in this department of research was engaged by his long and close observation of the foliated and gneissic rocks of the terrains he had mapped and by the realization that light on this subject might be revealed by experiment in which the factors of pressure, temperature and solution were separated, and the part played by each investigated, first independently, and then in combination. In this work he had the great advantage of collaboration with his engineering colleagues at McGill, first of Nicolson, later of Coker, while his financial resources were supplemented by a grant from the Carnegie Institution. Their results are set down in a remarkable series of publications dealing with the experimental flow of rocks (1901), the elastic constants of rocks (1906), the flow of marble (1910) and an experimental investigation on the depth of the zone of flow in the earth's crust (1912, 1917).

Formerly, almost the only quantitative data on the mechanical behaviour of rocks had been obtained by crushing cubes of rock in a testing machine according to the ordinary rules of engineering practice. Adams's experiments clearly demonstrated that rocks change their character when a confining pressure is applied so that they are no longer brittle but behave plastically. He was able to show that the structures presented by the deformed rocks matched some of those seen among crystalline schists, that the plastic flow of marble in his experiments was associated with gliding or twinning of calcite, unaccompanied, even at the elevated temperatures used or in the presence of water, by re-crystallization, and that in order to develop flow within the crust a rock must be subjected to differential stress which is much, often many times, greater than that sufficient to crush it under ordinary conditions obtaining at the surface.

These experiments had a direct bearing on various problems presented in geophysics—among them the movement of nappes and isostasy—and they have been the first to supply the much needed quantitative data for the study of these and related problems. As such they have formed the pioneer researches in this field of experimental geology, and it is only within recent years that investigation on these lines has been renewed under more closely controlled experimental conditions which advance in technique has permitted.

After his retirement from the Logan chair at McGill, Adams's activities continued unabated. He visited the Far East and spent several field seasons in Burma, Malaya and Ceylon. The most important of his publications during this period was his "Geology of Ceylon" (1929), which presented the first geological map of the island and the first attempt at deciphering its larger structures.

Adams's keen interest in the history of his own chosen field of geology was evinced in many of his early writings. Through the years by diligent search he had gradually acquired a great collection of rare historical texts, and their study served greatly to enrich the scholarly memoir on the "Birth and Development of the Geological Sciences" (1938) which formed the final product of his labours.

During a long and distinguished career, Adams received many honours both in Britain and America. His frequent visits to Great Britain had brought him into close contact with the leading British geologists, and he was a well-known figure at scientific congresses. He was elected a fellow of the Royal Society in 1907 and he was a foreign associate of the

U.S. National Academy of Sciences; he served as president of the Geological Society of America (1918), and as the outstanding Canadian geologist of the time was chosen as president of the International Geological Congress which met in Canada in 1913.

C. E. TILLEY.

Mr. F. W. Harbord, C.B.E.

MR. FRANK WILLIAM HARBORD, who died on December 27, at the age of eighty-two, after a long and active career as a metallurgist, was born in Norwich and studied at the Royal School of Mines. After holding posts in iron and steel works in Staffordshire he became consulting metallurgist to the Indian Government, and from 1892 until 1905 he was at the Royal Indian Engineering College at Coopers Hill. In 1905 he took up private consulting practice in London, and the firm of Riley and Harbord (later Riley, Harbord and Law) has always enjoyed a high reputation in the metallurgical world. Although greatly hampered in later years by failing eyesight, he retained his position as senior partner until his death.

Harbord published very few original papers, but he contributed regularly and usefully to the discussions before the Iron and Steel Institute, and his text-book on the "Metallurgy of Steel", in which Mr. John Hall collaborated on the engineering side, reached a seventh edition and long retained its position as the standard English authority on the subject. In his earlier career he published papers on the removal of non-metallic elements from steel in the basic open-hearth process, on nitrogen and arsenic in steel, and on the relations between the properties of steel and its process of manufacture. In 1937 he reviewed very fully the history of the basic Bessemer process, drawing largely on his knowledge of the men connected with its development. The problem of the efficiency of steel works was discussed by him on several occasions.

He was closely associated as a consultant with the development of many new inventions, and in 1903, at the request of the Canadian Government, he reported on the position of electric smelting processes. During the War of 1914-18 he rendered valuable services as honorary metallurgist to the Ministry of Munitions, and at its end was awarded the C.B.E. He was also an officer of the French Legion of Honour.

Harbord took an active interest over many years in the work of the Iron and Steel Institute, being a regular attendant at its Council and committee meetings. He received the Bessemer Medal of the Institute in 1916. His kindly character made him a very popular member.

C. H. DESCH.

WE regret to announce the following deaths:

Dr. George Crile, director of research at the Cleveland Clinic Hospital, of which he was one of the founders, and an honorary fellow of the Royal College of Surgeons, who was known for his work on surgical shock, on January 6, aged seventy-eight.

Sir Arbuthnot Lane, Bt., C.B., the well-known surgeon, on January 16, aged eighty-six.

Sir Henry Maybury, G.B.E., K.C.M.G., C.B., president in 1933 of the Institution of Civil Engineers, on January 7, aged seventy-eight years.