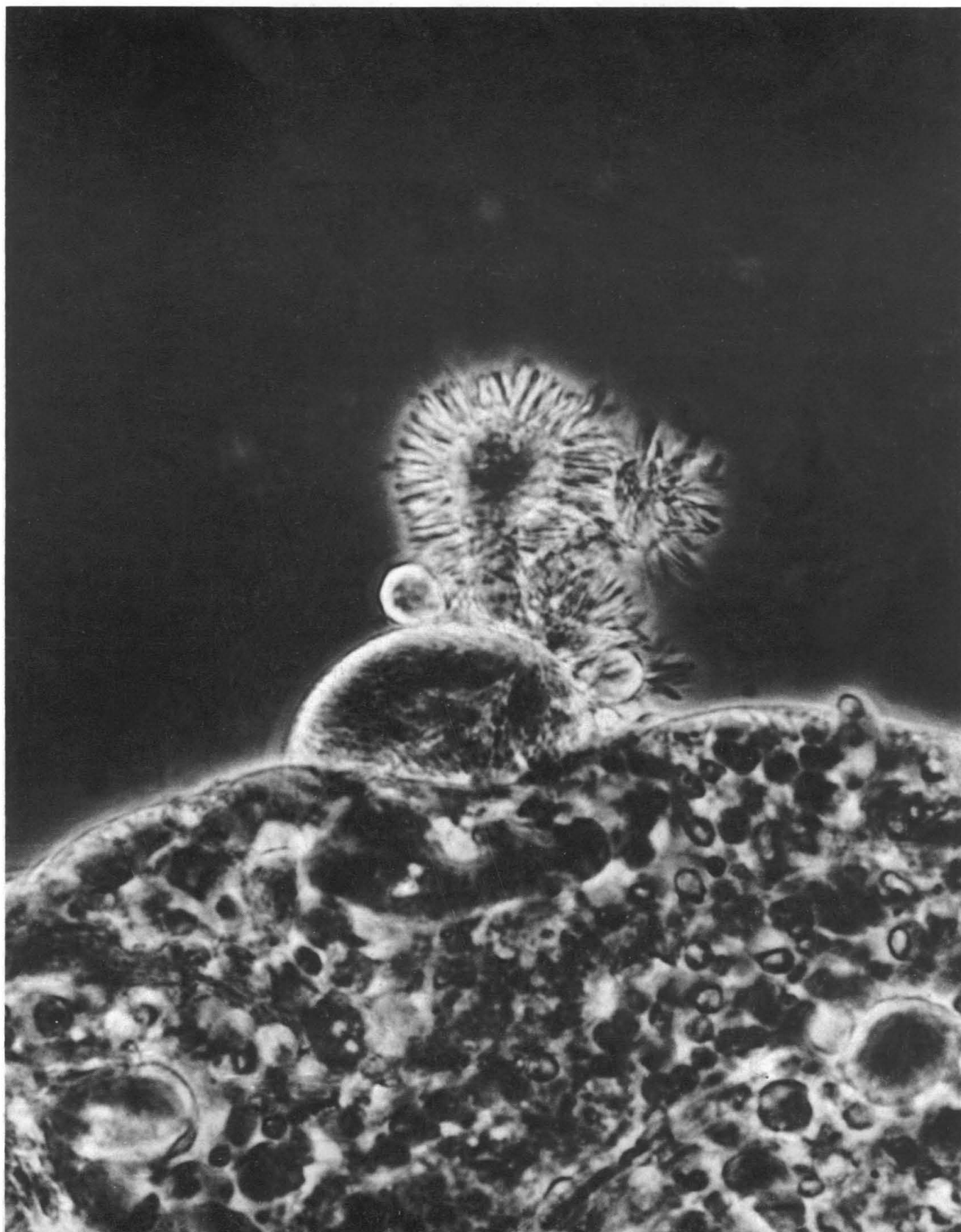


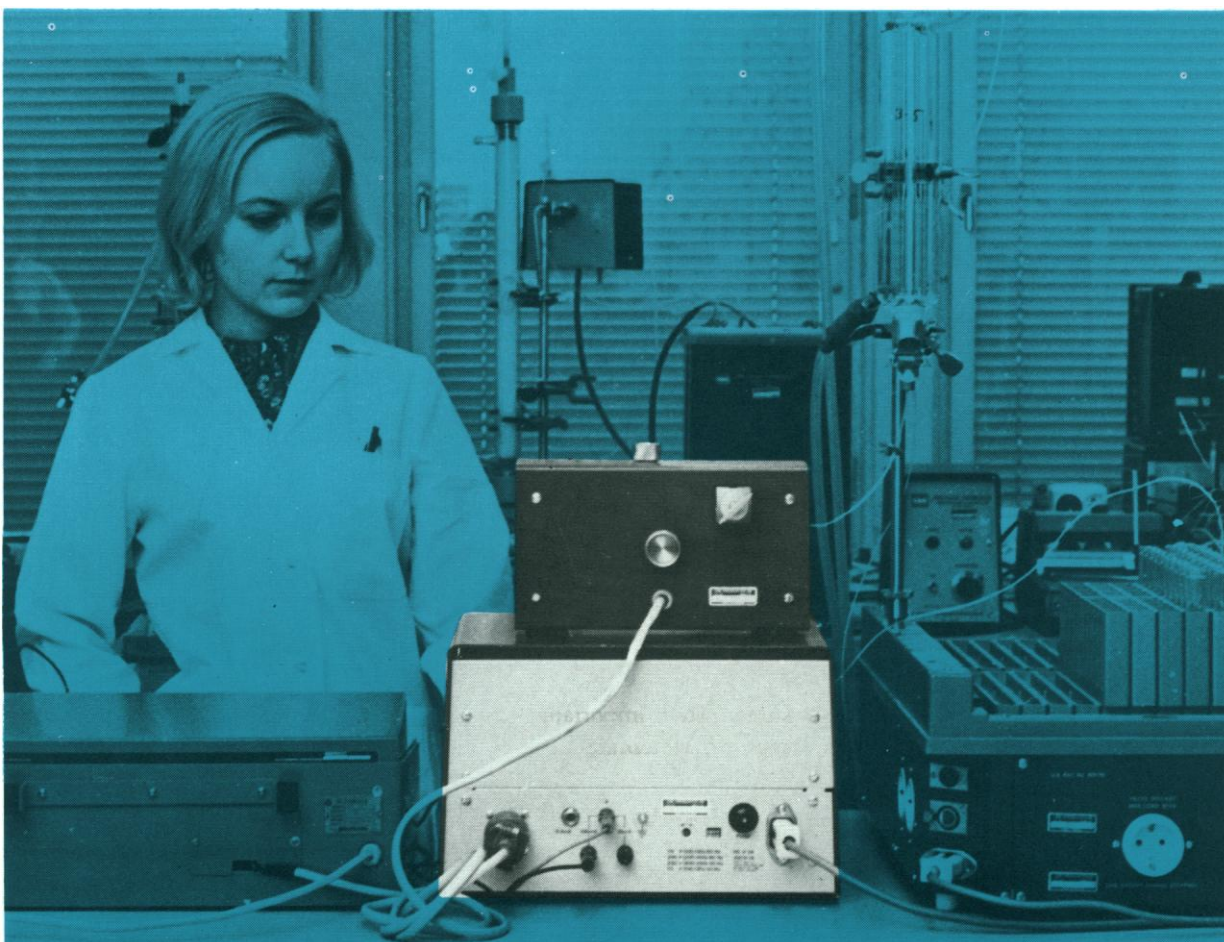
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Rupturing oocyst of the lizard malaria parasite, *Plasmodium mexicanum*, on the stomach wall of a phlebotomine sandfly. Released sporozoites localize in the salivary glands when sandfly is ready for a subsequent blood meal. See page 891. [S. Ayala and D. P. Furman, University of California, Berkeley]

