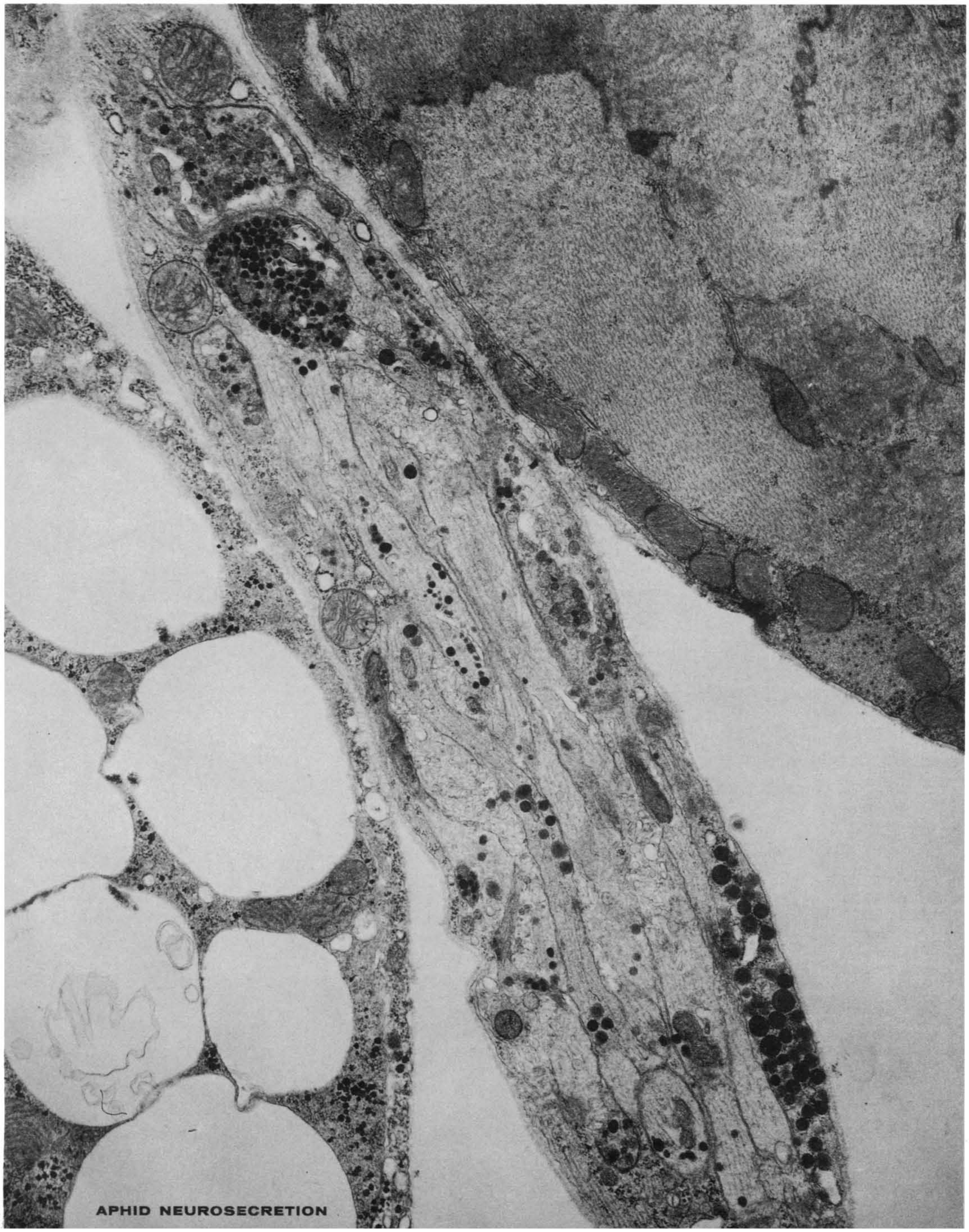
SCIENCE

19 July 1963
Vol. 141, No. 3577

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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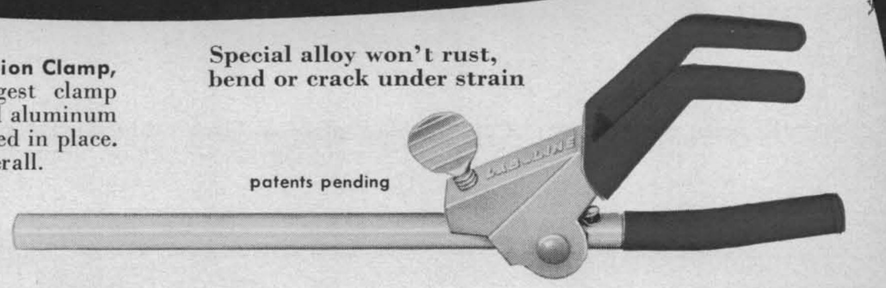

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7000	Vinyl Jaws	$1.30	$1.15	$1.10	$1.05	$1.00
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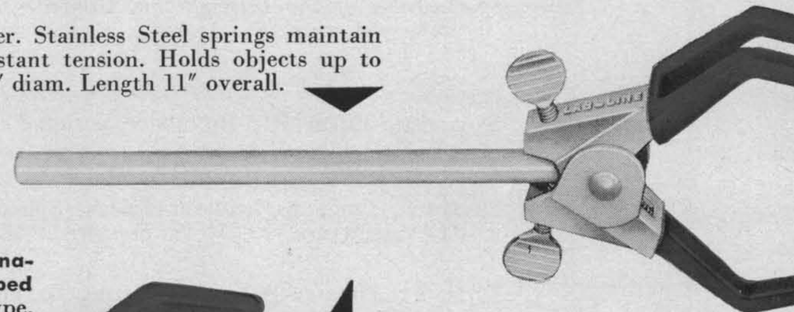

Cat. No.	Description	Price, each, in lots of: 1	12	72	144	720
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patents pending

Cat. No.	Description	Price, each, in lots of: 1	12	72	144	720
7010	Vinyl Jaws	$1.65	$1.50	$1.40	$1.30	$1.25
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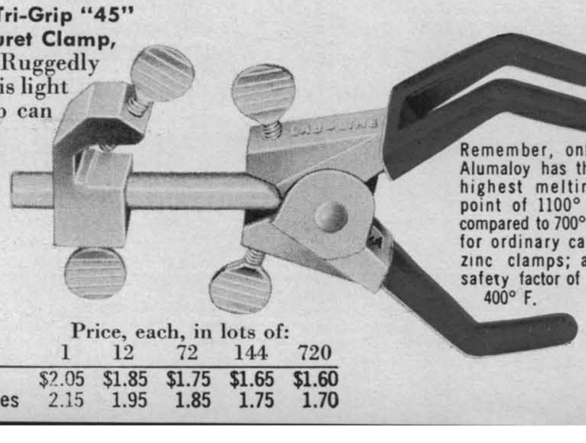

