SCIENCE

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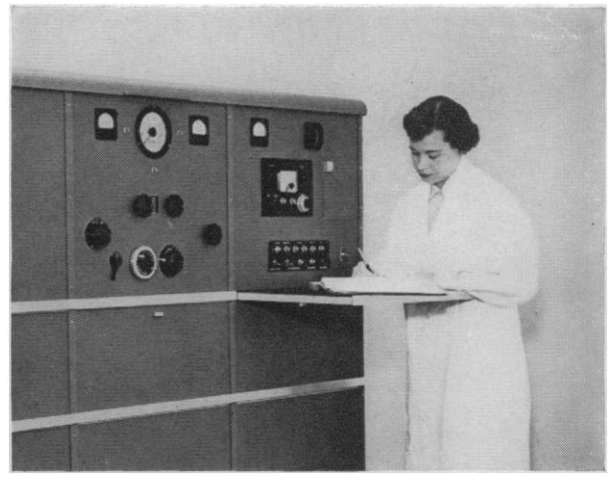
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

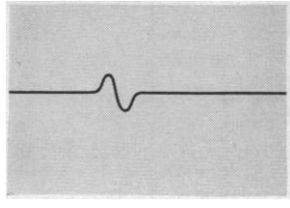
New ways to measure molecular weights with the Ultracentrifuge

The technique of ultracentrifugation – studying molecules while they are under centrifugal force – is a classic way to measure molecular weight and purity of viruses, enzymes, proteins, polymers and a variety of organic and inorganic molecules. Recently, a number of advances have greatly extended both the biochemical and industrial uses of the Ultracentrifuge.



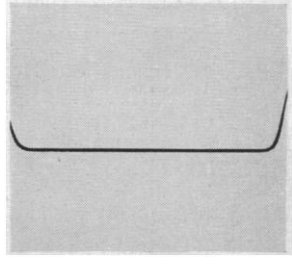
Beckman/Spinco Analytical Ultracentrifuge, Model "E." Speeds to 60,000 rpm, centrifugal forces to 260,000 G. Available with refrigeration, heating and vacuum systems; interchangeable analytical and preparative rotors; absorption, schlieren and Rayleigh fringe optical systems.

At California Institute of Technology, Meselson, Stahl and Vinograd have reported a method of measuring density and molecular weight simultaneously with the Analytical Ultracentrifuge. The method allows them to distinguish between changes in density – such as might result from folding or unfolding of a protein molecule – and changes in molecular weight from actual loss or gain of atoms. The method has many promising applications. It should prove a sensitive way to study denaturation of proteins and such relationships as enzyme coenzyme dissociations.



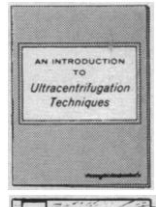
At the University of California at Los Angeles, Mommaerts and Aldrich have used Rayleigh interference fringe optics in conjunction with the approach-to-equilibrium method to measure concentration distribution in the Ultracentrifuge cell. With this technique, they determined with excellent reproducibility the molecular weight of the long, thin protein, myosin, whose molecular weight had been difficult to measure with standard velocity sedimentation methods.

At Clark University, Kegeles, Klainer and Salem have expanded the rapid approach-to-equilibrium method of Archibald to deal with polydisperse nonideal solutions. By selection of speed and centrifuging time for various concentrations of the polymer, the authors obtained data early in the Ultracentrifuge run which they could extrapolate to infinite dilution to obtain weight-average molecular weights.



At the University of California at Berkeley, Richards and Schachman have developed a differential technique for accurately measuring extremely small changes in sedimentation coefficient. Such changes might result from a change in molecular weight, change in frictional coefficient as with bonding a small ion to a protein molecule, or change in buoyancy term as with D_2O. In preliminary work, the authors have accurately measured differences in sedimentation coefficient as small as 0.05 svedbergs.

If Ultracentrifugation is new to you and you would like some interesting basic information on its usefulness in molecular research, we would like to send you a copy of a new technical paper, "An Introduction to Ultracentrifugation Techniques." A limited supply is also available of the latest issue of "Fractions," vol. 3, no. 2 – a periodical sent to Ultracentrifuge owners containing information on new developments in equipment and technique. For copies of either of these publications, write Spinco Division, Beckman Instruments, Inc., Stanford Industrial Park, Palo Alto 5, California.



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Coolidge received members and guests and gave an address of welcome. Among seven other afternoon or evening addresses was the third annual Sigma Xi address, given by Frederick Fuller Russell, general director of the International Health Board. There were 1781 papers and 12 vice-presidential addresses.

