

SCIENCE

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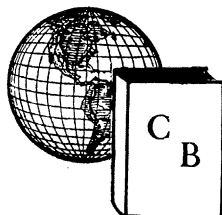
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Bell Laboratories researchers Henry S. McDonald, Dr. Eng. from Johns Hopkins, and Max V. Mathews, Sc.D. from M.I.T., examine magnetic tape used in new research technique. Voice waves are con-

verted into sequences of numbers by periodic sampling of amplitudes, 8000 samples per second. General purpose electronic computers act on these numbers as a proposed transmitting device might.

They send real voices on imaginary journeys

In their quest for better telephone service, Bell Laboratories researchers must explore many new devices proposed for the transmission of speech signals. For example, apparatus can be made to transmit speech in the form of pulses. But researchers must always answer the crucial question: how would a voice sent through a proposed device sound to the listener?

In the past it often has been necessary to construct costly apparatus to find out. Now the researchers have devised a way to make a high-speed electronic computer perfectly imitate the behavior of the device, no matter how complicated it may be. The answer is obtained without building any apparatus at all.

The researchers set up a "program" to be followed by the computer. Actual voice waves are converted into a sequence of numbers by sampling the waves 8000 times per second. Numbers and program are then fed into the computer which performs the calculations and "writes out" a new sequence of numbers. This new sequence is converted back into real speech. Listeners hear exactly how well the non-existent device could transmit a real voice.

With this novel technique, new transmission ideas are screened in only a fraction of the time formerly required. Thus valuable time and scientific manpower are saved in Bell Laboratories' constant search to provide still better service for telephone customers.

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pages), by J. W. Cornforth; "Benzoxazoles and related systems" (34 pages), also by Cornforth; "Isoxazoles" (32 pages), by R. A. Barnes; and "Thiazoles and benzothiazoles" (239 pages), by J. M. Sprague and A. H. Land. The pages are an index of the extent of the research work that has been reported on each of these ring systems.

Each chapter has an individual table of contents. The nomenclature and numbering scheme for each heterocyclic system are given, followed by discussions of structure, tautomerism, and resonance. The important syntheses, reactions, and physical and pharmacological properties are then treated in a critical fashion.

The authors and editor have done an excellent job of covering the literature and of organizing the material. The book is well printed and remarkably free from errors. An expanded general index assists greatly in locating specific topics. The book can be recommended to all scientists who are in need of an up-to-date survey of these heterocyclic ring systems.

RALPH L. SHRINER

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New Books

Alcoholism. Basic aspects and treatment. A symposium held under the auspices of the American Association for the Advancement of Science in cooperation with the American Psychiatric Association and the American Physiologic Society and presented at the Atlanta, Ga., meeting, 27-28 Dec. 1955. AAAS Publ. No. 47. Harold E. Himwich, Ed. American Association for the Advancement of Science, Washington, D.C., 1957. 212 pp. Members, \$5; nonmembers, \$5.75.

Selected Papers in Statistics and Probability by Abraham Wald. Edited for the Institute of Mathematical Statistics. T. W. Anderson, committee chairman. Stanford University Press, Stanford, Calif., 1957 (copyright 1955, McGraw-Hill, New York). 711 pp. \$10.

Laboratory Glass-Working for Scientists. A. J. B. Robertson, D. J. Fabian, A. J. Crocker, and J. Dewing. Academic Press, New York; Butterworths, London, 1957. 198 pp. \$4.

Botany. Carl L. Wilson and Walter E. Loomis. Dryden, New York, rev. ed., 1957. 528 pp. \$7.25.

Genus Pentremites and Its Species. Geological Society of America memoir 69. J. J. Galloway and Harold V. Kaska. Geological Society of America, New York, 1957. 113 pp.

The Structure of Nucleic Acids and Their Role in Protein Synthesis. Biochemical Society symposium No. 14 held at the London School of Hygiene and Tropical Medicine, 18 Feb. 1956. E. M. Crook, Ed. Cambridge University Press, Cambridge, England, 1957 (order from Cambridge University Press, New York 22). 74 pp. \$3.75.

Parthenogenesis and Polyploidy in Mammalian Development. R. A. Beatty. Cambridge University Press, Cambridge, England, 1957 (order from Cambridge University Press, New York 22). 143 pp. \$3.

Russian-English Atomic Dictionary. Eugene A. Carpovich. Technical Dictionaries Co., Box 144, New York 31, N.Y. 317 pp. \$12.

Voluntary Health Insurance in Two Cities. A survey of subscriber-households. Odin W. Anderson, research director, Health Information Foundation, and the staff of the National Opinion Research Center. Harvard University Press, Cambridge, Mass., 1957. 158 pp. \$5.

Bioenergetics. Albert Szent-Györgyi. Academic Press, New York, 1957. 153 pp. \$4.50.

Frequency Modulation Receivers. J. D. Jones. Philosophical Library, New York, 1957. 123 pp. \$6.

V.H.F. Television Tuners. D. H. Fisher. Philosophical Library, New York, 1957. 143 pp. \$6.

Energetics in Biochemical Reactions. Irving M. Klotz. Academic Press, New York, 1957. 71 pp. \$3.

Zoology. Alfred M. Elliott. Appleton-Century-Crofts, New York, ed. 2, 1957. 746 pp. \$7.

