SCIENCE

2 April 1965
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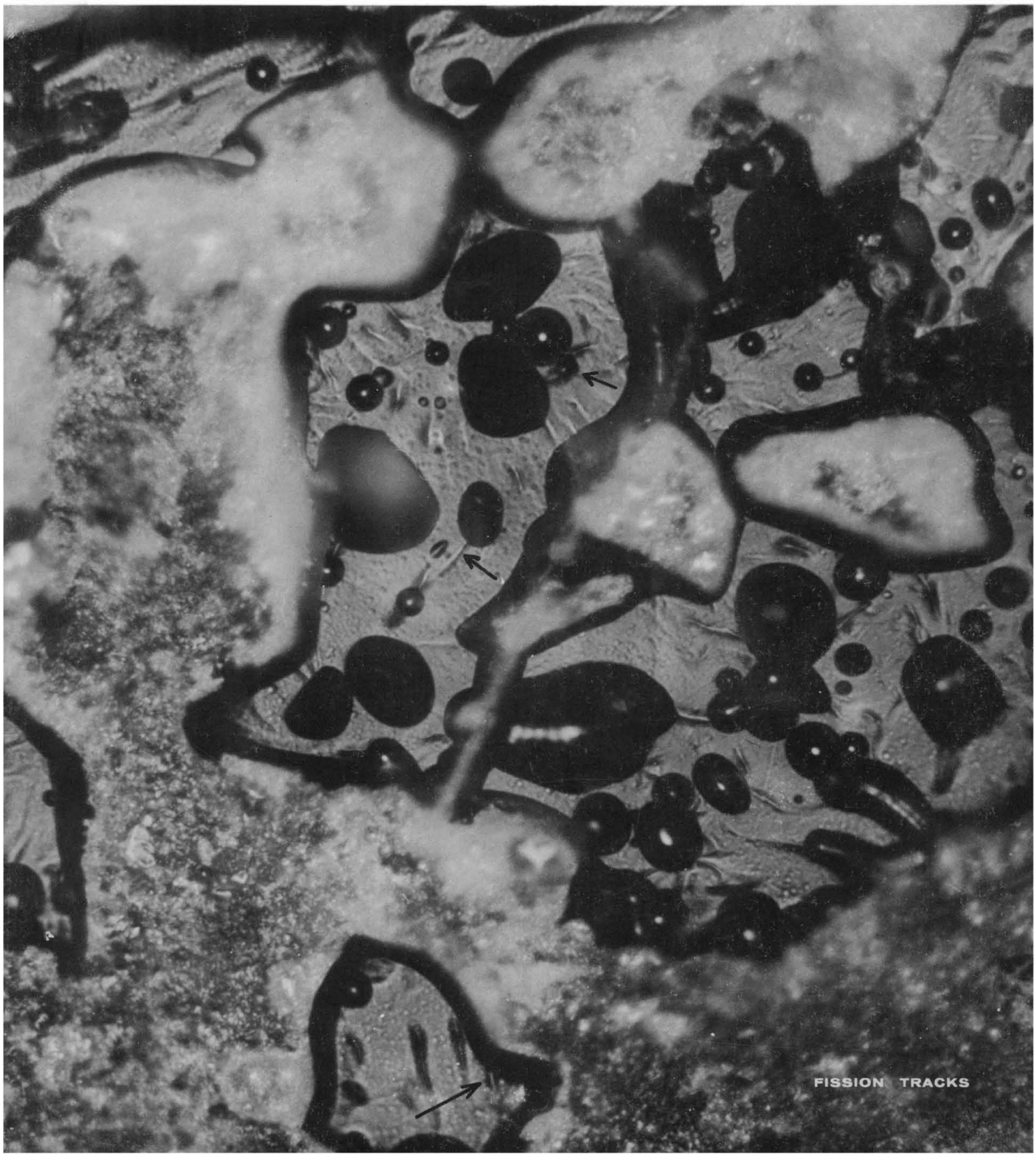
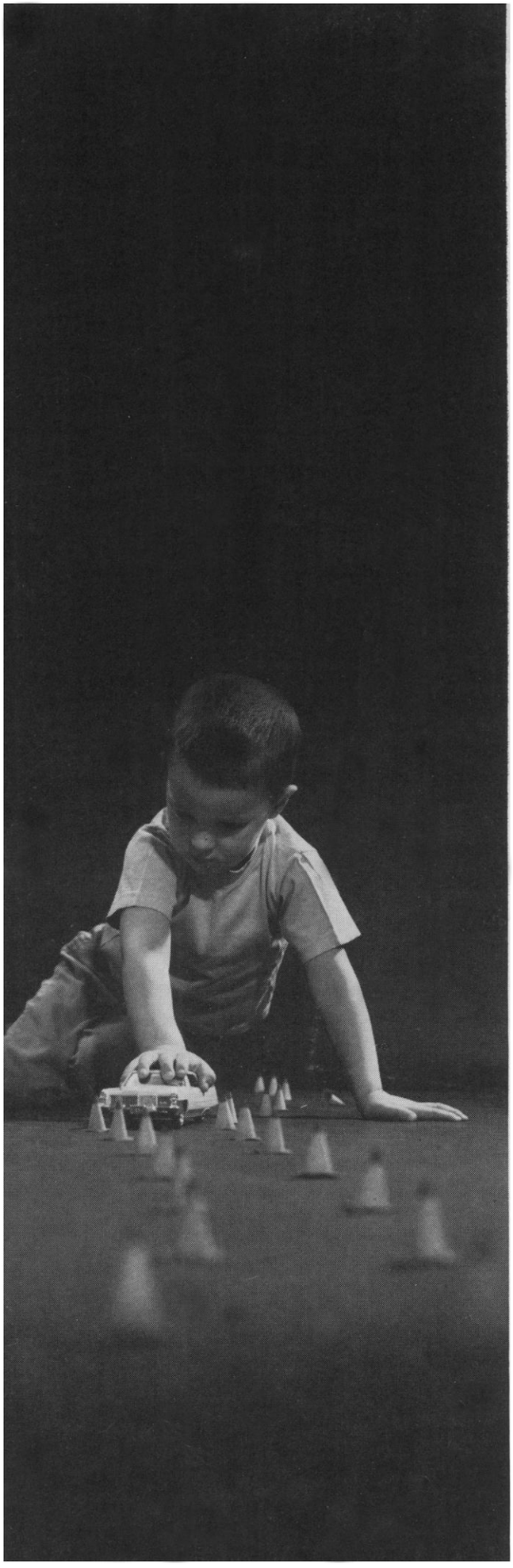
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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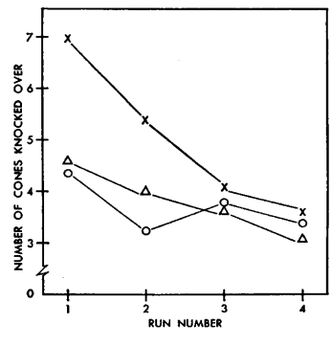

