

SCIENTIFIC NOTES AND NEWS

DR. CHARLES FRANKLIN KETTERING, vice-president of the General Motors Corporation and general manager of its research laboratories, has been elected president of the American Association for the Advancement of Science.

COLONEL BRADLEY DEWEY, president of Dewey and Almy Chemical Company, Cambridge, Mass., formerly Rubber Director, has been elected president of the American Chemical Society for 1946. He will take office as president-elect on January 1, when Dr. Carl Shipp Marvel, professor of organic chemistry at the University of Illinois, becomes president, succeeding the late Thomas Midgley, Jr.

THE Edison Medal for 1944 has been awarded by the American Institute of Electrical Engineers to Dr. Ernst Fredrik Werner Alexanderson, consulting engineer of the General Electric Company, "for his outstanding inventions and developments in the radio, transportation, marine and power fields." The presentation will be made on January 24 at a joint session of the institute with the Institute of Radio Engineers during the Winter Technical Meeting, which will be held in New York from January 22 to 26. The Edison Medal, founded by associates and friends of Thomas A. Edison, is awarded annually for "meritorious achievement in electrical science, electrical engineering or the electrical arts" by a committee composed of twenty-four members of the American Institute of Electrical Engineers.

DR. OTIS W. CALDWELL, general secretary of the American Association for the Advancement of Science, was presented with the manuscripts for a brochure entitled "What's Ahead in Education?," prepared by his associates in educational experimentation and science teaching as a testimonial of their esteem and friendship on his seventy-fifth birthday. The presentation was made at a dinner at the Hotel Astor, New York City, on December 18.

PROFESSOR W. D. CAIRNS, of Oberlin College, for twenty-seven years secretary-treasurer and for the past two years president of the Mathematical Association of America, was elected on November 26 at the Chicago meeting honorary president for life.

THE following officers for 1945 were installed on November 7 at the fifth annual meeting of the Sigma Xi Club of Hawaii: *President*, Dr. C. K. Wentworth; *Vice-president*, Dr. F. G. Holdaway; *Secretary-Treasurer*, Dr. R. W. Hiatt; *Councilors*, Dr. W. B. Storey, Dr. F. P. Mehrlich and Dr. C. J. Engard, *ex officio*. The address of the retiring president was given by Dr. Engard, who is associate professor of botany at

the University of Hawaii. It was entitled "The Concept of Homology in the Plant Kingdom."

DR. ARTHUR C. COPE, associate professor of chemistry at Columbia University, has been appointed professor of chemistry in charge of the division of organic chemistry of the Massachusetts Institute of Technology.

DR. PARKER D. TRASK, of the U. S. Geological Survey, has been appointed professor of geology in the University of Wisconsin. He will enter upon his new work in September, 1945, following completion of his present assignment on war work for the U. S. Geological Survey.

DR. C. WALTER CLARKE, executive director of the American Social Hygiene Association of New York, has been made clinical professor of public health practice at Harvard University.

DR. CHARLES A. DOAN, chairman of the department of medicine at the College of Medicine of the Ohio State University, has been appointed dean. Dr. Hardy A. Kemp has been made professor of public health and hygiene, the appointment to become effective on his return to the university from military service for which he now has leave of absence.

DR. LYLE R. DAWSON has been appointed professor of chemistry and head of the department at the University of Kentucky. On January 1 he will succeed Laurence L. Quill, who becomes a member of the faculty of Michigan State College at Lansing, Mich.

DR. ROLAND A. COULSON, who has returned from service with the Royal Air Force in Great Britain, where he was engaged in research for the Division of Nutrition of the Air Ministry, has been appointed instructor in the department of biochemistry of the School of Medicine of Louisiana State University.

DR. WILLIAM D. COOLIDGE will retire on December 31 as vice-president and director of research of the General Electric Company. Dr. C. G. Suits, assistant to the director, has been elected a vice-president of the company and has been placed in charge of the research laboratory.

DR. ZAY JEFFRIES, technical director of the lamp department at Cleveland of the General Electric Company, has been appointed, effective on January 1, vice-president of the company and manager of the chemical department.

DR. D. L. COTTLE has resigned as associate professor in chemistry at Rutgers University. He will join in January the Chemical Division of the Esso Laboratories.

PROFESSOR KNOWLES A. RYERSON, assistant dean of the College of Agriculture of the University of California, has returned from a year's leave of absence spent in establishing food production in the South and Central Pacific areas.

