SCIENCE

5 June 1964
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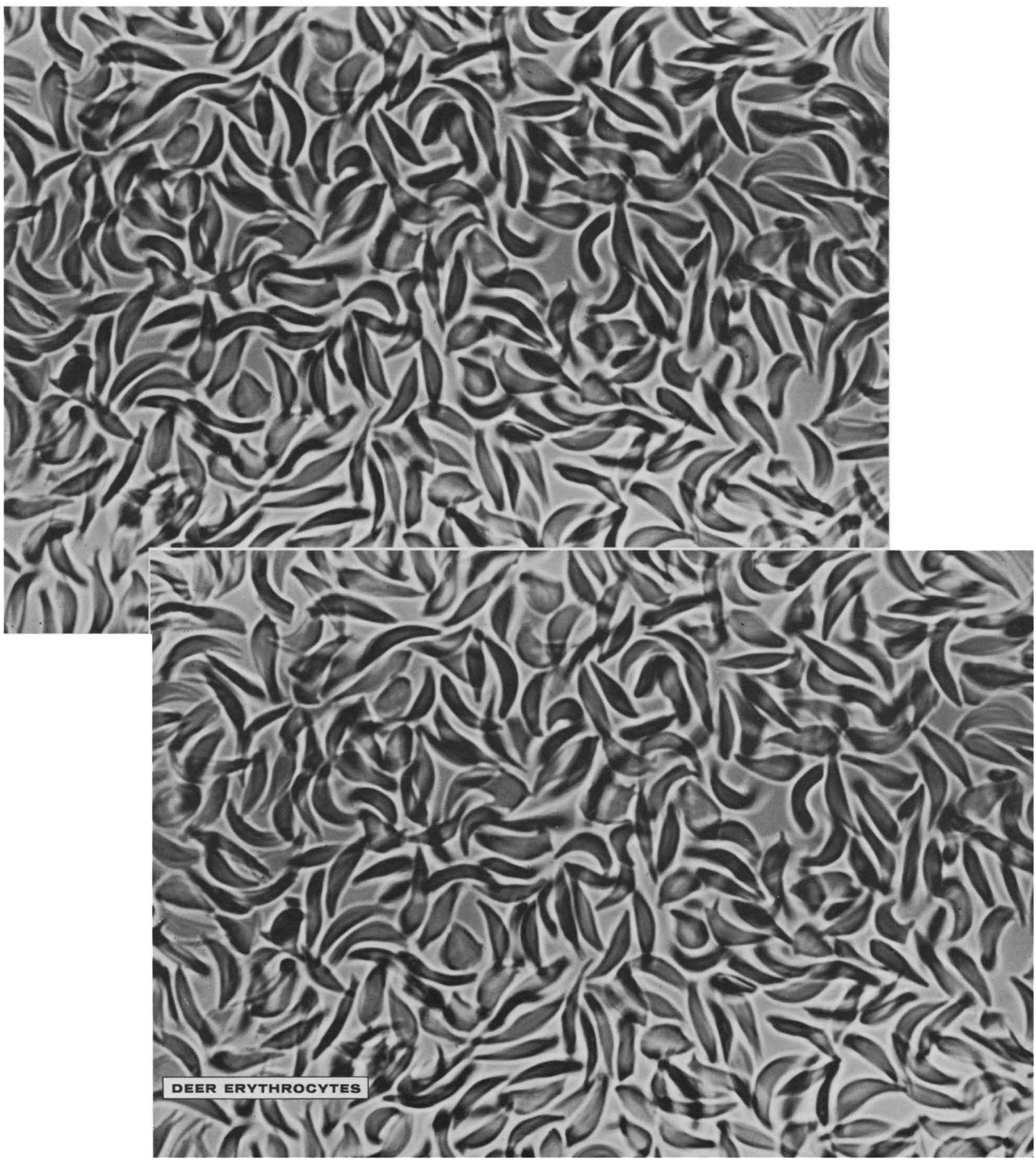
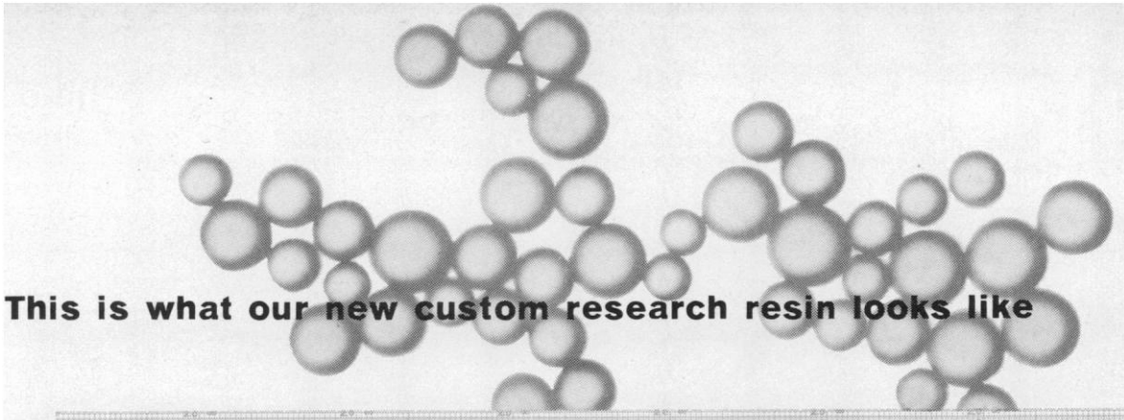
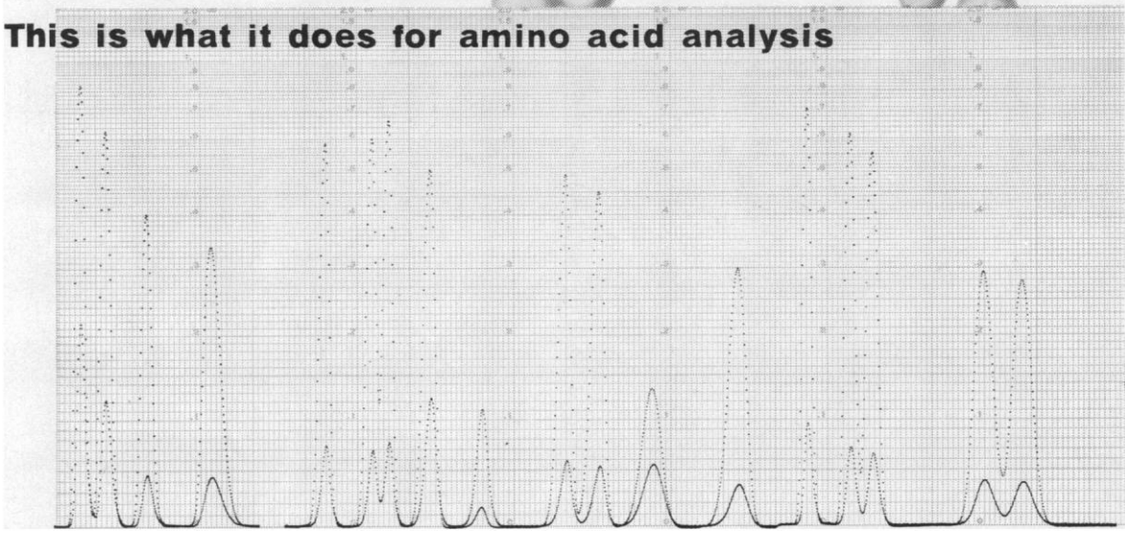
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE