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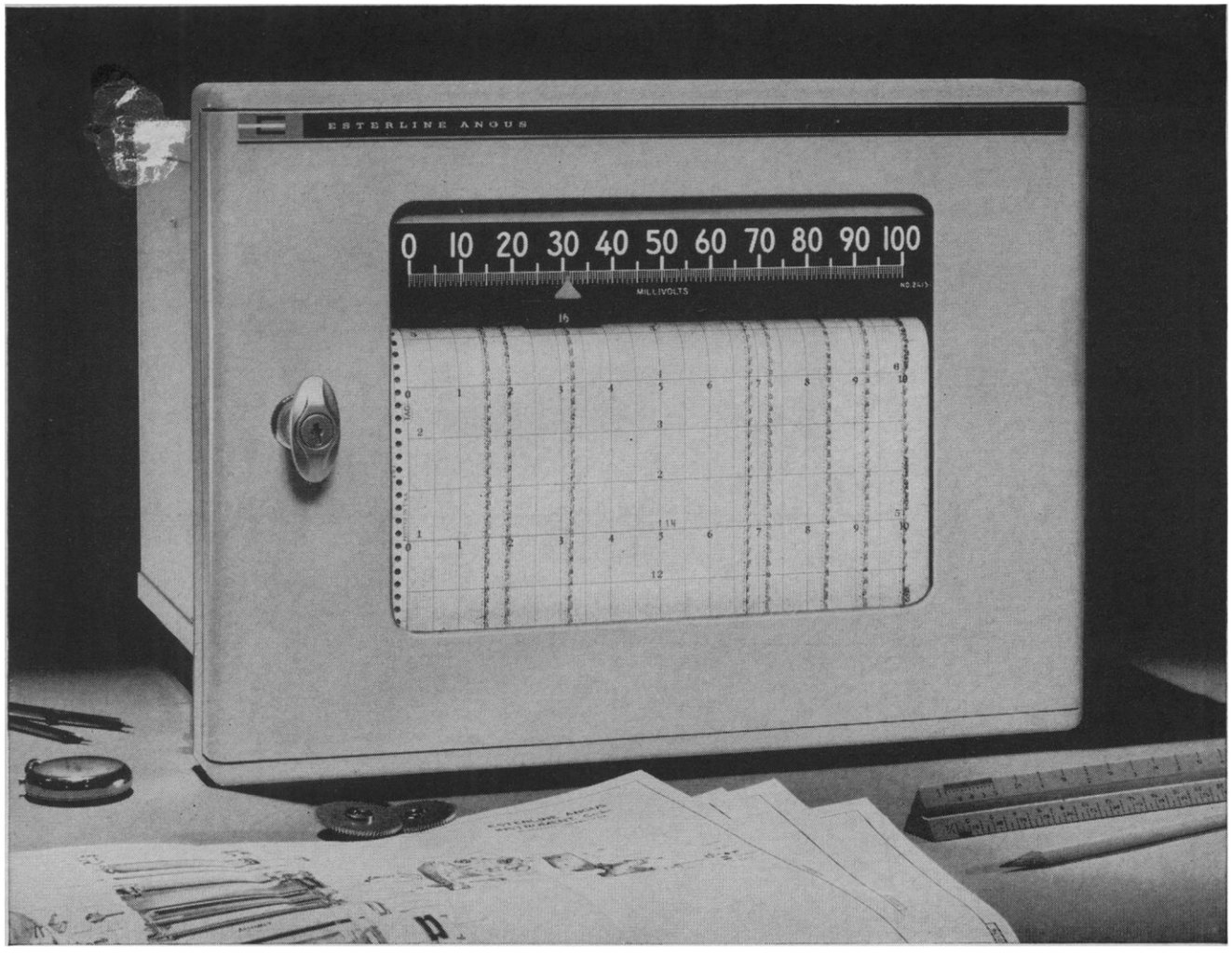

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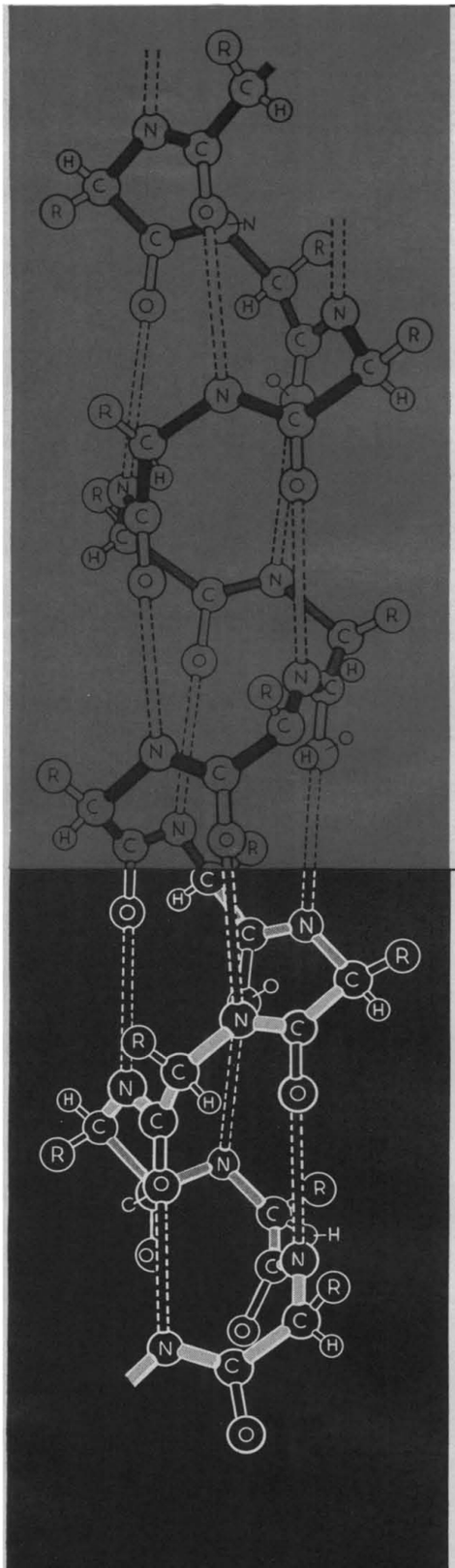
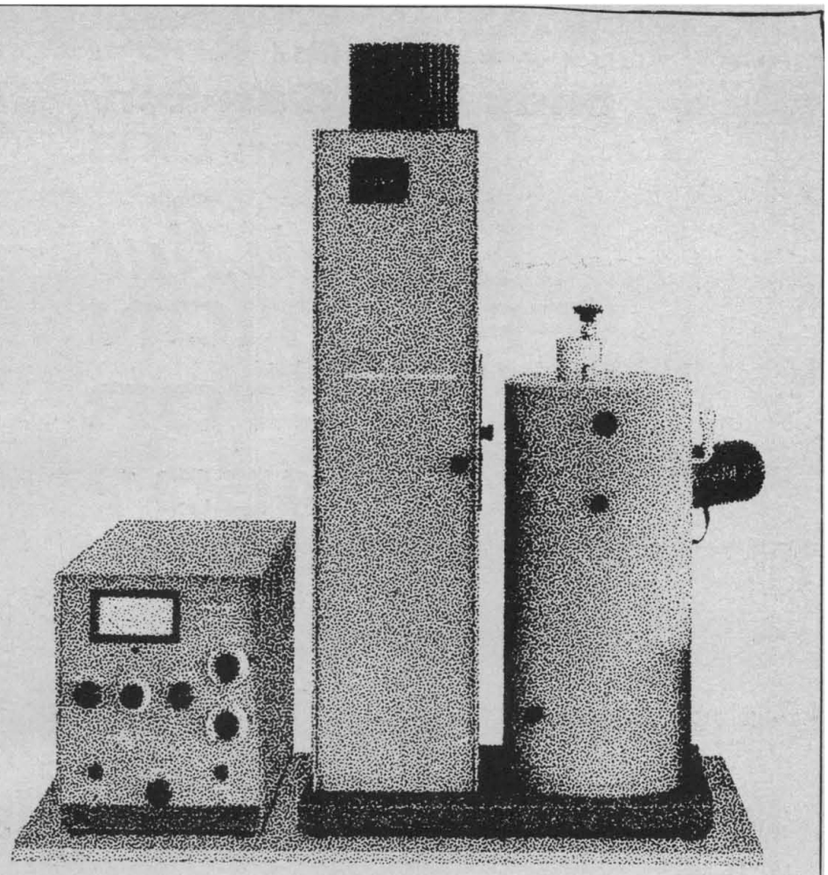
COVER

Pumice from the volcanic tuff of Bed I, Olduvai Gorge. The specimen was mounted in plastic, polished, and etched. The three arrows indicate the location of spontaneous fission events. Each event appears as an elliptical pit. The age of the pumice, determined by counting such events, has been found to be 2 million years (about × 700). See page 72.





