SCIENCE

4 January 1963

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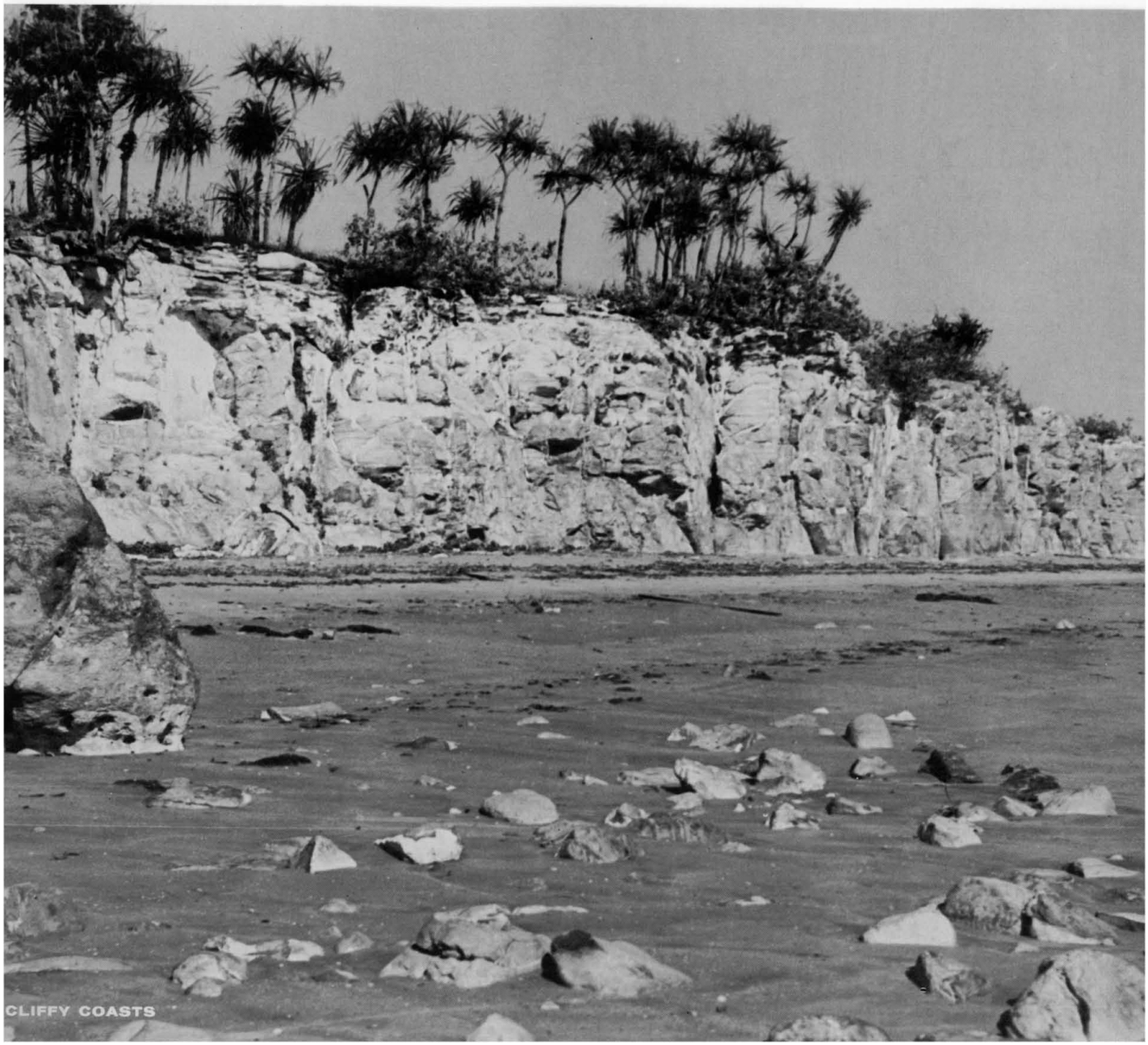
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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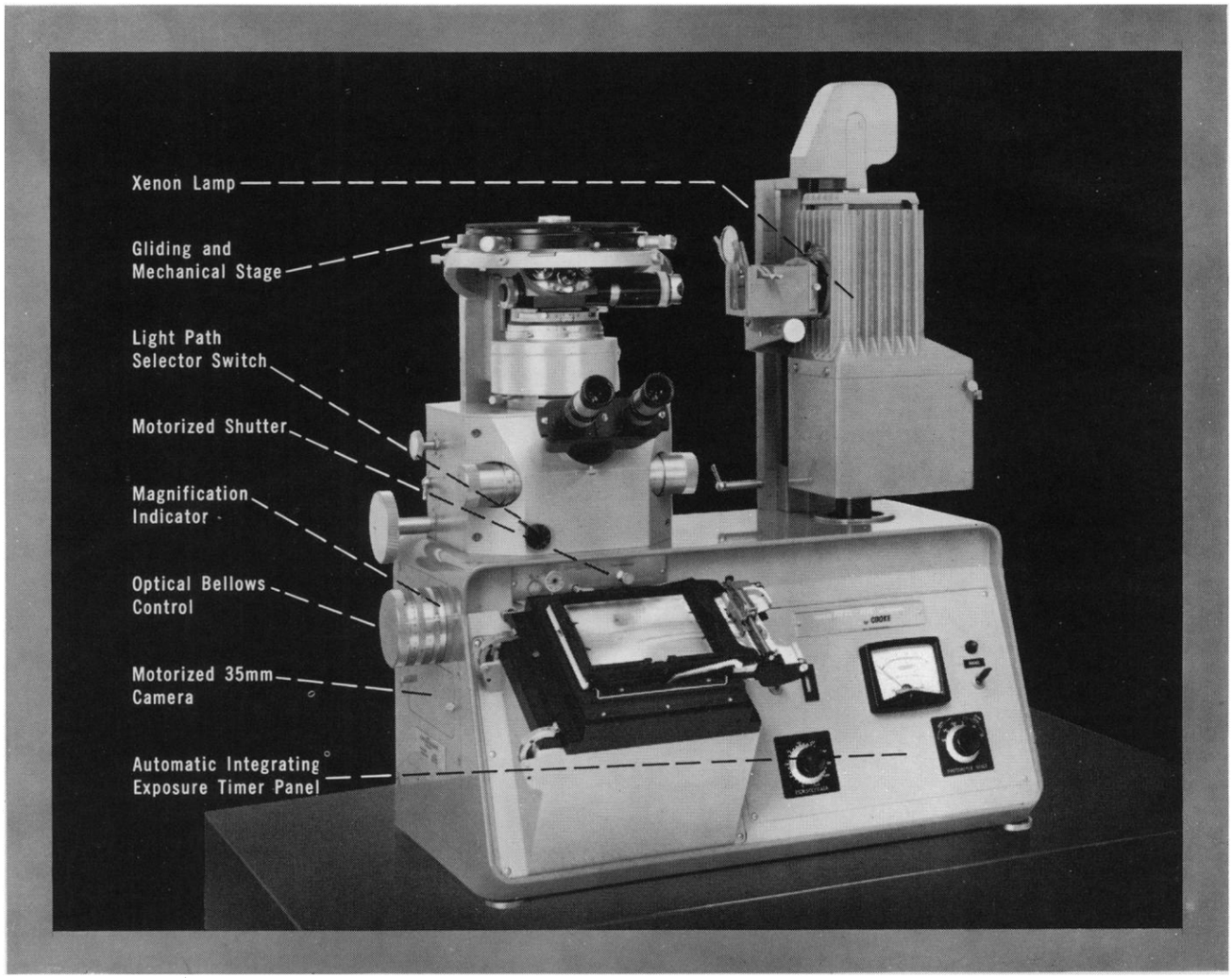