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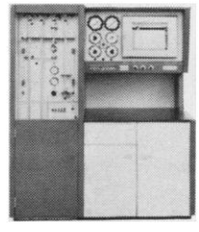

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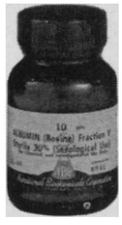

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Reference: Cohn et.al., J.A.C.S, 68, 459, (1946).

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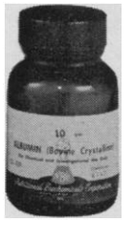

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These aberrant forms of deer erythrocytes, which produce no deleterious effect, are morphologically similar to the peculiar shapes seen in human sickle cell anemia. Whereas both the oxygen tension and *p*H must be low for sickling to occur in humans, high oxygen tension and *p*H induce sickling in deer (about × 1800). See page 1237.

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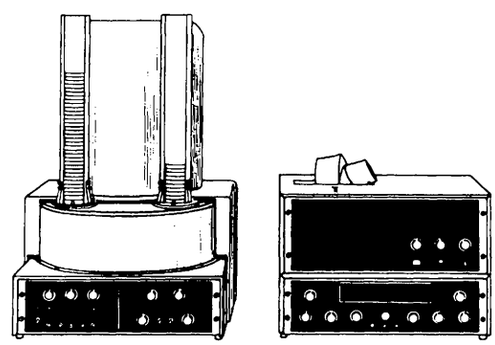

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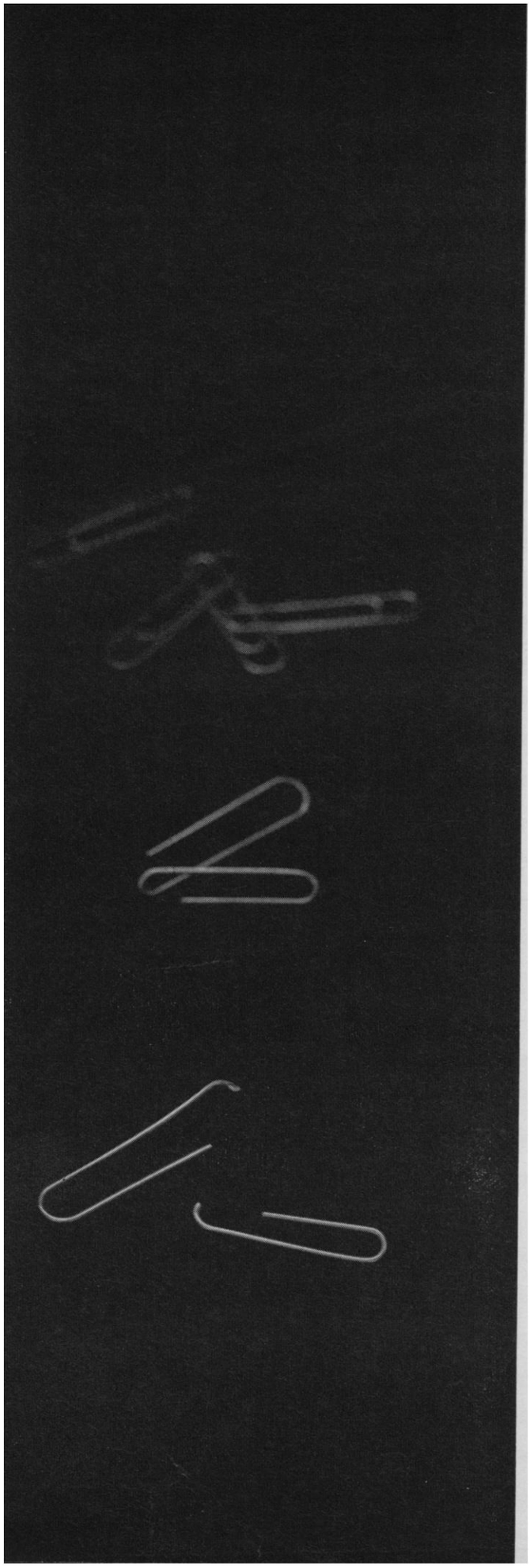

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The Curious Crystallography of Fatigue

Ever bend a paper clip back and forth till it breaks? That's metal fatigue, a problem important to those who work with materials and one just beginning to be understood at the atomic level. Unfortunately, there is still no generally accepted explanation as to why repeated loading on a part leads to the formation of fatigue cracks and eventual failure.

