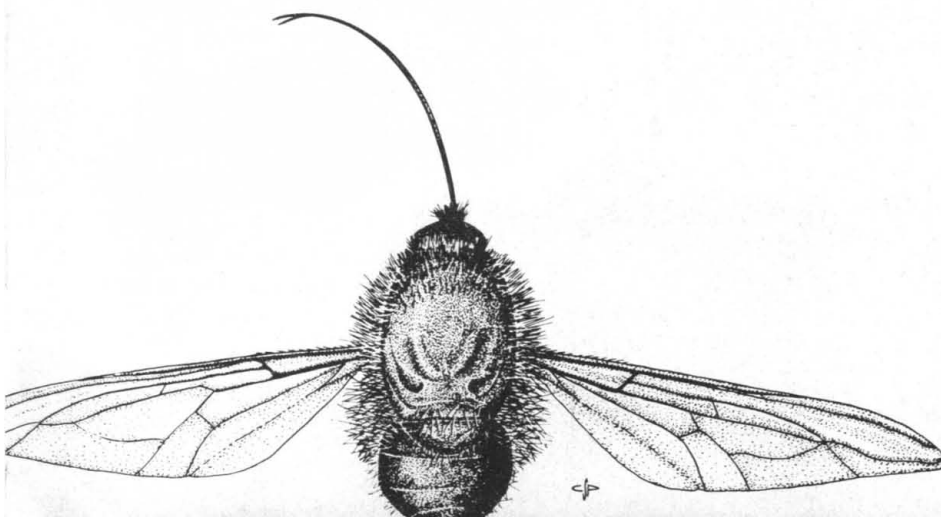
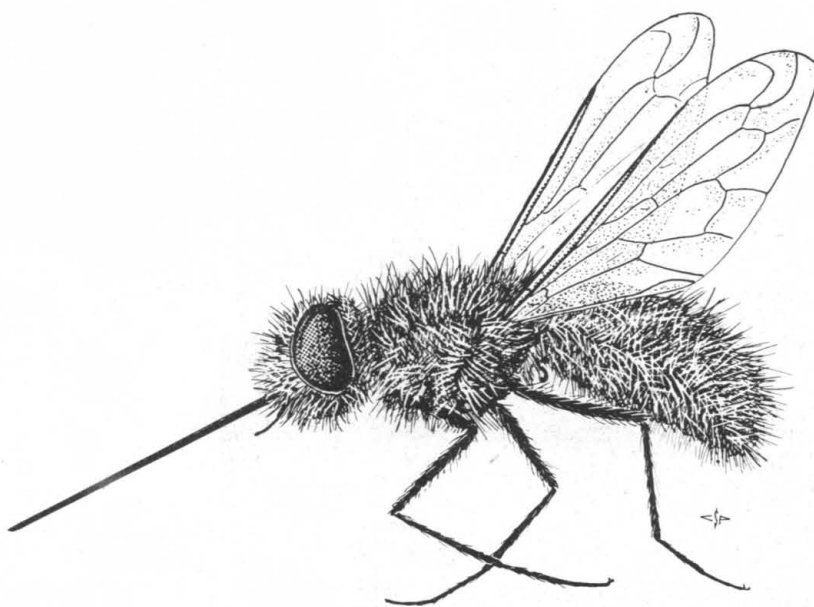
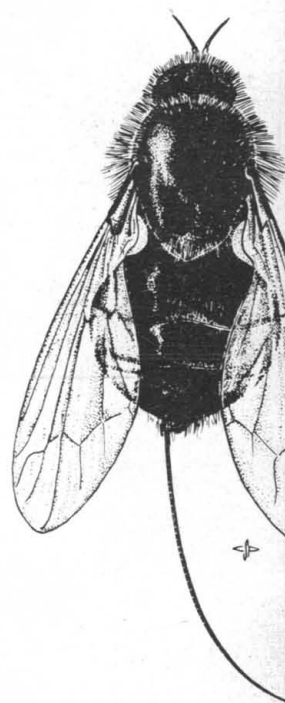


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12 November 1965

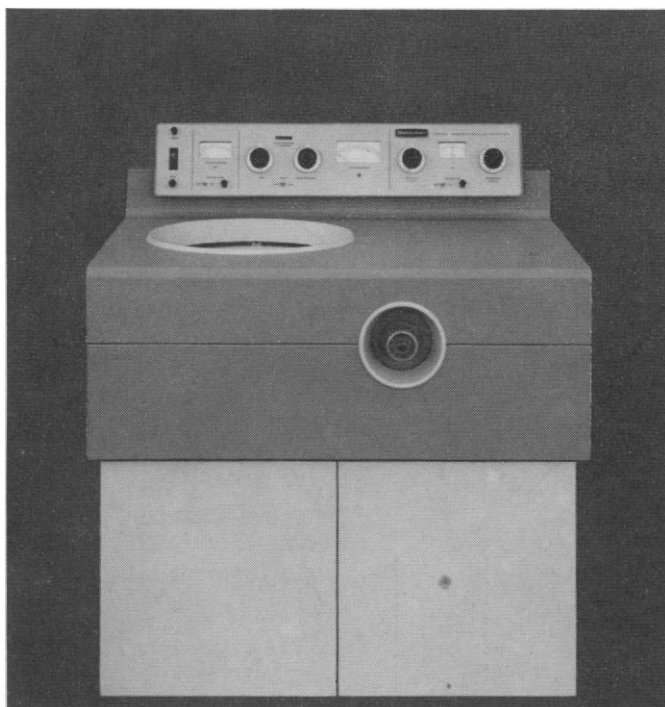
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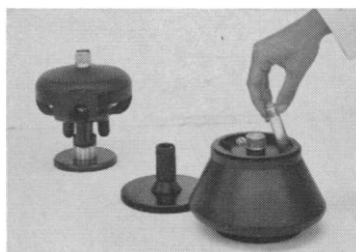


POLLINATORS

Two New Beckman Ultracentrifuges

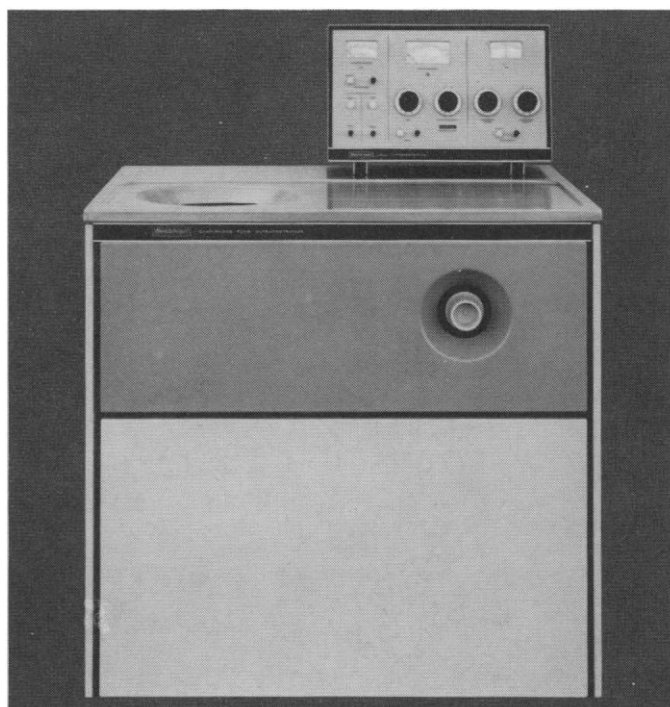


The Model L2-65—a powerful new preparative ultracentrifuge that will reduce separation times and improve resolution, and may bring some unexpected particles within the realm of routine investigation. The power of the L2-65 lies in its 65,000 rpm drive; two rotors are already available to take advantage of that speed, to

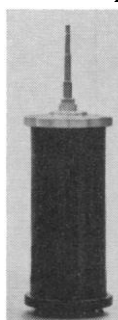


generate forces in excess of 400,000 *g*. More rotors are on their way. In addition, the L2-65 will accept all Beckman Model L and L2-50 rotors for an unprecedented variety of speeds, forces, and capacities to suit

an unpredictable range of applications. Standard features of the L2-65 include exacting temperature and speed controls, automatic temperature readout from the rotor itself, a diffusion pump to increase rotor chamber vacuum to 1 micron or below.