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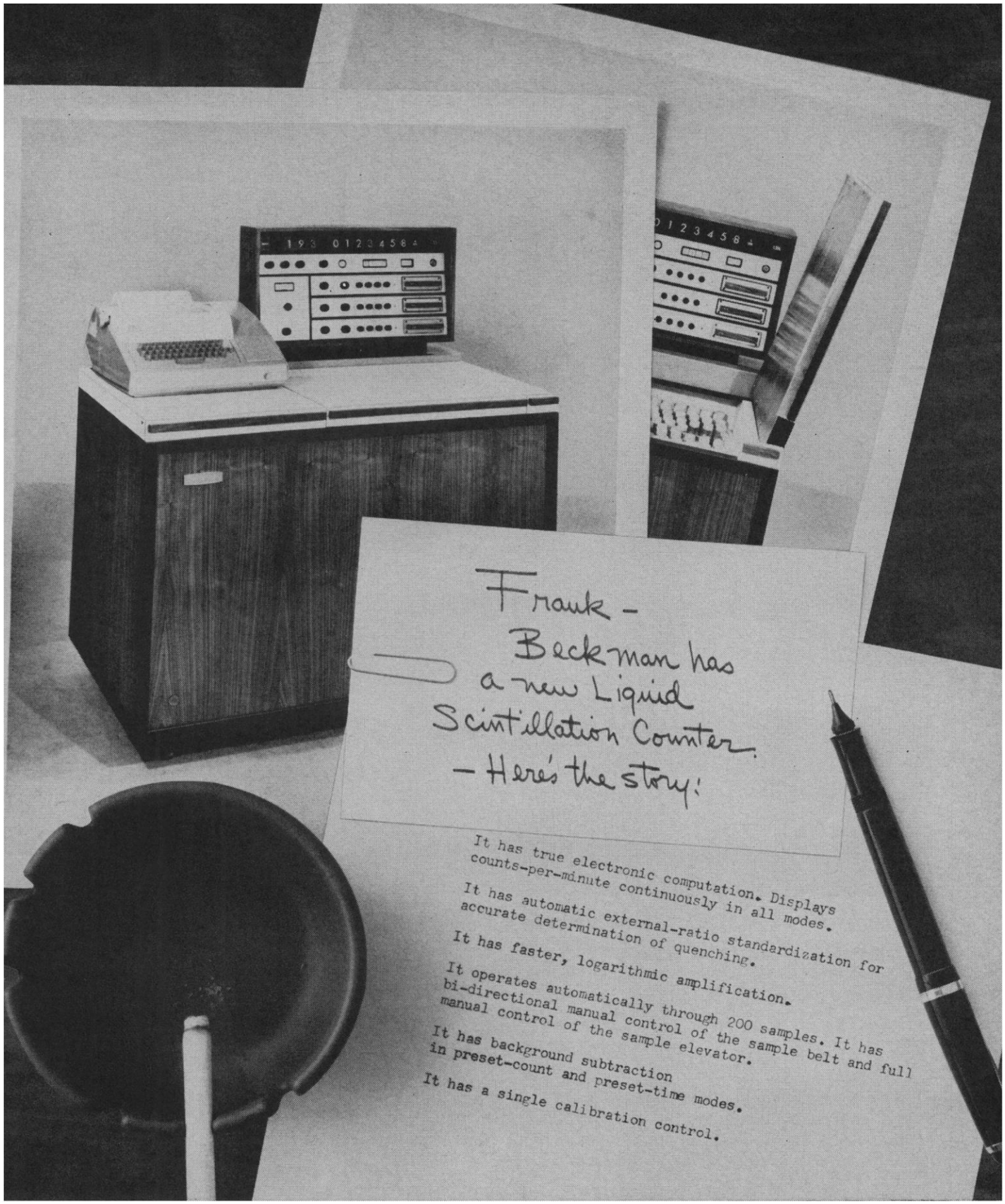

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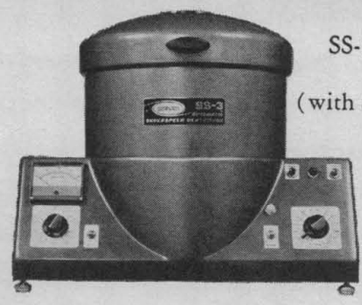

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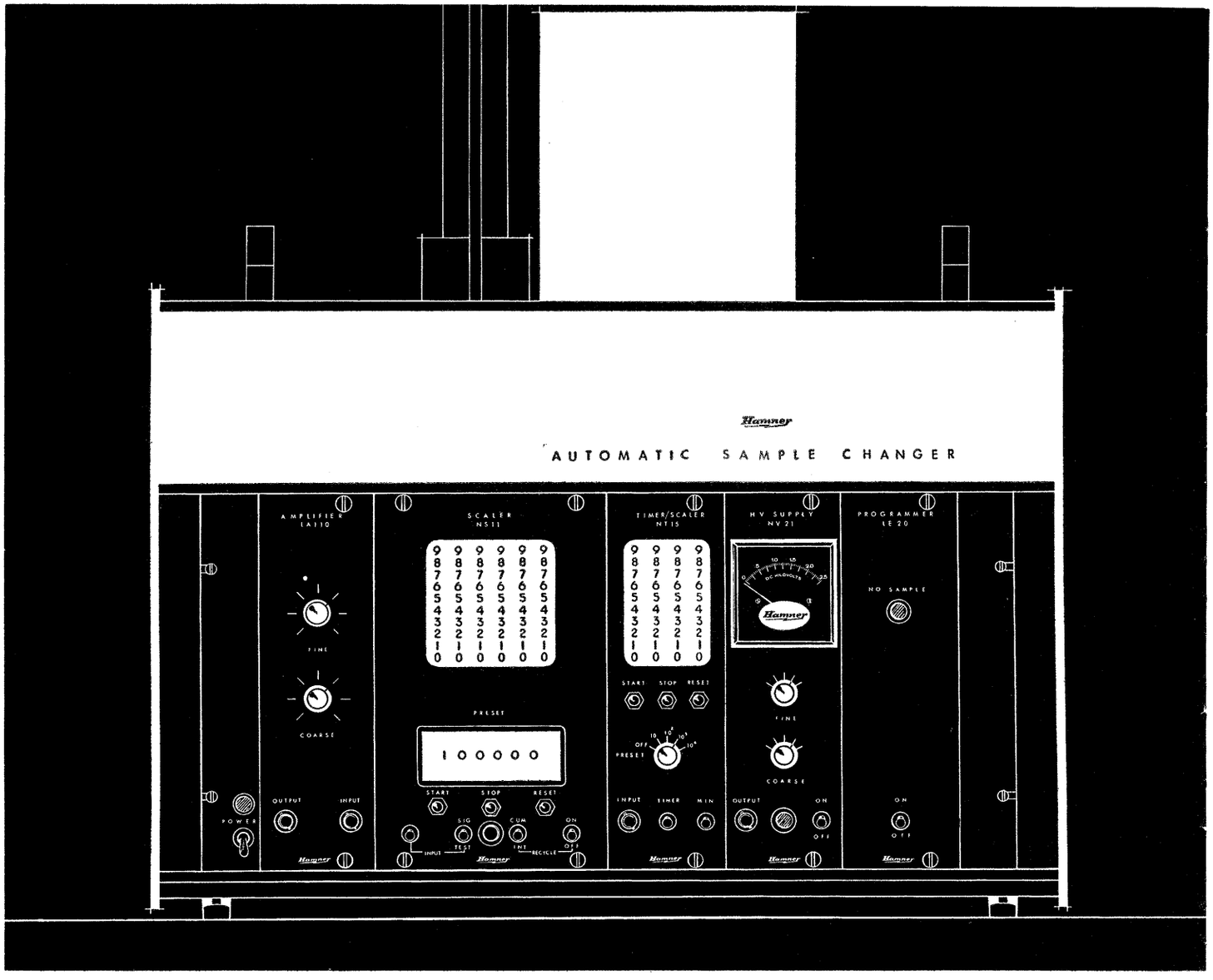

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The method originated in psychology, and it is obviously flexible. For instance, I have obtained meaningful zoning of an oil well in Alaska by applying factor analysis to palynological data that had resisted interpretation by standard techniques.

