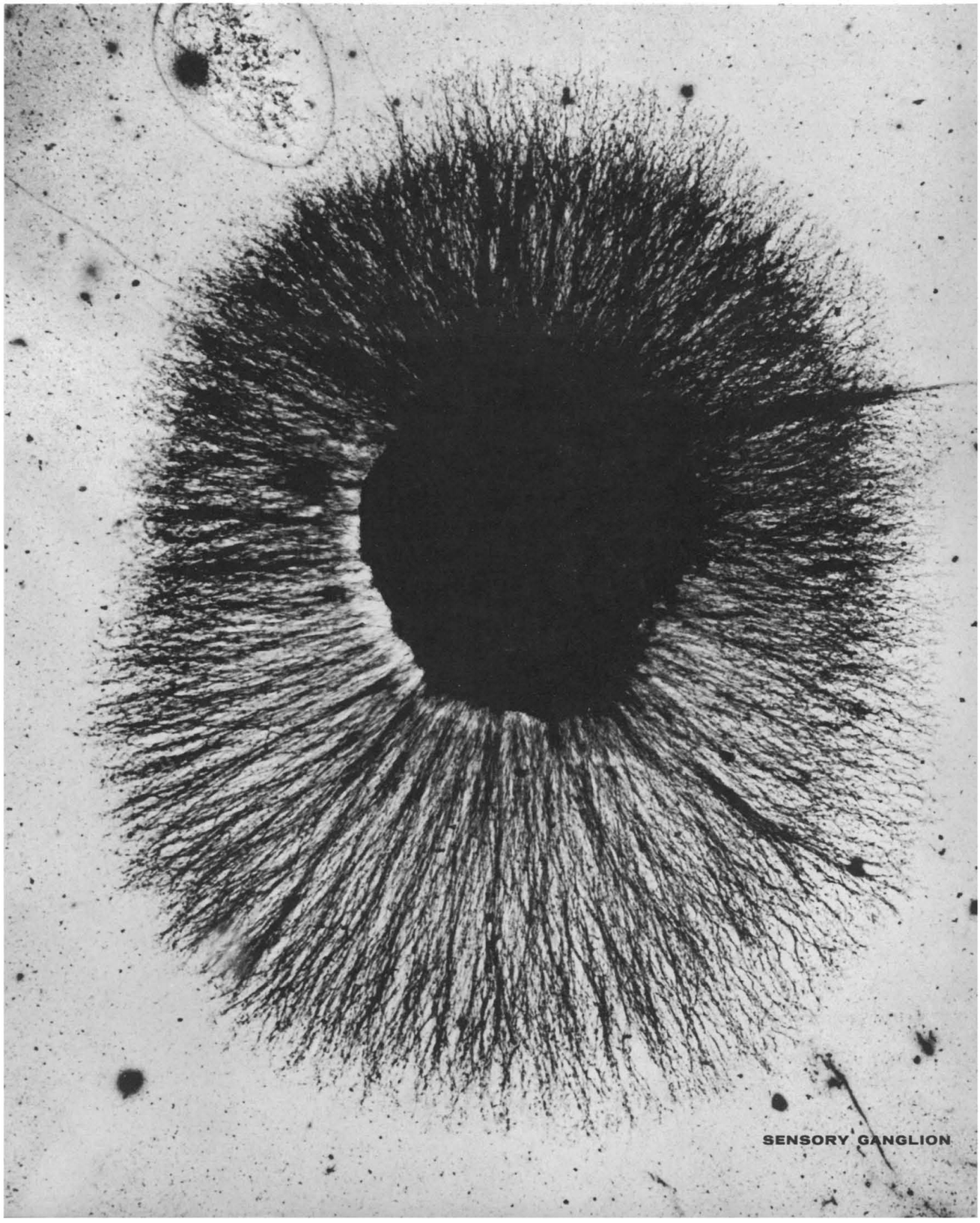
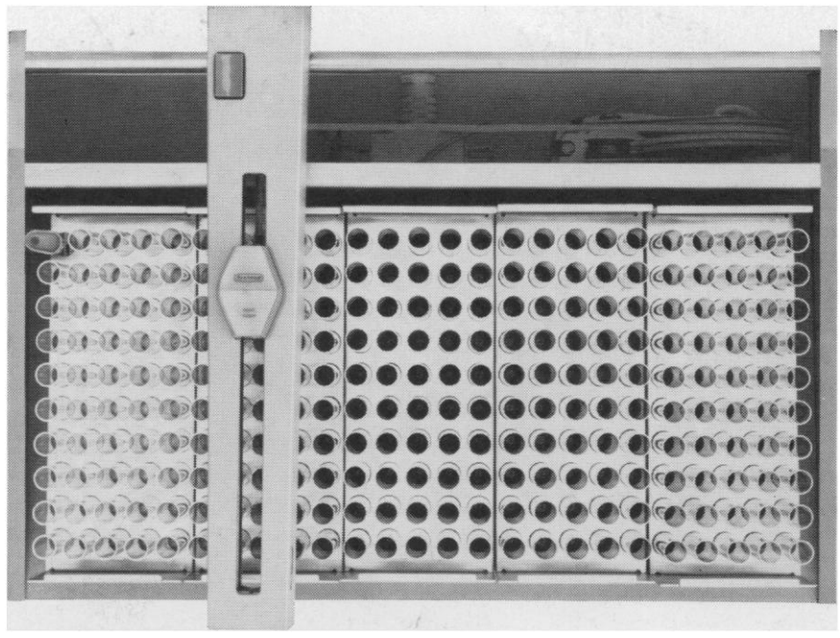
SCIENCE

10 January 1964

Vol. 143, No. 3602

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





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You're looking at the new shape in Fraction Collectors—a compact, practical rectangle that takes up only 26 inches of lab bench, yet provides a full 250 tubes. The controls have been designed into a separate transistorized unit which fits unobtrusively on the bench beside the collector, or on a shelf above.

The space problem isn't the only thing our Model 132 squares away. For example, identification of tubes is easier since the moving delivery head fills one row at a time in a logical front-to-back order. Cleaning is easier since each rack of 50 tubes can be washed without removing the tubes. Timed-flow and drop-counting delivery are available at the flick of a switch, and a simple accessory provides volumetric delivery.

If you're at all involved with column chromatography, send for a copy of our compact, rectangular Fraction Collector brochure.

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NEW

A manual to ease learning in a difficult area of biochemistry

New! Christensen- pH and Dissociation

This unique programed text is designed to help students of the biological sciences acquire a firm understanding of the association and dissociation of the hydrogen ion in aqueous solutions.

The *vertical linear* format is comprised of small sequential steps, followed by a question based on each new fact. The student is required to *write* the *correct* answer to each question before he is permitted to proceed to the next frame. This insures adequate feedback and reinforcement. After about 7 hours of study the reader can expect to reach a level where he can calculate the pH of buffer systems, select indicators and buffers for various applications, interpret the titiration curves of multifunctional compounds, predict the electrophoretic behavior and interractions of protein molecules and understand the buffering by biological systems and the sensitivity of biological events to pH.

The author presumes only a minimal acquaintance with pH, logarithms, indicators, titirations, stoichiometry and structural chemistry.

By HALVOR N. CHRISTENSEN, Ph.D., Professor of Biological Chemistry and Chairman of the Department, the University of Michigan. 60 pages, 7¼" x 10¼", illustrated. $1.75. *New—Published July, 1963!*

Important supplementary reading for the standard ecology course

New! Hazen- Readings in Population and Community Ecology

Here are 25 classic articles on varied aspects of Ecology, carefully chosen from the literature (1935 to 1963). These articles will beautifully supplement the standard course in Ecology. They are divided among these four general classifications: *Single Species Population; Relationships between Species; Community Metabolism* and *Community Structure.*

Coverage ranges from broad subjects such as *Life Tables for National Populations of Animals* to those on specific species and areas such as *A Study of Plankton Copepod in the Columbia Basin.*

Titles include: The Concept of Patterns in Ecology—A Study of the Cryptozoa of an Illinois Woodland—Distance to Nearest Neighbor as a Measure of Spatial Relationships in Populations—The Trophic-Dynamic Aspects of Ecology—The Intrinsic Rate of Natural Increase of an Insect Population—Studies of the Population Dynamics of the Salamander Genus Desmognathus in Virginia—Experimental Methods in Population Dynamics: A Critique—Behavior of Mixed Populations and the Problem of Natural Selection—Coactions in Laboratory Populations of Two Species of Daphnia—Metabolism and Bioenergetics—Potential Productivity of the Sea—Etc.

Collected by WILLIAM E. HAZEN, Ph.D., Assistant Professor of Zoology, San Diego State College, San Diego, California. 388 pages, 7¼" x 10¼", paperbound. About $4.50. *New—Ready January!*

A concise biochemical study of the life processes of insects

New! Patton- Introductory Insect Physiology

Here is an effective new textbook geared to the needs of the modern course in insect physiology. It is designed to meet the needs of the student who is well-grounded in the various disciplines of biology.

Dr. Patton's book is concise yet thorough . . . covering all generally accepted ideas on life mechanisms of insects, while holding dissenting opinions to a minimum. Physiologic phenomena common to most insects are stressed, and extraneous material and exotic mechanisms that might tend to sidetrack the student are avoided. Discussions range from *Functions of the Parts of the Digestive System* to *Structure and Microstructure of Insect Nervous Systems.*

The chapter headings and paragraph titles can readily form the basis for a lecture outline. This organization gives the instructor the opportunity to fill in new details of knowledge as they appear, and furnishes the student with a prepared outline for review study.

The approach is biochemical. Energy production and its related intracacies are correlated to show the complex interrelationships of the vital systems. New information is included on such topics as: *Nutrition—Transport—Neuromuscular phenomena—Sensory response—Pheromones—Circadian rhythms.*

By ROBERT L. PATTON, Ph.D., Professor of Insect Physiology, Cornell University 245 pages, 6⅛" x 9¼", illustrated. $5.50. *New—Published September, 1963!*

Fascinating articles, definitions, photographs of atomic age science

Atomic Energy Encyclopedia in the Life Sciences

Edited by Charles Wesley Shilling, M.D., D.Sc.

Written and published under the auspices of the AEC, this new combined encyclopedia and dictionary is filled with fascinating articles and definitions of biological science in the atomic age. This is an exciting book crammed with information on the *dangers to* and *effects on* living material from atomic radiation; on uses of radiation and radioisotopes in medicine, agriculture and biology; on scores of other peaceful uses of atomic energy. It contains over 1,200 alphabetically-arranged entries including 198 on Radiation—139 on Elements and Isotopes—87 on Somatic Effects.

Within this timely book you'll find a wealth of factual and technical material on: Effects of irradiation on the endocrine glands—Use of sulfur-35 in treatment of chondrosarcoma—Studies of radiation effects on plants—Food preservation by radiation—Radiocarbon dating—Use of estrogens to reduce radiation injury.

Editor and Major Contributor, CHARLES WESLEY SHILLING, M.D., D. Sc., Consultant to the United States Atomic Energy Commission, Deputy Director, Division of Biology and Medicine, USEAC, 1955-1960. Prepared under the auspices of the Division of Technical Information. USAEC. 474 pages, 7¼" x 10¼", 268 illustrations, 98 tables. About $10.50. *New—Ready January!*

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Vol. 143, No. 3602

SCIENCE

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COVER

A sensory ganglion explanted from a 7-day chick embryo and cultured in vitro for 18 hours in a medium supplemented with the salivary nerve growth factor. This factor calls forth the production of nerve fibers which form a dense fibrillar halo around the ganglion. The same results obtain with sympathetic ganglia. See page 105.

digital-type reading

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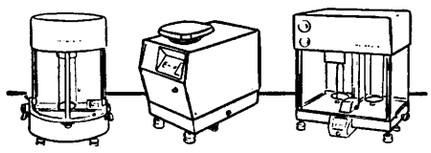

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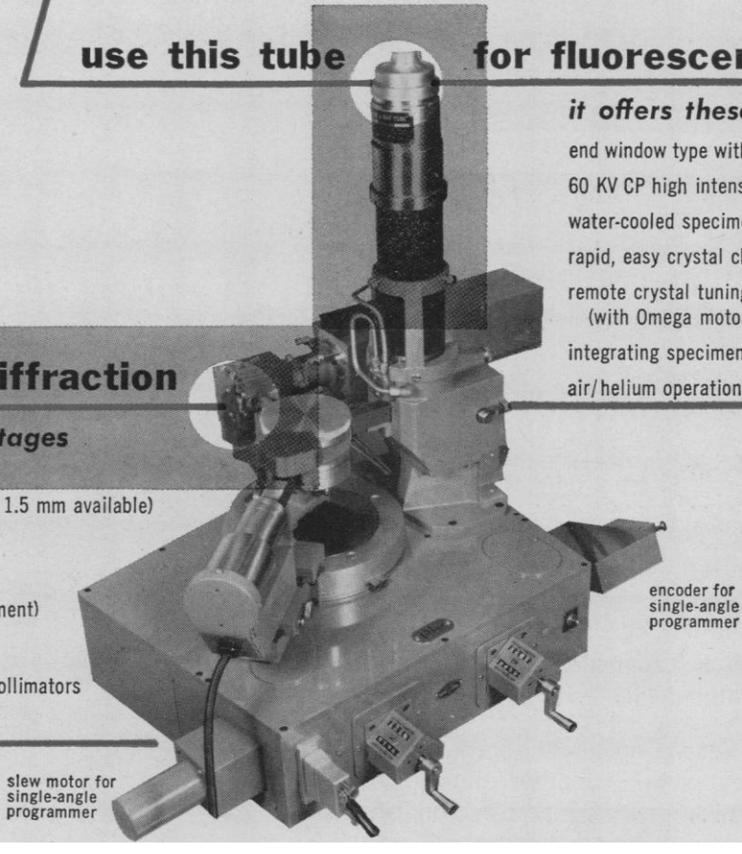