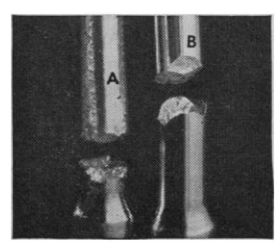
By stressing copper single crystals in cyclic torsion, physicists at the General Motors Research Laboratories are acquiring information that may help fill this gap. For instance, they have been able to relate fissure development to crystal orientation—and the type of surface deformation to the amplitude of cyclic strain.

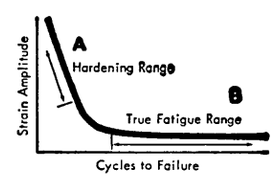
In developing a theory of fatigue, they have found that a fundamental distinction must be made between cycling at high and low strain amplitudes. In the hardening range of the fatigue curve (high amplitude), the crystal fractures in an irregular manner. In the true fatigue range (low amplitude), the fracture follows roughly the crystal's slip planes.

This basic research may eventually make it possible to predict the fatigue properties of an alloy from a knowledge of its microstructure. It's another example of the "research in depth" approach used by General Motors scientists and engineers to make things better.

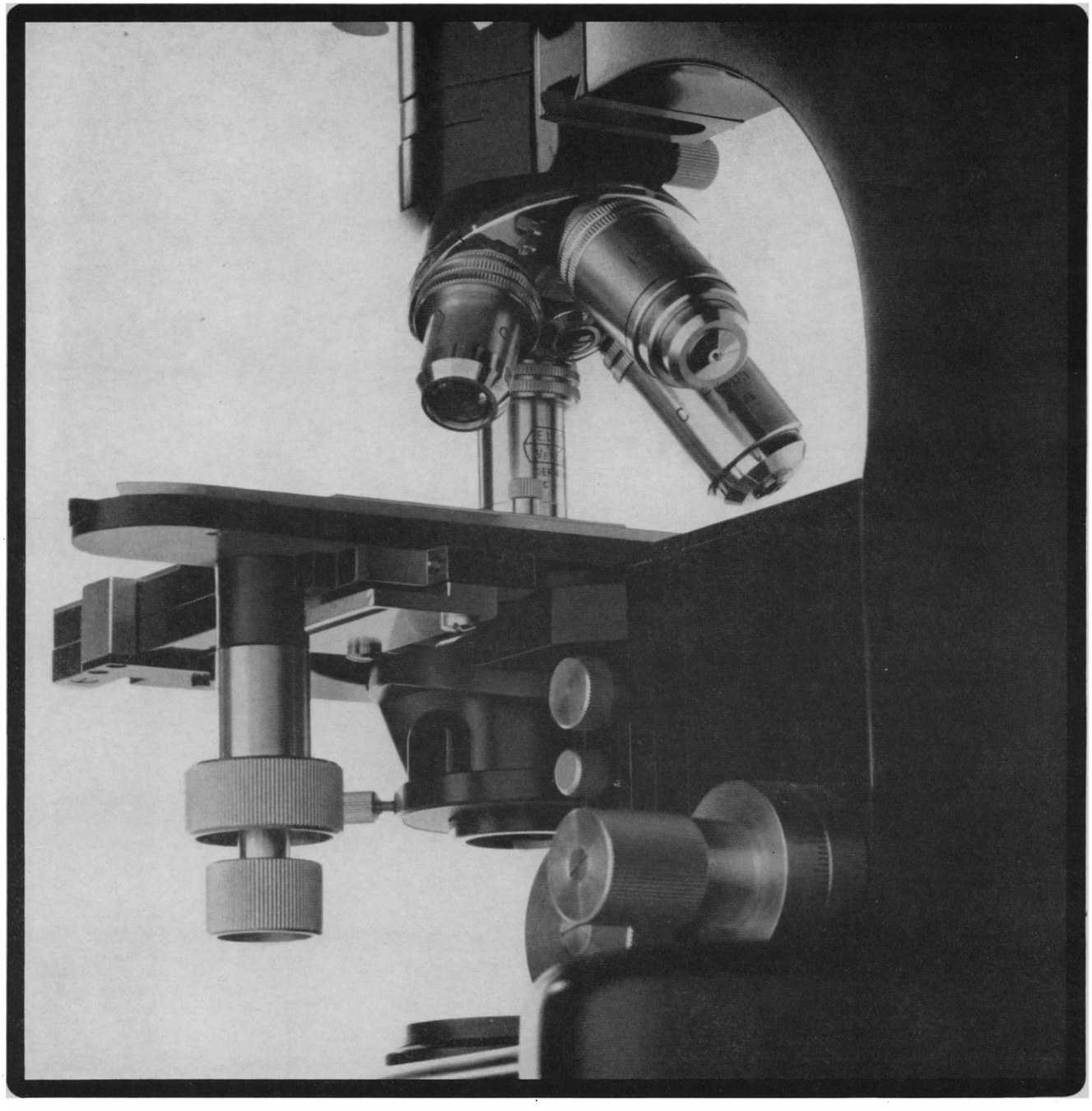
General Motors Research Laboratories

Warren, Michigan





Note differences in two fractured single crystals of copper—identically oriented but fatigued at different amplitudes.



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Predoctoral and Postdoctoral Fellowships

The present mechanisms of federal support of research have functioned well in many respects. The system, however, has weaknesses, and one of the most serious of these is related to the support of predoctoral and postdoctoral fellows. Today a large proportion of these fellows receive their stipends in connection with grants given by federal agencies for specific objectives. Individuals paid with such funds are under moral obligation to perform work relevant to the grant. This tends to stifle initiative on the part of the fellows and gives the principal investigators an extremely effective weapon in converting their underlings into intellectual serfs.

The predoctoral and immediate postdoctoral years are crucial in the lives of scientists, who are particularly plastic at this period, for they are undergoing metamorphosis. Heretofore they have been absorbers of knowledge. To become scientists they must become creators of knowledge. A drastic change in viewpoint and the development of a new set of value judgments are necessary. If students are to become scientists they must become sturdily independent. They must be heirs of Galileo, not followers of Aristotle.