The Model L4—a new concept in ultracentrifuges that permits introduction of sample solution and recovery of fractions during rotation, providing separations at 90,000 *g* in greater quantity than ever before. The L4 is actually three instruments in one. Its extra-deep rotor chamber accommodates a large-scale density gradient Zonal Rotor that holds 1725 ml, and a Continuous Flow Rotor that accepts sample solution at a rate of approximately two liters per hour. The large-scale Zonal and Continuous



Flow capabilities will be particularly valuable in studies of the distribution of particulates and in the production of vaccines, proteins, ribosomes, etc. And with its 65,000 rpm drive, the L4 can also utilize most Beckman Model L, L2-50, and L2-65 rotors. Other features—a removable control panel for remote use and solid-state speed control circuitry. For complete details on both these exciting new instruments—from the Company that knows ultracentrifugation best—write for Data File L24-5.

Beckman

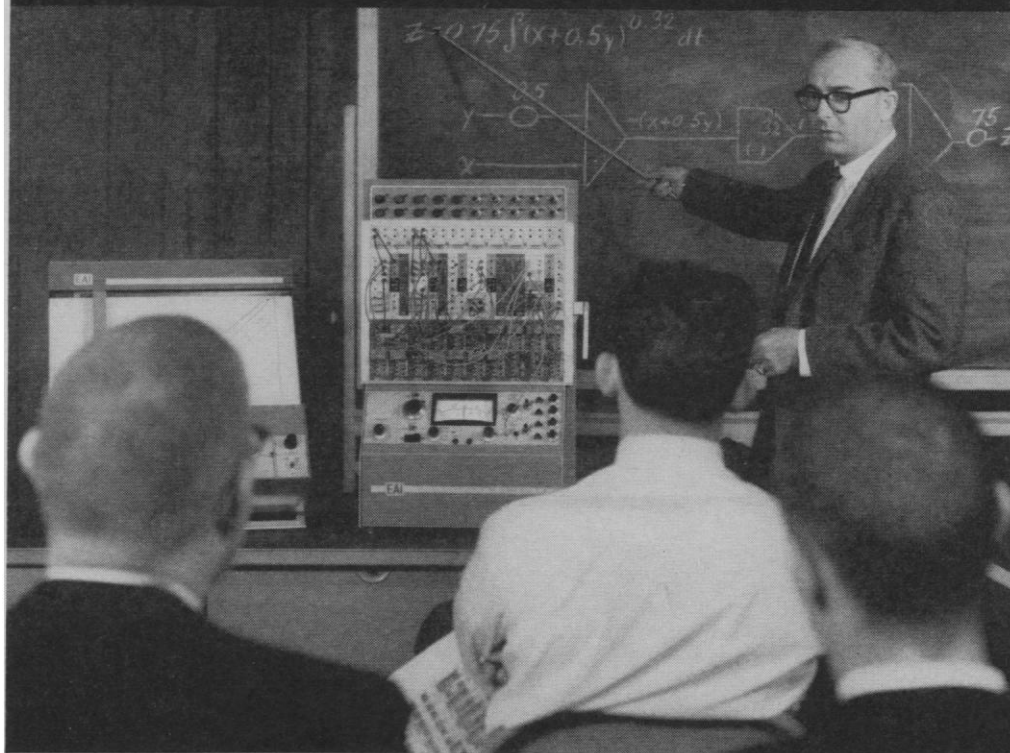
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COVER

Western American long-tongued flies. These medium-sized flies hover before flowers, stand still in the air, or dart swiftly from spot to spot. Their mouth parts, often very long and slender, are well adapted for securing nectar and pollen. See review of *Flower Pollination in the Phlox Family*, page 872. [Charles Papp, Riverside, California]

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

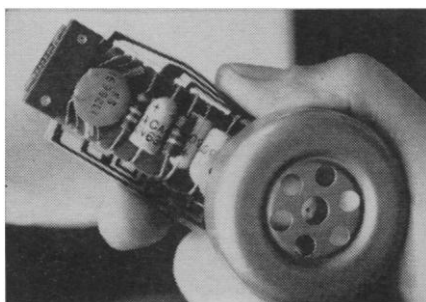
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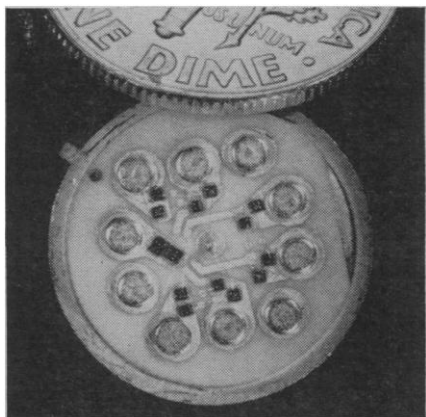
New circuits for communications

The success of a modern large-scale communications system depends importantly on the circuits of which it is built. For this reason Bell Telephone Laboratories places great emphasis on exploring new approaches to high-performance, economical circuit design. The circuits illustrated below are but a few examples of recent Bell Laboratories developments that are helping to advance the techniques of communications.

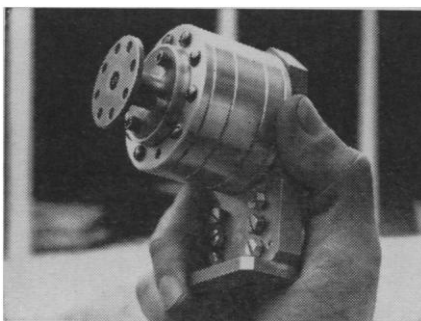
Bell Telephone Laboratories
Research and Development Unit of the Bell System



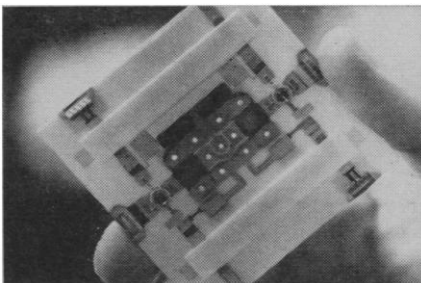
Circuit for mounting inside telephone handset for use by people with impaired hearing. Circuit includes one PNP transistor, provides up to 25 db gain, and has negative feedback for stability and to compensate for variations in component characteristics. Power is derived by taking a small part of direct current supplied to the telephone transmitter. Circuit board is flexible to permit part of conducting path to be bent and entire unit to fit snugly in narrow handset.



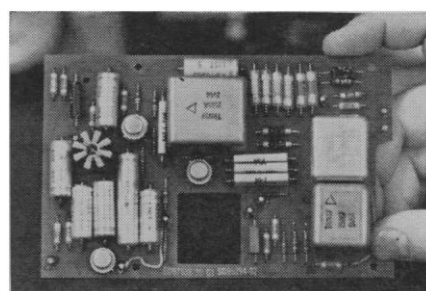
High-speed integrated logic package consists of 3 separate flip-flop circuits assembled together on a single header. On the 11-lead ceramic header, all circuit interconnections are made using gold thermo-compression bond wires. This device contains 6 transistors (2 are required for each flip-flop) and 12 resistors. The individual flip-flops perform their switching functions with typical operating times of approximately 6 nanoseconds.



