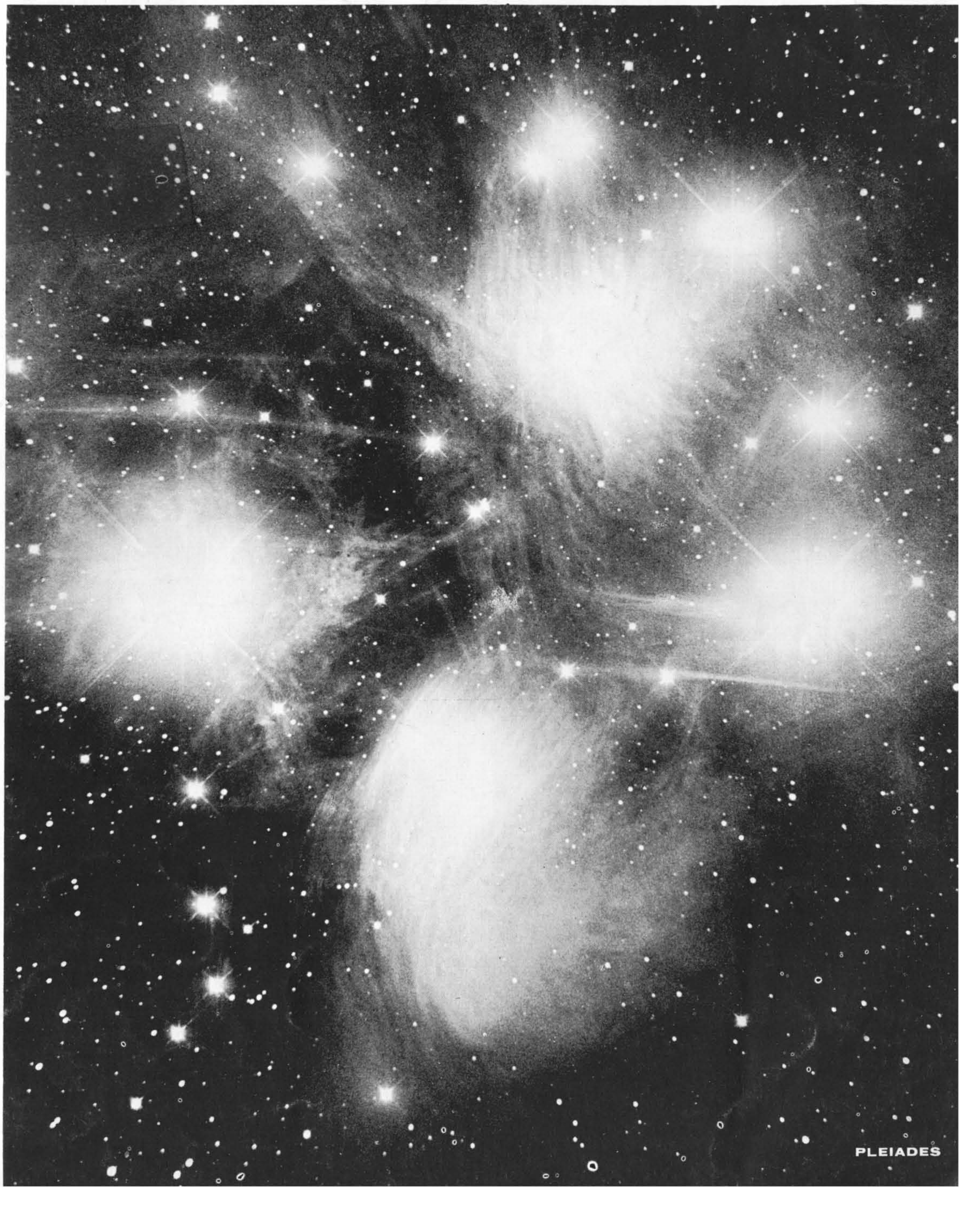
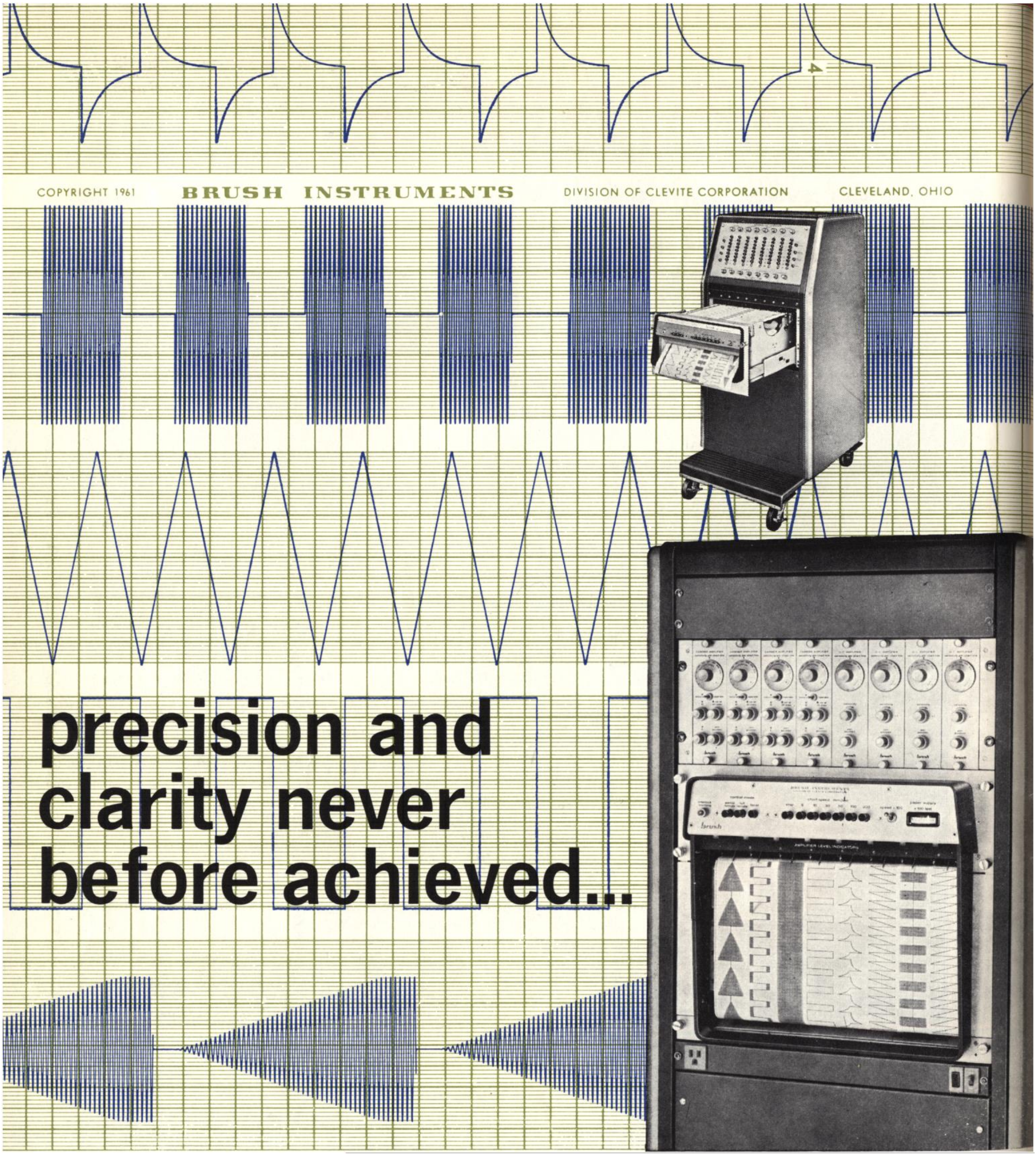
SCIENCE

21 December 1962

Vol. 138, No. 3547

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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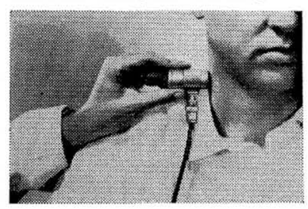

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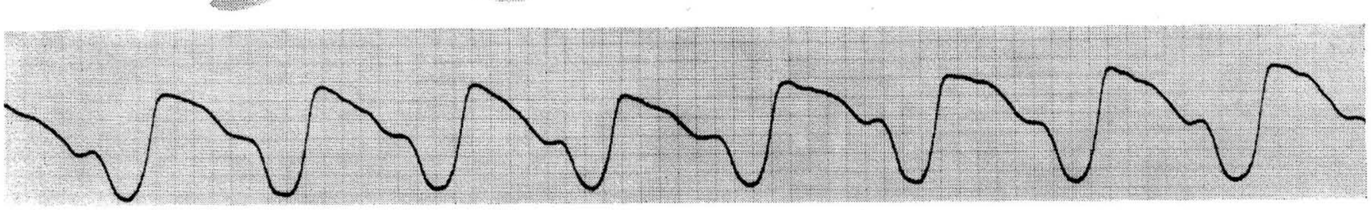

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SCIENCE

Cover Nebulosity surrounding the stars of the Pleiades. From *Astronomy of the 20th Century*, reviewed on page 1321. [Yerkes Observatory]

