any span of 2.8 pH. Accuracy is either 0.1 or 0.01 pH. This model can be connected to standard laboratory recorders or it can be used as part of our automatic recording endpoint and pH Stat titrator.

For further information, please contact:

METROHM

BRINKMANN INSTRUMENTS, INC.
115 Cutter Mill Road, Great Neck, N. Y.

PHILADELPHIA · CLEVELAND · HOUSTON · MIAMI · MENLO PARK, CAL. · ST. LOUIS



Mouse encephalomyelitis virus crystals.

You can achieve images like this routinely

The new Carl Zeiss Electron Microscope EM-9 can easily be operated by the scientist or the technician. Everything has been done to safeguard against operational errors. The entire control system is set up so that every essential control for manipulating the instrument is right at hand. Two operators can sit comfortably and observe the image on the luminescent screen through any one of three windows. The screen image can also be viewed through a microscope having a magnification of 10x.

In routine operations resolution is better than 20Å, and under optimum conditions—10 to 12Å.

The image-forming system uses three electromagnetic-type electron lenses: the objective, intermediate lens and projector. The objective is equipped with an electrostatic correction system known as the "Stigmator." Distortion-free electron micrographs can be made in four fixed steps. 1500x, 5000x, 16,000x and 35,000x. Continuous magnification from 0 to 35,000x is also possible.

A novel principle for adjusting image brightness simplifies the electronics in the EM-9 considerably. The tele-focus cathode delivers a *constant* beam current of 40μA at a *constant* beam voltage of 60kV. The beam is oscillated across a central aperture at high frequency. Varying the amplitude of frequency varies the length of time the beam remains over the aperture and hence the total energy of the beam.

With the EM-9 it is possible to take stereo electron micrographs by tilting the specimen. Electron diffraction images can be obtained by using the Boersch beam configuration. An automatic exposure timer and an automatic vacuum system are now available for the first time as accessories. Write us for further details. **Complete service facilities available.**

CARL ZEISS
WEST GERMANY

The Symbol of World Famous Optics

Carl Zeiss, Inc., 444 Fifth Ave., New York 18, N.Y.

A new concept in spectrophotometry...

The most advanced research instrument you will see in '63... the DK/UNIVERSAL!

Look for it at Pittsburgh!

and here's why!

The DK/UNIVERSAL is the first commercial double-beam *dual* monochromator instrument.

It's also the first spectrophotometer to measure double-beam fluorescence, excitation, and scattered light.

Another first is placing the sample between the prism and grating monochromators. And each monochromator has its own independently adjustable wavelength mechanism.

Still another is its new faster method of obtaining polarized fluorescence data... by simultaneously recording the parallel and perpendicular spectra.

Add to these a wavelength range of 160-3200 mμ with a built-in purge system for far UV work.

Plus super high pressure mercury and xenon sources never before on commercial instruments. And completely interchangeable with the standard tungsten and hydrogen lamps.

The three DK/UNIVERSAL plug-in accessories take just five minutes to interchange. Scattered light. Fluorescence. Or polarized fluorescence. Whichever you choose to use.

The versatility of the DK/UNIVERSAL is unequalled. It's truly an open end instrument; obtainable parameters now number 53. And these exclude special-order attachments that could extend this total even more.

DK/UNIVERSAL CAPABILITY

Modes and Functions for Obtaining Spectra		Types of Spectra							
		Emission and Flame	Spectral Response of Detectors	Transmission and Absorbance	Fluorescence	Polarized Fluorescence	Excitation	Phosphor-escence	Light Scattering
Single Monochromator		DK/U	DK/U	DK/U	DK/U	DK/U	DK/U		DK/U
Dual Monochromator		DK/U	DK/U	DK/U	DK/U		DK/U	DK/U	
Modes	Single-beam	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U
	Double-beam Time-shared			DK/U	DK/U		DK/U	DK/U	DK/U
	Double-beam Space-shared				DK/U	DK/U	DK/U		
Light Intensities Recorded as Function of:	Wavelength	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U
	Time	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U
	Plane of Polarization	DK/U	DK/U	DK/U	DK/U	DK/U	DK/U		DK/U
	Angle of Incidence (Light scattering)								DK/U

