SCIENCE

18 August 1961

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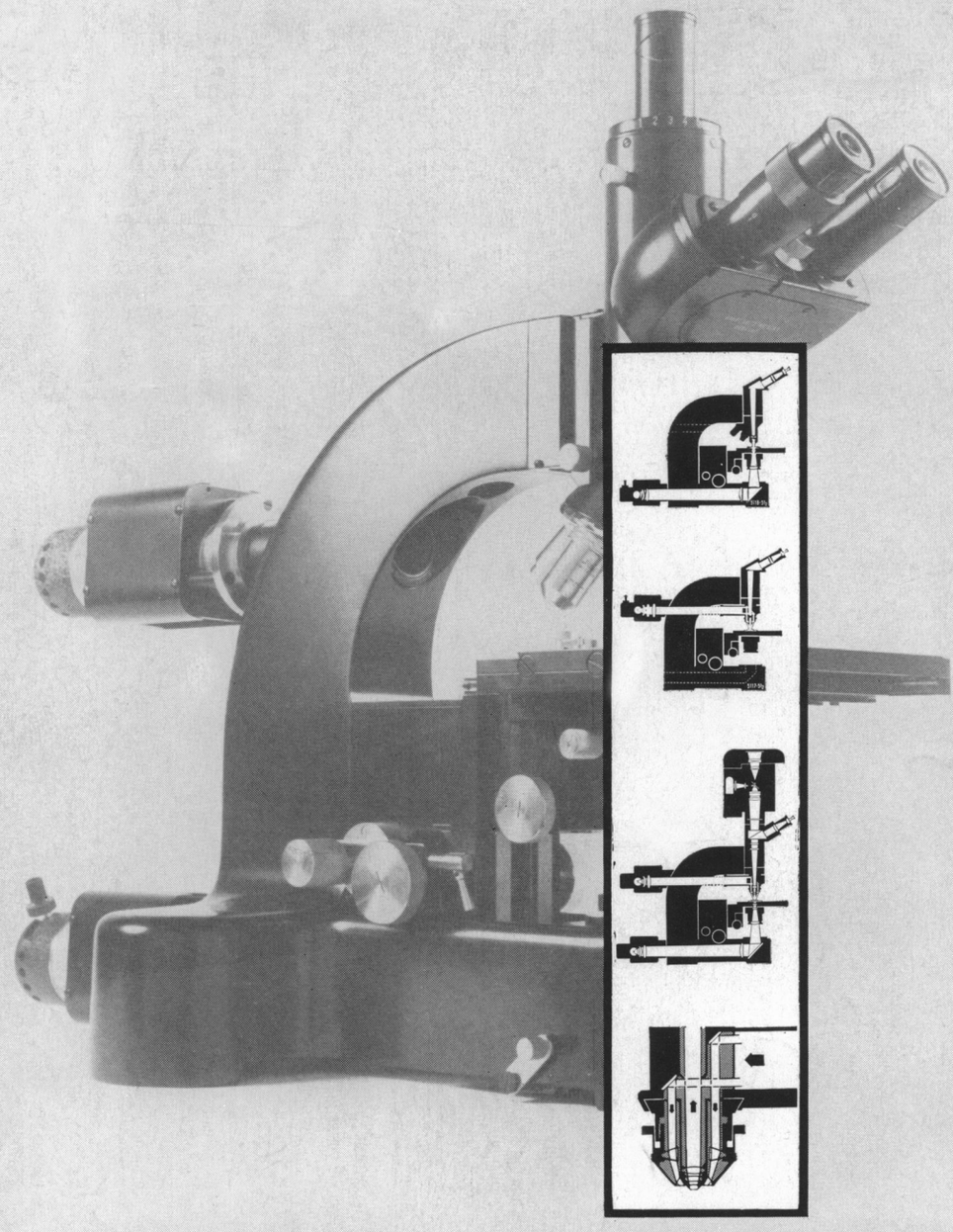
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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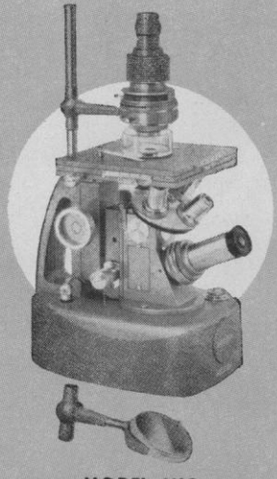
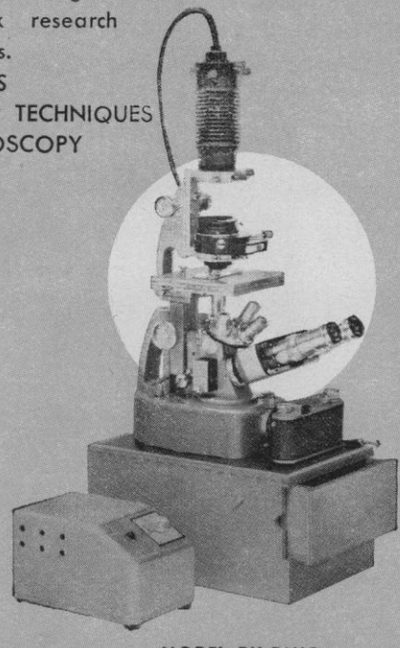
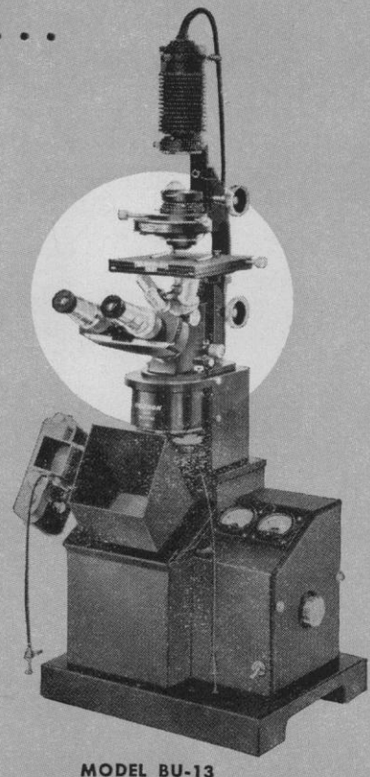


MODEL MIC



MODEL PH-BMIC



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Brightfield Laboratory Models:

MONOCULAR MODEL MIC. Four brightfield objectives 5X, 10X, 40X, 100X (oil); eyepieces 5X, 10X, 15X; ample height adjustment of condenser-illuminator for even large culture bottles; built-in base transformer. **$409.**

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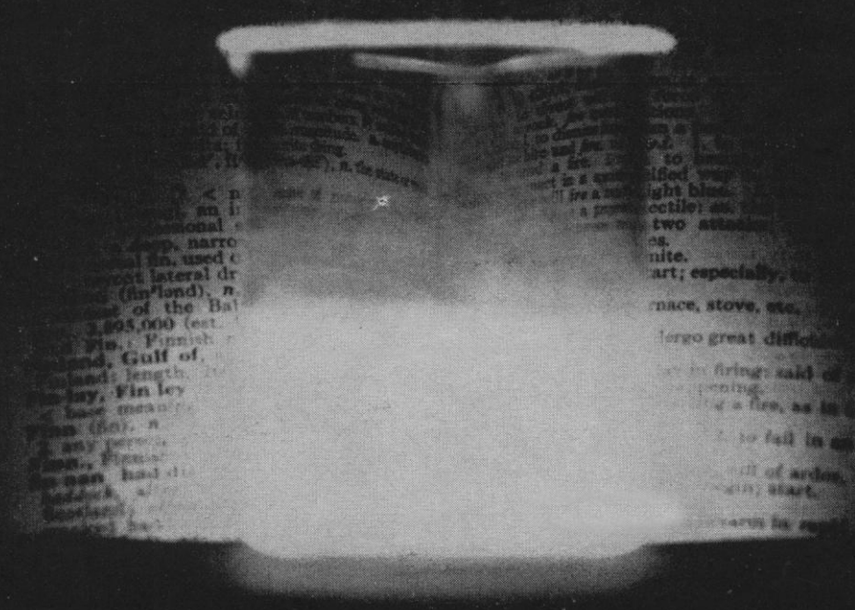
18 August 1961, Volume 134, Number 3477

SCIENCE

Cover

NGC 5128 shows one of the most peculiar objects in the sky. Walter Baade and Rudolph Minkowski believe it is two galaxies in collision. From *The Hubble Atlas of Galaxies*, reviewed on page 464. [Carnegie Institution of Washington]

FOR ATP MICROASSAY—DEHYDRATED FIREFLY TAILS—The most sensitive method* for assaying the minute levels of ATP found in biological systems. Use Schwarz' ATN, crystalline disodium adenosine 5'-triphosphate, to standardize your assay SCHWARZ BIORESEARCH is the primary manufacturer of phosphorylated adenosine compounds including isotopically labeled forms FIREFLY KIT TO DEMONSTRATE BIOLUMINESCENCE—Provides enough dehydrated firefly tails and ATP for 10 dramatic—and convenient—demonstrations.



The light for the photo was provided solely by firefly tails.

*For your copy of the latest revised procedure for assay of ATP and for further information on these and other nucleic acid derivatives write to Dept. HB:

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- Gaseous examination applications . . . gas industry; mining; rubber and linoleum factories; incandescent lamp manufacture; hospitals and tuberculosis clinics; physical, physico-chemical and chemical institutes

TECHNICAL DATA

Range of measurement —
5 to 5000 units of the fifth decimal of the refractive difference Δn, subdivided according to the length of chamber

Limit of error —
± 2 units of the eighth decimal to 2 units of the fifth decimal of the refractive difference Δn, likewise in accordance with the length of the chamber

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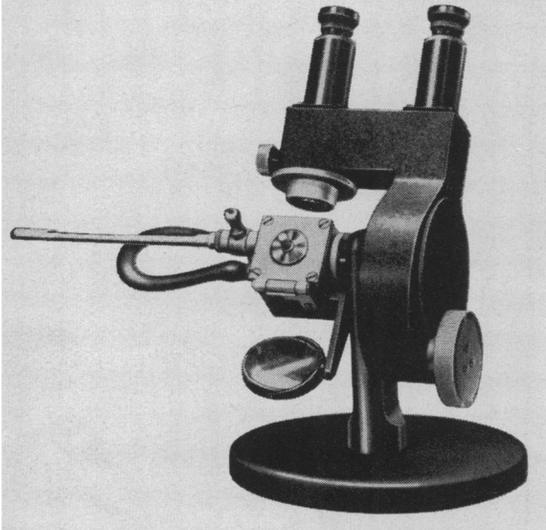


ABBE REFRACTOMETER

This newly designed instrument measures the refractive index of liquids, fats and oils as well as plastic and solid materials.

- Interchangeable prism casing with insulated lock
- Easier reading and increased measurement accuracy
- Safe, dust-proof scale housing
- Pinion head conveniently positioned for easy manipulation of border line setting
- Adjoining scales for refractive index and dry substance
- Measurements with higher or lower temperatures

TECHNICAL DATA

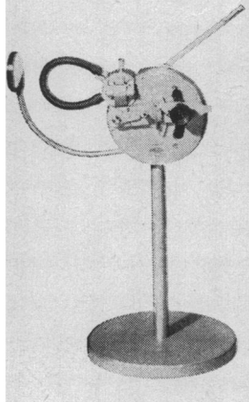
Range of measurement —
Refractive index $n_D = 1.3$ to $n_D = 1.7$
Dry substance 0 to 85%

Limit of error —
Refractive index ± 1 to 2 units of the fourth decimal
Dry substance ± 0.1 to 0.2%

FOOD PRODUCTS (SUGAR AND OIL) REFRACTOMETER

This precision production control and laboratory instrument is designed for rapid tests in series to determine dry substance or water content.

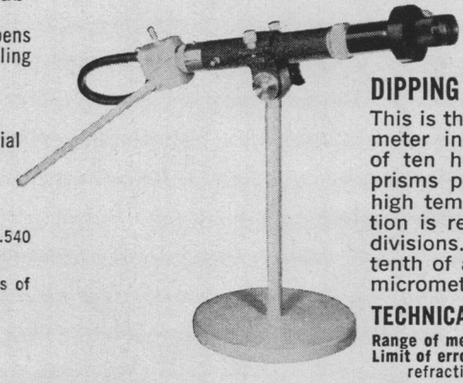
- Surface of double prism opens horizontally to facilitate filling with sample
- Easy to manipulate
- Fast, accurate measurements
- Economical use of test material



TECHNICAL DATA

Range of measurement —
Dry substance 0 to 95%
Refractive index $n_D = 1.300$ to 1.540

Limit of error —
Dry substance ± 0.1 to 0.2%
Refractive index ± 1 to 2 units of the fourth decimal



DIPPING REFRACTOMETER

This is the most accurate of all refractometer instruments. A complete range of ten heatable and ten non-heatable prisms permits rapid analysis, even at high temperatures. Boundary line position is read from scale containing 110 divisions. Readings can be made to one-tenth of a scale division by means of a micrometer screw.

TECHNICAL DATA

Range of measurement — 1.3254 to 1.6470
Limit of error — ± 2 units of the fifth decimal of the refractive index

Complete information may be obtained from your local Carl Zeiss Jena instrument dealer or by writing: Dept. S8/61

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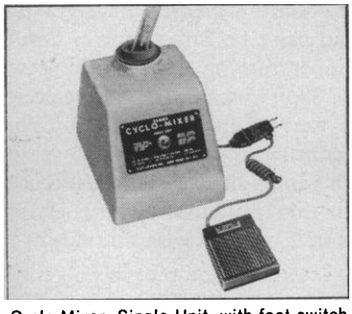

Cyclo-Mixer, Single Unit, with foot switch ....each **$68.50**

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G700—AQUET—One pint in polyethylene dispenser bottle, **each $2.05, per doz. $22.15**

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(A) Add 25 ml. bottle of Chromerge to standard 9 lb. container of concentrated sulphuric acid.
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(C) Super-efficient chromic-sulphuric acid solution is mixed and ready to use.
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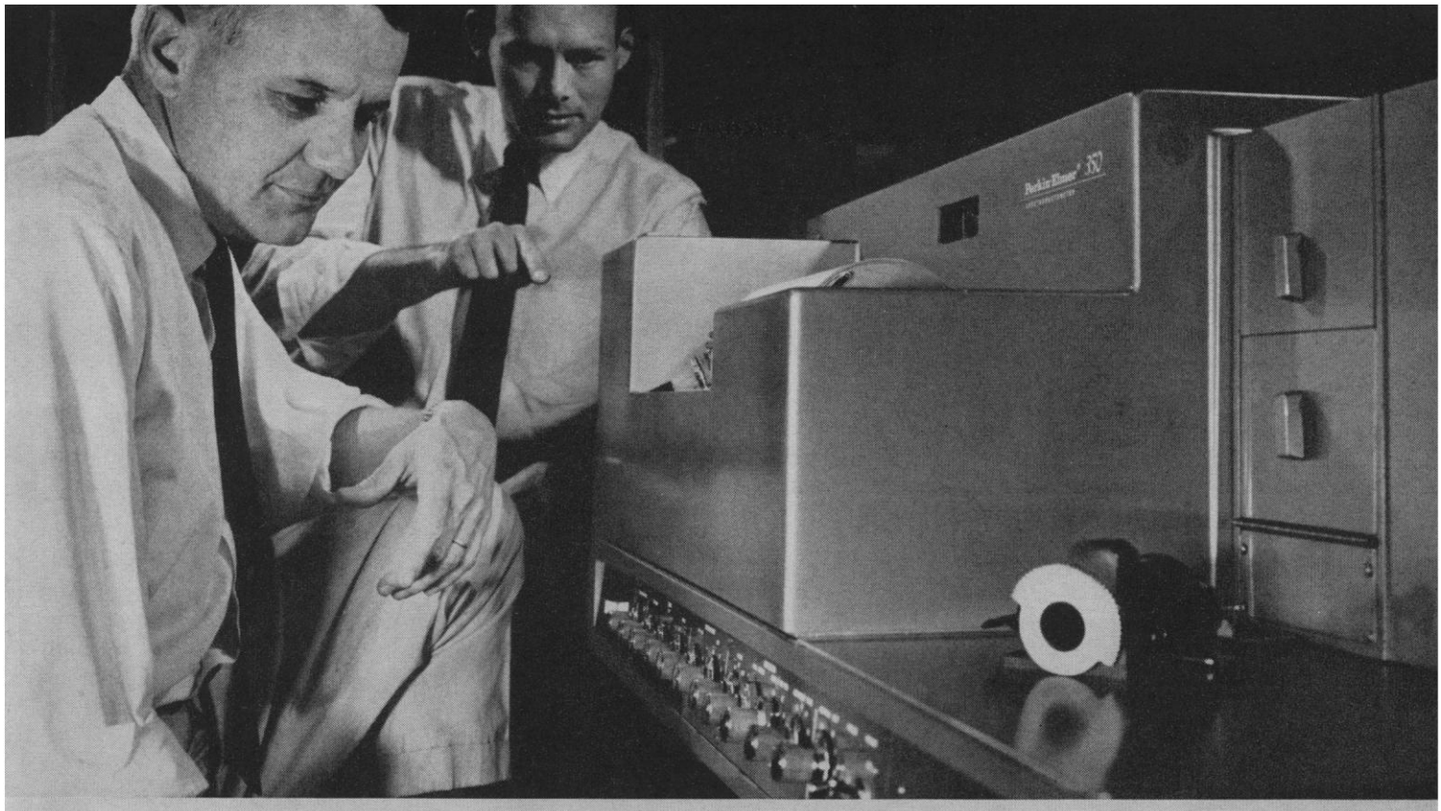
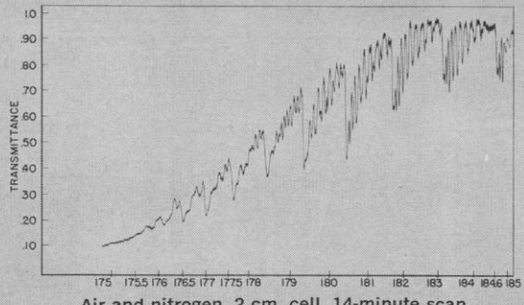
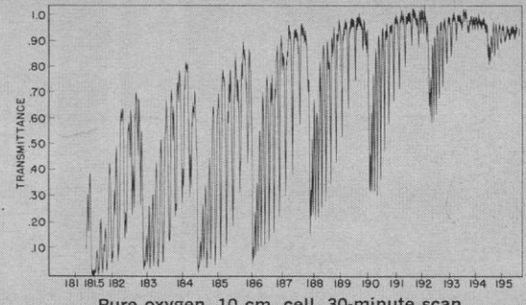


Far Ultraviolet Spectrum of Oxygen.