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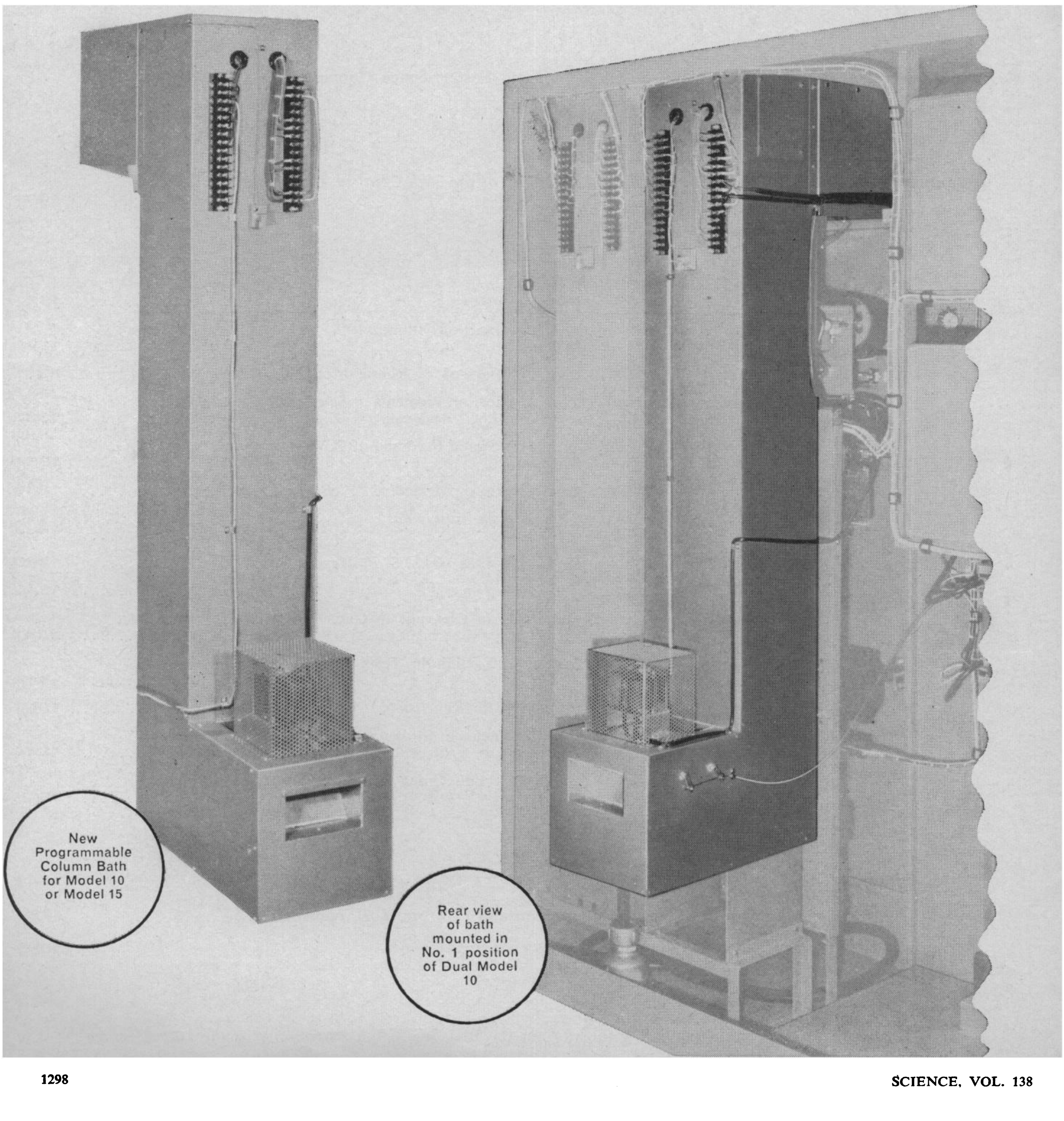
GAS CHROMATOGRAPHY

New Programmable U-shaped



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The new Programmable Column Bath opens areas of investigation previously unavailable to users of U-shaped columns. The choice of most biomedical researches, U-shaped columns have formerly been limited to isothermal operation. With temperature programming, the increased speed of analysis in some applications will offer new advantages to these investigators.

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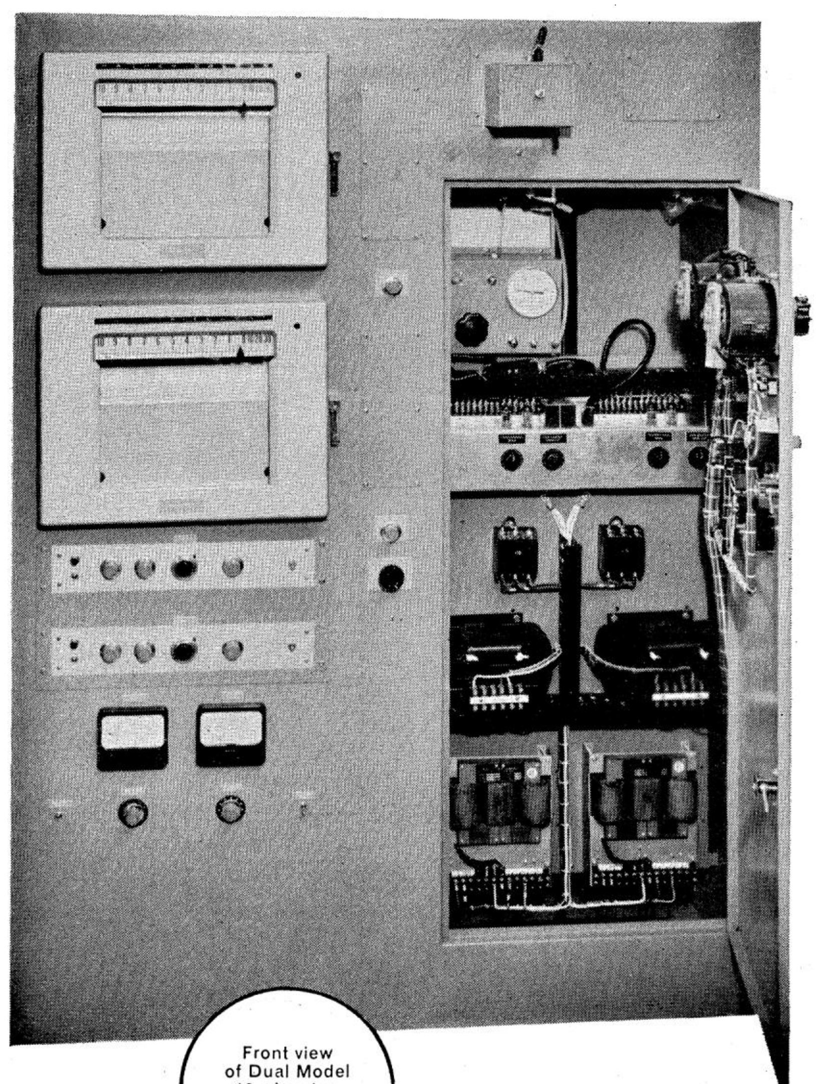
- Available with choice of detection: thermal conductivity, Argon, Flame Ionization, or Electron Attachment.
- Separate, individually controlled detector bath and flash heater.



Front view of Dual Model 10 showing bath temp. controls

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Woof

Warp is the threads that run the long way in woven fabric, and woof is the threads that run the short way. When they are interwoven, a strong and useful product results. * Let's say the warp is the Department of Defense and that the fabric desired is an effective national defense. The Institute for Defense Analyses helps to weave in the technical inputs that make the fabric strong. * IDA is an association of eleven universities, formed at the behest of the government to serve as a medium by which the academic and scientific community can provide the technical advice needed in the Department of Defense to develop the fabric of national defense. Many universities that are not Members also participate in the substantive work. * The IDA roster is filled from all sources of scientific and engineering talent from industry, from research laboratories, and from academic faculty and graduates. The IDA staff grapples with problems of great moment, and often of great urgency, in which science is a principal ingredient. * Thus IDA weaves separate but interdependent strands into the protective clothing of the national body. Its work involves the highest level of sophistication in technology, and affects the highest level of responsibility in the national defense. * IDA seeks highly qualified scientific and engineering talent. A permanent career with IDA is a most satisfying possibility for capable people. IDA also welcomes, and due to its unique nature can put to good use, learned and skillful people for comparatively short periods of time. If you feel you are qualified to make a contribution to this vital work, & wish to do so, let's discuss the matter. It's possible that you could be a great help to us.

