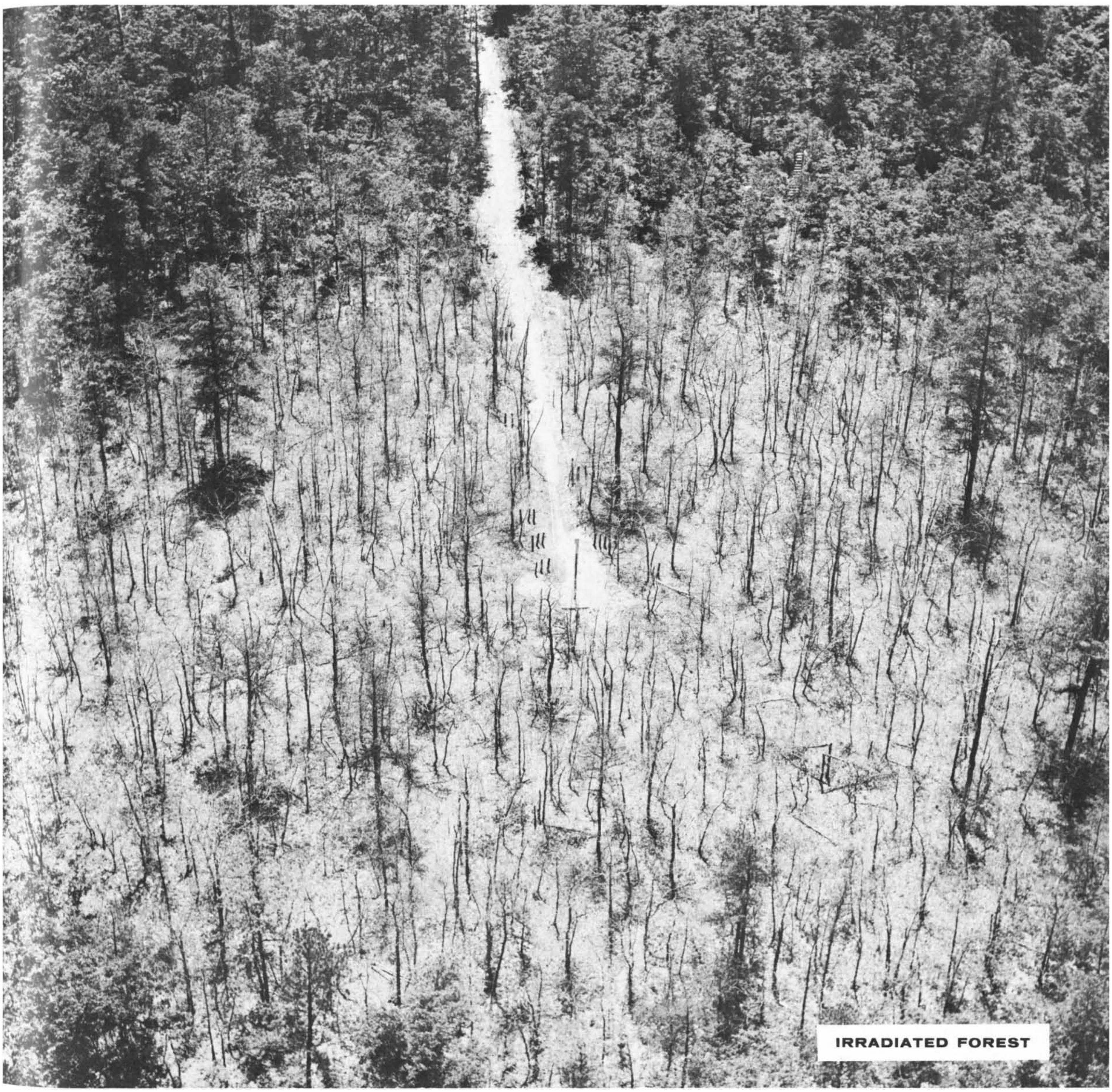
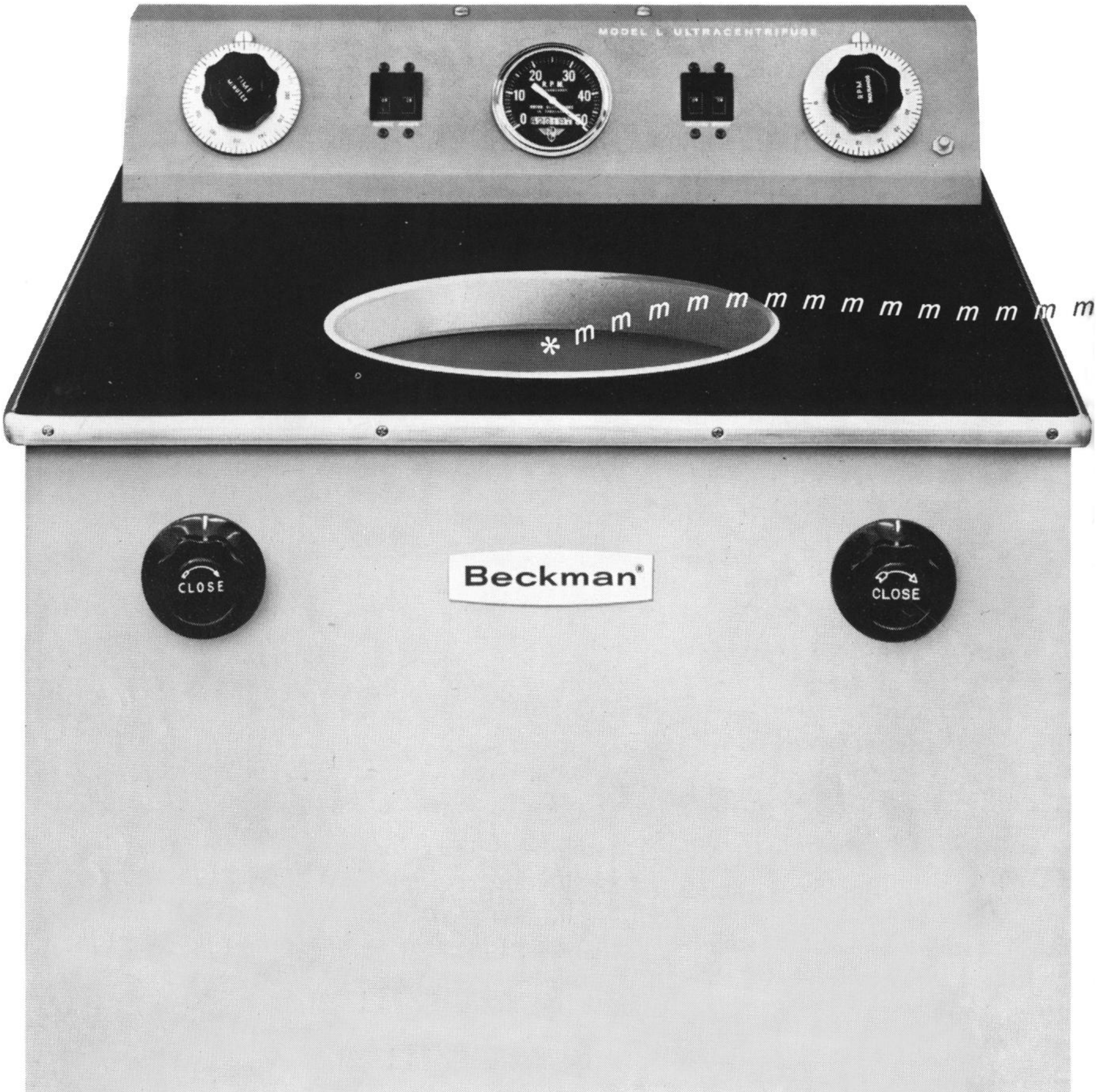
SCIENCE 2 November 1962
Vol. 138, No. 3540