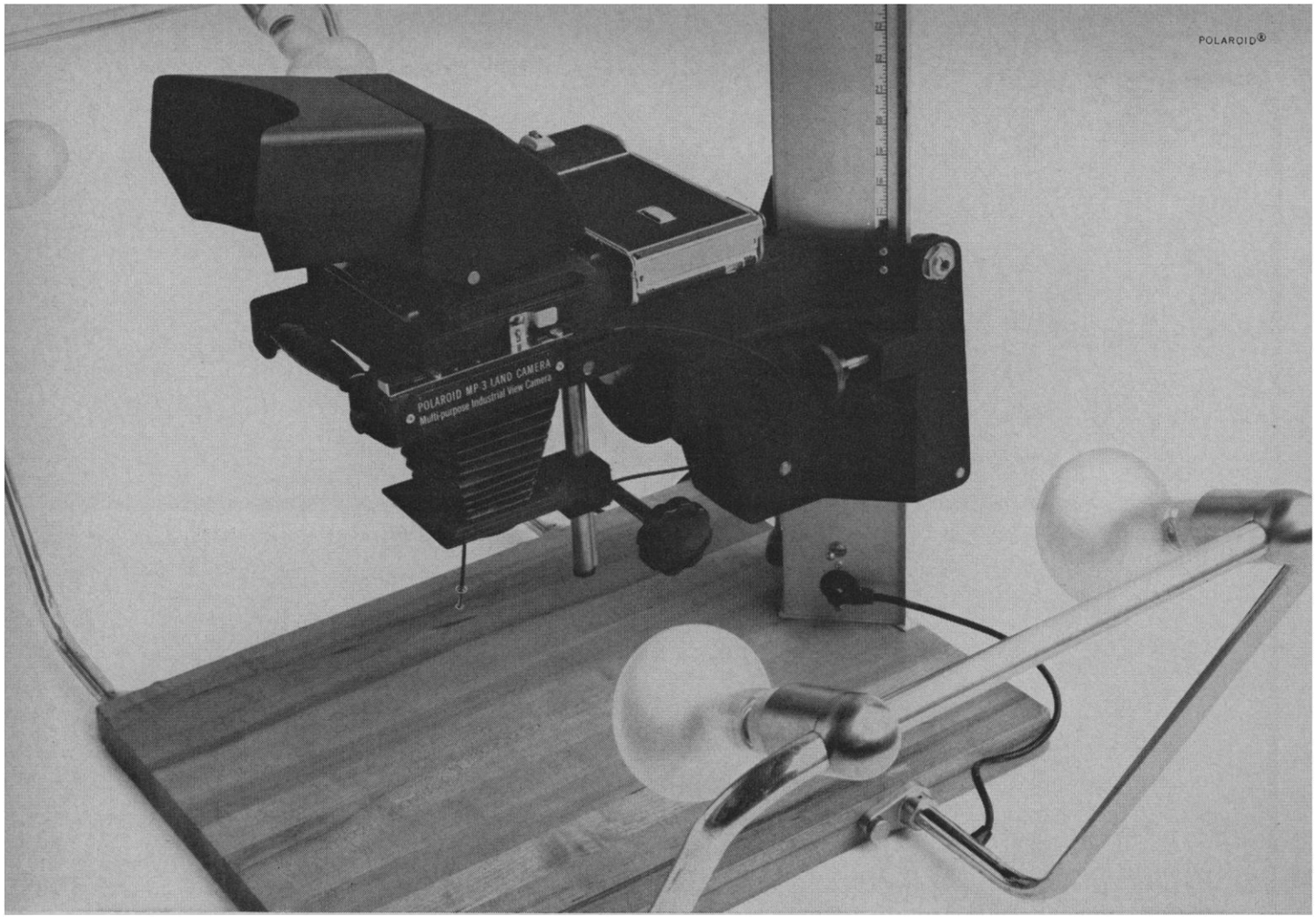
Not a prototype, the DK/UNIVERSAL was originally designed and developed for advanced biochemical research, specifically to study the interrelationship of scattered light and polarized fluorescence. This is one more example of Beckman's leadership in the UV spectrophotometry field, continuing to provide research with instrumentation more advanced than present analytical demands.

If you attend the show, you're invited to visit our booth and discuss the DK/UNIVERSAL with its developer, Dr. Wilbur Kaye, Research Director for Scientific and Process Instruments Division. Or write direct for Data File LUV-38-263.

Beckman® INSTRUMENTS, INC.

SCIENTIFIC AND PROCESS INSTRUMENTS DIVISION · Fullerton, California

International Subsidiaries: Geneva, Switzerland; Munich, Germany; Glenrothes, Scotland.



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 five different kinds of Polaroid Land Film (some not widely known among amateurs) plus conventional 4x5 b&w and color films.

Many jobs call for just a black and white print. You can get it in 10 seconds with 3¼ x 4¼ roll film or two speeds of 4x5 film (one is A.S.A. 3,000!). If you need a negative to work with, another 4x5 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, of course, if you aren't in a hurry you can use any conventional 4x5 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, six-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.

22 February 1963, Volume 139, Number 3556

SCIENCE

More Paper Work, Less Research

Scientists in all fields should be concerned about a sequence of events during the past year which has adversely affected the grants program of the National Institutes of Health and could be repeated with other agencies. For many years NIH enjoyed a favored status. Congress was against cancer, heart disease, and other ailments and for curing them. The management of NIH has consistently been first class and through the mechanism of Study Sections the organization has effectively utilized the best judgment of the scientific community.

Policies with respect to grants were excellent and involved minimum paper work. The program was successful. It attracted the very best talent and led to many practical accomplishments. In addition, fundamental research was successfully fostered, and biology in this country is in the midst of its most flourishing epoch.

The program owed its success to the fact that NIH selected and supported the best investigators and then trusted them. Unfortunately a small minority of scientists betrayed that trust. These few rendered NIH vulnerable to attack by a committee of Congress.

The operations of NIH are monitored by the Intergovernmental Relations Subcommittee of the Committee on Government Operations, House of Representatives. Congressman Fountain is Chairman. One of the activities of this committee is to hold hearings at which testimony is elicited from James A. Shannon and his staff. One of the crucial sets of hearings occurred on 28, 29, and 30 March 1962. The Subcommittee had uncovered a situation in which advantage had been taken of the NIH system.

