(*Continued from page* 1074)

undertaken in Igdlorssuit. An examination of five ancient habitation sites was made on Ubekendt Island, and two of these, on the south and south-west coasts, were very productive of material. In the more easterly of the two sites, two houses were excavated and showed traces of both Eskimo and European cultures. The latter is of eighteenth century origin and the former up to two centuries earlier.

A collection of 405 plant specimens was obtained for the British Museum in 1938, chiefly from Ubekendt Island.

In continuation in 1938 of the work by Carmichael and Dymond[3], a number of pilot balloon flights were made. Evidence was obtained confirming the work of the previous year, very small wind velocity being again noted in the stratosphere at heights above 15 km. and a velocity maximum about 9 km. in the troposphere. The single theodolite (R.A.F. type) method was employed on the assumption that the balloons rose at constant rate. The same type of balloon was used as in 1937.

Longitude and latitude observations made at Igdlorssuit by means of a Watts 3¼-inch micrometer theodolite indicate that the position of Ubekendt Island is correctly shown in the existing charts and maps. The topography of this island and also that of Upernivik is very inadequately and sometimes wrongly represented. A detailed plane-table triangulation on the scale of 1 : 50,000 was made of a small area embodying the most interesting geological features on the southern half of Ubekendt. Observations taken during excursions on Upernivik will amplify the topography and correct some errors.

Finally, it is thought desirable, on the whole, that work along similar lines should be encouraged, and, with the permission of the Greenland Administration, continued.

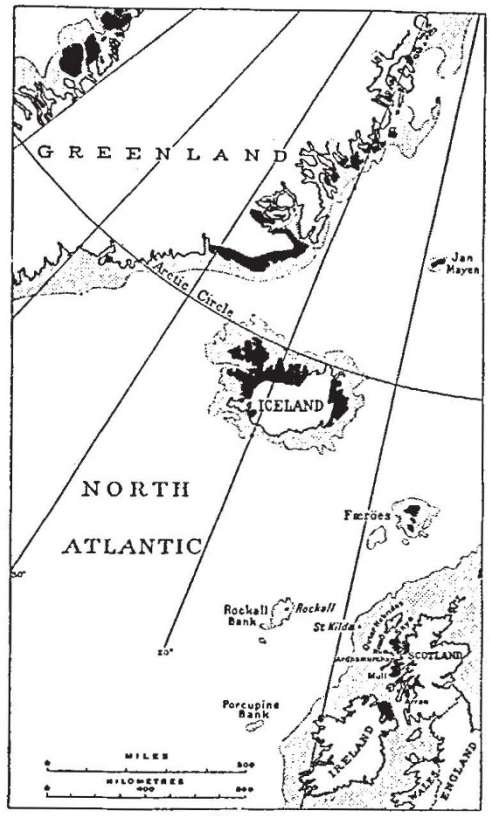

Fig. 2.

REPRODUCED FROM "SCOTLAND: THE TERTIARY VOLCANIC DISTRICTS", BY DR. J. E. RICHEY, BY PERMISSION OF THE CONTROLLER OF H.M. STATIONERY OFFICE.

[1] Wordie, NATURE, **140**, 1083 (1937); *Geogr. J.*, **92** (1938).
[2] Drever, *Geogr. J.*, **94** (1939).
[3] Carmichael and Dymond, NATURE, **141**, 910 (1938); *Proc. Roy. Soc.*, A, **171**, 345-359 (1939).

OBITUARIES

Prof. W. Lindgren

PROF. WALDEMAR LINDGREN, deeply respected by all mining geologists, died at Brookline, Massachusetts, on November 3 at the age of seventy-nine. He was born at Kalmar in Sweden, and, after a general education in his own country, qualified for the diploma of mining engineer at the well-known *Bergakademie* of Freiberg in Saxony. In 1884 he emigrated to the United States, and soon after was appointed an assistant on the United States Geological Survey, where he passed through successive grades to be chief geologist in 1911.

Lindgren's field work was mostly done on the mining fields of the western States, in Arizona, California, Colorado, Idaho, Oregon, and Utah, his results being described in a series of remarkable memoirs which were characterized by carefully detailed records of the geology and mineralogy of the ore deposits, supplemented always with cautiously restrained excursions into the field of theory regarding their origin. On the data recorded in these earlier papers was built up the theory of 'secondary enrichment', especially of sulphide-ore deposits; for he noticed that the solutions formed by meteoric waters near the outcrops of the lodes passed down along the ore-bodies, and became deoxidized at greater depths preparatory to re-precipitation of the metals as sulphides by reaction with the primary ores at lower

depths in the deposits. The theoretical aspects of this question and their variations due to previous changes in the physiography of the areas were afterwards discussed by Lindgren in various papers published in *Economic Geology*.

