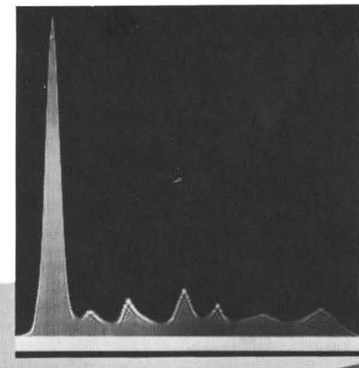
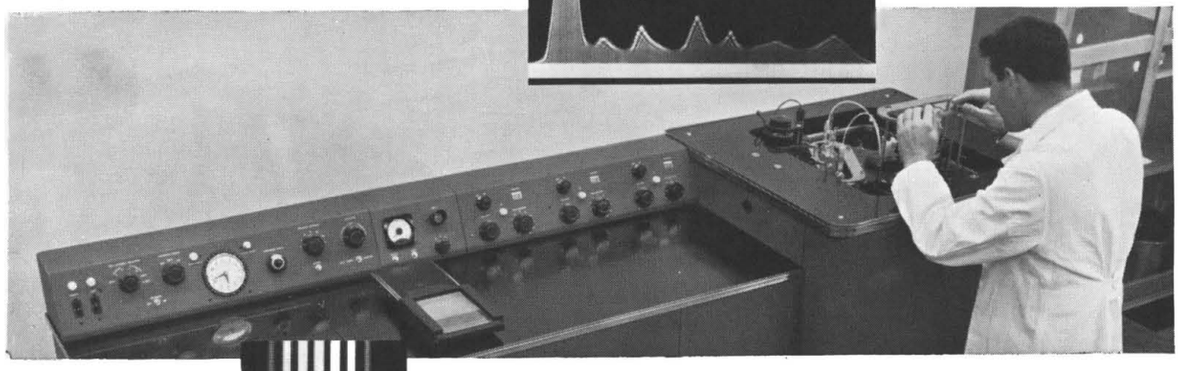
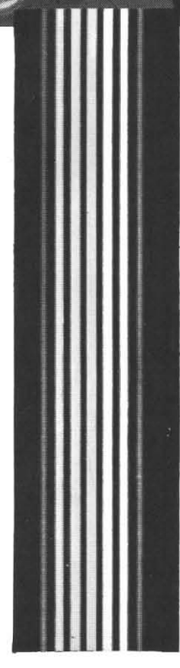
SCIENCE 30 November 1962
Vol. 138, No. 3544
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SHETLAND SHEEP DOG



Electrophoresis of human plasma diluted 1:6; ascending boundaries. Inclined knife-edge schlieren.





Portion of typical reference fringe pattern obtained from standard production model, magnified to show straightness and definition of entire pattern.

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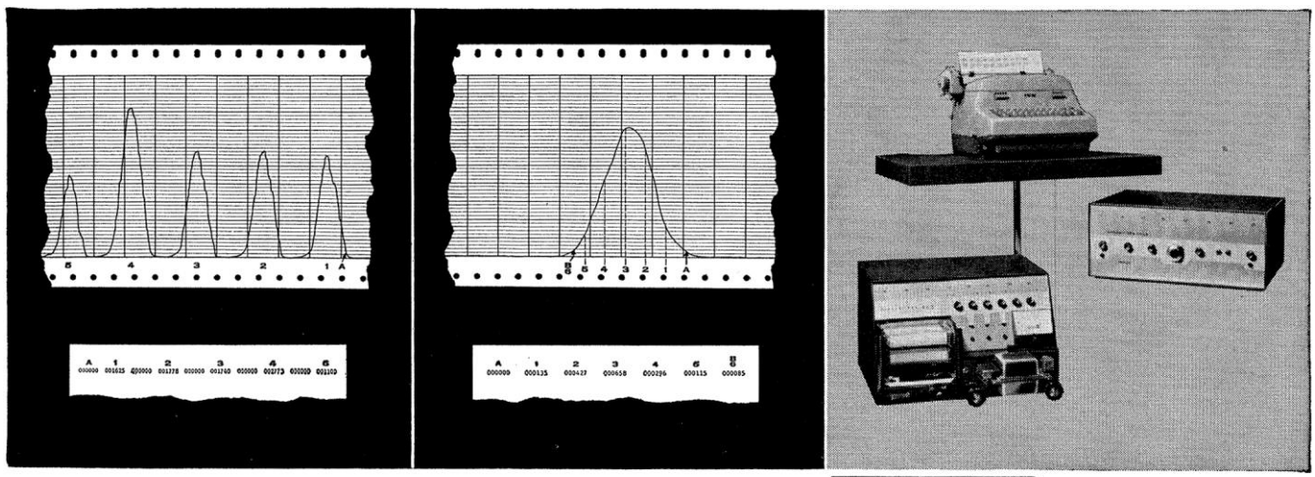

Shown above are the two modes of Data Presentation available with the model 880ADS. Digital information obtained in the Peak Print mode (left) and the Interval Print mode (right) is utilized through all phases of the quantitating procedure.

WRITE FOR THIS BOOKLET . . . Outlines distinctive features and operational characteristics of the Vanguard Model 880ADS Low Background AUTOSCANNER.

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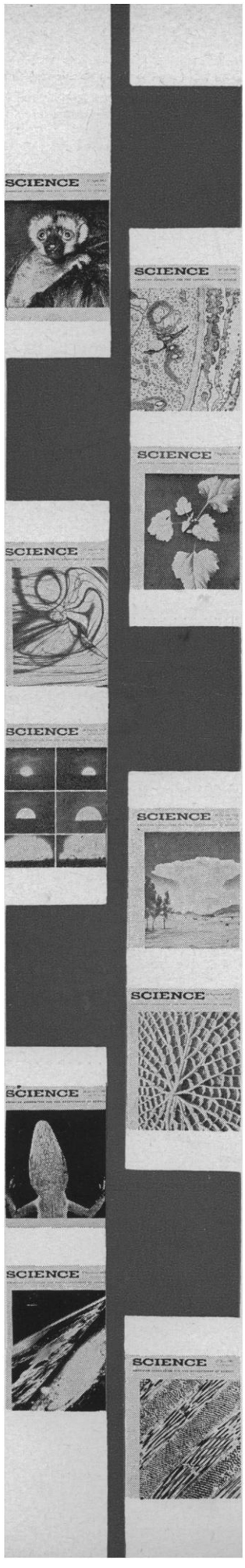
30 November 1962, Volume 138, Number 3544

SCIENCE

Cover A 9-week-old Shetland sheep dog during the critical period for primary socialization. See page 949.



