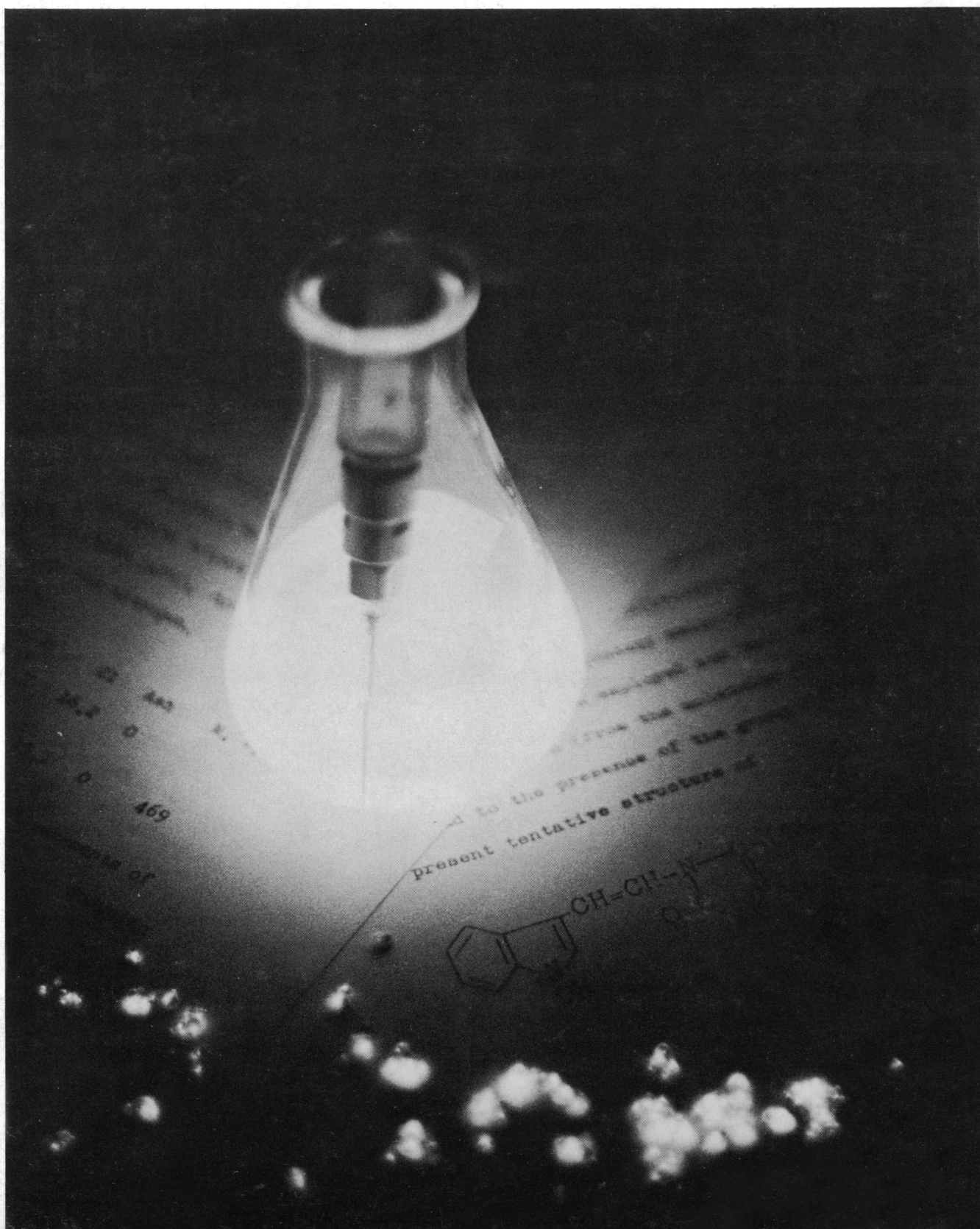


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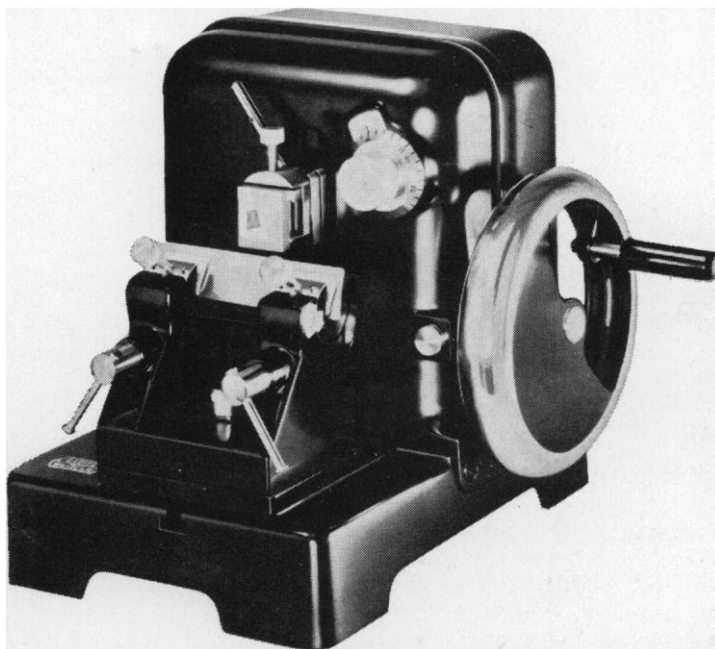
1 December 1961