Air and nitrogen, 2 cm. cell, 14-minute scan.



Pure oxygen, 10 cm. cell, 30-minute scan.

FAR ULTRAVIOLET SPECTRAL REGION OPENED BY NEW PERKIN-ELMER MODEL 350 SPECTROPHOTOMETER

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And more:

- Zero Absorbance Line Compensation
- Fast Pen Response
- Wide Dynamic Scan Speed Range
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- Integrated Controls
- Large Sample Compartments
- Wide Range of Accessories

Write for more information and spectra on the Model 350.

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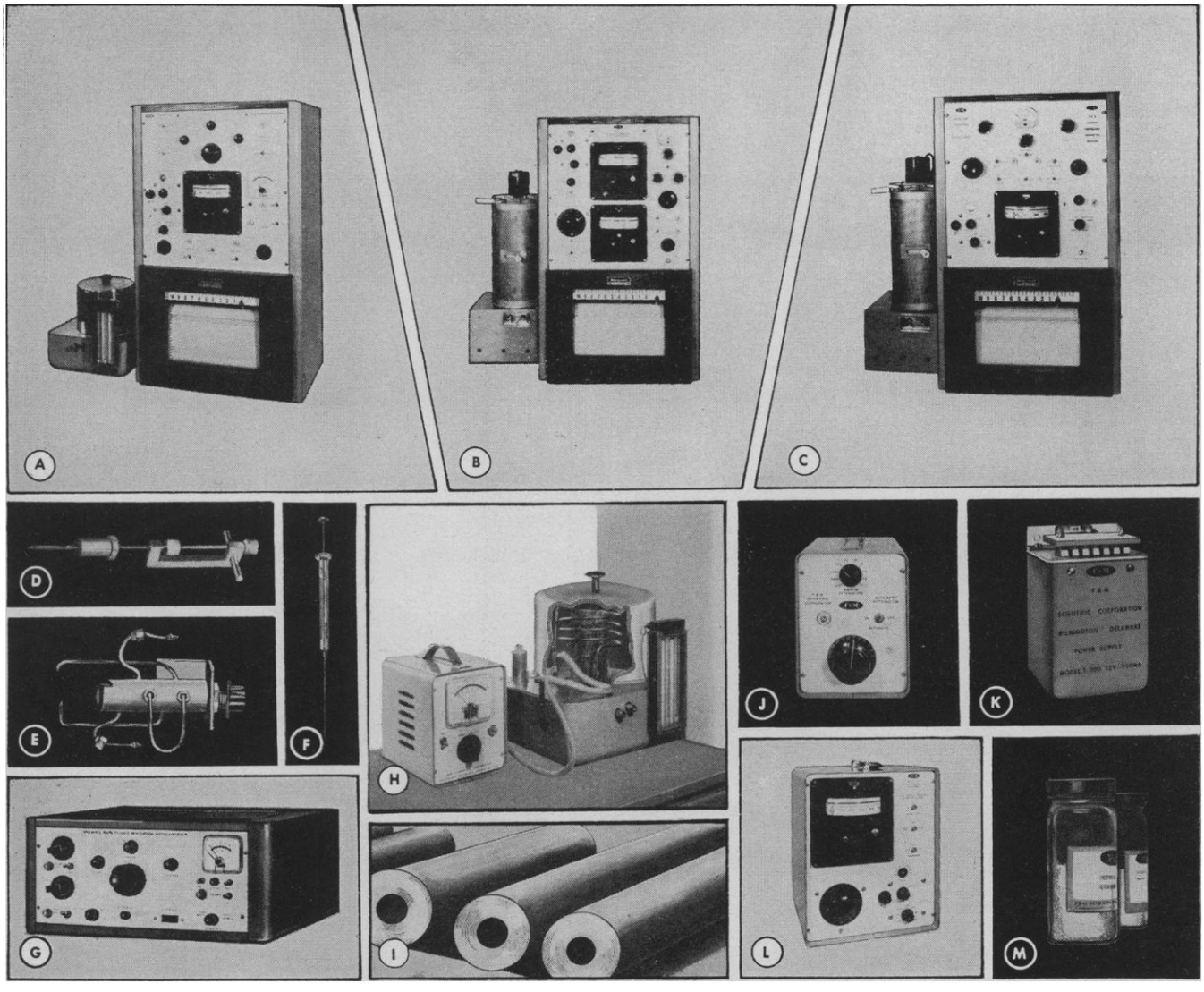

which chromatograph suits your needs?

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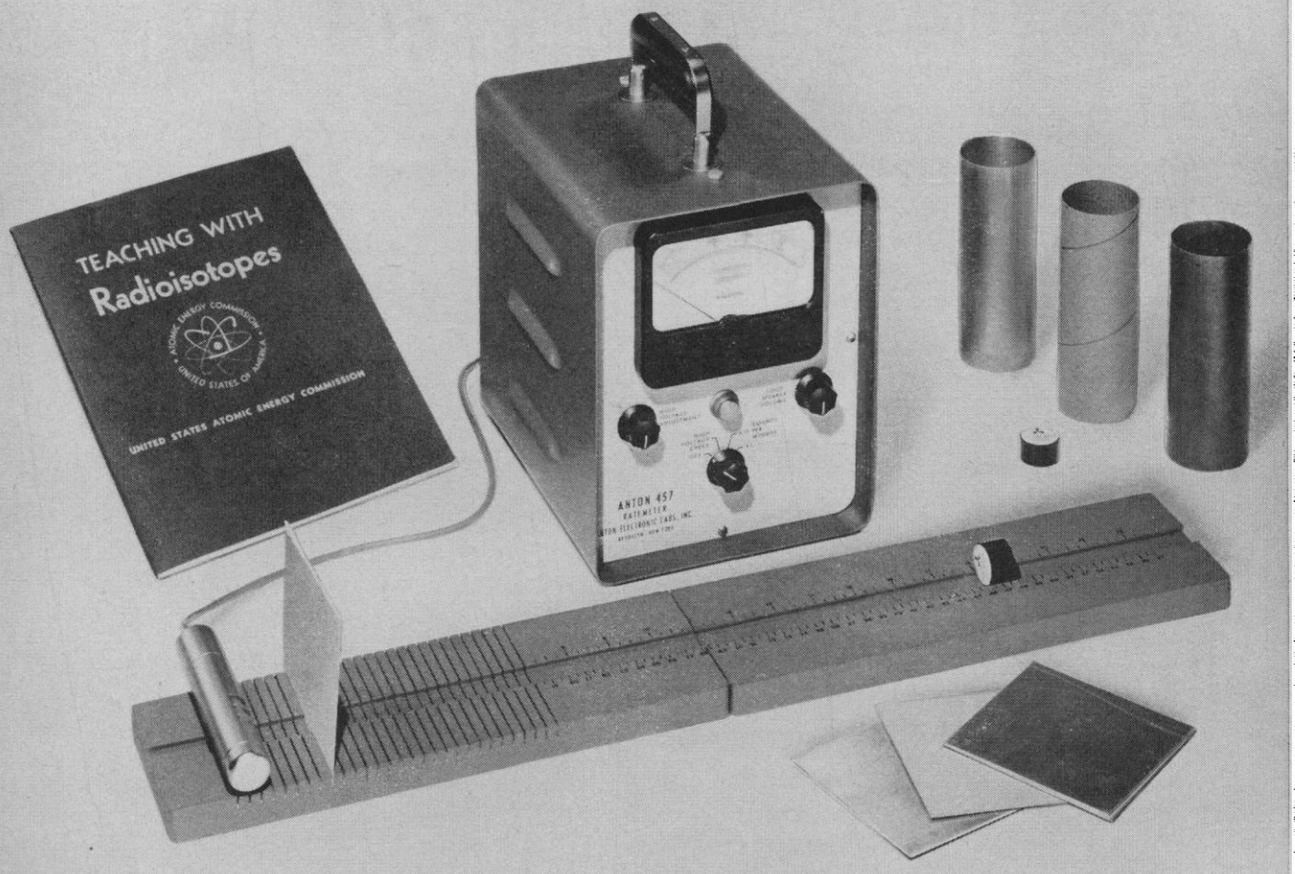

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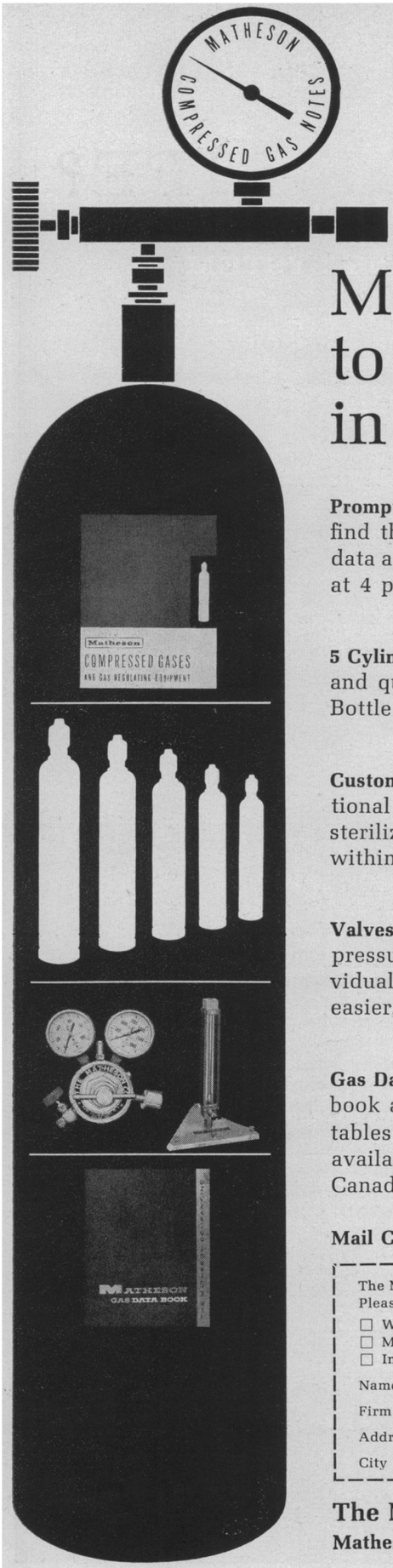

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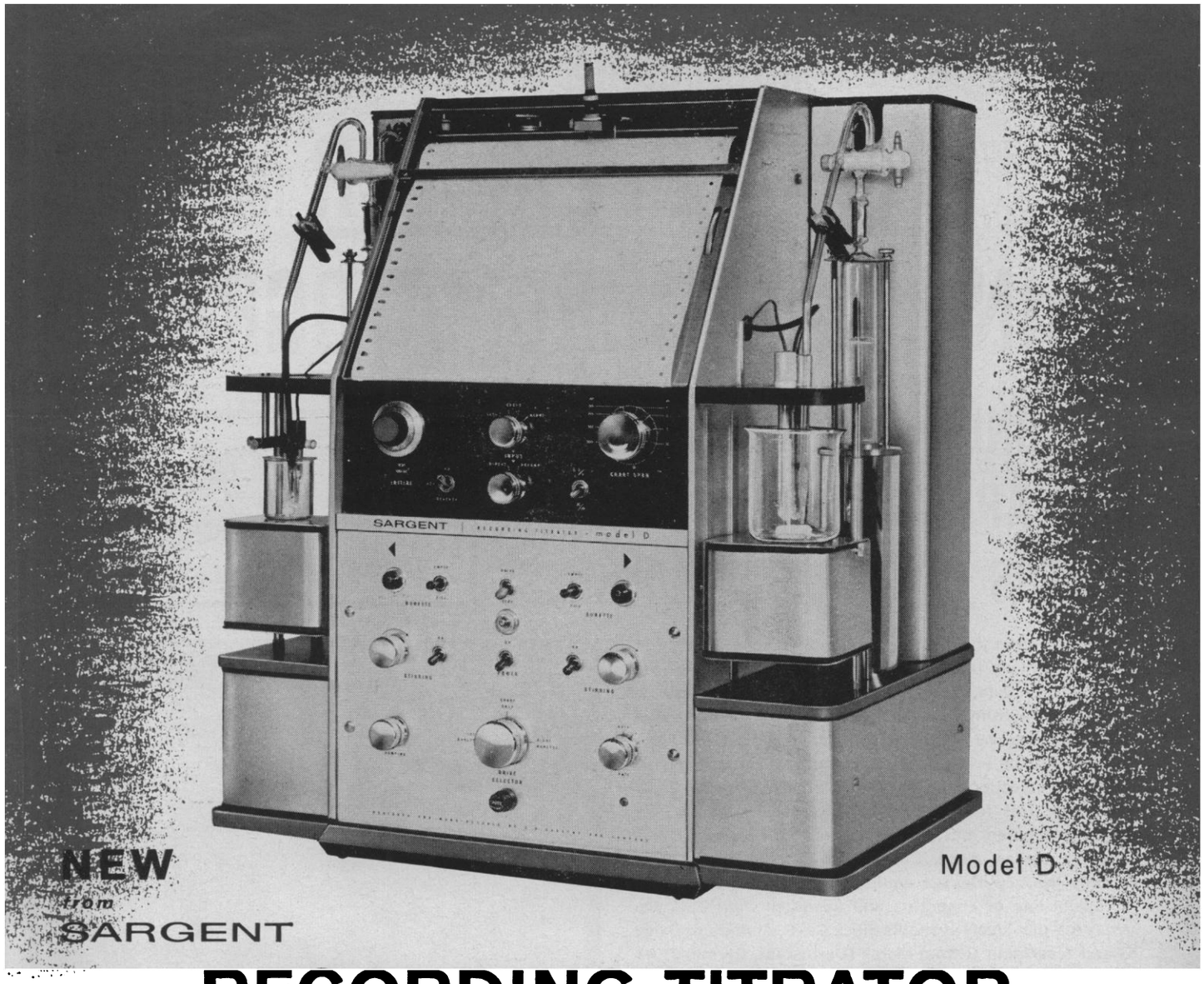

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A basic, universal recording titrator for any and all potentiometrically indicated reactions, using any form of electrode, either glass or metal, accommodating high or low resistance systems, aqueous or non-aqueous media, and all practical orders of constituent quantities whether in trace, micro or macro concentrations.

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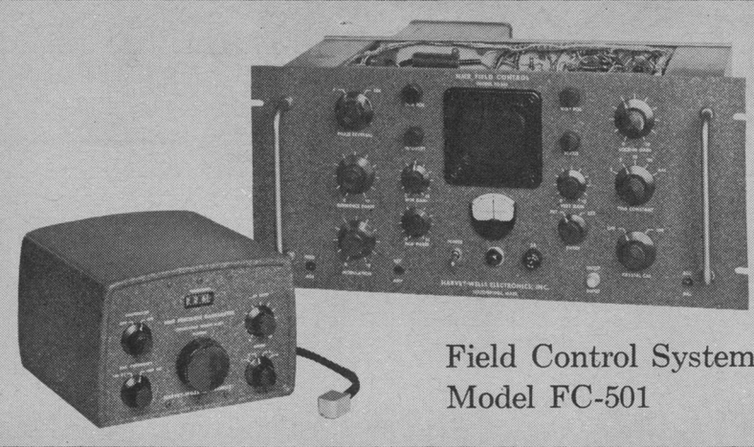
PRECISION NMR INSTRUMENTATION TO MEASURE AND CONTROL MAGNETIC FIELDS

Gaussmeter Model G-501

The Harvey-Wells Model G-501 NMR Gaussmeter is designed to measure homogeneous magnetic fields up to 30,000 gauss to an accuracy of one part in 100,000.

A broad range of measurement is achieved by the interchange of four 18 inch probes and one shunt (5 foot probes are also available), supplied as standard equipment with the unit.

The combination of simplified circuitry and ease of operation makes the G-501 Gaussmeter a most dependable and precise laboratory instrument. Both the G-501, and the FC-501 Field Control System (left) are adaptable to remote operation by use of extension cables combined with Harvey-Wells Standard Remote Drive Accessory.



Field Control System
Model FC-501

The Harvey-Wells Model FC-501 NMR Field Control System is recommended for applications where the user not only requires precision measurement of homogeneous magnetic fields but high stabilization of those fields.

The unit has the same capabilities and accuracy parameters as the G-501 Gaussmeter.

All operating controls are conveniently located. The resonance presentation and the meterized error signal are clearly visible on the rack-mounting front panel.

Field control is achieved by means of an error signal, derived from the NMR pattern, which is fed to the power supply enabling it to automatically adjust its output current to the magnet, producing the desired constant magnetic field.

