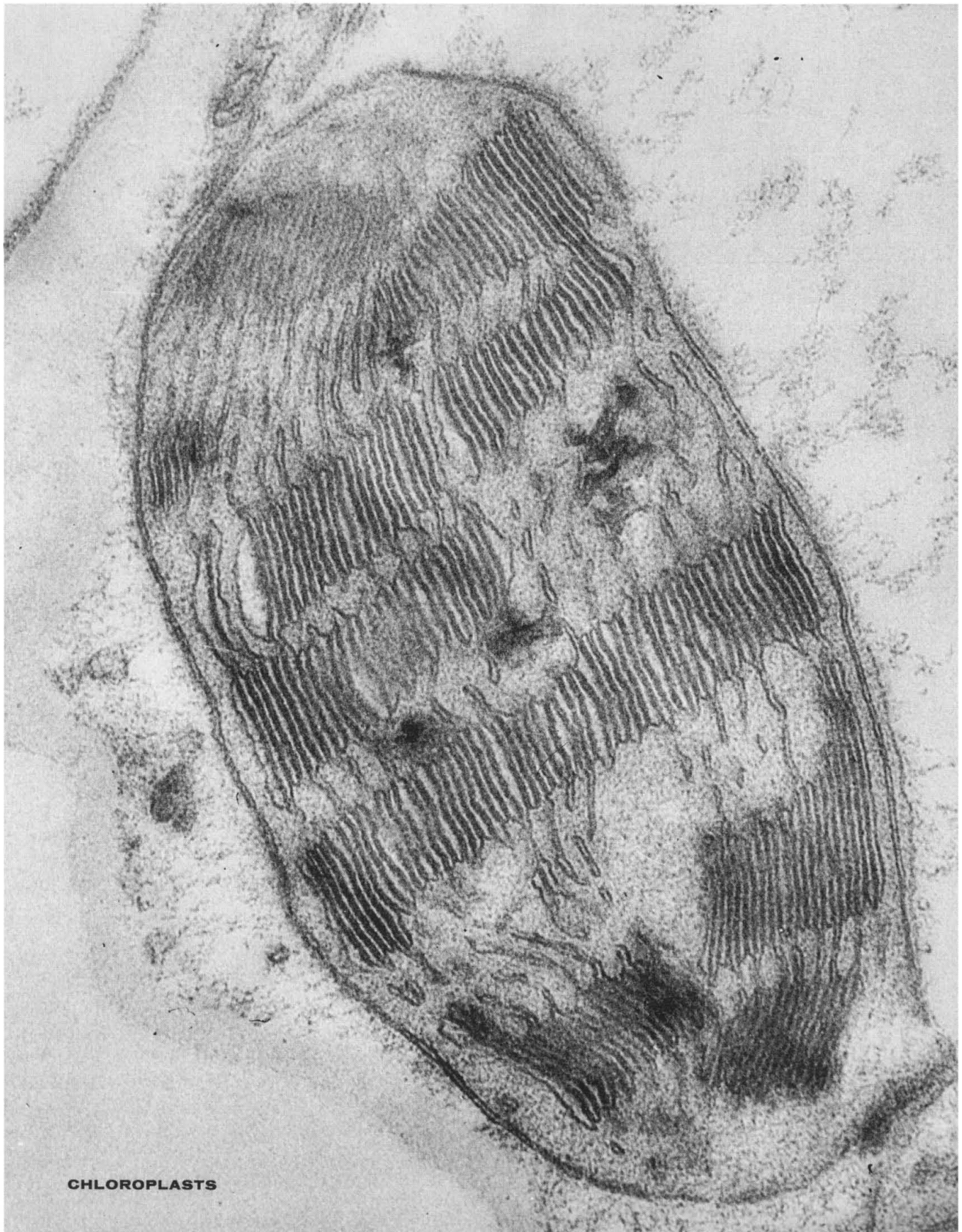


SCIENCE

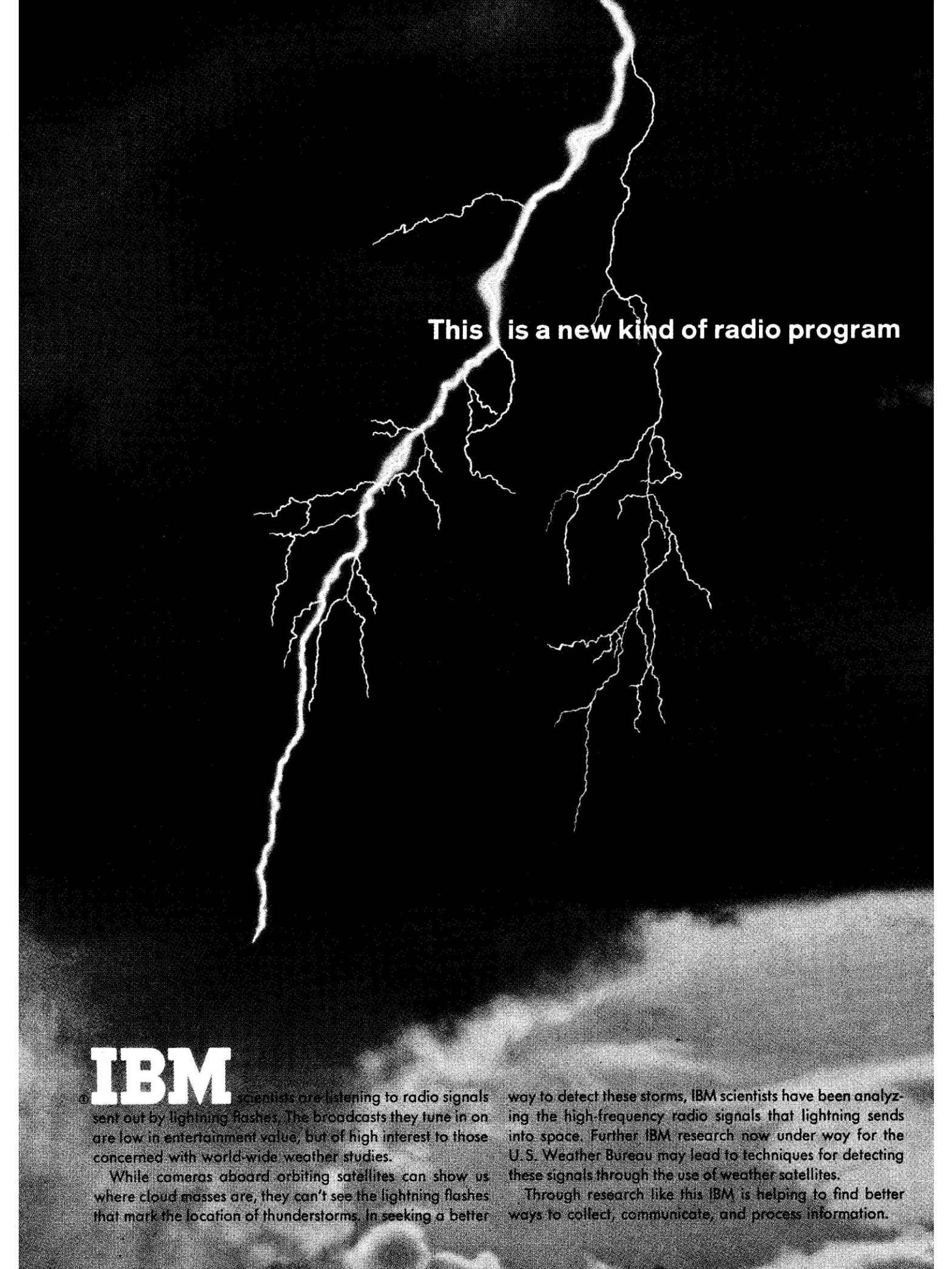
23 November 1962

Vol. 138, No. 3543

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



CHLOROPLASTS



This is a new kind of radio program

IBM

IBM scientists are listening to radio signals sent out by lightning flashes. The broadcasts they tune in on are low in entertainment value, but of high interest to those concerned with world-wide weather studies.

While cameras aboard orbiting satellites can show us where cloud masses are, they can't see the lightning flashes that mark the location of thunderstorms. In seeking a better

way to detect these storms, IBM scientists have been analyzing the high-frequency radio signals that lightning sends into space. Further IBM research now under way for the U.S. Weather Bureau may lead to techniques for detecting these signals through the use of weather satellites.

Through research like this IBM is helping to find better ways to collect, communicate, and process information.



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NEWS FROM
BELL TELEPHONE LABORATORIES

New high-purity alloys make better electron tubes



Ingot of high-purity nickel alloy is removed from controlled atmosphere melting furnace. Alloy is virtually free of impurities which inhibit electron emission. The new alloying technique and the methods for making cathodes and evaluating their electron-emitting properties were developed by K. M. Olsen and H. E. Kern.

Scientists at Bell Telephone Laboratories have developed new high-purity nickel alloys which are proving highly effective in lengthening the life of advanced-design electron tubes used in the Bell System. This development meets the demand of new electronic technology for long life and high reliability in electron tubes.