It will be of interest to some that I have adapted the Manson-Imbrie program to the system at Western Data Processing Center, where computing time is free to academic users from the 13 western states.

DONALD B. MCINTYRE
Department of Geology, Pomona College, Claremont, California

Congress and Science

In the News and Comment section of 15 January, John Walsh makes the following comment:

> While it should not be exaggerated, the current split on weather modification falls into the area of the problem of science advice for Congress. It represents, not a breakdown, but, rather, evidence that no adequate conduit between Congress and the community represented by the Academy and NSF has ever been soundly established.

This comment, made by an excellent reporter, concludes a discussion of the problems inherent in the government-sponsored weather modification program. In my view, however, it should not be allowed to stand unaltered. The article itself shows that the split referred to is alleged to exist in the Senate. I do not feel competent to say whether or not the statement is an accurate one with regard to the Senate. But Congress consists of two coordinate branches, and I certainly regard the statement as inaccurate so far as the House is concerned. The committee which I have the honor to chair has been working very hard for the past two years to develop a sound and useful relationship between the Academy, NSF, the Office of Science and Technology, and the scientific community generally. We believe that a good deal has been accomplished along these lines, and if the entities just mentioned were sounded out I believe that they would confirm this. Certainly much remains to be accomplished in this area, but the relationships which have now been begun rest on a solid basis and are, in our judgment, a significant step forward so far as technological advice for Congress is concerned.

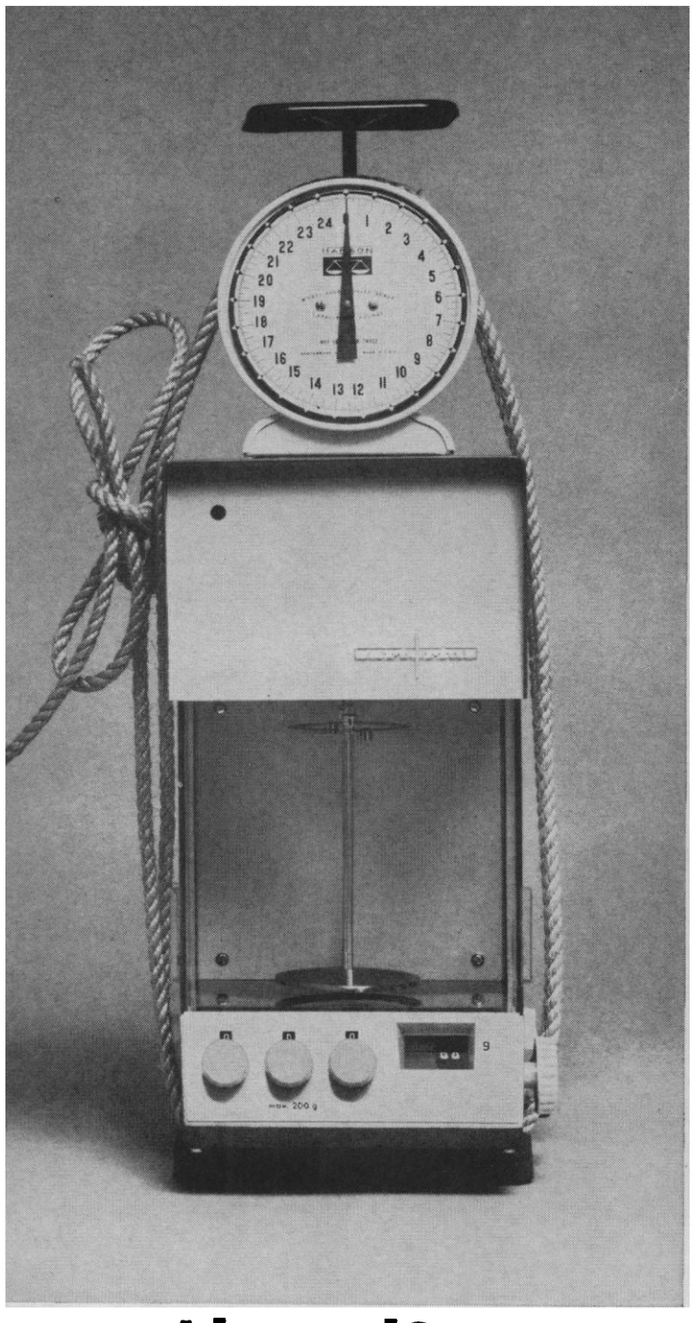
GEORGE P. MILLER
Committee on Science and Astronautics, House of Representatives, Washington, D.C.

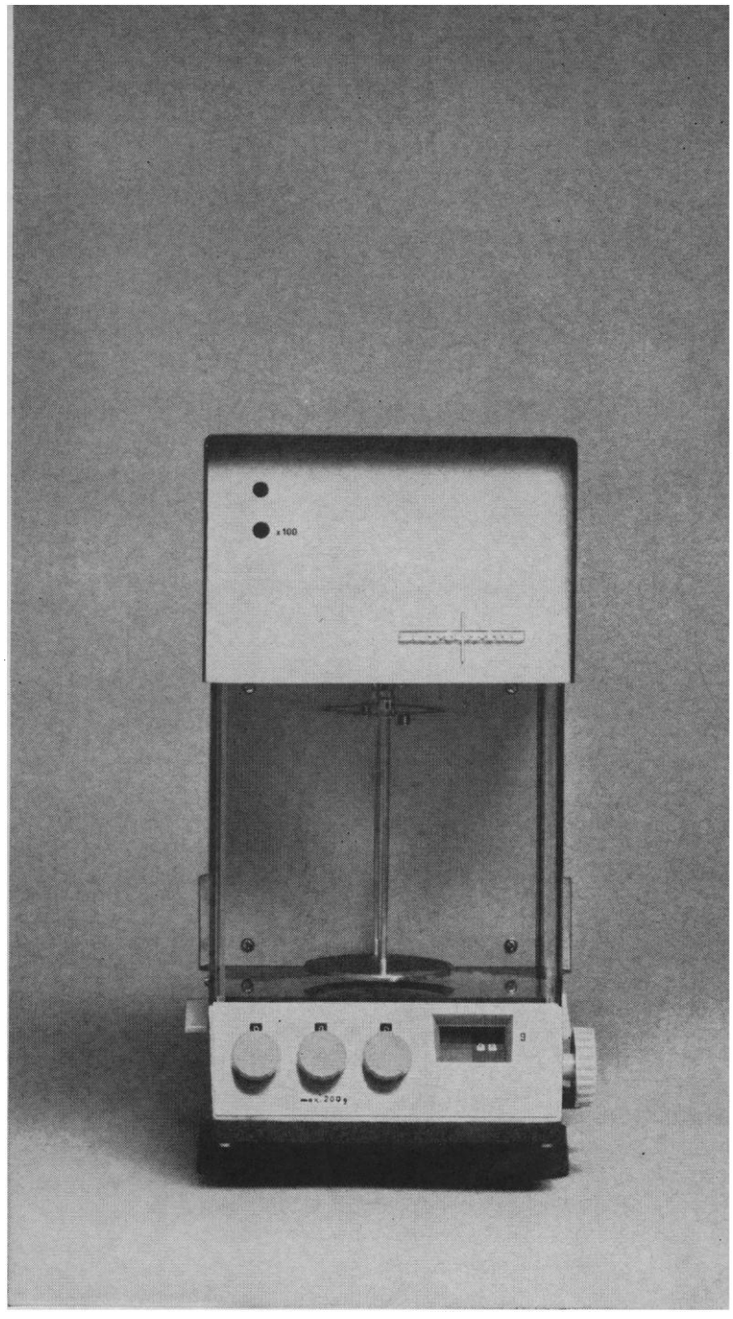
Title VI

Langer's analysis (29 Jan., p. 488) of Title VI of the 1964 Civil Rights Act, appearing shortly after the controversy precipitated by Ingle's article, raises several points of interest. One is her use of the term "tokenism" in close juxtaposition to the number of Negro students at some southern universities. What percentage of Negro students constitutes a token? Fixing a minimum fraction that must be exceeded would set up a quota system, an admission practice specifically labeled as discriminatory in the Department of Health, Education, and Welfare question-and-answer sheet. Clearly, the term *token* implies group-based thinking and has primarily emotional content when applied to the Civil Rights Act, where the goal is to guarantee to each *individual* treatment which does not discriminate "on the basis of race, color, or national origin."

