

SCIENCE

21 November 1969

Vol. 166, No. 3908

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Proceedings Issue

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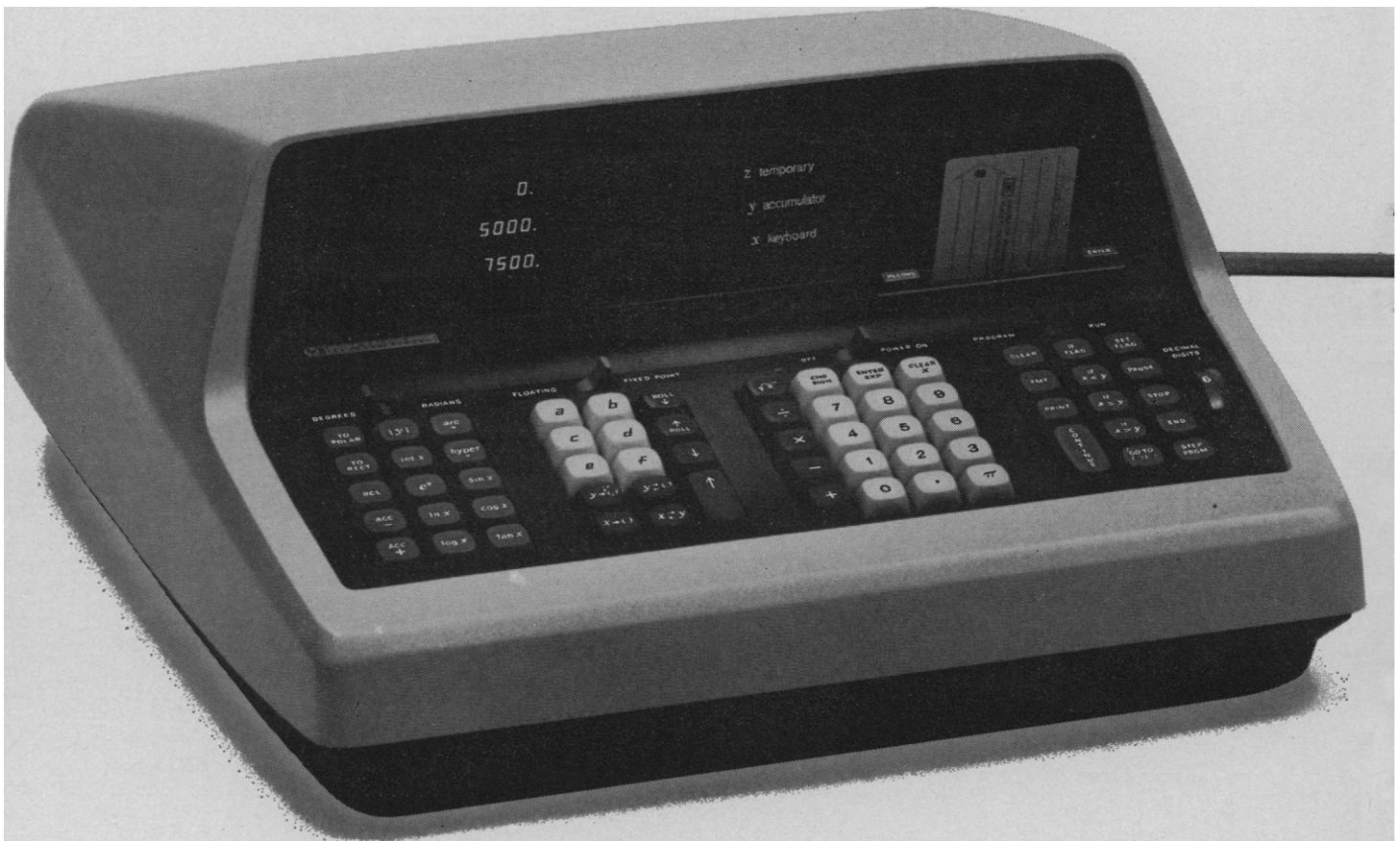
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COVER

Cretaceous trace fossil, *Helminthoida labyrinthica* (lower left); simulation by farmer spraying his fields (top, traced from aerial photograph); simulation by computer (right). See page 994. [David M. Raup, University of Rochester]