One of the new alloys is now providing the outstanding performance required in the electron-emitting cathode of the traveling wave tube in the Telstar satellite.

The first step was to devise new means for the fabrication of ultra-pure nickel to eliminate those impurities harmful to cathode performance. It was then possible to add to the ultra-pure nickel the alloy constituents and activating agents desired for optimum cathode performance, and at the same time to hold the undesirable impurities at levels below 50 parts per million. These techniques involved purifying the nickel raw materials and melting, alloying and casting in controlled atmospheres of hydrogen and helium.

This development is an example of how metallurgical scientists work to improve communications. The new nickel alloys are now being produced by the Western Electric Company, manufacturing unit of the Bell System.



Bell Telephone Laboratories

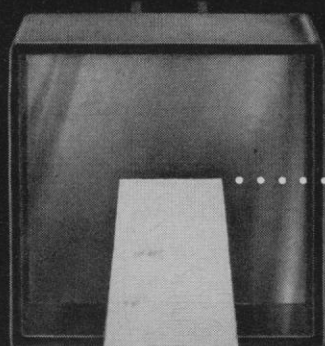
World center of communications research and development

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Cover	Starch-free chloroplast from fully expanded leaf of <i>Nicotiana rustica</i> , fixed in 2.5 per cent KMnO_4 (about $\times 7500$). The compartmented structures are grana and the chlorophyll is thought to be associated with the darkened partitions. A precursor of starch may form in the electron-transparent space between the partitions. The grana are embedded in a granular stroma and are connected by anastomosing channels or frets. The whole system, bounded by an envelope, is labile and responds to variations in light intensity, mineral nutrition, herbicides, and the type of fixative that is used to prepare the leaf material for study. See page 867 [T. E. Weier, University of California, Davis]	



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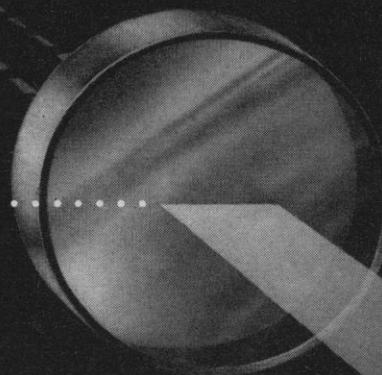


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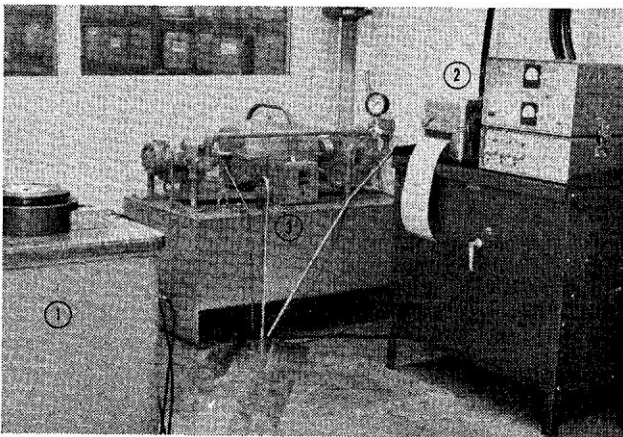
When measuring the dynamic effects of torque and load on a bolt fastener, Lamson and Sessions found that fast rise-time was the most essential characteristic of the measuring instrument.

The high frequency response of the Visicorder Oscillograph (DC to 5000 cps) thus made it the choice for measuring these sudden loads applied by an impact wrench. The test set-up is a load analyzer consisting of a Model 906 Visicorder, a Model 119 Honeywell Amplifier, an hydraulic pump unit, a test block, and a load cell.

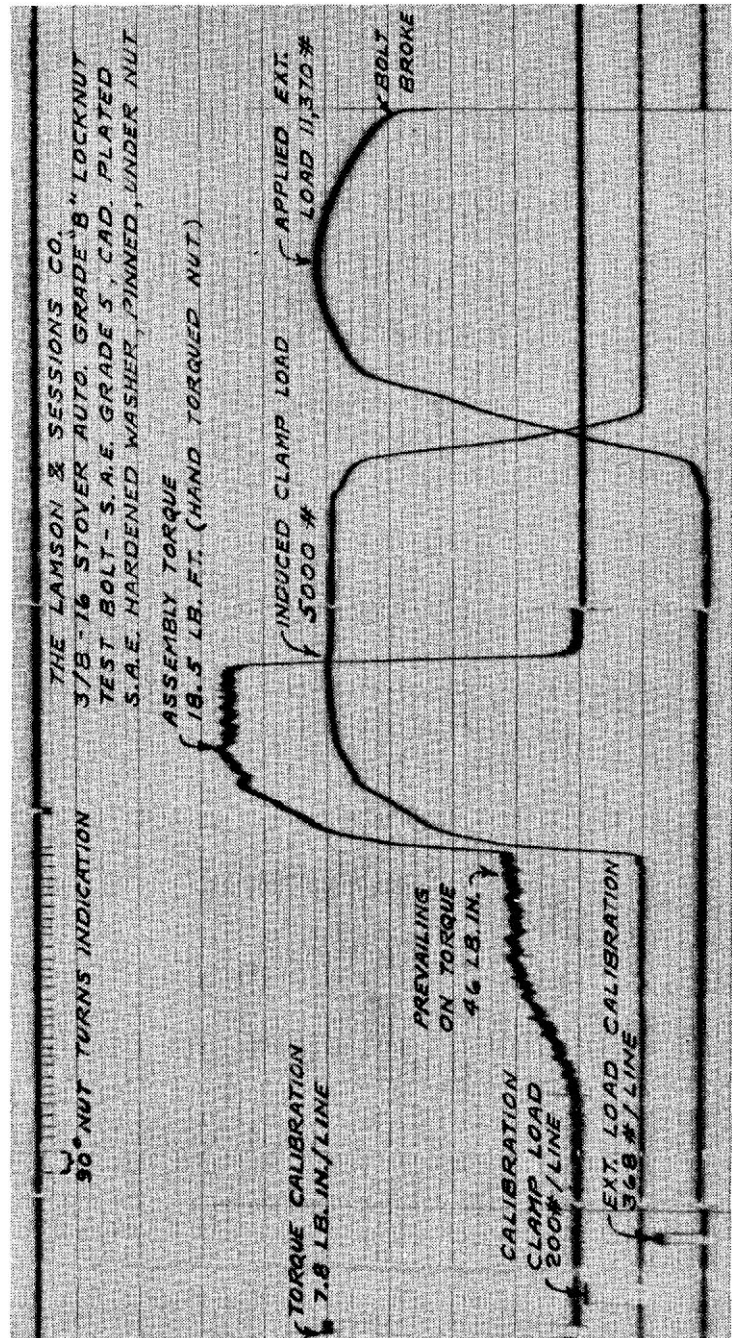
The Visicorder is extremely reliable in an application of this kind, since the light-beam galvanometers eliminate recording pens and the large mechanical systems that pens and styli require. And a wide range of chart speeds assures the desired degree of data resolution.

The Lamson and Sessions studies have charted the complex relationships of joint components under load. Some of these relationships are fastener strength; relaxation properties; optimum clamping load for a given size and strength of fastener; bearing areas adequate to prevent embedding; the number, size, and strength of fasteners consistent with the greatest strength, lightest weight, and lowest cost; and proper assembly techniques.

The Visicorder recordings have provided enough new knowledge of these factors to point the way to new fastener specifications and designs. There are five models of the Honeywell Visicorder Oscillograph, each designed to meet your specific test program requirements. Different models provide record capacity from 1 to 6



The Lamson and Sessions Load Analyzer: (1) Test block with load cell included, (2) Honeywell Model 906 Visicorder and 112 Amplifier, (3) Hydraulic pump unit.