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SCIENCE

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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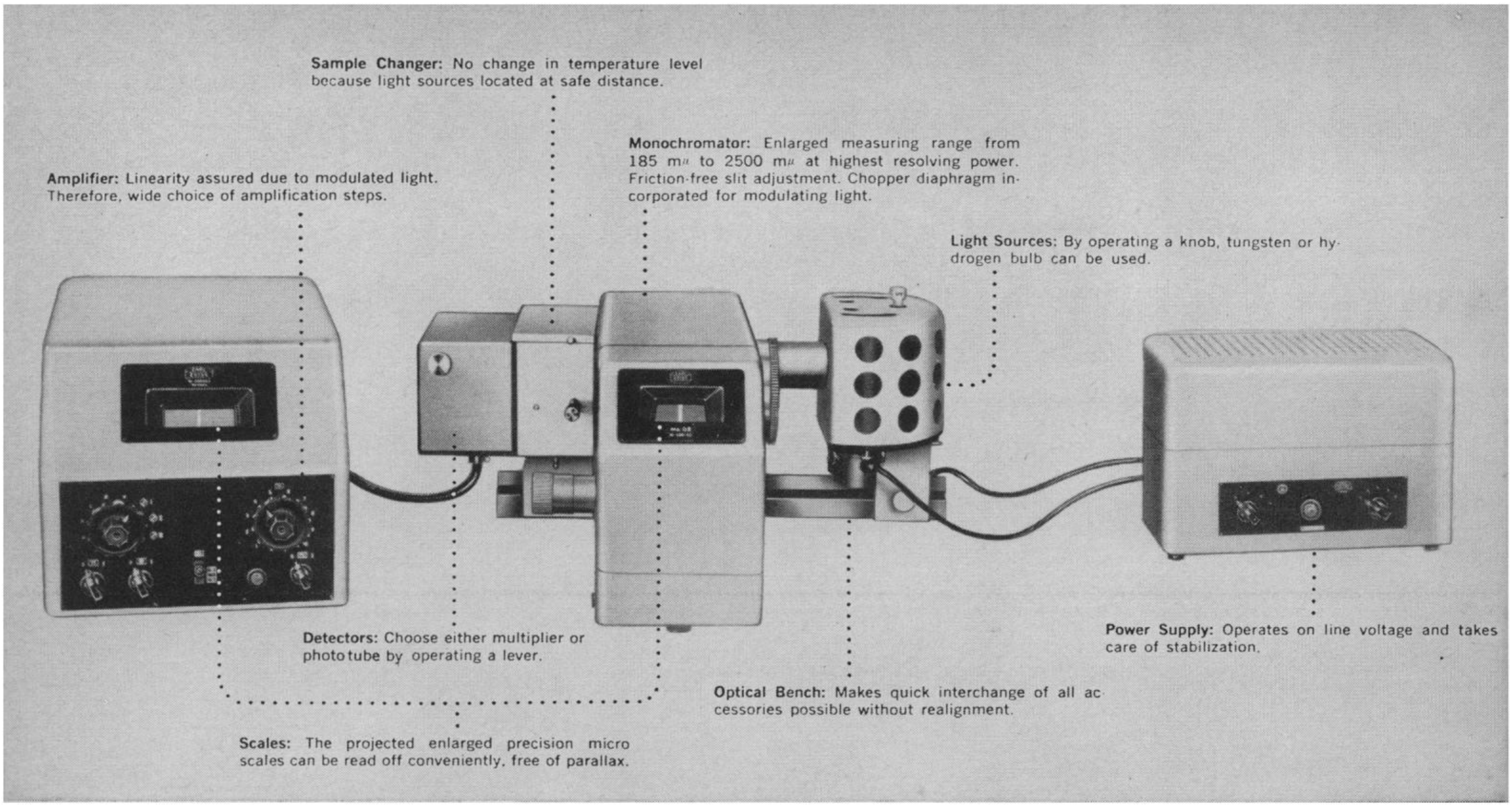
COVER

The lateral nerve from the corpus cardiacum of the aphid *Myzus persicae*. The nerve passes between a muscle fiber and a fat-body cell in the vicinity of the prothoracic neurosecretory granules, neurotubules, and a few mitochondria. The peripheral axons contain dilated elements of rough surfaced endoplasmic reticulum. The nerve is surrounded by a thin basement layer (× 14,700). See page 264.



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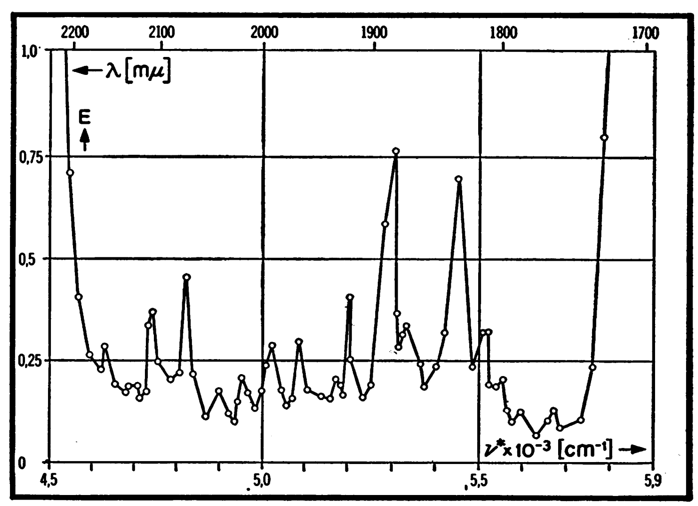

