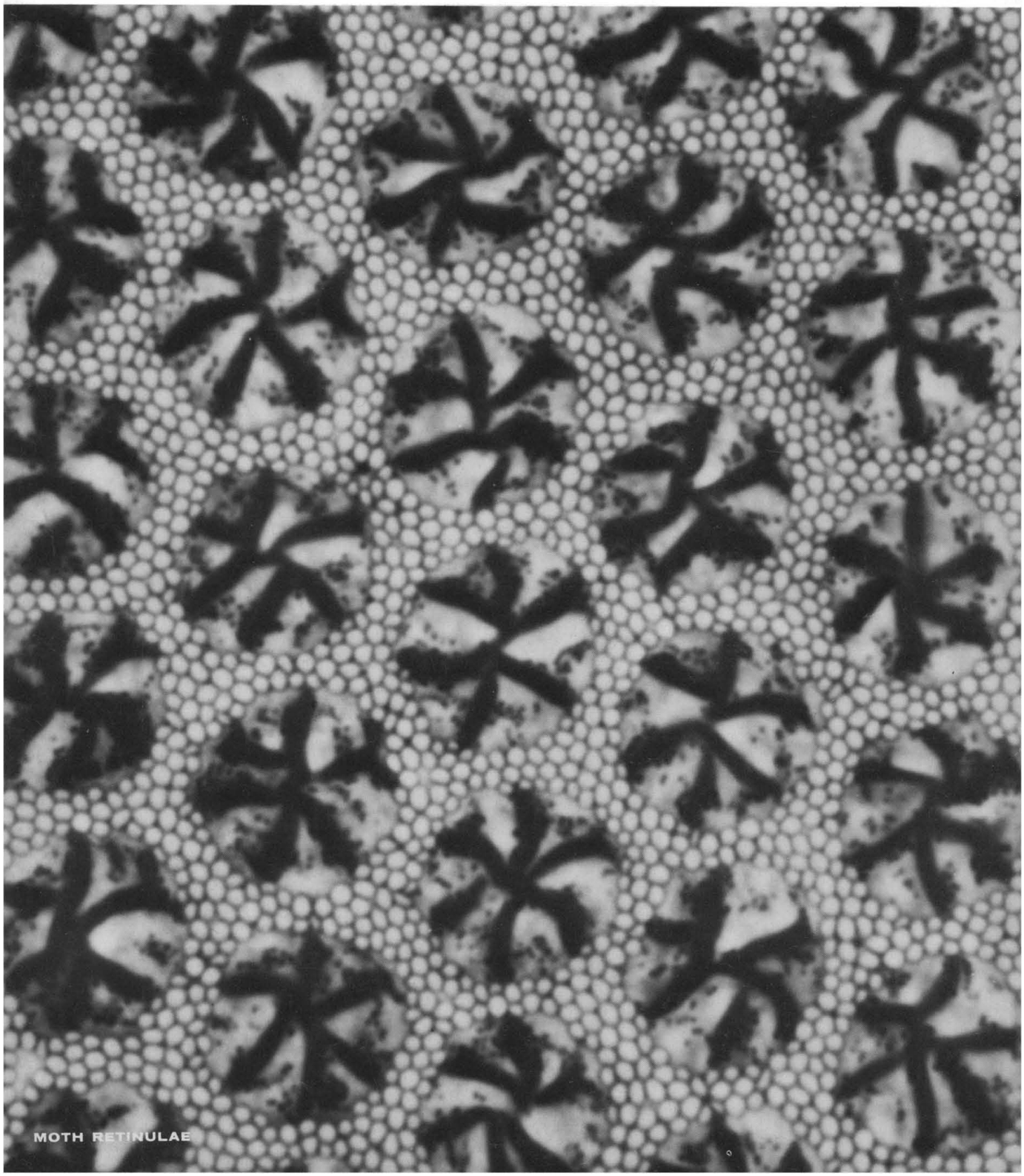
SCIENCE

13 October 1967

Vol. 158, No. 3798

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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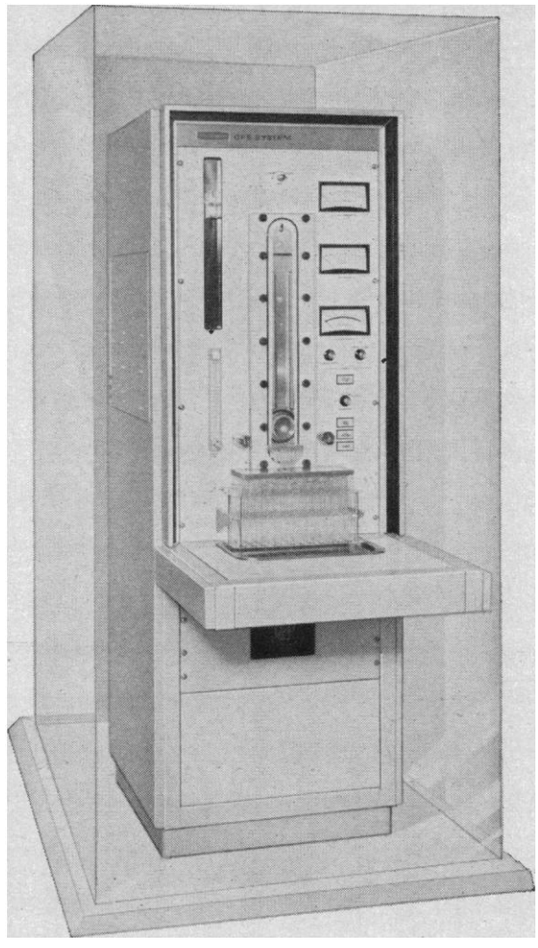

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13 October 1967
Vol. 158, No. 3798

SCIENCE

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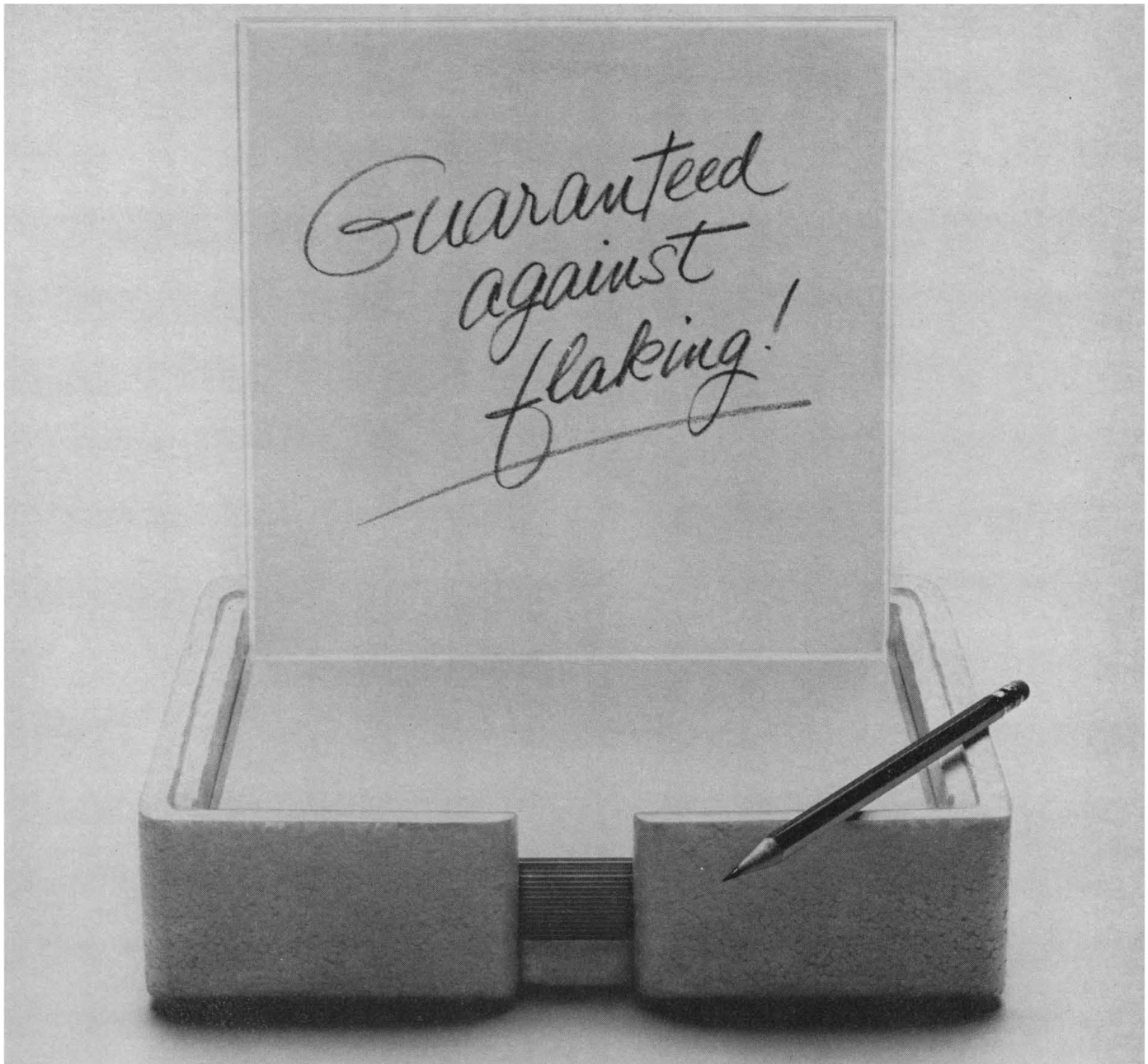
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Photoreceptor cell clusters, or retinulae, of the nocturnal moth *Manduca sexta.* Each retinula is composed of seven to eight photoreceptor cells. The interior cell boundaries represent opposing sets of microtubules upon which the visual pigment is probably located. Aeration of this area is accomplished by the tracheoles which surround each retinula (about × 3000). See page 268. [H. R. Steeves III and J. S. Vande Berg, Virginia Polytechnic Institute, Blacksburg, Virginia]



