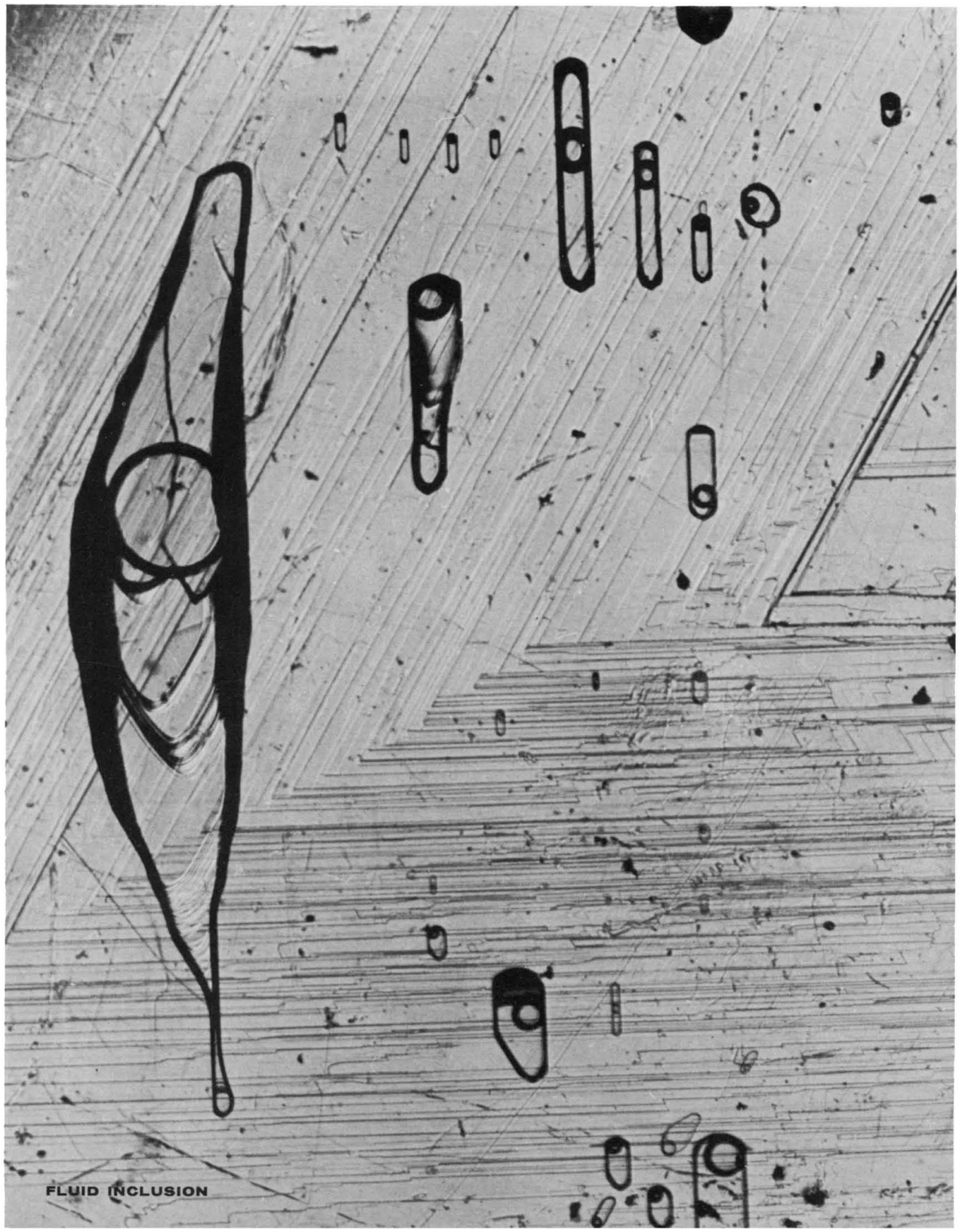
SCIENCE

26 April 1963

Vol. 140, No. 3565

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



FLUID INCLUSION

For Illustrated Brochure Detailing Melpar's Capabilities, Write to Office of the President, Melpar, Inc., Falls Church, Virginia

EXPERIENCED TRAVELER

Here is Melpar's case for space.

Experience? We've got a bagful—from the first probing start with Snark to the far-advanced Apollo program, from earth to the moon, to Venus and beyond. If you're aiming for a place in space, Melpar's proven capabilities can help you get there—fast.

Thinking small, like circuits ten millionths of an inch thin or refrigerators (thermo-electric coolers) half the size of your thumb nail? Melpar makes them.

Thinking big, like data handling complexes (Finder) as large as a basketball court? Melpar produces those, too.

If you're traveling or exploring in the spheres of Advanced Electronics, Aerospace, Physical or Life Sciences, just pack up your space problems and bring them to Melpar. We make wonderful traveling companions, because we've been there—and that's a mighty strong case anytime.

And, if you're a scientist or engineer who would like to travel along with this fast-moving leader in space and defense, we're ready to reserve your place in space, too. Write: Professional Employment Manager, 3010 Arlington Blvd., Falls Church, Virginia.

Serving Government and Industry

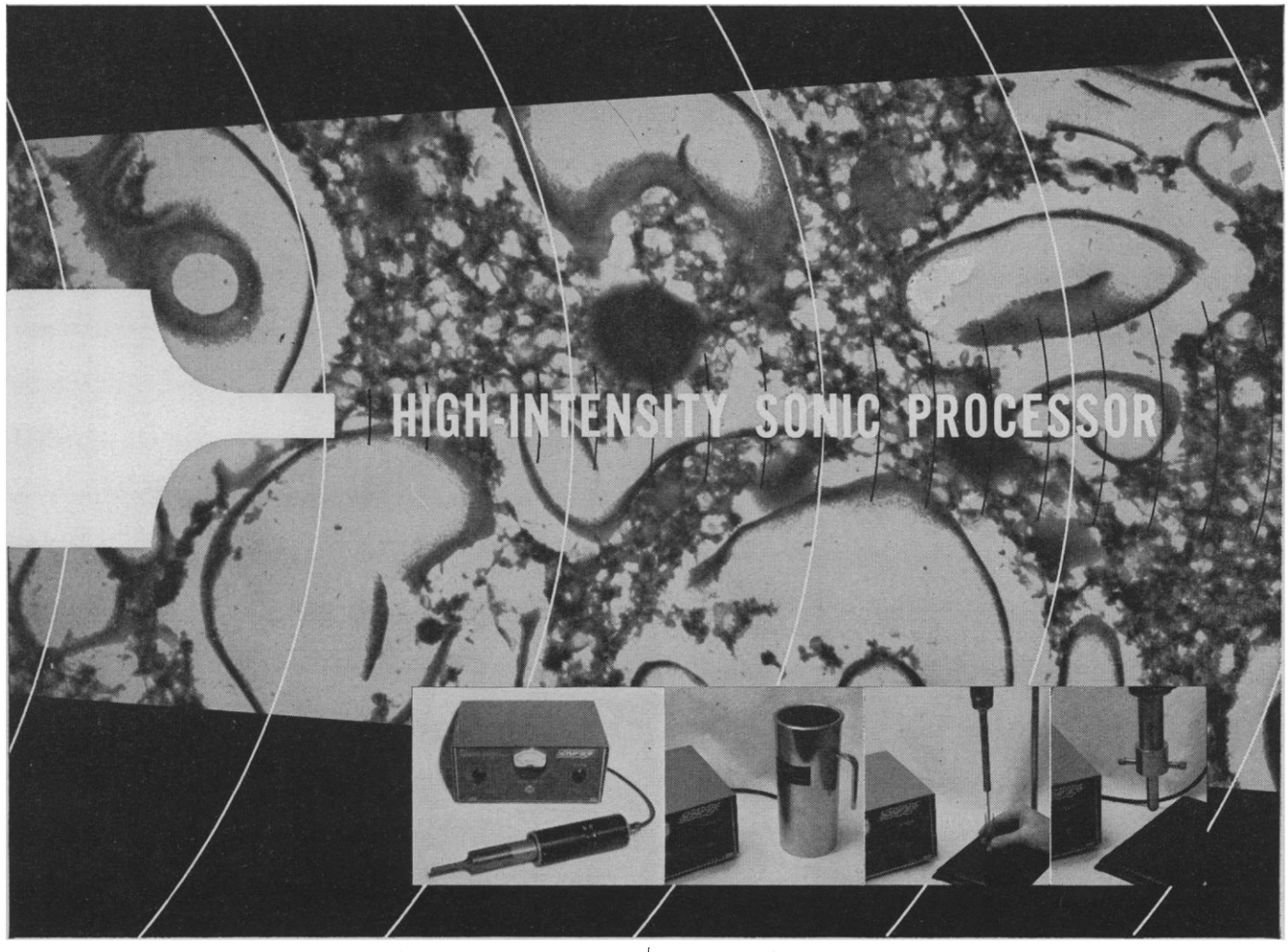
MELPAR INC

A SUBSIDIARY OF WESTINGHOUSE AIR BRAKE COMPANY

3906 Arlington Boulevard, Falls Church, Virginia.

An equal opportunity employer

Subsidiaries: Microwave Physics Corp., Garland, Texas • Television Associates of Indiana, Inc., Michigan City, Indiana • Melpar-Fairmont Corp., Fairmont, West Virginia



. . . . . Disrupts Cells / Homogenizes / Emulsifies / Accelerates Enzymatic Activity

SONIFIER® Sedisaver

Versatile, compact and convenient, the Sonifier provides concentrated ultrasonic power at high levels and at low cost. It converts ordinary house current into 20,000 cycle-per-second mechanical vibration which radiates into any material in contact with the tip. It can be conveniently hand-held or mounted on a ring stand. All parts that come in contact with test materials can be autoclaved.

The Sonifier does its work in a very short time — Ehrlich Ascites cells, for example, are disrupted in only a few seconds. Accessories such as sealed-atmosphere treatment chambers, sonic cleaning tank, continuous flow attachment and special tips are readily available to further increase the Sonifier's capabilities.

For details see your Aloe Scientific representative or write Aloe Scientific, [B] Division of Brunswick, 1831 Olive Street, St. Louis 3, Missouri.

V61400 Sonifier, with power supply and sonic converter.....$820.00
V61405 Sealed Atmosphere Attachment, 5 to 15 cc.....$175.00
V61406 Cleaning Tank.....$150.00
V61407 Step Horn.....$75.00
V61408 Micro Tip $50.00

Serving the Sciences that Serve Mankind

ALOE SCIENTIFIC

26 April 1963
Vol. 140, No. 3565

SCIENCE

EDITORIAL

Piecework Pay for Professors 355

ARTICLES

Geochronology: *G. R. Tilton* and *S. R. Hart* 357

New techniques provide knowledge of the time and mode of formation and subsequent evolution of rock systems.

Criminalistics: *P. L. Kirk* 367

A new and independent discipline evolves from modern techniques and new concepts of individualization.

