

junior colleague since his appointment to the professorship of natural philosophy in 1853, and had long since been admitted to the intimate circle of the home at Albemarle Street. That Tyndall's search for rocksalt of optical quality was ultimately successful is evident from the valuable collection of prisms, lenses and rough blocks of the mineral, formerly his property and used in his researches, now in the possession of the Royal Institution. A large block was presented to him by the King of Württemberg in 1867.

The letter contains one of Faraday's not infrequent references to his loss of memory—and a complaint on a different matter, the insanitary condition of the River Thames, a favourite topic, his strictures on which had provoked, a few years earlier, a cartoon in *Punch* of Prof. Faraday, holding his nose, rebuking Father Thames from the side of a steamboat.

The postscript is in Mrs. Faraday's handwriting, and the reference is to their niece Jane Barnard, who lived with them at the Royal Institution.

T. M.

## Obituary

### Prof. H. L. Le Chatelier, For. Mem. R.S.

THE death of Henry Louis Le Chatelier, which occurred at Miribel-les-Échelles on September 17, removes one of the great pioneers in the physical chemistry of the last quarter of the nineteenth century; he was born in Paris on October 8, 1850. His father, Louis Le Chatelier, who died in 1873, was a man of high technical abilities and scientific talents; in 1842, when France possessed only six hundred kilometres of railroads, he was put in charge of railway development and became largely responsible for the construction of the present French railway network. Louis also played a great part in the perfection of the locomotive, in the improvement of coal mining and utilization, in the manufacture of open hearth steel and of aluminium and in the organization of the Bordeaux pine forests.

The intense application of scientific methods to practical ends which marked the career of the father, gave direction to the life-work of the son. Henry Le Chatelier was essentially a scientific man of great talents and resource but most of his work seemed to aim at some technical application; the tendency of his mind was well shown in a money gift which he made to the Academie des Sciences in 1922 with a condition that the income should be given to "persons possessed of such scientific aptitude and facilities for work as would enable them to carry out essentially scientific work involving precise measurements which would be sooner or later applicable to industry". The same interests were manifested in the frequent occasions on which he exhorted his countrymen to apply scientific methods to the improvement of industrial practice; the work of F. W. Taylor in the United States on scientific management first obtained publicity in France through Le Chatelier's writings.

Le Chatelier was educated at the College Rollin, the Ecole Polytechnique and the Ecole des Mines; he taught at the latter school and at the College de France and in 1907 succeeded Moissan as professor at the Sorbonne. As the fundamental importance of his work became universally recognized, honours came in rapid succession. He was a Grand Officer of

the Legion d'Honneur and was elected to the Chemistry Section of the Academie des Sciences in 1907; he became a foreign member of the Royal Society in 1913 and received the Davy Medal in 1916. He was made a foreign member of the Chemical Society in 1908 and an honorary member of the Institute of Metals in 1913; an associate member of the Academie Royale de Belgique in 1913, a foreign member of the Accademia dei Lincei in 1918, and an *Ehrenmitglied* of the German Chemical Society in 1931. He was a President d'Honneur of the French Chemical Society and probably its senior member, having been elected in 1878.

Le Chatelier early devoted himself to the study of the thermal changes which accompany chemical reactions and dissociations, following in this Berthelot and his teacher Sainte-Claire Deville; his work on this subject is monumental and he contributed much to the application of thermodynamics to chemical reactions. His experimental work was characterized by a delicacy previously unknown and was accompanied by mathematical analysis of a searching character; thus, he was able to predict that calcium carbonate should be appreciably dissociated by water vapour at the ordinary temperature and to show experimentally that the prediction is correct. His great generalization now known as the principle of mobile equilibrium dates from 1884 and states that "toute transformation infiniment petite d'un systeme en equilibre chimique qui est produite par la variation d'un seul des facteurs de l'equilibre s'effectue dans un sens tel qu'elle tende a produire une variation en sens inverse du facteur considéré". He introduced great improvements in the methods of determining heats of reactions, specific heats of gases at high temperatures, explosion pressures and in the optical measurement of high temperatures. He made the thermoelement an efficient instrument for the determination of high temperatures in face of the criticisms of Regnault, who thought that the use of such an appliance involved sources of error which could not be eliminated; he was the first to use the platinum-platinum-rhodium thermoelement in thermochemical practice. Le Chatelier established a number of

principles connected with the second law of thermodynamics which now form part of our classical knowledge of gas reactions; in this connexion he took out a patent for the synthesis of ammonia which anticipated the Haber process, now so widely used.