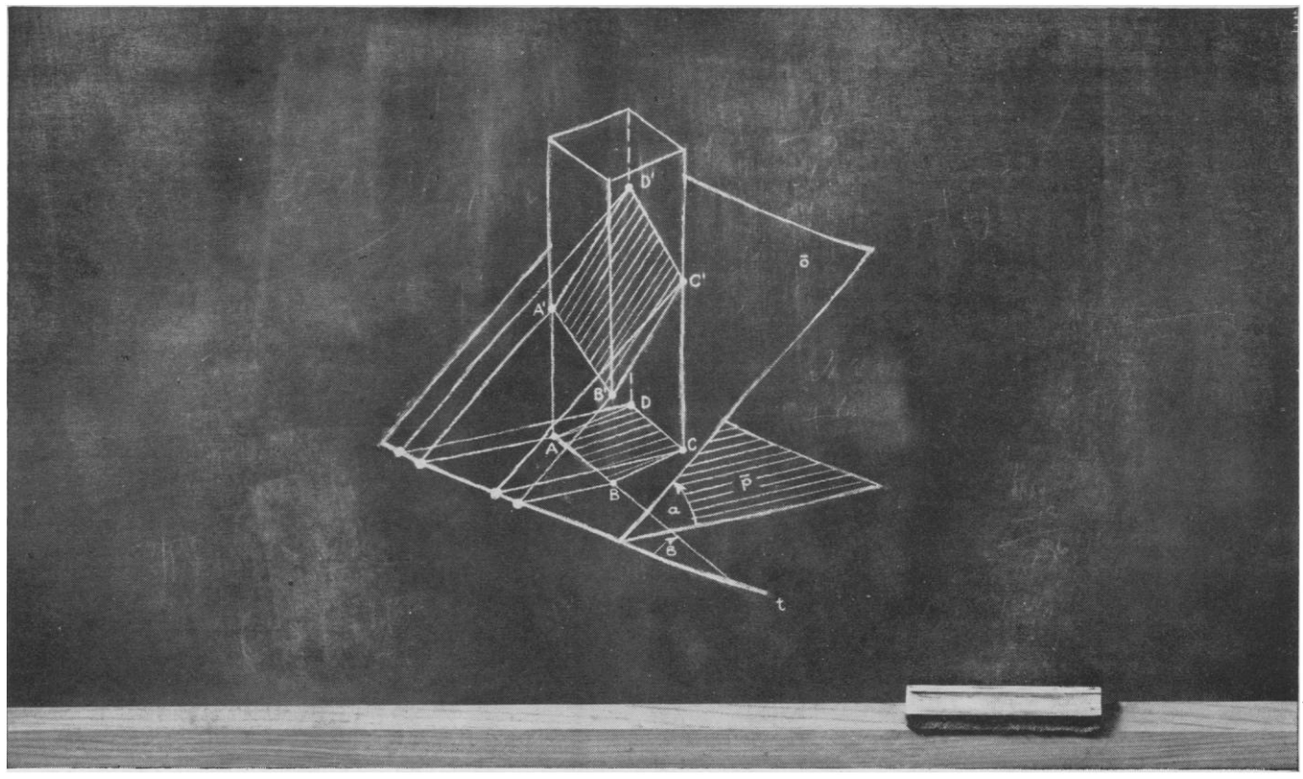
The graduate student needs broad guidance in the selection of suitable research goals. But he also needs maneuvering room, an opportunity to test his own mind and to develop intuitive judgments. He needs to be able to make mistakes for which he will suffer. He should have his share of triumphs, perhaps small, but nevertheless his own. The present grants system serves to thwart desirable patterns of growth. Too often the graduate student finds himself a member of a large "team" whose detailed goals are set by the principal investigator.

Even under favorable circumstances, the new Ph.D. rarely has completed the transformation to intellectual maturity. He very much needs experience as a fully responsible, self-directing, self-disciplined adult. He must be able to choose his own research goals and to formulate the questions. Given this freedom, if he has potential it will be quickly demonstrated.

When a person obtains his Ph.D. degree he has limited alternatives if he wishes to continue research in academic life. A seemingly attractive course is to accept a postdoctoral fellowship from one of the entrepreneurs of science. These empire-builders succeed in corralling space, equipment, and technicians, and they can offer sizable stipends. The young scientist feels that he is being given a great opportunity. Too often he is actually signing up for a continuation of scientific childhood. Too often the entrepreneur regards the postdoctoral fellow only as a means of advancing his own general program. As a matter of course he directs the research projects, and though his creative contributions may be trivial, he puts his name on papers coming out of the laboratory. In some instances federal funds have been used to create in the United States the equivalent of the Teutonic "Herr Professor." We need to take constructive, positive steps to offset this tendency.

A valuable precedent has been set in the fellowship program of the National Aeronautics and Space Administration. This agency has awarded funds to institutions and not to individuals, providing at the same time some expense money. Use of this mechanism should be expanded, so that a substantial fraction of the predoctoral and postdoctoral fellowships are financed in this way.

—PHILIP H. ABELSON



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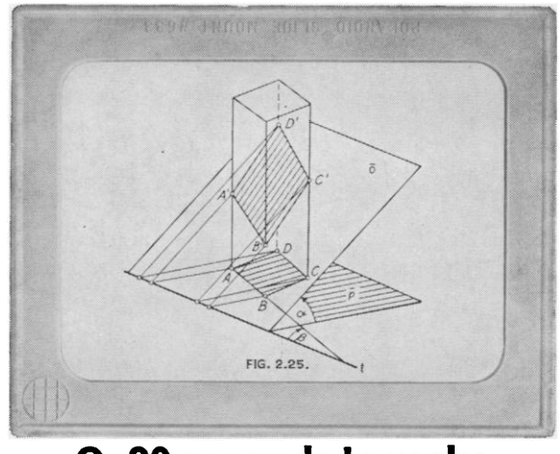

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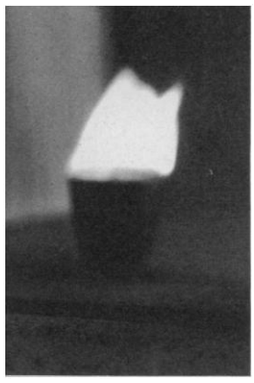