NEWS AND COMMENT

Peace Corps—Halfway Home; Federal Science—New Guide; Maps and Charts—Government and Private Firms Compete 371

BOOK REVIEWS

The Measure of the Moon and *Physics and Astronomy of the Moon*, reviewed by *D. Alter*; other reviews 374

REPORTS

National Academy of Sciences: Abstracts of papers presented at the annual meeting, Washington, D.C., 22–24 April 1963 378

Adipose Tissue: Ability To Respond to Nerve Stimulation in vitro: *J. W. Correll* 387

Tryptophan- and Indole-Excreting Bacterial Mutants: *P. G. Lim* and *R. I. Mateles* 388

Cysteine Stimulation of Glucose Oxidation in Thyroid Tissue: *J. A. Pittman, F. A. Zacharewicz, W. M. Shannon* 389

Glauconite from the Precambrian Belt Series, Montana: *R. A. Gulbrandsen, S. S. Goldich, H. H. Thomas* 390

SCIENCE is published weekly by the American Association for the Advancement of Science, 1515 Massachusetts Ave., N.W., Washington 5, D.C. Now combined with **The Scientific Monthly** ®. Annual subscriptions $8.50; foreign postage, $1.50; Canadian postage, 75¢; single copies, 35¢. School year subscriptions: 9 months, $7; 10 months, $7.50. Provide 4 weeks' notice for change of address, giving new and old address and zone numbers. Send a recent address label. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. Indexed in the **Reader's Guide to Periodical Literature.**

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Venus: A Map of Its Brightness Temperature: *B. C. Murray, R. L. Wildey, J. A. Westphal* .. 391

Local Anesthetic Drugs: Penetration from the Spinal Extradural Space into the Neuraxis: *P. R. Bromage, A. C. Joyal, J. C. Binney* 392

Intracranial Self-Stimulation in Man: *M. P. Bishop, S. T. Elder, R. G. Heath* 394

Radiolarians: Construction of Spherical Skeleton: *I. J. Smalley* 396

Acoustic Activity Recorder for Burrowing Animals: *C. Gans* and *J. J. Bonin* 398

Following-Response Initiation in Ducklings: Age and Sensory Stimulation: *G. Gottlieb* 399

Biosynthesis of Streptococcal Cell Walls: A Rhamnose Polysaccharide: *L. D. Zeleznick* et al. 400

Neutron Activation Analysis of Fluid Inclusions for Copper, Manganese, and Zinc: *G. K. Czamanske, E. Roedder, F. C. Burns* 401

Disappearance of Luminous Designs: *J. P. McKinney* 403

Plaque Formation in Agar by Single Antibody-Producing Cells: *N. K. Jerne* and *A. A. Nordin* 405

Antibody Quality after Sequential Immunization with Related Antigens: *R. V. Gilden* and *S. Tokuda* 405

Germination of *Melampyrum lineare*: Interrelated Effects of Afterripening and Gibberellic Acid: *E. J. C. Curtis* and *J. E. Cantlon* 406

Temperature Dependence of Wing Abnormality in *Tribolium confusum: J. V. Slater* et al. 408

Cytochrome in *Thiobacillus thiooxidans:* J. London 409

Phytotoxic Substance from a Species of *Penicillium: F. A. Norstadt* and *T. M. McCalla* 410

Schistosoma mansoni: Development of Challenge Infections in Mice Exposed to Irradiated Cercariae: *A. P. Szumlewicz* and *L. J. Oliver* 411

ASSOCIATION AFFAIRS Conference Board of the Mathematical Sciences; Forthcoming Events 416

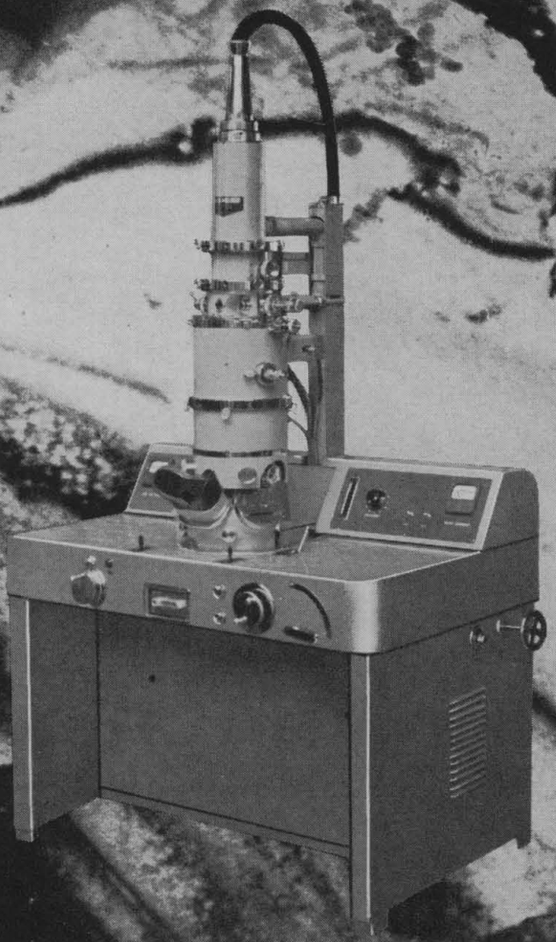
LETTERS Cross-Cultural Differences; Independent Research Institutes 422

EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., N.W., Washington 5, D.C. Phone: 202-DU 7-7171. Cable: Advancesci, Washington. Manuscripts should be submitted in triplicate, doublespaced throughout. The AAAS assumes no responsibility for the safety of manuscripts. Copies of "Instructions for Contributors" can be obtained from the editorial office.

ADVERTISING CORRESPONDENCE: Room 1740, 11 West 42 St., New York 36, N.Y. Phone 212-PE 6-1858.

COVER

Large primary two-phase fluid inclusions just under the striated face of a pale yellow sphalerite crystal from a silver-lead-zinc-copper deposit at Creede, Colorado (transmitted light, × 37). During the growth of this crystal in a vug, these small droplets of moderately saline hydrothermal fluid were trapped by new perfect crystal growth covering the imperfect skeletal growth. Shrinkage on subsequent cooling formed the water-vapor "bubble" in each; except for the few millimeters of water-vapor pressure, they are vacuums. The material trapped in these inclusions represents a sample of the fluids from which this ore mineral formed; similar fluid inclusions in adjacent contemporaneous quartz crystals have been analyzed for heavy metals. See page 401.



The background is a microphotograph of aluminum foil, taken at 70,000x

A BARGAIN, REGARDLESS OF PRICE!

...yet the price of the Hitachi HS-6 electron microscope has been reduced from $19,500 to only $15,750 ($13,750 for non-profit institutions who can purchase duty-free)!

Although the least expensive of the Hitachi line, this fine instrument offers by far the best optical performance available in its price range, in many respects comparing favorably with instruments costing thousands of dollars more. The Hitachi HS-6 has a unique permanent magnet lens system, simplified electronics, up to 30,000x magnification and guaranteed 20 AU resolution. Complete, with condenser, airlocks and a magazine-type 36-exposure camera.

Please write or call for further information on this budget priced instrument with the many high priced features.

ERB & GRAY SCIENTIFIC

A Division of The Perkin-Elmer Corporation

LOS ANGELES • HOUSTON • CHICAGO • NEW YORK

News from Bell Telephone Laboratories

WE'RE "FINGERPRINTING" VOICES...TO FIND BETTER WAYS OF TRANSMITTING THEM

Acoustics scientists at Bell Telephone Laboratories study voices to learn how one voice differs from all others, what makes yours instantly recognizable to friends and family, and what the elements of a voice are that give it the elusive qualities of "naturalness."

To enable us to examine speech closely, we devised a method of making spectrograms of spoken words. We call them voiceprints. They are actual pictures of sound, revealing the patterns of voice energy. Each pattern is distinctive and identifiable. They are so distinctive that voiceprints may have a place, along with fingerprint and handwriting identification, as an important tool of law enforcement.

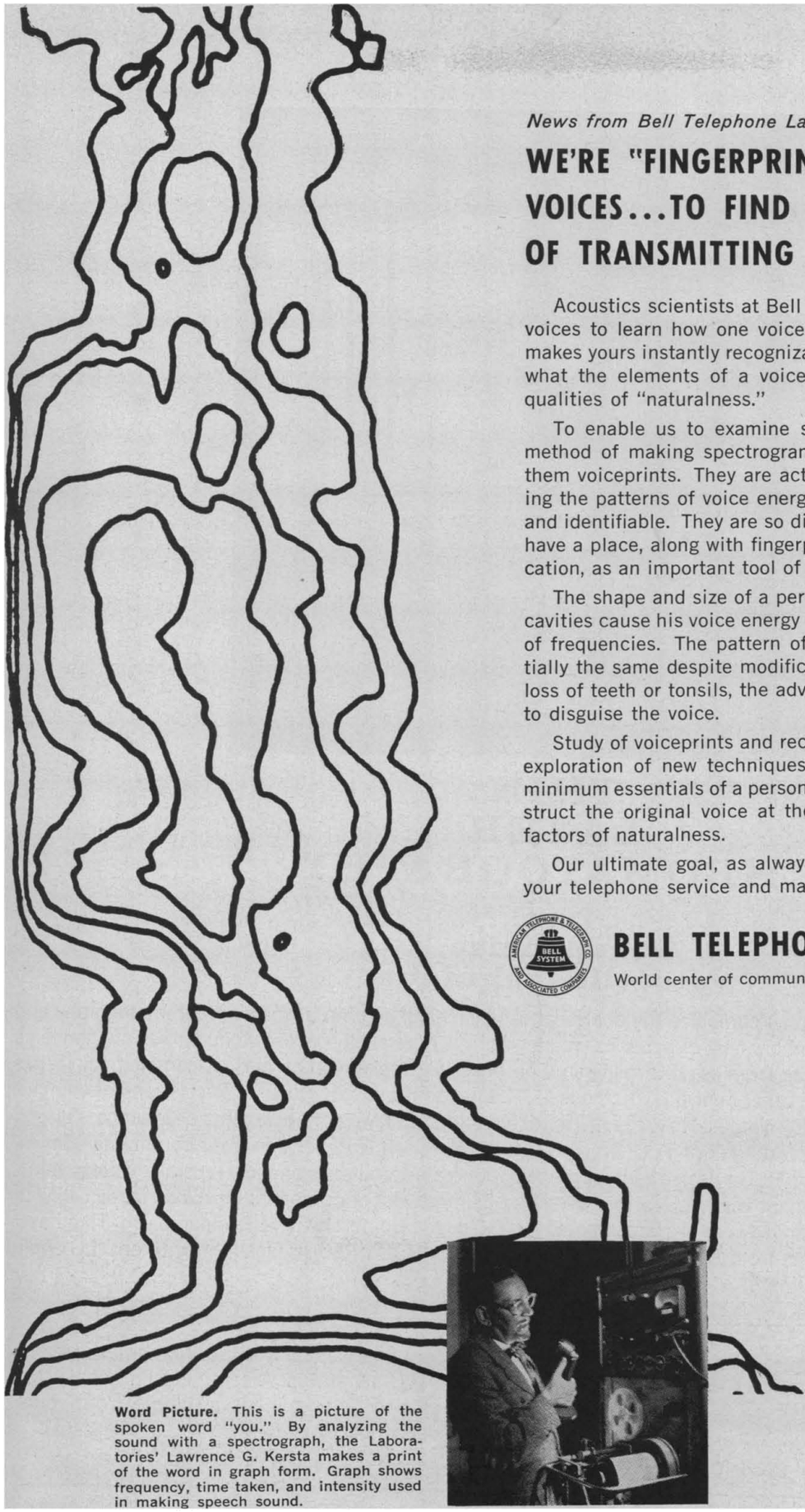
The shape and size of a person's mouth, throat and nasal cavities cause his voice energy to be concentrated into bands of frequencies. The pattern of these bands remains essentially the same despite modifications which may result from loss of teeth or tonsils, the advancement of age, or attempts to disguise the voice.

Study of voiceprints and recognition factors is part of our exploration of new techniques to extract and transmit the minimum essentials of a person's voice and from these reconstruct the original voice at the receiving end, retaining its factors of naturalness.

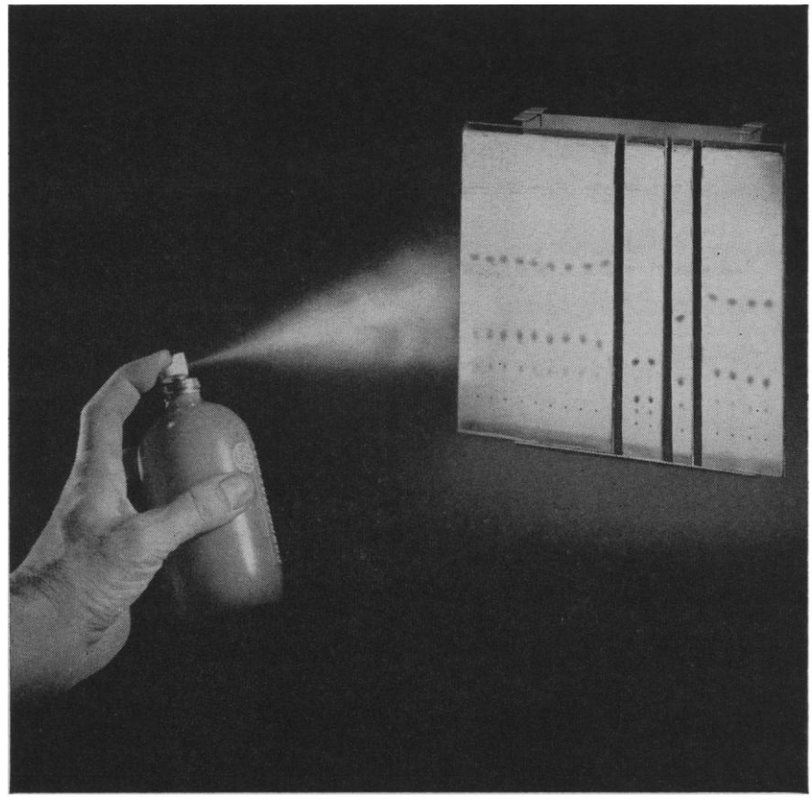
Our ultimate goal, as always, is to learn how to improve your telephone service and make it a better value.

