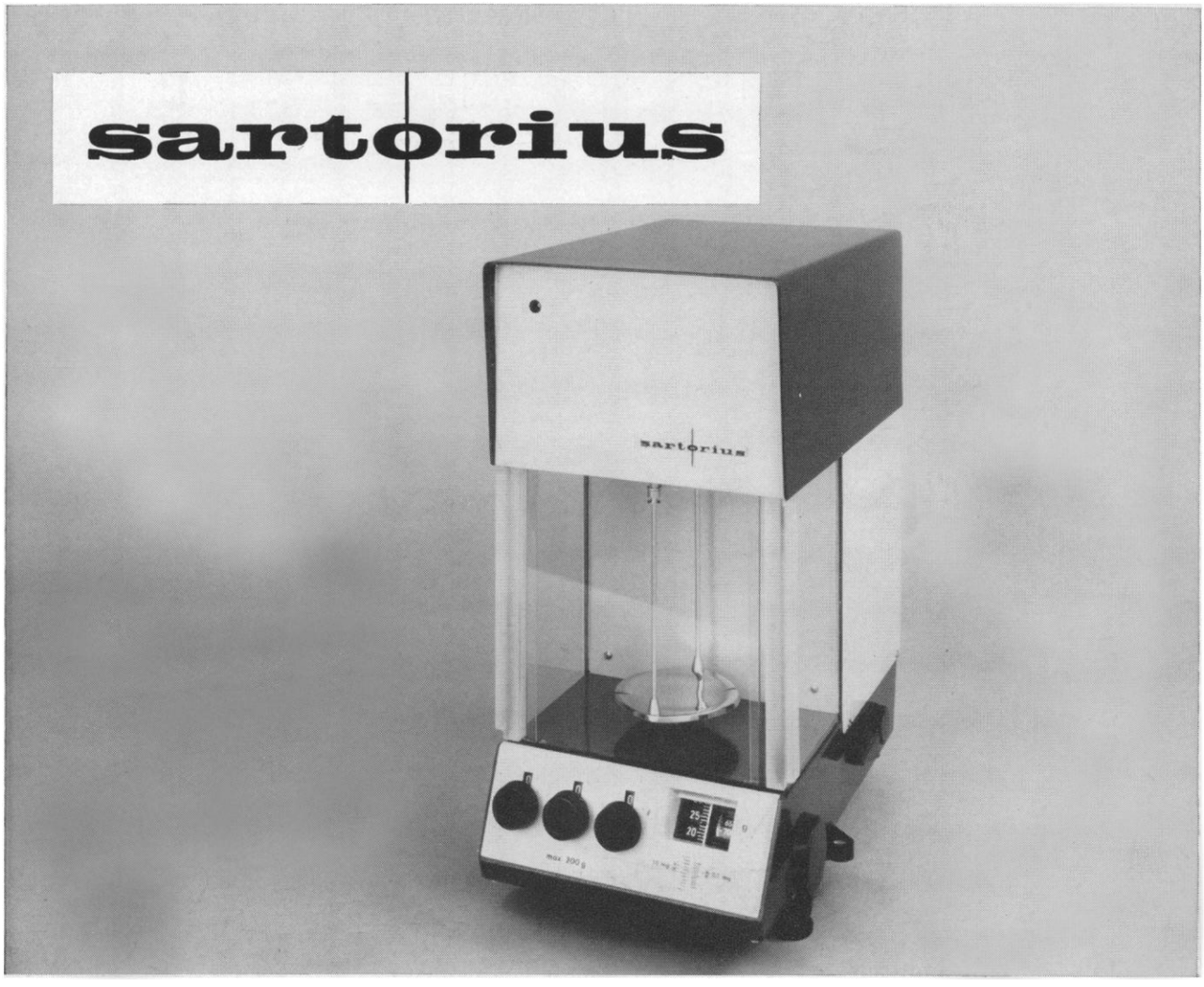
SCIENCE

5 January 1962

Vol. 135, No. 3497

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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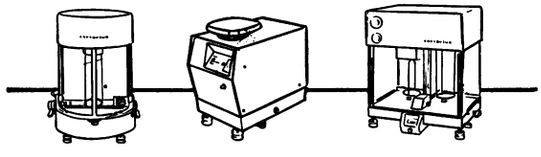