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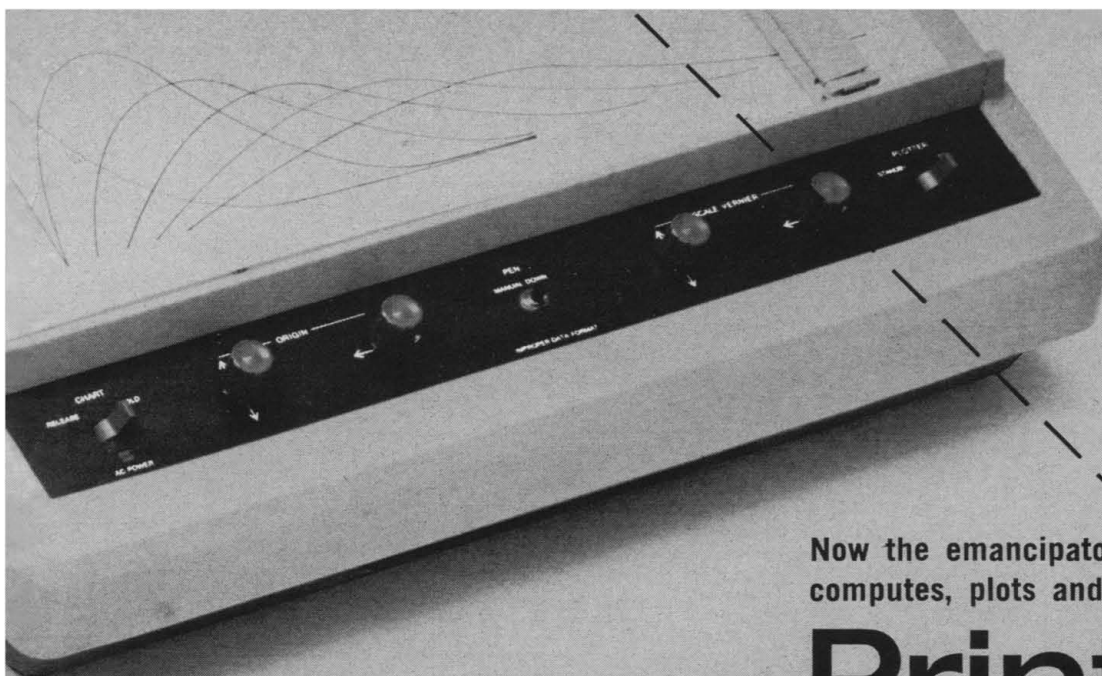
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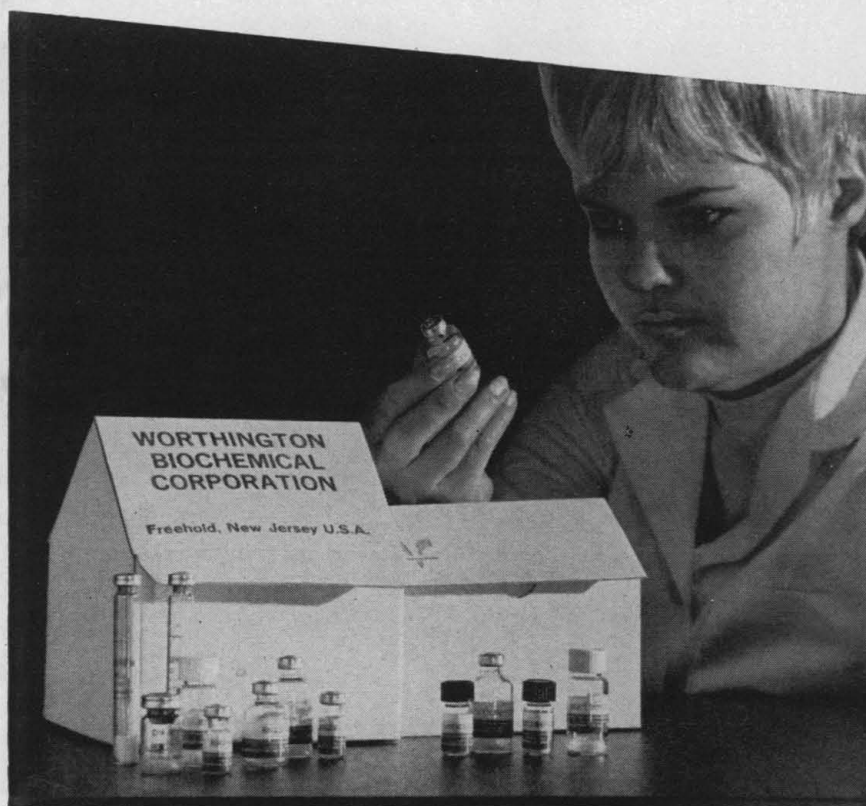
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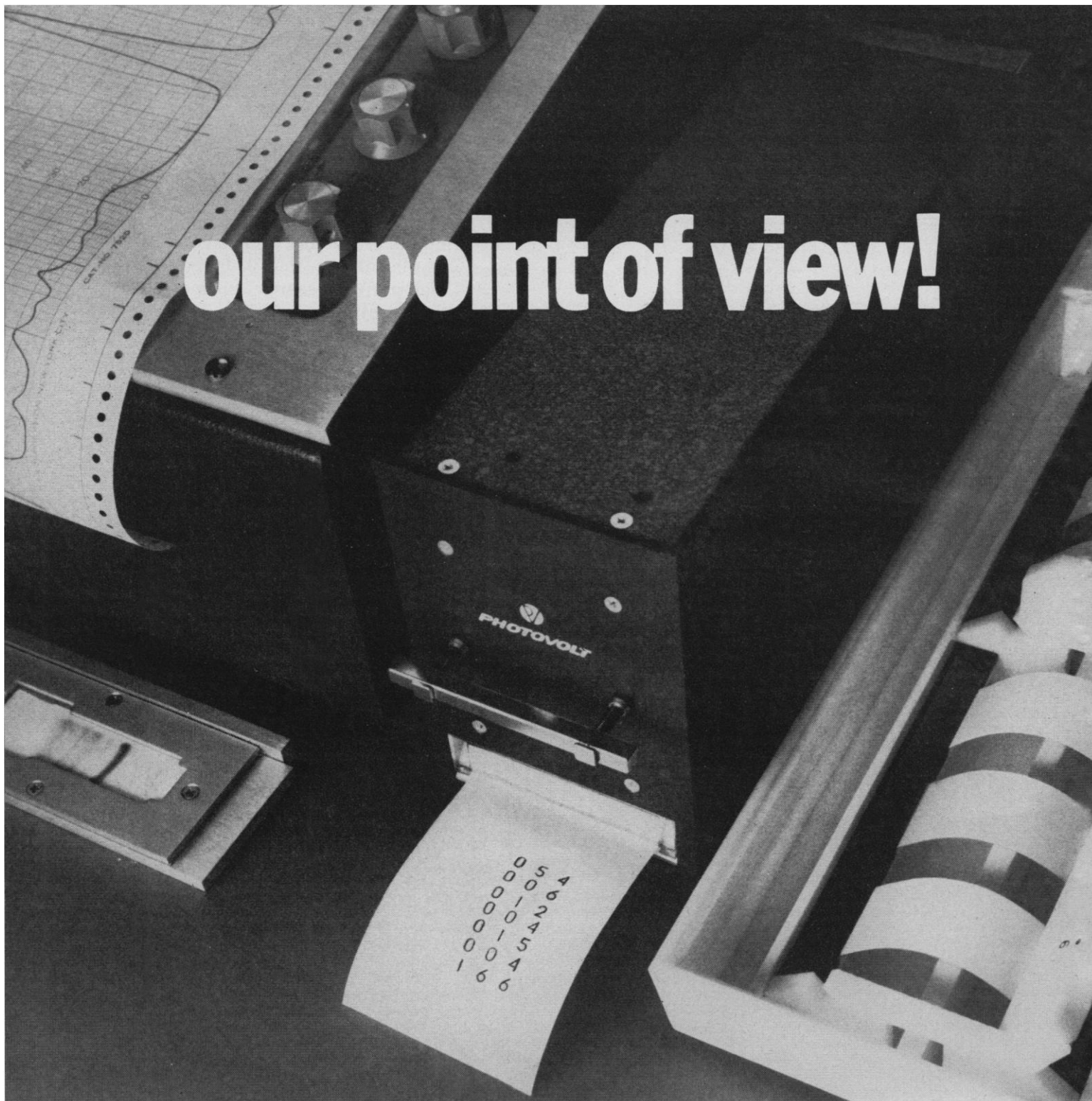
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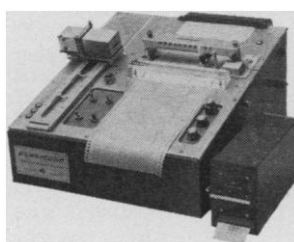
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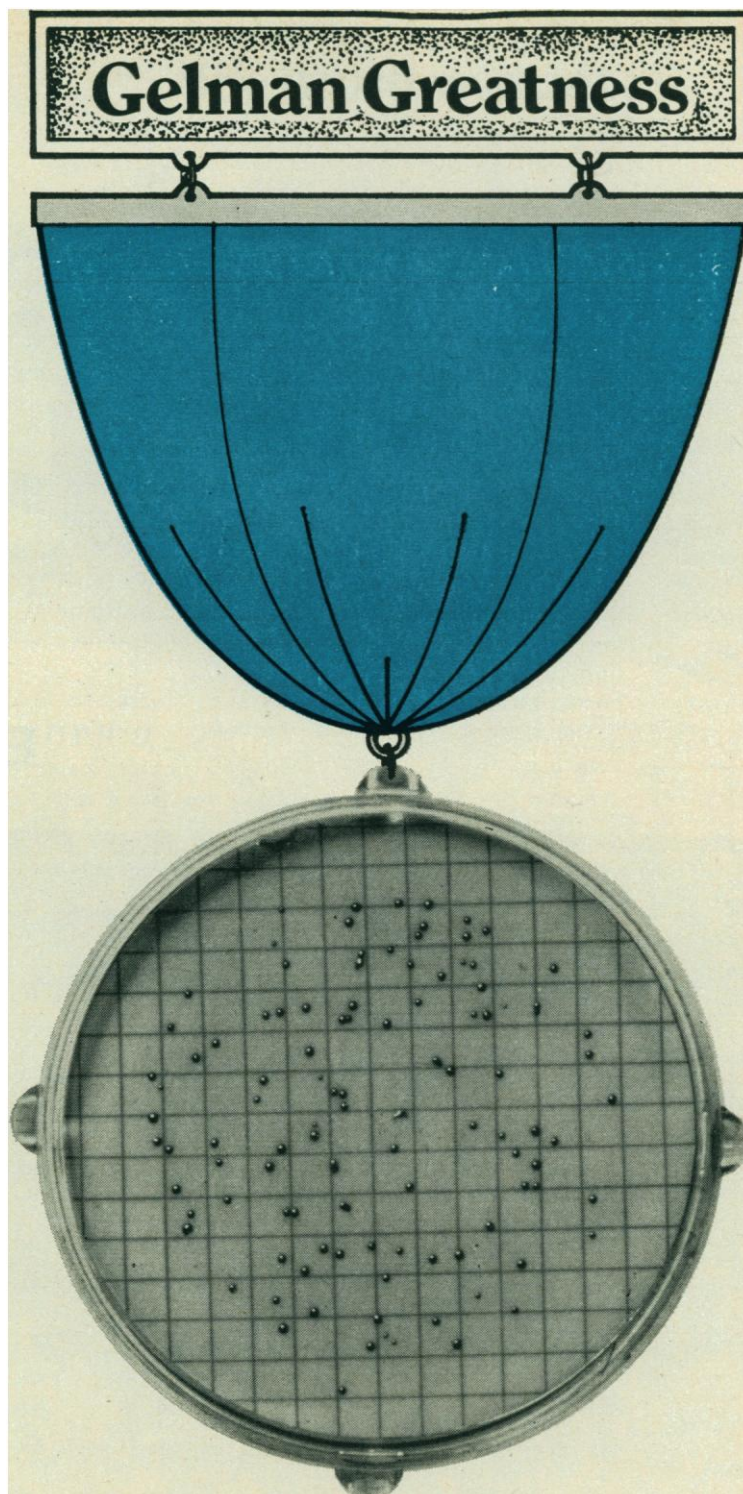
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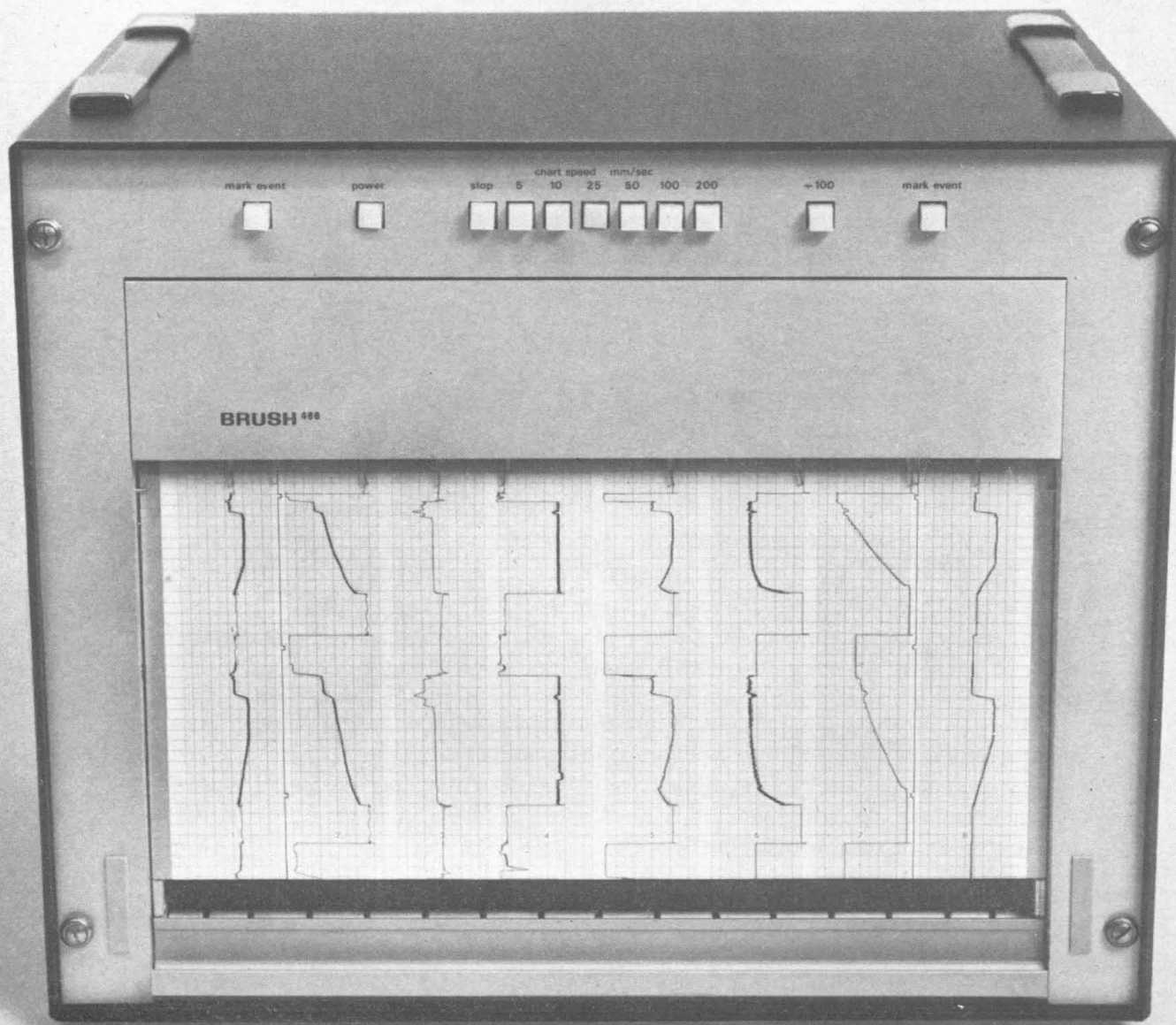
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How cryogenic storage can be a lifesaver for the bioscientist