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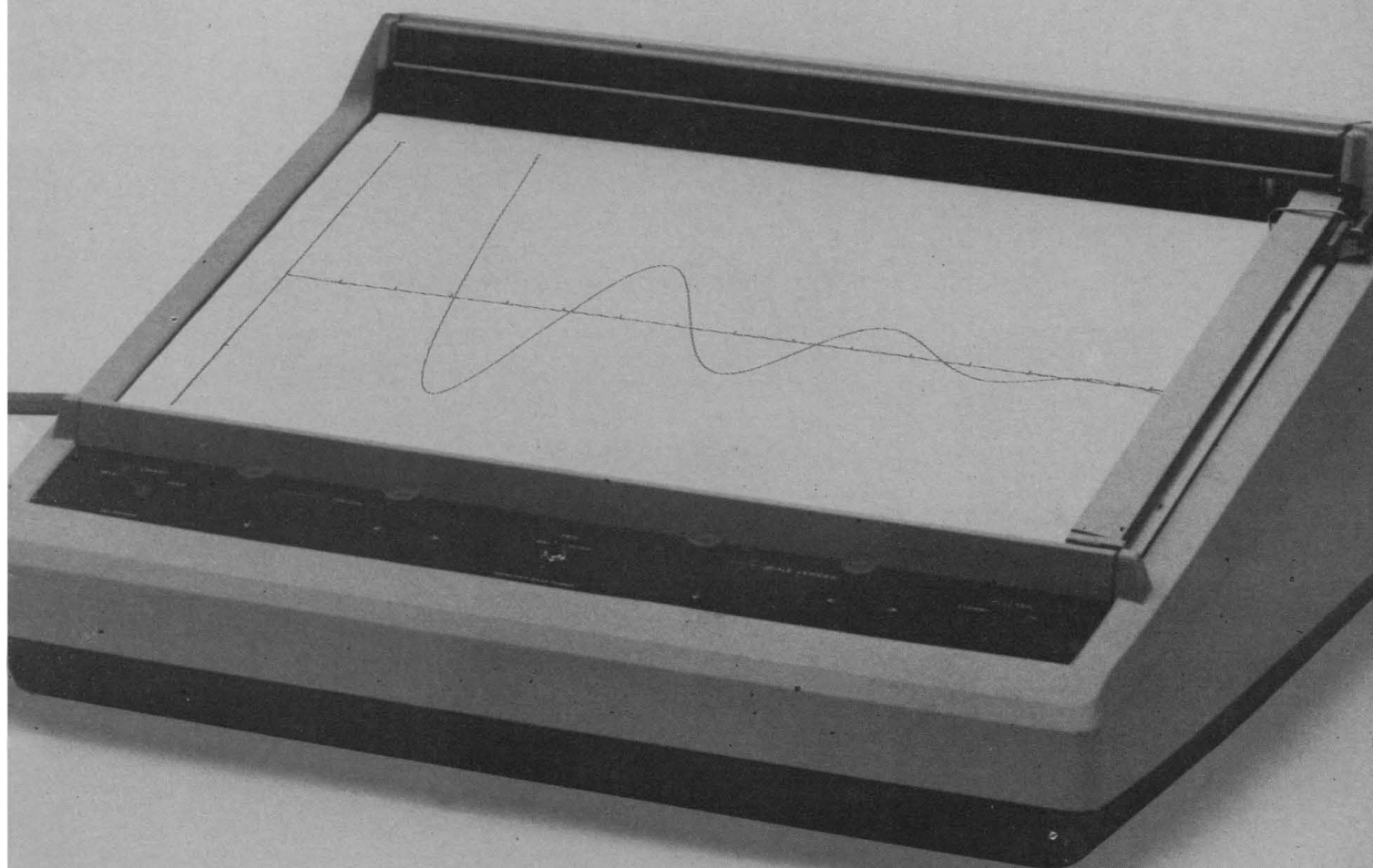
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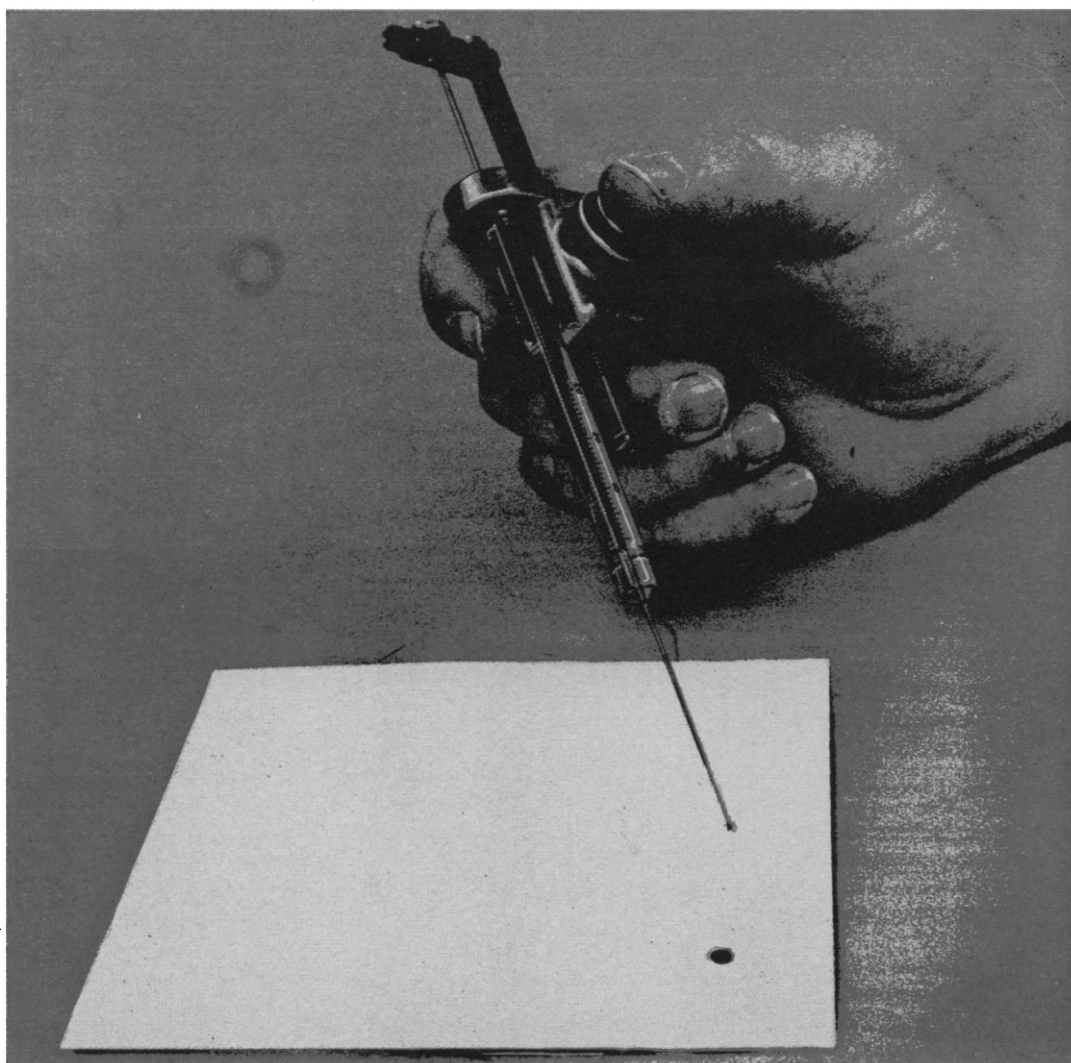
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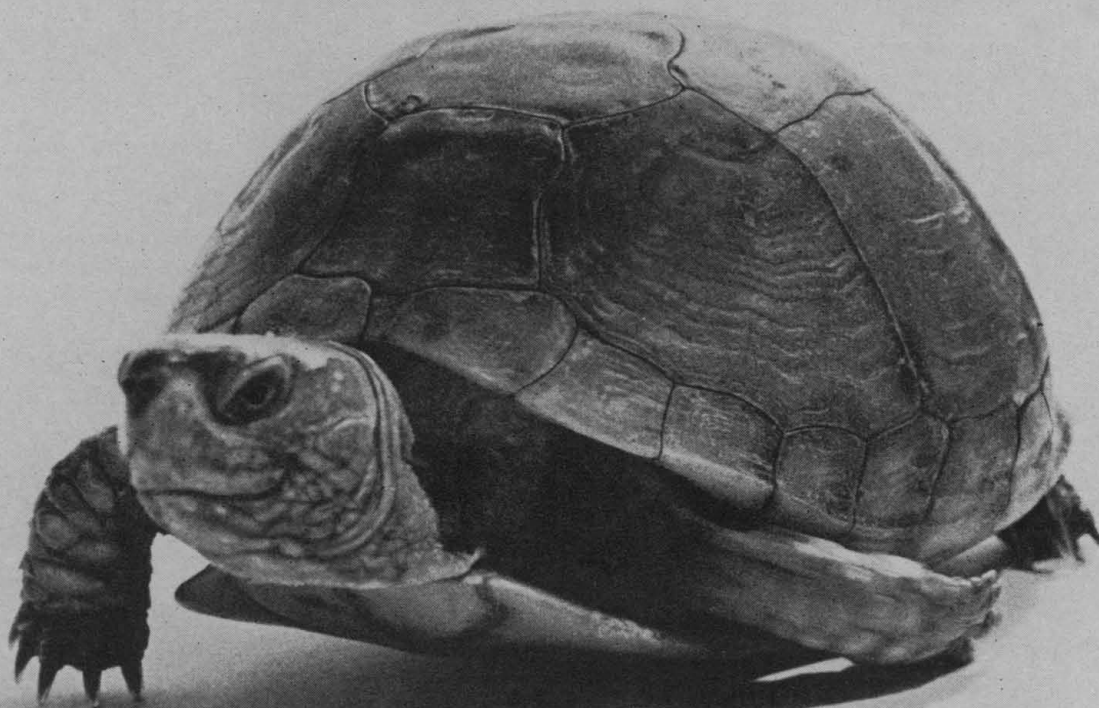
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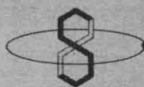
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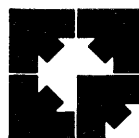
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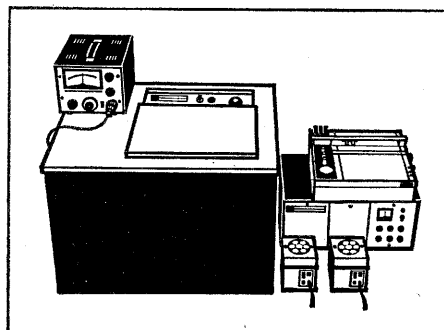
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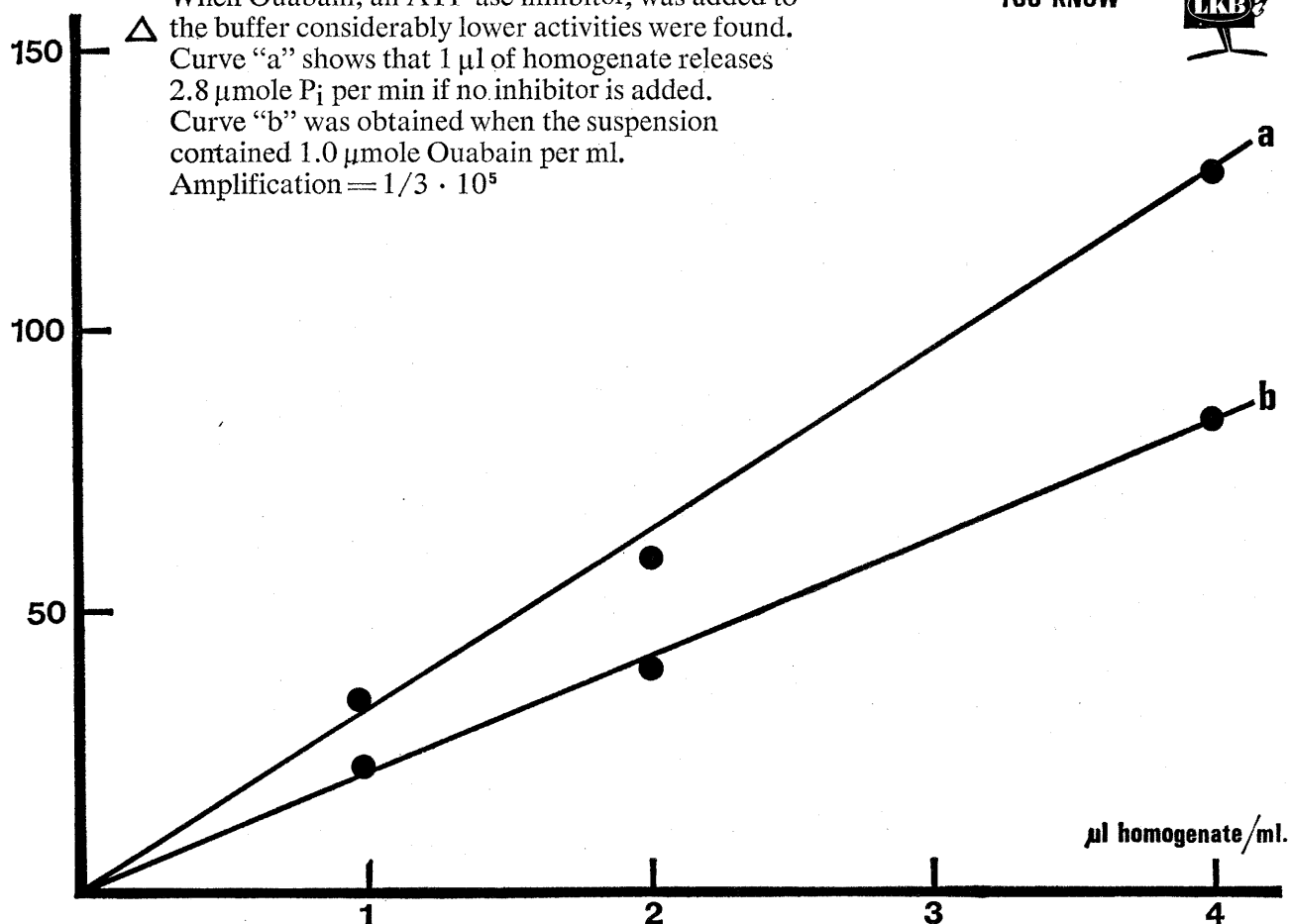
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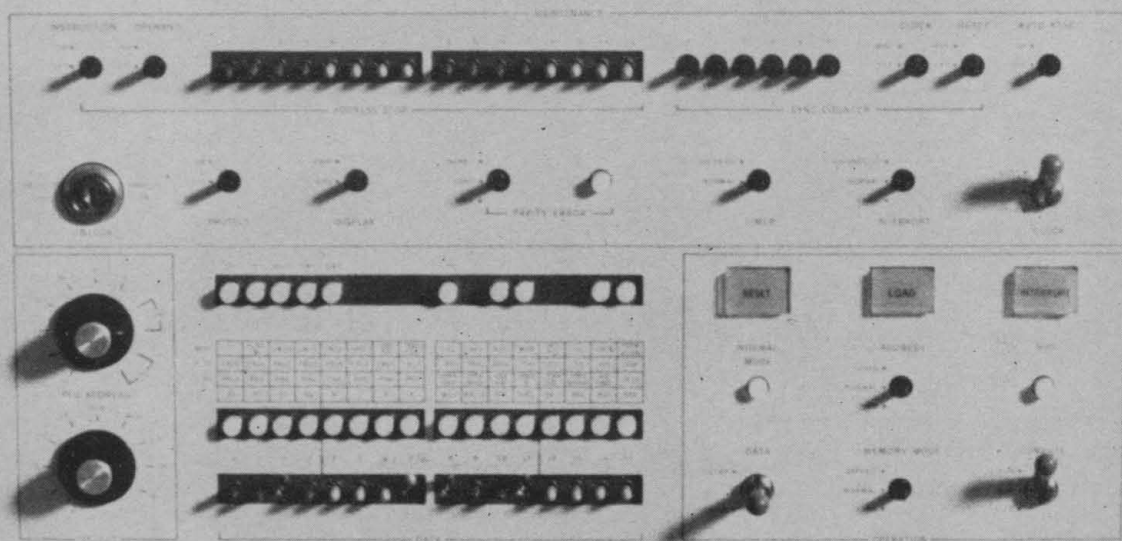
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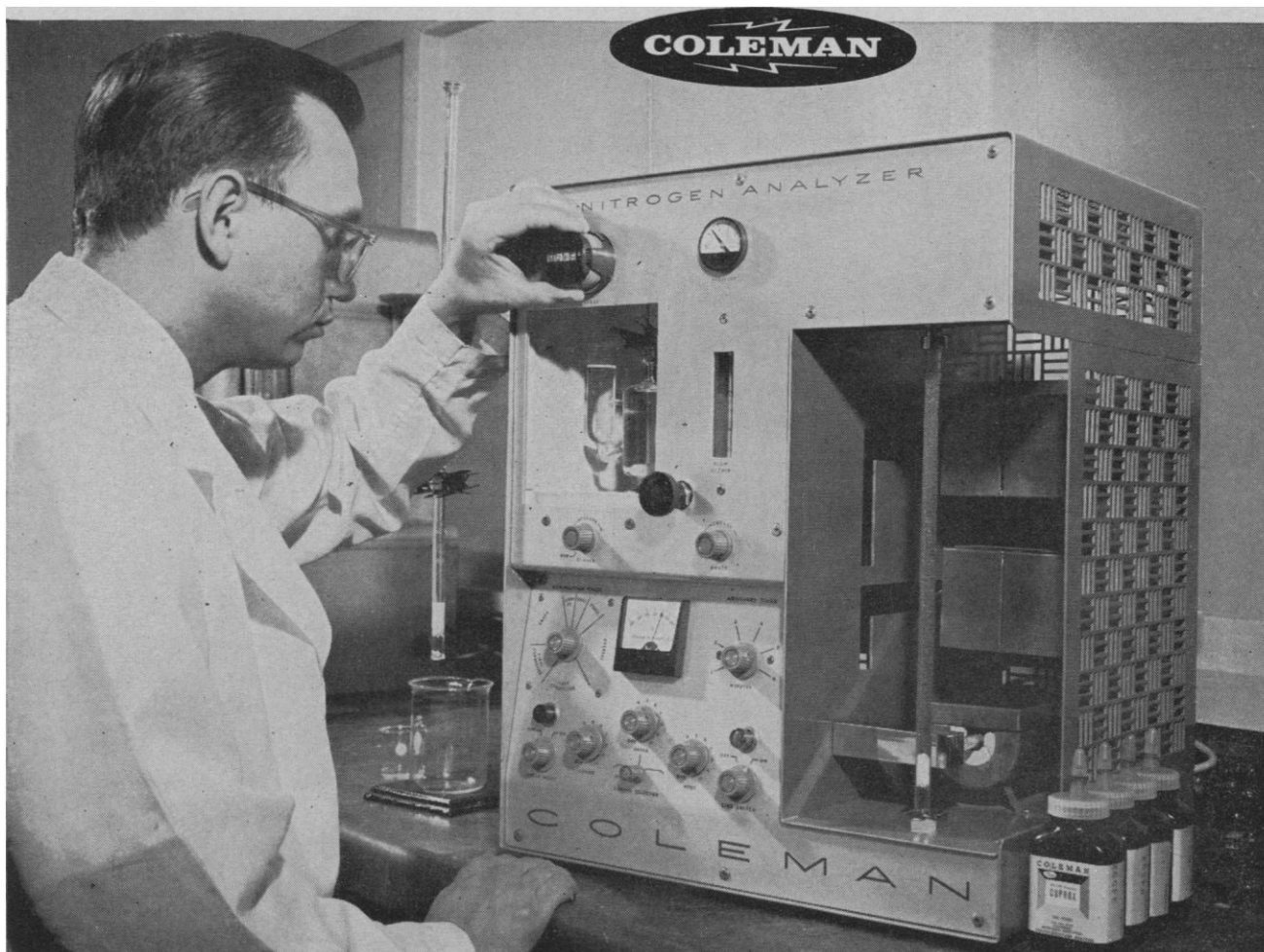
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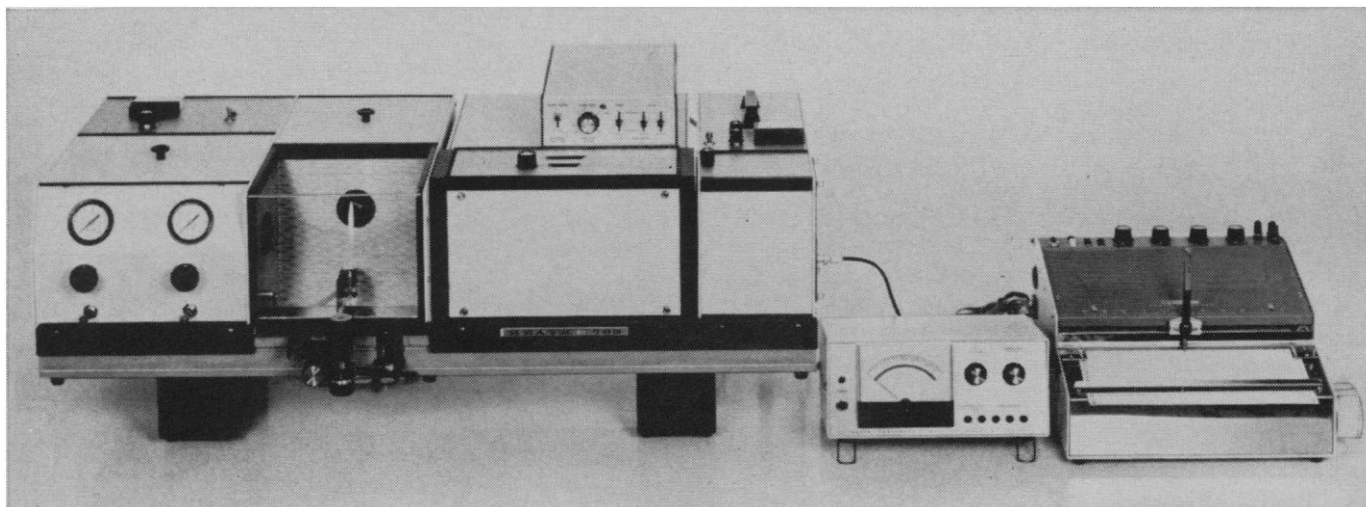
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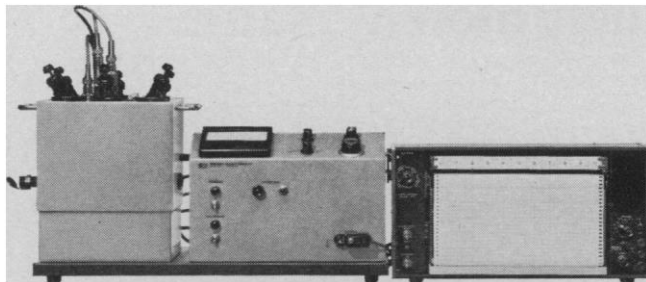
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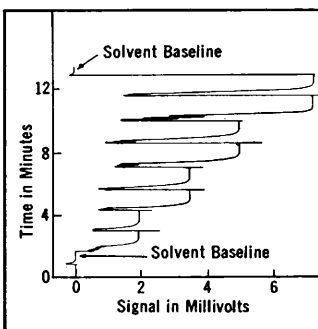
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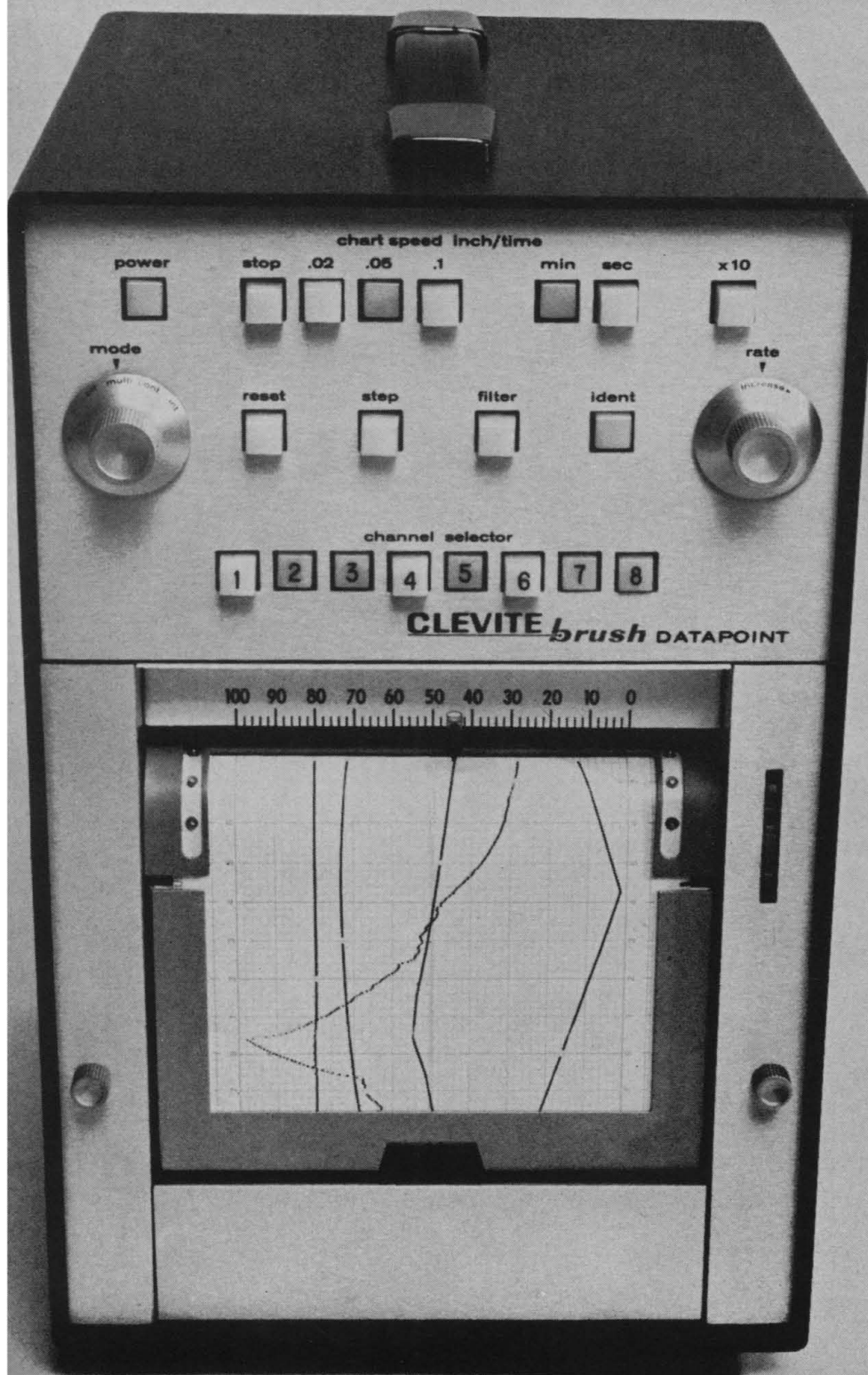
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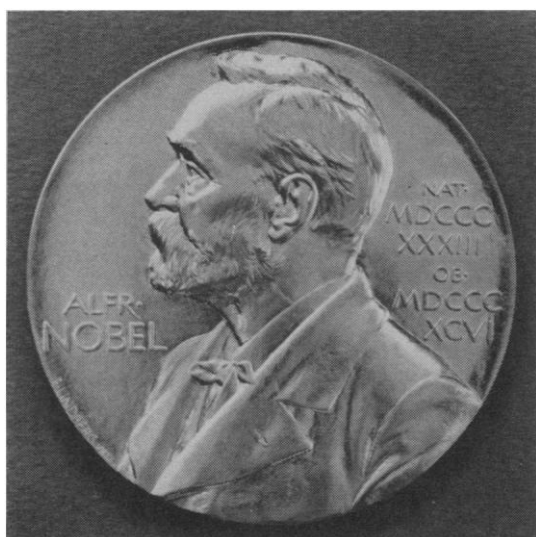
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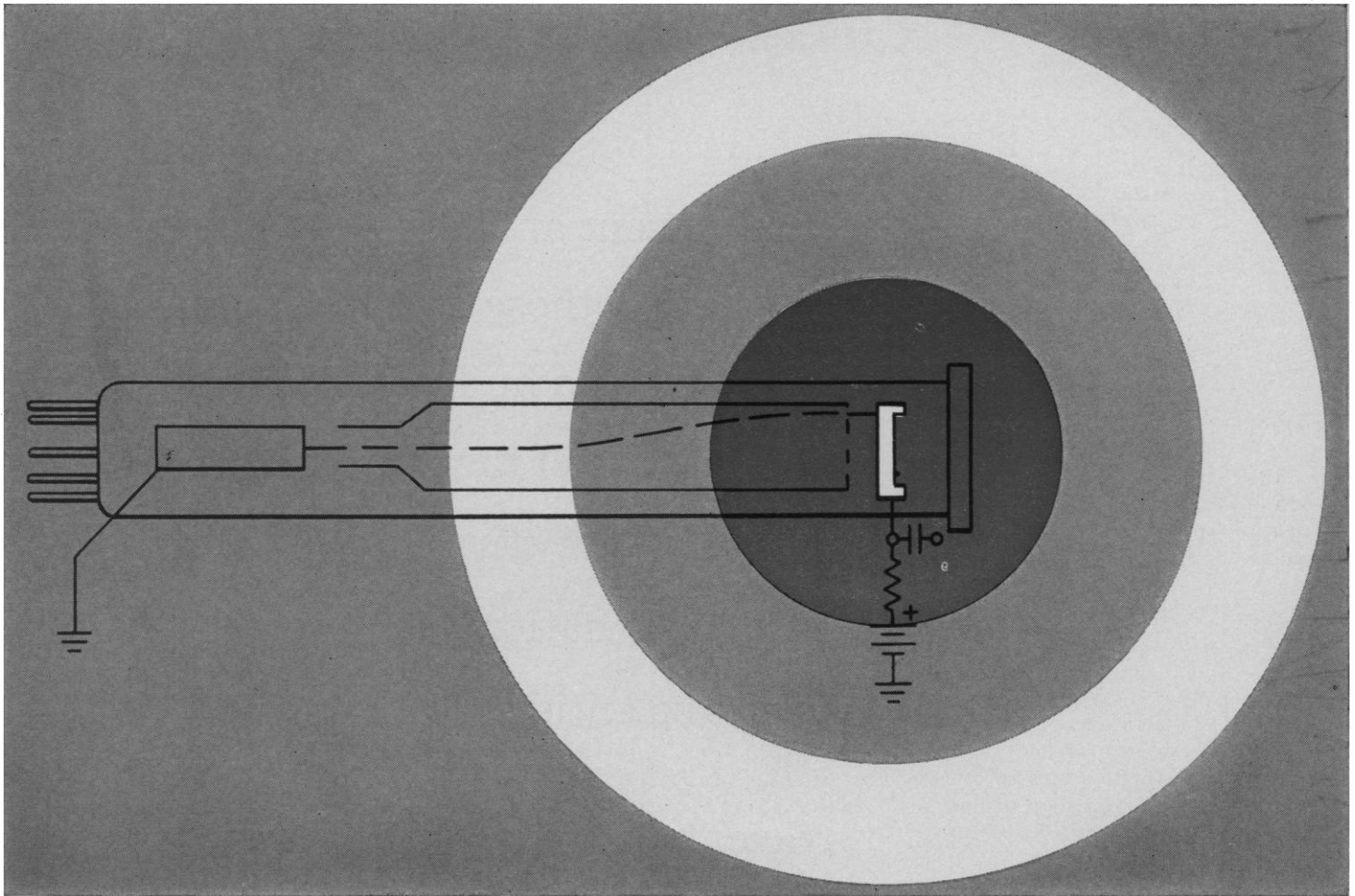
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A solid state target in a camera tube

