the Council would be wise is somewhat doubtful. There is no engineering impossibility in wiping out all the existing generating stations with their various systems of supply and in producing the whole of the electricity required for London in a station erected at Barking or Erith, as the Council proposes. But from the financial point of view the magnitude of the scheme appears to be its chief difficulty. Seventeen millions have already been sunk in electricity supply in London, and, according to a careful estimate in a leading financial journal, this sum would have to be nearly doubled before the Council could secure the monopoly at which it aims. Before embarking upon such a scheme, from which when once started there is no turning back, the ratepayers need to be very sure of the future developments of electricity. Three times in the past twenty years have the prime movers used for electrical production been entirely changed. The slow-speed horizontal engines which had been developed during the nineteenth century were first used, and gave place during the 'eighties to high-speed engines of the single-acting or forced-lubricating type for electrical supply. These are now being replaced by steam turbines. Many inventors are, however, at work upon the improvement of large gas engines and other internal-combustion machines, and the attempts which have been made to construct a satisfactory internal-combustion turbine may any day bear fruit.

Now it is obvious that if electricity production in London should become municipalised, so far as London is concerned the rate of development and the adoption of improved methods will be much hindered. Experience has shown that local authorities are, as in fact they should be, very cautious in adopting scientific improvements. This partly arises from a proper regard for the ratepayers' money, but partly from their objection to acknowledge that they have made a mistake and to the consequent criticism of the electorate.

This being so, it would be most unfortunate if anything should be done that would hinder the progress of electrical developments in the metropolis. London is so large that it could certainly afford to get the best in the first instance; the difficulty is to ensure a continuance in the adoption of the most efficient methods when concerns are municipalised. To-day the generating station erected by the Council at Greenwich is practically obsolete as an up-to-date power house.

The problem is one, however, crying for solution. The need for some improvement in London electrical supply is generally admitted, as are the advantages arising from concentration. The best solution of the difficulty is probably that outlined in the report of the Council's Finance Committee issued in December, which closed with the following words:—

"The financial difficulties to which we have called the attention of the Council would to a large extent be obviated if the Council saw its way to adopt some scheme of exercising the powers sought, if and when conferred by Parliament, by which the Council, while retaining general control, would be relieved of the responsibility of working the undertaking in whole or in part."

Whether the solution will be brought about by enlarging the existing stations, as their owners propose, or by erecting new and larger stations on more convenient sites outside, as other experts desire, is a question which must be settled by a Parliamentary Committee and the Board of Trade. But more delay in concentration will be fatal to London's industrial future, and is quite unnecessary if only the Council will realise the need for cooperating with private enterprise, as the Select Committee suggested.

PROF. HENRI MOISSAN.[1]

IT was with deep sorrow that the scientific world learnt of the death of the illustrious French chemist Henri Moissan, which occurred on Wednesday, February 20, following an operation for appendicitis.

Born in Paris on September 28, 1852, Moissan early developed an interest in chemistry, and in 1872 entered the laboratory of Fremy at the Muséum d'Histoire naturelle, attending also the courses of Henri Sainte-Claire Deville, Debray, and others.

This early training firmly fixed the direction of his life's work, for it is precisely along the lines so ably developed by this brilliant school of French chemists that Moissan's genius and resource in experimentation were applied. Worthily to have upheld the traditions and high quality of this school and to have widened the field of inorganic chemistry required powers of no mean order.

From 1873 to 1879 Moissan held the post of assistant in the laboratory of MM. Decaisne and Dehérain at the Muséum d'Histoire naturelle, and in 1874 published, in conjunction with M. Dehérain, his first contribution to science, a study of the absorption of oxygen and emission of carbonic acid by plants kept in a darkened room. In 1877 a series of papers on the oxides of the metals of the iron group was commenced, the whole work being collected and presented in 1880 as a thesis for the degree of *Docteur ès sciences* of the Faculty of Sciences of the Paris University. This research, carried out with much experimental skill and precision, considerably extended our knowledge of the reduction products of the oxides of iron, manganese, nickel, and chromium.

A long connection with the École supérieure de Pharmacie commenced in 1879, by his appointment as demonstrator in chemistry; the chair of toxicology being given him in 1887, after his memorable isolation of fluorine, and finally the professorship of *chimie minérale* in 1899, when his first opportunity occurred for holding a course of lectures on chemistry.

After his graduation, Moissan, from 1879 to 1883, devoted himself chiefly to the study of the compounds of chromium, investigating in particular the chromous salts and perchromic acid. Subsequently, in the laboratory of Debray, and with the active encouragement of Troost and Friedel, he commenced his researches upon fluorine which culminated in 1886 in the isolation of this element.

The difficulties, which had baffled the experimental ability of Humphry Davy, Faraday, Fremy, and many others, were overcome, and fluorine itself was presented to us. That this may justly be considered to be one of the greatest achievements of experimental chemistry in the nineteenth century can be judged not so much by the brilliant result attained as by the display of indomitable pluck and perseverance which assured the successful issue.

After a number of fruitless but well-planned attempts to separate the element from its compounds with silicon, phosphorus, and arsenic, Moissan, on June 28, 1886, communicated to the Academy of Sciences the first details of his experiments on the electrolysis of anhydrous hydrofluoric acid containing potassium bifluoride. The definite proofs of the identity and elementary nature of fluorine were presented in the following month, whilst, on November 8, Debray reported to the academy the complete conviction of the section of chemistry in the validity of the experiments.