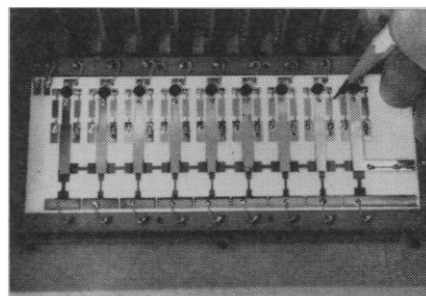
Parametric amplifier used in new microwave radio system will provide low-noise amplification to a radio frequency signal which is frequency-modulated by 1200 telephone conversations. It is a reflection type parametric amplifier operating in the 4-gigacycle range, providing approximately 13 db of gain using a varactor diode pumped at approximately 12 gigacycles. Its very low noise figure, typically 3.5 db, permits increased systems capabilities which are used to increase the number of telephone channels per radio channel.



Integrated balanced microwave amplifier makes use of high-frequency germanium transistors for precise wideband applications. Each stage of amplifier (one stage shown) consists of a pair of electrically similar transistors whose inputs and outputs are combined by 3-db couplers. This arrangement eliminates tuning adjustments and provides excellent gain flatness and impedance matching. Multistage amplifiers of this type have been designed to operate with bandwidths of 1000 mc in the 0.5- to 3-gigacycle range, with noise figures of about 6 db.



Compressor circuit used in several telephone carrier systems raises volume of soft voice sounds and lowers volume of loud voice sounds. This new circuit effects a 2-to-1 reduction in dynamic range of a telephone signal, which is then transmitted with an improved signal-to-noise ratio. Nearly perfect compression is achieved over greater than the normal voice range, as a result of circuitry that varies the impedance of two precise silicon diodes. A 3-stage feedback transistor amplifier maintains desired stability and provides the required transmission characteristics.



Thin-film decoder for high-speed pulse code modulation systems converts binary pulse sequences into analog signals. Circuit consists of precision resistor network and multiply-encapsulated control diodes. Precision resistors (pointer) generate reference currents that are switched into resistive ladder network (I-shaped elements at bottom of unit). Output voltage is proportional to binary code applied to diodes. Precision sufficient for decoding 9-digit binary codes is obtained, at code rates up to 12 mc (108 mb/s pulse rates).

INTRODUCING

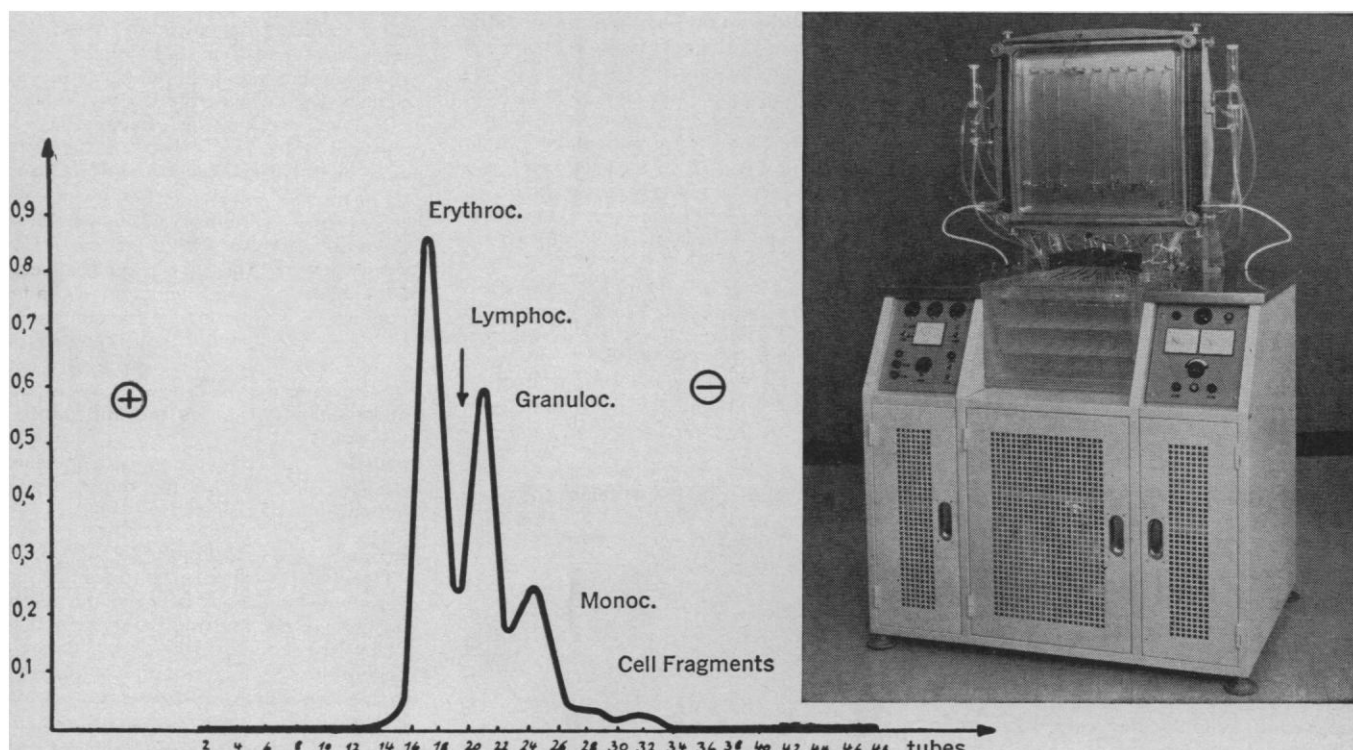
*a new free-flowing
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separation of cells and cell organelles
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The Model FF-2 Continuous Flow Electrophoretic Separator establishes carrier-free electrophoresis in a free-flowing buffer medium as an important new method of cell fractionation, to supplement distribution methods and ultracentrifugation. No conventional carrier materials are used because the separation takes place in the buffer stream itself.

Although the theory of using electrophoresis to separate coarse dispersed particles has been known for some time, electromechanical difficulties have prevented its successful applica-

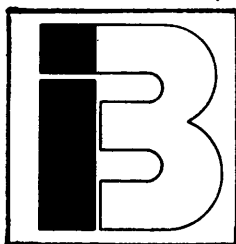
tion. These problems have now been solved through the unique design features of this new instrument.

An improved version of the standard Model FF-1 (for low-molecular weight samples) is also available. This instrument has already been used successfully for the separation of amino acids, dyes, enzymes, hormones, inorganic ions, nucleic acids, peptides, phage, polysaccharides, proteins, viruses, vitamins, and other biologically interesting compounds. Documentation can be supplied on request.



Curve: Separation of Human Blood Cells; Tris-Citrate-Glucose-buffer; pH 6.9; 2450 volts, 160 mA.

For complete current descriptive literature on both models, write to:

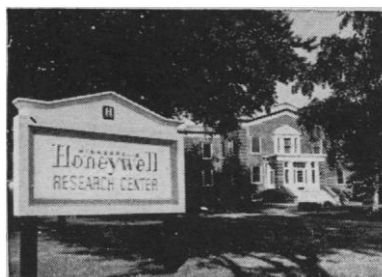


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Basic Research at Honeywell
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An Investigation of the Sense of Smell Through Examination of Individual Olfactory Cells

The olfactory cell can detect odors of a very few molecules per sensing cell. New studies of olfactory tissue and of individual cells hopefully will lead to an understanding of the transducer mechanism used by this highly specific chemical sensor.

New advances in the field of instrumentation and control will come from the development of new, accurate sensors. It is interesting to note that after hundreds of years of invention and development, nature's sensors still outperform machines by a wide degree in several senses such as smelling, tasting and color perception.

This has led scientists into the field of bionics on the assumption that if they could understand how animal biosensors work they might simulate the mechanism.

