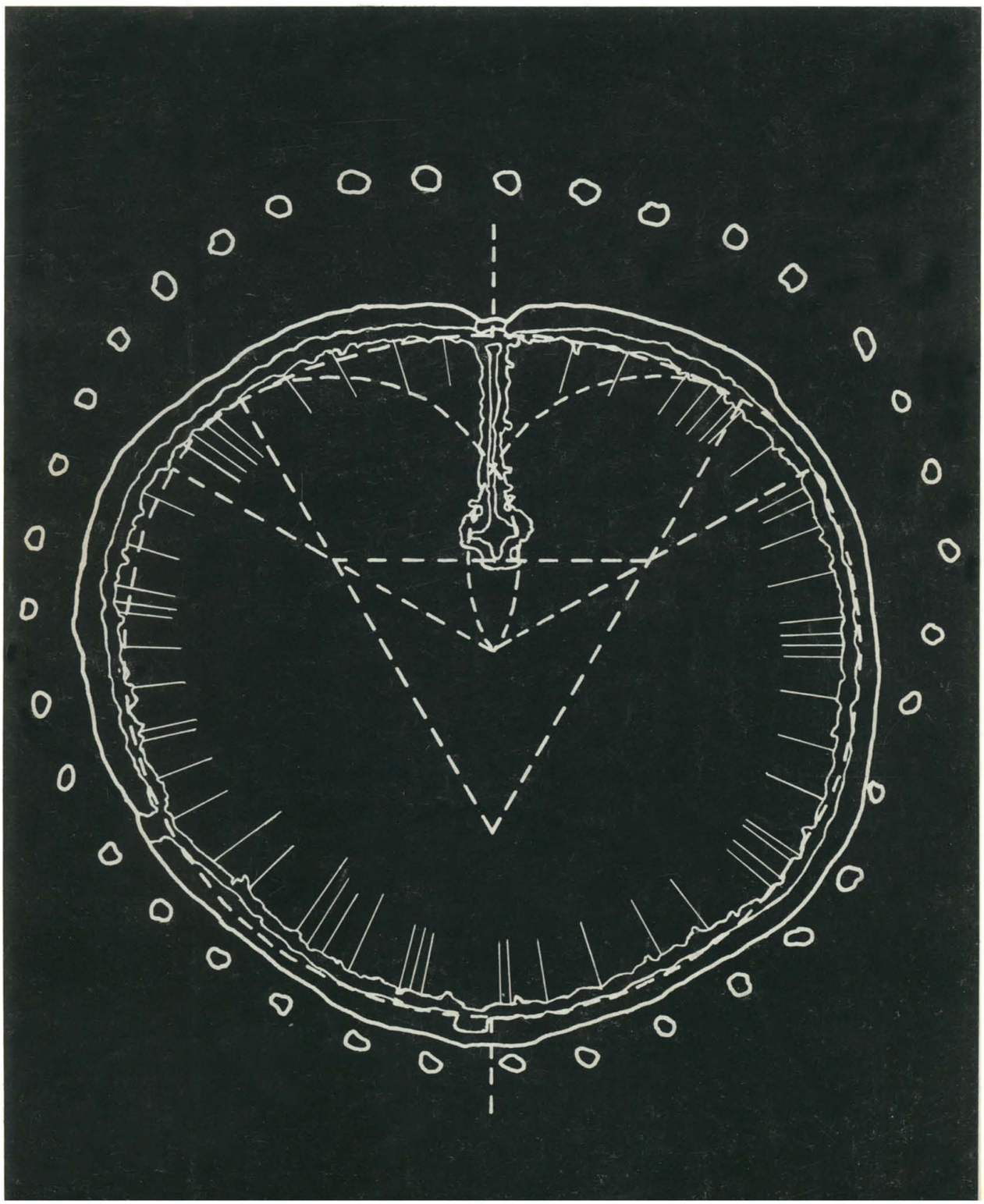
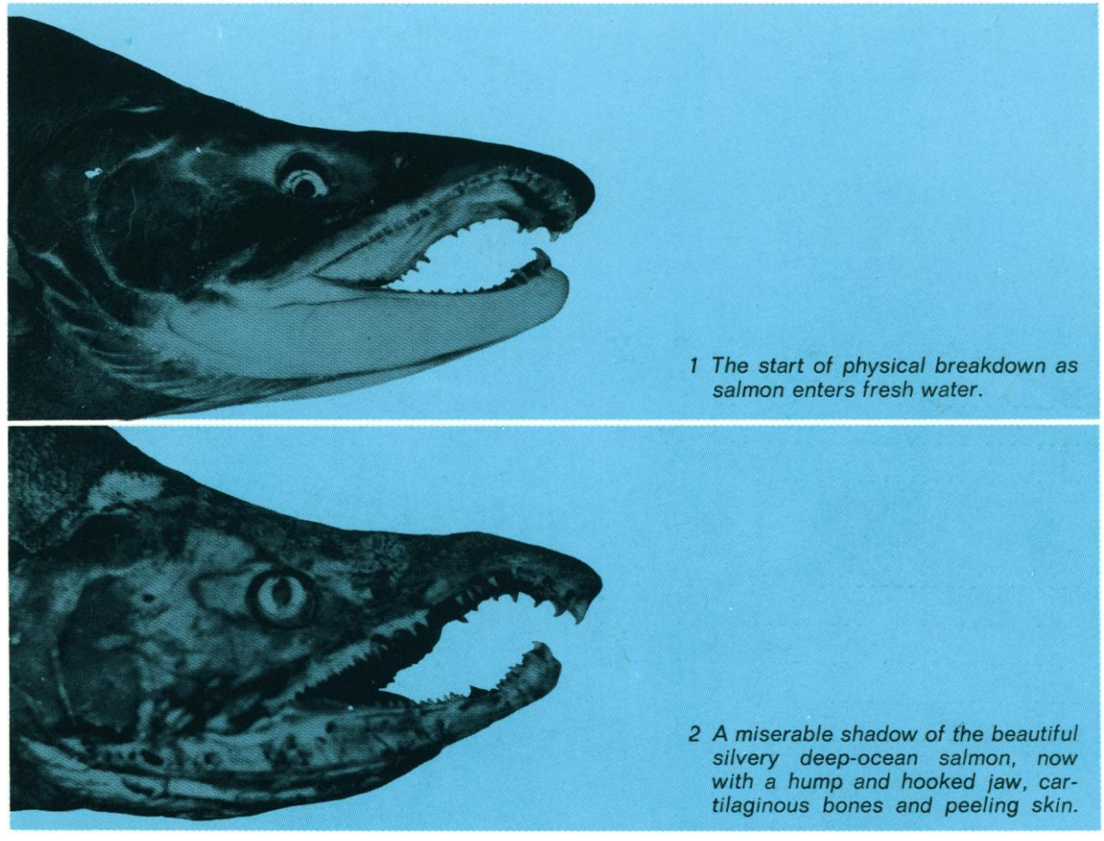
SCIENCE

17 April 1970

Vol. 168, No. 3929

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





1 The start of physical breakdown as salmon enters fresh water.

2 A miserable shadow of the beautiful silvery deep-ocean salmon, now with a hump and hooked jaw, cartilaginous bones and peeling skin.

Kind permission of Oceans Magazine

The Ultrotome at Sea

LKB have taken part in another "first", this time at sea, aboard the "Alpha Helix".
The "Alpha Helix" investigations concerned the rapid aging of salmon, illustrated in the photos above, which occurs when the salmon enter fresh waters on their spawning run.
During the autumn of 1968 the first electron-micrograph made aboard a ship, was produced on this marine-research vessel belonging to the Scripps Institution of Oceanography. A standard LKB Ultrotome cut the sections.
Excellent results were achieved, even when the ship was under way, on the high seas. There could hardly be a more convincing demonstration of the versatility of the LKB Ultrotome.
Some of the answers found by the research team could have a direct application to man, and ultimately help to reduce the physical and mental deterioration associated with human aging.

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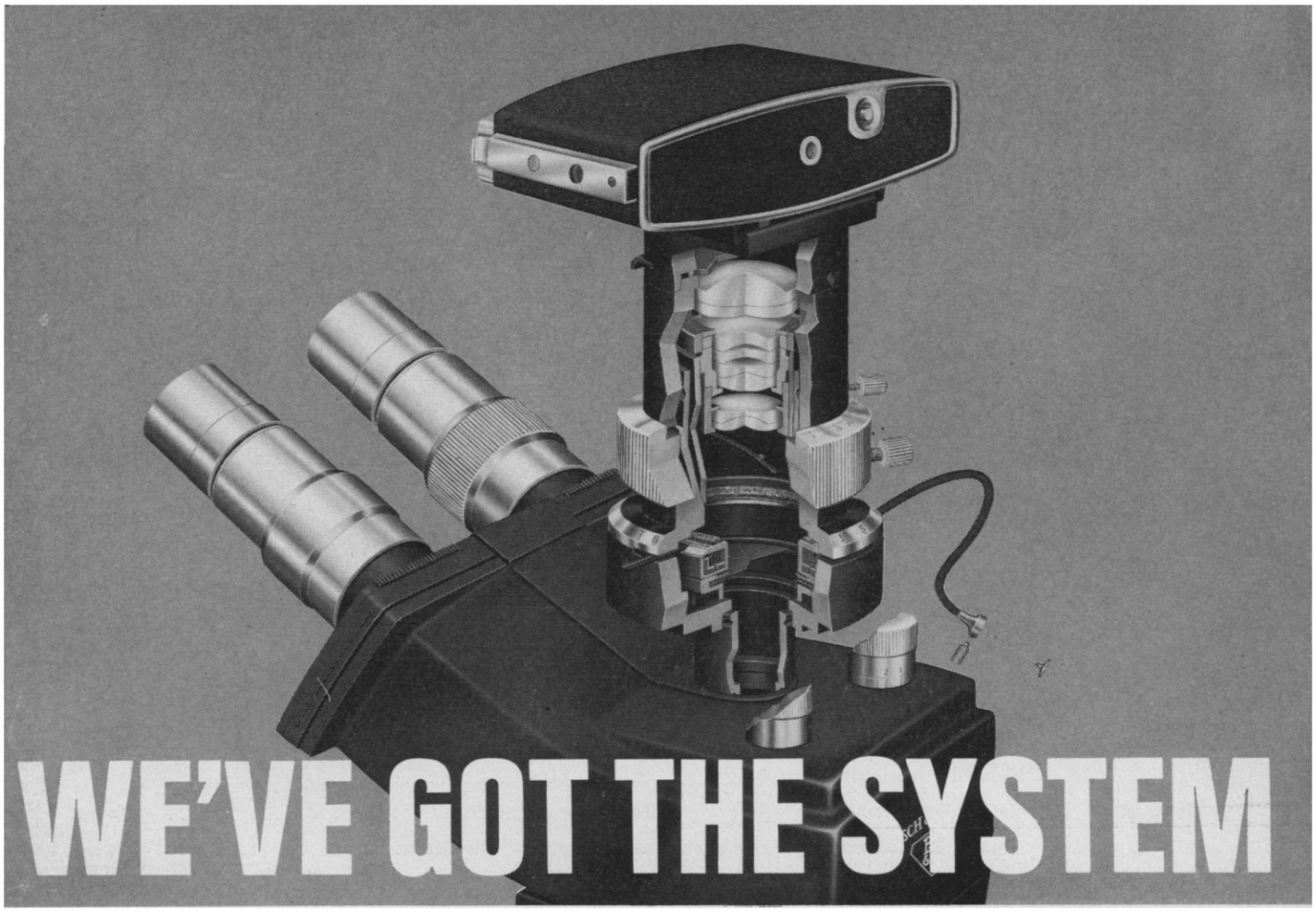

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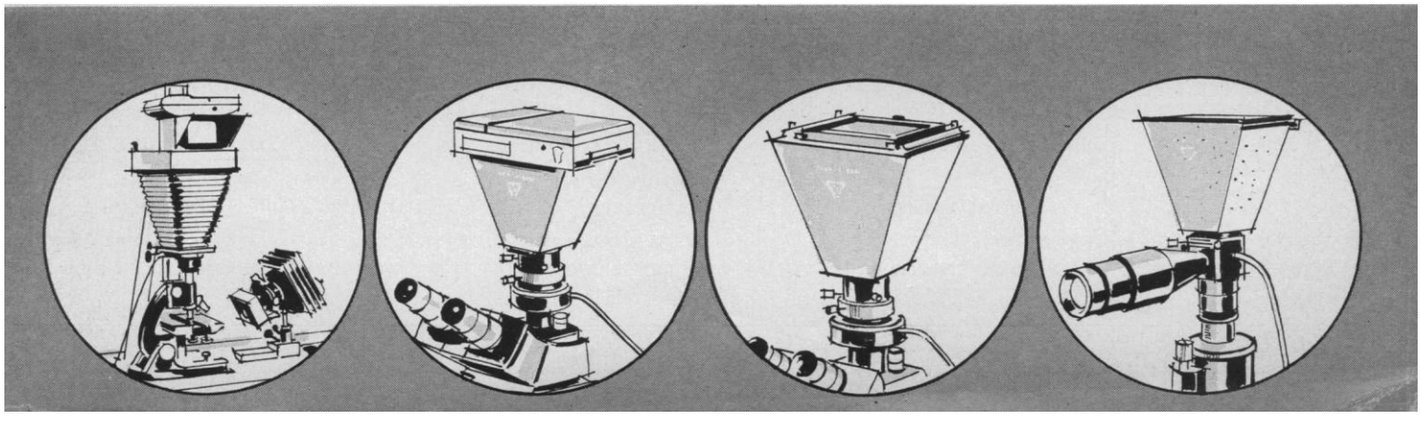

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SCIENCE

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COVER

Tumulus at New Grange, Ireland, with its ring of free-standing megaliths. See page 321. [Tracing from G. Daniel in *Megalithic Builders of Western Europe*; courtesy of Thaddeus M. Cowan, Oklahoma State University]

How to put today's instrumentation to work for you.