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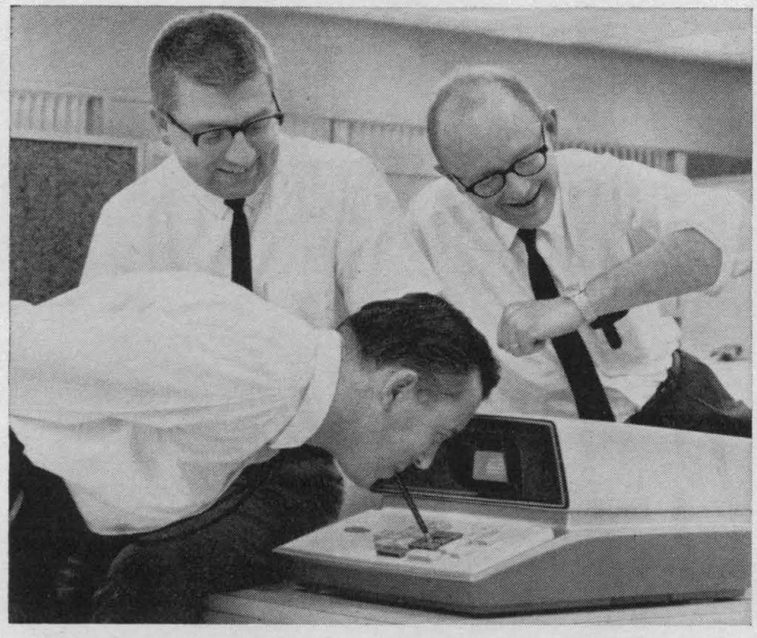
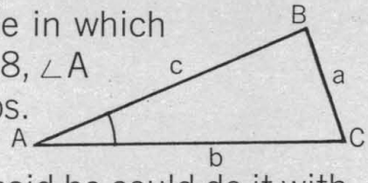


Someone gave him the following problem:

Find the length of side "a" of the illustrated triangle in which b = 12.7, c = 10.8, ∠A = 31° 25′ 10″, Cos. A = .85337.



He laughingly said he could do it with his hands tied behind his back. Someone bet him $5 he couldn't.

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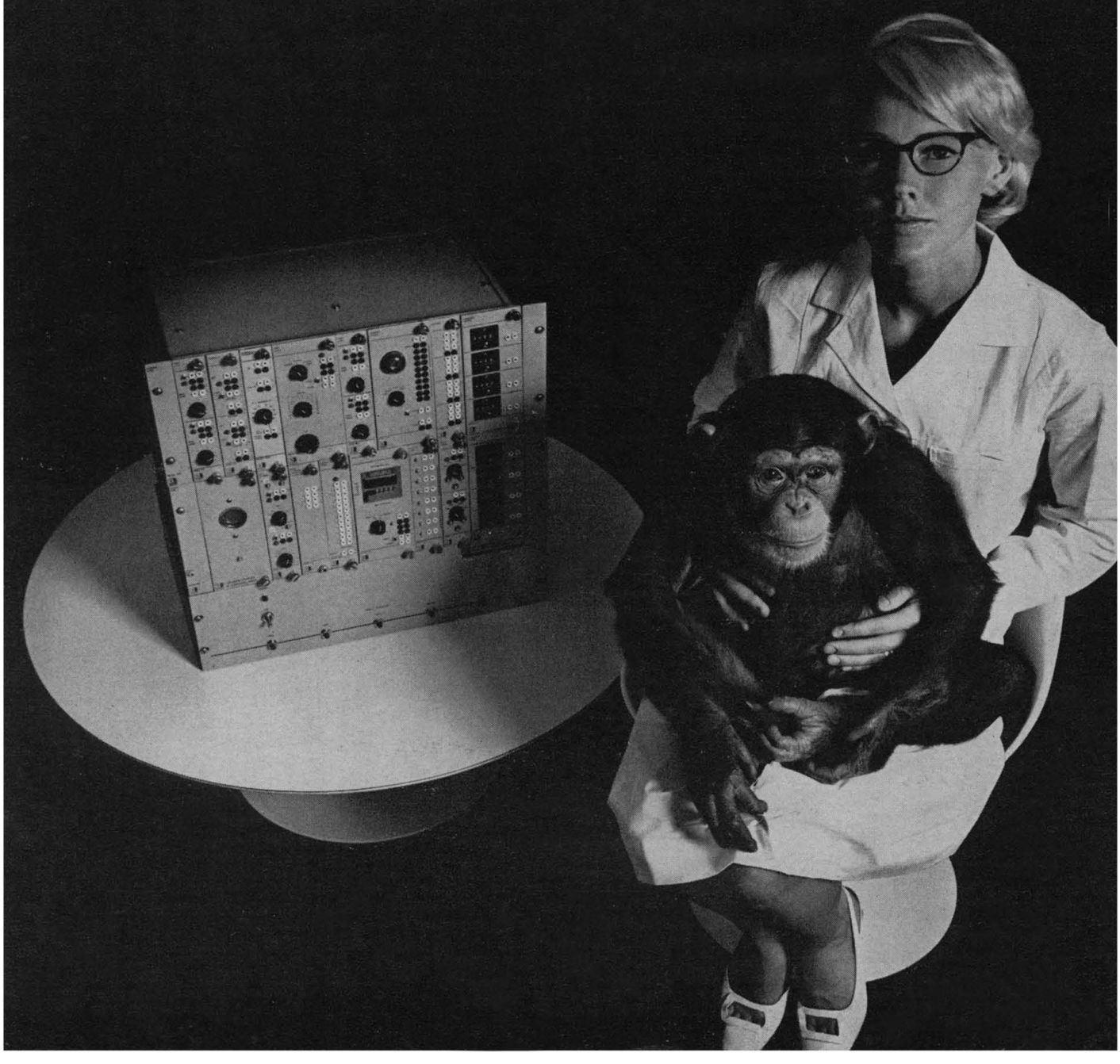