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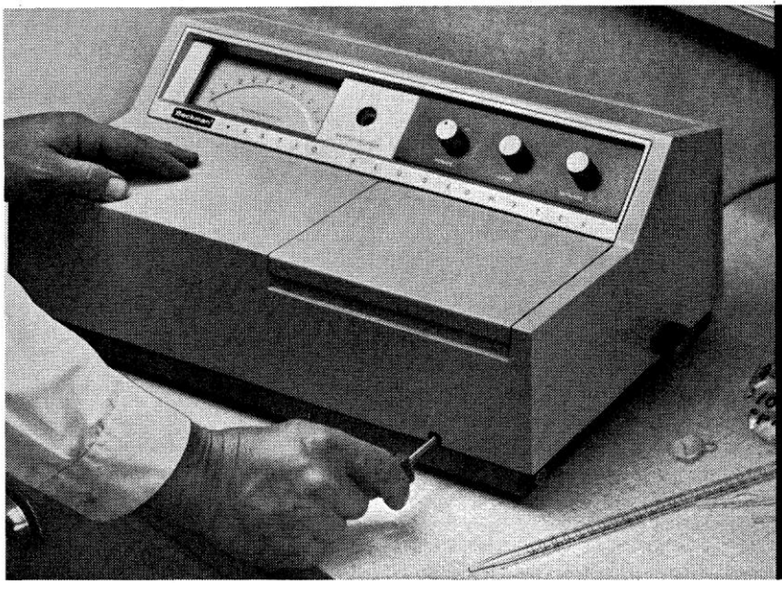

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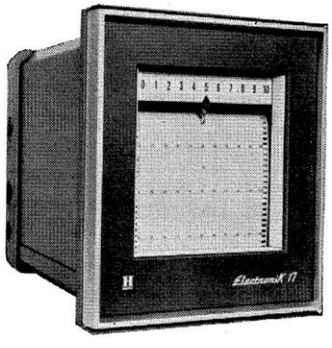
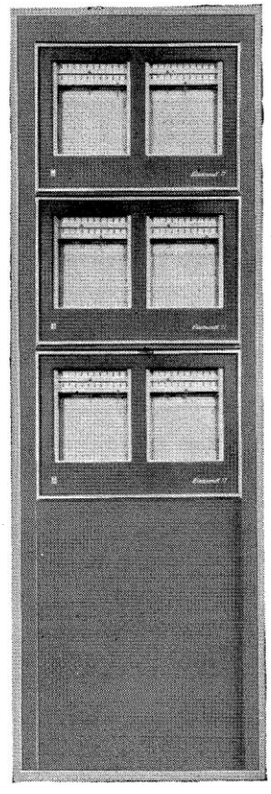


Single-case *ElectroniK 17* strip chart recorder (above), 6-inch calibrated width. Wide selection of ranges available.

Dual-case mounting of recorders (right) makes it possible to record up to four variables with dual pen option in only 14 inches of vertical space in a standard 19-inch relay rack.



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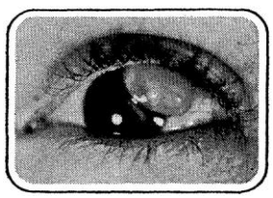
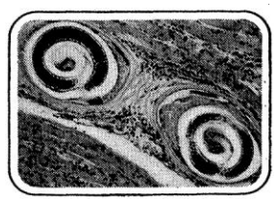
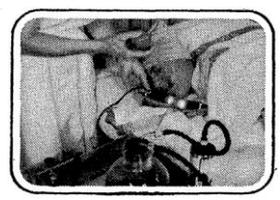
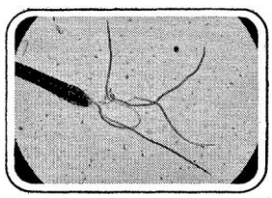

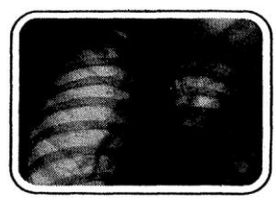
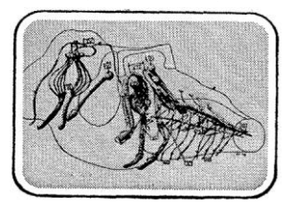

