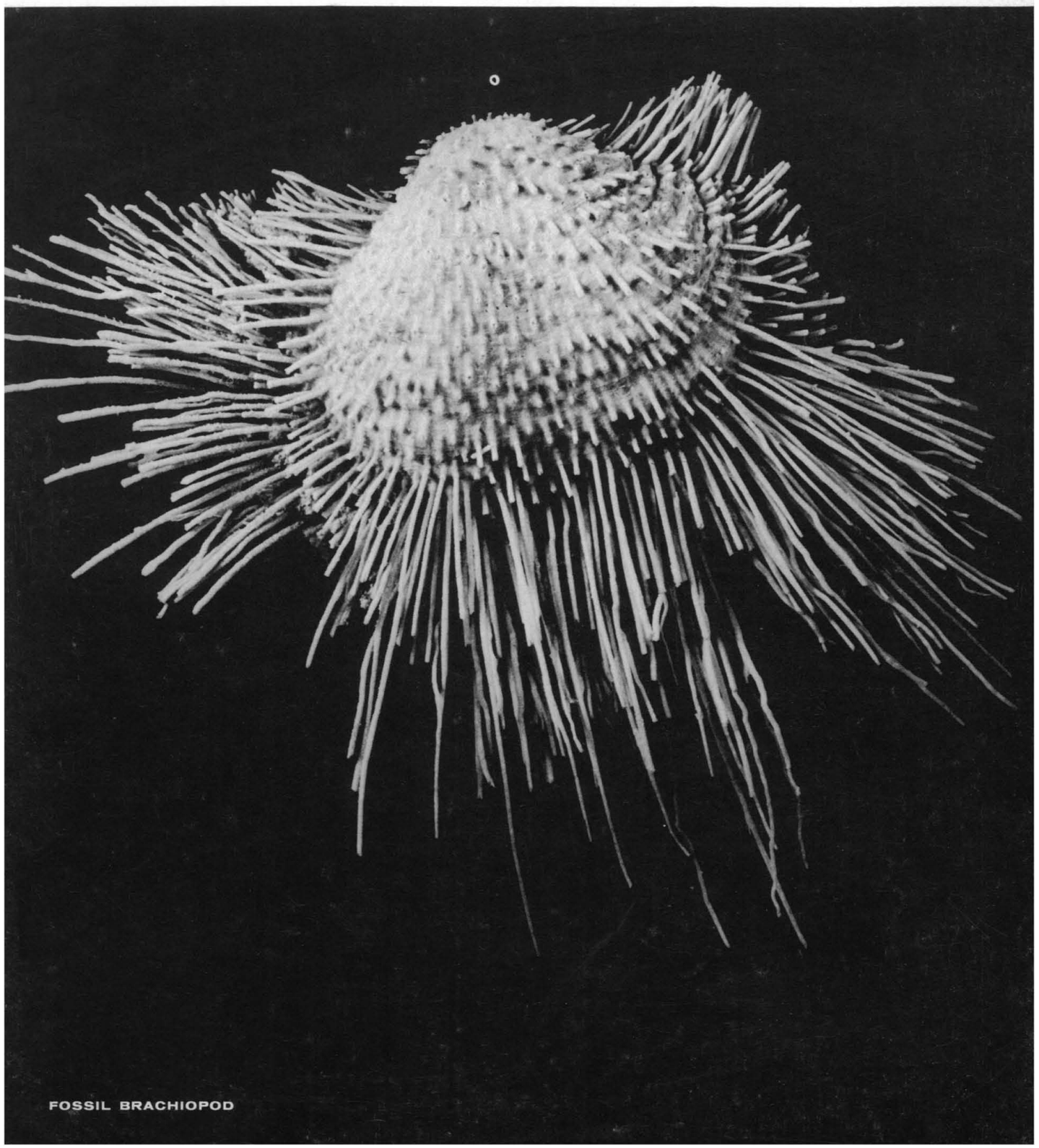
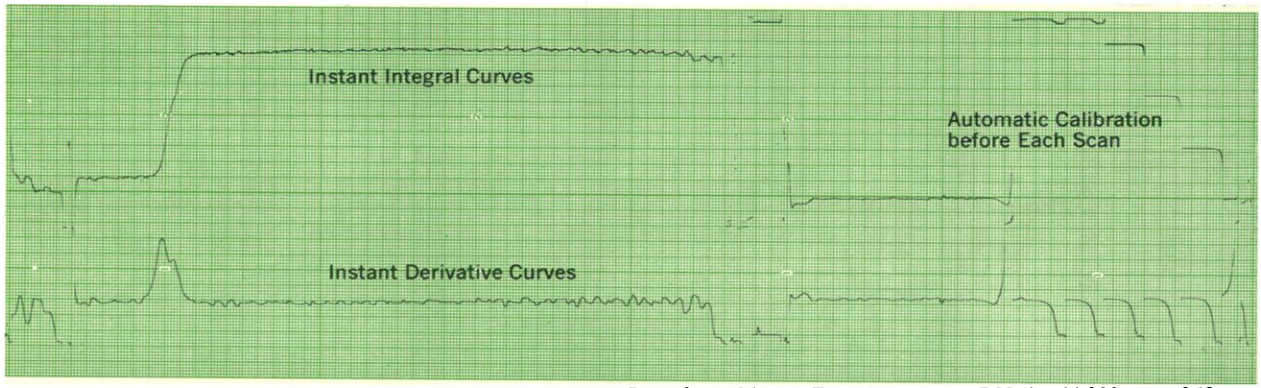
SCIENCE

29 April 1966
Vol. 152, No. 3722

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



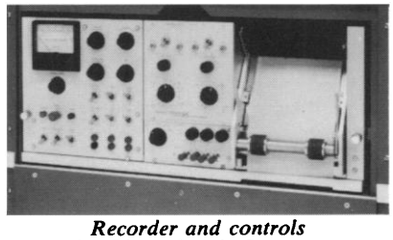
FOSSIL BRACHIOPOD



Boundary Velocity Experiment, two DNA's, 44,000 rpm, 265 mμ

Direct Scanning...the new era in analytical ultracentrifugation

The Photoelectric Scanner permits investigators, for the first time, to take full advantage of the highly discriminating absorption optical system of the Model E. It provides split-beam photometry—during centrifugation, at wavelengths selectable at will from 440 mμ down to 236 mμ. You can see what is happening in the cell as it happens because you get an immediate written record, and both integral and derivative curves are recorded simultaneously.