BELL TELEPHONE LABORATORIES

World center of communications research and development



Word Picture. This is a picture of the spoken word "you." By analyzing the sound with a spectrograph, the Laboratories' Lawrence G. Kersta makes a print of the word in graph form. Graph shows frequency, time taken, and intensity used in making speech sound.



THIN LAYER CHROMATOGRAPHY

fast, inexpensive, versatile technique

TLC (Thin Layer Chromatography) combines the analytical capabilities of column adsorption chromatography and the convenience, simplicity, and low cost of paper chromatography. □ The ability to resolve quantities of sample as small as a few nanograms or as large as 100 milligrams on one plate makes TLC a perfect complement to gas chromatography, infrared, and other analytical methods. □ TLC is rapid and easy to use. Resolutions of complex mixtures often take less than 20 minutes. No great skill is required to form layers of adsorbents or to process plates. □ **Attracted to the unique advantages of TLC?** Now you can explore the world of thin-layer chromatography inexpensively. For only $60, your RSCo dealer can supply you with a starter kit of standard, reusable catalog items which will allow you to experiment with TLC before investing in more elaborate apparatus. Write us or call your dealer for details. □ TLC's expanded uses are documented in a 30 page "Comprehensive Bibliography of Thin Layer Chromatography," available free from RSCo. Also available and free: RSCo Review, Vol. 4, No. 6, on TLC applications, techniques, and equipment.

RESEARCH SPECIALTIES CO.

200 SOUTH GARRARD BLVD. • RICHMOND, CALIFORNIA

Research Specialties Company is the only domestic manufacturer of TLC apparatus. A complete line of RSCo TLC supplies and equipment is available from your laboratory supply house.

BEST BUY: MODEL 139

NEW MODEL 139 ULTRAVIOLET-VISIBLE SPECTROPHOTOMETER —BY ANY STANDARD GIVES MORE PERFORMANCE AT LESS COST

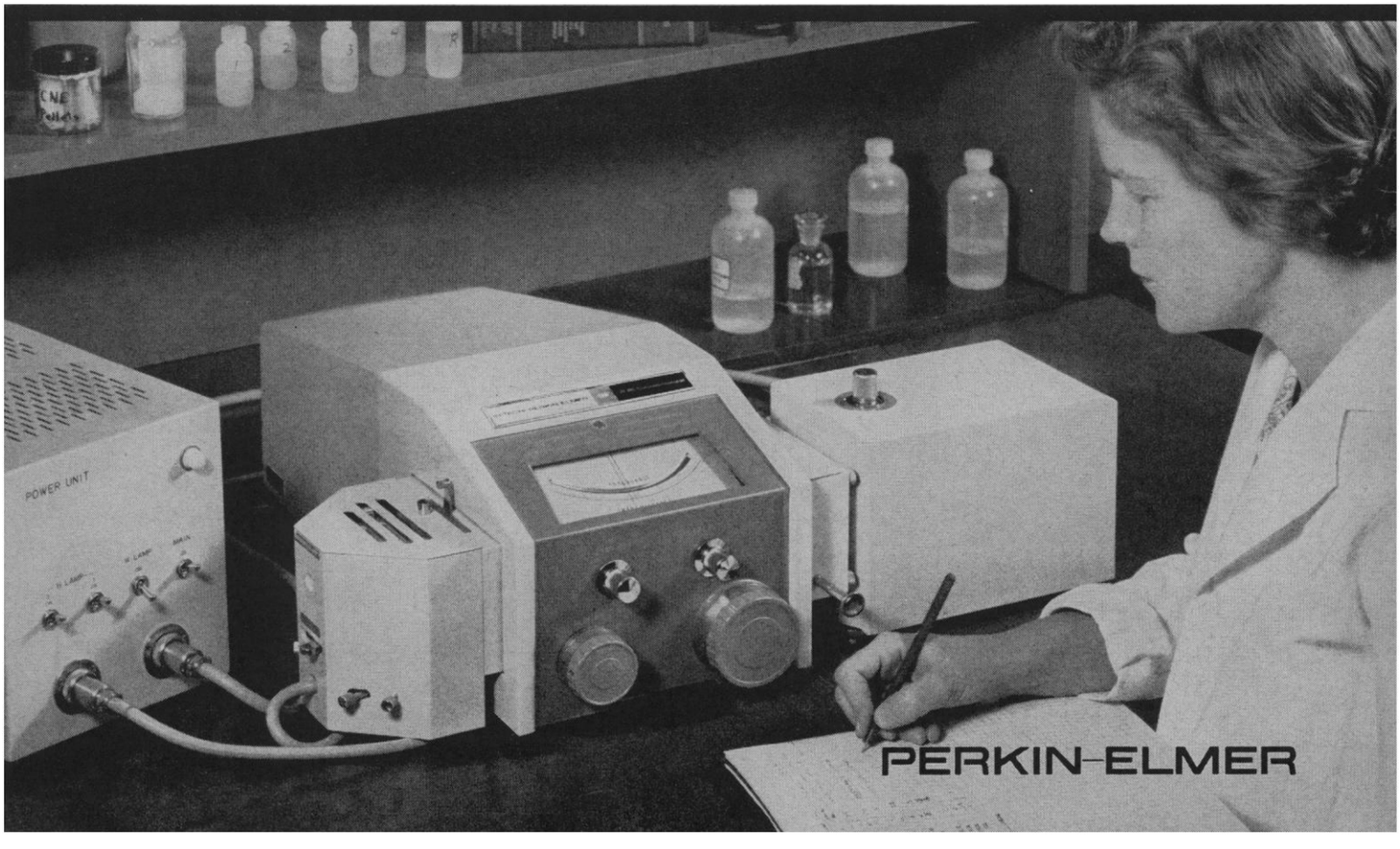
At no extra cost [1] Full coverage of ultraviolet and visible ranges. [2] Transistorized line-operated power supply. [3] High dispersion difraction grating optics. [4] Direct reading in transmittance and absorbance. [5] Precision scale expansion. [6] Linear wavelength output. Normal operating range is 205 to 800 millimicrons for transmittance measurement.

Optional All attachments for ultraviolet and visible spectral analysis, plus such exclusive attachments as atomic absorption and emission photometry.

Pooling two decades of experience in spectroscopic equipment, Perkin-Elmer and Hitachi Limited have joined to create this modern spectrophotometer.

We believe that the result of this joint effort is the finest instrument of its type available anywhere in the world. Price: $2300 delivered to your laboratory anywhere in the United States.

Please write for a complete brochure and price list on this new instrument to Instrument Division, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Conn.



1000 mg OPTICAL RANGE

A greater optical range increases operator convenience and permits faster, more automatic, weighing—only SARTORIUS offers single-pan true analytical balances reading direct to 0.1 mg (without estimation) which have a 1000 mg optical range and cost less than $1500.00—our prices start at just $725.00.

Other features of
SARTORIUS 2600 Models include:

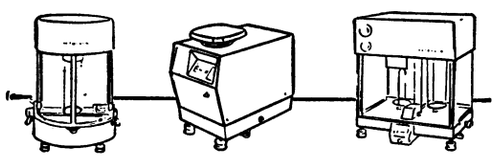
- ☐ Automatic temperature compensation
- ☐ Table level controls
- ☐ Logical left-to-right readout
- ☐ Single field of view
- ☐ Safety signal lamp
- ☐ Dual release levers
- ☐ No front corner posts
- ☐ Tared weighing boat
- ☐ Largest reading scale
- ☐ All-metal housing

MODEL	2601	2602	2603	2604
CAPACITY	200 g	200 g	100 g*	100 g
OPTICAL RANGE	10 g	1000 mg	1000 mg	100 mg
SENSITIVITY	1 mg	0.1 mg	0.1 mg	0.01 mg
DIRECT READING TO	1 mg	0.1 mg	0.1 mg	0.01 mg
READABILITY	0.5 mg	0.05 mg	0.05 mg	0.005 mg
PRICE	$810.00	$825.00	$725.00	$925.00

*Can be extended by taring to 150 g.

SARTORIUS balances are available everywhere through stocking dealers who will be glad to arrange for a free trial or demonstration. For further information, please contact:

sartorius



BRINKMANN INSTRUMENTS, INC.
115 Cutter Mill Road, Great Neck, N. Y.
PHILADELPHIA · CLEVELAND · HOUSTON · MIAMI · MENLO PARK, CAL. · ST. LOUIS

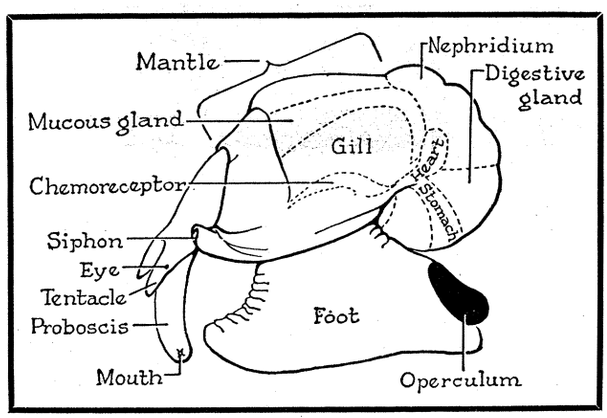


Figure 14.5. (A) Anatomy of *Busycon canaliculatum*—Left side, showing external organs and internal organs visible through the integument.

New Second Edition

Now Ready!

Villee-Walker-Smith's GENERAL ZOOLOGY

offers an excellent balance between the "Principles" and "Animal Types" approaches to college zoology

Whether you open your course in zoology with a study of a vertebrate such as the frog or a consideration of the amoeba, this unusually flexible text will ideally suit your needs. It is designed for a one year or one semester course at the freshman or sophomore level. No previous courses in biology, chemistry or physics are necessary.

Discussions of broad biological principles are skillfully blended with a thorough examination of carefully chosen representative animals. The authors incorporate current classifications of the invertebrates, present day concepts and thinking in taxonomy, plus a logical arrangement of material which familiarizes the student with the various organisms and animals. The book is divided into five absorbing and well written sections:

Part I GENERAL CONCEPTS A progressive study of protoplasm, cells and tissues, and the physiologic mechanisms all animals have in common—*respiration, locomotion, digestion, etc.*

Part II THE ANIMAL KINGDOM Considers each major invertebrate phylum in a separate chapter, featuring discussions of one or more typical species.

Part III VERTEBRATE LIFE AND ORGANIZATION Introduced with a detailed consideration of the frog as representative.

Part IV GENETICS AND EVOLUTION Today's latest knowledge of: *deducing genotypes—sex-linked characteristics—role of DNA in heredity—gene-enzyme relations—preadaptation—origin of species by hybridization—cultural evolution—phylogenetic inheritance—etc.*

Part V ANIMALS AND THEIR ENVIRONMENT An up-to-date discussion of ecology and certain of its practical implications—conservation in agriculture, forestry, wildlife, public health, etc.

This *New (2nd) Edition* presents a timely new chapter on the *Chemical and Mathematical Basis of Genetics.* Newer knowledge of cell structure and function has been incorporated into chapters on *cell metabolism, nervous coordination and biochemical genetics.* The entire book has been thoroughly revised and includes a number of new illustrations.

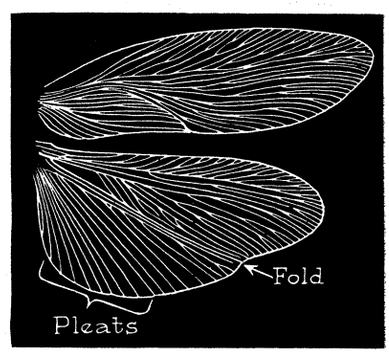


Figure 16.19. Wings of the cockroach, showing the numerous veins characteristic of the more primitive insects.

