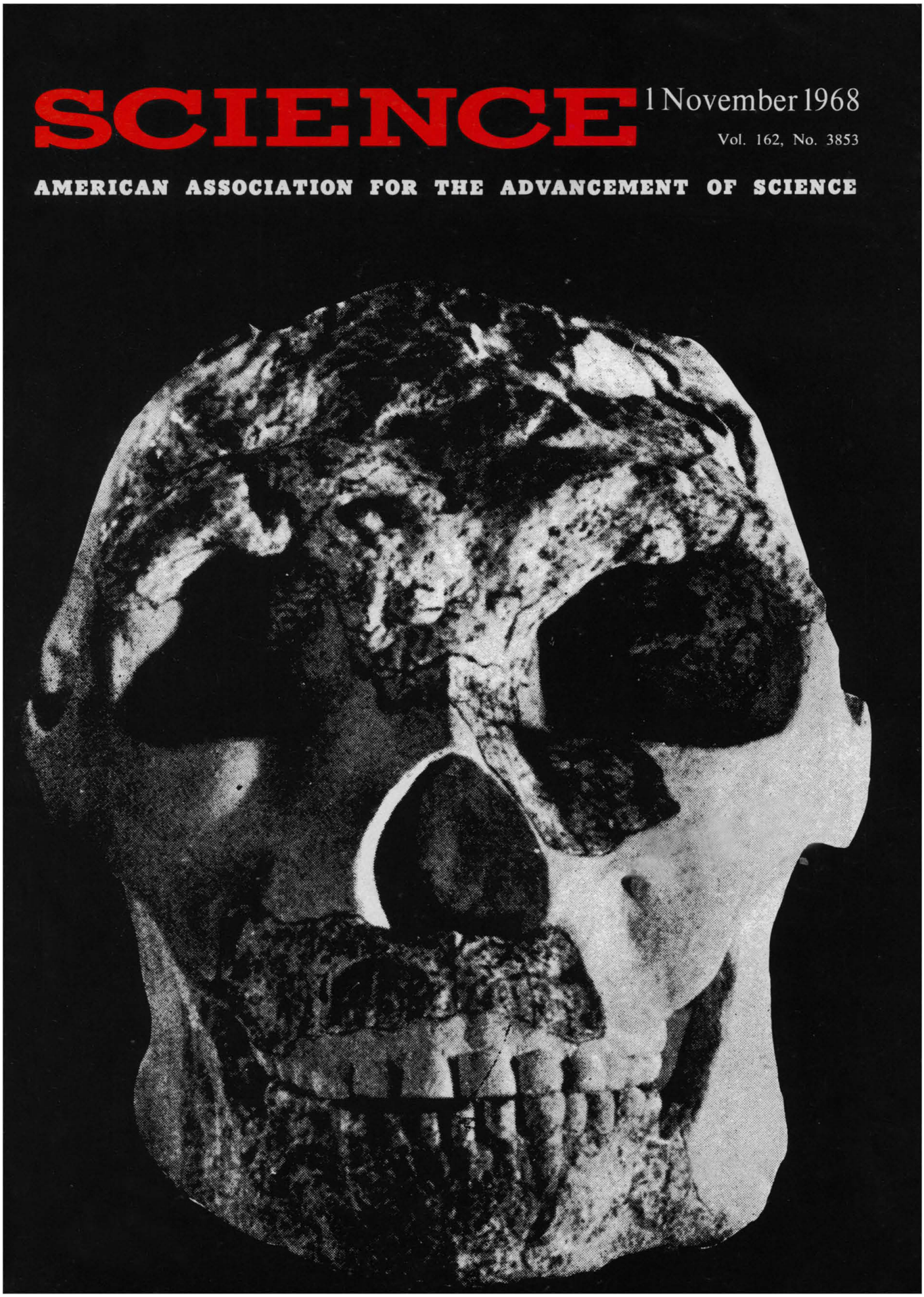
SCIENCE

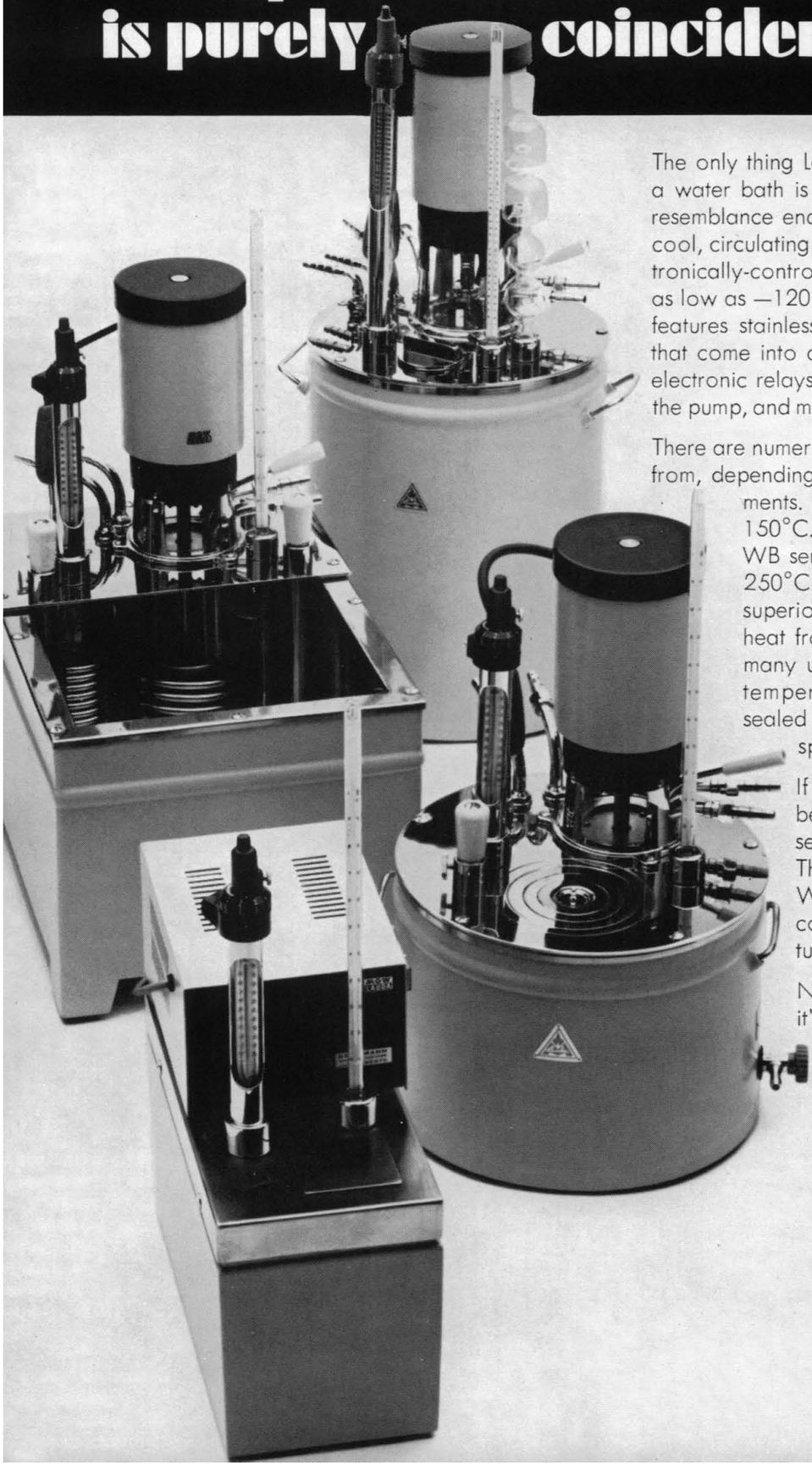
1 November 1968

Vol. 162, No. 3853

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



The Lauda all-stainless steel constant-temperature circulators. Any resemblance to a water bath is purely coincidental.



The only thing Lauda Circulators have in common with a water bath is the water they use. Beyond that, any resemblance ends. A Lauda not only heats, it can also cool, circulating water or other liquids at constant, electronically-controlled temperatures as high as 330°C. or as low as —120°C. In addition, every Lauda Circulator features stainless steel construction of all components that come into contact with the bath liquid, solid-state electronic relays, automatic excess load protection for the pump, and manual drainage and flow control valves.

There are numerous Lauda Circulator models to choose from, depending on your specific temperature requirements. For example, the K-2 series heats to 150°C. and can cool to —20°C., while the WB series is best for immersion heating up to 250°C. The N-HT has been engineered for superior high-temperature performance. It will heat from 50°C. to 330°C. and incorporates many unique features, including special high-temperature glass thermo-regulators, fully-sealed housing, water-cooled cover plate and special insulation.

If you do low-temperature work, you may be interested in the Lauda Ultra-Kryostat series that cools from ambient to —120°C. There is also a refrigerated version of the WB-20 that is specially recommended for controlled spectrophotometric temperature measurements.

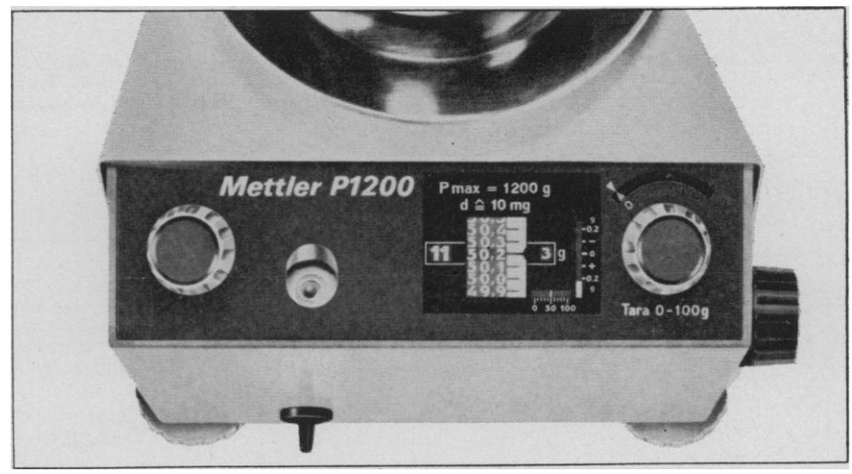
Now that we've begun to convince you it's a mistake to call a Lauda Circulator a water bath, let our free catalog drive the point home. For your copy, just write: Lauda Circulators, Division of Brinkmann Instruments, Cantiague Rd., Westbury, New York 11590.

A DIVISION OF BRINKMANN

LAUDA Circulators

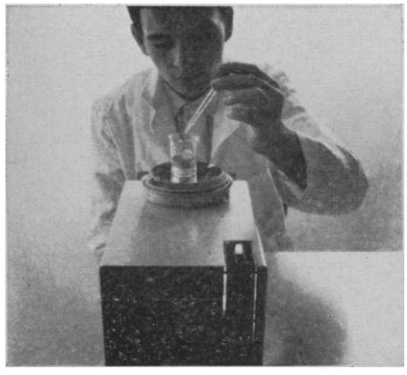
WEIGHT WATCHERS:
These Mettler balances can help reduce your weighing problems

If you have weight problems, chances are they can be solved with one of these three Mettler balances. Two are top-loaders, one an analytical. Collectively, they solve virtually any weighing problem in the laboratory. Individually, they perform their special jobs with unique speed, ease and precision.



Weight Watching Has Never Been Easier

The Mettler P1200, a well established and versatile top-loading balance, now has digital readout. This feature permits even relatively unskilled operators to obtain accurate results without misinterpretation or reading errors.



The P1200 will tackle weighings to 1200 grams (plus 100-gram tare), and give you a precision of ±5 mg. That's better than one part in 250,000. But despite its capabilities for handling the bigger weighing jobs, the P1200 will also complete a weighing in just three seconds. It will also checkweigh to plus or minus values as fast as you can place an object on the scale, and without referring to scale readout. Powdery, granular or liquid substances can be filled rapidly by the use of a filling guide which shows the approximate weight on the pan throughout the entire weighing operation. This eliminates time-consuming interruptions for reading the balance.

Remove Grams — Positively

The P160, another top-loader, weighs unknowns to 160 grams with a precision of ±1 mg. In addition to having all the features of the P1200, it is ideally suited for weight loss studies. It has a reverse scale which gives a positive reading as weight decreases in drying, evaporation and residue determination studies. This feature eliminates time-consuming calculations and the possibility of arithmetical errors. It also simplifies gravimetric titrations (for more information on the advantages of gravimetric titrimetry, write for Bulletin M-1014A).

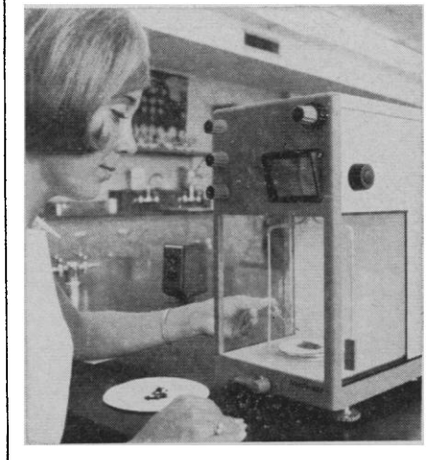
A Well-Balanced Balance

Slight changes in the balance level of the P1200 and the P160 (as in all Mettler top-loaders) are automatically compensated for by a zero point restoration feature. We call it Mettler Levelmatic. If your balance is out of plumb beyond its compensation range, you won't be able to make a weight reading because the readout is automatically obscured. Because Levelmatic automatically compensates for most shifts in zero position, it is rarely necessary to re-zero the balance before weighing.

Have Your Cake and Eat It

If you need an analytical balance to watch your weight, consider the Mettler H20 . . . it's really two balances in one. It gives you the 160.1-gram capacity of a macro-analytical balance, and the ±0.01 mg precision of a semi-micro instrument. The H20 readout, like the P1200 and P160, is digital. It also has a high-speed filling guide, and an optional accessory will let you weigh objects below the balance; for example, to make specific gravity measurements by weighing objects submerged in liquids.

Because of the unrestricted optical taring feature of the H20, you can tare off the weight of your container in seconds, and begin weighing-in with readout at zero. You can't make a weighing mistake. If you're adding several components, you can dial back to zero for each one.



Some Food For Thought

In case you have a weighing requirement that can't be solved by one of these three balances, Mettler has 35 more models ranging from top-loaders that weigh to 13 kilos all the way through analyticals to ultra micro instruments with precision of ±0.1 μg. We'll bet a gram-cracker that one of these will fill the bill. To arrange for a free demonstration or trial, or for further particulars, write to Mettler Instrument Corporation, 20 Nassau Street, Princeton, New Jersey 08540.

Mettler®

Circle No. 3 on Readers' Service Card

← Circle No. 16 on Readers' Service Card

1 November 1968
Vol. 162, No. 3853

SCIENCE

SCIENCE is published weekly on Friday and on the fourth Tuesday in November 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 $12; foreign postage: Americas $3; overseas $5; single copies, 50¢ (back issues, $1) except **Guide to Scientific Instruments**, which is $2. School year subscriptions: 9 months, $9; 10 months, $10. Provide 4 weeks notice for change of address, giving new and old address and zip codes. Send a recent address label. SCIENCE is indexed in the **Reader's Guide to Periodical Literature.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Restored skull of *Homo erectus lantienensis*. Lan-t'ien Man was discovered in Lan-t'ien in east-central Shensi, in 1963–64, from Middle Pleistocene deposits. It is regarded as a close, but slightly earlier, relative of Peking Man. See page 519. [Reproduced from *Vertebrata Palasiatica* (1966)]

Hasselblad is not a hypothesis.

The only guesswork you should ever have to worry about is your research. The accuracy and dependability of your research tools should be a fact of life. Otherwise the progress of your work is in constant jeopardy.