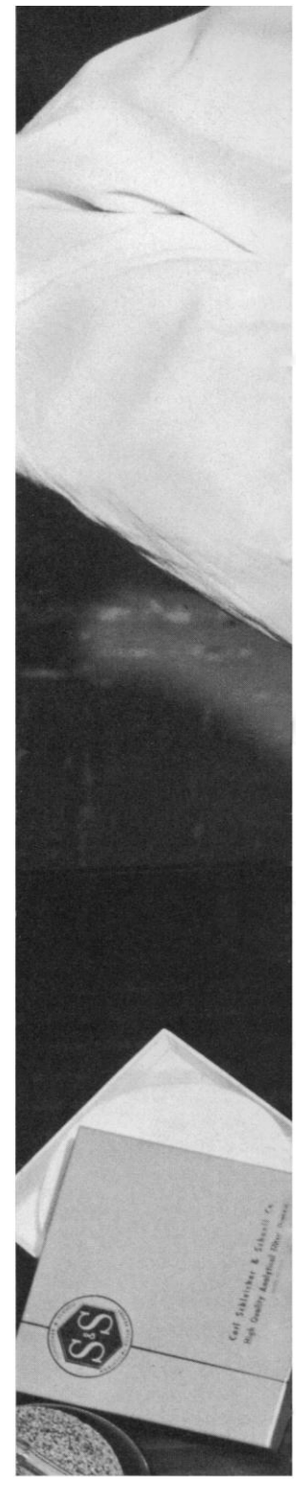

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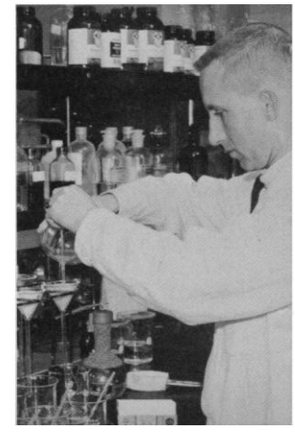