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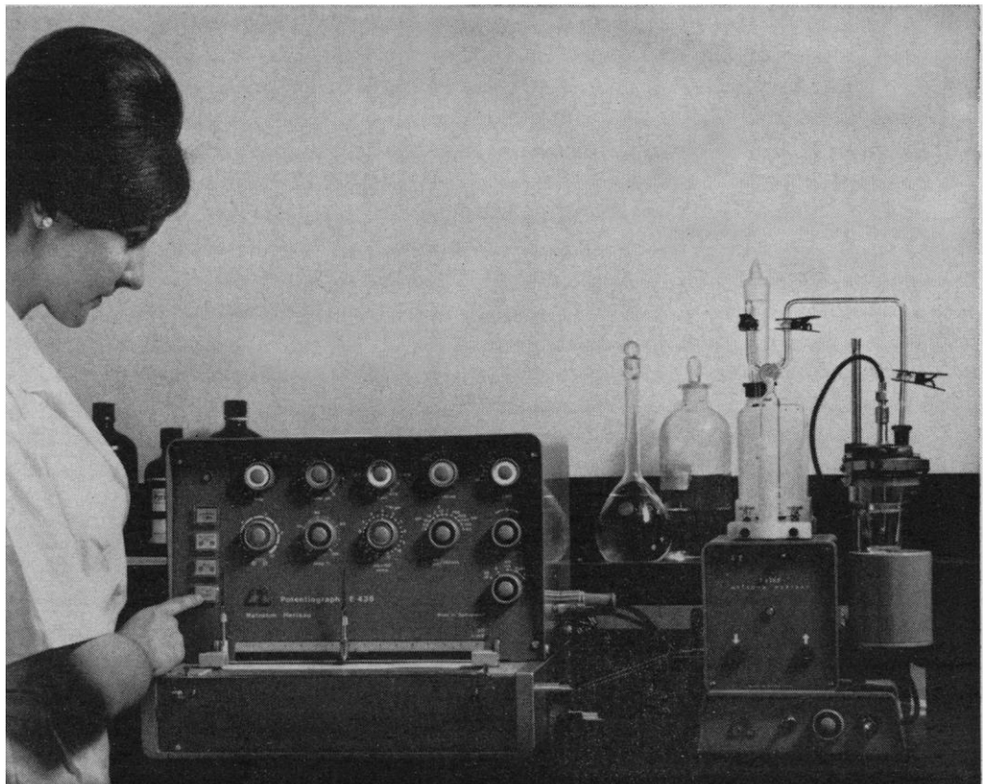

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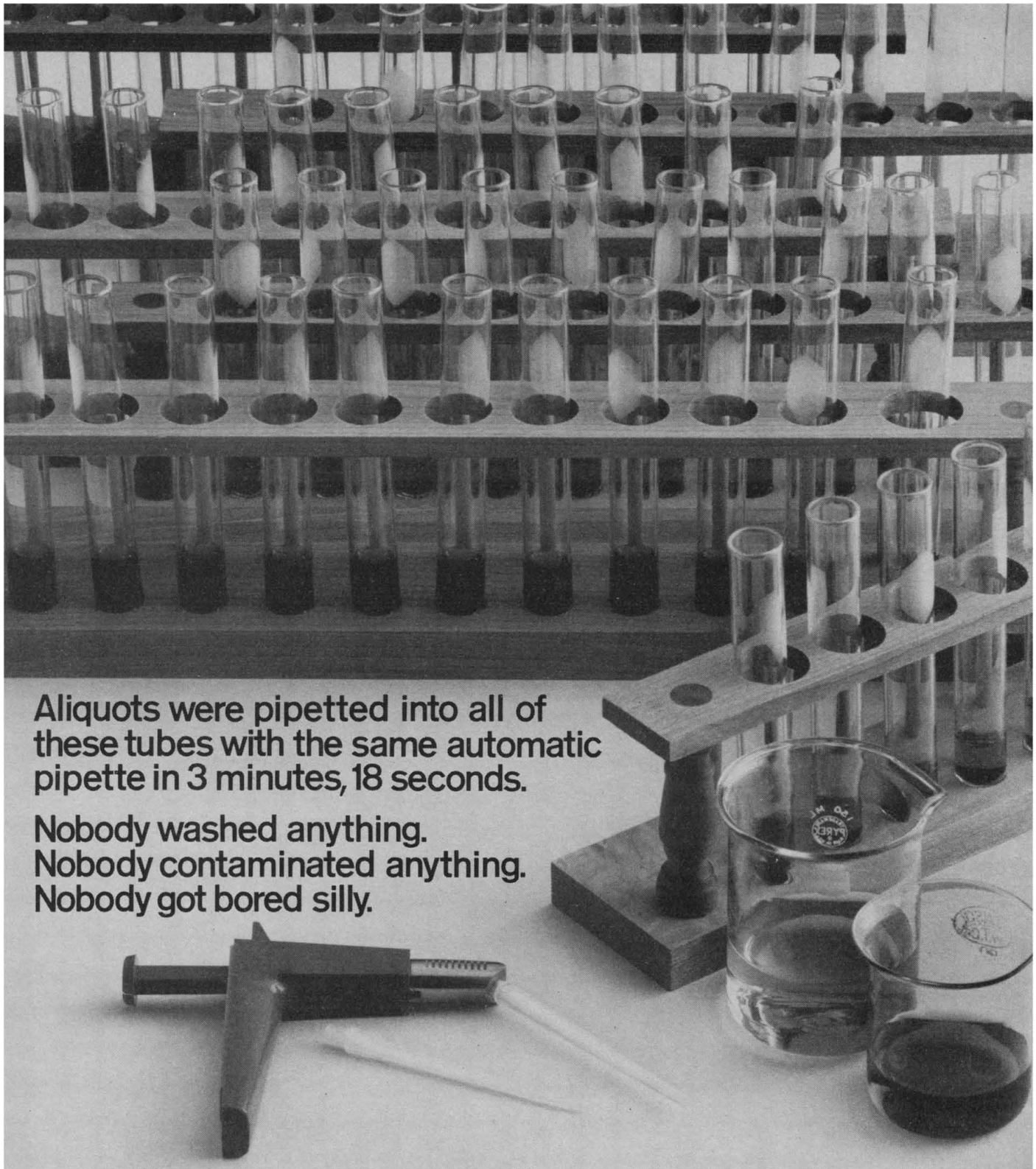

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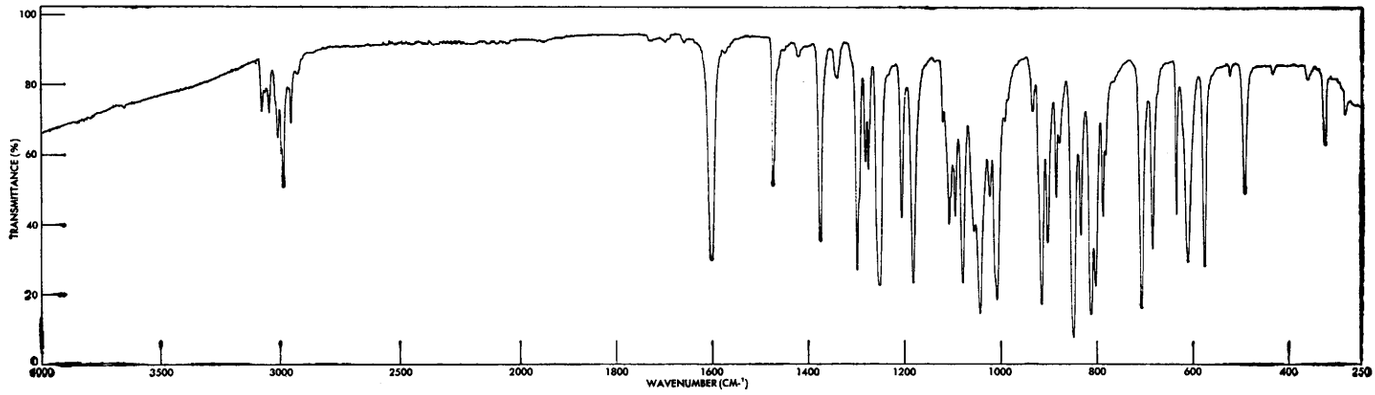

This scan of the insecticide Dieldrin demonstrates the Model 457's ability to provide complete, uninterrupted scans from 4000 to 250 cm^{-1} without energy fall-off. Note the well-resolved sharp band at 280 cm^{-1}. The instrument was run at normal slit program; speed was normal from 4000 to 600 cm^{-1}, slow from 600 to 250 cm^{-1}. 2.5 mg of sample were prepared in 300 mg of KBr and run as a 13 mm disk against a 13 mm KBr blank in the reference beam.