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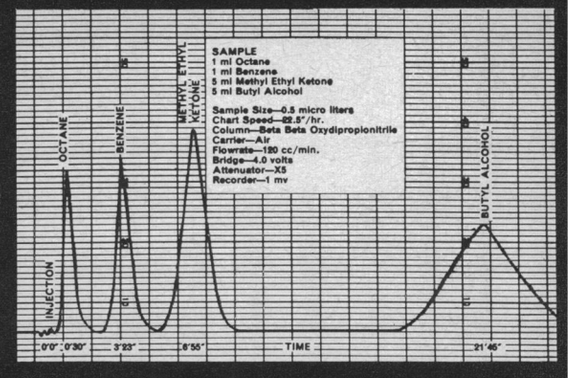

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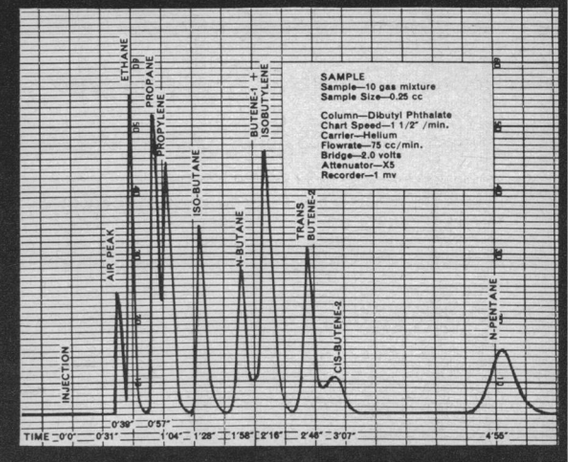

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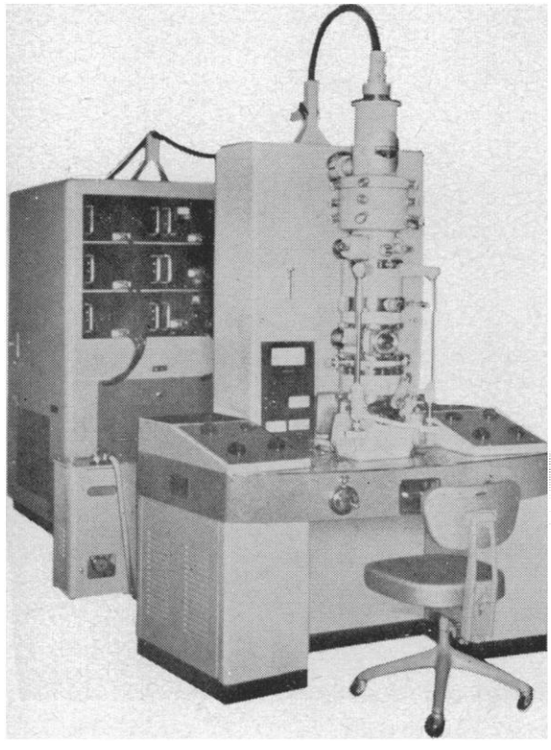

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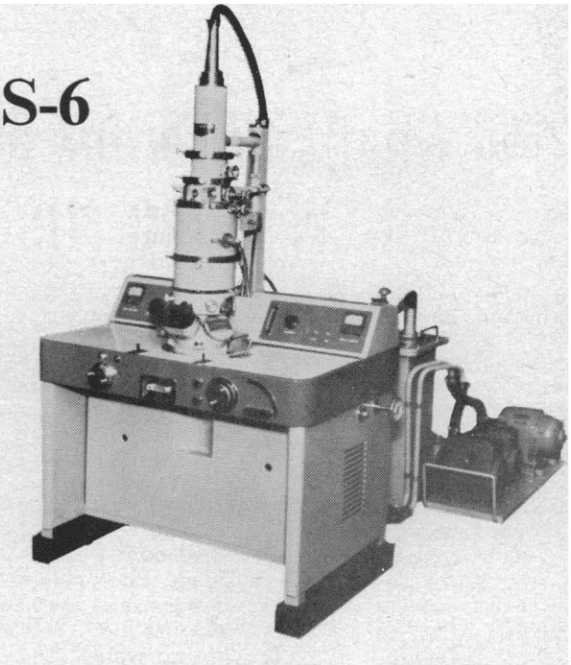

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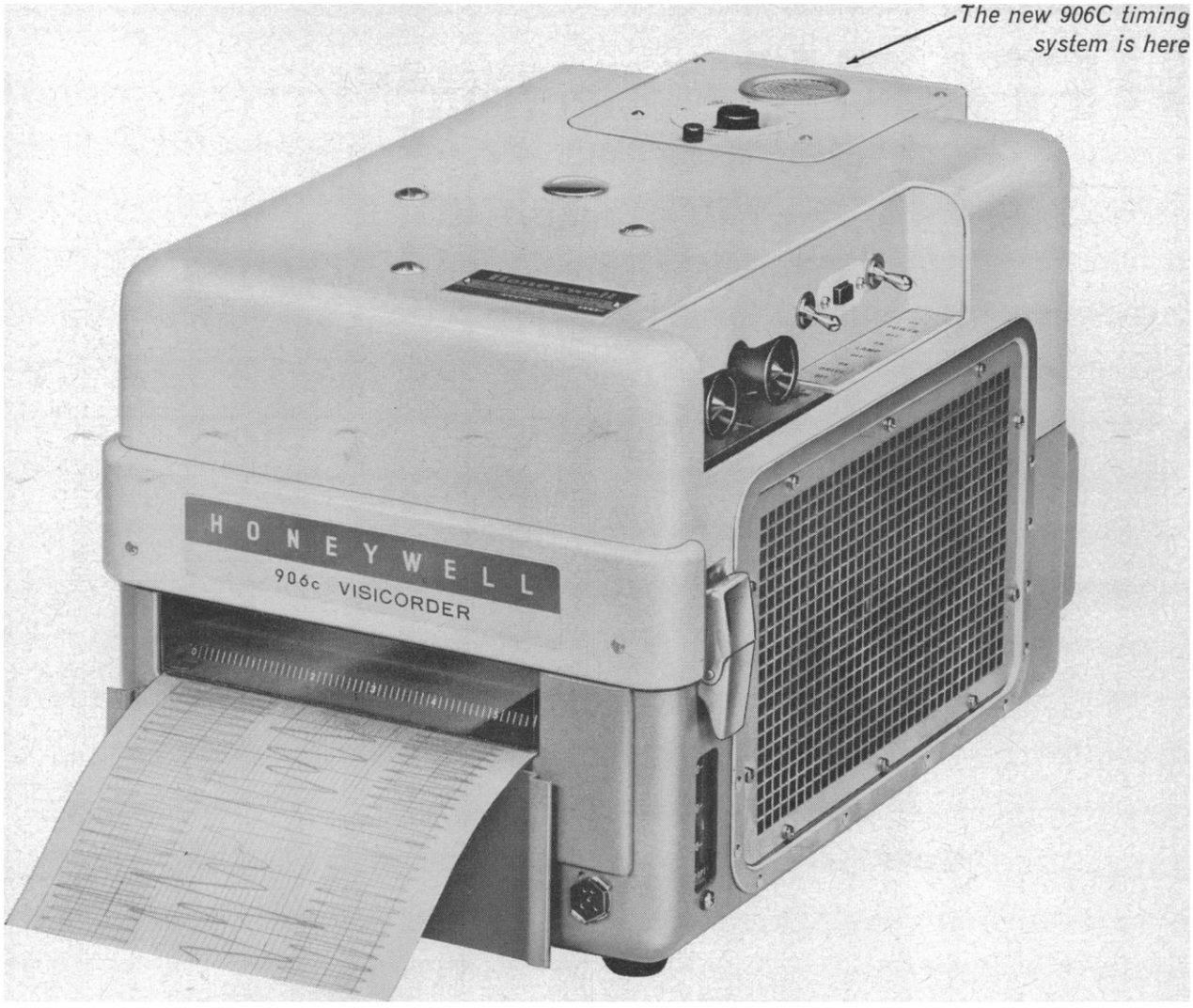

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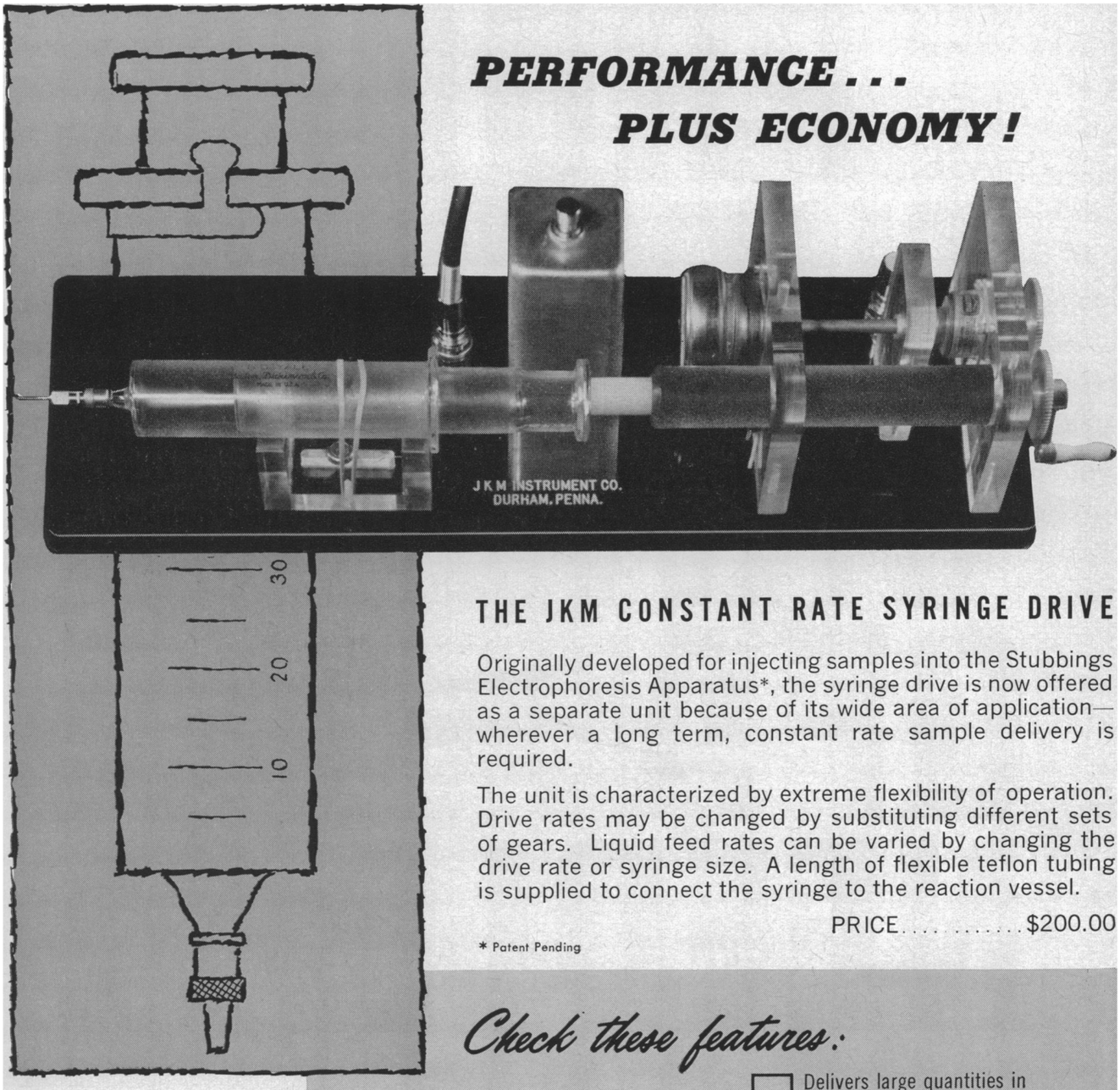

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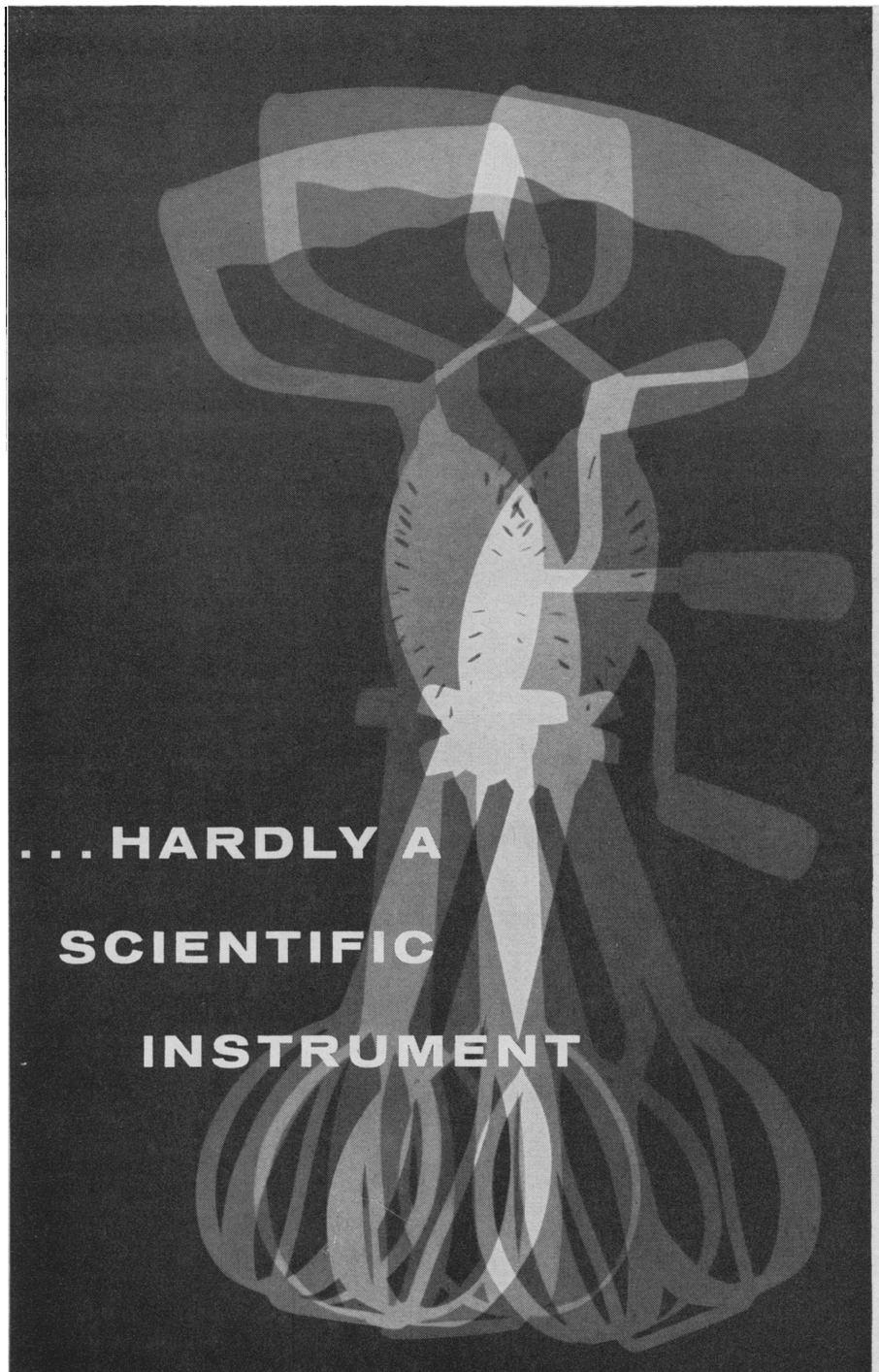

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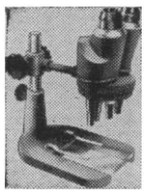

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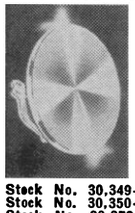

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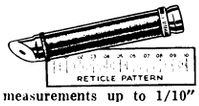

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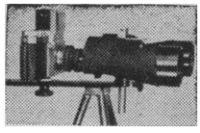

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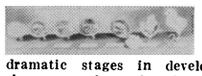

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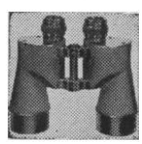

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Program Content

1. The two-session AAAS General Sessions, "Moving Frontiers of Science," Part I—Speakers: Howard A. Meyerhoff and Arthur R. von Hippel; Harrison Brown, presiding. Part II—Speakers: Halton C. Arp and E. W. Fager; Harrison Brown, presiding.
2. The 29th John Wesley Powell Memorial Lecture. Speaker: Glenn T. Seaborg; Paul M. Gross, presiding.
3. On "AAAS Day," the four broad, interdisciplinary symposia—Physics of the Upper Atmosphere; Geochemical Evolution—The First Five Billion Years; Existing Levels of Radioactivity in Man and His Environment; and Water and Climate—arranged by AAAS Sections jointly.
4. The Special Sessions: AAAS Presidential Address and Reception; Joint Address of Sigma Xi and Phi Beta Kappa by Harrison Brown; the Tau Beta Pi Address; National Geographic Society Illustrated Lecture; and the second George Sarton Memorial Lecture.
5. The programs of all 18 AAAS Sections (specialized symposia and contributed papers).
6. The programs of the national meetings of the American Astronomical Society, American Society of Criminology, American Nature Study Society, American Society of Naturalists, American Society of Zoologists, Beta Beta Beta Biological Society, Biometric Society (WNAR), National Association of Biology Teachers, Scientific Research Society of America, Society for General Systems Research, Society of Protozoologists, Society of Systematic Zoology, and the Society of the Sigma Xi.
7. The multi-sessioned special programs of the American Association of Clinical Chemists, American Astronautical Society, American Meteorological Society, American Physiological Society, American Psychiatric Association, Association of American Geographers, Ecological Society of America, National Science Teachers Association, National Speleological Society—and still others, a total of some 70 to 80 participating organizations.
8. The sessions of the Academy Conference, the Conference on Scientific Communication, and the Conference on Scientific Manpower.
9. The sessions of the AAAS Cooperative Committee on the Teaching of Science and Mathematics, of the AAAS Committee on Science in the Promotion of Human Welfare.
10. Titles of the latest foreign and domestic scientific films to be shown in the AAAS Science Theatre.
11. Exhibitors in the 1961 Annual Exposition of Science and Industry and descriptions of their exhibits.