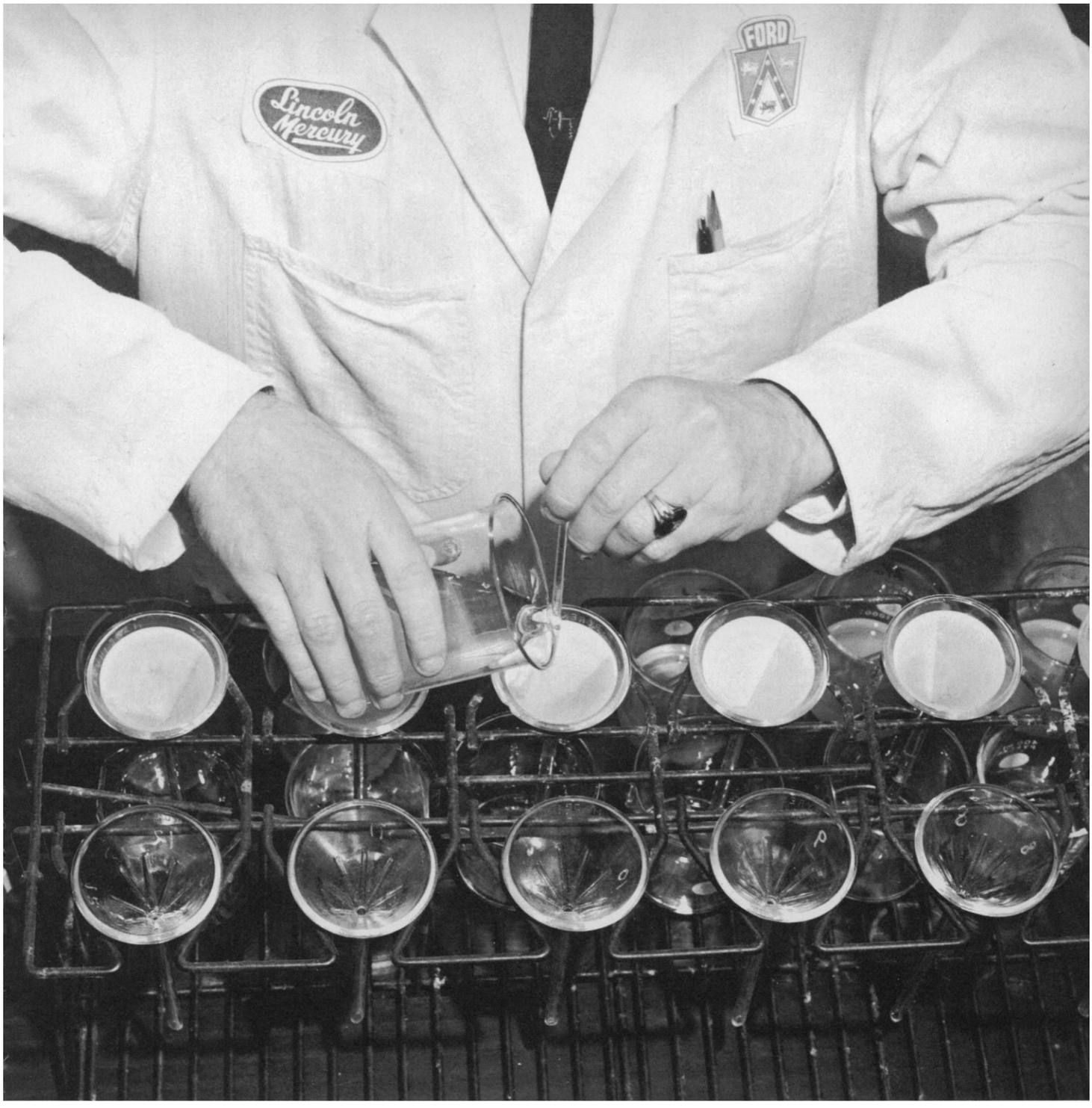

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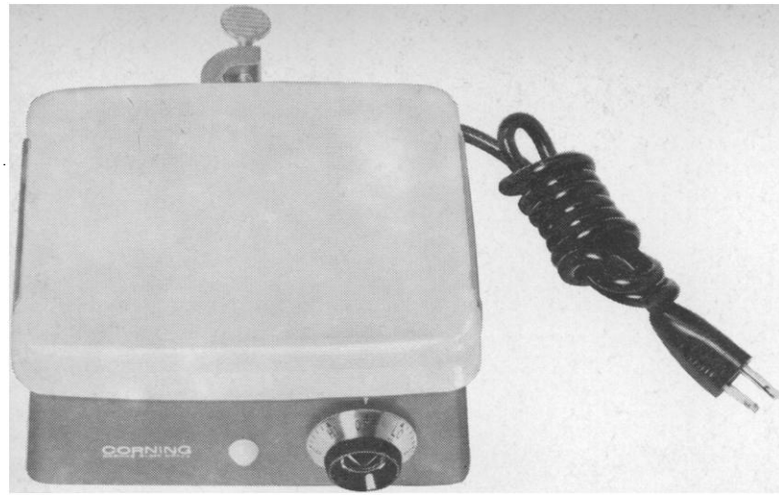

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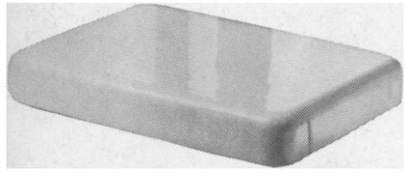
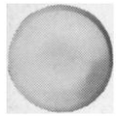
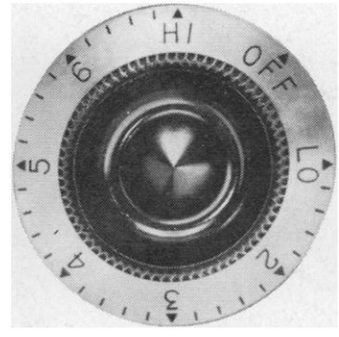
CORNING® Laboratory Hot Plates are different from what you are used to. For one thing, they are faster. Top plate reaches maximum temperature (950° F.) in only 7 minutes—two to three times faster than metal hot plates we tested. Cools down two to three times faster, too. (One up!)



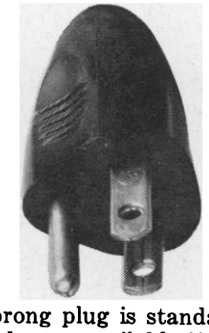
Then there's our PYROCERAM® brand top (7″x5″)—same material that goes into freeze-and-broil CORNINGWARE®. Not likely to corrode, much less rust. So spill some acids. Who cares? No corrosion of the plate—no contamination of your samples. (Two up!)



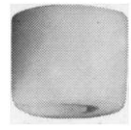
On-off light is non-cycling; stays "on" as long as unit is on. (Three up!)



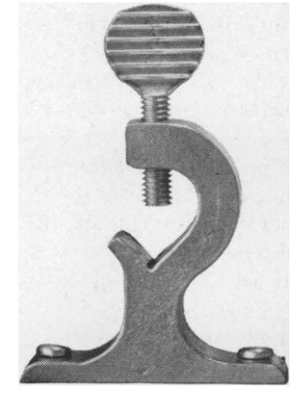
Not likely to be forgotten is the infinite control you get between LO and 2 and 3 and 4 and 5 and 6 and HI. Turn either way, too. HI to LO or LO to HI. (4!)



Three-prong plug is standard. Two-prong adapter available if you want one. (Not exclusive, so we don't score anything.)



Legs are nylon. Smooth. No scratches. Silent. No screeches. Inert. Corrosion-resistant. (5 up!)



Aluminum clamp allows the hot plate to be suspended from a ring stand or to function *as* a ring stand. Clamp and all, unit weighs 3¼ pounds. Leave screw-on clamp off if you like. (6 up!)

Notice overhung roof. No spillage into internals. No shorts or scary sizzles or smokes. Unit is compact, easy to store. Brightens up your lab. (7 up!)

120 volts. 600 watts. 950° F. You can afford it: $24.95 plus 12 bits for the clamp. (8 up! We win?)

At your lab supplier's now. Or write us at Corning, N. Y.

CORNING
CORNING GLASS WORKS

Tucson, Ariz. (H. F. Judkins, 32 Ridgeway Circle, White Plains, N.Y.)

22–24. **Medicinal Chemistry**, 9th natl. symp., Minneapolis, Minn. (A. T. Winstead, American Chemical Soc., 1155 16th St., NW, Washington, D.C. 20006)

22–24. Association for Research in **Ophthalmology**, San Francisco, Calif. (H. Kaufman, c/o Hillis Miller Health Center, Gainesville, Fla.)

22–24. **Photosensitization in Solids**, intern. conf., Chicago, Ill. (L. Grossweiner, Dept. of Physics, Illinois Inst. of Technology, Chicago)

22–24. American Assoc. of **Physical Anthropologists**, 33rd annual, Mexico City, Mexico. (T. D. Stewart, The Association, U.S. Natl. Museum, Washington, D.C.)

22–24. **Polymers**, 2nd biennial symp., American Chemical Soc., Durham, N.C. (H. N. Friedlander, Chemstrand Research Center, Inc., Box 731, Durham)

22–25. **Agricultural Pesticides** Technical Soc., Fredericton, N.B., Canada. (W. H. Minshall, University Substation P.O., London, Ont., Canada)

22–25. American Soc. of **Pharmacognosy**, annual, Pittsburgh, Pa. (R. Blomster, Univ. of Pittsburgh School of Pharmacy, Pittsburgh 15213)

22–26. American Soc. for **Engineering Education**, Orono, Maine. (W. L. Collins, Univ. of Illinois, Urbana)

22–26. **Nobel Prize Winners**, 14th meeting, Lindau im Bodensee, Germany. (H. F. Kinderlen, Standing Working Committee for the Nobel Prize Winners, Postfach 11, 899 Lindau im Bodensee)

22–26. Association of Official **Seed Analysts**, Rochester, N.Y. (E. W. Sundermeyer, 329 U.S. Court House, Kansas City 6, Mo.)

