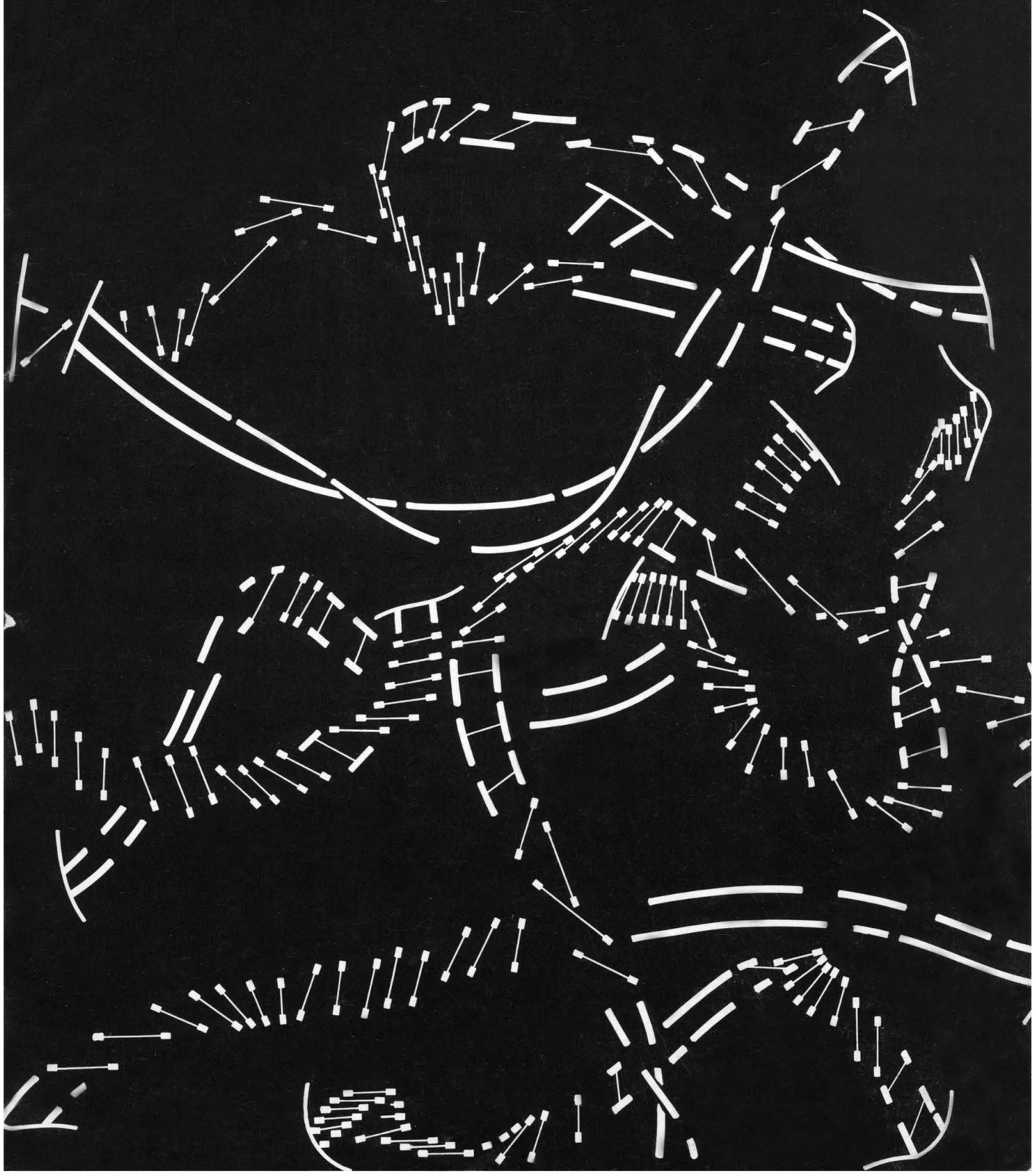
SCIENCE

5 December 1969

Vol. 166, No. 3910

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



It pays to listen to everybody.

Like the time Danish physicist Dr. Niels Bohr let the air out of Professor Einstein's objection to the Heisenberg uncertainty principle. You may recall how the Professor postulated a box lined with perfect mirrors having an alarm clock inside, the entire device suspended from a balance.

The contrivance suggested the Heisenberg principle wouldn't work in a 4-dimensional universe. That had Dr. Bohr stumped. Until he recollected having listened to Einstein's theory making the rate of the clock a function of gravity and saw that the clock's rate of operation must depend on its position in the gravitational field of the earth.

" 'Twas sport to have the master hoist with his own petard."

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Which is just as satisfying as winning a joust with Professor Einstein.

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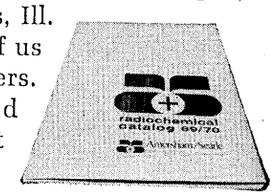
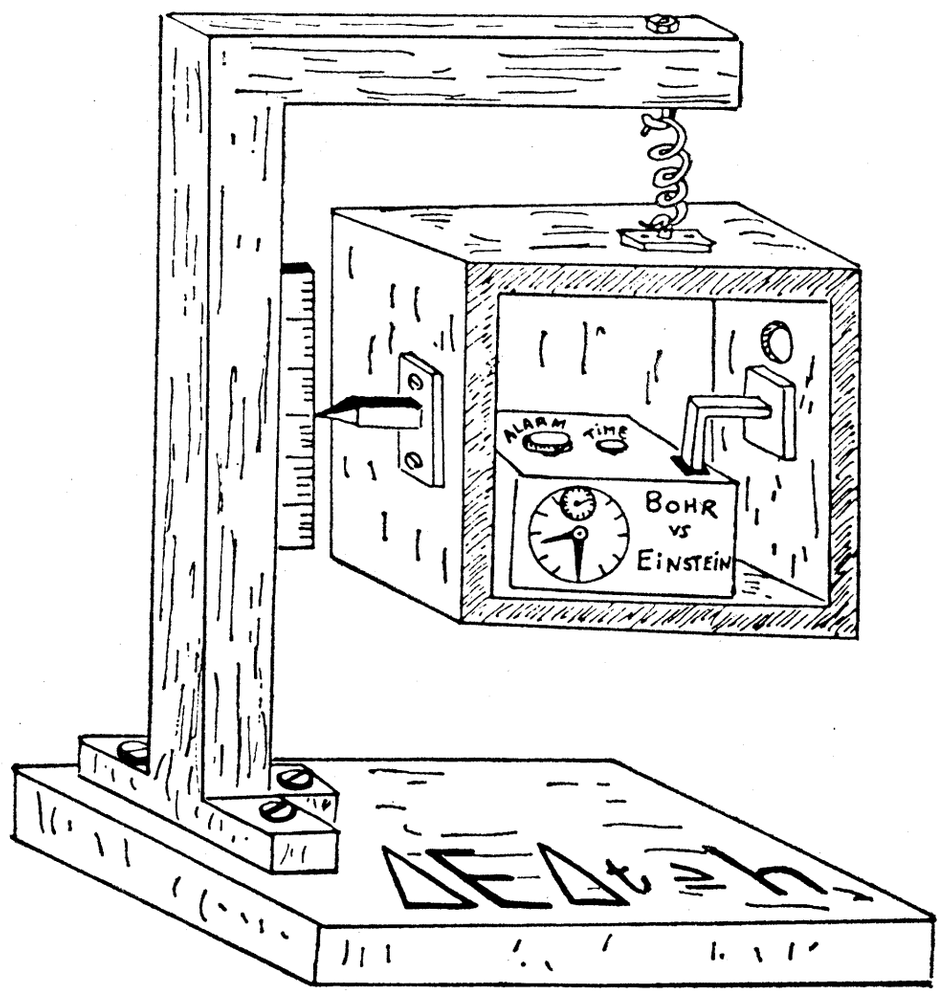
And send for our first edition.



how the great Dane helped old mc^2 box himself in



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5 December 1969
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SCIENCE

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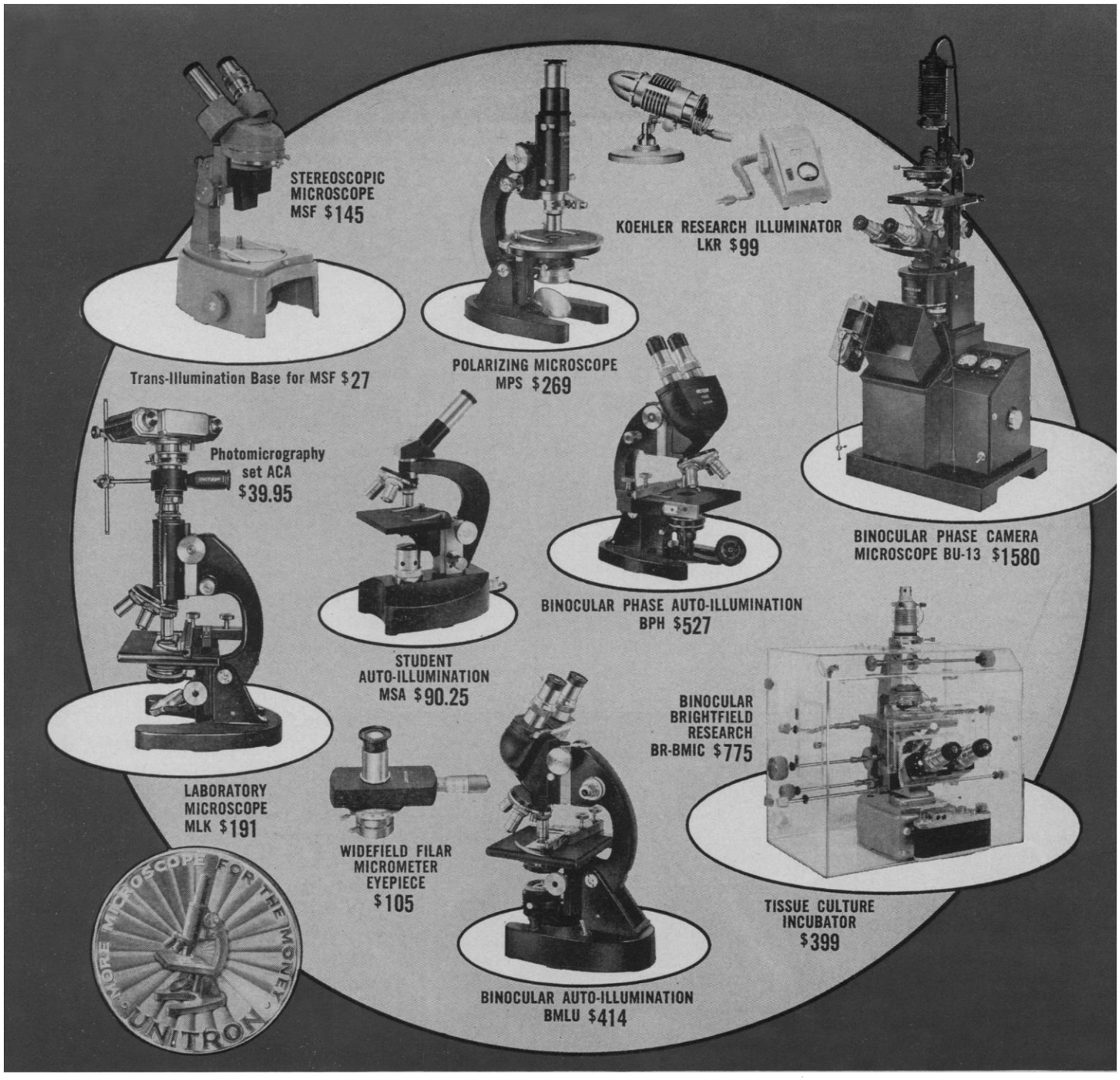
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Tracing of synaptinemal complexes which appeared in 49 consecutive sections of one nucleus. See page 1289. [Peter B. Moens, University of Downsview, Ontario, Canada, and Frank O. Perkins, Virginia Institute of Marine Science, Gloucester Point]