Bell System PICTUREPHONE® service will need small, reliable TV camera tubes for use in offices and homes, where lighting ranges from dim to very bright. Conventional vidicon tubes are unsuitable, so Bell Labs developed a new kind.

The heart of the new tube is a light-sensitive target containing nearly 700,000 silicon photodiodes in an area less than a half inch square. They are made by diffusing boron, a p-type impurity, through a silicon-dioxide mask into n-type silicon.

A scanning electron beam charges the p material negatively, reverse-biasing the diodes. Holes, created by incident light, are collected by the electric field at the p-n junctions, and individual diodes discharge by an amount proportional to the local light intensity. Recharging of the diodes by the scanning electron beam produces a varying current ... the output signal.

Among the tube's advantages: Its target tolerates high-temperature baking ... a processing step to improve reliability. Conventional vidicon targets cannot stand this.

Silicon's high thermal conductivity and chemical stability help make the new tube immune to "burn-in" (degradation of performance from continuous exposure to a fixed image, very bright light, or

a strong scanning electron beam).

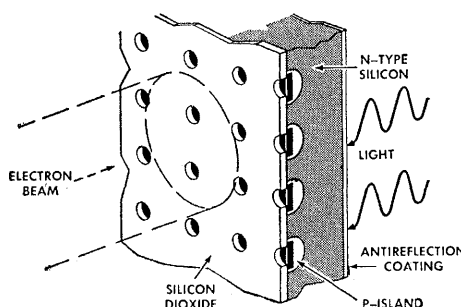
The time between a change in target illumination and a like change in output is much shorter with the new target. This improves response to fast-changing scenes.

The light-sensitive face of the new target is optically flat. So, a multi-layer antireflection coating can be applied for better sensitivity and minimum received-picture "halo".