While I suscribe to the opinion that Title VI will have an immense impact on southern life, it appears that there is a third alternative to the two potential fates Langer envisions for the bill—forceful administration or governmental hypocrisy—namely, enforcement as a result of individual or group prosecution in the courts. This alternative is not only "good politics," but also avoids involving the Public Health Service, National Science Foundation, Atomic Energy Commission, National Aeronautics and Space Administration, and certain other divisions of the federal government in activities of a primarily police type. In addition, while such an approach may not result in quite so rapid a "social revolution many people expect to be witnessing," it would certainly not permit the indefinite preservation of the Southern Way of Life.

MICHAEL D. GARRICK
32 University Circle, Charlottesville, Virginia





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The Continental Shelf

A new international Convention on the Continental Shelf gives to each coastal state sovereign rights over the adjoining seabed and subsoil out to wherever the sea is 200 meters deep, and, beyond that limit, for as much farther as it can exploit the natural resources of the undersea area. To a depth of 200 meters the right is exclusive; no other state can stake a claim within this limit. At greater depths, possession goes with ability to exploit. This new convention applies only to the land beneath the sea, not to the waters and not to the airspace above. It was drawn up in 1958 at the U.N. Conference on the Law of the Sea, but went into effect only recently, upon ratification by the necessary number of states.

The legal concept of the continental shelf had its first important formulation in 1945 when President Truman proclaimed U.S. ownership of the natural resources of the adjoining continental shelf. While there has been fairly general acceptance of this doctrine, the new convention constitutes an important codification that gives agreed form and certainty to the law governing rights to the seabed and subsoil, to mineral and other nonliving resources beneath the sea, and to living organisms that at the harvestable stage are either immobile or unable to move except in contact with the seabed or subsoil.

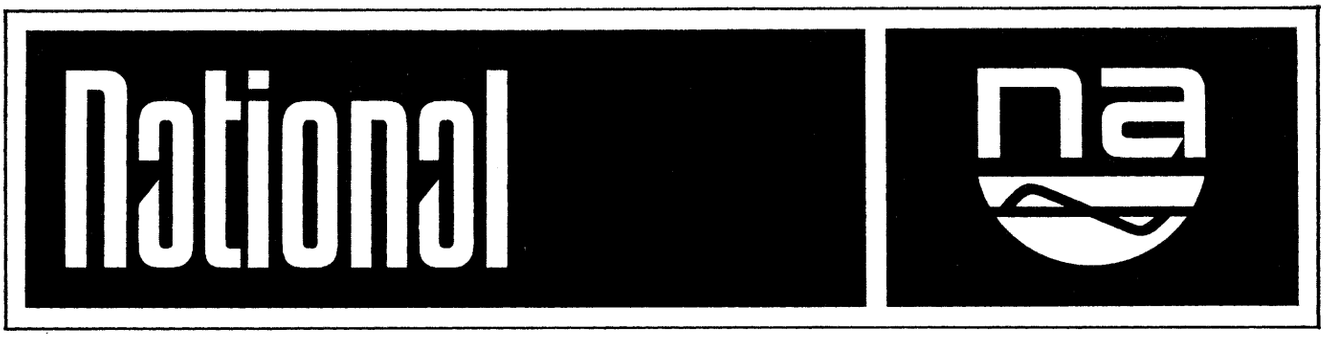
The granting of these rights is not intended to interfere with navigation or fishing rights, obligations to conserve living organisms of the sea, or the right of access for unclassified scientific research. Nor is there yet clarification of the confused problem of the extent of territorial seas. The U.S., in 1793, adopted the 3-mile limit, as have many other countries, but not all. The Scandinavian countries claim 4 miles; some of the Mediterranean countries, 6 miles; and others, 9 or 12.

But the right to subsea resources is now clear. In 1959, the year after this convention was written, the discovery in Holland of one of the world's largest gas fields raised hopes that more riches might lie under the 220,000 square miles of the shallow (average depth = 50 meters) North Sea. Under license from the six bordering countries, 50 companies in various joint ventures are prospecting for North Sea oil and gas deposits. Off the California coast, drilling for oil is already going on at a depth of almost 200 meters. The Mohole project and other crustal drillings for scientific purposes will provide experience that will help to extend present commercial limits to much greater depths. The recent National Academy of Sciences report on oceanography reports current exploitation of submarine diamond, tin, iron, and sulfur resources, as well as oil and gas, and predicts early mining of gold off the Alaska shore. Phosphates, chromite sands, and other material seem promising possibilities. The same report points out that wherever modern beaches have potentially valuable mineral content, there is good likelihood that the drowned Pleistocene beaches farther offshore have similar content.

The 3-mile limit was defined, partly at least, in terms of 18th-century technology, the estimated range of land-based artillery. But the definition was pessimistic and inflexible. The new convention also involves a technological definition, but a flexible and more optimistic one. The seabed is available for each coastal state to exploit as far as it can. The limit will move farther and deeper as technology advances.

—DAEL WOLFLE

How to identify the finest laboratory apparatus money can buy.



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sites studied, since the effects of local terrain cannot be ignored in describing turbulence and diffusion. In addition, Heinz Lettau presented a new hypothesis which relates eddy velocity and mean wind velocity by means of a three-dimensional vector expression. Application of proper boundary conditions to the problem leads to realistic wind profiles.

The greatest interest at the conference centered about turbulence and its relationship to the diffusion of aerosols. A theoretical approach to the problem of turbulence was offered by Hans Panofsky, who reviewed the principles of similarity theory and showed how some statistics of turbulence can be related to lapse rate, terrain, height, and mean wind speed.

F. N. Frenkiel pointed out that rigorous solutions of the complicated equations of fluid dynamics are becoming practical through the use of high-speed computing techniques. Computers are also valuable for processing the large amounts of experimental data involved in the microscale of turbulence. A large part of research on turbulence consists of statistical analysis of data obtained during field studies of wind. Several papers reported investigations of this type over various terrains. Measurements were made of vertical and horizontal wind fluctuations at several heights. Analysis included spectral energy distributions over ranges from small-scale mechanical turbulence to semidiurnal cycles. Many such studies are needed to increase our understanding of microscale processes.

Diffusion problems are currently studied directly by making measurements at grid points of tracer dosages from a known source. However, forecasting the dispersal of contaminants depends on ability to predict the fine structure of the winds. Several theoretical and empirical models are used to evaluate diffusion on the basis of turbulence statistics, which include terrain effects, source size and release time of the contaminants, and wind speed. Factors which are important in selecting the time and space scales to be used in various studies for the prediction of dosage levels and distributions were also the subject of many of the papers presented.

The conference was concluded with a panel discussion of the relation between turbulence and diffusion, chaired by Morton L. Barad. Members of the panel were S. Corrsin, H. E. Cramer, F. N. Frenkiel, F. A. Gifford, Jr., G. R. Hilst, and H. A. Panofsky. Much of the discussion revolved about the problems inherent in using Eulerian turbulence statistics to describe the basically LaGrangian process of diffusion. While data leading to Eulerian statistics are easily obtainable with current instrumentation, diffusion studies require data on moving "parcels" of turbulence which cannot be obtained with the sensing systems now available. Bubbles and balloons which simulate such parcels can be tracked but tend to influence the microscale system under study. A feasible approach in the future could include the use of lasers. Another suggestion was the greater use of high-speed electronic computers as experimental tools. Increased attention to and use of wind-tunnel modeling and testing by engineers and classical fluid dynamicists should be encouraged. In conclusion, the perennial request for increased communication among related disciplines was made during both the panel discussion and the discussion from the floor which followed.