The second Newcomb Cleveland Prize was divided between L. R. Cleveland, for two papers on the symbiosis of termites and their intestinal flagellate protozoa, and Edwin P. Hubble, for his paper "Cepheids in spiral nebulae."

Again the Willard was AAAS headquarters, and many other hotels were used. Sessions were as widely scattered as in 1911, with the Brookings Institution, the National Academy of Sciences, the Weather Bureau, U.S. Department of the Interior, and the city high schools pressed into service. (At the last, a "no smoking" rule was enforced.) Trolley tokens had risen from six for a quarter to six for 40 cents since the previous meeting. Social events were numerous. The Biologists' Smoker was jointly sponsored by the AAAS and the Union of Biological Societies; the Columbian Women of George Washington University gave a reception and dance; the National Geographic Society entertained visiting geographers, and the American Association of University Women and College Women's Club had "at homes."

Some of the actions taken by the AAAS Council were approval of any improvement in the calendar that would adjust it to modern conditions for scientific work; endorsement of the Navy program for oceanographic study; and approval of the proposed national arboretum. The sum of $500 was voted to the Union of Biological Societies to assist in the founding of *Biological Abstracts*.

A few of the authors of papers at the 1924 meeting who are expected to attend the 1958 meeting are F. O. Rice, now chairman of Section C, whose paper then was on "Catalysis in homogeneous systems"; H. H. Plough, now chairman of Section F, who discussed "A self-fertile strain of *Drosophila* which is partially sterile in outcrosses"; and A. Irving Hallowell, now chairman of Section H, who discussed "Some observations and measurements of the Indians of Labrador."

Centenary

The sixth Washington meeting, held 13–17 Sept. 1948—the 115th national meeting of an association celebrating its centenary—is too recent to require a detailed account. It was an exceptional meeting date for an exceptional occasion—the centennial of the founding of the AAAS in Philadelphia, in September 1848.

The meeting was exceptional in other respects. There were no sectional pro-

grams as such, though the principal disciplines were included. Completely absent were the scores of sessions for contributed papers of the participating societies—because there were no participating societies. To make possible this one special meeting, the societies had been asked to arrange separate sessions —preferably, immediately preceding the AAAS centenary. In cooperation, the biological societies met in Washington 10–13 September.

The five-day AAAS meeting, as arranged by the program committee, headed by retiring president Harlow Shapley, was devoted to 14 important symposia in the mornings; to an extensive series of afternoon tours to the area's scientific institutions, public and private; and to 17 illustrated lectures and addresses in the evenings.

The Annual Exposition of Science and Industry was not held at this meeting, but there were special exhibits on display at many of the governmental agencies visited during the tours.

The theme of the meeting was "One world of science." The keynote paper, with this title, written by AAAS president Edmund W. Sinnott, explained that the emphasis of the celebration was not on the origins of the AAAS but on the current status of science—and of man. The theme, he wrote, carried "no thought of speed or power, no threat of destruction or promise of paradise. On the contrary it [implied] that science is the same everywhere throughout the world, and . . . that the universe is orderly."

Each symposium had three papers and several discussants, and there was an opportunity for selected written questions from the audience to be considered. Most of the symposia centered on the world's resources of minerals, food, and energy and on the health and future of mankind. Necessarily, the symposia were in concurrent groups of three or four. The proceedings of all but one of these symposia were subsequently published in an attractive quarto volume, *Centennial,* a few copies of which are still available.

On the first evening, in Constitution Hall, President Harry S. Truman gave an appropriate address of welcome and commentary on the state of science, at which most of the 2734 registrants were present. Harlow Shapley's AAAS presidential address, "One world of stars," came next. The reception that followed was held in the Pan American Union. There were refreshments and music by the U.S. Air Force Band.

The lectures and addresses on the remaining evenings were also in concurrent groups of four or five and, like the symposia, were held in the headquarters hotel, the Statler, and in the larger auditoriums in downtown Washington.

The tours, arranged by a committee

chaired by Raymund L. Zwemer, proved deservedly popular.

The general chairman of the sixth Washington meeting was F. R. Moulton, completing his last year as AAAS administrative secretary, before retirement. The assistant administrative secretary was John M. Hutzel, who was also soon to leave the Association. A meeting of this exceptional pattern would have been impossible without the personal services and interest of the many scientists who served on the local committees or who were on the staffs of the more than 40 local scientific organizations and institutions. Historical vignettes of the cooperating agencies were published in *Science,* and an excellent survey of science in Washington was written for the gold-lettered, green-covered souvenir program by Paul H. Oehser. Included were sketches on the beginnings of the Smithsonian Institution, the National Academy of Sciences, the U.S. Department of Agriculture, the U.S. Geological Survey, and other agencies.