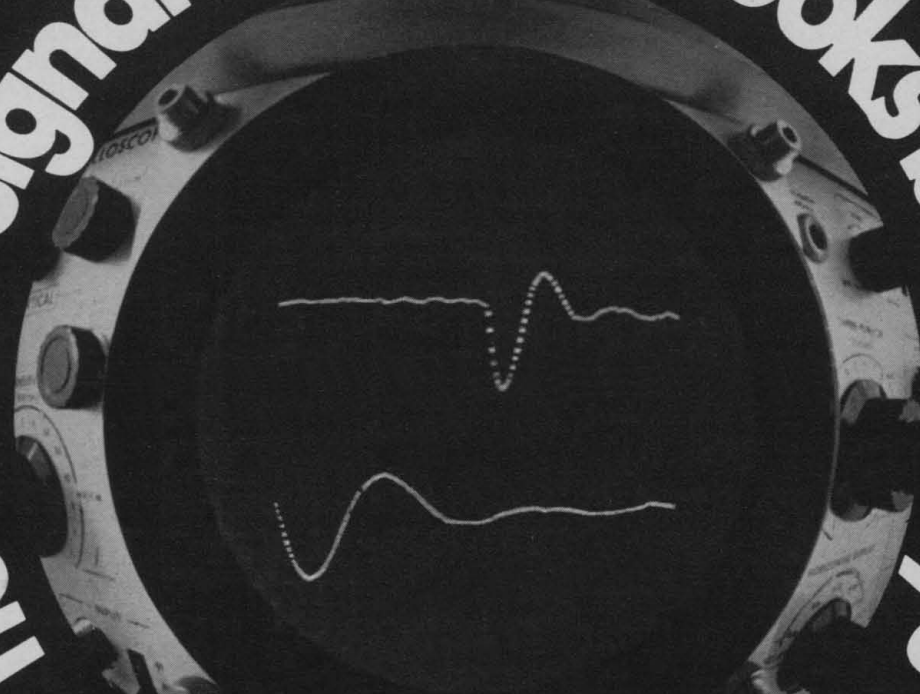
Silicon targets have relatively uniform response through the visible and near-infrared—from 4,000 to 9,000 Å. Quantum efficiency (electrons per photon) exceeds 0.5. So, these targets have at least 10 times the sensitivity of a standard vidicon camera tube in incandescent light.

This new camera tube is in the latest model PICTUREPHONE set, now undergoing field trials.

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work against, instead of with, the ecological dynamics of the vegetation. Working contrary to the ecosystem is always expensive and difficult, especially so with chaparral species because they are adapted to an environment that is submarginal or detrimental for most species. Furthermore, chaparral is a fire type and the plants sprout or have seed that can survive in the soil for many years.

Fire records in southern California show that all the mountainous chaparral-covered land is burned periodically. The fires may be caused by man or nature and even the best protected areas are not immune to destruction. In 1960 the 17,000-acre San Dimas Experimental Forest, almost pure chaparral, and used for watershed research, was swept by fire even though the forest was closed to the public, had a network of roads, and several fire fighting units located on its perimeter. The fires started by lightning and consumed 12,000 acres of brush the first day and 15,000 by the end of the week.

To prevent such extensive and hazardous forest fires which occur especially in southern California, I suggest that more effort be expended at working with, instead of against, the ecological characteristics of the vegetation. The brush on the San Dimas area is now 9 years old. This is an ideal area to test a controlled burning program as prevention against a major fire in the future. The watersheds have contour trails at 500-foot elevation intervals, and in some areas after the 1960 fire trenches were established at 40- to 90-foot elevation intervals. I propose that each year a band of vegetation on the slopes be burned starting at the tops of the ridges and mountains. In this way the burn of the previous year would act as a fire break for the present year's burn. Since the elevation difference between the top and bottom of the forest is approximately 4000 feet, it would take 8 years to burn the entire area using 500-foot elevation strips. At that time the natural vegetation would be dense enough to start the process again. If at any time during the process a fire is started at the higher elevations it would be prevented from spreading downward by the burned zones below. Fire starting low on the slopes would stop at the previously burned area and would not generate sufficient heat to cross ridges and jump canyons.

Although this controlled burning would involve the risk of some flooding in heavy rain years, it couldn't be as

severe as what happened this past winter below whole mountain slopes which had been denuded by fire. Furthermore, the vegetation below and above the burned strip would serve to some extent as a barrier to erosion and flooding.

HENRY HELLMERS

*Department of Botany,
Duke University,
Durham, North Carolina 27706*

XXX Chromosome: Medical and Legal Aspects

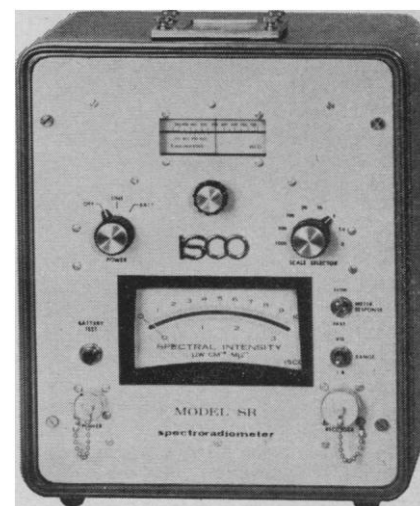
Kennedy McWhirter's discussion of the XXX chromosome and criminal acts (Letters, 6 June) and comments on that discussion by C. B. Goodhart (Letters, 5 Sept.) point up a basic weakness in society's approach to the control of antisocial or criminal behavior. . . .

McWhirter rightly emphasizes that restraints placed upon individuals must be minimal, and that their purpose must be protection, not retribution. But this principle really should apply no matter what the nature or cause of the behavior that society (or the individual himself) is being protected against.

Behavior is generally believed to be determined by a complex of relatively unalterable genetic factors, more easily alterable effects of previous environment, and freely chosen values and objectives. Current judicial processes presuppose that malefactors with congenital defects, those with temporary mental aberrations, and those that have freely chosen to do wrong can be clearly and readily differentiated; that the legal rights of the individual vis-à-vis those of society, and the legal processes required to adjudicate those rights, differ for these different classes of malefactors (and with the age of the malefactor); and finally, that appropriate, different processes are known and available for rehabilitating malefactors of each class.

However, information currently available offers little assurance that the various factors affecting human behavior are sufficiently well understood to permit reliable diagnosis and effective treatment. . . . For example, it seems likely that when reliable diagnostic procedures are available, they will reveal that most malefactors suffer from combinations of all three general types of defects, and hence will require the same basic kind of treatment in the same basic kind of facility for effective rehabilitation. It also seems likely that

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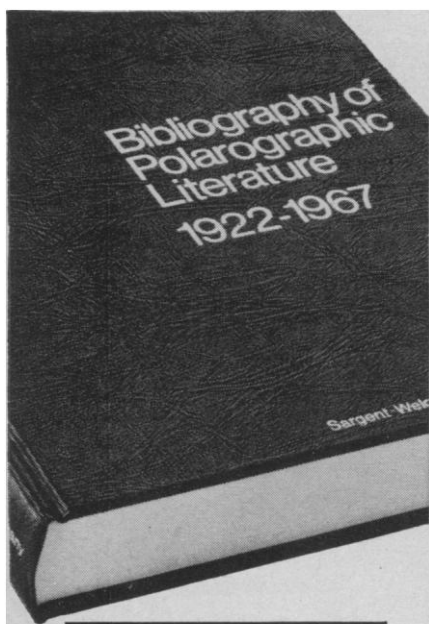
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such a facility and its staff would resemble those of present-day medical and educational institutions rather more than those of present-day penal institutions.

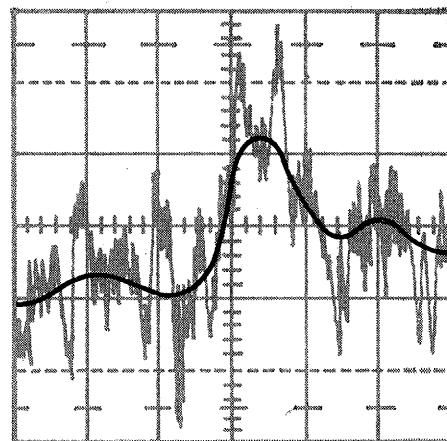
The judicial procedure may also turn out to be the same for malefactors of all classes and ages and much like that now used for those judged to be criminally insane. That is, it may concentrate on evaluating the threat to society and determining the minimum amount and duration of restraint necessary to protect society against that threat. Society and the individual would probably be represented by prosecuting and defending attorneys and experts in order to ensure the fullest possible presentation of relevant facts and principles; however, since the objectives would be protection and rehabilitation rather than retribution, the introduction of evidence of specific criminal acts would be primarily for the purpose of determining the threat to society rather than the treatment of the malefactor. Appropriate consideration would be given both to society's right of self-defense and to the "every dog may have his bite" principle. . . .

P. ROGER GILLETTE

*Operations Analysis Division,
Stanford Research Institute,
Arlington, Virginia 22209*

Although the majority of recent letters on the XYY complement primarily discussed the legal implications connected with this chromosomal anomaly, Kessler and Moos (1 Aug.) referred to pathophysiological associations found with this karyotype. Our findings from research projects covering cytogenetic studies on either sociopaths or diseases related to myotonic dystrophy—which, incidentally, is the only disease which can be sometimes associated with an extra Y chromosome—tend to agree with the views expressed by Kessler and Moos.

The initial concept of the XYY syndrome included the well-known features of tallness, aggressiveness, and genital abnormalities. Now, however, attention is being given to many pathological features which are not consistently associated with an XYY karyotype. In some cases these features are found in other genetic syndromes; in other cases the clinical signs are symptomatically related to diseases of an orthopedic or neurological nature. The number of reports on single cases is still insufficient to detect a consistent clinical sign or dermatoglyphic pattern which could be



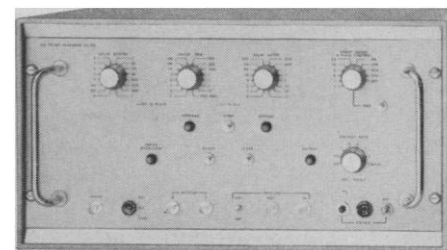
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GEORGE J. LUCAS

Cytogenetics Unit, Department of Health, Education, and Welfare, St. Elizabeths Hospital, Washington, D.C. 20032

Are, Not Acre

According to my Senator, some progress is being made in the United States Senate toward the passage of legislation which will replace the British system of weights and measures with the metric system. Although we are educating our legislators to the need for this legislation, three recent experiences I have had show that we need to get our scientific house in order: (i) Of 200 students in a general botany course, most of whom had taken a course in chemistry or physics, none of the Americans knew what a degree Celsius was, although all had heard of the degree centigrade. These students represented most of the 50 states. (ii) When I referred to "density of plants per *are*" in a manuscript submitted for publication, my spelling was "corrected" to read *acre* at every review, the last time in galley proof, even after I had defined the are, in parentheses, as (100 m²). (iii) In an article by a noted ecologist dedicated to the scientists attending the XIth International Botanical Congress, I found reference to a plateau of 26 million *square* hectares (reminiscent of the frequent references one sees of wind velocities in knots per hour).

Perhaps these annoyances are merely the result of confusion in trying to deal with two systems at one time and will disappear when we have adopted the metric system for daily use. A Swedish friend recalled the conversion to the metric system in his country as a time when housewives frequently requested a kilometer of butter or a gram of milk. . . .

LORENTZ PEARSON

Department of Biological Sciences, Ricks College, Rexburg, Idaho 83440

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AN OPEN LETTER TO SCIENTISTS

SCIENTISTS' COMMITTEE

on

CHEMICAL AND BIOLOGICAL WARFARE

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Dear Colleagues:

As a result of recent accidents and disclosures the American public has become aware of our substantial program of research and development in chemical and biological weapons. In Vietnam a form of chemical warfare—the use of herbicides and antipersonnel gases—has been in progress for many years. These developments are of far-reaching importance and have grave implications for the future of U.S. military and foreign policy. They require the closest scrutiny; those who are aware of the dangers involved should bring the issues to public attention, and press for suitable action.

The Scientists' Committee on CBW was established at Dallas in December 1968. We propose to gather and disseminate information, and to work for certain specific actions.

The information program is based on the following principles: 1) every effort will be made to obtain and publish information with traditional scientific objectivity; 2) all information will be made public; 3) the Committee will promote, and assist in, a comprehensive study of the ecological and sociological effects of the military uses of chemical agents in Vietnam; 4) technical information will be assembled on research and development of CB weapons in the United States and other countries; 5) the policies of various countries in the area of CBW will be brought to public attention.

We ask for action by our Government to ratify the 1925 Geneva Protocol on CBW, without reservations or restrictive amendments. We intend to campaign for ratification.

We now invite you to: 1) write to Congressman Richard D. McCarthy in support of H. Res. 439, a bill which urges the President to resubmit to the Senate for ratification the Geneva Protocol of 1925 banning the first-use of chemical and biological weapons; 2) write to Congressman Edward I. Koch in support of H. J. Res. 691, a bill to establish a joint commission to study the ecological effects of chemical warfare in Vietnam; and 3) join the Scientists' Committee on CBW and participate in our program. Membership is open to all scientists who sympathize with the Committee's aims.

Our first Annual Meeting will be held in Boston in December. We invite all scientists who are concerned about the problem of CBW to attend. We will meet at 9:00 P.M., December 27, 1969, in the State Suite of the Sheraton Plaza Hotel. Dr. John T. Edsall will speak on some aspects and implications of chemical warfare in Vietnam; Representatives E. I. Koch (D-N.Y.) and R. D. McCarthy (D-N.Y.) will discuss Congressional actions related to CBW, and Dr. E. W. Pfeiffer will present a short color film showing defoliation in Vietnam.

I wish to join the Scientists' Committee on Chemical and Biological Warfare

Name _____ Street _____

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Mail to: Dr. Philip Siekevitz, Rockefeller University, New York 10021, New York.

(Make checks payable to: Scientists' Committee on CBW. Regular membership is \$5.00, student membership is \$2.00.)