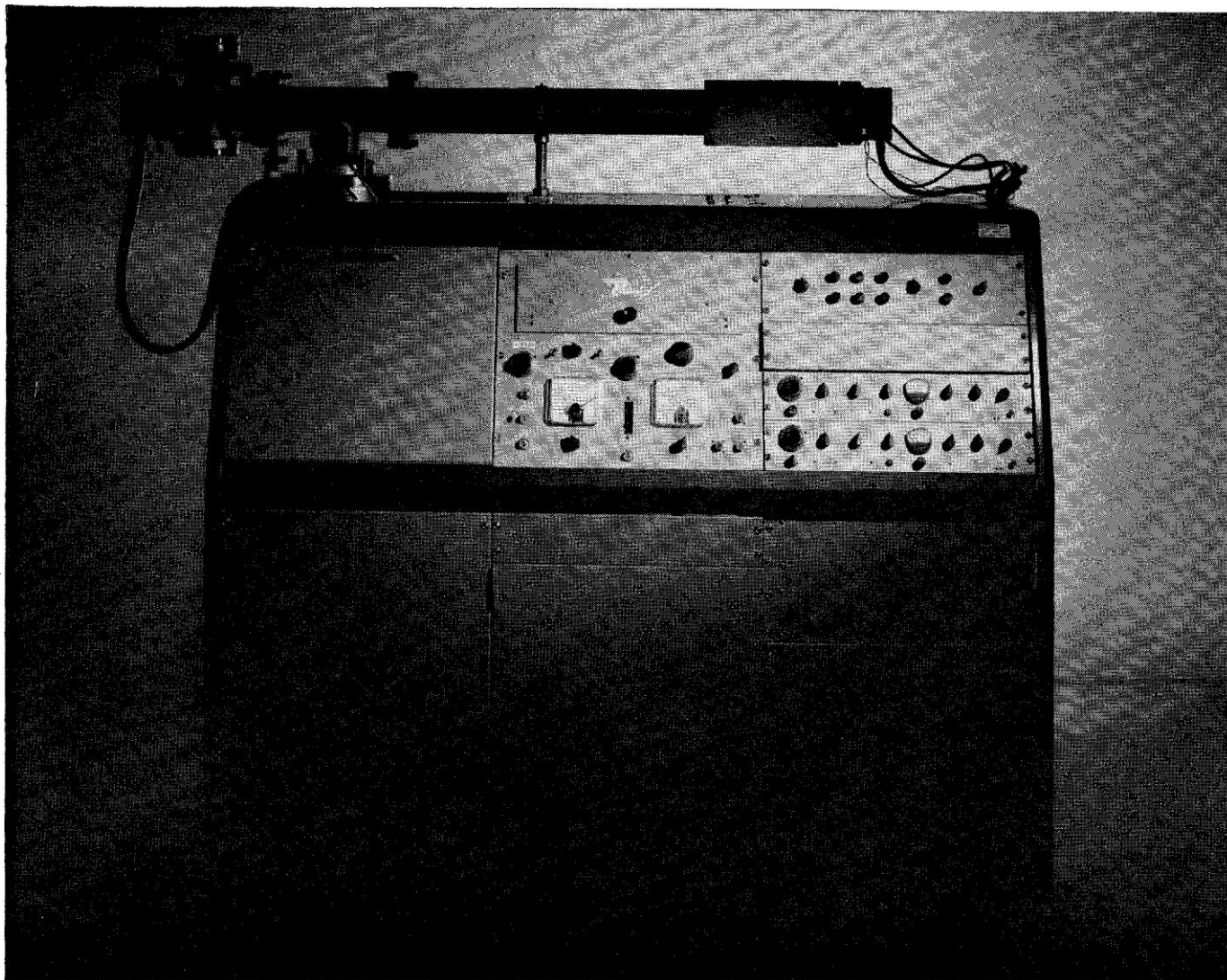
up to 1 to 36 data channels. Paper speeds from .1 inch per hour to 13 feet per second in the different models mean that data can be presented on the time base most meaningful to your test.

For full specifications on all Visicorder Oscillographs, write Minneapolis-Honeywell, Heiland Division, 4800 E. Dry Creek Road, Denver 10, Colorado. Or phone 303-794-4311.

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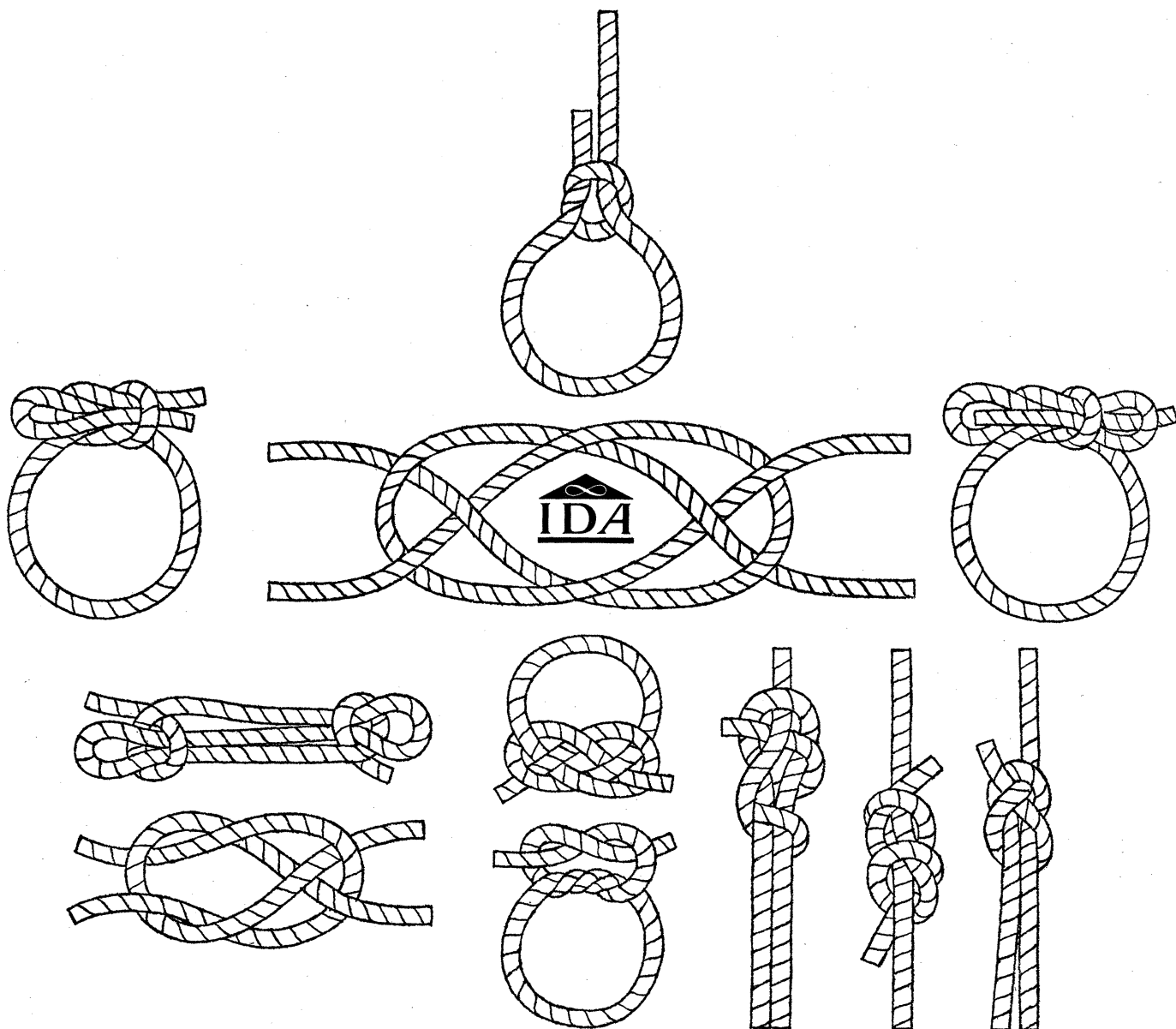


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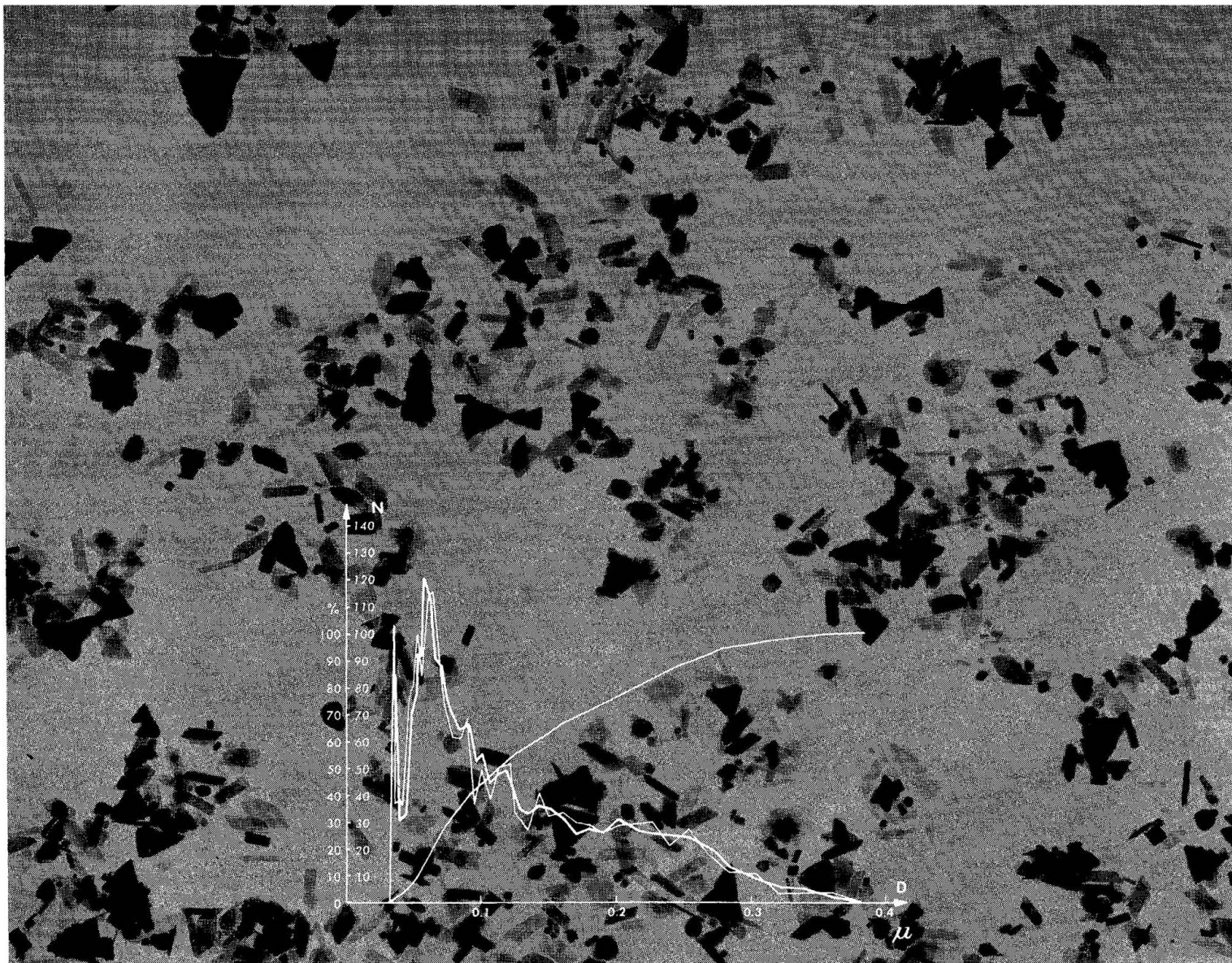
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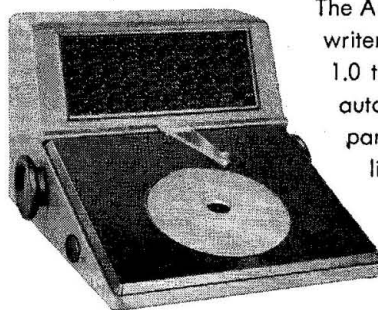