The gradual erosion of a biological property that is being maintained as a preservative measure in the frozen state at a temperature of -70°C or higher is an occurrence with which workers in the biosciences inevitably become familiar. Often marvels of ingenuity are exercised in preparing a system for the potentially dangerous phase transition. The bioscientist is able to show that, as the temperature of the basically aqueous medium is lowered, enzyme activity, membrane integrity, or cellular morphology has survived the excursion

from $+15^{\circ}\text{C}$ to -70°C and back. The system, perhaps with the addition of a protective additive, has presumably been well prepared not only for a passage to and from the solid state but also for a storage period in that state. Yet, if the return to $+15^{\circ}\text{C}$ is delayed for weeks, or months or years, these or other desirable and essential properties may be irretrievably lost. What has happened? Why?

The precise mechanisms by which entities of biological origin undergo degradation with time in a frozen environment have not been delineated in terms of their chemistry. The nonfunctioning enzyme system, the infertile sperm cell, the hemolyzed erythrocyte, and other biological disasters nevertheless attest to their reality. Clearly, as the cryobiologists probe the basics of their field, one can expect definition of reactions of great interest, conceivably of wholly new concepts in chemistry. There are porphyrins, perhaps, in Wang's dimerization of 1,3 dimethyl thymine in frozen environments, a photoreaction that proceeds at a negligible rate in the liquid state.

At present known only by their workings, a loss of activity or other form of biological integrity, these degradative reactions are temperature dependent, and it is on this relationship that the success or failure of a frozen storage operation may depend. For over a century we have known that a decline in temperature of 10°C decreases the reaction velocity by approximately $1/2$ or $2/3$, but those of you who remember your problems in chemical kinetics will recall the awe-inspiring influence of temperature on the specific reaction rate as expressed by Arrhenius:

$$K = Ae^{-\frac{\Delta E}{RT}}$$

The effect of temperature on K , the specific reaction rate, is exerted exponentially through the Boltzmann factor. If the storage temperature used permits significant biological decay, that is to say, an undesirably high degradative reaction velocity, one can slow the process effectively. How effectively can be seen in almost any text of physical chemistry. Daniels, for example, cites a first-order reaction in which the half-life is increased by a factor approaching 10,000 as the temperature is lowered from -75°C to -100°C . Such considerations are necessarily important when materials of biological origin, many of which are intrinsically unstable, are to be stabilized for indefinitely prolonged periods at reduced temperatures. Remember, too, that the frequency factor, A , diminishes with decreasing temperature.

Among the procedures by which the scientist may capitalize on the relationships inherent in the Arrhenius equation to provide maximum stability to systems of biological interest, the use of cryogenic fluids in appropriate storage equipment offers a relatively simple solution. Liquid nitrogen, abundantly available, is a boiling liquid, -196°C , at atmospheric pressure. An idea of its potential effectiveness as a refrigerating agent can be seen from the diagram below. Here we postulate a reaction with a half-life of one day at 0°C and a reduction of reaction rate by one half for each 10°C decline in temperature.

REFERENCES:
Daniels, F.: Outlines of Physical Chemistry, New York, John Wiley & Sons, Inc., 1948, p. 367.
Wang, S. Y.: Photochemical Reactions in Frozen Solutions. Nature 190:690-4, 1961.

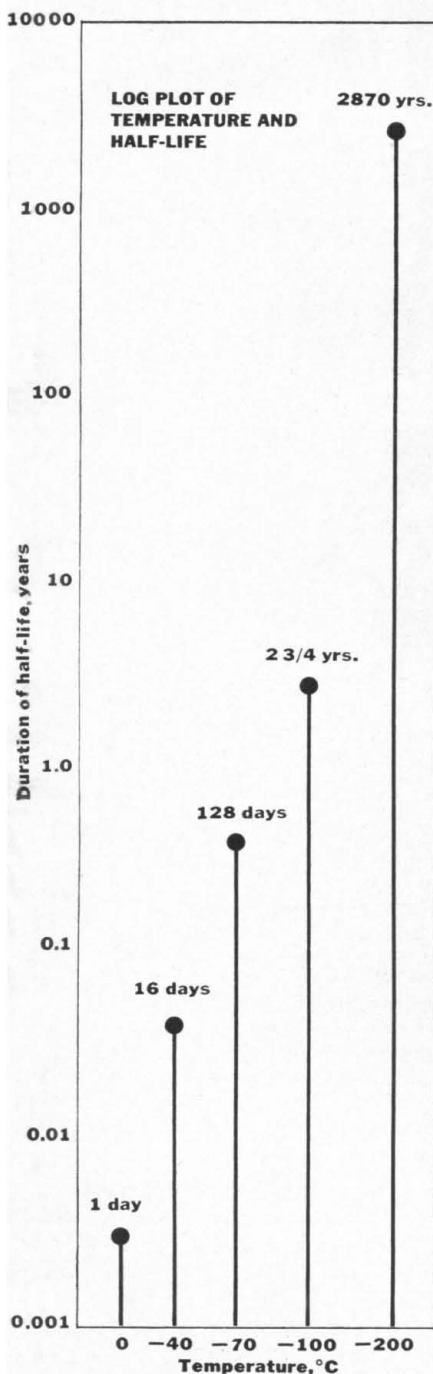
See also: Wang, S. Y.: Photochemical Reactions of Nucleic Acid Components in Frozen Solutions. Fed. Proc. 24(2) Part III: S-71-9, Mar.-Apr., 1965.