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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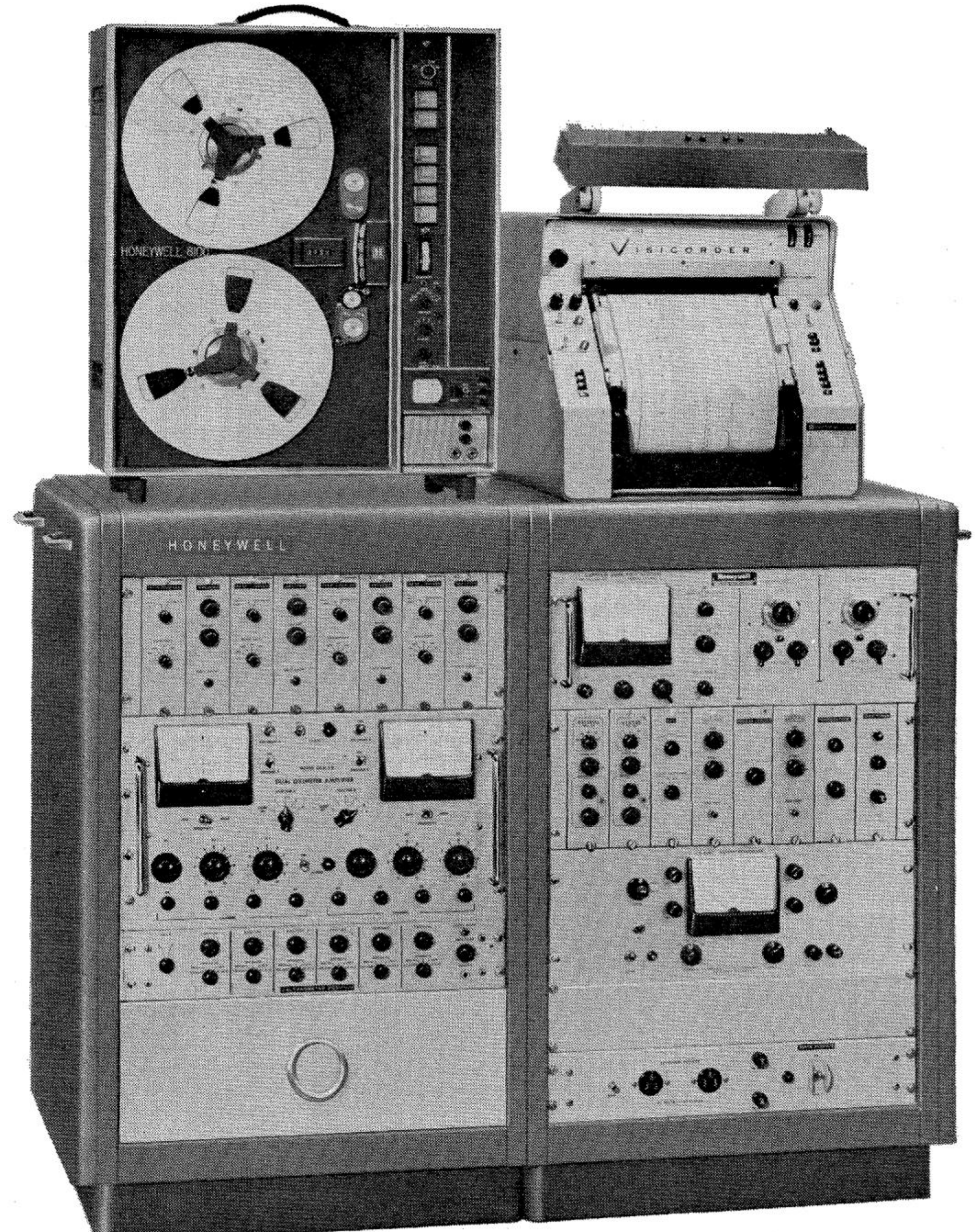