Vol. 134, No. 3492

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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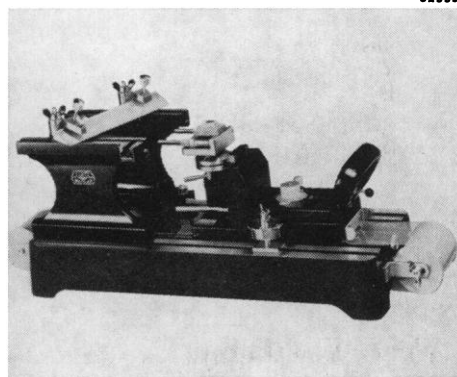
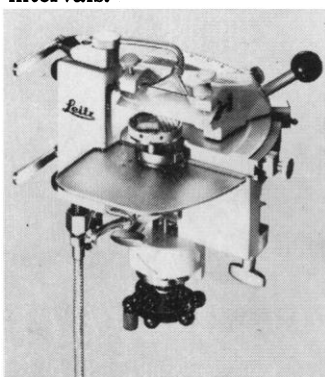
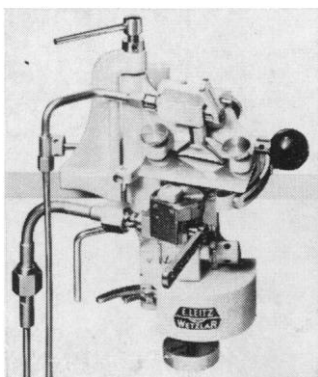
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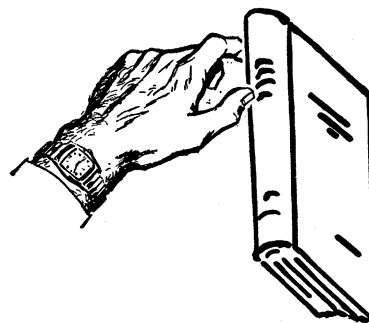
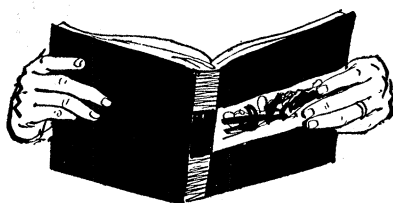
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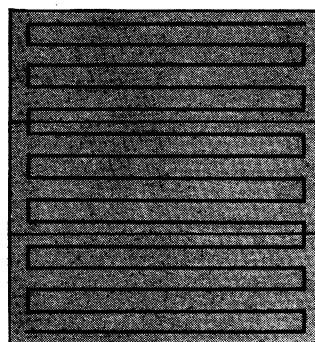
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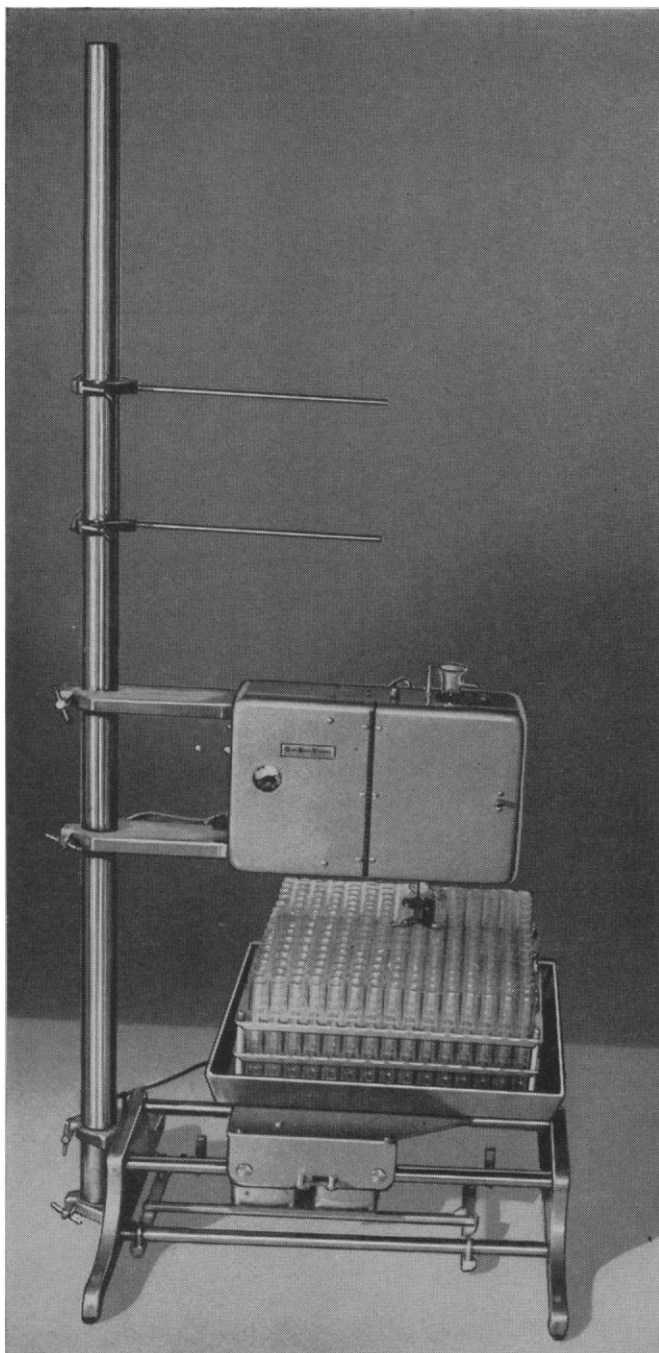


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Cover	Luminescence at micro concentrations of the enzyme-substrate system ("luciferase-luciferin" system) of the ostracod crustacean <i>Cypridina</i> (0.14 μ M luciferin and 1.2 μ M luciferase in the flask). In the foreground, specimens are luminescing after storage for 2 months with Dry Ice. See page 1755. [F. H. Johnson, Princeton University]	

APPLICATION FOR HOTEL RESERVATIONS

128th AAAS MEETING

Denver, 26-31 December 1961

The hotels for the AAAS Denver meeting have established special, low rates and have reserved appropriately large blocks of rooms for this meeting. Thus everyone making room reservations for the AAAS meeting is assured substantial savings.