Larger contributions will be welcome, and will indeed be essential for the work of the Committee.

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Assessing Technology


The National Academy of Sciences (*Science*, 5 September 1969) and the National Academy of Engineering (*Science*, 14 November 1969) have independently responded to a congressional request for advice on the possibility of analyzing in advance the benefits and the risks of exploiting new technological capabilities. The reports differ considerably in content and style, but agree that technology assessment is feasible. Neither, however, makes the job sound easy; analyzing the probable consequences of a proposed development will require an extensive amount of scientific, technological, and social information, the explicit formulation of assumptions concerning the future, and a substantial amount of work by a group of experts from several disciplines. The two studies also agree that the proposal is highly desirable and relatively inexpensive.

A good deal of technology assessment is already conducted by industry, government regulatory bodies, such agencies as the AEC, and organizations that seek to protect environmental and human values. The NAE and NAS reports expect these efforts to continue. What they recommend is an additional level of assessment—one that would work for the nation as a whole rather than for any special interest; one that could take account of the economic, human, and environmental values involved as well as the values of an advocate or an opponent; and one that could then render a comprehensive and impartial judgment of the probable secondary and tertiary as well as primary consequences of a proposed technological development or of alternative means of solving a particular problem.

The assessing agency should stop at this point, leaving decisions to the politically responsible executive and legislative agencies. Nevertheless, because every problem it took up would be controversial, it is important that the assessment agency be well insulated from political pressures. Yet if its reports are to be influential, it should be as close to the centers of congressional and executive power as possible. This organizational dilemma will be considered by the House Committee on Science and Astronautics in hearings later this year.

There are several ways in which the organizational problem might be solved, but none may have a chance to be tried out. Any proposed program of technology assessment will threaten the freedom of action of those interests whose plans and proposals would be subject to review. If this opposition can be overcome, the country will have gained a better means of using scientific and technological advice than it now has. On such matters as drugs, pollution, defense, and environmental problems, scientists and technologists frequently disagree. Congress, the executive agencies, and an often bewildered public must then decide whose advice to follow. A technology assessment program would not stop disagreements. But the varied individual judgments would be appraised by a panel of experts from different disciplines who would consider the evidence, the competing arguments, and the values involved, and would then publish their best judgment as to what would happen if one or another course of action were to be followed.

Such objective assessments could raise the level of public debate about the desirability and risks of new technology. The NAE and NAS reports can raise the level of discussion of how to go about the business of developing this national competency.—DAEL WOLFE



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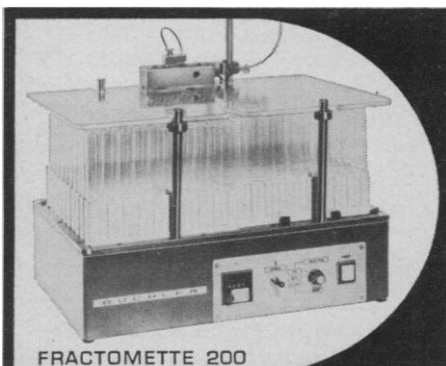
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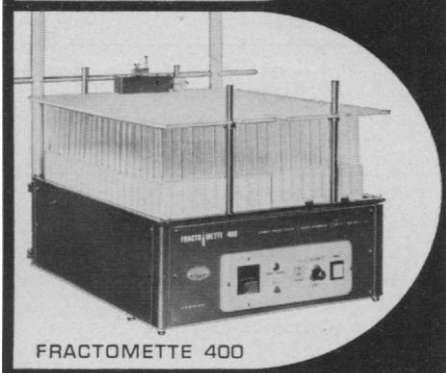
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In the final session, in addition to discussing such topics as research support, publications, more effective channels of communications, and problems of shipping cultures from one country to another, the conferees agreed upon those qualities which would make a particular plant ideal for research. Desirable characteristics would include absence of endopolyploidy, stable low chromosome number, stable concentrations of deoxyribonucleic acid, large chromosomes, good growth rate, good growth on defined medium, easy separation into suspension, easy organ regeneration, and a well-defined genetic background. Regrettably, no known plant has all of these attributes.

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Note

1. Conferees from eight countries included ten plant physiologists who have specialized in plant cell and tissue culture, two geneticists, and two scientific observers. Participants were: A. C. Braun, United States; E. C. Cocking, United Kingdom; F. D'Amato, Italy; T. Eriksson, Sweden; O. L. Gamborg, Canada; A. C. Hildebrandt, United States; G. Morel, France; L. G. Nickell, United States; J. Reinert, Germany; R. Riley, United Kingdom; J. G. Torrey, United States; Y. Yamada, Japan; L. M. Roberts, Rockefeller Foundation; and H. J. Carlson, National Science Foundation.

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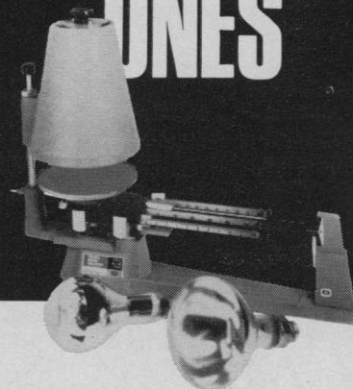
7-9. American Soc. of Hematology, Cleveland, Ohio. (F. H. Gardner, Presbyterian-Univ. of Pennsylvania Medical Center, Philadelphia 19104)

7-12. American Soc. for Testing and Materials, Cincinnati, Ohio. (T. A. Marshall, Jr., ASTM, 1916 Race St., Philadelphia, Pa. 19103)

8-10. Applications of Simulation, 3rd conf., Los Angeles, Calif. (P. J. Kiviat, Simulation Associates, Inc., 1263 Westwood Blvd., Los Angeles 90024)

8-10. Circuit Theory, intern. symp., San Francisco, Calif. (B. J. Leon, School of

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8-10. Southern Surgical Assoc., Hot Springs, Va. (D. C. Sabiston, Jr., Duke Univ. Medical Center, Durham, N.C. 27706)

8-11. Oak Ridge Associated Universities Symp. in Medicine, 12th, Oak Ridge, Tenn. (R. M. Kniseley, Medical Div., Oak Ridge Associated Universities, Oak Ridge 37830)

11-12. Conference on Holography and the Computer, Houston, Tex. (J. A. Jordan, Jr., IBM, Houston Scientific Center, 6900 Fannin St., Houston 77025)

12-14. American Psychoanalytic Assoc., New York, N.Y. (H. Fischer, 1 E. 57 St., New York 10022)

14-18. American Assoc. of Hospital Pharmacists, Washington, D.C. (J. A. Oddis, AAHP, 4630 Montgomery Ave., Bethesda, Md. 20014)

15-17. Phylogenesis and Morphogenesis in the Algae Conf., New York, N.Y. (J. F. Fredrick, Director of Chemical Research, Dodge Chemical Co., 3425 Boston Post Rd., Bronx, N.Y. 10469)

15-18. American Geophysical Union, San Francisco, Calif. (W. E. Smith, AGU, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

17-18. British Biophysical Soc., London, England. (E. M. Bradbury, Biophysics Lab., Physics Dept., College of Technology, Park Rd., Portsmouth, England)

17-19. Symposium on Infections and Immunosuppression in Sub-Human Primates, Rijswijk, Netherlands. (H. Balner, Radiobiological Institute TNO, Lange Kleiweg 151, Rijswijk Z.H.)

18-20. International Symp. on Computer and Information Science (COINS-69), Miami Beach, Fla. (J. T. Lou, Univ. of Florida, Gainesville 32601)

26-30. Sigma Delta Epsilon, Boston, Mass. (M. Myers, 6234 Mary Lane Dr., San Diego, Calif. 92115)

26-31. American Assoc. for the Advancement of Science, 136th mtg., Boston, Mass. (Meetings Manager, 1515 Massachusetts Ave., NW, Washington, D.C. 20005)

26-31. Ecological Soc. of America, Boston, Mass. (W. A. Niering, Dept. of Botany, Connecticut College, New London 06320)

26-31. American Soc. of Naturalists, Boston, Mass. (B. H. Judd, Dept. of Zoology, Univ. of Texas, Austin 78712)

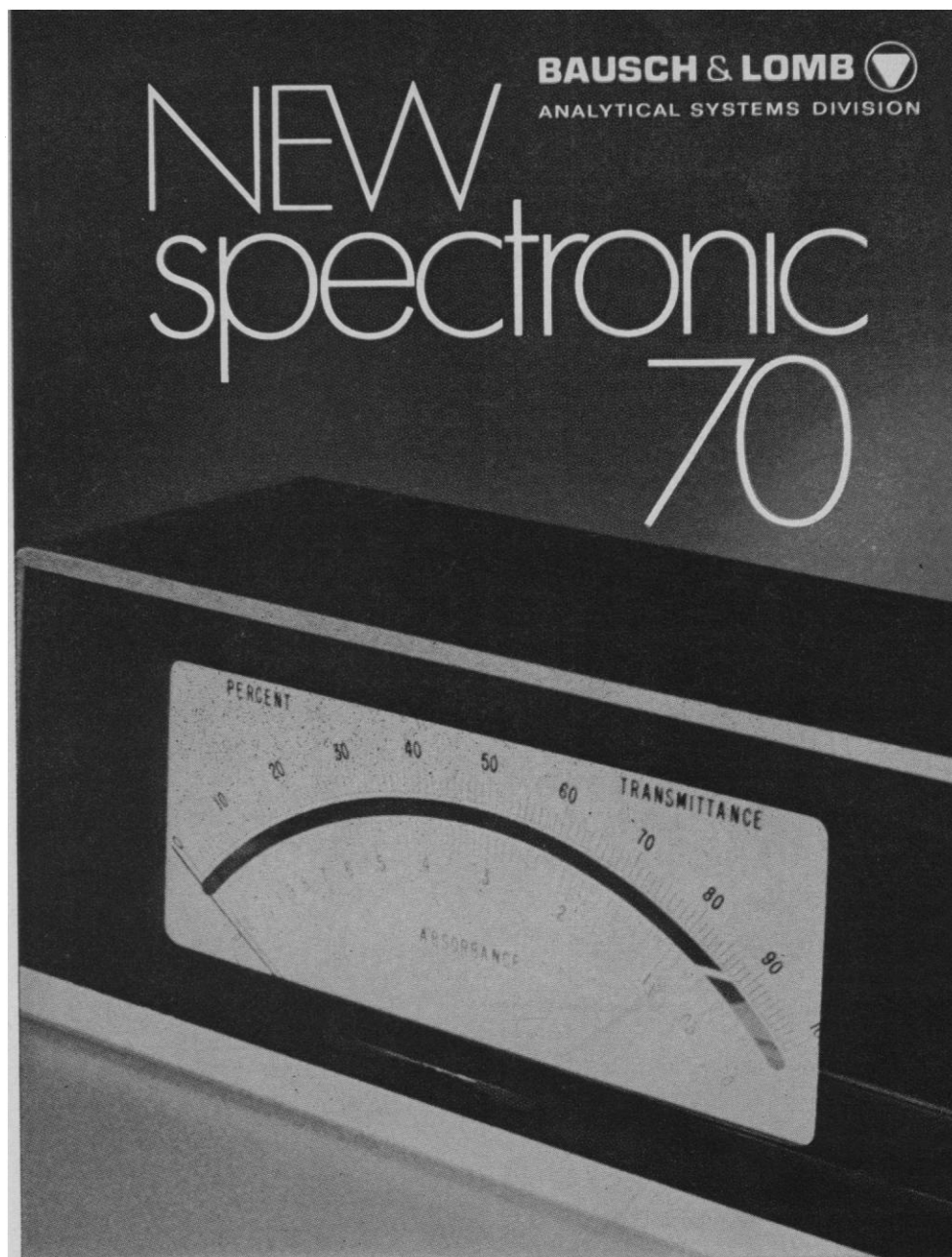
26-31. Society of Protozoologists, Boston, Mass. (M. Hammond, Dept. of Zoology, Utah State Univ., Logan 84321)

26-31. Scientific Research Soc. of America, Boston, Mass. (C. A. Walker, SRSA, 155 Whitney Ave., New Haven, Conn. 06510)

26-31. Sigma Pi Sigma, Boston, Mass. (C. G. Shugart, Society of Physics Students, State Univ. of New York, Stony Brook 11790)

26-31. Society for the Study of Evolution, Boston, Mass. (D. L. Jameson, Dept. of Biology, Univ. of Houston, Houston, Tex. 77004)

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27-29. American Philosophical Assoc., New York, N.Y. (A. Pasch, 117 Lehigh Rd., Univ. of Maryland, College Park 20742)

27-30. Archaeological Inst. of America, San Francisco, Calif. (J. S. Ord, AIA, 260 West Broadway, New York 10013)

27-30. Western Soc. of Naturalists, Los Angeles, Calif. (D. H. Montgomery, Dept. of Biological Sciences, California State College, San Luis Obispo 94301)

28-30. American Historical Assoc., Washington, D.C. (W. D. Harris, AHA, 400 A Street, SE, Washington, D.C. 20003)

29-31. American Physical Soc., Los Angeles, Calif. (W. W. Havens, Jr., APS, 335 E. 45 St., New York 10017)

January

6-8. Solid State Physics Conf., 7th annual, Manchester, England. (Meetings Officer, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London, S.W.1)

6-10. National Soc. of Professional Engineers, Atlanta, Ga. (P. H. Robbins, NSPE, 2029 K St., NW, Washington, D.C.)