Recorder and controls for Photoelectric Scanner

Thus direct scanning frees you from the tedious procedures associated with the camera; provides "direct viewing" of sedimentation processes, electronic precision and discrimination in scanning the cell, and a variety of wavelengths at which to work. The precision and versatility that this new tool brings to biochemical research will inevitably open new areas of study. Already two investigators working with a scanner have been able to distinguish the catalytic and regulatory protein subunits of an enzyme in an association-dissociation study that augurs well for exciting work ahead.

What that work will be, what more will be accomplished in the era of direct scanning, only time and the ingenuity of investigators will tell.

Inherent advantages of the Scanner

• Because the Scanner utilizes the split-beam principle, two samples in a double sector cell can be subjected to identical experimental conditions—an important factor in studying extremely small differences in sedimentation coefficients, for example. Or sample solution and solvent can be used in the double sector cell, with solvent reading automatically subtracted from the sample solution.

• With the Scanner classical sedimentation equilibrium measurements at extremely low concentrations in the UV are significantly easier to make. And they are more accurate because calibration steps are recorded before each scan.

• Having both curves simultaneously is a real advantage. For example: the derivative curve can show the presence of secondary components not readily recognizable from the integral curve; the integral curve can show heterogeneous material not revealed by the derivative curve.

For more information about the Photoelectric Scanner, write to Spinco Division at the address below.

Beckman INSTRUMENTS, INC.
SPINCO DIVISION
PALO ALTO, CALIFORNIA • 94304

INTERNATIONAL SUBSIDIARIES: Geneva; Munich; Glenrothes, Scotland; Tokyo; Paris; Capetown; London.

29 April 1966
Vol. 152, No. 3722

SCIENCE

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

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Silicified productoid brachiopod *Waagenoconcha abichi* (Waagen) from Permian rocks of the Khisor Range, West Pakistan. The dense corona of long slender spines around the visceral disc of the ventral valve is thought to have supported and anchored the living shell in soft substrate. The shell is oriented with the ventral valve downward (about × 3). See page 660. [Richard E. Grant, U.S. Geological Survey]

The problem with buying (or *selling*, for that matter) soluble RNA is that it is extremely hygroscopic. It can easily absorb atmospheric moisture totaling 5-10% of its weight. How do you avoid paying for this water? And how do you know exactly how much sRNA you're getting?

Don't buy it on a *weight* basis. Consider a more revealing characteristic: its ultraviolet absorption at 260 mμ. *We* did, and now offer—exclusively, it should be noted—sRNA from both yeast and *E. coli B* which is actually sold on the basis of A_{260} (OD) units. And this is determined in a magnesium buffer which tends to give values some 15% lower than one gets in water. We do it this way to achieve maximum secondary structure and the most reproducible A_{260} values. Goodbye ambiguity.

We really go much further too. Every batch of sRNA you receive will have our oft-mentioned (and really quite essential) Product Analysis Report. This will disclose: UV absorption, of course; sedimentation coefficient; amino acid acceptor activity; DNA content; heavy metals; nuclease activity; and biuret.