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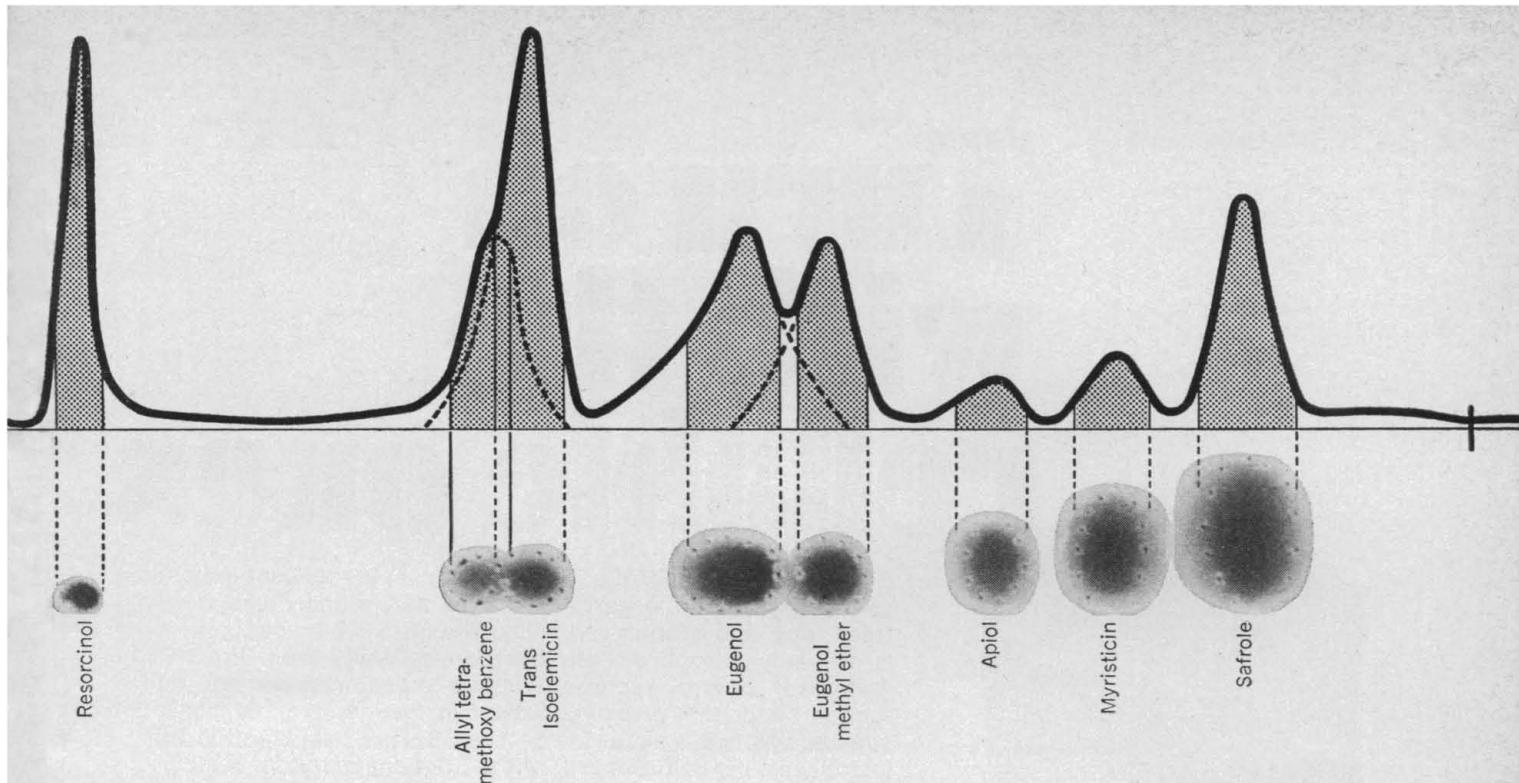


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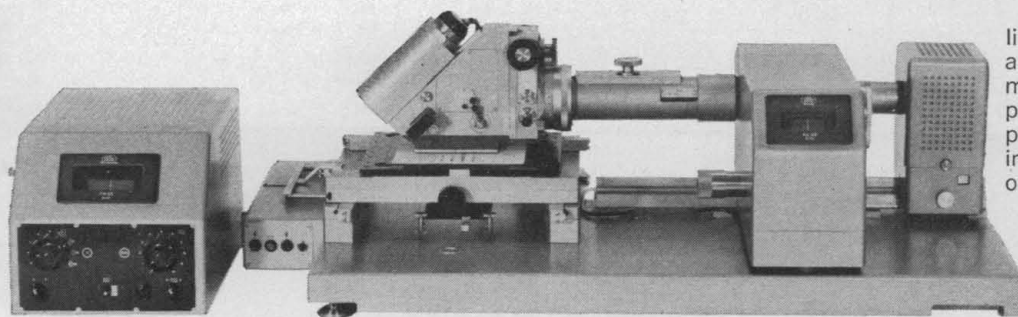
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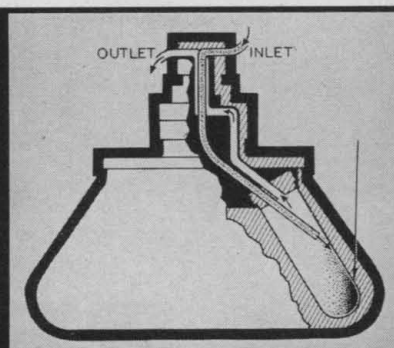


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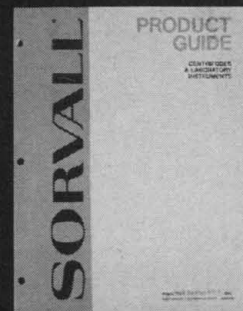
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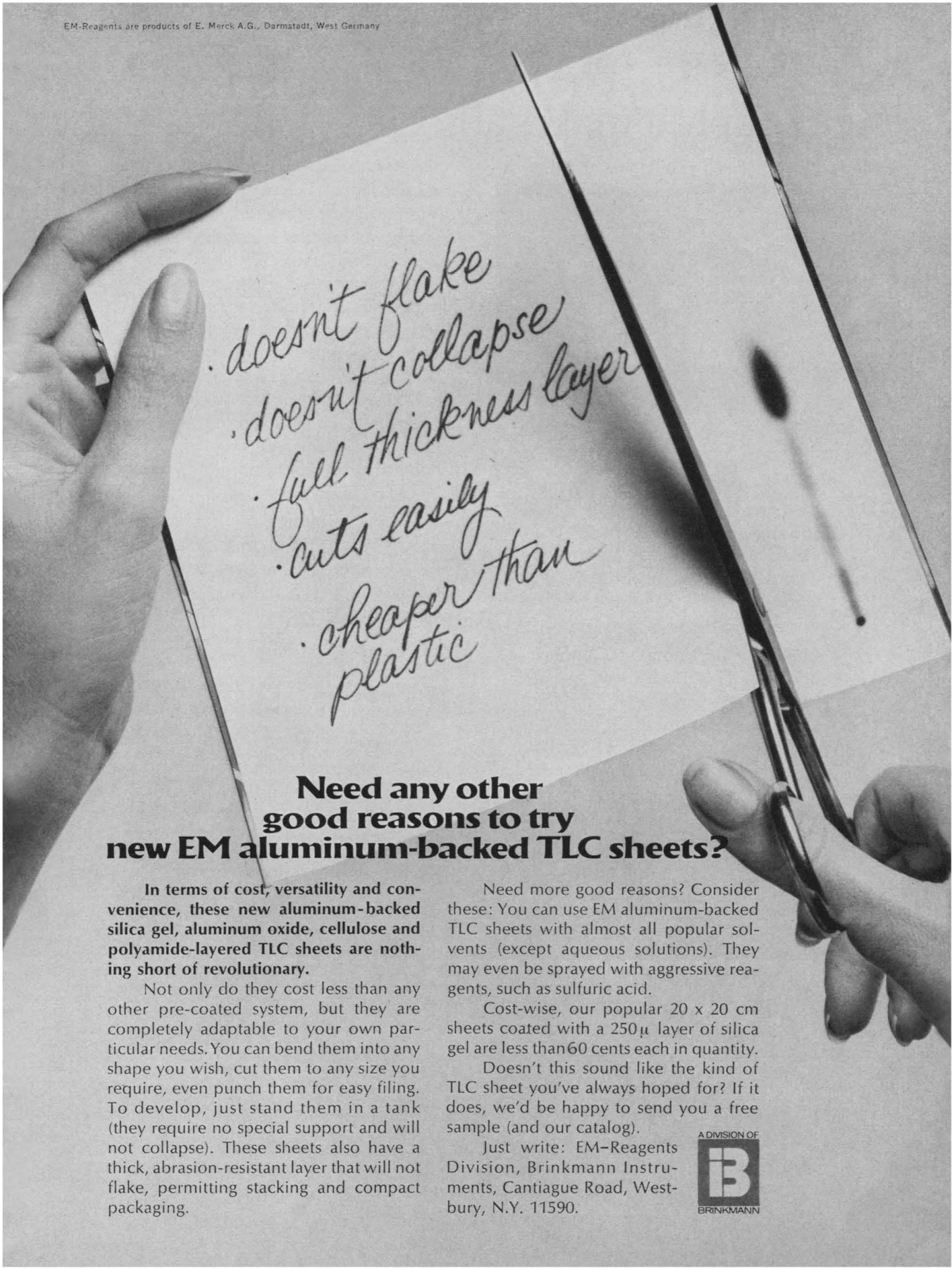
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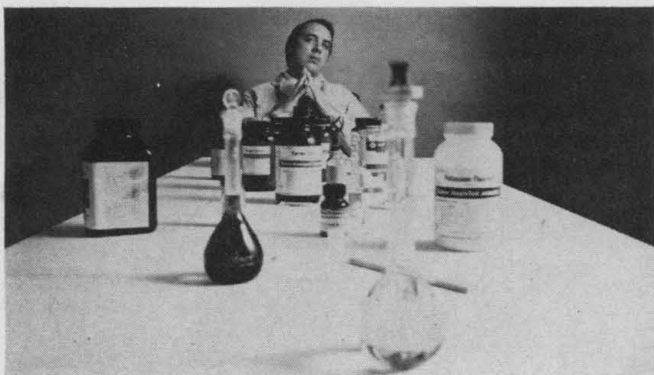
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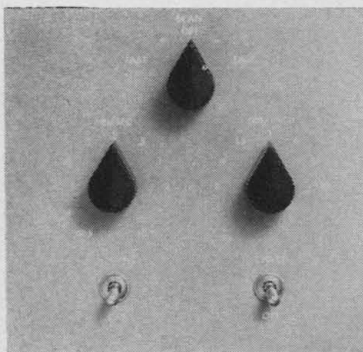