This unfortunate slip was used by the Subcommittee to subject Shannon and his aides to an extremely unpleasant three days. One instance of mismanagement was given great emphasis, and the excellence of the overall NIH program was overlooked.

The hearings forced an acceleration in changes in NIH policies toward closer control of its grants. The paper work required for yearly continuations has been substantially increased. Grantees report that they must spend from 1 to 7 days in obtaining information and filling out the form. Since many senior investigators are involved, work on this form will cost the nation millions of dollars in time lost from research.

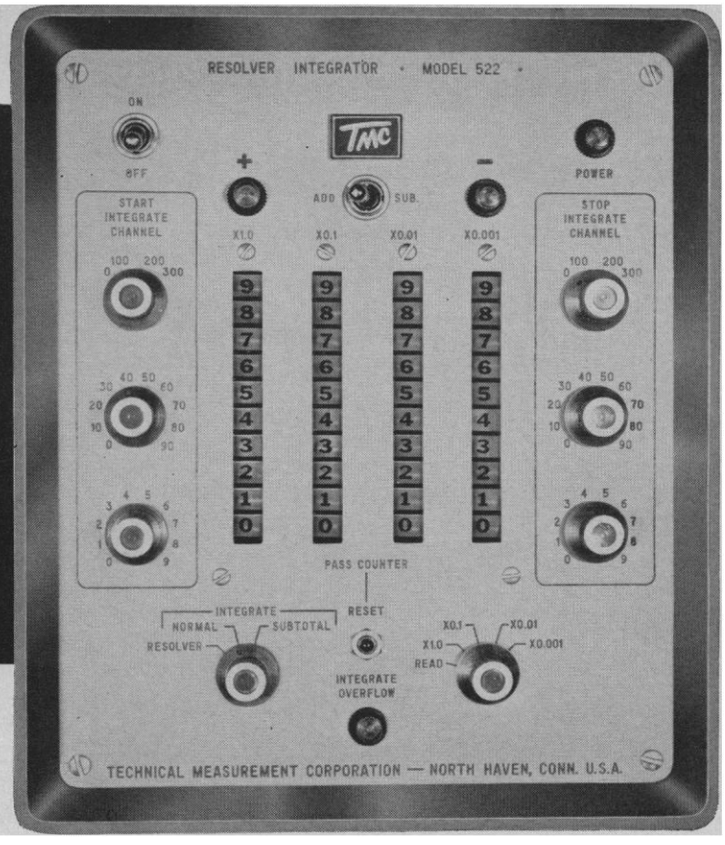
Moreover, grantees now must make a special justification to Washington whenever budgetary changes involving items costing over $1000 are made. To handle this paper work more bureaucrats must be recruited. Previously the NIH program was staffed with knowledgeable scientists. The new posts can only be filled with administrative types who will not be able to handle scientific problems with confidence. They can only run scared, go by the book, and introduce all kinds of excuses for delay.

The changes will increase inefficiency and delays substantially. If no further demands are made on NIH this price might be justifiable. However, if further controls are required the nation's health research program could be severely handicapped. It is unfortunate that in order to chastise a few, regulations must be imposed which penalize the many, including some of this nation's most valuable and productive scientists.—P.H.A.

Push-Button

RESOLVER / INTEGRATOR

integrates any group (0-399) in one step



This new all-electronic Model 522 Spectrum Resolver/Integrator may be used directly with TMC "400 Series" pulse analyzers to perform resolving and integration functions without the necessity of intermediate tape recording equipment.

As a Resolver the Model 522 takes information directly from any selected quarter or half of the analyzer memory and either adds it to or subtracts it from the data stored in an adjacent quarter or half of the memory. It is possible to remove individual components of a spectrum and leave only the desired elements by adding or subtracting 100%, 10%, 1% or 0.1% increments of reference spectra. The operator has precise control of the resolving process, and has an accurate visual record of the exact percentage removed.

As an Integrator, the Model 522 integrates memory-stored information within any band of channels from 0 to 399 *in one operation*. Two modes of integration are available:

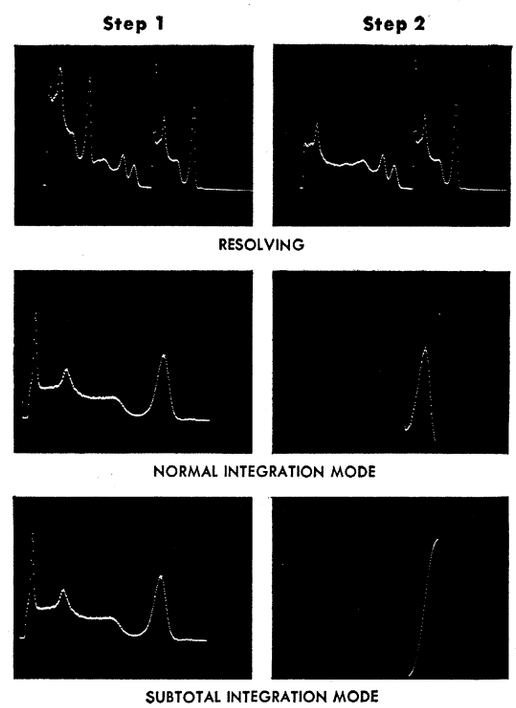
NORMAL mode sums the counts in the preselected band and stores the total in the last channel.