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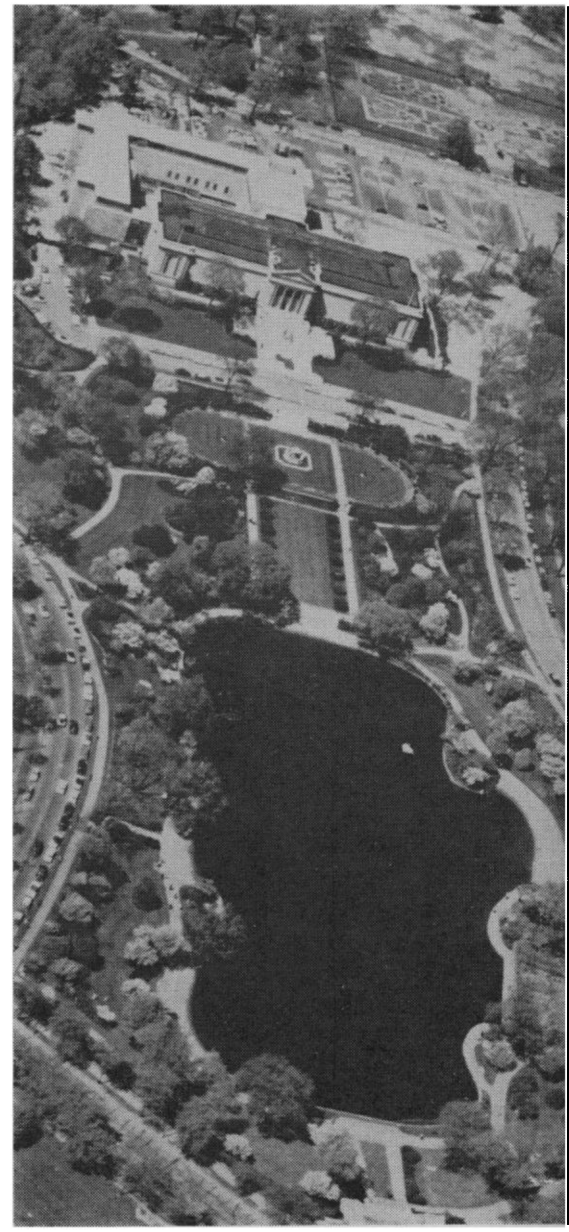

Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 280. The AAAS headquarters is the Sheraton-Cleveland.

The hotels for the AAAS Cleveland meeting have established special, low flat rates and have reserved large blocks of rooms for the meeting.

Use the coupon below to make your hotel reservation in Cleveland. Send your application to the AAAS Housing Bureau in Cleveland, not to any hotel. Give a definite date and estimated hour of arrival, and also probable date of departure. The Housing Bureau will make the assignment and send you a confirmation in two weeks or less.

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HOTEL RATES*
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

For a list of the headquarters of each participating society and section, see page 280, *Science,* 19 July.

Hotel	Single Bed	Double Bed	Twin Beds	Suites
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Statler-Hilton	8.50	14.00	15.50	28.00— 59.00
Manger	7.50	13.00	14.50	25.00— 35.00
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DATES: ARRIVAL .... A.M. ........P.M.........DEPARTURE ....

(These must be indicated—add approximate hour, A.M. or P.M.)

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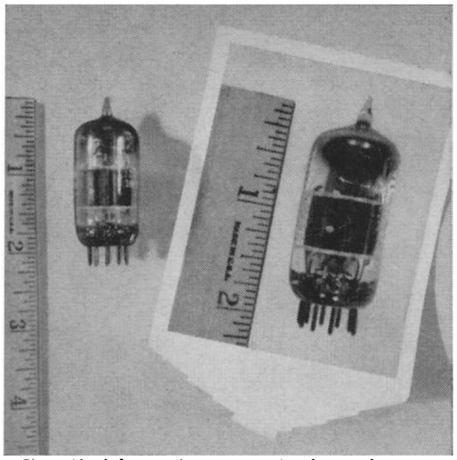
(Street) (City and Zone) (State)

Mail this coupon now to the Housing Bureau. Rooms will be assigned and confirmed in order of receipt of reservation.



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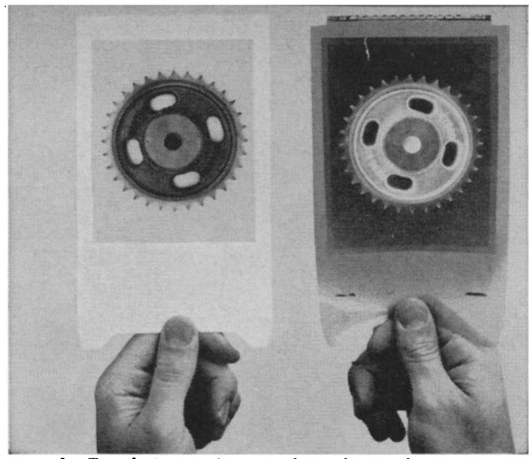

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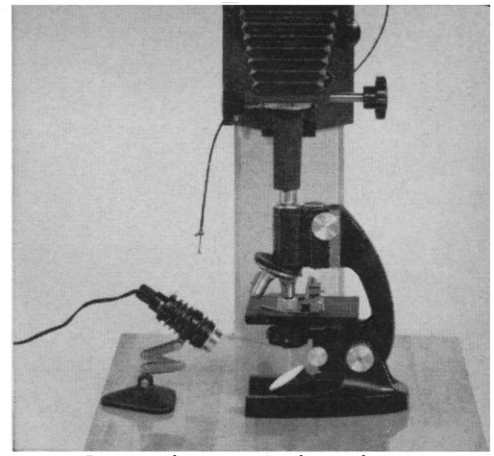

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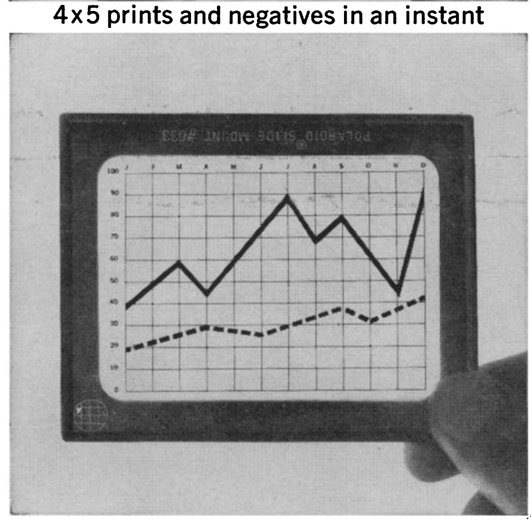

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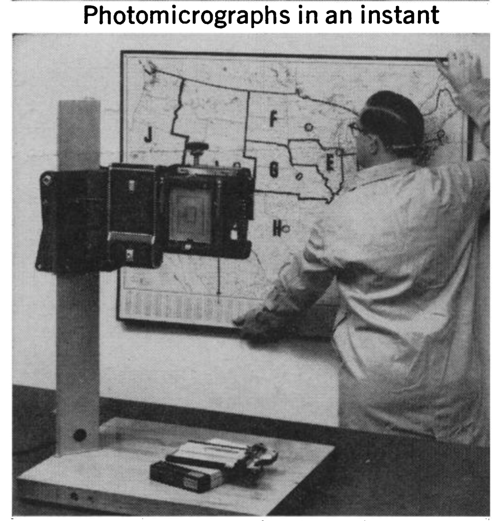