Not only was the centennial meeting (under the chairmanship of the late Austin H. Clark, assisted by Sidney S. Negus, Watson Davis, and Gorda Hubble) well reported in the press but there were network programs on radio and television. In retrospect, the 1948 meeting stands out as an earnest attempt to survey the impact of science and man's future.

During the centennial year there was an elaborate and successful campaign to increase the Association's membership. Over 200 committees throughout the country worked hard and effectively. The membership figures for the beginning and end of 1948 were 33,442 and 42,545, respectively—a net gain of more than 9000 members.

The growth of the Association continues. At the end of 1957, the Association's membership stood at 55,727. By the end of this 110th year, it is hoped that it will at least reach 60,000. In the past ten years the number of affiliated societies has increased from 207 to 279. The AAAS sections now number 18, with the activation of Section P (Industrial Science) in 1951 and the assumption of full sectional status by Nd (Dentistry) and Np (Pharmacy) in 1954. In the past few years, the AAAS has undertaken a variety of important new activities, and others are in prospect.

The seventh Washington meeting, of 26–31 Dec. 1958, will be a significant and memorable addition to the earlier meetings held in the nation's capital.

RAYMOND L. TAYLOR
American Association for the Advancement of Science

Pan American Sanitary Conference

More than 200 public health projects will be examined and a comprehensive program and budget for 1959 adopted at the fifteenth Pan American Sanitary Conference that is to meet 21 September through 6 October in San Juan, Puerto Rico. It will be attended by public health ministers and leading health authorities of the Western Hemisphere.

The conference, which is held every 4 years, is the supreme governing body of the Pan American Sanitary Organization—the regional organization in the Americas of the World Health Organization. The conference will elect the director of the Pan American Sanitary Bureau, executive organ of the PASO, to a term of 4 years commencing 1 February 1959. The present incumbent, Fred L. Soper, completes his third term in office on 31 January 1959.

The organization, serving as international coordinator and technical adviser, as catalytic agent and as information clearing house for the national health services, operates in practically all areas of public health. These embrace the promotion of disease eradication and control in malaria, tuberculosis, venereal disease and treponematoses such as yaws, the endemo-epidemic diseases, and pub-

lic health administration, nursing, social and occupational health, maternal and child health, mental health, nutrition, environmental sanitation, health aspects of atomic energy, public health education and training, and health education of the public.

The conference will review the organization's program of fellowships, seminars and training courses, a major means used to help overcome grave shortages of trained public health personnel in most countries, and for strengthening the national health services. Over the past 4 years 1532 fellowships have been granted in this hemisphere; 552 fellows received support during the past year.

Psychopharmacology

The Psychopharmacology Service Center of the National Institute of Mental Health is sponsoring a conference on Child Research in Psychopharmacology, to be held at the Hotel Statler, Washington, D.C., 27–28 October. The primary objectives of the conference are: to focus on basic problems, including methodology and measuring instruments; to develop new hypotheses and approaches to the study of drug effects in children; to prepare the groundwork for initiating long-term developmental studies; and to stimulate further research interest in this important area. The conference participants will consist of representatives from the fields of psychology, psychiatry, pediatrics, social work, and neurophysiology.

Although the second day will be a closed session, a limited number of interested observers will be admitted *by advance registration* to the opening session on 27 October. Requests for attendance and further details should be addressed to Dr. Seymour Fisher, Psychopharmacology Service Center, National Institute of Mental Health, Bethesda 14, Md.

Forthcoming Events

October

19–22. Land and Water, Soil Conservation Soc. of America, 13th annual, Asheville, N.C. (H. W. Pritchard, 838 Fifth Ave., Des Moines 14, Iowa.)

19–24. American Soc. of Anesthesiologists, Pittsburgh, Pa. (J. E. Remlinger, 802 Ashland Ave., Wilmette, Ill.)

19–26. Allergology, 3rd intern. cong., Paris, France. (S. M. Feinberg, Medical School, Ward Memorial Building, 303 East Chicago Ave., Chicago, Ill.)

19–26. Medical Hydrology, 21st intern. cong., Madrid, Spain. (Dr. Francon, 55, rue des Mathurins, Paris 8e, France.)

