Owners' Association, that a coal-dust explosion was obtained of sufficient violence to blow the gallery to pieces, and hurl masses of the boiler-plate of which it was constructed five hundred feet into the air.

For many years Galloway's conclusions were received with almost universal scepticism. The idea that colliery explosions are simply due to fire-damp was firmly rooted. It was, moreover, known that blasting with ordinary gunpowder was commonly carried out with impunity at working faces, provided that fire-damp was absent, though much coal-dust might be present. Owing to the conflict between his views and those of senior colleagues, he had to resign his position as inspector of mines. Gradually, however, confirmation came from other mining engineers or scientific investigators, and particularly from junior inspectors of mines, among whom the brothers W. N. and J. B. Atkinson and Mr. Henry Hall took a leading part. Meanwhile, Galloway held for many years the chair of mining at University College, Cardiff. He also became a well-known consulting mining engineer, and remained so until his death, retaining his activities and scientific interests to the last.

Galloway never tired of urging the necessity of precautions against coal-dust explosions. He laid most stress on keeping the roads wet, and providing dust-proof underground waggons; but he also pointed out, and proved by experiment, that the dust could be made safe by the addition to it of inert material. The latter precaution, independently initiated and vigorously developed by the late Sir William Garforth, has turned out to be practicable and effective; and our knowledge of the conditions under which coal-dust explosions occur, and what is necessary to prevent them, has advanced rapidly in recent years, a great part of the advance being due to the experiments carried out under Prof. Wheeler's supervision at the Experimental Stations at Eskmeals, and later at Buxton.

The death-rate from colliery explosions in Great Britain has been reduced to about a tenth of what it was when Galloway began his work. No better tribute than this could be paid to the inherent value of that work, since it is the attention which has been paid to the dangers from coal-dust that has brought about the reduction. But even if he had turned out to be wrong about coal-dust, those who knew him would still have loved and respected him for the greatness of his character. J. S. H.

THE memorial address on Prof. O. Wiener delivered by Prof. L. Weickmann before the Academy of Science at Leipzig on July 1 is reproduced in the *Berichte* of the Academy for that date. Otto Wiener, the son of Christian Wiener, professor of mathematics in Karlsruhe, was born on June 15, 1862, and after leaving school became a student in Karlsruhe, Berlin, and Strasbourg in succession. At Strasbourg he was associated with Kundt, and obtained his doctorate in 1887 with a thesis on the measurement of the thickness of the thin metallic films used by Kundt in his work on the passage of light through metals. After acting as assistant in Strasbourg and in Aix-la-Chapelle, Wiener was appointed professor at the latter in 1894, and at Giessen in 1895. After building a new physics institute there, he was appointed to Leipzig in 1899 and built a still larger institute, which was opened in 1905. He had much to do with the establishment of aeronautical and meteorological departments at Leipzig, and more recently was engaged in developing a kinetic ether theory of the universe. He is, however, best known for his optical researches. He died on Jan. 18 last.

News and Views.

ON Tuesday, Nov. 15, M. Paul Painlevé, professor of celestial mechanics at the Sorbonne, and French Minister for War, gave an evening discourse at the Royal Institution before a large audience. M. Painlevé's lecture took the form of a general review of the evolution of scientific conceptions on the structure of matter from the early speculations of Greek philosophers down to the most recent and advanced theories. He pointed out that this problem resides essentially in a change of scale, and put the question as to whether matter would appear continuous or discontinuous if our senses were refined far beyond the range of our most powerful instrument—the famous controversy of *plenum versus vacuum*. In turn, continuity and discontinuity have seemed to prevail as an explanation of matter and of light. The atomic theory, and the corpuscular emission of light on one hand, and on the other hand thermodynamics and the theory of luminous waves, are characteristic of these two tendencies. Turning to the question of the reality of molecules, M. Painlevé referred to the great number of very diverse methods agreeing to a remarkable degree of accuracy in their result as to the number of molecules in a unit weight, and mentioned in this connexion the researches of Prof. Perrin on the Brownian movement. He then dealt with the atomic microcosm, showing that the study of corpuscular radiations forces us to introduce the idea of discontinuity inside the atom and to regard all matter as made up of two final elements only—the electron and the proton. Towards the end of the lecture, M. Painlevé mentioned the difficulties which lie in the way of explaining the luminous spectra emitted by atoms, and expressed the hope that the new mechanics, by associating material corpuscles with these mysterious waves, would ultimately overcome those difficulties. He showed a series of interesting slides illustrating points which he had discussed in his lecture, such as atomic impacts and coloured regions with well-marked outlines indicating differences of molecular thickness in soap films. The audience frequently expressed appreciation of the lecturer's eloquent exposition of his subject.