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If requested, the hotels will add a comfortable rollaway bed to any room, at \$3.00 per night. Mail your application now to secure your first choice of desired accommodations. All requests for reservations must give a definite date and estimated hour of arrival, and also probable date of departure.

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For a list of the headquarters of each participating society and section, see page 197, *Science*, 21 July. The Hilton is the AAAS headquarters hotel.

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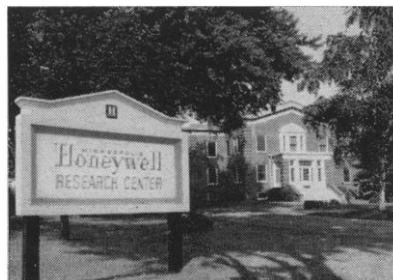
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Studies in the Magnetic Properties of Thin Metallic Films

Temporary or transient memories of electronic computers consist of small doughnut-shaped ferrite cores hand-assembled into many complex matrices. Bulk, speed of response and costly manufacture create inherent limitations. It now appears possible to overcome these by replacing ferrite cores with tiny spots of magnetic film vapor deposited on a smooth flat surface.

Today's electronic computer has a memory which is part of the brain of the machine. Larger machines commonly have two memories: one for permanent storage of information, the other for temporary storage of more transient information. The temporary memory consists of a collection of ferrite cores, each core shaped like a tiny doughnut and having a number of wires laced between it and other cores forming a matrix or grid. The wires carry either the pulse of electricity which magnetizes the core, or a similar pulse which is the core's response to interrogation.

A series of these pulses, handled in a binary number system, have become the language of the computer. To function binumerically, circuits represent "0" by not conducting current, and represent "1" by conducting. Each memory core can be magnetized in one direction for "0", the opposite direction for "1." To avoid ambiguities, cores are made so they are not readily magnetized in any direction other than these two.

Each small ferrite core can be magnetized or interrogated in about a micro-second (one-millionth second). Unfortunately, the assembly of ferrite cores discourages automation processes, making manufacture slow and costly. In addition, the tremendous bulk of many millions of cores properly assembled prohibits machines requiring considerably larger transient memories.

Current basic research indicates that one of the most promising successors to the ferrite core is a tiny spot of magnetic film about 1,000 Angstroms (four millionths of an inch) thick, deposited on a

smooth flat surface. These films have been prepared in Honeywell's Research Laboratories from an alloy of nickel and iron by heating the alloy until it vaporizes in a vacuum. Each freed vapor particle travels until it strikes a cooler surface. There it condenses and stays, if the surface is suitable and immaculately clean.

It might be assumed that the task would be simple. However, as the vapor condenses and becomes solid, it seems to become peculiarly sensitive to the nature of the surface on which it is being deposited. Unless oriented by a magnetic field (created by large coils that encircle the vacuum chamber), the films could be magnetized in a number of directions instead of along the desired single line. When we obtain uniformly bi-stable spots, we are in effect duplicating the action of ferrite cores. We also may use the same cycle by which bits of information are stored and extracted by reversing direction of the magnetic field.

The coercive force necessary to reverse (or "flip") the direction of magnetization within a thin film is very low. Another important advantage stems from the fact that reversal may be accomplished either by employing a rotational mechanism (simultaneous rotation of all atomic magnetic moments) or a wall-motion mechanism (sequential rotation of the atomic magnetic moments in the form of a moving wall). Both may be induced through application of a coercive force as small as one Oersted. Of the two mechanisms, rotational is much the faster; it makes possible the reading and writing of 100,000,000 bits of information per second

on a single spot, as compared to about 100,000 for ferrite cores.

Honeywell scientists have consistently produced 256 bit (16x16) matrices uniform to plus or minus 5% of energy. Only this uniformity makes it possible to use the films in circuits, since a given small electrical pulse applied to any film must flip that film.

Uniformity has been achieved in part through study of deposition techniques and experiments both with various types of substrata and with various methods of cleaning them before deposition. It has resulted also, through broader understanding of the mechanisms involved, in causing reversal of the magnetic field. Even more important, however, have been detailed investigations into the factors that lead to non-uniformity, and subsequent development of techniques that tend to eliminate them.

The most difficult task remaining seems to be linking the film spots with printed circuits which will probably replace the wires used with the ferrite cores.

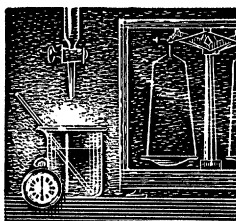
Our research on thin films is both basic and applied. Applied, since our scientists are trying to create better, faster, smaller memory systems for the commercial and military computers our engineers design; and basic, since they are trying to understand and explain all the phenomena described, as well as others that are completely baffling.

If you are engaged in magnetics research and would like to know more about Honeywell's work on thin magnetic films, you're invited to correspond with Dr. Richard Prosen, Honeywell Research Center, Hopkins, Minnesota. Or, if you would like a simplified explanation of the binary number system and how to perform standard mathematical manipulations using this system, write to Honeywell Research, Minneapolis 8, Minnesota.

