SCIENCE

5 February 1965

Vol. 147, No. 3658

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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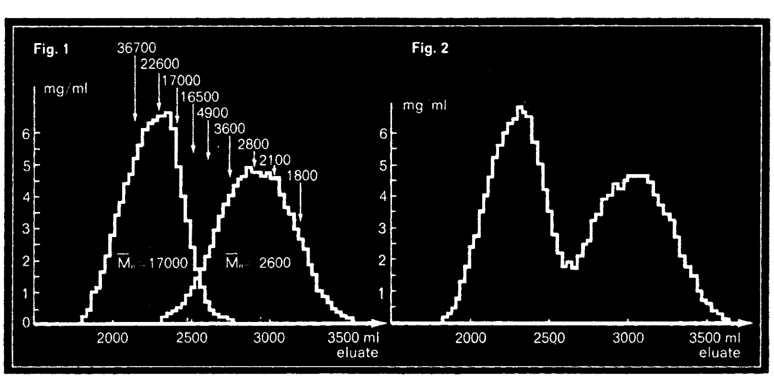
Fractionation of a Dextran Mixture



The diagrams show a separation of two fractions with $\bar{M}_n$ 17,000 and 2,600 respectively, chromatographed on two Sephadex G-100 and G-25 columns connected in series.

Figure 1 shows the elution pattern of the separate fractions.
Figure 2 demonstrates the elution pattern of the dextran mixture.

All Sephadex-G Types
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Sephadex Type	Fractionation range (MW)* determined for polysaccharides
G-25	
Fine/Coarse	100- 5,000
G-50	
Fine/Coarse	500- 10,000
G-75	1,000- 50,000
G-100	5,000-100,000
G-200	5,000-200,000

*For proteins the fractionation range is larger. P. Andrews, Biochem. J. 91:222, (1964).

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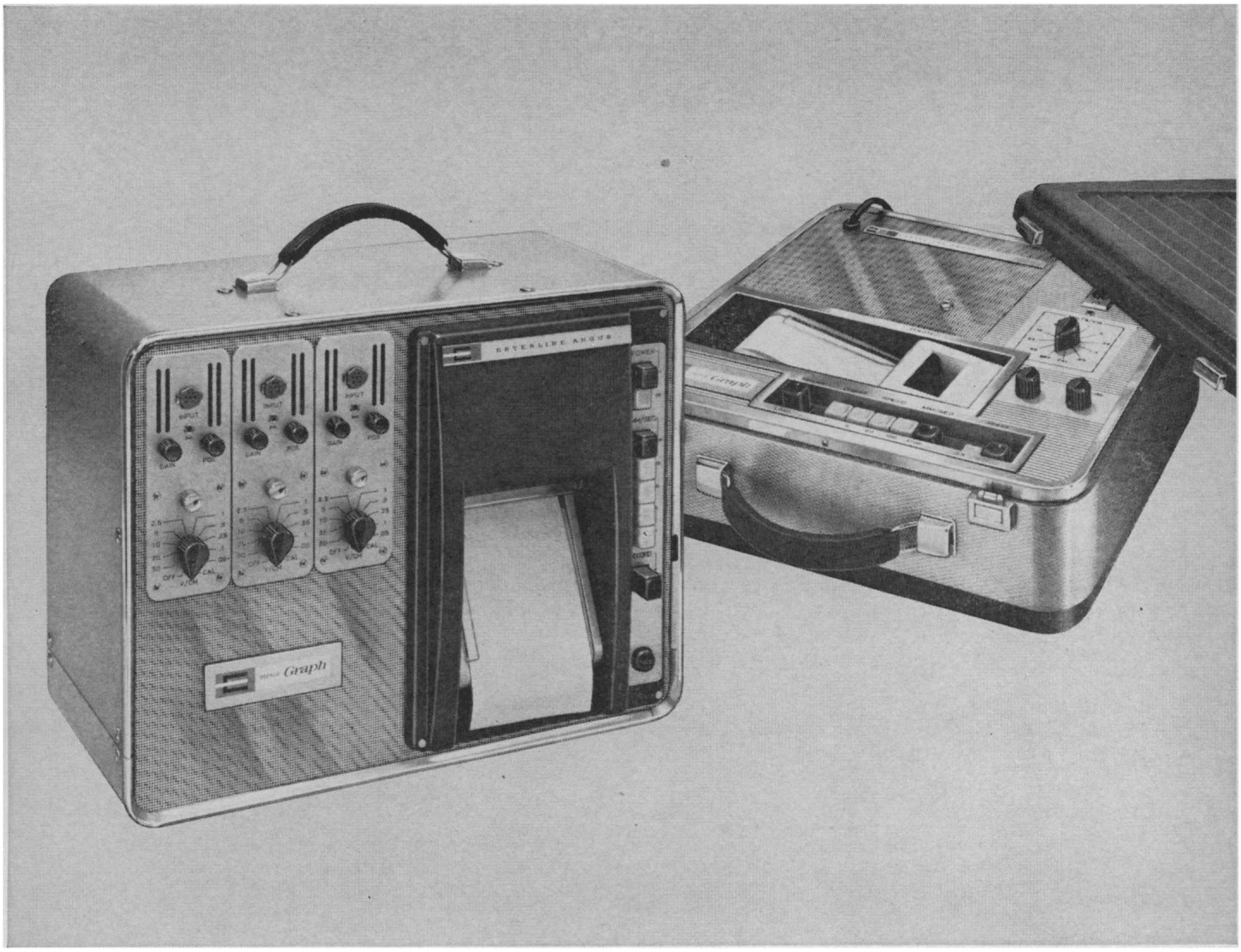

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5 February 1965
Vol. 147, No. 3658

SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Fossil forms discovered in the 18th century by German geologist Johann Bartholomew Adam Beringer, a transitional figure in the history of geology. Unaware that these exotic "fossils" had been placed in his dig by colleagues, Beringer published a treatise to interpret them. His discovery of a "fossil" bearing his own name made him aware of the hoax. See book review of *Approaches to Paleoecology*, p. 592. [From *The Lying Stones of Dr. Beringer*, Melvin E. Jahn and Daniel J. Wolff, University of California Press, Berkeley]


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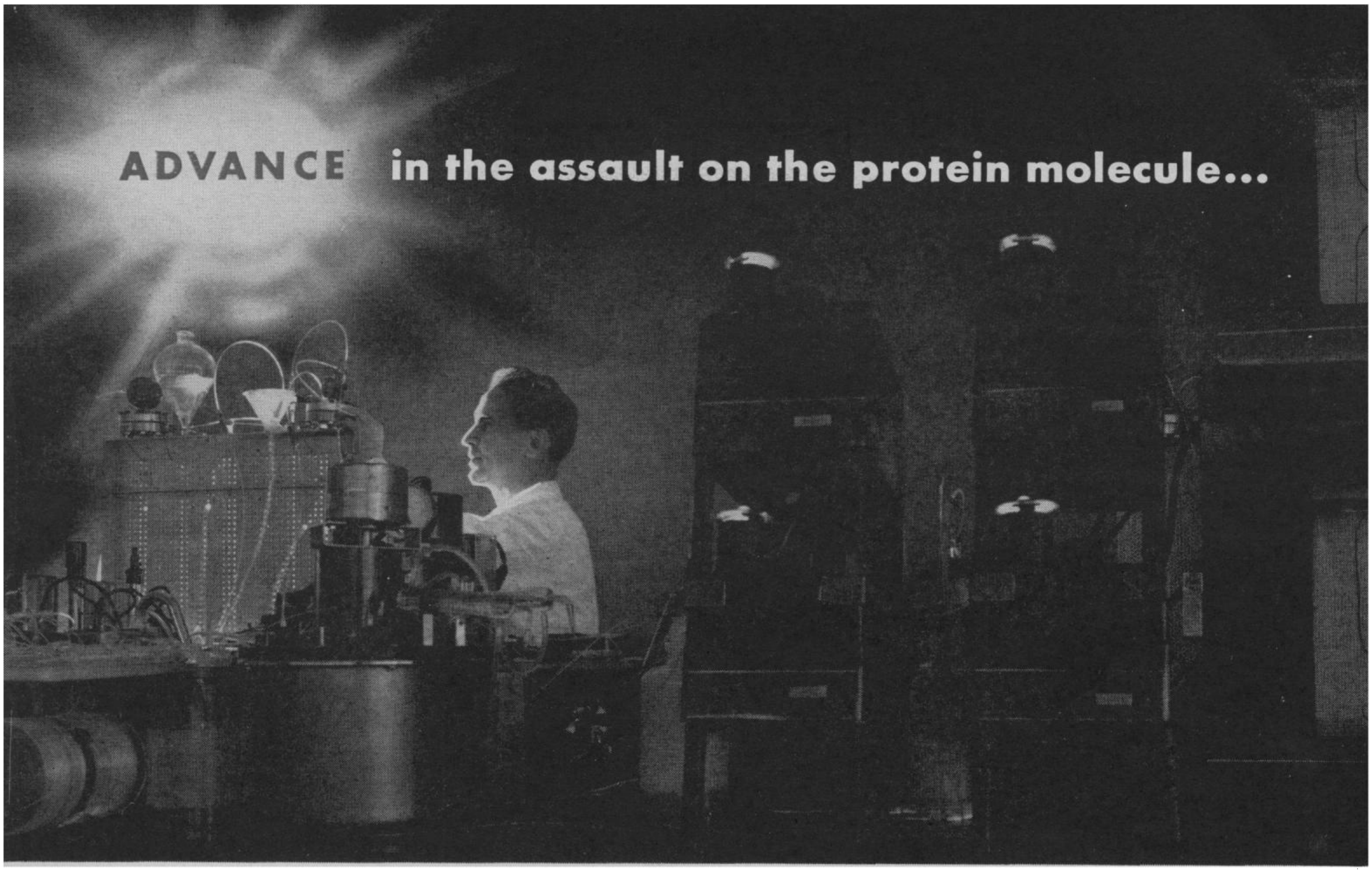

