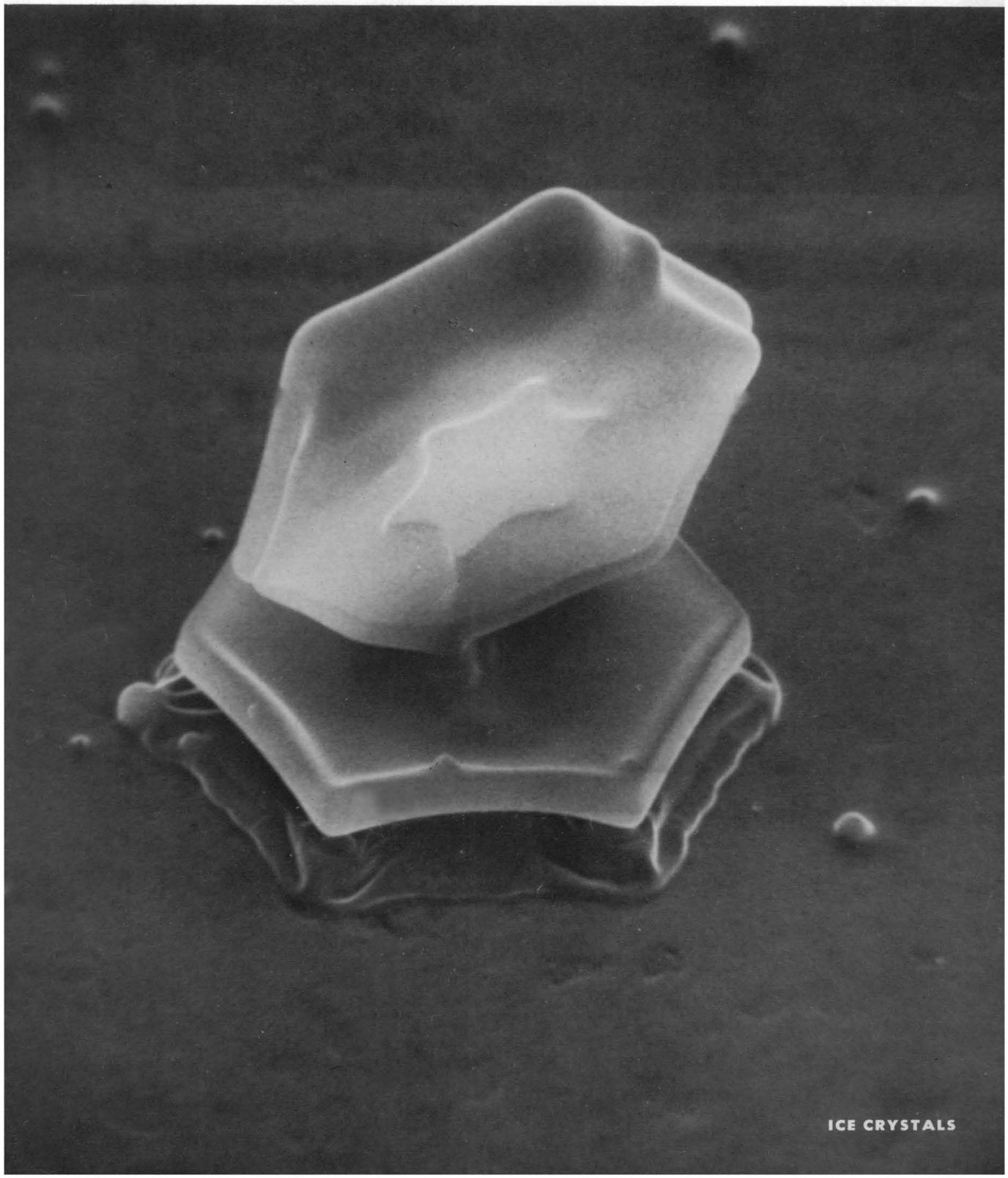
# SCIENCE

21 June 1968

Vol. 160, No. 3834

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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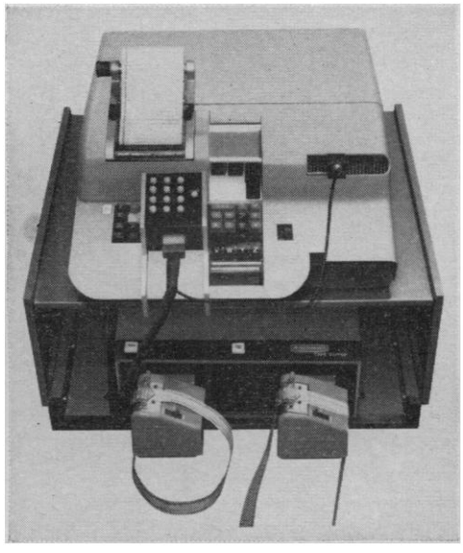

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21 June 1968
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# SCIENCE

**LETTERS** Pest Control Debates in Court: *R. C. Clement*; Poland: Barriers and Purges: *B. Greenberg*; Detrick Symposium Dissent: *J. M. Allen* et al.; TV for Disadvantaged Children: *P. E. Hackman*; Eclipse of Jacob: *E. E. Pilchik*; Better Research—Better Teachers: *D. L. Jameson* ..... 1287

**EDITORIAL** Medical School Curricular Reform ..... 1293

**ARTICLES** Cosmology after Half a Century: *W. H. McCrea* ..... 1295

Flash Photolysis and Some of Its Applications: *G. Porter* ..... 1299

Life's Irreducible Structure: *M. Polanyi* ..... 1308

Research and Development at the University: *D. E. Kash* ..... 1313

**NEWS AND COMMENT** CBW: British Protests Grow about Porton Center ..... 1318

Effort Reporting: Government Drops Much-Criticized Paperwork ..... 1322

Sea-Grants: Demand Is High, but Budget Is Low ..... 1323

Copyright Problems: Did Suit over Photocopying Kill Research Project? ..... 1324

**BOOK REVIEWS** *Ecology and Resource Management*, reviewed by *E. G. Leigh, Jr.*; other reviews by *J. T. Enright, D. Kubrin, R. D. Fogelson, M. Graubard, K. S. Pitzer, J. W. Warwick, N. Austern, E. G. Mishler*; Books Received ..... 1326

**REPORTS** Martian Craters: Number Density: *A. H. Marcus* ..... 1333

Oxygen-Isotope Analysis of Recent Tropical Pacific Benthonic Foraminifera: *P. B. Smith* and *C. Emiliani* ..... 1335

Peralkaline Silicic Volcanic Rocks in Northwestern Nevada: *D. C. Noble, D. W. Chipman, D. L. Giles* ..... 1337

Zinnwaldite: Octahedral Ordering in Lithium-Iron Micas: *M. Rieder* ..... 1338

Mode of Chemical Degradation of *s*-Triazines by Montmorillonite: *J. D. Russell* et al. ..... 1340



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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Chromosomal Effect in vivo of Exposure to Lysergic Acid Diethylamide: *R. S. Sparkes, J. Melnyk, L. P. Bozzetti* ..... 1343

Mechanism for Multiplication of Atmospheric Ice Crystals: Apparent Charge Distribution on Laboratory Crystals: *F. K. Odencrantz* et al. ..... 1345

Virus-Directed Protein Synthesis in Different Animal and Human Cells: *J. J. Holland* ..... 1346

Aluminum-26 and Beryllium-10 in Marine Sediment: *S. Tanaka* et al. ..... 1348

Fatty-Acid Composition of Mycoplasma Lipids: Biomembrane with Only One Fatty Acid: *A. Rodwell* ..... 1350

Crystal Structure of a Complex of Acridine, Cytosine, and Water (1 : 1 : 1): *E. Shefter* ..... 1351

Biosynthesis of Pectic Substance in Germinating Pollen: Labeling with Myoinositol-2-$^{14}$C: *M. Kroh* and *F. Loewus* ..... 1352

Homing Orientation by Olfaction in Newts (*Taricha rivularis*): *D. Grant, O. Anderson, V. Twitty* ..... 1354

Malate Dehydrogenase: Evidence for Tetrameric Structure in *Mus musculus*: *T. B. Shows* and *F. H. Ruddle* ..... 1356

Hereditary Autoimmune Thyroiditis in the Fowl: *R. K. Cole, J. H. Kite, Jr., E. Witebsky* ..... 1357

Fluorochrome-Labeled Deoxyribonuclease: Specific Stain for Cell Nuclei: *M. A. Benjaminson, D. B. Hunter, I. J. Katz* ..... 1359

Propanil Hydrolysis: Inhibition in Rice Plants by Insecticides: *S. Matsunaka* ..... 1360

Sleep Patterns of the Monkey and Brain Serotonin Concentration: Effect of *p*-Chlorophenylalanine: *E. D. Weitzman* et al. ..... 1361

Hippocampal Correlates of Aversive Midbrain Stimulation: *A. Routtenberg* and *R. C. Kramis* ..... 1363

Optomotor Responses to Monocular Stimulation: Relation to Visual System Organization: *E. S. Tauber* and *A. Atkin* ..... 1365