7-9. Polymer Chain Flexibility Conf., Colchester, Essex, England. (M. Gordon, British Polymer Physics Group, University of Essex, Wivenhoe Park, England)

8-10. Society for Historical Archaeology, 3rd annual, Bethlehem, Pa. (B. Salwen, Dept. of Anthropology, New York Univ., 25 Waverly Pl., New York 10003)

8-13. Taxonomy and Biology of Blue-Green Algae, Madras, India. (T. S. Sadasivan, University Botany Lab., Madras 5)

11-13. Association of American Colleges, Houston, Tex. (R. H. Sullivan, 1818 R St., NW, Washington, D.C. 20009)

12-14. Biological Effects of Carbon Monoxide, New York, N.Y. (A. Selwyn, 2 E. 63 St., New York 10021)

12-15. National Assoc. of Private Hospitals, 37th annual, Nassau, Bahamas. (M. Herman, Executive Secretary, NAPH, 353 Broad Ave., Leonia, N.J. 07605)

12-16. Automotive Engineering Congr. and Exposition, Detroit, Mich. (W. I. Marble, Soc. of Automotive Engineers, 2 Pennsylvania Plaza, New York 10001)

12-16. Highway Research Board, 49th annual, Washington, D.C. (J. C. Allen, Assistant Director for Administration, 2101 Constitution Ave., NW, Washington, D.C. 20418)

14-16. Engineering with Nuclear Explosives, Las Vegas, Nev. (P. Kruger, Stanford Univ. School of Engineering, Stanford, Calif. 94305)

18-20. Drug Information for the Medical Profession, Washington, D.C. (R. L. Marlin, Sandoz Pharmaceuticals, Hanover, N.J. 07054)

19-20. Biochemistry—Papanicolaou Cancer Research Inst., winter symp., Miami, Fla. (W. J. Whelan, P.O. Box 847, Biscayne Annex, Miami 33152)

19-21. American Soc. of Heating, Refrigerating, and Air-Conditioning Engineers, San Francisco, Calif. (A. T. Boggs

III, American Soc. of Heating, 345 E. 47 St., New York 10017)

21-23. Instrumentation for the **Process Industries Symp.**, College Station, Tex. (R. G. Anthony, Dept. of Chemical Engineering, Texas A & M Univ., College Station)

21-24. American **Group Psychotherapy** Assoc., New Orleans, La. (M. Schiff, Administrative Secretary, AGPA, Room 702, 1790 Broadway, New York 10019)

22-26. American **Mathematical** Soc., Miami, Fla. (G. L. Walker, AMS, P.O. Box 6248, Providence, R.I. 02904)

24-26. **Mathematical** Assoc. of America, Miami, Fla. (A. B. Willcox, MAA., 1275 Connecticut Ave., NW, Washington, D.C. 20036)

26-29. American Assoc. of **Physics Teachers**, Chicago, Ill. (M. W. Zemansky, American Inst. of Physics, 335 E. 45 St., New York 10017)

26-30. **Federacion Odontologica de** Centro America, Panama City, Panama. (R. Eisemann, Secretario del Exterior, FOCAP, P.O. Box 6406, Panama City 5)

27-29. **Automatic Lab. Techniques** Exhibition, London, England (M. Duck, Pressaids Ltd., 5 New Bridge St., London E.C.4)

27-29. **Reliability Symp.**, Los Angeles, Calif. (W. R. Abbott, D-60-01/B104, Lockheed Missiles & Space Co., P.O. Box 504, Sunnyvale, Calif. 94022)

27-30. Canadian **Pulp and Paper Assoc.**, 56th annual, Montreal, Canada. D. H. Paterson, CPPA, 2280 Sun Life Bldg., Montreal 2, P.Q.)

28-30. **Health Physics Soc.**, Louisville, Ky. (W. H. Parr, U.S. Army Medical Research Lab., Fort Knox, Ky. 40121)

February

1-14. **Alcoholism and Drug Dependence**, Sydney, Australia. (P. Diehm, Foundation for Research and Treatment of Alcoholism, P.O. Box 3284, Sydney)

2-6. American Soc. for **Testing and Materials**, 3rd, Cincinnati, Ohio. (T. A. Marshall, Jr., 1916 Race St., Philadelphia, Pa.)

9-12. American Soc. of **Range Management**, Denver, Colo. (F. T. Colbert, 2120 Birch St., Denver 80222)

9-13. American **Meteorological** Soc., Washington, D.C. (K. C. Spengler, AMS, 45 Beacon St., Boston, Mass.)

11-12. **Source and Control**, Urbana, Ill. (R. S. Engelbrecht, 3230 Civil Engineering Bldg., Univ. of Illinois, Urbana)

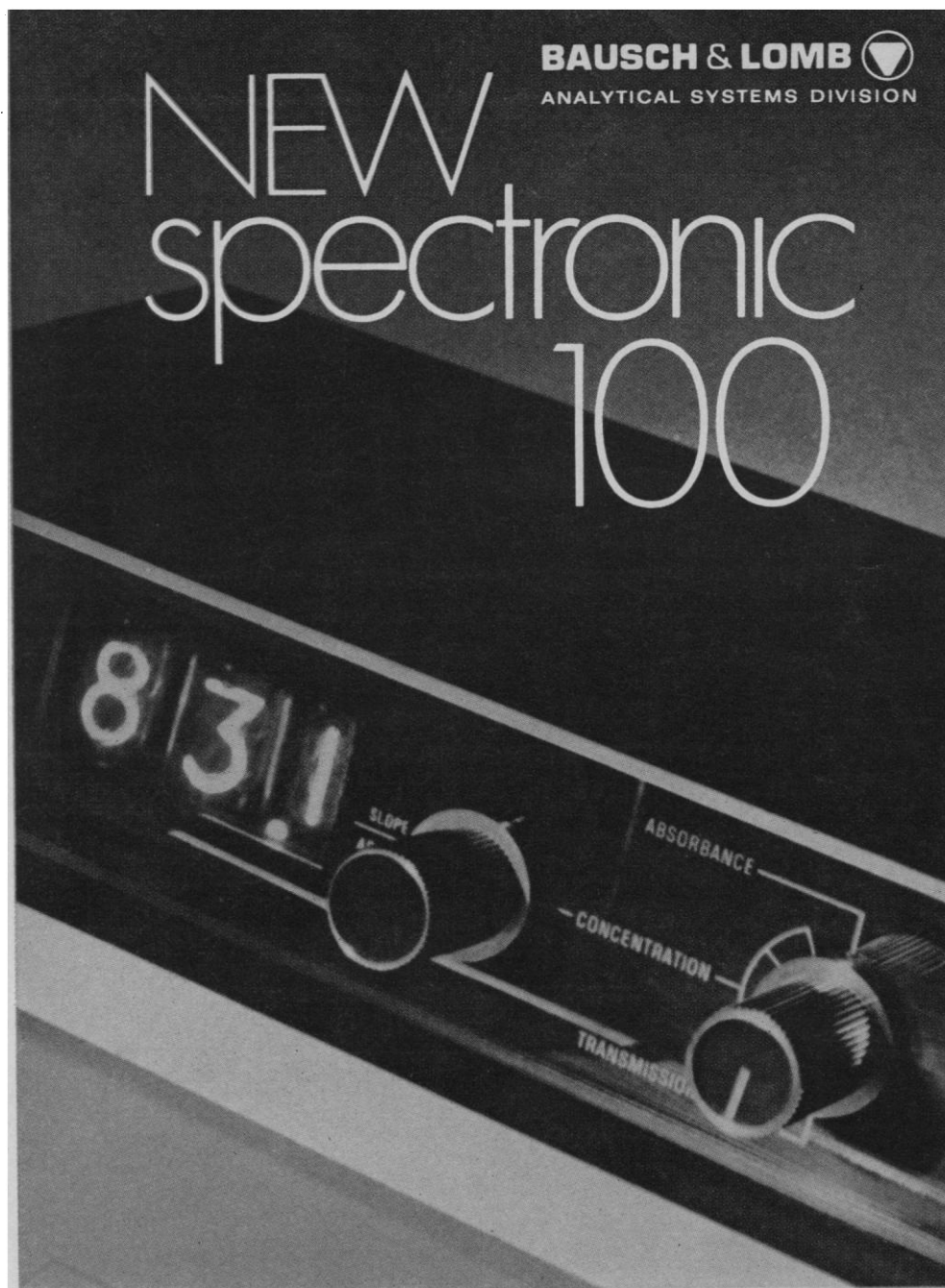
15-18. American Inst. of **Chemical Engineers**, Atlanta, Ga. (H. A. McGee Jr., Dept. of Chemical Engineering, Georgia Inst. of Technology, Atlanta)

15-19. Society of **Economic Geologists**, Denver, Colo. (R. A. Laurence, Secretary, SEG, P.O. Box 1549, Knoxville, Tenn.)

15-19. American Inst. of **Mining, Metallurgical and Petroleum Engineers**, Denver, Colo. (G. T. Moffatt, Activities Manager, 345 E. 47 St., New York 10017)

16-20. **Handling of Nuclear Information**, Vienna, Austria. (J. H. Kane, Div. of Technical Information, Atomic Energy Commission, Washington, D.C. 20545)

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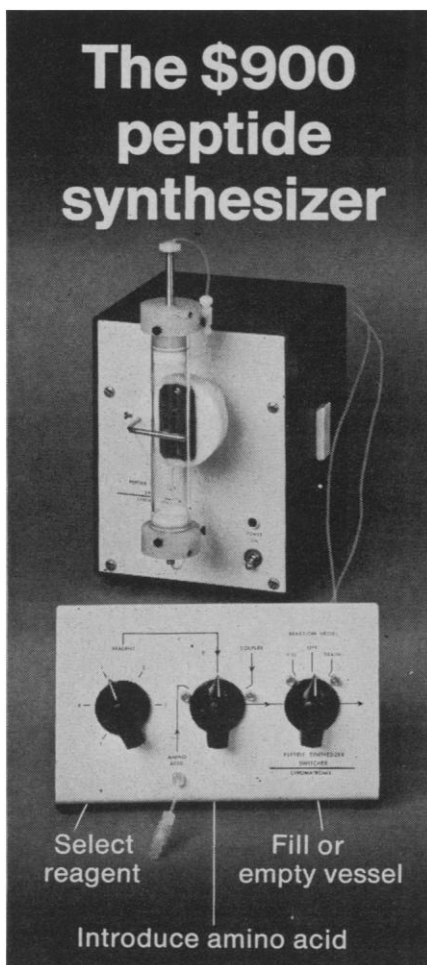
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(Continued from page 991)

Air Pollution Primer. Rena Corman. National Tuberculosis and Respiratory Disease Association, New York, 1969. 104 pp., illus. Paper.

American Education in Foreign Perspectives. Twentieth Century Essays. Stewart E. Fraser, Ed. Wiley, New York, 1969. xviii + 526 pp. Cloth, \$9.95; paper, \$5.95.

American Government. Conscious Self Sovereignty. John M. Dorsey. Center for Health Education, Detroit, 1969. xviii + 142 pp., illus. \$4.95.

Analysis and Design of Structural Sandwich Panels. Howard G. Allen. Pergamon, New York, 1969. xvi + 284 pp., illus. Cloth, \$7; paper, \$5.50. Commonwealth and International Library: Structures and Solid Body Mechanics Division.

Analytic Functions and Distributions in Physics and Engineering. Bernard W. Roos. Wiley, New York, 1969. xvi + 528 pp., illus. \$19.95.

Annapolis Visit. A Photographic Essay on Maryland's Ancient City. Mary Mitchell. Barre Publishers, Barre, Mass., 1969. 122 pp. \$10.

Annual Review of Astronomy and Astrophysics. Vol. 7. Leo Goldberg, David Layzer, and John G. Phillips, Eds. Annual Reviews, Palo Alto, Calif., 1969. viii + 718 pp., illus. \$8.50.

Apache Odyssey. A Journey between Two Worlds. Morris E. Opler. Holt, Rinehart and Winston, New York, 1969. xviii + 302 pp., illus. Paper, \$3.95. Case Studies in Cultural Anthropology.

Archaeological Excavations at 'Ubeidiya, 1964-1966. M. Stekelis, O. Bar-Yosef, and Tamar Schick. Israel Academy of Sciences and Humanities, Jerusalem, 1969. 30 pp. + plates. Paper, \$4.

Archeology on the Shonto Plateau, Northeast Arizona. Keith M. Anderson. With an Appendix on Bird Remains from Vicinity of Navajo National Monument, Arizona. Lyndon L. Hargrave. Published in cooperation with the National Park Service by Southwestern Monuments Association, Globe, Ariz., 1969. xii + 68 pp., illus. Paper, \$2. SWMA Technical Series, vol. 7.

