

muscle myosin, etc., and a stratified structure with alternating lipid and protein layers in the sheaths of myelinated nerves, the rod-shaped cells of the retina, and the red blood corpuscles. It is interesting, moreover, to trace a 'linear principle' through chain-molecules, micelles, and fibrils, to fibres in the mechanical tissues, and a 'foliar principle' through molecular layers of pigments associated

with layers of lipoids and proteins, in discoid grana in disk-shaped plastids which are exposed to light in a flattened leaf. The study of morphology must be pursued not simply to the somewhat arbitrary limit of microscopic resolution, but to the molecule, in which any change results in a change in the nature of the material itself.

S. H. CLARKE.

Obituary Notices

Mr. E. H. Richards

IT is with deep regret that we record the death of Eric Hannaford Richards, of the Rothamsted Experimental Station, Herts, which occurred at Bovey Tracey on May 16.

Richards was born on June 28, 1878, at Hanwell, Middlesex, only son of Joseph Peek Richards, medical superintendent of the Middlesex County Asylum in 1867-92, and educated privately. In 1902 he joined the staff of the Royal Commission on Sewage Disposal, working under Dr. George McGowan, and was put in charge of the Commission's large-scale experiments at Dorking on different methods of sewage purification. These were brought to a successful conclusion. In 1909 he was transferred to Belfast to study methods of dealing with the excessive growth of seaweed in Belfast Lough: this was done in association with Prof. Letts of Queen's University. He then returned to Dr. McGowan's laboratory at Ealing, where he remained until 1913.

In that year, the Hon. Rupert Guinness (now Lord Iveagh) decided to arrange for investigations into the possibility of utilizing organic waste materials as fertilizers. His experience of the Bagshot sands at Woking had impressed upon him the need for making greater use of organic manure, while the growing tendency to substitute motors for horses was decreasing the supply of the stable manure which had hitherto been the mainstay of market gardeners, potato growers and dairy farmers around London. He saw, therefore, the need for opening up new supplies, and he provided the funds for the Rothamsted Experimental Station to carry out a full investigation. E. H. Richards was chosen for this work, and he fully justified the selection.

For the first few years, in collaboration with me, Richards studied the changes taking place in the making and storing of farmyard manure and showed how the losses occurred, and how also they might be reduced. Information was also obtained about the decomposition processes that occurred during the making and storing of the manure. This side of the work was greatly developed by an investigation made in association with H. B. Hutchinson on the factors determining the rate and extent of the microbiological decomposition of straw. The essential conditions were an adequate supply of nutrients, particularly of nitrogen, which was generally deficient in the straw

itself; not too acid a reaction; and proper supplies of moisture and of air. The important practical result emerged that straw and other vegetable matter could be fairly rapidly decomposed with production of a humus manure by the simple expedient of adding a source of nitrogenous food for the micro-organisms bringing about the decomposition, and ensuring that the heap did not become too acid. The principles of compost-making were thus for the first time set out, and, although others have applied them in various ways, no new fundamental principles have been found.

One method of using the new principles, and the simplest that has yet been devised for use under British or similar conditions, was developed by Adco, an organization set up for this purpose by Lord Iveagh; it has been so successful that some 100,000 tons of manure are said to be made annually in this way, chiefly by private gardeners and market gardeners in Great Britain and by planters overseas. The method is also used in France for the making of mushroom beds. It is, however, less suitable for farmers, though modifications are from time to time devised which cheapen it.

In recent years Richards was also engaged on an investigation into the purification of effluents from sugar beet factories and milk factories. This was carried out for the Department of Scientific and Industrial Research in association with D. Ward Cutler and his colleagues in the Microbiological Department at Rothamsted, and with S. H. Jenkins, who supervised the large-scale experiments, while Richards himself had as collaborator N. W. Barritt. This work led to the discovery of the conditions necessary for decomposition and purification of the effluents, and methods were then devised whereby these conditions could be secured in factory practice. The whole investigation affords an excellent example of successful collaboration of three groups of workers for the solution of a difficult technical problem.

All his life Richards had suffered from a deformity which might have crushed the spirit of a less courageous man. But his spirit was indomitable, and he let nothing stand in the way of the work he had set himself to do. He had perforce to renounce some of the pleasures of life, but he had the satisfaction of gaining in the highest degree the respect and affection of all who were associated with him. He was a loyal

colleague and a considerate supervisor, but as he was unsparing of himself so he expected and obtained the best that his associates could contribute to the work they had in hand.

E. J. RUSSELL.

Rev. W. J. O'Leary, S.J.