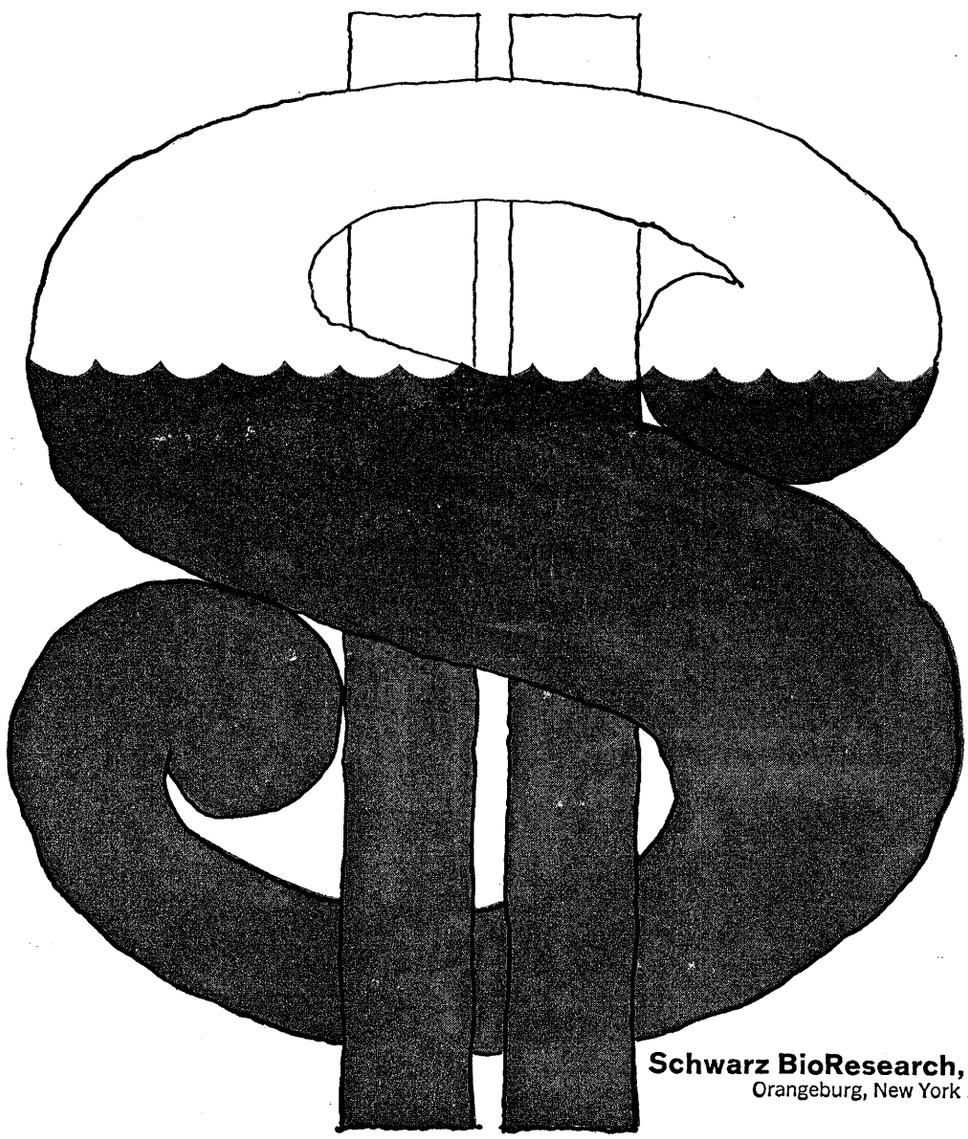
Now, price:

sRNA, Yeast	1,800 units	18,000 units	90,000 units
(Cat. #1110-50)	$10	$55	$230
sRNA, *E. coli B*	4,000 units	10,000 units	20,000 units
(Cat. #1110-40)	$20	$48	$85

(All units on basis of A_{260} in magnesium buffer.)

Complete specifications are yours for the asking. Another offer: if you promise not to *buy* sRNA by weight, we'll promise not to *sell* it that way. (Nevertheless we are not beyond revealing the following to curious readers: 18,000 OD units of sRNA, Yeast and 20,000 OD units of sRNA, *E. coli B* are equal to 1 gram *approximately*—which is really the point of the whole piece.)