At a later stage in his long career of activity, and based partly on a study of the tin deposits in Bolivia and elsewhere, Lindgren formulated the principles of metasomatism as a process in the formation of ore-deposits. This subject he analysed in all its theoretical aspects in his presidential address to the Geological Society of America in 1925.

Occasional by-products of his main line of work appeared as descriptions of new mineral species and new occurrences of known forms. He was the first to recognize analcite as a primary mineral in igneous rocks, and this led to the necessity of re-examining the colourless, isotropic substances previously assumed to be residual glass in many basalts.

In 1912 Lindgren was appointed professor of economic geology at the Massachusetts Institute of Technology, and in the following year he published the first edition of his comprehensive treatise on "Mineral Deposits". In 1933 he retired from his chair after twenty-one years of distinguished service; and Prof. Palache, the eminent mineralogist at Harvard, two years later took the opportunity of giving the name lindgrenite to a new natural molybdate of copper, in the year in which Lindgren received also the honorary D.Sc. from Harvard. At "Technology", as the Institute is locally known, Lindgren's name is deeply respected, and is there preserved as the name given to the library of mining and geology. In 1933 he was elected president of the International Geological Congress, and two years ago the Geological Society of London conferred on him the highest honour at its disposal, the Wollaston medal, which has the peculiar interest of being struck in palladium, the relatively rare metal first isolated in 1802 by W. H. Wollaston.

Lindgren's massive record of facts about mineral deposits has been and will be extended by others; but it is unlikely that his theoretical deductions will ever undergo serious change, for he was too wise to stray beyond the deductions immediately justified by the facts, and he knew far too much about his subject to regard any present theory of ore-deposits to be complete to the exclusion of all others.

T. H. HOLLAND.

Prof. W. P. Lombard

THE death of Warren Plimpton Lombard at the age of eighty-four years removes one of the last direct links between the laboratory of Carl Ludwig and experimental physiology in the United States—a link with which American physiologists, like those of Britain, have always been proud. Born on May 29, 1855, the son of Israel Lombard by his wife, Mary Ann Plimpton, he was descended on both sides of his family from Puritan stock which had emigrated to the American continent early in the seventeenth century. He was born and spent his boyhood in West Newton, Massachusetts, and obtained his preparatory education in the public schools of that town. He received his baccalaureate degree from Harvard in 1878; and also an M.D., Harvard, in 1881.

On the advice of Henry Pickering Bowditch, who was a pupil of Ludwig as well as the first experimental physiologist of Harvard, Lombard went to Leipzig in 1881 to spend three years in the stimulating and liberal atmosphere of Carl Ludwig's laboratory. There he became interested in muscular contraction, in spinal reflexes and in the various recording techniques which Ludwig had devised and of which he was an accomplished master. His first paper, published from the Leipzig laboratory, dealt with the sequence of contractions of various muscles of the hind limb of the frog under reflex stimulation (*Arch. Anat. u. Physiol.*, 408; 1885). He designed elaborate recording myographs which made possible simultaneous records of as many as twenty muscles attached simultaneously to the lever system.

Lombard was one of the first after Descartes to consider the problem of reciprocal innervation of antagonistic muscles. Later he studied the knee-jerk, vasomotor reflexes, skin temperature and its control; and his successor, Robert Gesell, states that much of Lombard's time during his early years was devoted to the study of the mechanics of two-joint muscles (see *Amer. J. Physiol.*, **20**, 1; 1907). "The fact that a two-joint muscle can make use of the tendon action of another two-joint muscle on the opposite side of the leg accounts for the paradox that a two-joint muscle, when in a position to have a stronger extensor than flexor leverage, may extend a joint of which it is a flexor". He was likewise interested in respiration and worked out a balance sufficiently sensitive to record the minute changes in weight incident to the fluid loss which accompanied each expiration. His technique for observing capillary circulation in man has been almost universally adopted in the many subsequent studies carried out in this field. As a teacher he followed Ludwig in being an ardent exponent of 'practical' laboratory instruction, and few better laboratory guides have ever been written than his "Directions for Laboratory Work in Physiology for the use of Medical Students (2nd ed. 1914).

On returning to the United States from Europe, Lombard became an assistant in physiology at the College of Physicians and Surgeons in New York City. Thereafter he went back to Europe for several years and on reaching America again in 1889 he accepted the appointment of assistant professor in physiology at Clark University in Worcester, Massachusetts. In the same year, William Howell took the chair of physiology at Michigan as successor to Henry Sewall, whose health had forced him to abandon the inclement weather of Michigan for the clearer and warmer climate of Colorado. Howell was called to Johns Hopkins in 1892 and Lombard was then asked to fill the chair of physiology at the University of Michigan, where he remained until his wife's death in 1923, at which time he retired.

Lombard was a warm and friendly person, who had wide interests apart from science, and in the