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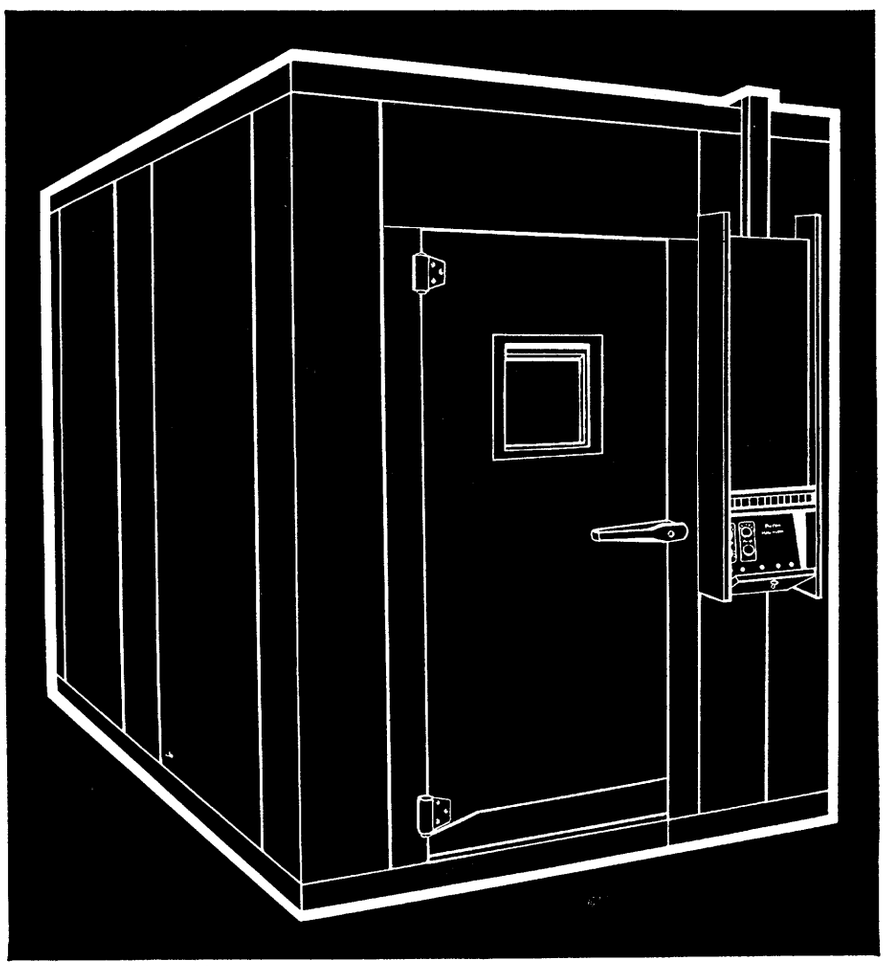

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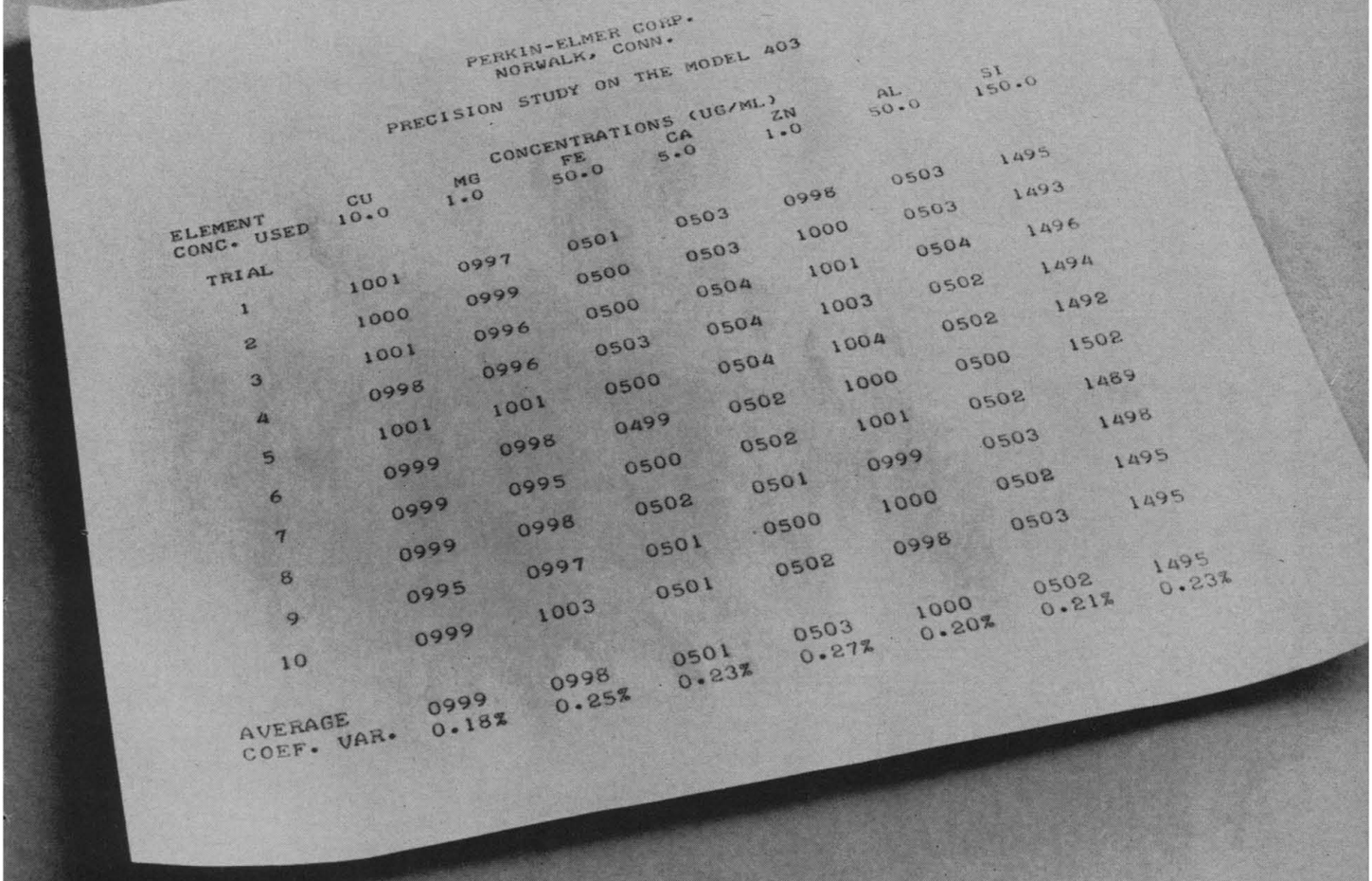

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PRECISION STUDY ON THE MODEL 403

CONCENTRATIONS (UG/ML)

ELEMENT	CU	MG	FE	CA	ZN	AL	SI
CONC. USED	10.0	1.0	50.0	5.0	1.0	50.0	150.0
TRIAL							
1	1001	0997	0501	0503	0998	0503	1495
2	1000	0999	0500	0503	1000	0503	1493
3	1001	0996	0500	0504	1001	0504	1496
4	0998	0996	0503	0504	1003	0502	1494
5	1001	1001	0500	0504	1004	0502	1492
6	0999	0998	0499	0502	1000	0500	1502
7	0999	0995	0500	0502	1001	0502	1489
8	0999	0998	0502	0501	0999	0503	1498
9	0995	0997	0501	.0500	1000	0502	1495
10	0999	1003	0501	0502	0998	0503	1495
AVERAGE	0999	0998	0501	0503	1000	0502	1495
COEF. VAR.	0.18%	0.25%	0.23%	0.27%	0.20%	0.21%	0.23%

The new Model 403 determines the concentrations of metallic elements, by atomic absorption or flame emission, directly on four illuminated digits. It is intended to be equally suitable for research and for routine analysis. Precision is enhanced by taking the automatic digital average of 10 separate readings in one second, or 100 readings in 11 seconds. This is made possible by the extensive use of integrated circuitry. The table above shows some aspects of the 403's performance.

What Was Done:

A Perkin-Elmer Intensitron™ seven-element hollow cathode lamp was used. Single standards were prepared for each of the seven elements, two of which (aluminum and silicon) required the nitrous-oxide flame. 10 successive determinations were made of each element, in the 100-average mode. The results were automatically typed out by the TR-1 Typewriter Readout Module, which also produced a punched paper computer tape.

Better Than 0.3% Precision:

Excellent precision was achieved, at great speed and convenience, The readout, naturally, was direct in concentration. Precision: In every case the precision of the 403 was better than 0.3% of the amount present, measured as a coefficient of variation. Speed: At 11 seconds per determination, all 10 analyses for each element were completed in under two minutes.