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Linde Cryobiology NEWS

REPORT NO. 2 FROM LINDE COMPANY, DIVISION OF UNION CARBIDE CORPORATION

Achieve maximum recovery of viable tissues, cells and microorganisms with liquid nitrogen

A PRACTICAL TECHNIQUE

Biologists and clinicians in many areas of science can now preserve tissue and cell cultures more efficiently and effectively because of recent advances made in cryobiology.

In fact, new techniques make it possible to preserve successfully many tissues and cell cultures which were formerly thought to be destroyed by the freezing process. Many of the inherent areas of risk in long-term experiments—such as chromosomal change or mutation, contamination of culture with bacteria or viruses or other cell lines, and loss of cultures—have been virtually eliminated.

Basically, best results in freezing and storing of viable specimens have been obtained by:

1) Cooling at a precisely controlled rate (in the range of 1°C. per minute to 15°C. per minute).

2) Using the proper amount of protective additive (usually glycerol or dimethyl sulfoxide).

3) Storing at liquid nitrogen temperature (−196°C).

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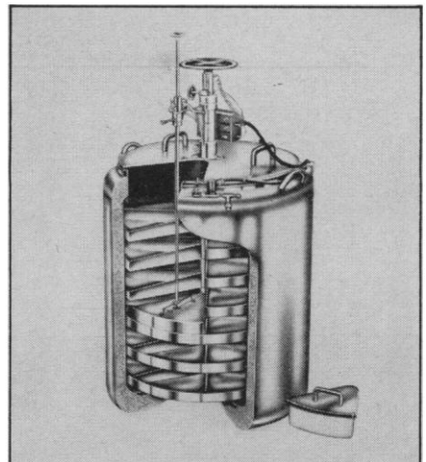
Linde Company has pioneered in the development of liquid nitrogen equipment for cryobiological purposes. LINDE provides a complete line of LN_2 refrigerators, low-loss liquefied gas containers, and precise controlled-rate freezers, as well as accessories. This is backed by the most experienced technical service available today—through LINDE's own cryobiology laboratories and field representatives.

LINDE liquid nitrogen refrigerators come in a wide range of capacities. These include, for major projects, the new large-capacity LNR-640-C and sophisticated LNR-360 *(see photo)*. Also, there is the new high-accessibility LNR-250, the improved medium-capacity LNR-35, the standard 720-ampule capacity LNR-25 widely used by biologists for many years, and the all-new fully portable, highly compact LNR-10.

NEW LNR-360 REFRIGERATOR



360-liter liquid nitrogen refrigerator developed especially for large-capacity storage of cell and tissue cultures, and microorganisms. 44 in. high, 35 in. outside dia., it has a 6.6 cu. ft. product storage capacity.

Features include:

- Unique semi-automatic tray selector indexing system for easier placement and removal of specimens.
- Large, removable 28.5 in. dia. cover with "pie-shaped" opening for complete accessibility to refrigerator's interior.
- All-welded, stainless steel construction for greater durability.
- Low liquid nitrogen consumption—fully charged refrigerator has a holding time of more than 50 days.
- 6 tray levels containing 37 canisters for greater storage capacity.

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Detailed literature is available on request. Also, LINDE's "Cryobiology Report No. 1" which deals more generally with the all-new method of freezing and storing biologicals. For further information, check your area(s) of interest on the coupon below and send.