Le Chatelier extended the work of Vicat, a friend of his grandfather, on hydraulic cements and was the first to apply petrological methods to the study of this subject; he thus identified several components of Portland cement, and his researches in this connexion still form the framework of our knowledge of cements and mortars. He was a pioneer in the application of heat dilatation, electrical conductivity and etching methods to the study of metals and their alloys.

In this brief notice it is impossible to give any adequate account of the vast field covered by Le Chatelier in the course of his original work; some mention should be made, however, of his literary activities. In 1899 he published a French translation of the papers of Willard Gibbs, with the work of whom his own was so closely interwoven, and he founded the *Revue de Métallurgie* in 1904. He published a series of lectures on carbon in 1908 and, with the collaboration of his daughter, Madame Jean Royer, produced in 1925 a book of more general appeal entitled "Science et Industrie". These two books reveal Le Chatelier as he was known to his friends—a profound and original thinker and a high-minded and patriotic Frenchman with a deep sense of humour. His reminiscences of his old friends were many and usually combined wisdom and jest. Thus he recalled that Sainte-Claire Deville was a discursive lecturer who furnished his students with little likely to be of service in the approaching examinations. He likened the chemical affinity between sulphuric acid and potash to that existing between a dog and a bone; the dog has an affinity for the bone but it may be equally claimed that the bone has an affinity for the dog and the two mutually absorb each other to form one single entity. The only difference lies in the fact that the dog has personal feelings which are absent in the bone; but how can one say which is the more noble, the acid or the alkali? In such a manner Sainte-Claire Deville expressed his antipathy for so-called scientific theories in which empty words often stand for non-existent ideas, the term reciprocal affinity serving merely as a vague mode of recalling an experimental fact.

Le Chatelier was a man of fine presence and of courtly manner; he was a brilliant talker and, although advancing years brought deafness, his personal charm always remained. With his death we lose one of the great figures of the scientific France of last century.

WM. J. POPE.

#### Mr. Sherard O. Cowper-Coles

THE name of Sherard Cowper-Coles is closely linked to the progress which has been made in numerous branches of electrodeposition work during the last half-century. Born in 1867, his first patent was brought out while he was still a minor, although

this had no connexion with electrodeposition; thereafter, there has scarcely been a year when his name has not appeared in the index to the *Patent Journal*.

Cowper-Coles's life was largely devoted to work in electrodeposition problems, his speciality being processes of electro-forming and applications of electrolysis which were rather outside the sphere of electroplating. If processes which are connected with the decoration and protection of metal surfaces interested him less, it is nevertheless a curious fact that what may possibly be considered his most important contribution from the industrial point of view was a method of protecting steel which is very widely practised to-day, and to which he gave his name—sherardizing. This process consists in the production of a zinc coating on ferrous articles, not by electrolysis but by cementation; later, it was progressively improved and now finds considerable application.

Among the many problems which interested Cowper-Coles were the electrodeposition of rubber, deposition on glass, sound recording, needle sharpening, production of white lead by electrolysis, transparent paper, sound-proof ventilation, while he also carried out some work on the smoke abatement problem.

For many years, Cowper-Coles worked in a private laboratory, which he built at Sunbury-on-Thames. Here, favoured visitors would be shown over a most fascinating and unique collection comprising examples of almost every aspect of applied electrodeposition, from electrolytic copper gramophone records to electrodeposited iron tubes of giant size. Most of these exhibits had been produced by Cowper-Coles during his lifetime, and some of them were shown at the Electrodeposition Exhibition held last year by the Electrodepositors' Technical Society at the Science Museum.

During the latter part of his life, Cowper-Coles devoted his efforts to the production of sheets by direct electrodeposition processes. He had a considerable financial as well as scientific genius, and a number of companies were formed to exploit his processes. He published a large number of papers in the proceedings of numerous societies and institutions. A man of considerable personal charm of manner, his courtliness was reminiscent of an age long passed. The niche which he filled in the world of electrodeposition was truly unique.

S. WERNICK.

We regret to announce the following deaths:

Sir George Hampson, Bt., formerly assistant keeper in the Natural History Museum, known for his work in entomology, on October 15, aged seventy-six years.

Prof. Alexander Larmor, formerly McCrea professor of natural philosophy in the Magee University College, Londonderry, on October 12.

Prof. Pietro R. Pirotta, formerly professor of botany in the University of Rome, on August 4, aged eighty-three years.