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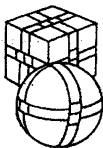
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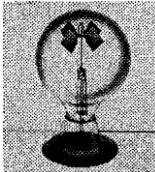
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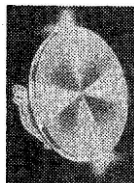
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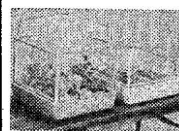
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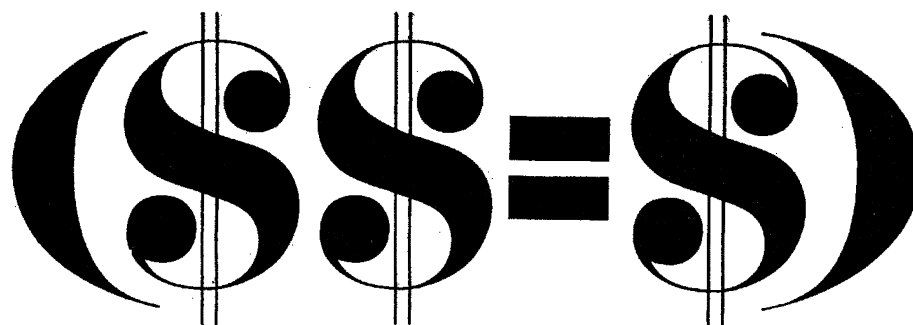


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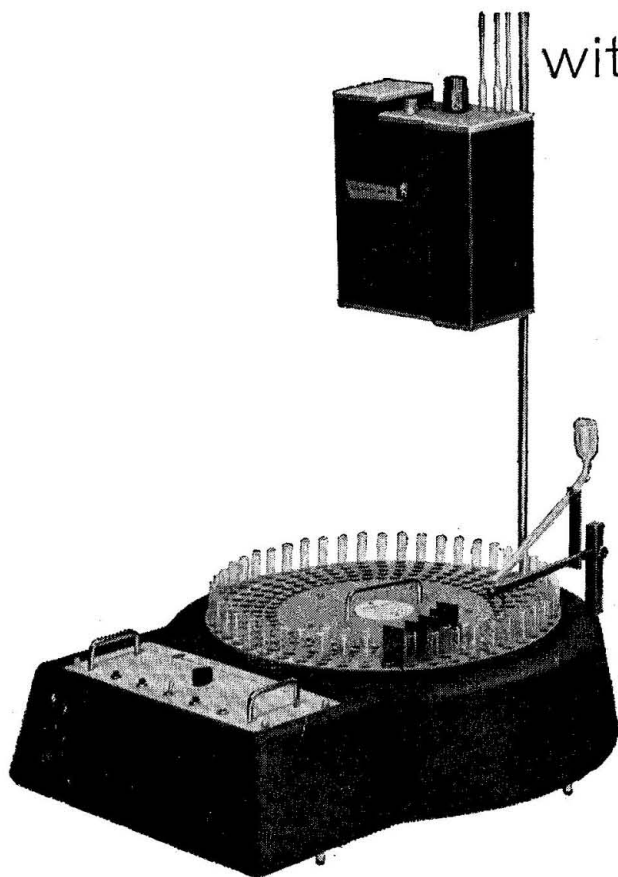
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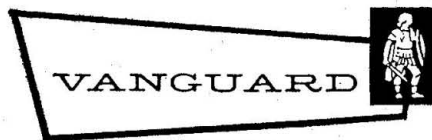


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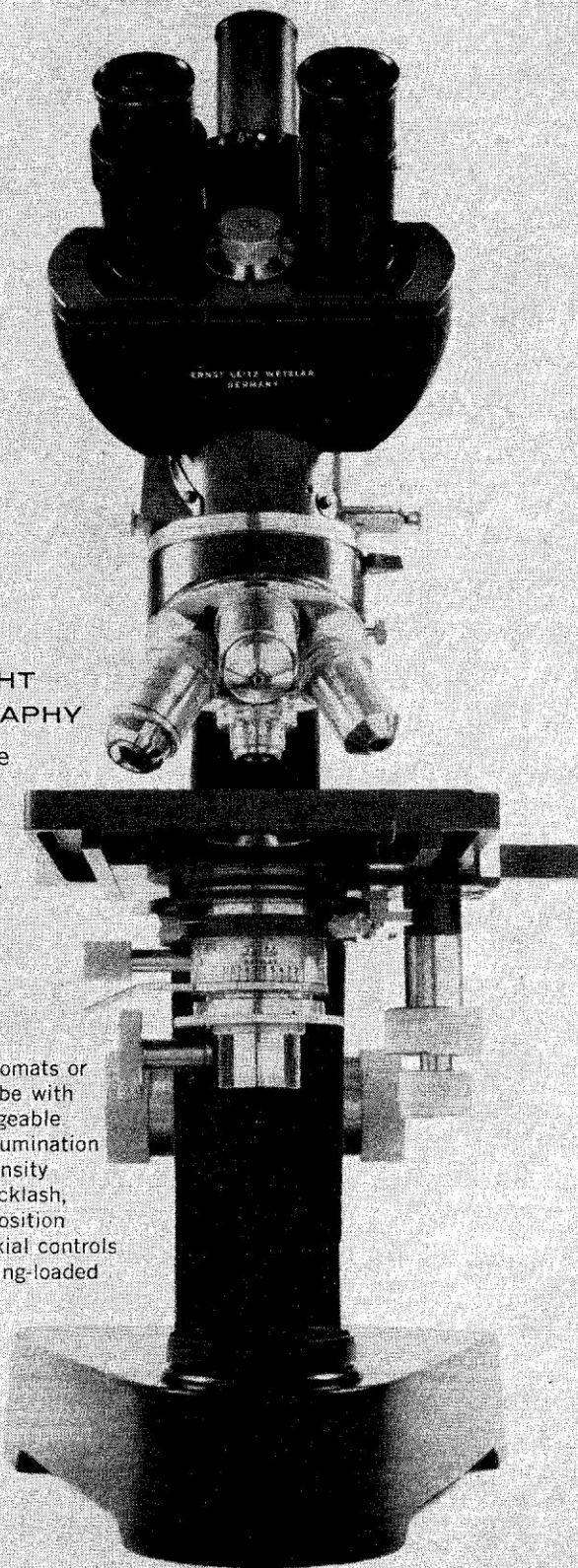
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Conflict of Interest

One hears an occasional disturbing comment about the advantage taken of a government appointment by a man whose long-term loyalties are to academic or industrial life. A recent example: "I was startled to hear _____ say baldly that if he didn't do anything else while in Washington he was certainly going to get some grants for his own laboratory." This attitude may be atypical, for one also hears such comments as: "I've sat on a large number of advisory councils, panels, and committees, but never yet have I seen my colleagues take advantage of their membership on these bodies. In fact, it seems to me that they lean over backwards to avoid favoring their own institutions." These contrasting observations may represent the range of behavior of consultants—or perhaps they represent the range from suspicion to charity of different observers.