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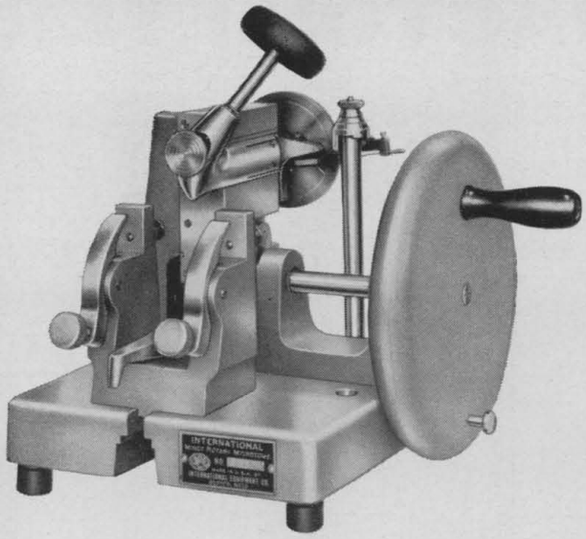

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DEMAND A DEMONSTRATION — If you do paraffin sectioning, you owe it to yourself to try this instrument — in your laboratory — before you buy **any** microtome. Write to:

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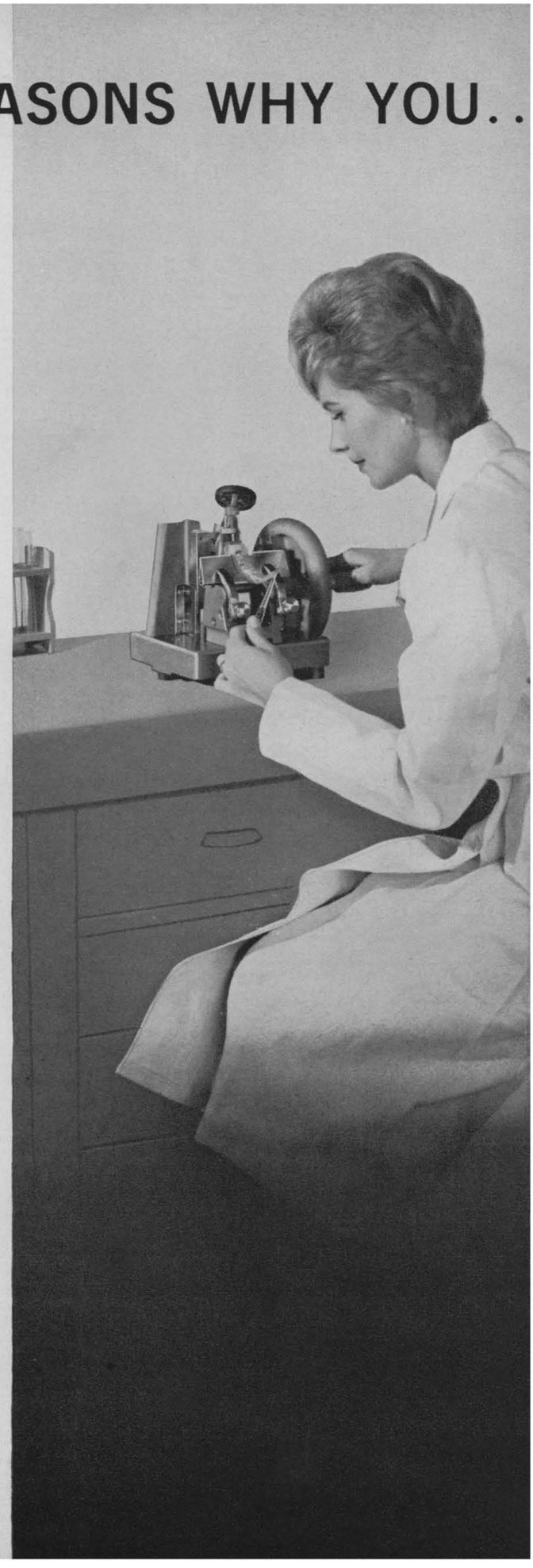

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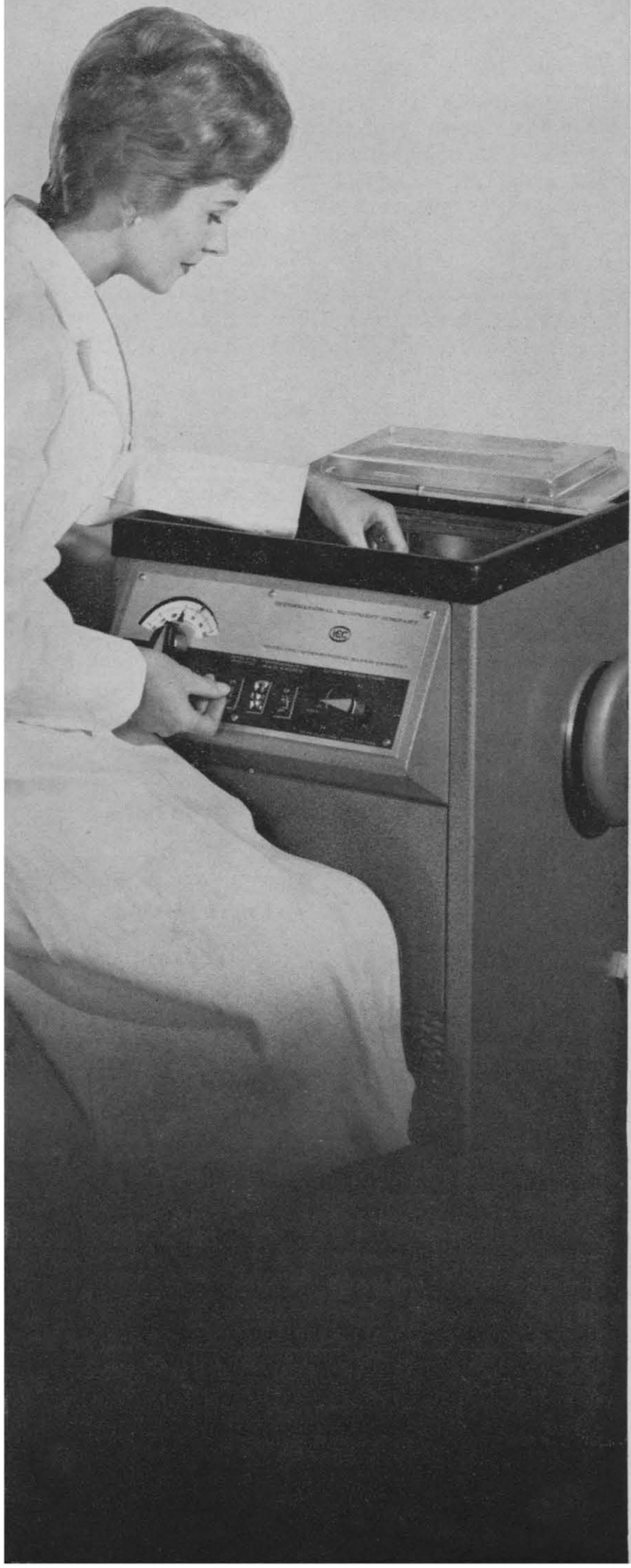

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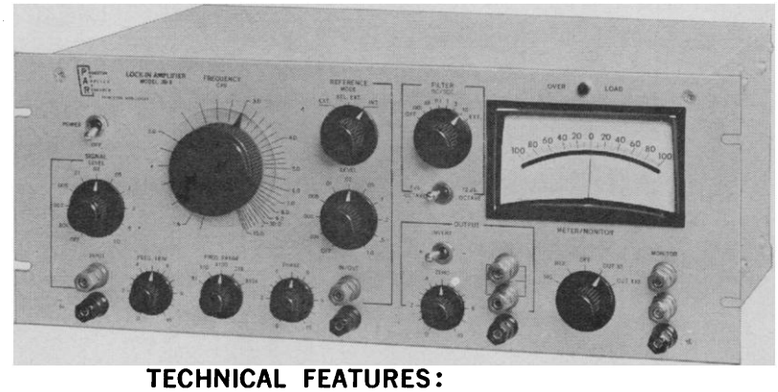

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Operating Modes: External, Selective External or Internal Reference. Lock-in accepts sinusoidal or non-sinusoidal reference signal or provides sinusoidal 5V p to p reference from internal oscillator.

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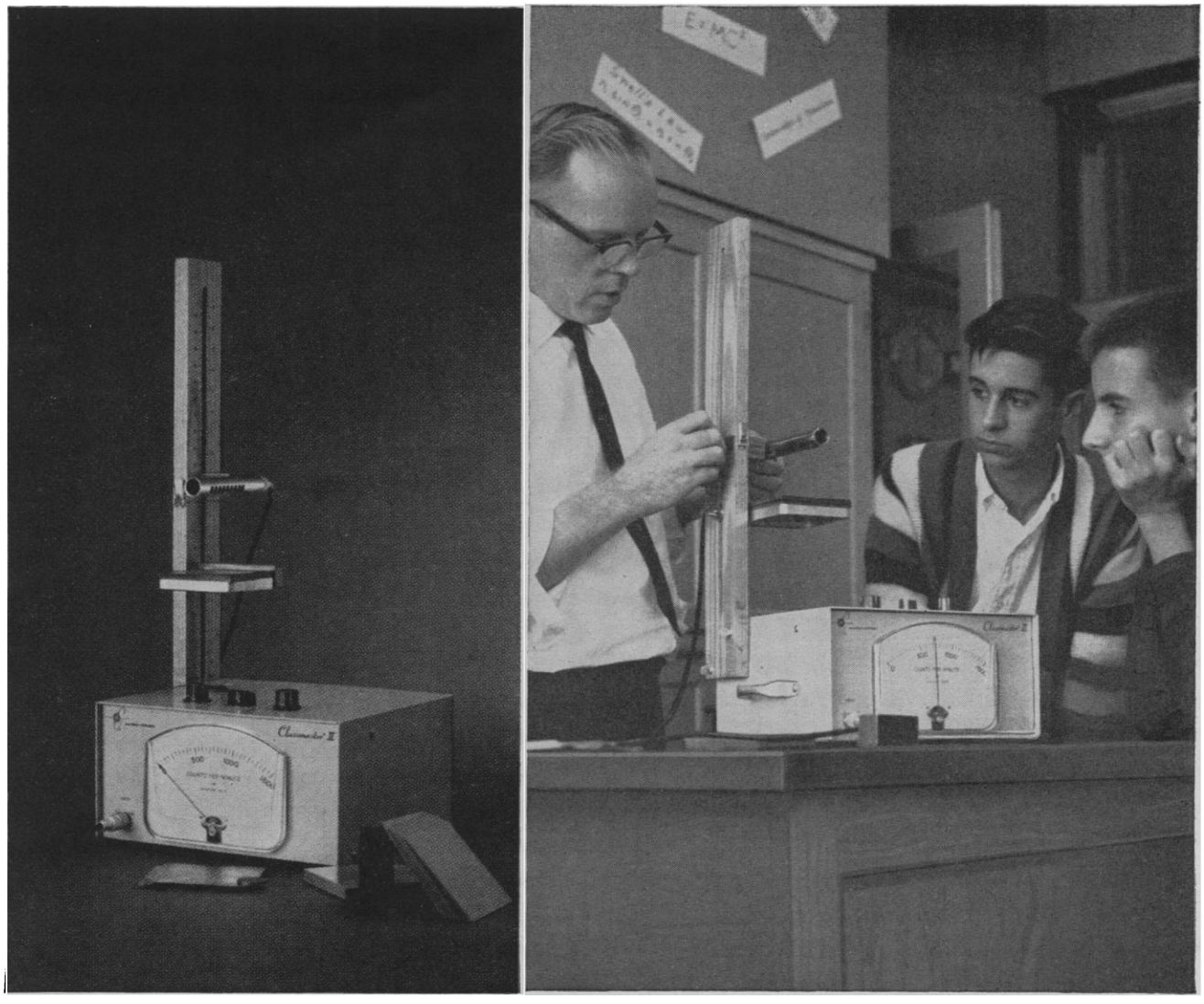