19–28. Society of Motion Picture and Television Engineers, 84th conv., Detroit, Mich. (SMPTE, 55 W. 42 St., New York, N.Y.)

20–21. Rubber and Plastics Instrumentation, natl. symp., Akron, Ohio. (D. R.

Davis, General Tire and Rubber Co., Central Research Lab., Akron 9.)

20–22. American Oil Chemists' Soc., fall, Chicago, Ill. (Mrs. L. R. Hawkins, 35 E. Wacker Drive, Chicago 1.)

20–23. American Acad. of Pediatrics, Chicago, Ill. (E. H. Christopherson, 1801 Hinman Ave., Evanston, Ill.)

20–23. American Psychiatric Assoc., Kansas City, Mo. (1700 18 St., NW, Washington 6.)

21. American Soc. of Safety Engineers, annual, Chicago, Ill. (J. B. Johnson, 425 N. Michigan Ave., Chicago 11.)

22–24. American Assoc. of Petroleum Geologists, southwestern, Mineral Wells, Tex. (R. H. Dott, Box 979, Tulsa 1, Okla.)

22–24. American Vacuum Society, 5th natl. symp., San Francisco, Calif. (D. Gustin, P.O. Box 1282, Boston 9, Mass.)

22–24. Aviation Medicine, 4th annual symp., Santa Monica, Calif. (T. H. Sternberg, UCLA Medical Center, Los Angeles 24, Calif.)

22–26. American Soc. for the Study of Arteriosclerosis, annual, San Francisco, Calif. (O. J. Pollak, P.O. Box 228, Dover, Del.)

23. Organic Chemistry, 5th biennial symp., Philadelphia, Pa. (D. Glusker, Rohm and Haas Co., 5000 Richmond St., Philadelphia 37.)

23–25. National Soc. of Professional Engineers, San Francisco, Calif. (K. E. Trombley, NSPE, 2029 K St., NE, Washington 6.)

23–25. Rocket Technology and Astronautics, intern., Essen, Germany. (Deutsche Gesellschaft fuer Raketentechnik und Raunfahrt, e.v., Neunsteinerstrasse 19, Stuttgart, Zuffenhausen.)

24–25. International Conference on the Insulin Treatment in Psychiatry, New York, N. Y. (M. Rinkel, 479 Commonwealth Ave., Boston 15, Mass.)

24–25. Taxonomic Consequences of Man's Activities, symp., Mexico, D. F. (H. C. Cutler, Missouri Botanical Garden, St. Louis.)

24–28. American Heart Assoc., San Francisco, Calif. (J. D. Brundage, 44 E. 23 St., New York 10.)

27–28. Child Research in Psychopharmacology, conf., Washington, D.C. (S. Fisher, Psychopharmacology Service Center, Natl. Inst. of Mental Health, Bethesda 14, Md.)

27–28. Plant Physiology, 9th annual research cong., Saskatoon, Saskatchewan, Canada. (D. T. Coupland, Plant Ecology College of Agriculture, Univ. of Saskatchewan, Saskatoon.)

27–29. Radio, Institute of Radio Engineers, fall meeting, Rochester, N.Y. (V. M. Graham, EIA, 11 W. 42 St., N.Y.)

27–29. Weak Interactions, APS conf. (by invitation), Gatlinburg, Tenn. (J. L. Fowler, ORNL, P.O. Box X, Oak Ridge, Tenn.)

27–31. American Inst. of Electrical Engineers, fall general, Pittsburgh, Pa. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

27–31. American Public Health Assoc., St. Louis, Mo. (B. F. Mattison, 1790 Broadway, New York 19.)

27–31. Metal Exposition and Congress, 40th natl., Cleveland, Ohio. (ASM, 7301 Euclid Ave., Cleveland 3.)

27–31. Vertebrate Speciation Conf., Univ. of Texas, Austin. (W. F. Blair, Dept. of Zoology, Univ. of Texas, Austin 12.)

27–1. Mental Health, 3rd Latin American cong., Lima, Peru. (B. Caravedo, Comite Peruano Organizador, III Congreso Latinoamericano pro Salud Mental, Avenida del Golf 1040, San Isidro, Lima.)

29–30. '58 Computer Applications, symp., Chicago, Ill. (M. J. Jans, Armour Research Foundation, 10 W. 35 St., Chicago 16.)

30–31. Plastics, intern. symp., Philadelphia, Pa. (ASTM, 1916 Race St., Philadelphia 3.)