HONEYWELL 8100 . . . A NEW LABORATORY TAPE RECORDER WITH INTEGRAL ELECTRONICS FOR MEDICAL DATA ACQUISITION

The new instrument in this array of Honeywell Electronic Medical System equipment is the 8100 FM Portable Tape Recorder (upper left). Unlike other instrumentation recorders in its price and applications class, it contains *all* of its own electronics—including built-in calibration instruments. The 8100 features one to eight data channels, in addition to compensation and voice channels; IRIG configuration is available. It records all physical phenomena from DC to 10,000 cycles with the fidelity of FM and reproduction quality of the largest non-portable instruments. Yet its price is extremely reasonable, ranging from $5900 to $11,300. You will use it in many places other than the laboratory, too—it's truly portable: only 75 pounds! *Send for 8100 brochure to Honeywell, Electronic Medical Systems, P.O. Box 8776, Denver 10, Colorado.*

Honeywell

H HONEYWELL *Electronic Medical Systems*

SCIENCE is published weekly by the AAAS, 1515 Massachusetts Ave., NW, Washington 5, D.C. Second-class postage paid at Washington, D.C., and additional mailing office. Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢.

2 November 1962, Volume 138, Number 3540

SCIENCE

Cover Forest ecosystem exposed to gamma radiation for 6 months. The intensity of exposure ranged from several thousand roentgens per day near the source at the center of the circular area of dead trees to about 60 roentgens per day at the circumference. See page 572.

High Voltage Engineering Corporation . . .

"CHARGED PARTICLES"

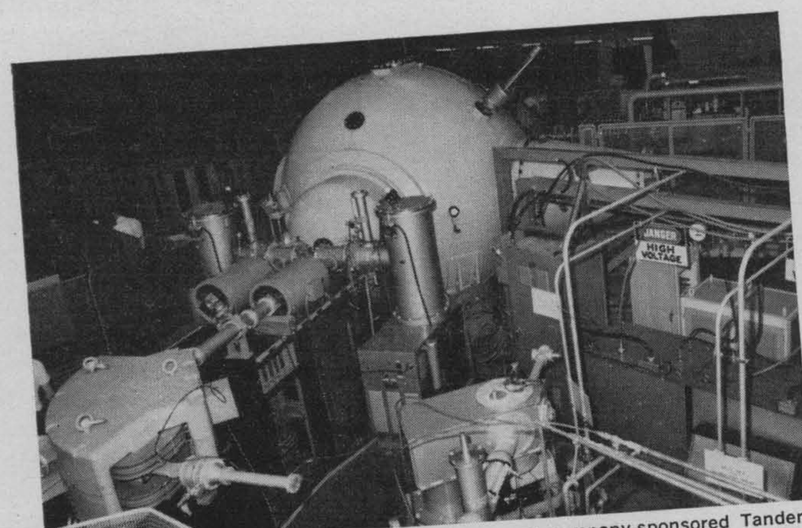
Nuclear-Structure Research

Initial work with the 12-Mev Tandem Van de Graaff has confirmed beyond expectations our early conviction that this accelerator system would greatly extend areas of useful research. A previously "dark" area, in fact the whole upper half of the periodic table, can now be investigated with precision. The range now beginning to be explored with extremely stable monoenergetic particle beams includes many isotope-rich elements and the important domain of fissionable materials. Current research indicates *the Tandem has increased the number of resolvable energy levels by an order of magnitude.* In constructing a theory of the nucleus, the precision we speak of is every bit as important as the extension in energy. Tandem ion beams permit discrimination between closely associated energy levels and reveal new subtleties in the fine structure of heavier elements.

The Tandem Van de Graaff's external ion source at ground potential is a boon to experimenters. There are at least seventeen stable nuclei up to oxygen that may be used as bombarding particles. With multiple stripping and two-stage acceleration, oxygen ions have been accelerated to 60 Mev.

A characteristic of truly new research tools is evident in the way the Tandem is shaping the direction and objectives of physics research programs. As a result, nine laboratories with machines installed and performing to specifications, and others awaiting Tandem delivery, are planning to undertake work that is new and challenging.

At High Voltage, a vigorous engineering and development program is extending the basic Tandem principle to higher energies and beam currents. Already in the process of construction are several "King-Size" Tandems (7.5 million-volt terminal potential) providing 15 Mev protons, and much higher energies with multiply-stripped heavy ions. The new "Emperor" Tandem design will generate 10 million-volts for two-stage acceleration of 20 Mev protons.



A formidable accelerator in its own right, this new company-sponsored Tandem development facility is designed specifically to investigate high current neutral, negative, and positive ion sources. It is an important empirical tool in the study of beam dynamics, pulsing techniques, and acceleration tube design.

The concept of heavy-ion acceleration opens up a new area to the experimenter. The acceleration of 200 Mev bromine ions, while retaining control in energy and homogeneity to a few kev, is feasible. The implications for nuclear structure research are quite profound. Certainly, new aspects of multiple coulomb excitation and nuclear-fission processes are among the realms that can be advantageously explored.