One badly needed sensor that has defied invention is an adequate odor detector. For over 100 years scientists have been trying to determine the mechanism behind the incredibly sensitive sense of smell in animals.

Several theories have been proposed but none have prevailed. One theory suggests that the hairs on the olfactory cell sense the vibrations of the molecules of the odoriferous gas. Another suggests that there is a chemical reaction between the hairs and the gas. A third theory suggests that the seven or eight basic odors each have a distinctive molecular structure, with each structure fitting an appropriate receptor site on the hairs of the olfactory cell.

The olfactory bipolar sensing cell and its supporting sustentacular cells have been described in various ways. However, the mechanism whereby a gas molecule triggers a signal which passes through the membrane and is then converted to electrical energy is still completely unknown.

Honeywell scientists in probing for the answer to this have chosen to visually and cytochemically examine the individual cell itself while carrying on biochemical analyses of the cellular contents at the same time.

For their observations, they have chosen the cells of the rabbit.

Individual cells are separated by two methods. In the first, a gentle mechanical action is used and the suspended cells settle out on specially treated slides or are placed in a Rose Chamber for isolation in tissue

culture. In the second method, a one millimeter square of olfactory tissue is explanted directly from the animal to the Rose Chamber, where some of the cells migrate and separate. Thus the cells are never touched and are presumed to be undamaged. Such cells can be exposed to various odors and compared visually with control cells.

In their studies, Honeywell scientists have maintained these single cells for weeks at a time.

Prior to electron microscopy, the individual cells are imbedded in an epoxy resin block for sectioning. Using an ultramicrotome, sections of 500 angstrom thickness are prepared for study with the electron microscope. Sections of 1 micron thickness are also prepared for correlated light microscopy.

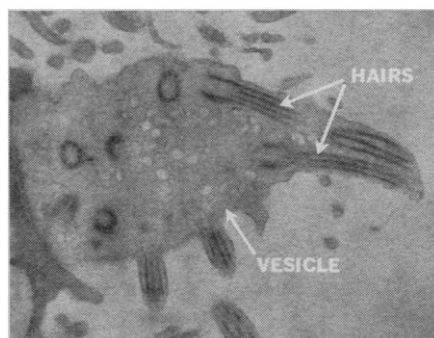


FIGURE 1. (X12,500)
Olfactory vesicle and hairs

From their observations Honeywell scientists theorize that the olfactory hair senses the odor in some unknown fashion and the hair or the olfactory vesicle (see Figure 1) is the probable site of a transducer process that initiates the impulse carried directly to the olfactory bulb of the brain via the olfactory rod, cell body and nerve fiber.

The bipolar cell presents a picture of a highly specialized cell characterized by a

small amount of cytoplasm in contrast to the supporting cell.

The electron micrographs are revealing concentrated areas of particular intracellular structures such as mitochondria and endoplasmic reticula in certain locations in the cell body. The arrangement pattern and structural relationship of the sensing cells to the supporting cells are also being revealed.

It would seem that to understand the unique mechanism involved the most promising parts for further study would be the hairs themselves and the olfactory vesicle.

The scientists, therefore, are first concentrating their work on the olfactory hairs to determine the exact nature of the outer membrane of the hair and the exact structure of the hair, seeking highly biologically active areas.

The scientists have observed that in the rabbit there is an average of 6 to 12 olfactory hairs per cell. The olfactory hairs show a structure similar to that of cilia found on other types of cells throughout the animal kingdom displaying the conventional 9-plus-2 pattern of fibers at their proximal ends. (see Figure 2)

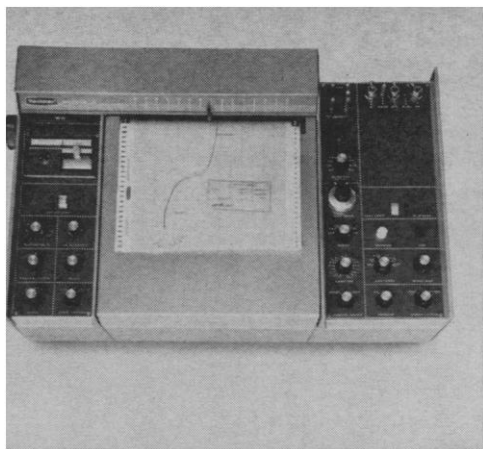
They also display an intricate pattern of fibrous connections between the central and outer fibers and the outer membrane.

Obviously much further investigation is needed but hopefully a more complete understanding will lead to new concepts for electronic sensing applicable to detecting and identifying odors in many problem areas including air pollution control, engine performance analysis and military detection procedures.

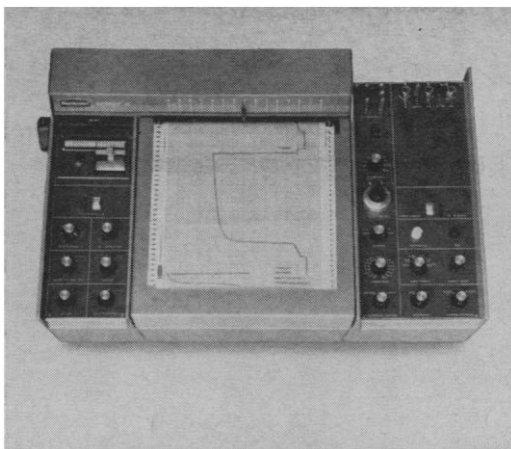
If you are engaged in biological research of olfaction and wish to know more of Honeywell's activities in this area, you are invited to write Dr. Herbert Heist, Honeywell Research Center, Hopkins, Minnesota. If you are interested in a career at Honeywell and hold an advanced degree write to Dr. John Dempsey, Director of Research at this same address.



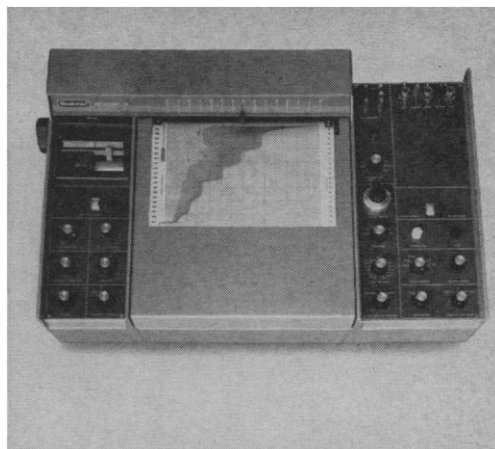
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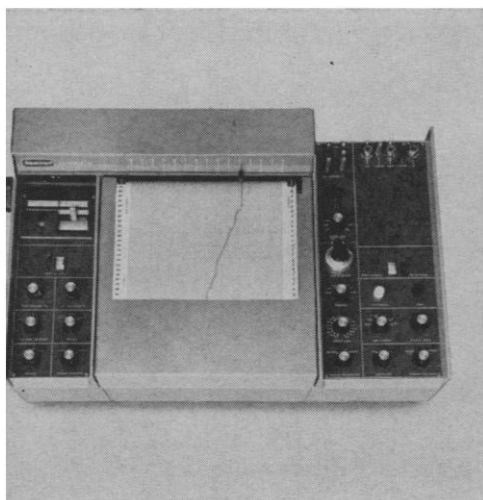
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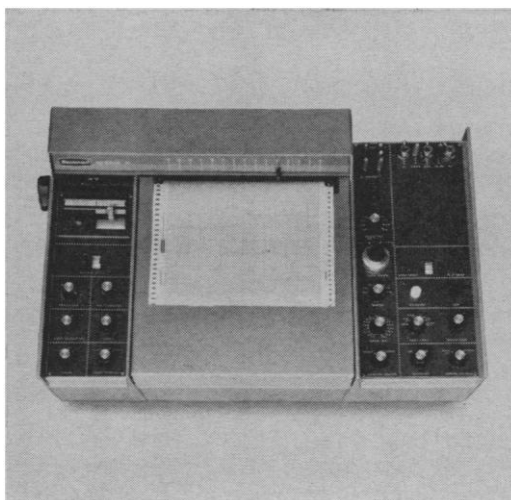
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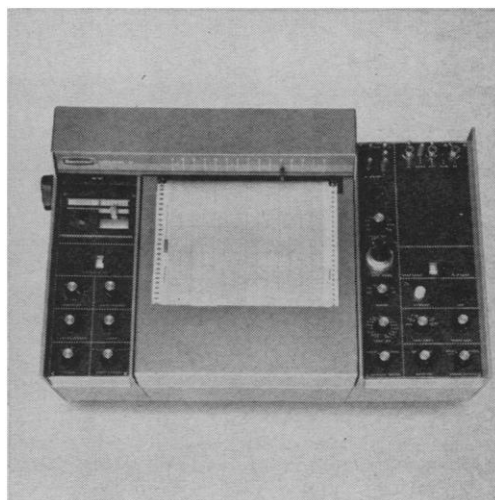
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etc....