New electronic probe can magnify, then analyze tiny specks with X-rays.

The Philips 4500 Electron Probe Microanalyzer offers the analytical chemist simultaneous optimization for operation as an electron probe microanalyzer and a scanning electron microscope.

The new microprobe system contains computer-adaptable spectrometry scanning, specimen stage drives and sample current metering. Up to four two-crystal x-ray spectrometers, combined with a dual lens electron optical system, permit qualitative and quantitative analysis of submicron to three inch samples from Boron up in the atomic table.

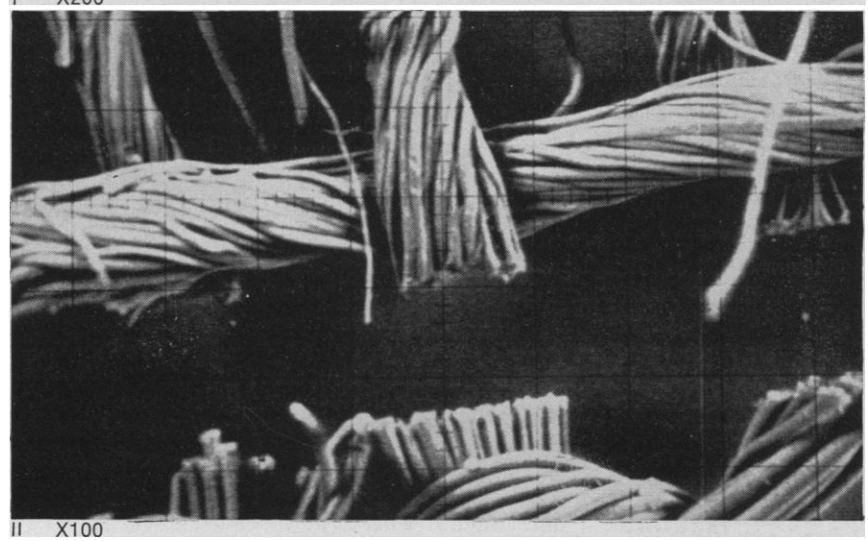
Typical applications are illustrated by the micrographs on the right. I is a scanning electron micrograph (back scatter electrons) of a typical integrated circuit. Instrument capability includes study of sample structure and morphology combined with the ability to analyze contamination spots which might cause circuit malfunction.

II is a scanning electron micrograph (back scatter electrons) of a cut edge of cloth. Applications in textile industries include not only study of fiber morphology but also studies involving analysis of contaminating layers, coatings, etc. Multiple spectrometers permit simultaneous analysis for up to 4 elements. High take-off angle permits examination of relatively rough surfaces.

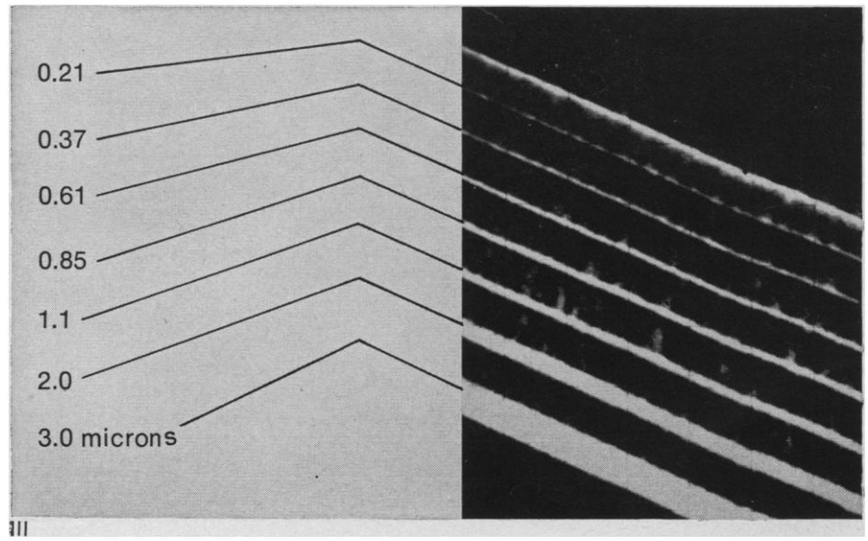
III. Back scattered electron images of copper-gold sandwiches demonstrate special resolution and minimum electron spot size in the electron probe mode of operation. The smallest copper layer visible is .21 micrometers. Optimization of the instrument for scanning electron microscope resolution to 500 A generally requires only the selection of limiting apertures and adjustment of lens current.

For full details, circle #1.

I X200



II X100



III

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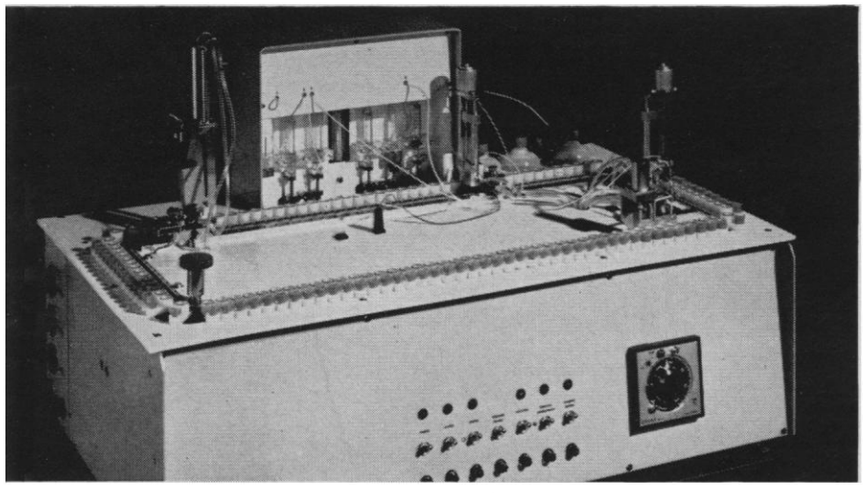
Analyze 120 samples an hour.

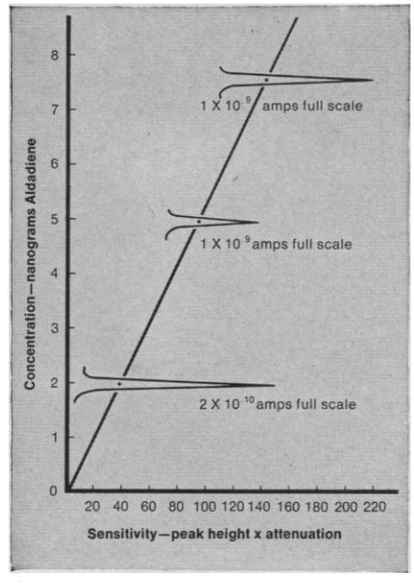


The new Unicam AC 60 Automatic Chemistry Systems are an outstanding choice for the busy routine laboratory and are the lowest cost systems available.

They are fully automated; so simple to operate that unskilled staff can be trained rapidly because both programming and interchanging of analysis scheme is simple and foolproof.

Typical methods include: Protein, Glucose, Urea, Inorganic Phosphorus, Hemoglobin, Magnesium, SGOT, SGPT, Cholesterol, Ammonia Nitrogen, LDH; ideal for automatic enzyme analysis. Circle #2.

Automated analysis of Aldadiene steroid using high temperature EC Ni 63 detector and auto solid sample injection.



The Pye Series 104/106 Gas Chromatograph offers you the following:

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  high sensitivity
  high specificity
  high temperature EC Ni 63 capability
- high column performance
- automatic solid sample injection
- computer compatible

Circle #4.

New computer-controlled X-ray spectrometer offers greater accuracy and speed.

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For full details, circle #3.

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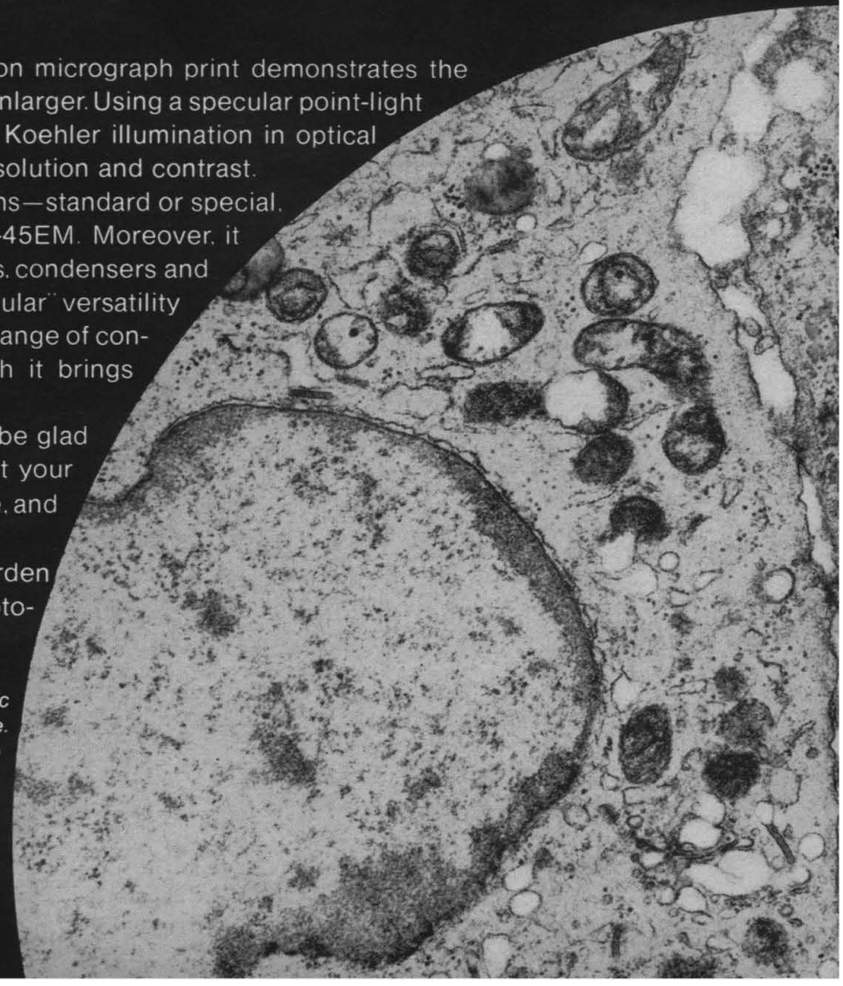

Section of human epidermis taken from a site of allergic eczematous contact dermatitis due to mercuric chloride. Parts of a Langerhans cell and of a keratinocyte are shown. Photographed at 6,000x in a Siemens Elmiskop 1 A electron microscope; enlarged to 16,000x with a Durst S-45EM.

(Courtesy of Dr. Inga Silberberg, New York University School of Medicine, Department of Dermatology).

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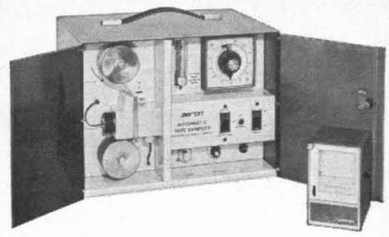
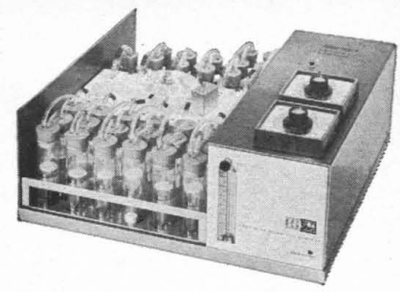


AUTOMATIC TAPE SAMPLER/RECORDER

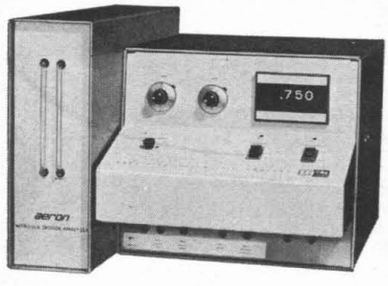
- Complies with ASTM D1704.
- 1-inch diameter sample spots on 2-inch centers.
- Automatically records 0-100% light transmission.
- Constant-voltage light source for consistent readings.
- Oil-less diaphragm pump.
- Easy conversion to Coh units.
- Flow rate adjustable from 2 to 20 C.F.H.
- Integral push-to-read flowmeter.
- Sample time variable from 0 to 240 minutes.