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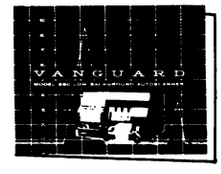

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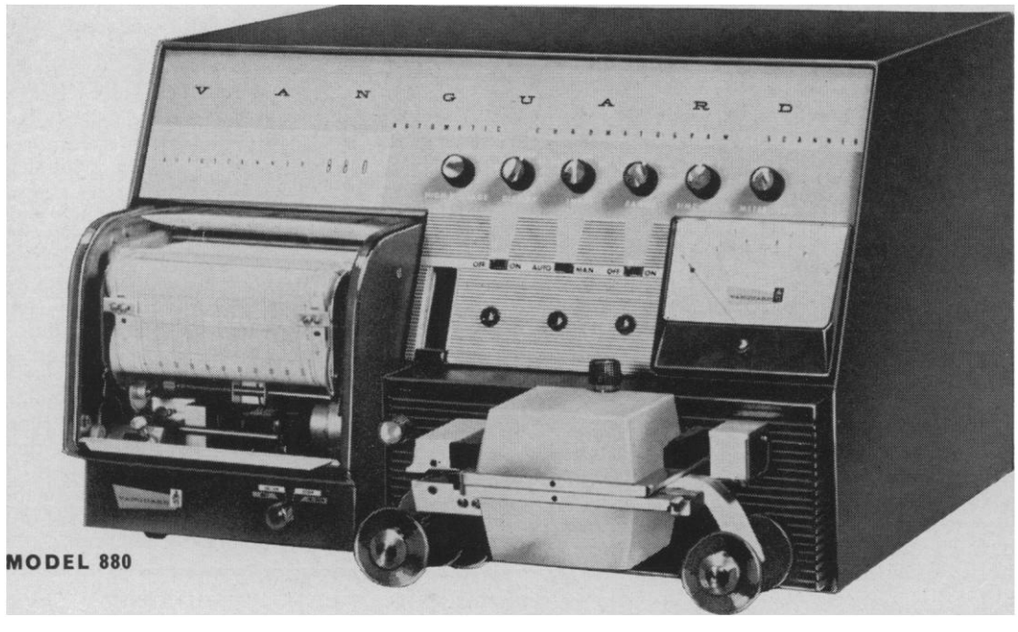

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A Proper Accounting

With the increase in numbers of scientific research workers, the great national meetings have tended to become unwieldy. Many simultaneous sessions must be held, with meetings scheduled in a number of different rooms and even in different buildings. It has thus become difficult for individuals to rendezvous and engage in the exchanges that were a valuable feature of earlier meetings.

These circumstances have fostered an increasing use of symposia, and many valuable special sessions are arranged in connection with meetings of the major scientific societies. These sessions in general are open to the public or at any rate to registrants. Increasing even more rapidly are the closed symposia. These involve specially invited small groups—often 20 or 30—who spend two or three days in intensive sessions. The participants may be brought together from all parts of the nation and even from abroad and include the more creative scientists active in a particular area of effort. The limited size of the group is a key ingredient in the success of these meetings. Transfer of information is facilitated; participants are less inhibited than they are in larger gatherings, and it is relatively easy to suppress the loquacious individual who insists on dealing in trivia. Informality sometimes characterizes the sessions, but a chairman maintains order and attempts to give direction. In other instances, the program is more formal. In any event, a large amount of information is transferred both in sessions and in personal contacts among the participants. For those directly involved, such meetings can be acutely stimulating, and significant scientific progress often can be traced to them.

Initiative for arranging the meetings usually comes from an established investigator. After a brief study of feasibility, including sounding out possible participants, he often seeks financial support amounting to $5,000 to $10,000. Because of his stature and his list of important potential participants, he can usually arrange for a subsidy. In most instances, funds are supplied by government agencies.

Unfortunately there are negative aspects of these closed meetings. Organizers of closed symposia tend to choose a small coterie of established individuals. This group gains the advantage of obtaining information concerning new research results far ahead of others. A net tendency is to favor senior investigators over younger men who have not yet won recognition. This favoritism often is compounded by what amounts to a policy of secrecy in the organization and conduct of the meetings. Understandably, the organizers usually have little stomach for the indignation of the uninvited. Less excusable is a common failure to communicate results or highlights of the symposia to the remainder of the scientific community. Often no direct notice of the event is forthcoming. Occasionally the papers are collected in a volume which appears only after the material is quite stale. Thus the conveners are in the position of expending public monies without a proper public accounting. At least one remedial step could easily be taken.

We feel that the organizers of government-supported symposia should be asked by the granting agencies to render in the open literature a brief report of the highlights of the meeting immediately after its completion. This would not remove all the aspects of special privilege; but it would insure that those not present could share in some measure in the proceedings, and development of the area of science involved would consequently be enhanced.—P.H.A.

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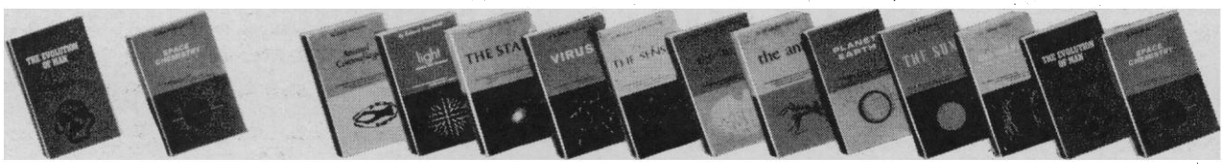