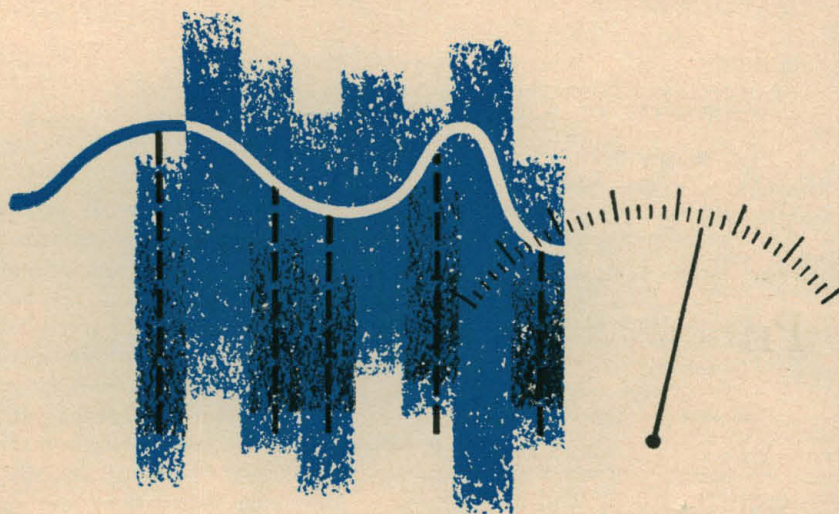
The law on conflict of interest has recently been revised. When consultants and members of advisory groups receive instructions concerning the new regulations, they will find that they have a bit of work to do and certain actions to take or to avoid taking during and after their periods of government service. The new regulations are reasonable, and they clear away a good bit of the ambiguity concerning conflict of interest which has plagued many an adviser in the past.

Legislation, however, cannot deal with the most pervasive and deep-seated source of conflict. A scientist who comes to Washington to advise a government agency can absent himself when a grant to his own institution is being considered, and he can do a number of other things to avoid the deliberate misuse of his power. But he cannot forget his loyalties to his discipline, his institution, and his professional colleagues. Legislation cannot deal with this problem; it can be handled only by high standards and good conscience on the part of the adviser and his fellows. (Scientists are not alone on this matter. The new legislation applies generally; the *Saturday Evening Post* of 17 November considers the conflicting interests of congressmen; Chief Justice Warren recently suggested that modern society needs professional consultants on ethics.)

Conflict between the public interest and the proper but special interests of the institution to which an adviser will return tonight or next year there certainly may be. How often this conflict leads to the misuse of power we do not know. But the danger is being quietly talked about, and opportunity and temptation grow as the number of advisers and the amounts of money involved continue to increase.

In *Science and Human Values*, Bronowski asserts that honesty and objectivity—reliance on the evidence rather than upon bias, wish, authority, or personal advantage—is one of the greatest gifts that science has given to society. Even though such utter honesty does not result wholly from the personal virtue of scientists, and even though there is not the same degree of objectivity of evidence in giving advice or in making grants as there is in conducting research, the tradition of complete honesty provides a high standard to aspire to and a warning to anyone tempted to adopt a different course.

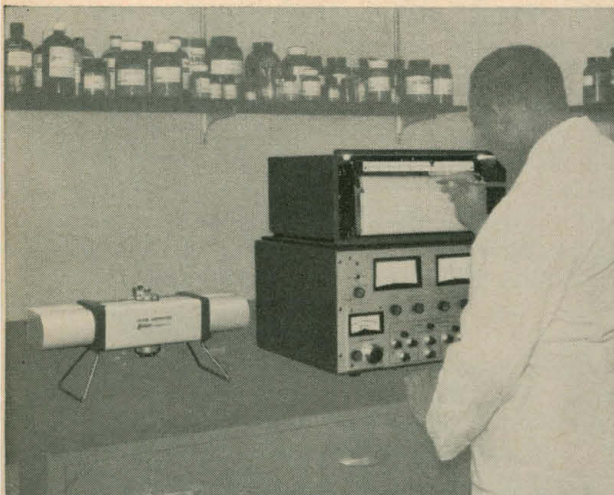
One obvious thing that scientists can do about this matter is to discuss it. If the integrity of science is in danger, we should recognize the danger and consider possible countermeasures. If the fears are groundless, that too we should know so that we can go about our business. Candid discussion of the problem would be a sign that the scientific conscience is still healthy—D.W.



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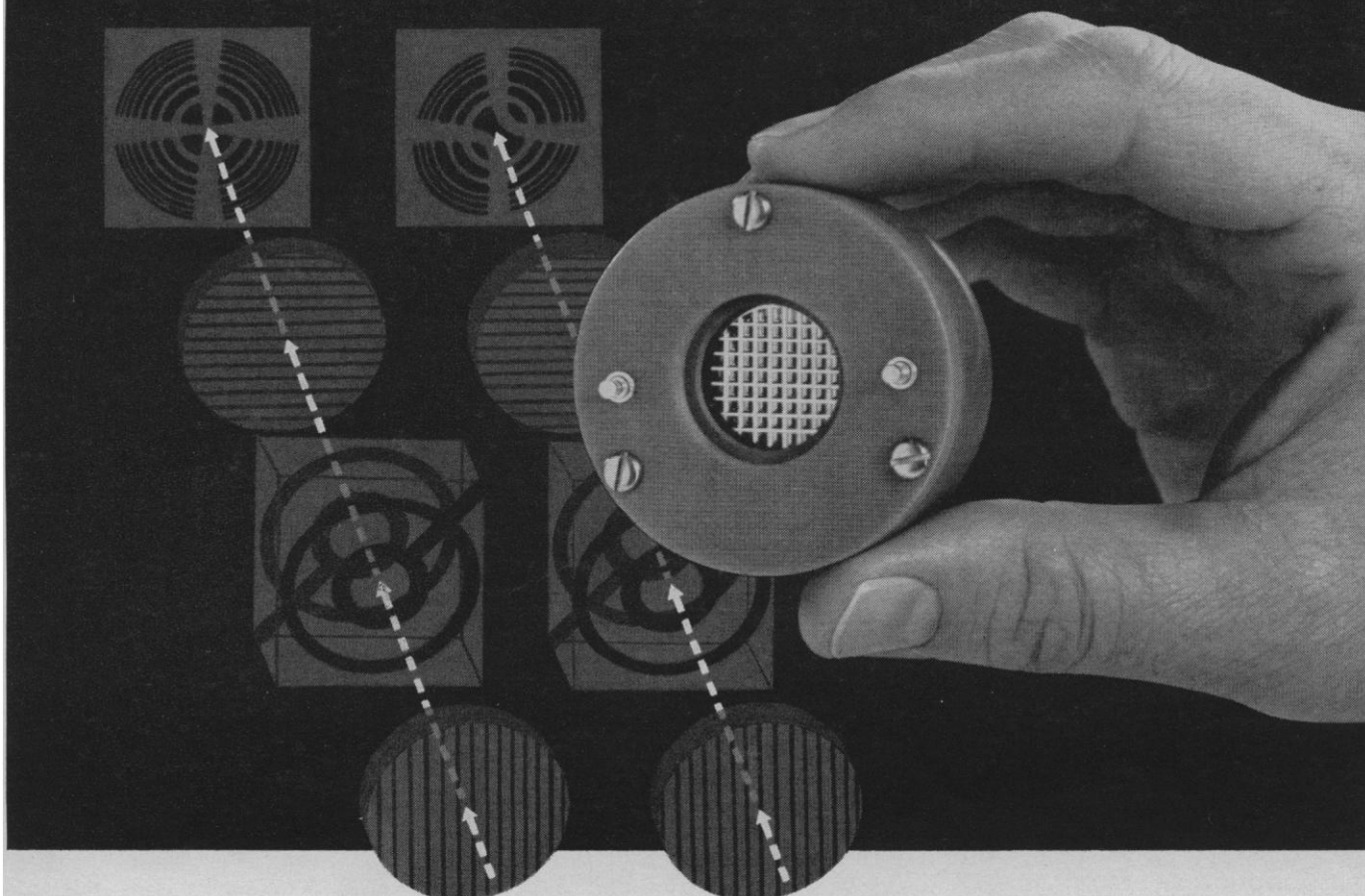
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probably also in phages T3, T4, T5, T7, and P22. Molecular weights of DNA from these phages, calculated from bandwidths in equilibrium-density-gradient centrifugation, are approximately half the expected values. Shear-broken fragments of T2 DNA exhibit density heterogeneity arising from differences in their base composition.

S. Spiegelman found differences in chromatographic patterns, on methylated albumin columns, of labeled RNA synthesized from 3 to 5 minutes and from 13 to 15 minutes after infection of *Escherichia coli* with T2 phage. He concluded that DNA messages are read nonrandomly in the transcription step. Since the columns can "recognize" RNA's of different base composition, individual genetic messages may eventually be identified. Spiegelman also obtained evidence that transfer RNA, as well as ribosomal and messenger RNA, is DNA-controlled.