FATHER W. O'LEARY, S.J., whose death occurred recently, was born in Dublin in 1869, son of Dr. W. O'Leary, M.P., a well-known Home Ruler. After the usual course of study—in Louvain and Dublin—he was occupied chiefly in teaching physics and astronomy in one or other of the Jesuit colleges in Ireland.

Father O'Leary's work on pendulums aroused his interest in seismology, as the result of a visit to Prof. J. Milne's observatory at Shide, I.O.W. He designed a form of inverted pendulum seismometer in which he replaced the suspension suggested by Tchebicheff by one designed by himself. The shaft of the pendulum was supported on a steel plate which was suspended in a concrete pit by three steel wires. The pendulum thus suspended was extremely sensitive and almost unstable. A suitable arrangement of levers and pens traced a record on smooth paper moving on a rotating cylinder. The weight of the 'bob' was one and a half tons. This instrument gives a very wide and clear record. In connexion with this he designed a recording clock on the free pendulum principle. It is of interest that Father O'Leary made and mounted every part of both seismograph and clock himself—with the exception of the castings for the bob. The instrument constructed by him in 1916 is still functioning in the Rathfarnham Castle observatory, and the steel wires have not been replaced. It is the only one of its kind in existence.

On the death of Father Pigot, director of the Riverview College Observatory at Sydney, Father O'Leary was appointed to succeed him in 1929. Until last year he held this post, when he retired, but still continued his work. In addition to his seismological activities, he did valuable work on the observation of variable stars, and designed a special form of blink comparator for this purpose. His work also included observations on solar radiation.

With the exception of a text-book on mechanics and the results of his observations, Father O'Leary published very little. The detailed description of his free pendulum clock, a piece of original and first-class work, awaits publication. It has only been described in the patent specification.

Father O'Leary was a past president of the New South Wales branch of the British Astronomical Association. He was well known to members of the British Association, before whom he preached on more than one occasion. The end came with great suddenness. For some time his heart had been giving him trouble, but this did not interfere with his work, and only the night before he had been working as usual in the observatory. A most kindly and popular man, he will be missed not only as a scientific worker, but still more as a friend.

H. V. GILL.

Sir George Kenrick

By the death on May 28 of Sir George Kenrick, the educational world has lost a man whose record for public service is remarkable even in a city, Birmingham, which is outstanding in its reputation for the production of leaders in civic work.

Sir George was born in 1850, and after a training as an engineer in the Nettlefold works, he entered the well-known firm of hollow-ware manufacturers founded by his grandfather. At thirty years of age he was elected a member of the Birmingham School Board. He was elected to the City Council in 1903 and was made chairman of the Education Committee, a post which he held for eighteen years. Together with George Dixon, he founded the Birmingham Day Training College for Teachers, giving £5,000 for its endowment. In 1886, as a member of the Council of the Birmingham and Midland Institute, he gave £1,000 towards the equipment of its metallurgical department. When Mr. Joseph Chamberlain announced his scheme for the creation of a University of Birmingham Kenrick subscribed £10,000. He went, with the late Profs. Poynting and Burstall, on a tour of inspection of American universities to acquire first-hand knowledge of the development of engineering departments in the United States with a view to the creation of such a department in the new university. He became chairman of the Building Committee which was responsible for the buildings on the new site at Edgbaston. When the formal opening of the new buildings by King Edward VII was arranged for 1909, it was fitting that George Kenrick should be Lord Mayor, and his services to education were recognized by the King in the conferment of a knighthood. When Mr. Joseph Chamberlain made a second appeal for funds for the University, Sir George again made a donation of £10,000, and in 1914 on the death of Prof. J. H. Poynting he gave £18,000 to endow the Poynting chair of physics.

So far back as 1881, George Kenrick introduced compulsory physical training into the elementary schools of Birmingham—the first attempt made by any school board to introduce physical training as part of the curriculum. Nor did his interest end with the training of the children, for he founded and endowed the Birmingham Athletic Institute for young men and women. He himself was a devotee of outdoor sport—fishing and shooting, cricket, lawn tennis, cycling and walking (even in old age he scorned an overcoat). He was an enthusiastic gardener; and, as a keen entomologist, he had made a fine collection of Lepidoptera in his extensive travels in India and the Americas. He had literary leanings, was specially interested in Shakespeare, and had a fine library.

In disposition, though modest and retiring, Sir George was characterized by quickness of judgment, untiring energy and tenacity of purpose. The city of Birmingham recognized its indebtedness and admiration for his services by conferring on him the highest honour at its disposal, that of an honorary freeman, in 1923. He was unmarried.

G. A. S.