Hasselblad, the camera and The System, is designed so precisely it is used in a slightly modified form on all manned NASA space flights. It is also becoming the most preferred camera for all scientific research. Once you are familiar with The System, you will understand why.

It has already been established that a single lens reflex camera is the best for research purposes because all viewing and focusing is done through the lens, which totally eliminates parallax error, regardless of the combination of supplementary lenses, extension tubes and bellows extensions used. But most of the single lens reflex cameras available to the researcher are 35mm, a format size which suffers from lack of image quality when it is enlarged to any degree. The Hasselblad is a single lens reflex camera with a 2¼ square format. This initial enlargement over 35mm insures superior image quality.

There are eight Carl Zeiss lenses in The Hasselblad System – 40, 50, 80, 120, 135, 150, 250, and 500mm. Each lens has a built-in Synchro Compur shutter, with automatic stopping down at the moment of exposure and manual preview for depth of field checks. Every lens has both M and X synchronization allowing the use of flash and strobe at all speeds up to 1/500th second.

There are five different instantly interchangeable film magazines which allow you to make 12 or 16 exposures on 120 film, 24 exposures on 220 film, and 70 exposures on 70mm film. You also have a choice of formats (2¼ square, 2¼ X 1⅝, 1⅝ X 1⅝) and the convenience of being able to change either film type or format in mid-roll.

The Hasselblad System not only has multiple lenses and magazines, it also consists of multiple Hasselblads. The standard Hasselblad is the 500C. It accepts all 8 Hasselblad lenses, and has a ground glass reflex viewing screen which shows your 3-dimensional pictures in 2 dimensions. And naturally, the lens, magazine, focusing hood, and winding knob of the 500C are instantly interchangeable.

The second camera in The Hasselblad System is the Super Wide C equipped with a 38mm, 90° angle of view Zeiss Biogon f/4.5 lens. The superb optics of the lens assures distortion-free horizontal and vertical delineation, with sharpness of image from corner to corner of the negative area, even at full aperture. (Depth of field at an aperture of f/22 is from 12 inches to infinity).

The third camera is the electrically driven Hasselblad 500EL. This camera automatically advances the film and cocks the shutter, permitting a rapid series of exposures, either by use of the camera release or long release cords, timer or remote radio control. The 500EL accepts all lenses and most accessories available for the 500C.

Hasselblad's fourth camera in The System is the electrically driven 70mm Hasselblad, which has all the features of the 500EL, plus a 70mm film magazine which allows up to 70 exposures on cassette loaded 70mm film. With it you can make a large number of exposures with total freedom from mechanical necessities.

Completing The System is a huge range of accessories. Proxars, extension tubes and bellows extensions for close-up work. Filters. Transparency copy holder. Cut film back. Eye level prism finders. Sports view finders. Grips. Underwater housing. Ring light. Tripod quick coupling. Microscope attachments and carrying cases.

Here are a few of the areas where Hasselblad has proven itself.

General instrument recording.
For constant surveillance of instrument banks and oscilloscope screens on a 24 hour basis, Hasselblad has given a flawless performance.

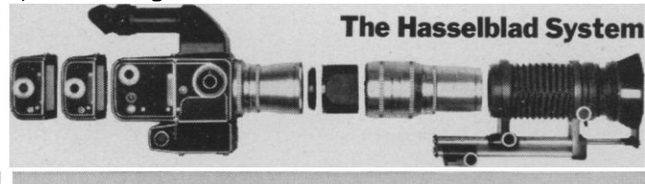
Hydraulic engineering and fluid flow research.
Banks of Hasselblad 500EL's, suspended over a scale model of a riverbed or sections of the ocean floor, have recorded flow speeds and current patterns for lengthy periods of time before they required reloading.

Materials testing.
When photographs of fractures and breakages of materials were needed in areas inaccessible to a photographer (e.g. blast furnaces, wine storage casks, both containing large quantities of toxic gas), the 500EL was lowered into the structures and operated by remote control.

Cave photography, speleology.
With working conditions unusually bad – mud, water, constant darkness – film changes were virtually impossible. The 70mm Hasselblad's tremendous exposure capacity made such changes unnecessary for long periods of time.

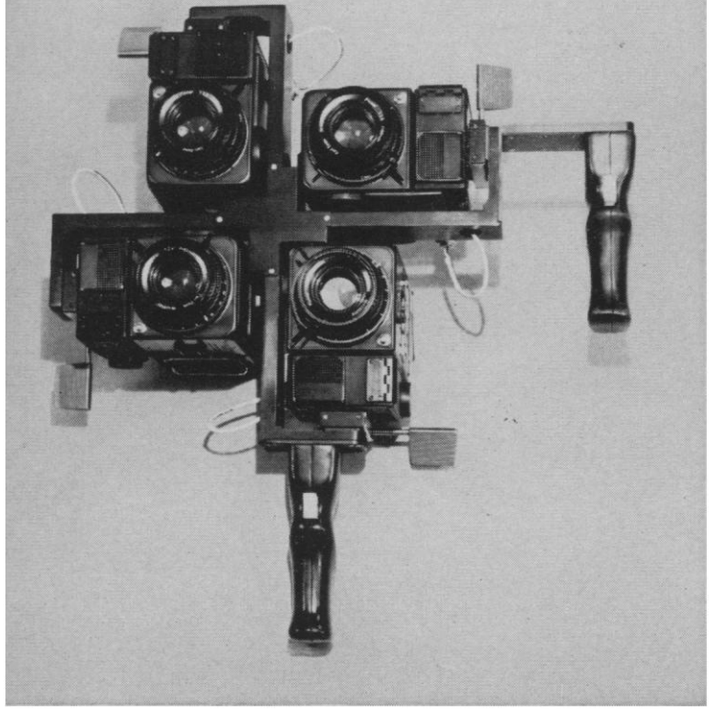
Aerial photography.
For the same reasons that NASA has used Hasselblads on all manned space flights, the Hasselblad has proved invaluable for more conventional aerial photography, such as recording flight instruments, pilot reactions, and topographical information. Single or multiple mounted Hasselblads have been operated by the photographer, pilot, flight test engineer, or by remote control, using prefocused Hasselblad EL's.

For more literature and the free 40 page catalogue, or specific information on the Hasselblad in relation to your particular research area, please address your inquiries to our Technical Director, Paillard Incorporated, 1900 Lower Road, Linden, New Jersey 07036.

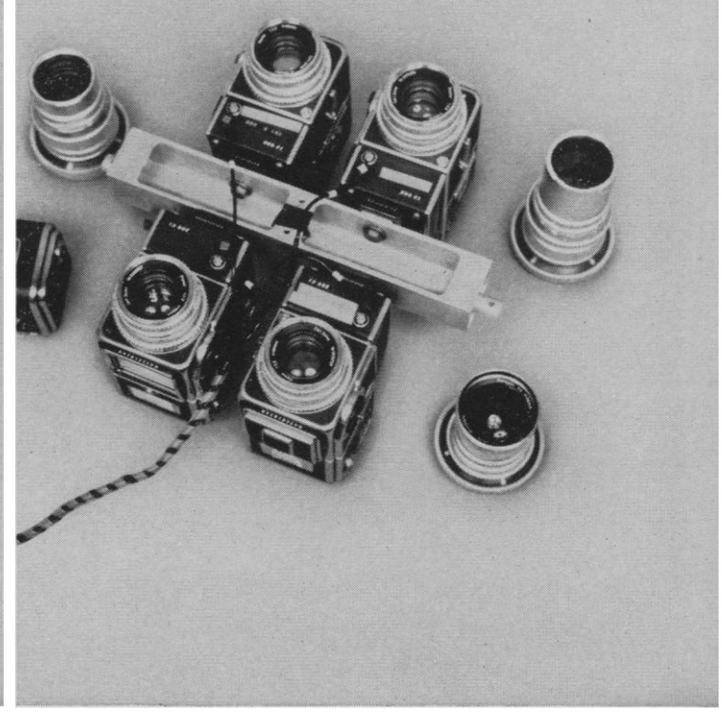


Circle No. 6 on Readers' Service Card

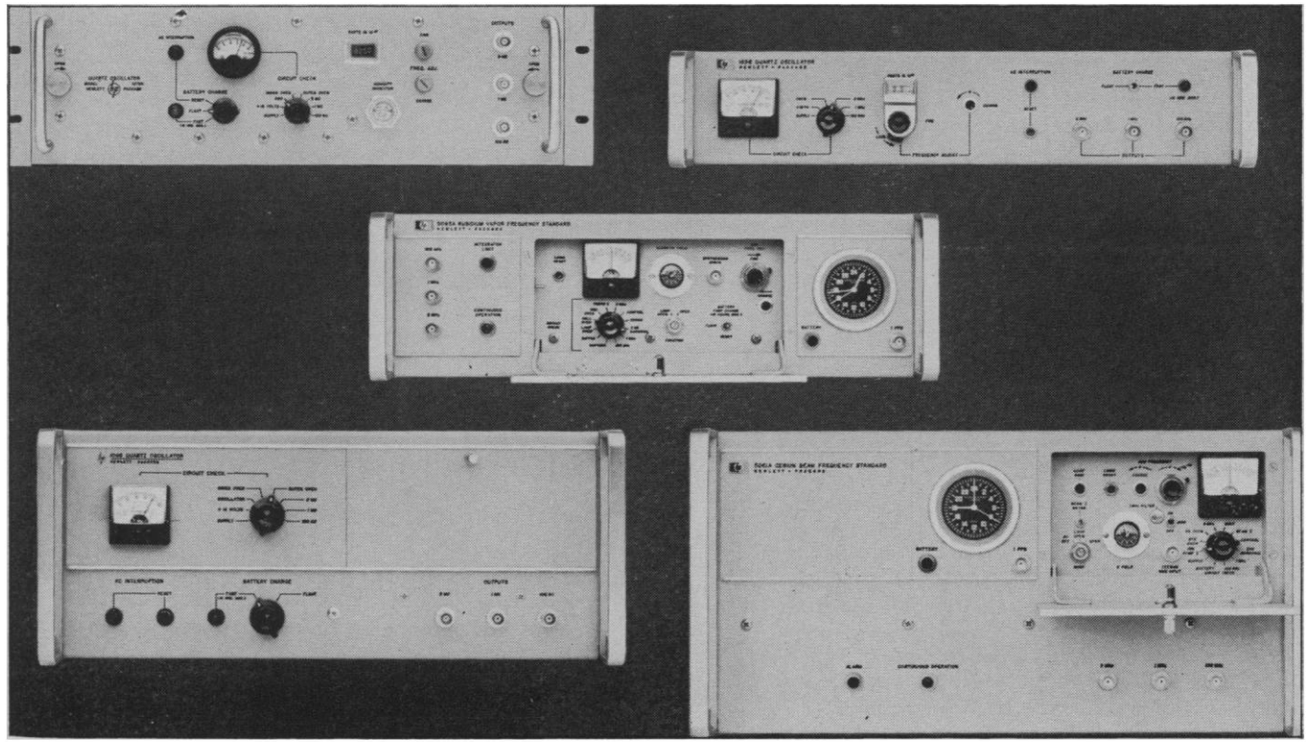
Shown is the NASA ganged Hasselblad Electric Camera array, designed for Experiment S065 (Multiband Terrain Photography-Hand Held), proposed for use in the Apollo Man-to-the-Moon Program. Photo courtesy of NASA.



Pictured is the U.S. Army's Hasselblad 4-camera system for the photographic interpretation of multi-emulsion studies contributing to environmental analysis. Photo courtesy of the U.S. Army Cold Regions Research and Engineering Laboratory.



No matter which HP frequency/time standard you buy....



you're getting the best of its kind.

Hewlett-Packard Frequency & Time standards are known throughout the world for their ability to meet specific frequency and timekeeping requirements. Each type gives outstanding performance in its particular class; accuracy, precision, stability and rugged dependability.

—The HP 5061A Cesium Beam Frequency Standard has been flown around the world to coordinate international timekeeping stations within 1 microsecond. It has no long-term drift and an absolute accuracy of ± 1 part in 10^{11} for the life of its cesium beam tube. That's the equivalent of losing only one second in more than 3000 years. It costs $14,800 as a frequency standard, $16,900 as a time standard with internal standby power.

—The HP 5065A Rubidium Frequency Standard offers you superior electrical quietness over short periods of time, with short-term stability of 7×10^{-11} rms, 100 s. avg.; 7×10^{-12} rms, 1 s. avg. It's highly portable, yet rugged enough to take tough field operation. It costs $7500 as a frequency standard, $9300 as a time standard with internal standby power.

—The HP 105A Quartz Oscillator offers you the best stability available for the price. Aging rate less than 5 parts in 10^{9} per day; short-term stability $< 1 \times 10^{-11}$ rms (1 s. averaging); S-N ratio >90 dB; rapid warm-up. It costs only $1500. The 105B has built-in standby power, $1800.

—The 106A is HP's most stable quartz oscillator: aging rate $< 5 \times 10^{-11}$ per day. Price: $3750. The 106B, with built-in standby power, is $4200.

—The 107AR is HP's most rugged quartz oscillator, and is hermetically sealed. Aging rate $< 5 \times 10^{-10}$ per day. Price: $2600. The 107BR, with built-in standby power, is $2950.

Also available from HP are the 117A VLF Comparator, for comparing frequency against NBS 60 kHz standard frequency broadcasts, $1400 (incl. loop antenna); the 115BR Digital Clock and Frequency Divider, $3000; and the highly versatile KO2-5060A Standby Power Supply, $2850.

For information about all HP frequency & time standards and their various options, call your HP field engineer. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.

HEWLETT hp PACKARD

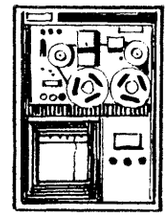
FREQUENCY STANDARDS 02821

We're not in all the emerging industries.

Yet.

AMBAC Industries Incorporated is the new name recently announced for American Bosch Arma Corporation. The change symbolizes the different character our company has achieved over the past four years and the exciting dimensions of its future.

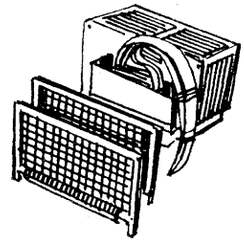
AMBAC is now a new, high technology company with activities balanced to meet changing economic, social and political conditions. Internal growth through ever-expanding product development programs, and the eight acquisitions made during the past two years, have established our new identity as a diversified technological company active in these emerging industries.



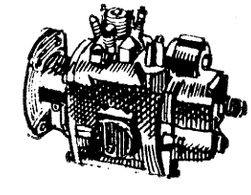
SCIENTIFIC AND MEDICAL INSTRUMENTATION—Packard Instrument Company provides laboratories and hospitals with precision instrumentation used in the biological, medical and physical sciences. Packard equipment is currently involved in studies of the relationship between diet and disease; the prevention and cure of cancer and heart disease; the problems of old age; the development of better livestock and superior food crops; and control of air and water pollution. Packard pioneered the use of radioactive measuring instrumentation and is a recognized leader in the field of nuclear and scientific analytical instruments. Its large international sales and service organization provides a good foundation for further growth in this field.

POLLUTION CONTROL—The Bacharach Instrument Company is engaged in developing instruments to monitor pollutants contained in automobile exhausts. Other products cover the broad fields of gas detection, service equipment and pollution emanating from industrial plants and private homes.

Also in this group is Michigan-Dynamics, Inc., which manufactures filtration equipment for air and water purification systems as well as for aerospace, mobile and scientific applications.



AEROSPACE ELECTRONICS—Arma Division is in production with its third generation specialized computer. It weighs five pounds! It is now an integral part of the most sophisticated operational navigation system for commercial aircraft. Telemetry equipment developed by Tele-Dynamics Division is now on-board orbiting satellites and in ground support stations. Today we are introducing new products to apply these communications techniques to advanced industrial process control systems.