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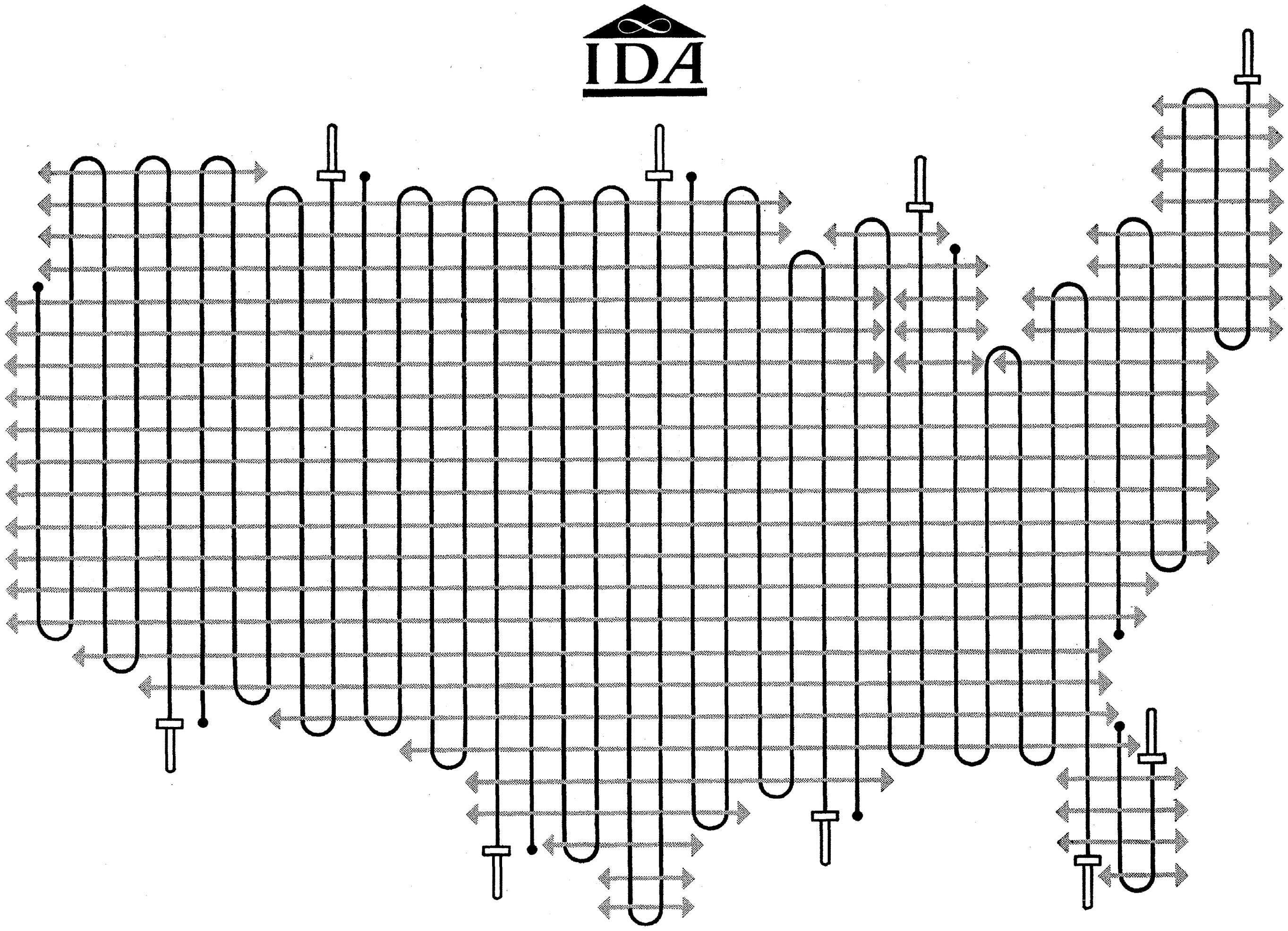

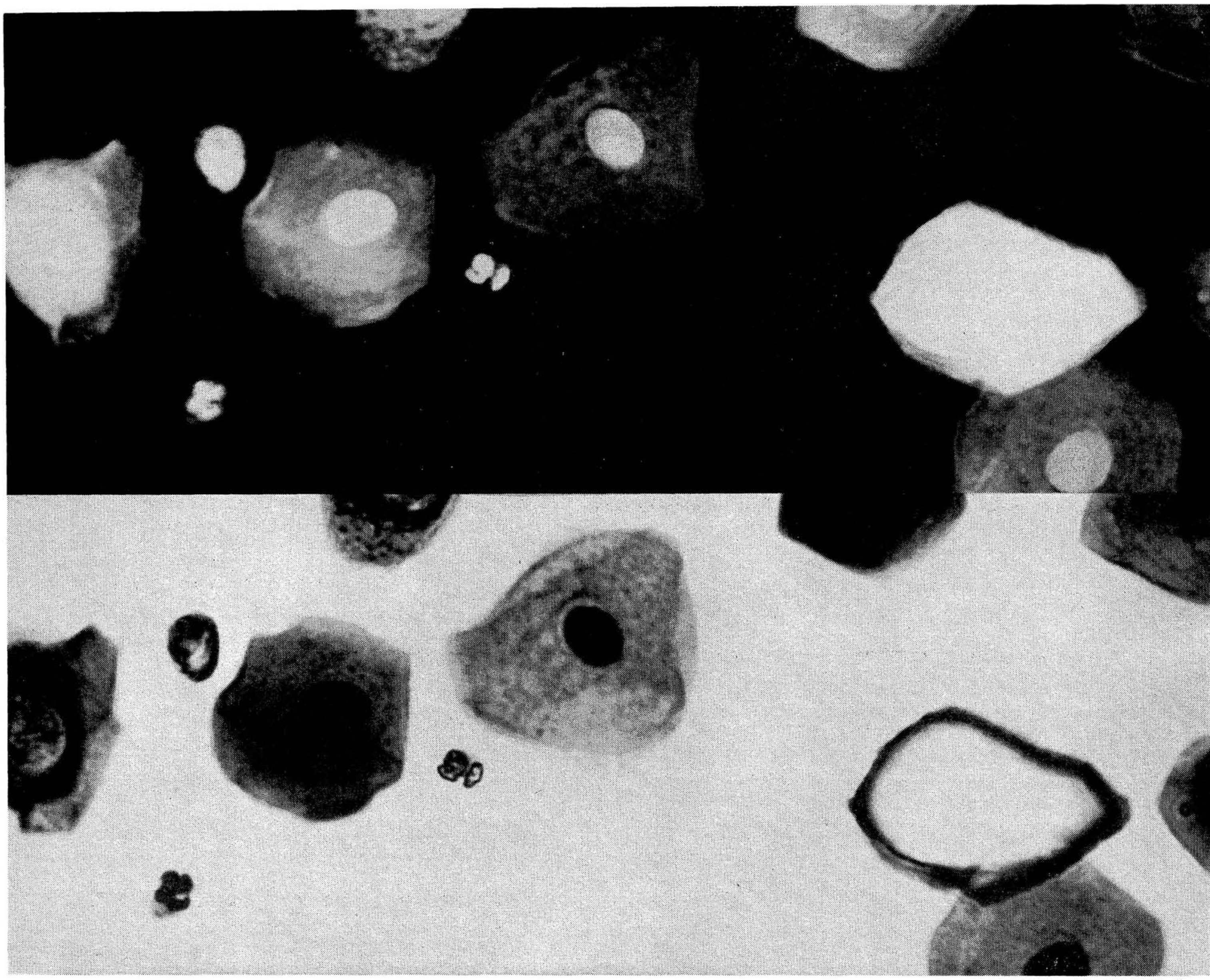

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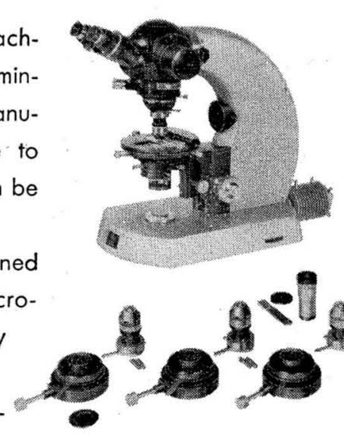

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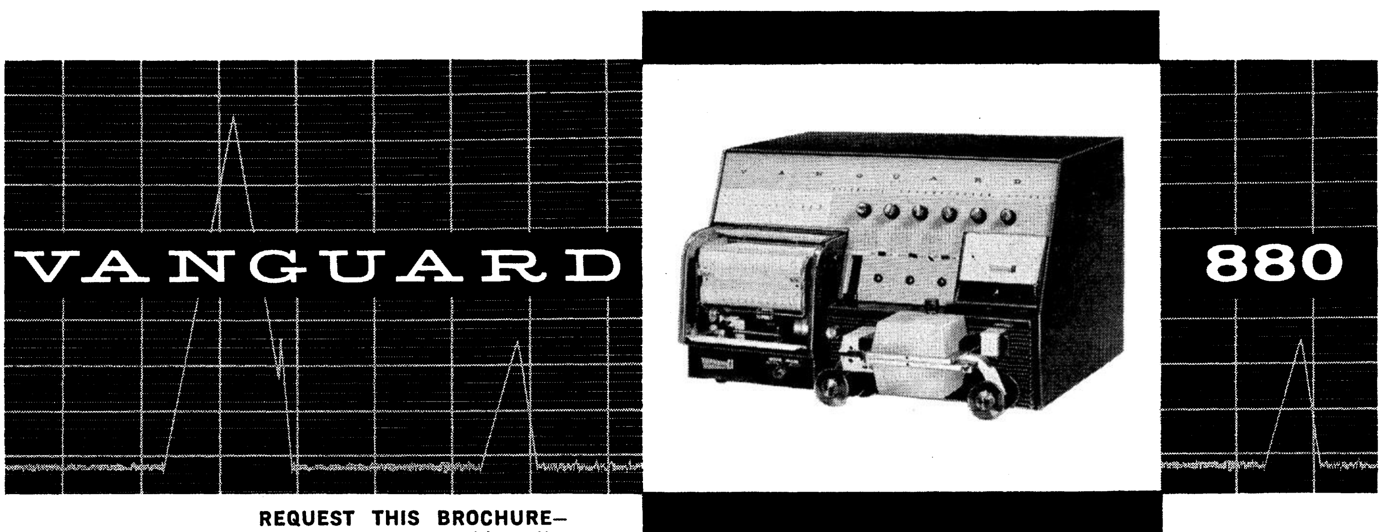