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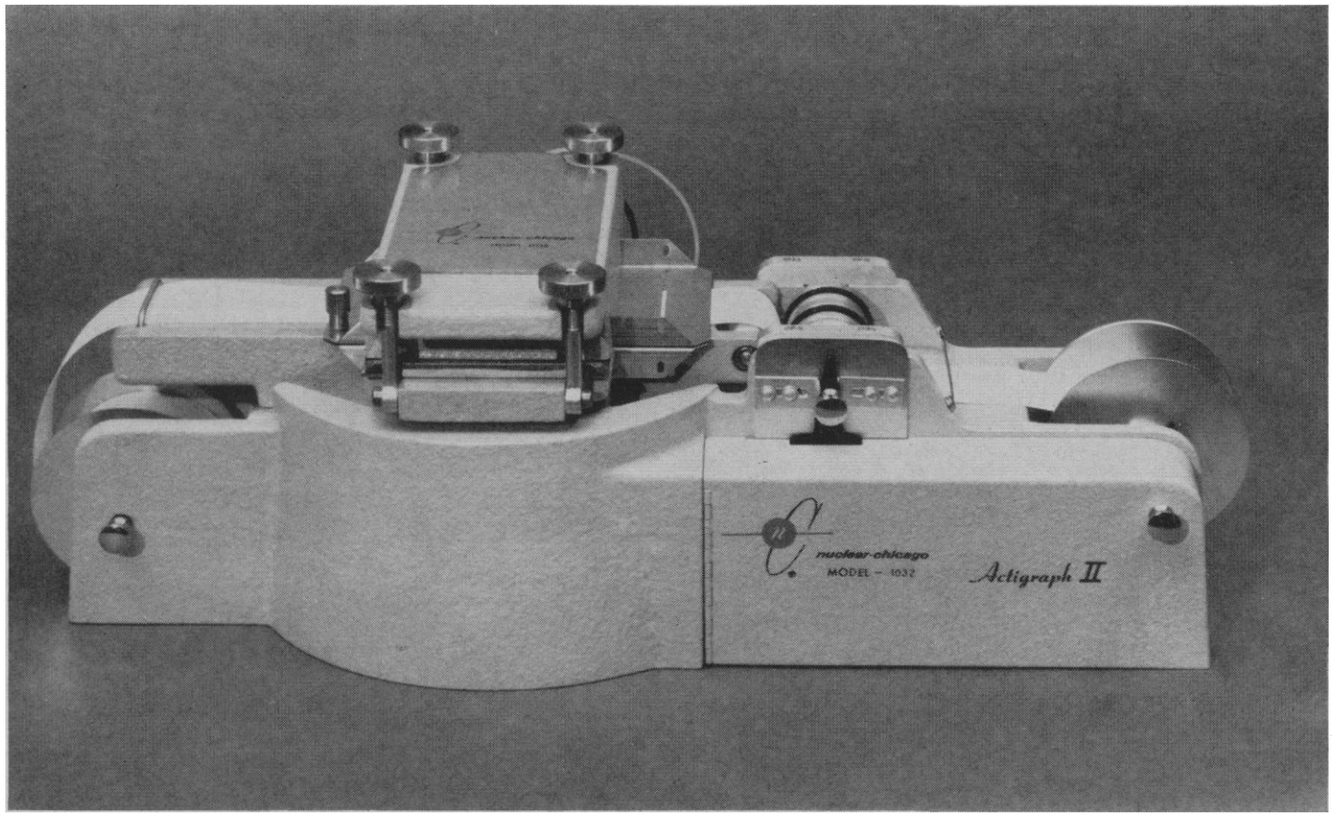
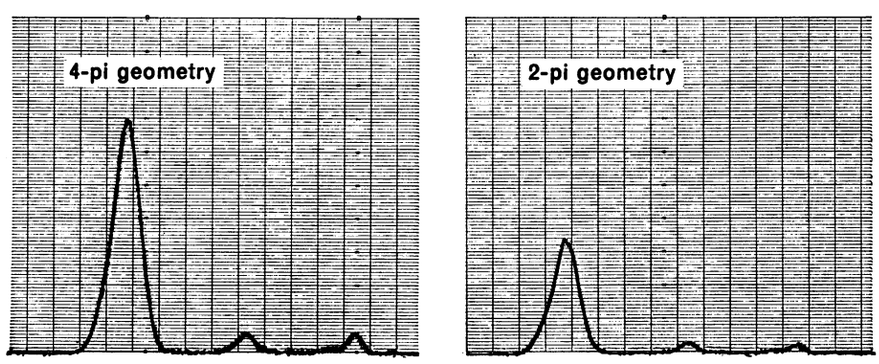


A new radiochromatogram scanning system by Nuclear-Chicago combines the advantages of 4-pi detection with window or windowless operation to offer greater versatility and accuracy to the user. Model 1032 Actigraph® incorporates a small-volume, dual-chamber detector that simultaneously scans both sides of the strip chromatogram. This design greatly increases the accuracy of the scan and practically doubles sensitivity over 2-pi systems. Efficiencies as high as 10% for carbon-14 and 2% for tritium can be obtained with a background of 15 counts per minute or less.

The Actigraph also features many time-saving conveniences. The unique clam-shell construction of the detector-assembly simplifies paper loading and allows easy access to the detector windows. Paper widths ranging from ½ to 1½ inches can be accommodated—including Whatman Nos. 1, 2, 3, and 4. Nuclear-Chicago's experience in the design and manufacture of radiochromatogram scanning systems (over 700 Actigraphs are currently in use) assures you that the Actigraph will deliver the most reliable performance and highest accuracy. Please write for our detailed literature covering the many benefits of this new system.



Actual strip-scan made with the new Model 1032 (left) compared to scan produced by a similar 2-pi system (right). Note that resolution is enhanced and the sensitivity is doubled with no increase in background. The conditions of the scans were: Developed chromatogram—H^3-labelled N-Butanol and H_2O; detector—windowless; scan speed—12 in./hr.; time constant—40 sec.; collimator width—¼ in.; total activity—approximately 1 microcurie.