sRNA
How to buy it without buying water

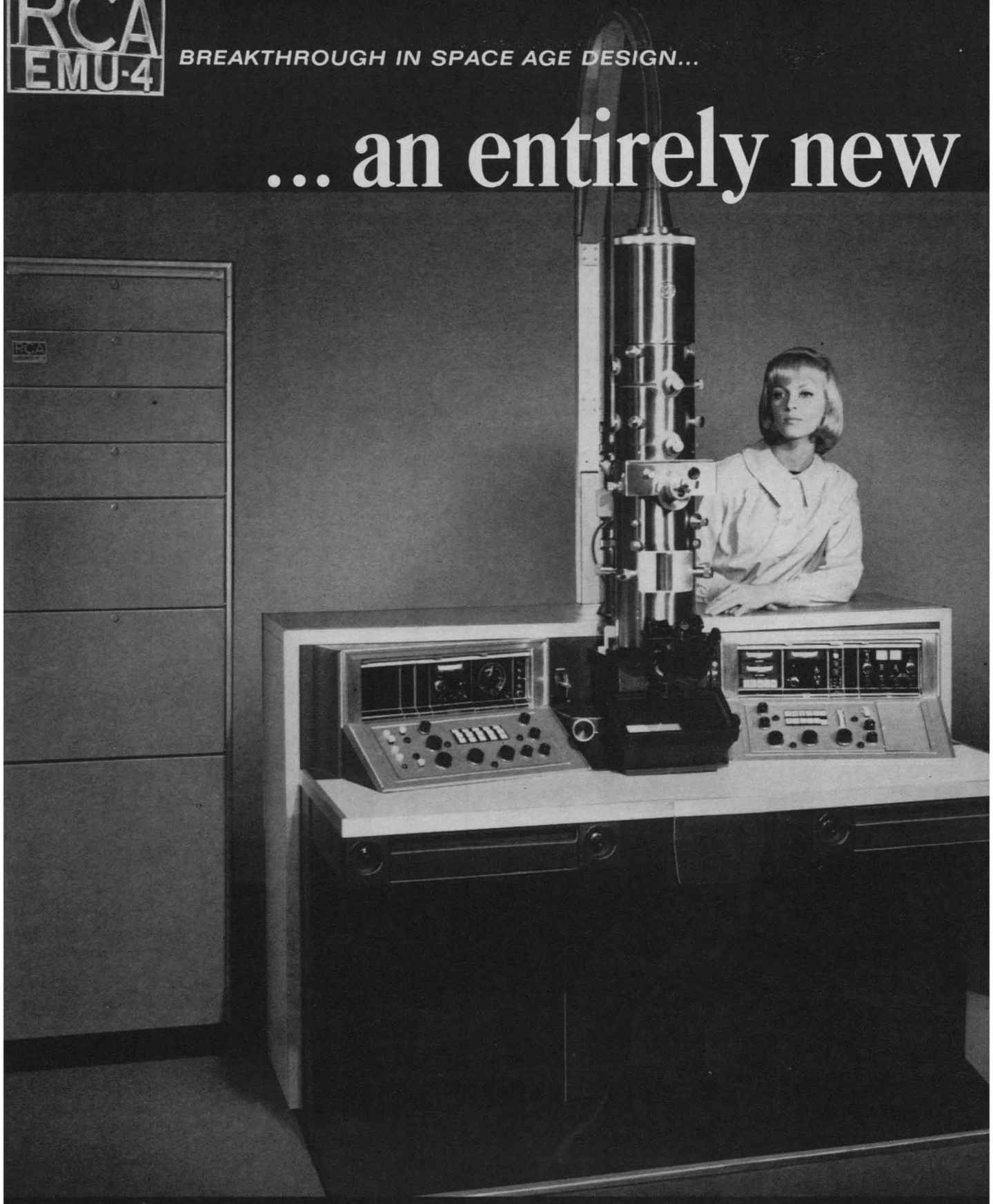


Schwarz BioResearch, Inc.
Orangeburg, New York 10962

RCA EMU-4

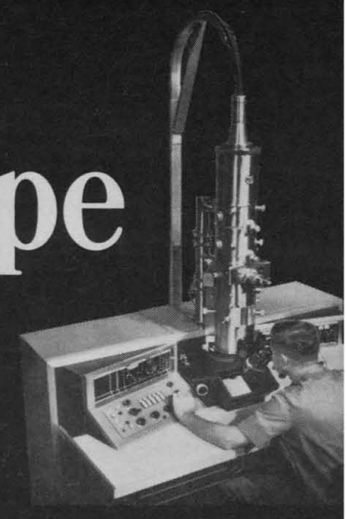
BREAKTHROUGH IN SPACE AGE DESIGN...

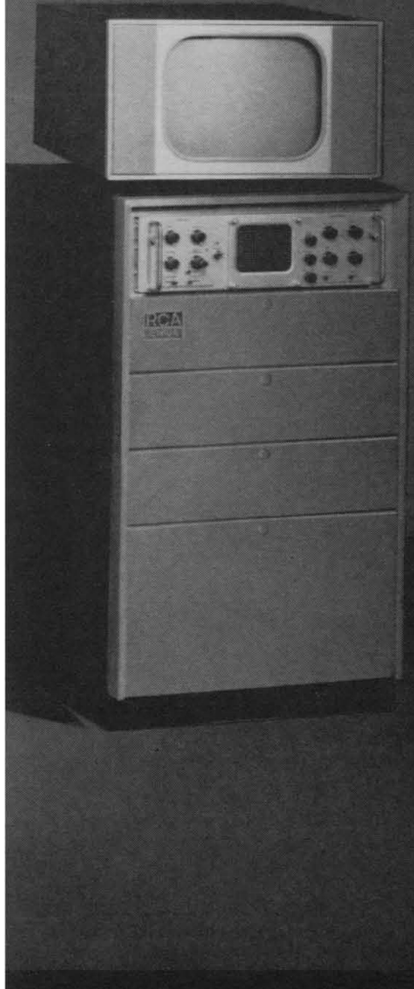
... an entirely new



Complete EMU-4 Electron Microscope System. Includes television image intensification. Rack at left stores the mechanical fore pump and power supplies.

Electron Microscope
FROM RCA





The EMU-4 is not just an up-dated model but a radically new design incorporating the best in space age solid state electronics, modular design, and vacuum technology. Here's a system which provides highest total performance, operational simplicity and long-term reliability.

SPACE AGE ELECTRONICS. Self-adjusting transistor circuits and use of high-voltage silicon rectifiers and temperature-compensated zener diodes assure highest reliability and simplicity of control.

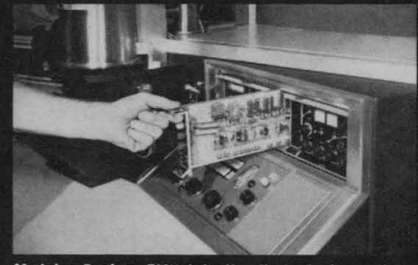
AUTOMATED VACUUM SYSTEM. Fast pumping speed with new air lock permits instrument to be operational 20 seconds after specimen change. Plates can be removed without breaking column vacuum. Only 20 sec. required for shutdown.

WIDE MAGNIFICATION RANGE. Continuously variable and step control over a range of 140 to 1, 1400 to 200,000X. Down to 500 to 70,000X, with the use of an optional low-magnification pole piece.

TV IMAGE INTENSIFICATION SYSTEM. (Optional) Greatly increases versatility of the EMU-4 as a research tool and for training purposes. The first electron microscope specifically designed to work with true TV image intensification.

PERMANENT OBJECTIVE APERTURE AND HIGH-VOLUME UNIVERSAL SPECIMEN CHAMBER. Are provided as standard equipment.

These and many other outstanding features of the EMU-4 will assure the microscopist highest production of top quality micrographs. To further increase the versatility of this instrument, a full line of accessories is available. Nation-wide service can be provided. For further information write RCA Scientific Instruments, Building 15-5, Camden, N.J. In Canada: RCA Victor Company Limited, Montreal.



Modular Design. EMU-4 is the first electron microscope constructed of standard transistorized modules. Modules speed servicing and make it easy to integrate new functions into the system.

New Highly Versatile Photographic Facilities. Capacity for six 2" x 10" plates for a total of 30 or 36 exposures; or eighteen 3¼" x 4" plates. Air lock permits removing cassette without breaking vacuum.