From 1886 to 1891 Moissan published numerous

[1] See also the article on Moissan's laboratory and his work in it in NATURE, January 16, 1902, vol. lxv. p. 252.

papers on the chemical and physical properties of fluorine and on many of its compounds, the careful and detailed nature of the investigations being characteristic of all his work.

It is unnecessary to describe further these researches, since the whole subject forms a chapter of their science well known to all chemists, and has, moreover, already been fully dealt with in NATURE (vol. xxxvii., p. 179; vol. xliv., p. 622). Attention should, however, be directed to the fact that in 1897, in conjunction with Sir James Dewar, fluorine was liquefied at the Royal Institution. The construction of an apparatus of copper in 1899, to replace the expensive platinum vessels previously employed, simplified the preparation of the element, and the discovery that dry fluorine exempt from vapours of hydrofluoric acid does not attack glass served in recent years to facilitate the investigation of its properties.

In 1891 Moissan was elected a member of the Academy of Sciences to fill the chair left vacant by the death of Cahours.

The main reason which impelled Moissan to pass from the study of fluorine to the high-temperature researches, which from 1892 onwards absorbed so much of his attention, seems to be closely connected with a desire, which he had long entertained, to solve the mystery of the origin of the diamond. The hope that the great activity of fluorine for other elements would help in the quest not being realised, he was led to a methodical study of the behaviour and transformation of the three allotropic modifications of carbon. This study, which is an excellent example of the logical application of experiment, resulted in the artificial production of diamond, and at the same time added greatly to our knowledge of the peculiar metamorphoses which characterise this element.

The examination of portions of the meteorite from the Cañon Diablo proved the presence of small diamonds, surrounded by thin ribbon-like strips of compressed carbon, hidden in the centre of a mass of iron, and gave him the clue to the solution of the problem. How he planned and successfully carried through the adaptation of this idea in the laboratory with the production of minute but unmistakable diamonds is well known to all. Although this work has been frequently challenged, he had fully upheld the validity of the results, so recently as 1905, by repeating the experiments with still greater precautions, and by applying a more intimate knowledge of the compounds formed under similar conditions. It was for the purpose of augmenting the solubility of carbon in iron that he first required and adopted the electric furnace.

In electric furnace work, Moissan's preeminent position is due, not to the design or discovery of a special form of furnace, but rather to the skill with which he investigated in detail a number of individual chemical reactions. In each case he devoted great care to the purification and analysis of the raw materials required in the process, and submitted the products to minute examination and quantitatively determined their composition. Thus his preparation of chromium, tungsten, molybdenum, uranium, titanium and many other metals in a fused form and high degree of purity greatly enriched our knowledge of the chemical and physical properties of these elements.

Of still greater importance was the methodical following up of the chance formation of calcium carbide which he observed around the carbon electrodes in his early furnace experiments. From this observation he was led to discover and determine fully the nature and properties of a large number of metallic carbides, borides, and silicides, most of them hitherto absolutely unknown, or, like the metals mentioned already, only obtainable as impure and fragmentary specimens.

There is perhaps no need to consider, at the present time, in how far industry is directly indebted to Moissan's work. He himself had invariably expressed his desire not to be considered in such discussions, and, so far as the merit of his work is concerned, it needs no support of this nature. Indirectly, both science and industry have benefited enormously. On the Continent his scientific investigations are directly credited with a renaissance in the study of inorganic chemistry, which, particularly in Germany, had been almost entirely neglected for the more productive field of organic chemical research. Even in England, which has always held a high position in the pursuit of inorganic chemistry, his work has been of great assistance in instilling enthusiasm and encouraging the deeper study of the subject.

As a teacher, Moissan will be affectionately remembered by all his pupils; even during the tenure of his professorship of toxicology he maintained a research laboratory for chemistry, and attracted to it a number of students, and from the time of his appointment, in 1900, to the chair of inorganic chemistry at the Sorbonne larger numbers were able to avail themselves of his teaching.

As a lecturer, both in his public discourses and in the lectures on inorganic chemistry, which he gave during the last few years of his life, he was distinguished, even amongst French chemists, by the brilliant exposition of his subject and by his skill in experimental demonstration. R. S. HUTTON.

NOTES.

WE regret to see the announcement of the death of Mr. H. C. Russell, C.M.G., F.R.S., Government astronomer of New South Wales.

THE autumn meeting of the Iron and Steel Institute will be held in Vienna on September 23–25, and will be followed by excursions to Bohemia and to Styria.

THE Women's Agricultural and Horticultural International Union is organising an exhibition and sale of farm and garden produce, &c., to be held in the Gardens of the Royal Botanic Society, Regent's Park, N.W., on Wednesday, July 17.

THE Mercers' Company has made a grant of 1000*l.* to the Imperial Institute for scientific research in regard to the economic products of British colonies and protectorates, to be expended under the direction of the managing committee, subject to the control of the Secretary of State for the Colonies.

THE Friday evening discourse at the Royal Institution on March 8 will be delivered by Prof. David James Hamilton, on "Certain Seasonal Diseases in the Sheep and means of preventing them."

ENGLISH geologists who know anything of France and the French Alps will especially regret the death of M. Marcel Bertrand, which took place on February 13. His work on mountain-origins and mountain-structure had an important influence in the development of geological thought. Bertrand succeeded Pasteur as a member of the French Academy of Sciences in 1896.

WE learn from the *Times* that the Royal Academy of Sciences at Stockholm is petitioning the Swedish Government to request the British Government to grant per-