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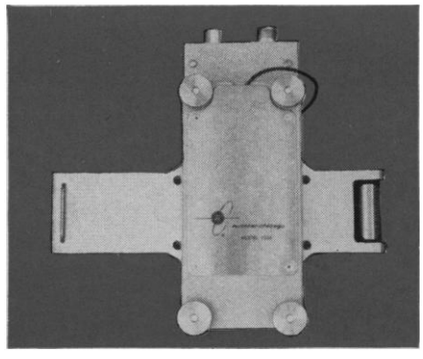
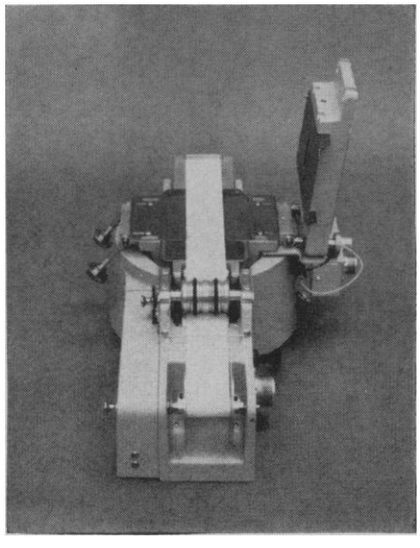
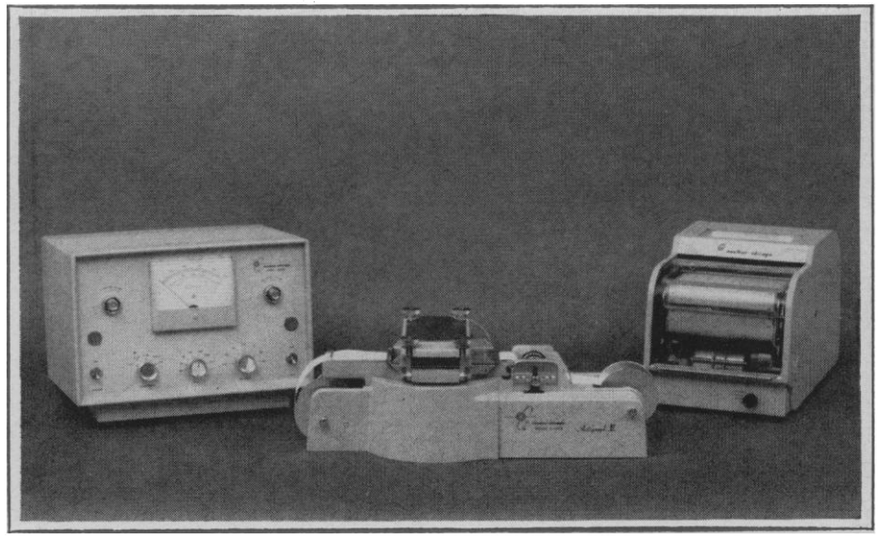
For automatic presentation of quantitative information, use either Nuclear-Chicago's digital print-out systems or Model 8408 Integrating Graphic Recorder. The 8408 records total counts in each peak while simultaneously presenting analog count-rate information.

Conversion available for Nuclear-Chicago 2-pi Actigraphs

Those presently using the Nuclear-Chicago Model C100A or C100B 2-pi Actigraph can also gain the advantages of a 4-pi system simply by adding Model 1036 Detector Assembly and Model VK2 Automatic Valve to their present scanning unit. The 1036 consists of the identical detecting chambers and preamplifier furnished with the Model 1032 4-pi Actigraph. It offers the same high levels of sensitivity and resolution. Conversion takes only a few minutes.







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Meetings

Repair and Differential Radiosensitivity

Chromosomal breakage and rejoining processes, repair or recovery of potential mutational or lethal damage, dose rate and fractionation effects, and stage sensitivity were the chief subjects of discussion at the symposium on "Repair from Genetic Radiation Damage and Differential Radiosensitivity of Germ Cells" which was held at Leiden, The Netherlands, 15 to 19 August 1962, under the auspices of the Department of Radiation Genetics of the State University of Leiden.

Dealing with various problems in the production of chromosome aberrations, papers by S. Wolff, D. R. Parker, H. J. Evans, and A. T. Natarajan emphasized the importance of the proximity of chromosomes and chromosome parts in determining dose kinetics and stage sensitivity. Wolff pointed out how the concept of a limited number of sites at which the chromosomes could be close enough for rejoining can account for much of the data represented by dose curves, Parker showed how the limited site concept can explain the changes in sensitivity and in kinds of aberrations during oögenesis in *Drosophila*. Evans discussed the role of variations in site number, oxygen tension, and concentration of free thiols in the sensitivity changes during the cell cycle. Natarajan discussed several factors controlling aberration production in seeds, among them postirradiation temperature.

Recent developments in the study of postirradiation repair of premutational damage were summarized in a series of papers on coliphage (W. Harm), *Escherichia coli* (C. O. Doudney and E. M. Witkin), *Paramecium* (R. F. Kimball), and *Drosophila* (F. H. Sobels). Included were the demonstration of gene-controlled repair in phage and bacteria (Harm), the analysis in bacteria of the biochemical processes involved in repair or removal of premutational damage and in its fixation or incorporation as mutation (Doudney, Witkin), the relation between the rates of repair of two classes of chromosomal lesions in *Paramecium* and the role of these two classes in differential sensitivity during the life cycle of the cell (Kimball), and the demonstration of some of the properties of repair of premutational damage during various stages of spermato-

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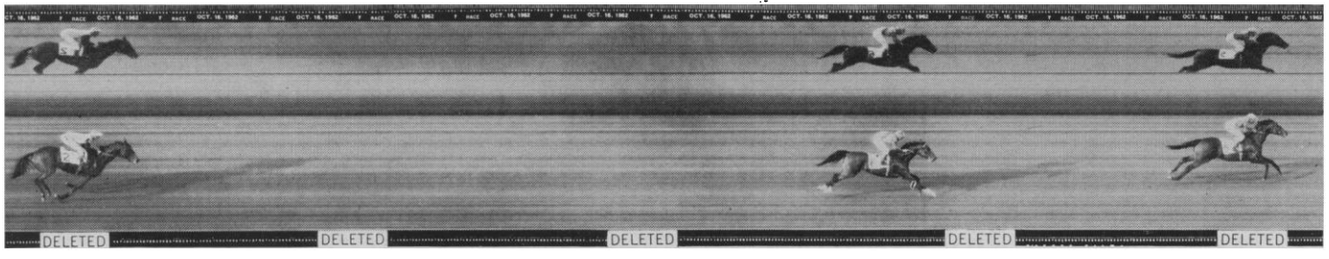
They shall beat their swords into plowshares and their spears into pruning hooks. Nation shall not lift up sword against nation. Neither shall they learn war any more. — ISAIAH

Lockheed is very proud of its F-104 Starfighter. At a recent U. S. Air Force Fighter Weapons Meet at Nellis AFB, Nev., an F-104 (C model) outflew, outgunned, and outbombed all 13 of its competitors.