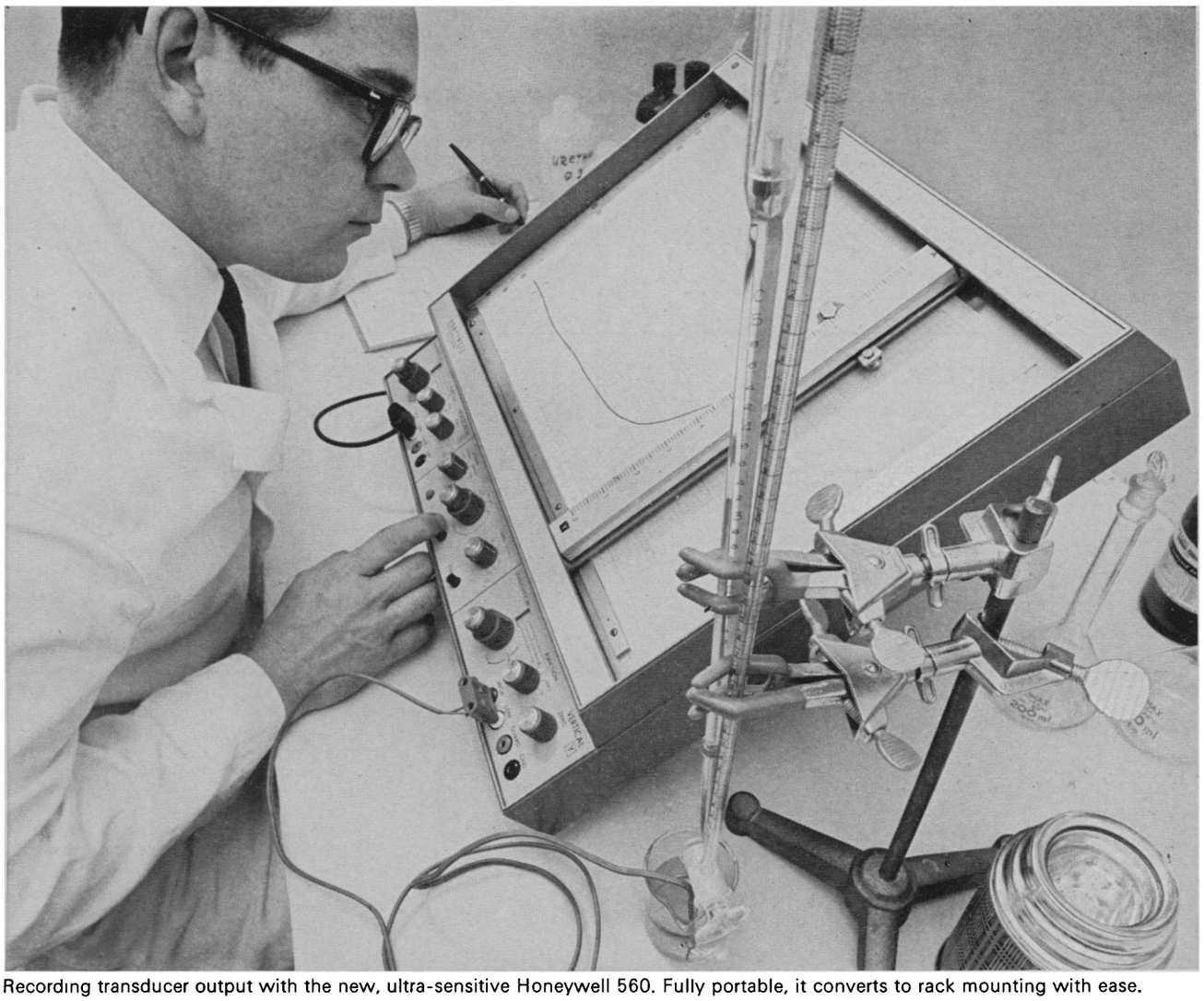
*Technical Comments*: Mongoose and Millipedes: *T. Eisner* ..... 1367

**MEETINGS** Hepatic Microsomes and Drug Oxidation: *R. W. Estabrook*; Calendar of Events .... 1368



**COVER**

Replica of ice crystal cluster produced in a 24-cubic meter cold box. The crystals fused together in the air and were collected on a metal pedestal. Electrical charges on ice crystals grown in the atmosphere correlate with crystal habit. The fact suggests a net negative charge on the basal faces and a positive charge on the prism faces. Replicas of clustered ice crystals appear to confirm this distribution of charge (about × 4200). See page 1345. [F. Kirk Odencrantz, William S. McEwan, Pierre St. Amand, and William G. Finnegan, Naval Weapons Center, China Lake, California]



Recording transducer output with the new, ultra-sensitive Honeywell 560. Fully portable, it converts to rack mounting with ease.

# This new Honeywell 560 is recording at 10μv/inch--10 times the sensitivity of any other X-Y recorder!

**Our design philosophy** on X-Y recorders boils down to this: first, you make one that doesn't break down. Then you give it state of the art electronics.

So, we borrowed the best mechanical concepts we developed a while back in our 550 recorder and incorporated them in the new 560. We used the same rugged, die-cast aluminum bezel and base, as well as the tough molded back cover that seals out dust and dirt, even when the recorder is rack-mounted. For smooth, quiet operation, we used the same precision-ground stainless steel carriage axis rods, ravel-free braided stainless steel drive cable, and snap-fit pen with non-clogging polished sapphire tip.

**We topped off the mechanics** with a sealed follow-up system, a maintenance-free fan vacuum system, and a standby position for easy paper loading. The result is an instrument built to last a long, long time. We know this because we subjected the 550 to more than 4.8 million cycles of constant operation before we designed the new 560. Its reliability exceeded our wildest expectations!

**Now for the electronic sophistication:** the 560 has ranges from 10μv to 50v per inch, permitting you to record just about any parameter you'll encounter without the need for additional signal conditioning equipment. It features accuracy of ±0.15%, and its time base is accurate to ±1% of full scale. Frequency response is DC to 5Hz; input impedance is two megohms on all ranges, with provision for potentiometric operation of the nine most sensitive ranges. A solid-state chopper and all silicon solid-state circuitry mean high performance over a wide ambient temperature range.

**The years-ahead 560 X-Y recorder** is another example of how Honeywell's broad line, backed by local sales and service, can provide the precise solution to your instrumentation problems. For full details on the new 560, call your local Honeywell Sales Engineer, or write: Honeywell, Test Instruments Division, P. O. Box 5227, Denver, Colo. 80217.

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# Yes, Hasselblad. But what have you done for us lately?

O the ingratitude of it all. We were the first to design a 2¼ square format reflex camera that put other 2¼ cameras out of date. With the best lenses. With interchangeable magazines. With all the convenience and portability of 35mm systems without the loss of image quality. The Hasselblad 500C even had ground glass viewing, so that you could see your three dimensional picture in two dimensions, for sharper focusing and more accurate framing and composition. When our 50mm Carl Zeiss wide angle lens didn't seem wide angle enough for you, we designed a 40mm wide angle lens. And we even made a special Hasselblad Super Wide C with a 38mm, 90° angle of view Zeiss Biogon f/4.5 lens that made it possible for you to take pictures previously considered impossible. The superb optics of the lens assured perfect 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 was from 12 inches to infinity.) And now you say to us—what's new?

There are two new electrically driven Hasselblad's. The Hasselblad 500EL automatically advances the film and cocks the shutter, permitting a rapid series of exposures, either by use of the camera release or long release cord, timer or remote radio control. The 500 EL accepts most of the accessories available for the 500C and all eight Carl Zeiss lenses: 40, 50, 80, 120, 135, 150, 250 and 500mm, each with a built-in Synchro Compur shutter that has automatic stopping down at the moment of exposure and manual preview for depth of field checks. Every lens also has both M and X synchronization, allowing the use of flash and strobe at speeds up to 1/500th of a second.

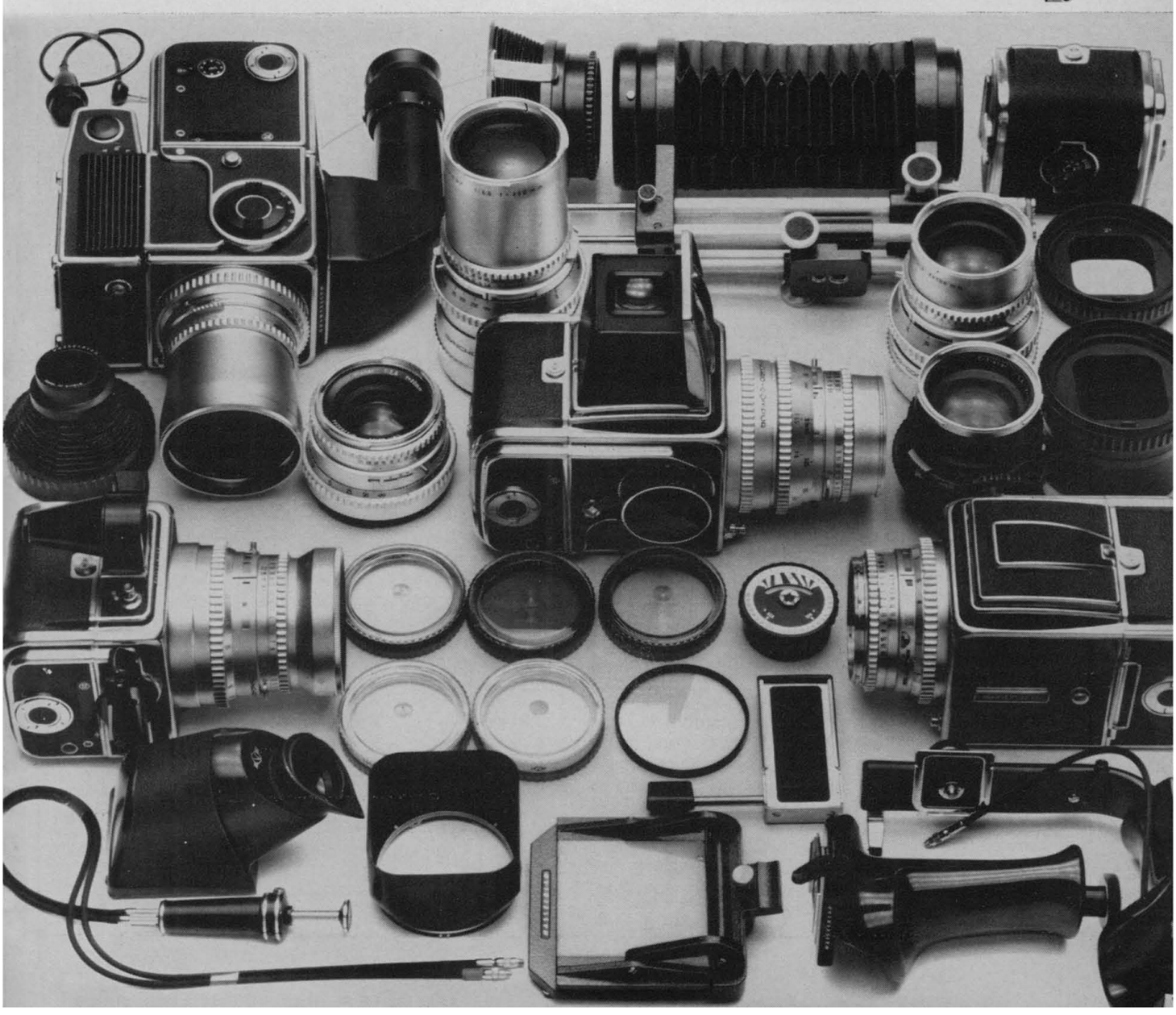
The electrically driven 70mm Hasselblad has all the features of the 500EL plus a 70mm film magazine which allows up to 70 exposures on cassette loaded 70mm film. With it, you can make a large number of rapid exposures with total freedom from mechanical necessities.