SUBTOTAL mode adds each channel count to the previous one to provide a running subtotal.

With every operation, results are displayed on the analyzer scope and may be printed, recorded or punched out by the readout method of your choice.

Case design of the Model 522 Resolver/Integrator is identical to that of the compatible "400 Series" fully-portable, 400-channel Pulse Height Analyzers.

TYPICAL DISPLAYS



SPECIFICATIONS

Resolving Rate.....0.5 sec. for one add or subtract operation per 100 channels
% Resolved.....100%, 10%, 1% or 0.1%
Integration Rate..... 0.5% sec. per quarter memory
Channel band..... Continuous 1 — 400 channels
Integrating Modes ..... Normal, Subtotal
Blanking..... Only channels to be integrated are visible on Analyzers CRT display
Size.....8⅝" w. x 10¼" h. x 21" d., 28 lbs. (approx.)

TMC is the original designer/producer of transistorized multi-channel analyzers. Today, TMC instrumentation is delivered to every nation in the free world for use in the most advanced laboratories known to man. For full specifications, information, consultation, please write or phone your nearest Sales Office or factory direct . . . North Haven CE 9-2501.

TECHNICAL MEASUREMENT CORPORATION
441 WASHINGTON AVENUE, NORTH HAVEN, CONN., U.S.A.
Sales Offices in all Principal Cities of the Free World

EUROPE: TECHNICAL MEASUREMENT CORPORATION, GmbH, Frankfurt/Main, Germany
FAR EAST: NICHIMEN CO., LTD., Tokyo, Japan

ANNOUNCING ANOTHER *Pharmacia* FIRST

NEW

Sephadex® G-100

a new "high" for macromolecule separation

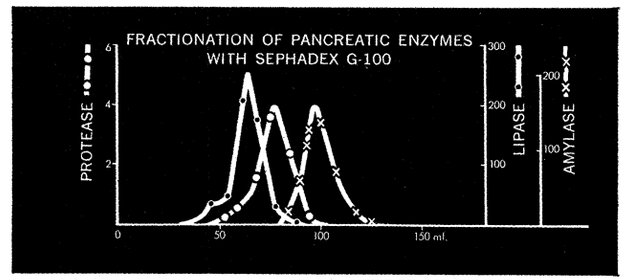
What G-100 Is

SEPHADEX G-100, like its well-known predecessors in the SEPHADEX series of dextran gels,* is produced by cross-linking dextran chains with random ether bonds between glucose residues in the polysaccharide chains. Highly stable mechanically and chemically, G-100 upon swelling produces three-dimensional networks bevoid of ionic groups. Prepared in bead form, G-100 offers very low flow resistance, thus permitting the use of fine particles for good resolution of separation.

What G-100 Does

This new SEPHADEX type is an important extension of the gel filtration method into the field of macromolecular fractionation, making possible the separation of substances with molecular weights smaller than about 100,000. Like the other SEPHADEX types,* G-100 acts as a molecular sieve, and molecules of larger dimension do not penetrate the matrices of the swollen gel.

The accompanying chart shows a separation of pancreatic enzymes. Powdered swine pancreas was extracted with a 0.05 M acetate buffer pH 5.3 containing 0.005 M calcium acetate. A 3 ml. sample was introduced in a 2 x 37 cm. (117 ml.) column packed with SEPHADEX G-100.



A Typical Separation with SEPHADEX G-100

Sample: 3 ml. of an extract of powdered swine pancreas in 0.05 M acetate buffer pH 5.3 containing 0.005 M calcium acetate.
Column size: 117 ml. (2 x 37 cm.).
Elution: 0.05 M acetate buffer pH 5.3 containing 0.005 M calcium acetate.

What G-100 Promises

Clearly, the SEPHADEX G-100 field is one of enormous interest, especially for biochemical and medical research. G-100 now makes possible the fractionation and purification of enzymes, polysaccharides, nucleic acids, peptide hormones, and proteins on preparative scale. And it supersedes the earlier, more complicated, and time-consuming methods that were previously required.

*Also available: SEPHADEX G-25, G-50, and G-75.

PHARMACIA
LEADING IN DEXTRAN CHEMISTRY

For complete information about Gel Filtration and all types of SEPHADEX, please fill in the request coupon and send it to us with your letterhead.

(Inquiries outside the Western Hemisphere should be directed to PHARMACIA, Uppsala, Sweden.)

PHARMACIA FINE CHEMICALS, INC. S
Department F, 501 Fifth Avenue, New York 17, New York

Please send the following:

☐ G-100 BROCHURE ☐ "SEPHADEX IN GEL FILTRATION" BROCHURE ☐ GEL FILTRATION ABSTRACTS

Name _____

Company _____

Address _____

orbit, also discovered and mapped the artificial radiation belt produced by the high altitude nuclear explosion of 9 July 1962.