OCEANOGRAPHY—It may be that the future of life on land rests on the ocean floor or, as it is called, "Wet Space". Our work in oceanography, ocean-bottom surveys, underwater acoustics and ocean resources studies is carried on by Mystic Oceanographic Company for commercial companies, universities and the U. S. Government. Our extensive aerospace and electronics background is an important asset in expanding oceanographic technology.

DIESEL AND FLUID POWER SYSTEMS AND ELECTRICAL PRODUCTS—The American Bosch Division produces diesel fuel injection systems for heavy-duty trucks, off-the-road vehicles and stationary engines, a multi-fuel system that enables a diesel-type engine to operate on virtually any fuel, and a line of LPG carburetion systems for farm equipment, buses and in-plant engines. The Electrical Products Division is a major supplier of electrical products including small motors used in windshield wipers, window and seat actuators, and cranking devices for lawn mowers, garden tractors and other home power equipment.

Building on the hydraulic research capabilities in diesel fuel systems, our Fluid Power Systems Division is active in this growth field. This new division manufactures electrohydraulic control systems for automating mobile equipment and industrial operations. Michigan-Dynamics also supplies filtration products for this market.

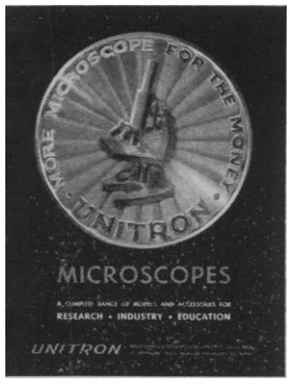
Our story becomes even more interesting when you look at our performance. For example: Earnings per share increased from $.91 in 1964 to $2.78 in 1967, and are continuing to grow. Why not check your investment counselor or broker for an appraisal, or write us for more information.

We haven't mentioned our important contributions to the nation's defense arsenal—Pace Corporation, for example, manufactures a broad range of advanced signalling, illuminating and warning devices for our military. Nor did we mention our European subsidiaries, Steelweld, Ltd., and AMBAC, N.V., which manufacture automated materials-handling equipment and precision components for our fuel systems, and Wanlass Electric Company's new innovations in power controls for computers, office copiers, and automatic machine tools. But, this story is to be continued . . .

AMBAC Industries Incorporated, 900 Old Country Road, Garden City, New York 11530.

AMBAC

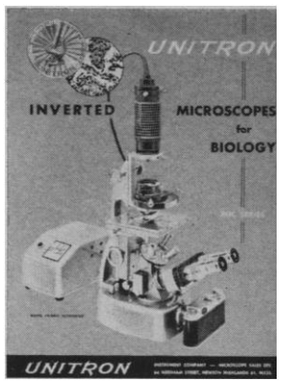
formerly American Bosch Arma Corporation

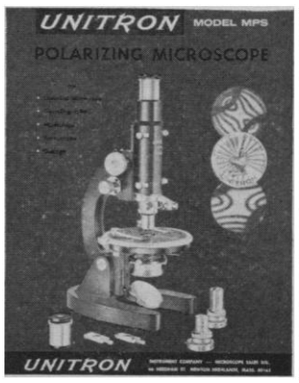


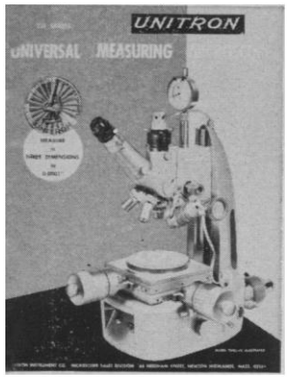
FREE MICROSCOPE BUYING GUIDE

Shown here in miniature are just some of the informative brochures which comprise the UNITRON Catalog . . . your buying guide to quality microscopes at prices within your budget. Whether your application is routine laboratory analysis, advanced biological research, or industrial quality control, you will find the instrument you need in UNITRON's complete line.

A UNITRON MICROSCOPE CATALOG is Yours for the Asking.



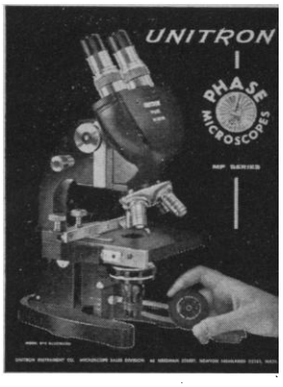


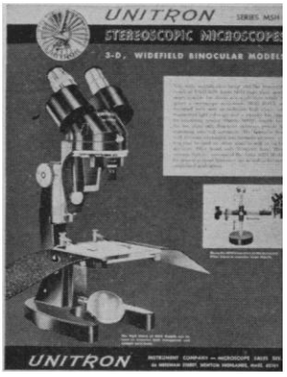


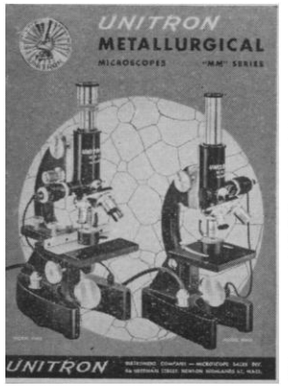
TRY ANY UNITRON MICROSCOPE FREE FOR 10 DAYS

A salesman's demonstration gives you only about 30 minutes to examine a microscope, hardly the best conditions for a critical appraisal. But UNITRON's Free 10 Day Trial gives you the opportunity to evaluate any model in your own laboratory and prove its value in your own application before you decide to purchase. See for yourself, as have thousands of other buyers, why . . .

UNITRON Means More Microscope for the Money.







Please send UNITRON's Microscope Catalog No. 4-Z

Name _____

Company _____

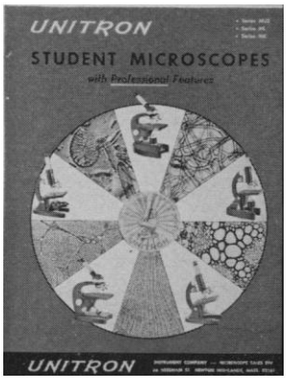
Address _____

City _____ State _____ Zip _____

Circle No. 13 on Readers' Service Card

UNITRON
INSTRUMENT COMPANY

MICROSCOPE SALES DIVISION
66 NEEDHAM STREET
NEWTON HIGHLANDS
MASSACHUSETTS 02161



ADVANCE REGISTRATION FORM

Mail to: American Association for the Advancement of Science, Dept. R, 1515 Massachusetts Ave., NW, Washington, D.C. 20005

(Advance Registration accepted only until 29 November)

☐ Enclosed is $10 Registration Fee (*Program* and Convention Badge)

☐ Enclosed is $15 Registration Fee (including spouse) (*Program* and Convention Badges)

☐ Enclosed is $5 Student Registration Fee (16 years and older) (*Program* and Convention Badge)

☐ Enclosed is $5 for the *Program* only (To be mailed 1 December)

☐ Enclosed is $..... for tours

PLEASE PRINT OR TYPE

AAAS Member Yes ☐ No ☐

NAME: _____
(Last) (First) (Middle Initial)

MULTIPLE REGISTRATION: _____
(List student's full name. Attach list if space is insufficient.)

MAILING ADDRESS: _____
(For receipt of *Program*) (Street) (City/State) (Zip Code)

INSTITUTION OR
COMPANY AFFILIATION: _____

_____
(City) (State) (Zip Code)

FIELD OF INTEREST: _____

CONVENTION ADDRESS: _____

APPLICATION FOR HOTEL RESERVATIONS

Please print or type and mail to: **AAAS Housing, Dallas Convention Bureau, 1507 Pacific Avenue, Dallas, Texas 75201**

(Reservations received after 13 December cannot be assured.)

CHOICE OF HOTEL: First_____ Second_____ Third_____

ROOM: ☐ Single ☐ Double ☐ Twin ☐ Suite Preferred rate $_____

Number in party_____ sharing this room will be (list name and address of each person, including your own):

_____

_____

ARRIVAL: Date_____; _____AM, _____PM

DEPARTURE: Date_____; _____AM, _____PM

Be sure to list definite arrival and departure date and time. Hotel reservations will be held *only* until 6 PM unless otherwise specified.

NAME:_____
(Individual requesting reservation)

ADDRESS:_____
(Street) (City and State) (Zip Code)

Tours at the AAAS Annual Meeting

The AAAS is pleased to offer tours to institutions of particular scientific interest for registrants at the Association's annual meeting. Personally conducted tours arranged by officials of each institution will afford the visitor a unique opportunity to see special exhibits, displays, behind-the-scenes operations, and scientific activities of various kinds which are not usually seen by the general public. Attendance at each site is necessarily limited in order to give the visitor full opportunity to see and hear about work in progress. At some locations refreshments will be served by the host institution. Details on the special attractions at each site will be published in later issues of *Science*.

Chartered buses will provide round-trip transportation from the Statler-Hilton Hotel. Afternoon tours will return to the Statler-Hilton Hotel no later than 6 p.m. Ticket sales are limited to registrants. A fee of *$2.00 per person* is charged for each tour to cover transportation costs. Your ticket is your receipt and is required for transportation and admission. Tickets will be mailed with the *Program* and convention badge. Advance registration for tours will not be accepted after 29 November. Tickets for spaces unsold by 29 November will be on sale at the AAAS Tours desk in the registration area at the Statler-Hilton Hotel, starting 26 December.

Please use the form to register for tours. Indicate the number of tickets you wish to order for each tour and enclose payment of $2.00 for each ticket ordered.

Since attendance at each site is limited, early registration is recommended. Refund requests on tour tickets cannot be accepted after 18 December.

AAAS Tour Registration

Number of tickets — Price of tickets is $2.00 each

..... Texas Instruments, Inc., 27 December, 9:00 a.m.–noon
..... Ling-Temco-Vought, Inc., 27 December, 2:00–5:00 p.m.
..... Callier Hearing and Speech Center, 28 December, 10:00 a.m.–noon
..... Amon Carter Museum, Fort Worth, 28 December, 1:00–5:00 p.m.
..... Dallas Museum of Fine Arts, 29 December, 1:00–4:00 p.m.
..... Ling-Temco-Vought, Inc., 30 December, 9:00 a.m.–noon
..... Texas Instruments, Inc., 30 December, 2:00–5:00 p.m.
..... Southwest Center for Advanced Studies, 30 December, 2:00–5:00 p.m.

Total number of tickets ..... Total amount remitted for tours $.....

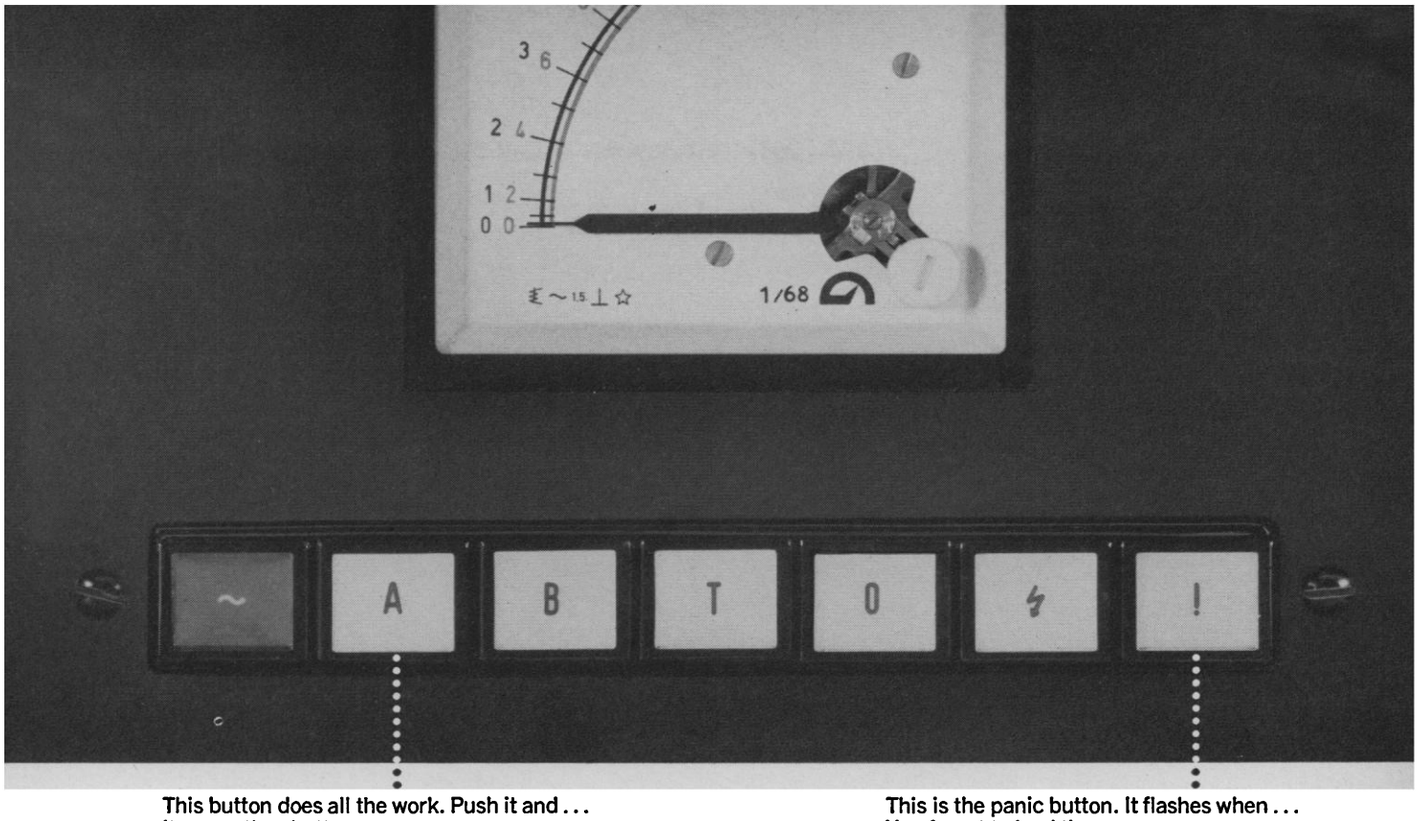
Please indicate on reverse side total amount remitted for tours.

The American Association for the Advancement of Science will hold its 1968 Annual Meeting in Dallas, Texas, 26–31 December. The Adolphus (1321 Commerce), Baker (1400 Commerce), Sheraton-Dallas (Southland Center), and Statler-Hilton (1914 Commerce) hotels will be used for housing. All the hotels will have Registration Centers.

HOTEL RATES* (Per Day)

HOTEL	SINGLE	DOUBLE	TWIN	SUITES†	PARKING
Adolphus	$10–14	$14–17	$15–18	$35–up	Free
Baker	11–17	14–20	16.50–20	32–75	Free
Sheraton-Dallas	13	18	18	42–61	$1.50
Statler-Hilton	13	18	18	36.50–76	Free

*All rooms are subject to a 3% city transient room tax. † Rates for suites, parlor and one- to three-bedroom. There is a charge of $4.00 for cots.



This button does all the work. Push it and . . .
It opens the shutter.
Exposes the film the proper length of time.
Closes the shutter.
Advances the film to the next frame.
Advances the frame counter.
Recocks the shutter ready for the next exposure.

This is the panic button. It flashes when . . .
You forgot to load the camera.
You've run out of film.
The film is torn.
You've reached the end of the roll.
You can't push button A while button ! is flashing.

Introducing the Photomicroscope II...

A tale of two buttons.

What the other buttons do is give you added versatility. But there are more important things to talk about here.

Such as the stability between camera and microscope only an integrated system can offer.

Such as exposure times from 1/100 sec. to hours, if need be.

Such as automatic exposure control for all films rated from 2½ to 8000 ASA.

Such as a system specifically designed to take optimum advantage of the latest high speed color films.