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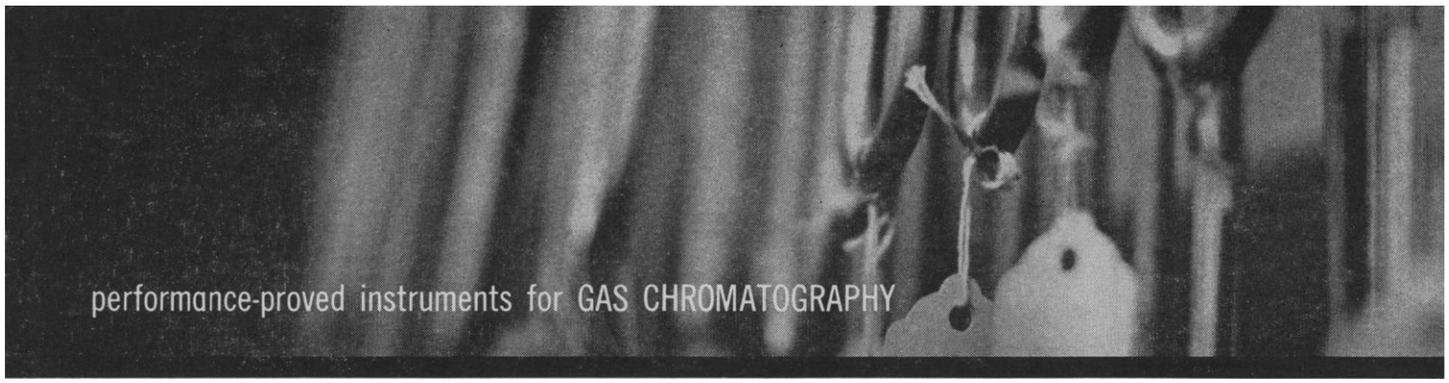

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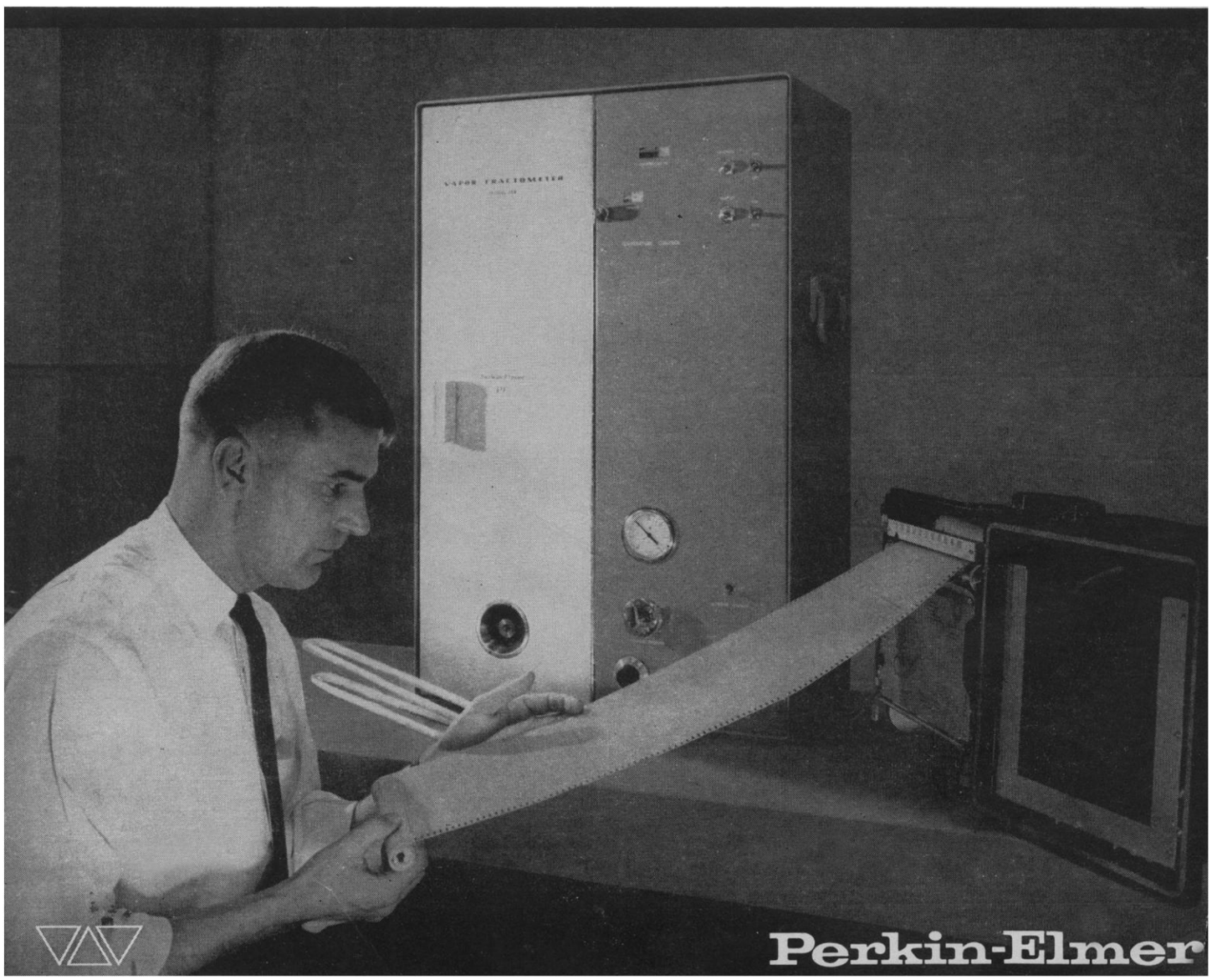