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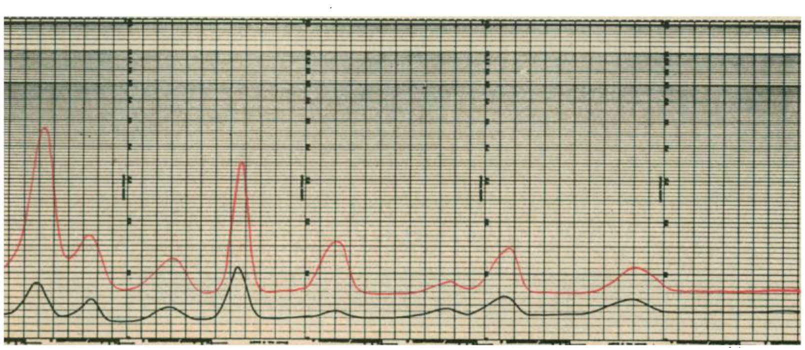

AFTER

BEFORE

Section of a chromatogram showing tryptic hydrolyzate of performic acid oxidized bovine pancreatic Ribonuclease before and after alkaline hydrolysis.

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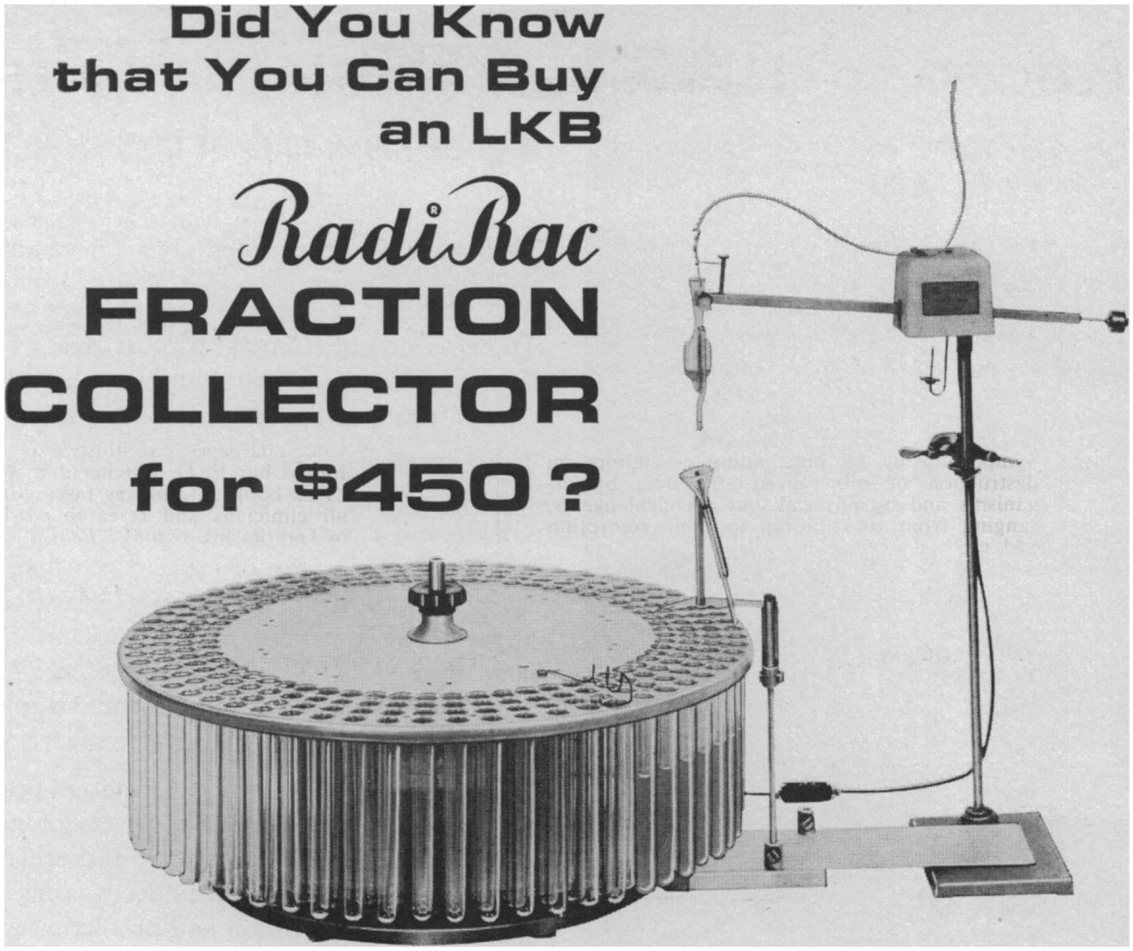

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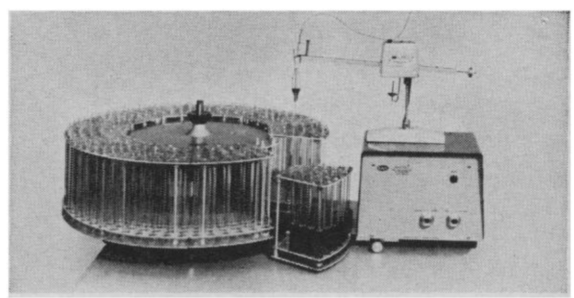

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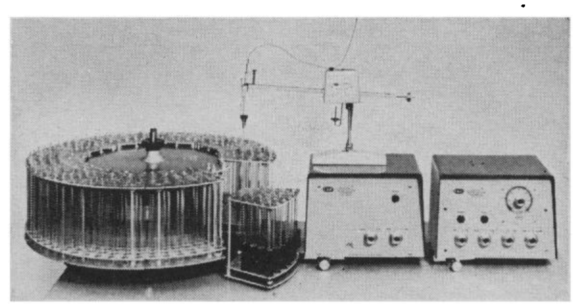

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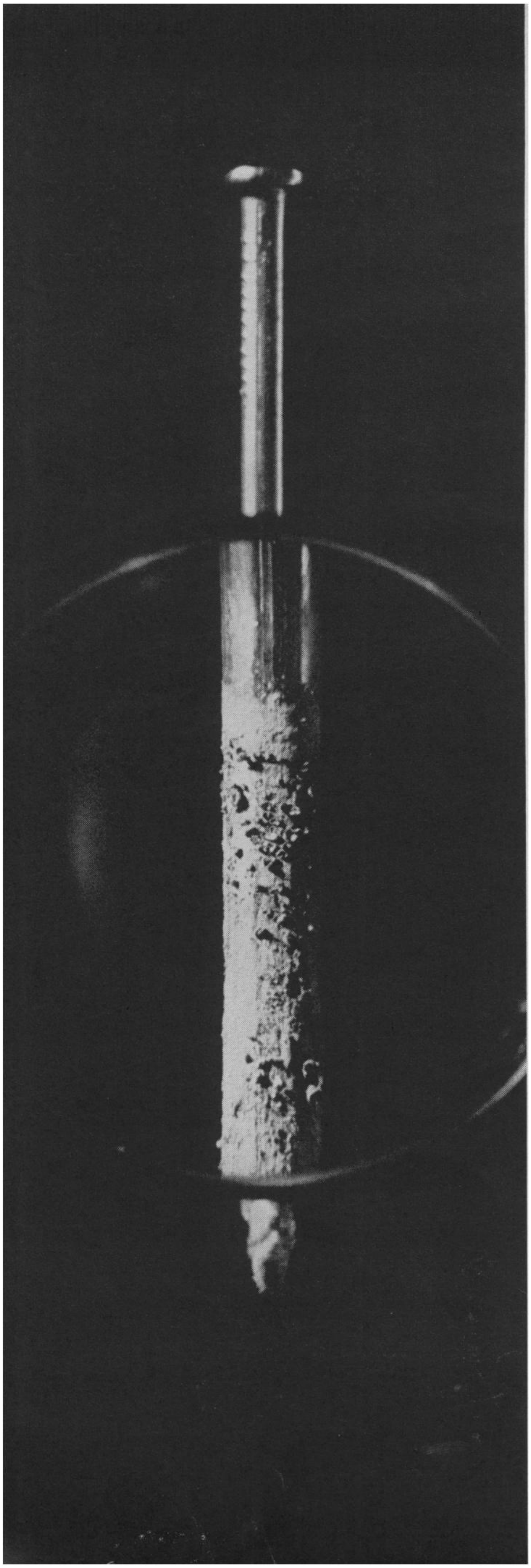


One of a series briefly describing GM's research in depth

A good close look at corrosion mechanisms

Most metals corrode when given the chance.