Automatic Readout:

The report was typed automatically, without human intervention, in the format that you see. A computer tape, made simultaneously, was then carried to a time-sharing input terminal. The computer automatically took the data, and delivered the average and the precision values. Clearly, the TR-1 saves much time and effort, both in report-writing and in computer applications, and eliminates transcription errors.

For full details on the new Model 403, write Instrument Division. Perkin-Elmer Corporation, 702 Main Avenue, Norwalk, Conn. 06852.

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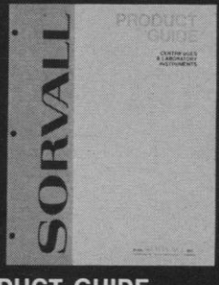

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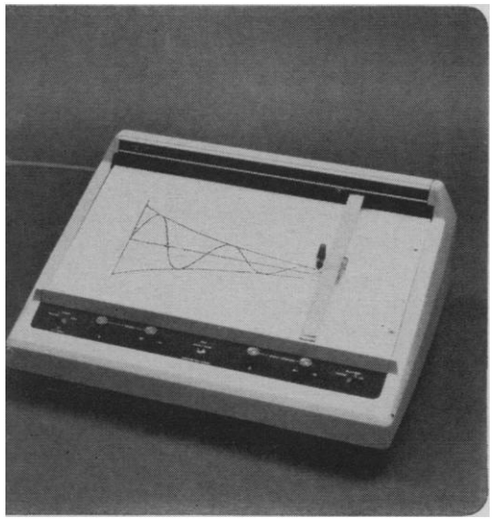
The Emancipator...

start of the small computing system!



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Or, write to Hewlett-Packard, P.O. Box 301, Loveland, Colorado 80537. In Europe: 1217 Meyrin-Geneva, Switzerland. Prices: HP 9100A Calculator $4400; HP 9100B Calculator $4900. Peripherals; HP 9120A Printer $975; HP 9125A X-Y Plotter $2475. Lease/rental programs start as low as $1.50/computing hour, based on average usage.

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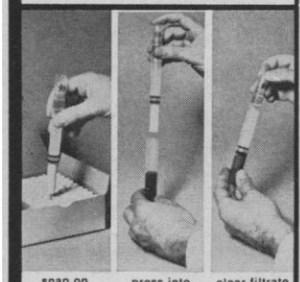

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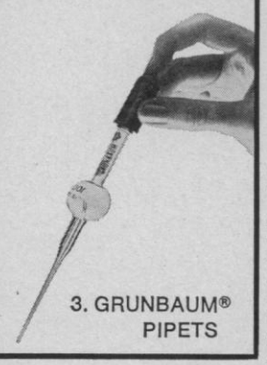
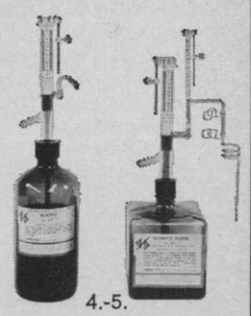


3. GRUNBAUM® PIPETS

3. GRUNBAUM® PIPETS (The Perfect Pipet). The versatile **GRUNBAUM** micro-pipet aliquots, dilutes, transfers, and stores reagents. It's self-adjusting, self-filling, non-dripping and self-cleaning (sample B washes out sample A). Guaranteed accuracy: 5 μl, ±3%, 10 and 20 μl, ±2%; 25 μl and larger, ±1%. Guaranteed reproducibility: 0.1% at 100 μl. Sizes stocked for immediate delivery: 1, 2, 3, 4, 5, 10, 15, 20, 25, 50, 75, 100, 150, 200, 250, 300, 400, and 500 μl. Other sizes on request.

Prices: 1 through 5 and 75 μl, **$7.** All others $6.



4.-5. Automatic REPIPETS® and Dilutors

4.-5. Automatic REPIPETS® and Dilutors. These unique instruments pipet, dilute and dispense with a *guaranteed* accuracy of 1% and a reproducibility of 0.1%. **PYREX® L/I REPIPETS** and Dilutors are of one-piece fused glass construction with no connections—eliminating any chance for leaks. L/I's instruments fit directly on your reagent bottles, ½ ounce and larger. Any reagent can be handled. All amber instruments are supplied for your labile reagents. Use L/I **LAMBDA-DIALS®** to increase precision to 1% at 10 lambdas! L/I stocks **REPIPETS** and Dilutors in ½, 1, 5, 10, 20, and 50 ml sizes, each adjustable from zero to full capacity. Square amber liter bottles optional at N/C.

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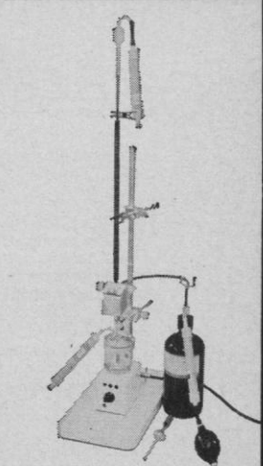

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6. Aquametry Apparatus. L/I's inexpensive Karl Fischer Aquametry Apparatus precisely determines water content of most materials in 4 minutes (1 ppm to 100% water). L/I's versatile apparatus uses the original stock K-F reagent bottle as a reservoir. The "reaction vessel" is an ordinary 4 oz., commonly available, disposable "cream" jar. It is interchangeable with a micro-reaction vessel requiring less than 2 cc total reaction volume for micro-aquametry applications.

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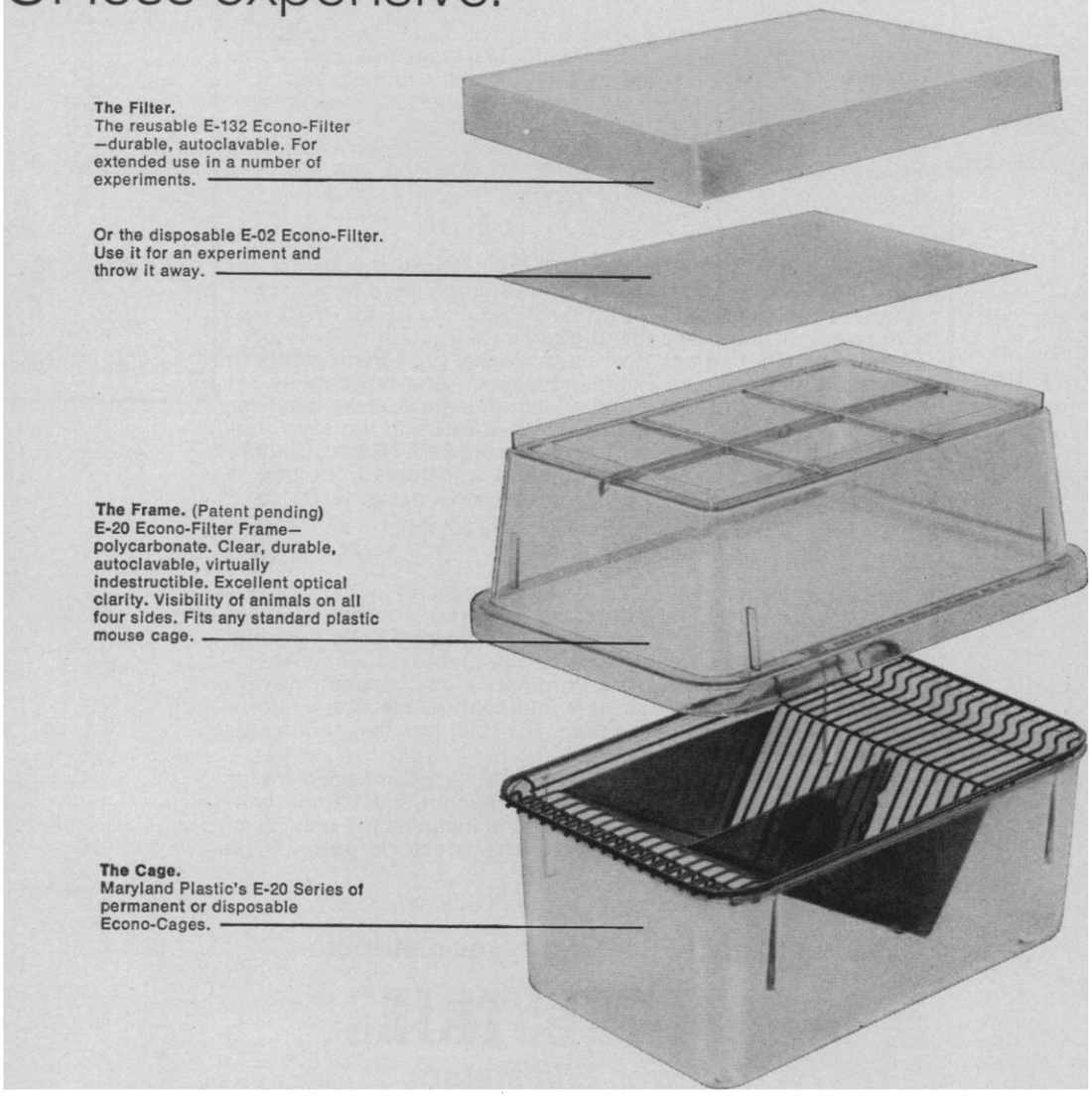

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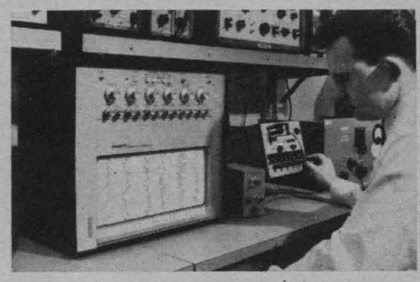