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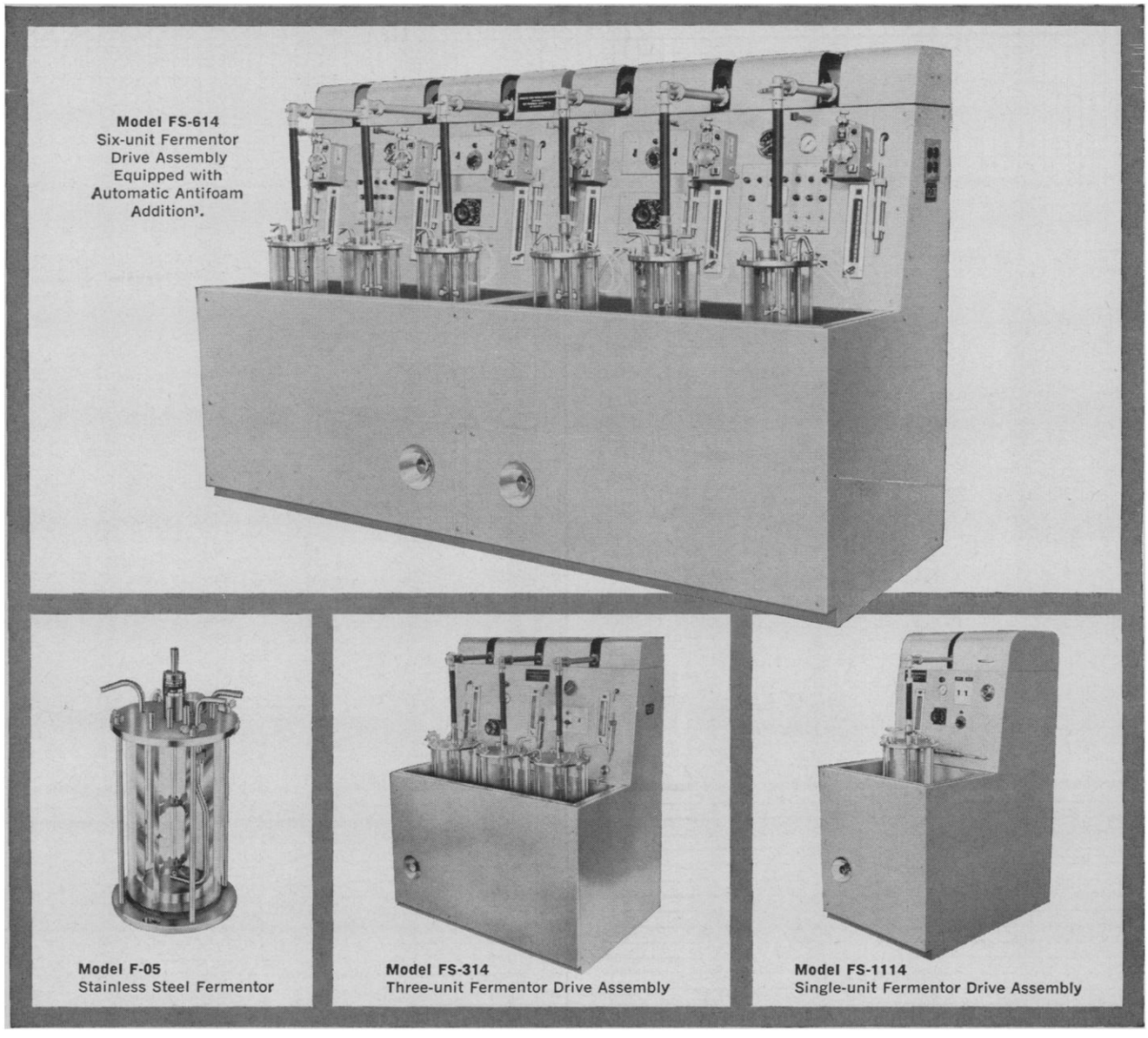

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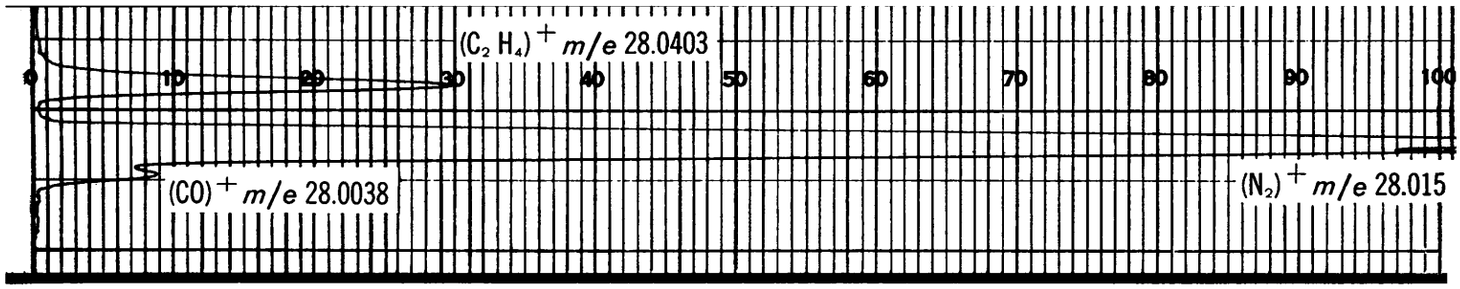

High Resolution *separation of N_2, CO and C_2H_4 peaks near Mass 28. Resolving power for N_2:C_2H_4 is 1/1120 and N_2:CO is 1/2540. Detector: Faraday Cup Ion Collector. The N_2 peak height is 350 chart divisions.*

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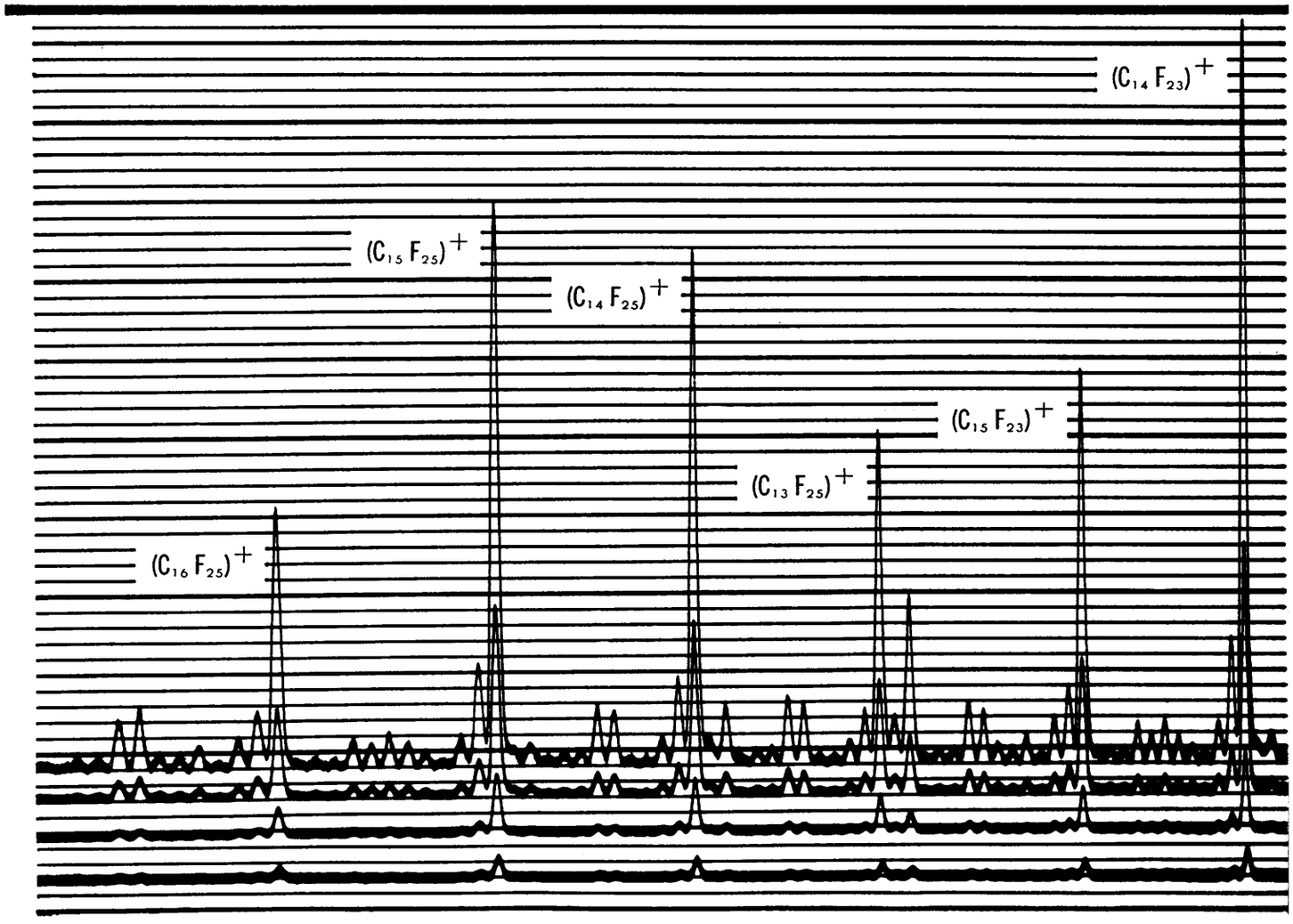
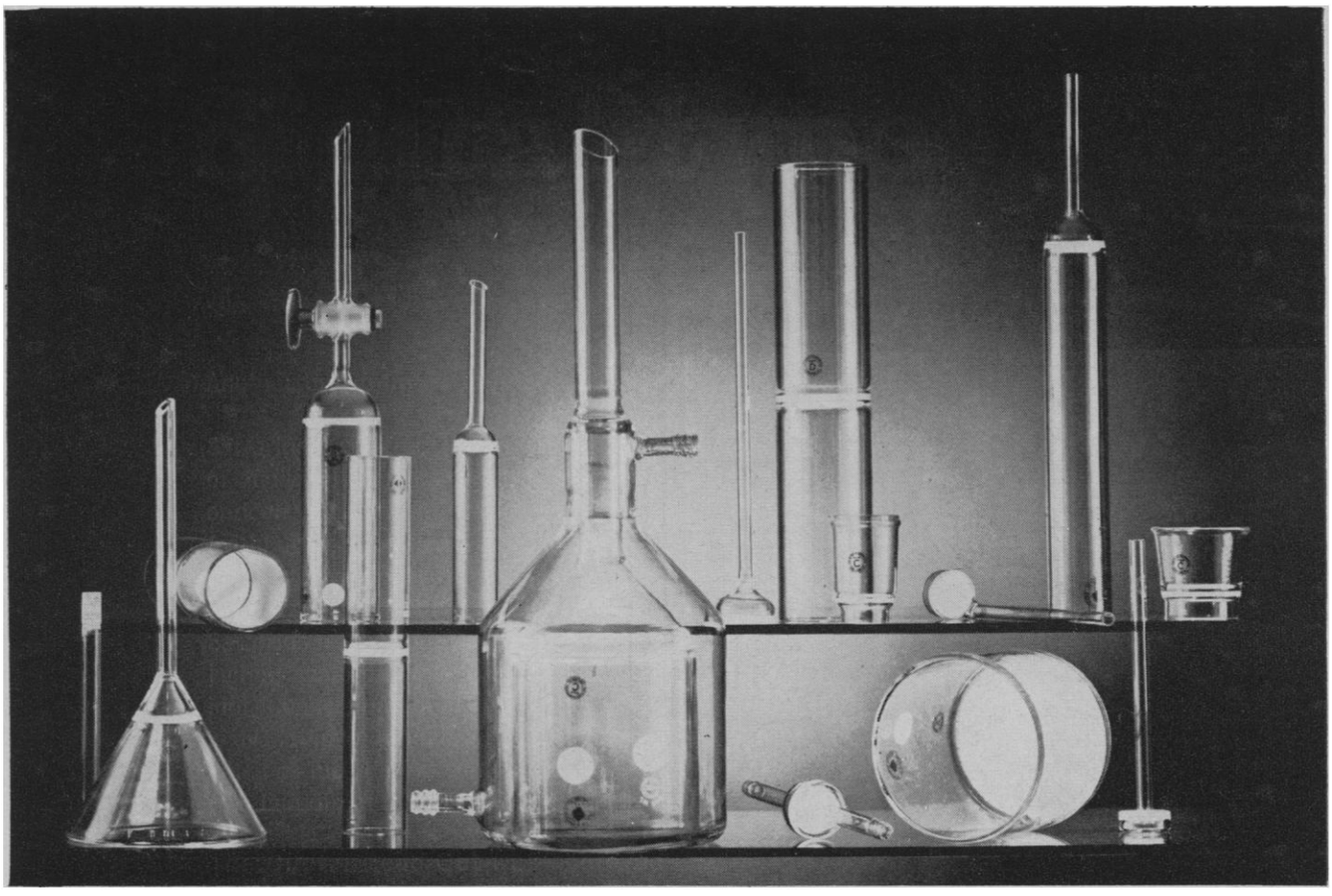
Magnetic Scan *with 1.5 KV constant acceleration voltage shows unit mass number separation of fragments above m/e 650. Sample: Perfluorokerosene. Detector: Electron Multiplier.*





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Vineland, New Jersey
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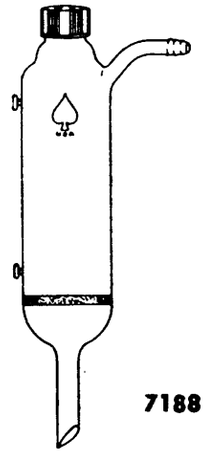

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"Science All Stars" presents brilliant achievements by gifted teenagers in every field from biology to electronics—with on-the-spot participation by the nation's leading scientists

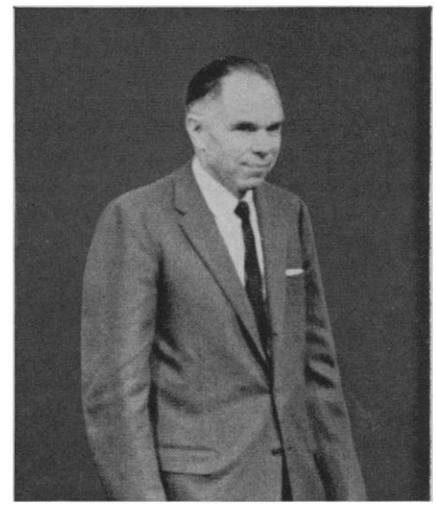
A different approach to the discussion of science forms the basis for an entirely new kind of network television show being presented by Honeywell. First, there is the enthusiastic, adventuresome spirit and actual scientific contributions typified by winners in Science Fairs who will show and explain their ingenious experiments. Second is the mature evaluation and valuable insights offered by world-famous leaders in science, education and government.