RCA®

The Most Trusted Name in Electronics

PICKER NUCLEAR
1275 Mamaroneck Avenue
White Plains, New York 10605

Please let me have additional information on these checked items:

☐ The **ANSITRON[T] II** liquid scintillation counter

☐ The **LIQUIMAT®** liquid scintillation counter

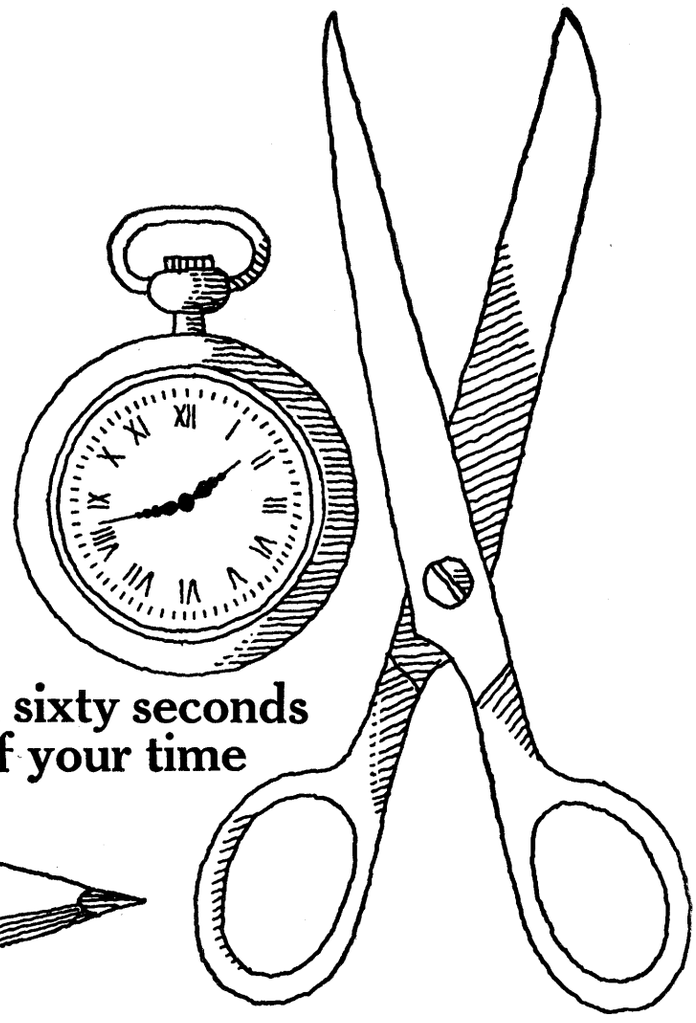
☐ The **SCINTI/FLOW** monitor system

Name_____

Address_____

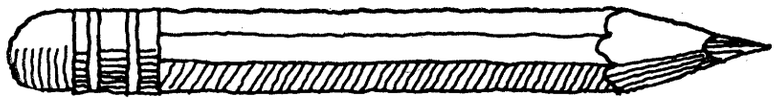
_____

(Reasonable facsimiles of this coupon welcomed.)



This coupon

and sixty seconds of your time



will give you the story on Picker's newly expanded line of liquid scintillation counters.

Picker Nuclear has an exceptionally diverse line of instruments for radio-tracer studies of every kind. But the *special* news here is this: the line has now been expanded to include the well-respected ANSITRON liquid scintillation counter for beta work, and a unique flow monitor system for liquid or gas streams. These instruments are now available only from Picker Nuclear. And Picker Nuclear will service them—*as it will every ANSITRON instrument sold previously in the United States and Canada.*

Ansitron[T] II liquid scintillation counter

The ANSITRON is clearly the unit of choice when the goal is maximum simplicity in beta counting. One example (of several): the availability of "β-Set" plug-in discriminators which provide preset control settings for commonly used isotopes and mixtures. When inserted, these "β-Set" modules automatically set upper and lower discriminator levels. This assures precise duplication of settings for repetitive experiments and effectively eliminates a source of human error. Other design features include: logarithmic spectrum shaping, cpm computation and automatic external standardization. (With Picker service everywhere.)

Liquimat® liquid scintillation counter

Picker's LIQUIMAT liquid scintillation counter is the preferred instrument if your current or future plans include both beta and gamma work. The LIQUIMAT is the *only* available liquid scintillation counter that provides a single integrated system for beta and/or gamma counting. This instrument also includes: logarithmic spectrum shaping, cpm computation and automatic external standardization. And Picker service everywhere.

The Scinti/Flow monitor system

This unique system permits the continuous assay of beta radiation in flowing gas or liquid streams. And it is *not* limited to aqueous solutions: materials in organic solvent systems can be continuously monitored. Other features: cross contribution subtraction provides virtually complete dual isotope separation; external standard enables quenching evaluation; logarithmic amplification simplifies control operation; compact design requires minimum laboratory space. And now too, Picker service everywhere.

Picker Nuclear: 1275 Mamaroneck Avenue, White Plains, N.Y. 10605

PICKER nuclear

sibility would be for agencies to add a fixed percentage to each grant, similar to the overhead allowance, for direct support of computer facilities. A third possibility would be to include computing facilities directly in overhead and increase the overhead rate accordingly. For those who believe that computing centers should be considered a necessary campus-wide service, analogous to libraries, this last solution seems logical.

ANTHONY RALSTON
Computing Center, State University of New York, Buffalo

Krebiozen and Faith

The Krebiozen case (News and Comment, 4 Mar., p. 1061) illustrates both the benefits and the hazards of human faith. When people in distress have a tremendous need to believe in something or somebody, then the forces of society seem powerless to effect an unmasking of the inconsistencies involved in that faith. Such vigor of faith no doubt is a necessity to many people in their times of crisis. When a truly effective anticancer agent is developed, Krebiozen will be instantly forgotten.