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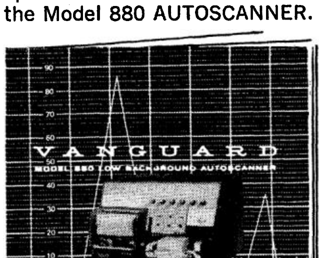

- Features 4 pi scanning—counts radiation on both sides of strip simultaneously
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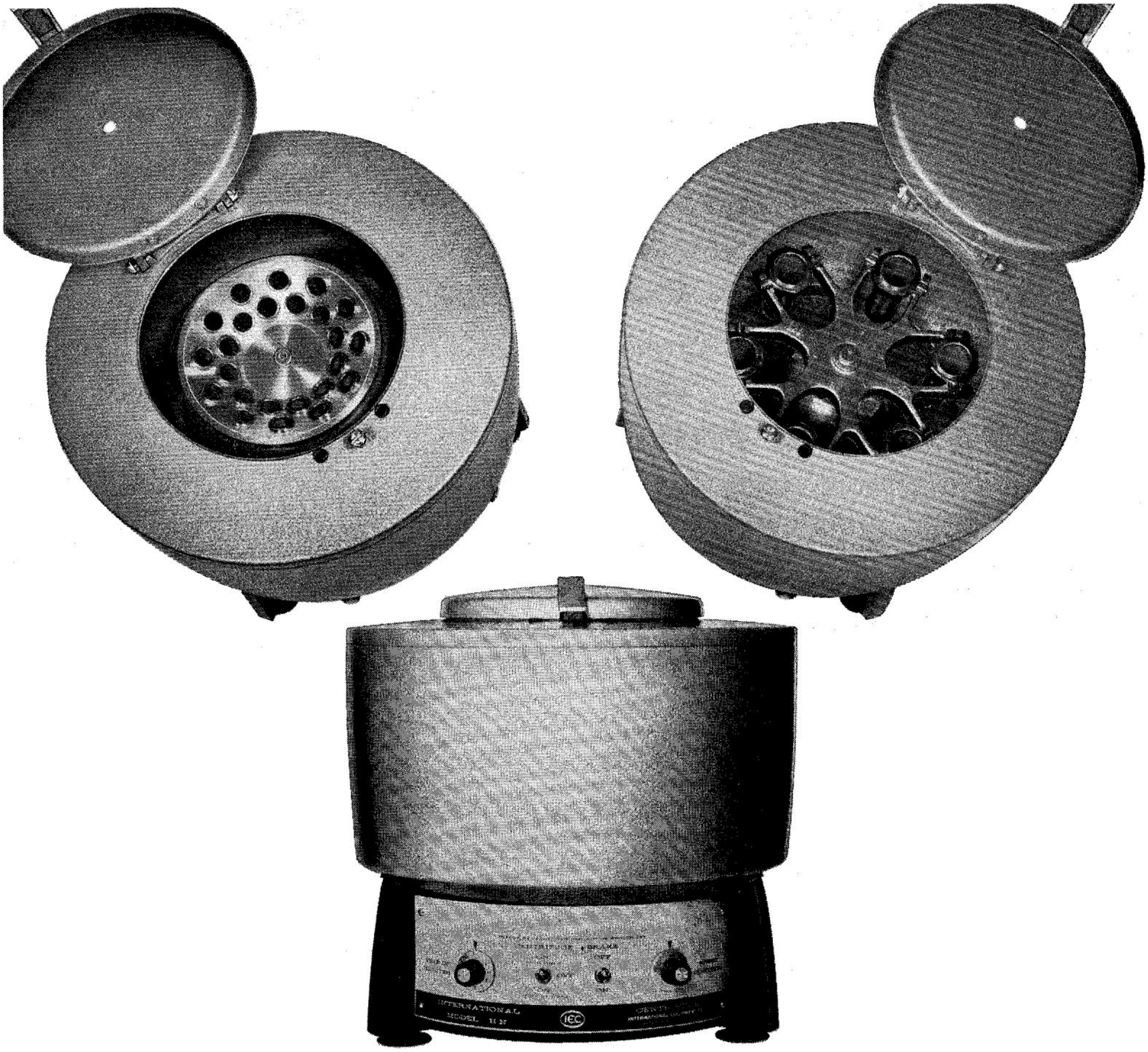

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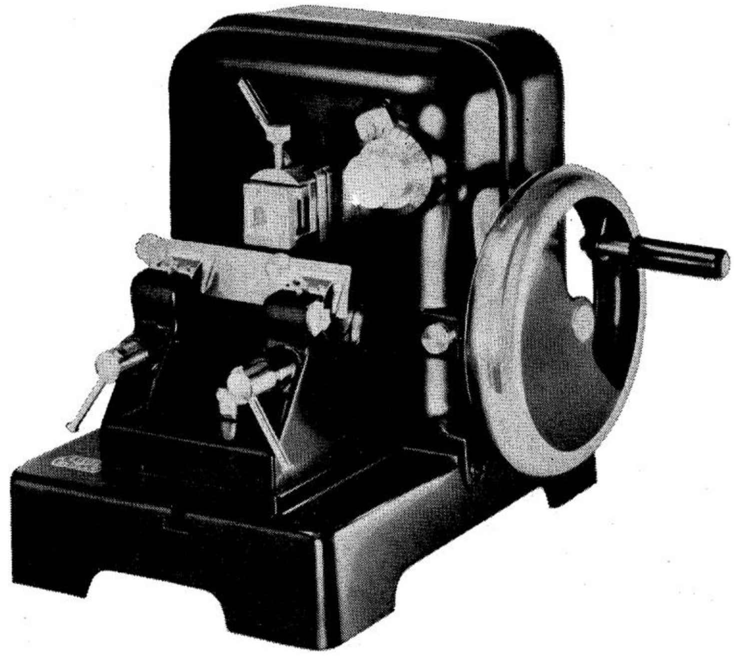

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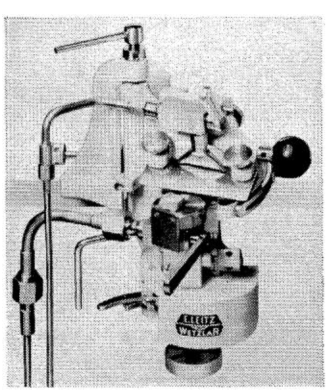

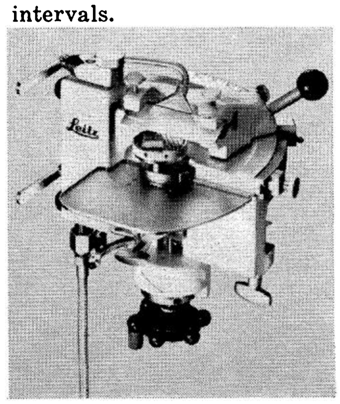

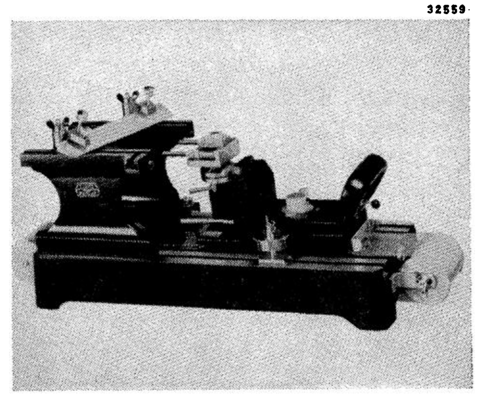

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Time and Talent

Shortly after he had settled in the United States, Einstein plaintively commented on the unquiet atmosphere of academe (even in Princeton!) and the deleterious effect this had on scientific productivity. On one occasion, I. I. Rabi recounted his travels during the preceding nine months. It was a schedule that would have stood up against that of an international airline pilot! And Rabi quoted Von Neumann, who had stated that if acceleration in transportation were considered in terms not of distance covered but of work performed we would have to conclude that the new speeds were resulting in people's traveling more slowly, since so much time was now being wasted.

Every week we hear doleful warnings about our precarious manpower position, particularly about the shortage of able people. There is no question about this. There *is* a shortage of able people. But the shortage is aggravated by the continued spinning of the able people we have—a spinning to which there appears to be no end.