Biology. Claude A. Villee. Saunders, Philadelphia, 1957. 635 pp.

A Textbook of Histology. Alexander A. Maximow and William Bloom. Saunders, Philadelphia, ed. 7, 1957. 628 pp.

Exploring with Your Microscope. Julian D. Corrington. McGraw-Hill, New York, 1957. 235 pp. \$4.95.

The Psychology of Careers. An introduction to vocational development. Donald E. Super. Harper, New York, 1957. 372 pp. \$5.75.

Clinical Toxicology of Commercial Products. Acute poisoning (home and farm). Marion N. Gleason, Robert E. Gosselin, and Harold C. Hodge. Williams & Wilkins, Baltimore, Md., 1957. 1160 pp. \$16.

Physical Science for Liberal Arts Students. Hugo N. Swenson and J. Edmund Woods. Wiley, New York; Chapman & Hall, London, 1957. 333 pp. \$6.50.

Chromatography, a Review of Principles and Applications. Edgar Lederer and Michael Lederer. Elsevier, Amsterdam, ed. 2, 1957 (distributed by Van Nostrand, Princeton, N.J.). 731 pp. \$12.75.

Technology and Social Change. Francis R. Allen, Hornell Hart, Delbert C. Miller, William F. Ogburn, and Meyer F. Nimkoff. Appleton-Century-Croft, New York, 1957. 529 pp. \$7.

The Temple of Jerusalem. Studies in Biblical archaeology No. 5. Translated by B. E. Hooke. Andre Parrot. Philosophical Library, New York, 1955. 112 pp. \$2.75.

Vector Analysis. Louis Brand. Wiley, New York; Chapman & Hall, London, 1957. 295 pp. \$6.

Experimental Research on Ageing. Symposium of the Biological and Medical Research Committee of the International Gerontological Association's European Section. Basel, 4-7 Apr. 1956. F. Verzar, Ed. Birkhauser, Basel, 1956. 290 pp. F. 34.

Thermodynamics, an Advanced Treatment for Chemists and Physicists. E. A. Guggenheim. North-Holland, Amsterdam, ed. 3, 1957. 476 pp. \$9.75.

Galactic Nebulae and Interstellar Matter. Jean Dufay. Translated by A. J. Pomerans. Philosophical Library, New York, 1957. 352 pp. \$15.

Die Periphere Innervation. Emil Villiger. Benno Schwabe, Basel, 1957 (order from Intercontinental Medical Book Corp., New York 16). 210 pp. \$5.

Cytology and Cytogenetics. Carl P. Swanson. Prentice-Hall, Englewood Cliffs, N.J., 1957. 596 pp. \$13.35.

Insight, a Study of Human Understanding. Bernard J. F. Lonergan. Philosophical Library, New York, 1957. 815 pp. \$10.

Science and Human Life. J. A. V. Butler. Basic Books, New York, 1957. 172 pp. \$3.95.

Elastic Waves in Layered Media. Lamont Geological Observatory contribution No. 189. W. Maurice Ewing, Wenceslas S. Jardetzky, and Frank Press. McGraw-Hill, New York, 1957. 391 pp. \$10.

Light, Vegetation and Chlorophyll. J. Terrien, G. Truffaut, and J. Carles. Translated by Madge E. Thompson. Philosophical Library, New York, 1957. 228 pp. \$6.

BCG Vaccination against Tuberculosis. Sol. R. Rosenthal. With sections by Camille Guerin, Bernard Weill-Halle, and Arvid Wallgren. Little, Brown, Boston, 1957. 389 pp. \$7.50.

Microbial Ecology. Seventh symposium of the Society for General Microbiology held at the Royal Institution, London, Apr. 1957. Cambridge University Press, Cambridge, England, 1957. 396 pp. \$6.50.

Glacial and Pleistocene Geology. Richard F. Flint and New York; Chapman & Hall, London, 1957. 566 pp. \$12.50.

Essays in Metabolism. The John Purnett Peters number of the *Yale Journal of Biology and Medicine*. Louis G. Welt, Ed. Little, Brown, Boston, 1957. 207 pp. \$6.50.

Bibliography of Parapsychology. Compiled by George Zorab. Parapsychology Foundation, New York, 1957. 127 pp.

Proceedings of Four Conferences of Parapsychological Studies. Parapsychology Foundation, New York, 1957. 180 pp.

Principles of Epidemiology. Ian Taylor and John Knowelden. Little, Brown, Boston, 1957. 307 pp. \$9.

Ordovician Trilobites of Argentina. Special publ. 1, Department of Geology, University of Kansas. Horacio J. Harrington and Armando F. Leanza. University of Kansas Press, Lawrence, 1957. 276 pp. \$6.

The Inheritance of Coat Color in Dogs. Clarence C. Little. Cornell University Press, Ithaca, N.Y., 1957. 194 pp. \$4.

A Short Dictionary of Mathematics. C. H. McDowell. Philosophical Library, New York, 1957. 76 pp. \$2.75.

Radiation: What It Is and How It Affects You. Jack Schubert and Ralph E. Lapp. Viking, New York, 1957. 314 pp. \$3.95.

Clinical Pathology in General Practice. Specially commissioned articles from the *British Medical Journal*. Lippincott, Philadelphia, Pa., 1957 (published in Great Britain in 1955) 330 pp. \$5.