

hypotheses to the most crucial and varied practical tests, and conclusively proved their truth, or determined the limits of error involved by them. He had the power of arranging almost intuitively simple experiments for qualitatively testing the value of an idea, and his mathematical knowledge and power of close and accurate reasoning enabled him to work out the quantitative results of a difficult problem with great facility. His experimental tank at Torquay, with all the delicate and interesting contrivances in connection with it for measuring and recording the behaviour of models in rolling or their resistance to motion through the water is a marvel of philosophical arrangement and practical skill. Mr. Froude's published papers include but a small portion, we believe, of his work. It would be a worthy tribute to his memory, and a great boon to science and to the shipping interests of the country if the result of his researches could be published in a complete form, and thus made readily accessible.

Mr. Froude had not much encouragement during the early days of his investigations upon these subjects. The first to appreciate their value were the late Prof. Rankine and Mr. Crossland, one of the constructors of the Navy. Mr. Crossland was one of the first to see that Mr. Froude, in his first paper on the Rolling of Ships, read before the Institution of Naval Architects in 1861, had indicated the true laws of rolling motion, and in the following year he contributed an original paper upon the same subject. Mr. Reed was the first to apply the principles enunciated by Mr. Froude to the construction of ships; and did so with great ability and success. Canon Moseley, Dr. Woolley, and others did not see, however, for a considerable time, that Mr. Froude had made a great stride in advance of previous knowledge, and had really discovered the means that had long been wanted of arriving at a due comprehension of the dynamical laws which govern a ship's behaviour at sea. Mr. Froude's lucid and painstaking explanation of his theory and replies to the objection of Dr. Woolley and others produced in due time their full effect, and in the course of a very few years all who were capable of understanding the arguments upon which the theory was based were thoroughly convinced that Mr. Froude's method and its results were sound, and were such as could alone lead to improvement in this branch of science.

Mr. Froude's scientific reputation and the value of his work now rest upon a solid foundation. His discoveries have revolutionised whole theories of hydrodynamics, and have stood the test of practical application. He has received various honorary distinctions, such as the degree of LL.D. from the University of Glasgow, and the Royal Medal of the Royal Society; but his greatest distinction, and that with which his name will always be associated, is that, in an age when science is fashionable and many of its professors look more to the show than the substance, Mr. Froude devoted his energies to a long and unwearied search after truth in a department of science that few knew anything about, and that could have no interest for the many, and he looked only to success for his reward. Happily, in this sense he was bountifully rewarded, and has left, both in the subject-matter of his researches and the example he set in pursuing them, a legacy to those who follow after which should stimulate them to work with all their might, with the one object of endeavouring also to attain unto truth and to be worthy of being admitted within the veil of the temple of nature.

KARL KOCH

THERE are very few even among professed botanists, who avail themselves to any thing like the extent they might do of the teachings of a garden. And yet for the study of the life-history of plants and for the due estimation of their precise degree of relationship one to the

other a garden offers in some ways—in many ways—unrivalled opportunities.

Karl Koch, whose death we lately recorded, was one of the few who had a right appreciation of the resources of a garden and who knew how to turn them to account. His tall, attenuated form and keen eye were to be observed at most of the International Botanical and Horticultural Congresses which have been held in various continental cities and in London in 1866. Everywhere, by horticulturists as by botanists, his claims to high rank among his fellows and his title to respect and even affection for his personal qualities were acknowledged, so that it became a pain to those who saw him recently to notice his gradually failing powers and to see how the old spirit was curbed and checked by impaired physical health.

Karl Koch was born in Weimar in June, 1809. In that little capital he came in contact, as a youth, with Goethe, and it was partly owing to his influence and advice that Koch made his visits to the Caucasus and various parts of Asia Minor. Shortly after he had completed his studies in medicine and natural history at Jena and at Würzburg he set out on his travels, his special objects being the investigation of the vegetation and an inquiry into the original sources of our cultivated fruit-trees. After two years' research he suffered so severely from the effects of sunstroke on Mount Ararat that he was obliged to return to Jena, but in 1843 he set out a second time for the East. Of his first journey an account was published in 1842, under the title of "Travels through Russia," of his second, in 1845, under that of "Wanderings in the East." A general account of his travels may be found in the *Linnaea* for 1848, in which publication also may be found catalogues and descriptive lists of the plants collected by him, together with remarks on the geographical distribution of plants in the Caucasus, &c. On his return from this second expedition he became assistant-director of the Botanic Garden at Berlin, secretary of the Prussian Horticultural Society, and, a few years later, Professor of Botany in the University.

His position at Berlin gave him exceptional facilities for studying cultivated plants, and, accordingly, much of his botanical work consisted of monographs of Arads, Bromeliads, Agaves, and other plants, necessarily imperfectly preserved in herbaria. Many such monographs are scattered through the *Wochenschrift* of the Berlin Horticultural Society, and which was for many years edited by him. As a pomologist also he held no mean position, but the most interesting and valuable part of his labours, so far as this branch is concerned, are those relating to the origin of cultivated fruit trees, a subject intimately connected with the history and migrations of our own race.

His *magnum opus*, however, is his "Dendrology"—a scientific description of the trees and shrubs cultivated in the forests and gardens of central Europe, a work for which his travels had well prepared him. For the purpose of compiling this volume Koch visited almost every country in Europe. All the great nurseries of the Continent and of our country were also inspected by him with the object of study or of securing specimens.

Despite small defects of method Koch's descriptions are excellent and characteristic, so much so, that it is a great pity that his work has not been translated into English. The technical details of his subject are enlivened by short biographical notices of the botanists and horticulturists whose names are the most prominently associated with the department of botany, of which his work treats. The reader of these interesting notes to an otherwise necessarily dry technical book will have no difficulty in understanding the estimation in which Koch's popular lectures on trees and on fruit trees in particular were held by the Berlin public.

In private life Koch was beloved for his uprightness, loyalty, and warm-hearted devotion to his friends.