Using this combination of viewpoints, science comes alive in an exciting and meaningful adult program rich in value for the inquiring mind. Among the fields to be explored on "Science All Stars" are:

- Radio Astronomy
- Generation of electricity from biological systems
- Theory of numbers including logic systems
- Gyroscopic stabilization
- Microwave sensing and signal transmission
- Crystalline materials – lasers and control of light
- Hydroponics
- Cardiology
- Rocket propulsion dynamics

All the exhibits slated for use on the program are technically excellent, and some have an engagingly lighthearted quality. A young scientist offers the services of his live fish in generating power (choose from one-fish, two-fish, or three-fish batteries!) ... two boys pit their computers against each other in a game of ticktacktoe ... you'll watch an oscilloscope pattern of the heartbeat of a flea as a 12-year-old-boy records the flea's electrocardiogram.

Appearing in the premiere show in mid-January are Dr. Glenn T. Seaborg, Nobel Prize winner and chairman of the Atomic Energy Commission, along with Colonel Charles Yeager, commandant of the Aerospace Research Pilot School and first man to fly a plane through the sound barrier. Subsequent programs will feature Dr. Jerome Wiesner, advisor on science and technology to the U. S. Government and soon to be Dean of Science at M.I.T.; Col. John Paul Stapp, Assistant for Aerospace Medicine; Dr. Nan Deiter, Research Astronomer at Cambridge Research Laboratory, and others who will participate in the exhibits of nearly 65 different young scientists from all over the country.



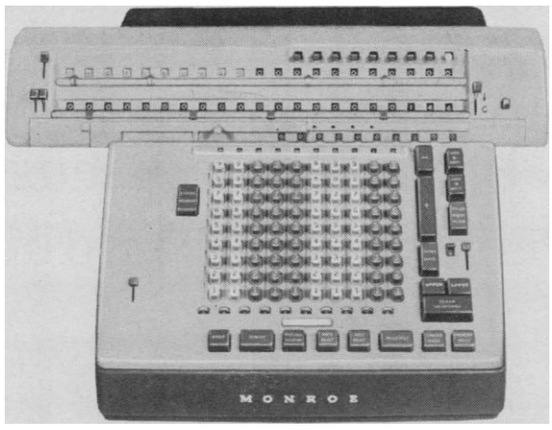
DR. GLENN T. SEABORG, AEC Chairman and winner of the 1951 Nobel prize in chemistry, will appear on the first program in the "Science All Stars" series. A television camera built by a 16-year-old boy for $40 will be used to televise Dr. Seaborg's part in the program.

By emphasizing the inherent excitement of scientific exploration, "Science All Stars" creates an aura of drama and fascination that not only makes science more understandable to the average person but is bound to intrigue young viewers everywhere. In sponsoring the program, Honeywell hopes to stimulate more of our youth to consider careers in science.

You are invited to watch "Science All Stars" Sundays at 4:30 EST on the ABC TV Network starting January 12. (Check your local TV listings.) Your comments will be appreciated. Address Dr. John Dempsey, Honeywell Research Center, Hopkins, Minnesota.

ONE OF THE YOUNGEST licensed ham radio operators in the country, 13-year-old Michael Schatzlein of Knightstown, Ind., discusses the theory of sound, carrier waves and the speed of light with Col. Charles Yeager. Michael will also "talk" the pilot of a supersonic jet through the sound barrier on "Science All Stars" using his home-made ham radio.

Honeywell



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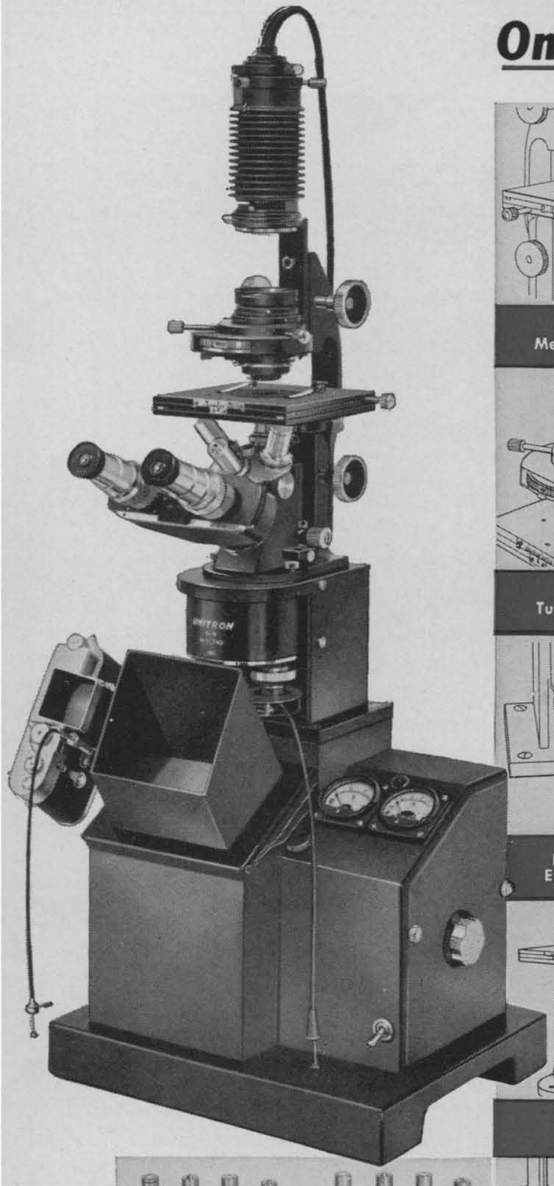
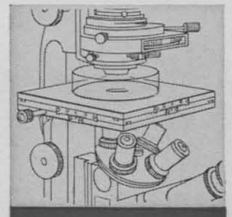
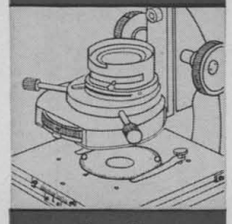
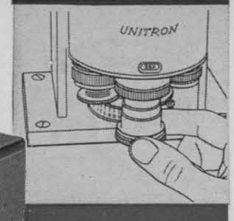




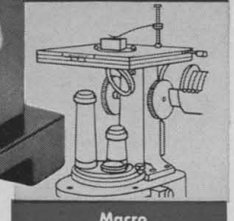
Graduated Mechanical Stage



Focusable Turret Condenser



Photographic Eyepiece Turret



Macro Accessories

UNITRON'S unique Phase-Camera-Microscope will assure you a **CONVENIENCE** of operation impossible to duplicate with a conventional microscope stand. For example, a specimen consisting of a tissue culture or aqueous solution may be examined in the very petri dish in which it has been prepared. Merely place the dish on the microscope stage; examine the contents visually, project the image on the viewing screen, or photograph — all in rapid sequence and at magnifications up to 2000X. With the inverted design, there is no need to contend with slipping cover glasses or evaporating fluids. Using the phase optics, you dispense with messy chemical staining. Aided by the self-contained illumination system and built-in cameras, you eliminate troublesome problems of alignment and vibration.

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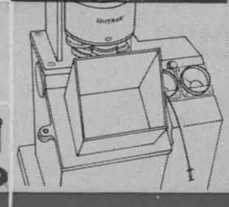
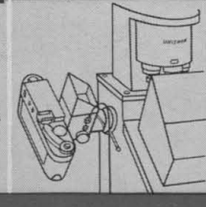
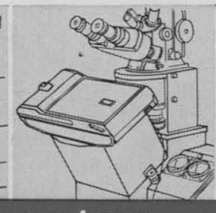


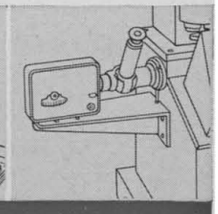
Standard 3¼" x 4¼" Camera



Accessory 35mm. Camera



Accessory 3¼" x 4¼" Polaroid Land Camera



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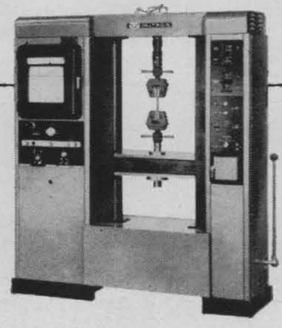

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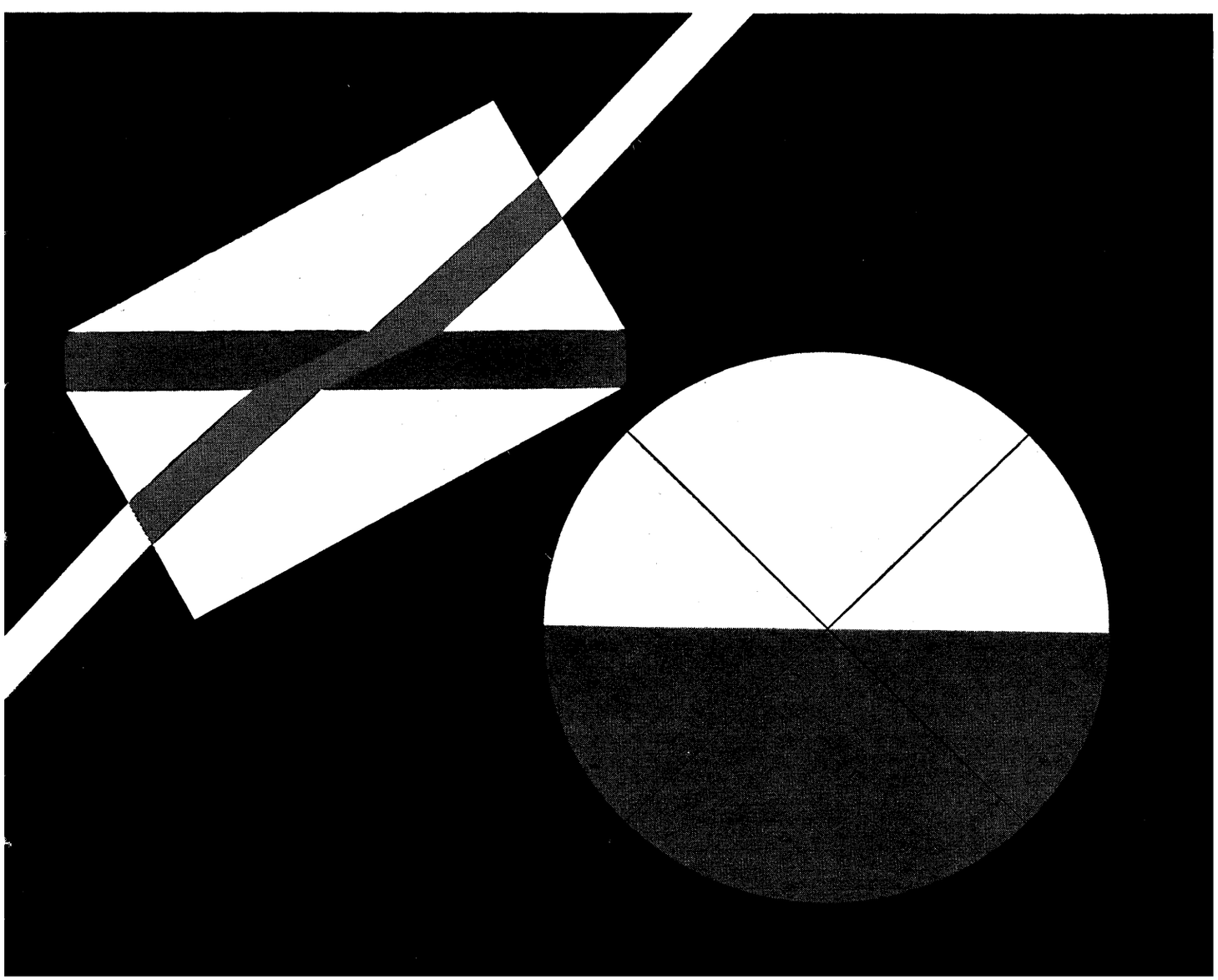

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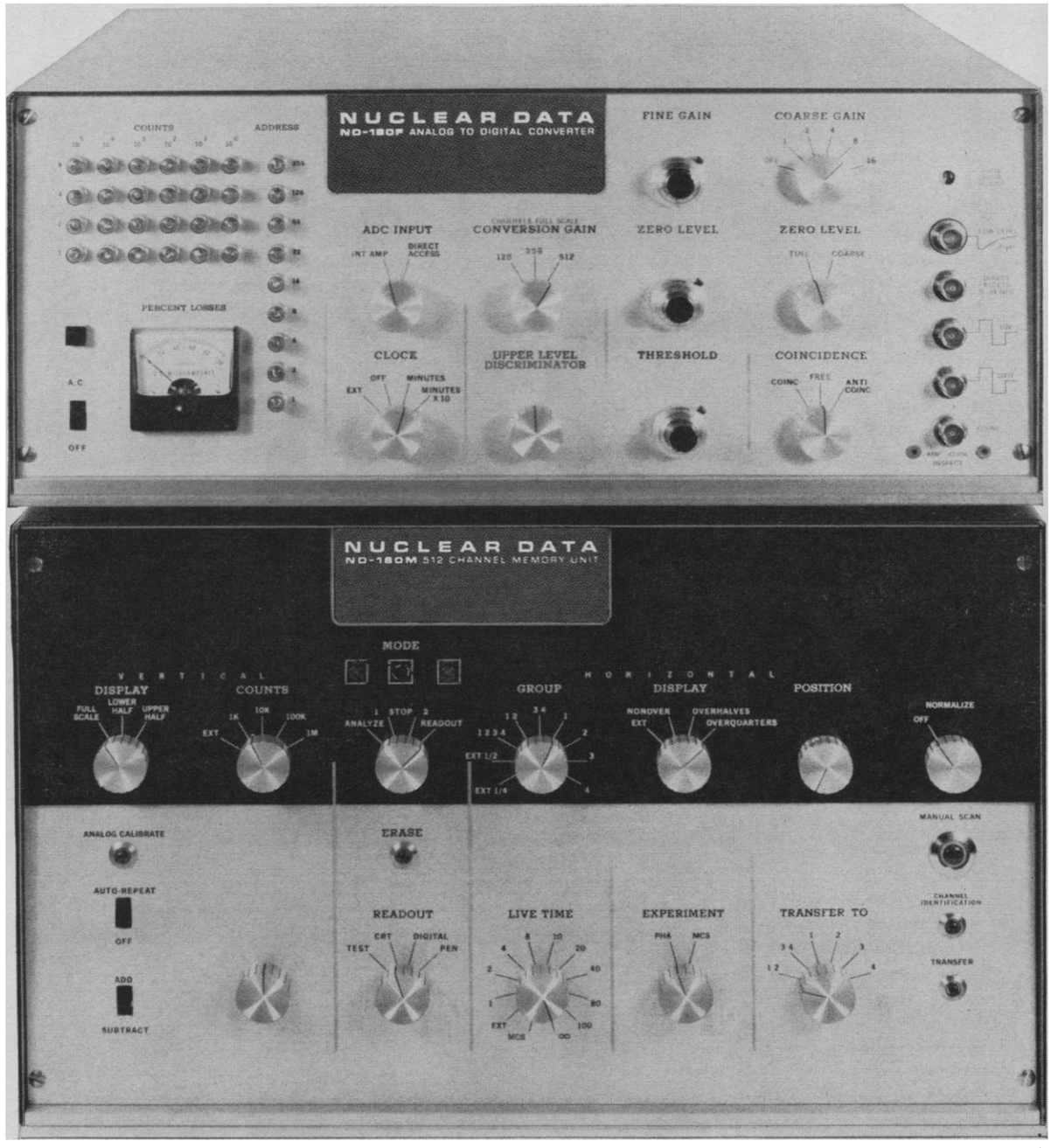

