SCIENCE

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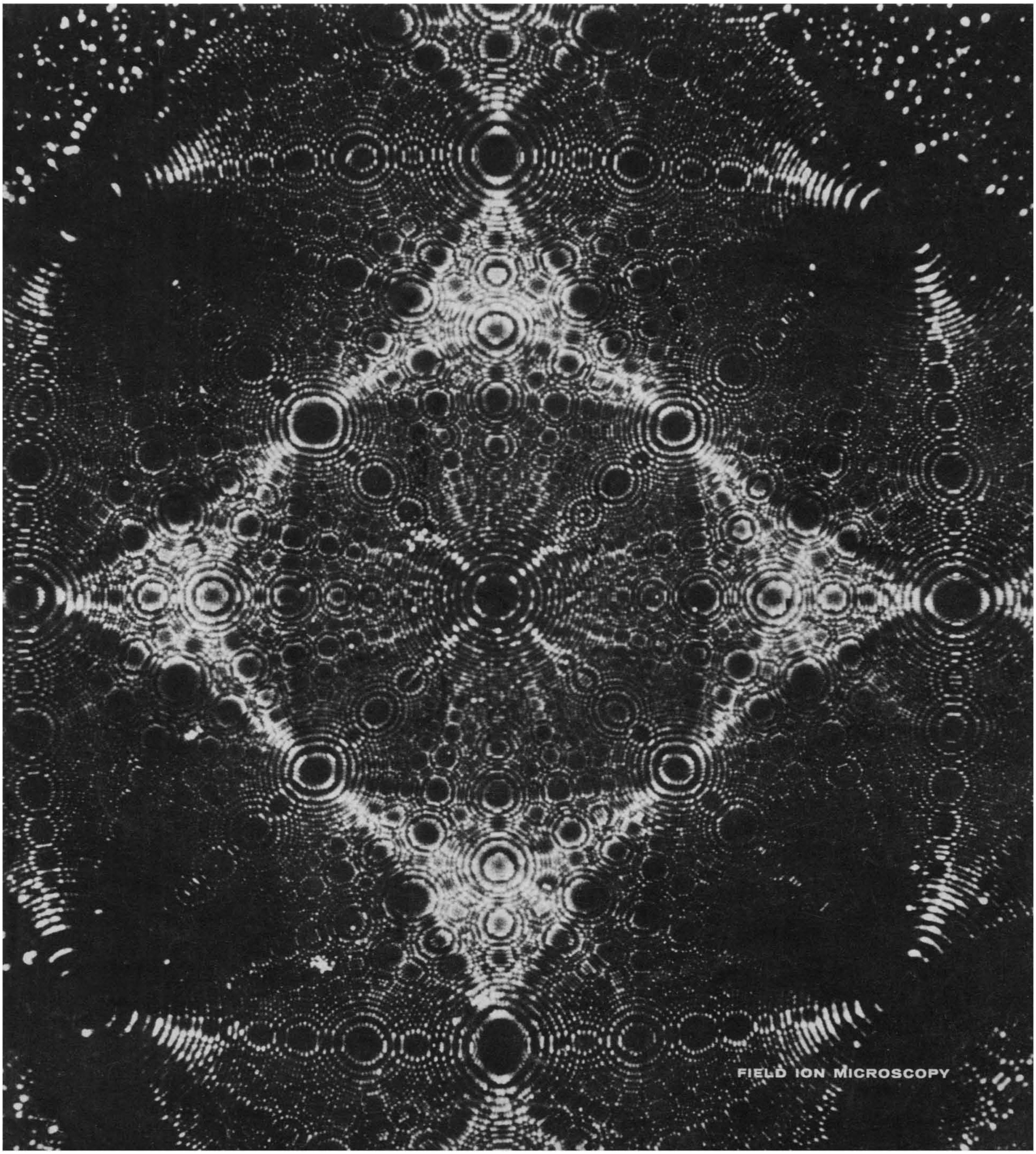
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Report from

BELL LABORATORIES

PULSE-CODE MODULATION—Experimental terminals operate at 220 megabits per second

Demonstration of the effect of Pulse-Code Modulation coding of television images transmitted over experimental 220-megabit system. With black and white images, each code corresponds to a shade of gray. In the extreme case where samples are coded to only one digit (left), two shades (dark and light or black and white) are possible—producing a high-contrast image. With 4-digit coding (center) up to 16 shades of gray are possible—producing an image with objectionable contouring. With 7-digit coding (right) there are sufficient levels to produce good television picture quality. Up to 9 digits per code may be required, however, when signals are transmitted over a number of Pulse-Code Modulation systems used in tandem.

Pulse-code modulation—one of the most interesting and promising techniques of communications technology—is simple in concept (see drawing). As with all new system concepts, however, PCM requires thorough research and skillful design to make it a practical reality.

A PCM system has been developed at Bell Telephone Laboratories and is now in widespread commercial service. This system, operating at 1.5 megabits per second, is proving useful in transmitting telephone voices and data over short distances, particularly in large cities, and other PCM transmission systems are being actively studied.