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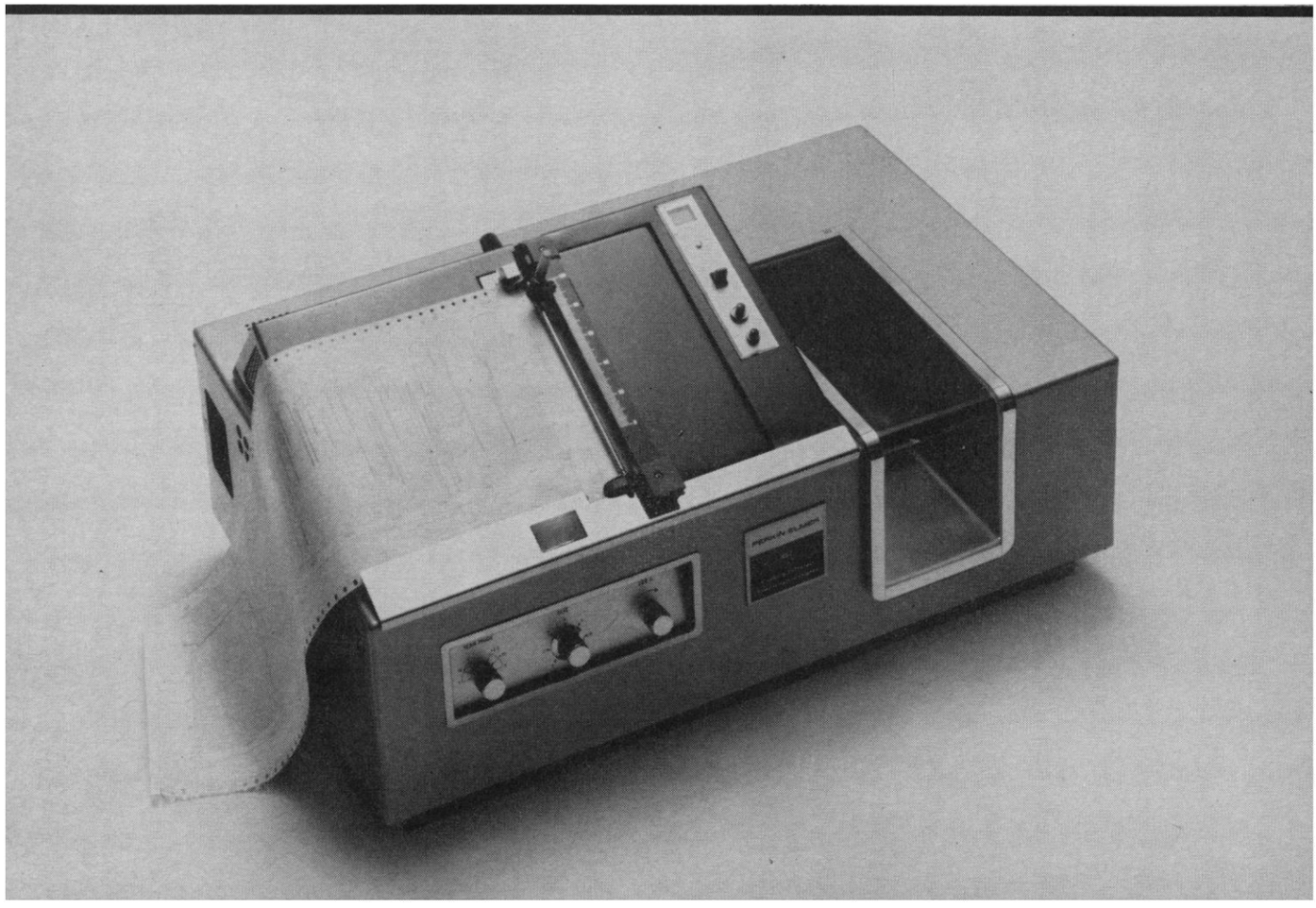

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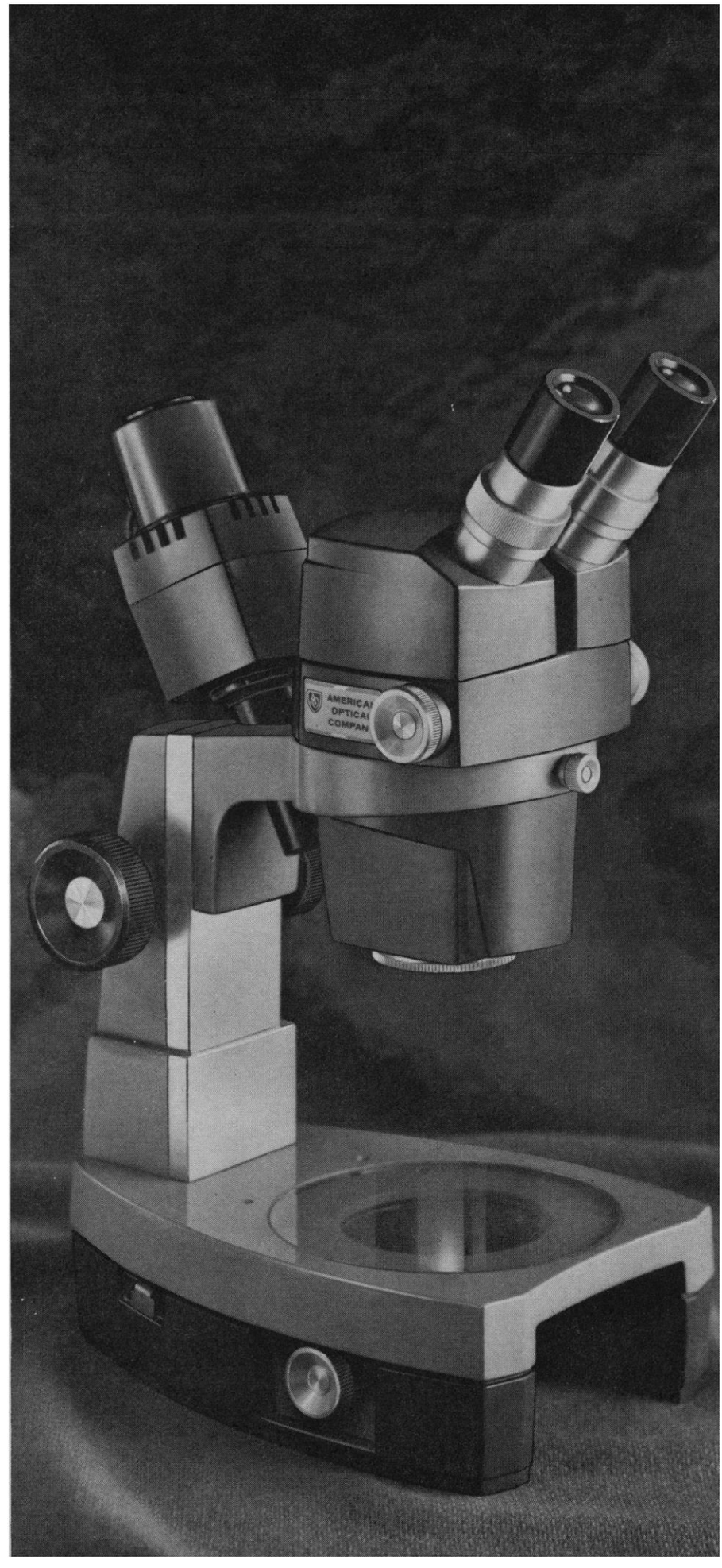

times as many qualified whites as Negroes. Hence, of the University of Michigan's 30,000 students, 1/46th, or about 650, might be expected to be Negro, as opposed to Kazmann's figure of 150. Kazmann quotes an estimate that at present about 450 students are Negro. It therefore seems that the question of discrimination remains open.

PAUL R. CHERNOFF
Department of Mathematics, Harvard University, Cambridge, Massachusetts

. . . I have no knowledge of the University of Michigan's entrance requirements with respect to scores on standardized intelligence tests. The assumption of selecting those whose scores fell among the upper 25 percent of those taking the test was made only for the sake of argument. I could just as well have used the upper 20 percent or 15 percent. In order to apply Chernoff's probability test, and to draw factual conclusions, factual information must be substituted for assumptions. In substance, even the corrected results of the elementary calculation are close enough to the figures actually reported, so that if there is any discrimination against Negro students the calculated figures do not bear it out.