Why? How?

To help find out, General Motors Research chemists have developed a very rapid, but accurate, method of examining corrosion reactions.

These perplexities are probed by carefully controlling an electric current that is made to flow between a metal sample and a nearby auxiliary electrode—with both immersed in a corrosive aqueous solution. This polarizing current supplements some corrosion reaction currents, opposes others. Simultaneously measuring the polarizing current and the electrochemical potential near the sample's surface provides a continuous monitor of subtle changes in instantaneous corrosion rate.

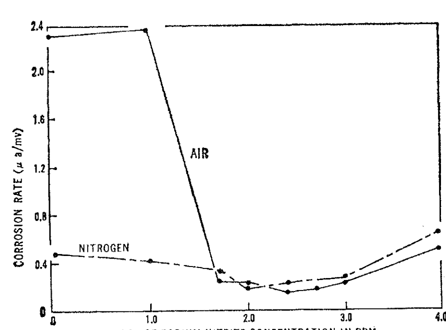
This continuous, dynamic information provides a rapid way to study the effects of a variety of corrosive ions, corrosion inhibitors, gases, and other environmental variables. It also helps in understanding the fundamental mechanisms of corrosion and protection processes.

For instance . . . results have reinforced the view that sodium nitrite inhibits the corrosion of steel, in chloride or sulfate solutions, by helping form a protective oxide film at the metal surface and maintaining it in dynamic equilibrium. They also indicate that the basic function of sodium nitrite is to help provide the current needed to form the protective oxide film.

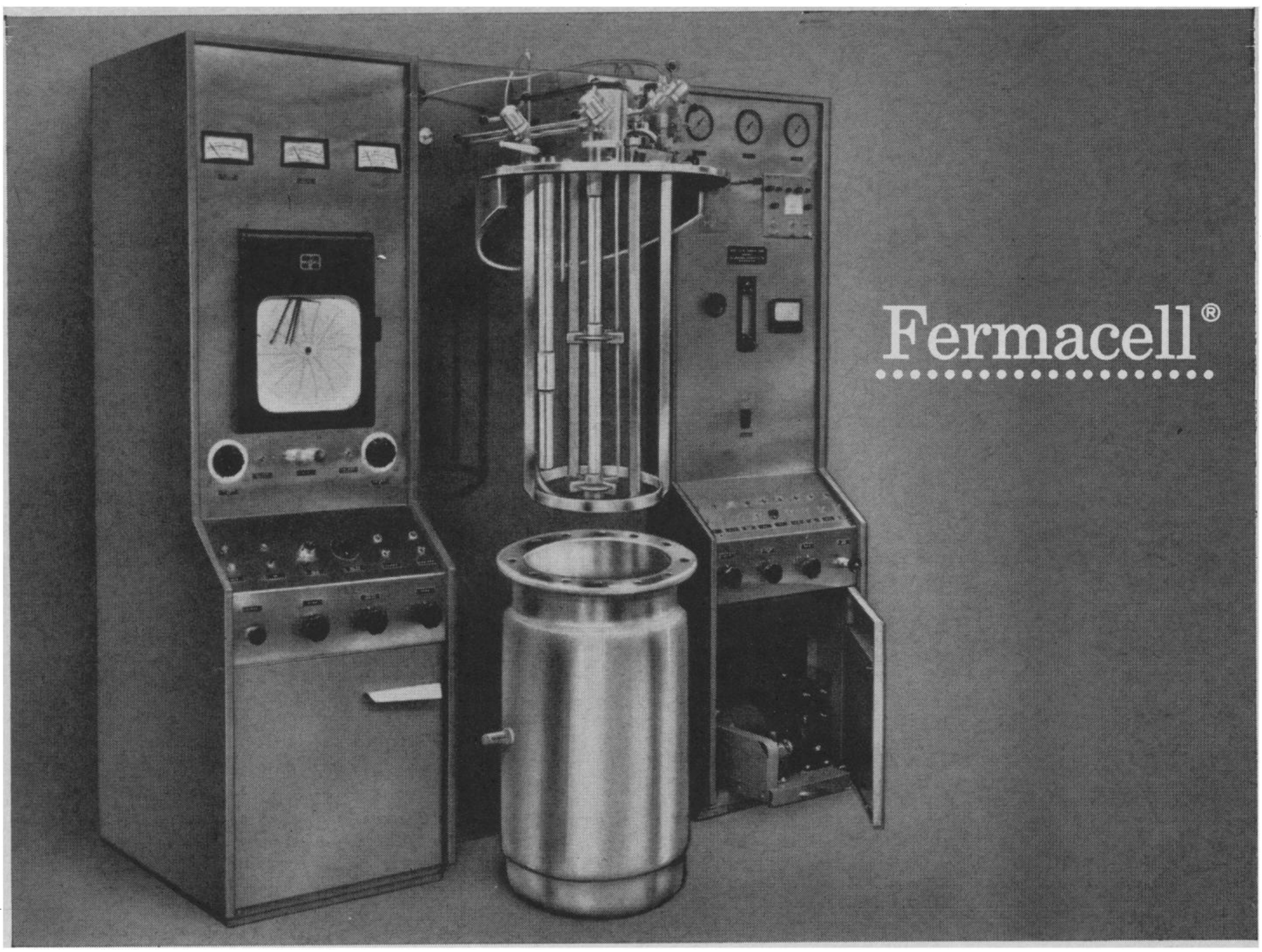
This blending of everyday application with basic understanding is a frequent consequence of General Motors research in depth.

General Motors Research Laboratories

Warren, Michigan



Effect of gases on a mild steel sample in a corrosive solution containing inhibitor.



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Easy to Handle and Easy to Use. The Fermacell's fermentor vessel can be removed quickly by one person in less than three minutes for cleaning as well as emptying and refilling. This design permits complete access to process lines, ports, and electrodes mounted in the stationary fermentor head plate.

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FERMACELL FEATURES

Removable Fermentor Vessel is easy to handle, easy to clean; provides complete access to the fermentor interior.

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Easy to Operate—all controls are conveniently mounted on the front of the apparatus.

is no unique theory that describes a given phenomenon, as is easily proved by making a trivial modification of any given theory which does not change its description of the set of phenomena that are on hand. The theory that endures is the one that describes a large set of phenomena compactly. This involves the minimization of a subjective quantity, human effort, which, like many quantities in engineering, is not capable of exact measurement. A theory is modified or abandoned when it fails to describe a phenomenon that it should describe. A theory does not necessarily have predictive power, and it may not necessarily be capable of predicting numerical values in a useful way. For example, consider the problem of designing a pulse circuit using diodes and transistors. Many have felt the desirability of applying digital computers to this task, but only a few have achieved any significant degree of success. Fundamental philosophic difficulties have impeded progress. To see this, first note that if the transient performance (response to arbitrary time-varying waveforms) of the circuit can be computed, then by known procedures a circuit can be designed (component parameter values obtained) given a circuit configuration. The determination of a circuit configuration is a creative act. To compute the transient response to a given waveform by known methods requires that differential, integral, and other equations be available for each component. A semiconductor diode is a physical device whose operation is described by solid-state theory. However, the equations describing the response of a real, physical diode to arbitrary stimuli have not been obtained. In principle, quantum mechanics applied to the physical structure of the diode could give quantitative answers, but no computer smaller than the universe could solve the problem in a reasonable time. The band approximation and the diffusion theory serve only to describe but do not give quantitative, useful results except for nearly ideal cases. The circuit designer has to design his circuit to use real devices obtainable from a manufacturer. He is limited to only those tests that can be made at the diode terminals. For linear black boxes, systematic procedures exist for obtaining accurate describing equations, but none exist for nonlinear systems. This problem is very similar to that faced by the physical scientist in constructing a mathematical theory on the basis of experiment or experience. That is, if a general synthesis procedure for nonlinear systems based on terminal properties could be found, the pulse-circuit-by-computer-design-problem could be done mechanically, and the procedure would be of inestimable value to the physical scientist.