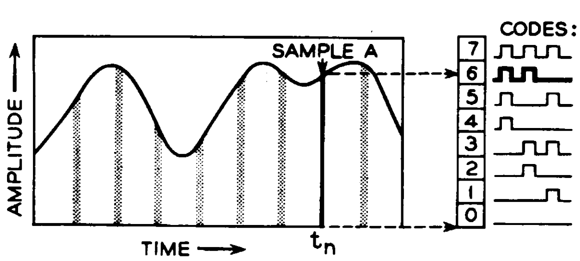
To realize more of PCM's potential, it is necessary to go to higher and higher rates of transmission. In doing this, ever more difficult problems are encountered—problems that lie on the frontiers of the technologies of devices, materials, circuits and systems design.

To demonstrate what can be done in this field and to gain valuable experience with PCM at high transmission rates, Bell Telephone Laboratories engineers have developed experimental PCM terminals that operate at 220 megabits per second.

At the transmitting terminal a color or black and white television signal and hundreds of telephone voice or other signals are sampled, coded and "mixed" (multiplexed) together. The receiving terminal demultiplexes or separates the various signals, decodes them, and restores them to their original form.

This experimental system has demonstrated that PCM systems with pulse rates up to 220 megabits per second are indeed feasible. High-speed electron-beam and solid-state encoders, a thin-film decoder, and other advanced components and techniques are utilized. These advanced techniques include arrangements for removing time "jitter" from the received pulse stream and provision for synchronizing terminals in a network of interconnected PCM systems.

Bell Telephone Laboratories
Research and Development Unit of the Bell System



Concept of PCM: Wavy line shows a time-varying current, which represents an analog communication signal such as human speech or a television picture. Electronic PCM circuits periodically "look" at or sample the signal, measure its amplitude, and convert each measurement into a digital code. For example, at time t_n the PCM circuits look at the signal at A. The height or level of sample A is then electronically compared with a built-in "scale." In this simplified illustration the level of the sample is 6, so 6 is encoded (in the binary number system, 6 would be 110, represented as shown by pulse, pulse, no-pulse). Codes from many signals may be interleaved in time, and a stream of electrical pulses representing all signals is sent over a transmission line. At the receiving terminal, other PCM circuits perform the inverse functions to restore the signals to their original analog forms. The experimental terminals operate with up to 512 codes per sample, and can code a sample into a 9-bit code in 80 nanoseconds.

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SCIENCE

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COVER

A perfect platinum crystal hemisphere of approximately 2000-angstrom radius, showing about 1000 net plane facets. Many of the facets have been resolved into single atoms. Three radiation damage spots appear on the left side, indicating the impact of three heavy negative ions of 25-kev energy. See page 591.

BERKELEY • 132nd AAAS

Order Your General Program

It provides complete, detailed information about all the sessions and symposia scheduled, the Annual Exposition of Science and Industry, and the Science Theatre.

Program Highlights

Moving Frontiers of Science: F. Clark Howell on Significant Advances in Human Evolutionary Studies; Norman F. Ness on A New Look at the Earth's Magnetic Field; Jerome Y. Lettvin on Physiological Basis of Mental Activity; and William M. Fairbank on Some Aspects of Low Temperature Physics.

AAAS Distinguished Lecture: Genetics and Cultural Change by George W. Beadle, president, University of Chicago.

Interdisciplinary Symposia: Ground-level Climatology; Proteins and Nucleic Acids; Materials Science in Medicine, Dentistry, and Pharmacy; Behavior, Brain, and Biochemistry; Mathematical Bases in Economic Planning.

Special Sessions: AAAS Presidential Address by Laurence M. Gould; the Joint Address of Sigma Xi and Phi Beta Kappa by J. Bronowski; the George Sarton Memorial Lecture; and the National Geographic Society Illustrated Lecture.

AAAS Committees: Special Program of the AAAS Committee on Council Affairs on Civil Defense; Committee on Desert and Arid Zones Research symposium on Evolving Water Law: Conflict between Federal and State Governments; Commission on Science Education.

Lawrence Hall of Science: Director Harvey E. White will lecture twice on this splendid Center of Science Education, 27 and 29 December.

Sections and Societies: The 20 AAAS Sections and some 92 participating societies are scheduling specialized symposia and papers.

AAAS Science Theatre: The latest foreign and domestic films.

Exhibits: The Annual Exposition of Science and Industry is on the lower level of the ASUC Student Center, AAAS Headquarters.

Advance Registration: By registering in advance, you avoid delay at the Registration Center on arrival; you receive the **General Program** in time to plan your days at the meeting; and your name is posted in the Visible Directory of Registrants when the meeting opens. Use the coupon below.

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Please mail this coupon and your check or money order for the total amount to the AAAS in Washington, D.C. (address as shown)

MEETING • 26-31 DECEMBER

Make Your Reservations

Make sure you have the sleeping accommodations you prefer. Since this is a campus meeting—and the ASUC Student Center is AAAS headquarters—society headquarters will be mainly in university buildings.

Hotel and Motel Information. A deposit of $5 is required by all hotels and motels. Deposits are credited toward the final bill, and are refunded if cancellation is received not later than 10 days before the date of your reservation. Make checks payable to the AAAS Housing Bureau.

Residence Hall Information. Accommodations are available for one or two persons per room, for couples, and for children 14 years or older. Hours for room registration at the Hall are 8:00 a.m.–10:30 p.m. daily. The full amount for room, with or without meals, is collected in advance. There is a special charge for overnight 30 December (no meals December 31): $6.00 single occupancy, $5.00 per person double. Parking is 50¢ per 24-hour day. The general deadline for residence hall reservations is 10 December.