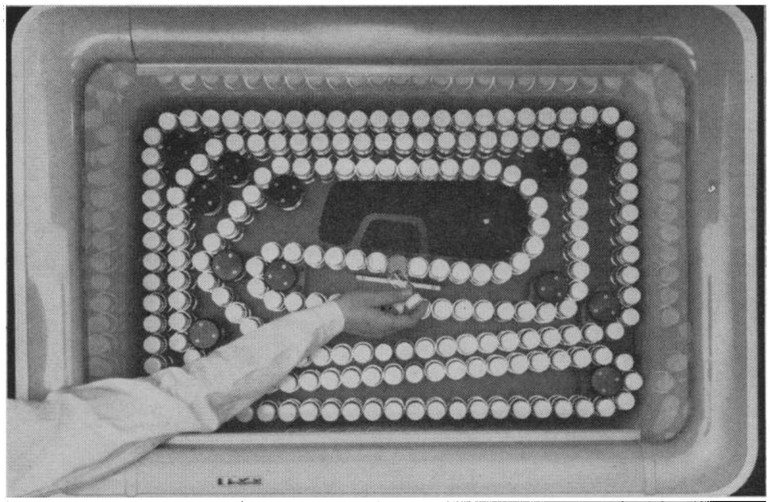
The reasons for travel, for too many commitments, for overextension are obvious. A man's reputation, his power, his prestige are very much conditioned by his being "on the inside." Only those who circulate, who circulate in the right circles, who have the right connections are likely to be called on to give advice, to be remembered when funds are distributed, to be elected when an opening occurs.

It is not easy to turn one's back on possible appointments, on other opportunities, and to stay put in a laboratory or library to struggle with one's problems and possibly to fail. Fortunately, however, some men are not suited to the life of the academic "operator." And a few others are able to withstand the temptations.

The size of our country adds to the difficulties. It is not easy to know the good people in a field where this requires an overview of 60 or 160 institutions scattered over an area of 6 million square miles. And so the good men who are identified are sought out again and again, until their scientific careers become a part of the past. As a consequence, many younger men who could help share the load—for we do need many to serve on committees and to do the other chores that need doing—remain unrecognized and are unable to enjoy opportunities that could add an important dimension to their development.

Many years ago, Wesley Clair Mitchell, great empiricist that he was, took out his appointment book to review what had happened to him during the preceding ten months. He calculated that he had been able to devote only about 30 percent of his total time to his research. And Mitchell was a most disciplined scholar.

We chew up the best people in this country. We do it for good or bad reasons, but we do it. The most important lesson that we have to learn is the importance of one word—*no*. For creative work requires time and repose. The nation is not suffering from a shortage of talent. It is suffering from a shortage of talented people who know how to preserve and protect their time.—ELI GINZBERG, *Director, Conservation of Human Resources, Columbia University*



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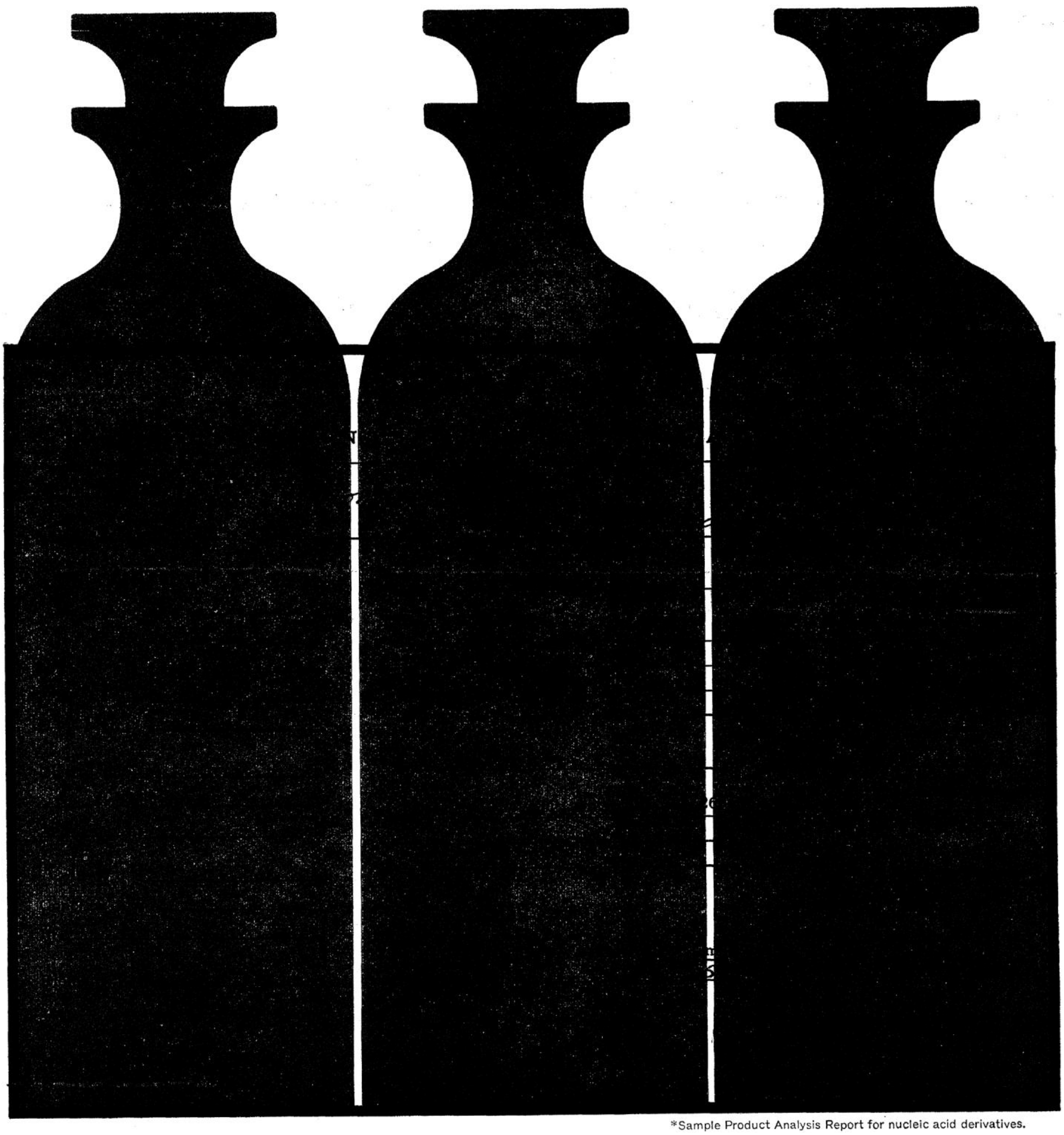

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The material in this section is prepared by the following contributing writers:

Robert L. Bowman (R.L.B.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

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

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Jet mill will grind as little as 2 to 3 g of material to a low-micron particle size. In operation, the particles of the material to be ground are thrown against each other at high speeds and are broken into finer particles by the impact. An air classifier is incorporated as an integral part of the unit. Both the grinding areas and the classifying areas may be lined with a variety of materials such as teflon, rubber, dense ceramic, or alloy steels, to control contamination. Fineness of grinding can be controlled so that coarser grinds are possible where speed is important. The grinding jet is supplied with compressed air, superheated steam, or inert gas. The device will operate on compressed air at 100 lb/in.^{2} pressure.—J.S. (Engineered Materials, Dept. S540, P.O. Box 363, Church Street Station, New York 8)

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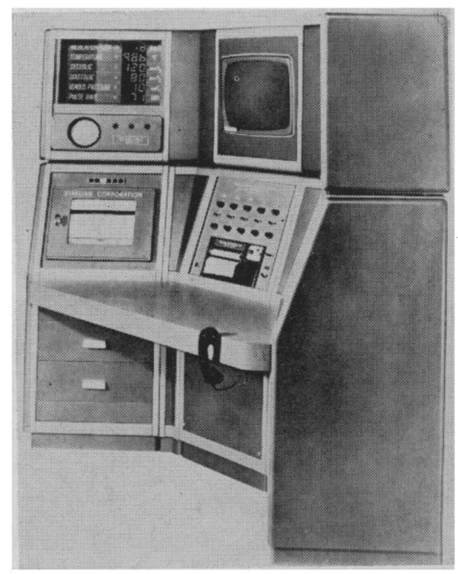

voice communications system which interconnects surgeon or any other instructor-demonstrator with students in a gallery, with a patient who may be undergoing a procedure without general anesthesia, and with the console operator. This bay has been planned so that it can accommodate equipment for closed-circuit television teaching. In addition to its essential functions of keeping the surgical team and the student observers continually conversant with the condition of a patient in the surgery, recovery room, or intensive care room, the new transistorized system has strengthened its teaching and research potential by the records it provides. These records, both of charts and of voice, can be utilized by medical students for review, by faculty and students in seminars and clinical conferences, and as an ongoing record of research progress.—R.L.B. (Starling Corp., Dept. S544, 2047 Sawtelle Blvd., Los Angeles 25, Calif.)