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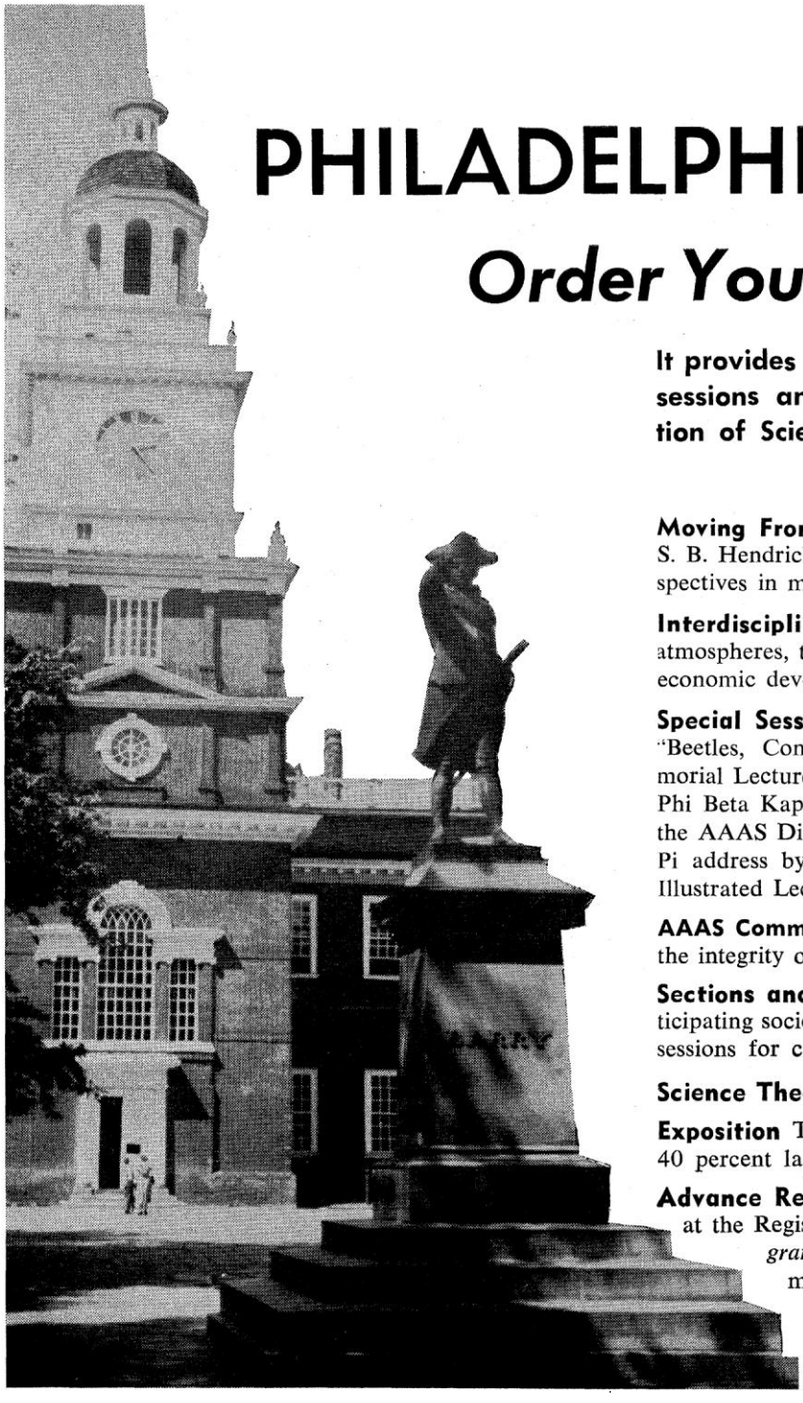

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Special Sessions AAAS Presidential Address by Thomas Park on "Beetles, Competition, and Populations"; the George Sarton Memorial Lecture by Gerald Holton; the Joint Address of Sigma Xi and Phi Beta Kappa by Loren C. Eiseley on "Man: The Lethal Factor"; the AAAS Distinguished Lecture by McGeorge Bundy; the Tau Beta Pi address by C. C. Furnas; and the National Geographic Society Illustrated Lecture by Barry C. Bishop.

AAAS Committees will have programs on late space science and on the integrity of science.

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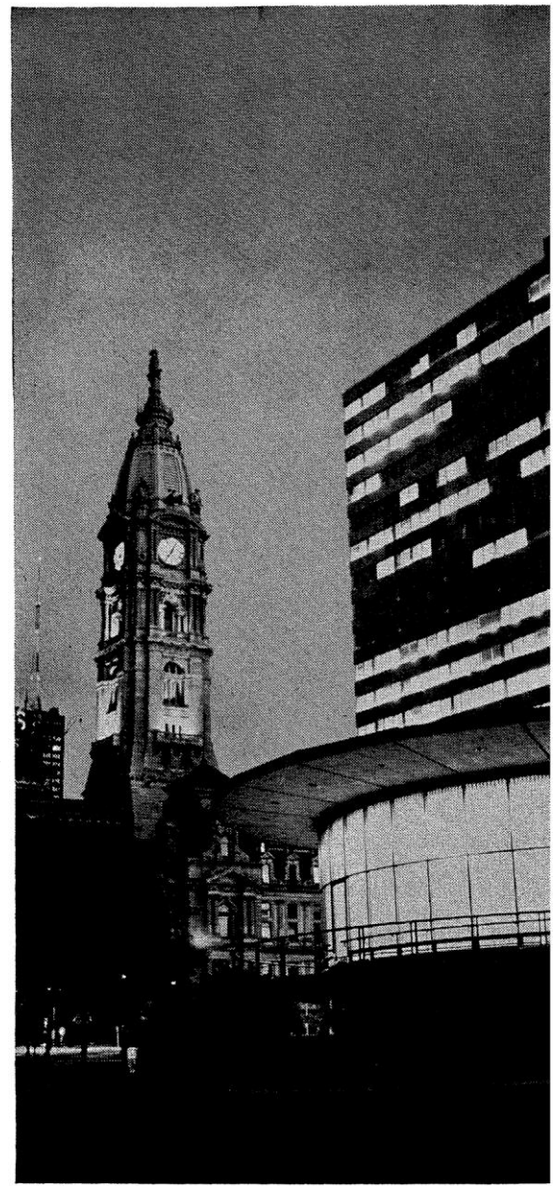