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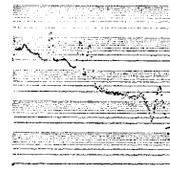

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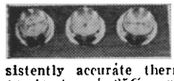

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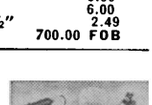

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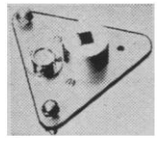

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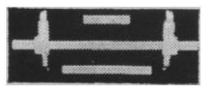

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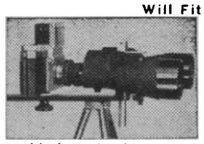

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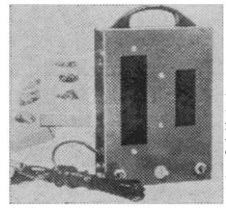

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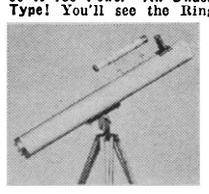

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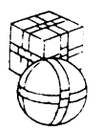

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THE PURSUIT OF ENGINEERING EXCELLENCE

This statement of policy was presented to the membership of the McDonnell Aircraft Corporation Management Club by Vice-President of McDonnell Engineering, Mr. Kendall Perkins. If you, as an engineer, are encouraged to seek greater excellence in your work, you will gain. If you are successful in your search for excellence, the Nation will gain.

"The pursuit of engineering excellence doesn't get talked about much—perhaps because it seems so obvious. It should be talked about more, however, because too few engineers recognize its vital importance or go to enough trouble to achieve it.

"To excel means to surpass or outdo. As applied to the kinds of engineering with which our company is mostly concerned, the pursuit of excellence might be defined as the attempt to do a better engineering job than anyone else. This isn't easy. There are a great many smart and energetic people in the aerospace industry and we're competing for an amount of business which isn't enough to keep all the capable groups as busy as they would like to be. Of course, this makes excelling all the more necessary.

"To effectively outdo the competition, an individual or an organization must:

1. Be fully conscious of the need to do a better job,
2. Have the ability to do a better job,
3. Have the desire to do a better job,
4. Work under conditions which permit doing a better job, and
5. Keep up the effort without letup.

"It is rare to find all these conditions in fullest measure. But every one is necessary and the success of an organization depends on the presence of such conditions. The same may be said with respect to each individual in the organization.

"The first of these requirements is to *be fully conscious of the need to excel.* From the standpoint of the collective group—the company or the engineering divisions of the company — the need is apparent. From the standpoint of each individual engineer, you would think it would be equally obvious, but it doesn't always seem to be. Our contracts make us responsible for a major segment of progress of our Nation. They demand our finest performance. Excellence is to be expected of those given assignments indicative of great national trust.

"*The ability to excel* isn't equally given to all of us but that doesn't mean we can't do better than we do. There is such a close relation between the ability and the desire that those who are anxious enough to excel very often do. You will find that the most successful people are just as likely to have ordinary ability and an outstanding desire to excel as they are to have ordinary desire to excel and outstanding ability. Of course, there are those who have plenty of both, but they can take care of themselves.

"*The desire to excel* is like 'will to win' in a game. It's hard to measure beforehand, but the results are easy to see. It isn't nearly enough for someone in charge of a project or proposal to have the great drive to do a better job than anyone else has ever done. Our engineering jobs must now depend on the efforts of many people. Unless they have a collective 'will to win' the chance for proposal and product excellence is slight.

"By *working under conditions which permit doing a good job,* I do not mean keeping the office well lighted, or paying a high salary, although these factors are not unimportant. Creating and keeping an environment for best operation of a winning team is one of the most important responsibilities of engineering management. It calls for many things including, but certainly not limited to, these:

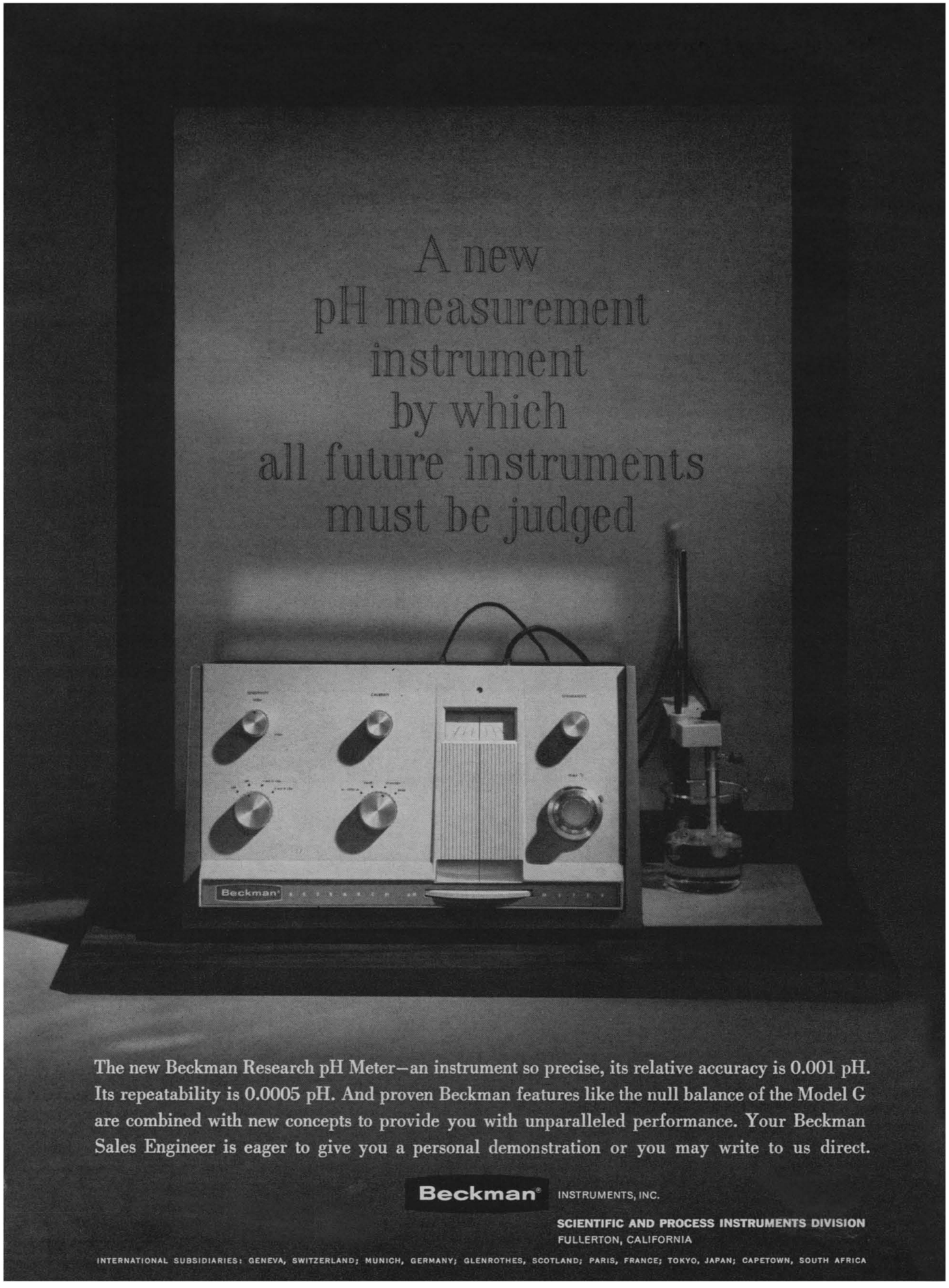
1. Recognition and appreciation of the special abilities and efforts of each individual,
2. Assignment of the maximum amount of the most difficult work to each individual in accordance with what that individual is capable of doing well,
3. Scrupulous insistence on fair treatment of all concerned including the customer,
4. Following policies which are consistent and understood,
5. Establishing and working toward objectives which are recognized as worthy,
6. Insisting that engineering decisions be made, insofar as practicable, on the basis of the over-all best interests of the largest appropriate group—the project, the company or the country, rather than primarily in the interest of individuals or their immediate groups,
7. Having the wisdom to avoid proposals unlikely to win, or projects unlikely to be fruitful, through no fault of the engineers who worked so hard toward their success,
8. In general, doing everything practicable to maintain a winning atmosphere.

"All this may sound unduly pious. But I really believe that promoting these conditions pays off in very practical ways.

"*Keeping up the effort* is probably the hardest condition to satisfy. As with other homely virtues, when effort is continued most consistently, it often seems appreciated least. There is no substitute, however, for the persistent expenditure of extra effort, otherwise known as 'hard work.' As in the case of almost all important creative accomplishments, notable success stems 10% from inspiration and 90% from perspiration.

"Although it seems harder each year to do the kind of engineering which excels, our competitors, and the Russians as well, have similar handicaps. We can keep ahead if we continue to exert ourselves in the pursuit of excellence. If we do this as well individually as we have in the past, I do not see how we can fail collectively to grow and prosper."

Additional engineers, scientists, physicists, and mathematicians with energy and enthusiasm are needed for projects in the National interest now underway at McDonnell. If you would like to work where the pursuit of excellence is a permanent corporate goal, the brief resume form below is included for your convenience.



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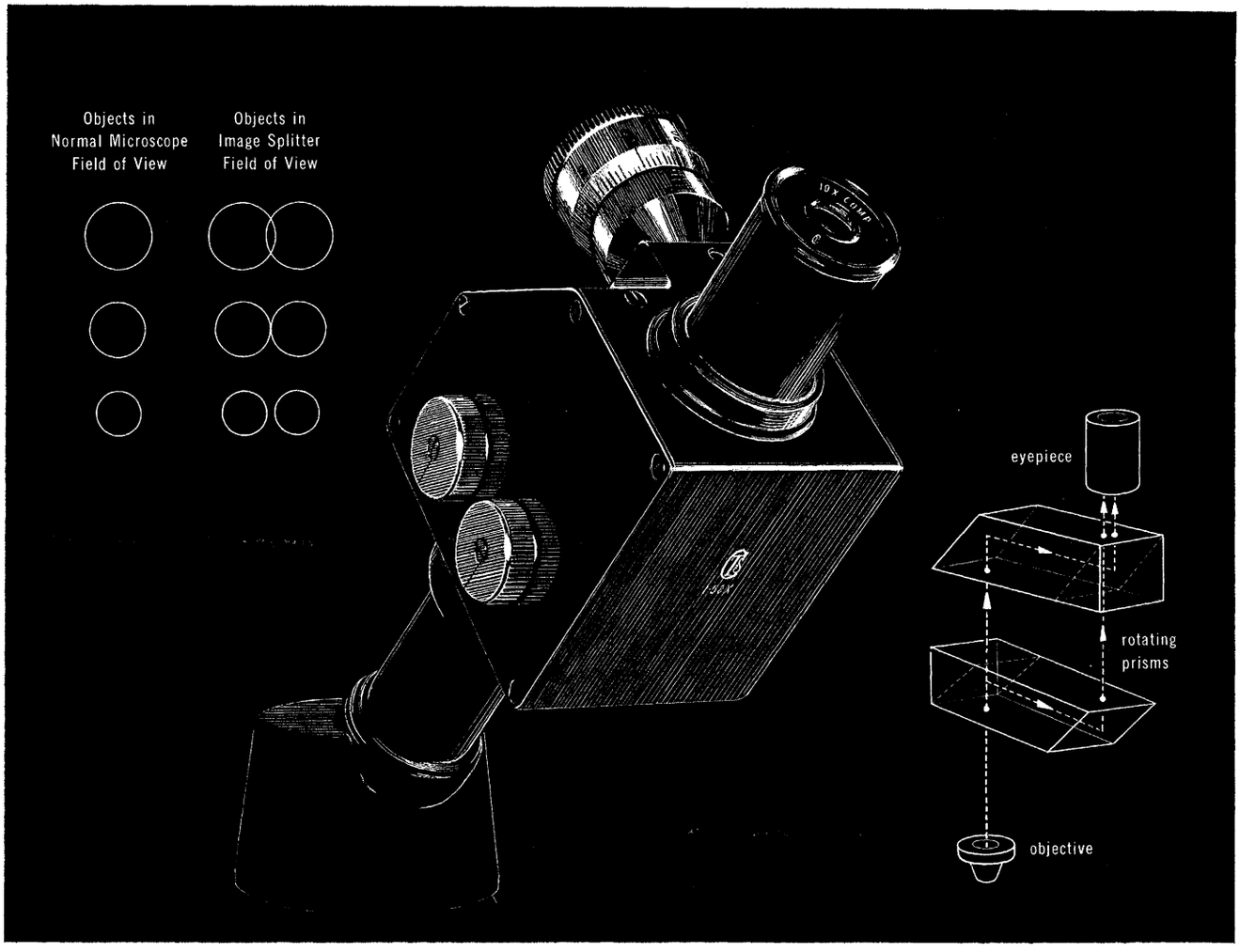