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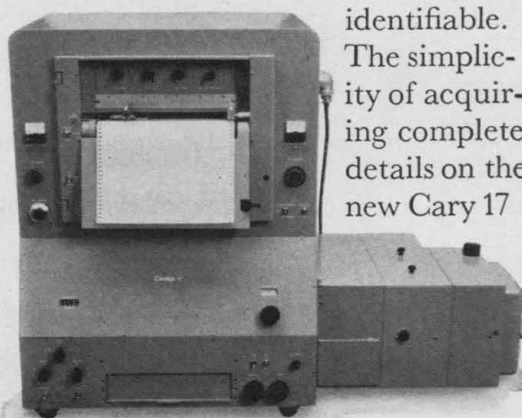
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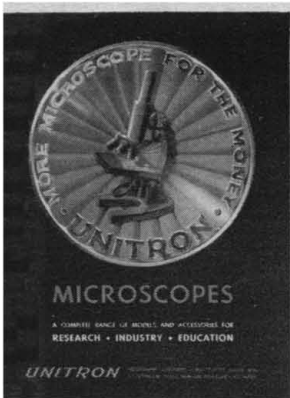
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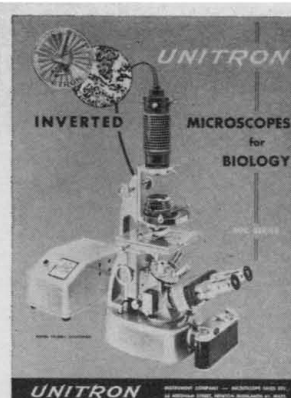


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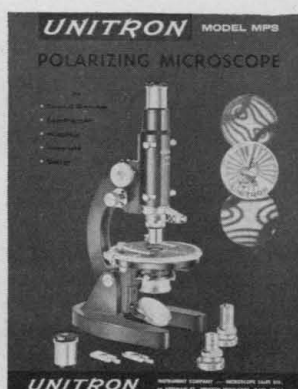
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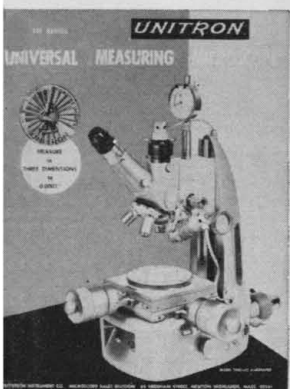
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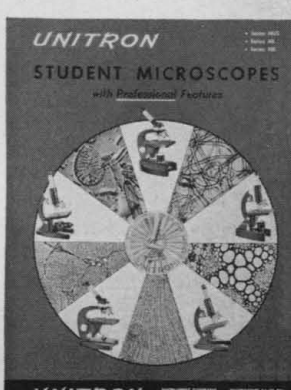
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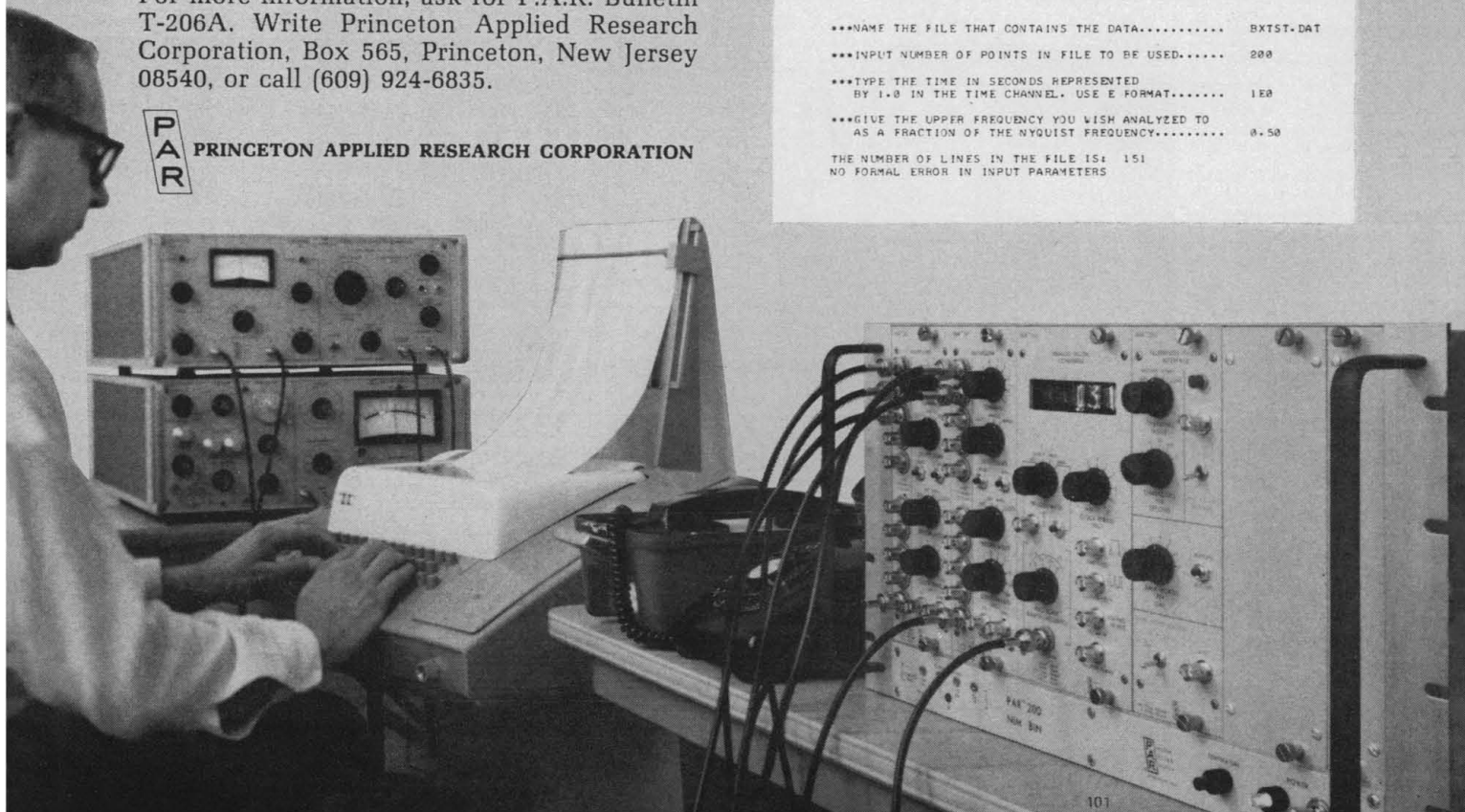
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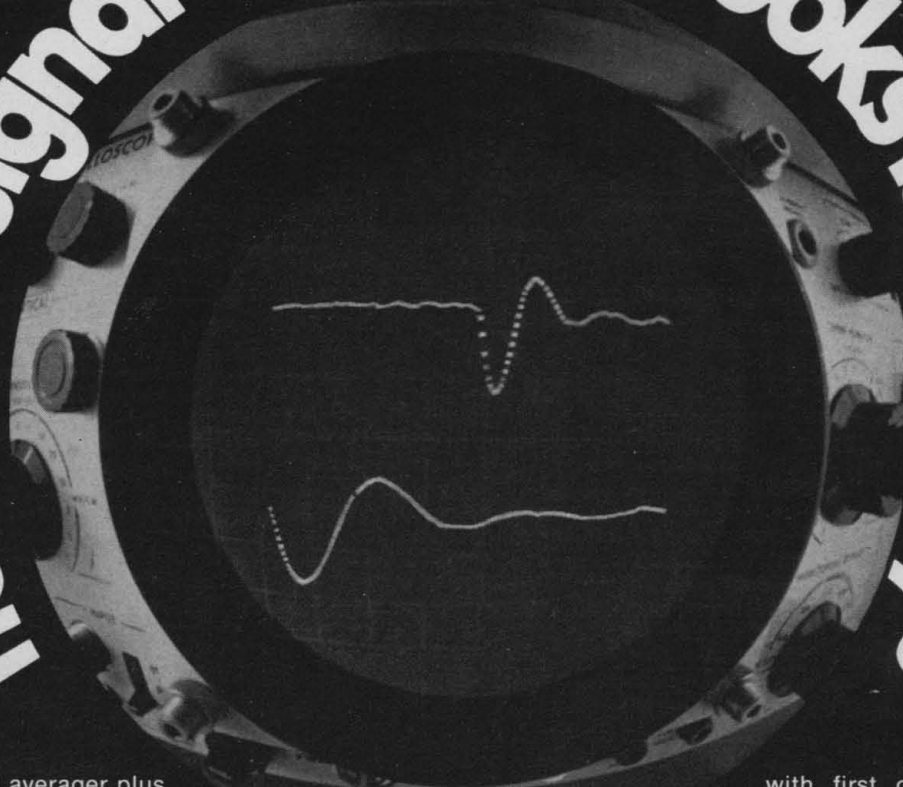
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Threatened Faculty Pensions

TIAA and CREF are in trouble. Ever since they were established, the Teachers Insurance and Annuity Association and the College Retirement Equities Fund have been regulated by the insurance department of the state of New York but have not been subject to different regulations by other states. Because of this uniformity, and because TIAA and CREF have employed no agents and have had no commissions to pay, the system has been economical and has had a high ratio of benefits to costs. Because of the uniformity of regulations and because annuities have been fully and immediately vested in the individual, participating faculty members have all had the same kind of contracts and have enjoyed easy mobility from institution to institution—a policy that has worked to the individual advantage of faculty members and the collective advantage of higher education.