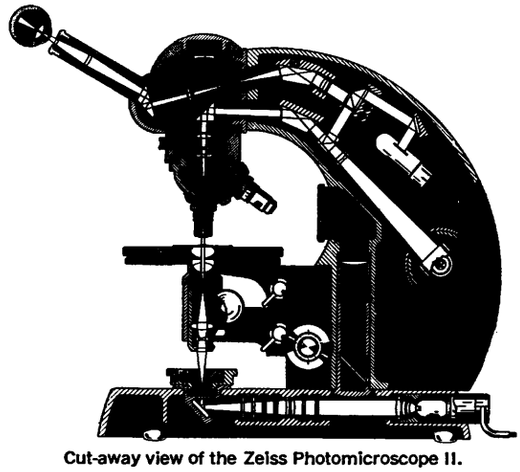
Such as increased sensitivity for selected-area "spot" readings—particularly helpful for dark-field and fluorescence work.

Such as a whole lot more.

The new ZEISS Photomicroscope II makes photomicrography literally a snap—as easy as using any quality 35mm automatic amateur camera. But it's as professional an instrument as you can get.

For complete information, including what the other buttons do, write Carl Zeiss, Inc., 444 Fifth Avenue, New York, N.Y. 10018.

Nationwide service.



Cut-away view of the Zeiss Photomicroscope II.

Circle No. 17 on Readers' Service Card

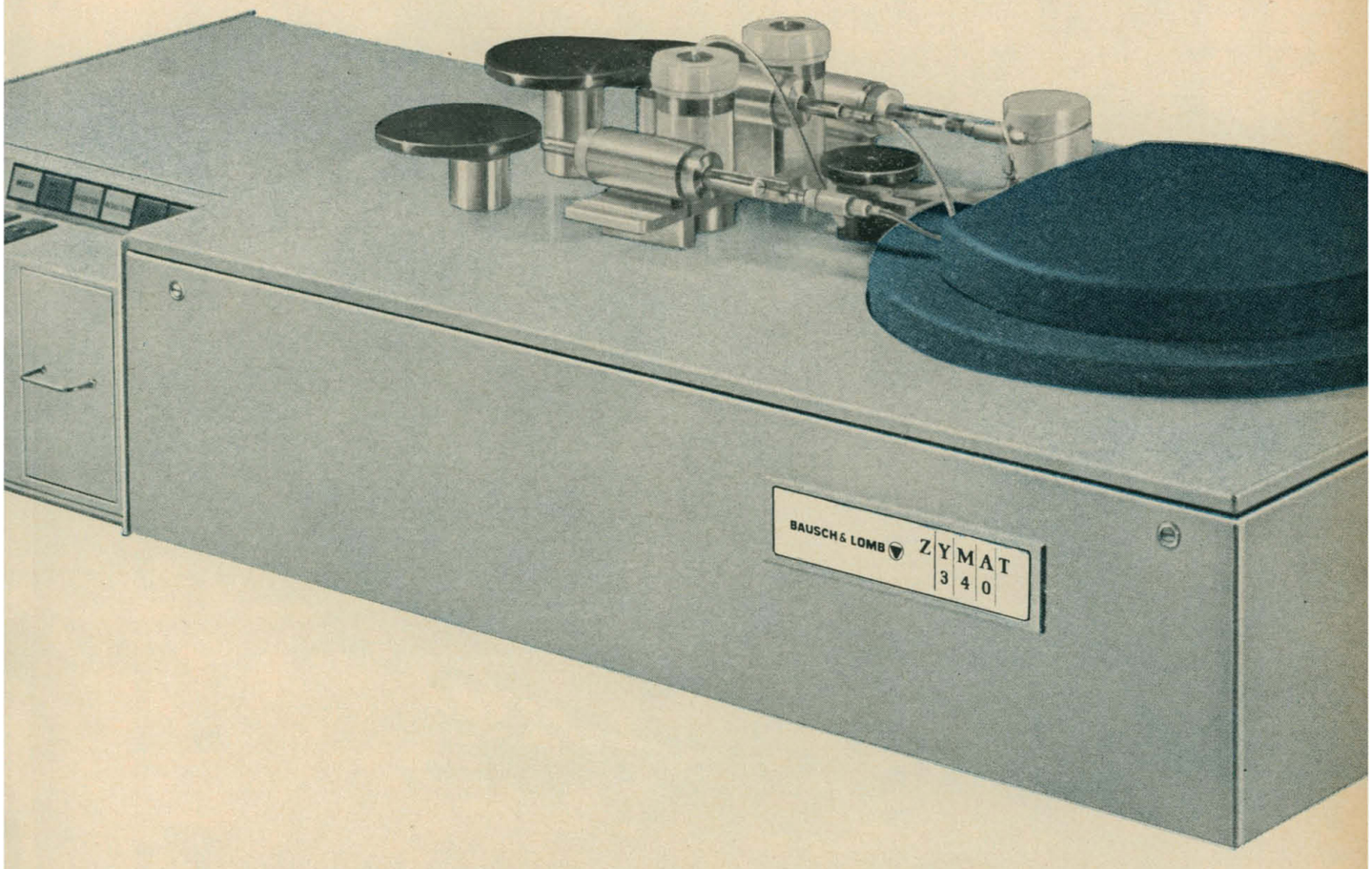
ZEISS

THE GREAT NAME IN OPTICS

CARL ZEISS

ATLANTA, BOSTON, CHICAGO, COLUMBUS, DENVER, HOUSTON, LOS ANGELES, PHILADELPHIA, ST. LOUIS, SAN FRANCISCO, SEATTLE, WASHINGTON, D. C.

do 47 GOT's in 108 minutes on the ZYMAT 340



. . . this unique, kinetic reaction instrument gives automatic, accurate determinations of LDH, GOT, GPT and others. Uses approved wet chemistry methods. Follows recommendations of the International Union of Biochemistry* for initial reaction rates, precise temperature control of ±.1° C over a range of 25-37° C and use of International Enzyme Units.

No more manual analysis drudgery. Zymat 340® does all the pipetting, measuring, mixing, stirring and heat controlling ordinarily done by lab technicians. Once you press the "Operate" button . . . it goes to work unattended. Handles up to 47 samples each load. Eliminates calculations, too. Highly precise answers are printed out directly in International Enzyme Units (U) with identifying serial numbers.

There's really nothing like Zymat 340. Get the full story by writing for Catalog 34-6016 or requesting a demonstration. Bausch & Lomb, 77411 Bausch Street, Rochester, New York 14602.

"ENZYME NOMENCLATURE" Recommendations 1964 of the International Union of Biochemistry

BAUSCH & LOMB
ANALYTICAL SYSTEMS DIVISION


"It's the most practical scope for us."
"It's quite convenient in both of our areas of interest. Specimen change is rapid and simple. And the low contamination rate is especially important."
Sumner Zacks, M.D., Pathologist, specializes in experimental pathology and neuropathology at a major Eastern teaching-affiliated hospital. He uses the electron microscope as a tool in experimental immunochemistry and histochemistry, and in studies of nerve and muscle morphology.
"We like the rapid pump-down too. It substantially increases production. And with the mechanical pump in the auxiliary cabinet instead of the console, operation is agreeably quiet and vibration is absent. The fast photographic system speeds up plate handling . . . the heated aperture is one of the better additions."
Features like these have made an EMU-4 electron microscope the logical choice of over 80 researchers. Its many other unique qualities can make it essential to your work too. Our brochure on the EMU-4 discusses them fully. Write RCA Scientific Instruments, Dept. A, Building 15-5, Camden, New Jersey 08102.
RCA

If the color on your film doesn't match the color of your specimen, it might as well be black and white.

You can't get accurate color unless your illumination matches the color balance of your film. There's a meter built into the Olympus Photomax that tells you when it does.

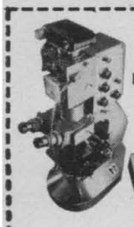
With any other photo-microscope, you have to shuffle a handful of filters, shoot some test rolls, keep accurate notes and pray a little before you know whether or not your color is right. With the Photomax, you know **before you shoot** whether your light's too red, too blue or right on the button—no matter what color film you're using.

And, since you can't get good color (or black-and-white, either) without accurate exposure, the Photomax automatically reads the light and sets your exposure. You don't have to read meters or adjust your shutter speed.

Even if you just shoot black-and-white, look into the Photomax. It costs a lot less than you think. And it might even start you shooting color.

Olympus Photomax. The only photo-microscope with a built-in color temperature regulator and meter.

Olympus Photomax



OLYMPUS CORPORATION OF AMERICA
PRECISION INSTRUMENT DIVISION
2 Nevada Drive (N.H.P.-P.O.)
Lake Success, New York 11040

Send information on ☐ The Olympus Photomax, ☐ Olympus research and medical microscopes. My applications include:

_____

_____

Name_____

Title_____

Organization_____

Address_____

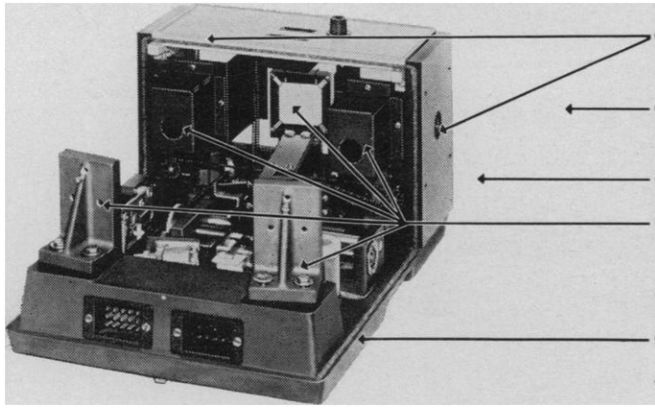
City_____

State_____ Zip_____

Circle No. 7 on Readers' Service Card

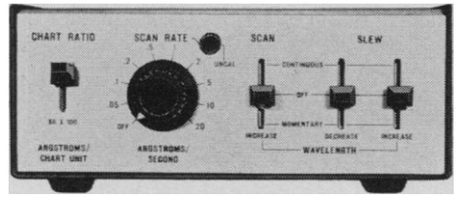
Circle No. 7 on Readers' Service Card

An $1195 Monochromator with these features is good news



- Continuously variable ganged slits: 5 to 2000 microns
- Modular versatility integrates the "700" into a series of spectrophotometers available soon
- In-line entrance and exit beams
- Optical excellence: better than 1 Angstrom resolution
- Wavelength: zero order to 10,000 Angstroms
- High Mechanical Stability with portability
- ± 1 Angstrom tracking accuracy

with Electronic Programmable Scanning it's great news!



The Heath/Malmstadt-Enke "700" Monochromator is operated by a remote control unit electrically connected to the instrument. All wavelength-scan and readout synchronization functions are programmed from the Control Unit.

ELECTRONIC DIGITAL SCANNING. The Control Unit uses Integrated Circuits and digital techniques to develop electronic pulses. The pulses control wavelength drive by means of a stepper motor within the Monochromator.

SCANNING RATES. This unique system permits a greater number of more accurate speeds than is possible by mechanical means. Nine basic scan rates are available, switch selected from 0.05 to 20 Angstroms/second; other scan rates are conveniently obtainable using an external signal. Since no complex gear system is used, all mechanical transmission problems and errors are eliminated and the cost of the instrument is considerably reduced.

PULSE TO PULSE READOUT SYNCHRONIZATION. The digital system assures synchronization of wavelength scan with any Heath EU-20 series chart recorder as these recorders use a similar pulse-driven motor.

This allows compression or expansion of the wavelength scale, yet maintains the precise relationship between the scan rate and the Angstrom/chart-division readout.

PROGRAMMABLE. Variable scanning may be programmed by simply connecting an external oscillator and turning a switch.

REMOTE CONTROL. The Monochromator requires only electrical connections to the Control Unit to perform in vacuum, radioactive, toxic, and other unusual environments while the control and recording are operated outside. No servos . . . no expensive complex mechanical links . . . the cost of remote controlling the Heath "700" is just the price of an extra length of cable.

FAST SLEWING. A separate motor allows quick bi-directional wavelength change at a rate of 5,400 Angstroms/second.

DIGITAL READOUT. Wavelength is read directly in Angstroms on a mechanical 5 digit-counter with a tracking accuracy of ± 1 Angstrom. Scale divisions of 0.2 Angstroms permits readability to 0.1 Angstroms.

OPTIMIZED DESIGN. The Heath/Malmstadt-Enke "700" combines high performance, versatility, stability and unique features in a modern design at a price of only $1195.

NEW HEATH SCIENTIFIC INSTRUMENTATION CATALOG

Write on your school or company letterhead for your free copy of this new detailed catalog. Contains complete information on the Monochromator plus other instruments: Recorders, pH Meters, Digital and Test Equipment. Many schematics, full specifications.

HEATH

HEATH COMPANY, DEPT. 560-19
Benton Harbor, Michigan 49022

☐ Please send free Heath Instrumentation catalog.
☐ Please send free Heath full-line catalog.

Name_____

Company_____

Address_____

City_____ State_____ Zip_____

Prices & specifications subject to change without notice. EK-259

variable viewing time 5 cm/μs stored writing speed

split-screen displays

all in the Tektronix Type 549 Storage Oscilloscope

Waveform display showing train of pulses. Upper screen in the stored mode shows three pulses with falltime of the pulse trailing edge showing system deficiency. Lower screen in conventional display mode shows the same pulse train with corrections applied to provide a well formed pulse shape. Pulse width shown is 8 μs with risetime of 0.1 μs. Vertical deflection factor is 0.5 volts/cm. Horizontal deflection factor is 10 μs/cm. Repetitive sweep used for both displays.

The Type 549 allows up to one hour of continuous visual storage, giving you ample time in most applications to measure and analyze stored waveforms. Stored displays can be erased in less than one-quarter of a second.

Split-screen displays

Unique with Tektronix storage oscilloscopes, split-screen displays bring you many advantages in waveform-comparison applications. You can use either half of the 6 cm by 10 cm display area for stored displays, the other half for nonstored displays, with independent control of each half. You can also use the entire screen for either type of display.

Variable viewing time

Variable viewing time — an outstanding feature of the Type 549 — allows you to automatically store displays, view them for a selected time, then automatically erase them on either or both halves of the screen. Two modes of operation are possible. In the After-Sweep Automatic Erase Mode, the selectable viewing time of 0.5 s to 5 s begins at the end of each complete sweep. After the viewing time, the display is automatically erased and the cycle begins again when the next sweep is triggered by a signal.

In the Periodic Automatic Erase Mode, the sequence of storing, viewing time and erasure is continuous and independent of the sweep or signal. In this mode, the viewing time can also be varied from 0.5 s to 5 s.

There is no degradation of stored traces during the selected viewing time, in either mode, and you can retain or erase displays manually whenever desired.

Bistable storage advantages

With bistable storage oscilloscopes, such as the Type 564 and Type 549, the contrast ratio and brightness of stored displays are constant and independent of the viewing time, writing and sweep speeds, or signal repetition rates. This also simplifies waveform photography. Once initial camera settings are made for photographs of one stored display, no further adjustments are needed for photographs of subsequent stored displays.

Tektronix bistable storage cathode ray tubes are not inherently susceptible to burn-damage and require only the ordinary precautions taken in operating conventional oscilloscopes.

Plug-in unit adaptability

Vertical deflection characteristics of the Type 549 are extremely flexible through use of any of the Tektronix letter- or 1-series plug-in units. These include multi-trace, differential, sampling, and spectrum analyzer units. Depending upon the plug-in being used, bandwidth of nonstored displays extends from DC to 30 MHz.

Among other features of the Type 549 are 5 cm/μs stored writing speed, calibrated sweep delay from 1 μs to 10 s, sweep speeds to 20 ns/cm, amplitude calibrator from 0.2 mV to 100 V and a locate zone for easy positioning of stored traces.