Also available—AUTOMATIC TAPE SAMPLER. Identical to the Automatic Tape Sampler/Recorder except for the omission of the strip-chart recorder, the photo-voltaic cell and the controlled light source.



SEQUENTIAL SAMPLER

- Complies with ASTM D1605, D1607, D1609.
- Inexpensive sampling containers.
- Samples gaseous or particulate matter.
- Operates unattended—for up to 4 days.
- Sulphur-free stoppers eliminate ground glass joints.
- Interchangeable impinger tubes or diffuser tubes at minimum cost.
- 12 stations—each accommodating up to 3 tubes.
- Sampling time from 2 to 240 minutes.
- Interval time from 2 to 240 minutes.
- Removable, preloadable racks for rapid change-out.
- See-through acrylic cover, bronze-tinted to protect light-sensitive solutions.



CONTINUOUS NO_2 MONITOR

- Correlates with ASTM D2012.
- Gives continuous measure of NO_2 (or NO) in the atmosphere.
- Sensitivity 0.02 ppm or better.
- No contact of reagents or sample with pump.
- All solid state and integrated circuit components.
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- Recorder outlet.
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- Evaluates spots at a rate of 720 spots per hour.
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- Tilt-up meter for easy reading.

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- Complies with ASTM D2010 (for SO_2) and ASTM D1739 (for dust fall).
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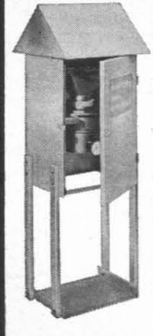

- Complies with ASTM D2009.
- Complies with USPHS Specifications.
- Gage indicates flow in c.f.m.
- High capacity blower—up to 80 c.f.m. free air.
- Designed for continuous usage.
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- Choice of outdoor shelter or indoor floor stand.

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Cryogenic freezing of red blood cells

Probably no single problem has received more attention from cryobiologists than the preservation of the human red cell. And with good reason. Procedures that extend the supply of erythrocytes for transfusion have meaning in terms of human lives.

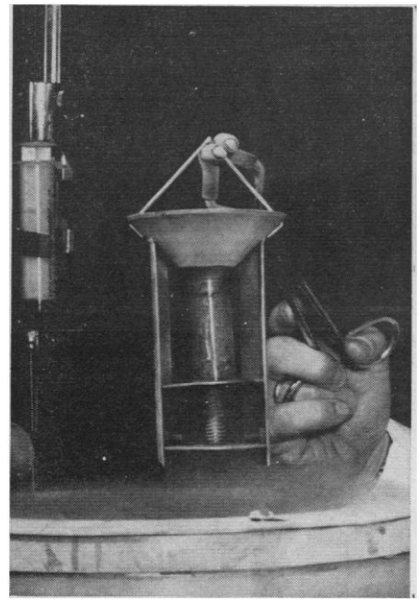
The prospect of a frozen blood reserve has been a matter of intensive interest to the blood banking agencies for the past twenty years; some have played a major role in the scientific attack on the problem. It has not been easy. It was observed in 1941 that red cells (suitably protected with additive substances) could survive the drastic environmental changes induced by freezing. Since then, processes have been sought for the preservation of blood in the frozen state that would provide a useful and acceptable product for transfusion. As evidenced over the past decade by the successful transfusion of thousands of units of blood preserved in the frozen state, that goal seems to have been reached.

The current limitation of twenty-one to twenty-elght days for blood preserved by conventional methods in the liquid state has often taxed the resources of the organizations that undertake to provide our communities with supplies of this indispensable agent. The relatively short shelf life of the cellular components of blood adds to the problem of coordinating supply with demand. The less common blood types sometimes are difficult to procure, but even the more common types may vary in supply at any given time.

Red cell wastage is an inevitable consequence of the dating period necessarily imposed on blood stored at 4°C. A primary objective of agencies interested in preserving blood at low temperatures is to prevent this wastage. Another, of course, is to assure adequate reserves of all types of blood at all times for each community. Conceivably then, as frozen blood banks become established in various parts of the country, an integrated and computerized inventory system could be developed that would result in an effective national reserve.

Several practical approaches to the preservation of blood at low temperatures have evolved. All have some elements in common. A solution of additives, often called cryoprotective agents—glycerol is the outstanding example—is combined with the red cells from which most of the plasma and much of the other cellular components of blood (leukocytes and thrombocytes) have been removed. This is done in special containers in which the erythrocytes are cooled and placed in long-term storage. When needed, the erythrocytes are withdrawn from storage, warmed, and subjected to a washing procedure to remove the protective agent before transfusion.

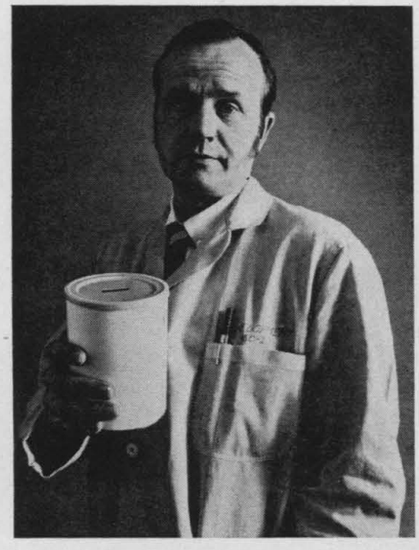
The heart of a frozen blood reserve is the storage facility. Storage equipment is of two general types: cryogenic and noncryogenic. The latter provides temperatures down to about −85°C and depends on electric power. The cryogenic equipment is independent of a power source and provides lower storage temperatures—down to −196°C—with liquid nitrogen, the most commonly used refrigerant. Associated with such storage equipment are cryogenic shipping units that permit transport of blood in the frozen state without danger of a destructive rise in temperature that might render the blood cells unfit for transfusion.



Small quantities of blood are instantly frozen for long-term storage in the droplet freezer. A mechanically vibrated syringe releases droplets into a revolving drum of liquid nitrogen. The frozen droplets are collected in the base. Thousands of droplets can be collected from each sample for use as reference specimens.

The banking of frozen blood with longer shelf life should considerably enhance the ability of the blood supply agencies to meet demand and might influence current procurement practices. The use of cryogenic storage equipment would provide a margin of safety for autologous blood banking in which individuals of rare blood type would establish a reserve of their own blood in anticipation of later need. Probably most important in terms of medical need, the availability of banks of frozen red cells would seem likely to lead to the development of banks of the other cellular components of blood. With current liquid state storage procedures, platelets and leukocytes—far less stable than the red cell—are without transfusion value within about three days or less after donation. At present, the only prospect for establishing a large-scale reserve of these invaluable components is to preserve them in the frozen state. Although low temperature preservation procedures for these cells are not technically as far advanced as for the red cell, several blood laboratories are fully aware of the need and are attacking the problem vigorously.

The new Cary 61. The CD spectropolarimeter that lets you save the money you probably don't have.



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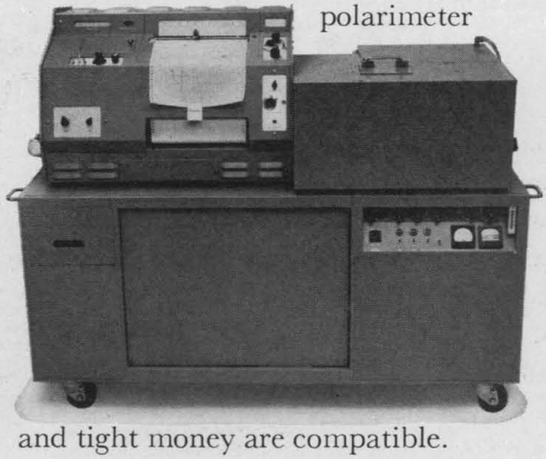

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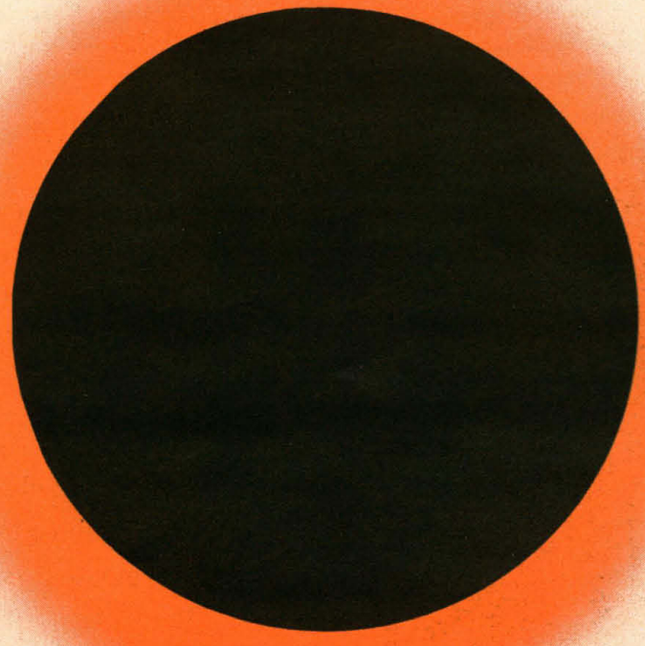

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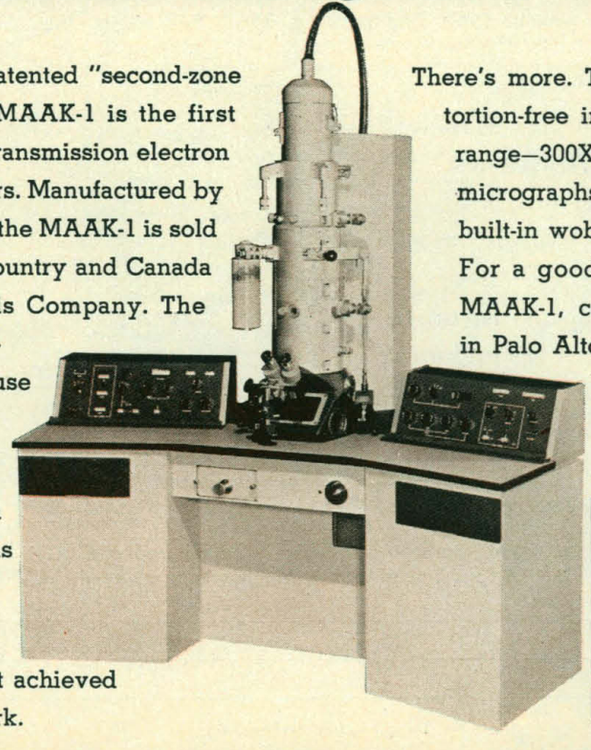

There's more. The MAAK-1 gives you bright, distortion-free images over its **entire** magnification range—300X to 500,000X. Further, you'll get sharp micrographs every time because the MAAK-1's built-in wobbler assures proper focusing.

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Suggested Reading for the

Environmental Teach-In

Estuaries

The development of coastal areas has been very rapid in recent years, but knowledge of estuarine environments has not kept pace with the necessity to resolve problems arising from their intensive use. This is the first comprehensive collection of scientific papers covering the comparatively new field of estuarine research.

This volume contains 71 articles on physical and biological factors, geomorphology, sediments and sedimentation, microbiota, ecology, evolution, fisheries, human influences and pollution.

Edited by George H. Lauff. 1967. 2nd printing, 1968. 776 pages. Illustrated. Bibliography. Indexes.

Agriculture and the Quality of Our Environment

This symposium is basically concerned with the problem of how environmental quality affects agriculture, and how agriculture affects the quality of the environment. It identifies the part which science must play in solving environmental pollution problems.

Edited by N. C. Brady. 1967. 476 pages. Bibliography. Author and subject indexes.

Air Conservation

This is a report of deliberations of the Air Conservation Commission of the AAAS over a 2-year period. It pulls together into a single reference a wealth of information presented by authorities in the fields of conservation, pollution control, pollutants and their effects, law, economics, meteorology, public health, public opinion and government.

The *Bulletin* of the American Meteorological Society calls this work "the most thoughtful, realistic and penetrating analysis of air pollution as a factor in the societies of today and tomorrow now available. It is a *must* for the serious student and professional, and can be highly recommended to the interested citizen."

Report of the AAAS Air Conservation Commission; James P. Dixon, Chairman. 1965. 2nd printing, 1968. 348 pages. Illustrated. Bibliography. Index.

Oceanography

A collection of 30 papers presented at the first International Oceanographic Congress by world-renowned authorities. An interdisciplinary reference that deals with some of mankind's most profound questions . . . the origin and history of living things, for example, and the history of our galaxy as recorded in marine sediments.

Edited by Mary Sears. 1961. 5th printing, 1969. 665 pages. 146 illustrations. Bibliography. Subject index. Author index.