Now uniformity is threatened. As a result of judicial decisions which dealt primarily with insurance programs, the regulatory powers of the individual states have been enlarged. Insurance commissioners and commercial insurance companies in some states have sought legislation to require TIAA-CREF to comply with state regulations, some of which would be inappropriate, for TIAA-CREF has no agents, makes no profits, and in other important ways differs from other retirement or insurance programs.

These difficulties could be solved by granting TIAA-CREF a federal charter which would require continued regulation by New York but would abolish the threat of 49 other sets of regulations. Last year Senator McClellan and 17 other senators introduced a bill, S. 1290, for this purpose. At hearings on 17 and 18 July, some insurance representatives opposed the bill and representatives of many public and private colleges and universities supported it. Since then the bill has been resting in the Senate Committee on the Judiciary.

A companion bill, H.R. 9010, has been introduced into the House of Representatives by Emanuel Celler, and identical bills have been introduced by several other representatives. As in the Senate, sponsorship is bipartisan. Hearings will soon be held before a subcommittee of the House Judiciary Committee, consisting of Byron G. Rogers (Colorado), Andrew Jacobs (Indiana), Jerome R. Waldie (California), Edwin W. Edwards (Louisiana), Charles E. Wiggins (California), Hamilton Fish (New York), and R. Lawrence Coughlin (Pennsylvania).

The fate of these bills is of immediate concern to the 300,000 staff members of colleges, universities, and other nonprofit institutions who hold TIAA-CREF contracts. If a federal charter is granted, TIAA-CREF can continue to offer a unique, economical, and uniform retirement program, at no financial loss to any state, for no state taxes are involved. If the states are permitted to introduce their own individualistic regulations, any of the 2000 institutions with TIAA-CREF coverage could soon come to have on its staff individuals whose differing contracts were written in different states. Each of the 2000 institutions would have to cope with up to 50 different types of contracts, and TIAA-CREF would have to deal with anywhere from one to 50 different plans in each of 2000 institutions! What was intended to be, and so far has been, a uniform system, treating all participants alike, would become an accounting nightmare, full of inconsequential differences and serious inequities for the participants. TIAA-CREF policy holders have a direct, personal interest in letting members of the Senate and members of the House committee know which system they prefer.—DAEL WOLFLE

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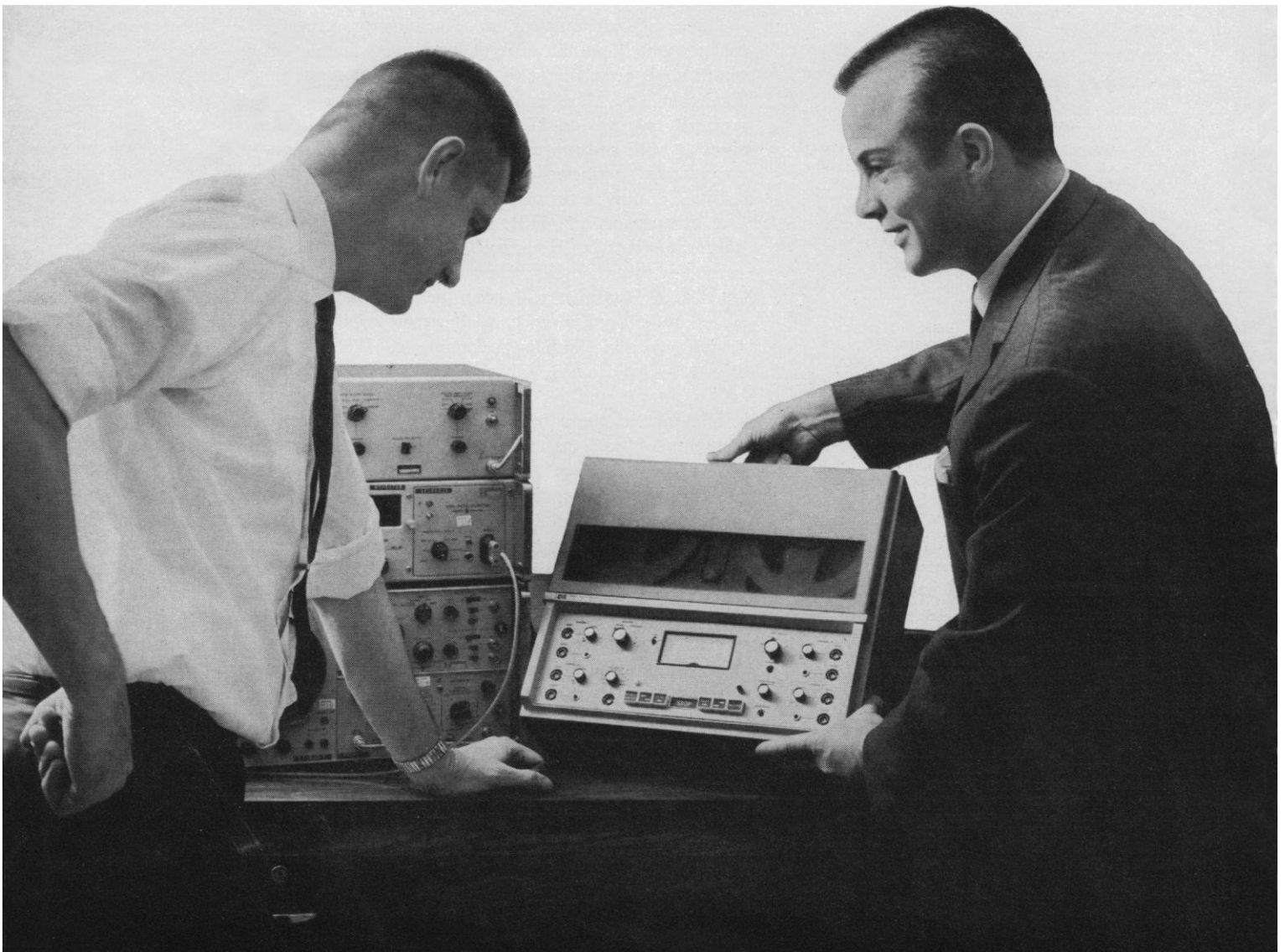
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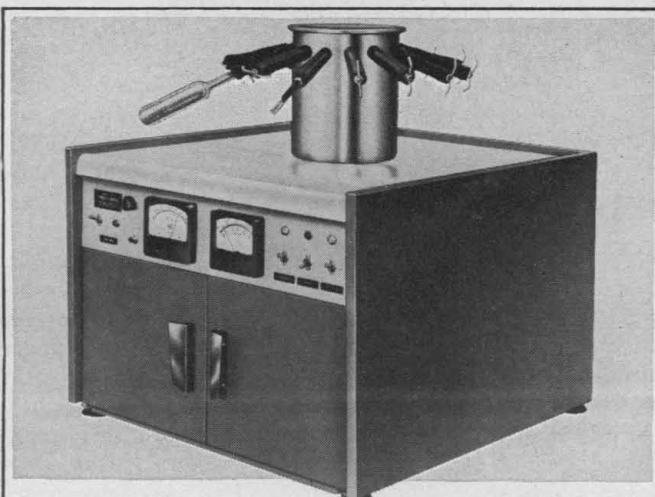
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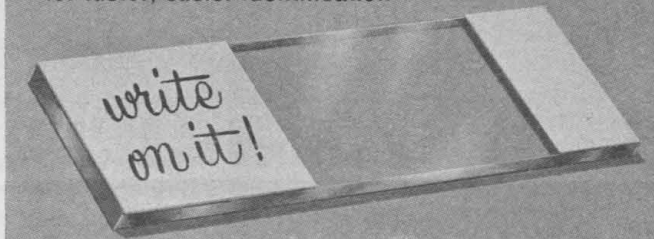


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Aspen Conference on Quantum Crystals

During the week 1-5 September 1969, approximately 100 participants gathered in Aspen, Colorado, for a Conference on Quantum Crystals. The outstanding facilities of the Aspen Institute for Humanistic Studies were made available, and support was provided by the National Science Foundation for the attendance of a significant number of foreign scientists. The organizing committee, consisting of H. R. Glyde, J. A. Krumhansl, H. Meyer, L. H. Nosanow, J. C. Raich, M. G. Richards, and C. A. Swenson, selected a conference format similar to that of the Gordon Conferences, which gave attendees the opportunity during the afternoons to sample the recreational endowments of the Aspen area.

The subject matter comprising the conference was the solid phases of helium and molecular hydrogen in their various isotopic forms. Properties associated with the lattice vibrational degrees of freedom of these crystals were considered, as well as those arising from the nuclear and (for molecular hydrogen) orbital angular momentum degrees of freedom. In addition, attention was given to isotopically and rotationally mixed crystals.

One of the most perplexing situations to emerge from the conference was the decided differences found between the hexagonal close-packed (hcp) and body-centered cubic (bcc) phases of He³. It was reported several years ago from two different laboratories that the specific heat of bcc He³ was larger at temperatures below 1°K than expected on the basis of normal lattice vibration theory.

Only recently, however, has this observation been recognized as a real effect, not due to quirks of experimental technique. Work reported by E. D. Adams (Florida) has confirmed the observations using sensitive strain gauge measurements. In addition, low-temperature thermal conductivity measurements by W. C. Thomlinson (Yale), in the region where the phonon mean free path is limited by sample boundaries so that the temperature dependence of the thermal conductivity is given by the specific heat, also indicate an anomaly for the bcc phase but not for the hcp phase. Effects of He⁴ impurities can be ruled out. It is hard to escape the suspicion that this is somehow connected with the nuclear spin system of He³, and the suspicion was enhanced by a reemphasis by M. G.