For more details on all of the above facilities and services, see the 23 July issue of Science, page 452.

The hotel, motel, and residence hall sleeping accommodations are for your convenience in making your room reservation in Berkeley. **Please use the coupon below and send it and any necessary deposit directly to the AAAS Housing Bureau in Berkeley.** Give a definite date and estimated hour of arrival, and also your probable date of departure. The Housing Bureau will make the assignment and promptly send you a confirmation.

Rates per Day

HOTELS	Single	Double	Twin	Suite	Parking
Claremont (300)	$11.00	$15.00	$15.00		Free
Durant (200)	8.50*		12.00*	$18.00-22.00	50¢, $1.00
Shattuck (250)	8.50	11.00	14.00	25.00-35.00	Public

* A few single rooms at $5.50, twins at $7.50.

MOTELS	Single	Double	Twin	Suite	Parking
Berkeley House (112)	10.50	14.50	14.50	25.00-28.00	
Berkeley Plaza (52)	7.00	8.50	9.50	15.00	
Berkeley Travelodge (46)	8.00	10.00	11.00		
California Motel (42)	6.50	7.00	8.00		
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Single occupancy—$7.50 without meals; $8.50 with breakfast and lunch
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P.O. Box 210
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Please reserve the following accommodations for the 132nd Meeting of the AAAS in Berkeley, 26-31 December 1965

First Choice of Hotel, Motel, or Residence Hall ....Second Choice ....

Type of room: Single ☐ Double bed ☐ Double, twin beds ☐ Suite ☐ Rate: Desired .... Maximum rate.............

Number in party .... Sharing this room will be: ....

(List name and address of each person, including yourself. Attach list if space is insufficient.)

....

DATES: ARRIVAL .... A.M. ............P.M. .... DEPARTURE ....

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

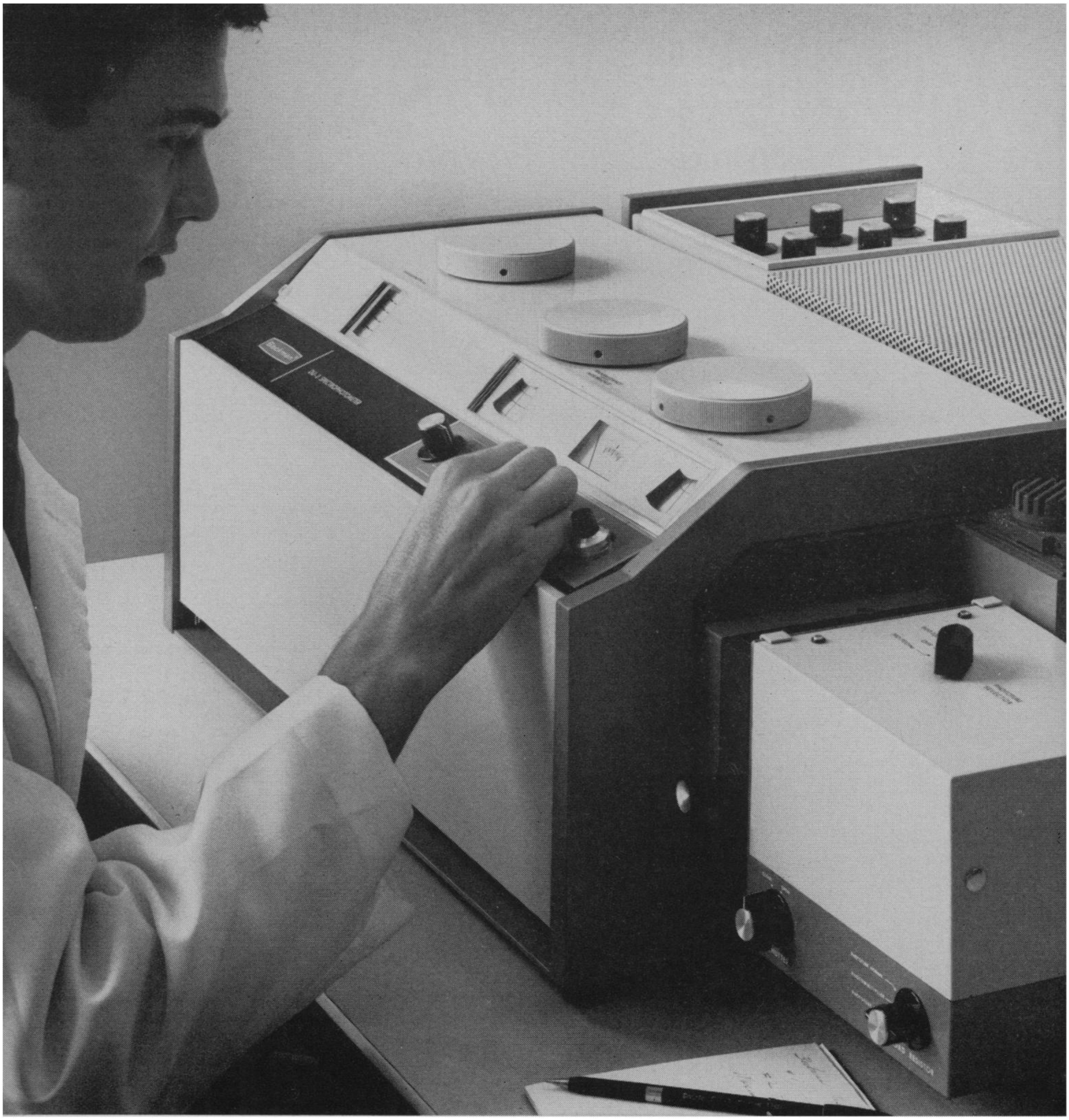
NAME ....