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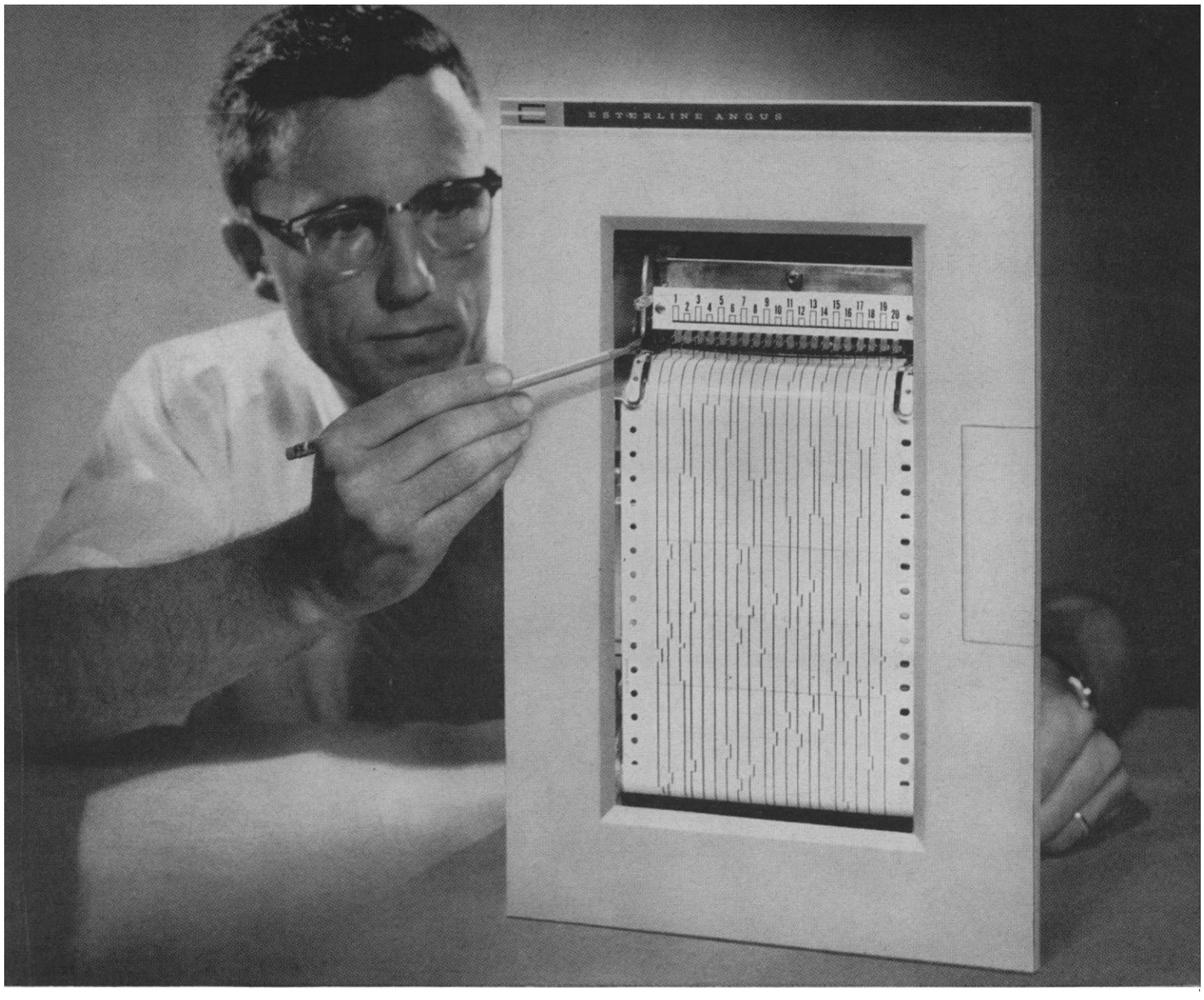

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Nuclear Radiations and Materials Evaluation

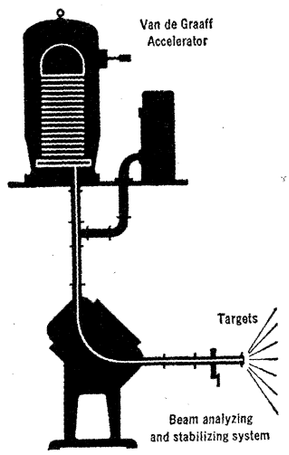
Chemists and metallurgists have been quick to adopt experimental techniques first used for fundamental nuclear physics research. Today, they are exploiting the characteristics of intense ion beams and neutron fluxes for applied research, engineering and analysis. Already, important results have been obtained using nuclear radiations for trace analysis, wear studies, semiconductor modification and similar applications where interactions of positive ions or neutrons create desired, predictable and measurable effects.

Although a number of positive-ion accelerators have been installed specifically for this kind of developmental work, we believe that the use of particle beams for *materials evaluation* is just getting started, and that many programs are dormant because of the cost and skill-requirement of owning and operating an accelerator facility.

Ion Beams and Neutrons for Hire

We think we have an answer to this problem for those who wish to explore activation analysis or research involving accelerated positive ions or neutrons. Here in Burlington, we have a fully-equipped and expertly-staffed *Positive Ion Service Facility*, employing a 2-Mev Van de Graaff accelerator and neutron source as the central research instrument. *Both the facility and the assistance of the staff are now available for independent research and analyses by outside organizations on a rental or contract basis.*

The Van de Graaff is our Model AN-2000. It offers 0.3 to 2.0 Mev hydrogen or deuterium ion beams with currents up to 100 microamperes in continuous or pulsed operation. A 90° mass analyzing magnet and feedback system stabilizes the voltage. A large fraction of the accelerated ion beam is emitted with a homogeneity within 1 part per 1000 for monoenergetic neutron experiments.



The facility is fully instrumented, including a 200-channel pulse height analyzer for scintillation spectrometry and decay-scheme studies, a remotely-operated sample changer, and neutron moderator.

You may want to use the facility to carry out specific analyses . . . or investigate the feasibility of a certain technique . . . or solve a knotty materials-evaluation problem. Other research possibilities are: *particle interactions; neutron-induced reactions; production of short-lived isotopes; instrument calibration; environmental research; radiation damage and shielding parameters; solid state surface studies; radiobiology.*

Users plan and evaluate all work. We provide an operator. If it bothers you to carry out what may be proprietary development programs in somebody else's house, have no fear. If the use of accelerators is encouraged, we are content. You may draw the shades tightly on any techniques used, and, of course, the results are strictly your own business. If, however, you would like to take advantage of some knowledge we have, a staff physicist is on hand to help.

If the requirement is perfectly straightforward, such as routine analysis, ship us the sample, and we'll do the work. We will supply cost estimates for any program contemplated on a project or continuous use basis. For more information, write for our Bulletin N-1.

Reaction	Neutron Energy (Mev)	Neutron Yield (n/sec)
D-D	1.5-6*	5×10^9
D-Be	0.6-5†	4×10^{10}
D-T	14-15*	5×10^8

*monergic †polyergic

Neutron Yield From 2-Mev Van de Graaff

Of course, if the rentee gets carried away with the possibilities of this work and wants to buy an accelerator, that's all right. Van de Graaffs are available from 0.4 to 4 Mev, producing up to 400 microamperes of current for monoenergetic neutron production. For really high neutron fluxes, the microwave linear accelerator excels. We can recommend a package of suitable instrumentation and would be glad to give counsel on installation and shielding.

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HIGH VOLTAGE ENGINEERING (EUROPA) N.V.

18 August 1961, Volume 134, Number 3477 **SCIENCE**

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New Categories for Old

Man, according to one famous sophistry, is a featherless biped with nails. Like a bird, man walks on two legs, but unlike a bird, he has no feathers. The possession of nails is mentioned in the definition to avoid confusion between men and plucked chickens. Much the same logic has characterized the study of some newer kinds of creatures. Recent history has seen Pentagon sophists produce similar definitions in their efforts to have missiles and other new weapons encompassed in an Army-Navy-Air Force scheme of things. But just as there are more effective ways to advance biology than by grouping together man and fowl, so there may be better ways to understand our military problems than by thinking in terms of land, sea, and air categories.

Just such an effort to provide a new set of categories is now under way in the Defense Department. Secretary McNamara and his comptroller Charles Hitch, an economist formerly with the Rand Corporation, have introduced the concept of what they call "program packages." There are seven packages, and the packages group together different military weapons and tasks in terms of similar purposes. Thus, one group is the Central War Offensive Forces program package. It includes both land-based and sea-based missile forces as well as certain aircraft forces, all of which taken together constitute our atomic retaliatory unit. Another group is the General Purposes Forces, which includes expeditionary units for fighting limited wars.

Research and development, which is understood to include all testing and evaluation of prototypes prior to operational use of a new weapon, enters the scheme in two ways. Work associated with a particular element, like the Polaris missile, is classified with that element in the appropriate package. Research efforts not so readily classified, like present military space projects, are grouped in a special program package devoted to "other" research and development.

The package-program approach cuts across not only present service classifications but also present accounting titles—personnel, maintenance, procurement, and so on. Thus, to help evaluate a possible new weapon, the new approach would provide an estimate of research and development costs, including the price of laboratory and test facilities; an estimate of the outlays for the initial equipment and training necessary to bring the new weapon into operational use; and an estimate of the recurring costs necessary to maintain the weapon once it is in use.

Improvements in planning, as might be suspected, did not start from scratch with the Kennedy administration. The idea of package programs builds on procedures that have been developing in the Defense Department during the past few years, particularly in the research and development section. Concerning earlier programing, Harold Brown, the scientific director of this section, told a congressional committee that timetables for development had proved right most of the time, but that efforts at estimating costs had been less successful. The present hope is to expand and improve on earlier efforts. What is wanted is a scheme that will explicitly array, in terms of military effectiveness and costs, the real choices among present weapons and possible future weapons.—J.T.

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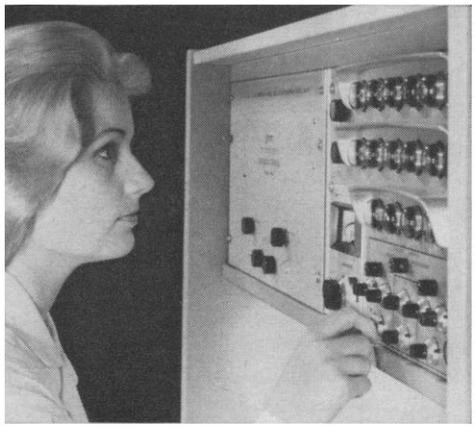

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molecular and functional evolution of neurohypophyseal principles associated with the names of W. H. Sawyer, H. Heller, and J. Maetz; on higher nervous centers as they impinge upon the hypothalamo-hypophyseal complex; and on the insect subesophageal ganglion as an endocrine structure. Crustacean neuroendocrinology, too, was only touched upon.

The 4th International Symposium will be held in Paris in 1964, under the leadership of Louis Gallien. It will face the challenge of maintaining the high quality of the first three symposia and of providing continued coverage of "frontier" areas in the growing field of comparative endocrinology.

HOWARD A. BERN
Department of Zoology,
University of California, Berkeley

Forthcoming Events

September

1–5. Danube Research, intern. symp., Budapest, Hungary. (Biological Sciences Group, Hungarian Acad. of Sciences, Roosevelt Tèr. 9, Budapest V)

1–9. Topology and Its Methods in Other Mathematical Disciplines, symp., Prague, Czechoslovakia. (Organizing Committee, Ke Karlovu 3, Prague 2)

1–10. International Pharmaceutical Students' Federation, 7th congr., Munich, Germany. (U. Peto, 10 Groffstr., Munich 19)

2–7. International Assoc. for Quaternary Research, Warsaw, Poland. (R. Galon, Secretary General, INQUA, Geographical Inst. Univ., Torun, Poland)

2–9. International Soc. of Surgery, 19th congr., Dublin, Ireland. (T. C. J. O'Connell, 35 Fitzwilliam Pl., Dublin)

3–7. International Assoc. for Hydraulic Research, 9th congr., Belgrade, Yugoslavia. (H. J. Schoemaker, Waterloopkundig Laboratorium, Raam 61, Delft, Netherlands)

3–8. American Chemical Soc., 140th meeting, Chicago, Ill. (A. T. Windstead, National Meetings Dept., ACS, 1155 16 St., NW, Washington 6)

3–9. International Federation of Gynaecology and Obstetrics, 3rd world congr., Vienna, Austria. (V. Grünberger, Medizinische Akademie, Alserstrasse 4, Vienna 9)

3–10. Inter-American Congr. of Radiology, 7th, São Paulo, Brazil. (W. Bomfim-Pontes, Rua Cesario Motta 112, São Paulo)

4. World Federation for Mental Health, 14th annual, Paris, France. (WFMH, 19 Manchester St., London, W.1, England)

4–6. International Assoc. for Shell Structures, colloquium, Brussels, Belgium. (Prof. Dutron, 127 Avenue Adolphe Buyl, Brussels 5)

4–6. International Symp. on the Earth Storm, Kyoto, Japan. (T. Nagata, Science Council of Japan, Ueno Park, Tokyo)

4–7. Neuropathology, 4th intern. congr., Munich, Germany. (W. Haymaker, Armed Forces Inst. of Pathology, Walter Reed Army Medical Center, Washington 25)

4–7. Rheumatology, 10th intern. congr., Rome, Italy. (C. B. Ballabio, Clinica Medica Generale, Via F. Sforza 35, Milan, Italy)

4–8. Low Energy Nuclear Physics, intern. conf., Manchester, England. (L. J. B. Goldfarb, Physics Dept., Univ. of Manchester, Manchester)

4–8. Pharmaceutical Sciences, 21st intern. congr., Pisa, Italy. (Intern. Pharmaceutical Federation, 11 Alexanderstraat, The Hague, Netherlands)

4–8. Plasma Physics and Controlled Nuclear Fusion Research, conf., Salzburg, Austria. (Intern. Atomic Energy Agency, United Nations, New York, N.Y.)

4–9. International Assoc. for Analog Computation, 3rd intern. sessions, Belgrade, Yugoslavia. (D. Strujic, Decanska 14/IV, Belgrade)

4–9. International Congr. of Angiology, 4th, Prague, Czechoslovakia. (Z. Reinis, 4th Medical Clinic, Prague 2/499)

4–9. International Symp. on Fundamental Problems in Turbulence and Their Relation to Geophysics (by invitation), Marseilles, France. (Intern. Union of Geodesy and Geophysics, 53 Avenue de Breteuil, Paris 7)

4–9. Laurentian Hormone Conf., Hoberg's Resort, Lake County, Calif. (Committee on Arrangement of the Laurentian Hormone Conference, 222 Maple Ave., Shrewsbury, Mass.)

4–13. Inter-African Conf. for Food and Nutrition, 4th, Bukavu, Congo Republic. (Commission for Technical Cooperation in Africa South of the Sahara, Pvt. Mail Bag 2359, Lagos, Nigeria)

4–14. Anglo-American Aeronautical Conf., 8th, London, England. (Inst. of Aerospace Sciences, 2 E. 64 St., New York, N.Y.)

5–8. International Congr. of Homeopathic Medicine, 25th, Amsterdam, Netherlands. (J. L. Fonteijn, Westzijde 116, Zaandam, Netherlands)

5–8. Machine Translation of Languages and Applied Language Analysis, intern. conf., Teddington, England. (L. Dostert, Director, Machine Translation Research, Georgetown Univ., 1715 Massachusetts Ave., NW, Washington 6)

5–8. National Chemical Exposition, 11th, Chicago, Ill. (Chicago Section, American Chemical Soc., 86 E. Randolph St., Chicago 1)

6–8. Effects of Ionizing Radiations on Immune Processes, intern. symp., Lawrence, Kan. (C. A. Leone, Dept. of Zoology, Univ. of Kansas, Lawrence)

6–8. Transmission and Processing of Information, intern. symp., Boston, Mass. (R. M. Fano, Research Laboratory of Electronics, Massachusetts Inst. of Technology, Cambridge 39)

6–12. Human Genetics, 2nd intern. conf., Rome, Italy. (L. Gedda, 5 Piazza Galeno, Rome)

7–8. Pacific Slope Biochemical Conf., annual, San Diego, Calif. (R. G. Wolfe, Chemistry Dept., Univ. of Oregon, Eugene)

7–9. International Cardiovascular Soc.,

5th congr., Dublin, Ireland. (H. Haimovici, 715 Park Ave., New York 21)

7–9. Parapsychological Assoc., 4th annual congr., New York, N.Y. (C. B. Nash, St. Joseph's College, Philadelphia, Pa.)

7–10. Science News Writing Seminar, Colorado State Univ., Fort Collins. (M. G. Payne, Colorado State Univ., Research Foundation, Fort Collins)

7–11. European Orthodontic Soc., 37th congr., Bologna, Italy. (N. Gray, 16 College Rd., Eastbourne, Sussex, England)

7–12. Neurogenetics, symp., Rome, Italy. (L. Gedda, Instituto Gregorio Mendel, Viale Regina Margherita 261, Rome)

7–13. Electroencephalography and Clinical Neurophysiology, 5th intern. congr., Rome, Italy. (R. Vizioli, Viale Università 30, Rome)

10–14. Tuberculosis Conf., 16th intern., Toronto, Canada. (C. W. L. Jeanes, 265 Elgin St., Ottawa, Ont., Canada)

10–15. Neurology, 7th intern. congr., Rome, Italy. (G. Alema, Viale Università 30, Rome)

10–17. International Union of Forest Research Organizations, 13th congr., Vienna, Austria. (Forest Research Inst., IUFRO Bureau, Vienna 89)

11–13. European Organization for Quality Control, 5th congr., Turin, Italy. (Weena 700, Rotterdam, Netherlands)

11–14. International Flax and Hemp Federation, 12th congr., Lisbon, Portugal. (IFHF, 37 rue de Courcelles, Paris 8)

11–15. Cosmic Rays, 7th intern. conf., Kyoto, Japan. (Y. Sekido, Science Council of Japan, Ueno Park, Tokyo)

11–15 Cybernetics, 3rd intern. congr., Namur, Belgium. (Intern. Assoc. for Cybernetics, 13 rue Basse-Marcelle, Namur)

11–15. Instrument Soc. of America, instrument-automation conf. and exhibit, 16th, Los Angeles, Calif. (W. H. Kushnick, 313 Sixth Ave., Pittsburgh 22, Pa.)