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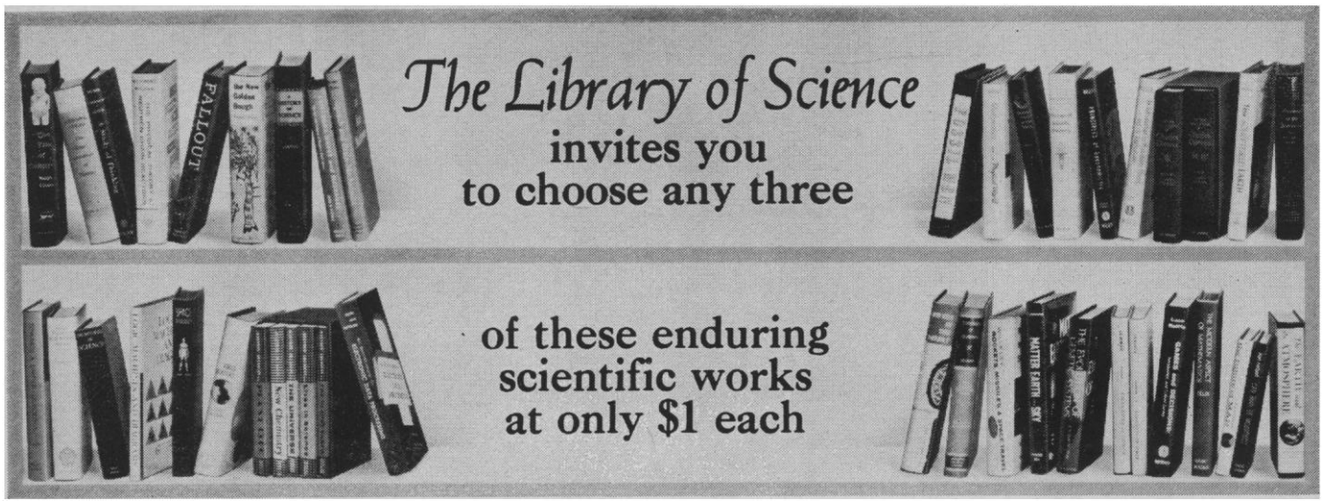
SCIENCE

Cover

Yucca Flat, Nevada test site, from the mesa in the northwest corner. The pinyon pine tree in the foreground stands on the lip of a crater formed by the venting of a partially contained underground shot (Blanca, October 1958) entombed in the mesa slope. The pinyon was one of the three plant species killed by apparent disruption of the root systems, while other species survived. See page 38.



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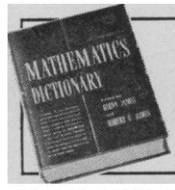

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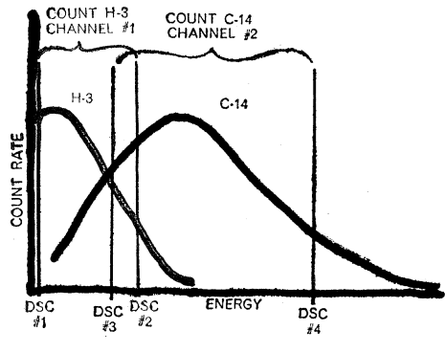

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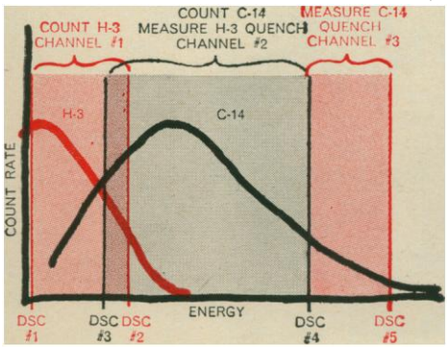

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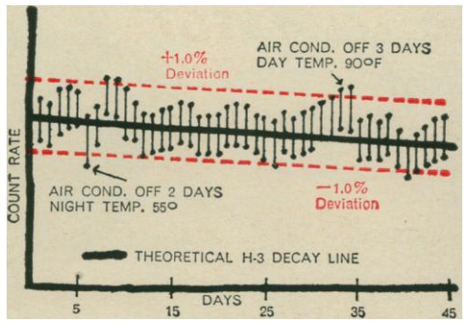

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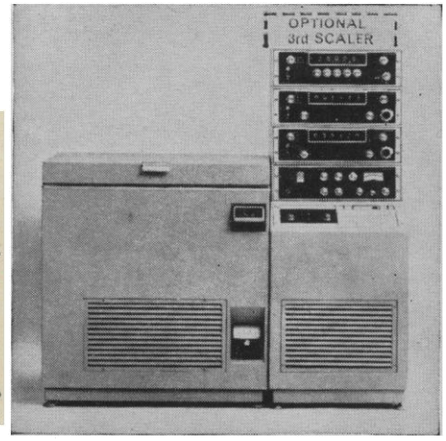

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Opportunity Knocks

An "alarming" drop in the number of graduate students pursuing the doctorate in education was reported last year by Maynard Bemis, executive secretary of the professional education fraternity, Phi Delta Kappa. According to the fraternity's study, the number of dissertations underway at U.S. and Canadian institutions dropped from 1,976 in 1959, with 91 institutions reporting, to 1,516 in 1960, with 105 institutions reporting. This is a decrease of around 23 percent despite an increase in the number of institutions cooperating with the study.