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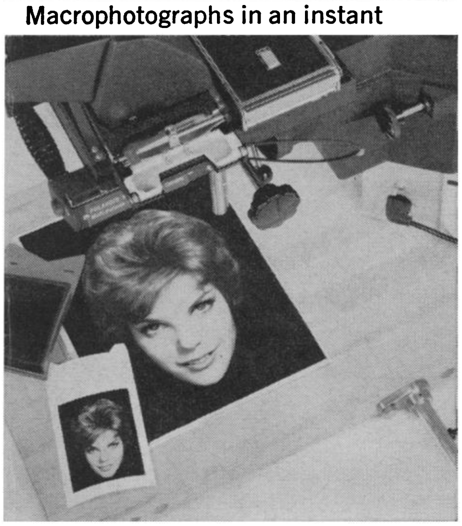

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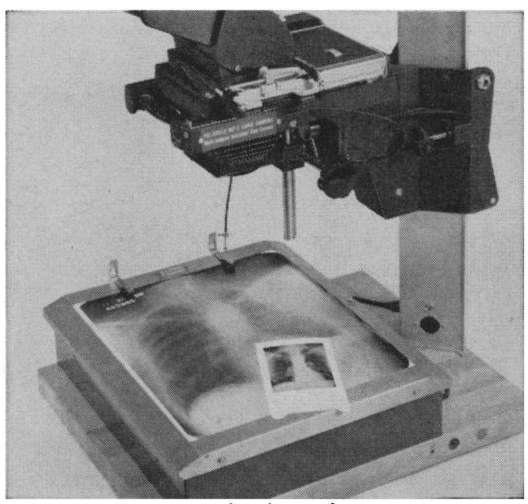

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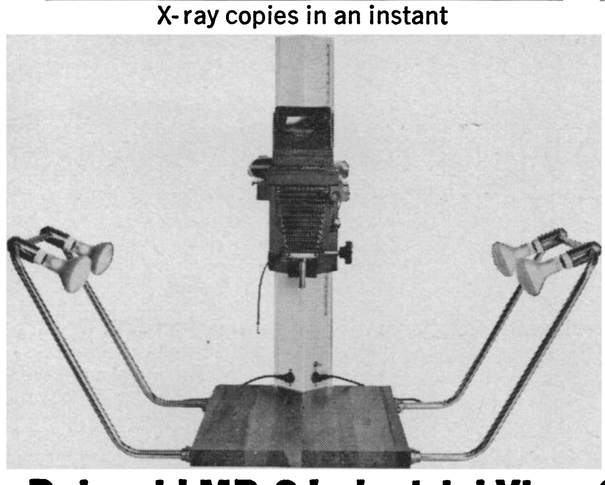

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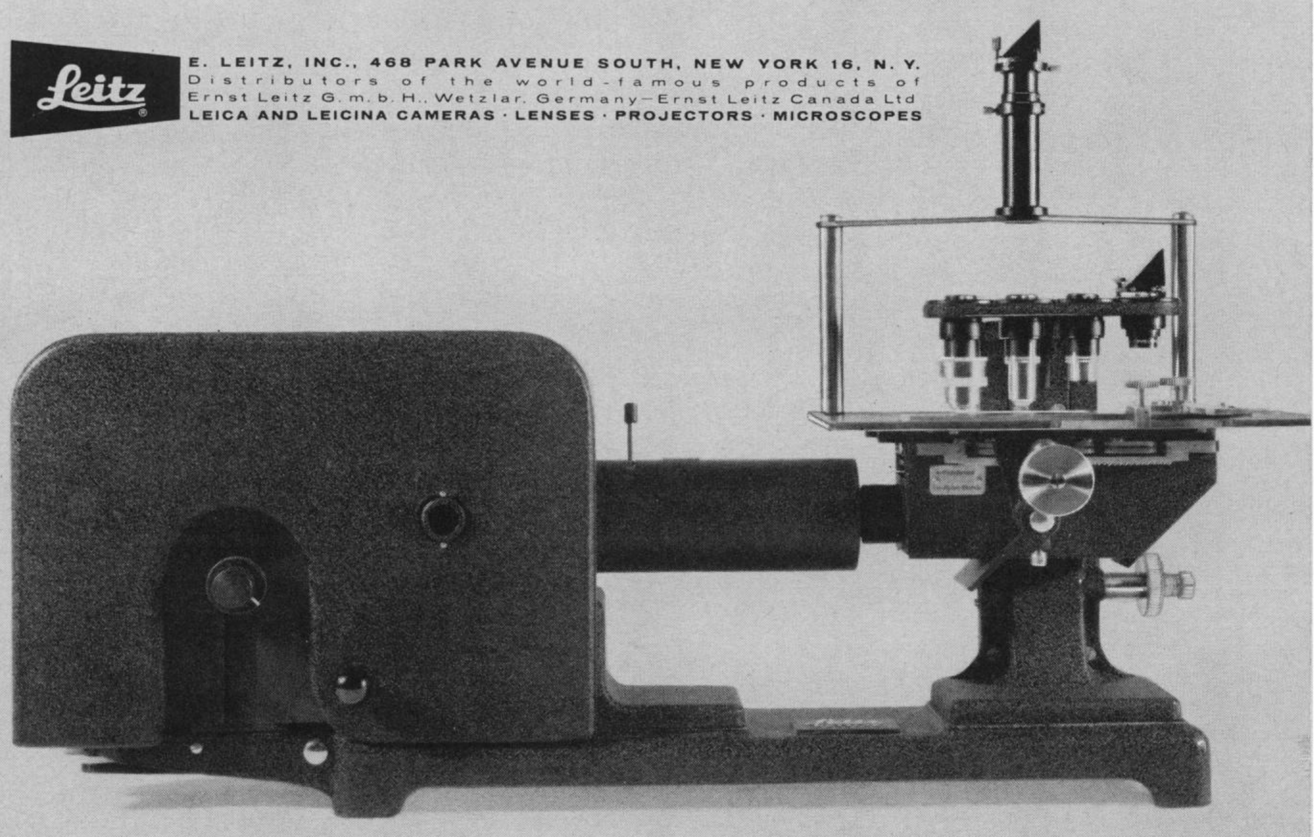

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SCIENCE

Standards for Science Teachers

A useful and satisfying chapter in the history of the Association ends this month with completion of the studies of the qualifications of science and mathematics teachers that AAAS has carried out jointly with the National Association of State Directors of Teacher Education and Certification. One study analyzed the characteristics and education of secondary school teachers of science and mathematics [*Science* **140**, 880 (1963)]. Another, to be published soon, recommends standards for the education in science and mathematics of prospective elementary school teachers.