Ochoa reviewed the use of synthetic polyribonucleotides as artificial messengers in determining the nucleotide composition of the words (or letters) of the genetic code and discussed code letter assignments on the basis of an assumed triplet code. He reported that poly U headed by an AUU triplet stimulated the incorporation not only of phenylalanine but also, specifically, of small amounts of tyrosine; AUU is thus indicated to be the word for tyrosine. Some of the phenylalanine, but no tyrosine, was found at the amino end of the polypeptide formed; some tyrosine was found at the carboxyl end. Since hemoglobin synthesis, as reviewed by H. M. Dintzis, starts at the amino end, the results suggest that AUU at the beginning of the poly U chain corresponds to the last amino acid added to the polypeptide.

A report by S. P. Champe and S. Benzer dealt with a successful test of Crick's adaptor hypothesis with the aid of a synthetic polynucleotide — poly UG—which contains code letters (presumably GUU) for cysteine but not for alanine (F. Chapeville, F. Lipmann, G. von Ehrenstein, B. Weisblum, W. J. Ray, and Benzer). After enzymatic attachment of cysteine to its transfer RNA and chemical reduction of the cysteinyl to an alanyl residue, alanine is incorporated into acid-insoluble polypeptides in the presence of poly UG (which thus recognizes a transfer RNA regardless of the amino acid attached). The problem of degeneracy of the genetic code was dis-

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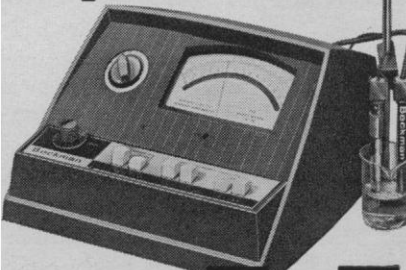
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cussed in the light of (i) two leucine-specific *E. coli* transfer RNA's active with poly UC and poly UG, respectively (Weisblum, Benzer, and R. W. Holley); (ii) similar cases involving other amino acids; and (iii) genetic suppression.

Degeneracy was further discussed by N. Sueoka and T. Yamane, who used methylated albumin columns to demonstrate characteristic heterogeneities in transfer RNA's and showed that 5-fluorouracil gave rise to drastically altered elution profiles. Recently, R. B. Roberts [*Proc. Natl. Acad. Sci. U.S.A.* 48, 1245 (1962)] considered degeneracy in connection with the U content of RNA and with his proposed doublet code and suggested that, if the triplet interpretation is to be retained, there must be degenerate words of low U content in natural RNA. The possibility of a code containing both doublets and triplets has not been eliminated.

Stimulation of amino acid incorporation by non-U polynucleotides, including poly AC, poly AG, and poly CG, was reported by M. W. Nirenberg. Poly CG, for instance, brings about the incorporation of alanine, arginine, and proline. The existence of code words containing no U is thus indicated, and the corresponding degeneracies could allow a degree of flexibility in the composition of coding nucleic acids. Some of the results can be viewed in terms of a degenerate triplet code or of a form of the doublet code; incorporation of, say, histidine in the presence of poly AC or poly AUC could be attributed to triplets (perhaps ACC or AUC) or to a doublet (AC).

The code words deduced from work with synthetic polynucleotides are in remarkable agreement with data on amino acid replacements in nitrous acid mutants of tobacco mosaic virus. H. G. Wittmann emphasized that the results are interpretable in terms of the known effects of nitrous acid and provide strong support for the concept of a nonoverlapping code.

T. H. Jukes discussed amino acid replacements in hemoglobin and other proteins. He proposed triplets, in stated sequences, to account for the replacement and incorporation data, on the assumption that AUU and GUU correspond to tyrosine and cysteine, respectively.

C. Yanofsky announced that mutational replacements for a particular amino acid (glycine) in the A protein of *Escherichia coli* tryptophan synthe-

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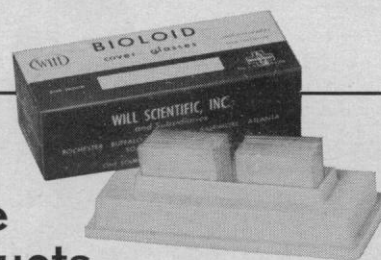
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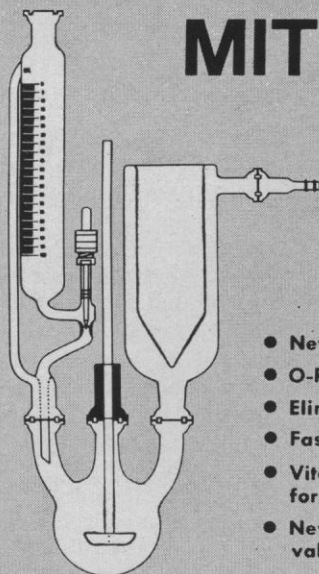
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tase were used for determining relative base sequences. The results were in complete harmony with proposed code triplets for glycine (UGG, in this relative order), glutamic acid (UGA), arginine (UCG), valine (UGU), and serine (UCU). Crosses of a glutamic acid mutant with an arginine mutant gave glycine recombinants; crosses of an arginine mutant with a valine mutant yielded glycine and serine recombinants. Thus, intracoding unit recombination is indistinguishable from mutation. Data for alanine (UGC) also fit a proposed triplet. Additionally, Yanofsky reported that the restoration of a wild-type A protein through a suppressor mutation may depend on a changed transfer RNA that occasionally accepts a "wrong" amino acid.

The agreement of the *Escherichia coli* coding results with amino acid replacements in tobacco mosaic virus and human hemoglobin and the formation of hemoglobin on rabbit reticulocyte ribosomes with *E. coli* aminoacyl s-RNA's (von Ehrenstein and Lipmann) indicate that the genetic code is universal. Moreover, as reported by N. D. Zinder, *f2* phage RNA effectively promotes amino acid incorporation in the *E. coli* system and gives rise to *f2* coat protein, identified by fingerprinting methods. Analogous experiments with RNA from tobacco mosaic virus (A. Tsugita, H. Fraenkel-Conrat, Nirenberg, J. H. Matthaei) were mentioned in the discussion. Further evidence that the genetic code is universal came from incorporation experiments with several nonbacterial systems discussed by I. B. Weinstein.

A paper by D. Nathans, J. E. Allende, T. W. Conway, G. J. Spyrides, and Lipmann described recent observations on the steps of protein synthesis from aminoacyl s-RNA to polypeptide, studied in a poly U-stimulated phenylalanine-incorporating system. It was reported that the supernatant fraction required for these steps was subfractionated into at least two enzymes. The specificity and mode of action of puromycin, a known inhibitor of protein synthesis, was studied: in the presence of puromycin, phenylalanine was incorporated into alcohol-soluble oligopeptides, including di- and triphenylalanine. A small active fraction of ribosomes could be prepared from 70 S ribosomes by sucrose gradient centrifugation in the presence of poly U.

Dintzis concluded that, in the cell-



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free hemoglobin-synthesizing system, partially synthesized chains, short or long, have an equal probability of finishing, and that chain growth proceeds stepwise from the amino to the carboxyl end.

Roberts reported a detailed kinetic study of nucleic acid and ribosome synthesis in *E. coli* and presented calculations on nucleic acid metabolism and protein synthesis; for example, he calculated that the rate of protein synthesis is of the order of 30 peptide bonds per second per template.

F. Gros estimated that an average *E. coli* messenger RNA functions in protein synthesis at least 5 to 10 times. The destruction of the messenger is not directly related to protein synthesis. Amino acid-charged s-RNA's are less inhibitory to RNA polymerase action than are uncharged s-RNA's. On induction of enzymes of galactose metabolism, an increase in specific messenger RNA was detected through hybridization with complementary DNA.

Reich, Acs, Mach, and Tatum pointed out that the available experimental evidence is insufficient to establish whether the rapidly labeled RNA fractions designated as messengers are anything more than mere precursors of ribosomal RNA. These authors proposed that the bulk, ribosomal RNA, contains the genetic information for protein synthesis and that the mammalian ribosome may function for prolonged periods in the synthesis of protein without further supply of RNA, subject to superimposed regulatory mechanisms.

G. D. Novelli and J. M. Eisenstadt, in an investigation of the in vitro synthesis of β -galactosidase, concluded that in the absence (but not in the presence) of an inducer, DNA directs the formation of an RNA capable of inhibiting enzyme synthesis at the level of the ribosomes. Additionally, there is evidence of regulation at the level of DNA. Two roles for the inducer are thus indicated, and this system may involve two repressors.

B. Magasanik found that catabolite repression of histidase in *Salmonella typhimurium* is subject to genetic control similar to genetic control of induction. Studies on the early kinetics of β -galactosidase synthesis indicate that the inducer promotes and the catabolite repressor inhibits the formation of a messenger RNA specific for this enzyme.

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with M. Freundlich and R. O. Burns, showed that valine, isoleucine, and leucine are required for the repression of enzymes of isoleucine and valine synthesis, a phenomenon termed multivalent repression.

A. B. Pardee and J. R. Beckwith described mutants capable of producing β -galactosidase constitutively, each at a different rate, over a 2000-fold range; the mutations governing the rate of enzyme production are in or near the structural gene. It was proposed that the rate of constitutive enzyme production is determined by the composition of the structural gene itself.

