and in 1899 retired, being granted the rank of Rear Admiral. He died at Jersey City, N. J., on February 28, 1903. Harkness was one of the founders of the Philosophical Society of Washington and in 1893 served as president of the American Association for the Advancement of Science.

SCIENTIFIC NOTES AND NEWS

THE American Association for the Advancement of Science and the associated societies are holding this week their annual meeting in Indianapolis. According to the preliminary program published in the issue of SCIENCE for December 3, the meeting is of much interest. The address of the retiring president, Professor Edwin G. Conklin, of Princeton University, is printed in the present issue of SCIENCE. Other official addresses and an extended report of the meeting will be printed in later issues.

DR. WILLIAM BOWIE, who until his retirement a year ago had served twenty-seven years as chief of the Division of Geodesy of the Coast and Geodetic Survey, has been appointed Officer of the Order of Orange-Nassau by the Queen of the Netherlands in recognition of his scientific work, particularly of his work with Dr. F. A. Vening Meinesz on the determination of gravity at sea.

THE Achievement Medal of the Florida Academy of Sciences for a paper given at the annual meeting of 1936 has been awarded to Dr. Harold H. Hume for his communication entitled "Cohering Keels in Amaryllids and Related Plants."

ALLAN H. MOGENSEN, industrial consultant, associate and consulting editor of *Factory Management and Maintenance,* was presented at the annual dinner on December 8 of the Society for the Advancement of Management with the Gilbreth Medal "for distinguished service to the industrial, engineering and management movements."

THE Hofmann Memorial Medal of the German Chemical Society has been awarded to Dr. Franz Fischer, director of the Kaiser Wilhelm Institute for coal research at Mülheim in the Ruhr.

PROFESSOR A. S. SPILHAUS, assistant professor of meteorology in New York University, has been elected a foreign member of the Royal Meteorological Society, London.

DR. EMIL ABDERHALDEN, professor of physiology at Halle, has been elected a corresponding member of the Royal Academy of Sciences, Arts and Letters of Padua.

DR. GERHARD SCHOTT, professor of oceanography at Hamburg, has been elected an honorary member of the Challenger Society of London.

THE following officers were elected at the thirty-third annual meeting of the American Society of Tropical Medicine, which was held in New Orleans from November 30 to December 3: *President,* Mark F. Boyd; *President-elect,* Alfred C. Reed; *Vice-president,* Asa C. Chandler; *Editor,* Charles F. Craig (three years); *Secretary-Treasurer,* E. Harold Hinman (three years); *Councilors,* Henry E. Meleney (four years) and N. Paul Hudson (four years).

DURING the absence on leave of Professor W. B. Fite, of Columbia University, Professor J. F. Ritt is acting as executive officer of the department of mathematics.

THE governing boards of the Neurological Institute and of the Presbyterian Hospital, New York City, will be merged after January 1. The Neurological Institute will continue to function as a separate hospital with its own staff and organization and will continue to carry forward research and teaching in diseases of the nervous system. Dr. Walter W. Palmer, professor of medicine at Columbia University, has become medical director of the institute, and Dr. Robert F. Loeb has been appointed associate medical director.

DR. R. H. WALKER, conservationist at the Intermountain Forest and Range Experiment Station, was recently elected director of the Agricultural Experiment Station at the Utah State Agricultural College, Logan. He will take up his new work in March.

PROFESSOR REINHOLD BAER, of the Institute of Advanced Study at Princeton, is lecturing at the University of North Carolina in the place of Assistant Professor L. L. Garner, who has leave of absence for the session of 1937–38.

PROFESSOR P. M. S. BLACKETT, of Birkbeck College, University of London, has been appointed to succeed Professor W. L. Bragg in the Langworthy chair of physics at the University of Manchester.

THE vice-chancellor of the University of Manchester, Professor J. S. B. Stopford, has been transferred from the chair of anatomy to the newly established chair of experimental neurology.

DR. W. S. PATTON has retired on the grounds of ill health from the Dutton Memorial professorship of entomology at the University of Liverpool, which he has held since 1927.

ERNEST G. RITZMAN, research professor in animal husbandry at the University of New Hampshire, has

been appointed a research associate in animal nutrition of the Carnegie Institution of Washington. The appointment carries with it a grant of funds to enable him to continue his work at the University of New Hampshire.