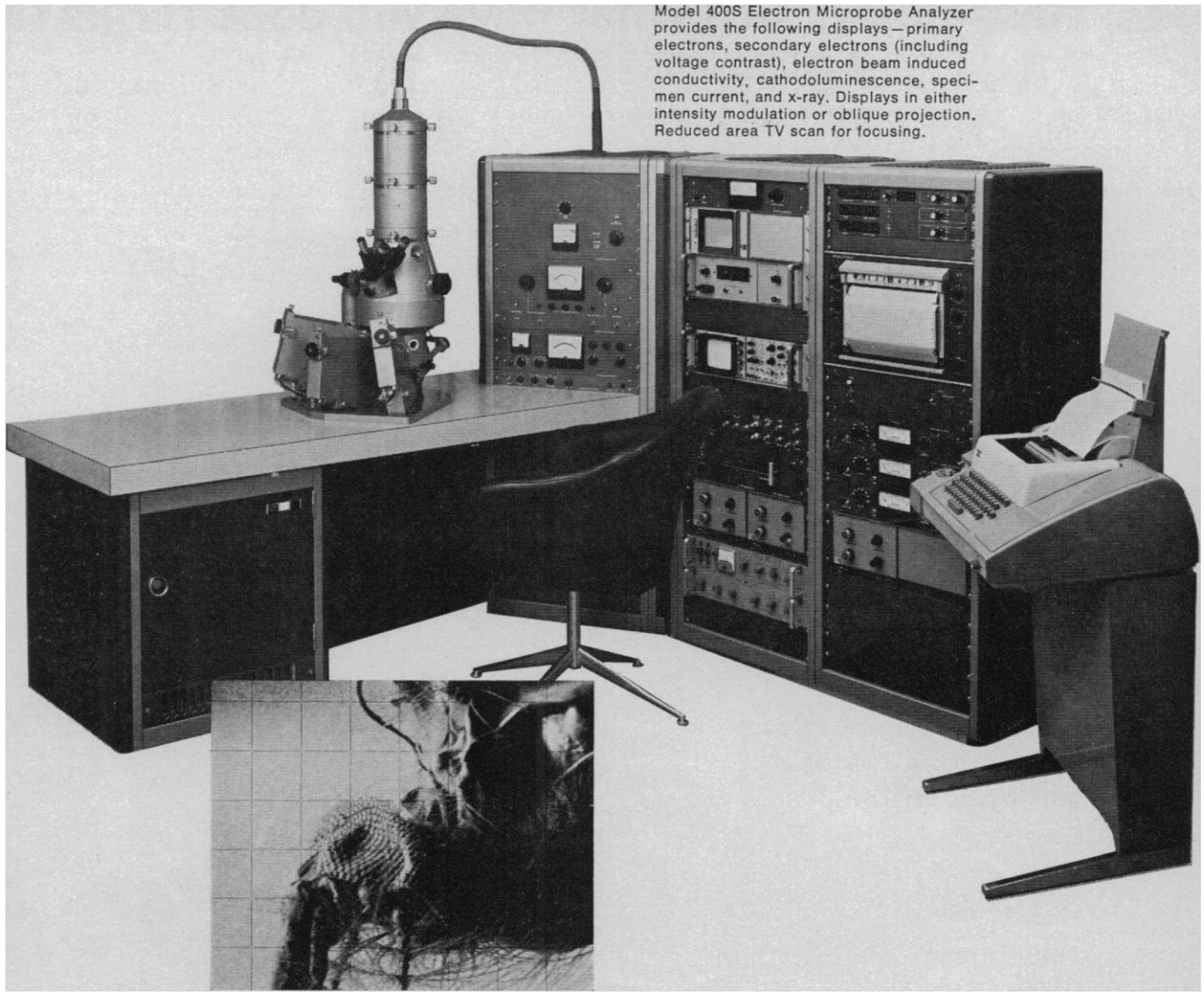
To refresh your memory, the four other interchangeable magazines allow you to make 12 or 16 exposures on 120 film, 24 exposures on 220 film, with a choice of three formats—2¼ square, 2¼ x 1⅝, and 1⅝ x 1⅝. And naturally, any two of the magazines allow you to switch from one film type to another in mid-roll.

And just in case you thought The Hasselblad System had any shortage of accessories, there are Proxars, extension tubes and bellows extensions for close-up work, filters, transparency copy holder, cut film back, eye level prism finders, sun shades, rapid winding crank, quick focusing handles grips, underwater housing, ring light, tripod quick coupling, microscope attachments, and carrying cases.

Now that you have a brief idea of what we've done for you lately, perhaps you'd like to know more. You can, by writing to us for literature and a free 40-page catalogue at Paillard Incorporated, 1900 Lower Road, Linden, New Jersey 07036. For specific technical inquiries, address your letter to the Technical Director.

**The Hasselblad System**





Model 400S Electron Microprobe Analyzer provides the following displays—primary electrons, secondary electrons (including voltage contrast), electron beam induced conductivity, cathodoluminescence, specimen current, and x-ray. Displays in either intensity modulation or oblique projection. Reduced area TV scan for focusing.

# A mosquito makes history

Back-scattered electron image of mosquito **(specimen uncoated). Instrument:** Materials Analysis Company Model 400S Combination Electron Microprobe Analyzer-Scanning Electron Microscope. **Voltage:** 24 KV. **Specimen Current:** 200 picoamps. **Magnification:** 80X. **Date:** March 18, 1968.

This remarkable photograph – taken in just 20 seconds—illustrates the unique performance of a new combination electron microprobe analyzer-scanning electron microscope developed by Materials Analysis Company. There's just no other way to get a picture like this.

The mosquito image was produced by the new Model 400S, which provides both microprobe x-ray analysis and scanning electron microscopy capabilities. Resolution is 1,000 Å or better in the scanning mode! And, a spot-size of 0.15 microns is guaranteed. Image magnifications range from 30X to 50,000X. With the x-ray system, both qualitative and quantitative chemical analyses of micron-sized volumes can be performed. All elements from boron up through the periodic table can be analyzed.

The 400S also features solid-state, modular design, up to three fully-focusing Johansson-type x-ray spectrometers, and a wide range of accessories.

There's more good news. For high-resolution scanning microscopy, Materials Analysis Company has developed the Model 700. And for analysis of highly radioactive specimens, MAC offers the Model 450 Electron Microprobe Analyzer.

All three instruments are available on a leasing basis. For complete details, please write to us at 1060 East Meadow Circle, Palo Alto, California 94303. Phone (415) 326-6556.

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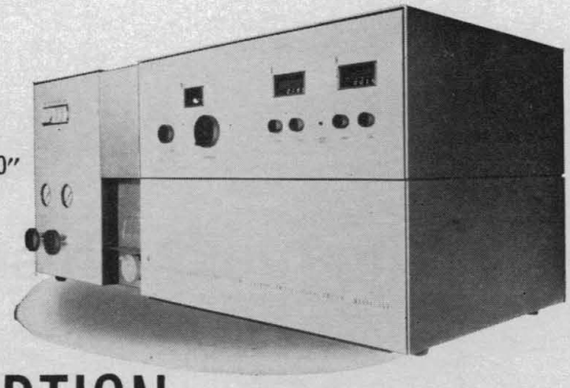

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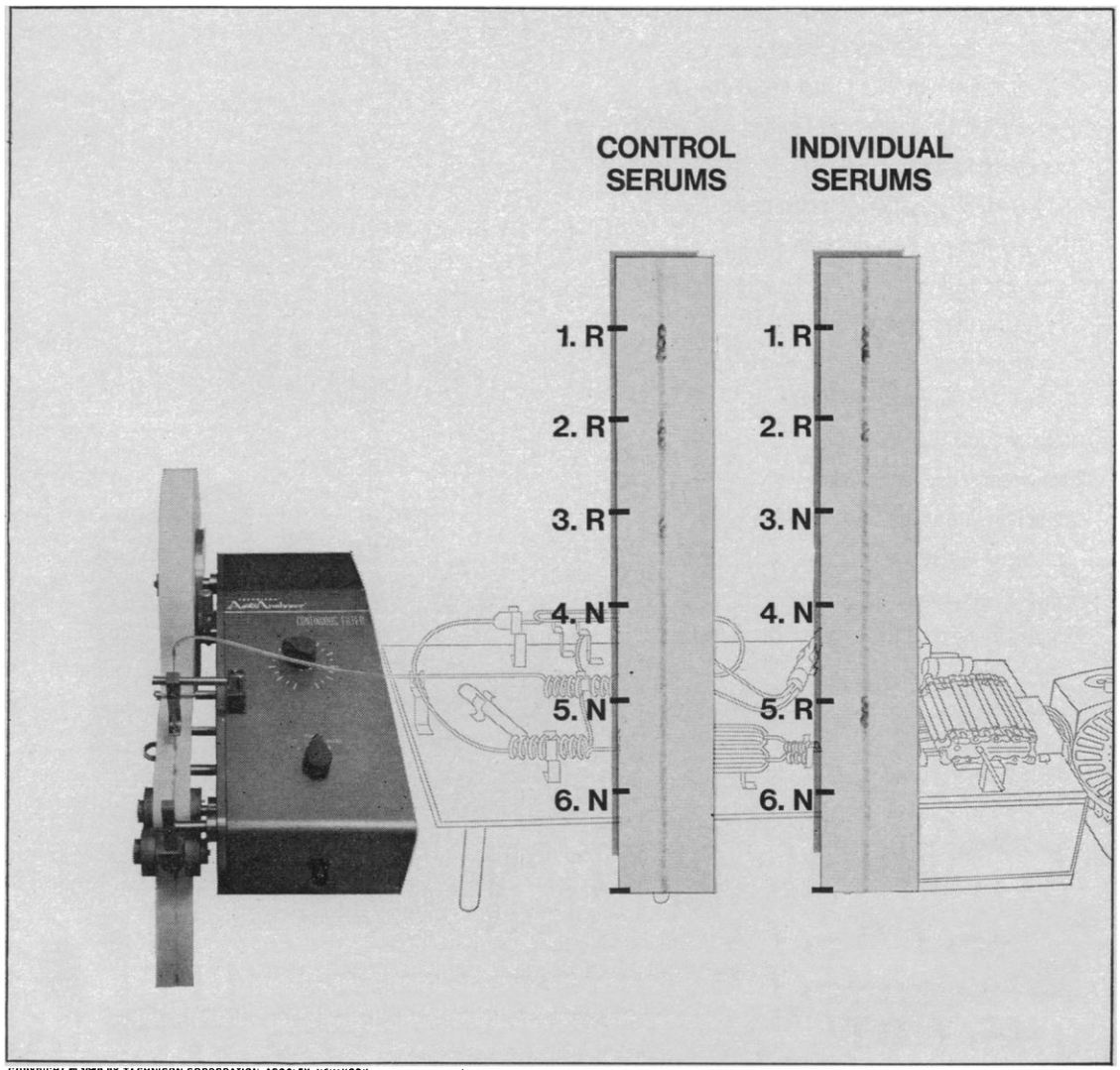
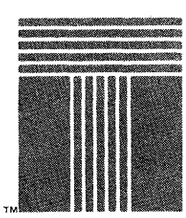
# New from Technicon... the Automated Reagin (AR) test for syphilis