Type 549, without plug-in units $2475

Type 1A1 Dual-Trace Plug-In Unit . . . . . $ 625

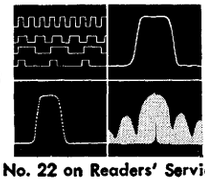
DC to 30 MHz at 50 mV/cm; DC to 23 MHz at 5 mV/cm.
2 Hz to 14 MHz at 500 μV/cm, single-channel.

U.S. Sales Prices, FOB Beaverton, Oregon

For a demonstration, contact your nearby Tektronix field engineer or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.

TEKTRONIX

Multi-trace, differential, sampling and spectrum analysis



. . . in all Tektronix 530-540-550-series plug-in oscilloscopes

Since the introduction of double-beam spectrophotometers capable of generating either a linear (% transmittance) or a logarithmic (absorbance) output, an interesting and useful new way of recording that output has evolved.

It is now possible to record the *logarithm* of absorbance as a function of wavelength. With the proper external recorder, of course.

But before we detail for you some of the advantages of log-absorbance recording, a few fundamentals.

We discuss here some of the advantages of recording the logarithm of absorbance...

To begin, the term absorbance (A) is defined thus:

$$A = ecl$$

where c is the concentration of sample in the absorption cell,

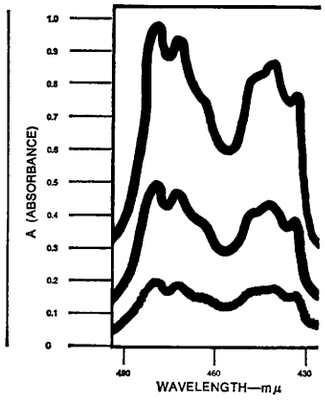
l is the *light-path* (the inside distance between front and back windows of the cell), and

e is a numerical coefficient.

The fact is that e is a characteristic of each compound or substance. It is dependent on temperature and wavelength, but independent of either the concentration, c, or the light-path length, l.

If we plot A versus wavelength for three samples of the same substance in concentrations in the ratio 1:2:5, we get the curves shown in figure 1. There is, unhappily, no basic correspondence among them.

FIGURE 1



But watch what happens with our original equation,

$$A = ecl$$

when we take the logarithm of both sides,

$$\log A = \log ecl$$

Since the logarithm of a product is the sum of the logarithms of its factors,

$$\log A = \log e + \log cl$$

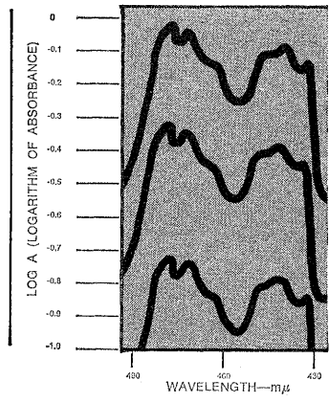
such as for "fingerprinting" a compound...

Now when we plot *log A* versus wavelength (figure 2), we immediately see our three 1:2:5 samples are represented by curves that have identical shapes. Each curve is that of *log e* displaced along the *log A* axis by the amount *log cl*. And each curve is separated by intervals that correspond to the 1:2:5 ratio of *cl*.

Here's where the "fingerprinting" of compounds comes in. Reference files of *log A* recordings facilitate the identification of unknown compounds by making it easy to compare their *log A* curves to those already on file. Large files of this sort are used in organic synthesis.

Now, a new topic: *log A* recording is also a valuable technique in studies of the kinetics of first-order reactions.

FIGURE 2



For proof of this statement, we resort once again to a basic equation:

$$-\frac{dc}{dt} = kc$$

where $-\frac{dc}{dt}$ is the rate at which the concentration is decreasing with time.

k is the velocity or rate constant, and

c is the concentration

A few manipulations of this basic equation yield:

$$t = \left[\frac{2.303}{k} \log c\right] - \left[\frac{2.303}{k} \log (c\text{-}x)\right]$$

Wherein we note that the first term in brackets is a constant and, therefore, the reaction time, t, is directly proportional to the second bracketed term, $\log (c\text{-}x)/k$.

Since $(c\text{-}x)$ is the concentration at time t, it will be proportional to the absorbance, A. And $\log (c\text{-}x)$ will likewise be proportional to *log A*.

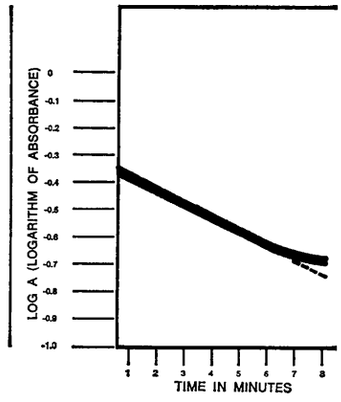
and for quickly determining reaction rates...

As long as the reaction is first-order, both *log (c-x)* and *log A* will be linear with time. So when we plot *log A* versus time at a fixed wavelength for a first-order reaction of a dye fading, we get the curve shown in figure 3.

The linearity of the curve in figure 3, in itself, tells us that this is a first-order equation. And where the linear section of the curve terminates (at the right of the curve) indicates a departure from strict first-order reaction. Finally, the rate constant, k, can be determined from the slope of the linear section.

These applications—for fingerprinting a compound and for studying the kinetics of first-order reactions—are but two to which *log A* recording is eminently suited. Other applications include the precise specification of color and the measurements of small differences in color.

FIGURE 3



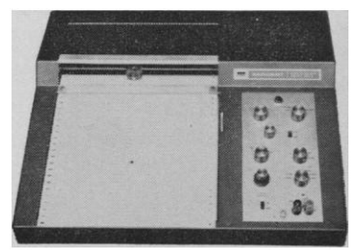
In all cases, this type of log recording requires an advanced, accurate, versatile recorder. The Sargent SRLG Recorder is just that. It uses precision, non-linear *gears* for accuracy and fidelity; these gears are much superior to electrical circuit approximations. Amplifier gain is adjusted *automatically* at all points in the log scale. There's also a switch for inactivating the zero adjustment and automatically setting the voltage-divider zero-point. Conformance of the logarithmic scale to the theoretical function is ±0.003 at any point.

But the SRLG is a *linear-log* recorder. (You change the mode of operation by simply changing the gears.)

Its accuracy on the linear scale is ±0.25% of full span and its reproducibility is ±0.1% of full span.

and we, of course, also recommend the ideal recorder for the task: our own SRLG.

The SRLG Linear-Log Recorder, like all Sargent recorders, is true potentiometric in its basic (millivolt) ranges, with no voltage dividers to load the circuit. Its full-scale pen response is less than 1 second. There are seven switch-selected, calibrated spans and three switch-selected chart speeds. Plus improved input filtering and circuit guarding to eliminate A.C. components of the input signal. All circuitry is solid-state. And batteries have been replaced by zener-diode regulation of all critical voltages.

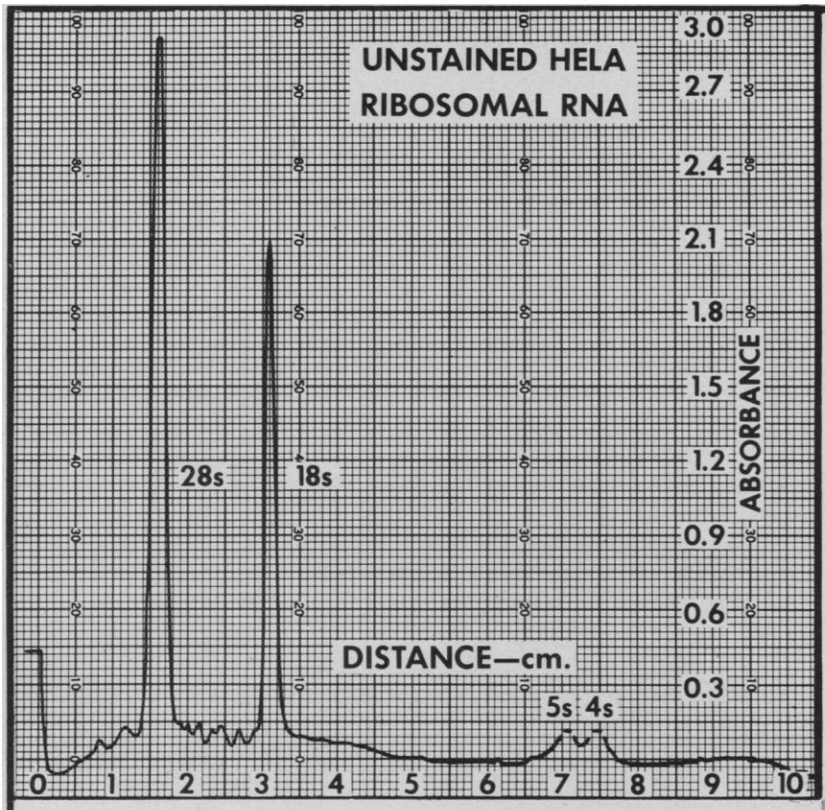


For additional information, including complete specifications and prices, please call or write us. 8-224

SARGENT-WELCH

Scientific instruments, apparatus, chemicals.
Sargent-Welch Scientific Company
4647 Foster Ave., Chicago, Ill. 60630

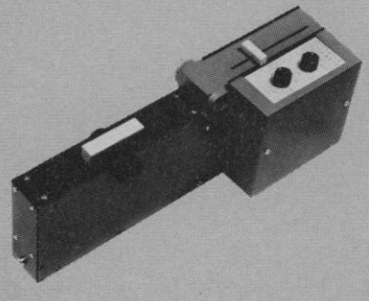
Chicago/Anaheim, Calif./Birmingham
Cincinnati/Cleveland/Dallas/Denver
Detroit/Springfield, N.J./Toronto, Canada



UNSTAINED GEL SCANNING

WITH THE

MODEL 2410 LINEAR TRANSPORT



Separation of ribosomal RNA by gel electrophoresis has made a powerful technique available.[1,2] The development of the Model 2410 Linear Transport permits you to scan these gels in the ultraviolet directly. You get increased accuracy with high resolution. The time consuming staining process is eliminated.

Unstained and stained materials may now be analyzed, as both ultraviolet and visible energy can be used with the Gilford Model 2410 Linear Transport. With the Model 2410 you will be able to handle materials such as polyacrylamide gel cylinders and slabs, cellulose acetate membranes and photographic emulsions.

All Gilford Spectrophotometers and most quality monochromators are readily adapted to use the Model 2410. To find out how inexpensively and easily this device can be adapted to your present system, mail the attached coupon or phone 216/774-1041 *today*.

1. Richards, E. G., Coll, J. A., and Gratzer, W. B., "Disc Electrophoresis of Ribonucleic Acid in Polyacrilamide Gels." Anal. Biochem. *12,* 452-471, *1965.*

2. Leoning, W. E., "The Fractionation of High Molecular Weight Ribonucleic Acid by Polyacrylamide Gel Electrophoreses." Biochem. J. *102,* 251, *1967.*

Gilford Instrument Laboratories, Inc., Oberlin, Ohio 44074

Gentlemen: Please send us full information on the Model 2410 Linear Transport.

Name _____ Title _____

Business or Institution _____

Address _____ S-1118

City _____ State _____ Zip _____

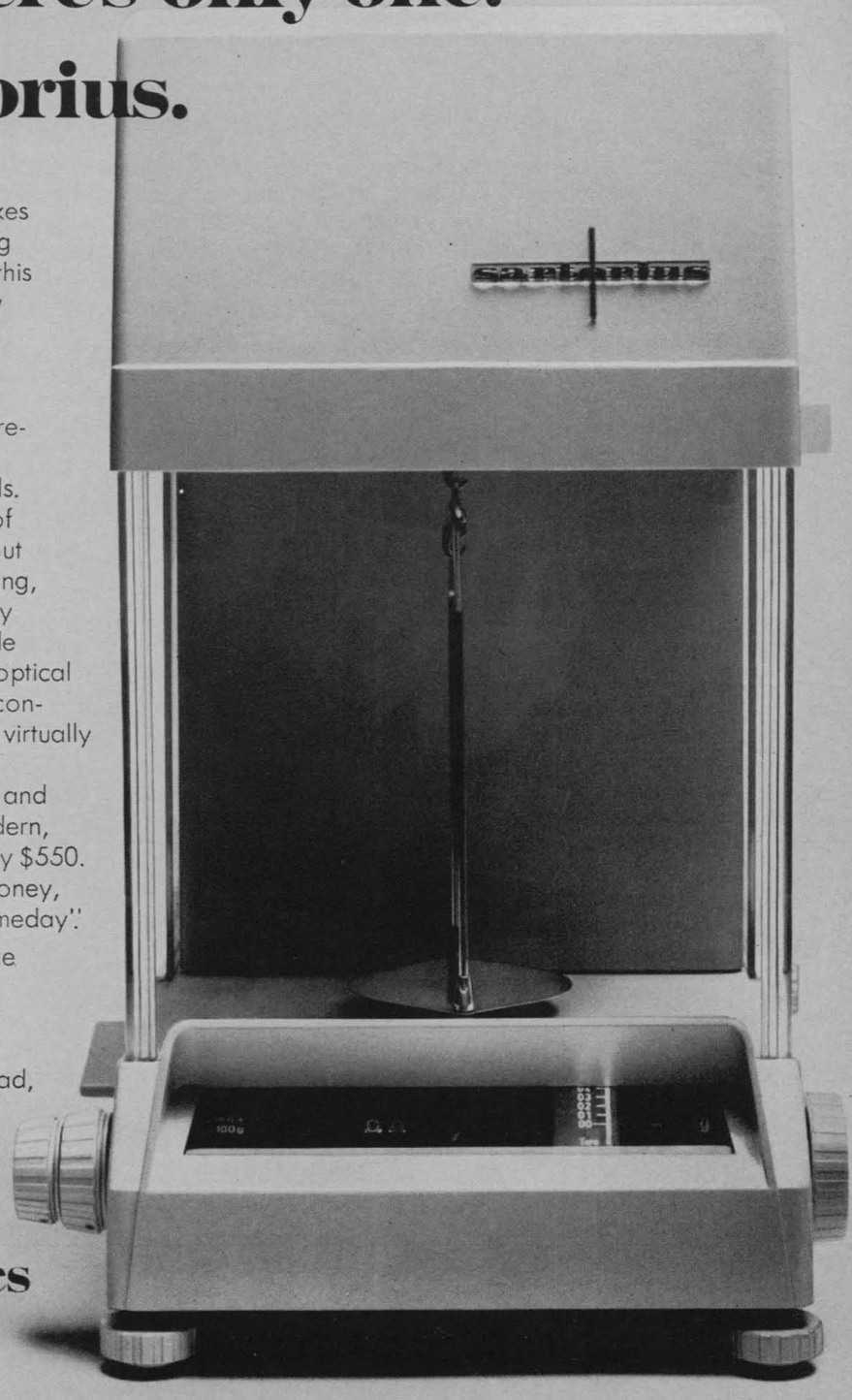
gilford®

Circle No. 14 on Readers' Service Card

Circle No. 12 on Readers' Service Card →

Someday, there may be other balances with automatic pre-weighing for as low as $550. Today, there's only one.

The Sartorius.



We're gratified to see other makes of laboratory balances finally offering automatic pre-weighing. We've had this important feature for years. Someday perhaps, they'll also be able to match us in price.

Meanwhile, our Model 2743 laboratory balance with automatic pre-weighing costs only $550, hundreds of dollars less than competitive models.

In addition to the convenience of obtaining instant coarse weight without time consuming "trial and error" dialing, the Sartorius 2743 also provides many other important features. These include all-digital read-out to 0.1 mg., 1 gm. optical range, readily accessible table-level controls, and a 100 gm. capacity to meet virtually all analytical weighing requirements.