One of the collorary hazards of faith is that constant repetition of unsubstantiated statements eventually produces the appearance of truth. The history of science is cluttered with unsubstantiated "truths," and some professional reputations rest more upon brashness and persistence in repeating such statements than upon brains and the careful pursuit of knowledge. . . .

JOHN T. FLYNN
Beekman-Downtown Hospital, 170 William Street, New York 10038

Lesson of Pittsburgh

I am inclined, from *Science's* recent account of developments at the University of Pittsburgh (News and Comment, 4, 11, and 18 Feb.), to regard ex-Chancellor Litchfield with far more esteem than I did. . . . Speaking as an administrator, I should like to say that the role is an unenviable one. One is a servant to those one administers as well as to those one has to account to. One doesn't take such a job out of altruism, but perhaps the chief reward is the achievement of goals that one believes one has a particular capacity to push through. I use the verb "push," because the administrator must have and maintain authority to enable him to do his job.

The era of Litchfield may be over for Pitt. It would be well, however, for the community and the trustees to recognize the debt they owe him, as brought out in the *Science* account. One aspect of Pitt's situation not brought out in that account is the proximity of Carnegie Tech, a strong academic institution to try to compete with. Yet Litchfield did so successfully, instilling an *esprit de corps* at the university that is not easily come by.

This is my expression of thanks to him for what he tried to do to strengthen higher education in one small sector of our country. I do not view the debacle that resulted as his personal failure, but as a lesson to us all in the requirements for establishing and operating a major academic institution. May we learn and benefit from it.

ROWENA W. SWANSON
505 Seward Square SE, Washington, D.C. 20003

Samuel Johnson on Dermo-optical Perception

Readers of Martin Gardner's article on dermo-optical perception (11 Feb. p. 654) may be interested in how Johnson dismissed the matter. In the 19 April 1772 entry in *Boswell for the Defense* [W. K. Wimsatt, Jr., and F. A. Pottle, Eds. (Heinemann, London, 1960), p. 134], Boswell records:

> We talked of the blind being able to distinguish colours by the touch. Mr. Johnson said that the great Saunderson mentions his having attempted to do it; but that he found he was aiming at an impossibility. That, to be sure, a difference in the surface makes the difference of colours. "But that difference," observed Mr. Johnson, "is so fine that it is not sensible to the touch." The General [Pasquale de Paoli] mentioned gamesters and jugglers who could know cards by the touch. Mr. Johnson said that those cards must not have been so well polished as ours are.

The editors add in a footnote:

> Nicholas Saunderson, blinded by smallpox at the age of twelve months, became in 1711 fourth Lucasian Professor of Mathematics at Cambridge. His *Elements of Algebra*, 1740, contains the disclaimer to which Johnson refers.

F. A. BREWER
Department of Radio and Television, Indiana University, Bloomington

29 April 1966, Volume 152, Number 3722 **SCIENCE**

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

Environmental Sciences

One of the newest fads in Washington—and elsewhere—is "environmental science." The term has political potency even if its meaning is vague and questionable. Lacking specific definition, it embraces every science—physical, natural, social—for all of them deal with man's surroundings and their influence and impact upon him.

An observer of the Government scene gets the impression that the title of a new agency in the Department of Commerce may be an astute response to the flexibility and hence the promotional value of the term "environmental science" in building a new empire in science and technology. The acronym ESSA, easily pronounced and remembered, and already imprinted on two orbiting satellites, stands for "Environmental Science Services Administration," truly a ponderous, hard-to-remember, and hard-to-define title, of puzzling import.

ESSA is within the Department of Commerce, presumably because the Weather Bureau was its nucleus. But, assuming the possibility of unlimited expansion, is Commerce logically the trustee and guardian of all human environment? Will ESSA's service extend to influencing all the phenomena with which science deals—in the heavens, beneath the sea, and upon and under the dry land—to protect man and, hopefully, to benefit him? Can one escape visualizing a vast rising tide of dollars deemed essential for guarding man against the threats of nature or for assuring him of nature's benign contributions to his well-being?

The various Government agencies with well-understood functions have, on the whole, performed creditably. They have taken seriously their responsibilities to the public. They have been doing research and development in scientific and technological areas to improve their competence in public services. Basic research in all fields is being well supported and well administered in NIH, NSF, AEC, ARPA, and other agencies. It seems reasonable to believe that all the agencies, with appropriations commensurate with needs, will continue creditably to perform their respective services.

What assurance is there that an agency put together out of parts heretofore existing and functioning in other agencies will provide more and better services? At least one consequence is assured: in an organization so vast within the possible interpretation of its name, the cost will be immeasurably greater.

The answers to the questions posed are not obvious, nor can they be deduced from observable events. One answer which may be proffered is that the purpose was "better coordination" among the component agencies. This, as may be recalled, was an objective in the creation of the Federal Council of Science and Technology, and of Interdepartmental Committees.

ESSA's establishment is a *fait accompli*. Fortunately its direction is in most capable hands. Its director has our best wishes for success in his difficult task. At the same time, the citizenry comprised of the scientists and technologists merits being told what "environmental science" means, and assured that ESSA is not to assume responsibility for all of science and technology in Government. Without such assurance, vigorous and sustained opposition to such unlimited expansion as is implied in "environmental science" is strongly indicated.