CLAUDE A. VILLEE
Harvard University

WARREN F. WALKER, JR.
Oberlin College

FREDERICK E. SMITH
University of Michigan

848 Pages 6½" x 9¾"
468 Illustrations. $8.50.
New (2nd) Edition—
Just Published!

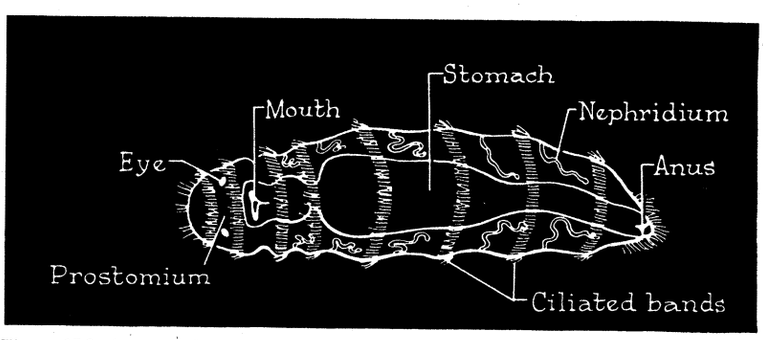


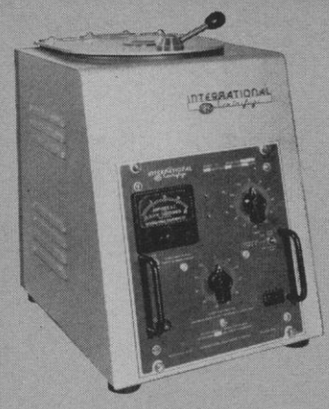
Figure 15.2. An example of the class Archiannelida. *Dinophilus,* a diminutive annelid that lacks external segmentation but has a metameric arrangement of body organs typical of the phylum. (After Meyer.)

Gladly Sent to Teachers on Approval!

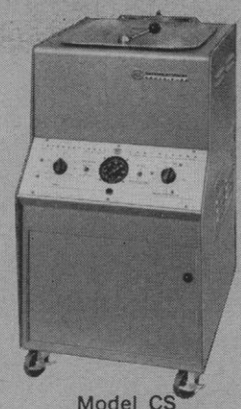
W. B. SAUNDERS COMPANY

WestWashington Square, Philadelphia 5

IF YOU OWN ONE OF THESE IEC CENTRIFUGES - NO MATTER HOW OLD -



Model HT
High speed bench centrifuge

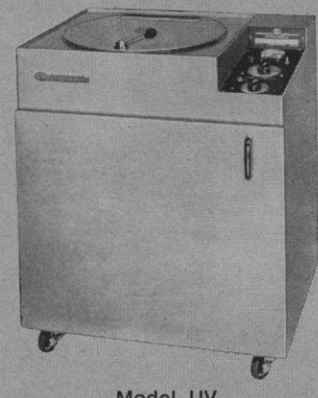


Model CS
Compact, general purpose centrifuge

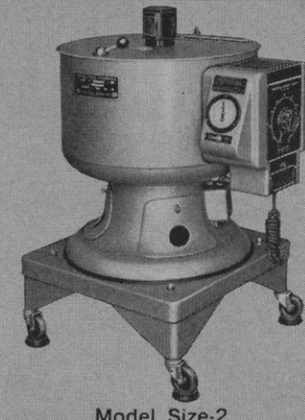
Model PR-2
Versatile refrigerated centrifuge

YOU CAN GIVE IT UP TO 400% GREATER SEPARATION EFFICIENCY

Model HR-1 High-volume
high G's, refrigerated centrifuge

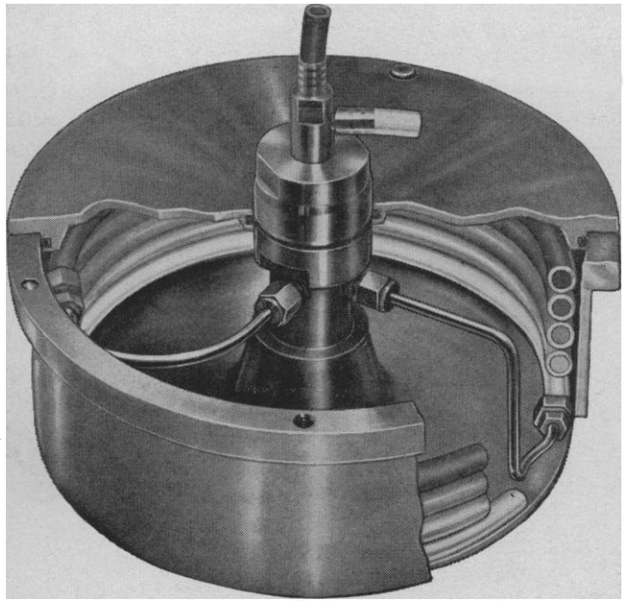


Model UV
Universal routine centrifuge



Model Size-2
Rugged large volume centrifuge

BY ADDING THE NEW IEC HELIXTRACTOR CONTINUOUS FLOW UNIT!

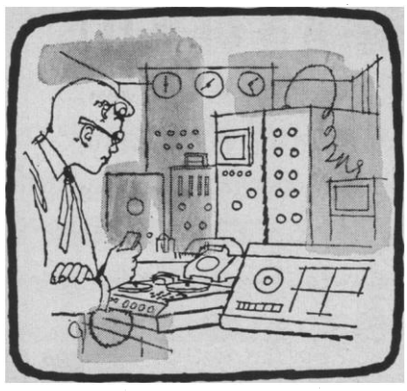


To separate micro deposits from large volumes you can now employ **helical flow continuous centrifugation** and get better results in a fraction of the time required by conventional methods!

In the Helixtractor material is introduced through a central stationary hub and separation occurs in a coil of plastic tubing. Solids are collected along the tubing wall in the form of a paste. The various phases are easily identified and isolated by cutting the tubing. All material is subjected to the same G force for the same length of time. The flowing liquid is only a fraction of an inch thick so solids separate three to four times faster than regular centrifugation. The Helixtractor is completely aerosol free and the entire unit easily autoclaved, thus is ideal for centrifuging infectious materials. **Maximize your present IEC centrifuge capabilities with helical continuous flow separation. Write for literature or a demonstration.**

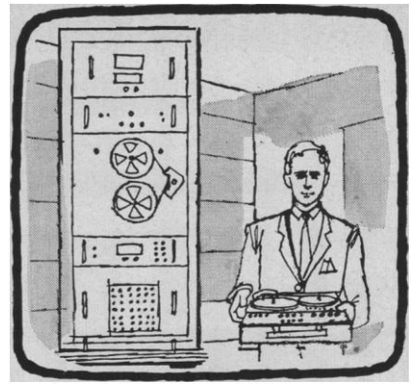
INTERNATIONAL IEC EQUIPMENT CO.

300 SECOND AVENUE • NEEDHAM HEIGHTS 94, MASS.

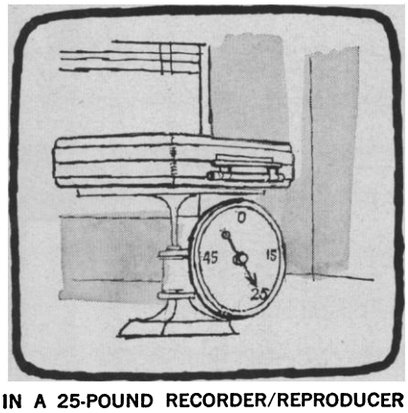


IF YOU ARE RECORDING IN THE LAB...

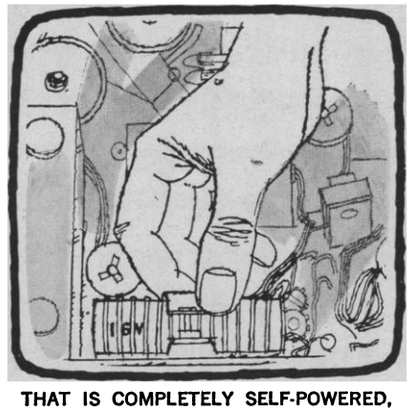
OR IN THE FIELD, YOU CAN NOW...



GET PRECISION PERFORMANCE...

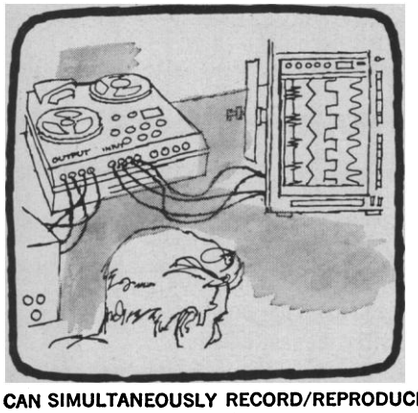


IN A 25-POUND RECORDER/REPRODUCER



THAT IS COMPLETELY SELF-POWERED,

CAN BE HAND-CARRIED ANYWHERE.



CAN SIMULTANEOUSLY RECORD/REPRODUCE 4 TRACKS.

DIRECT SYSTEM

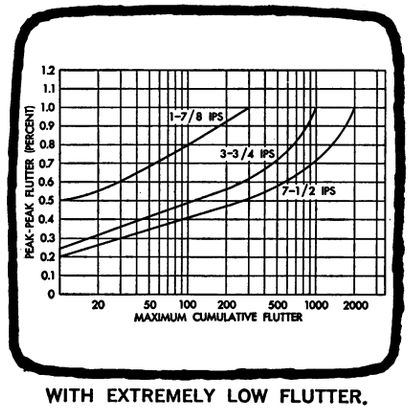
*Tape Speed	Frequency Response ± 3db
1⅞	50—5,000
3¾	50—10,000
7½	50—20,000

FM SYSTEM

Tape Speed	Frequency Response ± ½ db
3¾	0—1,000
7½	0—2,000

**optional speeds available*

FM OR DIRECT.



WITH EXTREMELY LOW FLUTTER.

THE NEW LOCKHEED 411 INSTRUMENTATION RECORDER

MAIL COUPON TODAY FOR FULL INFORMATION

LOCKHEED ELECTRONICS COMPANY/TAPE PRODUCTS DEPT., INDUSTRIAL TECHNOLOGY GROUP, Metuchen, New Jersey

Mr. Bernard Mayer: Send me free product specification folders on the Lockheed 411 instrumentation recorder/reproducer.

NAME .....

TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

LOCKHEED ELECTRONICS COMPANY

A Division of Lockheed Aircraft Corporation/Metuchen, N. J.

S-4

Who told the pilot his IFF transponder, UHF transceiver, ILS display and TACAN systems are operational?

She did

She wouldn't know a transistor from a can-opener. But pilots find her voice irresistible—and pay attention.

Just before takeoff the pilot punched a button on his UHF radio. A mile from the flight line a two-channel tape programmer went instantly into operation. One channel began an automatic electronic checkout of his communication, identification and navigation (CIN) subsystems. Simultaneously the other channel began to broadcast monitoring instructions to him in a small, calm, very feminine voice.

Complete checkout was accomplished in just two minutes. We call this tester RADFAC, for RADiating test FACility. It is automatic, self-checking, self-contained, self-powered, air-transportable and absolutely foolproof.

Although Republic originally built RADFAC for F-105 fighter-bomber testing, units are now operating with a variety of USAF aircraft in Europe and the Pacific.

Nothing can guarantee the success of an air mission. But RADFAC guarantees that no CIN failure will cause it to abort.

REPUBLIC
AVIATION CORPORATION
FARMINGDALE, LONG ISLAND, NEW YORK

26 April 1963, Volume 140, Number 3565 SCIENCE

Piecework Pay for Professors

Some faculty members have only their salaries as professional income. Others receive additional income from other sources. Indeed some medical schools allow faculty members to receive most of their income from private practice. Faculty members from many departments receive honoraria as consultants to industry or government. Research grants provide an additional source of income.

When external grants constituted only a small fraction of a university's income, the funds were used to supplement the university's resources. The investigator's salary was generally paid from the university's own funds. But as government funds have multiplied to become a large fraction of the income of many universities, the practice of charging a portion of the investigator's salary to the grant has become widely established.

Thus we have gradually arrived at a situation in which many a professor is paid on a kind of piecework basis, with so much from this grant and so much from that, $50 a day for service on one government advisory committee and $75 a day for service on another, other fees for industrial consulting, perhaps some book royalties, and in some cases participation in the earnings of a profit-making company formed to exploit a useful development that grew out of earlier research—and, of course, some salary from the general university budget. One reason for this situation is that academic salaries have been too low. To help to raise them there has been a deliberate, even if not always announced, policy of using external funds to supplement what the college or university could pay from its own resources.

The income increases are good, but the means of achieving them have brought divided loyalties, an unhealthy diversity of standards in the use of grant funds, and the competitive use of extra-earning privileges. On one campus a man may supplement his regular salary from grant funds during the academic year; on another he may not. On one campus summer work on a research grant augments regular salary by two-ninths; on another campus, by some other fraction. We have heard of one university that computes academic duties in terms of days and allows a faculty member to augment his salary at the rate of so much per day for each Saturday, Sunday, holiday, or summer day devoted to research supported by an external grant.