Lockheed has given us permission to disclose that the F-104 carries a 19.25mm hemisphere of KODAK IRTRAN 2 Optical Material on the flat face of which we deposit by a unique method a 4mm x 4mm film of lead sulfide to which leads are attached. This kind of infrared sensor we call a KODAK EKTRON Detector, Type Q-5, Modified. The hemisphere has been made also out of another high-index infrared-transmitting material, strontium titanate. Replacement of this by IRTRAN 2 material seems to make the time constant of the detector—which is about 250 μsec at 25°C—more stable over long periods with less effect from storage conditions. Also, the dark resistance stays put better. Therefore the s/n drifts less. Incidentally, signal and noise levels are both high, which lessens the demands on the associated circuitry. (NEP, however, is less than 6.7×10^{-11} watts for 600°C radiation chopped at 2500 cycles/sec over a 1 cycle/sec bandwidth.)

We mention high index. We are rather pleased at having it in the record that some years ago we suggested to the brethren that the same principle that makes an oil-immersion microscope objective resolve more detail than the best dry objective could also be worked for another purpose in the infrared game. Putting the detector film on the high-index hemisphere flat boosts the signal by 3.4×.

Safe as the F-104 makes us feel as we sit before our hearths, we'd feel even safer if we had more sales outlets for these buttons than just one make of airplane. We sure would like it if it turned out, in line with the prophet's beautiful allusion to old iron, that an entirely different use were found in addition for Type Q-5 detectors. Eastman Kodak Company, Special Products Division, Rochester 4, N. Y. can help you think about that.



Jones' film

The horseplayers of America have made a contribution to engineering. True horseplayers spend their lives contributing. They contribute by a process based on ordinal digits. Determination of the digits often requires instrumentation. A sound technology has developed to support this instrumentation. The horseplayers gladly support the technology by their contributions. The technology is now old enough to have added the expression "photo finish"* to common speech.

A photo finish negative is projected for the judges less than 25 seconds after the last horse crosses the finish line. They nearly always wait for the last horse. If the last horse is quite late, it looks longer than the first horse because there is hardly need for it to hurry any more as it passes the finish line. The finish line is the optical conjugate of a narrow slit at the focal plane of the camera. The film is exposed only at that point as it moves past the slit at constant speed.

We have just introduced a new KODAK Timing Negative Film for this work. We don't see why the new film should be denied to off-track use. It is a 35mm film with the perforations omitted and the edge legend KODAK SAFETY FILM reduced in height to .014", all in order to make room for the timing signal and other indicia (some of which have been deleted from the above illustration to protect the privacy of the jockeys). When developed for 10 seconds in the proper hot developer, it yields extraordinary definition at an Exposure Index of about 100. Fixation is extremely rapid. Contrast is readily controlled by the processing parameters. Spectral sensitivity is notably uniform from the ultraviolet to 630 mμ.

An inquiry to Eastman Kodak Company, Special Sensitized Products Division, Rochester 4, N. Y. will get you some data about this film. There is another possible approach. Our No. 1 customer for the product is Jones Precision Photo Finish, Inc., 2 Crest Avenue, Elmont, N. Y., who make their own cameras and provide race timing service for about 65 out of 100 race tracks in the country. They have more practical experience with the film than we do. Perhaps you can induce Jones to diversify.

Not TV

Two problems are being solved here in one swell foop. Problem No. 1: What further benefits can be realized from the reception room besides serving as a setting for display of the most charming girl that Personnel has been able to find? Problem No. 2: What further benefits can be realized from all those KODACHROME slides that chronicle the organization's activities?

That's not a TV. It's an instance of somebody (Lester A. Dine Co., 102 Jericho Turnpike, Floral Park, N. Y., to be precise) buying one of our products (the KODAK CAROUSEL Projector, to be precise) and doing something smart with it. Inside this fine walnut cabinet the projector shows 80 slides automatically and a tape machine plays a commentary along with them. $550 complete, they tell us.

Eastman Kodak Company ads like this have been appearing for 10 years. They suggest that we make a wide variety of products. Possibly you have at one time or another thought of buying one but, not knowing how to go about it, have said, "The devil with it." Are you interested enough to send for a pocket reference book that may help you and us achieve mutually beneficial contact? If so, address Eastman Kodak Company, Dept. 8, Rochester 4, N. Y. It is a tiny bit out of date, but that can't be helped. (Everybody dies a little each day.)

*Two words. The one word "photofinish" is a verb that refers to something entirely different, namely what you should have had done by now to any family snapshots taken during the recent festive season.

genesis in *Drosophila* (Sobels). Harm discussed repair of lesions by enzymes and the idea that repair, to be effective, must occur before DNA synthesis; this is becoming an increasingly attractive explanation for the various findings with *Escherichia, Paramecium,* and *Drosophila.*

The influence of dose rate and dose fractionation on mutation induction by ionizing radiation was discussed for the mouse (W. L. Russell), silkworm (Y. Tazima and S. Kondo), and *Drosophila* (H. J. Muller, I. I. Oster and S. Zimmering, and C. E. Purdom). The existence of dose rate and fractionation effects is now well established for the mouse and the silkworm but the data for *Drosophila* are still equivocal. Some of the effects in the mouse and silkworm can be explained best by hypotheses involving repair of premutational damage. Other effects require hypotheses postulating some form of selection, such as differential cell killing.