H. J. Vogel, D. F. Bacon, and A. Baich, in a study of regulation in the arginine path of *Escherichia coli*, obtained evidence that the structural gene for acetylornithine δ -transaminase contains information for the recognition of the functional repressor (whether repression occurs at the level of DNA or of a DNA product). Eight genes controlling arginine synthesis, as well as the relevant repressibility gene, were mapped in strain W. Four of the genes are closely linked; the other five are well spread out.

It seems clear that unprecedented

advances have just been made in the area covered by the symposium. The main features of the genetic code appear to have emerged, and remarkable contributions have come from enzymological work and from the isolation and characterization, both chemical and physicochemical, of important classes of macromolecules, in conjunction with genetic techniques. Of the impressive rate of progress, Tatum said: "Looking back some twenty-odd years, particularly with Dr. Beadle here, . . . I think we would not have been able to anticipate . . . this extraordinary phenomenon in the development of molecular biology." Directions of future attainment are discernible, and the present successful partnership of biochemistry and genetics is likely to persist.

The National Science Foundation furnished financial support for the symposium. The proceedings will be published in book form.

HENRY J. VOGEL

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Forthcoming Events

December

26-31. American Assoc. for the **Advancement of Science**, annual, Philadelphia, Pa. (R. L. Taylor, AAAS, 1515 Massachusetts Ave., NW, Washington 5)

The following 40 organizations will meet in conjunction with the AAAS annual meeting in Philadelphia:

Academy of **Psychoanalysis**. (A. H. Rifkin, 125 E. 65 St., New York 21)

American Assoc. of **Clinical Chemists**. (P. Paubionsky, Abington Memorial Hospital, Abington, Pa.)

American **Astronautical Soc.** (J. G. Stephenson, Airborne Instruments Laboratory, Walt Whitman Rd., Melville, L.I., N.Y.)

American **Economic Assoc.** (H. F. Williamson, AEA, Northwestern Univ., Evanston, Ill.)

American **Geophysical Union**. (W. E. Smith, AGU, 1515 Massachusetts Ave., NW, Washington 5)

American **Meteorological Soc.** (F. Sergeant, II, Dept. of Physiology, Univ. of Illinois, Urbana)

American **Nature Study Soc.** (J. A. Gustafson, Route #1, Homer, N.Y.)

American **Physiological Soc.** (R. E. Smith, School of Medicine, Univ. of California, Los Angeles)

American **Political Science Assoc.** (E. M. Kirkpatrick, APSA, 1726 Massachusetts Ave., NW, Washington, D.C.)

American **Psychiatric Assoc.** (M. Greenblatt, Massachusetts Mental Health Center, Boston)

American **Rocket Soc.** (B. Chifos, ARS, 500 Fifth Ave., New York 36)

American Soc. of **Criminology**. (J. Chwast, New York Inst. of Criminology, 115-117 W. 42 St., New York 36)

American Soc. of **Naturalists**. (W. K. Baker, Dept. of Zoology, Univ. of Chicago, Chicago 37, Ill.)

American Soc. of **Zoologists**. (R. L. Watterson, Dept. of Zoology, Univ. of Illinois, Urbana)

American **Sociological Assoc.** (B. Clark, Center for the Study of Higher Education, 2747 Bancroft Way, Berkeley 4, Calif.)

Association of American **Geographers**. (B. Burton, 213-1500 Arlington Blvd., Arlington, Va.)

Association for **Computing Machinery**. (B. Gilchrist, IBM Research Laboratory, Post Office Box 218, Yorktown Heights, N.Y.)

Biomedical **Information-Processing Organization**. (R. S. Ledley, Natl. Biomedical Research Foundation, Silver Spring, Md.)

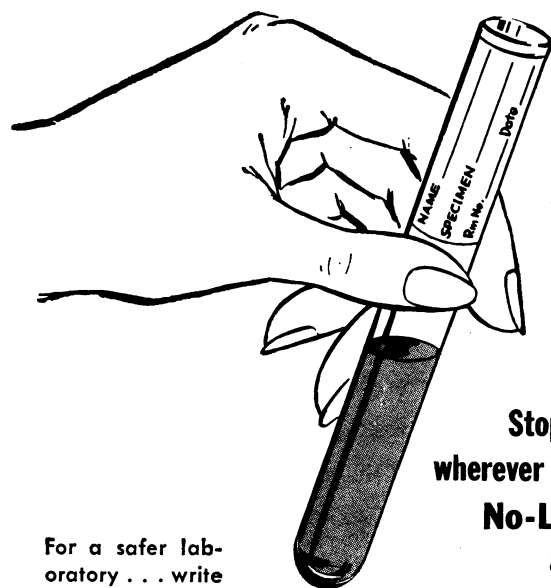
Biometric Soc., ENAR. (T. A. Bancroft, Iowa State Univ., Ames)

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Herpetologists' League. (W. Fox, School of Medicine, Louisiana State Univ., 1542 Tulane Ave., New Orleans 12)

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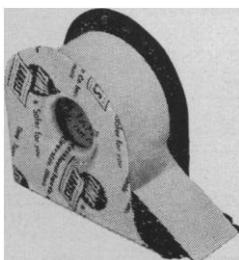
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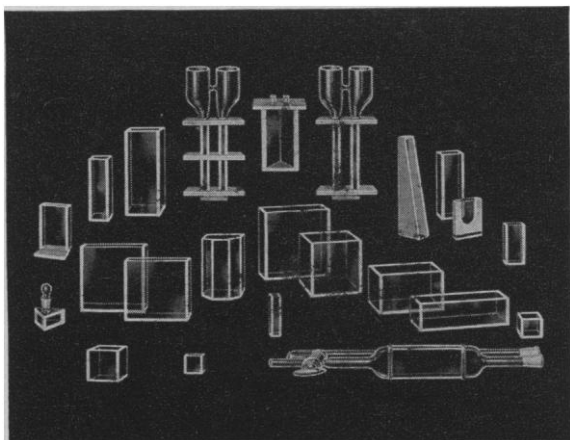
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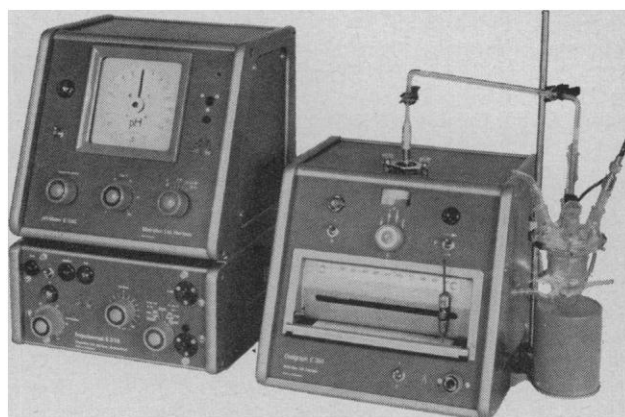


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Conference on **Scientific Manpower**. (T. J. Mills, National Science Foundation, Washington 25)

26-29. American **Physical Soc.**, Stanford, Calif. (H. A. Shugart, Univ. of California, Berkeley 4)

27-29. American **Geophysical Union**, western natl. meeting, Stanford, Calif. (W. W. Kellogg, Rand Corp., 1700 Main St., Santa Monica, Calif.)

27-29. American **Philosophical Assoc.**, Pacific Div., Berkeley, Calif. (L. E. Hahn, Washington Univ., St. Louis 30, Mo.)

27-29. Western Soc. of **Naturalists**, San Jose, Calif. (I. A. Abbott, Hopkins Marine Station, Pacific Grove, Calif.)

28-29. California Assoc. of **Chemistry**

Teachers, Fresno. (R. H. Major, 1736 N. Sierra Bonita Ave., Hollywood 46, Calif.)

28-29. **Northwestern Scientific Assoc.** Bellingham, Wash. (E. J. Larrison, Univ. of Idaho, Moscow)

28-30. **Archaeological Inst.** of America, Baltimore, Md. (L. A. Campbell, 5 Washington Sq. North, New York 3)

28-30. **Linguistic Soc.** of America, New York, N.Y. (A. A. Hill, Box 7790 University Station, Austin 12, Tex.)