Bemis warned that if this trend continues the teacher-preparatory schools and departments will find it increasingly difficult to fill positions on their faculties. Many places, he said, already are employing persons with master's degrees where they formerly required persons with the doctorate. Bemis suggested that graduate students are giving up study for the degree in education in order to take advantage of the generous fellowships in other fields, and he finds such allotment of fellowships unfair.

Now, it is true that in the allotment of fellowships graduate students in education get the short end. In the academic year 1959–60, according to a U.S. Office of Education bulletin, only 5 percent of the fellowships in 139 doctorate-granting institutions went to students in education. But increasing the number of fellowships open to graduate students in education may not achieve the desired effect. The new students pursuing doctorates would not necessarily be drawn from the ranks of those who would otherwise be studying mathematics, science, or the humanities.

From another viewpoint, however, the drop of graduate students in education may be, not a cause for alarm, but the sound of opportunity knocking. There is another solution to the problems posed by this drop. Instead of continuing to place so much reliance on persons with advanced degrees in education, greater use could be made of persons with advanced degrees in other fields. As evidence that this suggestion is not utterly absurd, consider a recent example of cooperation between some colleges of education and some university departments, in this case, astronomy.

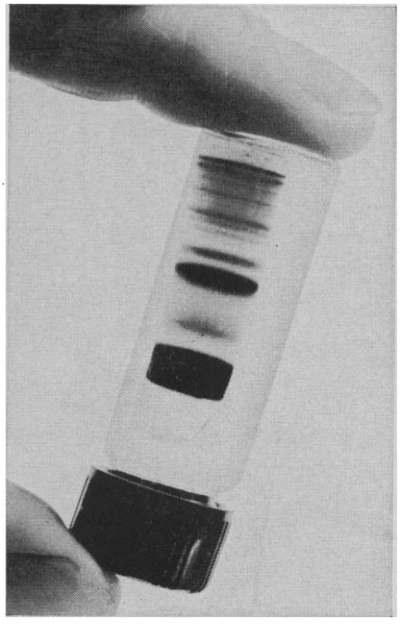
One criticism of present teaching is that it is tied too closely to matters of immediate social utility. In elementary school teaching such emphasis has meant building science discussions around such undeniably useful items as the local sewage system. To meet this criticism, a group of education specialists and scholars, in a program at the University of Illinois under a National Science Foundation grant, is developing a little treatise, now in its trial edition, entitled *Charting the Universe*. The purpose of this work is to give children a certain amount of knowledge about astronomy.

The little treatise also attempts to relate astronomy to the child's more immediate environment. Thus, in a discussion of the earth's shape, before considering the evidence afforded by the round shadow that the earth casts on the moon, the work asks—what does a traveler prove when he journeys around the earth without encountering sharp edges? The answer is that the traveler proves that the earth is not a pyramid, a cube, or a pentagonohedron. The traveler does not prove, however, that the earth is a sphere, for a picnicking ant circumnavigating a frankfurter also encounters no sharp edges.—J.T.

Kodak reports on:

what to do till the flying-spot scanner comes . . . why there are several spectrochemical emulsions . . . faraway warm spots

Disc electrophoresis



Each of the dark discs in this little tube of gel represents a different protein in a *3-microliter* sample of normal human serum. The separation was effected in 30 minutes. The pattern tells a detailed story to the practiced eye. The equipment can be jerry-built in the laboratory for a materials outlay of about $12.* The chemicals we recommend are *N,N-Methylenebisacrylamide* (Eastman 8383, meticulously recrystallized, gratefully praised for the purpose by those who know), *Acrylamide* (Eastman 5521), *2-Amino-2-(hydroxymethyl)-1,3-propanediol* (Eastman 4833), and *N,N,N′,N′-Tetramethylethylenediamine* (Eastman 8178). To reduce dependence on perceptual machinery in the skull of the operator, a program is under development wherein protein concentrations represented by the discs are to be determined by a TV-like flying-spot scanner and the signals fed to a digital computer programmed to identify patterns at the rate of 10^4 per week.

Peripheral as may be our connection with the new disc electrophoresis, we can do our part by drum-beating in print for people to learn how Drs. B. J. Davis and Leonard Ornstein of The Mount Sinai Hospital Cell Research Laboratory in New York City have extended electrophoresis in the directions of 1) more simplified equipment that gets you into the technique easily; 2) more sophisticated equipment that speeds and refines results once you have found the technique indispensable; 3) a clear (albeit concentrated and mathematical) exposition of the physical chemistry at work.