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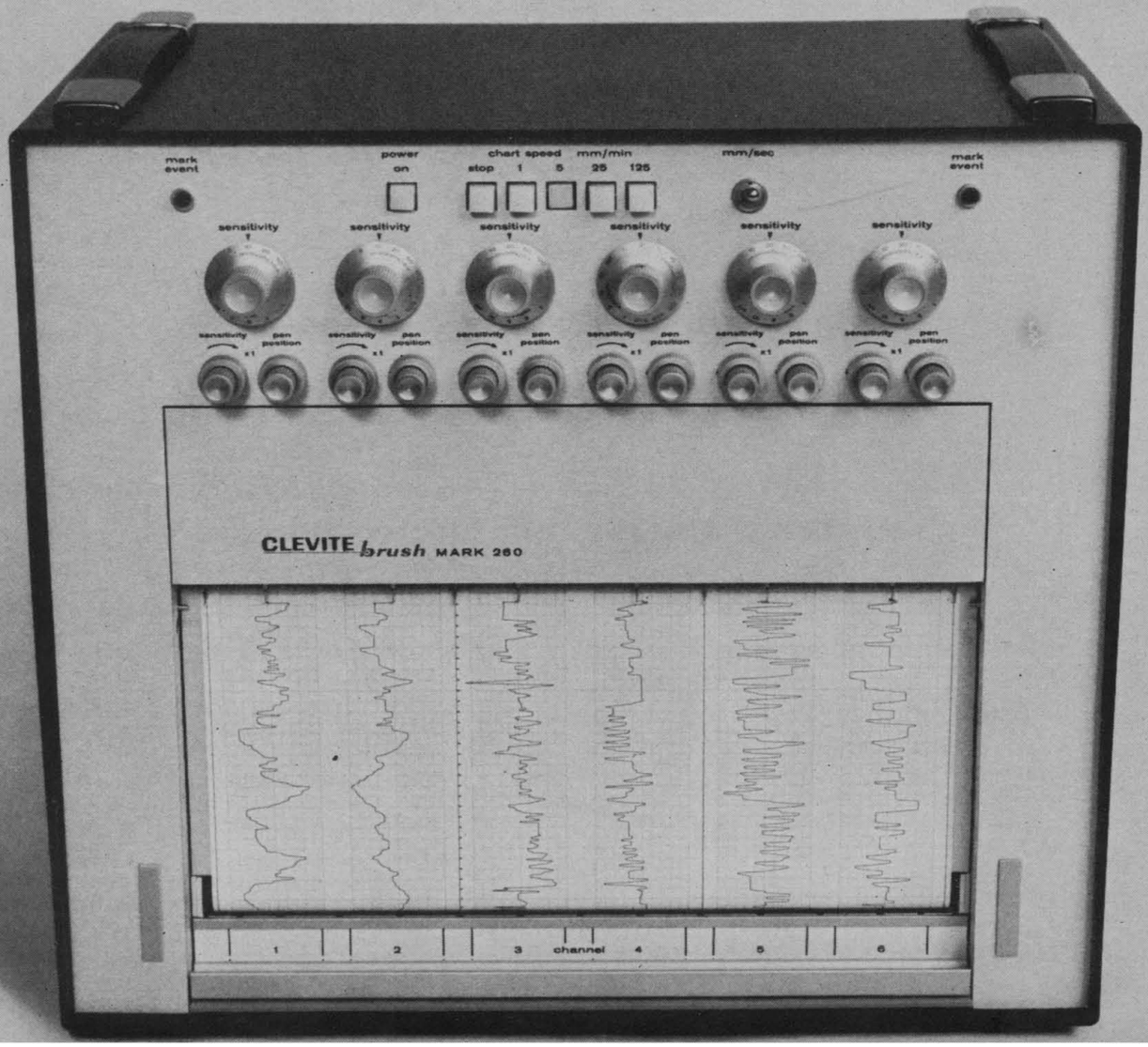

our point of view!

We've taken the fuss out of Electrophoresis.

No more floppy strips. Mylar backed acetate shakes strips firm, easy to handle.

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No more variable applications. Built-in guide provides in-chamber application. Sample position, quantity and alignment always the same.

No more jury-rigging—no magnets, clips, tails, sponges or outriggers. Simply mount strips in prepositioned slots and stripe.

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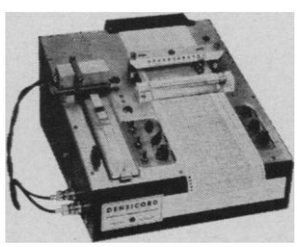

No more chemical preparations. Just empty prepackaged containers into appropriate process chamber.

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*Patent applied for

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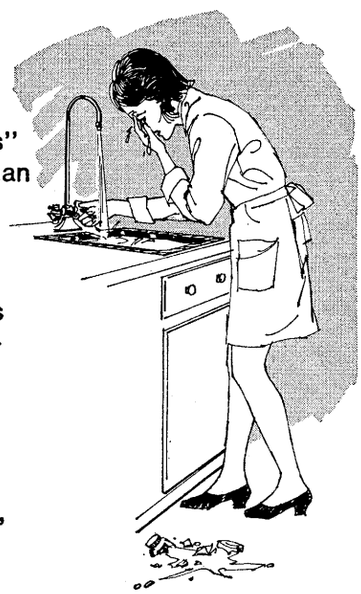

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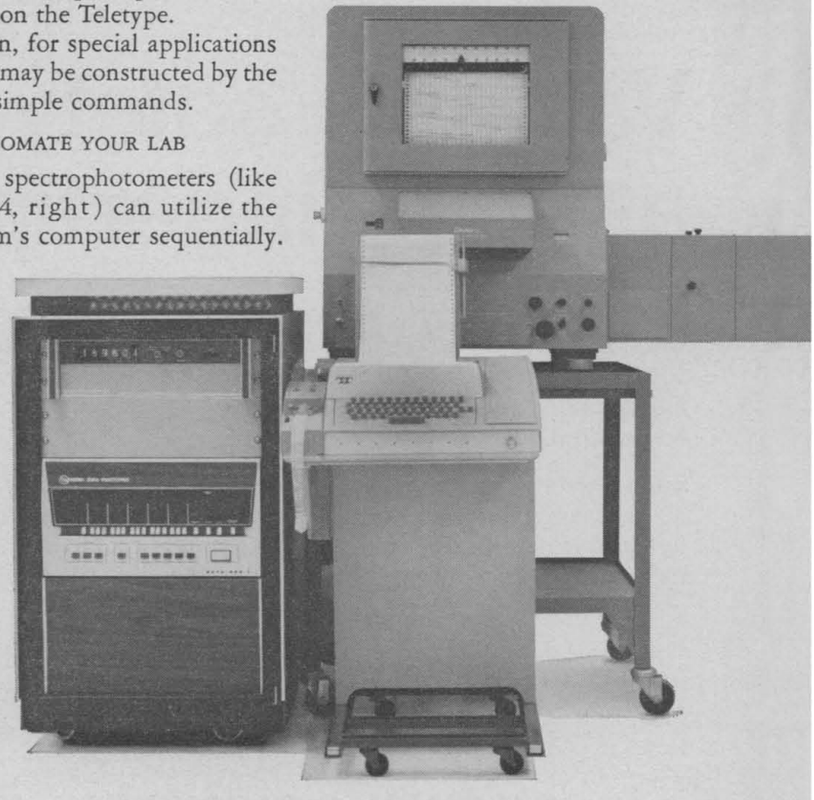

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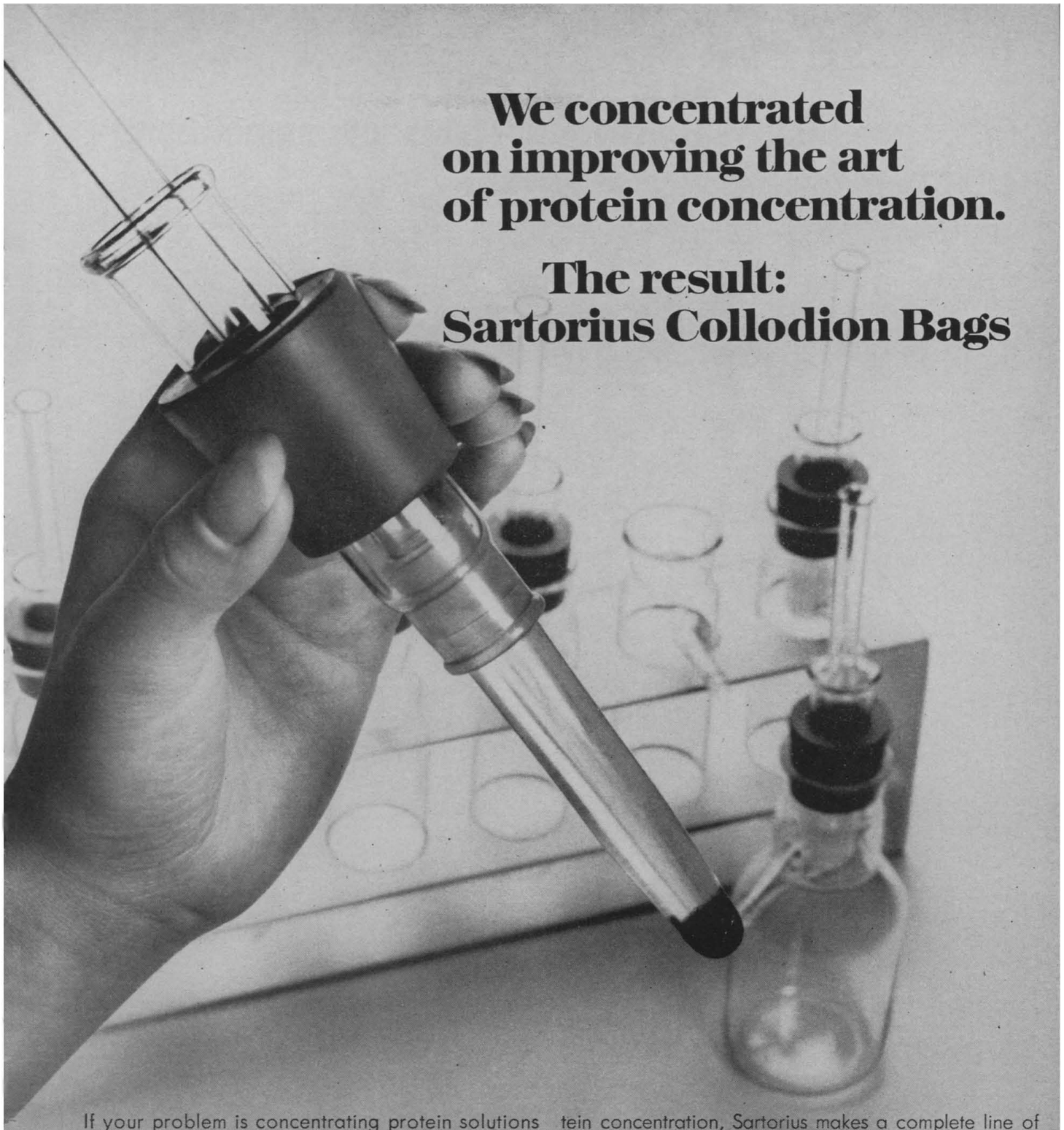