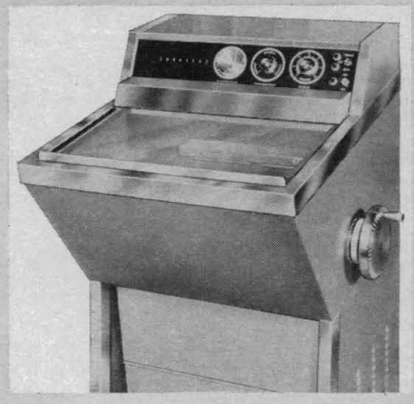





The Venereal Disease Research Laboratory, National Communicable Disease Center, and Technicon Corporation have developed the first automated flocculation test for syphilis. One hundred determinations per hour are performed on untreated plasma or serum samples (as small as 0.1 ml). The results have a 98% agreement with the VDRL slide test, which is the most widely used manual technique. The results of the Automated Reagin (AR) test are easily read, and they may be kept as a permanent record. For further information, write Department Z, Technicon Corporation, Ardsley, New York 10502.



# LOOK AT ALL THE ODDBALL OBJECTS OUR MICROTOME HAS BEEN SECTIONING LATELY



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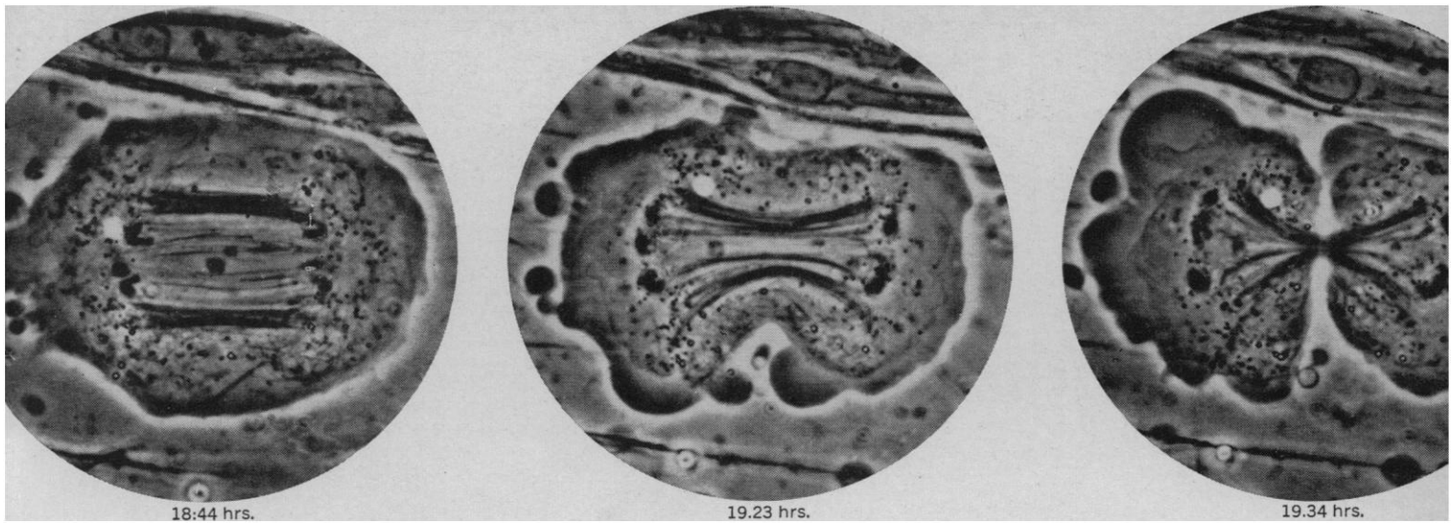


Anaphase: bivalents of homologous chromosome pairs moving to opposite poles during spermatogenesis in Pales ferruginea (Tipulidae).

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of Biological Sciences had in refusing to support the executive committee's agreement for cosponsorship by AIBS and Fort Detrick of two symposia ("Detrick birthday: Dispute flares over biological warfare center," 19 Apr., p. 285).

These symposia, honoring the 25th anniversary of the establishment of Fort Detrick, were concerned with basic research in two fields: "entry and control of foreign nucleic acids" and "leaf abscission." These fields impinge on areas of importance to biological warfare research, which may be directed against civilian populations, and over which scientists have no control. The reasons for our action were as follows:

1) It is not appropriate nor proper for an organization representing a large segment of the biological community to actively participate in a celebration honoring 25 years of biological and chemical warfare research.

2) It is not proper for the AIBS to lend its name and prestige to this celebration indirectly conveying the impression that AIBS actively favors this aspect of Defense Department activity. Although AIBS in this instance is acting simply as an agent of Fort Detrick, not having participated in planning the conference nor exerting any control over the program, its sponsorship in this way can be construed as tacit support.

3) It is not relevant whether the symposium was involved with basic research problems in biology, whether the discussion was to be open or closed, or whether the published symposium will be available to the biological community or will be classified.

4) The essential issue is a moral one: should an organization composed of life scientists participate in an anniversary celebration of an installation concerned primarily with research for the purposes of biological and chemical warfare?

JOHN M. ALLEN
*Department of Zoology, University of Michigan, Ann Arbor*
RALPH EMERSON
*Department of Botany, University of California, Berkeley*
PHILIP GRANT
*Department of Biology, University of Oregon, Eugene*
HOWARD A. SCHNEIDERMAN
*Case Western Reserve University, Cleveland, Ohio*
PHILIP SIEKEVITZ
*Rockefeller University, New York*

. . . One thing is certain—it's too late for a scientist to merely boycott a meeting or two. . . . The only argument of any importance made by either side is, to quote Boffey's article: "Outside scientists should maintain contact with Detrick in accord with the principle of civilian control over the military." This compressed statement contains the essential principle. If you let students take over the campus, you'll get action, but who is held really responsible when the fires are finally put out?

J. S. ROBOTTOM

*12115 Drujon,*
*Dallas, Texas 75230*

## TV for Disadvantaged Children

The Children's TV Experiment ("News in Brief," 26 Apr., p. 401) described a program to begin in the fall of 1969 for teaching preschool children and aimed at "stimulating the intellectual and cultural growth of children—'particularly those from disadvantaged backgrounds.'"

What disadvantaged preschool child has a 1-hour attention span—and one which can last 5 days a week for 26 weeks? Should preschool children, whose eyes are not fully developed, be staring at focal objects for protracted periods? How many disadvantaged homes have TV facilities? How about disadvantaged rural children who do not have access to National Educational Television? Isn't this discrimination? Shouldn't an investigation of these factors be made before going ahead with a $6- to $8-million workshop plan?

PEARL E. HACKMAN

*P.O. Box 115,*
*Handsboro, Mississippi 39554*

## Eclipse of Jacob

To bolster the morale of the scientific establishment shaken by the flight of our young from physics ("Physics and the polity," 26 Apr., p. 396), I offer this singular thread of hope. In answer to a religious school exam question: "Name the three patriarchs," one of our brightest fourth-graders listed: "Abraham, Isaac, and Newton."

ELY E. PILCHIK

*320 Tillou Road,*
*South Orange, New Jersey 07079*

## Better Research—Better Teachers

Bresler in "Teaching effectiveness and government awards" (12 Apr., p. 164) concludes that "the faculty member who is interested in publishing and in acquiring funds for research and other means of personal development . . . is likely to be a better teacher." While we agree with this position, he has not provided an answer to the assertion "that research efforts by professors were destructive to the teaching functions of universities." He also has not replied to the fallacious expression that research energy directed toward improvement of instruction and helping students would make the professor a still better teacher.

Science is a process, a way of thinking, which cannot be transmitted from teacher to student by the enumeration of encyclopedic content but which must be learned by participation. Since every student cannot participate in a meaningful way, the solution must lie in his having contact with practicing scientists. When we substitute professional teachers, full-time introductory instructors, and teaching fellows we extend prep school training to the university. I expect that science is not unique; music is best taught by musicians, art by artists, and literature by writers. Surely the student does not pay his money and, more important, spend his time, to receive third- and fourth-hand knowledge. He comes to the university to participate in the activity of scholarship, and scholarship is research, writing, thinking, discussing, and participating in the subject.

We deny the student and the financial supporters (taxpayer or alumni) their just due when we fail to provide an atmosphere where the student can participate in academia. When the burdens of the professor preclude his participation in scholarship, we are not using our very limited resources to provide appropriate university instruction. These burdens include oversized teaching assignments, too much committee work, pointless clerical and demanding money-raising duties. Do the burdens also include spending extensive amounts of time applying to granting agencies for money to support a program of scholarship compatible with the modern state of knowledge?

DAVID L. JAMESON

*Department of Biology,*
*University of Houston,*
*Houston, Texas 77004*

21 June 1968, Volume 160, Number 3834

SCIENCE



# Medical School Curricular Reform

Of the several components making up a medical school—faculty, student body, physical plant, available patient population, and curriculum—only one, the curriculum, is susceptible of relatively simple change. In view of many purported or real defects in current medical school curricula, it is no wonder that many of the most distinguished of our medical schools—among them Harvard, the University of Pennsylvania, and Stanford—are currently breaking old shackles, and possibly forging new ones.