In the afternoon session on the observatory generation of satellites, John W. Townsend, Jr. (Goddard Space Flight Center), who acted as chairman, pointed out that this class of omnibus satellites has been adopted by NASA as a means for economically accomodating a variety of related scientific experiments in the same vehicle. Obvious advantages exist in making a large number of simultaneous observations and in reducing the total cost for each experiment, but disadvantages and limitations resulting from mutual interference or incompatibility of experiments must also be considered. Thus, there will still be room for the individual, special purpose unmanned scientific satellite for special cases.

Three pairs of technical papers were presented, dealing first with the mission and then the engineering design aspects of NASA's current observatory satellite programs. All of these projects are still in the design and qualification stage.

The mission of the Orbiting Geophysical Observatories, discussed by Wilfred E. Scull (Goddard Space Flight Center), includes the measurement of magnetic fields, energetic particles, interplanetary dust, atmospheric structure, electron and ion densities in the ionosphere, solar monitors, astronomy surveys, and certain meterological measurements. In addition, the OGO's may be used to test planetary instrumentation, vehicle support systems, and certain biological experiments. Two major orbits are contemplated in the program—the Eccentric Orbiting Geophysical Observatory (EGO), scheduled for late 1963, and the Polar Orbiting Geophysical Observatory (POGO), scheduled for 1964 launch. The engineering design, described by George J. Gleghorn (Space Technology Laboratories), features active thermal and attitude control, and extended booms for experiments requiring isolation from the body of the satellite.

Although the first Orbiting Solar Observatory (OSO) has been successfully orbited and has yielded much useful information, NASA's Advanced Orbiting Solar Observatory program is necessary to meet more demanding requirements in the period beyond 1966. John C. Lindsay (Goddard Space Flight Center) pointed out that improved stabilization and instrumentation will enable detailed study of the energy storage phenomena in the pre-flare active regions of the sun and also the flare mechanism and manifestations of energy release from solar flares. Optical measurements from such a spacecraft also may detect solar streamers and other evidences of energy transport from the sun to earth. A. J. Cervenka's (Goddard Space Flight Center) discussion on important engineering design features of the AOSO included orbit selection, stabilization requirements, orientation, data capacity, thermal control, power supply, command subsystem, and weight limitations imposed by the launch vehicle.

Glimpses of astronomical observations outside of the earth's atmosphere have been obtained recently from balloons and rockets, but only an orbiting observatory can produce the continuous and high quality observations that are required. A flexible, highly stabilized, and controlled OAO satellite concept was described by Robert R. Ziemer (Goddard Space Flight Center). Specific objectives include a new sky map in the ultraviolet portion of the spectrum, photometric systems capable of determining stellar energy distribution and emission line intensities in the spectral region from 3000 to 800 angstroms, and absolute spectrophotometric measurements of stars and nebulae in the ultraviolet. Another experiment will observe the absorption lines of interstellar gas in the far ultraviolet region. The engineering requirements of the 3600-pound OAO satellite were discussed by Walter H. Scott (Grumman Aircraft Engineering Co.). The stabilization and control system must be capable of orienting and maintaining the satellite in a stable attitude within 15-arc seconds over a 50-minute period. Using the experiment as an error source, the fine momentum wheels will then be able to hold the optical axes to 0.1-arc second. The structural and thermal design characteristics and the usual satellite support systems were also included in this final paper.

This symposium was organized by J. G. Stephenson for the American Astronautical Society, and AAAS and NASA co-sponsored it.

J. GREGG STEPHENSON
Airborne Instruments Laboratory Division, Cutler-Hammer, Inc., Melville, New York

Forthcoming Events

March

12–13. Ecological Implications of Changes in the Amount of **Carbon Dioxide** in the Atmosphere, New York, N.Y. (Conservation Foundation, 30 E. 40 St., New York 16)

13–15. Goddard **Scientific Satellite** Symp., Washington, D.C. (C. P. Boyle, Code 200.3, Goddard Space Flight Center, Greenbelt, Md.)

14. Assoc. of **Vitamin Chemists**, Chicago, Ill. (H. C. Spruth, Abbott Laboratories, 14th and Sheridan, North Chicago)

14–15. Advanced **Air-Cooled Reactor**, symp., London, England. (Secretary, British Nuclear Energy Soc., 1–7 Great George St., London, S.W.1)

14–15. Central **Neuropsychiatric Hospital** Assoc., annual, Chicago, Ill. (American Psychiatric Assoc., 1700 18th St., NW, Washington 9)

14–15. **Psychotherapy Teaching**, Philadelphia, Pa. (Temple Univ. Medical Center, Broad and Ontario Sts., Philadelphia 40)

15–16. Pacific **Computer** Conf., Pasadena, Calif. (E. Schubert, Systems Div., Beckman Instruments, 2400 Harbor Blvd., Fullerton, Calif.)

17–24. **Military Medicine and Pharmacy**, 17th intern. congr., Caracas, Venezuela. (Organizing Committee, c/o Dirección del Servico de Sanidad Militar, Hospital Central de las Fuerzas Armadas Urbanización San Martin, Caracas).