SEDGWICK C. ROGERS, who recently received the degree of Ph.D. in agricultural biochemistry at the Pennsylvania State College, has joined the research staff of the Forest Products Laboratory of the U. S. Forest Service at the University of Wisconsin.

DR. EGBERT MORLAND, since 1935 editor of *The Lancet*, has retired. He is succeeded by Dr. T. F. Fox, who will be the seventh editor since the periodical was first published in 1823. Dr. E. Clayton-Jones will be assistant editor.

In testimony given on December 15 before the subcommittee on war-time health and education of the Senate, it was urged that private institutions receive Federal support for post-war long-range research. Those who testified included Dr. Henry S. Simms, of the College of Physicians and Surgeons, Columbia University; Dr. E. V. Cowdry, of Washington University, St. Louis; David Heyman, president of the Board of the New York City Public Health Research Institute; Dr. Lawrence S. Kubie, of Columbia University; Dr. Rolla E. Dyer, of the National Institute of Health; Colonel Cornelius P. Rhoads, of the Memorial Cancer Hospital, New York, and Admiral Harold W. Smith, of the office of the Surgeon General of the U. S. Navy.

DR. WARFIELD T. LONGCOPE, professor of medicine at the School of Medicine of the Johns Hopkins University, delivered on November 29 a lecture on "Allergic and Toxic Reactions to Sulfonamide Medication." This lecture was the first to be presented under the John Auer Lectureship founded by the Lambda Chapter of the Phi Beta Pi Fraternity at the School of Medicine of St. Louis University.

DR. VALY MENKIN, formerly of the Harvard Medical School, now of the department of pathology of the School of Medicine of Duke University, addressed on December 13 the Medical Group Conference of the University of North Carolina on "The Significance of Biochemical Units in Inflammatory Exudates."

THE annual fall lecture of the Society of the Sigma Xi at the University of Southern California was given on November 15 by Dr. Arthur H. Steinhaus, chief of the Division of Health Education and Physical Fitness of the U. S. Office of Education. His subject was "The Four Freedoms of Fitness."

THE Glenn L. Martin Aircraft Company has made a gift of \$1,700,000 to the University of Maryland for

education and research in aeronautical engineering. It is planned to establish the Glenn L. Martin College of Engineering and Aeronautical Science.

THE Mary Pemberton Nourse Fellowship in public health of Vassar College amounting to \$2,500 will be awarded on April 1. The fellowship is offered to "a woman college or university graduate for original and outstanding work in public health at any approved institution," to provide for a year of study in the carrying forward of an original project or in writing on the subject.

THE department of pharmacology of the College of Medicine of Wayne University announces that two teaching fellowships are available for students who wish to obtain the degree of master of science in pharmacology. The fellowships carry a yearly stipend of \$1,424 each. Applications and inquiries should be addressed to Professor Amedeo S. Marrazzi, chairman of the department, 1512 St. Antoine, Detroit 26, Mich.

THE name of the Athenaeum and Mechanics Institute of Rochester, N. Y., has been changed to the Rochester Institute of Technology.

THE following chemicals are wanted by the National Registry of Rare Chemicals of the Armour Research Foundation, 33rd, Federal and Dearborn Streets, Chicago 16, Ill.: 1-amino-2-naphthol-4,6-disulfonic acid, 2,3,5-triamino benzoic acid, adenosine-5-pyrophosphate, o-amino benzaldehyde, boron trimethylamine, trifluoro acetic acid or esters, benzotrifluoride, 3-methyl-5-hydroxy benzoic acid, diallyl maleate and fumarate, 2,3-dihydroxy naphthalene-6-sulfonic acid, hyenic acid, isobutyl carbamate, methyl, ethyl, n-propyl or isopropyl azides, methyl nitrolic acid, molybdenum oxychloride, 3-nitro-4-chloro cyclohexylbenzene, normicotine, phenyl carbamate, promin, sodium alpha naphthalene sulfonchloramide.

AT the University of Wisconsin research on penicillin is being carried on by three university departments. Members of the staff in charge are: in the department of biochemistry, Professors W. H. Peterson, M. A. Johnson and R. H. Burris; in the department of agricultural bacteriology, Professors E. M. McCoy and W. C. Frazier; and in the department of botany, Professors M. P. Backus and J. F. Stauffer. The work is being carried out under the auspices of the Office of Production, Research and Development of the War Production Board. It is in addition supported by grants from various companies which produce penicillin, including the Heyden Chemical Corporation, N. J., which has contributed \$4,400, and Lederle Laboratories, Inc., Pearl River, N. Y., which has contributed \$4,800. Funds have also been given by the Wisconsin Alumni Research Foundation.