The time-tested pedagogic devices of cadaver dissection (Vesalius) and histopathology (Virchow) formed the rigid basis of medical education in the post-Flexner medical school until the famous Western Reserve experiment was conceived, in the late 1940's. This has been followed by a growing revolution in curriculum design in which certain features are frequently encountered.

1) Increase in the time available to students for taking elective courses.

2) Curtailment of the great blocks of time formerly deemed essential for teaching certain basic sciences—for example, gross anatomy.

3) Early introduction of clinical material and attempts to reduce the man-made barrier between clinical and basic medical sciences.

4) Provision of research opportunities to medical students during the school experience.

5) Definition of a "core" in each discipline or group of disciplines—a body of knowledge and skills considered essential and minimal, mastery of which is demanded.

6) Integration, not only between basic and clinical matters but also among the several basic disciplines.

7) Reduction of the number of years between high school and the award of the M.D. degree from the traditional 8 to 7 or even 6. Prolongation of the academic experience is also being tested.

8) Earlier consideration, in increasing depth, of problems of man and his environment, the role of the doctor in society, the modes of delivery of medical care, and so forth.

In comparing new curricula with old, it should be borne in mind that there is no one curriculum that is best in all regards and for all people. Whether we study man "horizontally" (that is, by disciplines) or "vertically" (by organ systems) is of less importance than the dedication of the teacher, the excitement of the student. If the revolution enhances either of these last two elements, it is accomplishing its mission.

We should beware of the questionable practice, common among educators, of packaging old wine in new bottles. Changing the name of a course does not necessarily change its content. What is offered as "molecular biology" in one school may prove to be contained in the "genetics" and "biochemistry" offerings at another. It is easy to lapse into the "in" vernacular peppered with words like *core curriculum, seminal, integrative, elective,* and *correlative.* In most instances the actual substance taught and learned in medical schools changes more slowly than does the language used to announce the novelty of the curriculum.

—DEWITT STETTEN, JR., *Dean, School of Medicine, Rutgers University*

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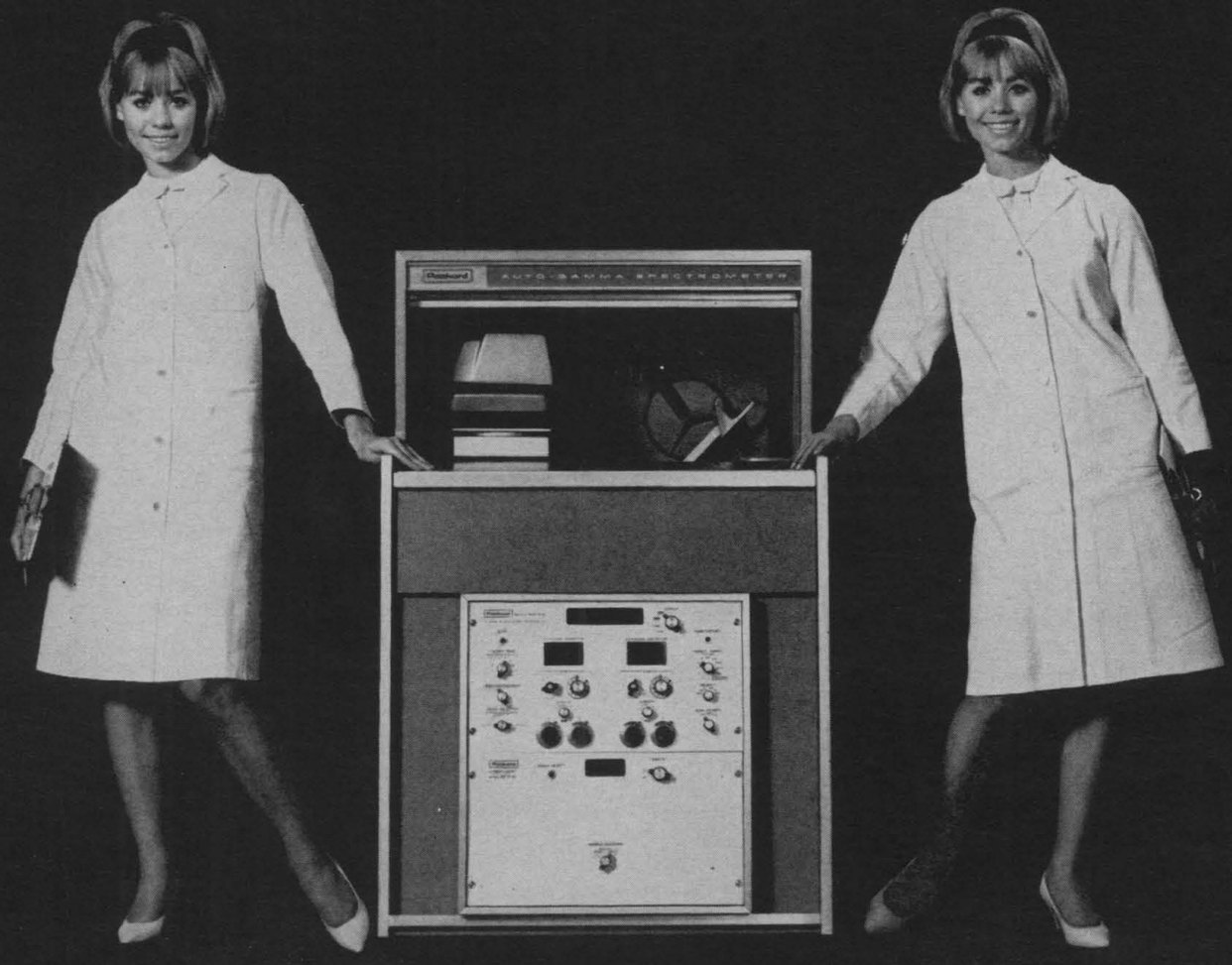

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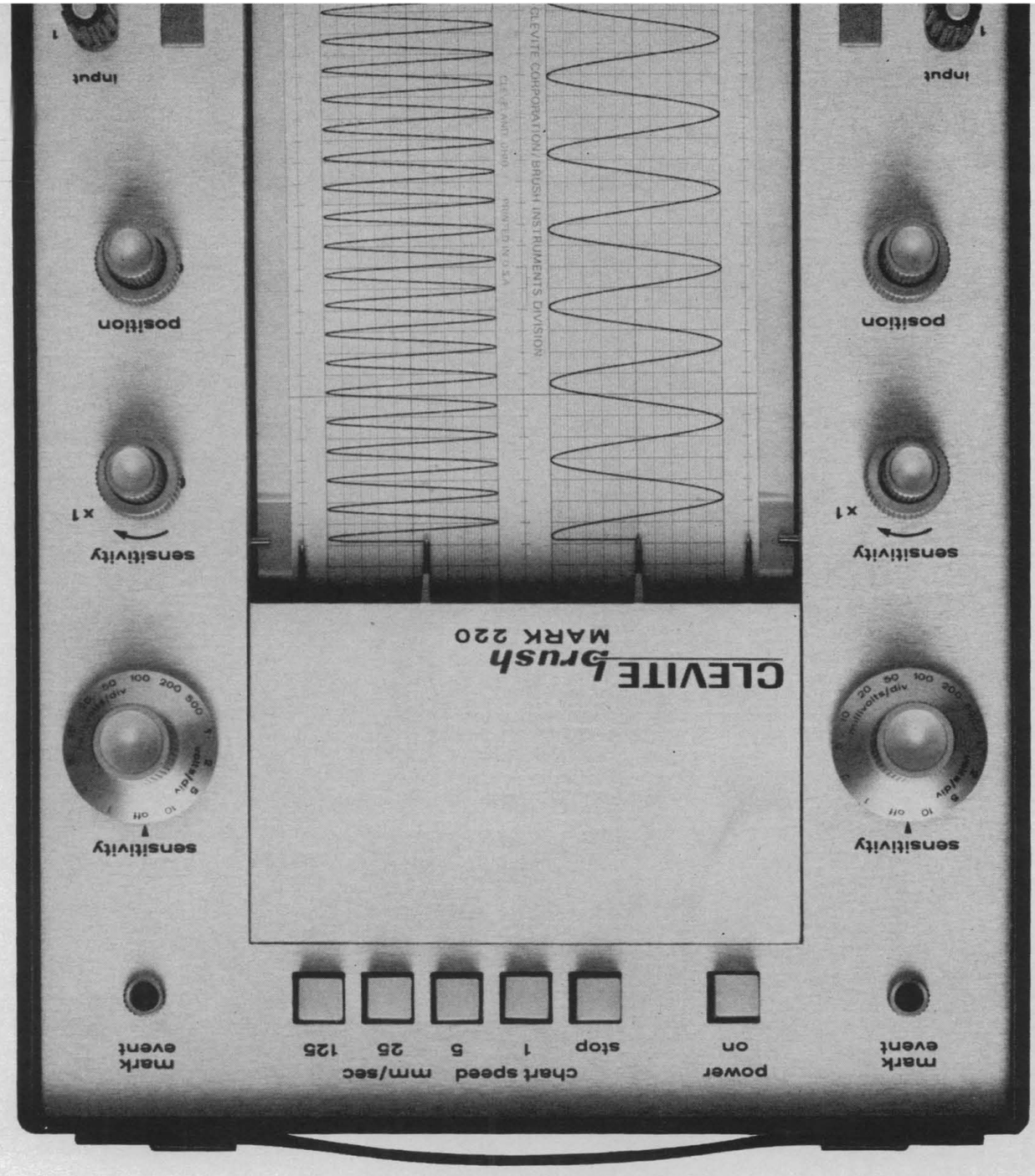


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that obtained by the direct proteolysis of microsomes. Sato concluded that "native" cytochrome $b_5$ contains a hydrophobic center, essential for its binding to the microsomal membrane and susceptible to loss when cytochrome $b_5$ is purified by proteolytic digestion.

J. Gillette directed attention to the postulated role of cytochrome P-450 in azo reductase and nitro reductase activity of liver microsomes. The effects of treatment of animals with inducing agents, or carbon tetrachloride, variation with sex or species, as well as inhibition of nitro reductase by substrates of microsomal mixed function oxidation reactions, supported the hypothesis of a role for cytochrome P-450 in the metabolism of *p*-nitrobenzoate and neoprontosil. Gillette also described experiments relating the rate of cytochrome P-450 reduction by NADPH with the overall rate of demethylation of ethylmorphine. He concluded that the step limiting the rate in the oxidation of drugs may be the reduction of a substrate-cytochrome P-450 complex.