—PAUL E. KLOPSTEG

NEW MODEL 3375 TRI-CARB®
LIQUID SCINTILLATION SPECTROMETER...

with these exclusive features:

- Push-button channel selection for single, double or triple label experiments; front panel adjustment permits normalization as required to retain factory-optimized counting conditions
- Patented, volume-independent Automatic External Standardization using a *compound source* of Americium-241 and Radium-226; choice of Ratio or Count methods of standardization
- Patented, "3+2" counting channel configuration; three completely independent channels of pulse-height analysis, each with precision gain control and continuously adjustable discriminators . . . *two additional* channels exclusively for Automatic External Standardization
- "On-line" electronic computation with continuous display of count rate and percent standard deviation; push-button selection of desired display, and full print control; complete selection of all possible Channel Ratios
- IBM Selectric Typewriter data presentation on continuous pre-printed forms . . . easy to read, organize and file

Model 3375 gives you these exclusive features and the latest, reliable integrated circuitry, plus the outstanding performance that is typical of all new Tri-Carb Spectrometer Systems. For complete information see your Packard Sales Engineer or write for Bulletin 1057B to Packard Instrument Company, Inc., 2200 Warrenville Road, Downers Grove, Illinois 60515.

Packard

read back over the telephone by a sighted reader from a CRT display at Briarcliff Manor.

While no neurophysiologists or sensory information processing specialists spoke at the conference, brief reference was made to the possibility of a nearly all-encompassing ultimate solution to the reading problems of the blind—development of substitute organs to replace defective parts of the visual system, and then conveying the visual information directly to appropriate parts of the central nervous system. Some participants considered this approach very difficult and expensive, but not completely impossible.

The conference was organized by the Veterans Administration.

HOWARD FREIBERGER
EUGENE F. MURPHY
Prosthetic and Sensory Aids Service, Veterans Administration, 252 Seventh Avenue, New York 10001

Forthcoming Events

May

3–5. **Industrial Waste**, 21st conf., Purdue Univ., Lafayette, Ind. (D. E. Bloodgood, School of Civil Engineering, Purdue Univ., Lafayette 47907)

3–6. American Chemical Soc., Div. of **Rubber Chemistry**, San Francisco, Calif. (G. N. Vacca, Bell Telephone Laboratories, Murray Hill, N.J.)

3–8. Mechanism of Action of **Fungicides and Antibiotics**, intern. symp., Biological Soc. of the GDR, Reinhardsbrunn, East Germany. (H. Lyr, Inst. für Forstwissenschaften, Alfred-Möllerstr., 13 Eberswalde die Berlin)

4. Society for **Analytical Chemistry**, mtg., Bristol, England. (The Society, 14 Belgrave Sq., London, England)

4–6. **Genetics** Soc. of Canada, 11th annual mtg., Banff, Alberta. (C. O. Person, Dept. of Genetics, Univ. of Alberta, Edmonton, Canada)

4–6. Society for Experimental **Stress Analysis**, spring mtg., Detroit, Mich. (B. E. Rossi, 21 Bridge Sq., Westport, Conn. 06882)

4–7. **Virginia Acad.** of Science, Madison College, Harrisonburg. (R. C. Berry, Virginia Acad. of Science, P.O. Box 8203, Richmond 23226)

4–8. **Laboratory Medicine**, 12th congr., Bad Kissengen, West Germany. (W. Albath, Katharinengasse 3, 87 Würzburg, Germany)

4–11. **Instability Phenomena in Galaxies**, symp., Armenian SSR. (A. N. Hakopian, Acad. of Sciences of the Armenian SSR, Erevan)

5–6. **Human Factors in Electronics**, 7th symp., Minneapolis, Minn. (C. A. Baker, Honeywell, Inc., 2700 Ridgeway Rd., Minneapolis)

5–6. **Rabies**, natl. symp., Atlanta, Ga. (J. R. Ray, American Veterinary Medical Assoc., Chicago, Ill.)

5–6. **Strontium Metabolism**, intern. symp., Annan, Scotland. (J. H. Martin, United Kingdom Atomic Energy Agency, Chapelcross Works, Annan, Dumfriesshire, Scotland)

5–7. Society for American **Archaeology**, 31st annual mtg., Univ. of Nevada, Reno. (D. D. Fowler, Dept. of Anthropology, Univ. of Nevada, Reno 89507)

5–7. New Jersey Soc. of **Professional Engineers**, 42nd annual conf. and exhibition, Atlantic City. (K. G. Stanley, The Society, 495 West State St., Trenton, N.J. 08618)

5–7. Midwestern **Psychological** Assoc., Chicago, Ill. (F. A. Mote, Psychology Dept., Univ. of Wisconsin, Madison)

5–8. **Protides of the Biological Fluids**, 14th annual colloquium, Bruges, Belgium. (P.O. Box 71, Bruges)

6–7. Institute on **Lake Superior Geology/Mineralogical** Soc. of America/Soc. of **Economic Geologists**, mtg., Michigan Technological Univ., Saulte Ste. Marie. (A. K. Snelgrove, Michigan Technological Univ., Houghton 49931)

6–7. **North Carolina Acad.** of Science, Catawba College, Salisbury. (J. A. Yarbrough, Meredith College, Raleigh, N.C.)

6–7. **North Dakota Acad.** of Science, North Dakota State Univ., Fargo. (B. G. Gustafson, Univ. of North Dakota, Grand Forks)

6–8. Society for Applied **Anthropology**, 25th annual mtg., Milwaukee, Wis. (The Society, Rand Hall, Cornell Univ., Ithaca, N.Y.)

6–8. **Wisconsin Acad.** of Sciences, Arts, and Letters, Lawrence Univ., Appleton, Wis. (D. J. Behling, 720 Wisconsin Ave., Milwaukee 53202)

6–9. American **Psychoanalytic** Assoc., Atlantic City, N.J. (H. Fischer, 1 E. 57th St., New York, N.Y.)