The Sartorius 2743 offers all this and automatic pre-weighing too, in a modern, functionally designed balance for only $550.

That's a lot of balance for the money, and you can get it right now, not "someday".

Comparing prices? Our 28-page balance catalog may prove helpful. We'll gladly send you a copy.

Just write: Sartorius Division, Brinkmann Instruments, Cantiague Road, Westbury, N.Y. 11590

sartorius balances

THE PERPEX PUMP With peristaltic operation – but NO PULSATION

Continuous, precise delivery of a great variety of liquids and gases without pulsation even at the lowest speeds.

FEATURES:

six gears available:	Choose between 5 : 10 : 20 : 40 : 80 : 150 ml/h
excellent repeatability:	Choice of drive ensures accurate, repeatable pumping speeds
ease of maintenance:	At no point does gas or fluid come in direct contact with pump parts
corrosion resistant:	Quickly and easily disassembled when cleaning is required
minimal tube wear:	Patented roller system eliminates friction, gives long life to chemically resistant, mechanically weak silicon tubing

Ask for the new folder in the actual size of this remarkably compact pump.

LKB

LKB INSTRUMENTS INC. • 12221 PARKLAWN DRIVE • ROCKVILLE Md. 20852

HQ LKB-PRODUKTER AB STOCKHOLM, SWEDEN

INTERNATIONAL SUBSIDIARIES: LONDON, THE HAGUE, COPENHAGEN, VIENNA, STOCKHOLM

permanently increase the number of species.

While the Indo-West Pacific region serves as the primary evolutionary and distributional center for the tropical marine world, the Western Atlantic region may be said to rank second in importance. Its geographic area is larger, its habitat diversity is greater, and its fauna is considerably richer than each of the remaining two tropical regions (the Eastern Pacific and the Eastern Atlantic). In general, we know that species from a richer ecosystem will prove to be competitively superior to those from a poorer one. For this reason, it is expected that most of the Western Atlantic species would be able to dominate their Eastern Pacific relatives.

It seems reasonable to assume that a sea-level canal would eventually permit the migration of more than 6000 Western Atlantic species into the Eastern Pacific and also the movement of more than 4000 species in the opposite direction. For the tropical Eastern Pacific, it may be predicted that its fauna would be temporarily enriched but that the resulting competition would soon bring about a widespread extinction among the native species. The elimination of species would continue until the total number in the area returned to about its original level. There is little doubt that the tropical Western Atlantic fauna would suffer far less. With the exception of a few species that may be ecologically distinct, the level of competition would probably be such that the invaders would not be able to establish permanent colonies.

Let us *not* be concerned about preparation for a great biological experiment. The important question is: Should the sea-level canal project be undertaken at all? Are we prepared to assume the responsibility for the irrevocable destruction of several thousand unique species in the Eastern Pacific? Shall we, on the one hand, continue to expend public funds in an effort to save a few endangered species such as the whooping crane and the tule elk and, on the other hand, expend other public funds for a project that will result in the greatest extinction of species the world has ever seen? We must realize that the sea-level canal program poses a conservation problem of an entirely new order of magnitude.

As an alternative, I suggest either an improvement of the existing structure or the construction of a new over-

land canal that would still contain freshwater for most of its route. There seems to be no reason why we cannot have a canal that could accommodate ships of any size, yet still maintain the freshwater barrier that is so important.

JOHN C. BRIGGS
Department of Zoology,
University of South Florida,
Tampa 33620

What Makes a Leader?

In the discussion of "Relevance in testing" by W. W. Turnbull, Devaney (Letters, 23 Aug.) suggests, "Relevance should pertain to the 50-odd years *after* college, not to the 4 to 8 years *in* college." He reaches this conclusion from his observation that a cross section of American leaders reveals only a small percentage of "straight A" students.

The weakness in this argument is the necessary assumption that current American leaders are the best suited to the job of leadership. In an absolute sense, this weakness cannot be overcome since comparative experience will never be available. One can speculate in this direction, however, and might conclude that the decision as to what is relevant in testing requires a determination of ends and objectives. If leadership is involved in a consideration of relevance of testing, the criterion should be success in leading, not simply attainment of a position of leadership.

ROBERT M. CHUTE
Department of Biology,
Bates College, Lewiston, Maine 04240

Japanese View on Defoliation

In 1965, the U.S. Armed Forces in South Vietnam began "defoliation operations" which strip the jungle with gasoline and napalm bombs after spraying large quantities of herbicides. According to the official U.S. announcement, these herbicides, including 2,4-D, 2,4,5-T, picloram, and cacodylic acid, were sprayed over a total area of 965,000 acres (390,530 hectares) (*1*). In addition, the United States announced on 12 May that the budget for "defoliation operations" would be increased by 24.9 percent in fiscal year 1969 and that it planned to spray about

38,000 kiloliters of herbicides in Vietnam.

From the ecological point of view, we fear that such wide-scale application of herbicides will deal a deadly blow to tropical forest ecosystems and cause serious damage to human beings and property. Even the report by the Midwest Research Institute admits the danger that the large-scale destruction of the vegetation in the high temperature and humidity of tropical forests may cause rapid erosion of organic matter in the soil and may turn the forest areas with the richest biological productivity into semipermanent lateritic barrens. The report also expressed fear that precious wild animals including the douc langur will be exterminated by the spraying. Moreover, it is possible that these herbicides will either kill small animals and fish, which are the important protein source for the natives, or contaminate them with poisonous residues. We recognize that such methods which cause these dangers are also the means of conducting war.

As ecologists, we share a world responsibility to prevent the destruction of nature by the thoughtless action of humans. At the 15th general meeting of the Ecological Society of Japan held at Ueda City, 2 June 1968, we resolved to demand that the United States immediately stop the large-scale military use of herbicides and forest burning in Vietnam. We also hope that ecologists everywhere will support our stand and take action on it.

YOSIAKI ITÔ

Division of Entomology, National Institute of Agricultural Sciences, Nishigahara, Kita-Ku, Tokyo, Japan

(The above resolution was also signed by 121 members of the Ecological Society.)

Reference

1. *Assessment of Ecological Effects of Extensive or Repeated Use of Herbicides* (Midwest Research Institute, Kansas City, Mo., 1 Dec. 1967).

Mathematics: Pro Bono Publico

The Council of the American Mathematical Society at its meeting on 28 August asked me to forward the following comments to *Science*:

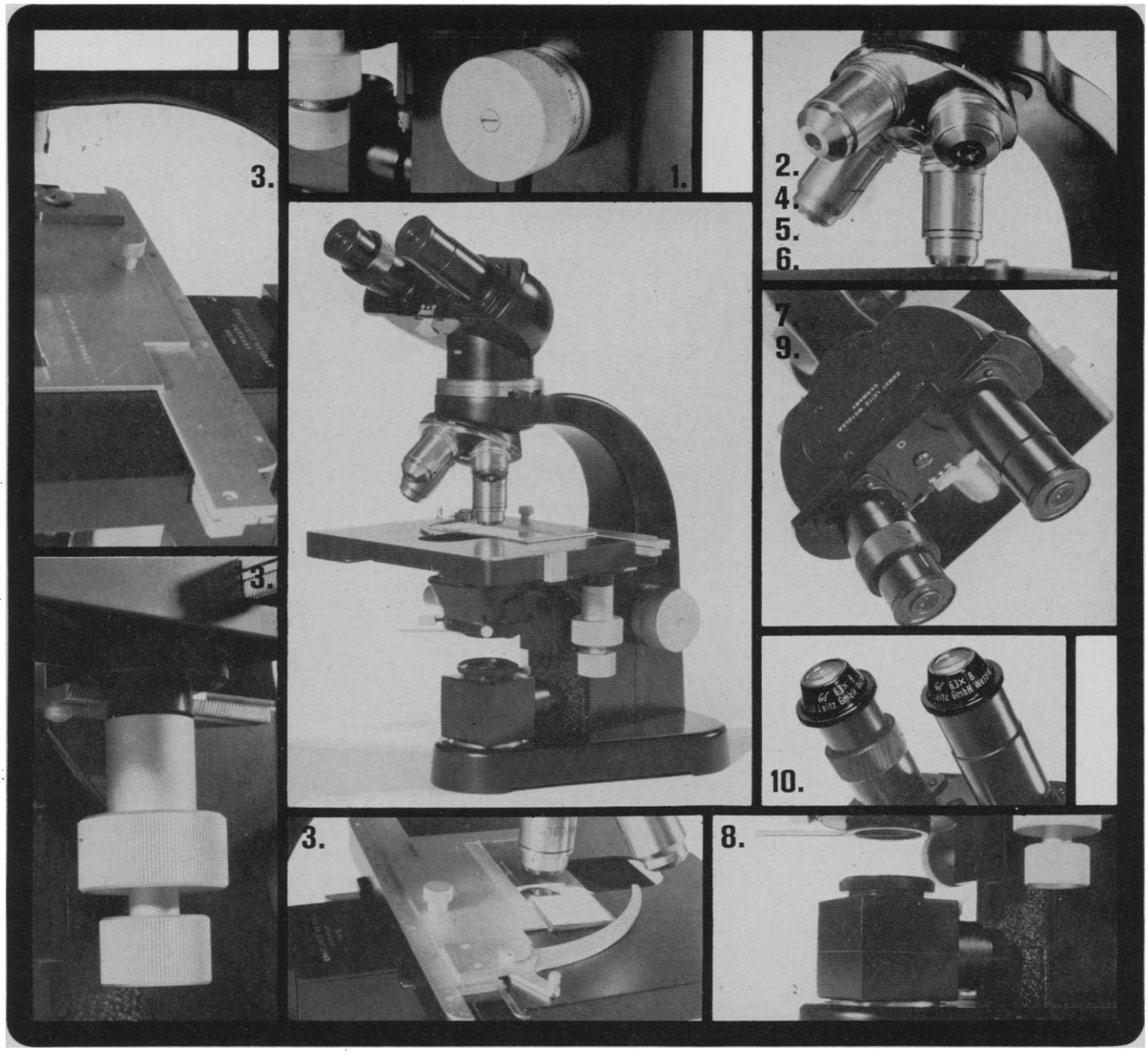
Many mathematicians were dismayed and shocked by the excerpts of the speech by Donald Hornig, the Presiden-

tial Science Adviser (19 July, p. 248). His . . . comments about mathematics and mathematicians are . . . uncalled for. Implicit in Hornig's remarks about vacations on the beaches of Rio or the Aegean Islands was a thinly veiled attack on Stephen Smale. The allegations against Smale were adequately disproved by Daniel S. Greenberg in his articles in *Science* on the Smale-NSF controversy (News and Comment, 15, 22, and 29 Sept.; 6 Oct.; and 3 Nov. 1967).

Hornig singles out mathematics in suggesting that the scientific community is one "which, insisting on its purity, will not deign to communicate with the public and justify itself. . . ." On the contrary, many branches of science have recently prepared extensive reports on their disciplines. In particular, the mathematical community, through the Committee on Support of Research in the Mathematical Sciences (COSRIMS), has just completed a comprehensive report, designed for the public and Congress, on the current problems of mathematical research and their relations to the national goals. Aware of the ever-increasing need and utility of mathematics in everyday life, this same community embarked on large programs (beginning with the "new math") to improve mathematical education in the elementary and secondary schools. Surely Dr. Hornig is aware of these, and other, steps to communicate with the public.

Government support has been a vital element in the rapid development of American science. Support by the NSF and other government agencies has in 10 years tripled the annual number of Ph.D.'s in mathematics. These young mathematicians have made a variety of profound and original discoveries ranging from those with direct practical applications (such as the unexpected use of logic in computing machines) to theoretical results which have attracted international acclaim (such as the work of Smale in dynamics and of Cohen in foundations). The future does involve a financial crisis which may have tragic consequences for the next generation of scientists and mathematicians. Hornig's statement is hardly a responsible contribution to the public discussion of this crisis or to the closing of the gap between working scientists and those in government concerned with science.

CHARLES B. MORREY, JR.
American Mathematical Society,
321 South Main Street,
Providence, Rhode Island 02904



CHOOSE A LEITZ SM FOR YOUR MEDICAL STUDIES

Only the finest professional instrument will do for those important, searching, pre-clinical years. The only real "bargain" in medical microscopy is quality. The LEITZ SM is an investment, where every dollar buys features designed to deliver unfailingly reliable performance. Before you purchase any microscope, examine the LEITZ SM and compare these features:

1. Single-knob focusing—combines fine and coarse for faster, more convenient operation; never needs lubrication.

2. Incomparable LEITZ optics—note sharp resolution throughout the entire range of magnification.

3. Graduated mechanical stage—conveniently placed controls, either standard or coaxial—accepts all slide sizes, permits instant location of any specific field.

4. Spring-loaded objective mounts—a protective feature—slide and high-powered lenses are not easily damaged.

5. Anti-reflection coating—tubes, optics and condensers are coated to increase light transmission and reduce flare.

6. Extra-wide range of magnification—35X to 1250X.

7. Monocular, binocular or trinocular tubes—360° rotatable—one-step interchange and lock-in.

8. Built-in low-voltage illumination—variable, high-intensity light source.

9. Periplanatic, wide-field eyepieces—color correcting, compensating to match the objectives.

10. Optional high-eyepoint eyepieces for wearers of glasses.

Leitz

E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK, N.Y. 10016
Distributors of the world-famous products of Ernst Leitz G.m.b.H., Wetzlar, Germany—Ernst Leitz Canada Ltd.
LEICA AND LEICINA CAMERAS · LENSES · PROJECTORS · MICROSCOPES
62866

1 November 1968, Volume 162, Number 3853

SCIENCE

Broadening the Participation of the Colleges

What can the colleges and universities do to improve their public image and their public support?

One thing they can do is to participate more fully and continuously as citizens and neighbors in community and political life. The public that supports us as teachers needs to see that we are not strange and doubtful creatures living in another world, but friends with mutual concerns. Yet how many of us take part regularly in neighborhood or club activities outside of our college in-group? How many of us have taken on a neighbor's son, or daughter, as an intellectual protégé, sharing with him our interesting books and models and intellectual excitements? Adult teachers and scientists from 25 to 75 far outnumber the youngsters between 8 and 18 who might follow in their footsteps. Each one teach one. It would be a chain reaction.

And how many staff members and students work with local political organizations between elections, or run for city council or the board of education, or are even careful not to lose their vote because of moving? Many students who will become alumni and contributors might find they have a considerable long-run interest in college-community problems.

In fact, the political importance of the colleges and universities is just beginning to be realized. There are now 2400 of them, and they constitute the major industry of a thousand cities and towns. Their millions of students have been shown to be the key factors in our rapid technological and economic growth, and the income of the colleges is now beginning to surpass net farm income, although it is only a small fraction of their addition to the gross national product. Since 1954, over half of our high school graduates have been going on to college, and in any given year some 10 million voting adults are helping to support children in college. Most of these families spend voluntarily on education more than they spend on cars or on defense taxes—even though they have no full-color magazine ads or TV shows to dramatize their investment. In the colleges themselves, there are now some 2 million students over 21 who could vote, and another 2 million or so voters on the faculty and supporting staffs, with their families, probably adding up, again, to a population larger than the dwindling farm population.

These college communities, of course, are not unanimous about anything, even education—and no one would want them to be. Nevertheless, they represent our most concentrated sources of knowledge in every field, as well as a commitment to an open-minded search for new knowledge and new solutions. Today their search for new ways of dealing with our crisis problems may be the only thing that can save us. And politicians are now finding that they need to listen to the college groups, with their pressure for better solutions, just as they listen, say, to the farm lobby or the military-industrial lobby. If the voices of education ever begin to have as much influence on state and national government, and on policy decisions, as the other voices, it will be a new day. Perhaps it is not as far off as we have thought.—JOHN R. PLATT, *University of Michigan, Ann Arbor*

Our B-20. Give it all you've got.