We propose a little experiment in casting bread upon the waters. We shall count how many will accept an offer hereby made by Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company) to send a free preprint of a paper by Dr. Ornstein on the theory and a fully illustrated set of directions by Dr. Davis on how to proceed. Then we shall wait and count how many orders come in for the above-named Eastman Organic Chemicals. The results of this experiment you will never know.

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The grateful but cautious spectrographer

For some reason or other we seem to sell quite a lot more spectrographic plates and film each year than we did the year before. This trend goes on despite the frequent flowering of new fashions in elemental analysis by physical methods and successful competition from within our own house by new Eastman Organic Chemicals as reagents for chemical determination of elements. The civilized world is analysis-happy and that makes *us* happy.

To betoken the happiness a small pamphlet has been issued under the title "Spectrum Analysis with Kodak Materials." The words it contains may prove less useful than its graphs and numbers, though the words devoted to a warning against taking the graphs and numbers too seriously must be taken seriously. That's life.

Life lived with the photographic emulsion as a measuring instrument for radiation intensity must be filled with gratitude for its simplicity, versatility, and economy and filled with caution against glib assumptions. Those who live that life have learned that:

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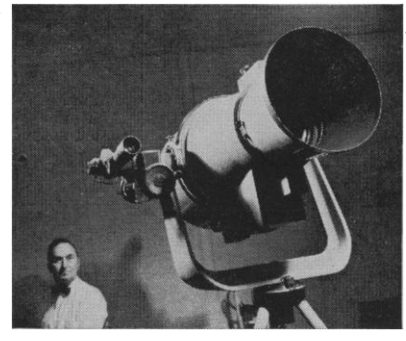
If you still want the pamphlet, write Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y. It is best to write or phone anyway for information about dealers, sizes, etc.

50 winking lights



This infrared scanning head contains a line of 50 gas-discharge lamps that wink in correspondence to infrared radiation imaged by a 10-inch-aperture *f*/0.76 Schmidt system on a 50-element linear array of Kodak Ektron Detectors. While the image is oscillated across the line of detectors, the line of lamps is effectively swept in synchronism across the visual field of the beholder. He sees a picture of a 20° chunk of the infrared environment for search and track of objects differing in temperature from the background by a number of degrees that is determined by which of several types of interchangeable detector arrays happens to be in place. The instrument is also useful in another mode of operation with multi-channel oscillographs for radiometry of faraway warm spots.

For further information write Eastman Kodak Company, Advanced Planning Group, Apparatus and Optical Division, Rochester 4, N. Y.

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of the transaction, the buyer may find that even though his contract specifies payment in 18 months he can skip or delay payments and end up by paying in, say, 24 months without an additional charge. Should he compute his "true interest" on the basis of the contract period, on what he plans to do, on the average performance of his class of buyer, or on the most he can get away with in an extreme case?

Clearly, the fallacy implicit in the Douglas bill is much greater than that of which *Science* has accused installment buyers—comparing absolute numbers instead of rates. The bill seems to assume that simplified formulas borrowed from the austere world of pure arithmetic can be applied literally to the complex and disorderly world of commerce. What the situation calls for is a systematic and statistically valid study, such as no one has yet made, of what really happens, with what consequences, to how many people, in the pricing of installment purchases. Only after such a study has been made will it be appropriate to prescribe remedies, if any are required.

REAVIS COX
Wharton School of Finance and Commerce, University of Pennsylvania, Philadelphia

Shielding

We wish to comment on the paper "Radiation dosimeter utilizing the thermoluminescence of lithium fluoride," by J. R. Cameron *et al.* which appeared in a recent issue of *Science* [**134**, 333 (1961)]. We wish specifically to call attention to the curves which appear in Fig. 1, the figure dealing with silver-activated phosphate glass.

We agree that glass of regular composition is energy-dependent, but low-Z glass is approximately half as energy-dependent; furthermore, proper shielding (we have used gold) of walls of certain thicknesses and of open-portal areas allows use of the low-Z glass in the 200-kv to 1.33-Mv range with discrete isotopes and radium as well as x-rays.

We believe that the authors did not consider this point, or that they have not investigated the use of low-Z glass and shielding materials.

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Veterans Administration Hospital, Bronx, New York

New Products

Osmometer permits determinations of molecular weight and osmotic concentrations with samples of 20 μliter or smaller. The instrument operates by measuring temperature differences, caused by differential mass transfer, between the sample and a reference solvent. Molecular weights up to 5000 are said to be measured with accuracy of ± 1 percent, and weights to 20,000 with reduced accuracy. Samples may be measured at approximately 2-min intervals. The sample is introduced into a chamber saturated with solvent vapor in an environment temperature controlled within ± 0.001°C. Samples and reference solution are introduced by a syringe-injector system and surround small bead thermistors that sense the temperature difference. The thermistor beads can be observed through a view port. (Mechrolab Inc., Dept. Sci495, 1062 Linda Vista Ave., Mountain View, Calif.)