Richards (Sussex) that the spectral density for spin fluctuations [by nuclear magnetic resonance) (NMR)] in the bcc phase was much more nearly of exponential form rather than the Gaussian found in the hcp phase.

Progress reported in techniques for orienting crystals of helium was quite encouraging. The birefringence of the hcp phase of He⁴ was used by groups associated with J. P. Franck (Alberta) and with D. Lee (Cornell) to help obtain the ultrasonic elastic constants. The feasibility of orientation by x-ray diffraction in hcp He⁴ was demonstrated by S. Fain and D. Lazarus (Illinois) in conjunction with the observation of anisotropy in thermal conductivity. Inelastic coherent neutron scattering has been used successfully by groups at Brookhaven and at Iowa State to obtain phonon dispersion curves, again for hcp He⁴. Many of these techniques should also be applicable to hydrogen, particularly in its hcp phase. Similarly, observation of a long wavelength optical phonon in Raman scattering from hcp hydrogen, by W. Hardy *et al.* (North American Rockwell), should also be possible in helium. Neutron scattering experiments in hydrogen were reported by W. Schott (Karlsruhe), in fair agreement with lattice dynamical calculations of W. Biem (Oak Ridge) and F. G. Mertens (Jülich) using the Nosanow treatment of zero-point motion.

Considerable light was shed on the nuclear spin ordering transition expected in He³. The fact that this would be an antiferromagnetic state, with Néel temperature at about 2×10^{-3} °K, was confirmed in several ways. No less than three groups (Cornell, Brookhaven, Stanford) reported nuclear susceptibility measurements fitted to a Curie-Weiss form. In good agreement was a determination inferred from strain gauge measurements, again by the Florida group. The most recent theoretical computations of the associated exchange splitting by R. Guyer (Harvard) agree with experiment to within a factor of 2, and with density dependence much improved over earlier calculations. The spin disorder of the solid above 2×10^{-3} °K can be used to cool by adiabatically compressing spin-ordered liquid into solid, a technique conclusively demonstrated by groups associated with J. Wheatley (La Jolla) and with Lee (Cornell). It would appear that this refrigeration de-

vice will be of great practical importance for carrying out a wide variety of other experiments in the few millidegree temperature range.

In hydrogen, where the molecule can have a metastable $J = 1$ excitation, an orientation ordering is known to take place due primarily to electric quadrupole interactions. Phonon zero-point vibrations modify the quadrupolar coupling constant, as calculated by A. B. Harris (Pennsylvania), with experiment and theory gradually converging. The orientational transition is closely accompanied by, but now found (groups at Duke and at Los Alamos) not to be simultaneous with, a lattice structural transformation. In the ordered state, rotational wave excitations ("librons") are expected; their observation in the Raman scattering spectrum reported by Hardy *et al.* suggests an inconsistency with the previously accepted orientational arrangement. Further doubts were cast on the accepted arrangement by H. James (Purdue) on the basis of computer simulations of the most stable orientational structure. Studies of these effects by NMR relaxation, as well as of the effects of isotopic and molecular spin mixing, were discussed by J. R. Gaines (Ohio State University) and by H. Meyer. T. Nakamura (Osaka) presented calculations of the energy of pairs of $J = 0$ molecules in an otherwise ordered $J = 1$ crystal.

Experimental emphasis in the area of helium isotopic mixtures was on spin-lattice relaxation of He^3 with dilute He^4 , as reported by M. Bernier (Saclay) and by H. Reich (IBM), and thermal conductivity of He^4 with dilute He^3 , carried out by groups at Oxford and at Duke. Theoretical investigation by C. M. Varma (Bell Telephone Laboratories) indicated that effective force constant changes and strain fields are induced around an isotopic defect, due to the large zero-point lattice motion in helium, with sizable effect on phonon transport scattering rates but little effect because of cancellations on the local exchange splitting. This is confirmed in experiments discussed by R. C. Richardson (Cornell). Observed changes in spin-lattice relaxation times with impurity content, as observed at Saclay and IBM, may be connected with defect migration, which drives the known low-temperature phase separation of solid mixtures.

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verse and Scientific Thought. F. P. Dickson. M.I.T. Press, Cambridge, Mass., 1969. xii + 228 pp. + plates. Paper, \$2.95.

Building Physics: Lighting. Seeing in the Artificial Environment. W. R. Stevens. Pergamon, New York, 1969. viii + 236 pp. + plates. Cloth, \$7; paper, \$5.50. Commonwealth and International Library: Physics Division.

Catalogue of the Type Specimens of Microlepidoptera in the British Museum (Natural History) Described by Edward Meyrick. Vol. 7, Gelechiidae (D-Z). J. F. Gates Clarke. British Museum (Natural History), London, 1969. iv + 532 pp., illus. £15. Publication No. 679.

The Chimpanzee. Vol. 1, Anatomy, Behavior, and Diseases of Chimpanzees. G. H. Bourne, Ed. Karger, Basel, 1969 (U.S. distributor, Phiebig, White Plains, N.Y.). xii + 468 pp., illus. \$27.60.

Cohomology of Groups. Edwin Weiss. Academic Press, New York, 1969. xii + 276 pp. \$15. Pure and Applied Mathematics, vol. 34.

Communication and Learning. Len S. Powell. Elsevier, New York, 1969. xii + 220 pp. + plates. \$7.75.

Comparative Studies in Kinship. Jack Goody. Stanford University Press, Stanford, Calif., 1969. xviii + 262 pp. \$7.50.

Computing Methods in Optimization Problems—2. Papers presented at a conference, San Remo, Italy, September 1968. Lotfi A. Zadeh, Lucien W. Neustadt, and A. V. Balakrishnan, Eds. Academic Press, New York, 1969. x + 398 pp., illus. \$12.

The Creative Photographer. Andreas Feininger. Prentice-Hall, Englewood Cliffs, N.J., 1967. xvi + 336 pp., illus. \$8.95. Reprint of the 1955 edition.

Cretaceous-Tertiary Formations of South India. A seminar, Bangalore, June 1966. Geological Society of India, Bangalore, 1968. viii + 380 pp. + plates. \$12. Geological Society of India, Memoir No. 2.

Current Topics in Clinical and Community Psychology. Vol. 1. Charles D. Spielberger, Ed. Academic Press, New York, 1969. xii + 268 pp. \$12.

Disorders of the Skull Base Region. Proceedings of the 10th Nobel Symposium, Stockholm, August 1968. Carl-Axel Hamberger and Jan Wersall, Eds. Interscience (Wiley), New York; Almqvist and Wiksell, Stockholm, 1969. 368 pp., illus. \$29.50.

Earth Shine. Anne Morrow Lindbergh. Harcourt, Brace and World, New York, 1969. xx + 76 pp. + plates. \$5.75. A Helen and Kurt Wolff Book.

Electronic Structure and Chemical Binding. With Special Reference to Inorganic Chemistry. Oscar Kneffer Rice. Dover, New York, 1969. xx + 512 pp., illus. Paper, \$3.75. Reprint of the 1940 edition.

Energy Conversion Statics. H. K. Meserle. Academic Press, New York, 1969. xvi + 344 pp., illus. \$16.50. Electrical Science Series.

The Ethical Imperative. The Crisis in American Values. Richard L. Means. Doubleday, Garden City, N.Y., 1969. x + 278 pp. \$6.95.



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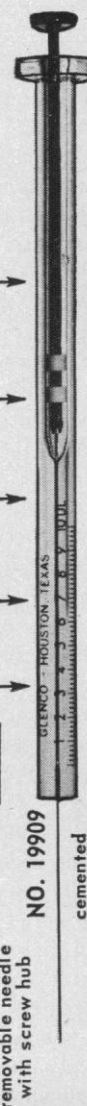
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Experimental Malaria. A panel workshop, Washington, D.C., May 1969. Elvio H. Sadun and Arthur P. Moon, Eds. Association of Military Surgeons of the United States, Chevy Chase, Md., 1969. Illus. Paper, \$4. *Military Medicine*, vol. 134, No. 10, pp. 729-1306.

Experimental Physics. Methods and Apparatus. D. V. Skobel'tsyn, Ed. Translated from the Russian edition (Moscow, 1968). Consultants Bureau, New York, 1969. vi + 190 pp., illus. Paper, \$27.50. Proceedings (Trudy) of the P. N. Lebedev Physics Institute, vol. 40.

Experiments in Physiology and Biochemistry. Vol. 2. G. A. Kerkut, Ed. Academic Press, New York, 1969. xvi + 412 pp., illus. \$18.

Family Planning Today. Alan Rubin, Ed. Davis, Philadelphia, 1969. x + 150 pp., illus. Paper, \$2.25.

The First Year Out. Mental Patients after Hospitalization. William W. Michaux, Martin M. Katz, Albert A. Kurland, and Kathleen H. Gansereit. Johns Hopkins Press, Baltimore, 1969. xviii + 302 pp., illus. \$8.

Flow Equations for Composite Gases. J. M. Burgers. Academic Press, New York, 1969. xvi + 336 pp. \$18.50. Applied Mathematics and Mechanics, vol. 11.

Flowering Plants. Origin and Dispersal. Armen Takhtajan. Translated from the Russian edition (Moscow, 1961) by C. Jeffrey. Smithsonian Institution Press, Washington, D.C., 1969 (distributor, Random House, New York). x + 310 pp. + plates. \$6.95.

Footprints on the Moon. By the writers and editors of the Associated Press. Manuscript by John Barbour. Macmillan, New York, 1969. viii + 216 pp., illus. \$7.95.

Foundations of Practical Gerontology. Rosamonde Ramsay Boyd and Charles G. Oakes, Eds. University of South Carolina Press, Columbia, 1969. xviii + 270 pp. \$5.95.