22–27. **AAAS Pacific Division**, 45th meeting, Vancouver, B.C., Canada. (R. C. Miller, California Acad. of Sciences, San Francisco)

22–27. International Organization for **Pure and Applied Physics**, 2nd general assembly, Paris, France. (J. Tonnelot, Laboratoire de Biologie Physico-Chimique, Orsay, Seine-et-Oise, France)

23. National Assoc. of **Science Writers**, San Francisco, Calif. (M. D. Spencer, Buffalo *Evening News*, Buffalo, N.Y.)

23–25. Precision **Electromagnetic Measurements**, conf., Boulder, Colo. (National Bureau of Standards, Boulder Labs., Boulder)

23–26. American **Home Economics** Assoc., 55th annual, Detroit, Mich. (AHEA, 1600 20th St., NW, Washington, D.C.)

24–25. **Computers and Data Processing**, 11th annual, symp., Estes Park, Colo. (W. H. Eichelberger, Denver Research Inst., Univ. of Denver, Denver, Colo. 80210)

24–26. Joint **Automatic Control** Conf., Stanford, Calif. (L. Zadeh, Univ. of California, Berkeley)

24–28. American Assoc. of **Bioanalysts**, annual, Las Vegas, Nev. (W. N. Reich, AAB, P.O. Box 607, Walnut Creek, Calif.)

24–1. **Air Pollution**, European conf., Strasbourg, Austria. (A. Stern, Div. of Air Pollution, U.S. Public Health Service, Washington, D.C. 20201)

25–26. Fundamental Phenomena in **Hypersonic Flow**, intern. symp., Buffalo, N.Y. (H. S. Tolley, Cornell Aeronautical Laboratory, P.O. Box 235, Buffalo 14221)

25–27. **American Physical Soc.**, Denver, Colo. (R. G. Sachs, Sterling Hall, Univ. of Wisconsin, Madison 53706)

25–28. **Rockets and Space Flight**, 13th symp., Darmstadt, Germany. (A. F. Staats, Hermann-Oberth-Gesellschaft, Fritz-Beindorff-Allee 9, Hanover, Germany)

28–4. American **Library** Assoc., St. Louis, Mo. (D. H. Clift, 50. E. Huron St., Chicago, Ill.)

29–30. **Vacuum Metallurgy**, conf., New York, N.Y. (M. A. Cocca, General Electric Laboratory, P.O. Box 1088, Schenectady, N.Y.)

29–1. American Soc. of **Heating, Refrigerating, and Air-Conditioning Engineers**, 71st annual, Cleveland, Ohio. (ASHRAE, 345 E. 47 St., New York, N.Y.)

29–1. Effects of **Radiation on the Hereditary Fitness** of Mammalian Populations, symp., Bar Harbor, Maine. (T. H. Roderick, Jackson Laboratory, Bar Harbor)

29–2. American Inst. of **Aeronautics and Astronautics**, 1st annual, Washington, D.C. (AIAA, 500 Fifth Ave., New York, N.Y. 10036)

29–2. American **Dermatological** Assoc., Honolulu, Hawaii. (W. M. Sams, 303 Ingraham Bldg., Miami 32, Fla.)

30–5. Society for **Social Responsibility in Science**, Fellowship Farm, Pa. (W. C. Davidson, Dept. of Physics, Haverford College, Haverford, Pa.)

July

1–4. National Soc. of Professional **Engineers**, annual, Asheville, N.C. (K. E. Trombley, NSPE, 2029 K St., NW, Washington, D.C.)

1–4. British **Tuberculosis** Assoc., St. Andrews, Scotland. (BTA, 59 Portland Place, London, W.1, England)

2–3. **Spectrochemical Analysis**, limits of detection, conf., Exeter, England, Institute of Physics and the Physical Society, 47 Belgrave Sq., London, S.W.1, England)

2–4. Scandinavian, **Dental** Congr., Helsinki, Finland. (N. Anderson, Bergmansg. 11 D, Helsinki)

2–5. Northwest **Proctologic** Soc., Banff, Canada. (F. C. Swartzlander, Greyhound Bldg., Calgary, Canada)

2–8. **Nuclear Physics**, intern. congr., Paris, France. (The Congress, B.P. No. 14, Orsay, Seine-et-Oise, France)

5–10. American **Physical Therapy** Assoc., annual conf., Denver, Colo. (H. J. Hislop, 1790 Broadway, New York, N.Y.)

6–8. **Electron-Beam Processes** for Microelectronics, symp., Malvern, Worcester, England. (Information Officer, Royal Radar Establishment, St. Andrews Rd., Malvern)

6–9. **Learning and Associated Phenomena in Invertebrates**, Cambridge, England. (D. Davenport, Dept. of Biological Sciences, Univ. of California, Santa Barbara)

6–9. **Signal Processing** in Radar and Sonar Directional Systems, Birmingham, England. (British Institution of Radio Engineers, 9 Bedford Sq., London, W.C.1)

6–10. **Magnetic Recording**, intern conf., London, England. (Secretariat, the Con-

ference, c/o Inst. of Electrical Engineers, Savoy Pl., London, W.C.2)

6–10. Theoretical and Applied **Mathematical Programming**, intern. symp., London, England. (M. Kinnaird, Operational Research Soc., 64 Cannon St., London, E.C.4)

6–10. Physics of **Non-crystalline Solids**, intern congr. Delft, Netherlands, (J. A. Prins, Lab. Technische Natuurkunde T.H. Delft)

6–11. **Magnetohydrodynamic Electrical Power** Production, Paris France. (European Nuclear Energy Agency, 38 Blvd. Suchet, Paris 16°)

6–12. **Sanitary Engineering**, 9th inter-American congr., Bogotá, Colombia. (J. A. Jove, Inter-American Assoc. of Sanitary Engineering, Centro Simón Bolívar, Edificio Sur, 6° piso, Caracas, Venezuela)

7–10. **American Dental Soc. of Europe**, annual, Brighton, England. (A. E. F. Sturridge, 35 Harley St., London, W.1, England)

7–11. European **Orthodontic** Soc., 40th congr., Athens, Greece. (H. N. Haralabakis, Akadimias St. 31, Athens 135)

8–10. **Sulfur Allotropes**, Univ. of California, Berkeley. (B. Meyer, Latimer Hall, Univ. of California, Berkeley)

8–11. International Soc. of **Gastroenterology**, 6th intern. congr., Medellin, Colombia. (J. L. A. Roth, 419 S. 19 St., Philadelphia, Pa.)