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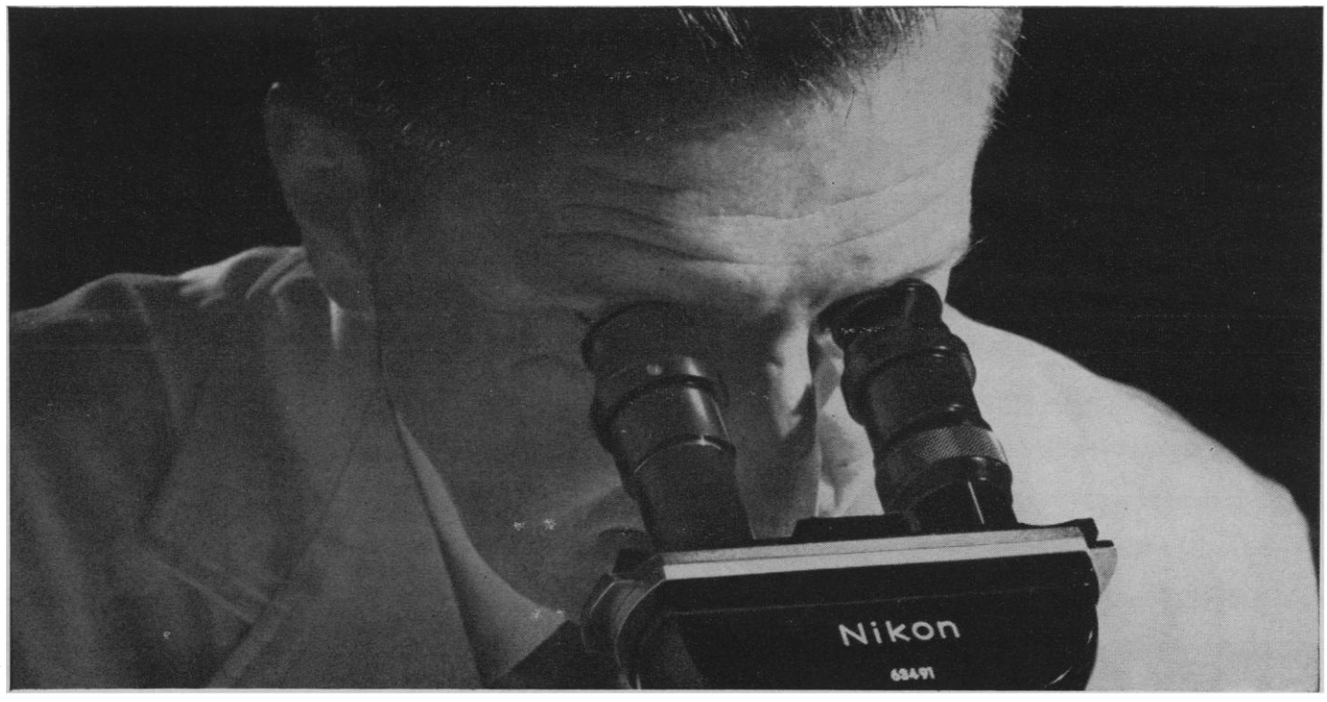

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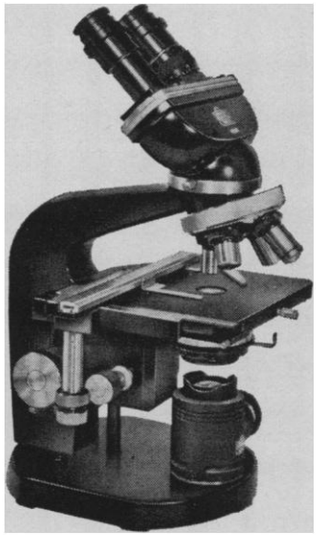

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But, apart from the ruggedness, versatility and smooth mechanical responsiveness of the Nikon SBR, the quality that commends it above all else is its optics. You will find it difficult to duplicate its performance with any other microscope — for uniformity and brightness of field, image resolution, and for the visual comfort and ease you enjoy even with prolonged use.

Building-block design readies the SBR for any number of special applications. It accepts dark-field and phase-contrast equipment, interference-phase and polarizing attachments, photomicrographic equipment, projection head, and a wide variety of eyepieces, objectives, illuminators, measuring reticles, and other accessories.

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10 January 1964, Volume 143, Number 3602 **SCIENCE**

Delayed Independence

It almost seems as if a conspiracy existed to delay the age at which the formal educational system lets go of a young scientist and allows him to be on his own. The process starts early. In 1947 one 5-year-old in four was in the first grade; now only one in eight is there, and school regulations are reducing even further the opportunity to enter first grade before the magic age of 6. Advancement by age rather than by ability or achievement is so commonly practiced that up through the age of compulsory attendance only about 5 percent or fewer are ahead of the normal grade level. (Even the 40 highly selected annual winners of the Science Service–Westinghouse Science Talent Search are usually right at the "proper" age for high school seniors.)

After high school some bright youngsters get a jump on their age mates by entering college with advanced standing, but they are a tiny fraction of the total, and few students graduate from college in less than 4 years.

After college, the time required to earn a doctor's degree has been increasing. The Office of Scientific Personnel of the National Academy of Sciences reports the mean lag between B.A. and Ph.D. in the physical sciences to have increased from 6.8 years in 1920–39 to 7.4 in 1950–59 and 7.8 in 1960–61. In the biological sciences the mean has increased from 8.0 years in 1920–39 to 8.3 in 1950–59 and 8.9 in 1960–61. In other fields the current lag is even greater: 10.4 years in the social sciences, 12.0 in the humanities and professional fields, and 15.2 in education. The delay is only partly due to professional work prior to receipt of the doctorate; the recipients of science doctorates in 1957–61 had spent a median of 2.9 years in such work between the B.A. and the Ph.D. Nor is earlier marriage an explanation. Candidates with one dependent (often a working wife) finish a bit younger than those with no dependents, and having one child is associated with only a minor delay.

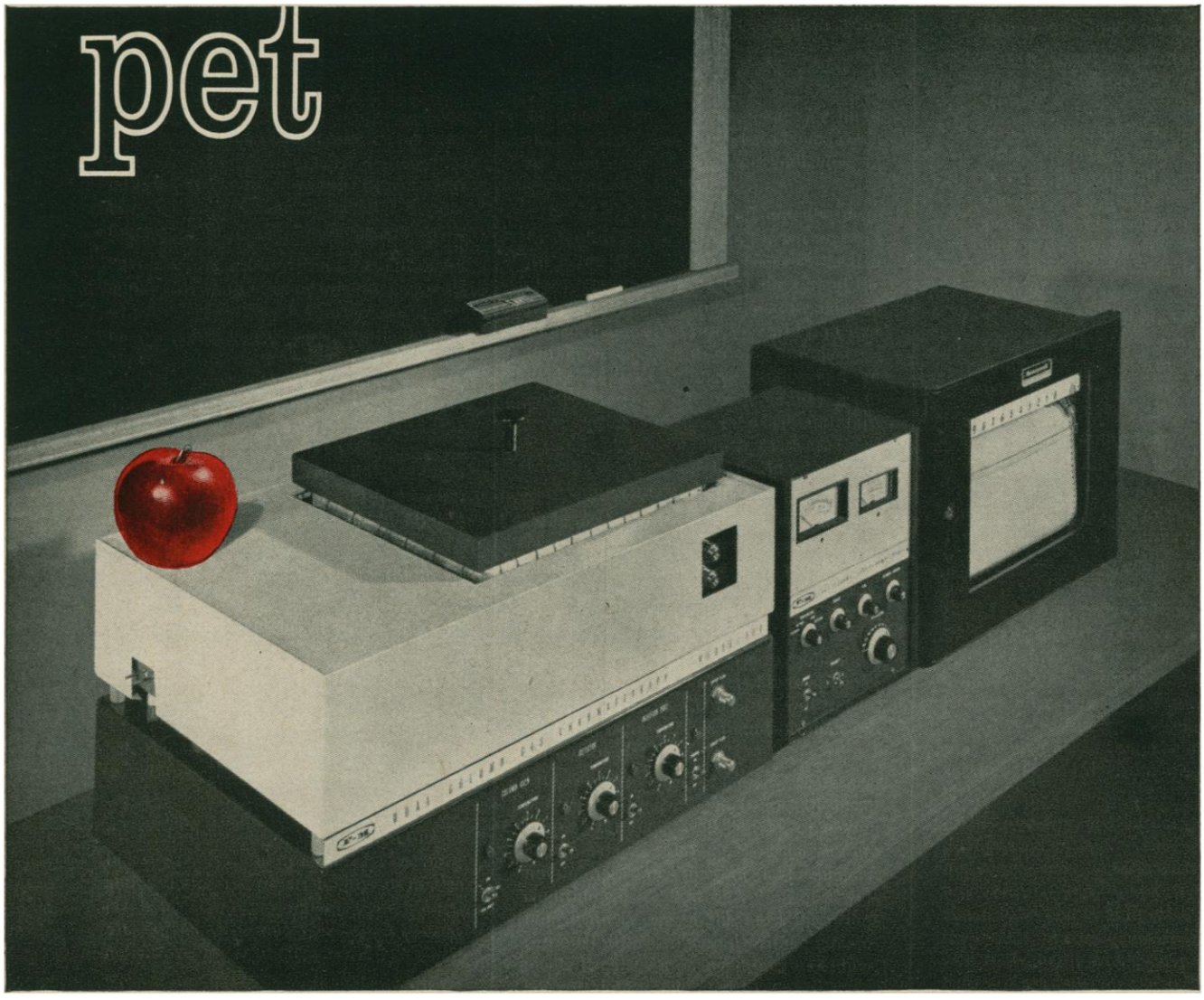
After the Ph.D., for some, comes one final delay: a postdoctoral fellowship is offered to some of the ablest students. The experience may be valuable, and apprenticeship under a good master is a fine way to develop research competence, but, nevertheless, the effect is sometimes to add one more year to the training that precedes intellectual independence.

From start to finish, justifications are offered: delaying entrance to the first grade minimizes failure; regular progression lessens the danger of emotional difficulties; there is so much for the Ph.D. candidate to learn; a postdoctoral fellowship is a reward and an advantage. But all these practices postpone independence—the freedom to sink or swim as the young scientist's own abilities and ideas determine—and often postpone it beyond the age when he is most full of energy and fresh ideas.

Our goal should be the opposite. Acceleration is demonstrably advantageous for bright, eager students. At graduate and postdoctoral levels, the effort to teach everything is hopeless anyway. The most important lesson we can teach is how to learn for one's self. If we do not teach that, adding extra years of instruction and extra bits of knowledge will not long hide our failure.

President Johnson has called this "the educational Congress" because of the amount of new educational legislation that has been enacted. Help from the federal government and other sources is fine, but some problems can be solved only from within the educational system. Delayed independence is one. All that is needed, and the only solution, is to do more vigorously and concertedly what we already know to be desirable.—D.W.

teacher's pet



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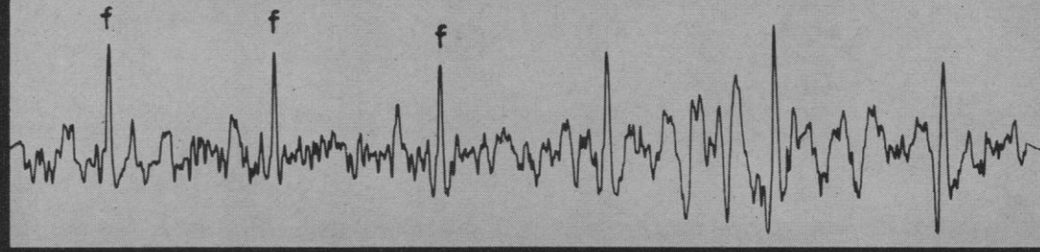

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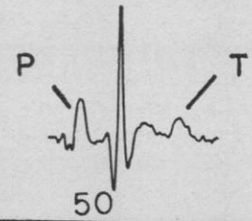

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The figures above illustrate CAT application in Fetal ECG analysis.[1,2] The upper portion, taken directly from a plotting device, is a waveshape recorded from the fetal scalp with concurrent noise components, before being applied to the CAT 400B. The lower portions indicate the same ECG signals summed 50 and 100 times. Note the clear definition of the signal under investigation and the gradual dissipation of the background noise.

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1. E.H. HON, S.T. LEE, Paper presented at the Fifth International Conference on Medical Electronics, July 1963, Liège, Belgium.
2. E.H. HON, S.T. LEE, "Noise Reduction in Electrocardiography", American Journal of Obstetrics and Gynecology (In press).

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cretion of substances from the epidermal cells to the surface of the leaves and for the absorption and transport of pesticides from the surface to the interior of leaves.

Other facets of entry and translocation that were dealt with were root uptake, polar transport, and plant and environmental characteristics which influence the behavior of herbicides in and on plants.