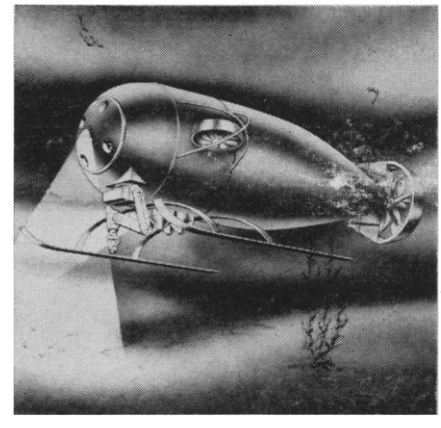
Time-lapse control equipment for cinephotography and cinemicrography incorporates a pulse generator that is said to be unaffected by normal input-voltage variations and a predetermined pulse counter to secure the desired time cycle interval. Desired timing and exposure intervals are dialed on the programmer. When the count reaches the set interval, an impulse is generated that starts the exposure. During exposure, all systems are inactive and no movement or vibration occurs. At the conclusion of the exposure cycle, the camera is automatically advanced one frame and the interval count cycle is resumed. The programmer and camera drive can be attached to any motion-picture camera according to the manufacturer. (Sanders Laboratories, Dept. Sci497, East Rutherford, N.J.)

Digital data-conversion system, for digitizing analog information for direct entry into computers, operates at rates up to 10,000 conversions per second. The system incorporates a sample and hold feature that freezes rapidly changing wave forms so that the value read into the computer is the true value at the time conversion was initiated. The system can also be used to convert digital magnetic tape into computer format and to convert the magnetic-tape record into analog form. Conversion accuracy is said to be ± 0.05 percent or 1 mv, whichever is greater, plus or minus one half the least significant digit. (Monitor Systems, Inc., Dept. Sci507, Fort Washington Industrial Park, Fort Washington, Pa.)

High-temperature demonstration furnace operates by passing controlled electric current through graphite-cloth heating elements. Temperatures higher than 6000°F are said to be produced in less than 1 min. Rapid cooling of the furnace is provided by circulating water through two carbon electrode holders. A bell jar is provided for evacuation of the heating area or for introduction of a desired atmosphere. (Baird-Atomic Inc., Dept. Sci499, 33 University Rd., Cambridge 38, Mass.)

Recorder of the strip-chart type can operate as a standard fixed-span recorder, or it can function with a variety of plug-in modules. A family of such modules, 24 in all, contains the circuitry necessary for performing as a strain-gage, adjustable-span-and-zero, temperature, pressure, or other recorder. The modules feature calibrated controls and may be panel mounted or used as table-top equipment. No rewiring of the recorder is needed to interchange the modules. The recorder is available in 5-in. and 11-in. chart sizes and in single-pen, dual-pen, and multipoint models. (Westronics Inc., Dept. Sci494, 3605 McCart, Fort Worth 10, Tex.)

Underseas research vehicle, the "seapup IV," is a two-man vehicle that is designed for simple, reliable operation to ocean depths of 6000 ft, according to the manufacturer. It will hover and rotate and can be maneuvered precisely in vertical, horizontal, and inclined planes. Equipped with the manufacturer's specially adapted model 150 mechanical arm, the vehicle can perform manual tasks while hovering or resting on the ocean floor. Overall length is 18.65 ft; overall width 8.00 ft; total weight, including batteries, lifting fluid, and all other standard equipment, is 12,600 lb; operational speed is 2 to 4 knots; maximum operating time when submerged is 12 hr. Power available is 15,300 watt hr. Main propulsion is provided by a 2.5-hp motor driving a 34-in shrouded propeller; control or lift propulsion is provided by two ¼-hp



motors driving two 14-in. shrouded propellers. The main propulsion assembly pivots 70 deg port or starboard, and thrust from control propulsion assemblies can be directed independently to any angle in a vertical plane. The pressure hull is cylindrical with hemispherical ends. (General Mills Electronics Group, Dept. Sci490, 1620 Central Ave., Minneapolis 13, Minn.)

Synchronous motor, designed to drive memory drums, features fast acceleration of large loads followed by vigorous pull-in torque. Full-load efficiency at 80 percent assures cool operation. Angular velocity is said to be constant within less than one part per million over 5 days of operating time. (Genisco, Inc., Dept. Sci477, 2233 Federal Ave., Los Angeles 64, Calif.)

JOSHUA STERN
National Bureau of Standards, Washington, D.C.

The information reported here is obtained from manufacturers and from other sources considered to be reliable. Neither Science *nor the writer assumes responsibility for the accuracy of the information. All inquiries concerning items listed should be addressed to the manufacturer. Include the department number in your inquiry.*

Meetings

History of Sciences in India

A symposium on the history of sciences in ancient and medieval India was held on 4 and 5 August 1961 at the Bose Institute, Calcutta, under the auspices of the National Institute of Sciences of India. The symposium was inaugurated by D. M. Bose, director of the Institute. In his opening remarks A. C. Ukil referred to the importance the study of the history of sciences in India had assumed during recent years and the problems that workers face in this field, especially in connection with the source materials. Chronology, he observed, constitutes a serious difficulty. Regarding studies already made, which he termed secondary sources, he stated that in many instances there should be re-examination and re-evaluation of past attitudes and points of view.