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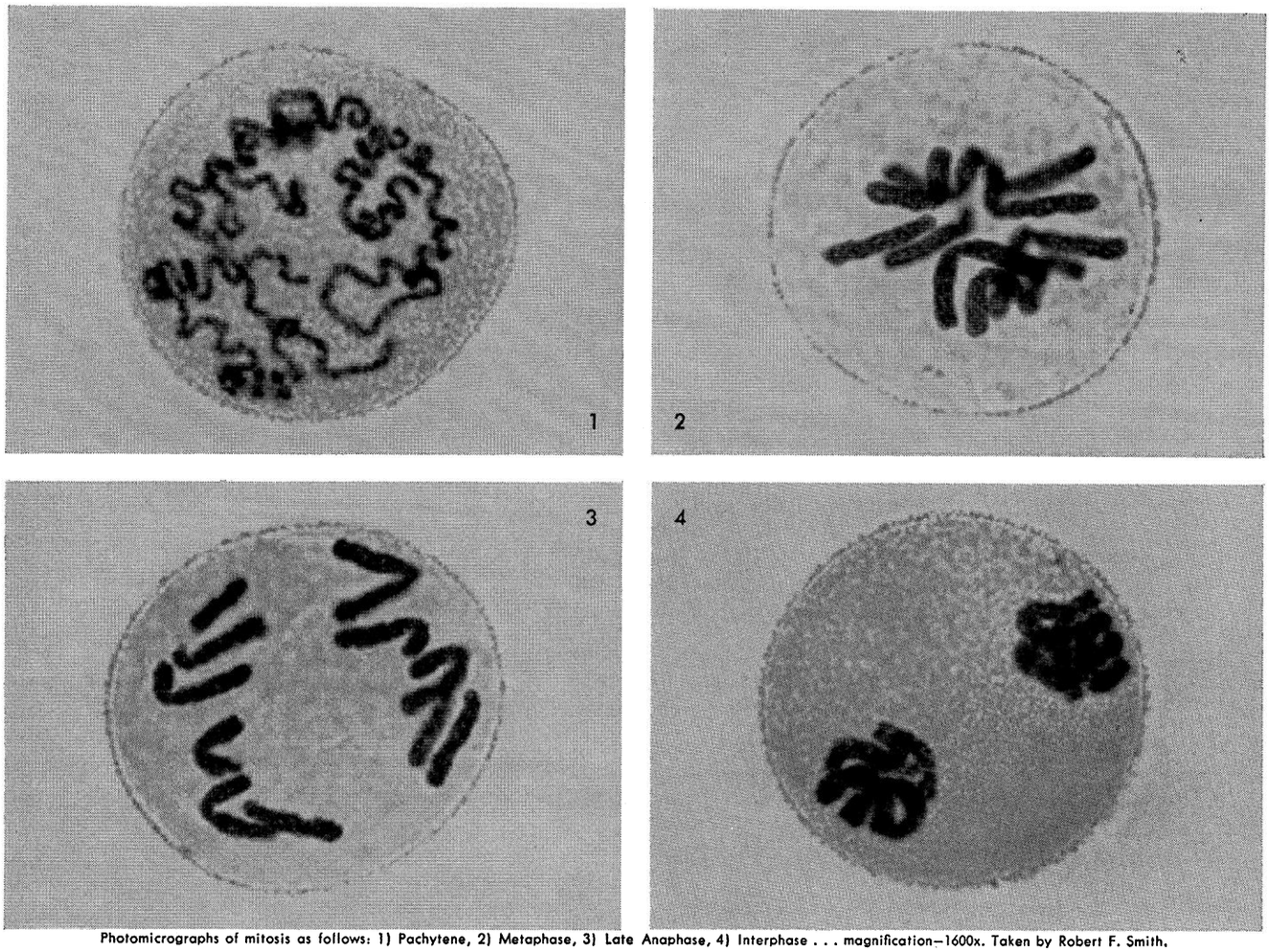
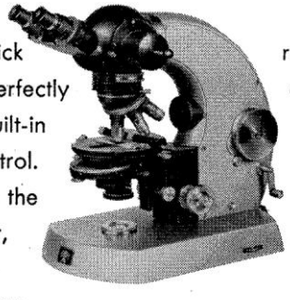


Photomicrographs of mitosis as follows: 1) Pachytene, 2) Metaphase, 3) Late Anaphase, 4) Interphase . . . magnification—1600x. Taken by Robert F. Smith.

Make a sequence like this by touching a button



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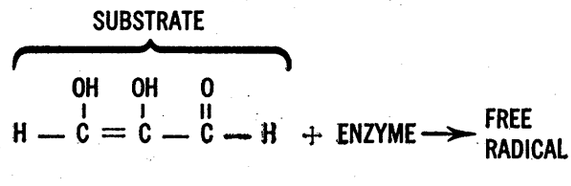

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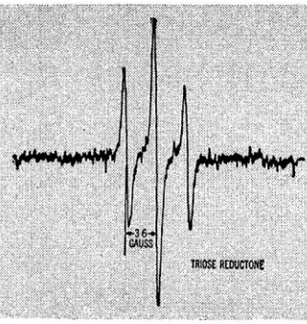

The example at left illustrates one of the first positive demonstrations of the detection of free radical intermediates in an enzymatic oxidation-reduction. The substrate triose reductone was oxidized by a one electron transfer by the enzyme horse-radish peroxidase-H_2O_2 to a free radical. The spectrum for the free radical as illustrated on the left was formed instantly in the steady state during a continuous flow experiment. This spectrum was positively identified as the triose reductate free radical.

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30 November 1962, Volume 138, Number 3544

SCIENCE

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Age and Creativity

Now that the public has at last become interested in science and, incidentally, in scientists, the problem of getting the most out of the latter is occupying much time and attention. Books are being written on "creativity," and, of course, the ubiquitous symposia are being held. Through all these words it is hard to discern any clear patterns. So hard has it become that we have turned to looking around among our friends to see what happens to creativity with the passage of time.

It seems to come quite simply to this: A young scientist's mind is not filled with many facts or responsibilities. He is ignorant enough to undertake the unreasonable and the unlikely and yet come up with a solution, sometimes with a significant discovery that overthrows entrenched ideas.

Once he has made an original discovery he finds it increasingly difficult to make another. He may be busy working out the details of the first, writing about it, or supplying samples of the material and know-how to others. Before he knows it he is overwhelmed by those who rush in to take advantage of the newly created opportunities. He may get lost in the jockeying for position that results.

If he does not quickly carry his discovery further, preferably to the "molecular level," he may well be accused either of resting on his oars or of having lost interest. There are plenty who will take up where they think he has left off.

The significance of all this is that, once he has been creative, the young scientist finds it very difficult to become creative again. Committees, review articles, symposia, and society meetings consume him. He has no time or spirit left for creativity. He loses his willingness to strike out into the wilderness. He begins to follow the safe and well-worn paths. He does not know that he has but a few years to go after the big discoveries, and that, with age, so many things will crowd out his chance to try again.

