professor of anatomy and chirurgy at the University of Dublin for the past thirty-three years, died on January 15, at the age of sixty-seven years.

THE Peking correspondent of the London *Times* reports that the Chinese geologist, Dr. V. K. Ting, has died at Changsha at the age of forty-eight years.

SCIENTIFIC NOTES AND NEWS

THE doctorate of laws was conferred on February 14 by Dartmouth College on Dr. James Rowland Angell, president of Yale University, on the occasion of the celebration of the fortieth anniversary of "Dartmouth Night." Dr. Angell and President Ernest M. Hopkins, of the college, were the principal speakers. Until 1920 Dr. Angell was professor of psychology and dean of the faculties of arts, literature and science at the University of Chicago and was later chairman of the National Research Council and president of the Carnegie Corporation.

DR. FREDERIC EUGENE IVES, known throughout the world for his invention of photoengraving and color photography, celebrated his eightieth birthday at his home in Philadelphia on February 17.

AT the annual dinner of the American Institute of Mining and Metallurgical Engineers on February 19, the William Lawrence Saunders Medal was presented to Clinton Crane, president of the St. Joseph Lead Company of St. Joseph, Mo.; the Robert W. Hunt Prize was given to C. C. Henning, of the Jones and Laughlin Steel Company of Pittsburgh, and the J. E. Johnson, Jr., Award was presented to Francis Hearne Crockard, of the Republic Steel Corporation. Dr. Robert Peele, professor emeritus of the Columbia University School of Mines, was named as an honorary member of the institute.

A MEDAL for "conspicuous alumni service" was awarded at the annual Lincoln Day celebration of the alumni of Columbia University to Dr. William H. Woglom, member of the medical class of 1901 and professor of cancer research at the Crocker Institute.

AT the recent annual meeting of the Geological Society of America, Dr. Victor M. Goldschmidt, professor of mineralogy and geochemistry at Göttingen; Dr. Paul Fourmarier, professor of commercial geography at Liége, and Dr. Emile Argand, professor of geology and paleontology at Neuchâtel, were elected foreign correspondents.

THE council of the Geological Society, London, has made the following awards: The Wollaston Medal to Professor Gustaaf Adolf Frederik Molengraaff, of Delft, in recognition of his researches concerning the mineral structure of the earth in many widely separated regions and especially in the Dutch East Indies and South Africa; the Murchison Medal to Ernest Edward Leslie Dixon, of the British Geological Survey, in recognition of the value of his geological researches, especially in South Wales and the North of England; a Lyell Medal to Mrs. Eleanor Mary Reid, for her studies of the fossil floras of the Tertiary and Pleistocene rocks; a Lyell Medal to Professor Leonard Johnston Wills, of the University of Birmingham, for his researches on the stratigraphy and paleontology of the Midlands.

SIR ARTHUR SMITH WOODWARD, until his retirement in 1924 for twenty-three years keeper of the Geological Department of the British Museum, has been elected a member of the Royal Swedish Academy of Sciences in Stockholm in the Section of Zoology.

H. P. CHARLESWORTH, assistant chief engineer of the American Telephone and Telegraph Company, has been reelected chairman of the Engineering Foundation, New York City. D. Robert Yarnall, of the Yarnall-Waring Company, of Philadelphia, has been elected vice-chairman and Alfred D. Flinn has been elected director and secretary. Members of the board of trustees are Mr. Charlesworth, Mr. Yarnall, A. L. J. Queneau, George L. Knight, George Barron, Everette DeGolyer, George E. Beggs, Langdon Pearse, Walter H. Fulweiler, Albert E. White, F. M. Farmer, Walter I. Schlichter, Frederick M. Becket, John V. N. Dorr and Edward R. Fish.

THE tenth national convention of Sigma Gamma Epsilon, professional fraternity for geology, mining, metallurgy, ceramics and petroleum engineers, was held at Hollywood, Calif., on December 27 and 28, 1935. The fraternity now has thirty chapters in all parts of the United States. The following national officers were elected: *President,* Professor E. F. Schramm, University of Nebraska; *Vice-presidents,* Dr. E. P. Henderson, U. S. National Museum, Professor K. K. Landes, University of Kansas, Professor E. T. Hodge, Oregon State College; *Secretary-treasurer,* Professor C. B. Carpenter, Colorado School of Mines; *Historian,* Professor F. M. Bullard, University of Texas, and *Editor,* Professor W. A. Tarr, University of Missouri. The next convention will be held at the University of Texas in December, 1937.