30–1. American Assoc. of Textile Chemists and Colorists, 37th natl. conv., Chicago, Ill. (J. G. Kelley, E. I. duPont de Nemours & Co., Inc., 7 South Dearborn St., Chicago 3.)

November

2–7. Radiology, 6th Pan American cong., Lima, Peru. (M. Lesende, Inter-American College of Radiology, Tucuman 1516, Buenos Aires, Argentina.)

3–4. Italian Soc. of Nuclear Biology and Medicine, 3rd cong., Florence, Italy. (Segreteria della Societá Italiana di Biologia e Medicina Nucleare, Clinica Medica, Pisa, Italy.)

4. Use of 650 and 704 Computers for Structure Analysis, conf., Pittsburgh, Pa. (G. A. Jeffrey, Dept. of Chemistry and Physics, Univ. of Pittsburgh, Pittsburgh 13.)

4–7. American Soc. of Tropical Medicine, Miami Beach, Fla. (R. B. Hill, 3575 St. Gaudens Rd., Miami 33.)

4–11. International North Pacific Fisheries Commission, 5th annual (by invitation), Tokyo, Japan. (R. I. Jackson, 209, Wesbrook Building, Univ. of British Columbia, Vancouver 8, Canada.)

5–7. Society of Rheology, annual, Philadelphia, Pa. (W. R. Willets, Titanium Pigment Corp., 99 Hudson St., New York 13.)

6–7. Nuclear Science, 5th annual, San Mateo, Calif. (H. Pratt, IRE, 1 E. 79 St., New York 21.)

6–8. Geochemical Soc., St. Louis, Mo. (K. B. Krauskopf, Geology Dept., Stanford, Calif.)

6–8. Geological Soc. of America, St. Louis, Mo. (H. R. Aldrich, 419 W. 117 St., New York 27.)

6–8. Gerontological Soc. 11th annual scientific meeting, Philadelphia, Pa. (N. W. Shock, Baltimore City Hospitals, Baltimore 24, Md.)

6–8. Paleontological Soc., St. Louis, Mo. (Miss K. V. W. Palmer, 109 Dearborn Pl., Ithaca, New York.)

6–8. Society of Economic Geologists, St. Louis, Mo. (H. M. Bannerman, U.S. Geological Survey, Washington 25.)

8. Society for the Scientific Study of Sex, 1st annual, New York, N.Y. (R. V. Sherwin, 1 E. 42 St., New York 17.)

8–13. International Rubber Conf., Washington, D.C. (B. S. Garbey, Jr., Pennsalt Chemical Corp., 813 Lancaster Pike, Wayne, Pa.)

10–12. American Petroleum Inst., 38th annual, Chicago, Ill. (API, 50 W. 50 St., New York 20.)

10–12. Physics and Medicine of the Atmosphere and Space, intern. conf. (by invitation), San Antonio, Tex. (Southwest Research Center, 331 Gunter Bldg., San Antonio.)

10–13. American Dental Assoc., Dallas, Tex. (H. Hillenbrand, 222 E. Superior St., Chicago, Ill.)

12–14. Society for Experimental Stress Analysis, annual, Albany, N.Y. (W. W. Murray, P.O. Box 168, Central Square Sta., Cambridge 39, Mass.)

12–15. Society of Naval Architects and Marine Engineers, 66th annual, New York, N.Y. (W. N. Landers, SNAME, 74 Trinity Pl., New York 6.)

16–21. Radiological Soc. of North America, Chicago, Ill. (D. S. Childs, 713 E. Genesee St., Syracuse, N.Y.)

16–23. Scientific Information, intern. conf., Washington, D.C. (Mrs. M. Sheppard, Intern. Conf. on Scientific Information, Natl. Acad. of Sciences–Natl. Research Council, 2101 Constitution Ave., Washington 25.)

17–20. Conference on Magnetism and Magnetic Materials, Philadelphia, Pa. (H. B. Callen, Dept. of Physics, Univ. of Pennsylvania, Philadelphia.)

18–20. Air Pollution, 1st natl. conf., Washington, D.C. (Dept. of Health, Education, and Welfare, U.S. Public Health Service, Washington 25.)

Letters

Creativity and Age

Harvey C. Lehman's painstaking studies on the subject creativity and age [see *Science* **127**, 1213 (1958)] graphically express the fact that most creative work is performed at an early age. This is a very disturbing fact when taken at its face value. Psychologically, it would mean that a scientist does not develop after, say, age 39. Conceptually, it has the strangest implications with regard to the relationship between science and experience. Presumably, as a scientist ages he acquires more experience, but this apparently does not help him in creatively contributing to science.