M. J. Coon described the isolation from liver microsomes of three components—a reductase fraction dependent on NADPH; a fraction containing cytochrome P-450; and a heat-stable, organic solvent extractable fraction. All components are required for the reconstitution of omega oxidation of lauric acid. These studies represent the first report of the resolution of a microsomal mixed function oxidation reaction in which cytochrome P-450 is functional. Purification was achieved by treating microsomes with deoxycholate in the presence of glycerol, sucrose, citrate, potassium chloride, and dithiothreitol, and fractionation on DEAE-cellulose. The relation of the microsomal enzyme system to that isolated from bacteria was pointed out by J. Peterson. D. Ziegler then described the isolation and 40-fold purification of a flavoprotein from pork liver microsomes functional in tertiary amine oxidation for the formation of N oxide product. The broad specificity for substrates, for example, tranquilizers, tropine alkaloids, narcotics, and hallucinogens, was documented by Zeigler for this microsomal oxidation reaction system in which cytochrome P-450 does not participate.

Hj. Staudinger described results with a variety of model systems, in order to differentiate three general mechanisms of considering "activated oxygen." The role of OH-radicals, an oxene mecha-

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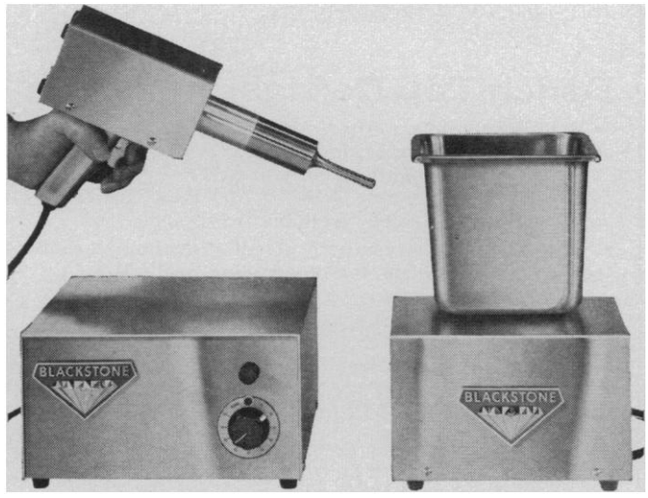


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nism, or hydroxylation by peracids (by $OH^+$), was evaluated in terms of current information on microsomal monooxygenase reactions. Staudinger concluded that "active oxygen" must be an electrophilic oxygen species with six electrons. S. Udenfriend discussed the significance of the "NIH shift" with respect to liver microsome hydroxylations. The intramolecular migration of a methyl group, halogen, deuterium, or tritium during hydroxylation of aromatic compounds permits the design of a variety of experiments to determine the multiplicity of microsomal hydroxylases.

S. Orrenius described recent experiments on the influence of PB treatment on the metabolism of steroids by liver microsomes. Using radioactive labeling of phospholipids as an indicator of E.R. synthesis, Orrenius proposed a timetable for the changes observed during induction of liver microsomes by barbiturates. The initial reaction between 0 to 3 hours after treatment of animals is a binding of the drug to the E.R. followed at 3 to 6 hours by an increase in phospholipid turnover. Concomitant with this change is an increase in the content of rough E.R. enzymes (4 to 6 hours) after which there is a detectable increase in the nuclear RNA polymerase (8 to 12 hours). Longer term effects are related to the increase in the enzyme content of the smooth E.R. (10 to 24 hours) and a decrease in the rate of breakdown of the E.R. (12 to 24 hours). Orrenius suggested that drug induction is a consequence of an alteration in the steroid balance of the animal, since drugs and steroids are competitive inhibitors. This concept was supported by studies with adrenalectomized and castrated animals.

A. Conney then discussed the question of the presence of a single enzyme system or multiple enzymes in liver microsomes for steroid hydroxylation. Alterations in the pattern of 6$\beta$-, 7$\alpha$-, and 16$\alpha$-hydroxylation of testosterone during the development of rats, as well as differential effects on enzyme activity by chlorothion, led Conney to conclude that separate rate-limiting components participate in the hydroxylation of testosterone, and that one or more CO-sensitive cytochromes (P-450) function in these hydroxylation reactions. Following the theme of the presence of multiple enzymes for hydroxylation in liver microsomes, G. Mannering presented data on two-substrate kinetics and the ability to detect, from the *p*H-dependence of the ethyl isocyanide-induced spectral changes of cytochrome P-450, the presence of a different reactive form of cytochrome P-450 in liver microsomes from animals treated with 3-MC. Studies of stability of microsomal pigments, changes in the pattern of substrate interaction as determined spectrophotometrically, and the influence of thioacetamide in causing a marked decrease in some enzyme activities, led to the conclusion that different forms of cytochrome P-450 might be present in microsomes. Another demonstration of this difference in various forms of P-450 modified by inducing agents was presented by R. Kuntzman, who described subtle spectral shifts in the location of the maximum of the CO derivative of reduced P-450 in liver microsomes from animals treated with benzpyrene, that is, a displacement from 450 nm to about 448 nm. H. Remmer and A. Hildebrandt then presented studies directly demonstrating spectral properties of the two forms of cytochrome P-450 preferentially altered by treatment of animals with barbiturates or polycyclic hydrocarbons. The ability to identify and characterize two forms of cytochrome P-450 and assess the content of each form (termed P-450 and P-446) in microsomes from various sources now opens the possibility of resolving the complexity of differences in enzyme activities which have been observed with various species, sex, age, or pretreatment of animals.

D. Nebert described studies showing the increased incorporation of amino acids in rat liver microsomes after treatment of animals with PB and the relationship of this change to the increased levels of messenger RNA. In contrast, treatment with 3-MC causes an increase in the rate of nuclear RNA synthesis and the content of RNA in the nucleus. Studies of polycyclic hydrocarbon stimulation of benzpyrene hydroxylase activity in tissue culture of embryonic cells indicate that the inducer hydrocarbon may be acting on mRNA translation, resulting in a feedback control affecting an increased synthesis of nuclear RNA. Thus it is concluded that inducing agents may exert their influence not only by causing an activation of specific genes but also by affecting the translation of mRNA. E. Bresnick then discussed the activation of chromatin by 3-MC by ascertaining the template efficacy of chromatin from livers of animals treated with 3-MC. Differences in nearest neighbor frequency in the product of RNA polymerase suggest that 3-MC causes an

activation of liver chromatin resulting in an increased number of sites available for the transcription of RNA.

I. Arias presented the results of a series of double labeling experiments designed to determine whether the increased level of hepatic smooth E.R., observed after PB treatment of animals, was a consequence of enhanced protein synthesis or decreased degradation (stabilization) of membranes. The results indicate that smooth E.R. proteins have considerably different turnover rates and that PB enhances synthesis of some microsomal proteins but not all.

T. Omura then discussed his experiments designed to establish that the turnover of cytochrome $b_5$ was unaffected, whereas that of the flavoprotein NADPH-cytochrome c reductase of liver microsomes was affected upon treating the animals with PB. Since PB showed little effect on the incorporation of radioactive amino acid into total microsomal protein, Omura concluded that the stimulation by PB seems to be fairly specific. In addition PB was shown to influence degradation of the reductase and cytochrome $b_5$, indicating that the increase in smooth E.R. may be mostly attributed to a relatively nonspecific prevention of breakdown of microsomal protein components. H. Marver then discussed studies describing the role of heme in the synthesis and repression of microsomal protein. Injection of 1 to 4 $\mu$mole of heme per 100 gram body weight represses drug-induced synthesis of aminolevulenic synthestase as well as drug-induced synthesis of cytochrome P-450.

During the general discussion at the end of the meeting, J. Casida described the role of cytochrome P-450 in the metabolism of insecticides by flies pointing out the similarities between the liver microsomal hydroxylation system of mammals and the parallel enzyme system in insects. A. Conney concluded the session by discussing some preliminary studies relating the content of benzpyrene hydroxylase in placentas from women who were cigarette smokers. The ability to directly demonstrate this activity in smokers, but not in nonsmokers, represents the first direct evidence for a compensatory enzymatic mechanism by humans to detoxify carcinogenic polycyclic hydrocarbons present in cigarette smoke.

The meeting was sponsored by the Committee on Applications of Biochemical Studies in Evaluating Drug Toxicity, Drug Research Board, Na-

tional Academy of Sciences–National Research Council, and the National Institute of General Medical Sciences, National Institutes of Health. It is anticipated that a complete report of the formal presentations as well as discussions will be published in the near future by Academic Press.

RONALD W. ESTABROOK
*Johnson Research Foundation, University of Pennsylvania, Philadelphia*

## Calendar of Events

### National Meetings

#### July

*8–11.* **Soil Conservation** Service and Experiment Stations, Clemson, S.C. (G. R. Craddock, Agronomy and Soil Dept., Clemson Univ., Clemson)

*9–13.* American **Therapeutic** Soc., Essex House, New York, N.Y. (R. T. Smith, 37 Narbrook Park, Narberth, Pa. 19072)

*12.* American Assoc. for the Study of **Headache**, New York, N.Y. (S. Diamond, 5214 N. Western Ave., Chicago, Ill. 60625)

*13–17.* American **Medical** Assoc., New York, N.Y. (F. J. L. Blasingame, 535 N. Dearborn St., Chicago, Ill. 60610)

*14–16.* American Inst. of **Aeronautics and Astronautics**, San Francisco, Calif. (Meetings Manager, ASME, 345 E. 47 Street, New York 10017)

*21–25.* American **Veterinary Medical** Assoc., Boston, Mass. (Director, Business Div., 600 S. Michigan Ave., Chicago, Ill. 60605)

*22–27.* American **Medical Technologists**, Dallas, Tex. (American Medical Technologists, 710 Higgins Rd., Park Ridge, Ill.)