Arid Lands in Perspective. Including AAAS Papers on Water Importation into Arid Lands. William G. McGinnies and Bram J. Goldman, Eds. AAAS, Washington, D.C.; University of Arizona Press, Tucson, 1969 (order from University of Arizona Press). x + 422 pp., illus. \$18.

Bedside Diagnostic Examination. Elmer L. DeGowin and Richard L. DeGowin. Macmillan, New York; Collier-Macmillan, London, ed. 2, 1969. xiv + 946 pp., illus. \$9.95.

Behavior Control. Perry London. Harper and Row, New York, 1969. x + 246 pp. \$6.95.

Biochemical Predestination. Dean H. Kenyon and Gary Steinman. McGraw-Hill, New York, 1969. xviii + 302 pp., illus. Cloth, \$12.50; paper, \$4.95.

The Biochemistry of Alkaloids. Trevor Robinson. Springer-Verlag, New York, 1968. x + 152 pp., illus. \$9.75. Molecular Biology, Biochemistry, and Biophysics, vol. 3.

The Biochemistry of Folic Acid and

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Readings from SCIENTIFIC AMERICAN
With Introductions by Garrett Hardin,
University of California, Santa Barbara

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1969, 384 pages, 274 illustrations
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ELECTRONIC CIRCUITS FOR THE BEHAVIORAL AND BIOMEDICAL SCIENCES

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Written in a manner that can be understood by readers with little prior experience in electronics, this book is the first that explains in detail how to construct and repair solid-state circuits for use in the behavioral and biomedical sciences.

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Related Pteridines. R. L. Blakley. North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xxii + 570 pp., illus. \$29. *Frontiers of Biology*, vol. 13.

Biochemistry of Ribosomes and Messenger-RNA. An International Symposium. Castle Reinhardtsbrunn, 1967. Ruth Lindigkeit, Peter Langen, and Jochen Richter, Eds., Akademie-Verlag, Berlin, 1968. 612 pp., illus.

Biology and the Physical Sciences. Samuel Devons, Ed. Columbia University Press, New York, 1969. xvi + 384 pp., illus. \$12.50.

Calculus. Lipman Bers. Holt, Rinehart and Winston, New York, 1969. xvi + 1056 pp., illus. \$13.95.

The Calculus of Physics. McAllister H. Hull, Jr. Benjamin, New York, 1969. xiv + 138 pp., illus. Cloth, \$8.50; paper, \$2.95.

Canadian Cancer Conference. Vol. 8, Proceedings of the Eighth Conference, Honey Harbour, Ontario, June 1968. J. F. Morgan, Ed. x + 442 pp., illus. \$19.

Cognitive Anthropology. Stephen A. Tyler, Ed. Holt, Rinehart and Winston, New York, 1969. xvi + 528 pp., illus. \$9.95.

Comparative Anatomy of the Vertebrates. George C. Kent, Jr. Mosby, St. Louis, ed. 2, 1969. xii + 440 pp., illus. \$9.75.

Congress and the New Politics. John S. Saloma III. Little, Brown, Boston, 1969. xxvii + 298 pp. Cloth, \$5.75; paper, \$3.95. Study of Congress Series.

Contributions in Mammalogy. A Volume Honoring Professor E. Raymond Hall. J. Knox Jones, Jr., Ed. Museum of Natural History, University of Kansas, Lawrence, 1969. 428 pp., illus. \$5. Museum of Natural History Miscellaneous Publication No. 51.

Contributions to Mechanics. Markus Reiner Eightieth Anniversary Volume. David Abir, Ed. Pergamon, New York, 1969. xiv + 446 pp. + plates. \$21.

A Course on Programming in FORTRAN IV. V. J. Calderbank. Chapman and Hall, London; Science Paperbacks, London, 1969 (U.S. distributor, Barnes and Noble, New York). viii + 88 pp., illus. Cloth, \$4; paper, \$2.50.

A Critical Review of the Marine Science Commission Report. Proceedings of a seminar. Washington, D.C., January 1969. Marine Technology Society, Washington, D.C., 1969. iv + 114 pp. + addendum. Paper, \$6.50.

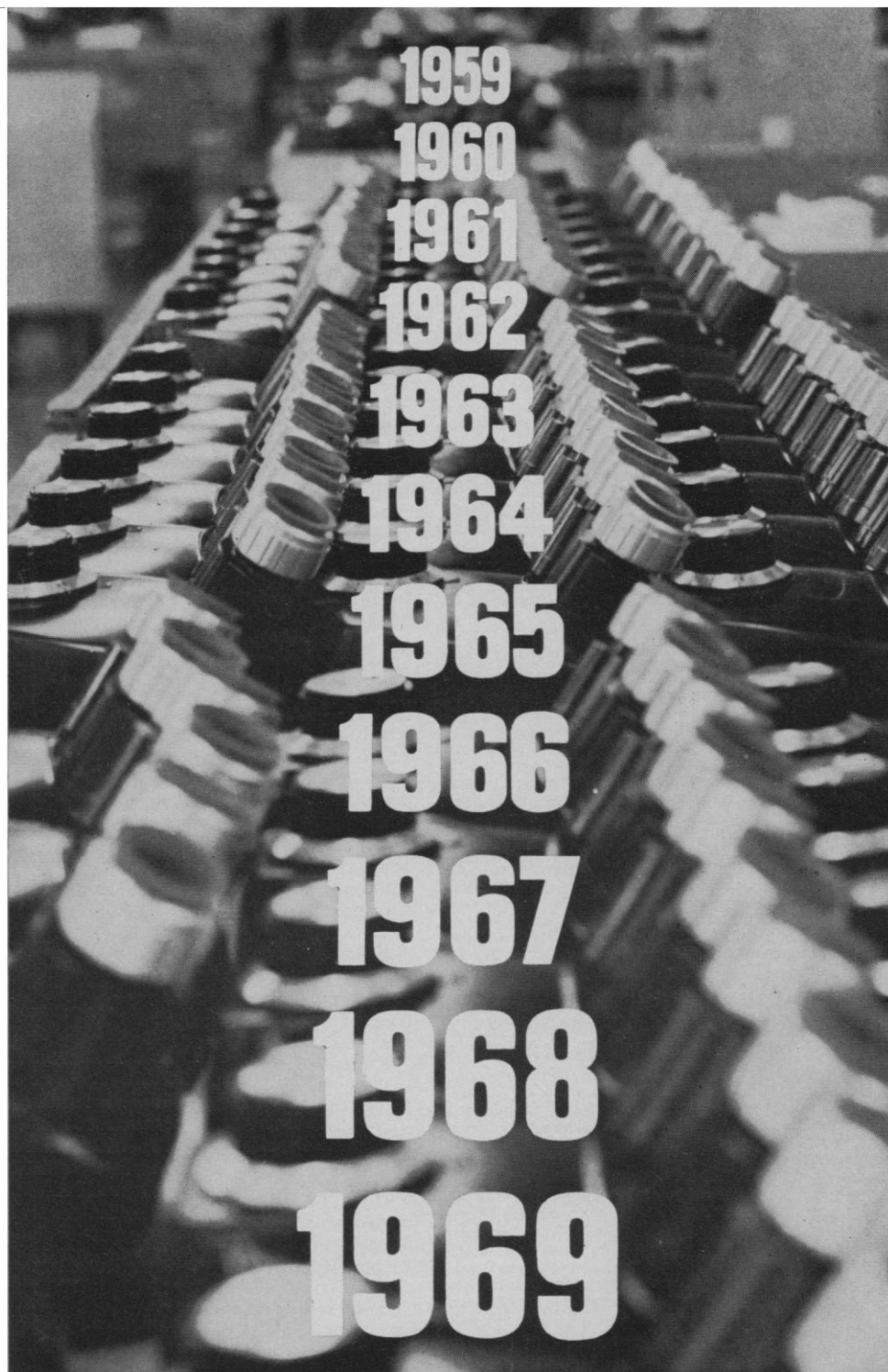
Culture and Society. Twenty-Four Essays. George Peter Murdock. University of Pittsburgh Press, Pittsburgh, 1965. xii + 376 pp. \$7.95.

Design Synthesis. J. H. Ellinger. Wiley, New York, 1968. Vol. 1 (xx + 132 pp., illus.); vol. 2 (unpaged, illus. + folio). Boxed, \$41.50.

Detection of Signals by Template Matching. David H. Friedman. Johns Hopkins Press, Baltimore, 1969. x + 62 pp., illus. \$6.50.

Developmental Plant Anatomy. Alan R. Gemmell. St. Martin's, New York, 1969. iv + 60 pp. + plates. Paper, \$1.50. Institute of Biology's Studies in Biology, No. 15.

Development of the Functions of the Small Intestine in Mammals and Man. O. Koldovský. Karger, Basel, 1969 (U.S.



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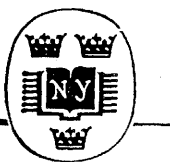
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January 1970 664 pp. illus. cloth \$10.00 paper \$5.50

Chemical Evolution: MOLECULAR EVOLUTION TOWARDS THE ORIGIN OF LIVING SYSTEMS ON THE EARTH AND ELSEWHERE

By MELVIN CALVIN, *University of California at Berkeley*. The study of chemical evolution is based on the assumption that life appeared on the earth's surface as a result of the normal operation of physical and chemical laws. This implies that there was a period in the earth's history that encompassed the transition between non-living molecules and a population of molecular aggregates that we should call "living." Two approaches are used here in the attempt to determine the nature of this interface and transition. The first, molecular palaeontology, is the view backwards into the historical record; the second is the construction of hypothetical chemical models that could have given rise to living organisms.

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The Quantum Physicists: AND AN INTRODUCTION TO THEIR PHYSICS

By WILLIAM H. CROPPER, *St. Lawrence University*. An absorbing narrative of the development of quantum physics, this account presents not only the formal basis of the theory but also the human endeavors of the scientists involved. Planck, Einstein, Bohr, Heisenberg, de Broglie, Schrödinger, Born, and Dirac are all seen in their struggles to extract meaning and mathematical procedures from the complex phenomena of the quantum realm. The study displays the formal basis of the theory, the postulates and main arguments of the theorems. It provides a readable introductory textbook for students of physics and physical chemistry.

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Models in Structural Inorganic Chemistry

By A. F. WELLS, *University of Connecticut*. This book describes the construction of three-dimensional models of most of the important types of inorganic compounds, using a set of units devised specially for the purpose. Beginning with a discussion of general principles the book describes models under five main headings: polyhedra and other finite systems; repeating patterns, two-dimensional and three-dimensional nets; sphere packings; structures built from tetrahedra and octahedra. Part 3 gives additional information on model building. Appendices.

Spring 1970 200 pp. 146 text figs. cloth \$7.20 paper \$4.25

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distributor, Phiebig, White Plains, N.Y.). viii + 204 pp., illus. \$12.70.

Dos Mamíferos Marinos de Baja California. Daniel Lluch Belda, Lowell Adams, and S. G. Losocki. Instituto Mexicano de Recursos Naturales Renovables, Mexico, D.F., 1969. viii + 118 pp., illus. Paper, \$3.

Drugs and Alcohol. Kenneth L. Jones, Louis W. Shainberg, and Curtis O. Byer. Harper and Row, New York, 1969. x + 134 pp., illus. Paper, \$2.50.

Earthquake Interpretations. Ruth B. Simon. Colorado School of Mines, Golden, ed. 2, 1969. 100 pp., illus. Paper, \$2.

Ecological Aspects of the Mineral Nutrition of Plants. Ninth symposium of the British Ecological Society, Sheffield, England, April 1968. I. H. Rorison, A. D. Bradshaw, M. J. Chadwick, R. L. Jefferies, D. H. Jennings, and P. B. Tinker, Eds. Blackwell Scientific Publications, Oxford, 1969 (U.S. distributor, Davis, Philadelphia). xxii + 486 pp. + plates. \$17.50.

Ecological Notes on Wall Vegetation. S. Segal. Junk, The Hague, 1969. 326 pp., illus. + appendices. Paper, \$16.65.

Edward Stevens. Gastric Physiologist, Physician and American Statesman. With a complete translation of his inaugural dissertation "De Alimentorum Concoctione" and interpretive notes on gastric digestion along with certain other selected and diplomatic papers. Stacey B. Day, Ed. Cultural and Educational Productions, Cincinnati, Ohio, 1969. 180 pp., illus. \$11.95.

Electrical Network Theory. Norman Balabanian and Theodore A. Bickart. With contributions from the work of Sundaram Seshu. Wiley, New York, 1969. xxii + 839 pp., illus. \$19.95.

Electronic and Ionic Impact Phenomena. In four volumes. H. S. W. Massey, E. H. S. Burhop, and H. B. Gilbody. Oxford University Press, New York, ed. 2, 1969. Vol. 1, Collision of Electrons with Atoms, H. S. W. Massey and E. H. S. Burhop, xx + 684 pp., illus. \$32; vol. 2, Electron Collisions with Molecules and Photo-ionization, H. S. W. Massey, xviii + pp. 665-1316 + plates, \$32. International Series of Monographs on Physics.