Three-stage Tandem acceleration extends the Proton energy capability of the Tandem principle to well over 30 Mev. The new Research Tandem at High Voltage is being pressed to develop ion sources with outputs that are orders of magnitude greater than currently available.

"Low-Energy" Physics

As we address ourselves to this subject, more elegantly called *nuclear-structure physics*, the reader may conclude we have an axe to grind, and we admit it. We believe a great deal of research remains to be done on light nuclei. There is, for example, time-consuming but rewarding precision nuclear spectroscopy to fill in gaps in existing energy level data, as well as new research related to the conservation of isotopic spin, excitation energies of low excited states and direct interaction mechanisms.

Because much nuclear-structure research can be accomplished with standard Van de Graaffs in the 1-6 Mev energy range, equipped with ion sources for hydrogen, helium or heavy elements, these machines represent ideal research instruments for the university physics laboratory of modest proportions. We are presently compiling information on exactly where machines of moderate cost and energy can make significant contributions in illuminating concepts of nuclear structure and would be happy to discuss this subject with you.

HIGH VOLTAGE ENGINEERING CORPORATION
BURLINGTON, MASSACHUSETTS, U.S.A.
•
APPLIED RADIATION CORPORATION
•
HIGH VOLTAGE ENGINEERING (EUROPA) N.V.

2 November 1962, Volume 138, Number 3540

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Too Slow

We have been waiting for some time for the U.S. Office of Education to publish a report on the number of bachelor's and higher degrees conferred in 1959–60. A summary table appeared a year ago, but the full report that would continue the annual series that began with 1947–48 has not yet appeared. This is too slow. Summary figures for 1960–61 are not yet available. This also is too slow.

In contrast, major reports from the vastly larger national census for 1960 have been available for some time, and estimates based on samples are available continuously and promptly on unemployment rates, cost of living, and other economic indexes.

For future historical use, it will make little difference whether such reports appeared promptly or tardily. But prompt publication is of great importance to students of educational and manpower trends and to university and government officers concerned with educational planning.

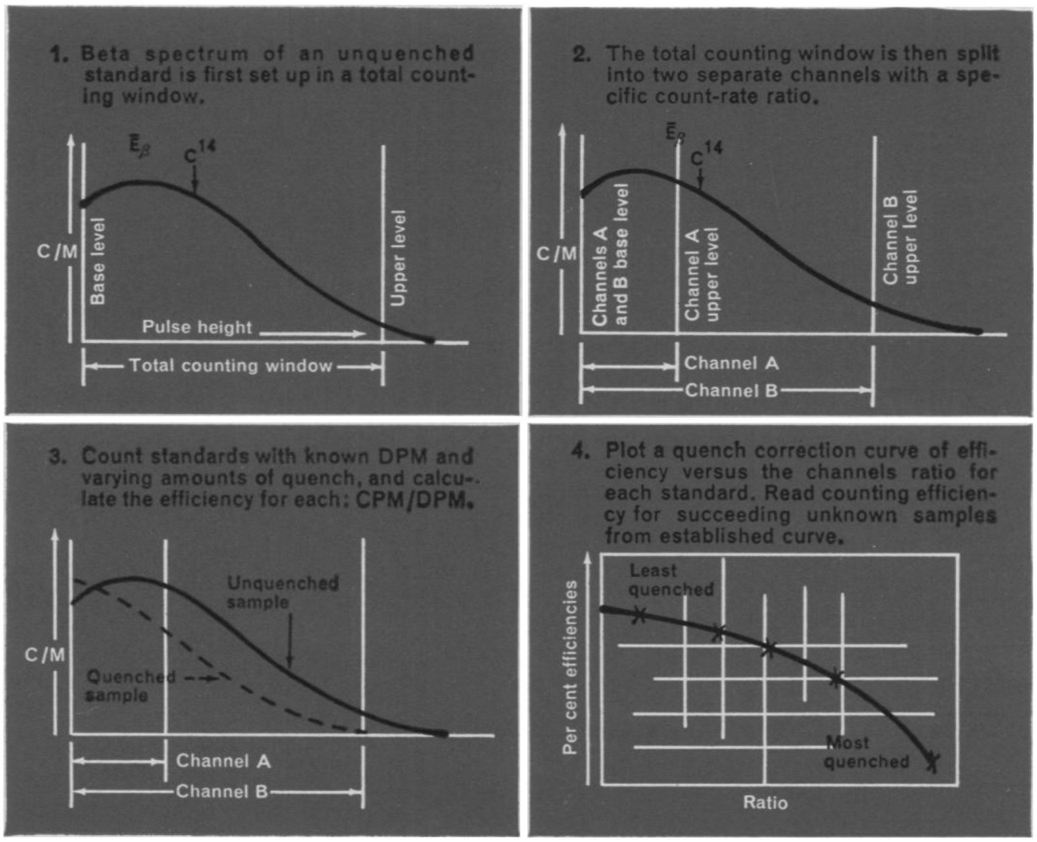
The users of educational statistics realize that compilation on a national basis requires time. The colleges and universities must know who actually received degrees before they can report the figures to the Office of Education. Unfortunately, their initial reports sometimes include errors, so the Office of Education, which takes pride in 100-percent coverage and in having its own report accurate, must verify many details through further correspondence before tabulation and reporting can be completed. But even so, the process is too slow.

While we wait for two-year-old figures on the number of degrees granted—information which is not available from other sources—the full report of a study of higher education salaries for 1961–62 has already been published. If salary data for 1961–62 can be published in September of 1962, why is it necessary to wait so long for degree data? A coordinated, rapid, and efficient system of compiling and publishing statistics on higher education would aid the Office of Education, other government agencies, the colleges and universities themselves, and the national educational organizations. Cooperation among these agencies and institutions will be necessary to achieve such a system, and, because the Office of Education should be centrally involved, support from Congress and the Bureau of the Budget will also be required.