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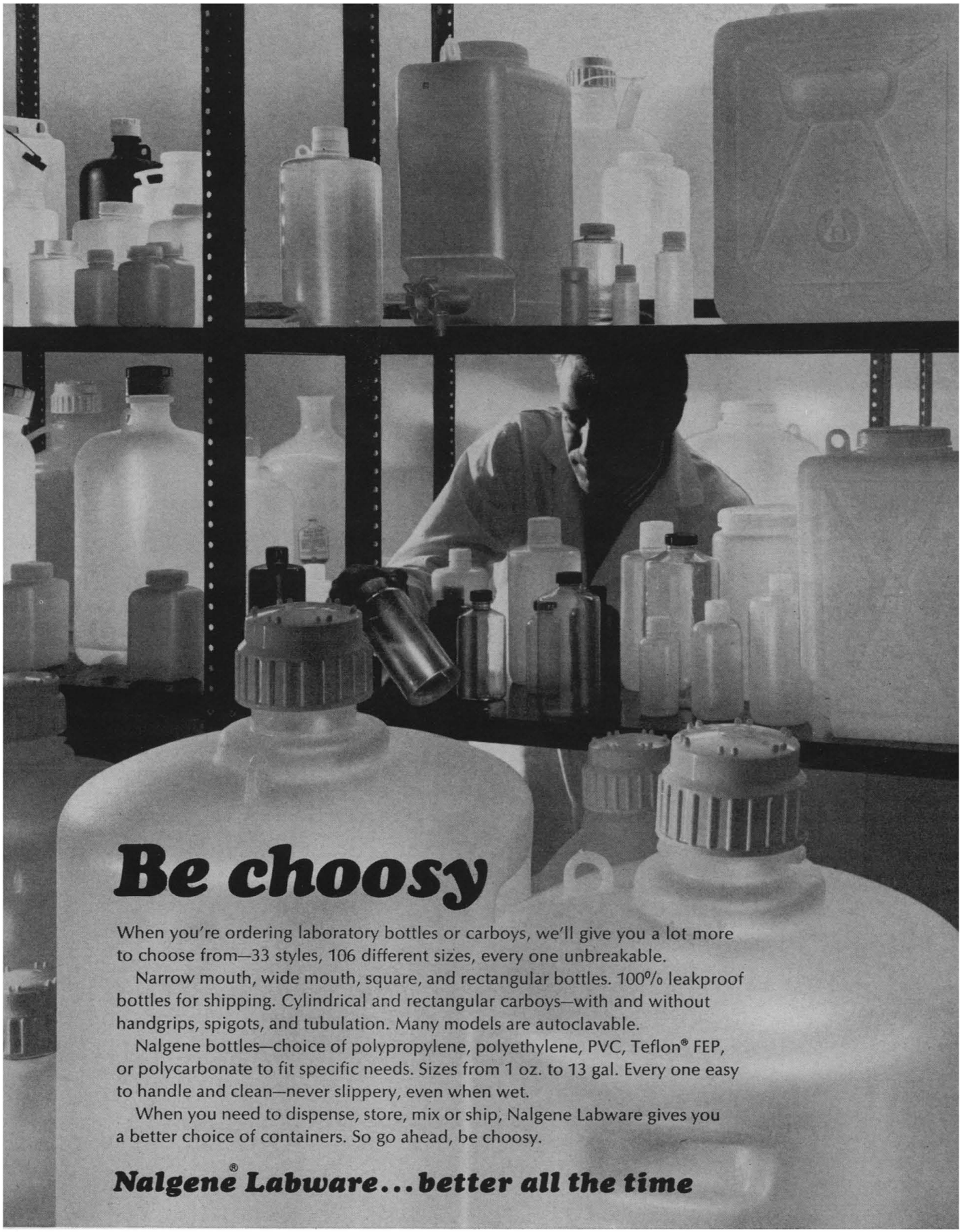

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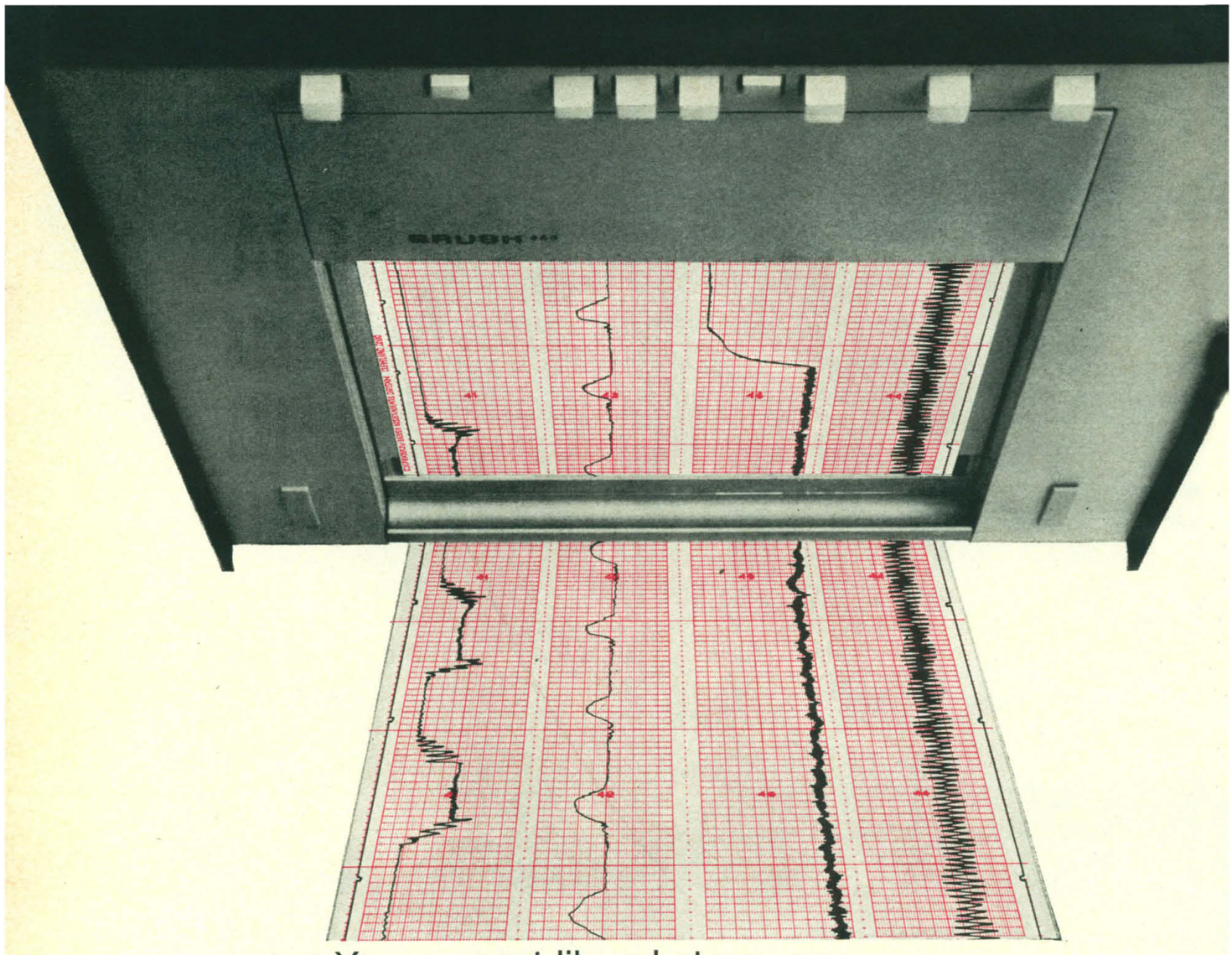

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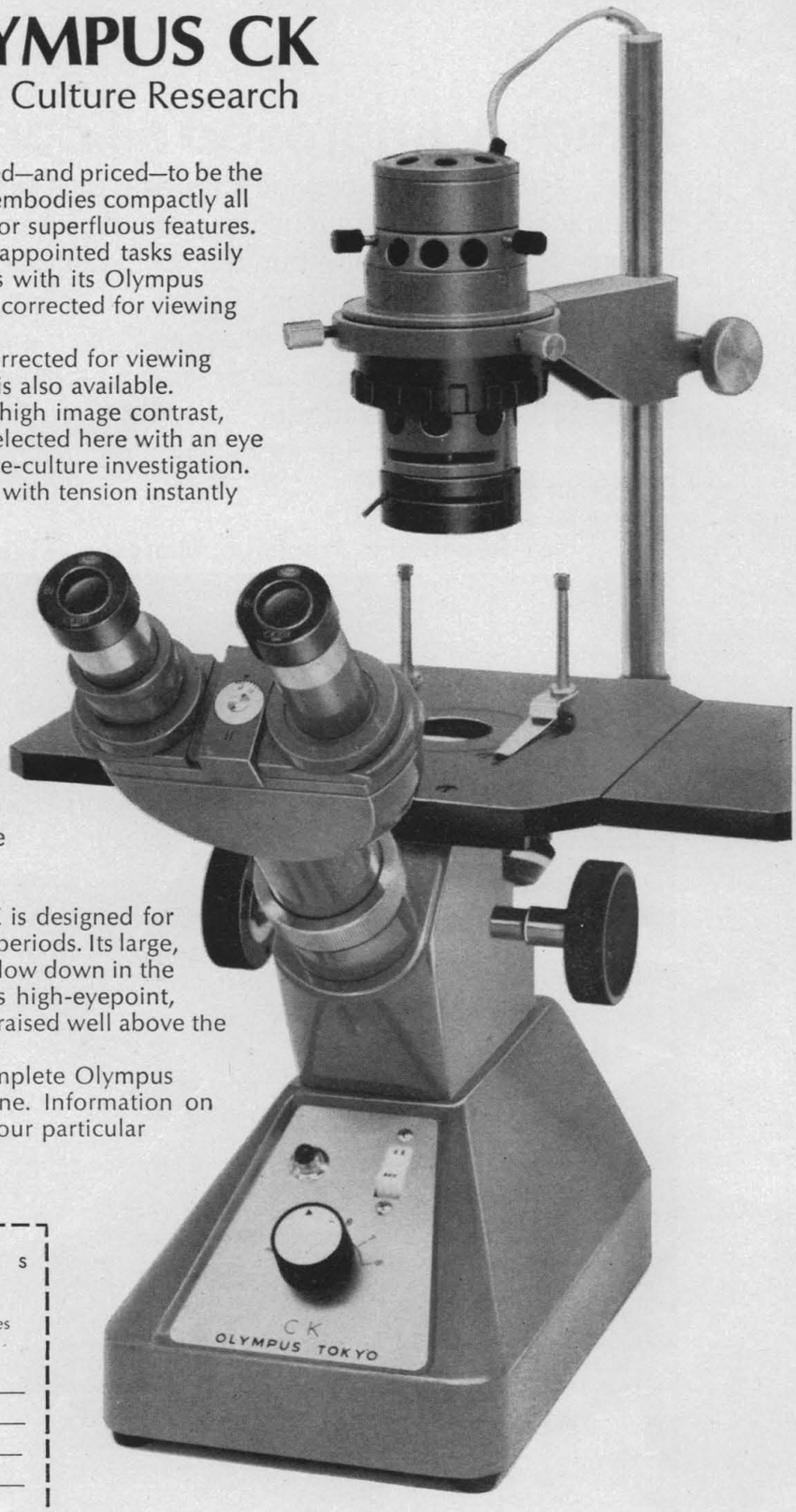

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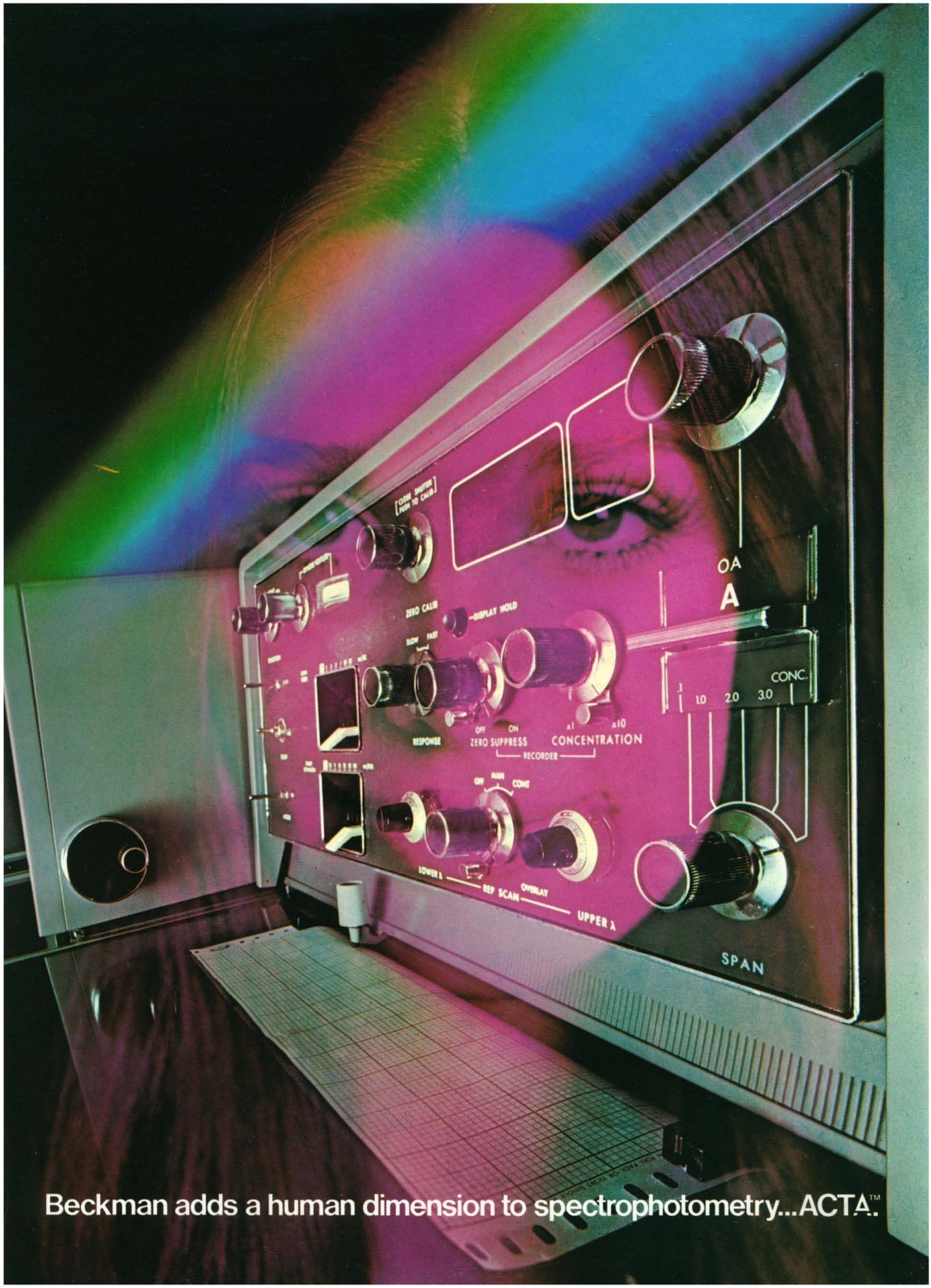