Conclusion

The remarks of Sir Robert Robinson, president of the congress, were of interest to everyone. He stressed the role of pesticides in increasing the world's food supply and in fighting human disease. Annual crop losses are estimated at from 15 to 30 percent, or £20 to £30 billion. The world's population now stands at some 3 billion, and it is expected to double by A.D. 2000. Food production must be doubled by 1980. In the area of disease, as recently as 1953 some 200 million people suffered from malaria and 2 million people died of it; these statistics, a matter of medical record, underline the importance of the continued use of DDT in bringing malarial mosquitoes under control. Sir Robert gave statistics on the safe use of pesticides in Great Britain. On farms in England there were 140 accidental deaths per year from 1956 to 1960, and none was caused by pesticides. During this period there were 20,000 nonfatal accidents on farms per year; only five of these were from toxins and none was from toxic residues on food. In the United States the Public Health Service has stated that the use of pesticides is compatible with public health. Sir Robert made it clear that the consequences of abandoning the use of pesticides, or the consequences of injudicious legislation against their use and development, might be disastrous.

The congress, attended by over 500 participants from 38 countries, was sponsored by the International Union of Pure and Applied Chemistry.

A. E. DIMOND
Connecticut Agricultural Experiment Station, P.O. Box 1106, New Haven
H. T. REYNOLDS
Department of Entomology, University of California, Riverside
W. B. ENNIS, JR.
Crops Protection Research Branch, U.S. Department of Agriculture, Beltsville, Maryland

Sudden-Death Syndrome

One-third of all infants who die within the first year of life and after the immediate neonatal period appear immediately before death to be in good health; they die suddenly, and the cause of death is unexplained. This problem has frustrated coroners and medical investigators for 300 years.

A conference that concerned itself with this problem was held at the University of Washington School of Medicine, Seattle, on 9 and 10 September. The participating pathologists agreed: (i) that specific findings are scarce; (ii) that considerable pulmonary edema, sometimes frankly hemorrhagic, is often present; (iii) that petechial hemorrhages involving pleural, epicardial, and occasionally endocardial surfaces are often seen; and (iv) that the thymus is not pathologically enlarged and on histologic examination appears normal. None of these findings were considered pathognomonic, but it was agreed that they are characteristic. In children who die before the age of 2 years, and most frequently in those who die when they are between 2 and 5 months old, these pathologic anatomic features, in conjunction with the absence of other demonstrable pathologic findings and the absence of any evidence of previous significant illness, appear to constitute a syndrome. The designation "sudden-death syndrome" seemed acceptable to all the conference participants.

The problem of the epidemiology was discussed. The evidence indicates the following points. (i) The syndrome appears in all socioeconomic groups, and the incidence is much the same in England and in several parts of the United States. (ii) The evidence relative to seasonal and sex incidence is not clear. (iii) Temporal correlation with the occurrence of infectious disease in the general population remains uncertain. (iv) Although multiple cases in a single family have been reported, no clear evidence as to whether these are fortuitous is available. Twin studies are in progress in England.

A major portion of the conference was concerned with the discussion of two problems, (i) the etiology, and (ii) the mechanism of death. Attempts at viral isolations have been made by several highly competent groups of investigators. However, not all of the most recent virological techniques have been applied. In a small number of instances viruses have been isolated from

tissues, including lung and brain, taken at autopsy. In a few instances the same virus has been recovered from other members of the immediate family. However, in the majority of cases examined no viruses were recovered from the autopsy tissues available. The possibility was raised that the sudden-death syndrome may represent a response to viral infection during the period of incubation. The response of mice infected with ectromelia was suggested as an example of occasional fatality during the usually silent incubation period. The data available at present neither support nor disprove a viral etiology for the syndrome.

The problem of immunological immaturity and the change from early neonatal resistance mechanisms to more mature responses was discussed. It was suggested that the second, third, and fourth month of life may be a transition period during which the infant is more vulnerable to infectious disease than he is shortly after birth. While gamma globulin levels in this group of infants appear to be within the normal range for this age, this finding cannot be taken as evidence against such a hypothesis.

There was considerable discussion of the possibility that hypersensitivity to proteins in cow's milk resulted, after inhalation of milk during sleep, in an atypical anaphylactic reaction. An experimental model in guinea pigs was presented in which the pathologic findings bore sufficient resemblance to those of the syndrome to merit serious consideration. Circulating antibodies to cow's milk proteins have been observed in a substantial proportion of infants who died with this syndrome, but nearly as high a proportion of living infants of the same age have also exhibited positive titers. Another finding consistent with this hypothesis was the frequent presence of cow's milk antigen in the lungs of children who died with the syndrome. All agreed that while the hypothesis was attractive, the evidence was highly circumstantial and currently incomplete. If one could prove that infants who never received cow's milk (entirely breast-fed) never exhibited the syndrome, the case for the hypothesis would be strong. Such information is exceedingly difficult to obtain.

Cardiopulmonary factors which might lead to sudden unexplained death were described by the pulmonary physiologists. It became evident that for the age group most affected, nothing is known about pulmonary physiology

and cardiopulmonary responses. Once again it was emphasized that the 2- to 5-month period may well be a transitional period between the neonatal and the more mature infant response, and that this possibility merits a great deal more study.

The conference brought together for the first time a variety of individuals interested directly or indirectly in the problem. The interchange revealed, as I have indicated, a number of gaps in basic information concerning infant development. One is startled to find that the number of infants who die of sudden-death syndrome is comparable in order of magnitude to the number of adults who die from carcinoma of the lung. Despite this fact, the epidemiological information is miniscule in comparison to that on carcinoma of the lung. The questions raised by the conference should provide a stimulus for more comprehensive and detailed studies of the areas indicated, including cooperative investigations on the epidemiology in this and other countries.

EARL P. BENDITT
RALPH J. WEDGWOOD
Departments of Pathology and
Pediatrics, University of Washington School of Medicine, Seattle

Calorimetry

In order to report new developments in thermodynamics and thermochemistry, to develop cooperative schemes for improving the acquisition and dissemination of thermodynamic data, and to exchange views on techniques, the 18th Annual Calorimetry Conference was held 16–18 October in Bartlesville, Oklahoma, at the Bureau of Mines Petroleum Research Center. This conference was the first to be held at the home laboratory of its founder, the late H. M. Huffman.

The keynote address, "Some legacies of H. M. Huffman to calorimetry and thermodynamics," was delivered by John P. McCullough (Socony Mobil Oil Co.), a successor of Huffman as director of the laboratory. He described the (i) development of a model laboratory and (ii) the method of obtaining coherent and comprehensive thermodynamic data by a coordinated series of various kinds of experiments upon carefully selected classes of compounds. This approach, initiated by Huffman and continued by his successors, has resulted in such outstanding contribu-

tions of thermodynamic data that it has become a model of its kind, widely copied and of great influence in its field.

The problems of making high-temperature enthalpy measurements have been increasing because of the materials requirements of the space era. E. D. West (National Bureau of Standards) discussed such problems and illustrated them by describing a new adiabatic "lift" (as contrasted to "drop") calorimeter for measuring enthalpies to 2500°C. Obtaining valid measurements of any degree of accuracy at these temperatures is a problem but West has obtained measurements with errors as low as 0.1 percent. To do so he has incorporated automatic photoelectric pyrometry for temperature measurements and furnace temperature control precise to 0.05°C to heat the sample, and a method of making heat measurements with varying amounts of material in the "lifted" capsule. The latter technique gives differential measurements which eliminate some variables not easily controlled or measured.

In a discussion on the low-temperature heat capacities of superconductors, F. J. Morin (North American Aviation Science Center) showed how it has been possible to map the energy levels of the *f*-band of electrons in a series of transition metals by measuring the temperature dependence of the electronic contribution to the heat capacities in the elements and intermetallic compounds of the series. His correlations were remarkably good. The heat capacities of superconductors have contributed much of the essential quantitative information leading to the nature of superconductivity. The heat capacities of "hard" superconductors are of particular interest recently because material of this type is used in high-field solenoids. Work by E. J. Ryder (Bell Telephone Laboratories) on V_3Si and V_5Si_3 and by B. Serin and G. T. McConville (Rutgers University) on Nb and Nb-Sn alloys have added further valuable data on the low-temperature heat capacities of this class of substances.

P. Dean (National Physical Laboratory, England) delivered a very graphic lecture and was careful to preface his remarks with a statement that he is a mathematician and is really not very much interested in calorimetry. Nevertheless, his analysis of the vibrational frequency spectrum of linear lattices of light and heavy atoms was a clear interpretation of the heat capacities of solids. His method of analysis, utilizing machine computation to work out the

tedious arithmetic, allows the variations in the spectrum to be readily followed as changes are permitted in the relative proportions and masses of light and heavy atoms in the lattice. The heat capacity, at least in its broad pattern, is readily derived, of course, when the frequency spectrum is fully known.

Of particular interest to calorimetrists is the accuracy of the temperature scale because the validity of most measurements is dependent upon it. J. L. Riddle (National Bureau of Standards) discussed the changes in the International Practical Temperature Scale proposed by the Advisory Committee on Thermometry of the International Bureau of Weights and Measures. These changes, currently the subject of intense work in several laboratories, would extend the International Practical Temperature Scale below the oxygen point to the hydrogen triple point, would extend the platinum resistance thermometer scale upward to 1063°C, and make several minor adjustments of defined fixed points. The object of the change is to create an International Practical Temperature Scale as close to the thermodynamic scale as can be done in the light of current knowledge. The prospect of making these changes within the next few years should stimulate studies to indicate whether or not the proposed changes are consistent with the best thermodynamic data.

An illustration of the lack of consistency in the present scales was given by G. T. Furukawa (National Bureau of Standards), who showed constistent deviations in correlations of low-temperature, heat-capacity data based on the temperature scales. When the experimental data are analyzed on the basis of the observed resistances of the thermometer instead of converting to temperatures, the deviations are eliminated. The deviations observed are attributed to inconsistencies in the dR/dT derived from the temperature scales.

In the calorimetry of reacting systems, P. Gross (Fulmer Research Institute, England) illustrated how, with apparatus of utmost simplicity, it is possible to obtain accurate heats of combustion of metals in fluorine or chlorine. The use of fluorine in bomb calorimetry was further illustrated by E. Greenberg, H. A. Porte, and W. N. Hubbard (Argonne National Laboratory) who described the heats of formation of pentafluorides of Nb, Ta, and Ru. W. D. Good, M. Mansson, N. K. Smith, and J. P. McCullough (U.S. Bureau of Mines, Bartlesville) showed that

the thermochemistry of boron, long a troublesome element for calorimetrists, can be handled with high precision in a rotating bomb calorimeter. They are able to burn organo-boron compounds completely and form a homogeneous, well-characterized final state by converting the boron to fluoroboric acid in aqueous solution.

A principal factor impeding measurements on the combustion of metals and refractory solids in a bomb calorimeter has been the inability to observe the actual combustion. Slow-motion pictures taken of combustion in a bomb with a window were shown by C. E. Holley, Jr. (Los Alamos Scientific Laboratory). This method, while not in any sense a calorimetric method, may result in devising a system for heat measurements which are traditionally very difficult because complete and reproducible combustion cannot be obtained easily.

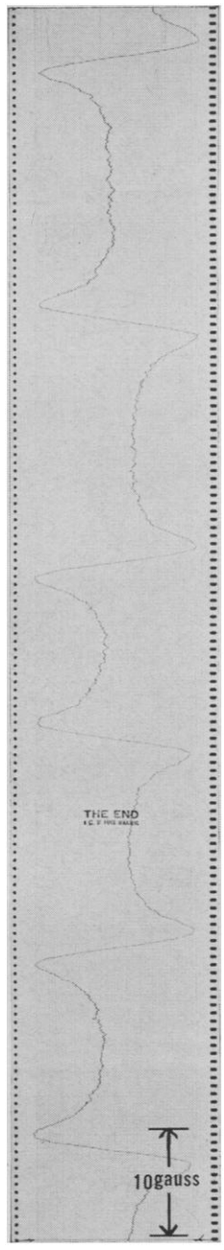
In discussions of solution calorimetry, L. A. K. Staveley (Oxford) and K. W. Dunning (University of Bristol) presented very ingenious studies on the energies of complex formation of metallic ions in combination with organic ligands; students of Cobble (Purdue University) reported on precise determinations of specific heats of aqueous salt solutions.

Dealing with calorimeters for measuring radiation dose, P. Nagl (International Atomic Energy Agency, Vienna) and E. Schleiger (U.S. Radiological Defense Laboratory) described calorimeters for measuring absorbed dose in rads (a rad is 100 erg/g); this device has received increasing attention during the past 5 years.

Many important new contributions in the field were noted at the conference; there were altogether a total of 51 papers. Several informal discussion groups were set up; their general topics and moderators included: experimental techniques in enthalpy measurements, E. F. Westrum (University of Michigan); experimental techniques in bomb calorimetry, W. N. Hubbard; standard reference materials for solution calorimetry, S. R. Gunn (Lawrence Radiation Laboratory); and classification of calorimetric data for publication and retrieval, G. T. Furukawa.

The Phillips Petroleum Company was joint host for the conference; J. A. Morrison (National Research Council, Canada) was conference chairman.

GEORGE T. ARMSTRONG
National Bureau of Standards, Washington, D.C. 20234



Strip Chart showing stability and sensitivity of prototype 602B/X EMR. Sample: Varian 0.00033% pitch standard; effective cavity power, 7 milliwatts; 3 second integration time; noise equivalent to 5 x 10^{10} spins/gauss.Rm. temp. Signal to noise, 40:1; f = 9.49gc;

New EMR Spectrometers Advance Standards in Sensitivity & Resolution

Strand Labs announces that its new B-series of X-band electron magnetic resonance spectrometers set a new standard in EMR sensitivity and resolution. Using a new development in microwave detectors, these systems, with a high-resolution 6 kc magnetic field modulation, offer demonstrated noise figures of 15 db at 1 milliwatt sample cavity power level. This figure corresponds to a minimum detectable number of spins of 2 x 10^{11} spins/gauss of line width when the sample is observed at room temperature in a cavity with unloaded Q of 25,000 (which is standard in our X-band systems) and with an integration time of 3 seconds.