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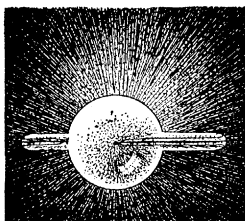
IT HAPPENED THIS MONTH...

a glance at yesterday in relation to today



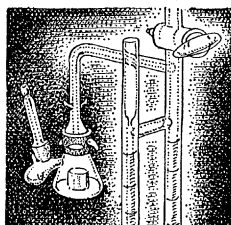
IN DECEMBER—(1905)—A preliminary communication to the Chemical Society (London) discusses a method of estimating tyrosine by bromination and the use of this estimate as a measure of proteolytic activity. Tyrosine is reported to be an early product of tryptic hydrolysis, all the tyrosine in a protein being liberated during the first stage of tryptic digestion. Resistance of the protein tyrosine nucleus to *peptic* hydrolysis is confirmed. This appears to offer a trustworthy method of differentiating peptic from tryptic enzymes.¹

Colorimetric and spectrophotometric methods of tyrosine determination are still widely used for the assay of extracellular tryptic activity. However, there is still no reliable method for measuring intracellular protein breakdown. If you are working in this area—or in the related and very active field of protein biosynthesis—Schwarz has a wide variety of biochemicals which you will find useful. These include optically standardized natural amino acids—many of them labeled with C^{14} , H^3 , S^{35} , N^{15} and O^{18} ; peptides and polyamino acids; ribonucleosides-5'-triphosphates for RNA synthesis, radiolabeled or isotopically stable, as you wish.



IN DECEMBER—(1934)—*Science*² reviews some of the year's important advances in physics and chemistry. By bombarding boron, magnesium, and aluminum with alpha particles, F. Joliot and Irene Curie-Joliot created artificial radioactivity for the first time. They predict the development of new radioisotopes useful in medicine. Triple-weight hydrogen, three times as heavy as the ordinary kind, was discovered by Rutherford, Oliphant, and Hartek at Cambridge; Tuve, Hafstad, and Dahl at the Carnegie Institute; and Harnwell, Smyth, Bleakney, and Smith at Princeton.

The prediction of the Joliot's has become an impressive reality; tracer techniques have since become essential for biological and medical research. Schwarz supplies tritiated ribo- and deoxyribonucleotides and tritiated-L-histidine, tyrosine, and proline—the only optically pure tritiated L-amino acids commercially available. Our tritiated thymidine contains 6.25 curies/mole, the highest specific activity obtainable anywhere.



IN DECEMBER—(1954)—Brawerman and Chargaff³ report some studies on malt, liver, and prostate nucleoside phosphotransferases (enzymes which transfer organically esterified phosphate to nucleosides). The prostate enzyme differentiates between ribo- and deoxyribosides, the liver enzyme between uracil and cytosine ribosides. The malt enzyme accepts phosphate from many nucleotides and may function as a catalyst for nucleotide interconversion—a role analogous to that of the transaminases in amino acid metabolism.

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1. Brown, A. J., and Millar, E. T.: The liberation of tyrosine during tryptic proteolysis. A preliminary communication. *Proc. Chem. Soc. (London)* 21:286 (Dec. 15) 1905. 2. *Science News: Science* 80:6 (Dec. 21) 1934. 3. Brawerman, G., and Chargaff, E.: On the synthesis of nucleotides by nucleoside phosphotransferases. *Biochim. et Biophys. Acta* 15:549 (Dec.) 1954.