RAPHAEL G. KAZMANN
611 College Hill Drive, Baton Rouge, Louisiana 70808

Dangers to Marine Mammals Confirmed

The cautions emphasized by Schevill and others (11 Aug., p. 630) concerning use of immobilizing drugs in studies of marine mammals are well taken. We have used the immobilizing drug Sernylan (phencyclidine hydrochloride) in studies of pinnipeds both in the laboratory and in the field (*1*). The drug was extremely useful in the laboratory as an easily administered preanesthetic agent enabling us to manage the animal during later induction of controlled surgical anesthesia for thoracotomy and laparotomy; it also permitted us to carry out minor procedures or measurements without using general anesthesia. We had no complications so long as the drug was given in measured doses (0.2 mg per kilogram of body weight) by syringe. However, on a field trip to Guadalupe Island, Mexico, to study diving physiology in the Northern elephant seal, *Mirounga an-*

gustirostris, two deaths occurred on land among old bulls given estimated doses of less than 0.5 mg per kilogram of body weight. Death was apparently due to immoblization of respiratory muscles and subsequent inadequate ventilation. Several adult females tolerated this dose without incident and later underwent surgery for implantation of blood flow telemetry equipment.

Marine mammals so medicated cannot survive in the water: they simply drown. We avoided such fatalities by loading the animals onto a raft—no mean engineering feat considering their size and the circumstances—and floated them to the site where physiological investigations were conducted. When water immersion was a required part of the study, a shallow tank was constructed into which they were lowered, the depth and duration of immersion being regulated by a hoist.

ROBERT L. VAN CITTERS
Department of Physiology and Biophysics, University of Washington School of Medicine, Seattle 98105

Reference

1. R. Van Citters, D. Franklin, O. Smith, N. Watson, R. Elsner, *Comp. Biochem. Physiol.* **16**, 267 (1965); R. Van Citters, O. Smith, N. Watson, D. Franklin, *Hvalradets, Skrifter* **48**, 15 (1965); R. Elsner, R. Van Citters, D. Franklin, D. Kenny, *Science* **153**, 941 (1965).

Unlimited National Resources?

In his statement of concern over the New York *Times* editorial which attacks the appropriation of national funds for a 200-Bev accelerator, Weisskopf (Letters, 25 Aug.) implies that our nation has access to an inexhaustible storehouse of resources. It should be clear to all of us that our nation cannot " . . . support all that is positive and valuable in our civilization." Man with his remarkable creative powers has demonstrated an ability to dream far beyond his ability to turn dreams into reality. Therefore, our attention must be focused increasingly on assignment of priorities, a problem which has received the informed attention of Weinberg (*Reflections on Big Science*, M.I.T. Press, Cambridge, Mass., 1967) and Pitzer (*Science*, 18 Aug., p. 779), among others.

WILMER K. FIFE
Department of Chemistry, Muskingum College, New Concord, Ohio

13 October 1967, Volume 158, Number 3798

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EDITORIAL CORRESPONDENCE: 1515 Massachusetts Ave., NW, Washington, D.C. 20005. Phone: 202-387-7171. Cable: Advancesci, Washington. Copies of "Instructions for Contributors" can be obtained from the editorial office. ADVERTISING CORRESPONDENCE: Rm. 1740, 11 W. 42 St., New York, N.Y. 10036. Phone: 212-PE 6-1858.

Technology Assessment

Should the U.S. build the SST, the commercial supersonic airplane? Arguments over this question illustrate why members of Congress want to increase congressional competence to assess the consequences of technological developments and proposals. The noise of early airplanes was no more annoying than their payloads were profitable. But now the physiological and social costs of the SST's continent-wide and ocean-wide sonic boom must be weighed against its effects on transportation efficiency and on the nation's balance of payments. Decisions about the SST must be made after the country has awakened to the undesirable consequences of other technological developments: pollution, health hazards to man and animals, killed lakes, lost estuaries, noise, and ugliness. We have long known the benefits of advancing technology. Recently we have become more acutely aware that some of the consequences are undesirable. We know, too, that the increasing scale and scope of technological power increase both the potential benefits and the potential harm. What, congressmen are asking, can Congress do to become better able to assess the consequences of technology?

The question should be considered not as a new kind of problem but as a new example of an old problem. What Congress needs in deciding about the SST or other technological matters is essentially what it needs in deciding about taxes, military affairs, education, or other matters with which it deals: ability to ask the right questions and ability to evaluate critically the information it receives from advocates and opponents of proposed actions.

The necessary competence cannot be secured by assigning technology to a committee of each House, as agricultural or tax matters are assigned; the uses and the effects of technology are too pervasive. So other solutions are being discussed: special committees, a joint committee of the two Houses, an ancillary agency similar to the Science Policy Research Division of the Legislative Reference Service, and others (*Science*, 18 August).

Last month the House Committee on Science and Astronautics met with ten invited consultants for a seminar on technology assessment. The participants did not try to agree on the means to be adopted, but they did agree that Congress needs a greater competence of its own in order to weigh and balance the arguments of the advocates and opponents of a particular proposal and the work of the many public and private bodies that are already engaged in some kinds of technology assessment.

Two characteristics of the new means—whatever form it takes—seem clear. First, the professional competence required will not be confined to technology itself. Social and economic and even moral and esthetic values must be considered. The relations of the federal government with industry, with states and communities, and with other nations will sometimes have to be considered, and new legal or social policies may be necessary. Broader wisdom than is to be found in any one specialty will be required.

Second, the new agency will inevitably become involved with national goals. Congress is not alone in setting national goals, but Congress has great influence in determining priorities and time schedules and in allocating national resources. If decisions on these matters are to be made realistically, attention must often be given to the state and trends and potentialities of technology. Moreover, at least some of the criteria for evaluating a technological proposal must be based on analysis of how it is likely to support or to interfere with the attainment of accepted goals. Congressional assessment cannot ask only, "Where is technology taking us?" but must also ask, "How can technology help us get where we want to go?"—DAEL WOLFLE

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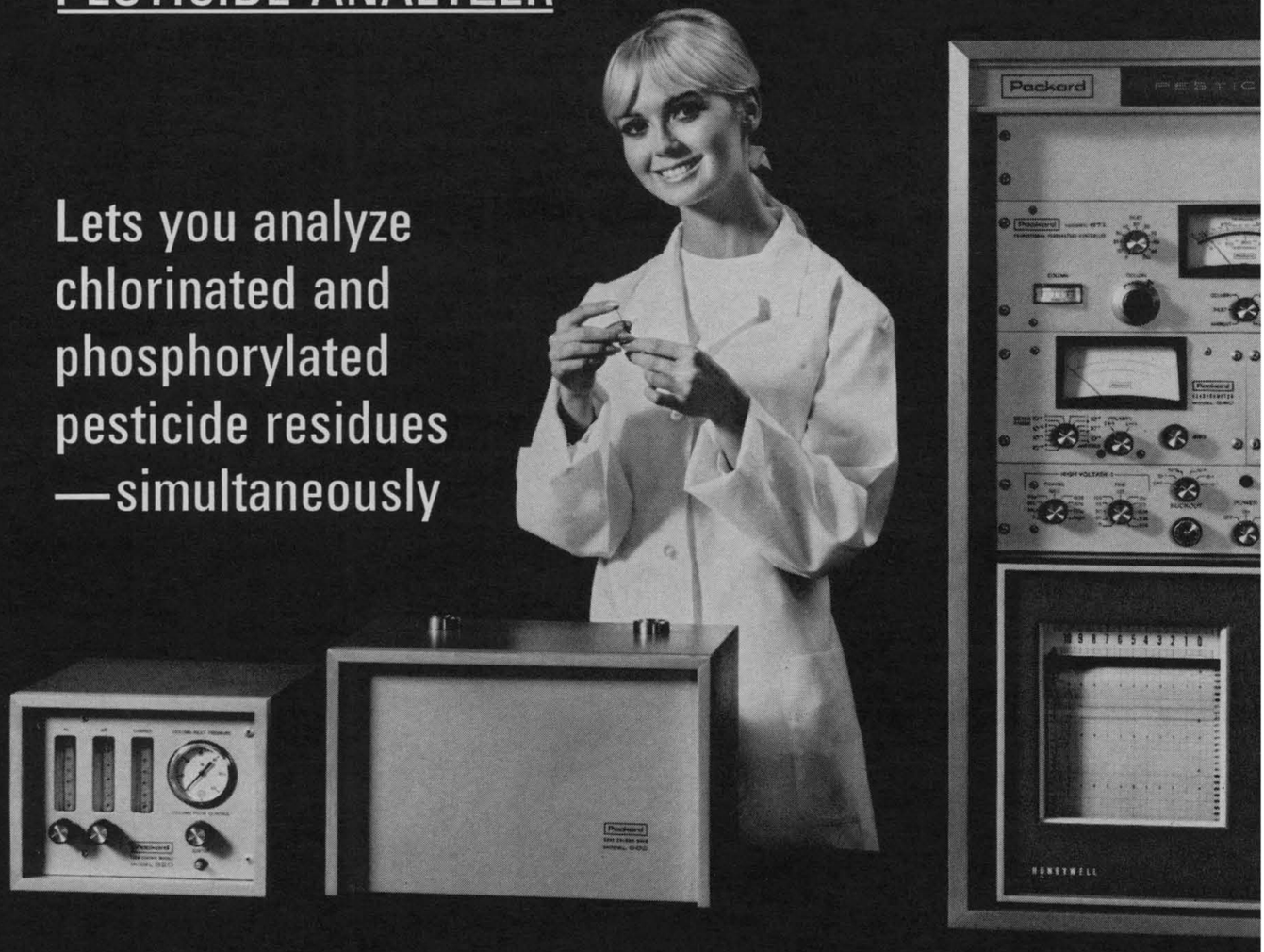

