notably exemplified in the design and construction of the Catskill Water Supply System.

Commander Heck was presented to President Richards for the degree of doctor of science by Professor C. C. Bidwell, head of the department of physics, with the following brief sketch of his achievements:

Commander Heck is a graduate of Lehigh University of the Class of 1903. He has achieved high distinction in his chosen field and is a recognized authority on seismology and terrestrial magnetism. He is the author of many scientific papers and publications of the Coast and Geodetic Survey. Among these are the following titles: "Radio Acoustic Method of Position Finding in Hydrographic Surveys," "Earthquake History of the United States," "Report on Network of Earthquake Observations of Countries bordering the Pacific," "Values of the Velocity of Sound for Echo Soundings in the Pacific Ocean," "Oceanography and Seismology in the Pacific Region," etc. It is a privilege to present to you Commander Heck for this degree.

In conferring the degree President Richards said:

Nicholas Hunter Heck, loyal son of Lehigh, recognized for distinguished service with the U. S. Coast and Geodetic Survey as commander of the schooner *Matchless* and of the steamer *Discovery,* and as chief of the Division of Terrestrial Magnetism and Seismology, contributor to the science of deep sea sounding, the compensation of the magnetic compass and the study of earthquakes.

SCIENTIFIC NOTES AND NEWS

THE Mueller Memorial Medal of the Australian Association for the Advancement of Science was awarded at the recent meeting at Brisbane, which was held from May 28 to June 4, to Sir Douglas Mawson for his contributions to Australian geology, associated with which are his achievements in geography and exploration. The first Liversidge Research Lecture under the bequest from the late Professor A. Liversidge was delivered by Professor N. T. M. Wilsmore, of the University of Western Australia, the title of the lecture being "Chemical Research and the State." At this meeting it was decided to change the name of the association to "The Australian and New Zealand Association for the Advancement of Science."

THE Moxon gold medal of the Royal College of Physicians, London, awarded every third year to the person who is deemed most to have distinguished himself by observation and research in clinical medicine, has been awarded to Dr. Frederick Parkes Weber. The Weber-Parkes prize and medal, awarded every third year for work on the etiology, prevention, pathology or treatment of tuberculosis, has been awarded to Professor S. Lyle Cummins.

THE honorary gold medal of the Royal College of Surgeons, London, has been awarded to Mr. R. Lawford Knaggs, in appreciation of his services to the museum, more especially in preparing a catalogue of and revising the Strangeways collection of specimens illustrating arthritis.

THE special gold medal awarded by the Congress to Colonel Charles A. Lindbergh, to commemorate his achievements in the advancement of the science of aviation, was presented to him by President Hoover on August 15.

IN appreciation of the service given to the University of California Medical School by Dr. William Palmer Lucas, for several years head of the department of pediatrics, who retired at the close of the academic year, members of his staff recently held a banquet and presented him with a gold watch purchased with contributions from students of every one of the seventeen years.

"As a token of appreciation of his outstanding civic services," the citizens of Tallulah, Louisiana, have presented to B. R. Coad, in charge of the cotton-insects division of the Bureau of Entomology, having its headquarters in their town, a motion-picture camera and projector. This presentation was made at a meeting of the Business Men's Luncheon Club of Tallulah, of which Mr. Coad recently was elected an honorary member.

THE Poultry Science Research Prize of $100, which is awarded annually to the member of Poultry Science Association who publishes the most outstanding piece of research contributing to the furtherment of the poultry industry, has been awarded to Dr. F. A. Hays, of Massachusetts, for his work "Inbreeding in Relation to Egg Production." Honorable mention was given the paper of Dr. D. C. Warren, of Kansas, on "The Inheritance of Rhode Island Red Chick Down-Color Variations and their Relation to Color Variations in Adult Plumage," published in the November 15, 1929, issue of the *Journal of Agricultural Research,* and to the paper by Hendricks, Lee and Titus, "Early Growth of White Leghorns," published in *Poultry Science* for September 1, 1929. The check for $100 was presented to Dr. Hays at the annual banquet of the Poultry Science Association by J. Holmes Martin, secretary-treasurer of the association.

THE Harveian oration of the Royal College of Physicians in 1931 will be delivered by Dr. Robert

Hutchison. The Bradshaw lecture will be given by Dr. J. S. Fairbairn.