Faster and more accurate reporting by the colleges (and that would be expected if the reports appeared more promptly), such new equipment as may be needed to process the data more efficiently, and a tight printing schedule could readily solve the delay problem, if the Commissioner of Education and the Secretary of Health, Education, and Welfare are sincerely interested in solving it.

But speed is not the only problem. Some critics ask why we need three separate annual studies of academic salaries, by the Office of Education, the National Education Association, and the American Association of University Professors. Such questions, and the serious delays, indicate the desirability of a thorough analysis of available and needed statistics on higher education. The agency that takes the initiative in studying this problem and sticking with it until a workable solution is agreed upon will have rendered a valuable service to higher education. The solution is not technically difficult. There seems to be no adequate reason to delay any longer in working out the operating details.—D.W.

Channels ratio... an important time-saving convenience in liquid scintillation spectrometry



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

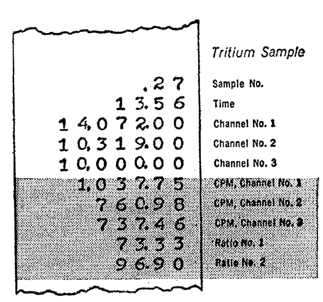
The channels ratio concept offers far more than just a highly accurate means of determining efficiency in liquid scintillation counting. It is a systematic technique that furnishes more time-saving, valid information about your samples than is offered by any other method—and with no additional cost or effort. Researchers continue to exploit the ability of channels ratio to provide accurate, valuable data on quenching. They are incorporating the advantages into their working procedure.

Even those using internal standardization methods for determining efficiency are finding that channels ratio provides an excellent check on the exacting preparation required by this method. In this application, both the unknown sample and the sample with internal standard added should produce the same channels ratio. If not, the careful worker knows that he may be experiencing error-producing phenomena such as a change in quenching or sample precipitation. This comparison technique is an extremely valuable aid when assaying large numbers of samples. It furnishes the investigator with a consistently accurate means of monitoring quench effects, thus assuring a high degree of reliability for each measurement. Please request our comprehensive data portfolio.

Channels ratio gives high accuracy with minimum sample handling time

Channels ratio counting is based on the fact that when quenching occurs the average energy of the beta pulse height spectrum decreases, and the entire spectrum shifts toward a lower energy. If the spectrum is then properly divided into two counting channels the ratio of the count rates in the two channels will change relative to the amount of quenching in the samples. Through careful settings of the counting channel window widths and detector high voltage, the ratio of the two count rates can be calibrated to represent the degree of quenching. It is this correlation between the count-rate ratio and counting efficiency that permits construction of a correction curve.

After the correction curve is plotted, the counting efficiency for unknown samples can be read directly, once the channels ratio for each is automatically calculated. Careful quenched standard preparation and instrument calibration gives a curve useful for normalization of samples containing dissimilar quenching agents. More important, the curve will cover a wide range of sample activity and counting efficiency.



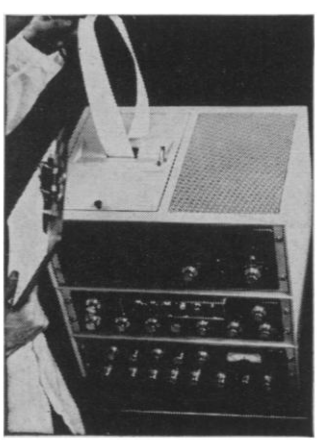
Actual data read-out of the 720 systems. Unshaded area of tape depicts data listing functions of the 722 and 724. The shaded area illustrates the additional calculation capabilities of the 723 and 725.

Counts per minute and channels ratio calculated automatically

Nuclear-Chicago's new 720 Series spectrometers permit routine application of channels ratio techniques directly to the liquid scintillation counting program. The automatic calculator furnishes the user with a choice of three read-out modes: 1) A simple listing of the data accumulated in each of the three channels together with sample number and elapsed time. 2) Calculated counts per minute for each channel. 3) Calculated ratios of total counts in one channel to total counts in each of the other two channels.

Automatic calculation is a valuable, time-saving convenience in liquid scintillation counting. It enables efficiency determination and quench correction for isotopes such as carbon-14 and tritium to become a part of every laboratory counting run with no more effort than previously required.

The automatic calculator, in combination with the three-channel analyzer and three-scaler/timer, fulfills virtually all practical requirements.



Computed sample data can be accumulated during off-hours. There is often no need to make additional calculations. Technician time and the chance of human error are eliminated.

Operation at temperatures above freezing

Reproducibility of measurement is difficult with samples which undergo phase separation or precipitation at temperatures below freezing. With the 724-725, these samples can be counted from 10° to 50°F at constant temperature without appreciable loss of counting efficiency.

Research with all types of photomultiplier tubes resulted in the choice of two 11-stage EMI photomultiplier tubes in all Nuclear-Chicago systems. The gain stability of these tubes is markedly superior. As a result of high gain with stability, less amplification is required.

The inherent low noise characteristics of the phototubes, along with advanced circuitry permits operation over a wide temperature range.

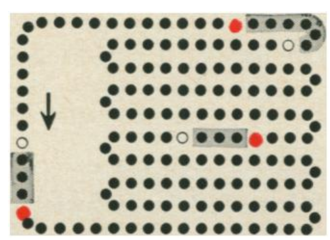
If small losses in efficiency and reduced sample capacity are acceptable, the Nuclear-Chicago 722-723 room-temperature systems are recommended—at a significant reduction in cost.