18–22. American Soc. for **Metals**, western metal exposition and congr., Los Angeles, Calif. (W. J. Hilty, ASM, Metals Park, Ohio)

18–22. **Driving Simulation** as a Research Tool, Columbus, Ohio. (B. W. Stephens, U.S. Dept. of Commerce, Bureau of Public Roads, Washington 25)

18–28. International **Astronomical** Union, 20th symp., Canberra and Sydney, Australia. (D. H. Sadler, c/o Royal Greenwich Obesrvatory, Hertsmonceux Castle, Hailsham, Sussex, England)

19–21. **Bionics**, 2nd symp., Dayton, Ohio. (Lt. Col. L. M. Butsch, Jr., Aeronautical Systems Division, ASRNEB-3, Wright-Patterson AFB, Ohio)

20–22. **Bone Dynamics**, intern. symp., Detroit, Mich. (H. M. Frost, Dept. of Orthopaedic Surgery, Henry Ford Hospital, Detroit 2)

20–29. **Quantitative Spectroscopy** at Elevated Temperatures and Selected Applications in Space Science. Pasadena, Calif. (D. L. Wennersten, Air Force Office of Scientific Research, Washington 25)

21–24. International Assoc. for **Dental Research**, 41st annual, Pittsburgh, Pa. (J. Muhler, 1120 W. Michigan St., Indianapolis 2, Ind.)

21–24. International College of **Applied Nutrition**, Pasadena, Calif. (D. C. Collins, 7046 Hollywood Blvd., Suite 503, Los Angeles 28, Calif.)

24–28. Institute of **Radio Engineers**, intern. convention. New York, N.Y. (G. W. Bailey, 1 E. 79 St., New York)

25–27. High Frequency **Communication**, convention. London, England. (Secretary, Institution of Electrical Engineers, Savoy Pl., London, W.C.2)

25–28. American Assoc. of **Petroleum Geologists**, 48th annual, Houston, Tex. (J. M. Parker, Kirby Petroleum Co., 518 Patterson Bldg., Denver 2, Colo.)

25–28. Society of Economic **Paleontologists and Mineralogists**, Houston, Tex. (L. C. Pray, Ohio Oil Co., Box 269, Littleton, Colo.)

26–28. Japan **Atomic Industrial** Forum/ United Kingdom Atomic Energy Authority, nuclear power symp., Tokyo, Japan. (UKAEA, 11 Charles II St., London, S.W.1, England)

27–28. **Drugs and Animal Behaviour**, symp. (by invitation only), London, England. (Ciba Foundation, 41 Portland Pl., London, W.1)

27–29. **Photochemistry**, intern. symp., Rochester, N.Y. (W. H. Wyatt, Air Force Office of Scientific Research, Washington 25)

28–29. Evolution of the **Atherosclerotic Plaque**, intern. symp., Chicago, Ill. (Miss M. Brookes, Chicago Heart Assoc., 22 W. Madison St., Chicago 2)

28–30. Natl. Soc. for **Programmed Instruction**, annual, San Antonio, Tex. (NSPI, Trinity University, 715 Stadium Dr., San Antonio 12, Texas)

29–31. American **Ethnological Soc.**, Ithaca, N.Y. (E. Friedl, Queens College, Flushing 67, N.Y.)

29–31. American Soc. of **Internal Medicine**, annual, Denver, Colo. (ASIM, 3410 Geary Blvd., San Francisco 18, Calif.)

31–4. National **Science Teachers** Assoc., natl. convention, Philadelphia, Pa. (R. H. Carleton, NSTA, 1201 16th St., NW, Washington 6)

31–5. American **Chemical** Soc., natl., Los Angeles, Calif. (A. T. Winstead, National Meetings Dept., ACS, 1155 16th St., NW, Washington 6)

31–5. National Assoc. of **Recreational Therapists**, annual, Norman, Okla. (American Psychiatric Assoc., 1700 18th St., NW, Washington 9)

April

1–2. **Process Automation**, 5th symp., Santa Monica, Calif. (D. Kader, P.O. Box 1065, Canoga Park, Calif.)

1–3. Oak Ridge **Radioisotope** Conf.—Applications to Physical Science and Engineering, Gatlinburg, Tenn. (Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn.)

1–4. American **Radium Soc.**, annual, White Sulphur Springs, W. Va. (C. G. Stetson, ARS, Dept. of Radiology, Englewood Hospital, Englewood, N.J.)

1–5. American College of **Physicians**, Denver, Colo. (E. C. Rosenow, Jr., 4200 Pine St., Philadelphia 4, Pa.)

1–27. World **Meteorological** Organization, 4th congr., Geneva, Switzerland. (Secretariat, WMO, 41 Avenue Guiseppe Motta, Geneva)

2–6. **Psychology**, 8th Inter-American congr., Mar La Plata, Argentina. (G. M. Gilbert, Psychology Dept., Long Island Univ., Brooklyn 1, N.Y.)

3–5. American Soc. of **Internal Medicine**, annual, Atlantic City, N.J. (ASIM, 3410 Geary Blvd., San Francisco 18, Calif.)

3–5. **Streamflow Regulation** for Quality Control, symp., Cincinnati, Ohio. (J. E.

McLean, Field Operations Section, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Pkwy., Cincinnati 26)

3–6. National Council of Teachers of **Mathematics**, Pittsburgh, Pa. (M. H. Ahrendt, 1201 16 St., NW, Washington 6)

4–5. Agricultural **Meteorology**, 5th natl. conf., Lakeland, Fla. (American Meteorological Soc., 45 Beacon St., Boston 8, Mass.)