Concerning the changes in sensitivity during gametogenesis and early cleavage stages, a number of striking parallels are found between diverse organisms. A rather full description was given by R. C. von Borstel and W. St. Amand of the changes in sensitivity from early oögenesis to early cleavage in *Habrobracon.* F. E. Würgler studied in detail the changes in sensitivity of *Drosophila* eggs during the first few cleavages. The *Habrobracon* and *Drosophila* studies agree in showing a peak of sensitivity just after meiosis in fertilized eggs and a periodic rise and fall in sensitivity corresponding to the first few cleavage mitoses.

The sensitivity of sperm and of various stages of spermatogenesis in *Drosophila* were discussed. R. Sävhagen summarized her work on the variation of sensitivity to induction of various types of genetic effects during spermatogenesis. J. Mossige considered in some detail the factors responsible for the difference in sensitivity between various batches of mature sperm. H. Traut analyzed the basis for variation in the form of the dose curves for recessive lethals in sperm of different origins. D. L. Lindsley pointed out the relations between the chromosome constitution of the sperm and its sensitivity to inactivation by radiation. B. P. Kaufman and H. Gay discussed electron microscopical and cytochemical studies of spermatogenesis.

Work by L. B. Russell on the sensitivity of various stages in gametogenesis and in the early development of the mouse zygote is now extensive enough to allow a number of comparisons with the studies on *Drosophila* and *Habrobracon.* These comparisons result in several striking parallels. G. E. Magni discussed the major changes in sensitivity that occur during meiosis in yeast and compared the sensitivity of mitosis and meiosis in this organism, both in regard to spontaneous and radiation-induced mutation.

The symposium was organized by F. H. Sobels who assembled a group of approximately 100 major investigators in the field. There were six half-day sessions and an evening session with a total of 24 invited papers. There was adequate time for discussion, and the discussion was lively. The conference was well organized and succeeded admirably in its purpose of defining the present status of research in this general area in the presence of most of the active workers. The invited papers and recorded discussion will be published by Pergamon Press.

Important advances have been made in understanding the mechanisms by which the initial radiation damage to the chromosomes is converted to chromosome aberrations or mutations, and it is becoming possible to apply this knowledge to interpreting variations in radiation sensitivity. The existence of dose rate and dose fractionation effects in the induction of specific locus mutations can no longer be doubted for either the mouse or the silkworm although the situation remains equivocal for *Drosophila.* Work in this area is turning now to analyses of the reasons for these effects. Many data have been accumulated on variations in radiation sensitivity during gametogenesis in various organisms, and some striking similarities have been found between quite diverse organisms. Though a number of more or less plausible explanations have been offered for the variations in sensitivity, general agreement has not yet been reached; the major advances in this area have been more descriptive than analytical.

R. F. KIMBALL
Biology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Forthcoming Events

January

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

23–26. American Group **Psychotherapy**

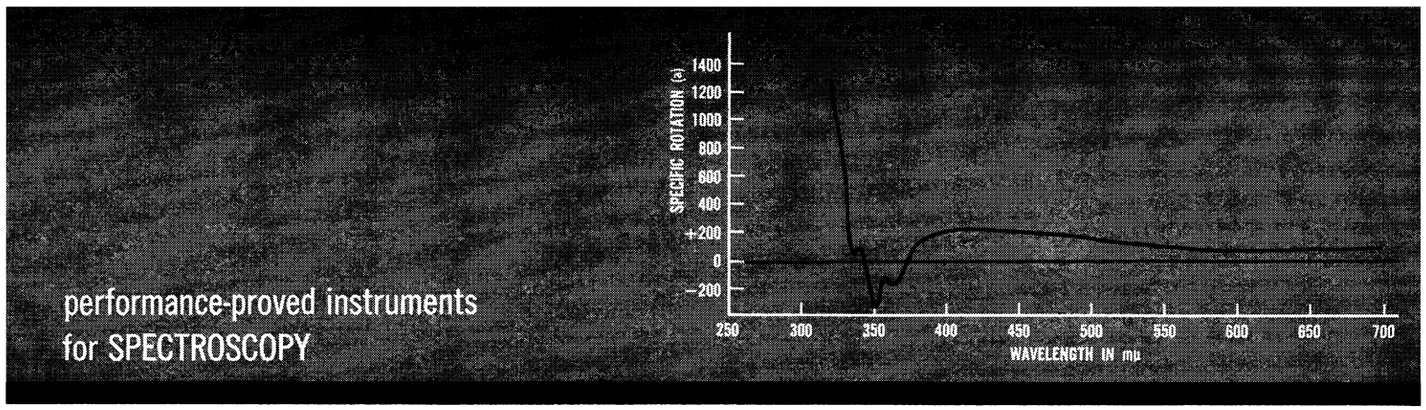


Chart shows spectral analysis by Optical Rotatory Dispersion of 2mg of testosterone in p-dioxane. With identical calcite polarizer-analyzer combinations in each beam, absorption by the sample is canceled out. Rotation of the light by the sample appears as a pen deflection on the chart, whence it is readily convertible to angular units by conversion tables provided with the accessory. The high scale expansions available on the Model 350 can be used to advantage in ORD work.

MODEL 350- AN ADVANCED COMBINATION OF FEATURES FOR UV-VIS-NIR ANALYSIS

Perkin-Elmer's Model 350 Spectrophotometer is the product of a completely fresh approach to instrument design. Keyed to today's demand for sophisticated analytical and research capability, it combines all the most-wanted features—each at its maximum potential.

In the range from 175 mμ in the far ultraviolet to 2.7 μ in the near infrared, the versatile Model 350 offers superior resolution and photometric precision for a wide range of differential analyses, for color measurement, kinetic studies, optical rotatory dispersion determinations, and other exacting applications. Optically designed for high energy per spectral slit width, with scale expansion and pen response control, it possesses extraordinary microanalytical sensitivity for sample-limited studies—biomedical, forensic and other.