H. J. GRAY
412 Colonial Park Drive,
Springfield, Pennsylvania

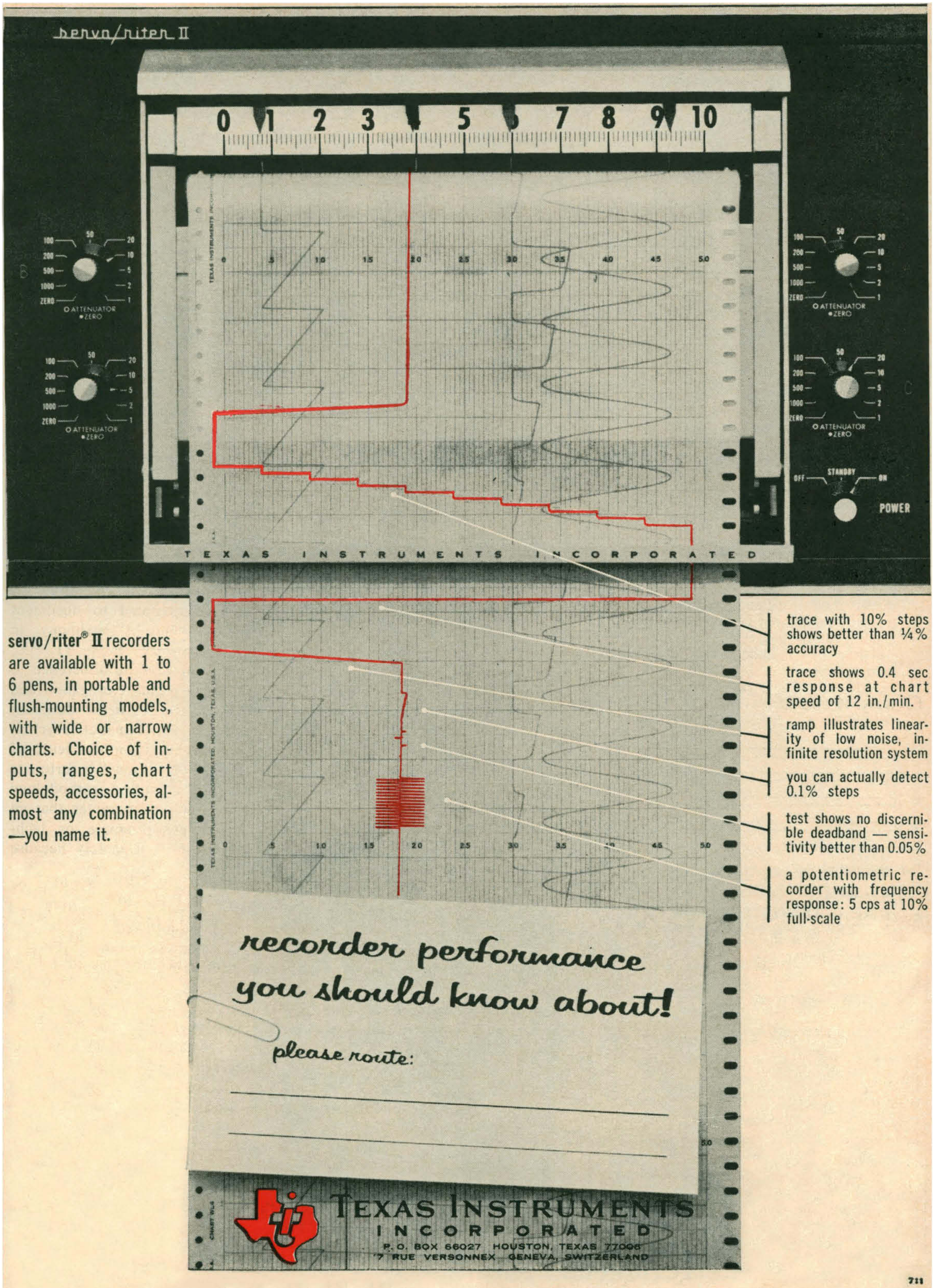
For Complexity

Szent-Györgyi's suggested resolution of the problems of teaching associated with expanding scientific knowledge (4 Dec., p. 1278) would have the undesirable effect of perpetuating an underlying assumption of simplicity or parsimony in the "laws of nature" that is directly contradicted by the increasing complexity evident in the very "explosion" of scientific knowledge to which Szent-Györgyi addresses himself.

As I have attempted to document in detail elsewhere ["Parsimony in psychology," *Psychol. Rept.* **11**, 555 (1962)], an inappropriate adherence to simplicity of scientific investigation and explanation has been a major deterrent to progress in experimental psychology, and probably in other fields of science as well. It is most unfortunate that current scientific methodology offers no satisfactory guarantee that an excessively simple principle or technique will be rejected merely because it is too simple to cope with the empirical facts. Consequently, it becomes exceedingly difficult in practice to rid science of oversimplified formulations, especially when so many scientists, like Szent-Györgyi, appear dedicated to the proposition that the many presently unresolved "riddles of nature" will ultimately yield to a single simple and general explanation. . . .

Our teaching will be far more helpful and effective if we attempt to convey the great importance and excitement attached to the complexities of science and the investigation thereof, rather than misleading the student by emphasizing an underlying simplicity which he probably will never experience.

WILLIAM F. BATTIG
Department of Psychology, University of Maryland, College Park 20742



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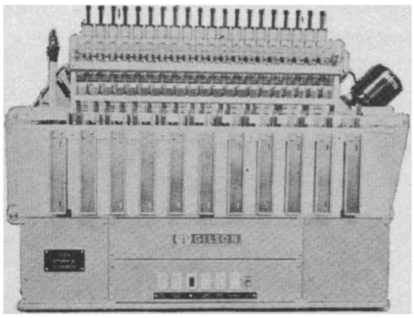

THE GILSON RESPIROMETER, an innovation in the field of microrespirometry, provides for differential respirometry with digital readout in numbers of microliters.

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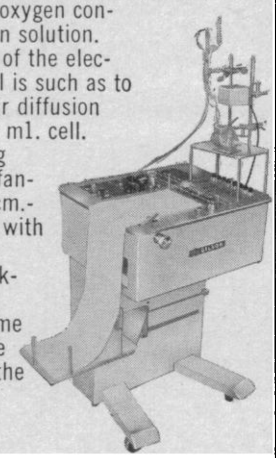

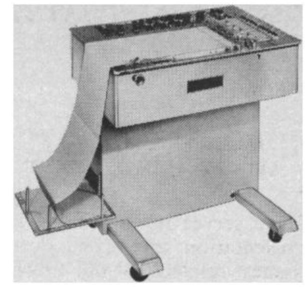

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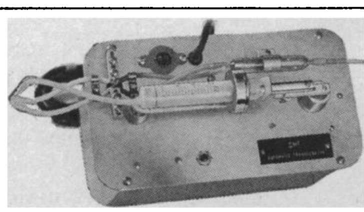
GME ULTRAVIOLET ABSORPTION METERS are designed to indicate which test tubes in the Fractionator contain material of interest.



THE GME TRANSFERATOR is an instrument designed to facilitate the use of the spectrophotometer. Successive samples may be transferred from test tubes into the spectrophotometer cuvette, read, and transferred back into the original test tubes.

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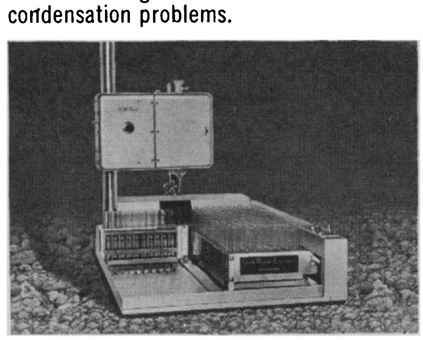

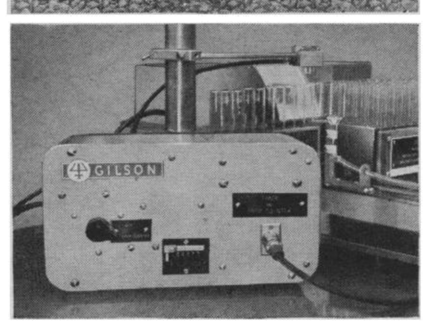

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5 February 1965, Volume 147, Number 3658

SCIENCE

The Federal Science Budget

In the 1966 federal budget, which was summarized in *Science* last week, one explanatory statement concerning funds proposed for the National Science Foundation will be of particular interest in the universities, for it states an objective that must have been involved in much of the thinking concerning basic scientific research and higher education: "Major emphasis in 1966 is on providing funds in the Foundation budget to maintain an adequate rate of growth in Federal support for research in colleges and universities. Funds are also included for increased support for graduate training in the sciences and engineering and for strengthening science programs at developing institutions."

Accordingly, the President requested that NSF funds for research grants be increased by 51 percent, enough to allow an increase from 2900 grants in 1965 to 4300 in 1966. Funds for institutional grants—including the new science development grants—are 27 percent above 1965.

Relatively smaller increases are planned in the budgets of other agencies. Research grant funds requested for the National Institutes of Health are up by 8 percent. NASA plans to increase expenditures for research in physics and astronomy by 23 percent and in the biosciences by 5 percent.