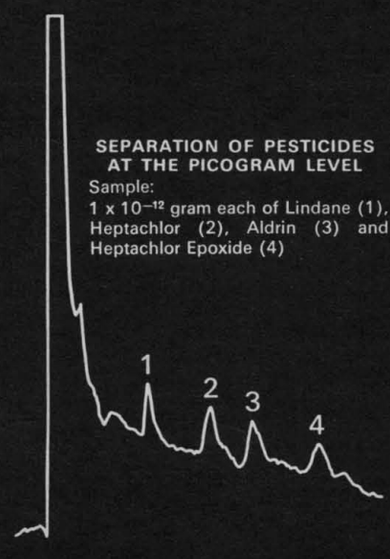

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The hope of doing each other some good prompts these advertisements

Exobiology, eh?

The late Edwin E. Jelley came to Rochester in our earlier days from the Research Laboratories of Kodak Limited in Harrow. He was fascinated by the interaction of dye molecules one with another. Physical chemists have honored his name by the term "J-band" for the intense, narrow absorption band he found down-frequency from the monomeric absorption band of a dye when it attaches itself to an anionic macromolecule.

Leslie G. S. Brooker has invented an incredible number of useful dyes since he, too, came to us from England. His patent on 4,5,4′,5′-dibenzo-3,3′-diethyl-9-methylthiacarbocyanine bromide expired on February 23, 1949. Now, a second 17 years later, we find we can render a significant service by offering the dye itself for sale, rather than just the benefit of its application in some of our photographic products.

It appears to offer an extraordinarily sensitive test for biological macromolecules in inorganic matter. Not only does a J-band appear at 650mμ in the presence of proteins, but other spectral changes mark other important classes of macromolecules, including nucleic acids and substituted polysaccharides.

Evaluation of this apparently remarkable dye is the purpose of NASA CR-466, a 76-page report entitled "Experimental Studies for the Detection of Protein in Trace Amounts," for sale at $3 by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. At $10.45, a gram of the compound itself as EASTMAN *2718, under the name* 1-Ethyl-2-[3-(1-ethylnaphtho[1,2d]thiazolin-2-ylidene)-2-methylpropenyl]naphtho[1,2d]thiazolium Bromide, *can be ordered from Eastman Organic Chemicals Department, Distillation Products Industries, Rochester, N.Y. 14603 (Division of Eastman Kodak Company).*

Before the 76-page report had brought new insight on the reaction mechanism of the dye and word of its behavior with humic acid (a substance easier to define operationally than chemically), we had already had numerous inquiries for this particular Brooker dye. They had resulted from a paper by workers who had obviously been applying themselves to some of the basic literature that has come out of our half-century of research on the photographic process. The paper had appeared in *J. Phys. Chem. 68:1896. It proposes that, for a great many complexes that the dye forms with trace amounts of protein, the exact wavelength of the induced maximum is characteristic of the protein.* Results are listed for 32 proteins and 37 peptides, as well as for 9 nucleotides and the difference between DNA and RNA.

Chemical price f.o.b. Rochester, N.Y. and subject to change without notice.

For the attention of geologists, ecologists, plant pathologists, wildlife management people, or others considering aerial photography:

Either send $2 to Dept. 454, Eastman Kodak Company, Rochester, N.Y. 14650 for brand new book, M-29, "Kodak Data for Aerial Photography" . . .

or ask Dept. 926, Eastman Kodak Company, Rochester, N.Y. 14650 to send you names of some reliable people who can relieve you from reading the book.

In the interests of solvent customers and mild air

Defenders of air pollution are now scarcer than foes of motherhood or friends of sin. Something will doubtless be done about automotive fumes. Furthermore, attention is turned to how you pollute the air when you paint your dwelling and all that solvent evaporates. As a maker of solvents we feel involved. We sympathize with our paint-and-lacquer-manufacturing customers, with the regulatory authorities, and with the innocent public, which includes us too. The issues are not only ethically and economically complex but also chemically so.

On the roof of the laboratory of the National Center for Air Pollution Control in Cincinnati, plastic containers of air are exposed to the sun. The air in the boxes has been loaded with about the number of parts per million of various olefins and aldehydes that might be encountered in a vicinity where people are earning a livelihood, maintaining their possessions, or just strolling in the park. The solar radiation below 340mμ turns out to be quite capable of oxidizing aliphatic aldehydes to intermediates that react with olefinic and aromatic hydrocarbons at these dilutions to produce significant levels of mucosal irritants and phytotoxicants. This process, some fear, could thwart efforts to sweeten the air by regulating nitrogen oxide effluvia.

Slightly ahead of regulatory action in less populous areas, Los Angeles County meanwhile has put into effect quantitative restrictions on the sale and use of photochemically reactive solvents. These are spelled out: 1) any hydrocarbons, alcohols, aldehydes, esters, ethers, or ketones with olefinic or cycloolefinic unsaturation; 2) aromatics of 8 or more carbons; 3) toluene; 4) trichloroethylene; 5) branched-chain ketones.

We are big both in branched-chain ketones and in competitive instinct. The latter has forced us to outperform competitors in helping solvent customers work out effective replacement formulas with the least rise in cost—even when necessary to include competitors' solvents in our suggestions.

Companies that wish to keep in touch with those suggestions should register their interest with Eastman Chemical Products, Inc., Kingsport, Tenn. 37662 (Subsidiary of Eastman Kodak Company).

Kodak

FISHER ACCUMET® pH METER, MODEL 210, ASSURES RELIABILITY BECAUSE IT TELLS ON ITSELF.

October, 1967

FISHER PRODUCT REPORT

Fisher Accumet pH meters have a unique test circuit, which—when a pH or potential reading is questioned—tells you whether the electrodes, buffer, sample or instrument is at fault. Accumet pH meters are tattletales—and that's just one reason you can rely on them. The high-stability, low-drift Fisher Accumet Model 210 and Research Model 310 should be your choice for routine pH measurements, titrations and research applications. (And, they are supplied with Fisher's quality electrodes.)

The Fisher Accumet 210 is a portable instrument with distinctive features not found in other pH meters in its price range. It is small, weighs only 10 pounds. It is equally accurate in the laboratory, operating on AC, or in the field, operating on batteries. It makes accurate pH readings in two seconds. And the Accumet 210 has a solid-state power supply that prevents readings from being affected by line-voltage fluctuations of up to 10 percent. When it is properly standardized, the Accumet 210 meter will read pH with an accuracy better than ±0.05 unit and a reproducibility of ±0.02.

For microtitrations or pH measurements in small samples, the Model 210 can be supplied with a Micro Swing-Arm Assembly, permitting the use of Fisher 2½-inch, miniature electrodes.

The Fisher Accumet 310 pH meter is designed for precision research as well as routine lab work. It has three mirror-back, parallax-free, seven-inch scales. On its expanded range, it can measure pH with an accuracy of ±0.005 unit and can be read to ±0.002 pH—on the normal range, to ±0.02 unit. The normal 0-14 pH (0 to ±1400 mv) range is divided into 13 overlapping 1.4-pH

SO DOES FISHER RESEARCH MODEL 310.

ranges in the expanded mode. In addition to the normal and expanded scales, the Accumet 310 has a logarithmic scale. This is used with a specific-ion electrode to measure ionic activity of monovalent ions in solutions. The sensitivity of the Accumet 310's expanded range makes this instrument ideal for microtitrations, using the Micro Swing-Arm Assembly.