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LETTERS

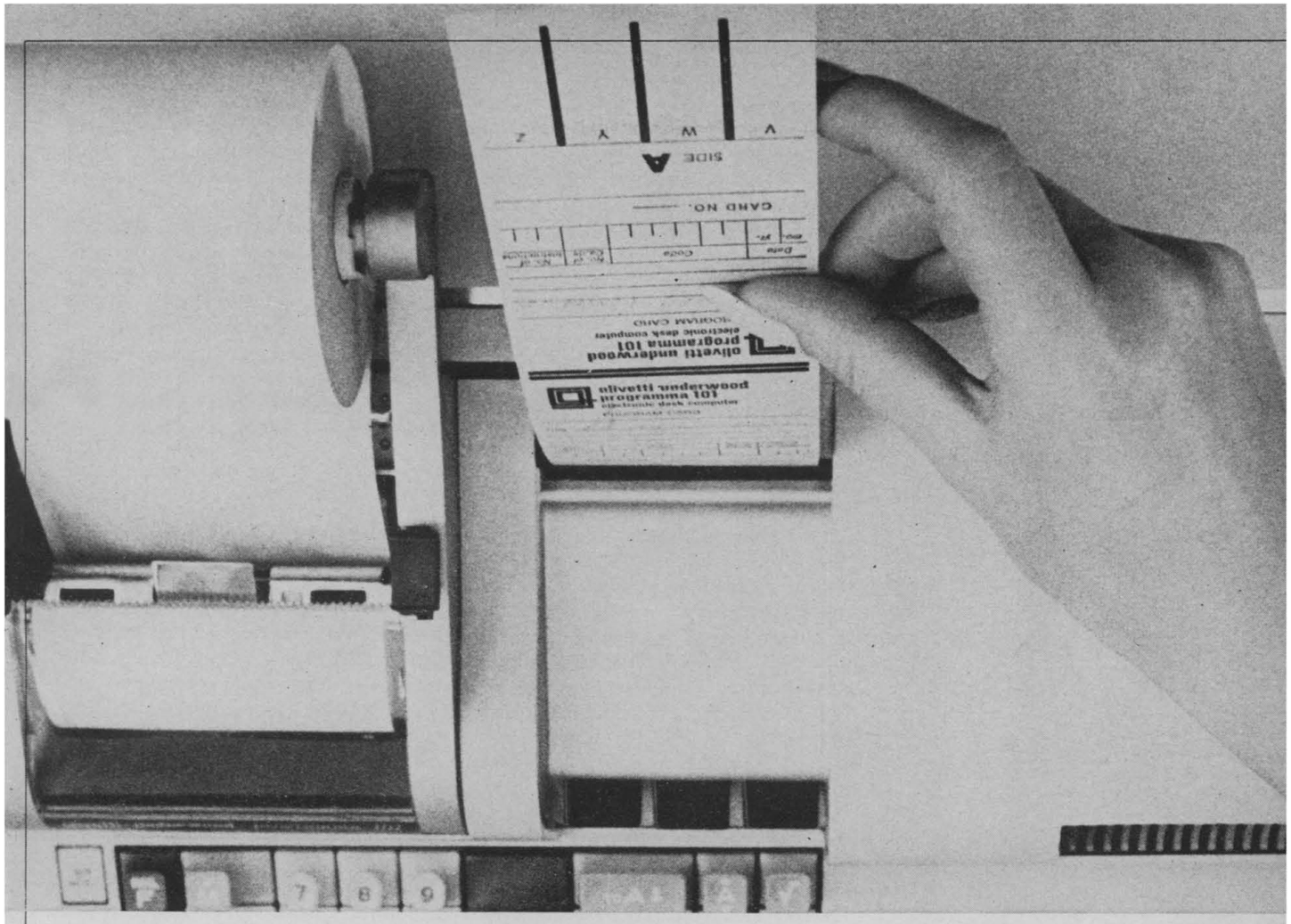
Rape of Alaska Can Be Rational

Carter's essay "North Slope: Oil rush" (3 Oct., p. 85) was a most rational and well-balanced discussion of the complex problems that we are facing now in Alaska, a fine example of enlightened scientific journalism. There is also one relevant problem, however, which was brought out effectively in Fahnestock's letter in the same issue. This is the fundamental problem of conservation and exploitation that can be stated, less delicately: "When rape is inevitable, relax and enjoy it." Certainly, if not this decade, then the next will see the mass exploitation of Arctic petroleum and minerals. We, as a society, *must* have large quantities of raw materials. Whether the extraction is done by private enterprise or by state corporations is quite immaterial. "Rape" in this sense is inevitable in the foreseeable future. Conservationists' pleas for total protection are laudable but fundamentally irrational. With radionuclides, pesticides, and other atmospheric pollutants, we have already saturated the entire environment of the earth; in other words, rape has already occurred.

Instead of attempting to prohibit exploration and exploitation, we must devise ways to accomplish these goals without totally destroying the environment. The Alaskan interior provides some interesting lessons. During the gold rush era, just before World War I, most of the interior (between the Alaska and Brooks Ranges) was prospected intensively for minerals. In the course of exploration, accidental or intentional fires cleared the major part of the Taiga forest from the area. Later, exploitation of the placer gold was by dredging, which completely chewed up the alluvium of the river valleys and left nothing but coarse gravel tailings behind. It is instructive to take a low, slow airplane flight around the Fairbanks area now. The Taiga itself in the area is almost completely restored. The flood plain forest here is an alternation of scrub-dominated "moose pasture" and tangled black spruce forest, an ecology adjusted to periodic fires, just like the vegetation of the California coast ranges. As it happens, the moose require such a situation—both the shelter of the spruce and the forage of the willow in recent burn areas to survive the winter. The nearby valleys dredged between 1920 and about 1960 are also instructive. During the first couple of decades after mining, these valleys appear as gross scars upon the countryside, with bleak, neat piles of coarse gravel to mark the path of the dredge. Then, suddenly, in areas that seem like beaten earth, a cover of willows appears and then the normal succession becomes established. You can roughly date the dredged areas by the color of the vegetation. The more recent tailings are brown and raw, then they are masked by the pale green of willows and alders. This pale green darkens as spruce become established until you cannot superficially distinguish the dredged and undredged river bottoms. Areas worked 50 years ago now are completely recovered.

The Alaskan interior displays—quite by chance—how an area can be exploited without permanent damage. Conservation was the last thought in the minds of the miners; they just wanted to get back to the Lower 48 to spend their money, but the countryside was given the opportunity and has successfully healed itself. What we must do, I believe, is study the environments where exploitation is inevitable (and this means literally any area with a valuable resource, including "wilderness") and plan for the maintenance of a viable natural balance while we plan the exploitation. Wilderness, in areas of economic resources, is an impossibility, but the perpetuation of a decent environment, at least for human beings, should be possible.

Again in Alaska, we have an example of another, more rational attitude toward resource development. At the University a team headed by John Teal has successfully domesticated musk-oxen and is attempting to develop techniques for the commercial use of their wool, qiviut, a wool finer than cashmere. Musk-oxen are the largest Arctic herbivore, and as domestic animals have proven to be quite docile and even friendly. The domestication project has been emphasized as a device to provide an economic base for Eskimo villagers, but musk-ox herding is also a sensible technique for exploiting the Arctic barrens without destroying their original character. As it happens, the musk-oxen now being reintroduced in Alaska (they had been extinguished by aboriginal hunting a century ago) are filling an empty ecologic niche. The other large herbivore of the tundra, caribou, is a moss-sedge feeder while the musk-ox prefers grasses and willows. The musk-ox project is an example of well-reasoned resource management and development. As well, it is specifically adjusted to the Arctic environment. . . .



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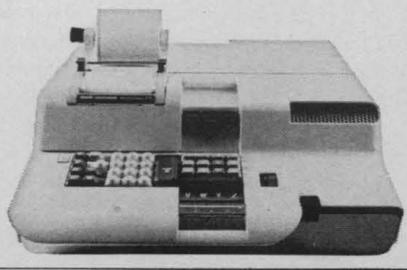

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Perhaps Arctic Alaska, because it is being opened at a time of national awareness of pollution and conservation problems, can serve as a laboratory for the development of techniques and a philosophy of rational exploitation without ruination.

F. F. WRIGHT
Institute of Marine Sciences,
University of Alaska, College 99701

Reno: Appraisal of DRI

The short article "Trouble at Nevada research center" (29 Aug., p. 880) errs in that it presents an incomplete picture of the research climate at Nevada. The Desert Research Institute at Reno, from which Wendell A. Mordy was asked to resign last spring, is only one branch of the University of Nevada system which also includes the Reno campus, the Las Vegas campus, and the computing center. The article gives the impression that the difficulties and the resignation of Mordy were due to a conflict between two strong-willed men over monetary policies, that research at the university was the loser, and that the university chancellor was the villain.

Actually, the trouble goes much deeper. At the time DRI was authorized in 1960, several academic departments of the university at Reno were beginning to develop Ph.D. programs. It was understood that DRI would encourage research within the academic departments of the university, help build up research competence and potential by attracting outstanding personnel, and help procure research grants and contracts, along with some administrative duties.

DRI started to do some of these things, but before long began to spend all its efforts on building up its own research projects, sometimes in direct competition with established programs. Eventually it split off from the university at Reno and became an entity in itself as a separate branch of the university system. (The conflict over the administration of the computing center arose at that time.) One of its original purposes—that of stimulating research within academic departments—was either discontinued or at least cut to a minimum. Administration of grants and contracts was turned back to the university.

As a result, Mordy's relationships with faculty members on the Reno campus left much to be desired. Many of us feel that very few of the academic departments have benefited appreciably, except in an indirect manner, by the existence of the DRI. Some have even suffered. We feel that so much more could have been done to benefit research throughout the university system if the administration of the DRI had been different, and we are not convinced that the resignation of Mordy will have an adverse effect on established research on the Reno or Las Vegas campuses.