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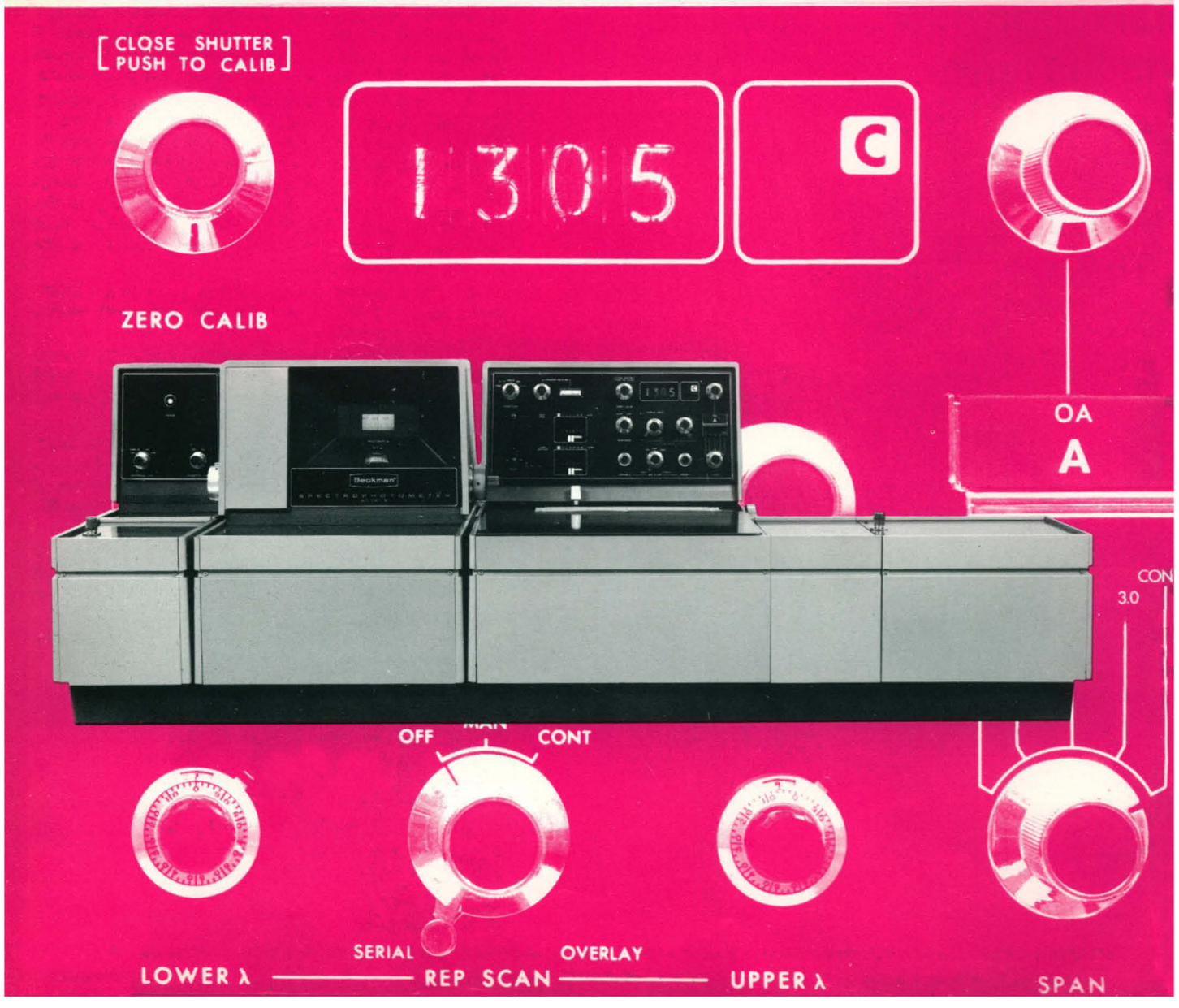

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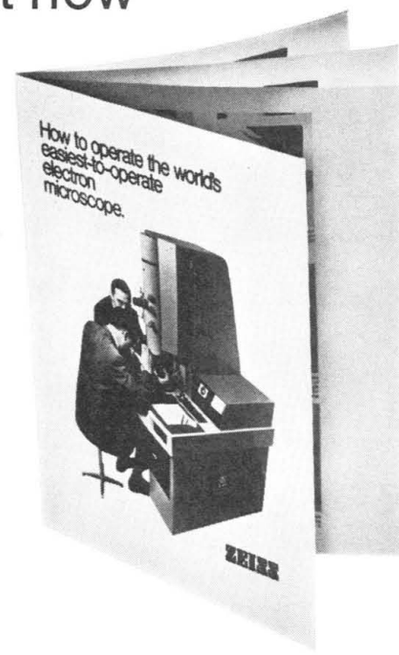

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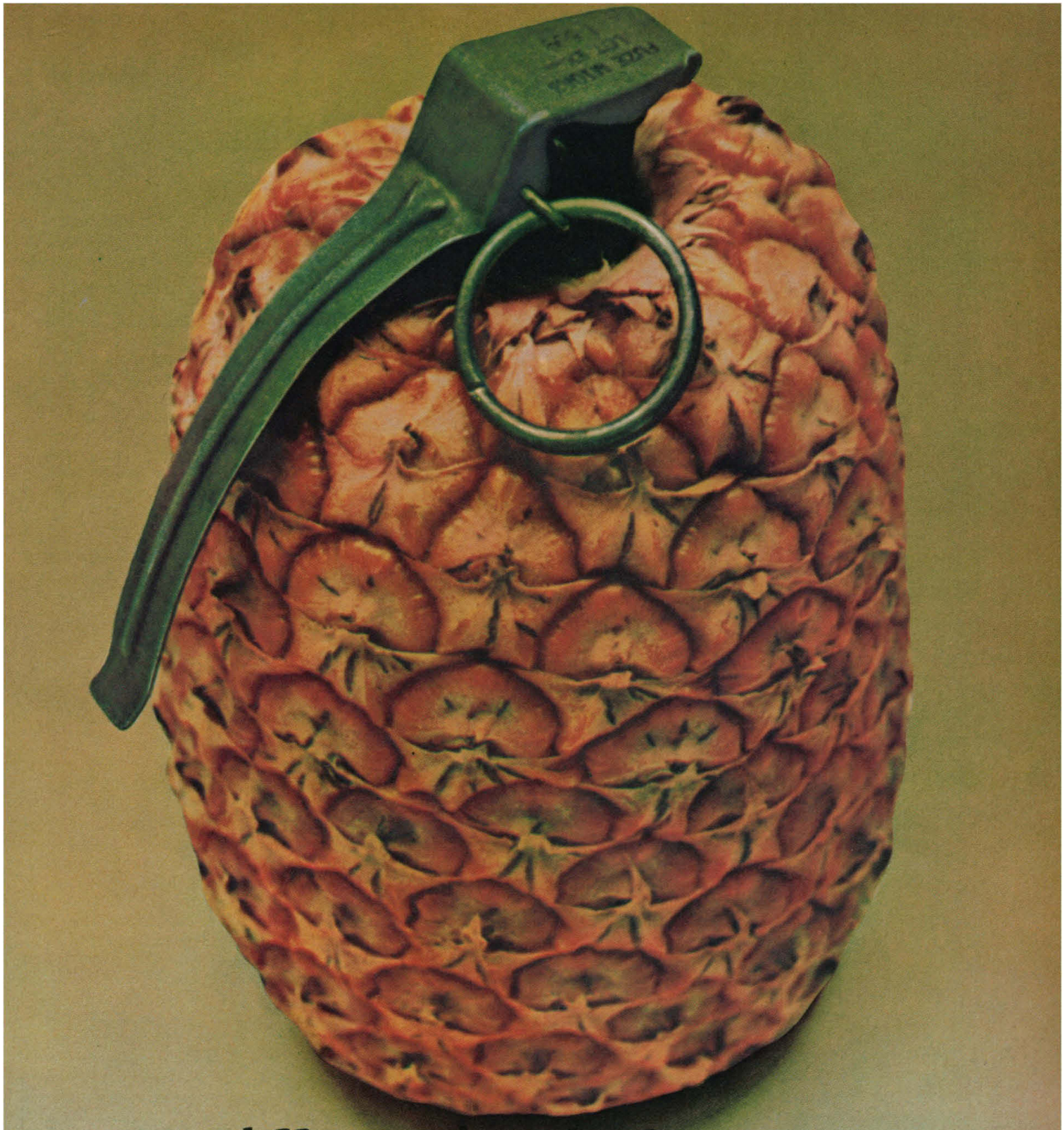

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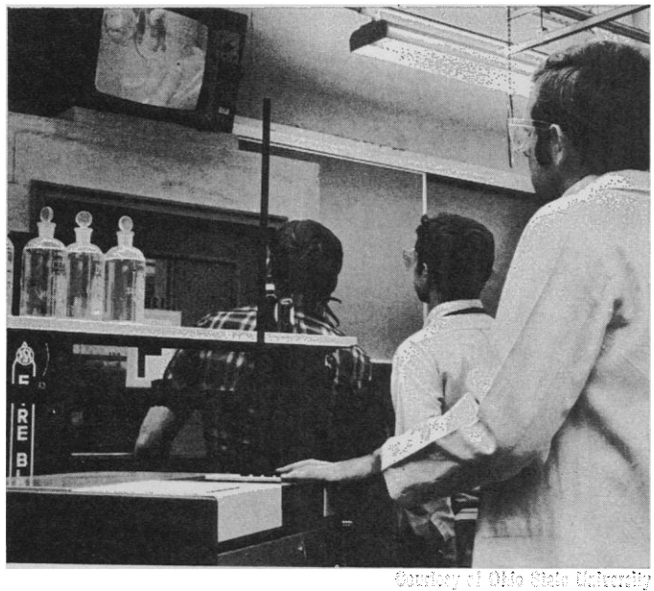

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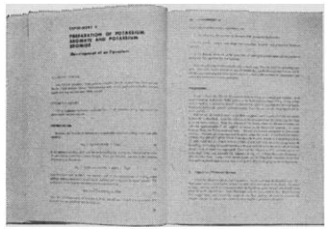

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By W. T. LIPPINCOTT, DEVON W. MEEK, and FRANK H. VERHOEK, *all of Ohio State University. About 350 pages, illustrated. Ready April, 1970. Teachers' Manual Available.*