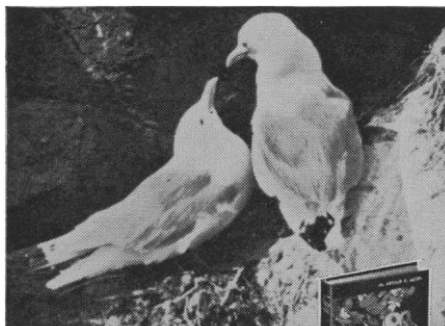


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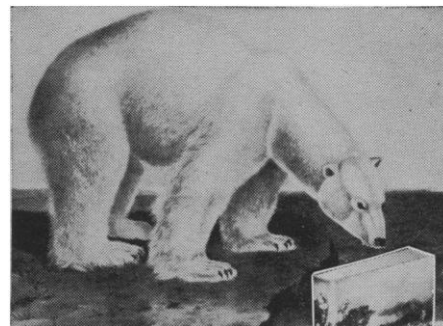
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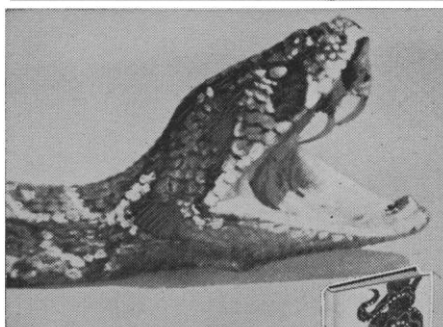
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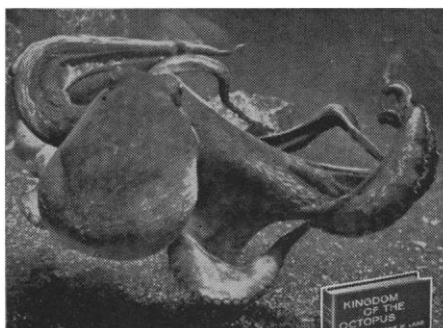
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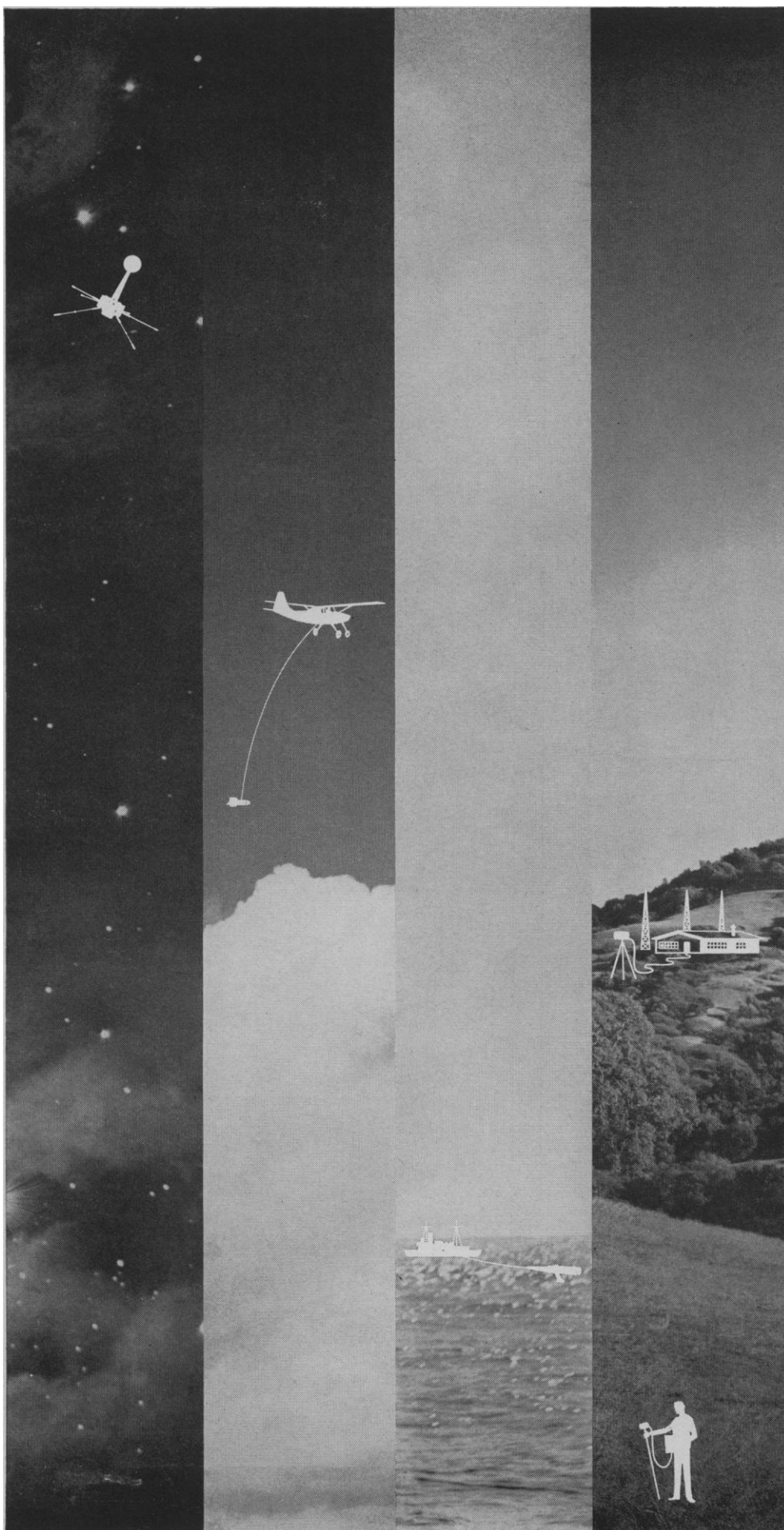
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Means and Ends

Our nation has long been committed to the proposition that education is both a private and a public good: that it benefits the individual by making him a more fully developed human being and by increasing his earning power and that it benefits the country by producing the skills and understanding that make a complex industrial democracy possible.

State and local governments have assumed the task of providing free high school education for all. But in higher education, recognition of public responsibility has not gone so far. Governments at all levels grant tax exemption to private institutions, and both state and local governments support universities and junior colleges at which the students typically pay tuition to cover a part of the educational costs.

The federal government made its first land grants to states for the support of education, including higher education, in 1787, and with the Morrill acts of 1862 and 1890 it greatly enlarged this support. Since then, the federal government has had an increasingly important effect on higher education, through loans to students, fellowships for graduate study (especially in the sciences), and contracts and grants for research and development.

The most important educational policy question for the 1960's is how to meet the coming crisis in higher education. That a crisis is on the way, no one can doubt. The number of students of college age (18 through 21) is increasing, as is the percentage of students who go to college. A study by Alice M. Rivlin, "The Role of the Federal Government in Financing Higher Education" (Brookings Institution, 1961), brings together the figures. In 1960 the number in the college age group was 9.6 million; by 1970 the number will be an estimated 14.6 million. The percentage of the college age group enrolled in college has increased more than ninefold since the turn of the century: 4 percent in 1900; 15 percent in 1940; and 38 percent in 1960. The percentage may rise to 50 in 1970. If it does, the number of students will go from the 3.7 million enrolled in 1960 to 7.6 million in 1970. If adequate facilities are to be constructed and if new faculty members are to be attracted in adequate numbers, costs will have to go up by more than a factor of 2.

How can the crisis be met? One proposal is to raise tuition sharply so that students would pay a larger share of the costs of their education. This would at the same time reduce the percentage of those who could go to college. Those opposed to this solution contend that higher fees would result in social injustice by depriving the economically underprivileged of equal opportunity for higher education and in a loss of potential talent that the country could ill afford from the standpoint either of economic growth or of national survival. Those who hold these views would resolve the debate, as Rivlin does, by urging a larger, but limited federal role: an expansion in the student loan program as carried out under the National Defense Education Act; provision of enough federal scholarships to assure that no bright but impecunious student would be barred from college for economic reasons; provision of federal funds for college buildings; and full payment of overhead costs for government-supported research and development projects.