(Individual requesting reservation) (Please print or type)

ADDRESS ....

(Street) (City) (State) (ZIP Code)

Mail this coupon now to the AAAS Housing Bureau. Enclose hotel or motel room deposit if needed. Make checks payable to AAAS Housing Bureau. All rooms will be assigned and confirmed in order of receipt of reservation.



still so small compared to the total national product that society can afford to support all of the worth-while scientific projects. It is not yet necessary to slow down the search for answers to basic questions, such as questions of the ultimate structure of matter or of the nature of life. As long as we still live in a period of scientific expansion, the community of scientists should fight together for a larger support for science as a whole. This is better done if scientists restrict their public activities to the praise of their own fields and refrain from attacking the fields of their colleagues. There will be a time in the not-too-distant future, however, when much wisdom and insight will be required to establish a healthy and broad scientific frontier within the limitation of means which may be no longer small compared to the total national product.

VICTOR F. WEISSKOPF
European Organization for Nuclear Research, Geneva 23, Switzerland

Ornstein dismisses the effort to justify high-energy physics in terms of certain general goals or attitudes of society as "flimsy metaphysics." But in the long run, pure science of any kind must be justified in these terms, rather than for the benefits it brings to society in the form of technology. To do otherwise is to distort the very aims of scientific research. It is simply false to pretend that physicists, and perhaps most biologists, are highly motivated in their research by the desire to improve social welfare; and if society will support only those working toward that end, it will have set up restrictions around science that will eventually destroy it. Or else the scientists will be driven to making overoptimistic claims for the possible applicability of their research, regardless of the distortion involved in doing so. Examples of this are already common in much of the dialogue between scientists and government. At least some of the contributions to *The Nature of Matter* were designed to give a different type of justification for support of high-energy physics.

Surely Ornstein must realize that societies do carry out expensive projects not for immediate benefits but for reasons of the type he calls metaphysical. One may cite such examples as the building of the Pyramids or of the medieval cathedrals—or, to use his own example, the Apollo project, which properly should be regarded not as a scientific experiment but rather as an expression of the human spirit. I for one am pleased that such motives play some role in social decisions.

The relation of atomic or particle physics to chemistry and biology is not a simple one, and Ornstein's comments seem to me to be somewhat incomplete. It can be granted that future research in particle physics is unlikely to turn up new laws relevant to biology. The fact remains that much of the best research in contemporary biology is strongly influenced by modern physics. The paper of Watson and Crick on DNA is a good case in point. This paper is written in the language of molecular physics and would have been incomprehensible to anyone unfamiliar with such physics. Indeed, the role of physics in biology can hardly be to describe biological phenomena as a special case of the 10^{23} body problem. Physics does not work this way even in such areas as solid-state phenomena. Instead, what physics does for other sciences is to state the general laws which all material systems must obey, such as conservation of energy, and to sometimes suggest specific mechanisms which may play an important role in systems of interest to another science. All of this is so elementary that one hesitates to dwell on it, but there is a danger that simple things may be obscured by deep feelings.

It is a good thing for scientists to discuss such issues among themselves. One might hope that the discussion will be carried out in a fraternal spirit rather than as a struggle for the lion's share of the public watering hole. If a scientist has a project that he considers worth while, no matter how expensive, he should propose it for the consideration of other scientists and society on its own merits. One cannot expect a man with a deep interest in a particular area to weigh its merits objectively in comparison with other fields in which he has no such interest. What one can expect is that he clearly indicate what he wishes to do, and say honestly why he thinks it is worth doing. This is what the high-energy physicists have attempted in *The Nature of Matter*.

G. FEINBERG
Department of Physics, Columbia University, New York 10027

CHARGED PARTICLES

Extending the capabilities of research equipment

Results from Tandem Research Program

The Tandem Research Group has made notable progress in the past year. Significant experimental results from the program are:

1. 250 mA high-brightness positive ion beam from an expanded-plasma source operating at 38 kv.

2. 270 μA analyzed beam of H_1^+ ions out of the Research Tandem with 320 μA H^- injection and water-vapor stripping.

3. 2.0 μA analyzed dc beam of He^- ions. The previous maximum current routinely available has been 0.1 μA with the EN source.

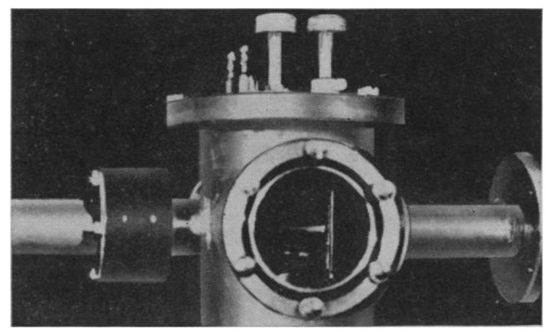
Doubly Charged Helium Ions

Components are now available for converting 3, 4 and 5 MeV machines to produce He^{++} ions at higher energies. Specifications: 30 μA at 5.0 MeV; 10 μA at 7.0 MeV; 5 μA at 10.3 MeV. More than double this current performance has been demonstrated but with some loss in stability and reliability. Multiple-charge states (2, 3 and 4) of neon, oxygen and nitrogen have also been produced with the new kit installed in a 3 MeV Van de Graaff. Beam energies from 5.04 MeV to 9.8 MeV and beam currents from 0.1 to 10 μA were observed. For details on the new HE^{++} kit and experimental results, write for Technical Note #13.