The situation has now reached a fair degree of chaos and may be settled by the imposition of rules formulated by the grant-making agencies of government. Last week (p. 284) John Walsh discussed the American Council on Education recommendations on supplementation of salaries from grant funds. We hope these recommendations will be carefully considered, for it would be better for all concerned if the solution were to come from the colleges and universities through general adoption of a set of principles that both the faculty community and those who supply the external funds consider equitable.—D.W.

Precise measurement of radioactivity in gas chromatography effluents

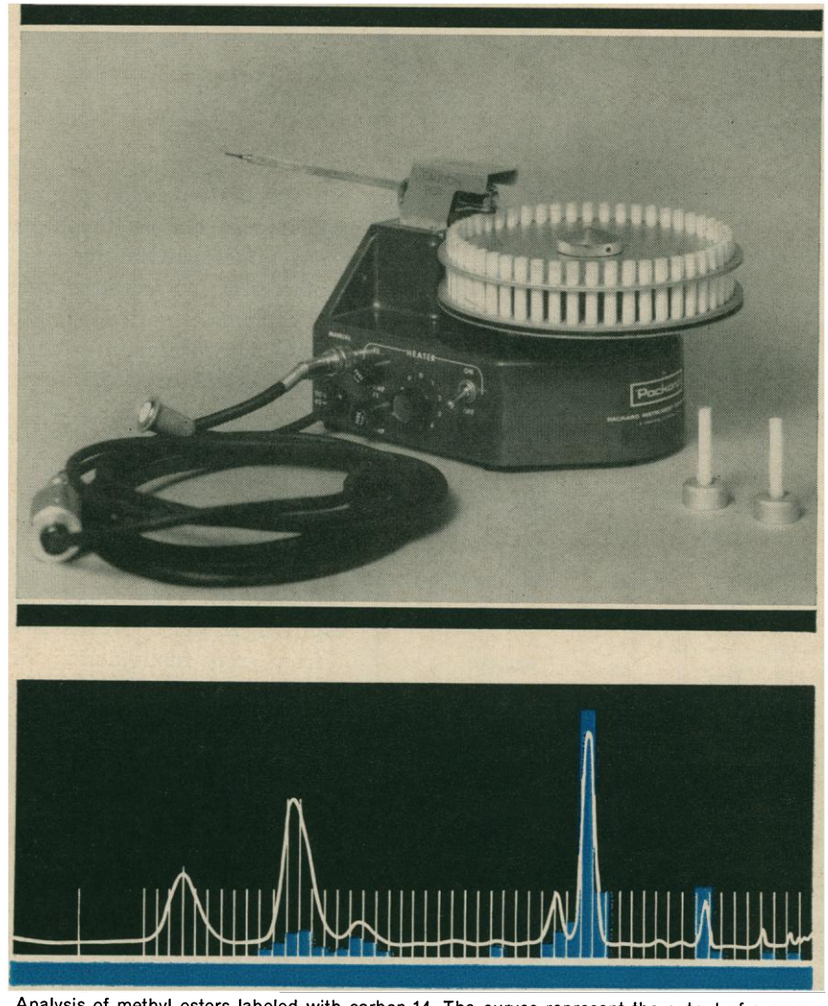
The Packard Model 830 Tri-Carb® Gas Fraction Collector enables quantitative collection of the individual organic components in a gas chromatographic effluent stream. It is suitable for use with any gas chromatograph using a non-destructive mass detector. Precise measurement of the radioactivity in component peaks can be made after collection.

An 8″ diameter turntable holds up to 50 Tri-Carb Cartridges, each packed with silicone-coated scintillation crystals. Vapors leaving the gas chromatography mass detector pass through the heated gas injection nozzle of the collector and condense on the coated surfaces of the scintillation crystals. Cartridges may be changed by actuating a pushbutton or automatically according to a preset time. Changing takes only a fraction of a second.

After sample collection, the cartridges are counted in an Automatic Tri-Carb Liquid Scintillation Spectrometer. No sample preparation is necessary.

Counting efficiency for C^{14} is over 50% and backgrounds are extremely low. Consequently, even peaks with very low activity can be accurately measured in short counting periods.

For more information call your local Packard Sales Engineer—or write for descriptive literature.

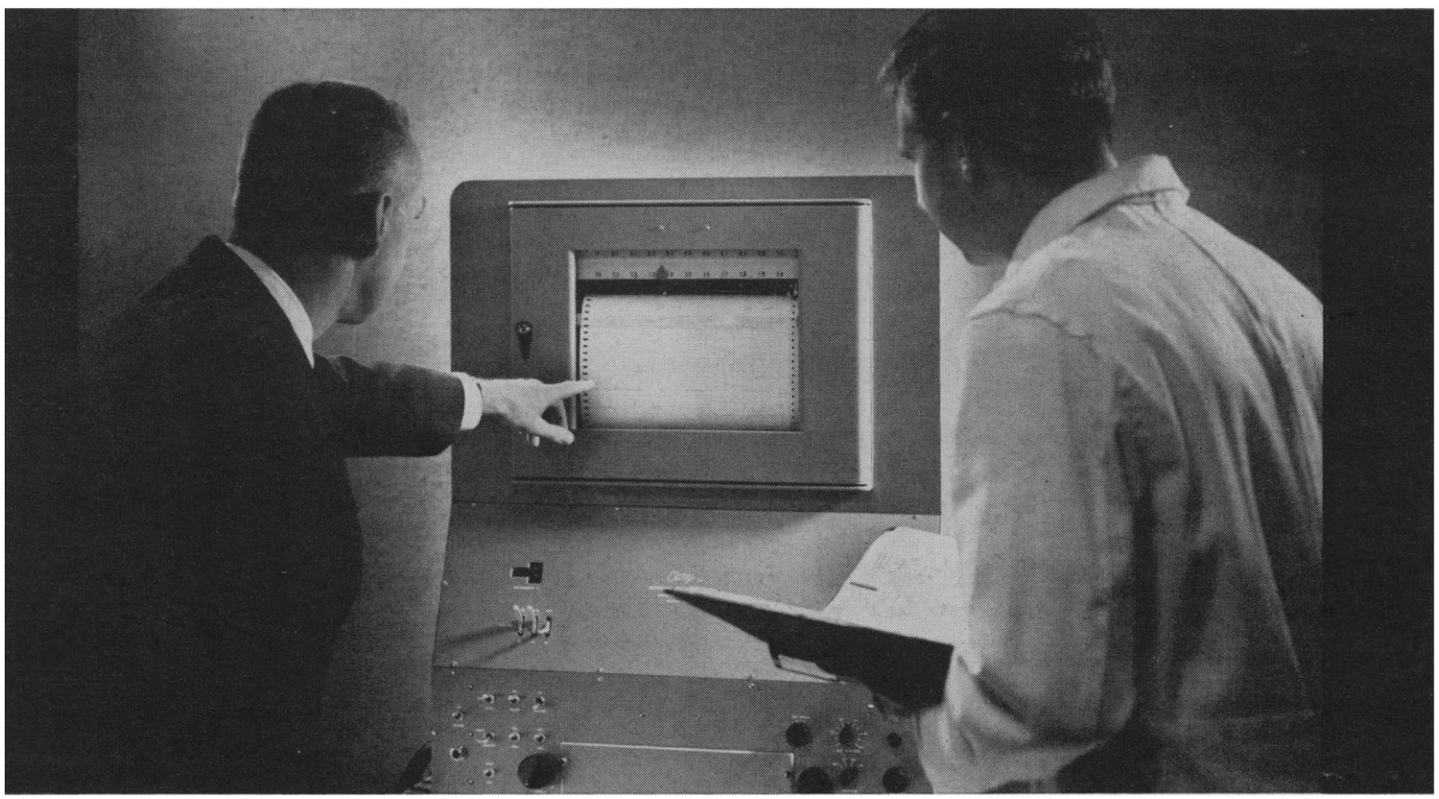


Analysis of methyl esters labeled with carbon-14. The curves represent the output of a mass detector. The white vertical lines represent the times at which the fraction collector was actuated. The bar graph represents the radioactivity in each fraction in counts per minute, determined by a 10-minute count. *(Ref.: Journal of Lipid Research 3, No. 1, 44, January, 1962)*

Packard

PACKARD INSTRUMENT COMPANY, INC.
BOX 428 • LA GRANGE, ILLINOIS • HUNTER 5-6330

HOW DOES THE CARY MODEL 14 SPECTROPHOTOMETER MAKE GOOD BUSINESS SENSE?



For operation and performance details, ask for Data File E225-43.

Model 14 maximizes the value of good technical people. In most laboratories payroll is the largest budget item. For full benefit from this investment, capable men should not be equipment-limited. The Model 14's precision and speed save manhours and allow the scientist to work to his full capability.

Model 14 meets constantly upgraded analytical demands. Advancing technology and increasing competition lead to demands for ever more precise information at faster rates. Instruments that are only adequate today won't stand the pace. The advanced design of the Model 14 assures meeting today's and tomorrow's needs as well.

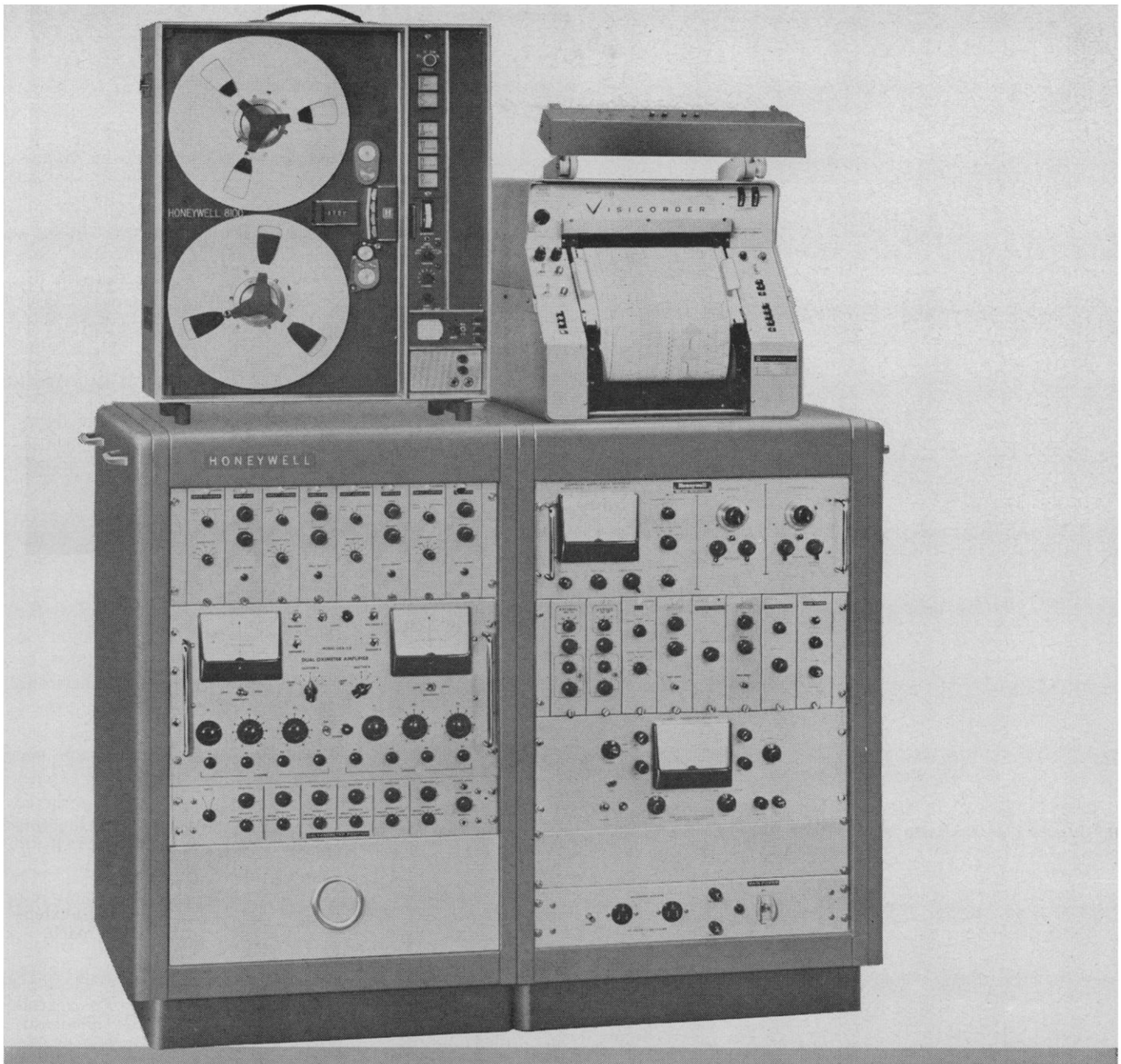
Model 14 allows greatest return on capital investment. The average analytical instrument is fully depreciated in five years. But in nearly nine years since its introduction, no Cary Model 14 known to us has yet been retired from service. Its field-proved reliability gives valuable data years after the initial investment has been returned. Considered by many as the finest instrument of its kind, the Cary Model 14 Recording Spectrophotometer has ruggedness and reliability for routine laboratory service plus precision and flexibility to handle the varied problems of research.