To discover the really new requires not only an attitude of mind but the ability to keep the roads to the solution of problems clear and, finally, to drive full speed down them. The timorous, insulated mind will not make the grade. Roads will be blocked by too much equipment, too much money, and too much seeking after status and security. The power to drive down the roads must be self-generated —a restless urge satisfied only by movement culminating in achievement. The price is high, the material rewards are minor, and the satisfactions must come chiefly from within. If you willingly pay this price, you have a ticket of admission to the ranks of the creative. However, the society of man is a great leveler; not to be leveled requires singular force of character. From such stuff creativity arises. To keep it alive in the face of the social forces that accompany maturity requires even greater strength. It is more than worth a try.—IRVINE H. PAGE, *Research Division, Cleveland Clinic Foundation, Cleveland, Ohio*

MNEW FROM MNEMOTRON!*

We are silent about the "M" in Mnemotron but not about our new 700 Series Data Recorder. With good reason. For one, it brings the size and cost of data recording systems down to sensible proportions if your data is analog voltage from DC to 5000 cycles per second. And its features would not embarrass even the costliest instrumentation recorder. Here are a few:

COMPACTNESS. A complete 7 channel record/reproduce system uses less than two feet of rack space. A 14 channel system adds less than seven inches more.

ACCURACY. Input-output characteristic is linear within 0.2 per cent with Mnemotron unique Pulse Frequency Modulation (PFM) data conversion technique.

FLEXIBILITY. As many data channels as you need with a choice of channel format. For greatest operating economy, choose up to 7 channels on ¼ inch magnetic tape, 14 channels on ½ inch tape, standard IRIG spacing and track width of 7 channels on ½ inch tape.

INTEGRATED RECORD/REPRODUCE MODULES. A single solid-state PFM Data Converter has all the record/reproduce electronics for each channel. Simple rotary switching lets you select data conversion for 3 tape speeds. No additional plug-ins needed.

ISOLATED INPUT CIRCUITS. Input terminals of each channel are isolated from all the others to readily accept data from floating, unbalanced or differential sources.

VERSATILITY. 700 Series plug-in accessories expand instrumentation capability. Typical: Electrocardiogram preamplifiers for recording directly from electrodes. Pulse Record unit for recording trigger pulses, time markers, or stimulus pulses in medical research . . .

PRICE. 7 Channel System from $6,495

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* To answer the many inquiries, Mnemotron comes from Mnemosyne, Greek Goddess of Memory.

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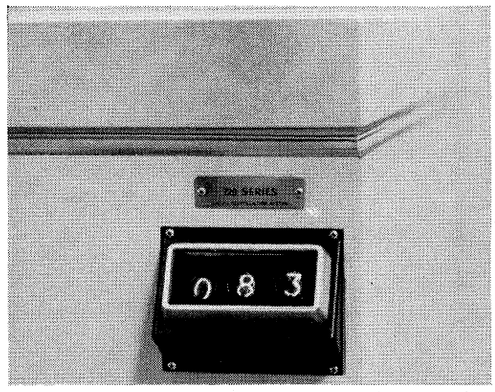
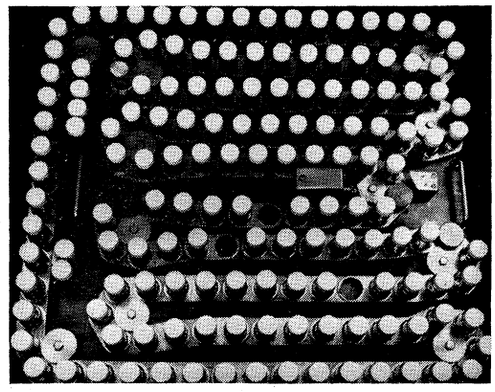
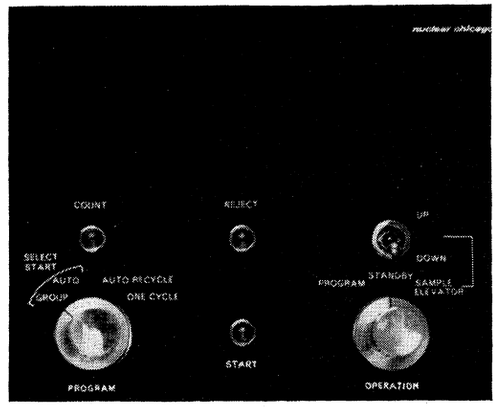
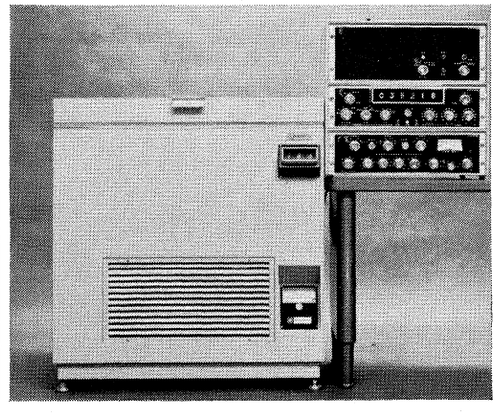
Subsidiary of Technical Measurement Corporation, North Haven, Conn.

Selective sample programming... an important time-saving convenience in liquid scintillation spectrometry









Every 720 Series liquid scintillation system carries a one-year guarantee to assure you that it meets or exceeds the specifications and performance claimed by Nuclear-Chicago. This guarantee fully covers all service —including parts, labor, and transportation — within one year from date of shipment at no cost to the customer.

The automatic sample changer featured with every Nuclear-Chicago 720 Series liquid scintillation system offers unusual flexibility in planning your busy counting schedule. "Select-start" changing programs, for example, allow preferred samples or sample groups to be counted while all others are bypassed. This exclusive feature permits assignment of specific sample numbers to individual personnel and departments who can then program the counting sequence according to their needs. The versatility of selective programming also allows immediate counting of high priority samples regardless of their position in the changer. Stored samples or samples from other projects are never disturbed, and no time is lost in counting low priority samples.

Positive sample-number identification is maintained throughout every changing program. Sample positions are consecutively numbered and are electronically interlocked with both the numerical read-out on the front of the sample changer and the index number printed by the data read-out facility.

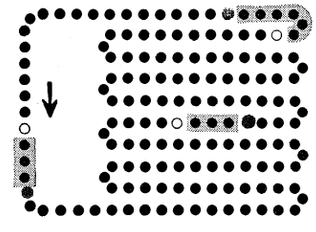
Complementing the selective-start programs are two additional automatic operating modes—"one cycle" for single-run counting of successive samples, and "auto-recycle" for repeat-run counting of all samples.

Manual operating facilities are also incorporated for handling samples on an individual basis or to permit repeat-counting of a single sample. Please send for our comprehensive literature.