8–16. **Entomology**, 12th intern. congr., London, England. (P. Freeman, British Museum of Natural History, Cromwell Rd., London, S.W.7)

10–11. Rocky Mountain **Cancer** Conf., Denver, Colo. (N. P. Isbell, 1809 E. 18 Ave., Denver 80218)

10–15. **Pleistocene Geomorphology**, symp., Exeter, England. (T. H. Elkins, Royal Geographical Soc., Kensington Gore, London, S.W.7)

12–15. **Solid Propulsion**, NASA meeting, Philadelphia, Pa. (W. H. Hunter, Office of Program Development, Washington, D.C. 10025)

12–16. **Gastroenterology**, 9th Pan American congr., Bogotá, Colombia. (C. A. Estape, Soriano 877, Montevideo, Uruguay)

13–15. Problems of **Capillary Permeability** in Health and Disease, Univ. of Michigan 1964 summer symp., Ann Arbor, Mich. (M. M. Dewey, Dept. of Anatomy, Univ. of Michigan, Ann Arbor)

13–15. **Data Processing and Acquisition in Biology and Medicine**, conf., Rochester, N.Y. (K. Enslein, 42 East Ave., Rochester 14604)

13–17. **Canadian Teachers'** Federation, Lac Beauport, P.Q., Canada. (G. Nason, 444 MacLaren St., Ottawa, Ont., Canada)

13–17. Chemistry of **Carbohydrates**, intern. symp., Münster, Germany. (F. Micheel, Organisch-Chemisches Institut, Universität, Hindengurgplatz 55, Münster)

13–17. International Assoc. for **Child Psychiatry** and Allied Professions, London, England. (F. H. Stone, Royal Hospital for Sick Children, 70 University Ave., Glasgow, W.2 Scotland)

13–18. **Instrumental Analytical Chemistry**, 3rd annual symp., Bethlehem, Pa. (A. J. Diefenderfer, Dept. of Chemistry, Lehigh Univ., Bethlehem)

Announcements

The AAAS invites newspaper and magazine science writers to enter the 1964 **AAAS-Westinghouse science writing awards** competition. Two $1000 awards will be presented, one for magazine writing, the other for newspaper articles, on the natural sciences and their engineering and technological applications, exclusive of medicine. Entries must have appeared in a U.S. publication between 1 October 1963 and 30 September 1964; articles from trade or professional journals are not eligible. Magazine nominations may consist of a single story or a series; newspaper entries may be a single story, a series, or a group of three unrelated articles, editorials, or columns. Each competitor may submit up to three separate entries, and nominations may be made by persons other than the author. All entries must be received by 10 October. Additional information on the competition is available from E. G. Sherburne, Jr., AAAS, 1515 Massachusetts Ave., NW, Washington, D.C. 20005.

The AAAS-Westinghouse awards are provided by the Westinghouse Electric Corporation through a grant from the Westinghouse Educational Foundation.

Scientists in the News

The 1964 R. D. Conrad award was presented recently to **Herbert Friedman**, superintendent of the Naval Research Laboratory's atmosphere and astrophysics division and chief scientist at the E. O. Hulburt Center for Space Research. He was cited for "outstanding technical and scientific achievement in research and development for the United States Navy."

Raymond U. Lemieux, professor of organic chemistry at the University of Alberta, has been chosen to receive the Chemical Institute of Canada medal, the organization's highest award.

Jack B. Bresler, associate professor of biology at Boston College, has been appointed director of research development at the university, as of 1 August.

The recently elected president of the Society for American Archaeology is **Paul S. Martin**, chief curator of the department of anthropology, Chicago Natural History Museum.

The National Science Foundation has appointed **Henry W. Riecken** associate director for scientific personnel and education, succeeding **Bowen C. Dees**, who recently became associate director for planning. Riecken had been division director for NSF's division of social sciences.

Recent Deaths

Henry W. Cave, 76; former chief of the first surgical division at Roosevelt Hospital, New York, and former clinical professor of surgery at the College of Physicians and Surgeons, Columbia; 20 May.

James Franck, 81; professor emeritus of chemistry at the University of Chicago; winner, with Gustav Hertz, of the 1925 Nobel Prize in physics for the discovery of the laws governing the impact between electrons and atoms; 21 May.

Louis Alan Hazeltine, 77; former chairman of the physics department at Stevens Institute of Technology; 24 May.

Clarence E. Libby, 71; retired professor of pulp and paper technology at the North Carolina State College forestry school, Raleigh; 26 May.

William MacCarty, 83; professor emeritus of pathology at the Mayo Foundation graduate school, University of Minnesota; 17 May.

Frank Neumann, 72; retired seismologist at the University of Washington, Seattle; 22 May.

Leo Szilard, 66, a nuclear physicist instrumental in research on nuclear fission which led to the development of the atomic bomb, died in La Jolla, California 30 May. Following World War II he was actively involved in matters of arms control and disarmament and in promoting the peaceful uses of nuclear power. He helped organize the Emergency Committee of Atomic Scientists. Dr. Szilard, professor of biophysics at the University of Chicago, since 1946, was appointed recently as a research associate at the Salk Institute for Biological Studies, La Jolla. He and Eugene Wigner shared the 1959 Atoms for Peace award for their part in the development of nuclear reactors.

Norman Treves, 70; associate professor emeritus of clinical surgery at Cornell Medical College and recently retired clinician in breast surgery at Sloan-Kettering Institute for Cancer Research; 17 May.