January

5. **Pediatrics, Medicine, Surgery, and Obstetrics**, seminar, Manila, Philippines. (A. C. Reid, 118 Riverside Dr., New York 24)

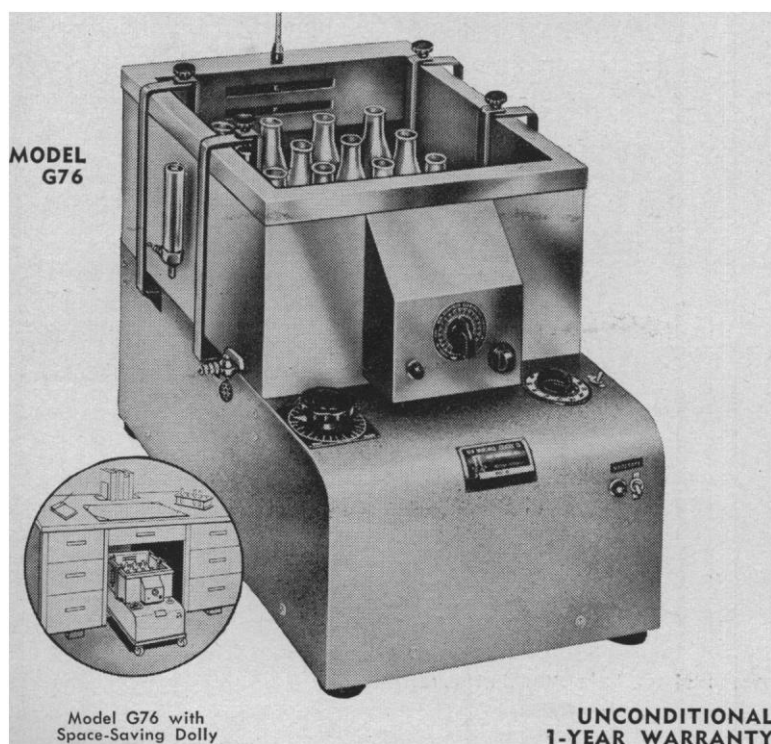
5-12. **Medical Conf.**, Dakar, Senegal. (P. Pene, c/o Faculté de Médecine, Dakar)

5-12. **Tumors of Conjunctive Tissue**, symp., Dakar, Senegal (by invitation). (H. F. Dorn, Intern. Union Against Cancer, c/o National Institutes of Health, Bethesda 14, Md.)

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)

7-10. **Millimeter and Submillimeter**, conf., Orlando, Fla. (H. L. Bassett, Millimeter Conf., Martin Company-MP-75, Orlando)

9-12. National Soc. of **Professional Engineers**, winter meeting, San Antonio, Tex. (P. H. Robbins, 2029 K St., NW, Washington 6)



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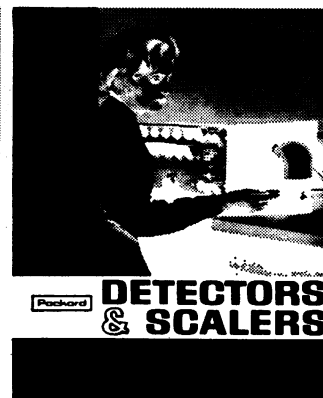
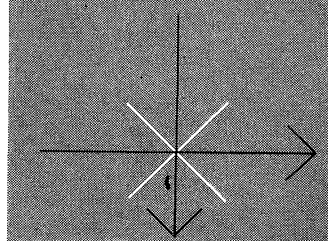
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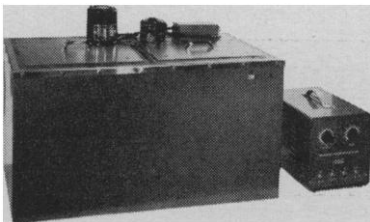
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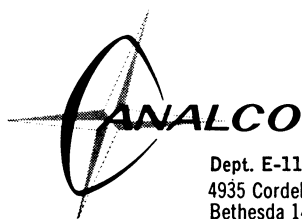


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13-18. American Chemical Soc., Cincinnati, Ohio. (A. H. Emery, 1155 16th St., NW, Washington 6)

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)

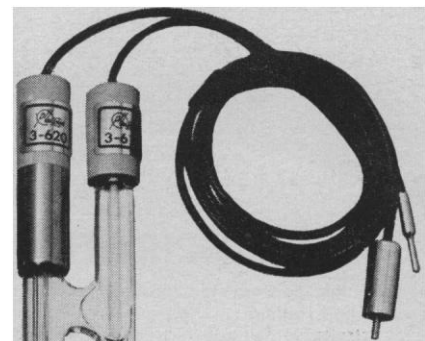
23-26. American Assoc. of Physics Teachers, New York, N.Y. (R. P. Winch, Williams College, Williamstown, Mass.)

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.)

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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)

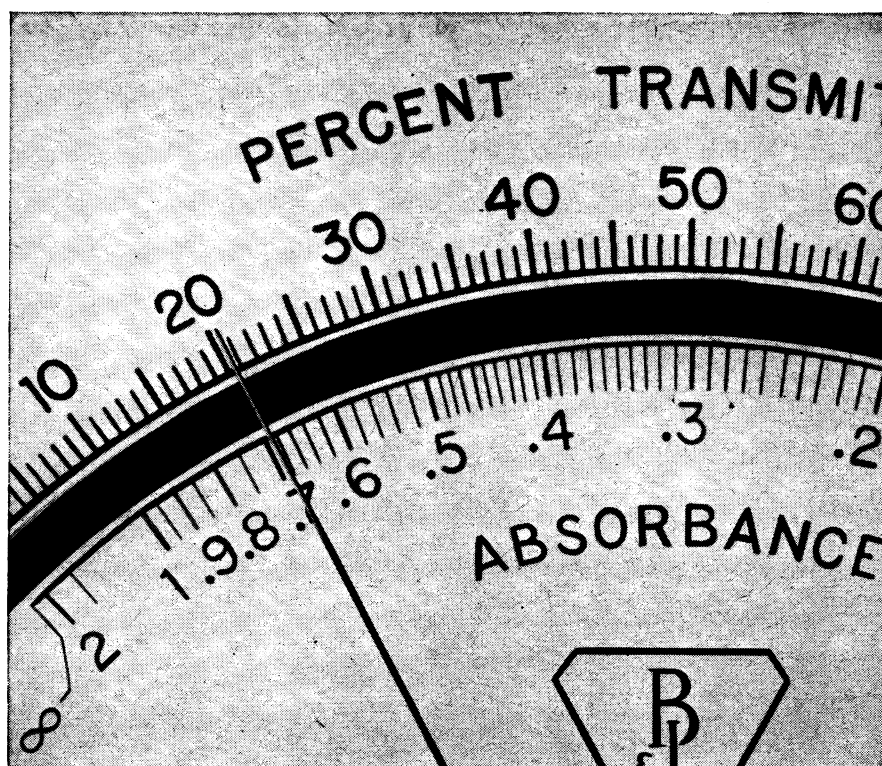
10-16. **Planned Parenthood**, intern. conf., Singapore. (V. Houghton, Intern. Planned Parenthood Federation, 69 Eccleston Sq., London, S.W.1, England)

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 8°)

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

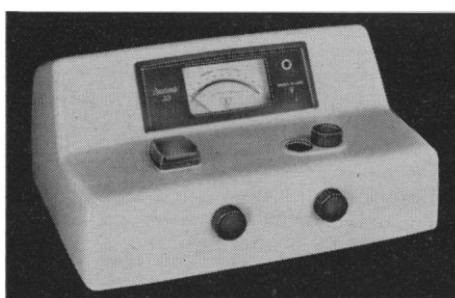


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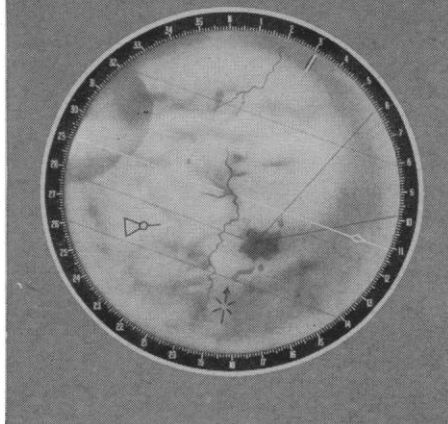
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13-15. **Electrochemistry**, 1st Australian conf., part I, Sydney, Australia. (F. Gutmann, Physical Chemistry Dept., Univ. of New South Wales, Kensington, N.S.W., Australia)

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**, FAO/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.)

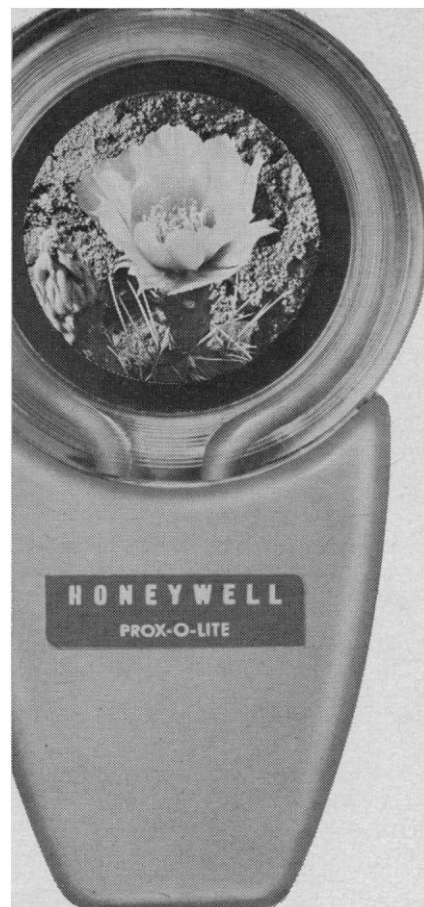
21-22. American Soc. for **Quality Control**, regional conf., Las Vegas, Nev. (S. R. Wood, Dept. 61, Bldg. 160, Aerojet-General Corp., Azusa, Calif.)

23-28. American Soc. for **Testing and Materials**, annual, 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)



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