Feed it the daily routine. Or challenge it with special assignments. Either way, this high-speed refrigerated centrifuge is equal to the job. It's the strong, silent type that takes all the punishment you can dish out. Yet it's so sophisticated it handles B-14, B-15, and Z-15 zonal rotors. Swings 4 x 250ml in a rugged bucket head. Offers belt-driven flexible drive designed to loaf along at 46,300g. And gives you automatic programming, precise temperature control, Turbo-Cover and feedback speed control. In short, an advanced performer that keeps going when the going gets tough. Write for Bulletin B-20. Or call your IEC distributor.

IEC INTERNATIONAL EQUIPMENT CO.

300 SECOND AVENUE • NEEDHAM HEIGHTS, MASSACHUSETTS 02194

radio-frequency ion mass spectrometer after two Aerobee rocket flights that traversed sporadic-E layers above White Sands, New Mexico, were presented. On the ascent during the first flight a minimum in the ion distribution, a factor of 5 below the ambient density in the region, was observed between two secondary maxima. Ion mass spectra taken when the rocket was within the Es layers showed it to be composed of atomic metallic ions of Na, Mg, Si, Ca, and Fe. Magnesium was the dominant ion detected in the mass spectra. Neither nitric oxide nor molecular oxygen ions were observed within the Es layer. The second flight recorded a weak Es layer. As before, Mg, Ca, and Fe ions were observed within the Es layer. Iron and magnesium ions were observed in and below but not above this layer. Nitric oxide ions were detected in the peak density region of this weak layer.

Metallic ions in the D and E regions were also detected by cryogenically pumped, quadrupole ion mass spectrometers aboard six rockets; they were launched during and after the 1965 Leonid meteor shower, at sunrise and sunset from Eglin AFB, and during the 1966 solar eclipse in Brazil. Every rocket flight that observed Es events detected metallic ions within the Es layer and, depending on the strength of the layer, observed a decrease in the molecular ion density. However, the converse is not true that the presence of metallic ions does not necessarily indicate an Es layer. Based on these rocket observations, the roles of charge transfer between the molecular ions and metallic atoms and of vertical neutral wind convergence in the formation and maintenance of metallic ion layers were discussed, but the group did not arrive at a definitive conclusion.

Atomic recombination processes which can liberate free metal atoms from solid surfaces of certain metallic compounds may play a role in liberating metallic atoms from dust layers in the ionosphere. Experiments involving the bombardment of solid films of Na_2SO_4 and other sodium salt by-products from a nitrogen discharge suggest that atomic or molecular excited species in the atmosphere may fulfill this role.

Recently available reaction rate measurements on atmospheric metal ion and metal oxide ion reactions indicate that chemical ion (and therefore electron) loss is not significant for the metallic ion sporadic-E layers in the

100-km region and above. It was also pointed out that some early theoretical treatments of meteor trail deionization which invoked electron attachment are now obsolete due to the subsequent experimental discovery and rate constant measurements of associative detachment processes, particularly for $O_2^- + O \rightarrow O_3 + e$. The associative detachment at 80 km is several orders of magnitude faster than the electron attachment. Three-body metal ion association, followed by electron recombination might, however, be important in meteor trail deionization in the ~ 80-km region.

Data from a new meteor-wind observation system in France, which provides returns from several hundred meteors per hour, with data at 2-km altitude spacing between 80- and 110-km altitude from each meteor, have been processed by power spectral analysis to assess prevailing and tidal components, and to anaylze the residual nontidal contributions. The major component is semidiurnal, with vertical wavelength greater than 100 km and an amplitude of 10 to 70 m/s. A downward phase velocity of the order of 10 km/hour is largely due to the semidiurnal component.

A statistical analysis of 70 midlatitude vapor trails between 90 and 150 km showed not only a consistent zonal flow to the east below 100-km altitude, but also mean values of total velocity of 50 to 70 m/s and mean shears of 0.02 to 0.004 m/s/m, varying with altitude. The altitude variation of velocity and shear can be explained by energy injection from below and viscous dissipation within the region of a simple helical profile, rotating in 12 hours and increasing in wavelength from 20 km at 90-km altitude to 100 km at 150-km altitude.

Simultaneous rocket observations of sporadic-E electron-ion density and wind profiles were successful in relating sporadic-E layering above 105 km to wind-shear structure. Below this height, the terminal deposition zone predicted by the "corkscrew" mechanism complicates the simple association of ion layers with shears.

Those areas of wind measurements in which adequate data are not available at this time include vertical winds, daytime winds above 110 km (the upper limits of the meteor-wind technique), and horizontally spaced winds to permit convergence estimates. Incoherent backscatter studies and drift reflections from ground sites may eventually largely displace rocket studies for statistically large sample collections.

On the whole, there is substantial agreement about the processes which lead to the production of temperate-zone sporadic E—that is, the layers are produced by the wind-shear mechanism and are composed mostly of long-lived metallic ions except possibly at higher altitudes when molecular ions can be involved. Most of the discussion therefore was concerned with refinements of the wind-shear theory and with the special problems associated with the production and loss of metallic ions.

Calculations of the loss rate of metallic ions into the D region due to the "corkscrew" mechanism showed that difficulties arise unless the sweeping effect is inhibited by the presence of standing waves. The main problem is that the density of metallic atoms present in the E region must be sufficient to allow ions to be produced at a rate comparable to the loss due to the "corkscrew" mechanism, and also be highly variable in order to account for the nighttime variations of fbEs.

The "corkscrew" mechanism shows that Es layers formed of long-lived ions can be expected to follow nodes in the effective neutral wind profile down to altitudes less than about 100 km. At lower altitudes the process fails quite suddenly at the point where the vertical ionization drift velocity and the descending phase velocity of the neutral wind profile become comparable.

It must be remembered that molecular ions can also play a role at higher altitudes ($\geq$ 120 km) where the vertical drift speeds of the ions can be quite large. Numerical solutions for the formation (by the wind-shear mechanism) of Es layers comprised of molecular ions showed that a uniform electric polarization field affects the rate of growth, movement, equilibrium, position, and maximum density. Particular attention was paid to the effects that might be produced by abrupt changes in the neutral gas, that is, gravity "shocks," and by electric polarization fields. Kinks in the ionization drift-velocity profile could lead to the flat-topped Es layers sometimes observed. The characteristic variations of Es occurrence according to season, time of day, and geomagnetic activity might somehow be accounted for by variations in the electric polarization field.

Concerning the effects of gravity waves, the vertical motion and the associated variations in density and temperature of the neutral gas can produce weak Es layers due to the resulting changes in the ionization production and

loss rates, as well as by the redistribution processes usually considered in the wind-shear theory. The electron temperature in the E region and in Es layers can be noticeably affected by variations of the neutral temperature associated with gravity waves.

Papers on the formation of small-scale irregularities of ionization by the so-called "crossed-field" instability produced considerable argument, mainly concerning the appropriate boundary conditions and the shape of the initial perturbation to be used in the analysis. One linearized treatment of the problem appeared to show that the configuration adopted was quite stable, whereas a non-linear treatment using different initial conditions showed the explosive development of plasma turbulence after some tens of seconds. A considerable amount of further study of this problem is obviously required.

Metallic ions seem to play an important role in Es at heights lower than about 110 km, but molecular ions are important for Es at higher levels. Since the electric polarization fields play an important role in the rate of Es growth, position, and maximum density, a future investigation of this field together with a detailed theoretical attack on the field's effect on Es is very desirable. Rocket observations should be conducted simultaneously at close horizontal spacing with more accurate height resolution. In addition to measurements of ionization density and composition, it is necessary to measure other parameters such as ion temperature, neutral density, and magnetic field in the vicinity of Es blobs. Upper atmosphere wind observations during the daytime and measurements of the vertical wind are required. The character of tidal oscillations should also be examined.

In summary, the very complex phenomenon of Es needs to be attacked with a combination of all possible methods in a well-organized form, particularly with better coordination of rocket and ground-based experiments and with cooperation between different groups and disciplines.

The proceedings of the seminar were distributed in October 1968. Those who wish to obtain a copy are advised to contact Mrs. Mary Landers, ESSA, R60, Boulder, Colorado 80302.

S. MATSUSHITA
E. K. SMITH
National Center for Atmospheric Research and *Environmental Science Services Administration, Boulder, Colorado 80302*

Calendar of Events

National Meetings

November

11–15. Society of the **Plastics Industry**, Inc., Chicago, Ill. (The Society, 250 Park Ave., New York 10017)

11–15. American College of **Preventive Medicine**, Detroit, Mich. (E. A. Piszcek, 6410 N. Leona Ave., Chicago, Ill. 60646)

11–15. American **Public Health** Assoc., 96th, Detroit, Mich. (Executive Director, 1790 Broadway, New York, N.Y.)

13–16. National Easter Seal Soc. for **Crippled Children and Adults**, Boston, Mass. (Natl. Easter Seal Soc., 2023 W. Ogden Ave., Chicago, Ill. 60612)

15–16. American **Psychiatric** Assoc., Chicago, Ill. (L. Rudy, Illinois Psychiatric Inst., 1601 W. Taylor St., Chicago 60612)

17–20. Academy of **Pharmaceutical** Sciences, 5th, Washington, D.C. (S. W. Goldstein, 2215 Constitution Ave., NW, Washington, D.C. 20037)

18–20. Institute of **Electrical and Electronics Engineers**, 7th, Cocoa Beach, Fla. (L. E. Williams Aerospace Corp., P.O. Box 4007, Patrick Air Force Base, Fla. 32925)

18–20. American **Petroleum** Inst., Chicago, Ill. (Secretary, Program Commission, 1271 Avenue of the Americas, New York 10020)

18–21. Symposium on **Basic Mechanisms of the Epilepsies**, Colorado Springs, Colo. (J. K. Penry, Section on Epilepsy, Room 8A-03, Bldg. 31, National Inst. of Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Md. 20014)

18–21. Conference on **Engineering in Medicine and Biology**, Houston, Tex. (W. T. Maloney, Suite 620, 6 Beacon St., Boston, Mass. 02108)

18–21. Conference on **Magnetism and Magnetic Materials**, 14th, New York, N.Y. (D. T. Teaney, IBM Thomas J. Watson Research Center, Box 218, Yorktown Heights, N.Y. 10598)

18–22. American **Water Resources** Conf., 4th, New York, N.Y. (P. Cohen, U.S. Geological Survey, 1505 Kellum Place, Mineola, N.Y. 11501)

19. **Air Pollution Control**, Columbia, Mo. (Extension Div., Whitten Hall, Univ. of Missouri, Columbia)

19–20. Council on **Arteriosclerosis** of the American Heart Assoc., Bal Harbour, Fla. (Dept. of Councils and International Program, American Heart Assoc. Natl. Office, 44 E. 23 St., New York 10010)

19–20. **Systems** Symp., 4th, Cleveland, Ohio. (P. Schneider, Systems Research Center, Case Western Reserve Univ., Cleveland)

19–21. **Photovoltaic Specialists** Conf., 7th, Pasadena, Calif. (R. E. Fischell, Applied Physics Lab., Johns Hopkins Univ., 8621 Georgia Ave., Silver Spring, Md. 20910)

19–22. **Acoustical** Soc. of America, Cleveland, Ohio. (The Society, 133 E. 45 St., New York 10017)

20–22. **Microelectronic Packaging and Interconnection** Conf., Palo Alto, Calif. (D. H. O'Neill, Soc. of Automotive Engineers, 485 Lexington Ave., New York 10017)

20–22. National Soc. for the **Prevention of Blindness**, Inc., New York, N.Y. (J. W. Ferree, 79 Madison Ave., New York 10016)

20–24. Society for **Clinical and Experimental Hypnosis**, 20th, Chicago, Ill. (The Society, 353 W. 57 St., New York 10019)

21–22. **Chemical Kinetics** Symp., Chapel Hill, N.C. (L. Pedersen, Dept. of Chemistry, Univ. of North Carolina, Chapel Hill 27514)

21–24. American **Anthropological** Assoc., Seattle, Wash. (Executive Secretary, The Association, 1530 P St., NW, Washington, D.C. 20005)

25–27. International Symp. on the **Metabolic Function of Vitamin A**, Cambridge, Mass. (G. Wolf, Room 56-235, Massachusetts Inst. of Technology, Cambridge 02139)

25–27. American **Physical** Soc., Miami, Fla. (Executive Secretary, 538 W. 120 St., New York 10027)

29–30. **Membrane Proteins** Symp., New York, N.Y. (J. Newkirk, New York Heart Assoc., 2 E. 64 St., New York 10021)

29–30. National Federation of Catholic **Physicians'** Guild, Miami Beach, Fla. (R. H. Herzog, 2825 N. Mayfair Rd., Milwaukee, Wis. 53222)

December

1. **Medical Aspects of Sports,** 10th, Miami Beach, Fla. (F. Hein, American Medical Assoc., Dept. of Health Education, 535 N. Dearborn St., Chicago, Ill. 60610)

1. American Acad. of **Oral Medicine**, New York, N.Y. (S. Conrad, 133-28 228th St., Laurelton, N.Y. 11413)

1–4. American **Medical** Assoc., Miami Beach, Fla. (F. J. L. Blasingame, 535 N. Dearborn St., Chicago, Ill. 60610)

1–4. **Reticuloendothelial** Soc., 5th, New York, N.Y. (F. J. DiCarlo, Warner-Lambert Research Inst., Morris Plains, N.J. 07950)

1–5. American Inst. of **Chemical Engineers**, 61st, Los Angeles, Calif. (Secretary, 345 E. 47 St., New York 10017)

1–6. **Radiological** Soc. of North America, Chicago, Ill. (M. D. Frazer, 1744 S. 58 St., Lincoln, Neb. 68506)

2. **Quantum Chemistry**, 9th winter inst., Gainesville, Fla. (Winter Institute, 525 Nuclear Sciences Bldg., Univ. of Florida, Gainesville 32601)

2–3. **Applications of Simulation**, 2nd conf., New York, N.Y. (A. Ockene, IBM Corporation, 112 E. Post Road, White Plains, N.Y. 10601)

2–4. New England Conf. on **Air Pollution**, Waterville, Maine. (Director, Colby News Bureau, Colby College, Waterville 04901)

2–4. Western National **Geophysical** Union, San Francisco, Calif. (J. C. Harrison, Dept. of Geophysical Sciences, Univ. of Colorado, Boulder 80302)

2–6. Greater New York **Dental** Mtg., 44th, New York, N.Y. (M. Purdy, Room 106A, Statler Hilton, New York 10001)

3. American Soc. of **Therapeutic Radiologists**, Chicago, Ill. (J. A. del Regato, Penrose Cancer Hospital, 2215 N. Cascade, Colorado Springs, Colo. 80907)

3–4. **Vehicular Technology** Conf., San Francisco, Calif. (W. G. Chaney, Lenkurt

Electric, 1105 Country Rd., San Carlos, Calif. 94070)

3–5. **Entry Vehicle Systems and Technology** Conf., Williamsburg, Va. (M. H. Bloom, Polytechnic Inst. of Brooklyn, Graduate Center, Route 110, Farmingdale, N.Y. 11735)

4–6. **Optical Character Recognition in Computerized Management of Information** in the Next Decade, Hollywood, Fla. (International Business Forms Industries, 20 Chevy Chase Circle, NW, Washington, D.C. 20015)

4–6. Academy of **Psychosomatic** Medicine, Miami Beach, Fla. (E. Dunlop, 150 Emory St., Attleboro, Mass. 02703)

4–7. American Assoc. of **Physicists in Medicine**, Chicago, Ill. (R. O. Gorsop, Stein Research Center, Jefferson Medical College, 920 Chancellor St., Philadelphia, Pa. 19107)

5–6. American **Rheumatism** Assoc., Tucson, Ariz. (M. M. Walsh, 1212 Avenue of the Americas, New York 10036)

6–7. American Federation for **Clinical Research**, Boston, Mass. (H. J. Levine, New England Medical Center Hospitals, 171 Harrison Ave., Boston 02111)

7–12. American Acad. of **Dermatology and Syphilology**, 27th, Chicago, Ill. (S. E. Huff, 1636 Church St., Evanston, Ill.)