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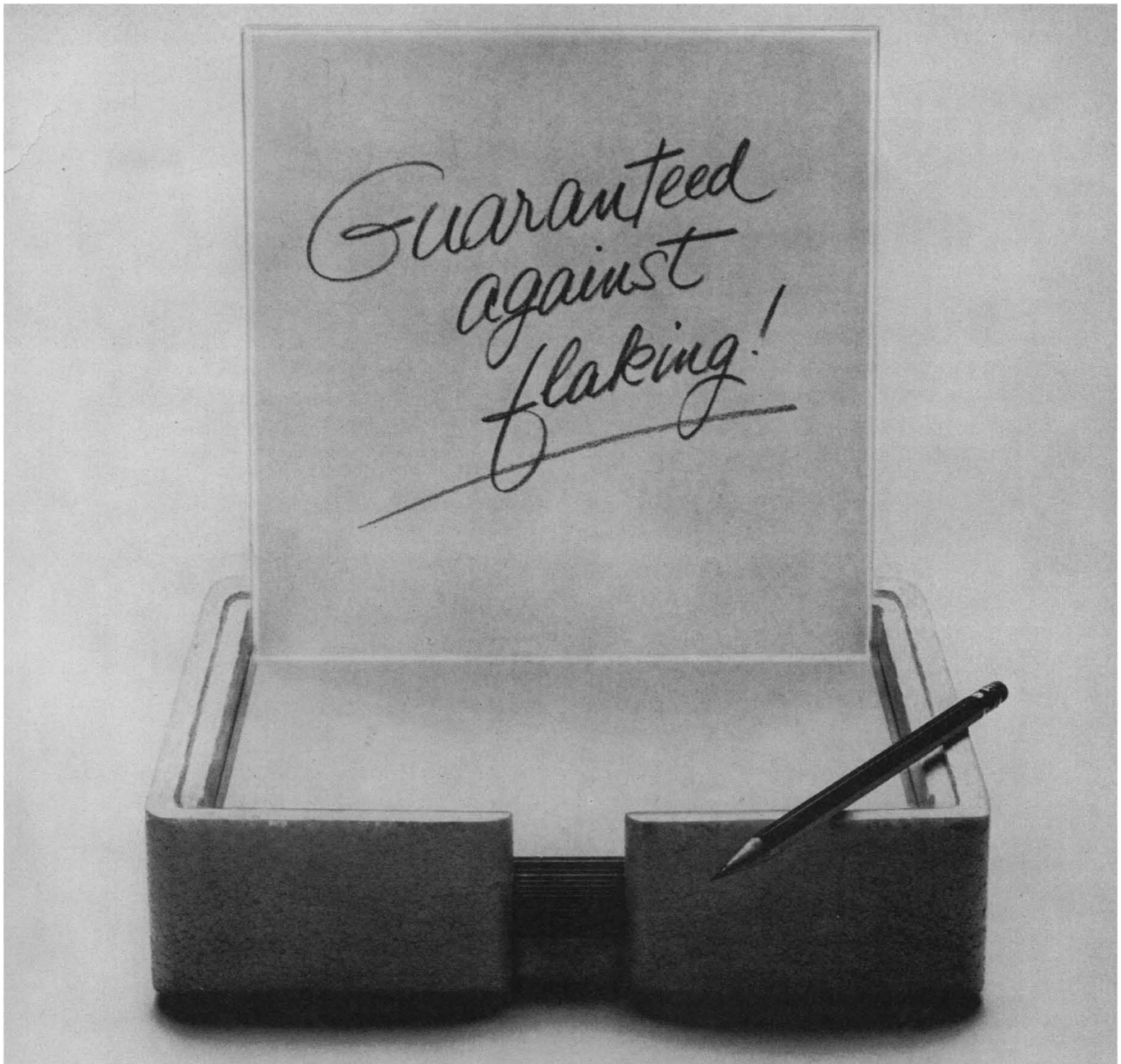

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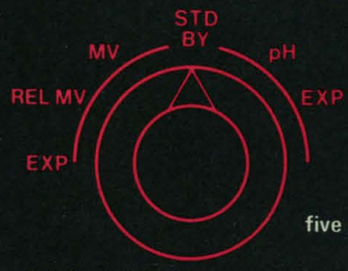

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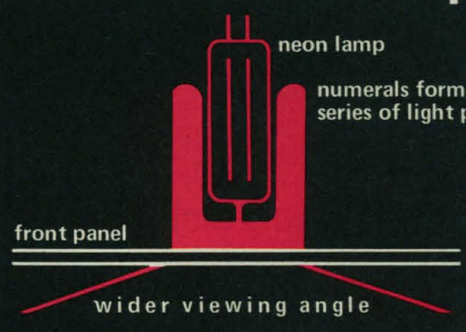

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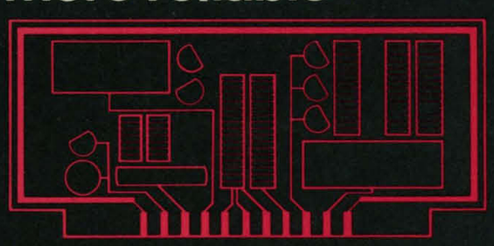

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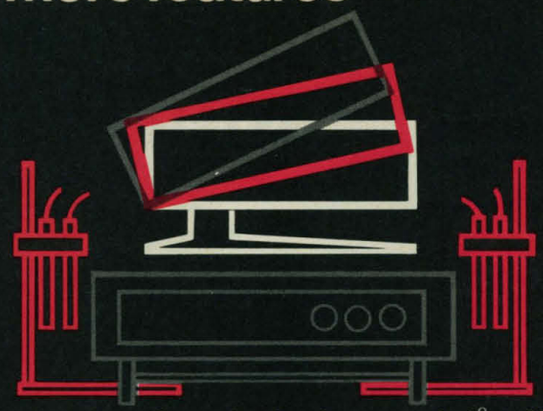

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emy of Sciences Panel on Technology Assessment, nuclear technology with appropriate assistance could provide and preserve "future options" and give more "attention and support to research and monitoring programs calculated to minimize technological surprise and to deal rationally with the burdens of uncertainty."

B. P. SONNENBLICK
Department of Zoology and Physiology, Rutgers University, Newark, New Jersey 07102

The University Is Not a Highway Department

There is much wisdom and sophisticated opinion expressed in F. Kenneth Hare's article "How should we treat the environment?" (23 Jan., p. 352). But his arguments are based on an implicit assumption which is unfortunately shared by many influential people in our universities, and which needs to be seriously questioned: The assumption that the university *should* answer the current call to solve society's very pressing social problems.

Since World War II those of us in the universities have done many things other than objective, detached scholarship and research, but most of us did stop short of taking the responsibility for the solution of practical social and political problems. Where we did take on such responsibilities we usually assumed them as a personal responsibility, without making them a university or institutional commitment, for we were aware that politics is a difficult and not always a gentlemanly game and that what is valuable in the university—intellectuality—is fragile and likely to be damaged in the arena of real, national politics.

We should seriously consider the possibility of letting ourselves be bypassed, as Hare suggests may happen, if we do not answer the call to solve social problems. Will it be damaging to the general welfare if we in the universities say to federal and state officials: build new institutions for groups of intellectuals who are "more flexible," who will share with you the direct responsibility for the solution of practical problems. Being so bypassed would not be such a terrible fate. We would still have many worthwhile tasks to accomplish in the university. We can devote ourselves to undergraduate education which in the past has not received a fair share of the resources of the major universities; we can devote ourselves to the education and training of fewer but more scholarly graduate students, allowing the less scholarly and more politically interested students to enter the new institutions. We can devote ourselves to our fundamental and applied research activities which will, *perhaps,* help in the solution of social problems. Some of us can engage in intellectual activities designed to assist in the solution of social problems, but we can leave the actual responsibility for the solution of those problems to others in the new institutions—with, perhaps, some consultation if the new institutions need assistance.

I am aware that in some sense the university will be "hurt" if such a strategy is adopted. It will not receive the sums of money that the private foundations and the federal and state governments promise to those who will actively try to solve our current, pressing social problems. But what the university will lose in the race for resources, it will gain by not suffering the blows that inevitably come to the more "flexible" and politically responsive organizations.

Perhaps we in the university should leave the actual solution of political and social questions to men of action as we have in the past. These men control enormous resources and can create laboratories and research organizations to assist them. Perhaps the universities should leave the actual solution of foreign policy problems to the President, the Secretary of State, and the groups of scholars and advisers they call upon. Perhaps the universities should leave the actual defense of the country to the Department of Defense and its intellectual advisers. Perhaps we should leave conservation to the Department of the Interior together with the intellectual apparatus it creates. Perhaps we can leave the construction of highways and trains to the Department of Transportation.

As individuals and citizens we can contribute to the solution of all these problems by political action. As scholars we can produce ideas that may help men of action. But it might be best to recall that the university is not the Department of State, nor the Department of Defense, nor the Department of Housing. Most of all, we can remind ourselves that the university is not a highway department.

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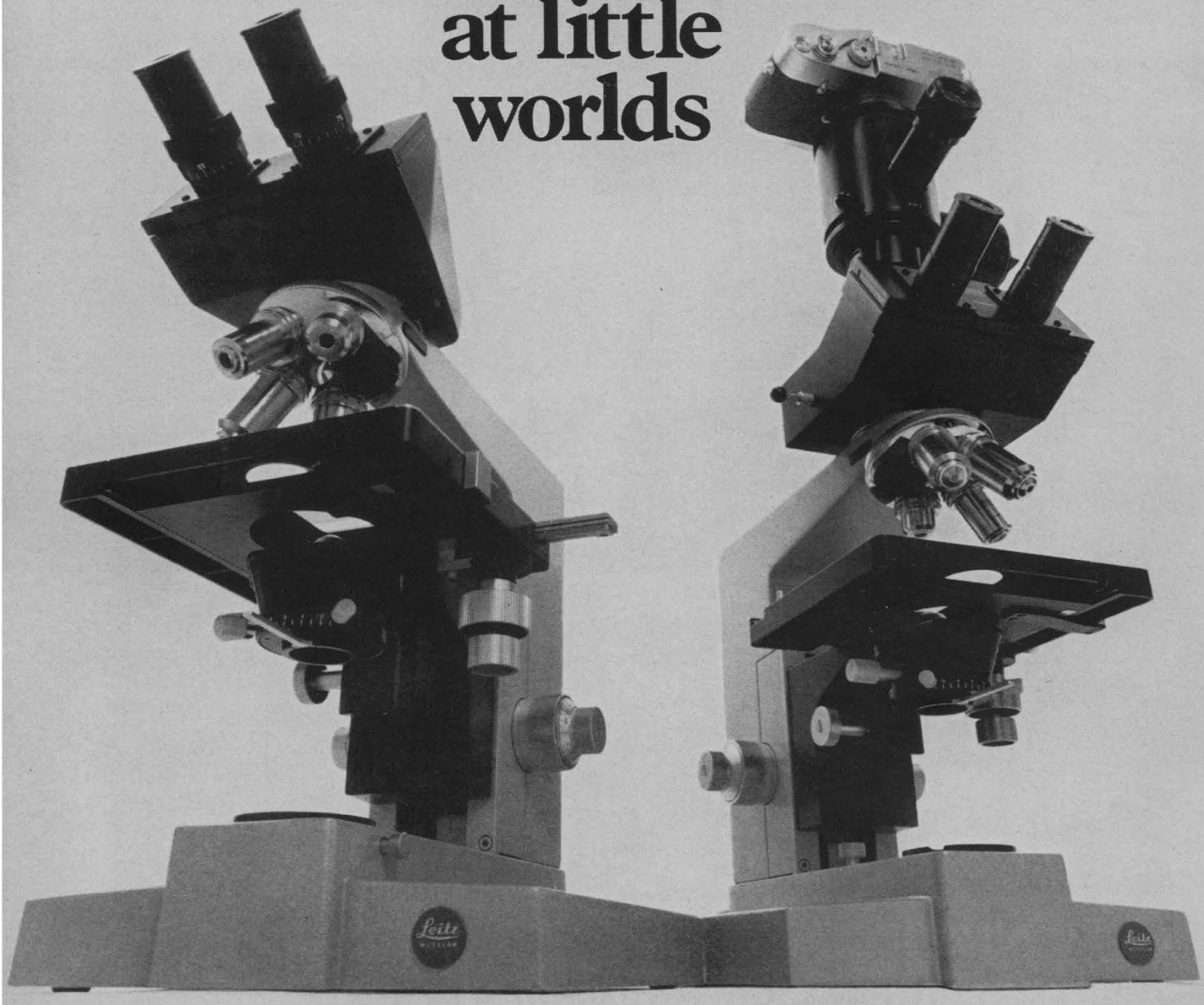

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17 April 1970, Volume 168, Number 3929 SCIENCE

Overeducation

Persons with more education have higher average incomes than do persons with less. It is also true that a considerable number of college graduates work at jobs that in earlier years were almost always filled by nongraduates, and that to a large extent still are. The usual conclusion has been that vocational competence is significantly increased by additional education.

Ivar Berg* has reported a number of studies of the relations between a worker's years of schooling and several aspects of his job performance. He concludes that an increasing percentage of workers are employed in jobs that utilize less education than they possess; that in many jobs experience is a better indicator of earnings than is education; that workers with more education show higher turnover rates and more dissatisfaction than do those with less; and that measures of aptitude are better than amount of education in predicting performance and earnings.

Paul Taubman and Terence J. Wales † have compared the earnings of college graduates with the earnings of equally bright high school graduates. Their results confirmed the usual finding that college graduates earn more money, but they also found that earnings differentials almost disappear within occupational categories. Bright salesmen earn more than dull ones, but college graduate salesmen earn no more than high school graduate salesmen of the same intelligence level.

In medicine, college teaching, and some other fields, the essentiality of higher education would meet with little challenge. In a number of other fields, higher education does not so directly contribute to occupational competence, and within these occupations the amount of education is poorly correlated with income. Nevertheless, it remains true that college graduates as a group have higher incomes than nongraduates, partly because they tend to be brighter, partly because some of them enter professions that reward them for the necessary higher education, and partly because some employers overvalue formal credentials and employ college graduates at entry levels higher than those open to otherwise comparable nongraduates.