Elementary Cryptanalysis. A Mathematical Approach. Abraham Sinkov. Random House, New York; Singer, New York, 1969. x + 190 pp. Paper, \$1.72; to schools, \$1.29. New Mathematical Library, vol. 22.

Emergency and Disaster Planning. Richard J. Healy. Wiley, New York, 1969. xii + 292 pp., illus. \$12.95.

Encyclopaedia of Linguistics, Information and Control. A. R. Meetham and R. A. Hudson, Eds. Pergamon, New York, 1969. xiv + 718 pp., illus. \$40.

The Ethnography of Franz Boas. Letters and Diaries of Franz Boas Written on the Northwest Coast from 1886 to 1931. Ronald P. Rohner, Ed. Translated from the German by Hedy Parker. University of Chicago Press, Chicago, 1969. xxx + 334 pp. + plates. \$12.50.

Feldspars. Tom. F. W. Barth. Wiley-Interscience, New York, 1969. xii + 264 pp., illus. \$14.50.

The Fertile Crescent. Travels in the Footsteps of Ancient Science. Clifford N.

Anderson. Exposition, New York, 1969. 332 pp. + plates. \$7.50.

Focus on Physics. Optics I—Lenses, Mirrors, and Optical Instruments. J. Warren Blaker. Barnes and Noble, New York, 1969. x + 118 pp., illus. Paper, \$1.25. College Outline Series, No. 129.

Focus on Understanding and Support. A Study in College Management. John W. Leslie. Statistical analysis by Charles Newton and Annette L. Bacon. American College Public Relations Association, Washington, D.C., 1969. xiv + 130 pp., illus. \$3.95.

Fungal Parasitism. Brian J. Deverall. St. Martin's, New York, 1969. iv + 60 pp. + plates. Paper, \$1.50. Institute of Biology's Studies in Biology, No. 17.

De Fysiologische, Biochemische en Enzymatische Klassifikatie van de Pseudomonadales. Karel Kersters. Koninklijke Vlaamse Academie voor Wetenschappen, Brussels, 1968. xii + 124 pp., illus. Paper. Verhandelungen van de Koninklijke Vlaamse Academie voor Wetenschappen, Letteren en Schone Kunsten van België, Klasse der Wetenschappen, Jaargang 30, No. 105.

General and Social Systems. F. Kenneth Berrien. Rutgers University Press, New Brunswick, N.J., 1968. viii + 232 pp., illus. \$9.

General Report on the Ground-Water Investigation of the Azraq Basin. Prepared for the Government of Jordan by the United Nations, New York, 1966. iv + 64 pp., illus. + folio. Paper. U.N. Development Programme.

Genetic Counseling. A Guide for the Practicing Physician. Walter Fuhrmann and Friedrich Vogel. Translated from the German edition (Berlin, 1968) by Sabine Kurth. Springer-Verlag, New York, 1969. viii + 106 pp., illus. Paper, \$3. Heidelberg Science Library, vol. 10.

Genetics Lectures. Vol. 1. Ralph Bogart, Ed. Published for the Genetics Institute of Oregon State University by Oregon State University Press, Corvallis, 1969. 196 pp., illus. Paper, \$4.

Heat and Mass Transfer in Recirculating Flows. A. D. Gosman, W. M. Pun, A. K. Runchal, D. B. Spalding, and M. Wolfshstein. Academic Press, New York, 1969. xii + 340 pp., illus. \$9.50.

A History of the First Hundred Years of the Mineral Collection in the British Museum. With Particular Reference to the Work of Charles Konig. W. Campbell Smith. Trustees of the British Museum (Natural History), London, 1969. Paper, 13s. Bulletin of the British Museum (Natural History): Historical Series, Vol. 3, No. 8, pp. 235-59.

How To Know the Aquatic Plants. G. W. Prescott. Brown, Dubuque, Iowa, 1969. x + 182 pp., illus. Cloth, \$3.25; spiral bound, \$2.50. Pictured-Key Nature Series.

How To Know the Lichens. Mason E. Hale. Brown, Dubuque, Iowa, 1969. x + 230 pp., illus. Cloth, \$3.75; spiral bound, \$3. Pictured-Key Nature Series.

How To Raise a Human Being. A Parents' Guide to Emotional Health from Infancy through Adolescence. Lee Salk and Rita Kramer. Random House, New York, 1969. xiv + 210 pp. \$5.95.

Human Afflictions and Chromosomal

Aberrations. Raymond Turpin and Jérôme Lejeune. Translated from the French edition (Paris, 1965). Pergamon, New York, 1969. xii + 392 pp., illus. \$21. International Series of Monographs in Pure and Applied Biology: Modern Trends in Physiological Sciences, vol. 32.

Human Neuroanatomy (Formerly Strong and Elwyn's *Human Neuroanatomy*). Raymond C. Truex and Malcolm B. Carpenter. Williams and Wilkins, Baltimore, ed. 6, 1969. xiv + 674 pp., illus. \$16.50.

Hunters of the Northern Ice. Richard K. Nelson. University of Chicago Press, Chicago, 1969. xxiv + 432 pp. + plates. \$8.50.

The Immortalist. An Approach to the Engineering of Man's Divinity. Alan Harrington. Random House, New York, 1969. x + 326 pp. \$6.95.

Immunity to Parasitic Animals. Vol. 1. G. J. Jackson, Robert Herman, and Ira Singer, Eds. Appleton-Century-Crofts, New York, 1969. xiv + 294 pp., illus. \$14.

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Insects and Insecticides. R. C. Reay. Oliver and Boyd, Edinburgh, 1969. viii + 152 pp. + plates. Paper, 7/6d. Contemporary Science Paperbacks, vol. 39.

Institute of Public Administration. General report prepared for the Government of Ghana by the United Nations, New York, 1967. 108 pp., illus. Paper. U.N. Development Programme.

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Life Sciences and Space Research VII. Proceedings of the Open Meeting of Working Group V at the Eleventh Plenary Meeting of the Committee on Space Research, Tokyo, May 1968, and the Symposium on Biological Effects of Radiation in Space, Tokyo, May 1968. W. Vishniac and F. G. Favorite, Eds. North-Holland, Amsterdam, 1969. xii + 212 pp., illus. \$14.

Linear Algebra. John de Pillis. Holt, Rinehart and Winston, New York, 1969. xii + 516 pp., illus. \$8.95.

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Mental Health in Public Health Training. Proceedings of the national conference, Warrenton, Va., May 1968. Stephen E. Goldston, Ed. National Institute of Mental Health, Washington, D.C., 1969 (available from the Superintendent of Documents, Washington, D.C.). viii + 92 pp., illus. Paper, 60¢. Public Health Service Publication No. 1899.

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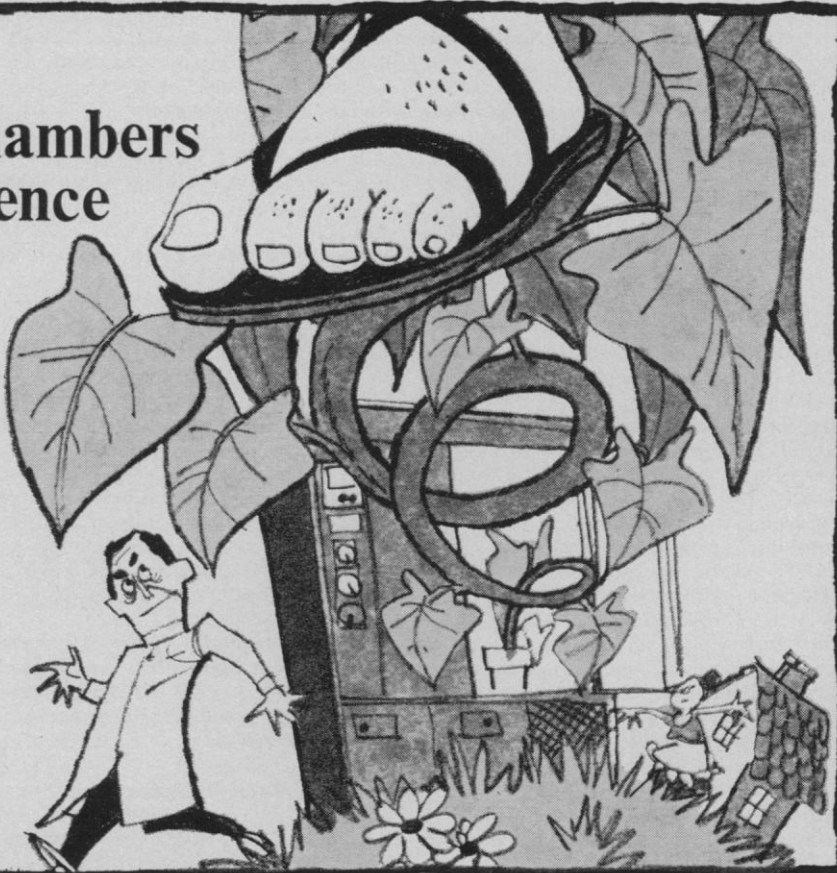
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Protozoa. Part 1 (Recent), compiled by R. A. Neal and Mary Tobias. Part 2 (Fossil), compiled by Mary Tobias and Margaret Oxenham. Zoological Society, London, 1969. vi + 190 pp. Paper, \$8.40. Zoological Record, vol. 103, section 2, 1966.

Quantitative Analytical Chemistry. H. A. Flaschka, A. J. Barnard, Jr., and P. E. Sturrock. Vol. 1, Introduction to Principles (xiv + 594 pp., illus., paper, \$5.95). Vol. 2, Short Introduction to Practice (x + 294 pp., illus.; paper, \$2.95). Barnes and Noble, New York, 1969. Barnes and Noble International Textbook Series.

"Ramona I." A Fortran Code for Transient Analysis of Boiling Water Reactors and Boiling Loops. P. Bakstad and K. O. Solberg. Institutt for Atomenergi, Kjeller, Norway, 1968. Unpaged. Paper. KR 135.

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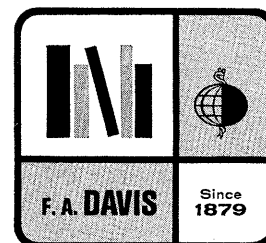
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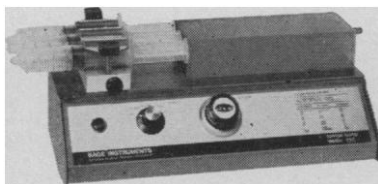
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The Social Context of Art in Northern New Ireland. Phillip H. Lewis. Field Museum of Natural History, Chicago, 1969. vi + 190 pp., illus. Paper, \$7.25. Fieldiana: Anthropology, vol. 58. Publication 1069.

Social Status and Psychological Disorder. A Causal Inquiry. Bruce P. Dohrenwend and Barbara Snell Dohrenwend. Wiley-Interscience, New York, 1969. xvi + 208 pp. \$9.50. Wiley Series on Psychological Disorders.

Speciation in Tropical Environments. Papers from a symposium, London, October-November 1968. R. H. Lowe-McConnell, Ed. Published for the Linnean Society of London by Academic Press, New York, 1969. viii + 248 pp., illus. \$11.50. Biological Journal of the Linnean Society, vol. 1, Nos. 1 and 2.

Statistical Dynamics of Sampled Data Systems. P. D. Krut'ko. Translated from the Russian edition (Moscow) by Scripta Technica. Iliffe, London; Elsevier, New York, 1969. xii + 524 pp., illus. \$25.

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The Study of Syntax. The Generative-Transformational Approach to the Structure of American English. D. Terence Langendoen. Holt, Rinehart and Winston, New York, 1969. xii + 180 pp., illus. Paper, \$3.95. Transatlantic Series in Linguistics.

A Study on the Airflow over Mountain. K. Yabuki and S. Suzuki. University of Osaka Prefecture, Sakai, Osaka, Japan, 1967. Illus. Paper. Reprinted from Bulletin of the University of Osaka Prefecture, Series B, vol. 19.

Systematics and Zoogeography of the Worldwide Bathypelagic Squid Bathyteuthis (Cephalopoda: Oegopsida). Clyde F. E. Roper. Smithsonian Institution Press, Washington, D.C., 1969 (available from Superintendent of Documents, Washington, D.C.). vi + 210 pp. + plates. Paper, \$1.50. U.S. National Museum Bulletin 291.

Textbook of Physiology. W. W. Tuttle and Byron A. Schottelius. Mosby, St. Louis, ed. 16, 1969. xii + 564 pp., illus. \$9.25.

Textile Flammability and Consumer Safety. Proceedings of an international conference, Ruschlikon-Zurich, January 1969. Gottlieb Duttweiler Institute for Economic and Social Studies, Ruschlikon-Zurich, 1969. vi + 206 pp., illus. Paper, \$5. GDI Occasional Publications, No. 45.

Theory of Intermolecular Forces. H. Margenau and N. R. Kestner. Pergamon, New York, 1969. x + 362 pp., illus. \$12. International Series of Monographs in Natural Philosophy, vol. 18.

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Thin Film Phenomena. Kasturi L. Chopra. McGraw-Hill, New York, 1969. xx + 844 pp., illus. \$24.50.

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