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

Selective sample programming

The advanced sample changing capabilities of the 724, 725 offer unusual versatility in planning the work load of your laboratory. Up to 150 samples can be handled in a single counting run with either manual or fully automatic changing. Selective programming allows counting of "preferred" groups of samples while all others are bypassed. This feature minimizes laboratory inconvenience by permitting assignment of specific sample number groups to individuals or departments. Sample-number identification is maintained regardless of the counting sequence.

A special sensing system rejects all off-size sample bottles that might accidentally jam the changing mechanism. There is no chance of bottle breakage and resultant changer contamination.

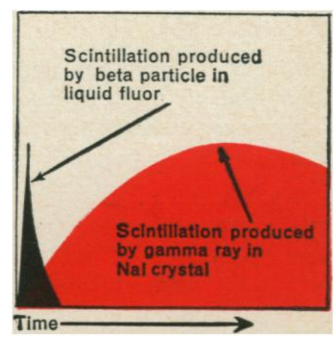


Diagrammatic presentation of selective sample programming. Red circles in the conveyor indicate sensors, white circles are empty bottle receptacles and black circles represent sample bottles. Bottles in the shaded region between sensors and empty receptacles are the "preferred" groups that will be counted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

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

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

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



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

NUC:B-2-270

nuclear-chicago CORPORATION

349 East Howard Avenue, Des Plaines, Illinois

Meetings

Ceramics

The upheaval that results when a useful discipline, rooted in antiquity and with a well-developed body of empirical knowledge, is overrun by modern technology is well-known to many scientists. Metallurgy came under the spell of physics many years ago, with revolutionary results. Few can doubt that the entire discipline has profited handsomely.

Anticipating that ceramics can be similarly revolutionized by physics and chemistry—and that in the process some vexing materials problems can be solved—the Office of Naval Research organized a symposium on the physics and chemistry of ceramics. It was held at the Pennsylvania State University from 28 to 30 May, with about 65 invited ceramists and solid-state physicists in attendance.

As noted in the prospectus, the purpose of the symposium was twofold: (i) to review the principles of solid-state physics and solid-state chemistry that are applicable to ceramics research and education today, and (ii) to examine mechanisms by which ceramics curricula can be made more responsive to the future needs of ceramics.

The first of these objectives was attained in notable fashion; rarely have so many people participating in the growth and development of the "new" ceramics come together to discuss current research. One had to conclude, however, that ceramics curricula at most universities are not at present geared to the needs of the time. Nor did the panel of ceramist-educators which closed the conference agree on what road should be taken. Yet it is safe to say that a ferment has been raised in every ceramics department in the nation.

It was fitting, indeed, that the stage for the symposium should be set by Frederick Seitz, coauthor of the Wigner-Seitz theory that lies at the heart of the physics of solids. However, his duties as newly elected president of the National Academy of Sciences prevented him from attending and his long-time associate at Illinois, R. J. Maurer, read the Seitz paper.

In it Seitz traced the flow of discovery during the last 100 years in the science of solids—from the delineation of macroscopic properties, through the concepts of the crystal lattice and the electronic structure of the perfect crystal, to the theory of imperfections—and discussed future study of the surfaces of solids. He found that metallurgists had been quicker to embrace the new knowledge than ceramists—that metallurgists took the challenge directly from the physicist, whereas ceramists usually waited for additional development by the chemist. He suggested that the ceramist accept the physicist on the latter's terms as a partner in instruction and research, much as the metallurgist has done.

W. R. Buessem, of Pennsylvania State University, then took up the problems the ceramist presents to the physicist. The ceramist, he said, is concerned with an empirical body of knowledge that is entirely adequate for most ceramic applications but represents only a gross approximation for the purposes of the solid-state physicist. He suggested that physicists should give the polycrystalline structure the same attention that they have given the incomparably simpler single crystal. Ceramists, in turn, can support this work by developing methods to manufacture pure and ultrapure materials, and by identifying the crystallites in the ceramic body with those which the physicist is using in his studies.

Buessem noted that a comparison between the properties of a material in single-crystal form and in the form of pressed powders or fired ceramic bodies is one of the most interesting avenues of research today. The lively discussion which followed Buessem's paper confirmed this statement, and many suggestions were made for obtaining polycrystalline samples. It was proposed that single crystals be crushed to pieces and put back together again, like Humpty Dumpty; that twinned or polycrystalline ingots be grown; or that samples be pressed and sintered from powders.

After this introductory session, 14 papers summarizing present research were given. These will soon be available in a proceedings volume, to be published by Gordon and Breach, New York.

The speakers and subjects were as follows: Leonid V. Azaroff (Illinois Institute of Technology), "Properties and crystal structure of materials"; Rustum Roy (Pennsylvania State University), "Crystal chemistry in research on ionic solids"; A. D. Franklin (National Bureau of Standards), "Impurity controlled properties of ionic solids";

Donald S. McClure (R.C.A. Laboratories), "Colors and spectra of transition-metal ions in ceramics"; H. G. Drickamer (University of Illinois), "Effect of pressure on the electronic structure of solids"; C. E. Birchenall (University of Delaware), "Diffusion in ionic crystals"; J. E. Burke (General Electric Research Laboratory), "Science and technology of sintering"; R. J. Maurer (University of Illinois), "Optical properties of ionic crystals"; H. C. Gatos (Lincoln Laboratory, M.I.T.), "Electrical properties of semiconductor materials"; L. R. Bickford, Jr. (I.B.M. Research Center), "Magnetic properties of ceramics"; John J. Gilman (Brown), "Electrons, dislocations, and the strength of ceramic crystals"; Roger Chang (Atomics International), "High-temperature mechanical behavior of ceramics"; W. D. Kingery (M.I.T.), "Effects of microstructure on the properties of ceramics"; and Gerald W. Sears (General Dynamics Electronics), "Nucleation and crystal growth."