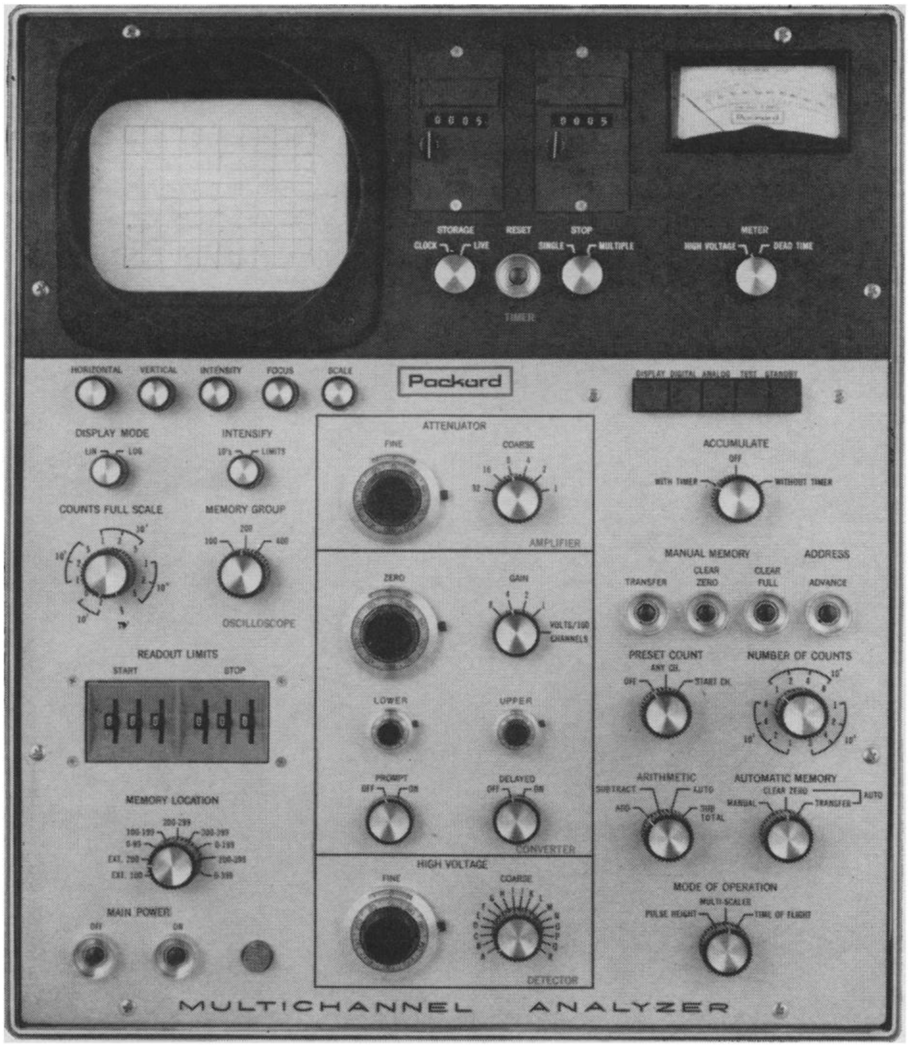
Money for fellowships and traineeships in the NSF budget would increase the number of graduate students supported from 7725 to 8810. The NIH fellowships and training grant funds are scheduled to increase by 13 and 7 percent, respectively. A larger budget for the Office of Education will allow an increase in the number of graduate fellowships from 5883 to 10,494, and in the number of student loans, from 317,000 to 340,000. The Office of Education fellowships and loans will go to students in many fields, including science and engineering.

Of related interest is the fact that the President has requested $98 million for the Office of Education (in comparison with $37 million in 1965) "for invention and testing of new ways of learning, including design of curricular materials."

From 1948 through 1964, the total federal R&D budget increased at an average rate of about 20 percent a year. Obviously that rate could not be sustained much longer; the annual total now exceeds $15 billion and represents more than 15 percent of the entire budget. Warnings of a necessary leveling off are clearly being borne out; the 1965 and 1966 totals will exceed those for the previous year by from 2 to 5 percent.

At the basic research end of the spectrum, however, substantial increases continue; there has been an average increase of 12 percent a year for the past 2 years. Ten years ago about 7 percent of federal R&D money went into basic research. The percentage has increased to 12 in 1964, 13 in 1965, and a budgeted 14 in 1966.

Congress will have its way with all these figures. There would be no violation of precedent if some were decreased and others increased. But at this stage it is clear that there is a leveling off in the total of R&D funds and that there continue to be substantial increases for basic research and the support of graduate students.—DAEL WOLFLE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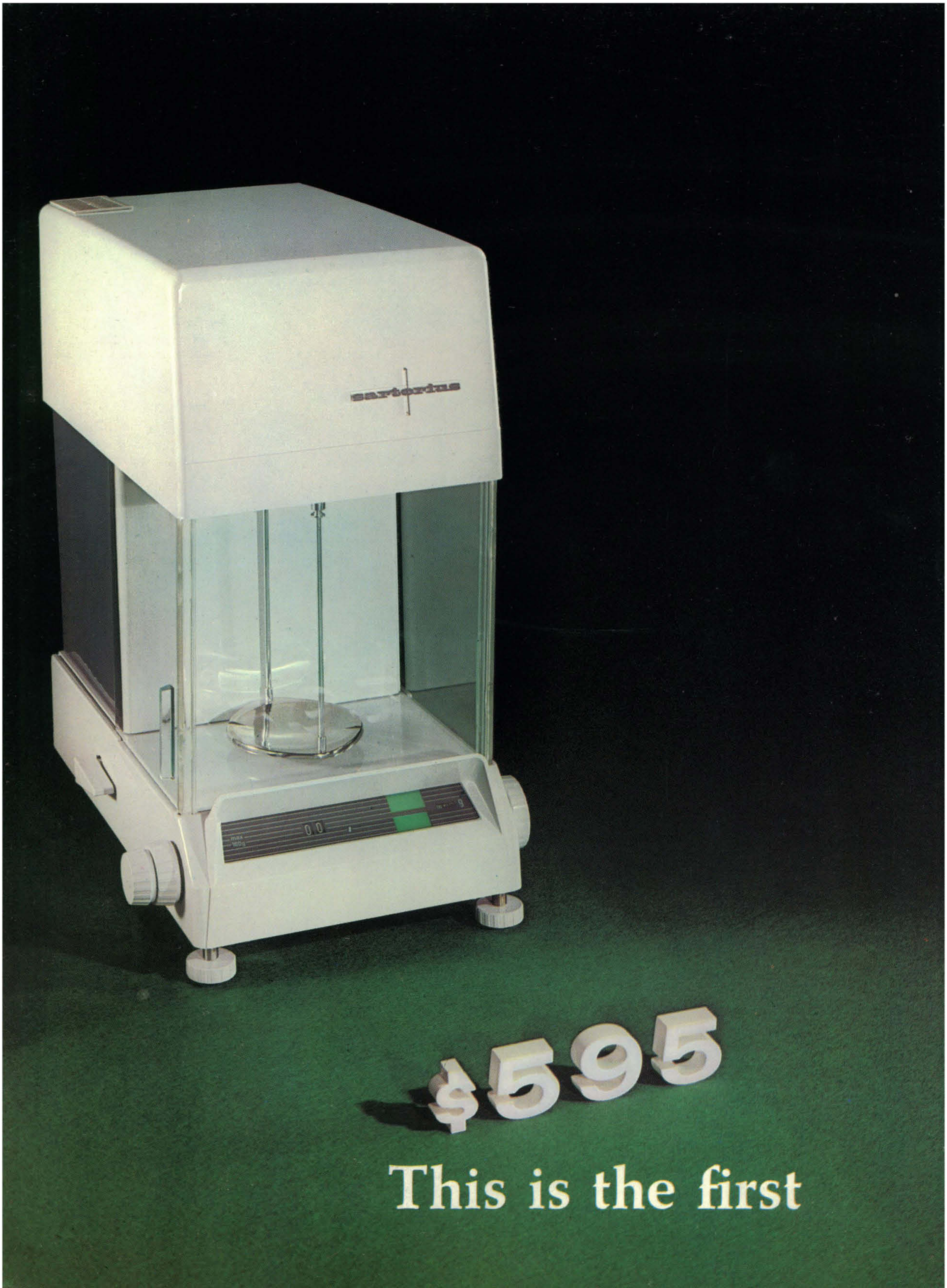
MULTICHANNEL ANALYZER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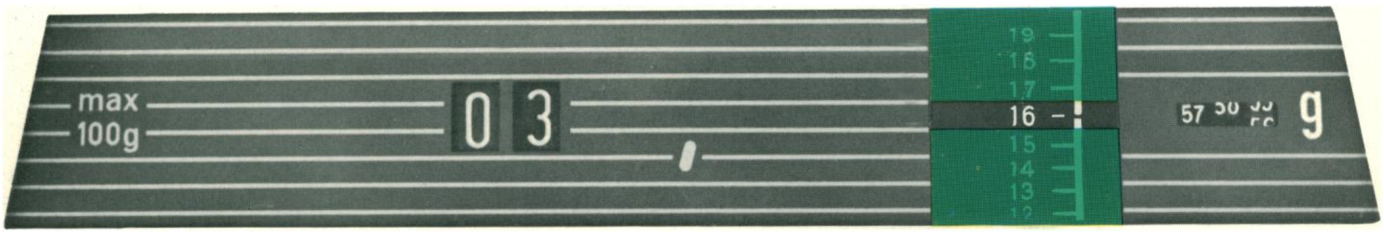
At this remarkable low price, Sartorius offers a single pan analytical balance with an all-digital readout system.



Indicated weight: 3.1657 grams.