11–15. Marine Sciences Instrumentation, symp., Woods Hole, Mass. (D. D. Ketchum, Woods Hole Oceanographic Institution, Woods Hole, Mass.)

11–15. Radioecology, symp., Fort Collins, Colo. (Miss A. Barker, American Inst. of Biological Sciences, 2000 P St., NW, Washington 6)

11–16. International Union for the Scientific Study of Population, 12th congr., New York, N.Y. (C. V. Kiser, Milbank Memorial Fund, 20 Wall St., New York 5)

11–16. University of Hong Kong, intern. scientific congr., Hong Kong. (University of Hong Kong, Hong Kong)

11–19. International Congr. of Navigation, 20th, Baltimore, Md. (E. W. Adams, Jr., 22 Light St., Baltimore 2)

11–21. International Cloud Physics Conf., Canberra and Sydney, Australia. (E. G. Bowen, Commonwealth Scientific and Industrial Research Organization, University Grounds, Sydney)

12–13. International Federation of Surgical Colleges and Societies, 4th annual Oslo, Norway. (K. Cassels, IFSC Office, Royal College of Surgeons of England, Lincoln's Inn Fields, London, W.C.2)

12–15. International Pharmaceutical Federation, 19th general assembly, Athens, Greece. (J. H. M. Winters, Alexanderstraat 11, The Hague, Netherlands)

12–15. Mass Spectrometry, conf., Oxford, England. (W. J. Brown, Instrumentation Div., A.E.I. (Manchester) Ltd., Trafford Park, Manchester 17, England)

15–20. World Medical Assoc., 15th general assembly, Rio de Janeiro, Brazil. (L. H. Bauer, 10 Columbus Circle, New York 19)

13–16. European Congr., of Gerontology, 3rd, Amsterdam, Netherlands. (A. J. S. Douma, Haanplein 8, The Hague, Netherlands)

14–17. Chemotherapy, 2nd intern. symp., Naples, Italy. (P. Preziosi, Casella postale 266, Naples)

14–20. High Energy Physics, intern., Aix-en-Provence, France. (E. W. D. Steel, European Organization for Nuclear Research, Geneva 23, Switzerland)

16–20. German Soc. for the History of Medicine, Physical Science and Technology, Augsberg, Germany. (G. Mann. Secretary, Wilhelmplatz 7, Bonn, Germany)

16–27. International Scientific Film Assoc., 15th congr., Rabat, Morocco. (M. Afifi, 85 Ibn Toumert, Rabat)

18–2. World Meteorological Organization, Commission for Aerology, 3rd session, Rome, Italy. (WMO, 1 Avenue de la Paix, Geneva, Switzerland)

18–20. Applied Spectroscopy, 8th symp., Ottawa, Canada. (R. Lauzon, Div. of Pure Chemistry, National Research Council, Ottawa, Ont.)

18–21. Embryological Conf., 5th intern., London, England. (L. Brent, Dept. of Zoology, University College, London, Grover St., London, W.C.1)

18–22. International Congr. of Neuroradiology, 6th Rome, Italy. (E. Valentino, CIT, Ufficio Congressi, Piazza Colonna 193, Rome)

18–23. Speleology, 3rd intern. congr., Vienna, Austria. (Generalsekretariat des 3rd Internationalen Kongresses für Speläologie, Obere Donaustr. 99/7/1/3, Vienna 2)

18–25. International Seaweed Symp., 4th, Biarritz, France. (M. Barriety, Centre Scientifique, B. P. 28, Biarritz.)

19–21. International Mechanical Pulping Conf., 4th, Chicago, Ill. (J. H. Perry, Norton Co., Worcester, Mass.)

19–29. International Conf. on Fish Nutrition, Washington, D.C. (FAO, Intern. Agency Liaison Branch, Office of the Director General, Viale delle Terme di Caracalla, Rome, Italy)

19–22. Australian Conf. on Food Technology, Homebush (near Sydney), Australia. (T. B. Partridge, Australian Scientific Liaison Office, 1907 K St., NW, Washington 6)

19–22. International Office of Documentation of Military Medicine, 23rd session, Athens, Greece. (Intern. Committee of Military Medicine and Pharmacy, Hôpital Militaire, 79 rue Saint Laurent, Liège, Belgium)

20–21. Industrial Electronics, symp., Boston, Mass. (W. M. Trenholme, General Electric Co., West Lynn, Mass.)

21–22. Conference on Radiofrequency Spectroscopy in Solids, Bangor, Wales. (Physical Soc., 1 Lowther Gardens, Prince Consort Rd., London, S.W.7, England)

21–23. French Medical Congr., 33rd, Paris. (C. Laroche, 34 rue de Bassano, Paris 8)

24–27. American Inst. of Chemical Engineers, Lake Placid, N.Y. (E. R. Smoley, 30 School Lane, Scarsdale, N.Y.)

25–29. European Committee of Liaison for Cellulose and Paper, symp., Oxford, England. (British Paper and Board Makers' Assoc., Technical Section, St. Winifred's, Welcomes Rd., Kenley, Surrey, England)

25–30. Magnetism and Crystallography, intern. conf., Kyoto, Japan. (Science Council of Japan, Ueno Park, Tokyo)

26–30. European Congr. of Aviation Medicine, 6th, Paris, France. (CERMA, 5 bis Avenue de la Porte de Sèvres, Paris 15)

27–3. International Union of Theoretical and Applied Mechanics, Kiev, U.S.S.R. (Y. A. Mitropolsky, Scientific Committee, Kalinin pl. 6, Mathematical Inst., Kiev)

28–29. European Conf. of Chemical Engineers, Toulouse, France. (Soc. of Industrial Chemistry, 28 rue Saint-Dominique, Paris 7, France)

October

1–3. Council for Intern. Organizations of Medical Sciences, Paris, France. (CIOMS, 6 rue Franklin, Paris 16)

1–4. Process Engineers, annual, Vienna, Austria. (Osterreichischer Intenieur- und Architektenverein, Eschenbachgasse 9, Vienna 1)

1–5. Electrochemical Soc., Detroit, Mich. (Electrochemical Soc., Inc., 1860 Broadway, New York 23)

1–7. International Special Committee on Radio Interference, plenary session, Philadelphia, Pa. (S. D. Hoffman, American Standards Assoc., 10 E. 40 St., New York 16)

1–8. International Congr. of Industrial Chemistry, 33rd, Bordeaux, France. (Société de Chimie Industrielle, 28 rue Saint-Dominique, Paris 7, France)

2–4. Communications Symp., 7th natl., Utica, N.Y. (R. K. Walker, 34 Bolton Rd., New Hartford, N.Y.)

2–7. International Astronautical Federation, 12th congr., Washington, D.C. (American Rocket Soc., 500 Fifth Ave., New York 36)

2–7. Inter-Regional Leprosy Conf., Istanbul, Turkey. (WHO, Regional Office for Europe and Regional Office for the Eastern Mediterranean, 8 Scherfigsvej, Copenhagen Ø, Denmark)

2–7. Climatic Change, symp., Rome, Italy. (UNESCO, Place de Fontenoy, Paris 7, France)

2–11. International Council for the Exploration of the Sea, 49th annual, Copenhagen, Denmark. (Charlottenlund Slot, Charlottenlund, Denmark)

3–5. Physics and Nondestructive Testing, symp., Argonne, Ill. (W. J. McGonnagle, Argonne Natl. Laboratory, 9700 S. Cass Ave., Argonne)

3–8. Aerosol Congr., 3rd intern., Lucerne, Switzerland. (Federation of European Aerosol Assocs., Waisenhaustrasse 2, Zurich, Switzerland)

4–10. Latin American Congr. of Electroencephalography, 5th, Mexico, D.F. (J. Hernandez Paniche, Instituto Mexicano de Seguro Social, Hospital La Raza, Mexico, D.F.)

4–10. Latin American Congr. of Neurosurgery, 9th, Mexico, D.F. (J. H. Mateos, Tonalá No. 15, Mexico 7, D.F.)

6–7. American Medical Writers' Assoc., New York, N.Y. (S. O. Waife, P.O. Box 1796, Indianapolis 6, Ind.)

6–8. Therapeutics, 7th intern. congr., Geneva, Switzerland (P. Rentchnick, Case Postale 229, Geneva 2)

8–10. Zooplankton Production, symp., Copenhagan, Denmark. (J. H. Frazer, Marine Laboratory, P.O. Box 101, Victoria Rd., Aberdeen, Scotland)

8–11. Society of American Foresters, Minneapolis, Minn. (H. Clepper, SAF, 425 Mills Bldg., Washington 6)

8–13. American Acad. of Ophthalmology and Otolaryngology, Chicago, Ill. (W. L. Benedict, 15 Second St., SW, Rochester, Minn.)

9–11. National Electronics Conference and Exhibition, 17th annual, Chicago, Ill. (NEC, 228 N. La Salle St., Chicago, 1)

9–12. Instrument Symp. and Research Equipment Exhibit, 11th annual, Bethesda, Md. (J. B. Davis, Natl. Institutes of Health, Bethesda 14)

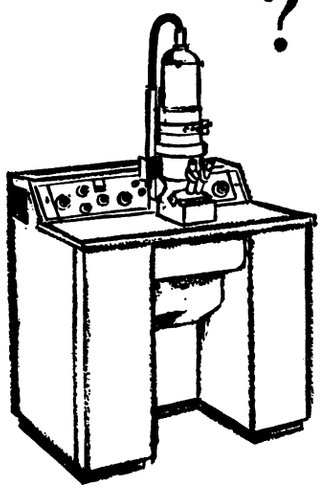
9–12. Water Pollution Control Federation, 34th annual, Milwaukee, Wis. (R. E. Fuhrman, 4435 Wisconsin Ave., NW, Washington 16)

9–13. American Rocket Soc., space flight meeting, New York, N.Y. (ARS, 500 Fifth Ave., New York 36)

9–13. Luminescence of Inorganic and Organic Systems, intern. conf., New York, N.Y. (Miss G. M. Spruch, New York Univ., Washington Sq., New York 3)

10–12. Nuclear Reactor Chemistry, 2nd

LOOKING FOR SOMETHING?



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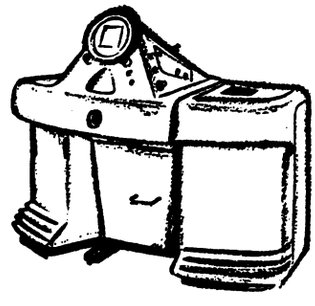

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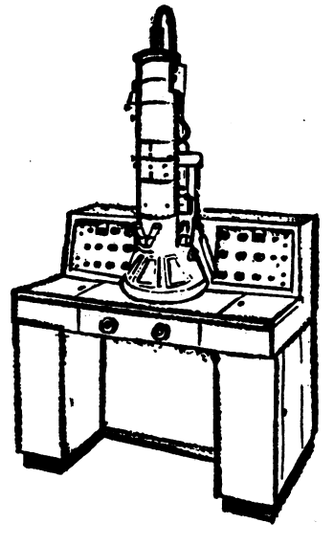

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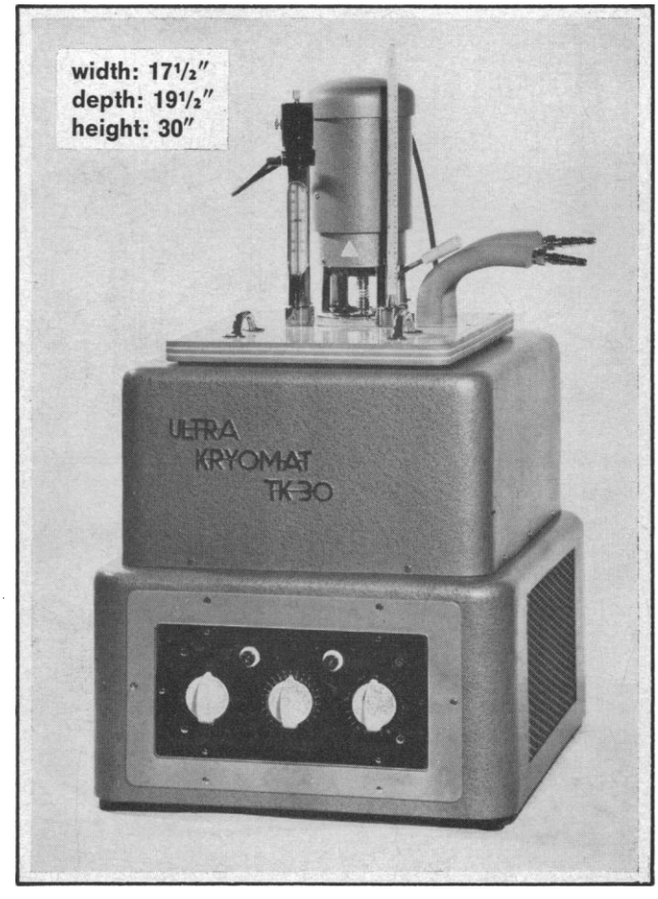
CONSOLE MODELS TO -80° C



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A separate line of instruments, Ultra Kryostats, for variable control or measurements between +40 and −80°C, are also available. Air or water cooling, built-in timer and accuracy to ±0.02°C are just a few of the many outstanding features of these instruments.

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P.O. Box 422 Great Neck, N.Y.

conf., and Analytical Chemistry in Nuclear Reactor Technology, 5th conf., Gatlinburg, Tenn. (Oak Ridge Natl. Laboratory, P.O. Box X, Oak Ridge, Tenn.)

10–20. International Committee for Biological Control, Tunis. [P. Grison, Laboratoire de Biocenotique et de Lutte Biologique, La Miniere, par Versailles (S.-et.-0.), France]

11–13. Gaseous Electronics Conf., American Physical Soc., Schenectady, N.Y. (C. J. Gallagher, General Electric Research Laboratories, Schenectady, N.Y.)

11–14. Tau Beta Pi Assoc., Cincinnati, Ohio. (R. H. Nagel, Univ. of Tennessee, Knoxville)

11–14. Western Inst. on Epilepsy, 13th annual conf., San Antonio, Tex. (F. Risch, 3097 Manning Ave., Los Angeles, Calif.)

12–13. Congress of Neurological Surgeons, New York, N.Y. (E. Weiford, 4706 Broadway, Kansas City 12, Mo.)

12–29. Pacific Intern. Trade Fair, 2nd, technical meetings, Lima, Peru. (PITF, P.O. Box 4900, Lima)

14–20. International Congr. of Neurological Surgery, 2nd, Washington, D.C. (B. S. Ray, 525 E. 68 St., New York 21)

15. American College of Dentists, Philadelphia, Pa. (O. W. Brandhorst, 4236 Lindell Blvd., St. Louis, Mo.)

15–20. American Inst. of Electrical Engineers, fall general meeting, Detroit, Mich. (E. C. Day, AIEE, 33 W. 39 St., New York 18)

15–20. International Congr. of Allergolgy, 4th, New York, N.Y. (W. B. Sherman, 60 E. 58 St., New York 22)

15–21. Pan American Congr. of Endocrinology, 5th, Lima, Peru. (M. San Martin, Av. Central 325, San Isidoro, Lima)

16–17. Engineering Writing and Speech, natl. symp., East Lansing, Mich. (J. D. Chapline, Philco Corp., 3900 Welsh Rd., Willow Grove, Pa.)

16–17. Ionization of the Air, intern. conf., Philadelphia, Pa. (I. C. Kornblueh, American Inst. of Medical Climatology, 1618 Allengrove St., Philadelphia 24)

16–18. American Soc., of Safety Engineers, Chicago, Ill. (A. C. Blackman, 5 N. Wabash Ave., Chicago 2)

16–18. Entomological Soc. of Canada and Entomological Soc. of Quebec, Quebec, Canada. (L. L. Reed, ESC, Neatby Bldg., Carling Ave., Ottawa, Canada)

16–18. Metallurgy of Beryllium, intern. conf., London, England. (Secretary, Inst. of Metals, 17 Belgrave Sq., London, S.W.1)

16–19. American Dental Assoc., Philadelphia, Pa. (H. Hillenbrand, 222 E. Superior St., Chicago 11, Ill.)

16–19. Vacuum Science and Technology, 2nd intern. congr., Washington, D.C. (W. M. Welch, Intern. Organization for Vacuum Science and Technology, 1515 Sedgwick St., Chicago 10, Ill.)

16–20. American Ornithologists' Union, Washington, D.C. (H. G. Deignan, U.S. National Museum, Washington 25)

16–20. American Soc. of Civil Engineers, New York, N.Y. (W. H. Wisely, 33 W. 39 St., New York 18)

16–20. Symposium on the Programming and Utilization of Research Reactors, Vienna, Austria. (Intern. Atomic Energy Agency, Room 2249, United Nations, New York, N.Y.)

17–19. Japan Conf. of Radioisotopes, 4th, Tokyo. (R. Suga, Japan Atomic Industrial Forum, Inc., No. 1, 1-Chome, Shiba Tamura-cho, Minato-ku, Tokyo)

18–20. Design of Experiments in Army Research, Development, and Testing, 7th conf. (by invitation only), Fort Monmouth, N.J. (F. G. Dressel, Army Research Office (Durham), Box CM, Duke Station, Durham, N.C.)