Lehman does not extend his work to any such conclusions; he purposely limits himself to statistics. Yet, he would like to see his results used as the basis for some kind of action; he indicates that in the cited article. However, his only conclusion is akin to the ancient device *carpe diem*—and not much more. If we wanted to arrive at further conclusions, we would have to know about the causes responsible for the statistical facts. In view of the wide implications I mentioned, I should like to point out two of the causes for Lehman's undoubtedly established facts: (i) The biographies of individual "great" chemists—and other scientists as well—show that, as these men grew older, administrative and public duties absorbed an increasing amount of energy previously applied to scientific work. Therefore, age in itself is not necessarily cause for creative decline. (ii) The men who remained creative during a long life were frequently those who changed their fields. Richard Willstätter did it within chemistry when he went from chlorophyll to anthocyanins and to enzymes. Wilhelm Wundt started in medicine and physiology, then turned to philosophy and to psychology.

It is certainly good for society to have administrators who have demonstrated creative abilities, and it may often be advantageous to change from one scientific field to another one. Lehman would give deeper meaning to his statistics if he would carefully weigh the individual factors and causes. He would then also arrive at a better means for judging who were the "greatest" chemists, and for his "statistical" choice of Berzelius and Dumas, he might then find reasons to substitute others.

EDUARD FARBER

Washington, D.C.

I fully agree with Farber's assertion that age in itself is not necessarily a cause of creative decline. I thought I made that point clear in my article. I disagree, however, with his statement that I chose Berzelius and Dumas as the "greatest" chemists. My article refers to them as two "great" chemists—not as the two "greatest" chemists.

If, prior to writing the above letter, Farber had turned to my book, *Age and Achievement* (Princeton University Press, 1953) (as was suggested in my article), he would have found (pages 328 ff.) a list of 16 *general* causative factors which help to account for my statistical findings but which I omitted from my article because I had already published them in my book. *Individual* causative factors are a far more difficult matter to deal with, for the simple reason that causes rarely operate singly.

Here are some reasons why I did not try to investigate *individual* causes. Many psychologists doubt that the individual is fully aware of his own deepest motivations; surface behavior is not always a dependable guide to the serious student of human behavior; the psychoanalysts would scorn any explanation of causative factors that fails to take subconscious factors into account; and there must also be social and economic as well as a host of other causative factors at work. It is also true that thumbnail sketches such as Farber submits in his letter are oversimplifications and are not very illuminating.

To date I have published more than 400 age curves, selected as the most

representative and most revealing from among a total of several thousand curves that I have made which set forth the relationship between age and creative achievement. These curves were obtained by study of the accomplishments of over 30,000 individuals—more than half of the creative "greats" of Christendom. When duplicate names and the names of living persons are deleted, the total number of individual achievers is still quite large. Not all of my data have been analyzed as yet, and my task is not yet ended. I say all this not boastfully, but merely to point out that it is impossible for any one investigator to do everything.

In criticizing a research report it is more important to note whether the investigator has achieved his goal than to say that he should have selected other goals or additional goals. Although Farber mildly chides me because I did not set for myself goals that he would have set, and although it is his privilege to do so, his criticism is not at all relevant to the integrity of my findings. When he asserts that I did not "carefully weigh individual factors and causes," I can only say in reply that that statement is correct.

HARVEY C. LEHMAN
Department of Psychology,
College of Arts and Sciences,
Ohio University, Athens

Soviet Scientific Literature

I have read with great interest the article "American use of Soviet medical research," by Saul Herner [*Science* **128**, 9 (1958)]. While my experience with Soviet scientific literature is in the fields of chemistry and related sciences, some 27 years of experience lead me to conclusions very similar to those of Herner. Much of the work is excellent, some is indeed mediocre. Some bears the earmarks of plagiarism from previously published Western work, but some is also pathbreaking.

From my point of view as an abstractor for *Chemical Abstracts,* one of the most exasperating things about Soviet scientific literature is the carelessness of the editing. Frequently references to the literature contain typographical errors, and typographical differences between what would appear to be the same mathematical equation on different pages have more than once cost me considerable time in rechecking a derivation.

Soviet book reviews I have in general found to be very detailed and critically analytical. Unlike journal articles, they do at times tend toward the nationalistic and political.

FRANZ H. RATHMANN
School of Chemical Technology,
North Dakota Agricultural College,
Fargo