Optical Spectroscopy of Excited Atomic States

When an energetic beam of ions is passed through a thin foil, the charge state of the ion may change, either up or down. The emitted particles may be left in states of electronic excitation from which visible light is subsequently emitted during de-excitation. The emitted light spectrum is characteristic of the excited ion. When particle beams of approximately 0.4 μA or more are used, the light is sufficiently intense for spectroscopic analysis.

The refinement and application of this technique promises to be of major importance in the theory of atomic structure, in measuring hot plasma temperatures, and in acting for the means of energy loss in fast fission fragments in an absorber. Perhaps most importantly, it will help determine the relative abundance of the elements in the sun and other stars, which is the basis for theory of stellar evolution, the origin of the chemical elements, the age of astronomical objects and the nature of the stellar energy. For further details, ask for Technical Note #10.

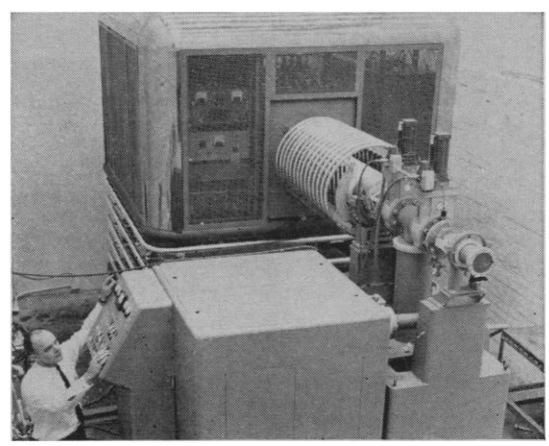


A nitrogen beam, 0.8 μA at 2 MeV, passes from right to left through a carbon foil approximately 9 $\mu g/cm^2$ thick.

Intense Ion Beams at 500 kv

The ICT-500 keV positive ion accelerator now being built by High Voltage Engineering operates at energies from 100 to 500 keV dc and pulsed. In performance tests, the machine has produced analyzed ion beam currents from 4 mA at 100 keV to 10 mA from 300 to 500 keV. 10 mA dc positive ion beam currents of H^1, H^2, and D^1 have been produced at a target located 6 feet from the end of the acceleration tube. Beam diameter is 15 millimeters maximum for all particles over the entire energy range. Previous experience with a similar machine of 300 keV maximum energy showed 15 mA of d_2^+ and a 3 centimeter beam diameter. The ICT-500 positive ion accelerator is designed for dc and pulsed operation in the nanosecond and microsecond range with a minimum pulse length of 2 nsec. at a repetition rate of 2.5 Mc/s. Pulse content is 1 mA protons and 0.7 mA deutrons.

The particle source utilized with the ICT-500 positive ion accelerator is an expanded plasma type which has produced 70 mA total beam at 500 kv.



The high-brightness, intense ion beam produced by the ICT-500 accelerator is eminently suited for laboratory production of 14 MeV neutrons for cross-section measurements, dosimetry studies, weapons-effect simulation and special low-density target experiments.

For detailed information, write to Technical Sales, High Voltage Engineering Corp., Burlington, Mass. or HVE (Europa) N. V. Amersfoort, The Netherlands. Subsidiaries: Electronized Chemicals Corporation, Ion Physics Corporation. ARCO Division, Walnut Creek, California.

HIGH VOLTAGE ENGINEERING

6 August 1965, Volume 149, Number 3684

SCIENCE

Distribution of U.S. Scientific Literature

There is growing recognition that English has become the language of science. A related development is an increasing foreign demand for U.S. scientific publications. On page 617 of this issue are printed statistics on the foreign distribution of *Science*. Our circulation is about 112,000; 9804 of these copies are sent outside the continental United States. The journal has subscribers in most nations, including China. Canada tops the list, the United Kingdom is second, and Japan is third.

The circulation of *Science* abroad is expanding. During the last year it increased 30 percent, while the domestic circulation was up 10 percent. In the past, the AAAS has concentrated on seeking membership in this country; in the future, citizens of other nations will be made aware that they too are welcomed as members or subscribers.

Publications of other American scientific organizations are also distributed widely abroad. The *Journal of Geophysical Research* is sent to about 7000 domestic and 2100 foreign members and subscribers. The growth rate of the non-U.S. component is three times that of the U.S. component.

The American Institute of Physics publishes 14 journals as well as translations of ten Russian periodicals. About 30 percent of the circulation of fundamental journals is foreign. Ranked by number of subscribers per million of population, the top five countries are as follows: United States, Israel, Canada, Switzerland, and Sweden. Figures for the U.S.S.R. are not meaningful, since the Russians make many copies of U.S. publications.