THE Council of the City and Guilds of London Institute has conferred the distinction of fellow of the institute upon the following: F. M. Denton, A. H. Dykes, W. M. Heller, E. M. Rich and F. F. Renwick. The fellowship is conferred by the council upon those who, having obtained the associateship of the institute and spent at least five years in actual practice, produce evidence of having done some original and valuable research work or of having otherwise contributed to the advancement of the industry in which they are engaged.

MR. R. W. TRULLINGER, assistant in experiment station administration and senior agricultural engineer of the Office of Experiment Stations, was elected president of the American Society of Agricultural Engineers at the recent annual convention at Moline, Illinois.

PROFESSOR LEWIS ROBERTSON SUTHERLAND has resigned from the chair of pathology at St. Andrews University.

THE following officers of the Royal College of Surgeons, London, have been elected for the ensuing year: *President,* Lord Moynihan; *Vice-presidents,* Mr. C. H. Fagge and Mr. R. P. Rowlands; *Physiological curator,* Mr. R. H. Burne; *Pathological curator,* Mr. C. F. Beadles; *Honorary curator of Odontological Collection,* Sir Frank Colyer; *Honorary curator of the Historical Collection,* Mr. C. J. S. Thompson.

PROFESSOR OWEN THOMAS JONES, of Trinity College, professor of geology and mineralogy at the Victoria University of Manchester, has been elected to succeed Professor J. E. Marr, of St. John's College, who will retire from the Woodwardian professorship of geology at the University of Cambridge on September 1.

AT the University of Cambridge Dr. J. M. W. Morison has been appointed to the university chair of radiology, tenable at the Cancer Hospital; Dr. H. D. K. Drew to the university readership in organic chemistry, tenable at East London College; Sir Arthur Evans, fellow of Brasenose College, Oxford, to the Frazer lectureship in social anthropology for the academical year 1930–31, and the appointments committee of the Faculty of Agriculture and Forestry has appointed H. E. Woodman, of Downing College, university lecturer in agricultural chemistry for three years from October 1, 1930, and W. K. Hubble, of Downing College, university demonstrator in agriculture for a like period. With the concurrence of the Ministry of Agriculture and Fisheries, Dr. Marshall was appointed director of the Animal Nutrition Institute from August 1.

DR. H. W. GILLETT, director of Battelle Memorial Institute, announces the following additions to the staff: Dr. O. E. Harder, assistant director; Dr. C. H. Lorig, metallurgist; Samuel Epstein, metallurgist, and L. H. Grenell, metallurgist. Dr. Harder has been professor of metallography at the University of Minnesota during the past eleven years and was also engaged in consulting work. He had previously been with the Portland Cement Association, the N. K. Fairbanks Company and the Mellon Institute. Dr. Lorig came directly from Drexel Institute, where he was professor of mechanical engineering in charge of their metallurgical courses, and will study foundry and general metallurgical problems at Battelle. He has had experience with the Wisconsin Steel Company, the Wisconsin Appleton Company, the French Battery Company and the Laddish Drop Forge Company. Mr. Epstein has been research metallurgist for the Illinois Steel Company and metallographer at the U. S. Bureau of Standards and will have charge of a research on the embrittlement of steel—one of the sponsored projects of Battelle. Mr. Grenell has been with the Ingersoll-Rand Company, the Bureau of Mines, the Bureau of Standards and the Frigidaire Corporation. He will study the production and utilization of metal foils—another sponsored project.

DR. FRED N. BRIGGS, of the office of cereal crops and diseases of the U. S. Department of Agriculture at Berkeley, California, has been appointed assistant professor of agronomy at the University of California and assistant agronomist of the Agricultural Experiment Station.

THE Frederick G. Donnan fellowship in chemistry, tenable for three years at the Johns Hopkins University, has been awarded to Mr. Alkin Lewis, of King's College, London.

DR. J. L. COLLINS, assistant professor of genetics at the University of California, has been appointed geneticist for the experiment station of the Association of Hawaiian Pineapple Canners, University of Hawaii, and is now in Honolulu.

THE *Experiment Station Record* reports that Dr. E. C. Stakman, professor of plant pathology and plant pathologist of the University of Minnesota, has been granted leave of absence to aid in organizing biological research in connection with a 50,000-acre rubber plantation in Liberia, which is being established by an American tire company. Arthur F. Verrall, instructor in plant pathology and assistant plant pathologist and botanist, accompanied him on this trip and

is expected to remain for a longer period to oversee the experimental work of the company until it is well under way.