The new Sartorius Series 2400 has lowered the cost of modern single-pan balances to a point well within the budget of smaller laboratories, schools and colleges. SARTORIUS Model 2403 provides analytical accuracy (0.1 mg.) at a cost of only $595.*

Other important advantages that are making the entire SARTORIUS 2400 series so popular include: unusually long (1000 mg.) optical range that reduces the need for weight dialing; simplified table-level controls; pan, counters and scales in a single field of view with convenient straight line left-to-right reading; improved visibility of the weighing chamber; and, elimination of the traditional arrestment pin under the pan—it is replaced by a brake located above the weighing chamber. Mechanical taring is provided on the three "T" models by means of a single knob control.

*Model 2405, offering direct digital readout to 1 mg., costs even less at $525.

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Mechanical Taring	NO	NO	NO	NO	NO	YES	YES	YES
Optical Range	10 g	1 g	1 g	10 g	1 g	10 g	1 g	1 g
Sensitivity	1 mg	0.1 mg	0.1 mg	1 mg	1 mg	1 mg	0.1 mg	0.1 mg
Readability (digital)	1 mg	0.1 mg	0.1 mg	1 mg	*	1 mg	0.1 mg	0.1 mg
Reproducibility	±0.3 mg	±0.05 mg	±0.05 mg	±0.3 mg	±0.3 mg	±0.3 mg	±0.05 mg	±0.05 mg
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tional forms must be taken into account. The transitional forms are nonbacterial phases, including the L-phase, in which the organism preserves its generic identity, survives, and multiplies.

Data suggesting the possible pathogenic activity of transitional forms have been gathered from cases of subacute bacterial endocarditis, rheumatic fever, Reiter's syndrome, rheumatoid arthritis, staphylococcal asteomyelitis, and other chronic or recurrent diseases. Transitional forms isolated from patients have multiplied in tissue culture and occasionally exhibited cytopathogenicity. In cell-free culture media, these forms could revert to the parent bacteria. As a model, in a case of subacute bacterial endocarditis, transitional forms persisted for 5 years, were resistant to all antibiotics, and remained capable of reversion to bacterial form in vivo. Changes in morphological form of the organism could be correlated with changes in the clinical symptoms of the patient. The capacity of transitional forms to survive, multiply, and revert in vivo would suggest intrinsic pathogenic potential.

Discussion was enthusiastic and lengthy. Concerning the formation of protoplasts in vivo, L. Muschel (University of Minnesota) commented on early contributions of his group with Gram-negative bacteria, such as *E. coli*. E. A. Mortimer (Western Reserve University) presented preliminary results from experiments in mice inoculated intraperitoneally with several strains of group A streptococci. The L-forms were recovered from heart blood in about half of the instances and from peritoneal exudate in the remainder; L-forms and streptococci both were isolated at death of mice. By reversion, as well as other techniques, the L-forms have been shown to be derived from the group A streptococci. A reverse relationship may exist between virulence for mice and the production of L-forms. Although it was believed that the L-forms were produced in the mice, one could not be absolutely certain that they were not produced in vitro on L-form medium. In any event, this appeared to be an exciting way to produce these L-forms of group A streptococci, and another facet of host-parasite relationships may be observed.

Louis Dienes (Massachusetts General Hospital, Boston) closed the meeting with observations suggesting that L-forms may take part in some pathological processes. T. M. Brown (George Washington University) had expressed similar views in comments on antibody studies of human material (presented with H. W. Clark and J. S. Bailey) which indicate that the rheumatoid factor is associated with *Mycoplasma* immunologic complex. Antibody studies by Y. Crawford (Naval Medical Research Unit No. 4, Great Lakes, Illinois) have suggested L-forms in streptococcosis.

T. R. HAMILTON
University of Kansas Medical Center, Kansas City 3

Marine Microorganisms

Many disciplines of science—chemistry, geology, physics, biology—are involved in marine research. One rapidly developing field is marine microbiology. In order to introduce other workers to this field, a conference on biology of marine microorganisms was held in Berkeley, California, 21–23 December 1964. Approximately 70 participants from all parts of the United States attended.

The conference opened with a discussion of microbial environments in the sea. After introductory remarks by M. B. Allen (Kaiser Foundation Research Institute) two extremes of environment were described—the deep sea, by C. E. ZoBell (Scripps Institution of Oceanography), and the surface film, or neuston, by R. E. Norris (University of Washington). Techniques used in the study of marine microorganisms were also described—methods for the collection and study of bacteria (C. E. ZoBell), chemical methods (J. D. H. Strickland, Scripps Institution of Oceanography), collection and preservation of phytoplankton (R. W. Holmes, Scripps Institution of Oceanography), and the collection and cultivation of living phytoplankton (M. B. Allen).

The principal types of marine microorganisms were described and discussed. These included marine bacteria (J. Liston, University of Washington), marine fungi, including those living as endosymbionts with invertebrates (H. Whisler, University of Washington), and diatoms and dinoflagellates (R. W. Holmes). R. E. Norris discussed the still little-known nannoplankton which he suggested might better be called cryptoplankton because it includes all the phytoplankton, large and small, not amenable to preservation by usual methods. M. B. Allen mentioned some effects of pollution on the marine biota.

Various activities of marine microorganisms were considered. The primary production of organic matter by photosynthetic microorganisms in the sea was discussed by J. D. H. Strickland. R. Y. Morita (Oregon State University) presented recent results from his laboratory on the effects of low temperature on marine bacteria and the factors responsible for obligate cryophily. The nutrition of phytoplankton and the possible role of soluble organic compounds produced by phytoplankton in the nutrition of zooplankton were discussed by M. B. Allen. (Allen also commented on the cycles of nitrogen and sulfur.) C. E. ZoBell described various geomicrobiological activities of marine microorganisms.

A general discussion period concluded the conference.

M. B. ALLEN
Kaiser Foundation Research Institute, Richmond, California

Forthcoming Events

February

8–10. American **Astronautical** Soc., annual, Denver, Colo. (Miss G. W. Heath, Flight Safety Foundation, 468 Park Ave. S., New York 10016)

8–11. Managerial Implications of the Emerging **Technology**, Washington, D.C. (P. W. Howerton Center for Technology and Administration, American University, 2000 G St., NW, Washington 20006)

8–12. American Soc. for **Testing and Materials**, spring meeting, Cleveland, Ohio. (ASTM, 1916 Race St., Philadelphia, Pa.)

9–10. International Soc. of **Terrain Vehicle Systems**, U.S.–Canadian regional meeting, Houghton, Mich. (E. W. Niemi, Dept. of Mechanical Engineering, Michigan Technological Univ., Houghton)

10–11. Corrosion of **Water Supply Systems**, 7th sanitary engineering conf., Urbana, Ill. (B. B. Ewing, Univ. of Illinois, Urbana)

10–12. American **Educational Research** Assoc., annual, Chicago, Ill. (R. A. Dershemer, 1201 16th St., NW, Washington, D.C.)

10–12. National Assoc. **Corrosion Engineers**, conf., Calgary, Canada. (T. J. Hull, NACE, 980 M&M Bldg., Houston, Tex. 77002)

10–13. National Soc. of College Teachers of **Education**, annual, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

10–13. American College of **Radiology**, annual, Philadelphia, Pa. (F. H. Squire, Presbyterian–St. Luke's Hospital, 1753 West Congress St., Chicago, Ill. 60606)

11–13. **Biology of Human Variation,** conf., New York Acad. of Sciences, New York, N.Y. (NYAS, 2 E. 63 St., New York 10021)

12. **Science Programs** for General Education and the Preparation of Elementary Teachers, conf., Long Beach, Calif. (A. F. Eiss, National Science Teachers Assoc., 1201 16th St., NW, Washington, D.C.)

12–17. All **Science** Conf., annual, Karachi, Pakistan. (N. Ahmad, Secretary General, Pakistan Assoc. for the Advancement of Science, Karachi)

13–15. National Assoc. for Research in **Science Teaching,** annual, Chicago, Ill. (J. D. Novak, Bio-Science Dept., Purdue Univ., Lafayette, Indiana)

14. Scientific Conference on **Psychoanalysis,** 3rd annual, Council of Psychoanalytic Psychotherapists, Inc., New York, N.Y. (Miss M. Nelson, 1965 Conference Program, Box 255, East Setauket, Long Island, N.Y.)

14–11. German Foundation for the Developing Countries, **Public Health Training** Problems in Asia, intern. seminar, Berlin, Germany. (GFDC, Tagungsreferat, Agrippinenstrasse 10, 53 Bonn, Germany)

14–18. American Inst. **Mining, Metallurgical and Petroleum Engineers,** annual, Chicago, Ill. (R. W. Taylor, AIME, 345 E. 47 St., New York, N.Y. 10017)

14–18. Society of **Economic Geologists,** annual, Chicago, Ill. (E. N. Cameron, Room 30, Science Hall, Univ. of Wisconsin, Madison)

15–17. **Flight Testing** Conf., American Inst. of Aeronautics and Astronautics, Huntsville, Ala. (D. L. Raymond, AIAA, 1290 Avenue of the Americas, New York, N.Y. 10019)

15–17. American **Standards** Assoc., Inc., Chicago, Ill. (ASA, Inc., 10 E. 40 St., New York, N.Y. 10016)

15–20. Impact of **Mendelism on Agriculture, Biology, and Medicine,** intern. symp., New Delhi, India. (A. T. Natarajan, Secretary, Indian Soc. of Genetics and Plant Breeding, Division of Botany, Indian Agricultural Research Inst., New Delhi 12)

17. Use of **Enzymes** in the Food Industry, seminar, New York Inst. of Food Technologists, Inc., New York, N.Y. (A. Bolaffi, Jell-O Division Laboratories, General Foods Technical Center, Tarrytown, N.Y.)