Distribution of the publications of the American Chemical Society is particularly significant. No nation can hope for a strong economy without an adequate base in chemistry. Fully a third of the copies of the fundamental publications of ACS are distributed abroad. Membership in the American Chemical Society is worldwide; in 1963 it totaled 86,249 domestic and 6545 foreign. The leading foreign countries on the basis of total membership were Japan (1413), Canada (893), the United Kingdom (524), and Italy (458). Leaders on the basis of membership per million inhabitants were Israel (59), Switzerland (58), Canada (45), and Sweden (25). In contrast, the continent of Africa outside of the Union of South Africa had a membership of about 0.3 per million.

Subscriptions to *Chemical Abstracts* provide an interesting measure of a nation's industrial potential. This publication covers the literature, from all parts of the world, that might be of interest to chemists. This includes pure and applied chemistry and much of physics, biology, geology, and technology. In overall performance, *Chemical Abstracts* is the best publication of its kind. Few first-rate research establishments can afford to be without it. The cost, however, ($1200 to industrial organizations) is such as to discourage frivolous subscriptions. The total circulation of *Chemical Abstracts* in 1963 was 6759, of which 3866 were foreign. The major users include Japan (1016), the United Kingdom (524), and France (357). In terms of copies per million inhabitants the United States (15) is first and Israel (12.5) is second; the figure for the other major industrial nations, except for the U.S.S.R., is about 10. The underdeveloped nations have a subscription rate of about 0.15 per million.

The world is in the midst of great changes in the distribution and use of scientific literature. The utilization of U.S. publications abroad is increasing. Through distribution of our literature we are making important contributions to the industrial development of those nations capable of using it.—PHILIP H. ABELSON

(J. D. Gates, 1201 16th St., NW, Washington, D.C. 20036)

29–2. American Assoc. of **Clinical Chemists**, 17th natl., Chicago, Ill. (M. E. Hanke, 8424 Rhodes Ave., Chicago)

29–2. **Illuminating Engineering** Soc., New York, N.Y. (A. D. Hinckley, 345 East 47 St., New York 10017)

29–3. AAAS, Laurentian **Hormone** Conf., Mont Tremblant, Quebec, Canada. (J. C. Foss, Laurentian Hormone Conf., 222 Maple Ave., Shrewsbury, Mass.)

29–10. **Forest Hydrology**, intern. symp., Pennsylvania State Univ., University Park. (W. E. Sopper, School of Forestry, Pennsylvania State Univ., University Park)

30–31. **Past and Future of Science**, symp., Krakow, Poland. (B. Suchodolski, Polish Acad. of Sciences, Palace of Culture and Sciences, Warsaw)

30–1. **Antennas and Propagation**, intern. symp., Washington, D.C. (R. J. Adams, Code 5330, U.S. Naval Research Laboratory, Washington 20390)

30–1. Applied **Mechanics**, West Coast conf., Univ. of California, Los Angeles. (P. M. Naghdi, Div. of Applied Mechanics, Univ. of California, Berkeley 94720)

30–1. **Rare Earth Research**, 5th conf., Iowa State Univ., Ames. (S. Legvold, Dept. of Physics, Iowa State Univ., Ames)

30–1. **Structural Dynamics and Aeroelasticity**, conf., Boston, Mass. (F. C. Hung, Space Information Systems Div., North American Aviation, Inc., Downey, Calif.)

30–2. **Fluorine Chemistry**, 3rd intern. symp., Munich, Germany. (F. Weygand, Inst. für Organische Chemie, Technische Hochschule München, Arcisstr. 21, 8 Munich 2)

30–2. **Mathematical** Assoc. of America, 46th summer, Cornell Univ., Ithaca, N.Y. (H. M. Gehman, State University of New York at Buffalo, Buffalo 14214)

30–2. **Regional Science** Assoc., 5th European congr., Krakow, Poland. (H. Wood, Dept. of Regional Science, Univ. of Pennsylvania, Philadelphia 19104)

30–2. American **Sociological** Assoc., Chicago, Ill. (G. M. Sykes, ASA, 1755 Massachusetts Ave., NW, Washington, D.C.)

30–3. **Neuropathology**, 5th intern. congr., Zurich, Switzerland. (O. T. Bailey, 912 S. Wood St., Chicago, Ill. 60612)

30–3. **Nuclear Materials Management**, intern. symp., Vienna, Austria. (J. H. Kane, Div. of Special Projects, U.S. Atomic Energy Commission, Washington, D.C.)

30–3. Society for Applied **Spectroscopy**, 4th natl., Denver, Colo. (M. W. Skougstad, 215 Hewitt Bldg., Denver 80202)

30–4. **Ionization Phenomena** in Gases, 7th intern. conf., Belgrade, Yugoslavia. (Organizing Committee, Studentski trg. 16/C/IV, P.O.B. 699, Belgrade)

30–4. **Macromolecular Chemistry**, intern. symp., Prague, Czechoslovakia. (O. Wichterle, 1888 Petriny, Prague 6)

30–4. **Organometallic Chemistry**, 2nd intern. symp., Madison, Wis. (R. West, Dept. of Chemistry, Univ. of Wisconsin, Madison)

30–10. **Population**, 2nd world conf., Belgrade, Yugoslavia. (United Nations Population Commission, United Nations, New York)

30–10. International Inst. of **Refrigeration**, symp., Prague and other cities, Czechoslovakia. (Organizing Committee, Prague 5-Smíchov, Ostrovského 34, Czechoslovakia)

31–11. **Information Theory**, Statistical Decision Functions and Random Processes, 4th conf., Prague, Czechoslovakia. (F. Hrabal, Foreign Relations Dept., Czechoslovak Acad. of Sciences, Narodni tr. 3, Prague 1)

September

1–3. American **Geophysical** Union, 5th western natl. mtg., Dallas, Tex. (AGU, 1145 19th St., NW, Washington, D.C.)