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Relativistic Astrophysics

Quasi-stellar sources, commonly called "quasars," are the most distant observable objects in the universe; they are so vast and so brilliant that their very existence cannot be explained by present physical laws. Their ability to generate enormous amounts of energy is not understood. The second of a series of symposiums on the subject (sponsored by the University of Texas and the Southwest Center for Advanced Studies, Dallas, Texas) attracted about 500 participants from various disciplines and many countries to the university in Austin for 5 days in December 1964; present were physicists and astrophysicists, relativists and mathematicians, radio and optical astronomers.

At this second symposium much more information on many more quasars was presented, but no clear solutions to the questions posed by these observations emerged. The hypothesis of gravitational collapse, a process of implosion followed by explosion, that was favored at the first

symposium (Dallas, December 1963) seems to be losing ground; relativity theory may provide an answer. Formal talks and discussions were largely limited to presentation of data, with a properly tentative approach to their interpretation.

But theories were inescapable. One of the more outstanding performances was the opening talk by Geoffrey Burbidge (University of California, San Diego) on "Extragalactic effects of high-energy radiation." Estimates proposed at the first symposium have been increased something like 1000 times. Burbidge listed some of the factors contributing to these larger estimates: physicists had assumed that the fast-moving particles in these sources were accelerated by a mechanism working with 100-percent efficiency. Burbidge proposed instead that an efficiency of only 0.03 percent be assumed; if the observed values for the atomic particles in these radio sources are taken in conjunction with this revised estimate of efficiency, one can easily assume that the original energy input needed to produce these gigantic events is at least 3000 times larger.

This interpretation was challenged by John Bolton (Commonwealth Scientific and Industrial Research Organisation, Sydney, Australia), who, with the advantage of the 210-foot (64-m) radio telescope at Parkes Observatory, had found that strong radio sources have the appearance of huge clouds shaped like dumbbells. These dumbbells, Bolton believes, have a shell-like structure, with high-energy particles tending to concentrate in areas of much greater brightness at the outer edges. At these bright edges, which were also described by Thomas Matthews (California Institute of Technology), it is possible that the energy builds up to the point where the gas smashes its way through the perimeter of the "dumbbell" to form a new cloud or quasar. This theory, too, had its detractors; one of the many talking points was whether a large quasar is in process of expansion leading to reproduction in an amoeba-like fashion, or whether, in losing energy, it is in fact shrinking.

Another high point in the symposium was the talk on "Models of quasi-stellars" by Maarten Schmidt (Mount Wilson and Palomar Observatories). Schmidt took the trouble to convince his audience by a process of simple logic that the quasars are in fact more than 10^9 light years away,

and that they are enormous—several thousand light years across. He pictures their structure as resembling an onion, with several layers of skin. The outer skin is relatively thin, a cloud of high-energy atomic particles; the second skin is another thin shell of glowing, rarefied gas, which emits light predominantly at a few fixed frequencies. The inner core, much smaller, is thought of as a sort of hot superstar of perhaps 10^8 solar masses, with a temperature of over 10,000°C; its diameter may be as little as a light year.

Before the concept of a red-hot onion was served to the participants, they viewed the sky photographs presented by Allan Sandage (Mount Wilson and Palomar Observatories). The beauty and order of the pictures were reflected in the clarity and symmetry of Sandage's talk in which he gave the latest count (by now, doubtless, out of date) of 34 identified quasars. In the last few weeks before the conference, 15 new objects had been identified in a systematic search with the 48-inch (120-cm) Palomar Schmidt telescope. An enigmatic characteristic of these confusing objects is enormous variation in brightness of the quasars that Sandage had observed. The radio source known as 3C2 has varied in brightness by as much as a factor of 4 in the last 2 years—many times more than any other observed source. It is possible that 3C2 is the most distant object in the universe and is retreating from us at a speed very close to that of light.

Henry Palmer (Jodrell Bank Radio Observatory, England), who started the hunt for quasars nearly a decade ago, reported on the newly discovered sources. His observations had been made with the world's largest scientific instrument, a radio interferometer more than 100 miles (160 km) long.

H. Friedman (Naval Research Laboratory, Washington, D.C.) reported discovery of a number of new x-ray sources; one of them, Scorpio, may be only 30 light years away.

William Fowler (California Institute of Technology), in summing up the discussions of neutrinos, pointed out that our knowledge of the properties of neutrinos is minute. Attempts to increase such knowledge are being made in South Africa, near Johannesburg, where Frederick Reines (Case Institute of Technology) is installing a first crude neutrino telescope in a mine at a depth of 3450 m. The depth below Earth's surface represents an attempt to screen the instrument from cosmic radiation; one cosmic neutrino candidate has already been detected. Davis (Brookhaven) reported on a project to bury a tank filled with 400,000 liters of cleaning fluid in a deep mine; there, it is hoped, a few of the chlorine atoms in the tank will be transformed into argon atoms by neutrino radiation. If this experiment is successful, it will provide direct proof that neutrinos come from the sun, which will be established as a nuclear-fusion device; it will also have produced an instrument capable of "looking into" the sun's central region, hitherto an impossibility.

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Forthcoming Events

April

6–9. Royal **Aeronautical** Soc., conf., Nottingham, England. (H. Umpleby, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, England)

6–9. **Automatic Control**, conv., Nottingham, England. (H. Umpleby, Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, England)

7–9. American Assoc. for **Cancer Research**, 56th annual, Philadelphia, Pa. (AACR, 7701 Burholme Ave., Fox Chase, Philadelphia 19111)

7–9. The **Chemical** Soc., anniversary meetings, Glasgow, Scotland. (CS, Burlington House, London, W.1, England)

7–9. **Nucleation Phenomena**, intern. symp., Cleveland, Ohio. (A. G. Walton, Dept. of Chemistry, Case Inst. of Technology, University Circle, Cleveland 6)

7–9. **Pesticides**, U.S.–Japan Cooperative Science program, Honolulu, Hawaii. (Office of Intern. Science Activities, Natl. Science Foundation, Washington, D.C.)

7–9. **Stress Analysis**, conf., Bristol, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

7–16. **Instrumentation for Hydraulic Research**, U.S.–Japan Cooperative Science Program seminar, Tokyo, Japan. (Office of Intern. Science Activities, Natl. Science Foundation, Washington, D.C.)

8–9. **Histochemical** Soc., 16th annual, Philadelphia, Pa. (S. S. Spicer, National Institute of Health, Bethesda, Md. 20014)

8–9. **Microbiological Deterioration in the Tropics**, symp., London, England. (Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1, England)

8–9. British Inst. of **Radiology**, annual congr., London, England. (BIR, 32 Welbeck St., London, W.1)

8–9. **X-ray Analysis**, Conf., Inst. of

Physics and the Physical Soc., Edinburgh, Scotland. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

8–10. North Pacific Soc. of **Neurology and Psychiatry**, Portland, Ore. (W. W. Thompson, 3300 S.W. Dosch Rd., Portland)

8–10. American **Radium** Soc., New Orleans, La. (J. L. Pool, 444 E. 68 St., New York 10021)

8–14. American Soc. for **Biological Chemists**, annual, Atlantic City, N.J. (K. Bloch, Harvard Univ., Cambridge 38, Mass.)

9–10. American Soc. for **Artificial Internal Organs**, Atlantic City, N.J. (B. K. Kusserow, Dept. of Pathology, Univ. of Vermont College of Medicine, Burlington)

9–10. American Assoc. of **University Professors**, Washington, D.C. (W. P. Fidler, AAUP, 1785 Massachusetts Ave., NW, Washington, D.C.)

9–11. Southwestern **Psychological** Assoc., annual, Oklahoma City, Okla. (O. Parsons, Dept. of Psychiatry, Neurology, and Psychology, Oklahoma Medical Center, Oklahoma City)

9–13. Mediterranean Cooperation for **Solar Energy**, Istanbul, Turkey. (M. Perrot, c/o Faculte des Sciences, Pl. Victor Hugo, Marseilles, France)

9–14. Federation of American Societies for **Experimental Biology**, 46th annual, Atlantic City, N.J. (Mrs. H. B. Lemp, FASEB, 9650 Wisconsin Ave., Washington, D.C. 20014)

10. **New Mexico** Acad. of Sciences, Socorro. (K. S. Bergstresser, 739 42nd St., Los Alamos, N.M.)