The merit of these proposals is that they build on what is already in existence and that they neither imperil the freedom of the universities and colleges nor preclude the need for local public and private support.—G.DuS.



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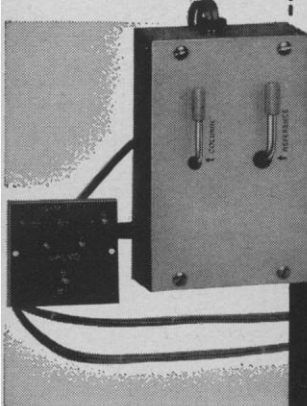
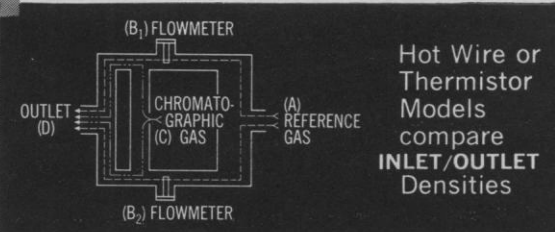
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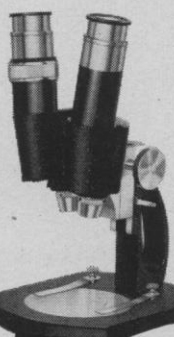
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ference, will preside. Academies of science as catalytic agents, Robert C. Miller, director, California Academy of Science; president, Academy Conference.

Thursday 28 December

Session on Junior Academies. Gerald Acker, Bowling Green State University, will preside. Report on standing committee on junior academies. Regional high school science conferences, Myron S. McCay. Scientific papers by high school students, Lincoln Pettit. A national junior academy, pro and con, Elnore Stoldt.

Conference on Scientific Communication (X5)

The Conference on Scientific Communication has been a recurrent part of the annual meeting of the AAAS since 1952. The original purpose of the Conference was to bring before the Association some of the important problems that confront those who prepare scientific manuscripts. Subsequently, the scope was expanded to provide a forum where members or organizations concerned with all media for communicating scientific knowledge could meet to discuss mutual problems and to interchange ideas.

Those who have conducted the Conference on Scientific Communication at AAAS meetings for the past 10 years would welcome the establishment of a new AAAS section devoted to information and communication, though it would eliminate the need for a continuation of the Conference. It is anticipated that the spirit of the Conference would pass over into the new section and that all who have supported the Conference would support the new section.

Saturday 30 December

Luncheon for those interested in communication.

"Inauguration Session of New Section" (applicable if the AAAS Council votes approval of the new section), arranged by Chauncey D. Leake, Ohio State University; chairman, AAAS board of directors, who will preside. Introduction by the chairman. The scientific explosion, a puff or a bang, and what shall we do about it? Phyllis Parkinson. The collecting, storage, and retrieval of scientific information, Ralph R. Shaw. Indexing in depth, Isaac Welt. Solving the problems of interdisciplinary

nary communication in science, Foster E. Mohrhardt. The status of reviews in interdisciplinary communication, George L. Seielstad. Panel I: Interdisciplinary science communication. Panel members: Dale Baker, Miles Conrad, Graham DuShane, Eugene Garfield, Richard Orr, and Charles Shilling. Panel II: Communicating science to the people. Panel members: Victor Cohn, Watson Davis, Hillier Kriehbaum, Edward G. Sherburne, Jr., and John Sherrod.

Conference on Scientific Manpower

The Conference on Scientific Manpower has met during the annual meetings of the American Association for the Advancement of Science since the 118th meeting at Philadelphia in 1951. Its objective is the recognition and consideration of problems involving scientific manpower in the fields of physical, biological, engineering, and social sciences.

Wednesday 27 December

Invited Address. Program of the Conference on Scientific Manpower, co-sponsored by the Engineering Manpower Commission, Scientific Manpower Commission, National Research Council, National Science Foundation, and AAAS Sections E-Geology and Geography and M-Engineering. Howard A. Meyerhoff, Scientific Manpower Commission, will preside. Engineering and science—a struggle for survival? Truman H. Kuhn, dean of faculty, Colorado School of Mines.

National Association of Science Writers

Wednesday 27 December

Business Meeting. Victor Cohn will preside.

Reception, by invitation.

Annual Dinner and Announcement of AAAS-Westinghouse Science Writing Awards. Victor Cohn will preside.

Scientific Research Society of America

Friday 29 December

Annual Convention of the Scientific Research Society of America.

Joint Luncheon of the Society of the Sigma Xi and the Scientific Research Society of America and Annual Ad-

dress of the Scientific Research Society of America. W. J. Coppoc, presiding. Award of William Procter prize by W. J. Coppoc. Cooperation—a responsibility of the scientist, Edward R. Weidlein, former director, Mellon Institute, Pittsburgh.

Sigma Delta Epsilon Graduate Women's Science Fraternity

Thursday 28 December

Tea for All Women in Science. Ernestine B. Thurman, National Institutes of Health, will preside.

Society of the Sigma Xi

Friday 29 December

Joint Luncheon of the Society of the Sigma Xi and the Scientific Research Society of America.

Sixty-second Annual Convention of the Society of the Sigma Xi. Wallace R. Brode will preside.

Joint Address of the Society of the Sigma Xi and the United Chapters of Phi Beta Kappa. William W. Rubey, member, AAAS Board of Directors, will preside. Science and government, Harrison Brown, professor of geochemistry, California Institute of Technology.