New refinements in sample handling and temperature control

150 samples can be handled by a 724, 725 in a single counting run. Changing is performed by an endless conveyer belt and motor driven elevator assembly that utilizes a minimum number of moving parts to insure long life under continuous operating conditions. Among the numerous additional features are an automatic, positive light shutter that prevents light leakage into the detecting chamber, and a special sensing system for rejecting off-size sample bottles which might accidentally jam the changer mechanism.

For those demanding the maximum ratio of efficiency[2] to background, the automatic sample changer of the 724, 725 systems is housed in a controlled temperature chamber designed exclusively for liquid scintillation counting. The precisely adjustable control of this chamber allows the investigator to select the optimum counting temperature for his sample composition.

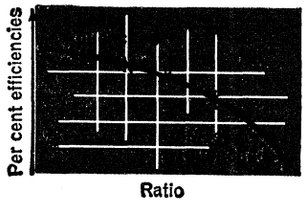


Diagrammatic presentation of selective sample programming. Red circles in the conveyor indicate sensors, white circles are empty bottle receptacles and black circles represent sample bottles. Bottles in the shaded region between sensors and empty receptacles are the "preferred" groups that will be counted when their respective sensors pass the counting station. Sensors may also be used to start the changing cycle at any selected bottle in the conveyor. Samples ahead of the selected point are bypassed.

New systems permit routine application of channels ratio techniques

The channels ratio concept of liquid scintillation counting is a highly reliable, systematic method of obtaining time-saving, valuable information about each sample. With a Nuclear-Chicago 720 Series spectrometer performing in your laboratory, channels ratio techniques can be directly and effortlessly applied to the liquid scintillation counting program.

Channels ratio counting is based on the fact that when quenching occurs, the height of the pulse produced by a beta particle is, on the average, decreased. If the pulse height spectrum of an isotope is then properly divided into two counting channels, the ratio of the count rates in the two channels will change in a unique way with the counting efficiency for the isotope. It is this correlation between the count-rate ratio and counting efficiency that permits construction of a quench correction curve. Through careful settings of the counting channel window widths and detector high voltage, this curve can be made useful over a wide range of efficiencies or sample activities.

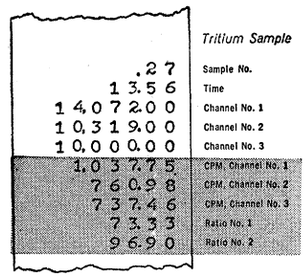


A correction curve is established by counting a series of standard samples of known activity and different degrees of quench. The counting efficiency for each standard is plotted as a function of the channels ratio of each, and the counting efficiencies of succeeding unknown samples can then be read directly from the resultant correction curve.

Counts per minute and channels ratio calculated automatically

Nuclear-Chicago's new 720 Series spectrometers with calculation capabilities deliver extra data on each sample automatically, and at a considerable savings in laboratory technician time. The automatic calculator offers the investigator a choice of three read-out modes: 1) A simple listing of the data accumulated in each of the three channels together with sample number and elapsed time. 2) Calculated counts per minute for each channel. 3) Calculated ratios of total counts in one channel to total counts in each of the other two channels.

Automatic calculation is a valuable, time-saving convenience in liquid scintillation counting. It enables efficiency determination and quench correction for isotopes such as carbon-14 and tritium to become a part of every counting run.

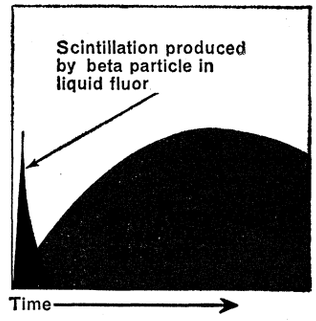


Actual data read-out of the 720 systems. Unshaded area of tape depicts data listing functions of the 722 and 724. The shaded area illustrates the additional calculation capabilities of the 723 and 725. Computed sample data can be accumulated during off-hours. There is often no need to make additional calculations. Technician time and the chance of human error are eliminated.

The advantage of a liquid scintillation spectrometer designed primarily for beta counting

In applications such as dual labelled sample counting and counting of samples with high specific activities, Nuclear-Chicago liquid scintillation systems give more accurate results because the spectrometer is designed specifically to handle fast beta pulses. From the experience gained in the design of gamma-ray analyzers, it was found that beta spectrometry presented substantially different design requirements.

All Nuclear-Chicago systems use a completely transistorized, three-channel analyzer specifically designed for liquid scintillation counting. The fast amplifier recovery time eliminates data losses due to circuit overloading.



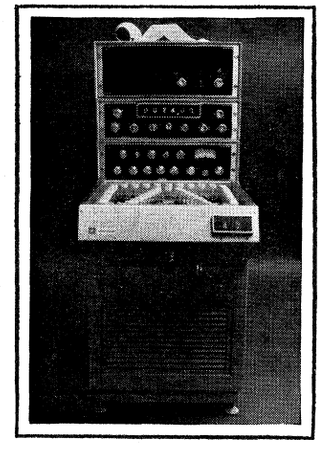
The decay time of a scintillation produced by a beta particle in a liquid scintillator is approximately 1/50 of the decay time of a scintillation produced in a NaI crystal by a gamma ray. If conventional amplifier circuitry as found in gamma-ray analyzers were used for beta spectrometry, the recovery time for high energy betas would be too long. This would result in amplifier overloading and a complete loss of pulses following a high energy beta.

Operation at temperatures above freezing

Samples that undergo phase separation or precipitation at temperatures below freezing are often a deterrent to reproducible measurements. With the 724, 725, these samples can be counted from 10° to 50°F at constant temperature without appreciable loss of counting efficiency.

Research with all types of photomultiplier tubes resulted in the choice of the two 11-stage EMI tubes used in all 720 Series systems. The gain and stability of these tubes are markedly superior, and as a result, less amplification is required. Inherent low noise characteristics along with advanced circuitry permit operation over a wide temperature range.

If small losses in efficiency and reduced sample capacity are acceptable, the 722, 723 room-temperature systems offer significant reductions in cost.



The 722 and 723 are the only commercially available room temperature, automatic liquid scintillation systems. They offer 50 sample capacity, selective sample programming, and three channel operation.