THE Board of Regents of the University of Arizona plans the establishment of a permanent laboratory for tree-ring research into climatic cycles, work which has been carried on by Dr. A. E. Douglass for many years. Dr. Emil Haury, professor of anthropology, and Dr. Edwin F. Carpenter, head of the department of astronomy, have been named to serve with Dr. Douglass on the laboratory board. They will help to work out a system of classifying data on more than 10,000 experiments.

DR. SAMUEL M. GORDON, secretary of the Council on Dental Therapeutics of the American Dental Association, resigned on November 30 to associate himself with Endo Products, Inc., New York, as vice-president in charge of research.

DR. JOHN C. MCDOWELL, head of the division of dairy herd improvement investigation in the Bureau of Dairy Industry since 1928, having reached the age of seventy years, retires from government service on December 31.

DR. A. C. HADDON, of Christ's College, University of Cambridge, has been appointed honorary keeper of the Indonesian Collection, as well as of the New Guinea Collections, in the Museum of Archeology and of Ethnology.

THE Royal Astronomical Society has appointed Professor S. Chapman, of Trinity College, chief professor of mathematics in the Imperial College of Science and Technology, London, to be a member of the Committee for Geodesy and Geophysics.

ASSOCIATE PROFESSOR C. C. CRAIG, of the University of Michigan, who has leave of absence, is studying at the Galton Laboratory at University College, London.

THERE has been established at Quebec a commission for scientific research which will be charged with the study and application of the information supplied by the technicians employed by the Quebec Government to take an inventory of the natural resources of the province. Esdras Minville, professor of the School of Higher Commercial Studies, has been named president of the commission. Other members are: Georges Maheux, provincial entomologist, vice-president; Fortunat Fortier, of Montreal, secretary, and Paul Riou, professor at the Higher Commercial School; Henri Roy, president of the Forestry Engineers Association; Dr. Georges Préfontaine, professor at the Zoological Institute, University of Montreal; L. Z. Rousseau, Quebec; Jacques Rousseau, botany professor, University of Montreal; A. O. Dufresne, director of the Provincial Mining Service; Abbé Alexandre Vachon, director of the School of Chemistry, Laval University, Quebec, and Adhemar Mailhot, director of the Montreal Polytechnic School.

A SERIES of six public lectures will be given from January 21 to 29, under the auspices of the North Carolina State College of Agriculture and Engineering of the University of North Carolina, by Dr. Dugald C. Jackson, professor emeritus of electrical engineering at the Massachusetts Institute of Technology. The titles of the separate lectures are: "Civilization, Engineering and the Earliest Men"; "Civilization and Engineering at the Dawn of History"; "Unfolding of Community Life and Commerce under the Influence of Engineering"; "Influence on Civilization of Further Widening of Engineering"; "The Inseparability of Engineering and Civilization"; "Present Relations and Future Outlook of Engineering and Civilization."

A SYMPOSIUM on medical education will be held on January 17, as part of the ceremonies attending the installation of Dr. Rufus C. Harris as tenth president of Tulane University. The symposium will be one of a series on "Current Trends in University Education." Dr. C. C. Bass, dean of the Tulane Medical School, will preside. The speakers include the Rev. Alphonse M. Schwitalla, S.J., dean of the Medical School of St. Louis University, and Dr. Waller S. Leathers, dean of the Medical School of Vanderbilt University.

THE National Advisory Cancer Council has approved the application of the Roscoe B. Jackson Memorial Laboratory at Bar Harbor, Maine, for $9,900 for equipment, supplies and expenses needed in the production of genetically stabilized mice necessary in cancer and other investigations.

A TRUST fund of $100,000 is provided for Swarthmore College by the will of Miss Laura Allen, in memory of her father, who was one of the founders of the printing firm of Allen, Lane and Scott. The income will be used to pay the salaries of professors of chemistry in the college.

AN appropriation of $25,000 from the Rosenberg Foundation has been made to the Kern County (Calif.) Medical Association for a study of fever conditions in the county.

THE Federal Government plans to erect a greenhouse at the cost of $4,000 at the Coastal Experiment Station at Tifton, Ga., for research in connection with the vegetable plant industry under the direction of Dr. W. D. Moore.