1–3. **Metallurgists**, 4th annual conf., Ottawa, Ont. (Canadian Inst. of Mining and Metallurgy, 906 Drummond Bldg., 117 St. Catherine St., W., Montreal, Que.)

1–3. Biomedical Aspects of **Shock and Vibration Technology**, symp., Denver, Colo. (E. R. Wilson, 5745 S. Huron St., Littleton, Colo. 80120)

1–4. **Aeronautics**, 6th European congr., Munich, Germany. (Wissenschaftliche Gesellschaft für Luft und Raumfahrt, Martinstr. 40–42, 5 Cologne)

1–4. International Assoc. of **Gerontology**, European Clinical section, 4th congr., San Remo, Italy. (A. Zilli, Viale Morgagin 85, Florence, Italy)

1–4. **Immunological Methods**, symp., Chantilly, France. (R. H. Regamey, Intern. Assoc. of Microbiological Societies, Inst. d'Hygiene, 1200 Geneva, Switzerland)

1–4. Society of General **Physiologists**, 20th annual, Marine Biological Laboratory, Woods Hole, Mass. (R. Milkman, Dept. of Zoology, Syracuse Univ., Syracuse, N.Y. 13210)

1–5. **Regional Science** Assoc., 5th European congr., Warsaw, Poland. (H. Wood, Dept. of Regional Science, Univ. of Pennsylvania, Philadelphia 19104)

1–8. **History of Pharmacy**, intern. congr., London, England. (A. L. Short, Pharmaceutical Soc. of Great Britain, 17 Bloomsbury Sq., London W.C.1)

1–9. **Physiological Sciences**, 23rd intern. congr., Tokyo, Japan. (G. Kato, Dept. of Physiology, Keio Univ. School of Medicine, Shinjuku-ku, Tokyo)

1–14. **Cosmical Gas Dynamics**, 5th symp., Nice, France. (M. Roy, Intern. Union of Theoretical and Applied Mechanics, 55, boul. Malesherbes, Paris 8^e^, France)

1–17. **Algebraic Number Theory**, instructional conf., Brighton, England. (R. R. Laxton, Mathematics Div., Physics Bldg., Univ. of Sussex, Brighton)

2–4. American **Physical** Soc., Honolulu, Hawaii. (K. K. Darrow, The Society, Columbia Univ., New York 10027)

2–5. International Medical Assoc. for the Study of **Living Conditions and Health**, 4th world congr., Karlovy Vary, Czechoslovakia. (Secretariat, Apolinárská 18, Prague 2)

2–9. German **Mineralogical** Soc., 43rd, Hanover, Germany. (F. Buschendorf, Mineralogisches Inst., Technische Hochschule Hanover, Welfengarten 1, 3 Hanover)

3–7. American **Psychological** Assoc., 73rd annual, Chicago, Ill. (The Association, 17th and Rhode Island Ave., NW, Washington, D.C.)

5–7. **Water Pollution**, 3rd intern. conf., Munich, Germany. (B. B. Berger, P.O. Box 1907, Washington, D.C.)

5–8. Federation of French-Speaking Societies of **Gynaecology and Obstetrics**, 21st congr., Lausanne, Switzerland. (P. Bloch, Hopital Cantonal, Lausanne)

5–8. **Mathematics**, 7th Canadian congr., Quebec, Canada. (The Congress, 985 Sherbrook St. W., Montreal, Que.)

5–9. **Allergology**, 6th European congr., Stockholm, Sweden. (S. Kraepelien, Sachs Children's Hospital, Stockholm)

5–9. **Biochemistry of Lipids**, 9th intern. congr., Noordwijk, Netherlands. (J. Boldingh, Unilever Research Laboratorium, Mercatorweg 2, Vlaardingen, Netherlands)

5–9. **Luminescence**, symp., Munich, Germany. (N. Riehl, Arcisstr. 21, 8 München, Germany)

5–9. International League Against **Rheumatism**, 11th congr., Buenos Aires, Argentina. (A Caruso, Juncal 1875, Planta Baja, Depto. 2, Buenos Aires)

5–9. Physics and Chemistry of **Scintillators**, intern. luminescence symp., Munich, Germany. (H. Kallman, Radiation and Solid State Laboratory, Dept. of Physics, New York Univ., New York 3)

5–10. International Committee of **Electrochemical Thermodynamics and Kinetics**, 16th mtg., Budapest, Hungary. (S. Lengyel, ELTE Fizikai-Kemial es Radiologiai Tanszek, Puskin u. 11–13, Budapest 8)

5–10. **Electromyography**, intern. mtg., Vienna. (K. Pateisky, Universitats Nervenklinik, 14 Lazarettgasse, Vienna 9)

5–10. **Neurology**, 8th intern. congr., Vienna, Austria. (Congress Office, Vienna Academy of Medicine, Alserstr. 4, Vienna 9)

5–10. Ecology of **Soil Bacteria**, symp., Liverpool, England. (N. A. Burges, Univ. of Liverpool, Hartley Botanical Laboratories, Liverpool)