NUC:B-2-277

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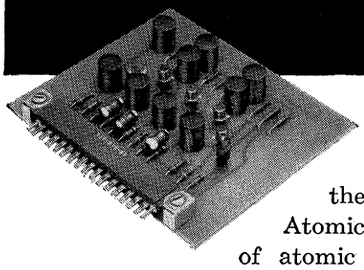
ANOTHER PRODUCT IN THE B/A *Cambridge Series*

MODEL CS-400

PRECISION LINEAR RATEMETER



The latest addition to the Cambridge Series, Baird-Atomic's all-transistorized line of atomic instrumentation, is the CS-400 Precision Linear Ratemeter. Featuring rugged construction and printed circuitry, this device is intended for uses demanding a high order of stability, accuracy and versatility. The CS-400 draws heavily on advanced computer and nuclear instrument techniques to set specifications unprecedented for such a relatively simple and low cost instrument.

The wide range of 10^2 to 3×10^6 CPM and time constants from 0.1 to 100 seconds allow the user complete freedom to set up experiments in the most suitable way, rather than tailoring them to instrument deficiencies. The highly stable recorder output is obtained from a high gain, transistor-chopper stabilized operational amplifier with heavy feedback.

The fine features and attractive appearance of the Baird-Atomic CS-400 make it a desirable instrument for any well-equipped laboratory.

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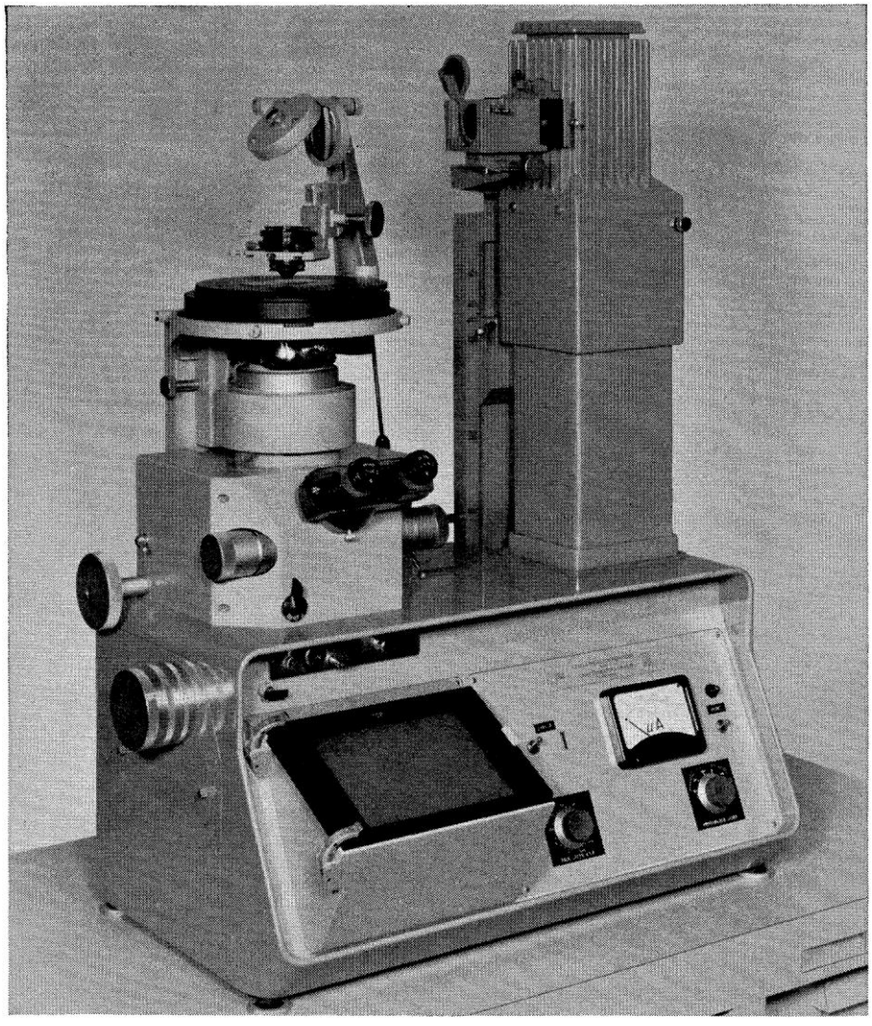
Vickers "55" Microscope with Automatic Photography



The inverted microscope has been commonly used only for a restricted range of biological techniques—mostly in tissue culture applications. However, the new Vickers "55" Microscope has been designed on the premise that there are positive advantages in an inverted design of the large universal photomicrographic stands which are used for research and for the rapid accumulation of high quality visual and photographic data.

With the availability of high efficiency projection screens it becomes practical (and most comfortable and convenient) to use the projected image for most routine examinations. This being so, the logical position for the viewing screen is somewhat below rather than, as in most instruments, quite high above the microscope. In this position both examination and photography are much more easily and conveniently carried out.

The Vickers "55" has been designed to achieve this basic improvement in viewing and photographic technique. An instrument, offering a complete range of optical capabilities, automatic photography and many exclusive operating features has been produced.

Automatic Photography

Built into the body of the instrument is the Automatic Integrating Photographic Timer which actuates a motorized, large aperture, roller-blind focal plane shutter (automatically rewound upon closure). Plates or film up to 5" x 7" in size, including Polaroid, with film speeds from 5ASA to 3200ASA can be exposed with the Timer.

Fully automatic 35mm photography is obtained by insertion into the optical path of a motorized 35mm cassette, also actuated by the Timer unit. The Light Path Selector Switch allows choice of simultaneous observation and photography or diversion of all light either to the film or the visual eyepieces. A high pressure Xenon light source (6300°K) is supplied as standard, but a mercury vapor lamp can be quickly mounted in its place.

Some Exclusive Operating Features

An Optical Bellows utilizing a pancratic (zoom) eyepiece operates in conjunction with a Magnification Changer to give continuous change of screen magnification from 24X to 2800X without change of eyepieces. The control drum for the Optical Bellows is graduated so as to give automatic indication of total screen magnification. A gliding stage with convenient joystick operating control is supplied. For research applications a unique rotating stage with combination gliding and micrometer-actuated traversing motions can be substituted.