PHILIP C. BETTLER, GEORGE BARNES
HUGH N. MOZINGO, VERNON E. SCHEID
RALPH A. YOUNG
University of Nevada, Reno 89507

Postage Meter Technology

In his letter Feeny (3 Oct.), exhorts his fellow scientists to use commemorative postage stamps on their letters. In this way, he reasons, one adds sparkle to his mail and, possibly, vitality to his publications. Aside from these gains, there may also be an educational benefit arguing for the use of postage stamps rather than metered mail.

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ROBERT PERLOFF
Graduate School of Business,
University of Pittsburgh,
Pittsburgh, Pennsylvania 15213

. . . Unfortunately, our institution discovered years ago that some of our correspondence was not getting through because of postage stamp thieves. We use a machine stamp and now our losses are almost nil.

CLYDE A. HILL
San Diego Zoological Garden,
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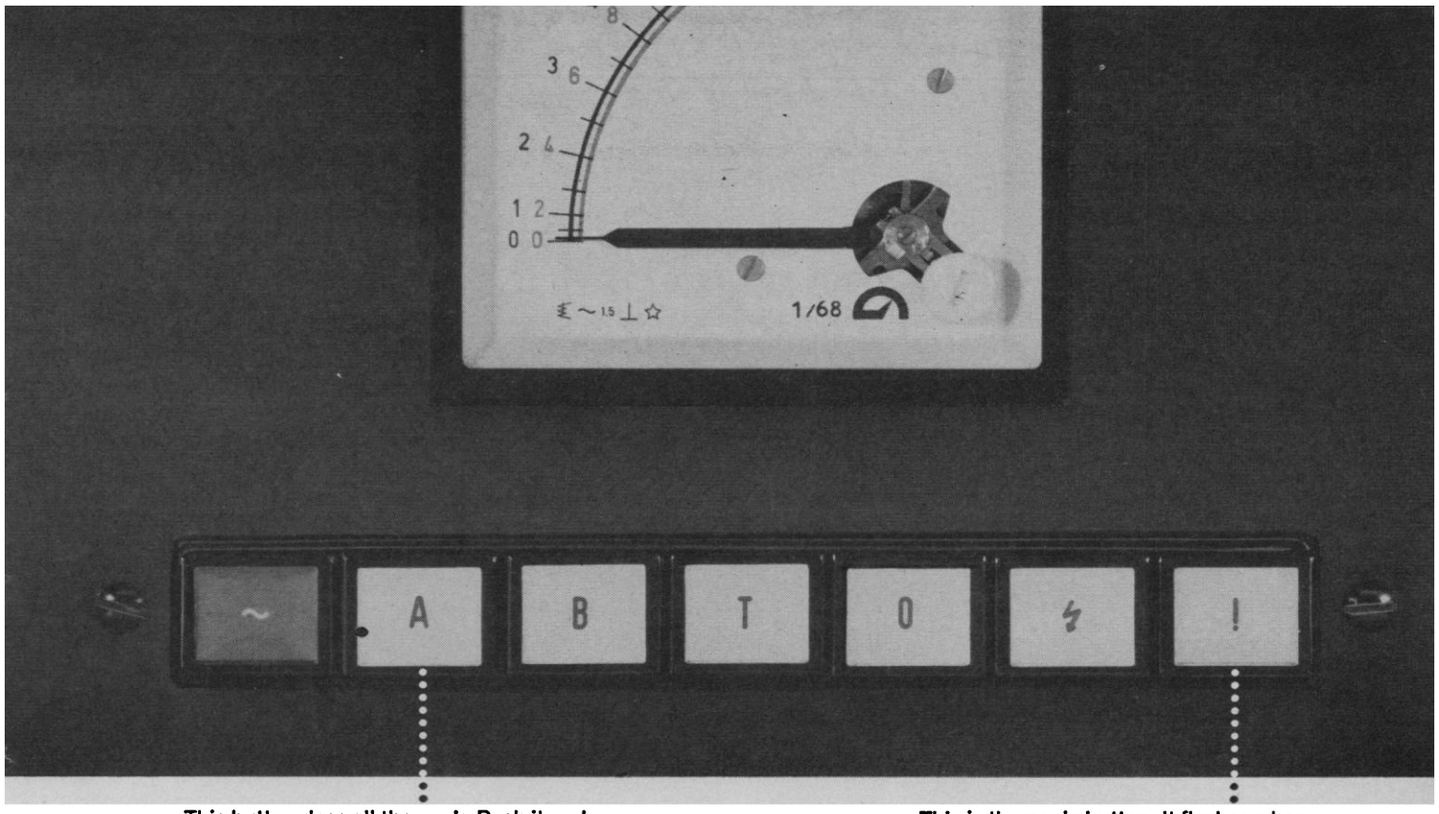

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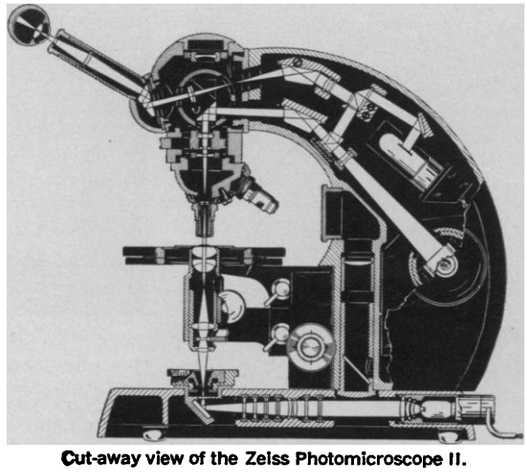

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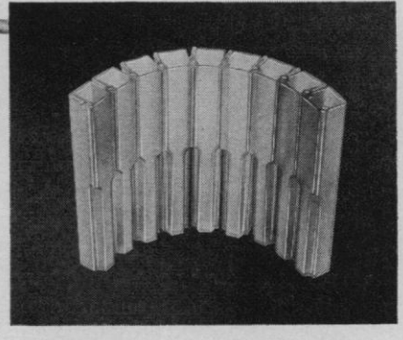

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5 December 1969, Volume 166, Number 3910 **SCIENCE**

Lunar and Terrestrial Exploration

This has been a remarkable year for geology and associated disciplines. Two great developments have enriched these fields with new knowledge, new puzzles, and new objects for study. The most widely publicized of these developments is the exploration of the moon. Examinations of lunar samples are progressing well, scientists are very excited about what they have been finding, and some results will be released in January. Investigators have only begun to study materials from the Apollo 11 landing, and specimens from Apollo 12 will soon be available.

The second development is the success of an extensive program of drilling of the deep-sea bottom. Holes have been drilled at 66 carefully selected sites in the Gulf of Mexico, the Caribbean Sea, and the Atlantic and Pacific oceans. At about 20 of the sites, cores all the way down to the igneous basement have been obtained. To date, examinations of the cores have been conducted on shipboard, but major conclusions have already been announced.

In terms of the total history of the earth, the present ocean basins are relatively recent features. Although the most ancient rocks on the continents are about 3400 million years old, the oldest sediments obtained from the deep-sea bottoms are only 140 million years old.

Results from the drilling strongly support hypotheses of sea-floor spreading and continental drift. About 200 million years ago, Europe, North America, South America, and Africa were joined, but at that time the separation of Europe and North America began. Examination of cores from the Atlantic Ocean reveals that new crust is forming at the Mid-Atlantic Ridge and is spreading on either side of it. The rate of movement ranges from 1 to 4 centimeters per year. The results confirm earlier views based on magnetic observations. However, the deep-sea drilling has changed speculation into something that must be regarded as established. Geophysicists point out that the drilling has a related benefit. It is fairly easy to survey large areas of the ocean with airborne magnetometers or with ship-carried seismic equipment. Results from drilling now permit confident interpretation of these geophysical observations.

In addition to the lateral movements of the continents there have been vertical motions, both up and down. For example, an area east of Brazil that was once at sea level is now 2000 meters beneath the surface.

Detailed study of the cores will begin shortly. Samples will be broadly available. They will provide an improved history of life, of climatic change, and of geochemical events in the oceans and the sediments.

The National Science Foundation has announced that it will support additional deep-sea drilling, which will facilitate exploration in the Mediterranean Sea, the Indian Ocean, and other as yet untapped areas. In addition, the drilling company Global Marine has plans to develop techniques whereby dulled bits can be changed and drill holes can be reentered. It will then be possible to obtain cores of substantial length in the basement rocks.

One cannot foresee the new knowledge, the new questions, and the new opportunities that will arise from the two great recent developments. It is clear, however, that before another decade is over our understanding of the earth and the solar system will be substantially increased.

—PHILIP H. ABELSON

whether it might be possible for students of the subject to agree to focus on one experimental system, for it is impossible to subscribe to any view, as long as the evidence is in its current state.

A concerted attack on one of the presumed instructive systems might be in order. Some additional features of the development of the mammary gland make it an attractive target, especially its sensitivity to hormones. For example, in the male mouse the gland begins to regress at 13.5 days as a consequence of the secretion of androgens of the fetal testes. This regression is also observed in vitro when 13-day-old mammary gland rudiments are combined with 13-day-old testes. However, according to Kratochwil the regression of the epithelium requires its combination with homologous mesenchyme. Neither mouse mammary epithelium combined with salivary mesenchyme nor salivary, lung, or pancreatic epithelium combined with mammary mesenchyme respond to male hormone.

Other speakers, notably Elsdale (United Kingdom), Weston (United States), and Sachs (Israel), emphasized that even in clonal and other simplified experimental systems, phenotypic expression may be influenced by contact-mediated interactions between cells. For example, Elsdale described interactions between fibroblasts and epithelial cells in vitro which suggest that the acquisition of polarity by epithelial cells may serve to restrict the possibilities for morphogenesis in mixed epithelial-mesenchymal systems. Finally, Ringertz (Sweden) described evidence from model experiments with hen erythrocyte ghosts which suggested that chromatin activation may be triggered by changes in the state of the cell membrane. His observations, coupled with other evidence on the possible importance of association between chromosomes and the nuclear membrane on the one hand, and on the occurrence of nucleic acids in cell membranes on the other, may enable us to begin to understand how a cell's genome may be influenced by contact with another cell.

JAMES D. EBERT

Department of Embryology, Carnegie Institution of Washington, 115 West University Parkway, Baltimore, Maryland 21210

References

1. M. Mead and P. Byers, *The Small Conference* (Mouton, Paris, 1968).
2. C. H. Waddington, *Science* **163**, 423 (1969).
3. A. Propper, *C. R. Acad. Sci. Paris* **268**, 1423 (1969).