4–5. **Systems**, 2nd symp., Cleveland, Ohio. (M. Mesarovic, Case Inst. of Technology, University Circle, Cleveland 6)

4–6. International Assoc. for **Dental Research**, British section, 11th annual, London, England. (C. Tonge, Dept. of Anatomy, King's College Medical School, Newcastle upon Tyne 1, England)

4–6. Latin **Medical** Conf., Rome, Italy. (Prof. Urso, Policlinico Umberto 1, Viale Policlinico, Rome)

5–6. Alabama **Acad. of Science**, Tuscaloosa. (W. B. DeVall, Forestry Dept., Auburn Univ., Auburn, Ala.)

6. **Paleontological Research** Inst., Ithaca, N.Y. (R. Harris, PRI, 109 Dearborn Pl., Ithaca)

7–13. Panamerican **Diabetic** Congr., 2nd, Chicago, Ill. (Diabetic Inst. of America, Inc., Suite 1646, Chicago 2, Ill.)

8–10. American Assoc. for **Thoracic Surgery**, 43rd, Houston, Tex. (AATS, 7730 Carondelet Ave., St. Louis, Mo.)

8–10. **Feedback Mechanisms in the Nervous System**, Villahermosa, Mexico. (E. Eidelberg, Div. of Neurobiology, St. Joseph's Hospital, 350 W. Thomas Rd., Phoenix, Ariz.)

8–10. **Seismological** Soc. of America, Berkeley, Calif. (K. V. Steinbrugge, 465 California St., San Francisco 4, Calif.)

8–11. American **College Personnel** Assoc., Boston, Mass. (B. A. Kirk, Counseling Center, Univ. of California, Berkeley 4)

9–11, American Assoc. of **Anatomists**, Washington, D.C. (L. B. Flexner, Dept. of Anatomy, School of Medicine, Univ. of Pennsylvania, Philadelphia)

10–11. Engineering Aspects of **Magnetohydrodynamics**, 4th symp., Berkeley, Calif. (G. S. Janes, Avco-Everett Research Laboratory, Everett 49, Mass.)

11–13. Natural **Radiation** Environment, intern. symp., Houston, Tex. (J. A. S. Adams, Dept. of Geology, Rice Univ., P.O. Box 1892, Houston 1)

11–13. Eastern **Psychological** Assoc., 34th annual, New York, N.Y. (M. A. Iverson, Dept. of Psychology, Queens College of the City University of New York, Flushing 67)

11–13. **Pulsatile Blood Flow**, intern. symp., Philadelphia, Pa. (E. O. Attinger, Presbyterian Hospital in Philadelphia, 51 N. 39 St., Philadelphia 4)

11–13. Southern Soc. for **Philosophy and Psychology**, Miami Beach, Fla. (E. A. Alluisi, Human Factors Research Lab., Lockheed Georgia Co., Marietta, Ga.)

12–13. Pennsylvania **Acad. of Science**, East Stroudsburg, (K. B. Hoover, Messiah College, Grantham, Pa.)

14–18. **Electrochemical** Soc., Pittsburgh, Pa. (ES, 30 E. 42 St., New York 17)

15–16. American Soc. for **Artificial Internal Organs**, annual, Atlantic City, N.J. (B. K. Kusserow, Medical College of Vermont, Burlington)

15–20. Association for Research into **Periodontal Diseases**, 17th intern., Athens, Greece. (O. Louridis, ARPA, 8 rue Hippocratous, Athens)

16–18. **Optical Masers**, intern. symp., New York, N.Y. (L. Bergstein. Symp. Committee, Polytechnic Inst. of Brooklyn, 55 Johnson St., Brooklyn 1, N.Y.)

16–19. USAF **Aerospace Fluids and Lubricants** Conf. (unclassified), San Antonio, Tex. (J. Harmon, Southwest Research Inst., 8500 Culebra Rd., San Antonio)

16–20. American **Physiological** Soc., Atlantic City, N.J. (H. Rahn, Dept. of Physiology, Univ. of Buffalo, Buffalo 14, N.Y.)

16–20. British Inst. of **Radio Engineers**, Southampton, England. (BIRE, 9 Bedford Sq., London, W.C.1, England)

16–20. Federation of American Societies for **Experimental Biology**, annual, Atlantic City, N.J. (M. O. Lee, 9650 Wisconsin Ave., NW, Washington 14)

16–21. American Soc. for **Experimental Pathology**, Atlantic City, N.J. (K. M. Brinkhous, Dept. of Pathology, Univ. of North Carolina, Chapel Hill)

16–21. American Inst. of **Nutrition**, Atlantic City, N.J. (A. E. Schaefer, Bldg. 16, Rm. 207, NIH, Bethesda 14, Md.)

16–24. **Forensic Immunology, Medicine, Pathology, and Toxicology**, 3rd intern. meeting, London, England. (I. Sunshine, 2121 Adelbert Rd., Cleveland, Ohio)

(See 15 February issue for comprehensive list)

(*Continued from page 744*)

utes; $34. Discusses rotating magnetic field pattern, factors that cause rotation of the magnetic field, and polyphase motor construction. (Order No. OE 384) (Norwood Films, 926 New Jersey Ave., NW., Washington 1)

Scientists in the News

Five scientists were recipients of the 1963 Arthur S. Flemming Awards, presented this month. The awards are for "outstanding contributions to the federal government." Those who received them included:

George M. Low, director of space craft and flight missions, NASA.