Cary

APPLIED PHYSICS CORPORATION
2724 SOUTH PECK ROAD · MONROVIA, CALIFORNIA

INSTRUMENTS

Raman/UV/IR Recording Spectrophotometers • Vibrating Reed Electrometers



HONEYWELL 8100 . . . A NEW LABORATORY TAPE RECORDER WITH INTEGRAL ELECTRONICS FOR MEDICAL DATA ACQUISITION

The new instrument in this array of Honeywell Electronic Medical System equipment is the 8100 FM Portable Tape Recorder (upper left). Unlike other instrumentation recorders in its price and applications class, it contains *all* of its own electronics—including built-in calibration instruments. The 8100 features one to eight data channels, in addition to compensation and voice channels; IRIG configuration is available. It records all physical phenomena from DC to 10,000 cycles with the fidelity of FM and reproduction quality of the largest non-portable instruments. Yet its price is extremely reasonable, ranging from $5900 to $11,300. You will use it in many places other than the laboratory, too—it's truly portable: only 75 pounds!

Send for 8100 brochure to Honeywell, Electronic Medical Systems, P.O. Box 8776, Denver 10, Colorado.

ELECTRONIC MEDICAL SYSTEMS

Honeywell

Conference Board of the Mathematical Sciences

The Conference Board of the Mathematical Sciences, one of the eight societies named as new affiliates of AAAS at the Philadelphia meetings in December 1962, is designed to provide mathematical organizations in the United States with a means of consultation and cooperation on problems inherent in the rapidly broadening scope of mathematical activity. Members of this society include: American Mathematical Society, Association for Computing Machinery, Association for Symbolic Logic, Institute of Mathematical Statistics, Mathematical Association of America, National Council of Teachers of Mathematics, and the Society for Industrial and Applied Mathematics.

The historical antecedents of the Board begin with the formation in 1942 of the War Policy Committee, by the American Mathematical Society and the Mathematical Association of America, to deal with problems arising out of World War II. The Committee was provided with funds by the Rockefeller Foundation; Marshall H. Stone served as its representative in Washington. During 1945–46 the War Policy Committee was replaced by the Policy Committee for Mathematics and representation was extended to other mathematical organizations. By 1957 all but one of the present constituents were represented.

During 1958–59 the Policy Committee, faced with the increasing demands made upon its six member organizations by the growth of mathematical research, education, and technology, formalized its structure as the Conference Board of the Mathematical Sciences with its own constitution and by-laws. In the same period the Mathematical Association of America acted to establish an office in Washington and received a grant from the Carnegie Corporation of New York for its initial support. Subsequently, the Association recommended, with the approval of the Carnegie Corporation and the Conference Board, that the funds provided by the grant be used for the establishment of the office of the Conference Board in Washington. This decision led to the incorporation of the Conference Board of the Mathematical Sciences in the District of Columbia

in 1960. The Association for Computing Machinery became the seventh member in 1962.

The governing board of CBMS is its council which meets twice a year. Recommendations of the Council which are approved by the constituent organizations are carried out under the guidance of advisory committees with assistance from the office of the Conference Board. The officers are: J. Barkley Rosser (Cornell University), chairman; John L. Kelley (University of California, Berkeley), vice chairman; John R. Mayor (AAAS), secretary and Treasurer; and Leon W. Cohen (University of Maryland), executive secretary.

Present plans of the Board include: (i) sponsoring the preparation and distribution of a report on buildings and facilities for the mathematical sciences to be published by the Columbia University Press; (ii) planning four programs in cooperation with AAAS on television communication among scientists; (iii) arranging a conference on the Gilliland Report of PSAC as it affects the mathematical sciences; and (iv) the preparation and distribution of career booklets reflecting the current outlook for employment in mathematical disciplines.

LEON W. COHEN

Conference Board of the Mathematical Sciences, 309 Mills Building, 17th and Pennsylvania Avenue, NW, Washington, D.C.

Forthcoming Events

May

26–27. Society for **Industrial and Applied Mathematics**, Menlo Park, Calif. (R. D. Gaskell, Dept. of Mathematics, Oregon State Univ., Corvallis)

26–29. Institute of **Food Technologists**, Detroit, Mich. (C. L. Willey, Inst. of Food Technologists, 176 W. Adams St., Chicago 3, Ill.)

26–31. American **Physical Therapy** Assoc., New York, N.Y. (L. Blair, APTA, 1790 Broadway, New York 19)

26–1. **Mineral Processing**, 6th intern. congr., Cannes, France. (D. A. Dahlstrom, Eimco Corp., 301 S. Hicks Rd., Palatine, Ill.)

27. **Operations Research** Soc. of America, Transportation Science Section, Cleveland, Ohio. (L. C. Edie, Port of New York Authority, 111 Eighth Ave., New York 11)

27–29. Canadian **Nuclear** Assoc., 2nd intern. conf., Montreal, Canada. (CNA, 19 Richmond St., W., Toronto 1, Ont., Canada)

27–29. **Frequency Control**, 17th annual

symp., Atlantic City, N.J. (Headquarters, U.S. Army Electronics Research and Development Laboratory, Fort Monmouth, N.J.)

27–30. **Tissue Culture** Assoc., 14th annual, Boston, Mass. (R. L. Sidman, Laboratory of Cellular Neuropathology, Harvard Medical School, 25 Shattuck St., Boston 15)

30–2. Society for **Applied Anthropology**, Albany, N.Y. (T. McCorkle, Div. of Behavioral Science, Pennsylvania Department of Health, Post Office Box 90, Harrisburg)

30–2. Stochastic Processes in **Mathematical Physics and Engineering**, symp. New York, N.Y. (Soc. for Industrial and Applied Mathematics, P.O. Box 7541, Philadelphia, Pa.)

31–4. **Child Psychiatry**, 2nd European congr., Rome, Italy. (Secretariat, Casella Postale No. 7130, Rome)

31–5. Cell Reactions in Adaptations of **Metazoa** to Environmental Temperature, intern. symp., Leningrad, U.S.S.R. (A. S. Troshin, U.S.S.R. Acad. of Sciences, Inst. of Cytology, Prosp. Maklina 32, Leningrad)

June

1–8. International **Electrotechnical** Commission, Venice, Italy. (American Standards Assoc., 10 E. 40 St., New York 16)

2–5. Society of **Aerospace Material and Process** Engineers, Philadelphia, Pa. (A. F. Feldbush, Box 613, Azusa, Calif.)

2–5. International Soc. for the Study of Diseases of the **Colon and Rectum**, 1st congr., Athens, Greece. (H. E. Bacon, Dept. of Colon and Rectal Surgery, Temple Univ. Medical Center, Philadelphia 40, Pa.)

3–11. **Space Science**, 4th intern. symp., Warsaw, Poland. (J. R. Beaulieu, COSPAR, 28 Nieuwe Schoolstraat, The Hague, Netherlands)

4–6. National **Electronic Packaging and Production**, conf., New York, N.Y. (J. McGrath, T. C. Gams & Associates, 250 Elizabeth Ave., Newark, N.J.)

4–6. Technical Assoc. of the **Pulp and Paper** Industry, 1st water conf., Cincinnati, Ohio. (H. O. Teeple, TAPPI, 360 Lexington Ave., New York 17)

4–7. European Federation of **Corrosion**, 3rd congr., Brussels, Belgium. (G. Biva, Société de Chimie Industrielle, 32, rue Joseph-II, Brussels 4)

4–8. Society of **Physical Chemistry**, 13th annual, Paris, France. (G. Emschwiller, Société de Chimie Physique, 10, rue Vauquelin, Paris 5)

4–10. Operating Experience with **Power Reactors**, conf., Vienna, Austria. (H. Storhaug, IAEA, Div. of Scientific and Technical Information, 11 Kärtner Ring, Vienna 1)

5–6. European Federation of **Chemical Engineering**, 46th, Frankfurt-am-Main, Germany. Secretariat, Deutschen Arbeitskreises Vakuum, 6 Frankfurt am Main 7, Rheingau-Allee 25, Germany)

5–7. International Symp. on **Zone Melting**, Karlsruhe, Germany. (H. Schildkrecht, Institut für Organische Chemie, Universität Erlangen, Fahrstr. 17, Erlangen, Germany)

5–10. **Documentation Research and**

Training Center, 1st seminar, Bangalore, India. (A. Neelameghan, Documentation Research and Training Centre, 696 Cross Rd. 11, Malleswaram, Bangalore 3, India)

6–8. **Chemical** Inst. of Canada, 46th conf. and exhibition, Toronto, Ont. (J. R. Gray, Chemical Div., Shell Oil Co. of Canada, 505 University Ave., Toronto)

6–8. **Manufacturing Chemists'** Assoc., 91st annual, White Sulphur Springs, W.Va. (MCA, 1825 Connecticut Ave., NW, Washington 9)

6–12. **Hurricanes and Tropical Meteorology**, 3rd technical conf., Mexico City, Mexico. (M. A. Alaka, Natl. Hurricane Research Project, Room 517, Aviation Bldg., 3240 NW 27th Ave., Miami 42, Fla.)

9–13. **Air Pollution Control** Assoc., annual, Detroit, Mich. (A. Arch, 4400 Fifth Ave., Pittsburgh 13, Pa.)

9–15. International **Hospital** Congr., 13th, Paris, France. (J. C. J. Burkens, Intern. Hospital Federation, 24/6 London Bridge St., London S.E. 1, England)

9–15. National **Speleological** Soc., Mountain Lake, Va. (J. R. Holsinger, 115 W. Cameron Rd., Falls Church, Va.)

10–11. American **Vacuum** Soc., annual conf., New York, N.Y. (W. G. Matheson, P.O. Box 1282, Boston 9, Mass.)

10–13. German **Metallurgical** Soc., general assembly, Berlin. (Deutsche Gesellschaft für Metallkunde, Alteburger Str. 402, Köln-Marienburg, Germany)

10–14. **Health Physics** Soc., annual, New York, N.Y. (L. Gemmell, Brookhaven Natl. Laboratory, Upton, N.Y.)

10–14. **Molecular Structure** and Spectroscopy, symp., Columbus, Ohio. (H. H. Nielsen, Dept. of Physics and Astronomy, Ohio State Univ., 174 W. 18th Ave., Columbus 10)

10–15. **Engineering** Societies of Western Europe and the U.S., 8th plenary assembly, Munich, Germany. (E. Hianne, Société Royale Belge des Ingénieurs et des Industriels, 3 rue Ravenstein, Brussels 1, Belgium)

10–21. **Analog Computation**, Washington, D.C. (B. P. Shah, Dept. of Mechanical Engineering, Catholic Univ. of America, Washington 17)

11–13. **Stimulus Generalization,** Boston, Mass. (D. Mostofsky, Boston Univ., 332 Bay State Rd., Boston 15)

12–14. **Heat Transfer and Fluid Mechanics** Inst., Pasadena, Calif. (J. J. Harford, American Rocket Soc., 500 Fifth Ave., New York 36)

12–14. **Stochastic Models** in Medicine and Biology, Madison, Wis. (J. Gurland, Mathematics Research Center, U.S. Army, Univ. of Wisconsin, Madison 6)

13–14. American **Rheumatism** Assoc., Atlantic City, N.J. (J. A. Coss, Jr., 20 E. 76 St., New York 21)

13–15. American Soc. of **Limnology and Oceanography**, Ann Arbor, Mich. (G. H. Lauff, Sapelo Island Research Foundation, Sapelo Island, Ga.)

13–15. **Endocrine** Soc., Atlantic City, N.J. (J. H. Turner, 1200 N. Walker, Oklahoma City, Okla.)