BECAUSE of decreased enrolment and war conditions the Commissioner of Education, with the approval of the Governor, has decided to close temporarily the regular sessions of the State Teachers College at Hyannis as of August 31, 1944, and permit the Massachusetts Maritime Academy to use its facilities exclusively for the training of personnel for the Merchant Marine and the United States Navy, and for vocational training which may be related to the courses of instruction at the academy.

THE sum of \$25,000 has been appropriated by the Michigan Legislature for research in forest products to be carried out by the Michigan Planning Commission.

COLUMBIA UNIVERSITY has received a gift from the Commonwealth Fund of \$14,500 to be applied to the study of respiratory physiology in the department of medicine.

THE Toledo Hospital Institute of Medical Research of Toledo, Ohio, is the recipient of a grant made by the Snyder Ophthalmic Foundation of \$6,500 per year for a period of two years for research on the physiology of the eye especially in relation to glaucoma. The grant will be extended for a longer period

depending upon the results obtained in the first two years. Because of the war, research will be delayed until a physiologist with specialized training in the eye will become available.

THE Imperial Chemical Industries, Ltd., has made a gift to the University of Oxford of £7,200 a year for seven years to establish research fellowships in chemistry or physics. An electing committee will be appointed to carry out the objects of the gift.

CHARLES BROTHERTON, head of the Yorkshire chemical firm of Brotherton and Company, Limited, has agreed to subscribe £1,000 a year under deed for seven years for the establishment of a research fellowship in chemistry tenable at the University of Leeds, and a further £1,000 for seven years for a new lectureship in chemical engineering. In addition, he has subscribed £2,000 for the provision of the necessary extra equipment.

GROUND will soon be broken for the new hospital of the School of Medicine of Georgetown University, which will be erected directly to the east of the school. This structure will have a 400 bed capacity and has been planned with a view to eventual expansion to 600 beds. The project is being financed jointly by the Federal Works Administration and by the university.

DISCUSSION

ECHOLOCATION BY BLIND MEN, BATS AND RADAR

THERE are a number of situations where men or animals can not see clearly but nevertheless succeed in finding their way about by making sounds and detecting echoes from solid objects which are still some distance away. Many blind persons develop in the course of time a considerable ability to avoid obstacles by means of auditory cues received from sounds of their own making, such as footsteps or the tapping of a cane. Their skill can be drastically impaired by ear plugs or by distracting noises.^{1, 2} Bats can fly through the total darkness of caves without striking the walls or the jutting stalactites which may complicate their path. The bats emit a supersonic cry (inaudible to human ears because its frequency is from 30,000 to 70,000 c.p.s.) and orient themselves by means of the echoes of this cry which return to them from any obstacles which lie ahead.^{3, 4, 5}

Since there is no convenient term available to describe this process of locating obstacles by means of

echoes, I suggest the word *echolocation*, not only for the abilities of bats and blind men, but for several other analogous cases which I shall mention below. The meaning of this word, and a corresponding verb *to echolocate*, are likely to be clear when first heard or read, since they are formed simply by joining *echo* and *locate*. It seems best to accent the first syllable in order to make clear that the word *echo* is employed. These terms would fill a definite need, since they describe an important and general process for which one otherwise requires long phrases or whole sentences.

Man has developed instruments for echolocation which are far more effective than the blind man's tapping cane. In fog-bound coastal waters the captain of a ship often blows his whistle and listens for an echo from cliffs or rocks which he suspects are near. Even such small objects as buoys are said to be detected in this way by men with long experience. The depth of water under a ship's hull is often measured by the sonic depth-finding apparatus or fathometer, an instrument which sends down sound waves through the water and measures its depth by timing the returning echoes. This same instrument has also been used by fishermen to echolocate schools of fish beneath their vessel.⁶ Submarines are detected by apparatus work-

¹ S. P. Hayes, "Contributions to a Psychology of Blindness," 49-63, 1941.

² M. Supa, M. Cotzin and K. M. Dallenbach, *Am. Jour. Psych.*, 57: 133-183.

³ H. Hartridge, *Jour. Physiol.*, 54: 54-57, 1920.

⁴ D. R. Griffin and R. Galambos, *Jour. Exp. Zool.*, 86: 481-505, 1941.

⁵ R. Galambos, *Sci. Monthly*, 56: 54-57, 1943.

⁶ A. L. Tester, Bull. 83, Fisheries Res. Board of Can., Ottawa, 1943.