These proven systems in Model 601 and Model 602 configurations are available for use with microwave power at the cavity of up to 200 milliwatts. Note that these B-series systems may be compared in sensitivity with existing units by scaling the sensitivity, 2 x 10^{11} spins/gauss, inversely proportional to both the square root of the microwave power and the Q of the sample cavity. In these systems, however, the use of the full 200 milliwatts of power may not increase the sensitivity by another factor of 14, since saturation of the sample tends to limit the increase in sensitivity with power. It can only be said that, in many cases, a sensitivity of better than 5 x 10^{10} spins/gauss is achievable in these systems with more power.

This sensitivity increase corresponds approximately to a reduction by 15 db in noise figure of Strand Labs A-series systems. This is accomplished by using a new type of semiconductor diode selected for low 1/f noise and for match in our detector mounts. We consider the B-series the ultimate in EMR apparatus since, though conceivably a further 10 db noise figure may be possible with maser amplifiers, this further reduction in noise figure yields only a factor of 3.1 decrease in the minimum number of detectable spins. The high Q of our sample cavity gave the Strand Labs A-series EMRs an 11 db increase in sensitivity over systems with sample cavity Q of 7,000. Now, with a detector noise figure within a few db of that attainable at any signal frequency, 100 kc or 30 mc, and with our ultra-stabilized klystron sources, Strand Labs offers a B-series EMR system with highest resolution and unsurpassed noise figure. The high Q sample cavity yields a bonus sensitivity of up to 11 db.

For the K (23 - 25gc), K_a (34 - 36 gc) and E (67 - 73 gc)-band EMR, Strand Labs expects similar increases in sensitivity, even though they are remarkably good at present. For example, the K and K_a units have been demonstrating sensitivities (based on molecular oxygen as a standard of better than 5 x 10^{10} spins/gauss of line width.

If you have a requirement for an electron magnetic resonance spectrometer that demands the limit of what is currently achievable at X, K, K_a or E-band, or if you already own a Strand Labs EMR and would like to have it modernized or given a maintenance check up, write the Technical Director at Strand Labs.

Zoology: Sixteenth International Congress

The 16th International Congress of Zoology took place in Washington, D.C., under the auspices of the National Academy of Sciences, 20–27 August 1963. More than 2400 registrants made this the largest in the long history of these congresses. Of the more than 60 countries represented, all the major nations, except Communist China, were included.

The objective of the congress, as symbolized in its emblem the Phoenix, was the reunion of zoology from its separate specialities. Plenary symposia covered the full spectrum from the molecular level to that of animal behavior. Speakers included Benzer, Meselson, and Spiegelman on genetic continuity; de Robertis, Ingram, and Lehninger on cell biology; Oppenheimer, Markert, and Abercrombie on development; Rendel, Lewontin, Mayr, and Kurten on evolution; Prosser, B. Schmidt-Nielsen, and G. S. Carter on phylogeny; and Bullock, Thorpe, and Tinbergen on behavior. Thirty specialized symposia were held; 500 contributed papers and demonstrations were presented.

The Permanent Committee for the International Congresses of Zoology, under the chairmanship of J. G. Baer (Neuchatel) requested, and obtained from the final plenary session "the necessary authority: (i) To include all the members of the Comité Permanent in the Board of the Division of Zoology of IUBS; (ii) to recognize the Board of the Division of Zoology of IUBS as the international body of zoologists responsible for maintaining the continuity of Zoological Congresses; (iii) to consider that henceforth the role of the Comité Permanent would be assumed by the Board of the Division of Zoology of IUBS on a much broader basis than before, and that it would be undesirable to maintain two similar international bodies; and (iv) to authorize the Comité Permanent to accept the proposal put before it by the Division of Zoology of IUBS, pending that the reorganization of this Division be adopted by the General Assembly of IUBS in 1964."

The plenary session also passed a resolution recognizing the singular importance of the *Zoological Record* to zoologists all over the world. The Congress expressed gratitude for the devoted and almost entirely donated work which makes the *Zoological Record*

possible and "strongly urged that every effort be made to continue publication of this unique bibliographic instrument."

A third resolution commended "the International Council of Scientific Unions for the inauguration of an International Biological Program which stresses the biological basis of productivity and human welfare" and urged zoologists individually and through their societies to support the program.

The plenary session ratified the new constitution of the International Commission on Zoological Nomenclature and changes involving articles 11(b), 11(d), 29(a), and 31 of the code. The election of the following members to the Commission was also ratified: do Amaral, Vokes, Stoll, Holthuis, Miller, Mayr, Ride, Krauss, Hubbs, Sabrosky, and Forest, and, subject to his agreement to serve, G. G. Simpson.

The officers of the congress were: president, Alfred S. Romer; vice presidents, Umberto D'Ancona (Italy); Jean G. Baer (Switzerland); Enrique Beltran (Mexico); N. John Berrill (Canada); L. C. Birch (Australia); P-P. Grassé (France); Sven Horstadius (Sweden); Libbie H. Hyman (U.S.); H. J. Muller (U.S.); Ye. N. Pavlovskii (U.S.S.R.); Eduardo de Robertis (Argentina); Oswain W. Richards (United Kingdom); B. R. Seshachar (India); E. J. Slijper (Netherlands); George G. Simpson (U.S.); Nikolaas Tinbergen (United Kingdom); Tohru Uchida (Japan); and C. M. Yonge (United Kingdom); secretary-general, Gairdner Moment; program chairman, John Moore; treasurer, Alexander Wetmore; and finance chairman, Gerard Piel.

Baer expressed the sincere hope of the permanent committee that the tentative invitation for the 17th Congress to meet in Delhi in 1968 will become firm and will be accepted. He also thanked all the various American committees which had worked so hard to achieve this outstanding Congress.

The *Daily Phoenix*, edited by William T. Kabisch of the AAAS staff, recorded the day-by-day progress of the congress and even reported a field sighting of the Phoenix.

Volumes 1–5 of the proceedings may be bought at $1.25 per volume by writing the Printing and Publishing office, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418. Each volume contains about 300 pages. Volumes 1 and 2 consist of the contributed papers, and volumes 3 and 4 are the specialized

symposia. Volume 5 contains the list of registrants and a general account of the congress. Volume 6 will contain the six scientific plenary sessions and will be published by the Natural History Press, Central Park West at 79th Street, New York, New York.

GAIRDNER B. MOMENT
Goucher College, Baltimore, Maryland

Paleontology

Advances in paleontological research and the republication of classic contributions to the field were reported at a meeting of the Paleontological Research Institution in Ithaca, New York, on 12 October.

The subject matter announced by K. V. W. Palmer, director of the institution, as having been published or in press in the serial publications of the institution (*Bulletins of American Paleontology* and *Palaeontographica Americana*) reflects a continuing interest in the problems of tertiary stratigraphy which first attracted the founder, Gilbert Dennison Harris. However, in recent years the institution has embarked on a program of republishing important references no longer readily obtainable. While some will be reprinted in their original form, such as Conrad's *Fossil Shells of the Tertiary Formation* (available in 1964), others are being reevaluated and modernized, such as K. V. W. Palmer's *Illustrations and Descriptions of Type Specimens of Marine Mollusca Described by P. P. Carpenter from the West Coast of Mexico and Panama* (in press).

The institution also compiles data covering wide geographic areas and a wide range of organisms. Research workers will soon have available the *Catalogue of Paleocene Mollusca of the Southern and Eastern U.S.A.* by K. V. W. Palmer and D. Brann, and *Late Cenozoic Pelecypods from Northern Venezuela* by N. E. Weisbord (both in press). Publications on organisms, from Foraminifera through Lycopods, indicate the breadth of the institution's activities in all areas of paleontology. Palmer noted that the total volume of publications had doubled during the last 3 years to sustain this activity. The number of manuscripts at hand point to further increases in volume in the near future.

In addition to activities pertinent to publication, the institution maintains and processes large collections of type

material and literature—both of which are accessible to qualified and interested workers. It was reported that to date 18,907 entries of species of duplicate material have been catalogued and 1885 locality stations made. The institution also acts as the business office and distributor of publications for the Cushman Foundation for Foraminiferal Research.

Upon being granted its charter by the State of New York in 1932 the institution's declared purpose was to "increase and disseminate knowledge in the field of Invertebrate Paleontology and to collect and preserve type material for the promotion of paleontological research."

From a modest beginning its role has become international in scope. In anticipation of future needs, plans are under way for enlarging its physical facilities.

DANIEL B. SASS
Department of Geology, Alfred University, Alfred, New York

Forthcoming Events

January

22–25. American Assoc. of **Physics Teachers**, New York, N.Y. (E. U. Condon, Oberlin College, Oberlin, Ohio)

23. Central Council for **Health Education**, annual conf., London, England. (Director, CCHE, Tavistock House, Tavistock Sq., London, W.C.1)

23–24. **Industrial Water and Waste** Conf., Austin, Tex. (J. B. Maline, Jr., 305 Engineering Laboratories Bldg., Univ. of Texas, Austin 12)

25. **Industrial Hygiene** and Air Pollution, 8th conf., Austin, Tex. (J. O. Ledbetter, 305 Engineering Laboratories Bldg., Univ. of Texas, Austin 12)

27–30. Society of **Plastics Engineers**, 20th annual technical conf., Atlantic City, N.J. (J. J. McGraw, Natl. Vulcanized Fibre Co., Philadelphia, Pa.)

27–31. UNESCO, working party on **scientific translation and terminology**, Rome, Italy. (UNESCO, Place de Fontenoy, Paris 7)

28–30. **Entomological** Soc. of America, southeastern branch, Asheville, N.C. (W. C. Nettles, Clemson College, Clemson, S.C. 29631)

29–31. American **Meteorological** Soc., 44th annual, Los Angeles, Calif. (A. Court, 17168 Septo St., Northridge, Calif.)

29–1. Southwestern Federation of **Geological Societies**, 6th annual, Midland, Tex. (W. E. Wadsworth, AAPG, 1444 S. Boulder, P.O. Box 979, Tulsa 1, Okla.)

29–1. Western Soc. for **Clinical Research**, 17th annual, Carmel-by-the-Sea, Calif. (H. R. Warner, Latter-Day Saints Hospital, 325 Eighth Ave., Salt Lake City, Utah)

30–31. Spontaneous and Experimental Comparative **Atherosclerosis**, conf., Bev-

erly Hills, Calif. (E. McCandless, Los Angeles County Heart Assoc., Los Angeles 57, Calif.)

February

2–5. American Inst. of **Chemical Engineers**, annual, Boston, Mass. (J. Henry, AICE, 345 E. 47 St., New York, N.Y.)

2–7. Institute of **Electrical and Electronics Engineers**, winter meeting, New York, N.Y. (A. P. Fughill, Detroit Edison Co., 2000 Second Ave., Detroit, Mich. 48226)

2–8. **Teratology**, workshop, Commission on Drug Safety, Gainesville, Fla. (D. C. Trexler, Commission on Drug Safety, 221 N. LaSalle St., Chicago, Ill. 60601)

2–11. Scientific-Technical **Documentation and Information**, intern. congr., Rome, Italy. (I. M. Lombardo, La Produttivita, Viale Regina Margherita, 84d, Rome)

3–4. Society of **Rheology**, Claremont, Calif. (T. L. Smith, Stanford Research Inst., Menlo Park, Calif.)

3–4. Perspectives in **Virology** IV, Gustav Stern symp., New York, N.Y. (M. Pollard, Lobund Laboratory, Univ. of Notre Dame, Notre Dame, Ind.)

3–7. **Materials**, intern. conf., Philadelphia, Pa. (A. G. H. Dietz, Dept. of Building Engineering, Massachusetts Inst. of Technology, Cambridge)

4–6. Society of the **Plastics** Industry, conf. of the reinforced plastics div., Chicago, Ill. (W. C. Bird, SPI, 250 Park Ave., New York, N.Y. 10017)

4–6. Cellular Biology of **Myxovirus Infections**, CIBA Foundation symp., London, England. (CIBA Foundation, 41 Portland Pl., London, W.1)

5–7. **Military Electronics**, 1964 winter conv., Los Angeles, Calif. (Inst. of Electrical and Electronics Engineers, Box A, Lenox Hill Station, New York, N.Y. 10021)

5–8. American College of **Radiology**, natl. meeting, Tucson, Ariz. (American College of Radiology, 20 N. Wacker Dr., Chicago, Ill. 60606)

7–8. **Differentiation and Development**, symp., New York, N.Y. (New York Heart Assoc., 10 Columbus Circle, New York, N.Y. 10019)

9–11. **Entomological** Soc. of America, Southwestern Branch, Monterrey, Mex. (D. F. Martin, P.O. Box 1033, Brownsville, Tex. 78521)

10–14. New Zealand Institution of **Engineers**, conf., Wellington. (F. N. Stace, P.O. Box 3047, Wellington, N.Z.)

10–14. **Information** Storage and Retrieval, 6th, Washington, D.C. (American Univ., 1901 F St., NW, Washington, D.C. 20006)

12–16. American College of **Cardiology**, 13th annual, New Orleans, La. (P. Reichert, Empire State Bldg., New York, N.Y. 10001)

13–14. Texas **Industrial Pharmacy** Seminar, Austin. (L. R. Parker, Pharmacy Extension Service, Univ. of Texas, Austin)

15–16. **Atomic Energy**, Japanese natl. symp., Tokyo. (Atomic Energy Soc. of Japan c/o Atomic Energy Research Inst., 1-1 Shiba-tamura-cho, Minato-ku, Tokyo)