Fisher also makes and individually tests its own rugged, full-range, high-quality electrodes that permit your making pH measurements and titrations with confidence. They are equipped with standard connectors and can be used with other direct-reading pH meters, as well as Fisher's own Accumet line. There is a complete selection of glass, reference, combination and metal electrodes for your laboratory needs.

Price of Fisher Accumet Model 210	$330
Price of Fisher Accumet 210 with Micro Swing Arm	$360
Price of Fisher Accumet Research Model 310	$645

More information? Write today for our free brochure concerning the entire Fisher Accumet line, and Fisher's expanded line of high-quality electrodes. Contact Fisher Scientific Co., 1398 Fisher Building, Pittsburgh, Pa. 15219.

G-652

FISHER SCIENTIFIC CO.

Instruments, apparatus, furniture & chemicals for laboratories • ATLANTA BOSTON CHICAGO CINCINNATI CLEVELAND HOUSTON PHILADELPHIA PITTSBURGH ST. LOUIS NEW YORK WASHINGTON EDMONTON MONTREAL TORONTO VANCOUVER

RECENT FINDINGS

RESEARCH LABORATORIES

Ford

Evidence of chain folding of polymers in solution

Nuclear magnetic resonance spectroscopy (NMR) has been used to study normal paraffin molecules, CH_3-$(CH_2)_{n-2}$-CH_3, in solution. These molecules are low molecular homologues of polyethylene. In this investigation, a new understanding of polyethylene structures in solution was obtained by examination of these homologous molecules. A precis of the essential experimental evidence is given below.

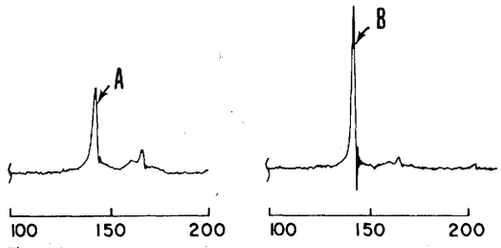


Figure 1

A. Methylene resonance of nonane (C_9H_{20}) in carbon tetrachloride solution at 35° C. B. Methylene resonance of eicosane ($C_{20}H_{42}$) in carbon tetrachloride solution at 35° C.

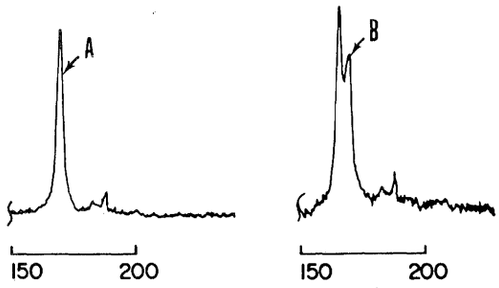


Figure 2

A. Methylene resonance of hexadecane ($C_{16}H_{34}$) in α-chloronaphthalene solution at 35° C. B. Methylene resonance of tetracosane ($C_{24}H_{30}$) in α-chloronaphthalene solution at 35° C. • Note: that the tetracosane resonance is split though the hexadecane has a single peak.

Except for penultimate groups, the CH_2 resonance of the normal paraffins is expected to be a singlet. Figure 1.

In certain aromatic solvents, this CH_2 resonance becomes more complex (provided that the chain length of the molecule is sufficiently long). Figure 2.

The complexity in the NMR spectrum tends to disappear as the temperature of the solution is raised. Figure 3.

The results enumerated above are insensitive to the solution concentration over a wide range (0.2% to 10%).

It follows from these experiments that under certain conditions, as in Figure 2b, the carbon atoms of the chain molecules are arranged in such a way that certain -CH_2-groups are in very different chemical environments from others on the same molecule. There is no simple direct evidence which tells what causes these different chemical environments.

Figure 3

Methylene resonance of docosane ($C_{22}H_{48}$) in α-chloronaphthalene solution. A. At 51° C. B. At 94° C. At still higher temperature the peak becomes a simple singlet.

It is known that polyethylene and other polymeric molecules fold back and forth in the crystallic solid. The hypothesis that these folded chain arrangements persist in some solutions for polyethylene and the normal paraffins, which are low molecular weight polyethylene, is an attractive one. An analysis of the problem indicates that the dependence of chain folding on temperature and chain length is entirely consistent with the experiments shown in Figures 2 and 3.

The conclusion that chain folded arrangements are actually found in normal paraffin hydrocarbons is a probable one, though this may not be considered as firmly established. By implication, it would follow that similar structure may be found in other polymeric systems in solution. Further investigations are in progress to discover whether this is true, and if true, where the phenomenon is found.

Ford scientists and engineers have long known that improvements are most likely obtained when knowledge of the systems and materials under investigation is both sophisticated and profound. It is in this context that fundamental studies such as these become natural objectives of Ford research.

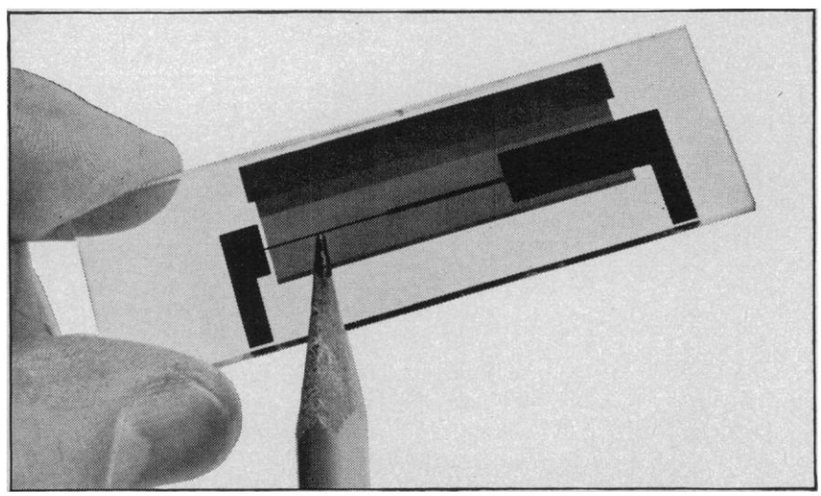
PROBING DEEPER FOR BETTER IDEAS

Ford

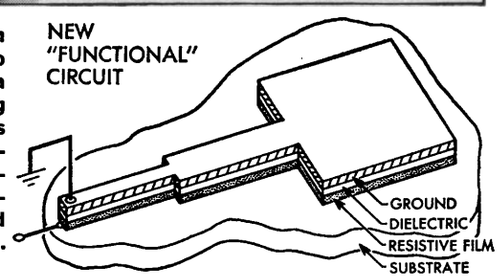
Report from

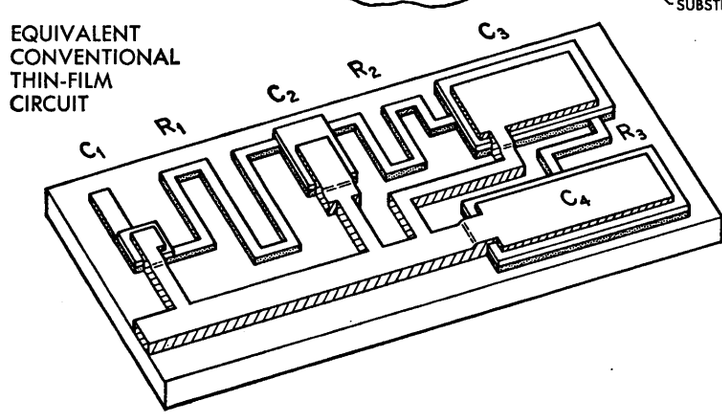
BELL LABORATORIES

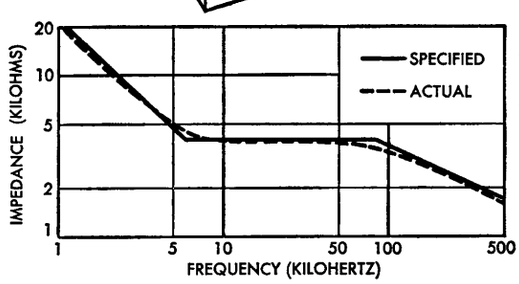
"Functional" Tantalum Integrated Circuits



The new "functional" thin-film circuit, shown in the above photo and in the drawing, right, is a two-terminal network consisting of thin films deposited on a glass substrate. For equivalent electrical performance, a conventional thin-film circuit would require at least three resistors and four capacitors (drawing, below).