18–20. Optical Soc. of America, Los Angeles, Calif. (Miss M. E. Warga, 1155 16 St., NW, Washington 6)

19–20. International Geophysics Assoc., 12th colloquium, Salzburg, Austria. (IGA, Freisaalgasse 31, Salzburg)

19–21. Indiana Acad. of Science, Terre Haute. (E. D. Weinberg, Dept. of Bacteriology, Indiana Univ., Bloomington)

20–21. Shallow Water Research Conf., Atlantic Coast, 1st natl., Baltimore, Md. (D. S. Gorsline, Oceanographic Inst., Florida State Univ., Tallahassee)

20–24. American Heart Assoc., annual, Miami Beach, Fla. (AHA, 44 E. 23 St., New York 10)

23–25. International Scientific Radio Union and Inst. of Radio Engineers, fall meeting, Austin, Tex. (Miss H. E. Hart, U.S.A. Natl. Committee URSI, 2101 Constitution Ave., NW, Washington 25)

23–25. Metallurgical Soc. of the American Inst. of Mining, Metallurgical and Petroleum Engineers, fall meeting, Detroit, Mich. (AIME, 29 W. 39 St., New York 18)

23–27. Metal Congr. and Exposition, 43rd natl., Detroit, Mich. (A. R. Putnam, American Soc. for Metals, Metals Park, Novelty, Ohio)

23–28. Congress of Chemical Engineering, 1st, San Juan, P.R. (R. Munoz, Apartado 47, Estación de Río Piedras, San Juan)

24–25. Shallow Water Research Conf., Gulf Coast, 1st natl., Tallahassee, Fla. (D. S. Gorsline, Oceanographic Inst., Florida State Univ., Tallahassee)

24–26. Aerospace Nuclear Propulsion, intern. symp., Las Vegas, Nev. (P. M. Uthe, Lawrence Radiation Laboratory, Univ. of California, Box 808, Livermore)

24–27. American Dietetic Assoc., 44th annual, St. Louis, Mo. (Mrs. T. Pollen, ADA, 620 N. Michigan Ave., Chicago 11, Ill.)

26–27. American Soc. of Tool and Manufacturing Engineers, Toronto, Canada. (A. Cervenka, Vanderbilt Blvd., Oakdale, L.I., N.Y.)

26–27. Instrumentation Facilities for Biomedical Research, symp., Omaha, Neb. (H. G. Beenken, Univ. of Nebraska College of Medicine, 42 and Dewey Ave., Omaha)

26–27. New Mexico Acad. of Science, Albuquerque. (K. G. Melgaard, P.O. Box 546, Mesilla Park N.M.)

26–28. Professional Group on Electron Devices, annual meeting, Washington, D.C. (I. M. Ross, Technical Program Chairman, Room 2A-329, Bell Telephone Laboratories, Murray Hill, N.J.)

26–30. American Soc. for Aesthetics, Detroit, Mich. (J. R. Johnson, Cleveland Museum of Art, Cleveland 6, Ohio)

27–28. Shallow Water Research Conf., Pacific Coast, 1st natl., Los Angeles, Calif. (D. S. Gorsline, Oceanographic Inst., Florida State Univ., Tallahassee)

New Products

Digital voltmeter measures from 100 μv to 1.500 kv in five ranges. Display is by means of optical projection and is free from ambiguity; red and black backgrounds signify positive and negative inputs, respectively. Input impedance is 10 megohms except on the lower two ranges which have impedances of 1 and 0.1 megohm. Long-term accuracy is said to be ± 0.1 percent of full scale in each range. Two additional voltage ranges of 100 and 1000 v have input impedances of 100 megohms and accuracy ± 0.5 percent. Readout time is constant at 280 msec. Normally voltage is measured continuously. An adjustable dead zone permits jitter free readings in the presence of transients. Short or long time constant is selectable. The internal Zener reference can be preset to its precise value and corrected if necessary against a built-in Weston standard cell. A sampling mode of operation permits single voltage readings that remain on display until a succeeding sample is taken. (Solartron Laboratory Instruments Ltd., Cox Lane, Chessington, Surrey, England)

Circle 1 on Readers' Service card

Slide projector is available with a zoom lens that permits up to 175-percent change in projection distance or picture size. Focal length is continuously variable from 3.75 to 6.5 in. The lens telescopes to fit the standard carrying case. (Bausch & Lomb Inc., Rochester 2, N.Y.)

Circle 2 on Readers' Service card

Excitation source provides all necessary supply voltages and wave forms for designing, testing, and demonstrating *p-n-p* transistor switching circuitry. The instrument contains three regulated power supplies, a square-wave generator, and output control switches. Two of the power supplies furnish, respectively, 0 to 15 volts, variable, regulated to 200 ma lead, and 12 volts, fixed, regulated to 100 ma lead. The third supply drives the square-wave generator over the range 0 to -12 volts. The generator provides two square waves 180 deg out of phase with each other. Frequency is variable from 5 to 500 kcy/sec. Also available is a push-button pulse generator. (Navigation Computer Corp., Valley Forge Industrial Park, Norristown, Pa.)

Circle 3 on Readers' Service card

Synchro tester is a portable instrument for testing aircraft and missile synchro-transmitter or indicator systems, or both. The instrument embodies a high-speed digital presentation which indicates directly in angle from electrical zero. Over-all accuracy is said to be ± 3 min when used either as a transmitter or receiver. A correction curve permits repeatability to 1 min accuracy. The unit has a self-checking electrical zero transformer with a zeroing adjustment to compensate for minor changes in temperature. (American Machine & Metals Inc., Sellersville, Pa.)

Circle 4 on Readers' Service card

Differential gaussmeter employs dual Hall-effect probes to measure magnetic field gradient. The two probes are held parallel and at a fixed separation by a spacer. They are balanced in a reference magnetic field and can then be rotated at will in the earth's field without affecting the gradient measurement. Full-scale ranges from 0–0.1 to 0–20,000 gauss are covered in 17 steps. Both gradient and absolute field are indicated directly in gauss on a meter or can be fed into an external oscilloscope or recorder. Frequency response is d-c to 400 cy/sec. (Radio Frequency Laboratories, Inc., Powerville Rd., Boonton, N.J.)

Circle 5 on Readers' Service card

Spectrum analyzer covers the frequency range 10 to 1180 Mcy/sec. According to the manufacturer, the analyzer is able to discriminate signals separated by as much as 80 db at 50 kcy/sec separation and by 90 db at 150 kcy/sec separation. Signal sensitivity better than 90 dbm is provided over the fundamental range, 10 to 68 Mcy/sec, and slightly reduced sensitivity is provided to 1180 Mcy/sec with harmonic operation of the local oscillator. Resolution is said to be 5 kcy/sec when signal levels are approximately equal. A built-in, 0.1- and 1-Mcy/sec crystal-controlled calibrator provides markers that allow calibration of the viewing screen at any spectrum-width setting. Photographic, *x-y*, and roll-chart recording facilities are available. (Lavoie Laboratories, Inc., Morganville, N.J.)

Circle 6 on Readers' Service card

Microwave tracking antenna mount (Fig. 1) designed for field use has handwheels for manual tracking in azimuth and elevation. The mount is available with parabolic, helical beam, and horn antennas. (Automation Dynamics Corp., 255 County Rd., Tenafly, N.J.)

Circle 7 on Readers' Service card

Mass flowmeter consists of a smooth-bore metal tube, a small heater coil, two temperature detecting elements, one downstream and the other upstream from the heater, and a temperature compensator. Heat is injected into the fluid through the wall of the tube and the liquid boundary layer. The down-

Fig. 1. Microwave tracking antenna mount.

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither *Science* nor the writer assumes responsibility for the accuracy of the information. A Readers' Service card for use in mailing inquiries concerning the items listed is included on pages 423 and 497. Circle the department number of the items in which you are interested on this card.

stream thermometer measures the resultant temperature of the outside surface of the boundary layer; the upstream thermometer measures initial temperature. Minimum measurable flow is determined primarily by the internal tube diameter; maximum is determined by the effects of turbulence. Accuracy is said to depend on application with ±1 percent being achievable. Operating temperature range is up to 500°F. (Flow Measurements Corp., 10506 Wheatley St., Kensington, Md.)

Circle 8 on Readers' Service card

Wire bonder (Fig. 2) is designed to bond a wire 0.0002 in. in diameter to a transistor stripe measuring 0.001 by 0.003 in. The wire is positioned on the stripe by maneuvering in the horizontal plane with joystick assemblies and in the vertical plane with a lever. A binocular microscope enables the operator to see the target. Positioning precision of 10 to 15 μin. is said to be possible. (Kulicke and Soffa Manufacturing Co., 401 N. Broad St., Philadelphia, Pa.)

Circle 9 on Readers' Service card

High-pressure pump (Fig. 3) produces pressures up to 10^5 lb/in.^{2} from air at 80 to 100 lb/in^2. The pump is a reciprocating type with an output of just over 6 in.^{3}/min at 10^4 lb/in.^{2}, falling to just under 2 in.^{3}/min at 9×10^4 lb/in^2. Pressure is adjusted by means of an air control valve. Pressure may be raised gradually or the control valve may be set to produce the required pressure. The pump is enclosed in a safety cabinet with electrically interlocked doors. The pressure gage is viewed through mirrors. (Charles S. Madan & Co., Ltd., Vortex Works Broadheath, Altrincham, England)

Circle 10 on Readers' Service card

Seismic timer and blaster permits determination of depth to bedrock. Determinations to 100 ft can be made with the timer when an instrumented sledge hammer is used to generate seismic shock waves. The blaster, which greatly extends the range, is a battery-operated, capacitor-discharge type. (Dynametric, Inc., 2965 E. Colorado Blvd., Pasadena, Calif.)

Circle 11 on Readers' Service card

Magnetic-memory drum, the size of a baseball, has a capacity of 358,000 bits with a storage density of 600 bits per inch. Magnetic heads used to store and pick up data are floated on a 0.0001-in. thick film of air on the surface of the drum. The drum, which rotates at about 10,000 rev/min, is suspended on air bearings. Access time is reduced by using a one-word loop. (Sperry Gyroscope Co., Great Neck, N.Y.)

Circle 12 on Readers' Service card

Ball and socket joints of glass use O-rings on the inner member to effect a vacuum-tight seal and are said to require no lubrication. Tubes may be joined within 10° of axial center and may be secured with a standard metal ball and socket clamp. The inner joint member can also be used in combination with standard ground sockets. (California Scientific Glass Co., 9811 E. Rush St., El Monte, Calif.)

Circle 13 on Readers' Service card

Automatic sampling machine (Fig. 4) withdraws a measured volume of the sample from a test tube placed in a locator and transfers the sample with a measured volume of reagent into an empty test tube. To prevent contamination, the sampling pipette automatically follows the lowered liquid level in its downward movement so that only the tip is wetted. As a further precaution, each sample is flushed from the pipette with the reagent. Both the volume of sample and the volume of reagent are preset by the operator. (National Instrument Co., Inc., 4119 Fordleigh Rd., Baltimore 15, Md.)

Circle 14 on Readers' Service card

Recorder control can be used with commercially available potentiometric recorders to set the recorder to any of 15 voltage ranges and any of 15 current ranges, and to change the setting while recording. Auxiliary circuits permit reversal of polarity and check of recorder zero without disturbing or disconnecting the input signal or the recorder. No modification or adjustment of the recorder or the control is required to change from one recorder to another. Ranges are 10 mv to 500 v, and 10 μa to 500 ma, full scale, on a 10-mv recorder. Output resistance as seen by the recorder is 1000 ohms (max.). Input resistance for voltage measurement is 100 kohm per volt of decade switch setting, 1 megohm/volt with a 1-mv recorder; for current measurement, input resistance is 1000, 100, or 10.0 ohms, depending on decade switch setting. (Cahn Instrument Co., 14511 Paramount Blvd., Paramount, Calif.)

Circle 15 on Readers' Service card

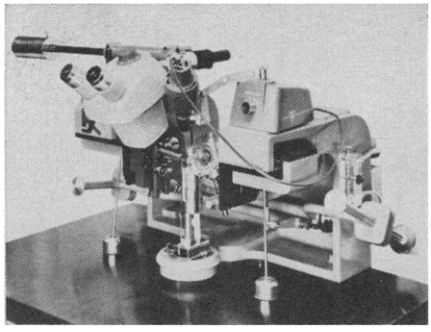


Fig. 2. Wire bonder.

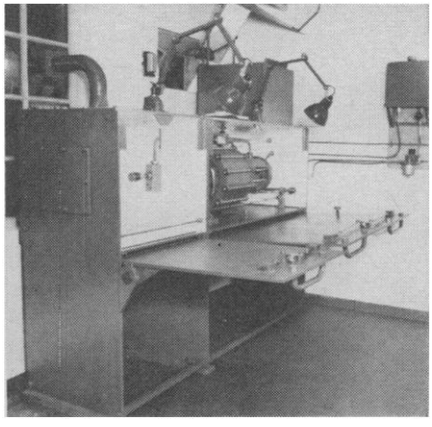


Fig. 3. High-pressure pump.

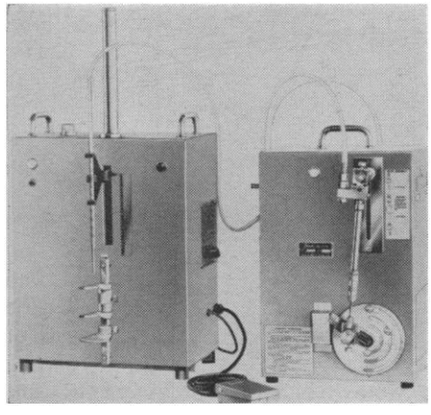


Fig. 4. Automatic sampling machine.

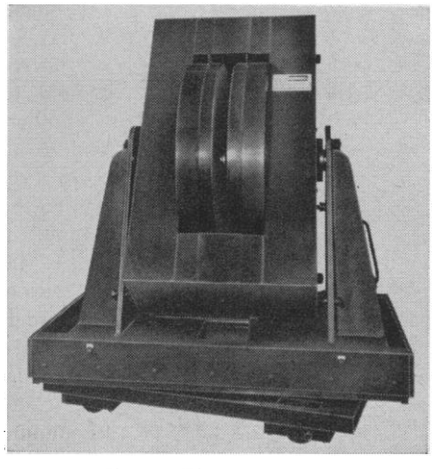


Fig. 5. Electromagnet.

Differential conductivity meter is designed to measure, indicate, and transmit to a remote recorder the difference in solution conductivity at any two locations. Independent temperature compensation is provided for the cells at the two locations. The instrument incorporates two complete and independent self-balancing Wheatstone bridges. Three indicating scales are provided, two for the individual conductivities and one for conductivity difference. Electrical or pneumatic transmitters can be provided for remote recording. Temperature compensators may be manual or automatic. (Industrial Instruments, Inc., 89 Commerce Rd., Cedar Grove, N.J.)

Circle 16 on Readers' Service card

Electromagnet (Fig. 5) provides a field of 51.5 kgauss with ½-in. gap and 1½-in. diameter pole pieces. Distance between coils as well as gap can be varied. Pole tips may have a maximum diameter of 18 in. A field of 40 kgauss is attained with 1-in. gap and 6-in. diameter tips; 35 kgauss with 2-in. gap and 6-in. tips; 10⅓ kgauss with 4-in. gap and 18-in. tips. Maximum power is 200 kw with low-impedance coils and 12 kw with high-impedance coils. Vertical and horizontal rotation are provided. (Pacific Electric Motor Co., 1009 66th Ave., Oakland, Calif.)

Circle 17 on Readers' Service card

Strip-chart recorder of the moving-coil type is said to be accurate within ±1 percent. The writing system may be ink pen, hot wire, or electrosensitive paper. Standard chart speeds of ½, 1, 6, or 12 in./hr or in./min may be changed by replacing wheels in a gear train. Dual-speed chart mechanisms are also available. A variety of voltmeter and ammeter ranges are available for both a-c and d-c. Response time is said to be about 0.6 sec. (Atkins Technical Inc., 1276 W. Third St., Cleveland 13, Ohio)

Circle 18 on Readers' Service card

Annunciator display has a capacity of 60 messages that may be displayed individually or in combination. The device operates on a rear-projection principle providing 60 lenses that are used for data or color background. The display features one-plane presentation. Overall size is 5¼ by 12 by 16½ in. (Industrial Electronic Engineers, Inc., North Hollywood, Calif.)

Circle 19 on Readers' Service card

Temperature transducers designed to be resistant to damage by nuclear radiation use tungsten as the resistance element. Operating temperature range is −325° to +500°F. Element resistances up to 1000 ohms at +32°F are available. Accuracy is said to be ±½°F, and repeatability to be within ±0.05 percent of resistance value measured at 77°F. Response time is approximately 0.4 sec for 63 percent of final resistance value. Transducer tube lengths up to 18 ft can be supplied, and sensing element diameters as small as 0.1 in. and sensitive length of 0.5 in. are available. Construction material in addition to tungsten includes alumina and 304 stainless steel. (Winsco Instruments & Controls, 11789 W. Pico Blvd., Los Angeles 64, Calif.)

Circle 20 on Readers' Service card

Composite seal is a stainless-steel V-ring combined with a fluorocarbon-plastic seal. The composite is designed to operate at temperatures from −65° to +600°F. The units are re-usable. (Pall Corp., 30 Sea Cliff Ave., Glen Cove, N.Y.)