C. G. FISHER, president of the Fisher Scientific Company, has been elected chairman for 1936 of the Pittsburgh Section of the American Chemical Society.

ANNOUNCEMENT is made of the retirement from active service next September of Dr. Reid Hunt, since

1913 professor of pharmacology at the Harvard Medical School.

DR. JOHN A. MILLER, research professor of astronomy at Swarthmore College and director of the Sproul Observatory, has retired.

DR. KARL SAX has been promoted from associate professor of plant cytology to professor of botany at Harvard University. He has been on the Harvard teaching staff since 1928. Previously for eight years he was biologist in charge of plant breeding at the Maine Agricultural Experiment Station.

DR. H. LOWERY, head of the department of pure and applied physics in the College of Technology of the University of Manchester and secretary of the Manchester and District Local Section of the Institute of Physics, has been appointed principal of the North-Western Polytechnic, London.

LOWRY NELSON, of Wisconsin, has been appointed director of the Utah Agricultural Experiment Station at Logan.

AT a recent meeting of the Board of Directors of the Long Island Biological Association it was voted to appoint Dr. Eric Ponder, investigator in general physiology at its Biological Laboratory, interim director, pending the appointment of a successor to the late Dr. Reginald G. Harris.

DR. KARL MURDOCK BOWMAN, of Newton Center, Mass., chief medical officer of the Boston Psychopathic Hospital, has taken over his work as director of the department of psychiatry at Bellevue Hospital, New York City. He succeeds Dr. Menas S. Gregory.

DR. WILLIAM BASIL KEELER, medical inspector for the South Boston health unit, has been appointed health commissioner of Boston, succeeding the late Dr. Francis X. Mahoney.

DR. ULYSSES P. HEDRICK, director of the Experiment Station at Geneva, N. Y., becomes *ex-officio* a member of the Board of Trustees of Cornell University, by virtue of his election as president of the New York State Agricultural Society. He succeeds Dr. Carl E. Ladd, dean of the Colleges of Agriculture and Home Economics.

AT the recent meeting of the International Dermatological Congress, held at Budapest, Hungary, Dr. H. N. Cole, of Western Reserve University, was elected to the permanent committee of eleven on organization, representing the United States.

THE Committee on Scientific Research of the American Medical Association has awarded a grant to Professor Israel S. Kleiner, of the New York Homeopathic Medical College and Flower Hospital, for further work on ascorbic acid, and Assistant Professor Helen C. Coombs, of the department of physiology and biochemistry, has received a grant for work on the action of acetyl choline on the central nervous system.

DR. EDWIN P. ADAMS, Henry professor of physics at Princeton University, has been granted leave of absence for the second term of the current academic year.

JOHN G. BARRY, consulting mining geologist and engineer of El Paso, Texas, has returned to El Paso following an examination trip in Sonora and Sinaloa, Mexico.

UPON the request of the Peruvian Government, the Bureau of Fisheries has loaned it the services of M. C. James, assistant chief of the Division of Fish Culture, for the purpose of making a survey of Lake Titicaca and determining the species of fish best suited to its waters.

DR. JAMES G. NEEDHAM, head of the department of entomology at Cornell University, spoke at the University of Alabama on February 13 on "War—a Biological Phenomenon." The lecture was under the auspices of the Sigma Xi Club and the Research Council. A dinner was given before the lecture at which Professor Needham was the guest of honor.

DR. JOHN JOHNSTON, since 1927 director of research for the United States Steel Corporation, delivered the monthly Sigma Xi lecture at Rensselaer Polytechnic Institute on February 14. He spoke on "The Physical Chemistry of Steel."

DR. R. W. WOOD, professor of physics at the Johns Hopkins University, lectures before the New York University Chapter of Sigma Xi on February 21. His lecture is entitled "Some New Effects Obtained with High Explosives."

DR. JOHN C. HOSTETTER, director of development and research at the Corning Glass Works, gave on February 14 a lecture at the Franklin Institute before the Rittenhouse Astronomical Society of Philadelphia. His lecture, which was preceded by a dinner of the society, was entitled "Glass for the Astronomer from Galileo to the 200-inch Disc." It was illustrated with slides and sound motion pictures.