Francis Bitter. Selected Papers and Commentaries. T. Erber and C. M. Fowler, Eds. M.I.T. Press, Cambridge, Mass., 1969. x + 558 pp., illus. \$20.

Gas Kinetics. G. L. Pratt. Wiley, New York, 1969. x + 246 pp., illus. \$9.50.

Garbage as You Like It. Jerome Goldstein. Illustrated by Virginia Howie. Rodale, Emmaus, Pa., 1969. iv + 244 pp. \$4.95.

Graphic History of the Americas. Theodore R. Miller. Wiley, New York, 1969. x + 62 pp., illus. Cloth, \$7.95; paper, \$3.95.

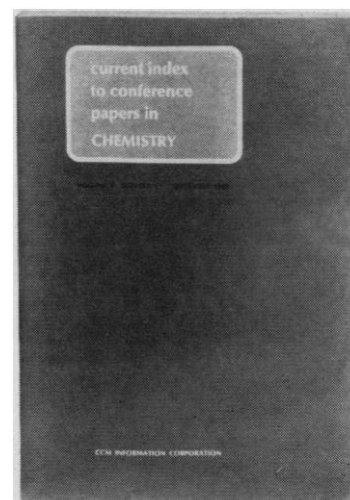
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Handbook of Clinical Neurology. Vol. 2, Localization in Clinical Neurology. P. J. Vinken and G. W. Bruyn, Eds., in collaboration with A. Biemond. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xii + 804 pp., illus. \$63; by subscription, \$53.75.

Handbook of Numerical Harmonic Analysis. V. I. Krylov and L. G. Kruglikova. Translated from the Russian edition (Minsk, 1968) by David Louvish. Israel Program for Scientific Translations, Jerusalem, 1969 (U.S. distributor, Davey,

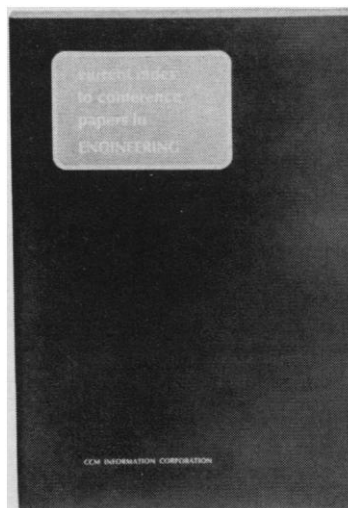
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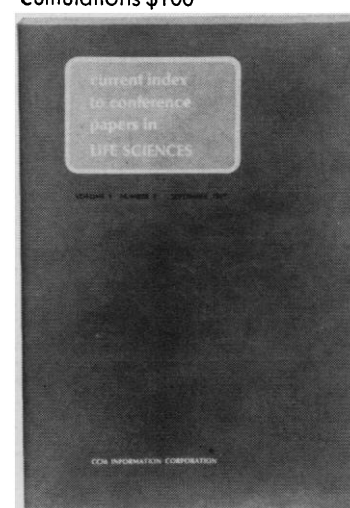
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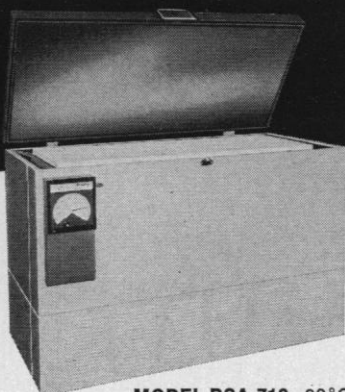
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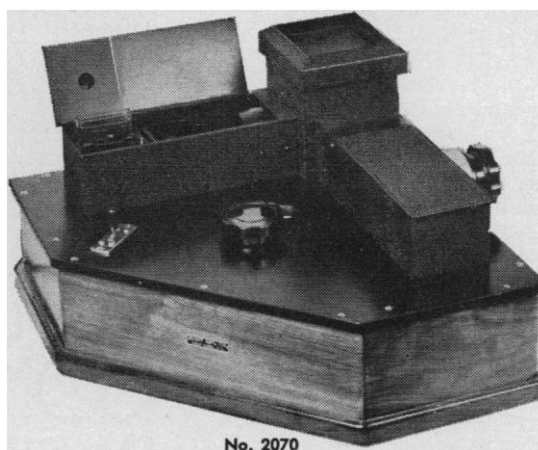
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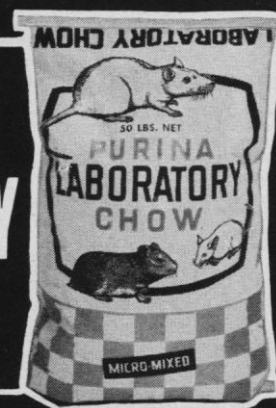
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National Parks and Reserves in Australia. Australian Academy of Science, Canberra, 1968. x + 46 pp. + map. Paper.

Odd Man In. Societies of Deviants in America. Edward Sagarin. Quadrangle, Chicago, 1969. 288 pp. \$6.95.

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The Pharmacology of Psychotherapeutic Drugs. F. Th. v. Brücke, O. Hornykiewicz, and E. B. Sigg. Translated from the German edition (Heidelberg, 1966) and revised by Ernest B. Sigg. Springer-Verlag, New York, 1969. vi + 160 pp. Paper, \$3.80. Heidelberg Science Library, vol. 8.

Phenomenological Theories of High Energy Scattering. An Experimental Evaluation. Vernon D. Barger and David B. Cline. Benjamin, New York, 1969. x + 214 pp., illus. Cloth, \$15; paper, \$6.95. Frontiers in Physics.

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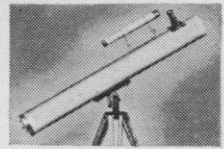
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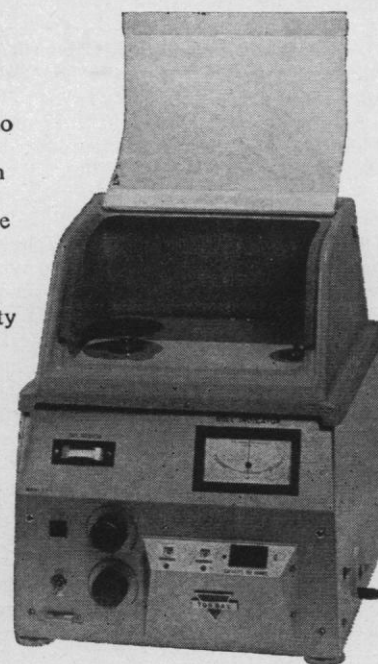
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stein, Eds. Pergamon, New York, 1969. xiv + 500 pp., illus. \$32. International Journal of Heat and Mass Transfer Monograph Series.

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Silicon Semiconductor Data. Helmut F. Wolf. Pergamon, New York, 1969. lvi + 648 pp., illus. \$27. International Series of Monographs on Semiconductors, vol. 9.

Smoking and Politics. Policymaking and the Federal Bureaucracy. A. Lee Fritschler. Appleton-Century-Crofts, New York, 1969. x + 166 pp. Paper, \$1.95.

Strukturelle Grundlagen der Biologischen Funktion der Proteine. T. Dévényi, P. Elödi, T. Keleti, and G. Szabolcsi. Pál Elödi, Ed. Akadémiai Kiadó, Budapest, 1969. 736 pp., illus. \$18.

Symmetry and Function of Biological Systems at the Macromolecular Level. Proceedings of the 11th Nobel Symposium, Södergarn, Lidingö, Sweden, August 1968. Arne Engström and Bror Strandberg, Eds. Interscience (Wiley), New York; Almqvist and Wiksell, Stockholm, 1969. 436 pp., illus. \$29.50.

Theory of Weak Interactions in Particle Physics. Robert E. Marshak, Riazuddin, and Ciaran P. Ryan. Wiley-Interscience, New York, 1969. xiv + 770 pp., illus. \$29.95. Interscience Monographs and Texts in Physics and Astronomy, vol. 24.

Thin-Film Transistors. A New Approach to Microelectronics. Andrew C. Tickle. Wiley, New York, 1969. xvi + 144 pp., illus. \$9.95.

Topics in Complex Function Theory. Vol. 1, Elliptic Functions and Uniformization Theory. C. L. Siegel. Translated from the German by A. Shenitzer and D. Solitar. Wiley-Interscience, New York, 1969. xii + 196 pp., illus. \$9.95. Interscience Tracts in Pure and Applied Mathematics, vol. 25.

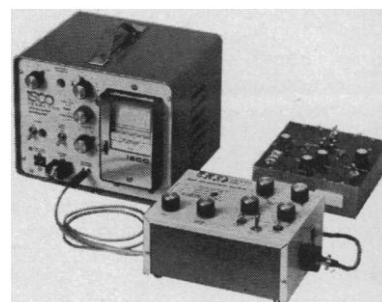
The Travels of the Naturalist Charles A. Lesueur in North America 1815-1837. E.-T. Hamy. Translated from the French edition (Paris, 1904) by Milton Haber. H. F. Raup, Ed. Kent State University Press, Kent, Ohio, 1968. xiv + 96 pp. + plates. \$6.75.

The Uniqueness of Man. A discussion at the fourth Nobel Conference, St. Peter, Minn., January 1968. John D. Roslansky, Ed. North-Holland, Amsterdam; Fleet, New York, 1969. xiv + 190 pp. \$6.95.

Wool Handbook. A Text and Reference Book for the Entire Wool Industry. Vol. 2, Part 1, Spinning, Weaving, Knitting. Werner von Bergen, Ed. Interscience (Wiley), New York, ed. 3, 1969. xx + 644 pp., illus. \$34.95.

The Yorkshire Jurassic Flora. Vol. 3. Bennettitales. Thomas Maxwell Harris. British Museum (Natural History), London, 1969. vi + 186 pp. + plates. £7. Publication No. 675.

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