Wyndrum formulated a class of equations which relate frequency response to the geometry of the thin-film pattern. The curves, left, show the specified and actual performance of such a circuit.

As electronic systems have grown in size and complexity, tantalum integrated circuits have reduced costs while increasing reliability and performance. To obtain even further integration of circuit functions, however, engineers at Bell Telephone Laboratories have used tantalum technology to build single thin-film components equivalent to networks of thin-film resistors and capacitors.

This new single, "functional" component (left) is basically a film capacitor with one electrode of resistive tantalum and a second electrode of conductive gold, separated by a dielectric layer of tantalum pentoxide. The component is made by depositing a thin film of tantalum onto a glass substrate, converting a portion of this layer to the insulating oxide, and then depositing the conductive gold electrode onto the oxide. In this arrangement, resistance and capacitance are distributed throughout the structure rather than among discrete electrical components. In addition to providing reliability and economy, this approach also offers the advantages of simpler fabrication and fewer electrical parasitics.

As an important contribution to the design of such structures, Bell Laboratories engineer Ralph W. Wyndrum, Jr., showed that it was possible to convert circuit performance specifications directly to tantalum thin-film patterns. Furthermore, he showed how appropriate geometries and film compositions could yield a wide range of impedance and transfer functions.

Wyndrum developed this synthesis technique while doing graduate work at New York University. He has advanced this technique further at Bell Laboratories, where tantalum integrated circuits were first created some ten years ago.

Bell Telephone Laboratories
Research and Development Unit of the Bell System

ological processes of sewage treatment.

Even outlying lakes in recreational areas, such as Lake Tahoe and Lake Windermere (England), are changing at a rapid pace due to drainage from septic tanks and resort and hotel sewage (Edmondson; J. W. G. Lund, England; R. A. Vollenweider, Italy).

Speakers concurred that it is now of greatest urgency to prevent further damage to water resources and to take corrective steps to reverse present damages. Suggested preventive and corrective measures include removing nutrients from municipal, industrial, and agricultural wastes; controlling algae and aquatic plants with chemical and mechanical removal methods; and establishing shoreland corridor regulations to protect lakes from further damage.

Rohlich emphasized that significant advances in sewage treatment have been offset by the huge increase in the population; hence corrective measures now necessary—such as diverting treated sewage through long pipes around highly populated lakes or even chemical stripping for removal of nutrients—are expensive. Treated sewage has been diverted around lakes Monona, Waubesa, and Kegonsa (Wisconsin); Lake Okoboji (Iowa); Lake Washington (Seattle); four lakes in Germany, two in Austria, and one in France. Recovery of these lakes after diversion of sewage effluent has been significant and promising (Edmondson).

Machinery, some still in the idea stage, was described by D. F. Livermore (Wisconsin) for harvesting large aquatic plants which choke irrigation ditches, floodwater canals, and shallow areas of tropical and temperate lakes. Chemical poisons which accomplish a less desirable effect of killing unwanted aquatic plants were evaluated by H. F. Mulligan (Cornell). Chemicals, however, distort the structure of multispecies aquatic communities and hence are less useful in lakes than they are in agriculture, where weeds for a single crop such as wheat have to be eradicated. In addition, chemicals are more difficult to manage and to restrict to problem areas within a body of water.

Several reports dealt with the positive features of eutrophication, namely, how to utilize sewage to fertilize forests (C. F. Cooper, Michigan) and augment crops of fish (Larkin), and how to direct the biological processes to yield useful and desirable species rather than objectionable ones. In addition, farm manure, particularly phosphorus, can be kept on the land at a profit if farmers could fluidize it and sprinkle it in spring and summer when the soil will hold it, rather than spread it on frozen land in winter (J. W. Biggar, Wisconsin).

The racing processes of eutrophication are too rapid to risk delay in taking legal action, emphasized J. H. Beuscher (Wisconsin), a leader in applying new concepts of water law to the alleviation of eutrophication. He stressed the need for proper zoning ordinances and forthright public initiative in modernizing the law when the scientific data, while not complete, suggested action. A new law in Wisconsin, which he was instrumental in formulating, requires a 1000-foot setback for all cottages and buildings on lakes and a 300-foot setback on streams, together with stricter specifications for septic tank construction depending upon soil percability. Edmondson described citizen participation in the bonding of a community for development of an expensive, $100-million sewage diversion program around Lake Washington, Seattle.

Predicting the consequences of eutrophication would be highly desirable for decision-makers. F. E. Smith (Michigan) described new techniques for constructing mathematical models of a drainage basin to make it possible to evaluate changes which might take place as various eutrophicating factors occur. Systems analysis is a powerful tool in dealing with these complex problems in which multifactor cause and effect are involved.

Scientists, engineers, and society in general will find in the forthcoming proceedings of the symposium, to be published early next year, facts about the accelerating process of eutrophication and suggestions for future action in coping with the rapidly worsening problem. It is paradoxical that the ancient night soil is still the most efficient use of man's manure; the flush toilet and sewers, which dump ever-increasing amounts of nutrients into our water resources, are a mixed blessing.

The renowned Wisconsin naturalist Aldo Leopold once said that the outstanding scientific discovery of the 20th century is not television or radio but rather the complexity of the land organism. It appears the general public, as well as the scientific community, is just beginning to realize the full impact of his statement.

The symposium was sponsored by

the National Academy of Sciences–National Research Council in cooperation with the U.S. Atomic Energy Commission, U.S. Department of the Interior, National Science Foundation, and the office of Naval Research.

ARTHUR D. HASLER
MARLETTE E. SWENSON
Laboratory of Limnology and
University-Industry Research Program, University of Wisconsin, Madison 53706

Calendar of Events—October

National Meetings

20–23. American **Heart** Assoc., 40th annual mtg., San Francisco, Calif. (AHA, 44 E. 23 St., New York 10010)

21–23. American Soc. of **Cytology**, Denver, Colo. (W. R. Lang, 1025 Walnut St., Philadelphia, Pa. 19107)

21–26. American Acad. of **Pediatrics**, annual mtg., Washington, D.C. (R. G. Frazier, 1801 Hinman Ave., Evanston, Ill. 60204)

22–26. American **Documentation** Inst., New York, N.Y. (J. E. Bryan, 2000 P St., NW, Washington, D.C. 20036)

22–26. American Soc. of **Sanitary Engineering**, annual mtg., Boston, Mass. (S. Schwartz, 228 Standard Bldg., Cleveland, Ohio 44113)

23–24. American College of **Preventive Medicine**, annual mtg., Miami, Fla. (J. J. Wright, Box 1263, Chapel Hill, N.C. 27514)

23–25. National **Electronics** Conf., Chicago, Ill. (R. J. Napolitan, 228 N. LaSalle St., Chicago 60601)

23–25. Society of **Rheology**, 38th annual mtg., Washington, D.C. (J. C. Miller, Plastics Div., Union Carbide, Bound Brook, N.J.)

23–26. American **Vacuum** Soc., 14th natl. mtg., Kansas City, Mo. (P. J. Bryant, Midwest Research Inst., 425 Volker Bldg., Kansas City, Mo. 64110)

23–27. American Inst. of **Aeronautics and Astronautics**, 4th annual mtg., Anaheim, Calif. (Meetings Manager, AIAA, 1290 Sixth Ave., New York 10019)

23–27. **Drug Discovery and Development**, symp., Hopatcong, N.J. (W. Oroshnik, Saul Gordon Associates, Center for Professional Advancement, P.O. Box 66, Hopatcong 07843)

23–27. American **Public Health** Assoc., 95th annual mtg., Miami Beach, Fla. (B. F. Mattison, 1790 Broadway, New York 10019)

25–27. **Antimicrobial Agents and Chemotherapy**, 7th interscience conf., Chicago, Ill. (R. W. Sarber, 115 Huron View Blvd., Ann Arbor, Mich.)

25–27. **Graphics Arts**, 4th conf., Rochester, N.Y. (K. G. Chesley, TAPPI, 360 Lexington Ave., New York 10017)

25–27. Gulf Coast Assoc. of **Geological** Socs./American Assoc. of **Petroleum Geologists**, San Antonio, Tex. (A. M Borland, Sun Oil Co., Box 3308, Lafayette, La.)

25–28. American Acad. of **Periodontol-**