7–8. Academy of **Psychoanalysis**, Atlantic City, N.J. (A. H. Rifkin, 125 E. 65 St., New York 10021)

7–12. American **Ceramic** Soc., 68th annual mtg., Washington, D.C. (The Society, 4055 N. High St., Columbus, Ohio 43214)

8–10. Society of the **Plastics Industry**, Canadian section, 24th annual mtg., Montreal, P.Q. (The Society, 250 Park Ave., New York 10017)

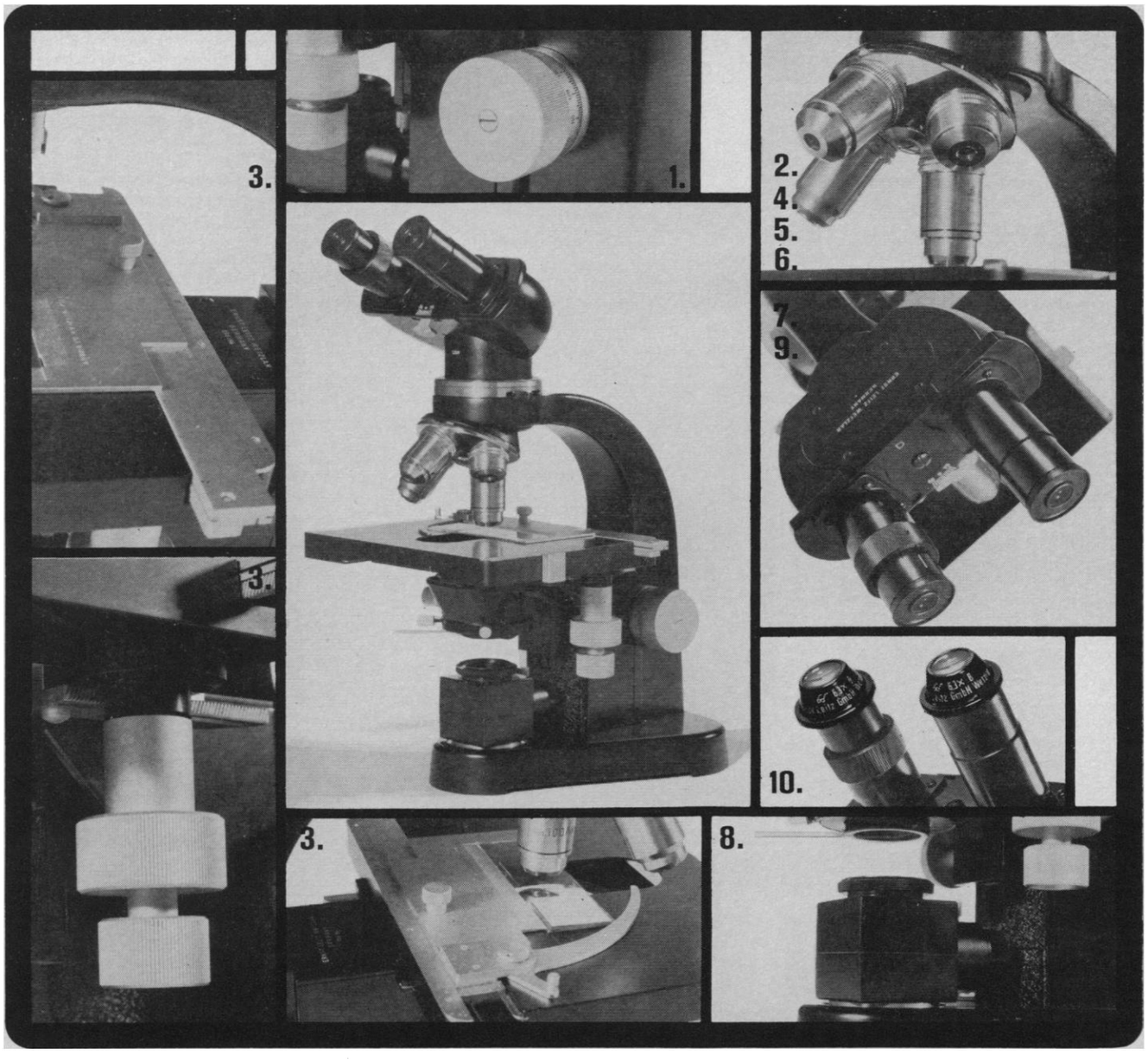
8–11. **Administrative Management** Soc., 47th intern. conf., Boston, Mass. (W. H. Latham, Willow Grove, Pa. 19090)

8–12. Association of American State **Geologists**, annual mtg., Univ. of Indiana, Bloomington. (W. C. Hayes, Missouri Geological Survey, P.O. Box 250, Rolla 65401)

8–12. **Organic Sulphur Compounds**, symp., Univ. of Groningen, Groningen, Netherlands. (M. J. Janssen, Dept. of Organic Chemistry, Univ. of Groningen, Groningen)

8–15. **Stereochemistry**, conf., Bürgenstock, Switzerland. (D. Arigoni, Dept. of Organic Chemistry, Univ. of Zurich, Zurich, Switzerland)

9–10. **Circuit Theory**, 9th midwestern symp., Oklahoma State Univ., Stillwater. (D. R. Wilson, School of Electrical Engineering, Oklahoma State Univ., Stillwater 74045)



CHOOSE A LEITZ SM FOR YOUR MEDICAL STUDIES

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

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

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

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

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

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

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

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

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

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

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

Leitz

E. LEITZ, INC., 468 PARK AVENUE SOUTH, NEW YORK, N.Y. 10016
Distributors of the world-famous products of Ernst Leitz G.m.b.H., Wetzlar, Germany – Ernst Leitz Canada Ltd.
LEICA AND LEICINA CAMERAS · LENSES · PROJECTORS · MICROSCOPES
62666