DR. HENRY E. SIGERIST, William H. Welch professor of the history of medicine of the Johns Hopkins University School of Medicine, lectured recently at Vanderbilt University School of Medicine on "Medicine in the Renaissance," "Medical Organizations in Europe" and "The Life and Work of Louis Pasteur and Robert Koch."

THE following announcements of lecturers for 1936 have been made by the University of Oxford: Sir Donald Tovey, Reid professor of music in the University of Edinburgh, will deliver the Romanes lecture; P. M. S. Blackett, professor of physics at Birkbeck College, will give the Halley lecture, and Emeritus Professor J. A. Smith, the Herbert Spencer lecture.

THE third annual meeting of the American Institute of Nutrition will be held at the Washington Hotel in Washington, D. C., on March 25. The officers for 1935–36 are as follows: *President,* John R. Murlin; *Vice-president,* Eugene F. DuBois; *Treasurer,* George R. Cowgill; *Secretary,* Icie G. Macy; *Members of the council,* Roland M. Bethke, L. A. Maynard and Arthur H. Smith.

THE one hundred and fourth annual meeting of the British Medical Association will be held at the University of Oxford, from July 17 to 24, under the presidency of Sir James W. Barrett, Melbourne, Australia.

BY the will of Roger Deering, Northwestern University receives the sum of $7,000,000. The bequest is unrestricted, and the trustees have determined that the money will not be placed in the building fund but will be used for educational purposes. This bequest brings the total amount received by the university from the Deering family to $10,300,000.

HARVARD UNIVERSITY will receive $100,000 under the will of Miss Belle Hunt, of Boston and Beverly, who died on January 17.

AN Associated Press dispatch reports that the first planetarium in the Far East is to be installed at Osaka, Japan, by the Carl Zeiss firm at Jena, which also has an order for a planetarium at the Paris world exposition in 1937. They are similar to the planetaria in New York, Philadelphia, Chicago and other American cities.

THE British Institution of Mechanical Engineers has set aside the interest on a substantial sum of money for the establishment of a James Watt Medal. It will be awarded biennially for "the most outstanding achievement in mechanical engineering during the previous two years" and will not be confined to British engineers.

THE *Journal* of the American Medical Association reports that Professor Nitescu, as the official representative of Bucharest University, at the International Congress of Physiology recently held at Moscow, while there was invited by the leaders of the Moscow faculty of pharmacy to exchange a certain number of students, beginning next year. Both states will erect a special home in which the exchange students will be given free accommodations.

THE Society for the Preservation of the Fauna of the British Empire, with the approval of the Secretary of State for the Colonies, has asked Sir Thomas Comyn-Platt and Captain Keith Caldwell to visit (1) Ceylon and Malaya, and (2) the West Indies, British Guiana and British Honduras, to report on the preservation of the fauna of those countries, with special reference to the danger of extinction to any rare species. The two missions will be conducted on lines generally similar to those undertaken by Major Hingston to East Africa in 1930, and by Colonel Haywood to West Africa in 1931–32, both of which were made on behalf of the society. Sir Thomas Comyn-Platt and Captain Caldwell planned to leave England early in the year, and will report directly to the society.

MORE than 181,000 visitors—a seven-fold increase since 1929—viewed during 1935 the exhibits in the Free Natural History Museum of the Academy of Natural Sciences, Philadelphia. This is an increase of 18,000 over 1934, and includes some 31,000 school children.

The British Medical Journal calls attention to the condition of the Harvey Memorial Tower at Hempstead Church in Essex. The work of restoration has proceeded, and about two thirds of the structure has been restored; but the fund is now exhausted and the work has ceased. The last third, together with the rehanging of the bells, remains to be completed. A sum of approximately £2,000 is required for this purpose. Lord Horder has consented to become chairman of the committee, in place of the late Sir John Rose Bradford. Donations should be made payable to the Harvey Memorial Fund and sent to Dr. G. de Bec Turtle, Royal College of Physicians, Pall Mall East, London, S.W.1.

A GIFT by Williams College of a 1,700-acre estate to the Federal Government for a forestry experimental station has been announced. The property, given to the college in November, 1933, by Mrs. M. Theresa B. Hopkins, of Boston, widow of Colonel Lawrence Hopkins, was known as Buxton Farms. It was valued at $100,000 a few years ago. The estate, which lies along the Taconic mountain range, makes up the northwestern corner of the Commonwealth of Massachusetts, being bounded on the west by New York and on the north by the Vermont line. The college had found no immediate use for the estate other than for field work by the department of botany and for the uses of the Williams Outing Club. Walter K. Starr, who is connected with the Forest Service Bureau of the U. S. Department of Agriculture, has been making a survey of the property and its resources since last April. A small staff of WPA workers is assisting him. Colonel Hopkins, a graduate of Williams College in the class

of 1863, was a son of the Williams president, Mark Hopkins.