Letters

On the Chemistry of Inert Gases

The report in *Science* [**138**, 136 (1962)] describing the synthesis of xenon tetrafluoride appeared just as I was explaining to my large introductory course in biology (we call it that, though living organisms don't appear until about Christmas) that inert gases have no chemistry. Of course I have had to comment on it, particularly since both the report and the accompanying editorial emphasized only the shattering of former idols, with no suggestion of an explanation. All honor to the men who upset the idols, but now that one has to think again, is there not a reasonably straightforward explanation of such compounds, so that—as with all the best discoveries—their existence should have been anticipated?

The view that an outer shell of eight electrons—as in all the inert gases beyond helium—represents ultimate stability carries also the implication that the maximum number of covalent bonds should be four, filling one *s* and three *p* orbitals. To explain the existence of such familiar compounds, however, as PCl_5 and SF_6 one invokes the principle of the "expanded octet," expanded in these instances by employing *d* in addition to *s* and *p* orbitals. The third period of the periodic system, in which sulfur and phosphorus occur, is closed when the octet is completed (when the *s* and *p* orbitals are filled), as in argon (2–8–8). Yet the third electron shell will eventually hold 18 electrons, as it does in krypton (2–8–18–8), owing to the filling of the five additional *d* orbitals; and elements in the third period can expand beyond the octet by borrowing against this potentiality. No such compounds as PCl_5 and SF_6 appear in the second period, since no *d* orbitals are available. If other elements in the third period can expand beyond an octet on the basis of 3*d* orbitals, why not the inert gas argon that closes the period?

The electronic formula of xenon (atomic number 54) is 2–8–18–18–8. The outermost shell of xenon will eventually go from 8 to 18 electrons, as in radon (atomic number 86: 2–8–18–32–18–8), by filling its five 5*d* orbitals with five additional pairs of electrons. This might be expected, therefore, to offer a bonding possibility. Actually, however, the energies of the 6*s* and 6*p* orbitals are close in this case to those of the 5*d* orbitals, so that any expansion beyond the inert gas structure might be expected to involve hybridization of all three types.

Similarly, compounds of radon might be expected to involve the hybridization of 6*d* and 7*s* orbitals, and compounds of krypton, hybridization of 4*d* and 5*s* (also 5*p*?) orbitals. Indeed, compounds of argon, if such can be prepared, might involve a similar hybridization of 4*s* and 3*d* (also 4*p*?) orbitals rather than 3*d* orbitals alone.

If these are the lines of a correct explanation, it should be exceedingly difficult ever to prepare compounds of helium, in which the single 1*s* orbital is filled and no others are available; or of neon, in which the 2*s* and 2*p* orbitals are filled and no others are available. (In these cases hybridization with orbitals on the next shells is very unlikely because of large energy gaps.)

Obviously I am not the one to say these things; and really I am not saying, but asking them.

GEORGE WALD
Biological Laboratories,
Harvard University,
Cambridge, Massachusetts

On the Recent Discoveries Concerning Jupiter and Venus

In the light of recent discoveries of radio waves from Jupiter and of the high surface temperature of Venus, we think it proper and just to make the following statement.

On 14 October 1953, Immanuel Velikovsky, addressing the Forum of the Graduate College of Princeton University in a lecture entitled "*Worlds in Collision* in the Light of Recent Finds in Archaeology, Geology and Astronomy: Refuted or Verified?," concluded the lecture as follows: "The planet Jupiter is cold, yet its gases are in motion. It appears probable to me that it sends out radio noises as do the sun and the stars. I suggest that this be investigated."

Soon after that date, the text of the lecture was deposited with each of us [it is printed as supplement to Velikovsky's *Earth in Upheaval* (Doubleday, 1955)]. Eight months later, in June 1954, Velikovsky, in a letter, requested Albert Einstein to use his influence to have Jupiter surveyed for radio emission. The letter, with Einstein's marginal notes commenting on this pro-

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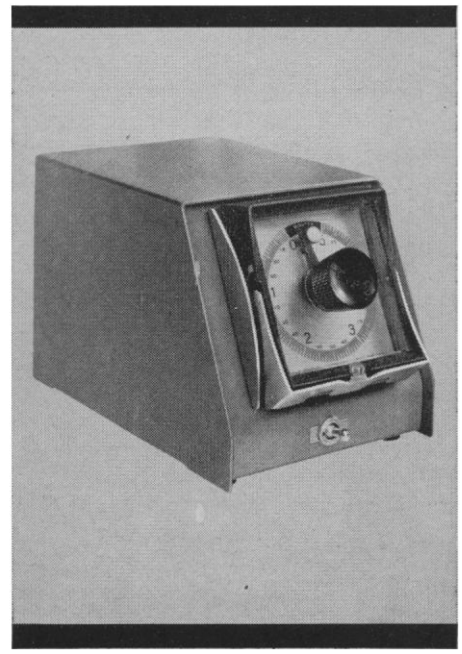

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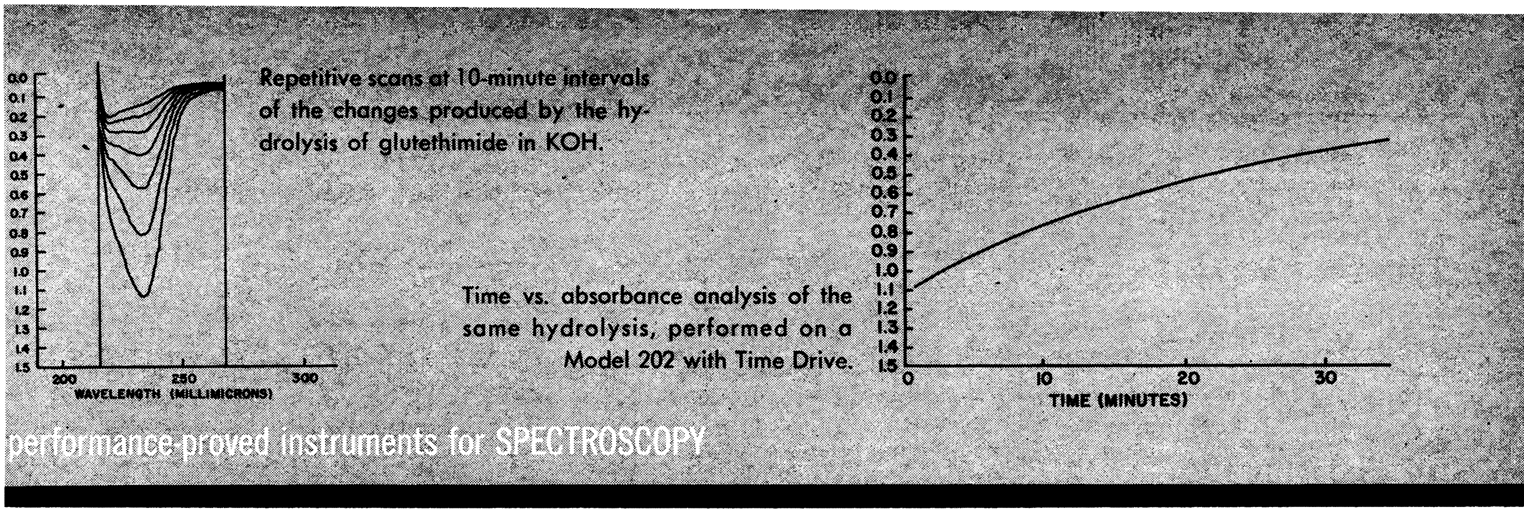