Edgar M. Cortright, Jr., deputy director of the Office of Space Sciences, NASA.

Joseph F. Saunders, head of the Medicine and Dentistry Branch, Naval Research Office.

Norman J. Doctor, supervisory physicist at the U.S. Army's Diamond Ordnance Laboratories.

Charles M. Herzfeld, director of Ballistic Missile Defense, Defense Department.

Paul E. Klopsteg, professor emeritus, Northwestern University, has been named treasurer of AAAS, replacing **Paul A. Scherer**, who has resigned the post.

At Pennsylvania State University, **William R. Bitler**, formerly at Carnegie Institute of Technology, has become associate professor of metallurgy.

Gerhard R. Barsch, experimental physicist from Germany, has been named senior research associate in applied physics, college of mineral industries.

Morton J. Stoller, head of NASA's Office of Applications, has been awarded the NASA leadership medal. He was cited for "outstanding and dynamic leadership in planning, developing and directing a complex scientific organization" for the research, development, and application of space technology.

Roy C. Weidler, formerly with the Advanced Research Projects Agency, U.S. Department of Defense, has been named head of electro-optical research projects at the Martin Company's Orlando (Florida) division.

Richard C. Greulich, professor of anatomy and oral biology in UCLA's health center, will receive the International Association for Dental Research award for basic research in oral science. The $1000 award honors his research in "the development and application of modern histophysical and histochemical techniques to the study of growth differentiation and mineralization of dental and osseous tissues."

The University of Maryland's department of physics and astronomy has announced the following appointments:

William C. Erickson, formerly at Convair Astronautics, San Diego, Calif.; associate professor of astronomy.

Charles A. Misner, formerly at Princeton; associate professor of physics.

H. L. Woltjer, on leave from the University of Leiden, Holland; visiting professor of astronomy.

Frank B. McDonald, of Goddard Space Flight Center, part-time visiting professor of physics.

A. A. Jaffe, formerly at the University of Manchester, England; visiting associate professor of physics.

The new executive director at the University of Oklahoma Research Institute is **Archie M. Kahan**, formerly executive director of the research foundation, Texas A&M College.

The American Physical Society last month presented its Oliver E. Buckley prize in solid-state physics to **William M. Fairbank**, physics professor at Stanford University. The medal and $1000 honorarium were presented to Fairbank "for his part in the experimental discovery of flux quantization in superconductors."

Samuel C. Bukantz, medical and research director of the Jewish National Home for Asthmatic Children and the Children's Asthma Research Institute and Hospital, Denver, has been named senior clinical investigator at the Schering Corporation, Bloomfield, N.J.

Alfred C. Redfield, emeritus senior oceanographer at Woods Hole Oceanographic Institute, has been elected president of the Bermuda Biological Station for Research.

Bernard Keisch, formerly with the Phillips Petroleum Company atomic energy division, has been named senior scientist at Nuclear Science and Engineering Corp., Pittsburgh.

Anders S. Lunde, former head of Gallaudet College's department of sociology, has become chief, Natality Statistics Branch, in the U.S. Public Health Service's National Vital Statistics Division.

George W. Hinman, associate professor of physics and mechanical engineering, Carnegie Institute of Technology, has been named chairman, department of experimental physics, General Atomic Division of General Dynamics Corp., San Diego, Calif.

David Minard, chief of the stress physiology division, National Naval Medical Center, Bethesda, Md., has been appointed professor and head of the department of occupational health in the University of Pittsburgh's graduate school of public health.

Recent Deaths

Barnum Brown, 89; curator emeritus of fossil reptiles, American Museum of Natural History, New York; 5 Feb.

Melvin DeGroote, 67; retired vice president of research, developments, and patents, in the Petrolite Corp., St. Louis, Mo.; 3 Feb.

Edgar H. Dix, Jr.; retired assistant research director, Aluminum Company of America; 29 Jan.

Jackson B. Hester, 58; owner, Hester Agricultural Research Laboratory, Elkton, Md.; 28 Nov.

John H. Keating, Sr.; past president, New York Heart Association; 21 Jan.

Harold P. Knauss, 62; former head, physics department, University of Connecticut; 1 Jan.

Robert H. Leach, 84; metallurgist, retired vice president, Handy and Harmon Company, Bridgeport, Conn.; 26 Jan.

Ralph A. Liddle, 66; petroleum geologist; 16 Jan.

Herbert E. Merwin, 84; retired Carnegie Institution geologist; 28 Jan.

Paul Rosbaud, 66; scientific adviser to Wiley, North-Holland, Oliver & Boyd, Allen and Unwin, and Viewig publishing houses; 28 Jan.

Roscoe L. Sensenich, 80; former president, American Medical Association; 18 Jan.

Winfrey Wynn, 54; associate research professor of physiology, Emory University; 26 Jan.

William P. Yant, 69; research activities director, Mine Safety Appliances Co., Pittsburgh, Pa.; 29 Jan.