The other study is the one that started collaboration between the two associations. Several years ago, the National Association of State Directors of Teacher Education and Certification became concerned about the inadequate subject-matter preparation of the new teachers they are called upon to certify, especially high school teachers of science and mathematics. With support from the Carnegie Corporation of New York and with a good start provided by the AAAS Cooperative Committee on the Teaching of Science and Mathematics [*Science* **131**, 1024 (1960)], the two associations collaborated in an extensive series of discussions, conferences, and sometimes compromises that resulted, in September of 1961, in the publication of a set of guidelines for the education of secondary school teachers of mathematics and science.

These guidelines recommend that a prospective science or mathematics teacher earn an undergraduate major in the field in which he plans to teach, that his program emphasize those areas of the discipline that are taught in high school, and that the undergraduate work be adequate in quality and quantity to permit him later to pursue honest graduate work in his field. The guidelines also recommend that a fifth year of college or university work, which increasingly is required of teachers, emphasize courses in the subject to be taught.

These guidelines have been adopted, wholly or in substantial part, by Arizona, Arkansas, Georgia, Indiana, Kansas, Louisiana, Mississippi, New Mexico, North Carolina, Oregon, Pennsylvania, Puerto Rico, Utah, and West Virginia, and have been "approved," without being "adopted," by Alabama, Colorado, Connecticut, Illinois, Maryland, Massachusetts, Montana, Nevada, New York, Oklahoma, Rhode Island, and Vermont. Action is pending in a number of other states; at least 170 colleges and universities have adopted the guidelines as standards for their own programs; and North Carolina used them as a basis for new standards in fields other than science and mathematics.

Here, then, is a fine and useful start in the direction of better educated teachers. There is, of course, a long way to go, and for some time to come there will be real justification for criticism of inadequacies of teacher education. At the same time, the fact that half of the states have so quickly adopted or approved the higher standards set forth in the new guidelines promises substantial improvement in the subject-matter qualifications of high school science and mathematics teachers. Scientists will no doubt approve this trend wholeheartedly. As they do, they can give credit to an educational organization for being a prime mover in bringing about this change.—D.W.

the attendant river deposits and offshore deposits associated with the deltas. Eustatic changes in sea level are real changes in sea level; they are not relative changes due to uplift or subsidence of a coastal area. In the past many geologists and most physiographers and geographers have emphasized that transgressions or regressions were due to true changes in sea level caused by extensive periods of glaciation and nonglaciation. From new studies of both recent and ancient sediments geologists now conclude that there are fewer real changes in sea level and that the shifting ocean boundaries on the edges of or across portions of a continental land mass are due to differential uplift and subsidence and further that many of these "ups and downs" are connected "chicken and egg" fashion with major delta systems. The influence of this shifting of delta systems was also stressed in the analyses of cyclically recurring sequences of rocks particularly in the Pennsylvanian age which contributed vast amounts of sediments throughout the United States. These sequences of sediments (cyclothems) have been studied in great detail in the Illinois and Appalachian basin areas, and they can be explained by shifting continental and marine depositional facies, delta, and river patterns without "yo-yo-ing" sea level.

A paper on the West Bastian Bay field by Clyde A. Brooke and Parker S. Turner (Pan American Petroleum Corporation, Houston, Tex., and New Orleans, La.) stressed the sedimentary and structural patterns that occur when local uplifting and faulting occur over a growing deep-seated salt dome. Brooke and Turner stated that the large, domal structure at West Bastian Bay field, central Plaquemines Parish, Louisiana, is a deep-seated salt dome. A large, normal fault which strikes east-west and dips south, and which was contemporaneous with the upward push of the salt, traverses the dome and controls accumulation of oil and gas in multiple upper Miocene sands. At the time of maximum growth along this Bastian Bay fault, sediment was deposited approximately three times faster in the downthrown block where most of the hydrocarbon accumulation occurs. The relative thickness of sediments shows that domal uplift, deposition of upper Miocene and younger beds, and movement along Bastian Bay fault were contemporaneous. Reliable electric log correlations together with paleontological data from well samples in the field area afford excellent data for a detailed study of contemporaneous normal faulting, a type of faulting common to Miocene sediments of the Gulf Coast and important to exploration for oil and gas. Microfaunal and lithologic data obtained from conventional cores through oil and gas productive strata show that the 'R' and 'S' sands were deposited predominantly in nonmarine environments. These sands in turn are separated by dense homogeneous gray-black shales, deposited in marine environments similar to those existing on the modern continental shelf. Production has been established in 20 sands ranging in depth from 2644 to 4664 meters (8677 to 15,305 feet).

Doyle T. Graves (Union Oil Development Corporation, Sydney, Australia) reported on the geologic significance of the Moonie Oil Field discovery, Queensland, Australia. Graves stated that the discovery of the first commercial oil field on the continent of Australia has caused a reappraisal of the petroleum prospecting potential of all its sedimentary basins. This discovery marks the beginning of an oil-producing industry and has caused many preconceived ideas to be discarded. Geologically, Moonie is most significant for its contribution to the understanding of the structural and sedimentary history of the Surat Basin as related to the accumulation of petroleum. The oil field is an accumulation on a large regional plunging nose with a relatively small local closure of 45.7 meters (150 feet). Immediately below the producing sands is a major angular unconformity, and the pre-unconformity structure is the steeply dipping flank of a complexly thrust-faulted regional anticline. Thick sequences of rock are missing on this steep, faulted anticlinal flank below the unconformity.

Geophysical papers stressed the importance of generation of sound waves for seismic surveying by means of vibrators, impact devices, or weight drops rather than by the conventional means of explosions in a shot hole. By the use of these techniques, coupled with electronic tape recording, reinforcement of useful seismic energy can be achieved. It is now possible to obtain fair quality seismic reflections from sedimentary beds in many deep basin areas. In many parts of the Gulf Coast province of the United States reliable seismic reflections from below 3600 to 4500 meters (12,000 to 15,000 feet) were impossible to obtain prior to the advent of the impact wave generation devices in which

a series of many drop patterns are recorded along a linear seismic spread. This allows "stacking" of the reflected sound waves and the enhancement of usable reflections. Good results at depths of 4500 to 7500 meters (15,000 to 25,000 feet) are being obtained.

The meeting, attended by 4600 registrants, was held in conjunction with the Society of Economic Paleontologists and Mineralogists and the Midwestern Societies of Exploration Geophysicists.