Gilman raised the possibility of obtaining ceramic materials with ultimate strengths of 5 million pounds per square inch, ten times stronger than steel. This, he said, can be done if we learn how to make single-crystal materials in which the dislocations do not move. "The monocrystalline form is important because of the intrinsic weakness of boundaries between such crystals," he said. The dislocations must not move because it is through the motion of dislocations that yield takes place, resulting ultimately in rupture. While probably no large structures could be made of single-crystal materials, such materials would be very useful for certain critical applications—for example, the manufacture of small-size objects such as high-pressure vessels, ultracentrifuges, gyroscopes, and magnets. The carbides of the transition metals or the light elements will be the strongest compounds for such applications.

Cyrus Klingsberg, ceramist in the metallurgy branch of the Office of Naval Research, who organized the symposium, discussed federal sponsorship of research in ceramics. He stated that only $15.8 million out of $9.6 billion spent annually for research could be clearly identified as spent for ceramics research, notwithstanding the critical need for new ceramics materials. He held both the ceramist and the government scientist in some degree responsible for this low level of support. On the one hand, the ceramist is primarily oriented toward the problems of industry, his research shows less breadth and imagination than research in other fields, and it is devoted primarily to making the most of the properties of known materials. On the other hand, the government funding agencies have shown much less interest in the problems of ceramics than in those, say, of metallurgy and have committed insignificant sums for the improvement of ceramics materials as compared to the huge investments in metals research. If the wall is to be breached, the ceramist must embrace the "new" ceramics and the funding agency must provide support commensurate with the potential rewards.

The wind-up panel on ceramics education focused on the problems of preparing bachelor's degree candidates to meet the needs of the ceramics industry and of conducting meaningful research at the graduate level to train an entirely different breed of ceramists. It was clear that not all departments have solved this problem, and in fact that none had solved it in its entirety. Participating in this discussion were G. W. Brindley (Pennsylvania State University), chairman; R. L. Coble (M.I.T.); R. L. Cook (University of Illinois); I. B. Cutler (University of Utah); V. D. Frechette (Alfred); J. E. Mueller (University of Washington); J. A. Pask (University of California, Berkeley); R. Russell, Jr. (Ohio State University); and R. L. Sproull (Cornell).

M. E. Bell
College of Mineral Industries, Pennsylvania State University, University Park

Forthcoming Events

December

1. New York State Registry of **Medical Technologists**, annual seminar, New York. (S. H. Keeling, 1719 Midland Ave., Syracuse, N.Y.)

2–4. American **Pomological** Soc., Yakima, Wash. (G. M. Kessler, Dept. of Horticulture, Michigan State Univ., East Lansing)

2–6. American Inst. of **Chemical Engineers**, Chicago, Ill. (F. J. Van Antwerpen, AICE, 345 E. 47 St., New York 17)

3–4. **Satellite Communication**, intern.

conf., London, England. (Secretary, Institution of Electrical Engineers, Savoy Pl., London W.C.2)

3–5. Allied Air Forces **Medical** Conf., annual, Fontainebleau, France (by invitation). (A. E. Lauschner, Medical Advisory Staff, Allied Air Forces Central Europe, Camp Guynemer, Fontainebleau)

3–6. **Entomological** Soc. of America, Phoenix, Ariz. (R. H. Nelson, 4603 Calvert Rd., College Park, Md.)

3–7. International Assoc. for the Prevention of **Blindness**, New Delhi, India. (J. P. Bailliart, 47 rue de Bellechasse, Paris 7ᵉ, France)

3–7. International Organization Against **Trachoma**, New Delhi, India. (J. Sedan, 94 rue Sylvabelle, Marseilles, France)

3–7. **Microbiology**, natl. congr., Monterrey, Mexico. (M. A. Rodríguez, Apdo. Postal 4464, Monterrey)

3–7. **Ophthalmology**, intern. congr. New Delhi, India. (Y. K. C. Pandit, Bombay Mutual Bldg., Sir Pherozeshah Metha Rd., Bombay 1, India)

3–7. **Rehabilitation**, Pan-Pacific conf., Manila, Philippines. (Philippine Foundation for the Crippled, Philippine Natl. Red Cross Bldg., Intramural, Manila)

3–10. Panel on **Tick-Borne Disease**, Food and Agriculture Organization of the UN–Intern. Office of Epizootics, Cairo, Egypt. (Intern. Agency Liaison Branch, Office of the Director General, FAO, Viale delle Terme di Caracalla, Rome, Italy)

3–13. **Hydraulics** and **Fluid Mechanics**, conf., Perth, Australia. (Conference Convener, School of Engineering, Univ. of Western Australia, Nedlands)

4–5. Microbiological Problems in **Petroleum** Production, symp., Long Beach, Calif. (C. C. Wright, Oilwell Research, Inc., 1539 W. 16 St., Long Beach 13)

4–6. **Computers**, joint fall conf., Philadelphia, Pa. (J. W. Leas, Radio Corp. of America, Camden, N.J.)