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The standard Electroscan 30 features a controlled DC current power supply, a high-speed, high-impedance, 10-inch recorder, and a wide variety of electrodes and sensors. It is also available with a built-in potentiostat accessory which converts the controlled current supply into a controlled

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If you've had to build your own electrochemical instruments, or if you've never taken advantage of the techniques of electroanalysis, find out what the Electroscan 30 can do for you. For details and specifications, and a copy of the informative new electrochemical primer, contact your Beckman Sales Engineer or write for Data File LES-165.

Then tell us about your etceteras.

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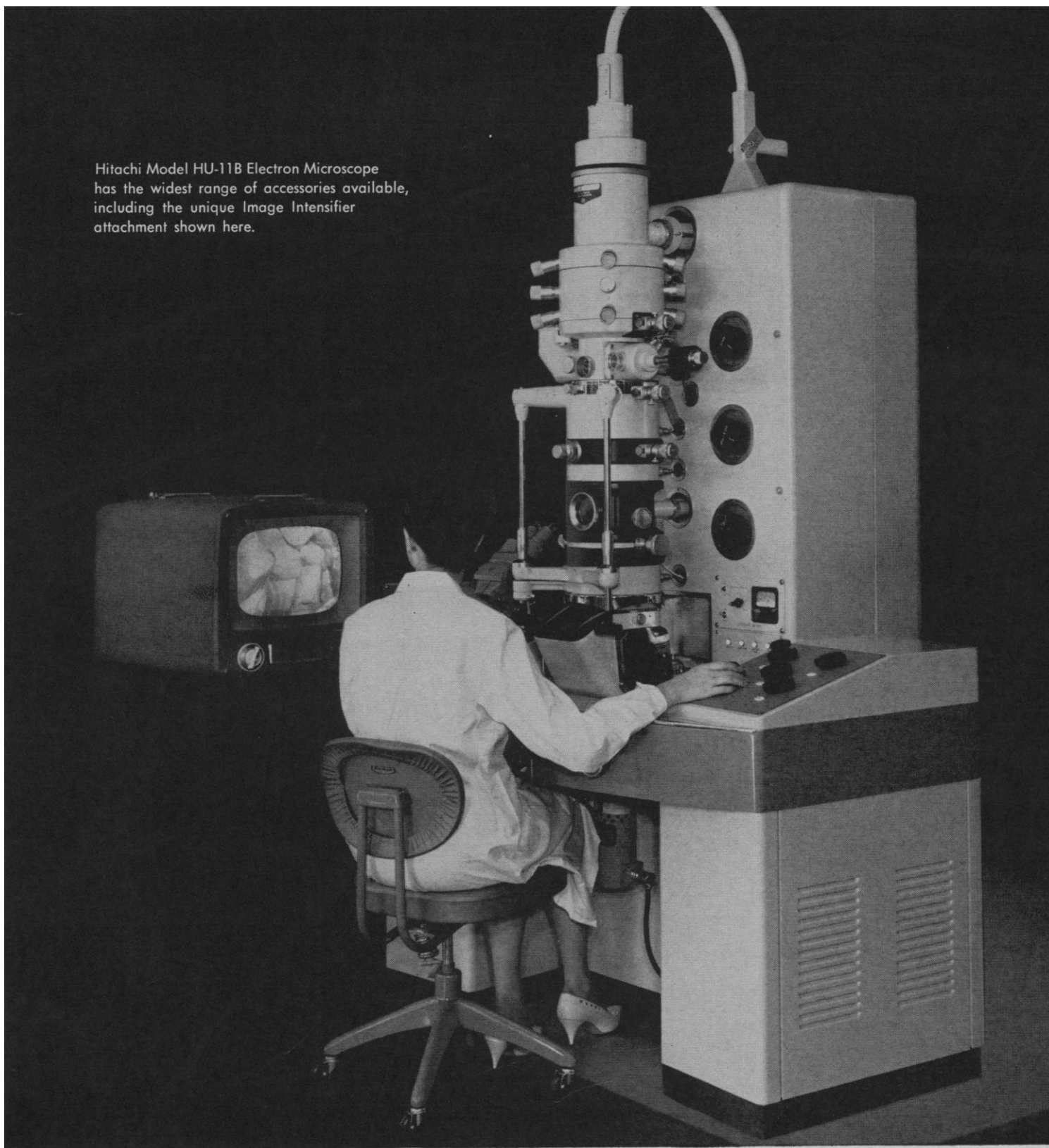
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THE HITACHI HU-11B

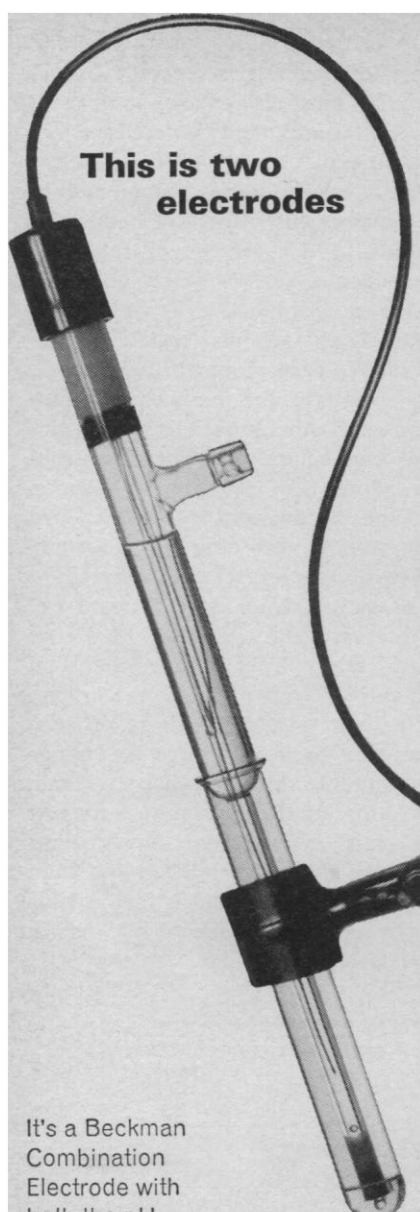
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will speak to you about a greater art, that of cybernetics, which saves, not only souls, but also bodies and possessions, from the greatest dangers." In the *Statesman* (299b-c), the Stranger suggests to the Younger Socrates that a law be passed to prevent people from "persuading other younger men to essay cybernetics and medicine not according to the laws." And in the *Cleitophon* (408b), we find "the cybernetics of men, as you, Socrates, often call politics."

Many centuries later, the French mathematician and physicist André Marie Ampère (1775-1836) employed the word "cybernetics" in his great *Essai sur la philosophie des sciences* (1834). By this, of course, Ampère meant only the "means of governing" people, not Wiener's important new science.