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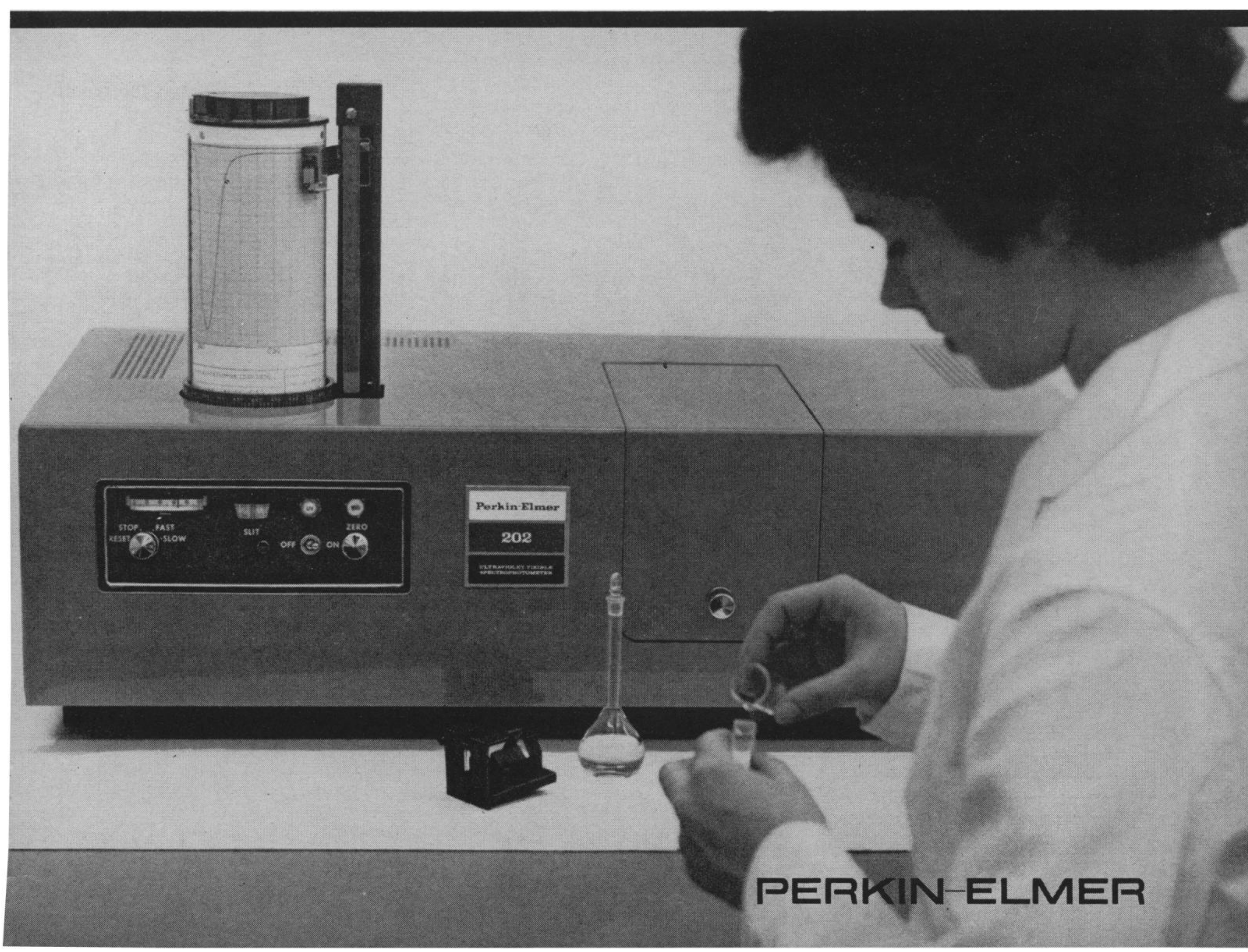

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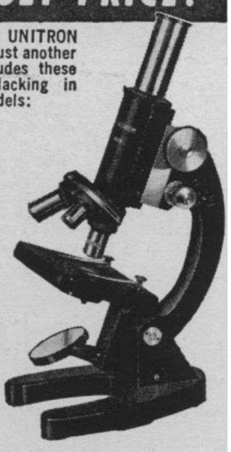

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posal, is before us. Ten more months passed, and on 5 April 1955 B. F. Burke and K. L. Franklin of the Carnegie Institution announced the chance detection of strong radio signals emanating from Jupiter. They recorded the signals for several weeks before they correctly identified the source.

This discovery came as something of a surprise because radio astronomers had never expected a body as cold as Jupiter to emit radio waves (*1*).

In 1960 V. Radhakrishnah of India and J. A. Roberts of Australia, working at California Institute of Technology, established the existence of a radiation belt encompassing Jupiter, "giving 10^{14} times as much radio energy as the Van Allen belts around the earth."

On 5 December 1956, through the kind services of H. H. Hess, chairman of the department of geology of Princeton University, Velikovsky submitted a memorandum to the U.S. National Committee for the (planned) IGY in which he suggested the existence of a terrestrial magnetosphere reaching the moon. Receipt of the memorandum was acknowledged by E. O. Hulburt for the Committee. The magnetosphere was discovered in 1958 by Van Allen.

In the last chapter of his *Worlds in Collision* (1950), Velikovsky stated that the surface of Venus must be very hot, even though in 1950 the temperature of the cloud surface of Venus was known to be −25°C on the day and night sides alike.

In 1954 N. A. Kozyrev (*2*) observed an emission spectrum from the night side of Venus but ascribed it to discharges in the upper layers of its atmosphere. He calculated that the temperature of the surface of Venus must be + 30°C; somewhat higher values were found earlier by Adel and Herzberg. As late as 1959, V. A. Firsoff arrived at a figure of + 17.5°C for the mean surface temperature of Venus, only a little above the mean annual temperature of the earth (+ 14.2°C) (*3*).

However, by 1961 it became known that the surface temperature of Venus is "almost 600 degrees [K]" (*4*). F. D. Drake described this discovery as "a surprise . . . in a field in which the fewest surprises were expected." "We would have expected a temperature only slightly greater than that of the earth. . . . Sources of internal heating [radioactivity] will not produce an enhanced surface temperature." Cornell H. Mayer writes (*5*), "All the observations are consistent with a temperature of almost 600 degrees," and admits that "the temperature is much higher than anyone would have predicted."

Although we disagree with Velikovsky's theories, we feel impelled to make this statement to establish Velikovsky's priority of prediction of these two points and to urge, in view of these prognostications, that his other conclusions be objectively re-examined.

V. BARGMANN
Department of Physics, Princeton University, Princeton, New Jersey

LLOYD MOTZ
Department of Astronomy, Columbia University, New York

References

1. See also the New York *Times* for 28 October 1962.
2. N. A. Kozyrev, *Izv. Krymsk. Astrofiz. Observ.* **12** (1954).
3. *Science News* 1959, 52 (Summer 1959).
4. *Phys. Today* **14**, No. 4, 30 (1961).
5. C. H. Mayer, *Sci. Am.* **204** (May 1961).

Lunar Influence on Precipitation Patterns

I read with much interest the report by Bradley, Woodbury, and Brier [*Science* **137**, 748 (1962)] and the report from Australia by Adderley and Bowen [*ibid.* **137**, 749 (1962)] dealing with possible lunar influence on precipitation patterns. I would like to offer the following as testimony relative to the findings reported.

About 10 years ago I was working on weekly rainfall totals and their effect on corn yields for 15 counties in central Indiana. From folklore I had learned that precipitation was more likely to occur during the week following a new moon and the week following a full moon than at other times, so I proceeded to test this idea. To my amazement I found some agreement. After applying several statistical treatments to the data I produced a short manuscript as well as an outline suggesting some further investigations along this line. I need not relate here the review comments or the outcome of the proposed investigations. In short, the whole matter was dropped.

Best wishes to all the authors in their further investigations.

JAMES E. NEWMAN
Department of Agronomy, Purdue University, Lafayette, Indiana

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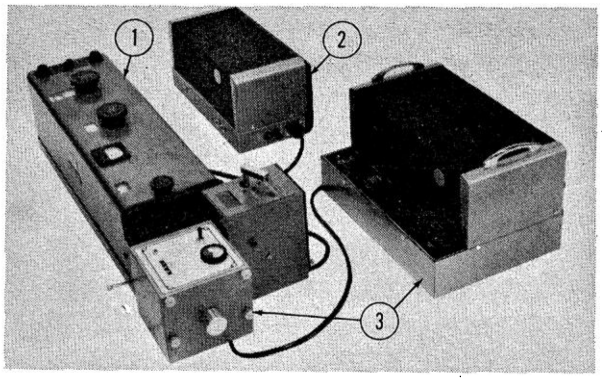

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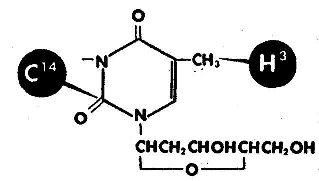

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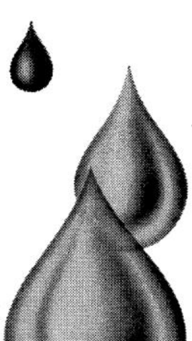

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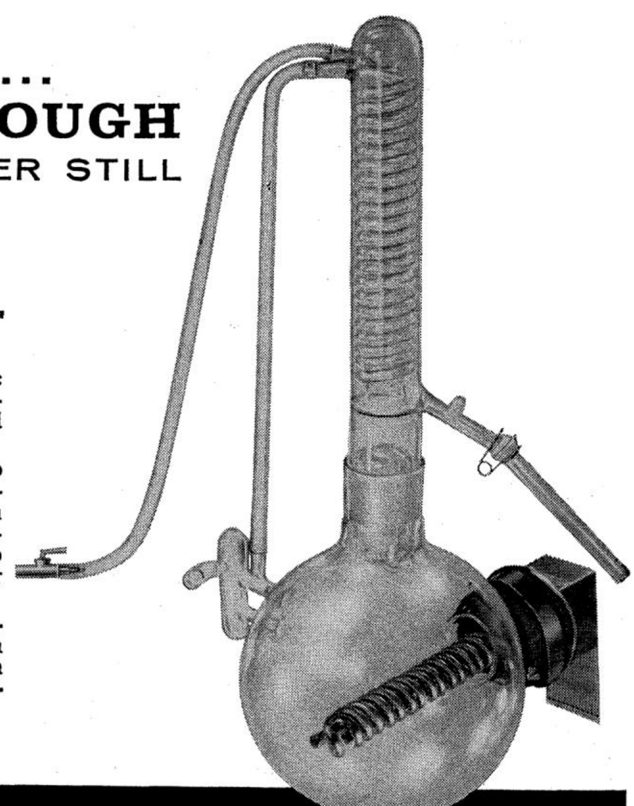