8–13. American Soc. of **Agricultural Engineers**, Chicago, Ill. (P. L. Bellinger, Technical Coordinator, 420 Main St., St. Joseph, Mich. 49085)

8–15. Symposium of **Analogue and Digital Computers in Hydrology**, Tucson, Ariz. (American Federation of Information Processing Societies, 211 E. 43 St., New York 10017)

9–11. **Computer** Conf., San Francisco, Calif. (R. H. Glaser, 1968 Joint Computer Conf., P.O. Box 2309, Stanford, Calif. 94305)

9–12. **Electrical Insulation** Conf., Los Angeles, Calif. (Secretary, 3600 Wilshire Blvd., Los Angeles 90005)

9–12. National **Electronics** Conf. and Exhibition, 24th, Chicago, Ill. (E. C. Jones, Electrical Engineering Dept., Iowa State Univ., Ames)

11–13. National **Oceanography** Conf., Portland, Ore. (J. H. Jorgenson, National Security Industrial Assoc., Suite 800, 1030 15th St., NW, Washington, D.C. 20005, or K. R. Cannon, Governor's Committee on Natural Resources, State Capitol, Salem, Ore. 97310)

15–17. New York State Soc. of **Anesthesiologists**, New York, N.Y. (E. C. Sinisi, 30 E. 42 St., New York, 10017)

16–18. Symposium on **Adaptive Processes**, 7th, Univ. of California, Los Angeles. (J. M. Mendel, Advance Flight Mechanics, Douglas Aircraft Co., Inc. 3000 Ocean Park Blvd., Santa Monica, Calif. 90406)

16–20. Texas Symp. of **Relativistic Astrophysics**, 4th, Dallas. (I. Robinson, South West Center for Advanced Studies, P.O. Box 30365, Dallas 75230)

18–20. American **Physical** Soc., San Diego, Calif. (W. Whaling, California Inst. of Technology, 1201 East California St., Pasadena 91109)

20–22. American **Psychoanalytic** Assoc., New York, N.Y. (American Psychoanalytic Assoc., 1 E. 57 St., New York 10022)

23–25. International **Electron Devices** Mtg., Washington, D.C. (D. A. Chisholm, Bell Telephone Labs., Murray Hill, N.J. 07974)

26–31. American Assoc. for the **Advancement of Science**, 135th, Dallas, Texas. (Secretary, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

26–31. Society for **General Systems Research**, Dallas, Texas. (M. D. Rubin, Mitre Corp., Bedford, Mass. 01730)

27–30. Institute of **Mathematical Statistics**, Washington, D.C. (J. R. Rosenblatt, 337 Administration Bldg., Gaithersburg, National Bureau of Standards, Washington, D.C. 20234)

28–30. **History of Science** Soc., Dallas, Texas. (J. C. Greene, Dept. of History, Univ. of Connecticut, Storrs 06268)

January

9–11. Society for **Historical Archaeology**, 2nd, Tucson, Ariz. (B. L. Fontana, Arizona State Museum, Arizona Univ., Tucson 85721)

12–17. **Brain Research**, Snowmass-at-Aspen, Colo. (J. E. Swett, Dept. of Anatomy, Univ. of Colorado Medical Center, Denver 80220)

13–14. Applications of **Sea-Going Computers**, La Jolla, Calif. (C. B. Jackson, MTS Data Engineering Committee, P.O. Box 2158, La Jolla 92037)

13–15. **Agricultural Waste Management** Conf., Syracuse, N.Y. (Agricultural Waste Management Conf., 400 Roberts Hall, Cornell Univ., Ithaca, N.Y. 14850)

13–15. **Animal Waste Management**, Syracuse, N.Y. (R. C. Loehr, 208 Riley-Robb Hall, Cornell Univ., Ithaca, N.Y.)

13–17. Society of **Automotive Engineers**, Inc., Detroit, Mich. (Manager, Meetings Div., 485 Lexington Ave., New York 10017)

15–18. National Soc. of **Professional Engineers**, Las Vegas, Nev. (K. E. Trombley, Natl. Soc. of Professional Engineers, 2029 K St., NW, Washington, D.C. 20006)

17–18. Symposium on **Blood**, Detroit, Mich. (E. F. Mammen, Dept. of Physiology and Pharmacology, Wayne State Univ., 1400 Chrysler Freeway, Detroit 48207)

17–18. American Soc. for **Surgery of the Hand**, New York, N.Y. (L. Milford, 869 Madison Ave., Memphis, Tenn. 38104)

18–23. American Acad. of **Orthopaedic Surgeons**, New York, N.Y. (J. K. Hart, 29 E. Madison, Chicago, Ill. 60602)

19–21. American Soc. for **Engineering Education**, Flint, Mich. (E. H. Wright, American Soc. for Engineering Education, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

20–22. American Inst. of **Aeronautics and Astronautics**, New York, N.Y. (AIAA, 1290 Sixth Avenue, New York 10019)

20–22. Society of **Thoracic Surgeons**, San Diego, Calif. (F. C. Byron, City of Hope Medical Center, 1500 E. Duarte Rd., Duarte, Calif. 91010)

21–24. **Physiological Aspects of Crop Yield**, Lincoln, Neb. (F. A. Haskins, Dept. of Agronomy, Univ. of Nebraska, Lincoln)

23–25. American Soc. for **Engineering Education**, Baton Rouge, La. (E. H. Wright, American Soc. for Engineering Education, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

Northwestern University Press, Evanston, Ill., 1968. x + 178 pp., illus. $12.

Environment and Change. The Next Fifty Years. Commissioned and edited by William R. Ewald, Jr., on behalf of the American Institute of Planners' Fiftieth Year Consultation. Indiana University Press, Bloomington, 1968. xvi + 397 pp. Cloth, $10; paper, $4.95.

Fundamentals of Reliability Theory. A. M. Polovko. Translated from the Russian edition (Moscow, 1964) by Scripta Technica. William H. Pierce, Transl. Ed. Academic Press, New York, 1968. xx + 459 pp., illus. $22.

Genetic Variations of Drosophila melanogaster. Dan L. Lindsley and E. H. Grell. Carnegie Institution of Washington, Washington, D.C., 1968. ii + 471 pp., illus. $3. Carnegie Institution of Washington Publication No. 627. Revised from *The Mutants of* Drosophila melanogaster.

Geological Evolution of North America. Thomas H. Clark and Colin W. Stearn. Ronald, New York, ed. 2, 1968. viii + 569 pp., illus.

Handbook of Histology. Karl A. Stiles. McGraw-Hill, New York, ed. 5, 1968. xiv + 251 pp., illus. $4.95.

Heroes of History. A Selection of Churchill's Favorite Historical Characters All Told in His Own Words from His Four-Volume *A History of the English-Speaking Peoples*. Followed by a profile of Sir Winston himself drawn from autobiographical writings and speeches. Pictures by Robert MacLean. Dodd, Mead, New York, 1968. v + 192 pp., illus. $4.95.

Index Plantarum Quae in Omnium Populorum Pharmacopoeis Sunt Adhuc Receptae. Indice delle Piante Finora Ammesse nelle Farmacopee Ufficiali dei Diversi Stati del Mondo. Antonio Imbesi. Istituto di Farmacognosia, Università di Messina, Messina, Italy, 1964. xii + 771 pp.

Integrated Managerial Controls. A Visual Approach through Integrated Management Information Systems. R. O. Boyce. Elsevier, New York, 1968. xxi + 372 pp., illus. $14.50. Management Studies Series.

Introduction to Electrical Engineering. William H. Hayt, Jr., and George W. Hughes. McGraw-Hill, New York, 1968. xiii + 443 pp., illus. $11.50.

An Introduction to Harmonic Analysis. Yitzhak Katznelson. Wiley, New York, 1968. xiv + 264 pp. $12.95.

Introduction to Magnetochemistry. Alan Earnshaw. Academic Press, New York, 1968. x + 115 pp., illus.

Introduction to Natural Science. Part 1, The Physical Sciences. V. Lawrence Parsegian, Alan S. Meltzer, Abraham S. Luchins, and K. Scott Kinerson. Academic Press, New York, 1968. xvi + 727 pp., illus. $10.95.

Introduction to Paleolimnology. C. C. Reeves, Jr. Elsevier, New York, 1968. xii + 228 pp., illus. $18. Developments in Sedimentology, vol. 11.

An Introduction to Random Signals and Communication Theory. B. P. Lathi. International Textbook Co., Scranton, Pa., 1968. xvi + 488 pp., illus. $14. International Textbooks in Electrical Engineering.

An Introduction to Space. Her Majesty's Stationery Office, London, 1968. ix + 103 pp., illus. 21s.

Kinship and Social Organization. Paul Bohannan and John Middleton, Eds. Published for American Museum of Natural History by Natural History Press, Garden City, N.Y., 1968. xiv + 391 pp., illus. American Museum Sourcebooks in Anthropology.

The Kon-Tiki Expedition. Thor Heyerdahl. Illustrated by Eric Palmquist. Rand McNally, Chicago, 1968. 222 pp. $11.95.

K-Theory. Lectures by M. F. Atiyah, notes by D. W. Anderson, fall 1964. Benjamin, New York, 1967. ii + 218 pp., illus. Paper.

The Laboratory Animal in Gerontological Research. Proceedings of a symposium, St. Petersburg, Fla., Nov. 1967. National Acad. of Sciences, Washington, D.C., 1968. vi + 110 pp., illus. Paper, $4.50. NAS Publication 1591.

Lawrence and Oppenheimer. Nuel Pharr Davis. Simon and Schuster, New York, 1968. x + 384 pp. $7.50.

Life, Land and Water. Proceedings of a conference on environmental studies of the Glacial Lake Agassiz region, Winnipeg, Canada, Nov. 1966. William J. Mayer-Oakes, Ed. University of Manitoba Press, Winnipeg, 1967. xviii + 414 pp., illus. Paper. University of Manitoba Department of Anthropology Occasional Papers, No. 1.

Materials of High Vacuum Technology. Werner Espe. Vol. 2, Silicates. Translated from the German edition (Berlin). Pergamon, New York; VEB Deutscher Verlag der Wissenschaften, Berlin, 1968. xxiii + 660 pp., illus. $42.

Modern Problems of Pharmacopsychiatry. F. A. Freyhan, N. Petrilowitsch, and P. Pichot, Eds. Vol. 1, Clinical Psychopharmacology. Karger, Basel, 1968 (distributed in the U.S. by Phiebig, White Plains, N.Y.). ix + 284 pp., illus. $15.60.

Molecular Vibrations and Mean Square Amplitudes. Sven J. Cyvin. Universitets Forlaget, Oslo; Elsevier, New York, 1968. xvi + 424 pp., illus. $27.

Monoamine Oxidase Inhibitors. Relationship between Pharmacological and Clinical Effects. Proceedings of the 3rd International, Sao Paulo, July 1966, Vol. 10. J. Cheymol and J. R. Boissier, Eds. Pergamon, New York, 1968. viii + 94 pp., illus. $9.

Muscle. D. R. Wilkie. St. Martin's, New York, 1968. 64 pp., illus. Paper. Institute of Biology's Studies in Biology No. 11.

Nonlinear Continuum Mechanics. An Introduction to the Continuum Physics and Mathematical Theory of the Nonlinear Mechanical Behavior of Materials. D. C. Leigh. McGraw-Hill, New York, 1968. xii + 240 pp., illus. $13.50.

Progressive Contact Metamorphism of the Biwabik Iron-Formation, Mesabi Range, Minnesota. Bevan M. French. University of Minnesota Press, Minneapolis, 1968. xvi + 103 pp., illus. $4.50. Minnesota Geological Survey. Bulletin No. 45.

Prostaglandin. Symposium of the Worcester Foundation for Experimental Biology, Shrewsbury, Mass., Oct. 1967. Peter W. Ramwell and Jane E. Shaw, Eds. Interscience (Wiley), New York, 1968. xxiv + 402 pp., illus. $15.

Psychological Testing. Anne Anastasi. Macmillan, New York; Collier-Macmillan,

London, ed. 3, 1968. xiv + 665 pp., illus. $9.25.

Psychosomatic Specificity. Vol. 1, Experimental Study and Results. Franz Alexander, Thomas M. French, and George H. Pollock, Eds. University of Chicago Press, Chicago, 1968. ix + 263 pp., illus. $7.50.

Radiation and Reentry. S. S. Penner and Daniel O. Olfe. With contributions by J. C. Stewart and L. D. Gray. Academic Press, New York, 1968. xii + 493 pp., illus. $24. Reentry Physics Series.

Radiative Energy Transfer. Proceedings of a symposium, Philadelphia, Feb. 1966. Robert Goulard, Sinclaire M. Scala, and Richard N. Thomas, Eds. Pergamon, New York, 1968. x + 618 pp., illus. $18.

Socialization and Society. John A. Clausen, Orville G. Brim, Jr., Alex Inkeles, Ronald Lippitt, and M. Brewster Smith. John A. Clausen, Ed. Little, Brown, Boston, 1968. xv + 400 pp. $5.50.

Solid State Physics. An Introduction to Its Theory. H. Clark. Macmillan, London; St. Martin's, New York, 1968. viii + 240 pp., illus. $7.25.

Soviet Space Exploration. The First Decade. William Shelton. Washington Square Press, New York, 1968. xii + 339 pp., illus. $6.95.

Space and Time in Special Relativity. N. David Mermin. McGraw-Hill, New York, 1968. xiii + 240 pp., illus. Cloth, $5.95; paper, $3.

Time. Fourth Dimension of the Mind. Robert Wallis. Translated from the French edition (Paris) by Betty B. Montgomery and Denis B. Montgomery, Harcourt, Brace and World, New York, 1968. xix + 247 pp. $6.95.

Treatise on Collagen. Vol. 1, Chemistry of Collagen. G. N. Ramachandran, Ed. Academic Press, New York, 1967. xiv + 556 pp., illus.

Treatise on Collagen. G. N. Ramachandran, Ed. Vol. 2, parts A and B, Biology of Collagen. Bernard S. Gould, Ed. Part A, xviii + 434 pp., illus. Part B, xvi + 488 pp., illus. Academic Press, New York, 1968.

The United Nations in War and Peace. T. R. Fehrenbach. Random House, New York, vi + 179 pp., illus. $1.95.

United States Government Organization Manual, 1968–69. Office of the Federal Register, Washington, D.C., 1968 (available from the Superintendent of Documents, Washington, D.C.). viii + 842 pp., illus. Paper, $2.

Wave Propagation in a Random Medium. Lev A. Chernov. Translated from the Russian by R. A. Silverman. Dover, New York, 1968. viii + 168 pp. Paper, $3. Reprint of the 1960 edition.

Wave Propagation in a Turbulent Medium. V. I. Tatarski. Translated from the Russian by R. A. Silverman. Dover, New York, 1968. xiv + 285 pp., illus. Paper, $3.25. Reprint of the 1961 edition.

Winged Rocketry. James C. Sparks. Dodd, Mead, New York, 1968. v + 183 pp., illus. $4.50.

Wool Growth. M. L. Ryder and S. K. Stephenson. Academic Press, New York, 1968. xviii + 805 pp., illus. 168s.

Words, Meanings, and Messages. Theory and Experiments in Psycholinguistics. Ragnar Rommetveit. Academic Press, New York; Universitets Forlaget, Oslo, 1968. viii + 328 pp., illus. $12.50.