13–15. Great Lakes **Navy Research and Development Clinic**, Columbus, Ohio. (B. D. Thomas, Battelle Memorial Inst., 505 King Ave., Columbus 1)

13–16. International College of **Angi-**

ology, 5th annual, Atlantic City, N.J. (H. E. Shaftel, ICA, 32 Broadway, New York 4)

13–17. American College of **Chest Physicians**, Atlantic City, N.J., (M. Kornfeld, 112 E. Chestnut St., Chicago 11, Ill.)

14–15. Institute of **Mathematical Statistics**, 95th Madison, Wis. (J. Gurland, Mathematics Research Center, U.S. Army, Univ. of Wisconsin, Madison 6)

14–17. **Instrument** Soc. of America, Los Angeles, Calif. (W. H. Kushnick, 530 William Penn Pl., Pittsburgh 19, Pa.)

15–16. Advancement of Private Practice in **Social Work**, 2nd conf., Denver, Colo. (P. Ledbetter, ACSW, Suite 1520, Medical Arts Bldg., Houston 2, Tex.)

16–19. Northeastern Section, **Botanical** Soc. of America, summer field meeting, Pittsburgh, Pa. (L. K. Henry, Section of Plants, Carnegie Museum, Pittsburgh 13)

16–20. **American Medical Assoc.**, Atlantic City, N.J. (R. M. McKeown, 510 Hall Bldg., Coos Bay, Ore.)

16–20. American **Nuclear** Soc., Salt Lake City, Utah. (O. J. DuTemple, 244 E. Ogden Ave., Hinsdale, Ill.)

16–21. American Inst. of **Electrical Engineers**, general meeting, Toronto, Ont., Canada. (R. M. Magee, Bendix Systems Div., Ann Arbor, Mich.)

16–22. **Medical Librarianship**, 2nd intern. congr., Washington, D.C. (R. MacDonald, Natl. Library of Medicine, Bethesda 14, Md.)

17–18. Learning, Adaptation, and Control in **Information Systems**, symp., Evanston, Ill. (J. T. Tou, Computer Sciences Laboratory, Technological Inst., Northwestern Univ., Evanston, Ill.)

17–19. American **Dairy Science** Assoc., Lafayette, Ind. (H. F. Judkins, 32 Ridgeway Circle, White Plains, N.Y.)

17–19. Canadian Federation of **Biological Societies**, London, Ont. (A. H. Neufeld, CFBS, Faculty of Medicine, Univ. of Western Ontario, London, Ont.)

17–19. Hanford Symp. on Biology of **Radioiodine**, Richland, Wash. (L. K. Bustad, Biology Laboratory. General Electric Co., Richland)

17–19. Society for the Study of **Development and Growth**, Storrs, Conn. (W. A. Jensen, Dept. of Botany, Univ. of California, Berkeley 4)

17–21. American Soc. for **Engineering Education**, Philadelphia, Pa. (W. L. Collins, American Soc. for Engineering Education, Univ. of Illinois, Urbana)

17–21. **Gas Chromatography**, 4th intern. symp., Ann Arbor, Mich. (Instrument Soc. of America, 530 William Penn Pl., Pittsburgh 19, Pa.)

17–22. **Pacific Division, AAAS**, San Francisco, Calif. (R. C. Miller, California Acad. of Sciences, Golden Gate Park, San Francisco)

17–22. International Congr. of **Engineers**, 4th, Munich, Germany. (Deutscher Verband Technisch-Wirtschaftlicher Vereine, Prinz-Georg-Str. 79, Düsseldorf, Germany)

17–23. Nuclear Energy, 8th intern. congr., Rome, Italy. (Ufficio Congressi e Mostre CNEN, Via Belisario 15, Rome, Italy)

18–20. Chemistry and Biochemistry of **Fungi and Yeasts**, symp., Dublin, Ireland. (T. S. Wheeler, Dept. of Chemistry, University College, Science Bldgs., Upper Merrion St., Dublin)

18–22. American Soc. of **Ichthyologists** and **Herpetologists**, Vancouver, B.C., Canada. (J. A. Peters, Biology Dept., San Fernando Valley State College, Northridge, Calif.)

19–21. Joint **Automatic Control** conf., Minneapolis, Minn. (T. J. Williams, Monsanto Chemical Co., St. Louis, Mo.)

19–21. Metal Chelates in **Chemical Analysis**, natl. symp., Tucson, Ariz. (H. Freiser, Dept. of Chemistry, Univ. of Arizona, Tucson)

19–26. **World Petroleum** Congr., 6th, Frankfurt-am-Main, Germany. (U.S. Natl. Committee, 15 W. 51 St., New York, N.Y.)

20–21. Institute of **Mathematical Statistics**, 96th, Eugene, Ore. (D. G. Chapman, Dept. of Mathematics, Univ. of Washington, Seattle 5)

20–21. **Nutrition** Soc. of Canada, 6th annual, London, Ont. (E. V. Evans, Dept. of Nutrition, Ontario Agricultural College, Guelph, Ont., Canada)

22–23. **Ukrainian Medical** Assoc. of North America, Kerhonkson, N.Y. (R. W. Sochynsky, UMA, 2 E. 79 St., New York 21)

23–26. American Soc. of **Agricultural Engineers**, Miami Beach, Fla. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)

23–29. American Soc. for **Horticultural Science**, Caribbean region, 11th annual, Mexico City, Mexico (E. H. Cásseres, Calle Londres 40, Mexico 6, D.F.)

23–26. American Soc. of **Mechanical Engineers**, Ithaca, N.Y. (A. B. Conlin, Jr., 345 E. 47 St., New York, N.Y.)

23–28. American Soc. for **Testing and Materials**, 66th annual, Atlantic City, N.J. (ASTM, 1916 Race St., Philadelphia 3, Pa.)

24–26. International **Astrophysical** Symp., 12th, Liège, Belgium. (M. Migeotte, Institut d'Astrophysique, Cointe-Sclessin, Belgium)

24–26. American Soc. of **Heating, Refrigerating and Air Conditioning** Engineers, Milwaukee, Wis. (R. C. Cross, 345 E. 47 St., New York 17)

25–28. American **Home Economics** Assoc., Kansas City, Mo. (D. S. Miller, 3705 Van Buren Ave., Corvallis, Ore.)

26–27. **Computers and Data Processing**, Estes Park, Colo. (W. H. Eichelberger, Denver Research Inst., Univ. of Denver, Denver 10, Colo.)

26–28. **Wind Effects** on Buildings and Structures, Teddington, Middlesex, England. (Mrs. S. M. Russell, Aerodynamics Div., Natl. Physical Laboratory, Teddington)

26–29. American Assoc. of **Bioanalysts**, annual, Chicago, Ill. (R. Thornburg, 720 N. Michigan Ave., Chicago 11)

26–29. Society of **Nuclear Medicine**, Montreal, Quebec, Canada. (S. N. Turiel, SNM, 333 N. Michigan Ave., Chicago 1, Ill.)

26–29. National Soc. of **Professional Engineers**, Cleveland, Ohio. (P. H. Robbins, 2029 K St., NW, Washington, D.C.)

28–1. **Psychosomatic Approach to Chronic Illness**, congr., Chamonix, France. (French Soc. of Psychosomatic Medicine, 15, rue Santerre, Paris 12)

Cross-Cultural Differences

In their paper "Cultural differences in the perception of geometric illusions" [*Science* **139**, 769 (22 Feb. 1963)] Segall *et al.* state that an "inference habit . . . could enhance, or even produce, the Müller-Lyer and Sander Parallelogram illusions." I would like to register some objections.

In their own data, if I read them correctly, children are more susceptible to these illusions than adults. Other investigators have found this to be the case with the Müller-Lyer illusion. If these illusions are due to ". . . habits of perceptual inference which relate to cultural . . . factors . . ." it is difficult to understand why adults, who are presumably more acculturized, have smaller illusions.

Winslow [*Arch. Psychol.* No. 153, 1 (1933)] has reported that chicks are susceptible to the Müller-Lyer illusion. It is inconceivable that chicks succumbed so rapidly to our Western cultural influences. It is just as possible that the Müller-Lyer and Sander illusions are induced by natural electrochemical brain processes propagated by the contours of the figure and that there are physiological differences between the groups. The horizontal-vertical illusion might be induced by some other physiological process or may in fact represent cultural differences. Piaget's centration effect may play a larger role in this illusion, and the groups may differ, for whatever reason, in the time spent looking at the vertical bar.

This is not to say that one or another interpretation is the correct one, but only that the "cultural inference" interpretation runs into difficulties, and that alternative nonenvironmental explanations were unstated.

HERMAN H. SPITZ
State Training and Research Center, Bordentown, New Jersey

Spitz objects on several grounds to the empiricistic interpretation of cross-cultural differences reported in our paper. In so doing, he notes correctly some complexities in our data, thus underlining the magnitude of the research program required before we can claim fully to understand the phenomena in question. In particular, Spitz is correct in pointing out that age trends in studies with the Müller-Lyer figures complicate our interpretive efforts. Existing data show children to be more susceptible than adults, and our line of reasoning demands that somewhere during the life span there must be an increase in susceptibility with age. Research has failed to uncover such an increase, but in no studies reported have children under 3 years of age been used as subjects. We believe that the visual inference habit we assume to be involved in the Müller-Lyer illusion (and others) is well established by the time hand-eye coordination and locomotive skills are achieved (before 3 years of age). It is also assumed that the degree of illusion susceptibility established by that age is a maximum, with the subsequent reduction resulting from an increase in analytic ability, particularly as the individual learns to inhibit form-constancy effects in drawing three-dimensional objects on two-dimensional surfaces. These hypotheses are to be tested in laboratory studies with young children at the University of Iowa Psychology Laboratory, but until we have data to support them, Spitz's point on age trends is well taken.

His other substantive point that chicks are susceptible to the Müller-Lyer illusion, and that this fact throws our interpretive position into serious doubt, is less well taken. In the paper cited by Spitz, Winslow did not demonstrate that chicks are susceptible to the Müller-Lyer illusion. His study involved training five chicks to choose the shorter of each of five pairs of stimuli, and then they were tested on eight Müller-Lyer figures. Winslow reasoned correctly that the chicks having been trained to choose the short member of stimulus pairs would, if susceptible to the illusion, tend to select the usually underestimated portion (the enclosed segment) of the test figures. However, his conclusion that the chicks were susceptible was, in our view, erroneous, because only two of the eight test figures provided appropriate tests of the illusion and on both of these the response tendency clearly was to choose the typically overestimated segment. The chicks tended to choose the usually underestimated segment only when it and its surround was actually shorter than the other segment and its surround. Thus, Winslow's study demonstrated at most that chicks could be taught a discriminative response habit which could transfer to a second set of stimuli.

Even if illusion susceptibility in chicks had been demonstrated, our interpretation of illusion-responses as incidental manifestations of usually valid visual inference habits would not be undermined. One could extend our general argument to other animals who could conceivably learn habits that are ecologically valid for them in a manner analogous to that we hypothesize for humans. Our thesis is simply that various features of the visual environment affect the probability that certain inference habits rather than others will be learned and that these habits will, under certain unusual conditions, lead to nonveridical perceptions. Stimulus configurations like those we have come to call geometric illusions are examples of such unusual conditions.

It is of course still conceivable that physiological processes, perhaps due to hereditary or dietary factors, may explain our data. However, even genetic explanations these days require analysis of the environmental factors which through differential selection contribute to genetic variation over time. We nonetheless accept as fair Spitz's comment that we did not state alternative nonenvironmental explanations. We would welcome attempts to spell out differences in "natural electrochemical brain processes" or other such factors which could account for the complex, bi-directional differences we reported.

MARSHALL H. SEGALL
Department of Psychology,
University of Iowa, Iowa City
DONALD T. CAMPBELL
Department of Psychology,
Northwestern University,
Evanston, Illinois

Independent Research Institutes

I am writing to express my concern over your recent editorial "Unnecessary research institutes" [*Science* **139**, 563 (15 Feb. 1963)]. Although I respect your right to "editorialize" as you see fit, I do feel that you used a "shotgun" approach. In an attempt to point out real abuses, you have (unwittingly I am sure) stigmatized a number of respectable institutions. Specifically, your editorial in effect equates small size and financial problems with inability to conduct good research or with motives for establishment based on "pleasure, profit or aggrandizement."

I take issue with this interpretation, which I feel could all too easily be de-

rived from your editorial, for the following reasons:

1) Many research institutes which are now financially stable and very large in size do excellent work and yet rely on government contracts for their existence. At one time all of these organizations were small and no doubt had financial problems.