PANOS D. BARDIS
Social Science, University of Toledo,
Toledo, Ohio

Readers, Foreign and Domestic

In his letter about the readership of *Contributions to Geology* ("Who reads the journals?", 17 Sept., p. 1325), R. B. Parker reports that "apparently our foreign readers outnumber the domestic ones by a very large factor," basing that conclusion on the fact that "we see references [to the journal] in many foreign journals, and reprint requests from abroad are numerous." He goes on to say, "The fact that many such requests and references are from respected and influential scientists reflects discredit upon American scientists," and he suggests that American scientists should "spend more time reading and less writing."

One is tempted to ask: How many journals has Parker canvassed in a search for references to *Contributions to Geology*? And in comparing reprint requests, has he taken into account that many American scientists mail reprints routinely to their colleagues without waiting for requests?

Having been associated with a perhaps similar publication (*Tulane Studies in Zoology*), I am aware of the tremendous response by institutions in foreign countries to an offer to exchange journals. American journals do not, to my knowledge, make a practice of exchanging. Thus an equally plausible explanation of the large num-

ber of foreign reprint requests may be that the distribution system favors them.

I object to the castigation of the reading habits of "American scientists" (presumably of all disciplines) on the basis of an unsubstantiated opinion concerning the reading of one journal primarily of interest to scientists in a single discipline. There may be some truth to Parker's accusation, but it is not supported by the statements in his letter.

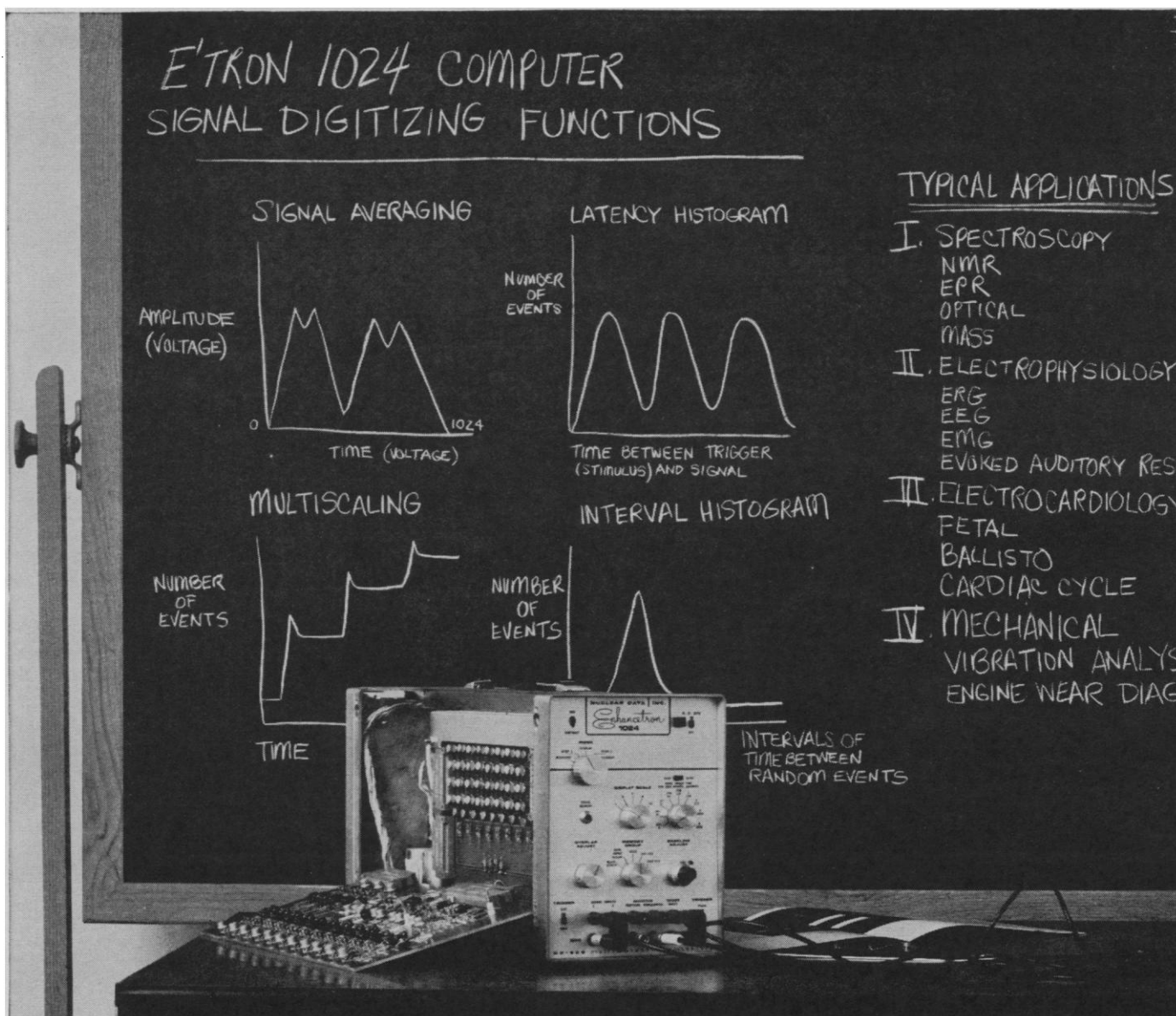
ROBERT K. CHIPMAN
University of Vermont, Burlington

Parker concludes from the active foreign readership of *Contributions to Geology* that "our colleagues in Europe and Asia are apparently vastly better informed than we are." I should like to suggest that exactly the reverse may be indicated. For most scientists serious reading represents an acknowledgment of the need to be informed. Those scientists who are geographically farthest removed from personal contacts with fellow specialists are quite likely to feel the greatest need for journals. It does not necessarily follow that they will become the best informed. Personal observation leads me to the opposite conclusion—that the man who is best informed relies least upon the journals for enlightenment. He is served by a number of other communication channels—personal contacts, conferences, correspondence, preprints—most of them considerably faster and more efficient. There may even be a continuous negative correlation across the spectrum of informedness, leading finally to the nervous neophyte who reads all the journals for fear of missing something.

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. . . I should like to ask Parker why he felt it necessary to start yet another journal. I submit that American scientists do read worth-while journals, but that most of them, like me, have more and more difficulty reading through more and more publications to separate the mass of trivia from the relatively few significant contributions to scientific knowledge.

JOHN HELWIG, JR.
Cardiovascular Section,
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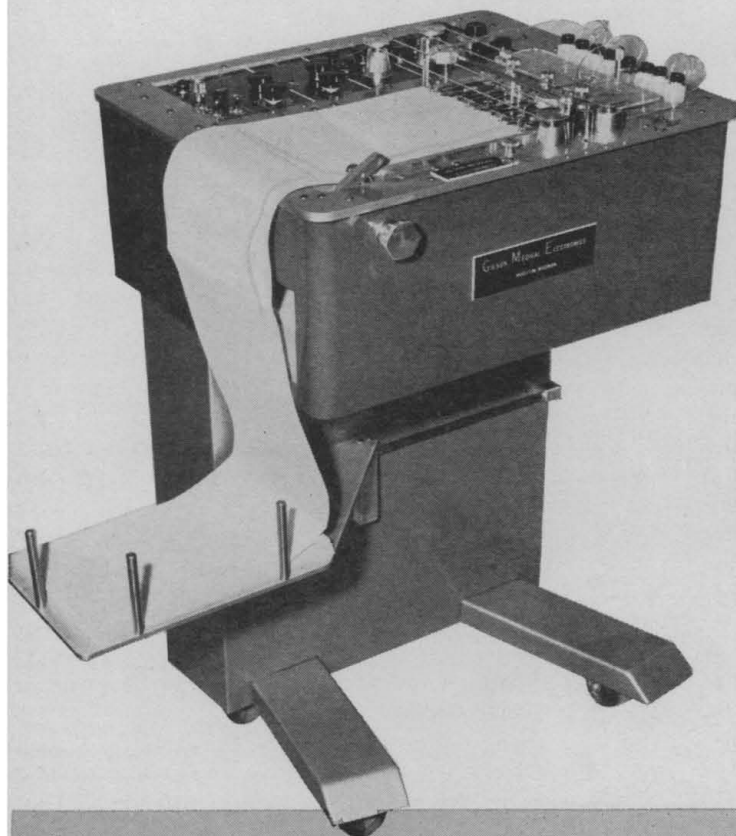
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Continuing Education