A wide dynamic range of scan speeds and complete selection of recording and sampling accessories enable the Model 350 to meet specialized analytical requirements with ease. For an illustrated brochure with complete description and specifications, write to Instrument Division, Perkin-Elmer Corporation, 910 Main Avenue, Norwalk, Connecticut.

Assoc., annual, Washington, D.C. (AGPA, 1790 Broadway, New York 19)

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

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

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

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

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

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

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

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

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

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

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

February

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

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

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

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

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

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

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

10–16. **Planned Parenthood**, intern.

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

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

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

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

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

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

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

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

15–14 Apr. **Aeronautics and Space**, intern. exhibition, São Paulo, Brazil. (Santos Dumont Foundation, Avenida Ipiranga N°. 84, São Paulo)

16–23. Caribbean **Dental** Convention, Port of Spain, Trinidad. (A. V. Awon, 43–45 Frederick St., Port of Spain)

17–21. Technical Assoc. of the **Pulp and Paper** Industry, annual, New York, N.Y. (TAPPI, 360 Lexington Ave., New York 17)

18–20. American **Standards** Assoc., natl. conf., New York, N.Y. (ASA, 10 E. 40 St., New York 16)

18–20. **Biophysical** Soc., annual, New York, N.Y. (A. Mauro, Rockefeller Inst., New York)

18–20. **Electrochemistry**, 1st Australian conf., part II, Hobart, Tasmania. (J. N. Baxter, Chemistry Dept., Univ. of Tasmania, Hobart)

18–25. Expert Committee on **Food Additives**, FOA/WHO, Rome, Italy. (Intern. Agency Liaison Branch, Office of the Director General, Food and Agriculture Organization, Viale delle Terme di Caracalla, Rome)

19–22. **Radiochemistry**, inter-American conf., Montevideo, Uruguay. (Pan American Union, Washington 6)

20–22. Fundamental **Cancer** Research, annual symp., Houston, Tex. (L. Dmochowski, Section of Virology and Electron Microscopy, M. D. Anderson Hospital, Houston 25)

20–22. **Solid-State Circuits**, intern. conf., Philadelphia, Pa. (F. J. Witt, Bell Telephone Laboratories, Inc., Murray Hill, N.J.)

20–23. National Assoc. for Research in **Science Teaching**, Washington, D.C. (J. D. Novak, Biological Science Dept., Purdue Univ., Lafayette, Ind.)

20–24. Diseases of the **Chest**, intern. congr., New Delhi, India. (M. Kornfeld, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.)

21–22. American Soc. for **Quality Control**, regional conf., Las Vegas, Nev. (S. R. Wood, Dept. 61, Bldg. 160, Aerojet-General Corp., Azusa, Calif.)

22–23. American **Psychopathological** Assoc., annual, New York, N.Y. (F. A. Freyhan, c/o St. Elizabeths Hospital, Washington 20, D.C.)

23–28. American Soc. for **Testing** and **Materials**, Atlantic City, N.J. (H. H. Hamilton, 1916 Race St., Philadelphia 3, Pa.)

24–25. Unit Processes in **Hydrometallurgy**, symp., Dallas, Tex. (F. T. David, Colorado School of Mines, Golden)

24–27. **Diffusion**, intern. conf., Palm Springs, Calif. (J. A. Biles, Univ. of Southern California, School of Pharmacy, Los Angeles 7)

24–28. American Inst. of **Mining, Metallurgical, and Petroleum Engineers**, annual, Dallas, Tex. (E. Kirkendall, AIME, 345 E. 47 St., New York 17)

25–27. Advanced **Marine Engineering** Concepts for Increased Reliability, symp., Ann Arbor, Mich. (G. L. West, Jr., Dept. of Marine and Nuclear Engineering, Univ. of Michigan, Ann Arbor)

25–1. **Environmental Engineering**, natl. conf., Atlanta, Ga. (W. H. Wisely, American Soc. of Civil Engineers, 345 E. 47 St., New York, N.Y.)

26–27. **Dairy Engineering**, natl. conf., East Lansing, Mich. (C. W. Hall, Dept. of Agricultural Engineering, Michigan State Univ., East Lansing)

26–1. Society of **Plastics Engineers**, annual technical conf., Los Angeles, Calif. (G. P. Kovach, Foster Grant Co., 289 N. Main St., Leominster, Mass.)

27–3. American College of **Cardiology**, Los Angeles, Calif. (D. Scherf, 55 E. 86 St., New York 27)

28–2. Experimental Aspects of **NMR Spectroscopy**, Pittsburgh, Pa. (W. A. Straub, Applied Research Laboratory, U.S. Steel Corp., Monroeville, Pa.)

March

1–3. **Developing Brain and Binding Sites** of Brain Biogenic Amines, intern. symp., Galesburg, Ill. (H. E. Himwich, Research Div., Galesburg State Research Hospital, Galesburg)

2–6. Canadian Assoc. of **Radiologists**, annual, Quebec, Canada. (J. L. Léger, 1555 Summerhill Ave., Montreal 25, P.Q., Canada)

4–6. Association of **Iron and Steel Engineers**, western meeting, Los Angeles, Calif. (T. J. Ess, 1010 Empire Bldg., Pittsburgh 22, Pa.)

4–6. **Wildlife Management** Inst., Detroit, Mich. (C. R. Gutermuth, 709 Wire Bldg., Washington 5)

4–8. **Analytical Chemistry and Applied Spectroscopy**, 14th annual, Pittsburgh, Pa. (W. A. Straub, Applied Research Laboratory, U.S. Steel Corp., Monroeville, Pa.)

4–9. **Astronautics**, 3rd Inter-American symp., São Paulo, Brazil. (Symp. Secretariat, Sociedade Interplanetaria Brasileira, Caixa Postal 6450, São Paulo)