Wilderness Society, Wildlife Management Institute, and Wildlife Society

These societies are cosponsors of Section O's symposium, Land and Water Use.

Forthcoming Events

December

12-15. American Soc. of Agricultural Engineers, Chicago Ill. (J. L. Burt, ASAE, 420 Main St., St. Joseph Mich.)

13. American Acad. of Arts and Sciences, Brookline, Mass. (J. L. Oncley, 280 Newton St., Brookline 46)

15-16. Modern Trends in Activation Analysis, College Station, Tex. (R. E. Wainerdi, Activation Analysis Research Laboratory, Texas A. and M. College, College Station)

15-16. Oklahoma Acad. of Science, Stillwater. (D. Buck, Northern Oklahoma Junior College, Tonkawa)

17-18. International Congr. of Comparative Pathology, 9th, Paris, France. (L. Grollet, Comité International Permanent des Congrès de Pathologie Comparée, 63 Avenue de Villiers, Paris 17°)

19-23. Inter-American Congr. of Psy-

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chology, 7th, Monterrey, Mexico. (G. M. Gilbert, Psychology Dept., Long Island Univ., Brooklyn 1, N.Y.)

22-29. Plant Tissue and Organ Culture, intern. symp., New Delhi, India. (P. Maheshwari, Univ. of Delhi, Delhi)

26-28. History of Science Soc., annual, Washington, D.C. (J. C. Greene, 1121 Iowa Ave., Ames, Iowa)

26-31. American Assoc. for the Advancement of Science, annual, Denver, Colo. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington 5)

The following 45 meetings are being held in conjunction with the AAAS annual meeting.

AAAS Cooperative Committee on the Teaching of Science and Mathematics (J. R. Mayor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C.). 27 Dec.

AAAS Southwestern and Rocky Mountain Division (M. G. Anderson, New Mexico State Univ., University Park). 26-30 Dec.

Academy Conf. (J. G. Arnold, Jr., Loyola Univ., New Orleans, La.). 27-28 Dec.

Alpha Epsilon Delta (N. F. Witt, Univ. of Colorado, Boulder). 28-29 Dec.

American Astronautical Soc. (M. Pitkin, Martin-Denver, Denver, Colo.). 28-29 Dec.

American Astronomical Soc. (H. J. Smith, Yale Observatory, 135 Prospect St., New Haven, Conn.). 26-30 Dec.

American Economic Assoc. (K. E. Boulding, Univ. of Michigan, Ann Arbor). 26 Dec.

American Educational Research Assoc. (D. D. Feder, San Francisco State College, San Francisco, Calif.). 30 Dec.

American Nature Study Soc. (S. G. Baldwin, Danville, Ill.). 27-30 Dec.

American Physiological Soc. (R. E. Smith, Univ. of California, Los Angeles). 29 Dec.

American Political Science Assoc. (J. Korbel, Social Science Foundation, Univ. of Denver, Denver, Colo.). 27 Dec.

American Psychiatric Assoc. (D. A. Hamburg, Stanford Medical Center, Palo Alto, Calif.). 27 Dec.

American Soc. of Criminology (G. H. Barker, Dept. of Sociology, Univ. of Colorado, Boulder). 29-30 Dec.

American Soc. of Naturalists (E. W. Caspari, Univ. of Rochester, Rochester, N.Y.). 27 Dec.

American Soc. of Zoologists (R. L. Watterson, Univ. of Illinois, Urbana). 27-30 Dec.

American Sociological Assoc. (C. Taeuber, Bureau of the Census, Washington, D.C.). 29 Dec.

American Statistical Assoc. (J. A. Niederjohn, Ideal Cement Co., Denver, Colo.). 29-30 Dec.

Association of American Geographers (M. J. Loeffler, Univ. of Colorado, Denver). 26-28 Dec.

Association for Computing Machinery (W. F. Cahill, Goddard Space Flight Center, Greenbelt, Md.). 28 Dec.

Beta Beta Beta Biological Soc. (Mrs. F. G. Brooks, Box 515 Ansonia Station, New York 23). 26-27 Dec.

BIO (Biomedical Information-Processing Organization) (R. S. Ledley, Natl. Biomedical Research Foundation, Silver Spring, Md.). 27 Dec.

Biometric Society, WNAR (F. Graybill, Statistical Laboratory, Colorado State Univ., Fort Collins). 28 Dec.

Committee on Desert and Arid Zones Research, Southwestern and Rocky Mountain Div. of AAAS (T. L. Smiley, Univ. of Arizona, Tucson). 30 Dec.

Conference on Scientific Communication (C. D. Leake, Ohio State Univ., Columbus). 30 Dec.

Conference on Scientific Manpower (T. J. Mills, Natl. Science Foundation, Washington, D.C.). 27 Dec.

Ecological Soc. of America (R. S. Miller, Univ. of Saskatchewan, Saskatoon, Canada). 27-29 Dec.

Institute of Management Sciences (M. M. Flood, Mental Health Research Inst., Univ. of Michigan, Ann Arbor). 29 Dec.

Mathematical Assoc. of America, Committee on Undergraduate Program in Mathematics (R. J. Wisner, Michigan State Univ., Oakland, Rochester). 30 Dec.

Metric Assoc. (R. P. Fischelis, 502 Albee Bldg., NW, Washington, D.C.). 27-30 Dec.

National Assoc. of Biology Teachers (Miss M. Beuschlein, Chicago Teachers College, Chicago, Ill.). 27-30 Dec.