JOHN M. PARKER

Kirby Petroleum Company, Denver 2, Colorado

Optical Masers

An international symposium on optical masers conducted by the Polytechnic Institute of Brooklyn in New York (16–18 April) not only provided a review of research, but also a forum for discussion of major problem areas and findings of interest to engineers, chemists, and physicists. The meeting was a comprehensive integration of the physics and technology bearing directly on the discovery, theory, and application of maser phenomena at optical and infrared frequencies.

N. Bloembergen (Harvard) presented a review of some theoretical problems in quantum electronics. He noted that although the fundamental problems of the interaction between electromagnetic radiation and matter are well understood, the advent of lasers has necessitated a more careful study of both quantum-mechanical and classical aspects of this interaction. Many well-known concepts from the realm of radio and microwaves have to be adapted to the optical region. Quantitative differences occur because several spatial modes are involved and quantum aspects, such as the uncertainty relations between amplitude and phase of the electromagnetic modes, are more prominent. Therefore, coherence, fluctuations, information, and channel capacity in optical fields are being studied with renewed vigor.

Nonlinear electromagnetic properties of materials at optical frequencies provide another illustration of the extension of well-known classical and quantum theories. It is possible to give quantum-mechanical expressions for linear and nonlinear complex susceptibilities with positive or negative imaginary parts. These may be incorporated in Maxwell's equations and describe the properties of lasers, Raman-type lasers, parametric amplifiers, and other nonlinear devices. Although the general framework exists, much detailed theoretical work remains to be done to account for specific geometries, to describe the large variety of materials ranging from mixtures of atomic and molecular gases to crystals with paramagnetic ions or organic molecules, and to broaden our understanding of the various damping mechanisms caused by collisions, lattice vibrations, or other interactions.

E. Wolf (Rochester University), one of the leading authorities in the field of optics, discussed the fact that until very recently optical coherence phenomena were almost exclusively described in terms of second-order correlation functions. Such a description is entirely adequate for the analysis of the usual optical experiments performed with light beams originating in thermal sources. However, in view of the development of the optical maser, and in view of a number of rather unconventional experiments that have been carried out or proposed very recently, the need has arisen for a broadened description.

Recent work on the noble gas optical masers was discussed by C. G. B. Garrett (Bell Telephone Laboratories). This holds out considerable promise for closing the gap between the optical and microwave portions of the spectrum. Oscillation has been achieved on about 150 different transitions. The longest wavelength achieved so far is about 28 microns (in neon). In the very important and even newer field of semiconductor lasers, B. Lax (Lincoln Laboratories, MIT) discussed various schemes which have been proposed for achieving maser action in semiconductors. These include a variety of phenomena involving transitions between impurity levels, interband transitions, and those between magnetic levels. To date, the only successful semiconductor maser has been the electrically pumped p-n junction diode of GaAs and related compounds. Lax described in detail the operation and theory of this device.

An application of the laser of outstanding practical and theoretical interest, namely, the ring laser rotation-rate sensor, was reported upon by W. M. Macek, D. T. M. Davis, Jr., R. W. Olthuis, J. R. Schneider, and G. R. White (Sperry Gyroscope Company). In summary, Olthuis said that the sensing of rotation rate with respect to an inertial frame of reference has been demonstrated using a traveling-wave gas laser in which the light propagates around in a closed loop. Under stationary conditions, a degenerate pair of independent modes exists which consists of waves propagating in opposite directions around identical paths. Rotation of the laser about an axis with a component normal to the plane of the laser path results in an effective lengthening of one path and a shortening of the other. To sustain oscillations, each path must be an integral number of wavelengths long, so the wavelengths of the oscillations must adjust themselves to meet this requirement. This results in a frequency splitting which is proportional to rotation rate. By sampling the output from each of the modes and heterodyning them together on a photocathode, a beat frequency is obtained which is proportional to rotation rate. Beat frequencies as low as 500 cycles per second have been observed corresponding to a rotation rate of two degrees per minute.

The symposium was cosponsored by the Air Force Office of Scientific Research, the Office of Naval Research, and the U.S. Army Research Office and was organized by the Polytechnic Institute of Brooklyn in cooperation with the Institute of Electrical and Electronics Engineers and the Optical Society of America.

WALTER K. KAHN
Department of Electrophysics, Polytechnic Institute of Brooklyn, New York

Protein Structure and Crystallography

Protein structure and crystallography have acquired great importance in recent years (as evidenced by the award of the Nobel Prizes last year) and were the subjects of a symposium held at Madras, India (14–18 January). This meeting, organized by the department of physics of the University of Madras, marked the first time that a conference of its type had been held by a university in that country. Outstanding scientists from all over the world attended; of the 100 delegates, nearly 40 foreign participants came from a dozen different countries.

The first half of the symposium was concerned with protein structure; the main themes were x-ray studies, optical studies, electron microscopic studies, chemical studies, and the genetic code.

In his presidential address, W. L. Bragg mentioned that the solutions to the complexity of structures solved by x-ray methods have been increasing steadily and the recent successful studies of myoglobin and hemoglobin by Perutz and Kendrew can be cited as important landmarks in the history of x-ray crystallography. It is also conceivable that the molecular structure of a virus might be forthcoming in the not too distant future. Results of recent x-ray diffraction studies have included a Fourier map at 4-Å resolution of the globular protein, ribonuclease (D. Harker, Roswell Park Memorial Institute) and the discovery that amino acid-transfer RNA has a double helix structure of three and a half turns which is similar to the structure of DNA (M. H. F. Wilkins, London).

In 1954 the first triple helical structure of collagen was discovered by the research of G. N. Ramachandran (University of Madras). Since then the structure has gone through a series of refinements and culminated in the latest version in 1960–61. Ramachandran pointed out how the triple helix and the alpha helix appear to be the two main helical chain configurations which occur in polypeptides and proteins. Additional protein structure work has been carried out on hemoglobin, myoglobin, lysozyme, beta-lactoglobin and alpha-chymotrypsin (D. C. Phillips, Royal Institution, London) and on natural and artificial polypeptides.

An optical method employed in the study of the configuration of proteins has been the use of the ultraviolet absorption spectra. J. T. Edsall (Harvard) has utilized the absorption band near 190 mμ to estimate the extent of helix formation in peptides and proteins. The frequencies and polarizations of infrared absorption bands can also give useful information about the orientation and configuration of the chains in protein structures. According to T. Miyazawa (Institute for Protein Research, Osaka), the alpha form, the beta form, and the random coil can be identified in this manner. Other optical and hydrodynamic studies have shown poly-L-proline-type polypeptides can exist in two forms, both in solution and in the solid state (E. Katchalski). Measurements of polypeptides and proteins by the optical rotatory dispersion technique have been used to determine helix content and the sense of the helix (E. R. Blout, Harvard).