Circle 21 on Readers' Service card

Microfilm recorder is actuated by information supplied by a computer to make multiview drawings of parts to be fabricated. Once the engineering specifications for the part are fed in, the computer can be asked to produce drawings of any view or cross section of the part in three dimensions. The same computer code used to produce the drawings can also be used to produce tapes for operation of automatic production equipment. Information is recorded on 35-mm microfilm. Printing is accomplished by photographing displays on the face of a Charactron shaped-beam tube. An accessory unit permits automatic processing and projection of the film on a 2- by 2-ft screen within 8 sec. (Stromberg-Carlson Div., General Dynamics Corp., P.O. Box 2449, San Diego 12, Calif.)

Circle 22 on Readers' Service card

Binary-coded decimal-to-decimal converter is the first of a series of modular solid-state devices constructed by simultaneous fabrication of multi-element components. The device contains 40 silicon diodes and is designed to drive an indicator tube directly from binary-coded inputs. In the manufacture of the units, a single silicon wafer is diffused to form a large planar diode. From this wafer, as many elements as desired are simultaneously fabricated in a specific pattern. The resulting array is joined to a circuit plate. (Burroughs Corp., Plainfield, N.J.)

Circle 23 on Readers' Service card

Strain-gage auxiliary instrument is a miniature device that contains a signal amplifier, power supply, bridge-balance circuits, and calibration circuits. The latter can be programmed from a remote source. Four reference points are provided, and polarity of the calibration can be reversed to simulate compression or tension of a strain gage. Signals are amplified to a maximum output of ±5 volts d-c., and output impedance is 350 ohms. (Video Instruments Co., 3002 Pennsylvania Ave., Santa Monica, Calif.)

Circle 24 on Readers' Service card

Cryogenic thermometer measures temperature in the range of 0.3° to 25.0°K. The instrument operates by measuring mutual inductances as small as 2×10^{-4} by use of an a-c bridge circuit and ruby crystals. Bridge current is supplied by a modular signal generator tuned to 155 cy/sec. Bridge output is amplified by a transistorized narrow-

band amplifier. Measurements are said to require no special compensation and can be read directly on a calibrated scale. (Malaker Laboratories, Inc., Mountainside, N.J.)

Circle 25 on Readers' Service card

Cadmium-sulfide **photoconductive cell** features a dark current of 2.5 μa and an average cell current of 10 ma with 5.0 ft-ca illumination of 2700°K color temperature. Dissipation rating is 1 watt. The cell is a side-sensitive device mounted in a hermetically sealed glass envelope with conventional seven-pin miniature base. (Amperex Electronic Corp., 230 Duffy Ave., Hicksville, N.Y.)

Circle 26 on Readers' Service card

Solid-state radiation detectors are semi-conductor devices sensitive to protons, electrons, deuterons, alpha particles, and high-energy heavy particles. A shallow, reversed bias *p-n* junction in silicon is used to attain high energy resolution, fast response, and linearity of pulse height with particle energy over a specified energy range. The width of the depletion area determines the sensitive volume of the detector. Output is proportional to the energy deposited within the depletion region and is independent of the mass of the particle. A variety of performance specifications is available in each of three sizes. (Hughes Aircraft Co., P.O. Box 90515, International Airport Station, Los Angeles 45, Calif.)

Circle 27 on Readers' Service card

Diode tester is a back-current and saturation-voltage tester with a voltage range from 0 to 3000 v in four steps and a current range from 0 to 100 μa in four steps. Regulation is said to be better than $\pm$0.1 percent; ripple and noise, 0.05 percent. (Trans Electronics, Inc., 7349 Canoga Ave., Canoga Park, Calif.)

Circle 28 on Readers' Service card

Infrared spectrophotometer, model 421, uses two gratings to cover the spectral range from 4000 to 550 wave numbers. Each grating is used only in its first order. Overlapping orders are eliminated by four filters automatically inserted into the radiation beam. The two gratings are mounted back to back. At the crossover point, 2000 wave numbers, scanning halts briefly, and the second grating rotates into position. If desired, abscissa scale change may also occur automatically at this point. The crossover occurs without gaps or overlapping and without shift in wave-number indication. Scanning rate can be varied from 65 sec for the entire range to 4.5 min per wave number. Accessories developed for use with other instruments can be used with model 421. Wavelength coverage of the far infrared can be added by suitable prism interchanges. (Perkin-Elmer Corp., Norwalk, Conn.)

Circle 29 on Readers' Service card

Nuclear methods are used to measure soil moisture and density with equipment composed of a counting unit and a moisture or density probe which contains radioactive material and a detector system. Measurements are performed by inserting the probe in, or placing it on, the material being tested and reading the portable counter. The equipment does not require an AEC license. (Testlab Corp., 3398 N. Milwaukee Ave., Chicago 41, Ill.)

Circle 30 on Readers' Service card

Digital clock furnishes a binary-coded output of the day, hour, and minute, provided by contact closures. Visible readout is also provided. Basic timing pulses are formed by a cam-microswitch arrangement driven by a synchronous motor to produce minute counts. Stepping switches then form a logical time counter with appropriate carries. Each digital output consists of four binary bits that may be arranged in any desired code. Stepping the switches takes 2 sec of each minute during which an inhibit signal prevents ambiguous readings. (Electro-Logic Corp., 515 Boccaccio Ave., Venice, Calif.)

Circle 31 on Readers' Service card

Coaxial tuner is designed for use in the frequency range 1.0 to 10 Gcy/sec (kMcy/sec). The tuner consists of a strip line section with a rail-guided carriage upon which an adjustable probe is mounted. Length of the tuner is 11.5 in.; carriage travel is 7.5 in. Voltage-standing wave ratio as high as 10:1, and of any phase, can be matched to 1.00. Radio-frequency leakage has been minimized by means of a poly-iron choke mounted along the tuner slot. Insertion loss is less than 1 db when a mismatch of 3:1 is corrected. (FXR, Inc., 25–26 50 St., Woodside 77, N.Y.)

Circle 32 on Readers' Service card

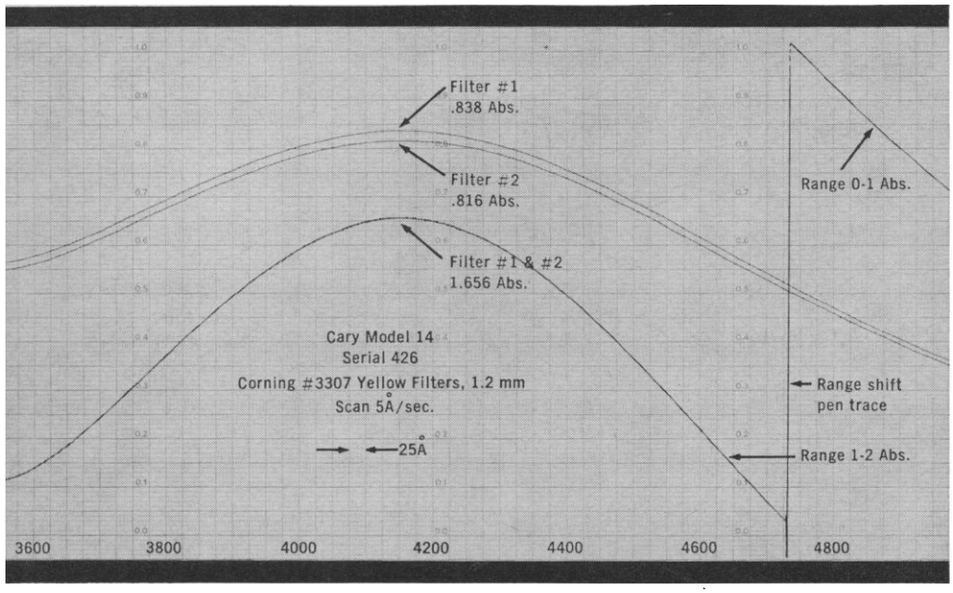
JOSHUA STERN

National Bureau of Standards, Washington, D.C.

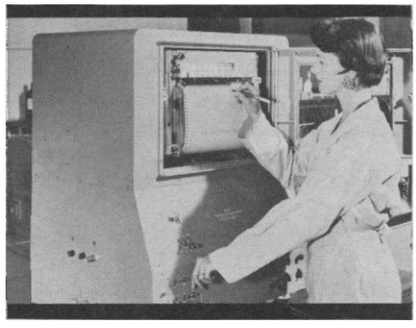
Cary NO. 3
DATA SERIES Evaluating Spectrophotometer Performance

PHOTOMETRIC ACCURACY and REPRODUCIBILITY:

The precision to which the instrument measures the absorbance of a sample (accuracy) and repeats this measurement (reproducibility).



Cary Model 14 records spectra accurate and reproducible to .002 at 1.0 absorbance unit, to .005 at 2.0



High photometric accuracy and reproducibility are essential to provide reliable data for correctly interpreting scientific studies. These features also are of prime importance in control analyses where product quality or important production decisions are based on analytical results.

The *high photometric accuracy* of the Cary Model 14 is illustrated by the above spectra of two Corning #3307 filters, 1.2 mm thick, which were measured separately and in combination. The individual absorbance values of filter #1 plus filter #2 were compared with the observed absorbance value of the combination. As shown on the record, the Model 14 measured the combined absorbance of the filters to *within .002 absorbance,* equivalent to .01% at 2% transmittance. With the superior performance of the Model 14, along with proper sample handling technique, an analytical accuracy of .2% may be obtained on concentration determinations.

The *excellent photometric reproducibility* of the Cary Model 14 is illustrated by the curve for the filter combination which is actually three superimposed records.

Photometric accuracy and reproducibility are just two of several important criteria on which spectrophotometer performance should be based. Others include: Resolution; wavelength accuracy and reproducibility; stray light. Because the Cary Model 14 excels in each of these performance criteria, it is regarded as the finest instrument of its kind. A descriptive brochure is yours for the asking. *Write for data file E23-81*

Cary INSTRUMENTS

APPLIED PHYSICS CORPORATION
2724 South Peck Road
Monrovia, California

for Kotzebue was 19 mi/hr. Since wind velocity has a decisive effect on fallout distribution, the AEC estimates of the fallout pattern must be in error.

3) Although fallout on the ground in northern Alaska from past nuclear tests is very low compared to that in temperate zones, the Sr^{90} levels of caribou and of the few Eskimo bones that have been analyzed thus far are much higher than the values for cattle and people in temperate United States. The CNI bulletin reports data which show that this is due to the unusual mineral nutrition of lichens. This remarkable situation is not mentioned in the AEC report, though we were pleased to learn recently that the responsible officials are now taking steps to institute a research program on the problem.

4) The CNI bulletin contains eight pages of detailed discussion, written by the biologists who investigated the problem for the AEC, of the unusual food chain in the Arctic (lichen-caribou-man). This discussion shows that predictions of biological Sr^{90} distribution based on the temperate-zone food chain (grass-cow-milk-human) do not apply to Alaska. Nor is the ecological behavior of Sr^{90} in tropical environments applicable to Alaska. Nevertheless, the AEC report on Project Chariot states that "possible radiation effects upon the biota of the Chariot site have been estimated from the Nevada Test site and the Pacific Proving ground data" (p. 55).

Margolis states that AEC officials believe "that the CNI assertion that the Sr^{90} yield might be ten times greater than the AEC believed likely was based on misreading of an AEC sponsored study. The study gave 5 percent as the most probable portion of the total radioactive yield that might get into the fallout." Margolis himself finds fault with the CNI conclusion and endeavors to show that at most the AEC estimate of fallout is low by a factor of 4 rather than by the factor of 10 suggested in our bulletin. As stated in the CNI report, the factor 10 is derived from two sources: a possibly fivefold underestimation by the AEC on the vented yield (which is explained above) and an estimated twofold error regarding the pattern of fallout deposition. The factor of 5 has been discussed already. The other factor of 2 can arise if the winds at the Chariot site are stronger than the values used in AEC estimates of the fallout pattern. Stronger winds could blow more of the fallout away from the immediate site (which can be

closed off from animals) and further downwind where it becomes accessible to the food chain. Of course, if the intensity downwind should rise the intensity at the site must drop accordingly, but for the reasons stated we are mainly concerned with some distances downward from the site. It seems reasonable that these effects could increase the AEC estimate of the downwind deposition of fallout by a factor of 2, because the wind velocities at the Chariot site tend to be significantly higher than the value used in the AEC estimate.

Margolis states on his own authority that "As it happens, the exposure from habitual television watching, or from current levels of fallout, is roughly the same as the exposure the 700 Eskimos might receive if pessimistic assumptions about the absorption of Sr^{90} are correct." Now, this sentence would be roughly correct if Margolis had added as an important condition, that the statement refers only to the effects of these three sources of radiation on the gonads. If Margolis were to amend his statement in this way it would then be technically correct, but still quite misleading to a reader interested in comparing the relative risks to his health from these three sources, because it fails to mention the risks to the bone marrow from these sources of radiation. It is an elementary fact now well established in the relevant literature that the risk from fallout radiation is of two kinds: (i) a genetic risk of deleterious mutations due to exposure to the gonads, and (ii) a somatic risk (from leukemia and other forms of cancer) due chiefly to irradiation of the bone marrow. The gonadal exposure is due to cesium-137; the marrow exposure is due to Sr^{90}. All published comparisons [see for example, the report of the British Medical Council, *The Hazards to Man of Nuclear and Allied Radiations* (Medical Research Council, HMSO, London, 1956)] of the radiation risk from television watching and from fallout refer only to gonadal exposure for the simple reason that while television watching may lead to a maximum of 1 mrem of exposure to the gonads per year, it has no measurable effect on the bone marrow, because the radiation is too soft to penetrate more than a few millimeters of body tissue. Hence any estimate of the risk from Sr^{90}, which necessarily refers to an effect on the marrow, will be incomparably greater than the hazard, to the bone marrow, of television

watching. It will be noted that Margolis' comment also includes a statement of equality between exposure to Eskimos from current levels of fallout, and from Sr^{90} that might result from the Chariot explosions. The exposure to Eskimos from present fallout is approximately known (about 1 to 3 $\mu\mu$c of Sr^{90} per gram of calcium in the bones; see *Radiological Health Data,* Jan. 1961, p. 21). We would expect Margolis to show, in support of his statement, that the Sr^{90} that Cape Thompson Eskimos might absorb from the Chariot explosion also amounts to about 1 to 3 $\mu\mu$c of Sr^{90} per gram of calcium in the bones. We suggest that he produce such calculations. For our part, after careful study of the available data, we concluded, as stated in the CNI report, that there were not sufficient data about the relevant parameters (for example the mineral nutrition and feeding habits of the caribou; the total Sr^{90} in the Eskimo diet) to warrant such a calculation.

None of the foregoing observations are adequately represented in Margolis' account of the CNI report on the Chariot Project. Nevertheless, Margolis had ample opportunity to become acquainted with these matters in advance of the preparation of his article. A few days after the CNI report had been made public, one of us received a long distance telephone call from Margolis. In this call he made several criticisms of the CNI report, and asked for comment on them. During this conversation Margolis acknowledged that he had not yet seen a copy of the CNI report. Accordingly, a copy of the report was sent to him immediately. After several days he called again. In this second conversation nearly all of the points which we have enumerated above (including an explanation of the so-called "technical error") were explained to Margolis at some length. We regret that they do not appear in his article. In particular, we believe that ordinary journalistic practice would recommend that the specific reply given to his query about the supposed technical error in the CNI report should appear in his article alongside his discussion of the AEC "complaint" about it.

We should also like to note that the quotations which Margolis attributes to "a spokesman for CNI" do not precisely reflect what was said to him, and it is pertinent that he neither asked for permission to quote (which would have readily been granted) nor checked the quotations with their source.

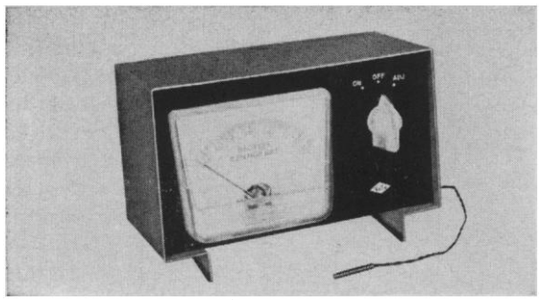
The foregoing comments explain why we believe that Margolis' article on the reports about Project Chariot is incomplete, misleading, and in some respects quite incorrect.

BARRY COMMONER
M. W. FRIEDLANDER
ERIC REISS
St. Louis Committee for Nuclear Information, St. Louis, Missouri

In reply to the CNI letter:

1) The bulk of my article, contrary to the impression given by CNI's letter, was not concerned with CNI's technical errors or with my own predictions of radiation levels, but with the likelihood that the CNI report would mislead rather than inform the public on the central question of the magnitude of the fallout risk.