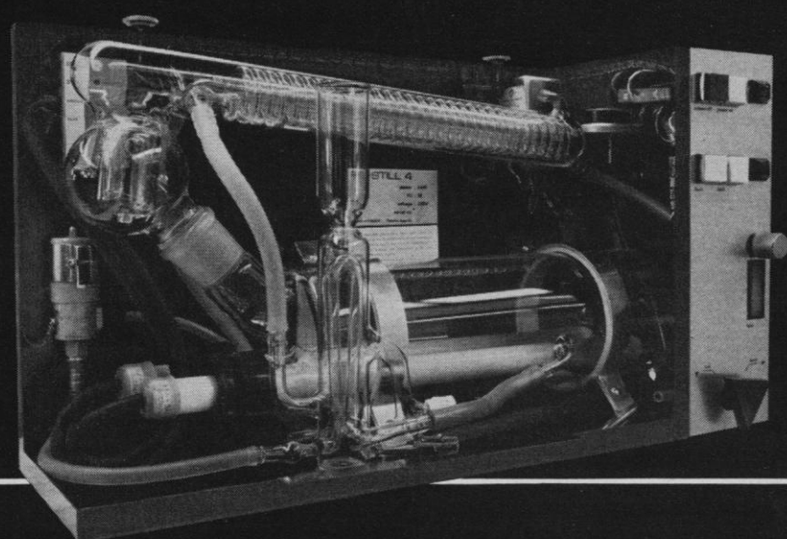
When a diploma is used as an employment screening device rather than as evidence of necessary qualifications, recruitment costs may be lowered, but what the employer saves must be paid for by someone else. Overemphasis on academic degrees discriminates against potential workers who have the necessary abilities but lack the required credentials, and it transfers part of the cost of employee selection to educational budgets and to the substantial number of young people who remain in college to secure employment credentials rather than to acquire greater competence or further education.

In the future, the relation between years of schooling and occupational performance may become even less close, for the disruptions that now afflict schools and colleges and the growing demand for ungraded courses and completely free elective programs are likely to make the time a student is enrolled in school and college an even poorer predictor of his adult competence.

To deemphasize "credentialism" will require that employers make greater efforts to evaluate applicants as individuals instead of treating them as members of educational classes. This change would be helped by better means of assessing aptitudes and by better records and measures of proficiency. It may be disquieting to some people to learn that the military services have progressed farther in these directions than have most civilian employers.—DAEL WOLFLE

* I. Berg, *Education and Jobs: The Great Training Robbery* (Praeger, New York, 1970).
† P. Taubman and T. J. Wales, Wharton School of Finance and Commerce, University of Pennsylvania, personal communication concerning an investigation of the benefits of higher education being conducted for the National Bureau of Economic Research.

They laughed when I set it on the lab bench.



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24–29. Chemical Inst. of Canada/ Canadian Soc. for **Chemical Engineering**, Toronto, Ont. (W. M. Campbell, Ontario Research Foundation, Sheridan Park, Ontario, Canada)

24–30. European **Cultural Foundation** Congr., 7th, Rotterdam, Netherlands. (Secretariat, Holland Organizing Centre, 16, Lange Voorhout, The Hague, Netherlands)

25–26. Symposium on **Biochemistry of Brain and Memory**, Kenosha, Wis. (S. P. Datta, Univ. of Wisconsin-Parkside, Kenosha 53140)

25–26. Progress in **Gas Dynamic Research by Optical Methods,** Syracuse, N.Y. (D. S. Dosanjh, Dept. of Mechanical and Aerospace Engineering, Syracuse Univ., Syracuse 13210)

25–29. European Conf. on **Psychosomatic Research**, 8th, Knokke, Belgium. (M. E. Houben, Universitaire St. Jozeikliniek voor Psychiatrie, 3070 Kortenberg, Belgium)

26–29. **Textile** Institute Conf., 5th annual, London, England. (Textile Inst., 10 Blackfriars St., Manchester 3, England)

27–29. **Alcohol and Drug Addiction** Foundation Symp., Toronto, Canada. (R. M. Gilbert, Addiction Research Foundation, 344 Bloor St. W., Toronto 179, Ont.)

30–1. Pan American **Cancer Cytology** Congr., Jamaica, B.W.I. (J. E. Ayre, Westbury Quadrangle, 113 S. Service Rd., Jericho, N.Y. 11753)

June

1–5. Symposium on Use of **Computers for Automatic Control of Traffic**, Versailles, France. (G. Ruppel, Intern. Federation of Automatic Control, Postfach 1139, Dusseldorf 1, Germany)

1–6. International **Mineral Processing** Congr., 9th, Prague, Czechoslovakia. (U. P. Vyskus Rud, Modranska 23, Prague)

1–6. World **Mining** Congr., 6th, Madrid, Spain. (A. G. Readett, Natl. Coal Board, Hobart House, Grosvenor Pl., London, S.W.1, England)

1–6. World Congr. of **Occupational Therapists,** 5th, Zurich, Switzerland. (G. Stauffer, Kraftstr. 22, 8044, Zurich)

2–4. Conference on **Stress Corrosion Cracking,** New Orleans, La. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

2–5. Mid-American Symp. on **Spectroscopy**, 22nd, Chicago, Ill. (W. A. Loseke, IIT Research Inst., 10 W. 35 St., Chicago 60616)

3–5. American **Chemical** Soc., Central regional, 2nd, Columbus, Ohio. (R. W. Bird, 2540 Olentangy River Rd., Columbus 43210)

4–5. **Environmental and Water Resources Engineering** Conf., 9th annual, Nashville, Tenn. (E. L. Thackston, Vanderbilt Univ., Box 133, Sta. B, Nashville 37203)

4–5. **Molecular Biology,** 4th intern. symp., New York, N.Y. (E. G. Bassett, Research Products Div., Miles Laboratories, Inc., Elkhart, Ind. 46514)

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7–9. **Computer Applications in the Earth Sciences,** 8th colloquium, Lawrence, Kans. (D. F. Merriam, Kansas Geological Survey, Univ. of Kansas, Lawrence 66044)

7–10. American Soc. of **Mechanical Engineers,** Boston, Mass. (A. B. Conlin, Jr., 345 E. 47 St., New York 10017)

8–9. Choice Criteria and **Management Systems for Estuarine Resources** Conf., Charleston, S.C. (J. C. Hite, Dept. of Agricultural Economics, Clemson Univ., Clemson, S.C. 29631)

8–10. International Conf. on **Communications,** San Francisco, Calif. (A. M. Peterson, Stanford Research Inst., Menlo Park, Calif. 94025)

8–10. Association for **Gnotobiotics,** Notre Dame, Ind. (M. Pollard, Dept. of Microbiology, Univ. of Notre Dame, Notre Dame 46556)

8–10. Conference on **Powder Metallurgy,** Detroit, Mich. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

8–12. International **Gas** Conf., 11th, Moscow, U.S.S.R. (R. H. Tonwaide, General Secretary, Intern. Gas Union, 4 Av. Palmerston, Brussels 4, Belgium)

8–12. International Symp. on **Plant Protein:** Their Improvement through the Application of Nuclear Techniques, Vienna, Austria. (J. H. Kane, U.S. Atomic Energy Commission, Washington, D.C. 20545)

9–12. American **Astronomical** Soc., Boulder, Colo. (H. M. Gurin, 211 Fitz Randolph Rd., Princeton, N.J. 08540)

9–12. Canadian Federation of **Biological** Societies, 13th annual, Montreal. (K. K. Carroll, Dept. of Biochemistry, Univ. of Western Ontario, London 72, Canada)

10–12. **Low Energy X- and Gamma Ray Sources and Applications,** 3rd symp., Boston, Mass. (J. W. Hitch, Div. of Isotopes Development, U.S. Atomic Energy Commission, Washington, D.C. 20545)

11–13. **Endocrine** Soc., St. Louis, Mo. (N. L. Mattox, Suite 304, 1211 N. Sharel, Oklahoma City, Okla. 73103)

12–14. Society of **Biological Psychiatry,** Atlantic City, N.J. (G. N. Thompson, 2010 Wilshire Blvd., Los Angeles, Calif. 90057)

13–14. American **Diabetes** Assoc., St. Louis, Mo. (J. R. Connelly, 18 E. 48 St., New York, N.Y. 10017)

14–18. **Botanical** Soc. of America, northwestern section, New London, Conn. (R. K. Zack, Dept. of Botany, Drew Univ., Madison, N.J. 07940)

14–18. American **Nuclear** Soc., Los Angeles, Calif. (O. J. Du Temple, 244 E. Ogden Ave., Hinsdale, Ill. 60521)

14–18. National **Plastics** Exposition and Conf., Cleveland, Ohio. (L. P. Williams, 250 Park Ave., New York 10017)

14–19. **Air Pollution Control** Assoc., 63rd annual, St. Louis, Mo. (A. Arch, 4400 Fifth Ave., Pittsburgh, Pa. 15213)

14–19. **Mass Spectrometry** and Allied Topics, 18th annual conf., San Francisco, Calif. [J. M. McCrea, Applied Research Lab. (73), U.S. Steel Corp., Monroeville, Pa. 15146]

14–19. American Soc. of **Medical Technologists,** Detroit, Mich. (S. B. Friedheim, Suite 1600, Hermann Professional Bldg., Houston, Tex. 77025)

14–19. Canadian Assoc. of **Pathologists,** Winnipeg, Man. (C. W. Penner, Winnipeg General Hospital, Winnipeg 3)

15–16. **Catalytic Hydrogenation and Analogous Pressure Reactions,** 3rd conf., New York, N.Y. (L. R. Neville, New York Acad. of Sciences, 2 E. 63 St., New York 10021)

15–17. American **Neurological** Assoc., 95th annual, Atlantic City, N.J. (S. A. Trufant, Cincinnati General Hospital, Cincinnati, Ohio 45229)

15–17. National Conf. of **Standards Laboratories,** Gaithersburg, Md. (R. J. Barra, Westinghouse Defense and Space Center, P.O. 746, Baltimore, Md. 21203)

15–18. American Soc. for **Engineering Education,** Columbus, Ohio. (W. L. Collins, 2100 Pennsylvania Ave., NW, Washington, D.C. 20037)

15–18. American **Meteorological** Soc. Symp., Boulder, Colo. (J. London, Dept. of Astro-Geophysics, Univ. of Colorado, Boulder 80302)

15–18. **Tissue Culture** Assoc., 21st annual, Washington, D.C. (V. P. Perry, American Foundation for Biological Research, 11125 Rockville Pike, Rockville, Md. 20853)

15–19. International Symp. on **Information Theory,** Noordwijk, Netherlands. (P. E. Green, Jr., M.I.T. Lincoln Lab., Lexington, Mass. 02173)

15–19. **Nuclear Data for Reactors,** 2nd intern. conf., Helsinki, Finland. (J. H. Kane, Div. of Technical Information, U.S. Atomic Energy Commission, Washington, D.C. 20545)

15–19. **Vacuum Metallurgy,** intern. conf., Anaheim, Calif. (E. L. Foster, Battelle Memorial Inst., 505 King Ave., Columbus, Ohio 43201)

15–19. American **Water Resources** Assoc. Conf., Milwaukee, Wis. (G. Karadi, Dept. of Applied Sciences and Engineering, Univ. of Wis., Milwaukee 53201)

16–17. **Environmental Variables in Animal Experimentation,** 2nd annual, Metropolitan Branch, American Assoc. for Lab. Animal Science, New Brunswick, N.J. (D. Miller, Smith Kline & French, 1500 Spring Garden St., Philadelphia, Pa.)

