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<td>Union, New Jersey</td>
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<tr>
<td>A</td>
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<tr>
<td>B</td>
<td>0-5.0</td>
<td>0.005</td>
</tr>
<tr>
<td>C</td>
<td>0-10.0</td>
<td>0.010</td>
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<tr>
<td>D</td>
<td>0-15.0</td>
<td>0.050</td>
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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 H₂⁺ 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.

Intense Ion Beams at 500 keV

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⁺, H²⁺, and D⁰ 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 deuterons.

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This book presents a survey of the development and current technology of data transmission; attention is focused on techniques applicable to transmission over band-limited channels, with special emphasis on voice-band telephone circuits.

The central problem of data transmission over such channels is the intersymbol interference that results from band-limiting and nonuniformity of channel amplitude and phase. Efficient transmission requires a signal design suited to the bandwidth limitations of the channel and equalization of the channel characteristics to reduce channel-induced perturbations to an acceptable level. The authors focus their attention on the question of signal design for band-limited channels; in particular, for each of a number of modulation-detection systems, received-signal spectra are derived which result in zero intersymbol interference. Results are obtained for the low-pass, or “baseband,” channel and for amplitude, frequency, and phase modulation. The spectra derived are directly applicable for signaling over an ideal, band-limited channel. The effects of perturbations inherent in real channels are considered only qualitatively. Although the results presented are interesting in their own right, the degree of mathematical detail tends to emphasize the differences between the various signaling systems rather than the underlying principles that lead to zero intersymbol interference. It should also be noted that the “raised cosine” shape which forms the basis for most of the spectra considered is only one of a class of spectra that lead to the desired result; omitting consideration of alternatives results in a biased picture of their relative importance.

Considering the book as a whole, great emphasis is placed on the question of signal design, whereas questions of channel equalization, carrier recovery, and synchronization are given comparatively brief treatment. The potential for much more efficient utilization of band-limited channels, which has been demonstrated in recent work on error correction techniques and adaptive receivers, is mentioned only in passing.

In summary, this book presents a useful compilation of contributions to the problem of signal design for data transmission and includes a brief survey of other topics relating to data transmission by telephone line.

Paul R. Drouilhet
K. L. Jordan
Lincoln Laboratory, Massachusetts Institute of Technology, Lexington

Note


Each memoir includes a photograph of the Fellow and a bibliography of his published works.

New Books

Biological and Medical Sciences


Autogenic Training: Correlations Psychosomatique. Wolfgang Luthe, Ed. Grune and Stratton, New York, 1965. 339 pp. Illus. $14.50. Fifty-four papers on the following topics: Theory and Research (18 papers); Clinical Application (21 papers); and International Perspectives (15 papers); the papers are in German, English, or both.


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particular system. As an example, J. Hoffman (National Bureau of Standards) described the application of nucleation theory in polymer crystallization. This is a new field which has been developing rapidly in the past few years and has given rise to a much greater understanding of the relationship between solid state structure of polymers and their mode of crystallization. Another area where theoretical and experimental developments have run parallel is that of heterogeneous vapor deposition, particularly the deposition of metal atoms. J. Hirth (Ohio State University) reviewed this area and felt that classical theory represented the situation fairly well. This view is in strong contradiction to some recent theories and some lively discussion ensued over the value of using contact angles as a suitable thermodynamic parameter. Although there was a sharp division of opinion on this point, Hirth adequately summarized the situation by saying that the contact angle could be considered as a rug under which many of the uncertainties could be conveniently swept.

In the second category, emphasis was on experimental data which could be related to essentially unmodified theory. S. Mossop (Commonwealth Scientific and Industrial Research Organisation, Australia) reviewed the current status of knowledge in cloud physics. He commented that only in recent years have fundamental studies enabled a quantitative approach to be formulated for cloud nucleation. This comment was amplified later in the proceedings when some recent experimental studies of water vapor condensation were outlined. A. Nielsen (University of Copenhagen) reported continued studies relating precipitation of sparingly soluble salts to the Volmer-Becker-Döring formulation; he mentioned recent successes in unraveling the role of homogeneous and heterogeneous nucleation in precipitation studies. Nielsen suggested that the relative solution of ions affects the kinetics of nucleation; he illustrated this effect with recent results. The role of nucleation processes in ceramics and noncrystalline solids was considered by R. Maurer (Corning Glass Research Laboratories), and was extended by an interesting contribution from J. Hammel (Pittsburgh Plate Glass Company). The degrees of quenching possible in glass transitions enable quite extensive nucleation studies, both homogeneous and heterogeneous, to be carried out.