Twenty-three papers were read and discussed at the symposium. In his paper on social and international relations in the development of science, R. C. Majumdar pointed out that there is direct evidence that scholars from India visited Western countries and taught the people of those countries medical science, astrology, astronomy, algebra, and arithmetic, as known in India. European scholars generally hold that in scientific matters India must have borrowed from Western countries, but with advances in our knowledge of history, Majumdar observed, it is difficult to subscribe to this view of one-way traffic. In support of Majumdar's observation, S. N. Sen cited archeological and epigraphic evidence of the flow of knowledge from east to west, and also historical examples, such as that of the transmission of knowledge of the decimal system and of some medical and astronomical ideas.

N. H. Keswani discussed the concepts of generation, reproduction, evolution, and human development found in the writings of ancient and medieval Indian scholars. He noted that the results of their observations, made without the help of microscopes and other modern instruments, approached in accuracy the results of modern workers, especially in the field of embryology. Zoological knowledge in the works of Kālidāsa was the subject of two papers, by C. S. Gupta and B. Rama Rao. S. S. Misra reviewed the development of medical sciences in India.

B. V. Subbarayappa presented a paper on the independent development of the atomic concept of matter in the Hindu, Buddhist, and Jaina literature and discussed the difference between the Indian ideas and those propounded by the Greek scholars headed by Democritus and Leucippus. S. P. Raychaudhuri and A. K. Bhattacharyya described agricultural practices and soil science in ancient India.

The geographical ideas of the Hindus were presented by S. M. Ali. In addition there were discussions of the development of mathematical series in India after Bhāskara II; of Bhāskara's works on differential and integral calculus; of science and society in the Arthaśāstra and the Rāmāyana; and of the general scientific content of the Vedic literature.

S. MITRA
National Institute of Sciences of India, Calcutta

Forthcoming Events

January

26–29. Man and Civilization: Control of the Mind—II, San Francisco, Calif. (S. M. Farber, Univ. of California San Francisco Medical Center, San Francisco 22)

28–3. American Inst. of Electrical Engineers, New York, N.Y. (R. S. Gardner, AIEE, 33 W. 39 St., New York 18)

28–3. Pan American Assoc. of Ophthalmology, interim congr., Lima, Peru. (J. M. McLean, 525 E. 68 St., New York 21)

29–31. American Soc. of Heating, Refrigerating and Air-Conditioning Engineers, St. Louis, Mo. (R. C. Cross, United Engineering Center, 345 E. 47 St., New York, N.Y.)

29–31. Institute of the Aeronautical Sciences, annual, New York, N.Y. (R. R. Dexter, Institute of the Aeronautical Sciences, 2 E. 64 St., New York 21)

29–1. Instrument Soc. of America, conf. and exhibit, Dallas, Texas. (W. H. Kushnick, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.)

30–1. Military Electronics, 4th winter convention, Institute of Radio Engineers, Los Angeles, Calif. (IRE, 1435 LaCienega Blvd, Los Angeles)

30-2. Society of Plastics Engineers, annual technical conf., Pittsburgh, Pa. (T. A. Bissell, SPE, 65 Prospect St., Stamford, Conn.)

31–2. American Geophysical Union, Pacific Southwest regional, Tucson, Ariz. (A. N. Sayre, U.S. Geological Survey, Washington 25)

February

1–2. Industrial Management Engineering Conf., Chicago, Ill. (F. A. Judd, Technology Center, Illinois Inst. of Technology, Chicago 18)

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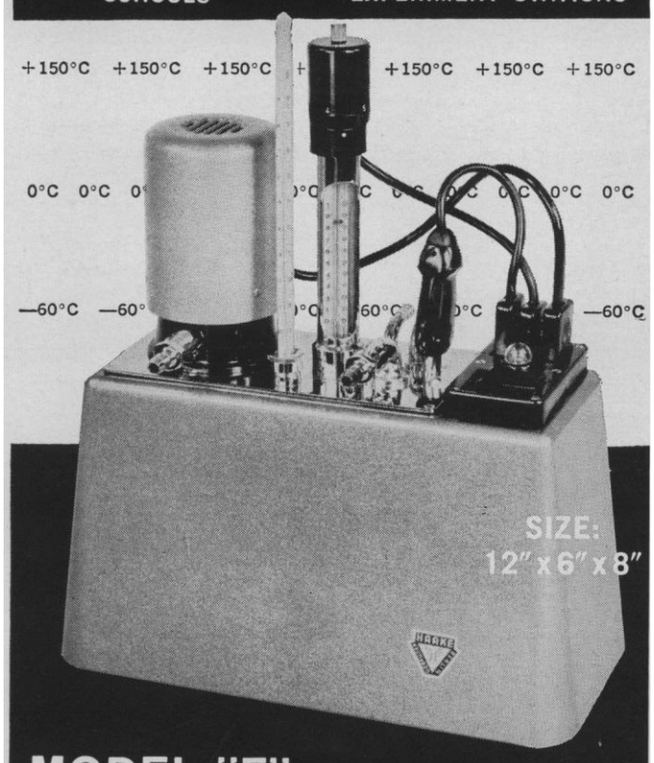