16–18. Conference on **Cold Forming of Metal Parts,** Cleveland, Ohio. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

16–18. American **Helicopter** Soc., 26th annual natl. forum, Washington, D.C. (H. M. Lounsbury, 30 E. 42 St., New York 10017)

16–19. Canadian **Psychiatric** Assoc., 20th annual, Winnipeg, Man. (W. A. Blair, 225 Lisgar St., Ottawa, Ont., Canada)

17–18. European **Dialysis and Transplant** Assoc., 7th annual, Barcelona, Spain. (W. Drokker, 75 de Lairessestraat, Amsterdam, Netherlands)

17–19. **Cryogenic Engineering** Conf., Boulder, Colo. (J. L. Smith, Jr., Rm. 41-204, Massachusetts Inst. of Technology, Cambridge, Mass. 02130)

17–20. American **Rheumatism** Assoc., Detroit, Mich. (M. M. Walsh, 1212 Ave. of the Americas, New York 10036)

17–21. American **Therapeutic** Soc., Chicago, Ill. (R. T. Smith, 37 Narbrook Pk., Narberth, Pa. 19072)

17–24. **Chemical Engineering** and Congr. of **Chemical Engineers,** Frankfurt-am-Main, Germany. (J. Dohent, Natl. Chemical Exposition, 86 E. Randolph St., Chicago, Ill. 60601)

18–19. Current Concepts of the **Histol-**

ogy of the Oral Mucosa Symp., Chicago, Ill. (C. A. Squier, College of Dentistry, Univ. of Illinois at the Medical Center, Chicago 60680)

18–20. **Bibliographical** Soc. of America, Philadelphia, Pa. (W. H. Bond, Houghton Library, Harvard Univ., Cambridge, Mass. 02138)

18–20. American Assoc. of **Bioanalysts**, New York, N.Y. (D. Birenbaum, 802 Ambassador Bldg., St. Louis, Mo. 63101)

20–25. American Soc. of **Radiologic Technologists,** Miami Beach, Fla. (G. J. Eilert, 527 S. Main St., Fond du Lac, Wis. 54935)

21–24. American **Dairy Science** Assoc., 65th annual, Gainesville, Fla. (C. Cruse, 903 Fairview Ave., Urbana, Ill. 61801)

21–24. American **Leather Chemists** Assoc., Lake Placid, N.Y. (M. T. Roddy, c/o Tanners Council Research Laboratories, Univ. of Cincinnati, Cincinnati, Ohio 45221)

21–25. American Association for the **Advancement of Science,** Pacific Div., Berkeley, Calif. (R. C. Miller, California Acad. of Sciences, Golden Gate Park, San Francisco 94118)

21–25. American **Medical** Assoc., Chicago, Ill. (W. E. Burmeister, 535 N. Dearborn St., Chicago, Ill. 60610)

21–25. American **Veterinary Medical** Assoc., Las Vegas, Nev. (D. A. Price, 600 Michigan Ave., Chicago, Ill. 60605)

21–26. American Soc. for **Testing and Materials,** Toronto, Ont., Canada. (T. A. Marshall, Jr., ASTM, 1916 Race St., Philadelphia, Pa. 19103)

22–24. International Conf. on the Role of **Tryptophan Metabolism in Biochemistry and Pathology,** Madison, Wis. (T. C. Meyer, Univ. of Wisconsin, Madison 53706)

22–25. Canadian Soc. of **Agronomy**, Ottawa, Ont. (R. Loiselle, Ottawa Research Sta., Central Experimental Farm, Ottawa)

22–25. Symposium on **Bioinorganic Chemistry**, Blacksburg, Va. (R. E. Dessy, Dept. of Chemistry, Virginia Polytechnic Inst., Blacksburg 24061)

22–25. Canadian Soc. of **Horticultural Science**, Ottawa, Ont. (E. C. Lougheed, Dept. of Horticulture, Univ. of Guelph, Guelph, Ont.)

22–25. American Assoc. of **Petroleum Geologists**, Calgary, Alta., Canada. (J. M. Browning, Tenneco Oil and Minerals, P.O. Box 1051, Calgary)

22–25. Canadian Soc. of **Soil Science**, Ottawa, Ont. (A. R. Mack, Central Experimental Farm, Ottawa)

22–25. **Thyroid** Conf., 6th annual, Vienna, Austria. (R. Hofer, c/o Wiener Medizinische Akademie, Alserstrasse 4, A-1090, Vienna)

22–26. American Assoc. of **Avian Pathologists**, Inc., Las Vegas, Nev. (G. H. Snoeyenbos, Univ. of Massachusetts, Amherst 01002)

22–27. **Mathematical Statistics and Probability**, 6th, Berkeley, Calif. (E. L. Scott, Dept. of Statistics, Univ. of California, Berkeley 94720)

23–26. State of the Art in **Corrosion Testing Methods** Symp., Toronto, Canada. (W. H. Ailor, American Soc. for Testing and Materials, Reynolds Metals Co., 4th and Canal Sts., Richmond, Va. 23218)

24. **Biometric** Soc., Western North American regional, Berkeley, Calif. (J. S. Williams, Statistical Lab., Colorado State Univ., Fort Collins 80521)

24–26. National **Aeronautics and Space** Administration, Ames Research Center, Moffett Field, Calif. (M. R. Heinrich, NASA, Ames Research Center, Moffett Field 94035)

24–26. American **Automatic Control** Conf., Atlanta, Ga. (D. Lyons, Dept. of Textiles, Clemson Univ., Clemson, S.C.)

24–26. **Equipment Manuals** Symp., Washington, D.C. (R. Post, Dept. of the Army, Materiel Command, Washington, D.C. 20315)

24–26. **Extreme Environments**: Microbial Adaptation. (M. R. Heinrich, Natl. Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif. 94035)

24–26. Canadian **Wood Chemistry** Symp., 3rd, Vancouver, B.C. (D. A. I. Goring, Pulp and Paper Research Inst. of Canada, 570 St. John's Rd., Pointe Claire, P.Q.)

24–27. **Drugs and Cerebral Function** Symp., 2nd annual, Denver, Colo. (M. L. Smith, Suite 1120, 2045 Franklin, Denver 80205)

24–27. **Hydrobiology**, natl. symp., Miami Beach, Fla. (J. C. Warman, Water Resources Research Inst., Auburn Univ., Auburn, Ala. 36830)

24–27. Western Soc. of **Malacologists**, 3rd annual, Stanford, Calif. (C. Skoglund, 3846 E. Highland Ave., Phoenix, Ariz. 85018)

24–1. International Symp. on **Mechanical Properties and Processes of the Mantle**, Flagstaff, Ariz. (L. R. Sykes, Columbia Univ., Palisades, N.Y. 10964)

25–27. **Leukocyte Culture** Conf., 5th, Ottawa, Canada. (J. Harris, Ottawa General Hospital, Ottawa 2)

28–2. **Health Physics** Soc., 15th annual, Chicago, Ill. (W. J. Blair, Biology Dept., Battelle Northwest, Richland, Wash. 99352)

28–4. American **Library** Assoc., Detroit, Mich. (D. H. Clift, Executive Director, The Association, 50 E. Huron St., Chicago, Ill. 60611)

28–4. American **Optometric** Assoc., 73rd annual congr., Honolulu, Hawaii. (G. Allen, Jr., 7000 Chippewa St., St. Louis, Mo. 63119)

28–4. **Radiation Research**, 4th intern. congr., Evian, France. (J. F. Duplan, Fondation Curie, 26 rue d'Ulm, F-75-Paris 5e, France)

29–1. **Drug Metabolism in Man**, New York, N.Y. (E. S. Vesell, Pennsylvania State Univ. College of Medicine, Hershey, Pa.)

29–1. American Soc. of **Heating, Refrigerating and Air Conditioning**, Kansas City, Mo. (J. T. Szabo, 345 E. 47 St., New York 10017)

29–1. Society for **Industrial and Applied Mathematics**, Denver, Colo. (N. Bleistein, Dept. of Mathematics, Univ. of Denver, Denver 80210)

29–1. **Water Quality Management Data and Instrumentation**, Madison, Wis. (I. Grossman, New York State Dept. of Health, 84 Holland Ave., Albany 12208)

29–3. International Conf. of **Operational Research** Soc. and Inst. of **Management**

Sciences, London, England. (Mrs. M. Kinnaird, Operational Research Soc. Ltd., 62–64 Cannon St., London E.C.4)

30–3. American **Dental** Soc. of Europe, Dublin, Eire. (D. Derrick, 140 Park Lane, London W.1, England)

July

1–3. Institute of **Navigation**, 25th annual, Colorado Springs, Colo. (R. E. Freeman, Suite 832, 815 15th St., NW, Washington, D.C. 20005)

1–4. Canadian **Dental** Assoc., Winnipeg, Man. (J. P. Beattie, 435 Academy Rd., Winnipeg 9)

1–6. National **Education** Assoc., San Francisco, Calif. (S. M. Lambert, NEA, 1201 16th St., NW, Washington, D.C. 20036)

2–3. American Inst. of **Aeronautics and Astronautics** and **Canadian Aeronautics and Space** Inst. joint meeting, Toronto, Ont., Canada. (H. C. Luttman, 77 Metcalfe St., Ottawa 4, Ont.)

5–9. **Agricultural Pesticide** Soc., Ottawa, Ont., Canada. (W. H. Minshall, Research Inst., Canada Agriculture, University Sub Post Office, London, Ont.)

5–9. Canadian Soc. of **Agronomy**, Ottawa, Ont. (R. Loiselle, Ottawa Research Sta., Central Experimental Farm, Ottawa)

5–9. Canadian Soc. of **Soil Science**, Ottawa, Ont. (A. R. Mack, Soil Research Inst., Central Experimental Farm, Ottawa)

6–10. **Microwave Spectroscopy** Conf., Bangor, England. (Meetings Officer, Inst. of Physics and The Physical Soc., 47 Belgrave Sq. London S.W.1, England)

6–10. Urban **Water Resources Management** Conf., Henniker, N.H. (K. R. Wright, Wright Water Engineers, Denver, Colo.)

6–11. Symposium on Applications of **Holography**, Besancon, France. (J. Ch. Vienot, Laboratoire de Physique Générale et Optique, Faculté des Sciences, Univ. de Besancon, 25 Besancon, France)

6–12. Society of **Nuclear Medicine**, Washington, D.C. (M. Glos, 211 E. 43 St., New York 10017)

7–9. Conference on **Scanning Electron Microscopy in Materials Science**, Newcastle upon Tyne, England. (E. H. Boult, School of Chemistry, The University, Newcastle upon Tyne)

7–9. Conference on **Modern Welding Techniques**, New York, N.Y. (J. A. Fellows, American Soc. for Metals, Metals Park, Ohio 44073)

7–10. **Catalytic Oxidation Principles and Processes**, intern. symp., London, England. (J. F. Gibson, Chemical Soc., Burlington House, London)

7–10. International Conf. on the **Chemistry and Physics of Organic Scintillators** and **Liquid Scintillation Counting**, San Francisco, Calif. (C. T. Peng, School of Pharmacy, Univ. of California, San Francisco 94122)

7–10. Symposium on **Stock and Recruitment**, Aarhus, Denmark. (L. R. Day, Intern. Commission for Northwest Atlantic Fisheries, P.O. Box 638, Dartmouth, Nova Scotia, Canada)

8–10. American Soc. of **Agricultural Engineers**, 63rd annual, Minneapolis, Minn. (J. L. Butt, P.O. Box 229, St. Joseph, Mich. 49085)

8–10. Symposium on **Non-Aqueous Electrochemistry**, Paris, France. (J. Badoz-Lambling, Laboratoire de Chimie Analytique, 10 rue Vauquelin, Paris 5)

8–10. Western **Resources** Conf., Denver, Colo. (J. J. Schanz, Jr., Denver Research Inst., Univ. of Denver, Denver 80210)

8–11. World Congress of **Digestive Endoscopy**, 2nd, Copenhagen, Denmark. (S. Stoichita, 29 ree Pitar Mos, Bucharest, Rumania)

9–10. Texas **Water Pollution Control** Assoc., 9th conf., Houston, Tex. (H. N. Myrick, Dept. of Civil Engineering, Univ. of Houston, Houston 77004)

12–16. **Powder Metallurgy**, 3rd intern. conf., New York, N.Y. (P. K. Johnson, Metal Powder Industries Federation, 201 E. 42 St., New York 10017)

12–18. International Soc. of **Gastroenterology**, 4th world congr., Copenhagen, Denmark. (M. Andreassen, Univ. Kirurgiske Klinik C., Rigshospitalet, Copenhagen).

12–18. **Photochemistry**, 3rd intern. symp., St. Moritz, Switzerland. (D. Bryce-Smith, Dept. of Chemistry, Univ. of Reading, Reading, England)

12–18. International Soc. of **Urology**, 15th congr., Tokyo, Japan. (T. Ichiawa, 1 Toyamacho, Shinju Ku, Tokyo)

13–15. American Assoc. of **Physicists in Medicine**, Washington, D.C. (J. A. Hancock, Jr., Box 2546, Malcolm Grow USAF Hospital, Andrews Air Force Base, Washington, D.C. 20331)

13–17. American Soc. of **Civil Engineers**, Boston, Mass. (W. H. Wisely, ASCE, 345 E. 47 St., New York 10017)

13–17. **Engineering Foundation Research** Conf., Henniker, N.H. (F. P. Huddle, Reference Service, Library of Congress, Washington, D.C.)

13–17. National Policy for **Materials**, Henniker, N.H. (F. P. Huddle, Library of Congress, Washington, D.C.)

13–17. **Transportation and Engineering**, Boston, Mass. (W. H. Wisely, American Soc. of Civil Engineers, 345 E. 47 St., New York 10017)

14–16. **Electromagnetic Compatibility**, internat. symp., Anaheim, Calif. (J. C. Senn, P.O. Box 1970, Anaheim 92803)

15–23. **World Water Balance**, intern. symp., Reading, England. (R. L. Nace, U.S. Geological Survey, Water Resources Div., Washington, D.C. 20242)

16–19. American Soc. of **Extra-Corporeal Technology**, 8th intern. conf., New Orleans, La. (E. C. Berger, 287 E. Sixth St., St. Paul, Minn. 55101)

16–20. American **Malacological** Union, 36th annual, Key West, Fla. (A. Solem, Field Museum of Natural History, Chicago, Ill. 60605)

17–18. Rocky Mountain **Cancer** Conf., Denver, Colo. (D. G. Derry, Colorado Medical Soc., 1809 E. 18th Ave., Denver 80218)

19–24. American Assoc. of **Clinical Chemists**, 22nd natl., Buffalo, N.Y. (D. A. Pragay, P.O. Box 38, Buffalo 14215)

20–22. American Inst. of **Aeronautics and Astronautics**, Detroit, Mich. (W. I. Marble, 2 Pennsylvania Plaza, New York 10001)

20–22. Society of **Automotive Engineers**, Detroit, Mich. (W. I. Marble, 2 Pennsylvania Plaza, New York 10001)