Information obtained by using the

electron microscope in protein research has supplemented data from other sources. Recent electron microscopic and sedimentation studies on different types of human hemoglobin appear to support the picture of the molecule obtained by X-ray diffraction.

Chemical methods have proven useful for finding the sequence of amino acids in the protein ribonuclease (S. Moore, Rockefeller Institute) and finding the active (zinc binding) site of the enzyme carboxy-peptidase A and determining the amino acid sequence around the thiol there. Other investigations have been made on the physical and chemical properties of resilin, a rubber-like protein found on the wings of insects (T. Weis-Fogh, Copenhagen) and on the amino acid composition of ichthylepidin of fish scales (R. V. Seshaiya, Annamalai University).

The determination of the genetic code, a topic of intense current interest, is dependent upon discoveries in protein structure research. Previously it was thought that the base uracil was essential for all the codes. However, recently S. Ochoa (New York University) has shown that polynucleotides containing only adenine and cystosine lead to the synthesis of polylysine and polyproline, respectively, and several of the coding units do not contain uracil.

The second part of the symposium was devoted to crystallography. The main topics dealt with methods of structure analysis and crystal imperfections.

Several approaches have been attempted in the study of the phase problem. The Patterson function has been described as a special kind of image function which can be studied by using an image algebra developed for this purpose. However, it appears that nonperiodic functions with the same self-convolution do not exist unless the function is centrosymmetrical (M. J. Buerger, Massachusetts Institute of Technology). According to Dan McLachlan (Denver), optical arrangements can be devised to substitute for computation in the phase determining techniques. Another technique, devised by Ramachandran, has been utilized for the determination of a structure when only a part of it is known. When isomorphous crystals or anomalous dispersion data are available it is possible to determine the unknown part by feeding the data into a Fourier synthesis without actually calculating the phase angle. The relative superiority of the beta synthesis, as compared with the usual heavy atom synthesis, has been demonstrated by practical tests.

Various direct methods of structure determination used at the present time include the statistical method of sign determination (S. Naya *et al.*, Japan); the "shift product" method, and another which employs the Sayre relation to find the signs of additional structure factors (W. Hoppe, Munich); and the use of electronic computers (W. Cochran *et al.*, Cambridge).

The anomalous dispersion technique is another method used in protein structure research. As a result of work on the absolute configuration of $NaClO_3$ and $NaBrO_3$, Bijvoet (Utrecht) found that the crystals of the two compounds, which are alike and have the same sense of optical rotation, have opposite configurations. Additional structure analyses have been performed on the compound factor Vla, a derivative of vitamin B_{12}; barium glucose-6-phosphate; and other crystals.

One useful technique employed in the determination of crystal perfection is x-ray reflection. Defects, such as those of the point type, can be revealed by accurate measurements of x-ray intensities. According to R. Parthasarathy (Madras), the intensity of x-ray reflections from perfect and mosaic crystals reveals that under certain conditions the integrated intensity for a perfect crystal can be greater than that of a mosaic crystal of the same thickness.

Investigations on disorder in crystals have encountered many problems. According to H. Jagodzinski (Würzburg, West Germany) a mathematical treatment for the two- and three-dimensional cases is difficult to handle. He outlined general rules that could be applied for the occurrence of sharp and diffuse maxima in the reciprocal lattice for a disordered crystal.

Advancements in crystallography have occurred not only in research, but also in instrumentation. Two new instruments for use in x-ray crystallographic work are the automatic, four-circle, counter diffractometer and the integrating Weissenberg camera for low and high temperature studies.

The symposium was followed by a winter school (22–27 January) in which ten of the participants delivered seminar lectures. This school was organized with the assistance of the Council of Scientific and Industrial Research and the University Grants Commission, Government of India.

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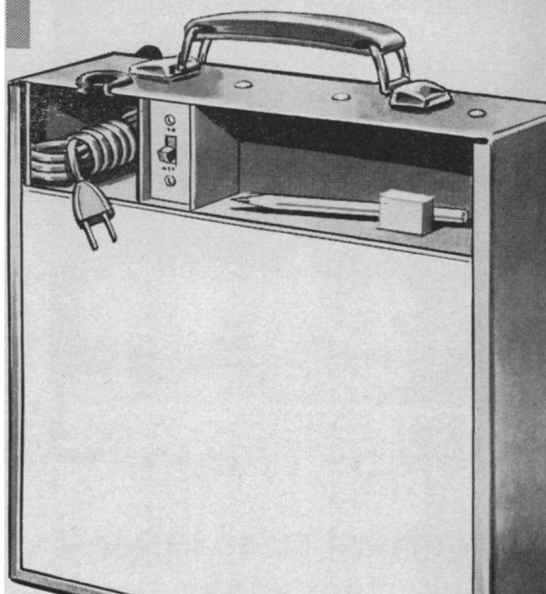

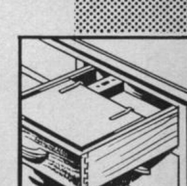

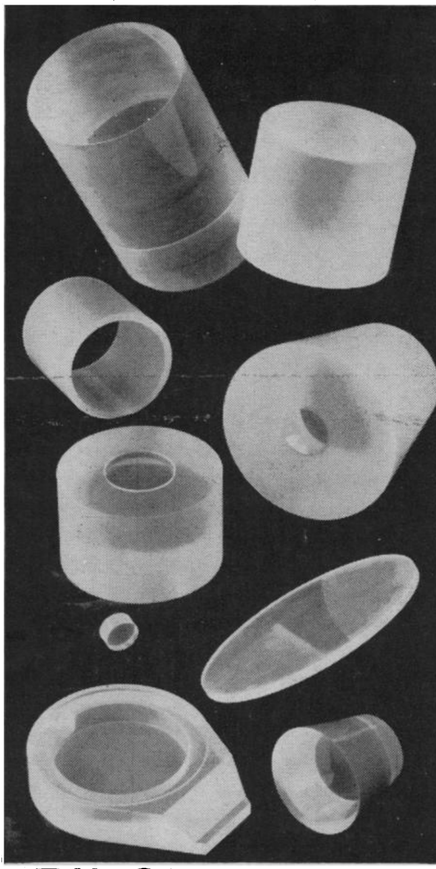

Forthcoming Events

August

12–15. Quantification of Animal and Human Behavior, conf., Bar Harbor, Maine. (E. D. Chapple, Research Facility, Rockland State Hospital, Orangeburg, N.Y.)