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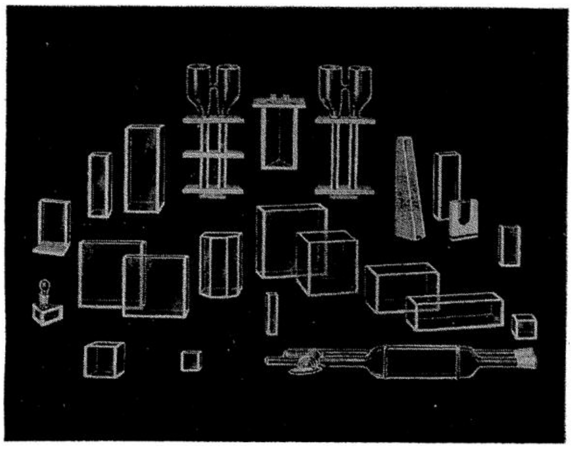

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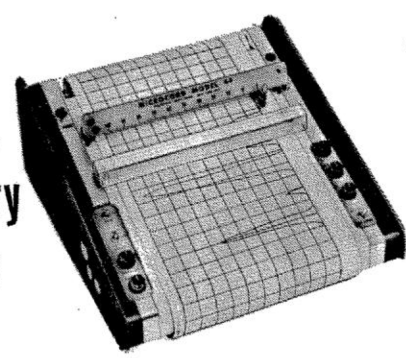

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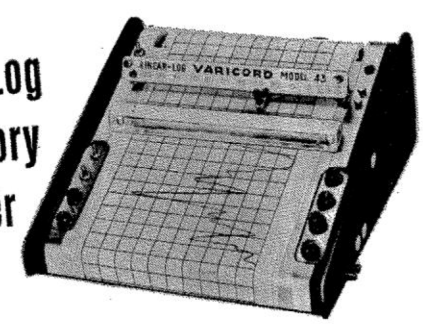

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18–19. **Blood,** annual symp., Detroit, Mich. (G. F. Anderson, Dept. of Physiology and Pharmacology, Wayne State Univ., 1401 Rivard St., Detroit 7)

21–23. Chemistry and Biochemistry of **Seed Proteins,** intern. conf., New Orleans, La. (C. H. Fisher, Southern Utilization Research and Development Div., Agricultural Research Service, U.S. Dept. of Agriculture, P.O. Box 19687, New Orleans 19)

21–23. Institute of the **Aerospace Sciences,** annual, New York, N.Y. (IAS, 2 E. 64 St., New York 21)

21–24. American **Meteorological** Soc., annual, New York, N.Y. (R. L. Pfeffer, Lamont Geological Observatory, Columbia Univ., Palisades, N.Y.)

21–24. Advances in **Gas Chromatography,** intern. symp., Houston, Tex. (A. Zlatkis, Chemistry Dept., Univ. of Houston, Houston)

22. Infectious Diseases of the **Heart and Circulation,** conf., New York, N.Y. (C. A. R. Connor, New York Heart Assoc., 10 Columbus Circle, New York 19)

22–24. **Reliability and Quality Control,** natl. symp., San Francisco, Calif. (L. W. Ball, Boeing Co., P.O. Box 3707, Seattle 24, Wash.)

23–25. **Elevated Temperature Mechanics,** intern. conf., 3rd Navy Structural Mechanics Symp., New York, N.Y. (by invitation). (A. M. Freudenthal, 624 Mudd Bldg., Columbia Univ., New York 27)

23–26. American Assoc. of **Physics Teachers,** New York, N.Y. (R. P. Winch, Williams College, Williamstown, Mass.)

23–26. American Group **Psychotherapy** Assoc., annual, Washington, D.C. (AGPA, 1790 Broadway, New York 19)

24–27. American **Mathematical** Soc., annual, Berkeley, Calif. (AMS, 190 Hope St., Providence 6, R.I.)

25–6. International College of **Surgeons,** West Indies congr., aboard *S.S. Santa Rosa.* (Secretariat, 1516 Lake Shore Dr., Chicago 10, Ill.)

26. Association for **Symbolic Logic,** Berkeley, Calif. (T. Hailperin, Dept. of Mathematics, Lehigh Univ., Bethlehem, Pa.)

26–28. **Mathematical** Assoc. of America, annual, Berkeley, Calif. (H. M. Gehman, Univ. of Buffalo, Buffalo 14, N.Y.)

27–1. American Inst. of **Electrical Engineers,** winter general meeting, New York, N.Y. (R. S. Gardner, AIEE, 33 W. 39 St., New York 18)

28–2. American **Library** Assoc., Chicago, Ill. (D. H. Clift, ALA, 50 E. Huron St., Chicago 11)

28–2. **Body Composition,** conf., New York, N.Y. (J. Brozek, Dept. of Psychology, Lehigh Univ., Bethlehem, Pa.)

30–1. Military **Electronics,** natl. winter convention, Los Angeles, Calif. (F. P. Adler, Space Systems Div., Hughes Aircraft Co., Culver City, Calif.)

31–1. American Soc. for **Engineering Education,** college-industry conf., Atlanta, Ga. (W. L. Collins, Univ. of Illinois, Urbana)

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31–1. Society of **Rheology**, annual western regional meeting, Emeryville, Calif. (T. L. Smith, Stanford Research Inst., Menlo Park, Calif.)

31–2. Western Soc. for **Clinical Research**, annual, Carmel-by-the-Sea, Calif. (H. R. Warner, Latter-day Saints Hospital, Dept. of Physiology, Salt Lake City 3, Utah)

February

4–8. **Rice Genetics** and **Cytogenetics**, symp., Los Baños, Laguna, Philippines. (Inter. Rice Research Inst., Manila Hotel, Manila, Philippines)

4–9. Recent Trends in **Iron and Steel Technology**, symp., Jamshedpur, India. (Secretary, Indian Inst. of Metals, 31 Chowringhee Rd., Calcutta, India)

4–20. Application of **Science and Technology** for the Benefit of Less Developed Areas, U.N. conference, Geneva, Switzerland. (Science Conference Staff, Agency for International Development, 826 State Dept. Annex 1, Washington 25)

5–14. International **Radio** Consultative Committee, Plan Subcommittee for Asia, New Delhi, India. (V. Barthoni, 128 rue de Lausanne, Geneva, Switzerland)

6–9. American College of **Radiology**, Chicago, Ill. (F. H. Squire, Presbyterian–St. Luke's Hospital, 1753 W. Congress St., Chicago 12)

8–18. United Nations Committee on **Industry and Natural Resources** in Asia and the Far East, Bangkok, Thailand. (S. Santitham, Rajadamnern Ave., Bangkok)

10–15. **Management** Function in Research and Development, conf., Pasadena, Calif. (Management Development Section, Industrial Relations Center, California Inst. of Technology, Pasadena)

10–16. **Planned Parenthood**, intern. conf., Singapore. (V. Houghton, Intern. Planned Parenthood Federation, 69 Eccleston Sq., London, S.W.1, England)

11–14. American Soc. of **Heating, Refrigerating, and Air-Conditioning Engineers**, New York, N.Y. (R. C. Cross, 345 E. 47th St., New York 17)

11–14. Industrial **Lubrication**, intern. conf. and exhibit, London, England. (E. V. Paterson, Scientific Lubrication, 217a Kensington High St., London W.8)

11–15. Quantum **Electronics**, intern. symp., Paris, France. (Secrétariat, Troisième Congrès International d'Electronique Quantique, 7 rue de Madrid, Paris 8ᵉ)

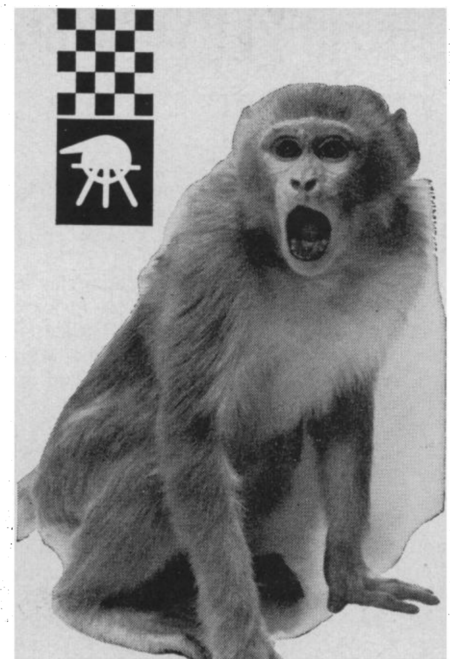
12–14. **Lysozomes**, symp. (by invitation), London, England. (Ciba Foundation, 41 Portland Pl., London W.1)

13–15. **Electrochemistry**, 1st Australian conf., part I, Sydney, Australia. (F. Gutmann, Physical Chemistry Dept., Univ. of New South Wales, Kensington, N.S.W., Australia)

13–16. National Soc. of College Teachers of **Education**, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

14–15. American Soc. for **Quality Control**, Textile and Needles Trades Div., annual conf., Clemson, S.C. (H. F. Littleton, c/o Charles H. Bacon Co., Lenoir City, Tenn.)

(See 23 November issue for comprehensive list)



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