One consequence of the large-scale activity in research is the obsolescence, at least to some degree, of all scientists, engineers, and physicians. The problem is not new, but the rate of obsolescence has increased, while the traditional means of meeting it have become less effective. Earlier, the dedicated individual could keep his knowledge current by devoting a reasonable fraction of his time to books, journals, and meetings. Today, there are so many meetings and so many publications that such an individual can attend to only a small part of what may be relevant to his interests. We cannot be sure that we are producing knowledge at a highly accelerated rate, but we can be certain that the number of pages devoted to presenting it has increased drastically. Commercial publishers find that technical books on almost any subject sell well enough to justify publication. The publish-or-perish doctrine has had its inevitable consequence. New journals proliferate while old ones get thicker. There is increasingly wide distribution of unevaluated material. The bottleneck in utilization of knowledge is not a shortage of publications or inadequate information retrieval. The lag occurs in the step between the pile of books on a man's desk and the transfer of that information to his mind. We need to devote much more energy to determining what is significant and then conveying it in concentrated form.

One method of instilling the essence of new knowledge is through short, intensive refresher courses. In this area the continuing education program of the American Medical Association is outstanding. About 1500 courses are offered annually by some 400 sponsoring organizations, and about 100,000 physician-students are enrolled. Most of these courses last from one day to several days. Some last longer.

Scientists and engineers have been less vigorous in meeting the challenge of obsolescence. A promising exception is a new activity sponsored by the American Chemical Society. The program was initiated at the society's national meeting in Detroit in April 1965. Two-day sessions on mass spectrometry and photochemistry were held ahead of the meeting. A 3-day course on radiochemistry was given at the conclusion of the meeting. The courses were developed for the graduate chemist who completed formal training some years ago and has recently found that entirely new disciplines have become important to his research work. The courses met with an enthusiastic response, as measured by enrollment and by answers to questionnaires circulated afterward. As a result, five courses were given in conjunction with the national meeting held in Atlantic City in September 1965. A further ACS educational program is now in progress. Two traveling short courses will be offered, in a total of nine cities. These are encouraging beginnings which should stimulate similar activity on the part of other societies.

The problem of continuing education is bigger than that of maintaining competence in a professional specialty. Men must also prepare for broader responsibilities. Some must develop new specialties to replace those no longer in demand. These activities require more resources than the average individual commands. Professional societies can be helpful, but universities, business, and government organizations must share the load.—PHILIP H. ABELSON

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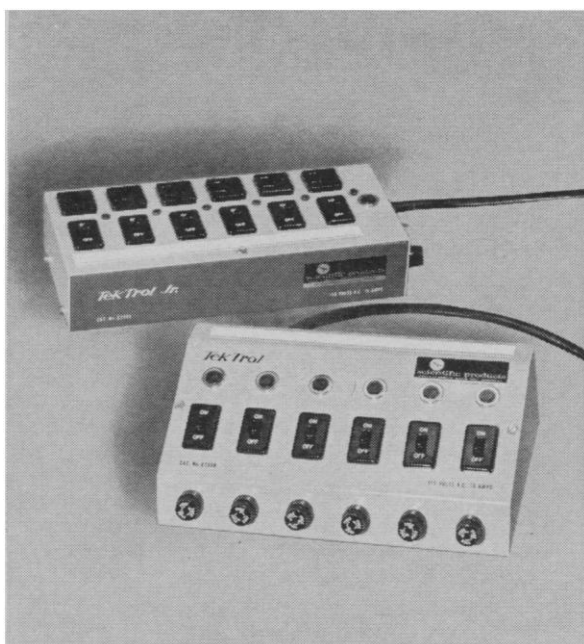
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2-3. **Bone Marrow**, conf., San Francisco, Calif. (L. J. Cole, Experimental Pathology Branch, U.S. Naval Radiological Defense Laboratory, Hunter Point, San Francisco 94135)

2-3. Society of **Plastics Engineers**, regional technical conf., Newark, N.J. (SPE, 65 Prospect St., Stamford, Conn. 06902)

3-5. **Leptospirosis**, intern. colloquium, Antwerp, Belgium. (A. Grare, Inst. de Médecine, Tropicale Prince-Leopold, Antwerp)

3-5. Academy of **Psychoanalysis**, mid-winter meeting, New York, N.Y. (H. Davidman, 125 E. 65 St., New York 10021)

3-5. American **Psychoanalytic Assoc.**, fall meeting, New York, N.Y. (APA, 1 E. 57 St., New York 10022)

3-4. **Macromolecular Metabolism**, symp., New York, N.Y. (New York Heart Assoc., 10 Columbus Circle, New York 10019)

5. American Acad. of **Dental Medicine**, mid-winter annual meeting, New York, N.Y. (S. Conrad, 133-28 228th St., Laurelton, N.Y. 11413)

5-9. American Inst. of **Chemical Engineers**, Philadelphia, Pa. (AICE, 345 E. 47 St., New York 10017)

5-11. American **Rheumatism Assoc.**, Congr., Mar del Plata, Argentina. (G. Speyer, 10 Columbus Circle, New York)

6. **Food Law** Inst. and Food and Drug Administration, joint educational conf., Washington, D.C. (FDA, Washington, D.C.)

6-7. Medical and Social Aspects of **Migration**, Ciba Foundation guest symp., London, England. (Ciba, 41 Portland Pl., London, W.1)

6-8. **Transmission of Viruses** by the Water Route, symp., Cincinnati, Ohio. (G. Berg, U.S. Public Health Service, 4676 Columbia Parkway, Cincinnati 45226)

6-10. **Space Communication**, Paris, France. (UNESCO, Pl. de Fontenoy, Paris 7^e)

6-10. Practices in the Treatment of Low and Intermediate Level **Radioactive Wastes**, symp., Vienna, Austria. (Intern. Atomic Energy Agency, Kärtner Ring 11, Vienna 1)

6-10. Structure and Function of the **Nucleolus**, symp., Montevideo, Uruguay. (F. A. Saez, Instituto de Investigaciones de Ciencias Biológicas, avda. Italia 3318, Montevideo)

6-12. **Hydraulics and Fluid Mechanics**, 2nd Australasian conf., Auckland, New Zealand. (A. J. Raudkivi, Univ. of Auckland, School of Engineering, Ardmore College Post Office, Auckland)

7-10. American Soc. of **Agricultural Engineers**, winter meeting, Chicago, Ill. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)

8-10. **Coccidioidomycosis**, 2nd natl. symp., Phoenix, Ariz. (Arizona Tuberculosis and Health Assoc., 733 W. McDowell Rd., Phoenix 85007)

8-10. Changing Concepts of **Human Habitation**, symp., Roorkee, India. (D. Mohan, Central Building Research Inst., Roorkee)

8-10. New Concepts in **Gynecological Oncology**, symp., Hahnemann Medical College and Hospital, Philadelphia, Pa.