In diversifying the areas of interest
at this symposium, the organizers included physiological nucleation processes; bone mineralization and gall stone formation were considered. The former area was reviewed by M. Glimcher (Harvard University), and his discussion turned out to be one of the highlights of the symposium. A brisk discussion following this paper centered around the form of calcium phosphate which nucleates at serum pH. Some of the participants felt that octocalcium phosphate was a metastable precursor to bone mineral; Glimcher felt that hydroxyapatite nucleated directly. Both factions agreed, however, that in physiological processes the nature of the initiating nucleus was dependent upon the protein substrate.

From general comments and discussion following the papers it seems that at least one of the major symposium aims, that of improving communication between various areas of nucleation study, was attained. The symposium was sponsored jointly by the National Science Foundation and Case Institute of Technology. Abstracts of the proceedings may be obtained from the undersigned.

A. G. WALTON
Department of Chemistry,
Case Institute of Technology,
Cleveland, Ohio

Forthcoming Events
June
20–23. American Soc. of Agricultural Engineers, 58th annual, Univ. of Georgia, Athens. (J. L. Butt, P.O. Box 229, St. Joseph, Mich.)
20–24. American Soc. of Mammalogists, Winnipeg, Manitoba, Canada. (B. P. Glass, Dept. of Zoology, Oklahoma State Univ., Stillwater 74075)
20–24. American Nuclear Soc., 11th natl., Gatlinburg, Tenn. (ANS, 244 East Ogden Ave., Hinsdale, Ill.)

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Ocean Park Blvd., Dept. A2-260, Santa Monica, Calif.)
21-23. Society for the Study of Development and Growth, annual, Carleton College, Northfield, Minn. (J. A. Schiff, Dept. of Biology, Brandeis Univ., Waltham, Mass.)
21-24. Automatic Control in Peaceful Uses of Space, intern. symp., Stavanger, Norway. (J. A. Aseltine, Aerospace Corp., P.O. Box 95085, Los Angeles, Calif.)
21-24. Fuel Cells, intern. symp., Brussels, Belgium. (Mr. Vanleughenhaghe, S.E.R.A.I., 1091, chaussee d'Alsemberg, Brussels 18)
21-25. Canadian Anaesthetists' Soc., annual, Charlottetown, Prince Edward Island. (S. M. Cassell, 178 St. George St., Toronto 5, Ont.)
21-25. Carbon, 7th biennial conf., Case Inst. of Technology, Cleveland, Ohio. (W. W. Lozier, Union Carbide Corp., Carbon Products Div., P.O. Box 6116, Cleveland, Ohio 44111)
21-26. AAAS Pacific Div., Riverside, Calif. (R. C. Miller, California Acad. of Sciences, Golden Gate Park, San Francisco 18)

The following societies plan to meet in conjunction with the AAAS Pacific Div.: American Meteorological Soc. (J. E. Miller, New York Univ., New York)
American Nature Study Soc. (B. O. Bergh, Univ. of California, Riverside)
American Phytopathological Soc., Pacific Div. (C. E. Horner, Oregon State Univ., Corvallis)
American Soc. for Horticultural Science, western regional (C. K. Labanauskas, Univ. of California, Riverside)
American Soc. of Ichthyologists and Herpetologists, western div. (R. Rosen-
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<td>Annual Premium (Payable only 16 Years)</td>
<td>$134.00</td>
<td>$159.00</td>
<td>$206.50</td>
</tr>
<tr>
<td>Cash Dividend End of First Year*</td>
<td>55.50</td>
<td>61.00</td>
<td>70.50</td>
</tr>
<tr>
<td>First Year Net Premium</td>
<td>$78.50</td>
<td>$98.00</td>
<td>$136.00</td>
</tr>
</tbody>
</table>

*These dividends are based upon the 1965 dividend scale and are, of course, not guaranteed.

This is a plan of level premium Term insurance which provides its largest amount of protection initially, reducing by schedule each year over a 20-year period to recognize decreasing insurance needs. There are several other insurance periods, and Home Protection policies are available at all ages under 56.

