

the University of Edinburgh under Crum Brown, at Glasgow under Dittmar, and finally at Munich. His connexion with the shale oil industry, destined to be a lifelong one, began about 1875, when he became a laboratory assistant to the late Sir George Beilby at the Oakbank Oil Works. In 1877 he was appointed chief chemist to the Broxburn Company, and retired from that post five years ago.

Mr. Steuart was a strenuous worker, endowed with a mind of exceptional intellectual insight and power. His writings are well known, and include a number of articles, contributed to the Transactions of the Society of Chemical Industry, on the shale oil industry, petroleum, and brown coal; some of these are of practical interest, others in speculative vein. To the same Society he read a paper entitled "The Oxidation of Mineral Oils," and edited and read one by his nephew, Mr. B. Steuart, on "The Composition of Shale Naphtha." It was one of his regrets that his routine duties did not permit him to devote more time to organised research; he, however, strongly advocated the desirability of industrial research being taken up by qualified university workers. That his eminence as an authority on shale was widely recognised is attested by articles written by request to "Economic Geology" (U.S.), Ure's "Dictionary," Muspratt's "Chemistry," Thorpe's "Dictionary of Applied Chemistry," and an important contribution to the memoirs of the Scottish Geological Survey entitled "The Chemistry of the Oil Shales." In the last mentioned he propounded a theory referring to the origin of oil shales.

Mr. Steuart's humane instincts led him, in 1890-95, to direct public attention to the number of deaths caused by the use of low flashing burning oils in lamps. He wished the standard of flash point to be raised from 73° F. to 100° F., and gave evidence on the subject before a Select Committee of the House of Commons during the reading of the Petroleum Bill. The measure was unsuccessful, but as the light constituents of petroleum (the cause of low flash point) afterwards became valuable as motor fuel, Mr. Steuart had the satisfaction of seeing burning oils made safer by the elimination of much of the danger in the refinery.

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PROF. O. BREFELD.

THE death was recently announced of Prof. Oscar Brefeld, the founder, and for fifty years a leader, of modern mycology. Born at Telgte in Westphalia, on August 19, 1839, the son of a wealthy pharmacist, whose business he was intended to inherit, he early took an interest in the lower plants, but it was not until 1868 that he began his mycological studies in earnest. At the outset he realised the necessity of sterilising the culture media and the apparatus, and of studying microbes and spores as individuals. For this purpose he introduced gelatine—which he replaced later by agar-agar—and devised the method of pure culture by thinning the medium so as to grow a colony from a single cell under continuous microscopic observation. Thus he laid the foundation of all subsequent microbiological study ten years before R. Koch took up the inquiry.

In 1870 the contemporary work of Pasteur led a Munich brewer to seek the assistance of Brefeld. Here he gained experience and a crop of fruitful ideas, but his work there was cut short by the Franco-Prussian war. From the siege of Paris he was invalided home after an attack of typhus and prosecuted his studies in Berlin. Here he took his doctor's degree, and in 1872 published the first volume of his great life work, "Botanische Untersuchungen aus dem Gesamtgebiete der Mykologie" (18 vols.), known as the mycologists' Bible. The following year saw the publication of his epoch-making researches on the Ascomycetes, especially on the cultivation of the blue mould *Penicillium glaucum* from a single spore to a mycelium with complete fructification. One cannot here go through the contents of successive volumes, but his important work on *Bacillus subtilis*, undertaken for the Prussian Government in 1878, demands mention. Brefeld did not, however, pursue bacteriology, feeling that his medical knowledge was too slender: Robert Koch was therefore substituted to become the "German Pasteur."

Brefeld, after habilitating as privat-docent in Berlin, became, in 1876, professor at the Forestry Academy in Eberswalde. Here he lost the sight of one eye. As a consequence of the "Kulturkampf" he was urged by the Government to become professor of botany at Münster in Westphalia. Here he continued to publish the most valuable work, until his removal to Breslau in 1898. In the year before the War, Brefeld resided in Berlin, where he lectured; but he became completely blind and had to resign his professorship.

Brefeld was a hard worker, entirely bound up in his life-work. He did not care to have pupils, but he trained a succession of assistants, among whom may be mentioned the Germans, Zopff, Alfred Möller, and R. Falck; the Norwegians, Holtermann and Sopp; the Swiss, Von Tavel; and the Hungarian, Gyula de Istvanffi. We are indebted to an article by Dr. Sopp in a recent issue of *Naturen* for the details of Brefeld's life.

WE learn from the *Chemiker-Zeitung* with much regret that on August 4, shortly before his fifty-fifth birthday, Dr. Friedrich Auerbach, younger brother of the physicist Dr. Felix Auerbach of Jena, and well known as the collaborator with Abegg in the "Handbuch der anorganischen Chemie," died suddenly of heart failure. Auerbach studied at his native town, Breslau, under Ladenburg, to whom for a while he acted as assistant, after which he was engaged for several years in industrial work. But his real interest lay in scientific investigation, and in 1903 he returned to Breslau, where Abegg had recently begun to build up a flourishing school of chemistry. Shortly afterwards he was transferred to the Imperial Health Department. At Breslau, Auerbach devoted his attention chiefly to physical chemistry, and he published many papers dealing with the theory of electrolytic dissociation and the theory and practice of the electrometric titration of acids. After the death of Abegg in 1910, Auerbach undertook the onerous task of editing the "Handbuch der anorganischen Chemie." Before the War he was a member of the International Association of Chemical Societies.