Optical Capability

All techniques of transmitted, normal incident and mixed illumination can be undertaken with the "55". A feature of the instrument is the provision for macro examination and photography of the highest quality at magnifications of 5, 10 and 15.

Special attention has been given to facilities for quantitative determinations in the design of the equipment for polarized light. Built-in analyzer and quartz sensitive tint plate can be separately introduced and withdrawn and simultaneously rotated. Compensators of all types may be used and can be rotated through a full 360°. A Rotary Elliptic Compensator is supplied for measurement of very small retardations.

An interesting type of human mutation was reported by C. Baglioni (Naples), as the result of work with hemoglobin Lepore. His evidence indicates that the abnormal peptide chain is the product of a gene which is part delta and part beta. The hybrid is thought to have arisen by nonhomologous crossing over.

In a review paper, H. Dintzis (Johns Hopkins) explained why protein biosynthesis can be so well studied in the reticulocyte. From his own work he described the assembly of the hemoglobin peptide chains as a sequential process, proceeding stepwise from the amino group at the end of the chain. In the reticulocyte only 1 to 2 minutes (at 37°C) are required for the synthesis of a whole chain. On the other hand, in cell-free systems prepared from reticulocytes, it appears that peptide chains are merely completed and that the synthesis of few if any new chains is begun. This point was disputed by R. S. Schweet (Kentucky).

A. Rich (M.I.T.) demonstrated that aggregates of reticulocyte ribosomes are needed for the active synthesis of hemoglobin. His electron micrographs do indeed show aggregates of approximately five ribosomes. Rich interprets these as being held together by a strand of messenger RNA. Each ribosome is synthesizing one or more peptide chains as it moves along the messenger RNA—a stimulating idea. The data of P. A. Marks (Columbia) also show that the aggregated ribosomes are those active in hemoglobin synthesis and that information for protein synthesis is contained in a relatively stable form in these particles. The role of soluble RNA as the "adaptor" in placing amino acids in sequence on the messenger RNA template was clearly demonstrated by G. von Ehrenstein (Johns Hopkins).

In another area of study, H. Borsook (California Institute of Technology) related hemoglobin production to the developing red cells (erythroblast series) in the bone marrow. Hemoglobin synthesis normally is completed at the orthochromatic stage. An interesting report was read by L. Bernini (M.I.T.) who showed that human bone marrow cells synthesize carbonic anhydrase in addition to hemoglobin A and A_2.

The three chairmen of the sessions, J. T. Edsall (Harvard), F. Lipmann (Rockefeller), and J. V. Neel (Michigan), were most effective, and much of the success of the workshop was

due to their guidance. The conference closed with a unique talk by H. Lehmann (London) who connected the ethnological distribution of the abnormal human hemoglobins throughout the world with certain unusual social customs.

The conference was sponsored by the Department of Medicine of Columbia University and generously supported by the National Heart Institute.

VERNON M. INGRAM
DICKINSON W. RICHARDS
ALFRED P. FISHMAN

Department of Medicine,
Columbia University, New York

Forthcoming Events

January

7–8. Ultra-High Energy **Nuclear Physics**, conf., Bristol, England. (Administrative Assistant, Inst. of Physics and the Physical Soc., 47 Belgrave Sq., London S.W.1, England)

14–16. **Radiation Research**, intern. conf., Natick, Mass. (Army Quartermaster Research and Engineering Center, Natick)

14–18. Association of **Surgeons** of West Africa, Ibadan, Nigeria. (V. A. Ngu, University College Hospital, Ibadan)

14–19. Atomic and Molecular **Quantum Theory**, symp., Sanibel Island, Fla. (D. W. Smith, Chemistry Dept., Univ. of Florida, Gainesville)

15–15 Feb. World Meteorological Organization, Working Group on **Meteorological Transmissions**, Paris, France. (WMO, 41 Avenue Giuseppe Motta, Geneva, Switzerland)

15–17. Association of **American Colleges**, annual, Atlantic City, N.J. (T. A. Distler, AAC, 1818 R St., NW, Washington 9)

15–17. **Sesame**, intern. conf., Maracay, Venezuela. (D. G. Langham, Sesamum Foundation, Milford, Conn.)

15–19. **Immunopathology**, intern. symp., La Jolla, Calif. (by invitation). (Science Information Div., National Foundation, 800 Second Ave., New York 17)

17–19. **Engineers' Training**, conf., Strasbourg, France. (Council of Europe, Avenue de l'Europe, Strasbourg)

17–19. Royal College of **Physicians and Surgeons** of Canada, annual, Edmonton, Alberta. (J. H. Graham, RCPSC, 74 Stanley Ave., Ottawa 2, Ont., Canada)

18–19. **Blood**, annual symp., Detroit, Mich. (G. F. Anderson, Dept. of Physiology and Pharmacology, Wayne State Univ., 1401 Rivard St., Detroit 7)

21–23. Chemistry and Biochemistry of **Seed Proteins**, intern. conf., New Orleans, La. (C. H. Fisher, Southern Utilization Research and Development Div., Agricultural Research Service, U.S. Dept. of Agriculture, P.O. Box 19687, New Orleans 19)

21–23. Institute of the **Aerospace Sciences**, annual, New York, N.Y. (IAS, 2 E. 64 St., New York 21)

21–24. American **Meteorological** Soc., annual, New York, N.Y. (R. L. Pfeffer, Lamont Geological Observatory, Columbia Univ., Palisades, N.Y.)

22. Infectious Diseases of the **Heart and Circulation**, conf., New York, N.Y. (C. A. R. Connor, New York Heart Assoc., 10 Columbus Circle, New York 19)

22–24. **Reliability and Quality Control**, natl. symp., San Francisco, Calif. (L. W. Ball, Boeing Co., P.O. Box 3707, Seattle 24, Wash.)

23–25. **Elevated Temperature Mechanics**, intern. conf., 3rd Navy Structural Mechanics Symp., New York, N.Y. (by invitation). (A. M. Freudenthal, 624 Mudd Bldg., Columbia Univ., New York 27)

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

23–26. American Group **Psychotherapy** 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.)

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)