17. Colors in **Food,** seminar, New York Inst. of Food Technologists, Inc., New York, N.Y. (A. Bolaffi, Jell-O Division Laboratories, General Foods Technical Center, Tarrytown, N.Y.)

17–19. American Acad. of **Occupational Medicine,** annual, Columbus, Ohio. (G. M. Hemmett, AAOM, Eastman Kodak Co., 343 State Street, Rochester 4, N.Y.)

17–19. **Solid State Circuits,** intern. conf., Inst. of Electrical and Electronics Engineers, Philadelphia, Pa. (R. Emberson, IEEE, Box A, Lenox Hill Station, New York, N.Y. 10021)

17–21. American College of **Cardiology,** annual, Boston, Mass. (Executive Director of the College, Empire State Building, New York, N.Y. 10001)

18–19. Mechanical and Transplant **Heart Substitutes,** symp., Heart Assoc. of

Southeastern Pennsylvania, Philadelphia. (L. L. Perry, HASP, 318 S. 19 St., Philadelphia 19103)

18–20. **Skin Bacteria** in Infection, symp., San Francisco, Calif. (Administrative Secretary, Div. of Dermatology, Univ. of California, San Francisco Medical Center, San Francisco 94122)

19–20. **Comparative Psychopathology**—Animal and Human, annual symp., American Psychopathological Assoc., New York, N.Y. (F. J. Kallmann, APA, 722 W. 168 St., New York 10032)

20. **Reliability**, 6th annual West Coast symp., American Soc. for Quality Control, Los Angeles, Calif. (A. S. Golant, Rocketdyne, Canoga Park, Calif.)

20–26. Caribbean **Dental** Convention, 4th annual, Port of Spain, Trinidad. (K. Henry, Dental Assoc. of Trinidad and Tobago, 109 Frederick St., Port of Spain)

21–22. Chicago **Dental** Soc./Acad. of Dentistry for the Handicapped, Chicago, Ill. (R. T. Kirk, Acad. of Dentistry for the Handicapped, Box 213, Springfield, Ohio)

21–25. Technical Assoc. of the **Pulp and Paper** Industry, 50th annual, New York, N.Y. (A. E. Dembitz, TAPPI, 360 Lexington Ave., New York 10017)

22–26. American Soc. for **Metals**, western metal and tool exposition and conf., Los Angeles, Calif. (ASM, Metals Park, Ohio 44073)

22–26. Society for **Nondestructive Testing**, spring convention, Los Angeles, Calif. (SNT, 914 Chicago Ave., Evanston, Ill. 60202)

23–24. National **Dairy** Engineering Conf., East Lansing, Mich. (C. W. Hall, Agricultural Engineering Dept., Michigan State Univ., East Lansing)

23–25. **High Polymer** Conf., East German Chemical Soc., Magdeburg. (East German Chemical Soc., Unter den Linden 68/70, Berlin W.8)

24–26. **Biophysical** Soc., 9th annual, San Francisco, Calif. (R. B. Setlow, Biophysical Soc., Oak Ridge National Laboratory, P.O. Box Y, Oak Ridge, Tenn. 37831)

24–26. American **Crystallographic** Assoc., Suffern, N.Y. (W. L. Kehl, ACA, Gulf Research and Development Corp., P.O. Box 2038, Pittsburgh, Pa. 15230)

24–28. Canadian Assoc. of **Radiologists**, annual, Toronto, Ontario. (Miss A. I. Ekstrand, CAR, 1555 Summerhill Ave., Montreal, Canada)

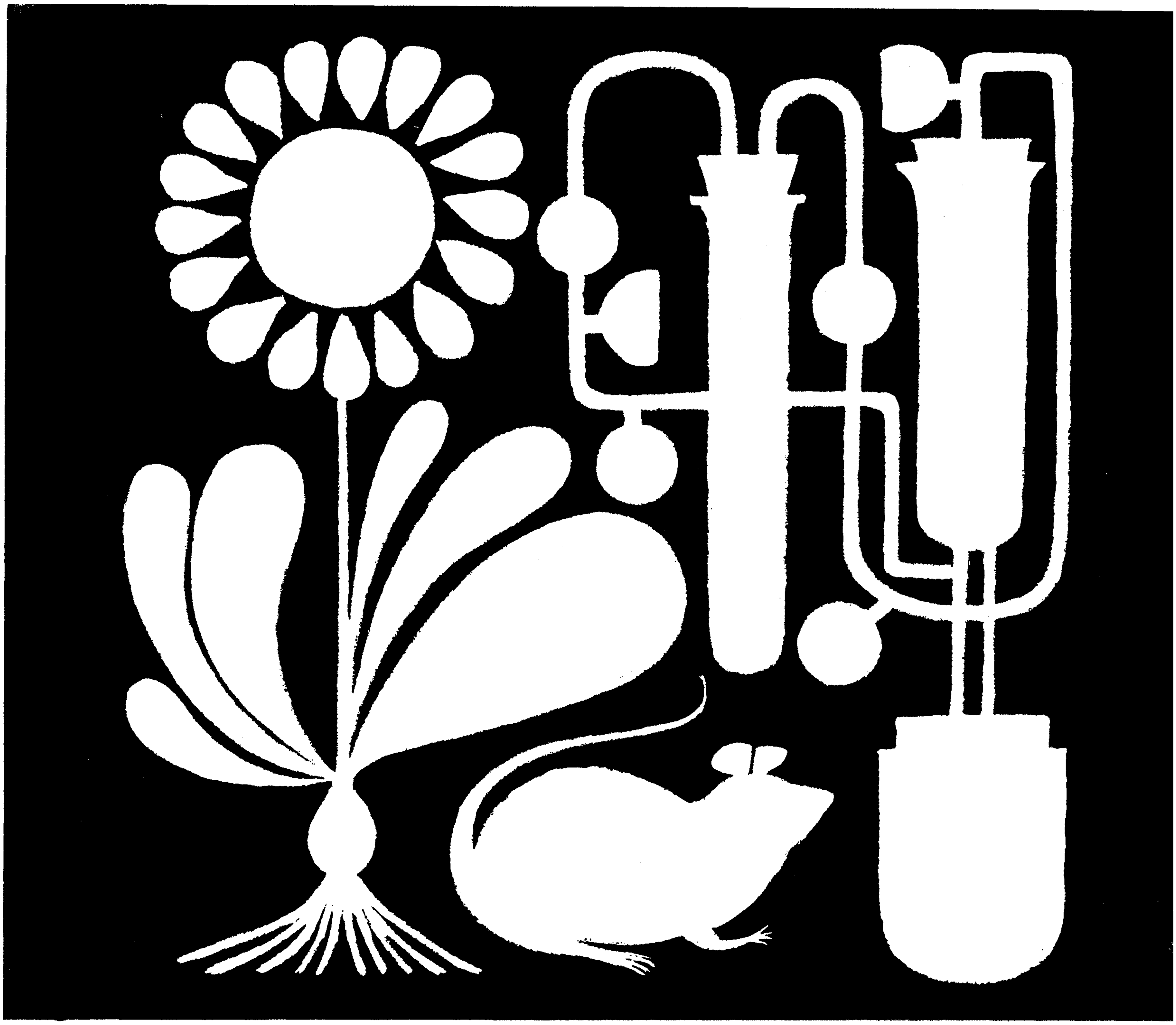
25–26. Society for **Information Display**, 5th natl. convention and symp., Santa Monica, Calif. (R. E. Bernberg, 591 Tigertail Road, Los Angeles, Calif. 90049)

25–27. American Acad. of **Forensic Sciences**, annual, Chicago, Ill. (W. J. R. Camp, 1853 W. Polk St., Chicago 12)

26–27. American **Physical Soc.**, Norman, Okla. (R. G. Sachs, Argonne National Laboratory, Argonne, Ill. 60440)

27–15. Apr. **Commonwealth Mining and Metallurgical** Congr., Australasian Inst. Mining and Metallurgy, Australia and New Zealand. (AIMM, Osborne House, 299 Little Collins St., Melbourne, C.1, Victoria, Australia)

28–3. **Gas Turbine** Conf., American Soc. Mechanical Engineers, Washington, D.C. (D. J. Schneider, ASME, 345 E. 47 St., New York, N.Y. 10017)



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Frozen tissue pulverizer comprises a stainless steel reservoir for the freezing medium, a sample holder (mortar) in contact with the medium, and the pulverizer (pestle). Reservoir is filled with dry ice, dry ice and acetone, or liquid nitrogen, depending on the application. Sample is placed in the mortar, frozen or thawed. The pestle, a separate unit resembling a staple gun, is placed over sample and mortar. The lower handle is squeezed, driving the pestle against the sample. A built-in retaining shield confines the sample. By half-cocking the trigger, pestle may be used as a grinder. Effective with kidney, bladder, intestine, spleen, liver, heart, muscle tissue, and skin. List: $99.50.—D.J.P. (Bio-Chem Instruments, Inc., 39 Decker Street, Copiague, L.I., N.Y.)

