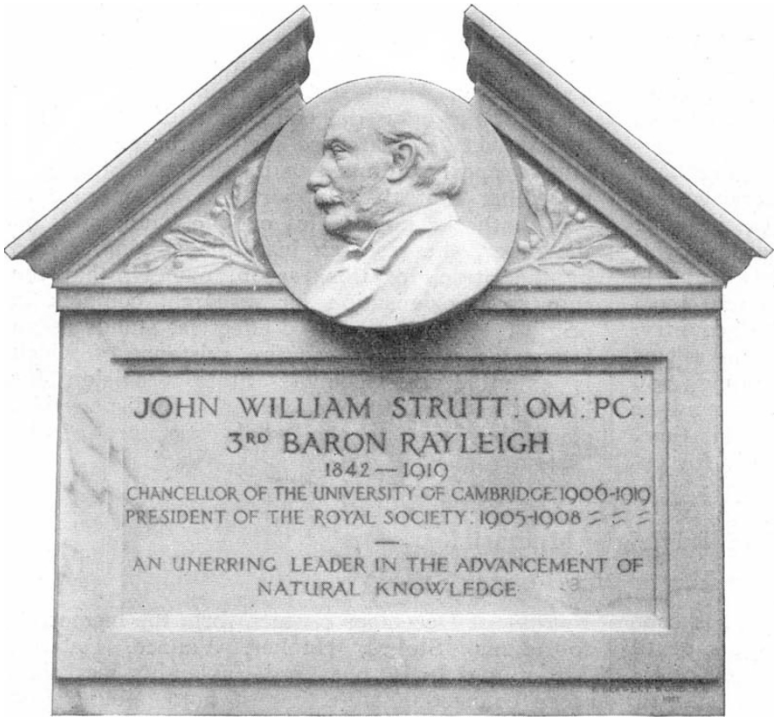
The following members of Lord Rayleigh's family and representatives of the University of Cambridge, the council of the Royal Society and other institutions with which he was connected were among those who were present:—

The Dowager Lady Rayleigh, Lord and Lady Rayleigh, Mrs. Sidgwick, the Hon. R. Strutt, the Hon. Edward and Mrs. Strutt, the Rt. Hon. G. W. and Lady Betty Balfour, and Mr. E. J. Strutt; the vice-chancellor of the University of Cambridge, Sir Joseph Larmor, and Mr. J. F. P. Rawlinson, Members of Parliament for the university; the president of the Royal Society, Sir J. J. Thomson, Sir David Prain, Mr. W. B. Hardy, Mr. Jeans, Sir Arthur Schuster, Prof. Lamb, Sir William Bragg, Prof. Fowler, Prof. O. W. Richardson, Sir Gerald Lenox Conyngham, members of council of the Royal Society; and Prof. F. Derwent Wood, Lord Southborough, Sir James Dewar, Sir William McCormick, Sir Charles Parsons, Sir George Beilby, Sir Oliver Lodge, Sir Maurice Fitzmaurice, Sir Napier Shaw, and Sir Richard Glazebrook.



Photo] [*F. Hilaire d'Arcis*

Memorial tablet of Lord Rayleigh by Prof. Derwent Wood R.A., unveiled in Westminster Abbey on November 30.

In order to promote research in a branch of science in which Lord Rayleigh was interested, it has been arranged to hand over the balance of the fund, some 500*l.* in amount, to the University of Cambridge to be used as a library fund at the Cavendish Laboratory, where there is a research library to the formation of which Lord Rayleigh contributed when professor. To have an annual sum available for the purchase of periodicals, binding, etc., would, in the opinion of both Sir J. J. Thomson and Sir Ernest Rutherford be of real service and would greatly promote research in physics at Cambridge.

Sir Joseph Thomson's Address.

On behalf of the Royal Society and of the University of Cambridge it is my privilege to thank the Dean and Chapter of Westminster for permission to erect a memorial to Lord Rayleigh in the Abbey. I desire also to thank the artist, Mr. Derwent Wood, whose skill has made the memorial an excellent likeness of Lord Rayleigh, and has endowed it with artistic merits which make it worthy of a place on these walls. I desire also to thank the contributors whose generosity has made this memorial possible. I owe my position here this afternoon to the courtesy of the president of the Royal Society, and of the vice-chancellor of the University of Cambridge. Either of these would have been a more appropriate representative than myself, but it is their wish that, as chairman of the Committee of the Memorial, I should undertake this duty. It seems fitting that, on this occasion, when we place a memorial to Lord Rayleigh in a building surrounded by memorials of the most illustrious of Englishmen, a few words should be said as a tribute to his work and in support of his claim to be represented on these walls. Lord Rayleigh devoted a long life with entire singleness of purpose and pre-eminent success to the pursuit of what, in the phraseology of the Royal Society, is called "the promotion of natural knowledge." For fifty years, without pause and without hurry, he pursued researches which are one of the glories of English science. It is possible to form an estimate of the quality and quantity of Lord Rayleigh's work by those six volumes of collected papers which we owe to the enterprise of the Syndics of the Cambridge University Press. Among the 446 papers which fill these volumes there is not one that is trivial, there is not one that does not advance the subject with which it deals, there is not one that does not clear away difficulties; and among that great number there are scarcely any which time has shown to require correction. It is this, I think, which explains that while the collected papers of scientific men often form a kind of memorial tablet in our libraries, respected but not disturbed, those of Lord Rayleigh are among the most frequently consulted books in the physicist's library.