4–7. American **Documentation** Inst., Hollywood-by-the-Sea, Fla. (J. B. Kaiser, 1718 N St., NW, Washington 6)

4–8. Controlled Field Trials of **Communicable Diseases**, conf., Geneva, Switzerland. (World Health Organization, Palais des Nations, Geneva)

4–13. Techniques of Surveys on **Epidemiology** of **Mental Disorders**, Manila, Philippines. (World Health Organization, Regional Office for the Western Pacific, P.O. Box 2932, Manila)

5–11. American Acad. of **Optometry**, Miami, Fla. (C. C. Koch, 1506-08 Foshay Tower, Minneapolis 2, Minn.)

6–8. **Mathematics**, annual conf., Santa Monica, Calif. (H. Couzins, Chaffey High School, Ontario, Calif.)

7–8. American **Rheumatism** Assoc., Richmond, Va. (J. A. Coss, 20 E. 76 St., New York 21)

7–8. Oklahoma Acad. of **Science**, Tulsa. (A. D. Buck, Northern Oklahoma Junior College, Tonkawa)

7–9. American **Psychoanalytic** Assoc., New York, N.Y. (H. Kohut, 664 N. Michigan Ave., Chicago 11, Ill.)

7–11. **Visual Communications**, intern. congr., Philadelphia, Pa. (Visual Communications Congr., 18465 James Couzens Hwy., Detroit 35, Mich.)

7–12. Environmental **Physiology and Psychology in Arid Conditions** symp., Lucknow, India. (UNESCO, Dept. of Natural Sciences, Arid Zone Unit, Place de Fontenoy, Paris 7e, France)

9–13. **Air Pollution**, intern. congr., Washington, D.C. (A. C. Stern, Div. of Air Pollution, Dept. of Health, Education, and Welfare, South Bldg., Washington 25)

10–14. **Neutron** Detection, Dosimetry, and Standardization, Harwell, England. (Intern. Atomic Energy Agency, 11 Kärntner Ring, Vienna 1, Austria)

10–15. Chronic Nonspecific **Pulmonary Maladies**, symp., Moscow, U.S.S.R. (World Health Organization, Regional Committee for Europe, 8 Scherfigsvej, Copenhagen Ø, Denmark)

10–15. Committee on **Biological Standardization**, Geneva, Switzerland. (World Health Organization, Palais des Nations, Geneva)

11–17. Committee on **Antibiotics**, Geneva, Switzerland. (World Health Organization, Palais des Nations, Geneva)

12–14. American Soc. of **Agricultural Engineers**, Chicago, Ill. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)

17–20. International **Arms Control**, symp., Ann Arbor, Mich. (IACS, P.O. Box 1106, Ann Arbor)

17–21. University **Physics Teaching** Curricula, Laboratory Experiments, and Equipment in UNESCO member states, comparative survey, Paris, France. (UNESCO, Place de Fontenoy, Paris 7e)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Ecological Soc. of America. (R. B. Platt, Dept. of Biology, Emory Univ., Atlanta 22, Ga.)

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

Institute of **Management Sciences**. (B. V. Dean, Dept. of Management, Case Inst. of Technology, Cleveland, Ohio)

Metric Assoc. (R. P. Fischelis, 1426 G St., NW, Washington, D.C.)

Mountain Lake **Biological** Station. (J. L. Riopel, Univ. of Virginia, Charlottesville)

National Assoc. of **Biology Teachers**. (P. R. Fordyce, Oak Park–River Forest High School, Oak Park, Ill.)

National Assoc. of **Science Writers**. (N. Haseltine, *Washington Post*, Washington, D.C.)

National **Geographic** Soc. (W. R. Gray, NGS, 16th and M Sts., Washington 6)

National **Science Teachers** Assoc. (R. H. Carleton, NSTA, 1201 16th St., NW, Washington 6)

National **Speleological** Soc. (J. V. Thrailkill, Dept. of Geology, Princeton Univ., Princeton, N.J.)

Philadelphia **Botanical** Club. (W. M. Benner, Acad. of Natural Sciences of Philadelphia, Philadelphia 3)

Scientific **Research** Soc. of America. (D. B. Prentice, RESA, 51 Prospect St., New Haven, Conn.)

Sigma Delta Epsilon. (D. Quiggle, 133 Chemical Engineering Bldg., Pennsylvania State Univ., University Park)

Society for General **Systems Research**. (R. L. Meier, Mental Health Research Inst., Ann Arbor, Mich.)

Society for the **History of Technology**. (T. P. Hughes, Dept. of History, Washington and Lee Univ., Lexington, Va.)

Society for Industrial and Applied **Mathematics**. (G. Kaskey, Remington Rand Univac, 1900 W. Allegheny Ave., Philadelphia)

Society for Industrial **Microbiology**. (T. C. Cordon, Agricultural Research Service, 600 E. Mermaid Lane, Philadelphia 18)

Society of the **Sigma Xi**. (T. T. Holme, 51 Prospect St., New Haven, Conn.)

Society of Systematic **Zoology**. (C. F. Lytle, 801 Ware St., SW, Vienna, Va.)

Tau Beta Pi Assoc. (R. H. Nagel, Tau Beta Pi Assoc., Univ. of Tennessee, Knoxville)

United Chapters of **Phi Beta Kappa**. (C. Billman, 1811 Q St., NW, Washington 9)

Special conferences to be held during the meeting include:

Academy Conference, natl. meeting of 47 state academies. (R. C. Miller, California Acad. of Sciences, San Francisco 18)

Conference on **Science Manuscripts**. (N. Reingold, Science and Technology Div., Library of Congress, Washington 25)

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

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

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

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

28–29. California Assoc. of **Chemistry Teachers**, Fresno. (R. H. Major, 1736 N. Sierra Bonita Ave., Hollywood 46, Calif.)

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