10–12. **Aerospace Electronics**, natl. conf., Dayton, Ohio. (Inst. of Electrical and Electronics Engineers, Dayton Office, 1414 E. 3 St., Dayton)

10–14. American Soc. for **Experimental Pathology**, Atlantic City, N.J. (H. D. Moon, Univ. of California School of Medicine, San Francisco 94122)

10–14. American Inst. of **Nutrition**, annual, Atlantic City, N.J. (O. Mickelsen, Dept. of Foods and Nutrition, Michigan State Univ., East Lansing)

10–14. American **Physiological** Soc., Atlantic City, N.J. (R. G. Daggs, 9650 Wisconsin Ave., Washington, D.C.)

10–16. American Assoc. of **Immunologists**, Atlantic City, N.J. (B. H. Waksman, Massachusetts General Hospital, Boston 14)

11–15. **Calcified Tissues**, 3rd European symp., Davos, Switzerland. (H. Fleisch, Laboratorium für Experimentelle Chirurgie, Schweizerisches Forschungsinstitut, Davos)

12–13. **Inorganic Single Crystals**, symp., London, England. (Asst. Secretary, Soc. of Chemical Industry, 14 Belgrave Sq., London, S.W.1)

12–13. **Seismological** Soc. of America, annual, St. Louis, Mo. (C. Kisslinger, Dept. of Geophysics and Geophysical Engineering, St. Louis Univ., 3621 Olive St., St. Louis 63108)

12–14. **Atomic Spectra and Radiation Processes**, conf., Oxford, England. (Administration Asst., Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1, England)

12–14. **Ballistocardiography and Cardio-**

vascular Dynamics, 1st world congr., Amsterdam, Netherlands. (A. A. Knoop, Physiological Laboratory, Free Univ., Valeriusplein 11, Amsterdam)

12–15. American **College Personnel** Assoc., Minneapolis, Minn. (A. H. Hitchcock, 1605 New Hampshire Ave., NW, Washington, D.C. 20009)

13–14. Kinetics of **Proton Transfer Processes**, Faraday Soc., Univ. of Newcastle-upon-Tyne, England. (FS, 6 Gray's Inn Square, London, W.C.1, England)

13–14. **Thermal Analysis**, symp., London, England. (B. R. Currell, Dept. of Chemistry, Mathematics, Biology, and Geology, Northern Polytechnic, Holloway Rd., London, N.7)

13–15. **Telemetering**, natl. conf., Houston, Tex. (R. W. Towle, Advanced Technology Laboratories, 369 Winsman Ave., Mountain View, Calif.)

13–17. American Soc. of **Parasitologists**, 40th annual, Atlanta, Ga. (F. J. Kruidenier, Dept. of Zoology, Univ. of Illinois, Urbana)

13–17. **Rehabilitation**, Pan Pacific conf., Tokyo, Japan. (Intern. Soc. for Rehabilitation of the Disabled, 701 First Ave., New York 10017)

14. **Programmed Instruction in Medical Education**, symp., Newark, N.J. (A. Krosnick, Div. of Chronic Illness Control, New Jersey State Dept. of Health, Box 1540, Trenton 25)

14–16. **Water Resources and Pollution Control**, Raleigh, N.C. (C. M. Weiss, Box 899, Chapel Hill, N.C.)

15–16. **Heat Transfer** at Cryogenic Temperatures, Oklahoma State Univ., Stillwater. (J. D. Parker, Dept. of Mechanical Engineering, Oklahoma State Univ., Stillwater 74075)

15–16. **Programming and Control**, intern. conf., U.S. Air Force Academy, Colorado Springs, Colo. (O. J. Manci, G. B. Dantzig Operations Research Center, Univ. of California, Berkeley)

15–17. American **Ethnological** Soc., Lexington, Ky. (N. F. S. Woodbury, Office of Anthropology, U.S. Natl. Museum, Washington, D.C.)

15–17. Southern Soc. for **Philosophy and Psychology**, Atlanta, Ga. (E. A. Alluisi, Psychology Dept., Univ. of Texas, Austin 78712)

16–17. **Montana** Acad. of Sciences, Montana State College, Bozeman. (L. H. Harvey, Dept. of Botany and Microbiology, Montana State Univ., Missoula)

16–18. Association of **Southeastern Biologists**, annual, Charlottesville, Va. (J. N. Dent, Room 270, Gilmer Hall, McCormick Rd., Charlottesville 22903)

18–22. Association of American **Geographers**, annual, Columbus, Ohio. (E. Taafee, Dept. of Geography, Ohio State Univ., Columbus)

18–24. **Tsunami Run-up**, U.S.–Japan Cooperative Science Program mtg., Sapporo, Japan. (Office of Intern. Science Activities, Natl. Science Foundation, Washington, D.C.)

19–21. Nondestructive Evaluation of **Aerospace and Weapons System Components and Materials** (unclassified), San Antonio, Tex. (J. R. Barton, Southwest Research Inst., 8500 Culebra Rd., San Antonio 6)

19–21. **Biomedical Sciences Instrumen-**

tation, 3rd natl. symp., Instrument Soc. of America, Dallas, Tex. (D. R. Stearn, ISA, 530 William Penn Place, Pittsburgh, Pa. 15219)

19–21. Mechanics, Physics, and Chemistry of **Solid Propellants**, Purdue Univ., Lafayette, Ind. (A. C. Eringen, School of Aeronautics, Astronautics and Engineering Sciences, Purdue Univ., Lafayette)

19–22. Modern Trends in **Activation Analysis**, intern. conf., Texas A&M Univ., College Station. (R. E. Wainerdi, Texas A&M Univ., College Station)

19–22. American **Geophysical** Union, annual, Washington, D.C. (W. E. Smith, AGU, 1145 19th St., NW, Washington, D.C. 20036)

19–22. **Nuclear Magnetic Resonance**, 2nd annual workshop, Washington, D.C. (A. J. Rosen, Dept. of Chemistry, Georgetown Univ., Washington, D.C.)

20–22. **Frequency Control**, 19th annual symp., Atlantic City, N.J. (Director, U.S. Army Electronics Laboratories, Headquarters, U.S. Army Electronics Command, Attn: AMSEL-RD-PF, Fort Monmouth, N.J. 07703)

20–22. **Great Plains**, symp., North Dakota State Univ., Fargo. (S. W. Russell, North Dakota State Univ., Fargo)

20–22. **Physics of Solids at High Pressures**, 1st intern. conf., Tucson, Ariz. (C. T. Tomizuka, Dept. of Physics, Univ. of Arizona, Tucson 85721)

20–22. Photochemical Aspects of **Air Pollution**, symp., Cincinnati, Ohio. (A. P. Altshuller, Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 45226)

20–22. **System Theory**, symp., Polytechnic Inst. of Brooklyn, Brooklyn, N.Y. (J. Fox, Polytechnic Inst. of Brooklyn, 333 Jay St., Brooklyn 1)

20–23. American Assoc. of **Anatomists**, annual, Miami, Fla. (R. T. Woodburne, Dept. of Anatomy, Univ. of Michigan, Ann Arbor 48104)

20–23. American **Meteorological** Soc., spring meeting, Washington, D.C. (K. C. Spengler, 45 Beacon St., Boston 8, Mass.)

20–23. U.S. Natl. Committee, Intern. **Scientific Radio Union**/Inst. of **Electrical and Electronics Engineers**, spring meeting, Washington, D.C. (A. T. Waterman, Stanford Electronics Laboratories, Stanford Univ., Stanford, Calif.)