AN 800-ACRE tract of land two miles east of Chapel Hill belonging to the University of North Carolina will be made headquarters of the southeastern states in experimentation of control of soil erosion. Experiments will consist chiefly in growing trees and shrubs for highway bank protection, game conservation and gully control. A 50-foot plot has been prepared for setting out plants to be brought from the government's station at Statesville. E. L. Evinger, horticulturist, graduate of Washington University in St. Louis, is in command of the station; L. S. Haughton, formerly with the Department of Agriculture, will be plant propagater; O. L. Veerhoff, a graduate of the Johns Hopkins University, will make experimental studies in seed germination. The personnel at the station will also include natural scientists who will function as "field men," to collect plants from all over the southeast. Operations on the farm will be steadily expanded. Engineers will be sent from the soil conservation service at High Point to make a topographic survey and a soil survey of the farm. Also, an irrigation system, to cover five acres at first, will be installed. The farm will be financed by the Department of Agriculture but labor will be supplied by the North Carolina division of the Works Progress Administration, a joint enterprise of the government and the university. The project will serve as a laboratory for scientific study and eventually will become an arboretum, containing millions of trees and shrubs.

DISCUSSION

MAGNITUDE AND ENERGY OF EARTHQUAKES

LISTS and catalogues of earthquakes are frequently used for both popular and scientific purposes. Occasionally such lists are compiled without suitable discrimination, including all the shocks, small and large, which may happen to come to notice. Under such circumstances the number of earthquakes listed for any given region is likely to be a better index of the density of population than of the seismicity; for minor shocks are very frequent in all seismic regions, and even in many districts not commonly thought of as seismically active. Similar undiscriminating use of instrumental data gives undue weight to minor shocks occurring near seismological stations.

Some means evidently is required for selecting and listing the larger shocks. The logical procedure is to number shocks on a definite scale, and for general purposes to list only those of higher scale number. Several arbitrary scales are in regular use; these rate shocks in terms of intensity, which properly refers only to the degree of manifestation at a particular point. For example, intensity IV may be defined as that degree of shaking at which windows and dishes rattle, etc. Such a scale does not directly give much information about the earthquake as a whole; given effects may be due to a comparatively small shock originating near by or to a large shock at considerable distance.

When the circumstances of a shock are completely known, a rough rating is supplied by the maximum intensity manifested. However, this maximum varies with the physical conditions of the shock—depth of focus, geological structures, nature of ground, etc.—and the observations will be much affected by accidental circumstances such as the number and character of structures in the shaken area. Moreover, a large majority of strong shocks are submarine or occur in unpopulated areas, so that any reliable listing of strong shocks must depend on seismographic records.

It would be desirable to rate earthquakes in terms of the energy actually liberated in each shock; but at present the determination of such energies from seismograms is subject to large uncertainties. Accordingly, a partly arbitrary magnitude scale has been set up,[1] originally for use with local shocks of the Southern California region. The magnitude of a shock is defined as the logarithm of the amplitude written by a standard seismograph distant 100 km. from the epicenter. Thus a shock of magnitude 7 writes amplitudes 10 times as large as those for magnitude 6, 100 times those for magnitude 5, etc.; the corresponding energy ratios should be 100 and 10,000. The arbitrary zero of the scale has been chosen to coincide with the smallest recorded shocks. The smallest shocks reported felt are of magnitude 1.5, the smallest causing any damage are about 4.5, and major earthquakes exceed magnitude 7, but in most cases the intensity is distributed so irregularly that it can not be used to determine the magnitude.

This scale has now[2] been extended, with some additional uncertainty, to apply to large shocks in all parts of the world, the data being the earth motions recorded at a considerable number of stations. The largest shocks, beginning with 1904, have been investigated in this way. The selection is not difficult, as the greatest shocks produce surface waves with amplitudes of a millimeter or more over nearly the whole earth. The

[1] C. F. Richter, *Bull. Seism. Soc. Amer.*, 25: 1, 1935.

[2] B. Gutenberg and C. F. Richter, *Gerlands Beiträge zur Geophysik.* In press.