The first impression that we gain on looking at these volumes is the catholicity of Lord Rayleigh's work—mathematics, light, heat, electricity, magnetism, the properties of gases, of liquids and solids, are all represented in fairly equal proportions. If I were asked to explain in what department of physics Lord Rayleigh's work was most important I should be quite at a loss to do so. In these days when we speak of electricians, of molecular physicists, elasticians, or even if we take the wider classification

of mathematical physicists and experimental physicists, it is refreshing to come across one who was each—who, like Kelvin and Stokes, was each and all of these. Lord Rayleigh took physics for his province and extended the boundary of every department of physics. The impression made by reading his papers is not only due to the beauty of the new results attained, but to the clearness and insight displayed, which gives one a new grasp of the subject. No subject passed through Lord Rayleigh's mind without being clarified and having its difficulties either removed or brought so strongly into the light as to be subject to attack on every side.

The impression that one gets after reading a paper by Lord Rayleigh is that the subject, if I may use a homely phrase, has been tidied-up. Law and order have been substituted for disorder. There are some great men of science whose claim consists in having said the first word on a subject, in having introduced some new idea which has proved fruitful; there are others whose claim consists perhaps in having said the last word on the subject, and who have reduced the subject to logical consistency and clearness. I think by temperament Lord Rayleigh really belonged to the second group. Certainly no man ever revelled more in that greatest of intellectual pleasures, working at a subject which was all obscured and tangled and bringing it to a stage where everything was clear and in order. When we take Lord Rayleigh's papers we find some purely mathematical, in which, with his characteristic directness of attack and simplicity of means, he obtained most important results. We get others almost purely experimental, such as the determination of the absolute unit in electricity, in which, again, with simple apparatus, he attained results which rivalled in accuracy those of Regnault and Joule. But in the majority of writings we have a combination of mathematical analysis and experimental work, and his papers, I think, afford the best illustration of the true co-ordination of those two great branches of attack on the problems of nature. The physical ideas direct the mathematical analysis into the shortest and most appropriate channels, while the mathematics gives precision and point to the physics.

Just one word about another characteristic of Lord Rayleigh. He was, so to speak, the knight-errant of physics. There are men of whom it is said that they never shirk a difficulty, but Lord Rayleigh went roaming about seeking for difficulties to destroy, and I really believe that he loved a difficulty for its own sake, and perhaps felt sorry for it after he had destroyed it. But among the difficulties in physics none was ever created by any default of Lord Rayleigh in clearness of expression or clearness of thought. He was an artist in the production of his papers. He had the artist's instinct ingrained so deeply that even the excitement and hurry of the Cambridge Mathematical Tripos in the old days, when it was literally a race against time, could not destroy it. Every one of his examiners on that occasion said that his papers were so clear that they could have been sent to press without revision.

Among Lord Rayleigh's many discoveries I will just confine myself to one, the discovery of argon, because that is the one which attracted most attention, and in which, perhaps, he broke the newest ground. The discovery of argon is one of the romances of science. The fact was that we had, unsuspected among us, the element in large proportions—there are, I believe, some tons of it within the walls of this building—and yet, in spite of the experiments of chemists and physicists for centuries no suspicion of its existence had ever arisen. It seems rather an irony that while the chemists had been ransacking mines and searching the stars for new elements, all the time there had been in their laboratories an element with more remarkable properties than any that had been discovered. The remarkable thing about Lord Rayleigh's investigation was that it was not because he used instruments more powerful than any of those at the command of his predecessors. Argon was tracked down by the oldest piece of chemical apparatus, the balance, an instrument which had been at the command of all Lord Rayleigh's predecessors, and by which they might have made the discovery, but they did not. In the isolation of argon Lord Rayleigh was fortunate enough to procure the co-operation of Sir William Ramsay, and when the properties of the new substance were investigated they turned out to be of extraordinary interest, and the discovery of this, which was followed by the discovery of other gases of the same nature, has had a very pronounced influence on the progress of our ideas as to the structure of matter.

I must pass on from Lord Rayleigh's contributions to science to consider some of his public services. He was long and intimately connected with the Royal Society. For nine years he was secretary, and for three years he was president. He enriched the publications of that society by papers which added greatly to its prestige. He rendered great services to the University of Cambridge. On Maxwell's death in 1879, when the success of the new School of Physics was not yet assured, Lord Rayleigh, at considerable personal sacrifice, came to the rescue, and for five years he was the Cavendish Professor of Physics, and this work, with the assistance of that of Sir Richard Glazebrook and of Sir Napier Shaw, put the school on such a firm basis that its success has never since been in doubt. The University took the opportunity of honouring Lord Rayleigh by making him their chancellor; but it was not only work that Lord Rayleigh gave to the University: he was a generous benefactor. When he received the Nobel prize he handed over the money for the use of the University. Again, he was long connected with the Royal Institution. He was professor there for seventeen years, and many of us have heard those clear explanations of some of the most difficult problems of physics, accompanied by experiments, which were characteristically simple and beautiful.