21. **Oral Cancer**, 3rd annual symp., Poughkeepsie, N.Y. (M. A. Engelman, 1 East Academy St., Wappingers Falls, N.Y. 12590)

21–22. **Mathematical Geodesy**, symp., Turin, Italy. (A. Marussi, Univ. of Trieste, Trieste, Italy)

21–23. American Inst. of **Chemists**, 42nd annual, Richmond, Va. (R. E. Anderson, Albemarle Paper Manufacturing Co., Richmond 23217)

21–23. **Cognitive Processes and Clinical Psychology**, 3rd symp., Univ. of Colorado, Boulder. (R. Jessor, Dept. of Psychology, Univ. of Colorado, Boulder)

21–23. **Combustion** Inst., western states section, spring meeting, Hollywood, Calif. (A. S. Gordon, Forrestal Research Center, Princeton Univ., Princeton, N.J.)

21–23. Instititute of **Environmental Sciences**, 11th annual, Chicago, Ill. (IES, 34 Main St., Mount Prospect, Ill. 60057)

21–23. Engineering Aspects of **Magnetohydrodynamics**, 6th symp., Pittsburgh, Pa. (E. Reshotko, Div. of Electrical Engineering, Case Inst. of Technology, Cleveland, Ohio 44106)

21–23. Support for **Manned Flight**, conf., Dayton, Ohio. (G. L. Schwarz, Headquarters, AF Logistics Command (MCO), Wright-Patterson Air Force Base, Ohio)

21–23. **Marine Sciences Instrumentation**, 3rd natl. symp., Instrument Soc. of America, Univ. of Miami, Miami, Fla. (H. A. Cook, Airpax Electronics, Inc., P.O. Box 8488, Fort Lauderdale, Fla.)

21–23. **Nonlinear Magnetics**, 3rd intern. conf. (INTERMAG), Washington, D.C. (E. W. Pugh, I.B.M. Components Div., Dept. 231, Bldg. 703-2, Poughkeepsie, N.Y. 12602)

21–23. **Ophthalmological** Soc. of the United Kingdom, annual, London, England. (Joint Secretariat, 47 Lincoln's Inn Fields, London, W.C.2)

21–23. **Optimization Techniques**, symp., Pittsburgh, Pa. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y.)

21–23. **Pulse Radiolysis**, symp., Manchester, England. (M. Ebert, Paterson Laboratories, Christie Hospital and Holt Radium Inst., Withington, Manchester 20, England)

21–24. Federation of European **Biochemical** Societies, Vienna, Austria. (The Secretariat, Alserstr. 4, Vienna 9)

21–24. British **Paediatric** Assoc., Scarborough, England. (E. W. Hart, Hospital for Sick Children, Great Ormond St., London, W.C.1, England)

21–2. **Industrial Chemistry**, 26th intern. congr., Paris, France. (Soc. of Industrial Chemistry, 28 rue St. Dominique, Paris 7)

22–23. **Nondestructive Testing** of Materials, intern. conf., Vienna, Austria. (Firma Gebr. Böhler & Co., A.G., Kapfenberg, Austria)

22–23. Chemistry of **Polymerization Processes**, symp., London, England. (W. R. Moore, Dept. of Chemical Technology, Bradford Inst. of Technology, Bradford 7, Yorkshire, England)

22–24. Eastern **Psychological** Assoc., 36th annual, Atlantic City, N.J. (M. A. Iverson, Queens College, Flushing, N.Y. 11367)

22–24. Role of the **Solvent in Chemical Kinetics**, E. A. Moelwyn-Hughes symp., Univ. of Arkansas, Fayetteville. (A. Fry, Dept. of Chemistry, Univ. of Arkansas, Fayetteville 72701)

22–24. **Wildflower Pilgrimage**, 15th annual, Great Smoky Mountains Natl. Park. (E. E. C. Clebsch, Dept. of Botany, Univ. of Tennessee, Knoxville)

23–24. **Georgia** Acad. of Science, Oglethorpe Univ., Atlanta. (J. T. May, School of Forestry, Univ. of Georgia, Athens)

23–24. **Information Retrieval**, 2nd annual natl. colloquium, Univ. of Pennsylvania, Philadelphia. (Inst. for Scientific Information, 325 Chestnut St., Philadelphia 19106)

23–24. **Iowa** Acad. of Science, Univ. of Dubuque, Dubuque. (G. W. Peglar, Dept. of Mathematics, Iowa State Univ., Ames)

23–24. **Mississippi** Acad. of Sciences, Biloxi. (C. Q. Sheely, Mississippi State Univ., State College)

23–24. **Ohio** Acad. of Science, annual, Ohio Univ., Athens. (J. H. Melvin, 505 King Ave., Columbus, Ohio 43201)

23–24. **Parasitism**, colloquium, Oregon State Univ., Corvallis. (J. E. McCauley, Dept. of Oceanography, Oregon State Univ., Corvallis 97331)

23–24. **Population** Assoc. of America, annual, Chicago, Ill. (A. J. Coale, PAA, Office of Population Research, 5 Ivy Lane, Princeton, N.J.)

23–24. **South Dakota** Acad. of Science, Black Hills State College, Spearfish. (T. Van Bruggen, Botany Dept., Univ. of South Dakota, Vermillion)

23–24. **West Virginia** Acad. of Science, Fairmont State College, Fairmont. (J. B. Hickman, 8 Mineral Industries Bldg., West Virginia Univ., Morgantown)

25–26. **Pi Gamma Mu**, natl. social science honor soc., St. Paul, Minn. (E. B. Urquhart, 1719 Ames St., Winfield, Kan.)

25–28. American **Oil Chemists** Soc., Houston, Tex. (C. W. Hoerr, Durkee Foods, 2333 Logan Blvd., Chicago, Ill.)

25–28. Southeastern **Psychiatric** Assoc., annual, Southern Pines, N.C. (H. Brackin, Jr., 1918 Church Ave., Nashville 3, Tenn.)

25–29. American Assoc. of **Cereal Chemists**, Kansas City, Mo. (E. J. Bass, Intern. Milling Co., Inc., 1423 S. 4th St., Minneapolis, Minn. 55404)

25–29. American Soc. for **Microbiology**, annual, Atlantic City, N.J. (R. W. Sarber, ASM, 115 Huron View Blvd., Ann Arbor, Mich.)

25–29. International College of **Surgeons**, North American Federation, Las Vegas, Nev. (Secretariat, 1516 Lake Shore Dr., Chicago, Ill. 60610)

26–27. European Days of **Chemical Engineering**, Paris, France. (Societé de Chimie Industrielle, 28, rue St. Dominique, Paris 7)

26–27. **Electroanesthesia**, 2nd symp., Univ. of Tennessee, Knoxville. (C. E. Short, UT-AEC Agricultural Research Laboratory, 1299 Bethel Valley Rd., Oak Ridge, Tenn.)

26–27. **Environmental Health Problems**, 2nd AMA congr., Chicago, Ill. (Dept. of Environmental Health, AMA, 535 North Dearborn St., Chicago, Ill. 60610)

26–28. **Error in Digital Computation**, symp., Madison, Wis. (L. B. Rall, U.S. Army Mathematics Research Center, Univ. of Wisconsin, Madison 53706)

26–29. **Aerospace Medical** Assoc., 36th annual, New York, N.Y. (Gen. J. M. Talbot, Headquarters USAF, AFMSPA, Washington, D.C. 20333)

26–29. Mechanisms and Therapy of **Cardiac Arrythmias**, 14th Hahnemann symp., Philadelphia, Pa. (L. Dreifus, Dept. of Medicine, Hahnemann Medical College and Hospital, Philadelphia)

26–29. Society of **Economic Paleontologists and Mineralogists**, New Orleans, La. (D. M. Curtis, Shell Oil Co., Box 127, Metairie, La.)

26–29. American Assoc. of **Petroleum Geologists**, 39th annual, New Orleans, La. (G. Atwater, 424 Whitney Bldg., New Orleans)

26–29. American **Physical** Soc., Washington, D.C. (K. K. Darrow, APS, Columbia Univ., New York 10027)

26–1. **Geodetic Uses of Satellites**, conf.,