Forthcoming Events

December

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

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

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

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

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

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

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

26–31. American Soc. of **Zoologists,** Boston, Mass. (J. R. Shaver, Dept. of Zoology, Michigan State Univ., East Lansing 48823)

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

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

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

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

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

January

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

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

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

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

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

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

12–14. **Biological Effects of Carbon**

Monoxide, New York, N.Y. (A. Selwyn, 2 E. 63 St., New York 10021)

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

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

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

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

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

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

19–21. American Soc. of **Heating, Refrigerating and Air-Conditioning Engineers**, San Francisco, Calif. (A. T. Boggs III, American Soc. of Heating, 345 E. 47 St., New York 10017)

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

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

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

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

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

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

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

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

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

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

February

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

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

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

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

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

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

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

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

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

18–20. International **Solid-State Circuits** Conf., Philadelphia, Pa. (L. Winner, 152 W. 42 St., New York 10036)

22–1. **Animal and Plant Toxins**, 2nd intern. symp., Tel Aviv, Israel. (A. De Vries, P.O. Box 85, Petah Tikva, Israel)

23–24. **Chemical Marketing Research** Assoc., Houston, Tex. (P. E. Levesque, FMC Corporation, 633 Third Ave., New York 10017)

25–27. **Biophysical** Soc., Baltimore, Md. (W. A. Brodsky, Inst. for Medical Research, 220 E. 23 St., New York 10010)

25–27. **Pesticides in the Soil**, East Lansing, Mich. (S. K. Ries, Dept. of Horticulture, Michigan State Univ., East Lansing)

25–1. American College of **Cardiology**, New Orleans, La. (W. D. Nelligan, AMCC, 9650 Rockville Pike, Bethesda, Md. 20014)

26–28. American Acad. of **Forensic Sciences**, Chicago, Ill. (A. H. Schatz, 750 Main St., Room 1000, Hartford, Conn. 06103)

28–6. American Assoc. of **Junior Colleges**, Honolulu, Hawaii. (E. J. Gleazer, 1315 16th St., NW, Washington, D.C.)

March

1–5. **Radiation** Research Soc., 18th annual, Dallas, Tex. (R. J. Burk, American Univ., Washington, D.C. 20016)

1–5. American **Radium** Soc., 52nd annual, San Diego, Calif. (F. G. Bloedorn, Univ. of Maryland, Baltimore 21201)

1–6. **Analytical Chemistry and Applied Spectroscopy**, 21st conf., Cleveland, Ohio. (R. Mainier, Koppers Co., Inc., 440 College Park Dr., Monroeville, Pa. 15146)

1–6. American Soc. of **Photogrammetry**, Washington, D.C. (L. P. Jacobs, 105 N. Virginia Ave., Falls Church, Va. 22046)

1–6. American Congr. on **Surveying and Mapping** and the American Soc. of Photogrammetry, Washington, D.C. (R. R. Randall, Room 1104, National Press Bldg., Washington, D.C. 20004)

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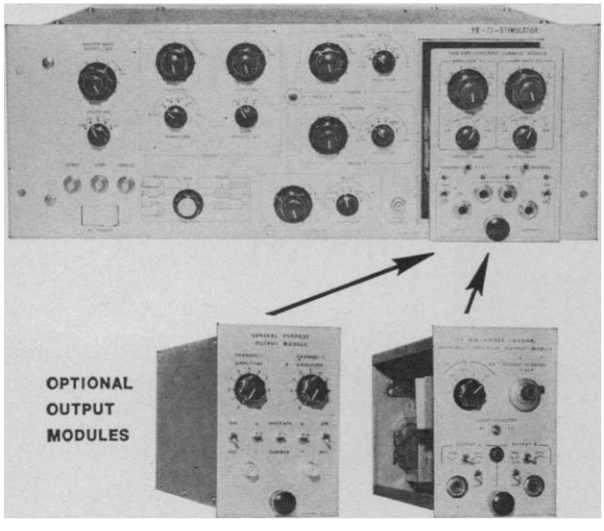

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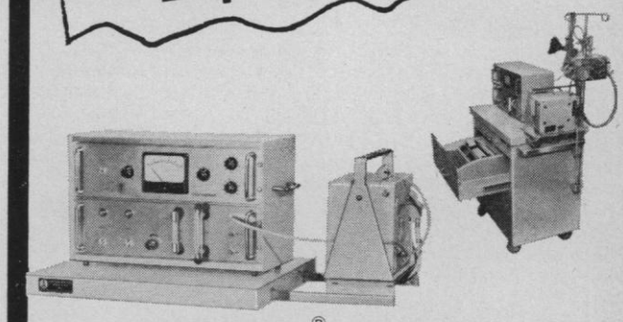

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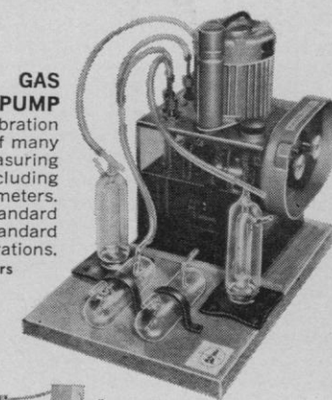

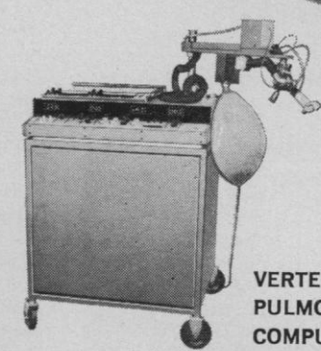

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2–4. American **Crystallographic** Assoc., New Orleans, La. (C. J. Fritchie, Chemistry Dept., Tulane Univ., New Orleans)

2–6. **Automatic Control in Space**, 3rd symp., Toulouse, France. (H. Desmoutier, LASS, B.P. 4036, 31 Toulouse 04)

2–6. **Engineering Design** Show and Conf., Brighton, England. (Miss L. Harvey, Business Conf. and Exhibitions Ltd., Mercury House, Waterloo Rd., London S.E.1)

3–6. American **Educational Research** Assoc., Minneapolis, Minn. (R. A. Dershimer, AERA, 1126 16th St., NW, Washington, D.C. 20036)

4–6. **Fundamental Cancer Research**, 24th annual symp., Houston, Tex. (F. Goff, Special Projects, M. D. Anderson Hospital and Tumor Inst., Univ. of Texas, Houston 77025)

4–6. **Ophthalmology**, 21st intern. congr., Mexico City, Mexico. (S. A. Zertuche, Apartado Postal, 35-523, Mexico City)

8–14. American Assoc. of **Pathologists and Bacteriologists**, 67th annual, St. Louis, Mo. (K. M. Brinkhous, Univ. of North Carolina School of Medicine, Chapel Hill)

9–13. **Fast Breeder Reactors**, Vienna, Austria. (International Atomic Energy Agency, Kaerntnerring 11, A-1010, Vienna)

9–13. **Use of Isotopes in Hydrology**, Vienna, Austria. (International Atomic Energy Agency, Kaerntnerring 11, A-1010, Vienna)

9–14. **Primary Radiation Effects in Chemistry and Biology**, intern. mtg., Mar del Plata, Argentina. (M. A. Molinari, Comision Nacional de Energia Atomica, Avenida del Libertador 8250, Buenos Aires, S29, Argentina)

9–14. **Waste Water of the Agricultural Industry**, 12th intern. symp., Budapest, Hungary. (Secretariat General Commission, International des Industries, Agricoles et Alimentaries, 18 Avenue de Villars 75, Paris, France)

10–11. **Ash Utilization**, 2nd symp., Pittsburgh, Pa. (N. H. Coats, General Chairman, U.S. Bureau of Mines, P.O. Box 880, Morgantown, W.Va. 26505)

11–13. Institute of **Electrical and Electronics Engineers**, Inc. Scintillation and Semiconductor Counter Symp., Washington, D.C. (The Institute, 345 E. 47 St., New York, N.Y.)

15–19. International **Anesthesia Research** Soc., 44th congr., Las Vegas, Nev. (Executive Secretary, IARS, 3645 Warrensville Center Rd., Cleveland, Ohio 44122)

15–19. Society of **Toxicology**, annual scientific mtg., Atlanta, Ga. (J. F. Borzelleca, Dept. of Pharmacology, Medical College of Virginia, Richmond 23219)

16–18. American Soc. of **Mechanical Engineers, Plant Engineers and Maintenance**, Fort Worth, Tex. (A. B. Conlin, 345 E. 47 St., New York 10017)

16–18. **Solar Energy** Soc., 6th annual mtg., Sydney, Australia. (F. E. Edlin, Arizona State Univ., Tempe)

16–19. International Assoc. for **Dental Research**, 48th session, New York, N.Y. (A. R. Frechette, Executive Secretary, 211 East Chicago Ave., Chicago, Ill. 60611)

16–20. Symposium on **Fourier Spectroscopy**, Aspen, Colo. (G. Vanasse, Air Force Cambridge Research Lab., L. G. Hanscom Field, Bedford, Mass. 01730)

BOOKS RECEIVED

(*Continued from page 1262*)

The Age of Giant Mammals. Daniel Cohen. Illustrated by James G. Teason. Dodd, Mead, New York, 1969. 160 pp. $4.

Algebra. An Intermediate Approach. Florence M. Lovaglia, Merritt A. Elmore, and Donald Conway. Harper and Row, New York, 1969. xii + 388 pp., illus. $8.95.

The Amino Sugars. The Chemistry and Biology of Compounds Containing Amino Sugars. Vol. 1A, Chemistry of Amino Sugars. Roger W. Jeanloz, Ed. Academic Press, New York, 1969. xxii + 482 pp., illus. $27.

Analysis Instrumentation. Vol. 6. Proceedings of the 14th annual symposium, Philadelphia, May 1968. Lewis Fowler, B. L. Connelly, and R. G. Krueger, Eds. Plenum, New York, 1969. viii + 376 pp., illus. $18.50. Instrument Society of America publication.

Ancient Australia. The Story of Its Past Geography and Life. Charles Laseron. Revised by Rudolph Oskar Brunnschweiler. Taplinger, New York, ed. 2, 1969. xii + 256 pp. + plates + maps. $14.95.