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Circle 5 on Readers' Service card

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Denis J. Prager (D.J.P.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

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NEW BOOKS

(Continued from page 602)

Illus. Plates. $2.25. Seven papers: "The prehistory of Panamá Viejo" by Leo P. Biese; "The language of Santa Ana Pueblo" by Irvine Davis; "Observations on certain ancient tribes of the Northern Appalachian Province" by Bernard G. Hoffman; "El Limón, an early tomb site in Coclé Province, Panama," "Archeological notes on Almirante Bay, Bocas del Toro, Panama," and "The archeology of Taboga, Urabá, and Taboguilla Islands, Panama" by Matthew W. Stirling and Marion Stirling; and "Iroquois masks and maskmaking at Onondaga," by Jean Hendry.

Astronautics and Aeronautics, 1963. Chronology on science, technology, and policy. Prepared by the NASA Historical Staff. Natl. Aeronautics and Space Administration, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 618 pp. Paper, $2.

Astronomy for the Layman. Arthur T. Adams. Vantage Press, New York, 1964. 217 pp. Illus. $3.95.

BSCS Biology-Implementation in the Schools (Bulletin No. 3). Arnold B. Grobman, Paul DeH. Hurd, Paul Klinge, Margaret McKibben Lawler, and Elra Palmer. Hulda Grobman, Ed. Biological Sciences Curriculum Study, Boulder, Colo., 1964. 102 pp. Illus. Paper, $3.50; cloth, $5.

Bird Art in Science: The Growth of a Tradition. R. L. Scheffel. State Education Department, Univ. of the State of New York, Albany, 1964. 36 pp. Illus. Paper, 50¢ (order from New York State Museum and Science Service, Albany). A supplement to the New York State Museum's permanent exhibit, Bird Art in Science.

Byron's Journal of His Cincumnavigation 1764–1766. Robert E. Gallagher, Ed. Published for the Hakluyt Society by Cambridge Univ. Press, New York, 1964. 312 pp. Illus. $7.50.

Catalogue of Data in World Data Center A: Oceanography. Data received during the period 1 July 1957 to 31 December 1963. Compiled by W. C. Jacobs. World Data Center A: Oceanography, Washington, D.C., 1964. Unpaged.

A Cheyenne Sketchbook: Cohoe. Commentary by E. Adamson Hoebel and Karen Daniels Petersen. Univ. of Oklahoma Press, Norman, 1964. 112 pp. Illus. $5.95.

Computers: Theory and Uses. Vincent S. Darnowski. Hugh Allen, Jr., Ed. Natl. Science Teachers Assoc., Washington, D.C. 116 pp. Illus. Paper, $1.

The Concept of Nature. The Tarner lectures delivered in Trinity College, November 1919. Alfred North Whitehead. Cambridge Univ. Press, New York, 1964. 212 pp. Paper, $1.95; cloth, $5 (reprint of the 1920 edition).

Disaster Handbook. Solomon Garb and Evelyn Eng. Springer, New York, 1964. 256 pp. Illus. Paper, $3.50; cloth, $4.75.

Drinking Among Teen-Agers. A sociological intrepretation of alcohol use by high-school students. George L. Maddox and Bevode C. McCall. Rutgers Center of Alcohol Studies, New Brunswick, N.J., 1964. 143 pp. $6.

Effects of Atomic Radiation. Report of the United Nations Scientific Committee, 19th session. United Nations, New York, 1964. 124 pp. Illus. Paper, $1.50.

Elementary Teacher's Classroom Science Demonstrations and Activities. David E. Hennessy Prentice-Hall, Englewood Cliffs, N.J., 1964. 320 pp. Illus. $7.95.

Exploration of the Universe. H. C. King. New American Library, New York, 1964. 335 pp. Illus. Paper, 75¢.

Willard Gibbs. Muriel Rukeyser. Dutton, New York, 1964. 475 pp. Illus. Paper, $1.95 (reprint of the 1942 edition).

International Yearbook of Education. vol. 25. International Bureau of Education, Geneva; UNESCO, Paris, 1963 (order from Columbia Univ. Press, New York). 557 pp. Paper, $6.50. Contains individual reports of 98 countries and an analysis of the educational trends that have influenced the progress of education in these countries in 1962 and 1963.

Laboratory Animals. vol. 2, *Animals for Research*. A directory of sources of laboratory animals, equipment, and materials. Natl. Acad. Sciences–Natl. Research Council, Washington, D.C., ed. 5, 1964. 95 pp. Paper, $2.

Law, Science, and Technology: A Symposium. (*George Washington Law Rev.* **33**, No. 1). George Washington Univ., Washington, D.C., 1964. 458 pp. Paper, $4.95. Twelve papers concerned with the impact of science and technology on legal processes. The contributors are Thomas A. Cowan; Arthur Selwyn Miller; Robert G. Dixon, Jr.; W. Wallace Kirkpatrick; Harold P. Green; Samuel D. Estep; Spencer M. Beresford; J. Forrester Davison; Donald B. King; Donald N. Michael; Irving Kayton; and Louis H. Mayo and Ernest M. Jones.

Lightning in His Hand: The Life Story of Nikola Tesla. Inez Hunt and Wanetta W. Draper. Sage Books and Swallow, Denver, Colo., 1964. 269 pp. Illus. $5.

Listen to Leaders in Engineering. Albert Love and James Saxon Childers, Eds. Tupper and Love, Atlanta, Ga.; McKay, New York, 1965. 350 pp. $5.95. Twenty-two chapters written by Vannevar Bush, Gordon Stanley Brown, Frederick Emmons Terman, Andrew S. Schultz, Jr., George E. Holbrook, Nathan M. Newmark, Rolf Eliassen, George S. Schairer, Wernher von Braun, Manson Benedict, Simon Ramo, Oscar T. Marzke, Philip Sporn, Bernard M. Oliver, John R. Pierce, Edward E. David, Jr., Charles Stark Draper, Walter A. Rosenblith, Newman A. Hall, William O. Baker, James R. Killian, Jr., and Jerome B. Wiesner.

Listen to Leaders in Science. Albert Love and James Saxon Childers, Eds. Tupper and Love, Atlanta; McKay, New York, 1965. 288 pp. $5.50. Eighteen chapters contributed by George W. Beadle, Lee A. DuBridge, Glenn T. Seaborg, Robert Oppenheimer, Donald H. Menzel, M. King Hubbert, Frank Press, George Wald, Jackson W. Foster, George Gaylord Simpson, James Bonner, James F. Crow, David G. Mandelbaum, George A. Miller, John W. Tukey, Roger Revelle, Henry G. Houghton, and Warren Weaver.

Personal Knowledge: Towards a Post-Critical Philosophy. Michael Polanyi. Harper and Row, New York, 1964 (reprint of the 1962 edition). 444 pp. Paper, $2.75.

Public Papers of the Presidents of the United States: Harry S. Truman, 1949. General Services Administration, Washington, D.C., 1964 (order from Superintendent of Documents, Washington, D.C.). 707 pp. $6.75. Contains the public messages, speeches, and statements of the president.

Radiation Preservation of Foodstuffs. Second Scandinavian Meeting on Food Preservation by Ionizing Radiation (Stockholm), September 1963; arranged by the Committee for Technical Applications of Ionizing Radiation, Royal Swedish Academy of Engineering Sciences. Per-Olof Kinell and Vera Runnström-Reio, Eds. Johanssons, Karlshamn, Sweden, 1964. 87 pp. Illus. Paper, Kr. 25. Eighteen papers on experimental techniques, application to special foodstuffs, and the fundamental problems involved. The contributors are K. Abrahamsson, A. Brynjolfsson, P.-I. E. Hansen, J. B. Henriksen, B. Henricson, N. W. Holm, M. Jaarma, N. Molin, T. Nilsson, C. G. Österlundh, E. F. Reber, D. N. Rhodes, K. Sehested, J. P. Skou, E. von Sydow, G. Thaarup, and T. A. Truelsen.

The Reconstruction of Past Environments. Proceedings, Fort Burgwin Conference on Paleoecology, 1962. Assembled by James J. Hester and James Schoenwetter. Fort Burgwin Research Center, Ranches of Taos, N.M., 1964. 95 pp. Illus. Paper, $3. Sixteen papers given at the conference.

Religion and the State University. Erich A. Walter, Ed. Univ. of Michigan Press, Ann Arbor, 1964 (reprint, 1958 edition). 320 pp. Paper, $2.25.

The Research State: A History of Science in New Jersey. John R. Pierce and Arthur G. Tressler. Van Nostrand, Princeton, N.J., 1964. 183 pp. Illus. $3.95.

David Rittenhouse. Brooke Hindle. Princeton Univ. Press, Princeton, N.J., 1964. 408 pp. Illus. $8.50.

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