

obituary

L. F. Cooling

DR L. F. COOLING died on Tuesday, 15 February after a short illness. He was 73. His death marks the close of a significant era in the development of engineering science in Britain. Born in Birmingham, he graduated there in physics in 1925 and later gained an MSc for studies of the thermo-magnetic properties of meteorites. In 1927 he joined the Building Research Station at Garston and he remained there until his retirement as an assistant director 41 years later in 1968.

His early work on permeability and evaporation properties of porous building materials formed a good basis for his future research into the engineering properties of the ground. In 1933 he was made head of a soil physics section formed to carry on Prof C. F. Jenkin's work on earth pressure and to study road foundation problems for the Road Research Board. His laboratory in the Stable Block at Garston was the pioneer soil mechanics laboratory in Britain.

Cooling was the only British participant at the first International Soil Mechanics Conference in Harvard in 1936 where he acquired confidence in

his subject. By 1937, when he had been joined by Prof A. W. Skempton, FRS, and Dr H. Q. Golder, he had aroused considerable interest among civil engineers in the practical value of soil mechanics by his investigations of several landslips involving railway cuttings and retaining walls. In particular his diagnosis of the Chingford Reservoir embankment failure, which brought Karl Terzaghi to England for the first time, provided the impetus for the recognition of soil mechanics as an engineering discipline throughout Britain and engineers from many organisations came to the Building Research Station to be trained.

Cooling was practically minded but he never pretended to be an engineer. His lucid understanding of physics enabled him to convince engineers of his reasoning and they had absolute confidence in him. He was unpretentious and always talked sense.

During the war years the emphasis on the investigation and analysis of foundation and earthwork failures grew. The field studies pointed to weakness in the understanding of the in-situ mechanical behaviour of the ground and Cooling initiated a programme of intensive field investigations in which

detailed measurements were made of the performance of structures such as earth dams, tunnels and building foundations.

Cooling's contributions to engineering science were recognised in 1952 by his University with the award of a DSc, this time in engineering, and by the Institution of Civil Engineers who invited him to their membership. In later life Dr Cooling played many leading roles in the committees, societies and journals concerned with the national and international organisation of soil mechanics. He gave the second Rankine Lecture "Field measurements in Soil Mechanics" to the British Geotechnical Society who also recognised his interests in young people by creating the Cooling Prize, to be awarded annually to the best presentation from a young engineer—a function he always looked forward to in his retirement.

Cooling was a keen sportsman. At University he played for the England Amateur football team. He was a Midland Counties Champion runner and an enthusiastic player of shove ha-penny and golf.

He leaves a wife and a daughter.

W. H. Ward

E. Cunningham

EBENEZER CUNNINGHAM who died in Corbridge, Northumberland, on February 12 at the age of 95 was a pioneer in introducing the work of Einstein in this country. His father was a cabinet maker; G. D. Cunningham, organist and conductor, was his elder brother. From Owen's School, Islington, he won a mathematical scholarship at St John's College, Cambridge, was Senior Wrangler in 1902 and a Smith's Prize-man in 1904, when he was elected to a Fellowship. After holding lectureships at Liverpool University and University College, London, he returned to St John's in 1911 and until 1976 his home was in Cambridge, where he played an important part both in the Faculty of Mathematics and in his college. His clear and stimulating lectures on branches of applied mathematics are remembered with pleasure and a pupil says of his approach to an unfamiliar

problem, "you were seeing the Senior Wrangler in action."

His first few papers were on pure mathematics but by 1907 he was writing on electromagnetism; in 1909–12 he and H. Bateman, for a time a colleague at Liverpool, contributed papers to the *Proceedings of the London Mathematical Society* on the four-dimensional transformations of the electro-dynamical equations. In 1910 he also made a correction to the Stokes formula for the velocity of steady fall of particles in a fluid.

For the next decade his main interest was the study and exposition of Einstein's theories. *The Principle of Relativity* (C.U.P. 1914) gave the first account in English of the Special Theory of Relativity. In 1915 he published *Relativity and the Electron Theory* (Longmans, Green & Co.) and in the second edition (1921) he included an introduction to the General Theory; "Gravitation" was added to the title.

His books emphasise comparison with theory at every stage; in most other accounts it is difficult to see how much of the theory is directly required by experimental evidence and how much, apparently, by pure thought. In 1919, very soon after the announcement on November 6 of the results of the Solar Eclipse Expeditions, he wrote three articles in *Nature* (Vol. 104) on "Einstein's Relativity Theory of Gravitation." In 1921 *Nature* for February 17 was devoted to articles on Relativity and his contribution follows that of Einstein.

He and his wife, whom he married in 1908, were active members of Emmanuel Congregational Church and they made many friends in all walks of life. He bore with courage her loss in 1969 and his increasing blindness. In this he was helped by his strong religious belief and his lifelong love of music.

Harold Jeffreys