*23–26.* American Soc. of **Pharmacognosy**, Iowa City, Iowa. (D. P. Carew, College of Pharmacy, Univ. of Iowa, Iowa City 52240)

*25–30.* American **Podiatry** Assoc., Chicago, Ill. (J. Tipton, Convention Manager, 2301 16th St., NW, Washington, D.C. 20010)

#### August

*1–3.* Conference on **Dermatology**, Aspen, Colo. (W. C. Eisele, Univ. of Colorado Medical Center, 4200 E. 9th Ave., Denver 80220)

*3–9.* National **Poultry** Science Assoc., Fort Collins, Colo. (R. E. Moreng, Animal Science Bldg., Colorado State University, Fort Collins 80521)

*11–15.* National **Medical** Assoc., Houston, Tex. (S. C. Smith, 520 W St. NW, Washington, D.C. 20001)

*12–14.* American Inst. of **Aeronautics and Astronautics**, Pasadena, Calif. (W. J. Brunke, Meetings Manager, 1290 Sixth Ave., New York 10019)

*12–16.* American **Crystallographic** Assoc., Buffalo, N.Y. (W. L. Kehl, Gulf Research & Development Co., P.O. Box 2038, Pittsburgh, Pa. 15230)

*18–21.* **Botanical** Soc. of America, Davis, Calif. (Botany Dept., Indiana Univ., Bloomington)

*18–21.* **Mycological** Soc. of America, Davis, Calif. (Pioneering Research Div., Natick Labs., Natick, Mass.)

*18–21.* American **Bryological** Soc., Davis, Calif. (The Society, Box 36, Missouri State College, Springfield)

*18–21.* **Ecological** Soc. of America, Davis, Calif. (Ecology Section, Health Physics Div., Oak Ridge Natl. Lab., Oak Ridge, Tenn.)

*18–21.* American Soc. for **Horticultural Science**, Davis, Calif. (C. Blackwell, P.O. Box 109, St. Joseph, Mich. 49085)

*18–21.* American Soc. of **Plant Physiologists**, Davis, Calif. (Dept. of Biology, Yale Univ., New Haven, Conn. 06520)

*18–21.* American Soc. of **Plant Taxonomists**, Davis, Calif. (Botany Dept., Univ. of California, Berkeley)

*18–22.* IUTAM Symp. on **High-Speed Computing in Fluid Dynamics**, Monterey, Calif. (F. N. Frenkiel, U.S. Natl. Committee on Theoretical and Applied Mechanics, David Taylor Model Basin, Washington, D.C.)

*19–23.* American **Crystallographic** Assoc., Buffalo, N.Y. (W. L. Kehl, Gulf Research and Development Co., P.O. Box 2038, Pittsburgh, Pa. 15230)

*19–29.* Symposium on **Physics of the Magnetosphere**, Washington, D.C. (J. Gazin, % Committee on Space Research, 55 Boulevard Malesherbes, Paris 8, France)

*20–23.* Association of American **Geographers**, 64th annual, Washington, D.C. (J. W. Nystrom, 1146 16th St., NW, Washington, D.C.)

*20–23.* American **Statistical** Assoc., 128th annual, Pittsburgh, Pa. (Executive Director, 810 18th St., NW, Washington, D.C. 20006)

*21–23.* **Applications of X-ray Analysis**, 17th conf., Denver, Colo. (J. B. Newkirk, Metallurgy Div., Univ. of Denver, Denver)

*21–23.* American Soc. of **Civil Engineers**, Cambridge, Mass. (W. H. Wisley, United Nations Plaza, 345 E. 47 St., New York 10017)

*22–24.* American **Nuclear** Soc., Schenectady, N.Y. (J. E. Burke, General Electric Research and Development Center, Schenectady)

*28–30.* Society for the Study of **Reproduction**, Nashville, Tenn. (R. P. Amann, 105 Borland Lab., Pennsylvania State Univ., University Park, 16802)

*30–1.* American **Psychological** Assoc., San Francisco, Calif. (E. Reed, 1200 17th St., NW, Washington, D.C.)

*30–3.* American **Physiological** Soc., San Francisco, Calif. (E. Walker, Dept. of Psychology, Univ. of Michigan, Ann Arbor)

### International and Foreign Meetings

#### July

*8–9.* Canadian **Aeronautics and Space** Inst., Montreal, P.Q. (Secretary, CASI, 77 Metcalfe St., Ottawa 4, Ont.)

*8–13.* **Chemistry of Natural Products**, 5th intern. symp., London, England. (Secretary, % The Chemical Soc., Burlington House, London, W.1)

*8–20.* International Soc. for **Photogrammetry**, 11th congr., Lausanne, Switzerland.

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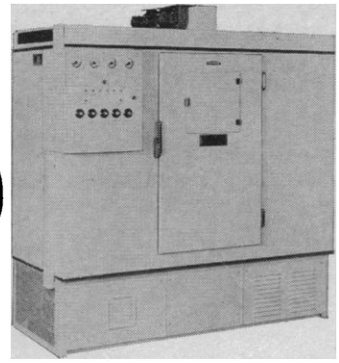

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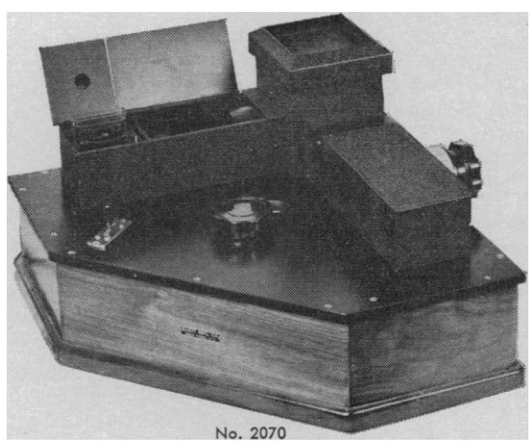

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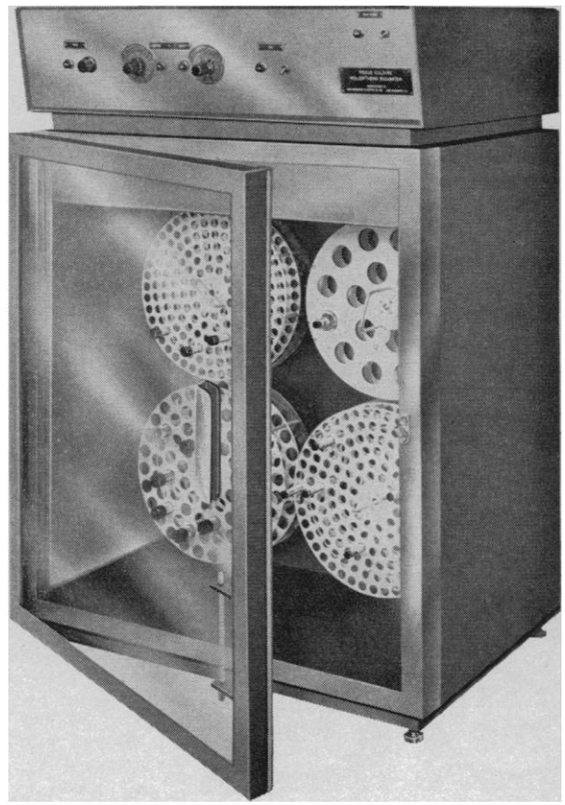

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*9–12.* **Chemistry of Organic Silicon Compounds**, Bordeaux, France. (R. Calas, Lab. of Organic Chemistry, Univ. of Bordeaux, 20, Cours Pasteur, Bordeaux)

*10–12.* Commonwealth Conf. on **Plant Pathology**, 8th, Surrey, England. (The Director, Commonwealth Mycological Inst., Ferry Lane, Kew, Surrey)

*10–12.* **Primatology**, 2nd intern. congr., Atlanta, Ga. (G. H. Bourne, Yerkes Regional Primate Research Center, Emory Univ., Atlanta 30322)

*10–21.* **Large Electric Systems**, 22nd intern. conf., Paris, France. (Conf. on Large Electric Systems, 112 Boulevard Haussmann, Paris 8)

*11–13.* Canadian Soc. for the Study of **Fertility**, Calgary, Alta. (J. R. O'Brian, Suite 680, 3550 Cote des Neiges Rd., Montreal, P.Q., Canada)

*14–20.* World Assoc. for **Animal Production**, Beltsville, Md. (R. E. Hodgson, USDA Animal Husbandry Research Div., Agricultural Research Center, Beltsville, Md. 20705)

*15–19.* Society for **Analytical Chemistry**, Nottingham, England. (Secretary, The Society, 14 Belgrave Sq., London, S.W.1)

*15–22.* **Virology**, 1st congr., Helsinki, Finland. (J. Melnick, Dept. of Virology, College of Medicine, Baylor Univ., Houston, Tex. 77025)

*21–27.* European Assoc. for the Study of **Diabetes**, 4th annual, Louvain, Belgium. (A. E. Renold, Inst. of Clinical Biochemistry, Sentier de la Roseraie, 1211, Geneva 4, Switzerland)

*22–25.* **Animal Production and Artificial Insemination**, 6th intern. congr., Paris, France. (C. Thibault, Station de Physiologie Animale, C.M.R.Z., 78-Jouy-en-Josas, Seine-et-Oise, France)

*22–26.* International Union of **Pure and Applied Chemistry**, 2nd, Münster, Germany. (Symposium Secretariat, IUPAC, Hittorfstrasse 58-62, 44 Münster)

*23–25.* Institute of **Information Scientists**, Sheffield, England. (R. Sewell, U.S. Steel Companies Ltd., Research and Development Dept., Swinden Laboratories, Rotherham, Yorks, England)

*23–27.* **Food Chains in the Sea**, Aarhus, Denmark. (H. Tambs-Lyche, Intern. Council for Exploration of the Sea, Charlottenlund Slot, Charlottenlund, Denmark)

*24–4.* Society of **Economic Geologists**, Cagliari, Sardinia. (R. A. Laurence, P.O. Box 1549, Knoxville, Tenn. 37901)

*29–23.* Australian School of **Nuclear Technology**, Lucas Heights, New South Wales. (The Principal, Australian School of Nuclear Technology, Private Mail Bag, Sutherland, N.S.W.)