But of all the bodies with which Lord Rayleigh was associated I doubt if there was one in which he was more interested than in the National Physical Laboratory. He was the chairman of the committee which recommended the foundation of that institution, and he was chairman of the executive body from the beginning until a year or two before his death. The growth of that institution from very small beginnings to the position it now occupies, that of the most important institution of its kind in the world, is due in no small degree to the work that Lord Rayleigh gave to it, to the judgment that he displayed in conducting its affairs, to his knowledge, and to his influence.

Another subject in connection with which Lord Rayleigh rendered great services was that of flight. He was convinced long before other people of the possibility, and even the probability, of flight, and when flight became a serious problem to this country he became chairman of the Committee on Research in Aeronautics, and it meant everything to that sub-

ject, perpetually perplexed with new problems, to have at its command the unerring judgment of Lord Rayleigh and his knowledge of theory and his keen instinct for practice. During the war, when any specially important or specially difficult point arose in connection with the application of science for the use of the Army or Navy, Lord Rayleigh was very often consulted, and never in vain. Lord Rayleigh, I believe, has had every honour that this country can bestow, and he deserves that place on the walls of the Abbey close by the memorials to Davy and to Young, for, like them, he increased the prestige of this country in science, and widened the bounds of our knowledge of nature.

International Physico-chemical Symbols.

By PROF. ALEX. FINDLAY.

IN the years prior to the war endeavours were made by various internationally constituted bodies to secure greater uniformity in the symbols used in different countries and by different writers to represent physical, physico-chemical, and electrotechnical quantities. As part of the general movement to this end the International Association of Chemical Societies, founded in 1911, set up a Commission for the Unification of Physico-chemical Symbols, and in 1913 this commission submitted to the council of the International Association of Chemical Societies a list of symbols for quantities especially of physico-chemical importance. At this point, however, the need was felt for co-ordinating the work of the commission with that of other bodies, and a small "working committee," consisting of Sir William Ramsay (chairman), Dr. Friedrich Auerbach, Profs. P. A. Guye, P. J. Walden, and Alex. Findlay (secretary), was therefore set up in order to secure this co-ordination and to suggest methods of organisation and work.

The list of symbols drawn up by the Commission for the Unification of Physico-chemical Symbols was submitted for consideration and criticism to the chemical societies of the different countries represented on the International Association, to the Ausschuss für Einheiten und Formelgrössen, and to the International Electrotechnical Commission. The criticisms and suggestions received from these bodies were considered in May, 1914, by the working committee to which reference has been made above, and a list of symbols was then drawn up for the approval of the International Commission. Unfortunately, however, before the meeting of the International Commission took place, international scientific relations were ruptured by the outbreak of war, and the list of symbols recommended unanimously by the members of the working committee could not, therefore, receive the approval of the parent commission. As it is not to be doubted that this approval would have been given, and as it would have been a misfortune if the labours of the committee on which Great Britain, France, Germany, Russia, and Switzerland were represented had been in vain, the council of the Chemical Society, with the approval of the recently constituted International Union of Pure and Applied Chemistry, authorised the publication of the committee's report and list of symbols in the Transactions of the Chemical Society, April, 1921.[1]

As regards the general principles adopted by the working committee it may be said that in drawing up its list the committee restricted itself to symbols for quantities of chemical or physico-chemical importance and approved the general principle adopted by the International Commission that Greek letters should be used as sparingly as possible. In respect of symbols for quantities used, especially in mathematics, physics, and the various branches of mathematics and physics, the committee restricted itself to *noting* the symbols which had been recommended or adopted by the scientific bodies specially interested in these quantities, and there were included in the committee's list only those symbols about which there was general agreement among the specially competent bodies. As it was not possible, in the case of symbols which are employed in different branches of pure and applied science, always to obtain agreement among the representatives of different sciences, the committee adopted the symbols which find, or are likely to find, general acceptance by chemists or physico-chemists.

Although a practically universal agreement already obtained regarding many of the symbols, there were a number of quantities for which diverse symbols were employed by different writers or were suggested by various bodies. It was necessary, therefore, for the committee to examine, carefully and critically, the different suggestions and to make a decision as to the symbols to be recommended for use. The reasons for the choice of symbol made by the committee in the debated cases are appended to the list of symbols.

Although it is not possible to refer specifically to all debatable cases, reference may be made to a few important quantities. For entropy and for maximum work the committee recommends the symbols S and A respectively, although in doing so regret is expressed at having to depart from the classical symbols ϕ and ψ employed by Willard Gibbs. The committee, however, states that it felt such departure to be advisable on the twofold principle of disturbing existing usage as little as possible and of employing Greek letters as sparingly as possible. For degree of dissociation

[1] Copies of the report and list of symbols may be obtained on application to the Assistant Secretary of the Chemical Society, Burlington House, London, W.1.