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Send the coupon for the new Life Insurance Guide and a personal illustration of TIAA policies for your age. TIAA is nonprofit and employs no agents.
27–30. Botanical Soc. of America, Northeastern Section, summer field meeting, Univ. of Maine, Orono. (R. K. Zuck, Dept. of Botany, Drew Univ., Madison, N.J.)

27–30. Canadian Pediatric Soc., annual, Ottawa, Ont. (CPS, 14 Green Ave., St. Lambert, Quebec)

27–2. American Crystallographic Assoc., Gatlinburg, Tenn. (W. L. Kehl, Gulf Research and Development Co., P.O. Box 2038, Pittsburgh, Pa.)


27–2. New Industrial Technologies, engineering seminar, Pennsylvania State University, University Park. (Continuing Education Conference Center, Pennsylvania State Univ., University Park 16802)

28–29. Hepatology, 4th intern. symp., Chianciano Terme, Italy. (Secretariat, via Nicolo Porpora 9, Rome)


28–30. Electromagnetic Scattering, conf., Univ. of Massachusetts, Amherst. (R. S. Stein. Polymer Research Inst., Univ. of Massachusetts, Amherst)

28–30. Relaxation Techniques in Chemical Kinetics, symp., State Univ. of New York, Buffalo. (Mrs. E. E. Schmidt, 193 Hayes Hall, State Univ. of New York, Buffalo 14214)


28–2. Vacuum, 3rd intern. congr., Stuttgart, Germany. (H. Adam, 5 Köl-Bayental, Postfach 195, West Germany)


29–1. Mutant Mice with Neurological Diseases, conf., Jackson Laboratory, Bar Harbor, Maine. (J. L. Fuller, Jackson Laboratory, Bar Harbor)

29–2. Data Processing Management Assoc., intern. conf., Philadelphia, Pa. (Conference Registrar, Data Processing Management Assoc., P. O. Box 1079, Philadelphia 19105)


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July

1–4. Astronomical League, Miami, Fla. (A. P. Smith, Jr., 1601 S.W. 10th St., Miami)


1–1 August. Theoretical Biology and Theoretical Biophysics, Colorado State Univ. colloquium, Fort Collins. (H. J. Morowitz, Dept. of Molecular Biology and Biophysics, Box 2166, Yale Station, New Haven, Conn.)

2–3. British Soc. for Immunology, summer meeting, Glasgow, Scotland. (I. Roitt, Courtauld Inst., Middlesex Hospital, London W.1, England)

2–4. Astronomical League, Milwaukee, Wis. (W. M. DuVall, 518 Emmertsen Rd., Racine, Wis. 53406)


5–10. French Soc. for the Advancement of Science, 84th annual congr., Tours. (The Association, 28 rue Serpente, Paris 6e, France)


6–9. American Dental Soc. of Europe, annual, Florence, Italy. (A. Sturridge, 35 Harley St., London W.1, England)


6–10. Plant Viruses, 5th intern. conf., Wageningen, Netherlands. (State Agricultural Univ. of Wageningen, Laboratory of Virology, Salverdalep10, Wageningen)


11–15. Psychoanalysis, 2nd intern. forum, Zurich, Switzerland. (G. Chrzanowski, 4 E. 95 St., New York 10028)

11–15. American Veterinary Medical Assoc., annual, Portland, Ore. (AVMA, Dept. of Public Information, 600 S. Michigan Ave., Chicago 5, Ill.)

12–14. Biological Sciences symp., 16th annual, Univ. of Michigan, Ann Arbor. (L. E. Mellett, Dept. of Pharmacology, Univ. of Michigan Medical School, Ann Arbor)

12–14. Physiology and Biochemistry of Muscle as a Food, symp., University of Wisconsin, Madison. (E. J. Briskey, College of Agriculture, Univ. of Wisconsin, Madison 53706)

12–14. Japan Soc. of Constitutional and Diathetic Medicine, congr., Kyoto, Japan. (The Society, Dept. of Pathology, Kyoto Univ., Kyoto)


13–16. Royal Medico-Psychological Assoc., annual, Glasgow, Scotland. (RMPA, 11 Chandos St., London W.1, England)


15–16. Water Quality Management in River and Reservoir Systems, hydraulic engineering research aspects, seminar, Vanderbilt Univ., Nashville, Tenn. (W. H. Wisely, American Soc. of Civil Engineers, 345 East 47 St., New York 17)


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