DR. SAMUEL J. HOLMES, professor of zoology at the University of California, who has been traveling in Europe during the past year, has returned to Berkeley.

DR. ROBERT K. NABOURS, who is spending the year as associate in the department of genetics of the Carnegie Institution at Cold Spring Harbor, will return to the Kansas Agricultural College on September 1.

DR. ALEXANDER SILVERMAN, head of the department of chemistry of the University of Pittsburgh, sailed on August 21 for Europe. He will visit educational and research institutions in France, Holland and Belgium, and will attend the Tenth International Congress of Industrial Chemistry at Liége, Belgium, during the week of September 7, as a delegate from the American Ceramic Society, and the tenth International Union of Pure and Applied Chemistry, also at Liége, during the week of September 14, as one of fifteen delegates from the National Research Council and the National Academy of Sciences.

DISCUSSION

RELATIVE LENGTH OF PLEISTOCENE GLACIAL AND INTERGLACIAL STAGES

IN a report by R. T. Chamberlin[1] dealing with fluctuations of sea-level as controlled by glaciation, an estimate is presented of the percentage of the Pleistocene glacial epoch involved in glacial as compared with interglacial stages, and also an estimate of the percentage of time in a glacial stage in which the ice-sheets were at about their greatest extent. The estimates were given him by ten American glacialists who had had considerable experience in the study of glacial deposits in North America. In this composite estimate the glacial stages were given only one fourth the length of the interglacial stages, or 20 per cent. of the time involved in the Pleistocene glacial epoch. It was estimated by seven of the ten glacialists (three failing to give estimates) that the ice-sheet was at about its greatest extent for only one fifth of a glacial stage, or 4 per cent. of the glacial epoch, being in process of advance and retreat for four fifths of the glacial stage or 16 per cent. of the glacial epoch.

It now appears from a study of the distribution of moraines developed in the Wisconsin stage of glaciation that there was very little difference in the area covered by the ice-sheet throughout the greater part of that glacial stage, or from the time of the outermost Early Wisconsin moraine, the Shelbyville, to the time of the outermost Late Wisconsin moraine, the Port Huron. By extensive westward growth in Middle and Late Wisconsin time beyond the limits reached in Early Wisconsin time, the shrinkage shown by the exposed part of the Early Wisconsin deposits in the south part of the area was counterbalanced by the greater westward extent in higher latitudes. This shifting seems to have been due to a greater nourishment on the western side of the ice-sheet rather than to a change to higher temperature. The southern part became undernourished and showed a corresponding shrinkage. In view of these conditions it is probable that not less than 60 per cent. of the Wisconsin stage should be allotted to the culmination, and 20 per cent. each to the advance and the retreat of the ice-sheet.

From a study of the recession of Niagara Falls by Spencer, Taylor and others[2] it appears that the Port Huron morainic system, which marks the limits of the Late Wisconsin drift, was formed some 25,000 to 30,000 years ago. It also appears from a study of the Falls of St. Anthony on the Mississippi by Winchell, Grant and especially by Sardeson[3] that the outlet of the Glacial Lake Agassiz did not shift to Hudson Bay until some 8,000 to 10,000 years ago. This being the case the Wisconsin ice-sheet persisted in central Canada to within 10,000 years of the present time. It also appears that a period of about 15,000 years is involved in the retreat from the Port Huron moraine to the breaking up of the ice-sheet in central Canada. If then this retreat represents 20 per cent. of the time involved in the Wisconsin stage of glaciation, the length of this glacial stage is some 75,000 years and its beginning about 85,000 years ago. If then the culminating phase involved three fifths of the entire glacial stage, it endured some 45,000 years.

Estimates of the relative ages of the Kansan, Illinoian and Wisconsin drifts are based mainly on the erosion each has suffered. The Kansan drift appears to have been eroded to such a degree that an average of fifty feet of material would be required to restore the original surface as left by the withdrawal of

[1] Rollin T. Chamberlin, "Geological Interpretation of the Coral Reefs of Tutuila, American Samoa," pp. 145–178, Publication 340, Carnegie Institution of Washington, 1924.

[2] See Niagara Folio, U. S. Geological Survey.

[3] See St. Paul-Minneapolis Folio, U. S. Geological Survey.