Anglo-Saxon Schools of Metascience. Gerard Radnitzky. Akademiförlaget, Göteborg, Sweden; Humanities Press, New York, 1969. xxiv + 200 pp. $6.50. Contemporary Schools of Metascience, vol. 1. Studies in the Theory of Science.

An Annotated Bibliography of Visual Discrimination Learning. Edward J. Green and Joan A. O'Connell. Teachers College Press, Columbia University, New York, 1969. viii + 172 pp. Paper, $2.95.

Annuaire Hydrologique de Belgique 1967. Institut Royal Meteorologique de Belgique, Uccle-Bruxelles, Belgium, 1968. xviii + 264 pp., illus. Paper.

The Annual of Czechoslovak Medical Literature. Vol. 11, 1966. National Medical Library of Czechoslovakia, Ed. Czechoslovak Medical Press, Prague, 1968. xx + 828 pp. Paper.

Annual Review of Photochemistry. Vol. 1, Survey of 1967 Literature. Nicholas J. Turro, George S. Hammond, James N. Pitts, Jr., and Donald Valentine, Jr. With the assistance of A. D. Broadbent, Willis B. Hammond, and E. Whittle. Interscience (Wiley), New York, 1969. xiv + 592 pp., illus. $19.95.

Antarctic Ascidiacea. Monographic Account of the Known Species Based on Specimens Collected under U.S. Government Auspices, 1947–1965. Patricia Kott. American Geophysical Union, Washington, D.C., 1969. xvi + 240 pp., illus. $16.50. Antarctic Research Series, vol. 13.

Antimicrobial Agents and Chemotherapy—1968. Proceedings of the 8th Interscience Conference, New York, October 1968. Gladys L. Hobby, Ed. American Society for Microbiology, Bethesda, Md., 1969 (distributor, Williams and Wilkins, Baltimore). xii + 556 pp., illus. $15.

The Apollo Spacecraft. A Chronology. Vol. 1, Through November 7, 1962. Ivan D. Ertel and Mary Louise Morse. Office of Technology Utilization, National Aeronautics and Space Administration, Washington, D.C., 1969 (available as NASA SP-4009 from the Superintendent of Doc-

uments, Washington, D.C.). xiv + 270 pp., illus. Paper, $2.50. NASA Historical Series.

Applications of Nuclear Magnetic Resonance Spectroscopy in Organic Chemistry. L. M. Jackman and S. Sternhell. Pergamon, New York, ed. 2, 1969. xvi + 460 pp., illus. $11. International Series of Monographs in Organic Chemistry, vol. 5.

Arboles Tropicales de México. Manual para la Identificatión de Campo de los Principales. T. D. Pennington and Jose Sarukhan. Illustrated by Silvia Garcia and Rosa Marie C. De Dies. Instituto Nacional de Investigaciones Forestales, Mexico City; United Nations Food and Agricultural Organization, Rome, 1968. x + 414 pp., illus.

L'Astronomie Expérimentale. Jean-Claude Pecker. Presses Universitaires de France, Paris, 1969. iv + 156 pp. + plates. Paper. La Science Vivante.

Biochemical Factors Concerned in the Functional Activity of the Nervous System. First International Meeting of the International Society for Neurochemistry, Strasbourg, 1967. D. Richter, Ed. Pergamon, New York, 1969. iv + 236 pp. Paper, $8.

Bioelectric Phenomena. Robert Plonsey. Introduction and first chapter by David G. Fleming. McGraw-Hill, New York, 1969. xvi + 384 pp., illus. $17.50. McGraw-Hill Series in Bioengineering.

Biogeography and Ecology in South America. Vol. 2. E. J. Fittkau, J. Illies, H. Klinge, G. H. Schwabe, and H. Sioli, Eds. Junk, The Hague, 1969. xii + 500 pp., illus. $20.80. Monographiae Biologicae, vol. 19.

Biological Effects of Pesticides in Mammalian Systems. A conference, New York, May 1967. Herman F. Kraybill, Ed. New York Academy of Sciences, New York, 1969. Illus. Paper, $23. *Annals of the New York Academy of Sciences*, vol. 160, Art. 1, pp. 1–422.

Die Biologie und Variabilität des Tuberkelbakteriums und die Atypischen Mycobakterien. Experimentelle und Theoretische Untersuchungen. J. G. Weiszfeiler. Akadémiai Kiadó, Budapest, 1969. 312 pp., illus. $8.40.

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Catalogus Faunae Graeciae. A. Kanellis. Part 2, Aves. W. Bauer, O. v. Helversen, M. Hodge, and J. Martens, with the cooperation of W. Makatsch. Available from Max E. Hodge, 6345 Western Ave., Washington, D.C., 1969. 204 pp. Paper, $4.75.

Cells into Organs. The Forces that Shape the Embryo. J. P. Trinkaus. Prentice-Hall, Englewood Cliffs, N.J., 1969. xvi + 240 pp., illus. Cloth, $6.95; paper, $3.50. Foundations of Developmental Biology.

Ceramic and Silicate Institute. General report prepared for the Government of Israel by the United Nations, New York, 1967. 64 pp. Paper. U.N. Development Programme.

Chemical Applications of Radioisotopes. H. J. M. Bowen. Methuen, London, 1969

(U.S. distributor, Barnes and Noble, New York). x + 132 pp., illus. $5. Methuen's Monographs on Chemical Subjects.

Chemical Evolution. Molecular Evolution Towards the Origin of Living Systems on the Earth and Elsewhere. Melvin Calvin. Oxford University Press, New York, 1969. x + 278 pp. + plates. Paper, $4.50.

Chemical Fallout. Current Research on Persistent Pesticides. Proceedings of a Rochester Conference on Toxicity, Rochester, N.Y. Morton W. Miller and George G. Berg, Eds. Thomas, Springfield, Ill., 1969. xxii + 538 pp., illus. $22.50.

Chemical Zoology. Vol. 4, Annelida, Echiura, and Sipuncula. Marcel Florkin and Bradley T. Scheer, Eds. Academic Press, New York, 1969. xvi + 552 pp., illus. $27.

Chester Through Derry Conodonts and Stratigraphy of Northern Clark and Southern Lincoln Counties, Nevada. G. D. Webster. University of California Press, Berkeley, 1969. vi + 122 pp., illus. + maps. Paper, $4. University of California Publications in Geological Sciences, vol. 79.

Child and Adolescent Psychology. Behavior and Development. Gene R. Medinnus and Ronald C. Johnson. Wiley, New York, 1969. x + 790 pp., illus. $9.95.

Child Welfare: Services and Perspectives. Dorothy Zietz. Wiley, New York, ed. 2, 1969. xiv + 354 pp., illus. $9.95.

Clinical Toxicology. C. J. Polson and R. N. Tattersall. Lippincott, Philadelphia, ed. 2, 1969. xii + 660 pp. $18.50.

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Colloque sur l'éocène. Paris, May 1968. Vol. 2. Bureau de Recherches Géologiques et Minières, Paris, 1968. 192 pp., illus. + tables. Paper. Mémoires du BRGM, No. 59.

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Computer Compilation of Molecular Weights and Percentage Compositions for Organic Compounds. Michael J. S. Dewar and Richard Jones. Pergamon, New York, 1969. xxx + 478 pp. $32.

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Correlation of Infrared and Raman Spectra of Organic Compounds. Herman A. Szymanski. Hertillon, Cambridge Springs, Pa., 1969. xii + 126 pp., illus. Spiral bound, $2.50.

Critical Point Theory in Global Analysis and Differential Topology. An Introduction. Marston Morse and Stewart S. Cairns. Academic Press, New York, 1969. xii + 396 pp. $18. Pure and Applied Mathematics, vol. 33.

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The Development of Statoconia in Mice. Val B. Veenhof. North-Holland, Amsterdam, 1969. 52 pp. + plates. Paper, $2.80. Verhandelingen der Koninklijke Nederlandse Akademie Van Wetenschappen, Afd. Natuurkunde, Tweede Reeks, Deel 58, No. 4.

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Dilute Solution Reactions of the Nitrate Ion as Applied to Water Reclamation. Frank C. Gunderloy, Jr., Cliff Y. Fujikawa, V. H. Dayan, and S. Gird. Federal Water Pollution Control Administration, Cincinnati, Ohio, 1968. x + 67 pp. Paper. Report No. TWRC-1.

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Dispersion Theories of Strong Interactions at Low Energy. D. V. Shirkov, V. V. Serebryakov, and V. A. Meshcheryakov. Translated, revised, and enlarged from the Russian edition (Moscow, 1967). North-Holland, Amsterdam; Interscience (Wiley), New York, 1969. xii + 364 pp., illus. $19.50.

Dr. Fitzsimons Commemorative Volume. Available from the Director, Namib Desert Research Station, P.O. Box 953, Walvis Bay, South Africa. iv + 150 pp.,

illus. Paper, R4.50. Scientific Papers of the Namib Desert Research Station, Nos. 37–53; IV, 1969.

The Domestication and Exploitation of Plants and Animals. Proceedings of a meeting of the Research Seminar in Archaeology and Related Subjects, London, May 1968. Peter J. Ucko and G. W. Dimbleby, Eds. Aldine, Chicago, 1969. xxvi + 582 pp., illus. $17.50.

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Eclipse Phenomena in Astronomy. F. Link. Springer-Verlag, New York, 1969. x + 272 pp., illus. $19.50.

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Ecology and Behaviour of the Black Rhinoceros (Diceros Bicornis L.). A Field Study. Rudolf Schenkel and Lotte Schenkel-Hulliger. Verlag Paul Parey, Hamburg, 1969. 104 pp., illus. Paper, DM 28. Mammalia depicta.

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Evolution and Phylogeny of Flowering Plants. Dicatyledons: Fact and Theory. J. Hutchinson. Academic Press, New York, 1969. xxvi + 718 pp. , illus. $25.

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Field Guide to Snow Crystals. Edward R. La Chapelle. University of Washington Press, Seattle, 1969. x + 102 pp., illus. Cloth, $6.50; paper, $2.95.

Fine Structure of the Developing Avian Cornea. Elizabeth D. Hay and Jean-Paul Revel. Karger, Basel, 1969 (U.S. distributor, Phiebig, White Plains, N.Y.). viii + 144 pp., illus. $7.70. Monographs in Developmental Biology, vol. 1.

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