*31–2.* Commonwealth **Medical** Assoc., Canberra, Australia. (D. P. Stevenson, BMA House, Tavistock Sq., London, W.C.1, England)

**August**

*1–2.* Commonwealth **Medical** Assoc. Canberra, Australia. (BMA House, Tavistock Sq., London, W.C.1, England)

*5–8.* **Aviation and Space Medicine**, 17th intern., Oslo, Norway. (C.-W. Sem-Jacobsen, EEG Lab, Sykehus Gaustad, Vinderen 3, Oslo)

*5–9.* **Rorschach and Other Projective**

**Techniques**, 7th intern. congr., London, England. (C. Williams, 32 Willes Rd., London, N.W.5)

*5–10.* Asia-Pacific Acad. of **Ophthalmology**, 3rd Conf., Singapore. (E. Kwee, % Ophthalmic Dept., General Hospital, Singapore 3)

*5–10.* General Assembly of the World **Medical** Assoc., Sydney, Australia. (World Medical Assoc., 10 Columbus Circle, New York 10019)

*6–16.* **Soil Science**, 9th intern. congr., Sydney, Australia. (Australian Organizing Committee, % CSIRO Waite Agricultural Research Inst., Adelaide)

*12–15.* International Conf. on **Radiation Chemistry**, Argonne, Ill. (E. J. Hart, Argonne National Lab., 9700 S. Cass Ave., Argonne 48090)

*12–17.* **Mental Health**, 7th intern. congr., London, England. (World Federation for Mental Health, Regional U.S. Office, Suite 716, 124 E. 21 St., New York 10016)

*12–30.* **Limnology**, 17th intern. congr., Israel. (International Assoc. of Theoretical and Applied Limnology, % Freshwater Biological Assoc., Ferry House, Far Sawrey, Ambleside, Westmorland, England)

*13–16.* Disorders of the **Skull Base Region**, 1st intern. congr., Stockholm, Sweden. (C. A. Hamberger, Ear, Nose, and Throat Clinic, Karolinska Sukhuset, Stockholm 60)

*14–27.* United Nations Conf. on the **Exploration and Peaceful Uses of Outer Space**, Vienna, Austria. (Bundesministerium fur Auswartige Angelegenheiten, Ballhausplatz 2, A-1010 Vienna)

*18–22.* International Congr. of **Histochemistry and Cytochemistry**, New York, N.Y. (R. M. Rosenbaum, Dept. of Pathology, % Albert Einstein College of Medicine, New York 10461)

*18–22.* Canadian **Pharmaceutical** Assoc., Regina, Sask. (P. W. Bell, 175 College St., Toronto 2B, Ont., Canada)

*18–23.* **Thermal Analysis**, 2nd intern. conf., Worcester, Mass. (P. D. Gain, Univ. of Akron, Arkon, Ohio 44304)

*18–24.* International Union of **Theoretical and Applied Mechanics**, Monterey, Calif. (F. N. Frenkiel, U.S. National Committee on Theoretical and Applied Mechanics, % David Taylor Model Basin, Washington, D.C.)

*19–21.* **Water Pollution Research**, 4th intern. conf., Prague, Czechoslovakia. (P. A. Krenkel, American Commission, Box 1670, Station B, Vanderbilt Univ., Nashville, Tenn. 37203)

*19–23.* American **Meteorological** Soc., Montreal, P.Q., Canada. (D. W. Hitschfeld, Dept. of Meteorology, McGill Univ., Montreal)

*19–23.* International **Peat** Congr., 3rd, Quebec City, P.Q., Canada. (Div. of Building Research, Natl. Research Council, Ottawa 7, Ont., Canada)

*19–28.* International Assoc. of **Geochemistry and Cosmochemistry**, Prague, Czechoslovakia. (E. Ingerson, Univ. of Texas, Austin 78712)

*19–28.* International **Geological** Congr., 23rd, Prague, Czechoslovakia. (M. A. Dudek, Ustredni Ustav geologicky, Malostranske nam. 19, Prague 1)

*19–28.* International Congr. of **Genetics**, 12th, Tokyo, Japan. (Y. Tazima, % National Inst. of Genetics, Yata 1, 111, Misima, Sizuokaken, Japan)

## BOOKS RECEIVED

*(Continued from page 1332)*

**Excursion Flora of the British Isles.** A. R. Clapham, T. G. Tutin, and E. Warburg. Cambridge University Press, New York, ed. 2, 1968. xxxviii + 586 pp. $5.50.

**Exploring Mount Rainier.** Ruth Kirk. Photographs by Ruth Kirk and Louis Kirk. University of Washington Press, Seattle, 1968. viii + 91 pp. Paper, $1.95.

**A Guide for Authors.** Manuscript, Proof and Illustration. John Fuller Thomas. Original book by Payne E. L. Thomas. Thomas, Springfield, Ill., ed. 2, 1968. viii + 87 pp., illus. Paper, $3.

**Guide to Stationary Phases for Gas Chromatography.** Compiled by T. R. Lynn, C. L. Hoffman, and M. M. Austin. Analabs, Hamden, Conn., ed. 5, 1968. 103 pp.

**Guide to the Microfilm Edition of the George Ellery Hale Papers, 1882–1937.** At the Mount Wilson and Palomar Observatories Library, Pasadena, Calif. 100 rolls. Daniel J. Kevles, Ed. Carnegie Institution of Washington, Washington, D.C.: California Institute of Technology, Pasadena, 1968. 47 pp.

**Heat and Mass Transfer in Process Metallurgy.** Proceedings of a symposium held by the John Percy Research Group, London, April 1966. A. W. D. Hills, Ed. Institution of Mining and Metallurgy, London, 1967 (distributed in the U.S. by Elsevier, New York). x + 252 pp., illus. $12.50.

**Liquid Metals.** N. H. March. Pergamon, New York, 1968. viii + 133 pp., illus. $7. International Series of Monographs in Natural Philosophy, vol. 15.

**Men of Space.** Vol. 8. Shirley Thomas. Chilton, Philadelphia, 1968. xx + 235 pp., illus. $7.95.

**Methods of Studying Plant Hormones and Growth-Regulating Substances.** John W. Mitchell and George A. Livingston. Agricultural Research Service, Washington, D.C., 1968 (available from Superintendent of Documents, Washington, D.C.). iv + 140 pp., illus. Paper, 55¢. Agriculture Handbook No. 336.

**The Mind.** Biological Approaches to Its Functions. William C. Corning and Martin Balaban, Eds. Interscience (Wiley), New York, 1968. x + 321 pp., illus. $12.50.

**Modern Physics.** John E. Williams, H. Clark Metcalfe, Frederick E. Trinklein, and Ralph W. Lefler. Holt, Reinhart and Winston, New York, ed. 5, 1968. xii + 707 pp., illus. $6.64. Holt Physics Program.

**The Modern Technique of Rock Blasting.** U. Langefors and B. Kihlström. Wiley, New York, ed. 2, 1968. 405 pp., illus. $17.50.

**Nebraska Symposium on Motivation, 1967.** David Levine, Ed. University of Nebraska Press, Lincoln, 1967. x + 335 pp., illus. Cloth, $6.25; paper, $3.25. Current Theory and Research in Motivation, vol. 15.

**Nuffield Mathematics Project.** Brian Young, Director. How to Build a Pond (21 pp., illus. Paper, $1.75); Shape and Size (viii + 101 pp., illus. Paper, $2.50); Computation and Structure (viii + 103 pp., illus. Paper, $2.50); Desk Calculators (9 pp., illus. Paper, 95¢); Mathematics Begins (viii + 61 pp., illus. Paper, $2.25).

Published for the Nuffield Foundation by W&R Chambers and John Murray; Wiley, New York, 1968.

**Oeuvres Médicales.** Paracelse. Choisies, traduites et présentées, par Bernard Gorceix. Presses Universitaires de France, Paris, 1968. xvi + 261 pp. Paper, 24 F. "Galien," Histoire et Philosophie de la Biologie et de la Medecine.

**Order and Life.** Joseph Needham. M.I.T. Press, Cambridge, Mass., 1968. xxii + 175 pp., illus. Paper, $2.45. Reprint of the 1936 edition.

**Organic Reactions.** Vol. 16. Arthur C. Cope, Roger Adams, A. H. Blatt, Virgil Boekelheide, T. L. Cairns, D. K. Cram, and H. E. House, Eds. Wiley, New York, 1968. xii + 444 pp., illus. $12.50.

**Organismic Psychology and Systems Theory.** Ludwig von Bertalanffy. Clark University Press with Barre, Barre, Mass., 1968. xii + 76 pp. $3.75. 1966 Heinz Werner Lecture Series, vol. 1.

**On the Development of Memory and Identity.** Jean Piaget. Translated from the French by Eleanor Duckworth. Clark University Press with Barre, Barre, Mass., 1968. x + 42 pp., illus. $3.75. 1967 Heinz Werner Lecture Series, vol. 2.

**The Origin of Life.** John Keosian. Reinhold, New York, ed. 2, 1968. viii + 120 pp., illus. Paper, $2.25. Selected Topics in Modern Biology.

**The Origin of Terrestrial Vertebrates.** I. I. Schmalhausen. Translated from the Russian edition (Moscow, 1964) by Leon Kelso. Keith Stewart Thompson, Ed. Academic Press, New York, 1968. xxii + 314 pp., illus. $15.

**Palladium.** Recovery, Properties, and Uses. Edmund M. Wise. Academic Press, New York, 1968. xii + 187 pp., illus. $11.

**Personality and Assessment.** Walter Mischel. Wiley, New York, 1968. xiv + 365 pp., illus. $8.50.

**The Person in Psychology.** Selected Essays by Gordon W. Allport. Beacon, Boston, 1968. viii + 440 pp. $9.95.

**Planning for Diversity and Choice.** Possible Futures and Their Relations to the Man-Controlled Environment. Documentation of a conference, Dedham, Mass., October 1966. Stanford Anderson, Ed. M.I.T. Press, Cambridge, Mass., 1968. xii + 340 pp., illus. $12.50.

**Practical Semi-Conductor Experimentation.** Ronald R. Meyers. Prentice-Hall, Englewood Cliffs, N.J., 1968. vi + 185 pp., illus. Paper, $5.95. Prentice-Hall Series in Electronic Technology.

**Problems in Probability Theory, Mathematical Statistics and Theory of Random Functions.** A. A. Sveshnikov, Ed. Translated from the Russian edition (Moscow, 1965) by Scripta Technica. Bernard R. Gelbaum, Ed. Saunders, Philadelphia, 1968. x + 481 pp., illus. $14.50; in Canada, $15.70.

**Prostaglandins.** Proceedings of the Second Nobel Symposium, Stockholm, June 1966. Sune Bergström and Bengt Samuelsson, Eds. Interscience (Wiley), New York; Almqvist and Wiksell, Stockholm, 1967. 299 pp., illus. $18.50.

**Public Knowledge.** An Essay Concerning the Social Dimension of Science. J. M. Ziman. Cambridge University Press, Cambridge, Mass., 1968. xii + 154 pp. Cloth, $3.95; paper, $1.95.