2) With regard to the material dealt with in the letter, much of it is simply a recounting of parts of the CNI report, and this recounting does not conflict with the summary of the report I gave in my article. Other parts are attacks on the AEC, to which I assume the AEC will reply if they deem it worthwhile. I should point out, though, that



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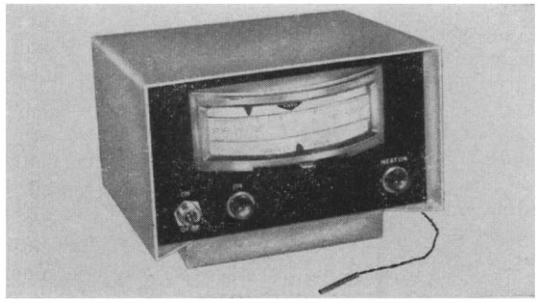

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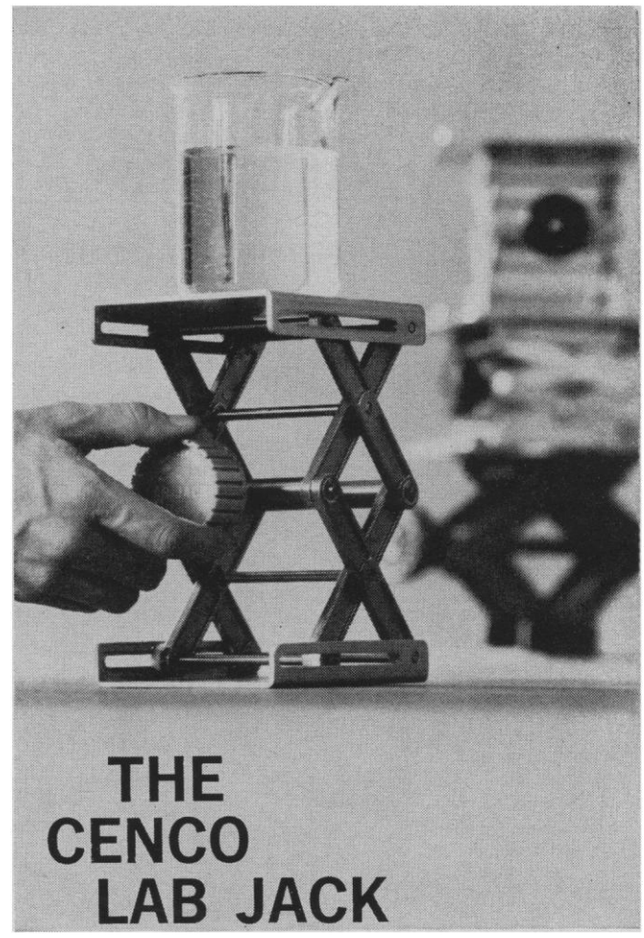

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the CNI summary of what the AEC said and did is not always, indeed is rarely, quite the same as what the AEC said and did. For example, the AEC began contracting for studies of the food chain, including the absorbtion of strontium, nearly 2 years ago, and indeed a good deal of the material CNI cites was developed as a result of studies sponsored by the AEC.

3) On the technical points directly questioning the reliability of my article: I don't see how CNI argues that it has not erred in its handling of the AEC fallout figures. The pertinent AEC report clearly states that its estimates are based on an assumed fivefold enrichment of Sr^{90} (not four- to five-fold, as stated in CNI's letter). The AEC prediction for the most probable average venting of fallout was 5 percent, and for Sr^{90}, 25 percent. Obviously CNI's report, which postulated a further fivefold increase in Sr^{90}, must be wrong, since the fallout can hardly contain more than 100 percent of all the Sr^{90} produced by the test. Further, Dr. Friedlander, in calculating CNI's estimate of the average Sr^{90} deposit throughout the zone, simply multiplied the AEC estimate by 10, and although CNI might well argue that the deposit "some distance downwind" might be 10 times the AEC estimate, the average deposit throughout the zone can hardly, for the reason noted above, be off by more than a factor of 4.

CNI is correct in criticizing my handling of the television example, although if readers will refer to my article I think they will find that the error is not as significant as CNI implies. What is curious is that CNI itself has included a grosser form of this same error in its own report. CNI does not inform its readers that there is no danger of genetic damage from Sr^{90}, but actually includes a reference to the possibility of genetic damage. Further, Dr. Commoner's article in the CNI report, in giving figures on the generally recommended guide lines for Sr^{90} absorbtion in humans, does not give the figure for Sr^{90} (67 units) but instead gives the figure for whole body exposure (including, of course, the gonads) and announces that "this corresponds to about 17 strontium units in the bone." Thus CNI misleads its readers into believing the generally accepted guide line is smaller by a factor of 4 than the actual figure, and this is done by applying the whole body rate, deliberately set this low because it includes genetically dangerous exposure, to calculate a rate for

bone marrow, where the danger is solely somatic.

This ties in with CNI's complaint about my statement that the probable increase in Sr^{90} in the 700 Eskimos, under pessimistic assumptions, would be about equal to present levels. CNI gives the current level of strontium in Eskimos as 1 to 3 units. This is based on a total sample of six. The values are: an infant (2.42), a 7-year-old (3.35), and four adults (0.18; 1.94; 0.47; and 0.59). Aside from the small sample size, it is difficult to know what would be a fair average calculated from this data to compare with the National Committee on Radiation Protection guide line, which is 67 units for an average for individuals within a population, and three times this, 200 units, for a single individual within the population. The levels for very young children are higher since they have been exposed to a given level all their lives. If, as with the Chariot test, the level is not to be kept up by continued testing, the level in the children will fall as they grow. This makes the CNI calculation seem somewhat excessive, but if we accept their figure of 1 to 3 units as the range for the average figure and compare it with the relevant NCRP guide line (67 units), then the current levels would be about 1/67 to 1/22 of the guide line. Even under the assumptions in the CNI report this seems unlikely to be increased more than several times, if that much, and the increase, like the base, will be some small fraction of the guide line, in other words (to repeat my error) an increase "roughly the same" as current levels.

The point of my comparison of the potential increase, under pessimistic assumptions, with exposure from television and current levels of fallout was not to imply that the type or amount of radiation was precisely the same, but to give the reader a general idea of the magnitude of exposure involved, in contrast to the CNI report which talked repeatedly in terms of "great uncertainty" concerning the harm that might be done, of the fallout "sealing off Cape Hope," of "little margin for error," and which, in general, could not have been better phrased to scare the daylights out of the lay audience for which it was written.

4) Finally, I must insist that my article reflects quite precisely Dr. Commoner's responses to my questions concerning the misleading nature of the CNI report.—H. M.

Reprint Requests

Some years ago an article appeared in which the merits of printed "reprint-request" postcards were closely examined [J. Hedgpeth, *Am. Scientist* **42**, 497 (1954)]. Rather few of the cards' alleged merits withstood the author's critical scrutiny. The cards were adjudged discourteous, inconsiderate, and generally to be abhorred. In fact, I was sufficiently impressed by the fire of condemnation to forswear the use of such contemptible missives. Subsequently, each of my reprint requests was accompanied by a carefully worded letter of justification. Unfortunately, this habit was shattered by the disillusionment that resulted when I and several colleagues at Yale received smudged, printed reprint-request postcards from several of the same knights who had joined in challenging the boorish reprint collectors. Sad is the life of the idealists!

In recent months the need for renewed attack has become acute. To pass over, for the moment, the dozens of mailings to anonymous collectors that the cards demand, there are now appearing increasing numbers of cards requesting *two* reprints, "one for me and one for my library." When each of the two workers at an arctic research station sent me such a card the dam was breached, and this flow commenced. Perhaps these men were merely lonely and wanting to encourage correspondence. Perhaps their months of solitude in bitter arctic wastes had caused each to retreat from contact with the other (but two libraries?). In the face of such a pattern, however, it is clear that the most economical solution would be to abolish all journals and to offer all articles for sale as separates. Could the alternative proposed by Hedgpeth also be prayerfully reconsidered?

PETER H. KLOPFER
Department of Zoology, Duke University, Durham, North Carolina

Repetitive Self-Stimulation

Since Olds and Milner described the repetitive self-stimulation by rats with electrodes implanted in their brain, there has been increasing acceptance of the concept that this self-stimulation is of a rewarding nature. Certainly it is understandable how this view has arisen, but I submit that this

is not quite the correct significance of the phenomena observed. To equate this self-stimulation with reward is to equate it with a consummatory act. A consummatory act is accompanied by gratification and is followed by quiescence and by cessation of appetitive or searching behavior. Prior to culmination of the consummatory act an animal continues to search incessantly for gratification. This is manifested as "repetition compulsion" in myriad forms resembling the self-stimulation phenomenon. A rat, for instance, may copulate 50 times in rapid succession but stops after ejaculation.

From the physiological as well as the psychological standpoint it would appear that this self-stimulation has to do with the "promise of a reward," with a productive phenomenon anticipating the consummatory act. The questions to be asked are: Does it lead to cessation of the specific behavior? Is it followed by relaxation and sleep? Does a new form of behavior develop upon awakening? If an animal were to be stimulated in such a way that this sequence of events were to occur, we could properly refer to such stimulation as involving a reward system. (For comparison, consider the case of the donkey with a carrot held out in front of it. The Olds-Milner system never allows the donkey to get the carrot.) Otherwise we should continue to employ the term first used by Olds and Milner: *positive reinforcement system.*

WILLIAM J. TURNER
Central Islip State Hospital,
Central Islip, New York

Letters in "Science"

I hope you will permit a reader from foreign parts to offer his thanks to Conway Zirkle for writing the letter on degrees and titles [*Science* **133**, 1626 (1961)] and to you for publishing it. The activities of the Society for the Rationalization of the Title of Doctor cannot be too widely known. And while I am about it, thanks also to Kirby Walker for his letter, in the same issue (p. 1648), on books as prestige objects.

To those of us who spend our lives contemplating the dreary acres of scientific literature unrelieved by a spark of wit, it is a real joy to read such correspondence in a scientific journal.

BENJAMIN FULLMAN
29 Hampstead Hill Gardens,
London, England

The Yellin Case

A recent editorial, "One in eighteen thousand" [*Science*, **133**, 2037 (1961)], begins with the words: "For many scientific purposes an event that happens only once in ten or twenty thousand tries is statistically insignificant. . . . But in other cases, the focus of interest may be on the unusual event itself. . . ." That editorial represents for me just such an unusual event, since it is the first time that I have found an idea proposed by an editor of *Science* so repugnant and outrageous as to compel me to express myself in the form of a "letter to the editor."

I refer, of course, to the suggestion that: "To minimize the chance that so rare an event [the Edward Yellin case] will occur again the [National Science] Foundation need only include on its application form a question about the criminal record of the candidate."

I do not know what proportion of the members of the scientific community have criminal records, but I would guess that such individuals must be rare, indeed. Furthermore, to my knowledge, there is no evidence whatsoever that such persons, as a group, have demonstrated any lack of scientific ability, even if that term is interpreted to include such qualifications as "motivation, independence, objective judgment, accuracy, and integrity" in their scientific endeavors.

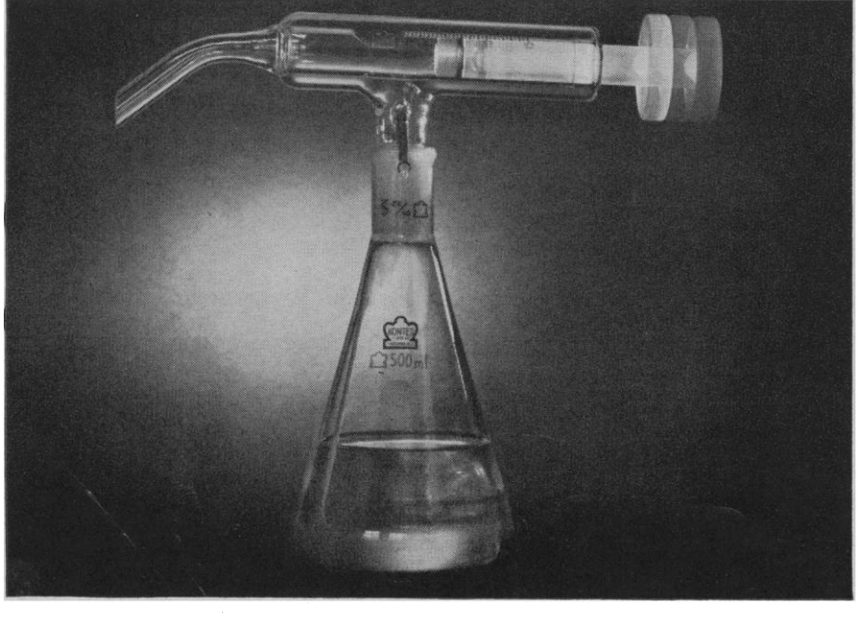
On the other hand, the National Science Foundation, and all other granting agencies, recognize that some small percentage of funds granted for scientific investigations is used illegally by scientific charlatans for their own furtherance or aggrandizement. Again however, there is no correlation, to my knowledge, between that group of persons engaging in such unfortunate activities, and the hypothetical group of investigators with previous criminal histories. Until such a significant, positive correlation has been demonstrated, it seems to me that the editor's suggestion is, at the very least, irrelevant.

Irrelevance is a sufficient reason not to accept a suggestion. However, I do not find this idea repugnant primarily because it is irrelevant, but because it is one more manifestation of a trend in present-day society to suggest, and sometimes even to accept, protestations and oaths of loyalty, purity, and moral righteousness in place of such qualities as capability, originality, and creative thought.

ROBERT L. DEHAAN
3003 North Calvert Street, Baltimore, Maryland

Your proposal in the editorial, "One in eighteen thousand," that National Science Foundation fellowship application forms include a question concerning the candidate's record of criminal convictions is reasonable enough, but it fails to touch on the central issue raised by the Yellin case—freedom of the individual conscience and the privacy of ideas.

National Science Foundation officials would not have had to face the stern inquisitors of the House Un-American Activities Committee if they had awarded a fellowship to an individual previously convicted of the common crime of embezzlement or bigamy. Yellin's offense was to invite an indictment for contempt of Congress by refusing to answer the House Un-American Activities Committee's questions about his past political associations on the grounds that this committee's investigation was an encroach-



ment of his constitutional rights of free speech and asembly guaranteed by the First Amendment. Yellin could easily have avoided serious difficulty with the committee and the citation for contempt by refusing to cooperate with the committee as hundreds of others have done in recent years by standing on the Fifth Amendment.

Yellin's challenge of the committee's right to probe the political beliefs of our citizens was undertaken with the clear knowledge that this action could result in his imprisonment. His decision to undergo this risk is in the highest traditions of our nation. It was awareness of this, I am sure, that helped Yellin win his reinstatement as a student after a hearing by the investigating committee of the University of Illinois.

Several years ago, an application for financial support of a research project on leukemia was rejected by an agency of the Public Health Service because the principal investigator, Linus Pauling, had failed to obtain the necessary political clearance. Public opposition to this unwarranted interference in research now makes it unnecessary for an investigator to undergo political screening to obtain a federal grant for a project in the health sciences.

Protection of freedom of thought is particularly important to us as scientists. It would be harmful to all of us if political clearance became a necessary condition to obtaining a federally supported fellowship.

MONROE SCHNEIDER
Jewish Chronic Disease Hospital, Brooklyn, New York

Krebiozen

We read with interest your notes on the Krebiozen trial [*Science* **133**, 1345 (1961)], which included reference to the Citizens Emergency Committee for Krebiozen.

If any further proof were required as to the validity of your statement that "professional sentiment in the field is overwhelmingly against Krebiozen," it is furnished by your most liberal application of the noun *scientist* to George D. Stoddard in connection with his criticism of the work of Andrew C. Ivy. Indeed, a large question involved in the litigation of Ivy versus Stoddard is that of freedom of research and inquiry in America. But to imply that a "scientist" in the field of education is qualified to criticize the work

of, and imply professional incompetence on the part of, a physiologist in the highly specialized field of cancer research is ludicrous, to say the least.

RHODA BOYKO
Citizens Emergency Committee for Krebiozen, New York, New York

According to American Men of Science, *Stoddard is a former head of the department of psychology at the University of Iowa. In recent years he has held administrative posts, and he is now chancellor of New York University.*—ED.

Mathematics Degrees

I noted with interest the editorial on the proposed Doctor of Arts degree for noncreative mathematicians [*Science* **133**, 1979 (1961)]. I commend you for publishing it.

I would urge, however, that it may be equally productive to consider a more restricted designation than the current Ph.D. for programs which stress the creative aspects of a discipline more than a scholarly treatment of its substance, structure, and relation to other fields of knowledge. For the former group, the Doctor of Mathematics might be appropriate.

H. CRAIG SIPE
George Peabody College for Teachers, Nashville, Tennessee

Communication between Social and Physical Scientists

In the 12th to 14th paragraphs of the New York *Times* obituary of the Soviet physicist Kurchatov (8 February 1960), the following sentences appeared (p. 4).

"One of Dr. Kurchatov's most significant public statements came in early 1958 when he publicly asserted that it was the Soviet Union, not the United States, that invented the hydrogen bomb. . . .

"That the Academician's claim may be correct has been indicated by evidence published in this country that the Soviet 1953 thermonuclear explosion was accomplished with the use of a form of lithium deuteride as a solid. This evidence suggests that the November, 1952, American thermonuclear device had to be very bulky because it contained much refrigeration apparatus

needed to keep the heavy hydrogen employed in liquid form. Not until March, 1954, a half year after the Russian explosion, the evidence suggests, did the United States explode a real hydrogen bomb utilizing lithium deuteride."

If it was news that the Russians had the first hydrogen bomb and that there was a period of 6 months in which a hydrogen-bomb gap existed, then, as the following comments suggest, the news was—and remains—quite well hidden.

An informal survey was conducted among social and physical scientists in the Cambridge, Massachusetts, area. Quite universally social scientists had not previously known that there had been an apparent 6-month hydrogen-bomb gap in Russia's favor, and what is more, although they professed to having read the *Times* story, they (again quite universally) had not appreciated what was being reported. Some of these persons, it might be noted, teach and write about international (and particularly military) policy.

Physical scientists, on the other hand, did not see the matter as news. Quite universally they had "here or there" picked up the information given in the story, and, what is more, they expressed surprise that it was, in some quarters, news.

At least two points are worthy of further consideration. First, the story, which if news was surely one of the most important stories of the postwar period, was not picked up, given headline status, or made any sort of national issue by those (congressmen, commentators, and so on) who make national issues. Indeed, when more recently Khrushchev repeated the assertion, reports of his speech indicated not that he was apparently correct but that this was a typical Soviet claim. Second, if social scientists are to concern themselves with offering advice and evaluating national policies, then some means must be found by which they are given at least that information which the community of physical scientists has acquired.

Suggestions for the regular transmission of such information certainly seem in order.

HARVEY SACKS
Department of Sociology, University of California, Berkeley
DAVID ZIPSER
Department of Biology, Harvard University, Cambridge, Massachusetts