5–12. **Electroencephalography and Clinical Neurophysiology**, 6th intern. congr., Vienna, Austria. (M. A. B. Brazier, Brain Research Inst., Univ. of California Medical Center, Los Angeles 24)

5–14. **Fertility and Sterility**, 5th intern. congr., Madrid, Spain. (J. Ascenzo Aabello, Parque Meliton Porras, 161, Miraflores, Lima, Peru)

6–9. **Organosilicon Chemistry**, intern. symp., Prague, Czechoslovakia. (Inst. of Chemical Process Fundamentals, Prague-Suchodol 2)

6–9. **Thermal Analysis**, first intern. conf., Aberdeen, Scotland. (C. B. Murphy, Bldg. 5, General Electric Co., 1 River Rd., Schenectady, N.Y.)

6–10. **Embryology**, 7th intern. conf., Edinburgh, Scotland. (A. S. G. Curtis, Dept. of Zoology, University College London, Gower St., London W.C.1, England)

6–10. **Plasma Physics and Controlled Nuclear Fusion Research**, 2nd conf., Abingdon, England. (H. H. Storhaug, Div. of Scientific and Technical Information, Intern. Atomic Energy Agency, Kärntner Ring 11, Vienna 1, Austria)

6–10. European Organization for **Quality Control**, 9th conf., Rotterdam, Netherlands. (Secretariat, Weena 700, Rotterdam)

6–10. International Union of Directors of **Zoological Gardens**, annual, Berlin, Germany. (E. M. Lang, Zoologischer Garten, Basel, Switzerland)

6–11. **Electromagnetic Distance Measurement**, symp., London, England. (R. C. A. Edge, Field Survey, Ordnance Survey, Leatherhead Rd., Chessington, Surrey)

6–11. **Electromagnetic Wave Theory**, Intern. Scientific Radio Union, symp., Delft, Netherlands. (R. Timman, Technological Univ., Julianalaan 132, Delft)

6–11. **Polarization Phenomena of Nucleons**, 2nd intern. conf., Karlsruhe, Germany. (H. Schopper, Institut für Experimentelle Kernphysik, Kernforschungszentrum Karlsruhe, Postfach 947, 75 Karlsruhe)

6–11. Basic Problems in **Thin Film Physics**, intern. symp., Clausthal-Göttingen, Germany. (R. Nossek, Physikalisches Institut, Technische Hochschule, Clausthal)

6–12. International Soc. for Research on **Nutrition and Vital Substances**, Salzburg, Austria. (H. A. Schweigart, The Society, Bemeroderstr., 61, Hanover-Kirchrode, Germany)

6–12. **Photosynthesis**, Western European conf., Zeist, Netherlands. (J. C. Goedheer, Physica Inst., State Univ., Bijlhouwerstraat 6, Utrecht, Netherlands)

6–17. **Cosmic Rays**, 9th intern. conf., London, England. (C. J. Hatton, Physics Dept., Leeds Univ., Leeds 2, England)

6–17. **Equatorial Aeronomy**, 2nd intern. symp., Brazilian Space Commission, São José dos Campos, Brazil. (F. de Mendonca, Comissão Nacional de Atividades Espaciaia, São José dos Campos)

6–17. **Laboratory Animal Husbandry**, symp., Dublin, Ireland. (M. L. Conalty, Medical Research Council Laboratories, Trinity College, Dublin 2)

7–9. **Electronic Materials**, conf., San Francisco, Calif. (American Inst. of Mining, Metallurgical and Petroleum Engineers, 345 E. 47 St., New York 17)

7–9. Internal **Friction** in Solids, conf., Manchester, England. (G. M. Leak, Dept. of Metallurgy, Univ. of Manchester, Manchester 13)

7–9. **Minerals**, Soc. of Mining Engineers fall mtg., Phoenix, Ariz. (American Inst. of Mining, Metallurgical and Petroleum Engineers, 345 E. 47 St., New York 17)

7–9. Biology of **Parasites of Veterinary Importance**, World Assoc. for the Advancement of Veterinary Parasitology, 2nd intern. conf., Univ. of Pennsylvania, Philadelphia. (S. M. Gaafar, Dept. of Veterinary Microbiology, Pathology, and Public Health, Purdue Univ., Lafayette, Ind.)

7–10. **Virus and Vector on Perennial Hosts**, intern. conf., Davis, Calif. (B. Hewitt, Dept. of Plant Pathology, Univ. of California, Davis 95616)

7–14. **Acoustics**, 5th intern. congr., Liége, Belgium. (J. Frenkiel, 33 rue St.-Gilles, Liége)

8–10. **Automation** in Analytical Chemistry, intern. symp., New York, N.Y. (E. C. Whitehead, Technicon, Research Park, Chauncey, N.Y.)

8–10. **Biochemistry of Copper**, intern. symp., Harriman, N.Y. (J. Peisach, Dept. of Pharmacology, Albert Einstein College of Medicine, Yeshiva Univ., New York 61)

8–10. **Genetics** Soc. of America, Colorado State Univ., Fort Collins. (R. P. Wagner, Univ. of Texas, Austin)

8–10. **Magnet Technology**, intern. symp., Stanford Univ., Stanford, Calif. (R. H. Moulton, Jr., Stanford Linear Accelerator Center, P.O. Box 4349, Stanford Univ., Stanford)