2) Universities are relying more and more on government grants for support of graduate research and facilities. Without such funding, graduate research in all but a handful of schools would be crippled.

3) There are research institutes, such as the one of which I am a member, that definitely were not founded for unworthy motives, that have good research facilities and are attracting and holding good scientists, but are still young and small. We rely heavily on government contracts. Most of our contracts are renewed, primarily because our work performance has been good.

4) Many of the abuses to which you refer are probably found in small *privately owned* companies which exist on government contracts.

I believe your editorial was written in an effort to point out some bad situations which undoubtedly do exist, but feel your attack will unfortunately damage legitimate and "necessary institutes" along with the targets of your editorial. I hope that my letter may persuade you to take another look at this subject and possibly you may see fit to write not a retraction, but an extension or redefinition of your first editorial.

MONROE E. WALL
Research Triangle Institute, Durham, North Carolina

[Your editorial] . . . is extremely important and very timely, and I sincerely hope that it will be acted upon by those "gate keepers" who are crucial in controlling the flow of funds to such research institutes. There have already been embarrassing episodes involving such institutes, and I believe there will be more unless the kind of action you call for is taken.

RENSIS LIKERT
Institute for Social Research, University of Michigan, Ann Arbor

. . . I strongly contend that, in our particular society, it is essential that the small independent research institute continue to exist, even though it must subsist entirely on government grants. Anything that will help to break the

stranglehold which the large and well-established research and development organizations have on the individual scientist can't be all bad. In my somewhat considerable experience with these 'sound' establishments, I have found your vaunted freedom to be almost nonexistent and the atmosphere to be oppressive. . . .

JOSEPH FUGGER
P.O. Box 1405, Pittsburgh, Pennsylvania

. . . I would like to add a word about a different class of small research establishment, namely those which are formed to explore a field or an idea which has not yet broken through to the point needed for major support. . . . The very large governmental and academic organizations require much time for moving and a small, independent foundation may be fully justified and very useful as an intermediate step for pump-priming and pioneering work because of freedom from the inertia which makes larger organizations slow to react.

JOHAN BJORKSTEN
Bjorksten Research Foundation, Madison 1, Wisconsin

Responses to the editorial entitled "Unnecessary research institutes" ranged from, "Since when is it permissible to use the American Association for the Advancement of Science and its official publication as a means of propaganda in opposition to the free enterprise system upon which our country is founded?" (from a three-page letter from the president and founder of an institution bearing his name) to, "Toward the end of each month some administrator . . . sits down to juggle the time sheets. . . . As a former project leader, I was frequently amazed when I received a list of the charges made against some of my projects at the end of each month. At times I was supporting people who hadn't spent one hour working on the project" (from one of the letters that came from present or former staff members who asked that their names not be used).

The 15 February editorial dealt with a specific type of research institute: "the small, inadequately financed one that is formed to secure government grants and contracts and to live on the proceeds of such support." The variety of comment provoked by the editorial indicates that there is both concern and controversy over the place of such institutes in the scientific enterprise.—D.W.

(Continued from page 373)

other agencies which typically charge relatively small amounts for their public documents. The wisdom of making an exception of a single agency on behalf of a single company seems debatable.

The proposal has implications for air safety, too, and raises a question of the relation of safety to competition in the field of navigation aids. According to Melvin Tyrrell, chief of FAA's Flight Information Division, FAA is not alarmed by the price rise proposed now, since it is a fairly small one, but introducing the principle of competitive prices raises the possibility that cost may interfere with availability of the charts sometime in the future. This would worry the FAA a good deal.

Underlying the pricing problem is a more basic one that, so far, no one has openly tackled—whether there should be two sets of charts in use at all. Admiral Karo testified last year that "the man in the cockpit of a plane and the man in the control tower should be speaking from the same sort of compilation so that there is no chance of error," but his remarks got little notice. The FAA, which seems to want to avoid appearing hostile to private enterprise, maintains that the charts are so similar that, despite variations in format, their simultaneous use is no cause for alarm. Nonetheless, the FAA would not be averse to a unified system or even, in the long run, to providing charts free of cost to all users of the airways.

The idea of competition, however, dies hard. The Carroll Committee, while paying its respects to federal responsibilities, given the inadequacies of existing commercial capacity, paid greater respects to the benefits of competition. "It is preferable that there be two or more sources of chart supply in order that all the usual benefits of competition may be received," the report says. "Ideally, this competition would involve two or more private producers, but it can be between a private producer and the Government."

Thus, in its heart, the committee really favored more competition rather than less, and only as a second best, supported government participation at all. From the point of view of safety, however, and not of ideology, it seems questionable that the goal should be increasing diversity rather than increasing uniformity. Although the FAA also feels that competition between the government and Jeppesen has been useful, so far the benefits of competition do not seem to have been weighed against the possible hazards of nonuniform flight information.

Coast and Geodetic Survey is not happy about the turn of events, but it is not a very powerful agency and will go along gracefully if the Senate passes Allott's bill. Agency officials would still prefer to go in the direction of greater standardization.

Finally it should be pointed out that this case is not an isolated one. Smaller companies in many fields of mapping have fallen on difficult times and raised a cry of "government competition" in several places recently. The Geological Survey last year only narrowly rescued its request for aircraft for aerial survey operations over the objections of some small surveying companies who thought the work should be contracted to them; a USGS program of mapping in Kentucky has been much attacked by private companies, who claim, though the Survey disagrees, that they could do the job as well or better. These companies are now trying to figure out ways to improve their services and reverse the trend of government's in-house mapping activities. These efforts, however, have fewer implications for public safety than Jeppesen's campaign on aeronautical charts.—ELINOR LANGER

Announcements

The Direct Relief Foundation is soliciting **surgical, medical, and hospital supplies** for use in underdeveloped areas of the free world. The supplies are sent to doctors, hospitals, or clinics overseas and must be used free of charge for indigent patients. Doctors are recommended by the American Medical Association to receive these materials. (Direct Relief Foundation, Warehouse MR, 700–702 N. Milpas St., Santa Barbara, Calif.)

The National Science Foundation invites letters from U.S. scientists interested in participating in the **U.S.–Japan Cooperative Science Programs**. Emphasis is on joint activity in scientific investigation of the Pacific Ocean, and animal and plant geopraghy and ecology of the Pacific area. Scientists who are working with the Japanese in these areas, or who are interested in doing so, are asked to write to NSF, giving a

brief description of their research projects, ways in which they are cooperating with Japan, and, if possible, the names of Japanese scientists who would be involved.

A study of Hawaiian volcanoes, scheduled to begin this spring, is the first project to be undertaken in the cooperative program. The U.S. portion of the research is financed by a NSF grant to the U.S. Geological Survey.

Further information on the program is available from the U.S.–Japan Cooperative Science Programs, NSF, Washington 25.

Meetings Notes

Papers are invited on scientific and engineering aspects of **electronics** for presentation at the National Electronics Conference, 28–30 October, in Chicago. Authors must submit four copies of a 150-word abstract, and two copies of either the completed paper or a 700-word summary. Papers are eligible for two $500 awards for the best paper, and an award of merit, amounting to $750. Deadline: *15 May*. (H. W. Farris, Electrical Engineering Dept., Univ. of Michigan, Ann Arbor)

Neural-physiological mechanisms underlying **motivated behavior** is the subject for a symposium to be held at Wayne State University, 17–18 May. Reservations for attendance are available. (D. Asdourian, Dept. of Psychology, Wayne State University, Detroit 2, Mich.)

Papers are invited for two **American Heart Association** meetings, scheduled for October. The Council on Arteriosclerosis will meet 23–24 October, in Los Angeles, Calif.; sessions are open to nonmembers. This conference will be followed 25–29 October by the annual meeting and scientific sessions of AHA, also in Los Angeles, for which papers must be based on original studies in, or related to, cardiovascular diseases. Deadline for receipt of abstracts for both conferences: *15 May*. (R. E. Hurley, AHA, 44 E. 23rd St., New York 10)

The tenth conference on **religion in an age of science** is scheduled for 27 July to 3 August, at Star Island, Portsmouth, N.H. The main topic for discussion will be the condition of man in society, as seen by scientists and theologians. The conference fee is $20. (I.R.A.S., 280 Newton St., Brookline 46, Mass.)

The Engineering Foundation **research conferences** will be held 5–30 August in Andover, N.H. Topics covered will include technology and the civilian economy, comminution, engineering in medicine, and urban transportation research. Attendance is limited to 100 persons, and is by invitation or acceptance of application. The conferences are patterned after and assisted by the Gordon Research Conferences. (H. K. Work, Engineering Foundation, 345 E. 47 St., New York 17)

Scientists in the News

The following scientists were elected this week to membership in the National Academy of Sciences:

Christian B. Anfinsen, professor of biological chemistry, Harvard Medical School.

Theodore H. Bullock, professor of zoology, University of California, Los Angeles.

Robert E. Connick, professor of chemistry, University of California, Berkeley.

Harry Eagle, professor and chair-

man, department of cell biology, Albert Einstein College of Medicine, Yeshiva University.

Fred R. Eggan, distinguished service professor of anthropology, University of Chicago.

William K. Estes, professor of psychology, Stanford University.

William M. Fairbank, professor of physics, Stanford University.

Charles S. French, director, department of plant biology, Carnegie Institution of Washington, Stanford.

Marvin L. Goldberger, Higgins professor of physics, Princeton University.

George S. Hammond, professor of organic chemistry, California Institute of Technology.

Klaus H. Hofmann, professor and chairman, department of biochemistry, University of Pittsburgh.

Hoyt C. Hottel, director, fuels research laboratory, and professor of fuel engineering, Massachusetts Institute of Technology.

Clyde A. Hutchison, Jr., professor of chemistry, University of Chicago.

Dwight J. Ingle, professor and chairman, department of physiology, University of Chicago.

Leon Knopoff, professor of geophysics (on leave), California Institute of Technology.

Joseph H. Mackin, Farish professor of geology, University of Texas.

Maclyn McCarty, member and professor, Rockefeller Institute, and physician-in-chief, Rockefeller Institute Hospital.

William D. McElroy, professor and chairman, department of biology, Johns Hopkins University.

John W. Milnor, Henry Putnam university professor of mathematics, Princeton University.

John A. Moore, professor of zoology, Barnard college, Columbia University.

James Van G. Neel, professor of human genetics and internal medicine and chairman, department of human genetics, University of Michigan Medical School.

Jerzy Neyman, professor of mathematics, University of California, Berkeley

Bryan Patterson, Alexander Agassiz professor of vertebrate paleontology, Museum of Comparative Zoology, Harvard University.

Isadore Perlman, professor of chemistry, University of California, Berkeley.

Emanuel R. Piore, vice president for research and engineering, International Business Machines Corporation.

Colin S. Pittendrigh, professor of biology, Princeton University.

Allran R. Sandage, astronomer, Mount Wilson and Palomar Observatories.

Knut Schmidt-Nielsen, professor of physiology, Duke University.

Albert C. Smith, director, Museum of Natural History, U.S. National Museum, Smithsonian Institution.

James J. Stoker, professor of mathematics, New York University.

Sherwood L. Washburn, professor and chairman, department of anthropology, University of California, Berkeley.

Gian-Carlo Wick, senior scientist, Brookhaven National Laboratory.

Raymond L. Wilder, research professor of mathematics, University of Michigan.

Abel Wolman, professor of sanitary engineering, Johns Hopkins University.

Hans A. Bethe, physics professor at Cornell University, has received the Rumford Premium from the American Academy of Arts and Sciences. He was cited for his "contributions to the theory of energy production in stars." The award consists of two medals and a $5000 honorarium.

Newly elected president of the National Wildlife Federation is **Ross L. Leffler**, a regional director of the federation.

George M. Hunt, retired director of the U.S. Forest Products Laboratory, USDA, Madison, Wis., has gone to Mérida, Venezuela to help establish a forest products research laboratory there.

Ven Te Chow, professor of hydraulic engineering at the University of Illinois, has received the 1962 research prize of the American Society of Civil Engineers. He was cited for an "outstanding contribution to the knowledge of flood control and farm drainage."

Robert A. Aldrich, former chairman of the pediatrics department in the University of Washington's medical school, has been named director of the new National Institute of Child Health and Human Development at NIH.

Richard C. Greulich, associate professor of anatomy at the University of California, Los Angeles, has been named recipient of the International Association for Dental Research award for basic research. The prize carries a $1000 honorarium.