12–16. Results of **International Geophysical Year**, symp., Los Angeles, Calif. (C. Harris, Administration Bldg., Room 1104, Univ. of California, Los Angeles 24)

12–17. American **Ornithologists** Union, Gainesville, Fla. (L. H. Walkinshaw, 1703 Wolverine Federal Tower, Battle Creek, Mich.)

12–30. Canadian **Mathematical** Congr., 2nd seminar, Saskatoon, Sask., Canada. (L. F. S. Ritcey, Sherbrooke Avenue West, Montreal, Que., Canada)

14–16. **Gas Dynamics**, 5th symp., Evanston, Ill. (Gas Dynamics Laboratory, Northwestern Univ., Evanston)

14–17. **Communication** processes, symp., Washington, D.C. (D. Almy, Psychological and Social Science Div., Room 3E 1037, Pentagon, Washington 25)

14–21. **Veterinary** Congr., 17th, Hanover, Germany. (H. Merkt, Tierärztliche Hochschule, Hans-Böckler-Allee 16, Hanover)

15–17. International College of **Surgeons**, European Federation congr., Helsinki, Finland. (ICS, 1516 Lake Shore Dr., Chicago 10, Ill.)

15–30. International Assoc. of **Meteorology and Atmospheric Physics**, 13th general assembly, Berkeley, Calif. (W. L. Godson, Meteorological Office, 315 Bloor St. West, Toronto 5, Ont., Canada)

18–22. **Health**, 12th annual conf., University Park, Pa. (E. J. Kusko, Dept. of Health, P.O. Box 90, Harrisburg, Pa.)

19–21. **Cryogenic Engineering** Conf., Boulder, Colo. (K. T. Timmerhaus, Chemical Engineering Dept., Univ. of Colorado, Boulder)

19–23. **Clinical Chemistry**, 5th intern. congr., Detroit, Mich. (D. G. Remp, Henry Ford Hospital, Detroit 2)

19–25. Electrochemical **Thermodynamics and Kinetics**, 14th, Moscow, U.S.S.R. (Secretary General, Swiss Federated Institute of Technology, Dept. of Industrial and Engineering Chemistry, Universitätstr. 6, Zurich 6)

19–30. **Macromolecules**, statistical theory, seminar, Hanover, N.H. (Dean of Summer Programs, P.O. Box 833, Hanover)

19–31. **Geodesy and Geophysics**, 13th general assembly, Berkeley, Calif. (W. E. Smith, AGU, 1515 Massachusetts Ave. NW, Washington 5)

20–23. Western **Electronic** Show and Conf., San Francisco, Calif. (J. D. Noe, WESCON, 701 Welch Rd., San Francisco)

20–24. **Poultry Science** Assoc., Stillwater, Okla. (W. E. Shaklee, Cooperative State Experiment Station Service, USDA, Washington 25)

20–26. **Psychology**, 17th intern. congr., Washington, D.C. (American Psychological Assoc., 1333 16th St. NW, Washington 6)

20–26. **Zoological Nomenclature**, intern. committee meeting, Washington, D.C. (W. E. China, British Museum of Natural History, Cromwell Rd., London S.W.1)

20–27. **Zoology**, 16th intern. congr., Washington, D.C. (Secretary of the Congress, Natl. Acad. of Sciences, 2101 Constitution Ave., NW, Washington 25)

21–23. **Biochemical Conf.**, Pacific Slope annual, Honolulu, Hawaii. (P. E. Wilcox, Dept. of Biochemistry, Univ. of Washington, Seattle 5)

21–29. International Conf. on **Population**, Ottawa, Ont., Canada. (B. Benjamin, Intern. Union for the Scientific Study of Population, General Register Office, Somerset House, London W.C.2, England)

22–24. National Council of Teachers of **Mathematics**, Pittsburgh, Pa. (E. G. Begle, Stanford Univ., Stanford, Calif.)

25–28. **Soil Conservation** Soc. of America, Logan, Utah. (H. W. Pritchard, Soil Conservation Soc., 7515 Northeast Ankeny Rd., Ankeny, Iowa)

25–29. **Medical** Correctional Assoc., Portland, Ore. (F. L. Rouke, 14 Studio Arcade, Bronxville, N.Y.)

26–28. Simulation for **Aerospace Flight**, specialists meeting, Columbus, Ohio. (Inst. of the Aerospace Sciences, 2 E. 64 St., New York 21)

26–28. **Superconductivity**, intern conf., Hamilton, N.Y. (R. W. Schmitt, General Electric Research Laboratory, P.O. Box 1088, Schenectady, N.Y.)

26–29. American **Sociological** Assoc., Los Angeles, Calif. (T. Parsons, Dept. ot Social Relations, Harvard Univ., Cambridge 38, Mass.)

26–30. American **Mathematical** Soc., 68th summer, Boulder, Colo. (Mrs. R. Drew-Bear, Special Projects Dept., AMS, 190 Hope St., Providence 6, R.I.)

26–30. **Rheology**, 4th intern. congr., Providence, R.I. (R. S. Rivlin, Brown Univ., Providence 12)

26–30. **Solar Spectrum**, intern. symp., Utrecht, Netherlands. (C. de Jager, Theoretical Dept., Sterrewacht, Servaasbolwerk 13, Utrecht)

26–31. **Haematology**, European Soc., 9th congr. Lisbon, Portugal. (Secretary, Haematology Congr., Dept. of Haematology, Inst. of Tropical Medicine, Lisbon)

27–30. **Alaskan Science** Conf., Anchorage. (A. H. Mick, Alaska Agricultural Experiment Station, Palmer)

27–30. American **Physiological** Soc., Coral Gables, Fla. (M. Edwards, Physiology Dept., Univ. of Miami School of Medicine, Coral Gables 34)

27–30. **Computing Machinery** Assoc., natl. conf., Denver, Colo. (F. P. Venditti, Univ. of Denver, Denver 10)

27–31. American Inst. of **Biological Sciences**, Amherst, Mass. (R. A. Jester, Dept. of Floriculture, Univ. of Massachusetts, Amherst)

27–4. **Automatic Control**, 2nd intern. congr., Basel, Switzerland. (A. von Schulthess, Wasserwerkstr. 53, Zurich 6, Switzerland)

28–31. **Electron Microscope** Soc. of America, 21st annual, Denver, Colo. (V. L. Van Breemen, Mercy Inst. for Biomedical Research, 2920 E. 16 Ave., Denver 6)

28–4. **British Assoc. for the Advancement of Science**, Aberdeen, Scotland. (Sir G. Allen, Burlington House, Piccadilly House, London, England)

29–30. **Solvation** Phenomena, symp., Calgary, Alberta, Canada. (P. J. Krueger, Dept. of Chemistry, Univ. of Alberta, Calgary)