National Assoc. for Research in Science Teaching (Miss E. M. Selberg, Colorado State College, Greeley). 27-30 Dec.

National Assoc. of Science Writers (H. B. Nichols, U.S. Geological Survey, Washington, D.C.). 27 Dec.

National Geographic Soc. (R. Gray, National Geographic Soc., Washington, D.C.). 30 Dec.

National Science Teachers Assoc. (Miss M. Gardner, Natl. Science Teachers Assoc., Washington, D.C.). 27-30 Dec.

National Speleological Soc. (W. R. Halliday 1117 36 Ave., East, Seattle, Wash.). 29 Dec.

Philosophy of Science Assoc. (C. W. Churchman, Univ. of California, Berkeley). 29 Dec.

Scientific Research Soc. of America (D. B. Prentice, 51 Prospect St., New Haven, Conn.). 29 Dec.

Sigma Delta Epsilon (Miss E. B. Thurman (Natl. Institutes of Health, Bethesda, Md.). 28 Dec.

Society for General Systems Research (R. L. Meier, Mental Health Research Inst., Univ. of Michigan, Ann Arbor). 29 Dec.

Society for Industrial and Applied Mathematics (D. L. Thomsen, Jr., I.B.M. Corp., White Plains, N.Y.). 29 Dec.

Society of Protozoologists (N. D. Levine, College of Veterinary Medicine, Univ. of Illinois, Urbana). 27-30 Dec.

Society of the Sigma Xi (T. T. Holme, 51 Prospect St., Yale Univ., New Haven, Conn.). 29 Dec.

Society of Systematic Zoology (C. F. Lytle, Tulane Univ., New Orleans, La.). 27-30 Dec.

Tau Beta Pi Assoc. (R. H. Nagel, Univ. of Tennessee, Knoxville). 29 Dec.

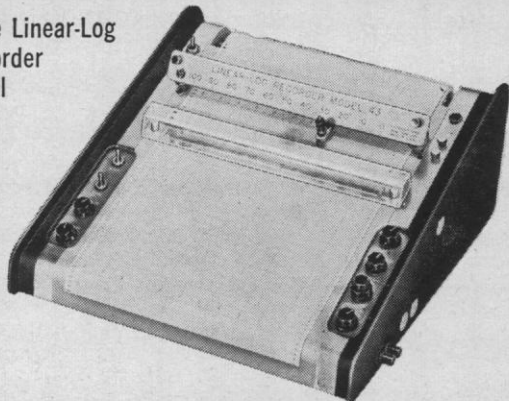
United Chapters of Phi Beta Kappa (C. Billman, 1811 Q St., NW, Washington 9). 29 Dec.

27-29. American Economic Assoc., New York, N.Y. (J. W. Bell, AEA, Northwestern Univ., Evanston, Ill.)

27-29. American Folklore Soc., Cincinnati, Ohio. (T. P. Coffin, 110 Bennett Hall,

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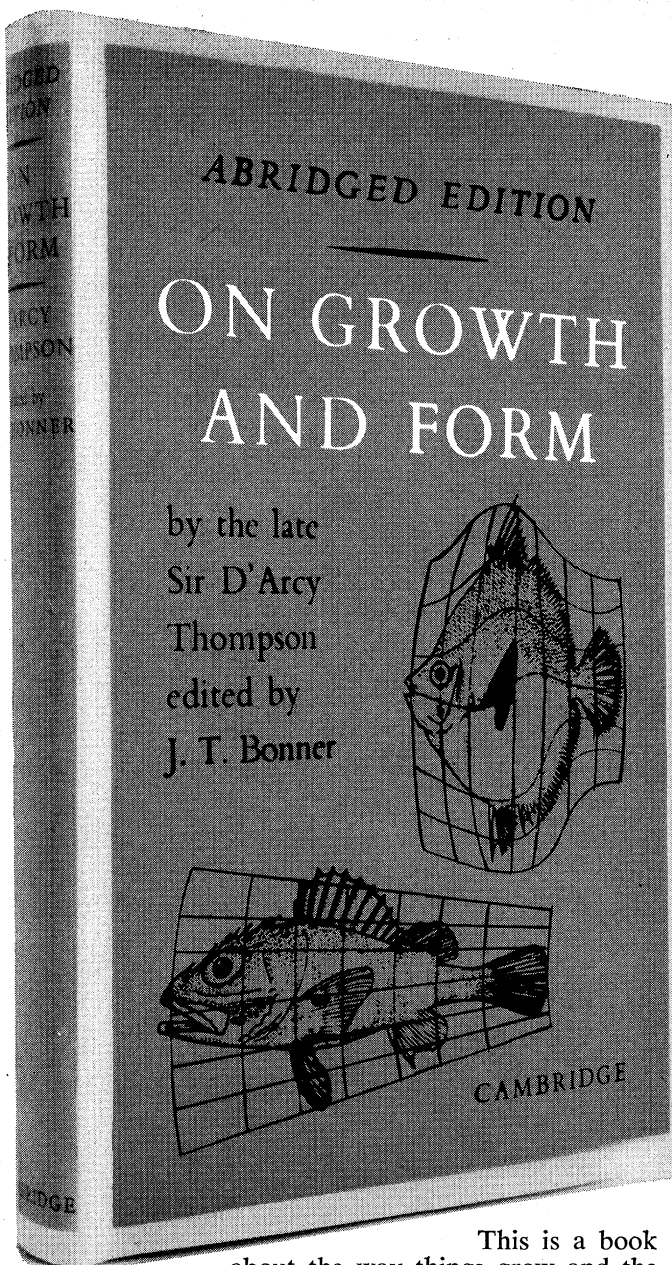
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