PREVIOUS awards from the Elizabeth Thompson Science Fund were reported in SCIENCE on January

15, and earlier. Since the last report the following awards have been made. At the meeting of April 30, $300 was awarded to Dr. Christianna B. Smith, Mount Holyoke College, for a study of the origin of red corpuscles in the liver in tissue cultures; $200 to Dr. Edward Girden, Brooklyn College, for a study of the problem of reorganization of the functions of hearing in the central nervous system; and $80 to Dr. H. D. Doolittle, Trinity College, for a study of an electrode-less discharge as a more prolific source of hydrogen ions. The trustees of the fund are as follows: G. B. Baxter, *president;* Jeffries Wyman, Jr., *secretary;* Charles P. Curtis, *treasurer;* G. B. Wislocki, J. C. Slater, A. C. Redfield, *trustees.* The next meeting will be held in April, 1938, and applications for grants should be made to the secretary, Biological Laboratories, Harvard University, Cambridge, Mass.

THE establishment of a group of scholarships at the Carnegie Institute of Technology by the Westinghouse Electric and Manufacturing Company as part of a cooperative engineering plan between the company and the college has been announced by Dr. Webster N. Jones, director of the College of Engineering. These scholarships are in engineering, are undergraduate in character and are to be known as the George Westinghouse Scholarships. Normally there will be fifty scholarships, of which ten will be vacated each year upon the graduation of the student. Each has a value of $3,000 payable monthly at the rate of $50 for the five-year period of the course. The first ten scholarships will go into effect on June 1. Appointment will be made jointly by the institute and the Westinghouse Company. Applications should be made to the Manager of Technical Employment and Training, Westinghouse Electric and Manufacturing Company, Union Bank Building, Pittsburgh. Students who receive scholarships will take the regular engineering course at the Carnegie Institute, and in addition will spend the summer months and two college semesters at the Westinghouse plant. The course will be organized and managed by a George Westinghouse professor of engineering, who will be appointed. The Westinghouse Company made an appropriation of $200,000 in October to the endowment of the institute. Under an arrangement with the Carnegie Corporation of New York this amount will be increased by $400,000 in 1946.

DURING the past year the College of Medicine of the University of Illinois has received for the library a valuable collection of some 1,500 selected books, also numerous separates and reports in the field of dermatology, presented by Dr. William Allen Pusey. This collection has now been placed in the library and is available for the use of students and physicians. A collection made by Dr. Arthur E. Hertzler, of Halstead, Kansas, consisting of about 7,000 volumes and 8,000 separates, largely in the field of surgery and surgical pathology, has also been deposited in the library.

DISCUSSION

THE SHAPE OF COMPRESSED SPHERES

THE brief report by Mr. J. W. Marvin on the shape of compressed lead shot[1] is of unusual interest. It presents an observation contrary to the expectation of Lord Kelvin, Sir D'Arcy Thompson and all physicists who have adverted to that topic, so far as we know. The reason why dodecahedral bodies were believed to arise whenever a stack of spheres of equal volume was compressed until all interstices had been eliminated is very simple. Place spheres of uniform size in a compact layer upon a plane surface, and each will be in contact with six others. Establish an overlying layer by placing spheres of the same size in the depressions presented by the layer below, and every sphere in the basal layer will be brought into contact with three above. When there is an underlying layer there are likewise three contacts below, which makes twelve contacts altogether for any sphere within the heap. Such is the "normal piling" of engineers—the arrangement of cannon balls as usually stacked. Twelve contacts under compression would seem to yield twelve facets, converting each sphere into a rhombic dodecahedron. Such dodecahedra are uniform bodies, stacking without interstices, and they were once regarded by French and German botanists as the basic shape of cells.

But if the plastic "spheres" are not quite uniform in size or perfect in shape, will they still yield dodecahedra? In the appendix to his Baltimore Lectures (1904, p. 625), after referring to Reynolds' experiments with rubber bags of small shot, Lord Kelvin remarks:

> But it is possible, it almost seems probable, that in bags of sand or powder, of some kinds of smooth rounded bodies of any shape, not spherical or ellipsoidal, subjected persistently to unequal pressures in different directions, and well shaken, stable positions of equilibrium are found with almost all the particles each touched by twelve others.

Sir D'Arcy Thompson believed that plastic spheres would yield dodecahedra on compression, expressing that opinion on his recent visit to Boston for a memorable course of Lowell Institute lectures. In his "Growth and Form" (p. 339) he debated whether cells in masses would take the 14-hedral form of

[1] SCIENCE, November 26, 1937.