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1–3. Congress on Hospital Administration, 5th annual, Chicago, Ill. (American College of Hospital Administrators, 840 N. Lake Shore Dr., Chicago)

4–7. American Inst. of Chemical Engineers, natl., Los Angeles, Calif. (American Petroleum Inst., 1271 Avenue of the Americas, New York 20)

5. World Meteorological Organization, Working Group on Networks of the Commission for Synoptic Meteorology, Geneva, Switzerland. (Secretary, WMO, Geneva)

5–6. Gustav Stern Symp. on Perspectives in Virology—III, New York, N.Y. (M. Pollard, Lobund Inst., Univ. of Notre Dame, Notre Dame, Ind.)

5–7. American Acad. of Allergy, annual, Denver, Colo. (Scientific Liaison Office, Natl. Research Council, Sussex Dr., Ottawa, Ont., Canada)

5–9. Electroforming Applications, symp., American Soc. for Testing and Materials, Dallas, Tex. (ASTM, 1916 Race St., Philadelphia 3, Pa.)

6–7. Vertebrate Pest Control Conf., Sacramento, Calif. (M. W. Cummings, Univ. of California, Davis)

6–8. Society of the Plastics Industry, Reinforced Plastics Div., Chicago, Ill. (Scientific Liaison Office, Natl. Research Council, Sussex Dr., Ottawa, Ont., Canada)

7–9. Military Electronics, Inst. of Radio Engineers, Los Angeles, Calif. (M. E. Brady, Space Technology Laboratories, P.O. Box 95001, Los Angeles)

7–10. American College of Radiology, annual, New York, N.Y. (ACR, 20 N. Wacker Dr., Chicago 6, Ill.)

8. Problems in Food Processing, Assoc. of Vitamin Chemists, Chicago, Ill. (H. S. Perdue, Abbott Laboratories, North Chicago, Ill.)

8. Tissue Homotransplantation, 5th biennial conf., New York, N.Y. (W. Dameshek, New England Center Hospital, 171 Harrison Ave., Boston 11, Mass.)

9–11. National Open Hearth and Blast Furnace Conf., American Inst. of Mining, Metallurgical, and Petroleum Engineers, Detroit, Mich. (E. O. Kirkendall, AIME, 29 W. 39 St., New York 17)

12–16. Management of Science Information Centers, Inst. on Information Storage and Retrieval, 4th, Washington, D.C. (L. H. Hattery, Center for Technology and Administration, American Univ., 1901 F St., NW, Washington 6)

12–23. Latin American Seminar on Irrigation, 2nd, Panama City, Panama. (J. Melendez, Jefe, Depto. de Ingenieria, Ministerio de Agricultura, Comercio e Industrias, Panama City)

13–14. Sanitary Engineering, 4th conf., Urbana, Ill. (B. B. Ewing, Dept. of Sanitary Engineering, Univ. of Illinois, Urbana)

14–16. Biophysical Soc., 6th annual, Washington, D.C. (D. Cowie, Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, 5241 Broad Branch Rd., NW, Washington 15)

14–16. Solid State Circuits, intern. conf., Philadelphia, Pa. (L. Winner, 152 W. 42 St., New York 36)

14–17. National Soc. of College Teachers of Education, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

16–18. Medical Congr. in Honor of the Centennial of Bretonneau, Tours, France. (Directeur, École Nationale de Médecine, Tours)

17–24. Pan American Medical Women's Alliance, 8th congr., Manizales, Colombia. (C. Carthers, 1661 Riverside Ave., Suite B, Jacksonville, Fla.)

18–22. American Inst. of Mining, Metallurgical, and Petroleum Engineers, annual, New York, N.Y. (E. O. Kirkendall, AIME, 29 W. 39 St., New York 17)

18–22. Technical Assoc. of the Pulp and Paper Industry, annual, New York, N.Y. (TAPPI, 360 Lexington Ave., New York 17)

19–21. American Educational Research Assoc., Atlantic City, N.J. (G. T. Buswell, 1201 16 St., NW, Washington 6)

19–21. Tracking and Command of Aerospace Vehicles, Inst. of the Aerospace Sciences, San Francisco, Calif. (IAS, 2 E. 64 St., New York 21)

19–22. American Concrete Inst., annual, Denver, Colo. (W. A. Maples, 22400 W. Seven Mile Rd., P.O. Box 4754, Redford Station, Detroit 19, Mich.)

19–22. Industrial Ventilation Conf., E. Lansing, Mich. (Engineering Dept., Michigan State Univ., E. Lansing)

19–23. American Soc. of Civil Engineers, Houston, Tex. (W. H. Wisely, 345 E. 47 St., New York 17)

(See 22 December issue for comprehensive list)