(Miss S. Rosen, Hahnemann Medical College and Hospital, 230 N. Broad St., Philadelphia 19102)

8-15. American Acad. of **Optometry**, Chicago, Ill. (C. C. Koch, 1506 Foshay Tower, Minneapolis, Minn.)

9-10. **Ciba Foundation** guest meeting European Pancreatic Club. London, England. (H. T. Howat, 41 Portland Pl., London, W.1)

12-14. **Lymphatic System**, intern. conf., New Orleans, La. (H. S. Mayerson, Dept. of Physiology, School of Medicine, Tulane Univ., New Orleans 70112)

13-15. **Aerothermochemistry of Turbulent Flows**, conf., American Inst. of Aeronautics and Astronautics, San Diego, Calif. (H. Yoshihara, Space Sciences Laboratory, Mail Zone, 596-00, General Dynamics/Astronautics, Kearny Villa Rd., San Diego)

13-15. European **Biological Editors**, Paris, France. (D. S. Ferner, Dept. of Biology, Univ. of Washington, Seattle)

13-15. Radiological Protection in the **Industrial Use of Radioisotopes**, intern. conf., Paris, France. (J. Pradel, 66 rue Augustin Dumont, Malakoff, Seine, France)

13-18. **Engineering and Technological Sciences**, conf., Bangkok, Thailand. (P. Purachatra, Assoc. of Southeast Asian Insts. of Higher Learning, Chulalongkorn Univ., Race Course Rd., Bangkok)

15-18. **Microbiology**, 1st Central American congr., Univ. of Costa Rica, San José. (F. Montero-Gei, School of Microbiology, Univ. of Costa Rica, Apartado 2157, San José)

19-21. Middle East **Neurological Soc.**, Jerusalem, Jordan. (F. S. Haddad, Orient Hospital, Beirut, Lebanon)

19-23. Indian **Statistical Inst.**, Malleswaram, Bangalore. (S. R. Ranganathan, Indian Statistical Inst., Documentation Research and Training Centre, 112 Cross Rd. 11, Malleswaram)

20-21. **Nuclear Medicine**, 2nd natl. congr., Tel Aviv, Israel. (P. Czerniak, Israel Atomic Commission, Soreq Nuclear Research Center, Doar Yavne)

20-22. British **Biophysical Soc.**, 20th winter meeting, London, England. (R. E. Burge, Physics Dept., Queen Elizabeth College, Campden Hill Rd., London W.8)

20-22. American **Physical Soc.**, Los Angeles, Calif. (W. Whaling, California Inst. of Technology, Pasadena 91109)

26-31. **American Assoc. for the Advancement of Science**, annual, Berkeley, Calif. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington, D.C.)

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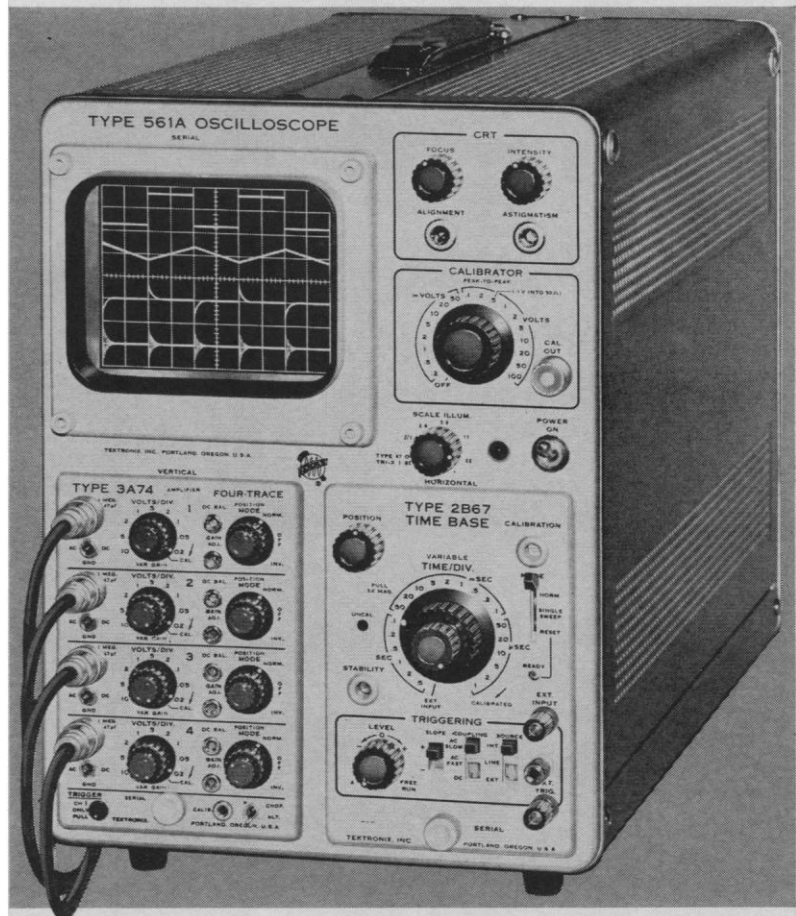
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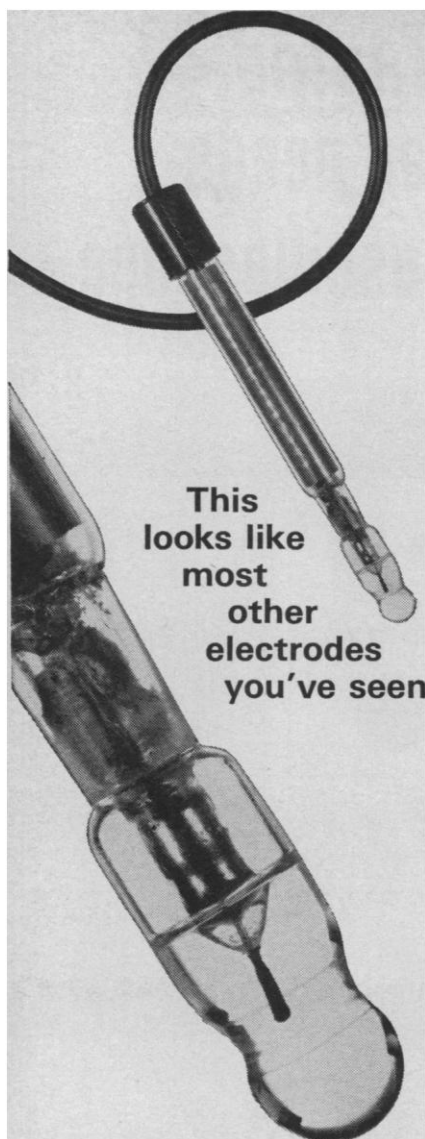
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American Chemical Soc., California Section. (R. L. LeTourneau, Chevron Research Co., Richmond, Calif.)

Astronomy

American Astronomical Soc. (G. C. McVittie, Univ. of Illinois, Urbana)

Geology and Geography

Association of American Geographers. (M. Mikesell, Univ. of Chicago, Chicago, Ill.)

National Geographic Soc. (R. Gray, 17th & M Sts., NW, Washington, D.C.)

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Biometric Soc., WNAR. (S. W. Nash, Univ. of British Columbia, Vancouver, Canada)

Mathematical Statistics and Probability, 5th Berkeley symp. (J. Neyman, Statistical Laboratory, Univ. of California, Berkeley)

Science in General

Academy Conf. (J. T. Self, Univ. of Oklahoma, Norman)

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

Sigma Delta Epsilon. (Miss A. Hanson, Univ. of Minnesota, Minneapolis)

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

27-29. Academy of Management, New York, N.Y. (P. P. LeBreton, College of Business Administration, Univ. of Washington, Seattle)

27-30. Differential Equations and Dynamical Systems. Univ. of Puerto Rico, Mayaguez. (Center for Dynamical Systems, Brown Univ., Providence, R.I.)