

Obituary.

DR. R. E. FROUDE, C.B., F.R.S.

ROBERT EDMUND FROUDE, who passed away at Cambridge on March 19 after a brief illness, came of a distinguished family. One of his uncles was the celebrated historian, James Anthony Froude, professor of modern history at Oxford, and author of many well-known historical works, while another uncle, Hurrell Froude, took a prominent part in the Oxford Tract movement. His father, the late William Froude, F.R.S., devoted a lifetime to research in ship propulsion, and was the pioneer of the system of testing the probable qualities of a proposed ship design by towing experiments in an "experiment tank" on a model hull carefully made to the exact proportions of the intended ship. Beaufoy, in the latter part of the eighteenth century, had carried out some interesting experiments on frictional resistance in the open water of the Greenland Dock (London), but it was William Froude who conceived and carried out the idea of having a large covered tank specially built in which ship models were tested for resistance. This tank was erected at Chelston Cross near Torquay about 1870, and it was there that the earliest work of this kind was carried out. How the system has spread may be gathered from the fact that in Great Britain alone six such tanks, for warship and merchant ship models, all much larger and more completely equipped than their prototype, are now built and fully occupied; while similar tanks exist in America, France, Italy, Germany, Austria, Holland, Russia, and Japan.

The system when first proposed was, like many other useful discoveries, looked upon complacently enough as a pleasant recreation for amateur enthusiasts, but the remarkable results obtained and the accurate forecasts of the power required to drive a proposed ship at a given speed, which could by this means be made, soon brought recognition of its value, and William Froude was in 1870 engaged by the Admiralty to test models of projected warship designs. In 1884 the Admiralty decided to build a larger (500 ft.) tank at Haslar (near Portsmouth), and when this tank was completed, Mr. R. E. Froude, who had received his early training in model experiment work under his father, became superintendent of that establishment. Here for more than thirty years (until 1919) Mr. Froude continued to carry on the work inaugurated by his father, and his notable contributions to the Transactions of the Institution of Naval Architects and other scientific societies bear evidence not only of his great skill as a scientific investigator, but of the practical lines upon which his research work was carried on. Hull forms and resistance were the principal branch of that work; but to propeller problems, so difficult of exact solution, he also devoted much time and thought; while wave motion and the rolling of ships were carefully investigated and yielded valuable results. The more notable papers which he contributed to the Transactions of the Institution of Naval Architects form the basis of all subsequent work, and have become classic examples of the best research in this branch of applied science.

Mr. R. E. Froude was born in Devonshire in 1846. All of his professional life was spent on the south coast,

but after retiring under the age limit from his Admiralty post he moved to Cambridge, where he spent the remaining years of his life. He had always been an enthusiastic yachtsman, and was a frequent competitor in single-handed sailing matches in the Solent. His knowledge of ship design doubtless added to the interest which he took in this form of sport, though the art of successful yacht-building still conceals many secrets from the purely scientific investigator.

Mr. Froude was elected fellow of the Royal Society in 1895, and was awarded a C.B. in 1910 for the services he had rendered to the Admiralty. He served for many years on the Council of the Institution of Naval Architects; and was in 1905 elected an honorary vice-president of the Institution, to which he had made such valuable contributions.

COUNT HILAIRE DE CHARDONNET.

THE death of Count Hilaire de Chardonnet in Paris on March 12 will be regretted in the world of science. A career of consistent devotion to a scientific-technical ideal through a long life of eighty-four years, and closing without diminution of vital—even passionate—interest in his work, impresses the immediate sense of loss, which at once gives place to the pleasing recognition of so much positive achievement.

"Artificial silk" suffers from its name, but the wit of the age which has seen its birth and development to a staple textile is not equal to the discovery of a term free from any bar sinister. To Chardonnet belongs the peculiar honour of first transforming cellulose into a textile fibre rivalling the insect product which held the world for nearly 5000 years as the last expression of elegance and strength in this field of natural products. It must not be forgotten that a silk thread, with its diameter of 1/100 mm., represents a colloid of such structural quality that the unit thread has a tenacity represented by a breaking strain of 50 kilo. per square mm. of sectional area. The public which uses the artificial silk in immense quantity has little thought of its history, and perhaps even the corporate body of men of science are not quite sure as to how far its French pioneer is to be taken "au grand sérieux." A short account of his career and work may, therefore, be of interest to many readers of NATURE.

Chardonnet had his formal training at the École Polytechnique. On leaving, he entered at once into research work, studying particularly the absorption of ultra-violet rays by normal and morbid tissues both vegetable and animal. Such contact with biology, at a time when Pasteur was publishing his important works on the silkworm, supplied the incident or accident which so often appears in directing the life-work of inventors. Chardonnet was attracted to the subject of silk and took it up on rigid scientific lines. Probably he dived back into ancient history and found that Réaumur in 1734, in a "Mémoire pour servir à l'histoire des insectes," gave a categorical forecast of artificial silk.

The stages of his life-work are a short story—1878-1884, researches ending in filing his *pli-cacheté* at the Academy containing a close description of the essential