

Nobel Prize in Physics 1904



Lord Rayleigh (John William Strutt)

The Nobel Prize in Physics 1904 was awarded to Lord Rayleigh *"for his investigations of the densities of the most important gases and for his discovery of argon in connection with these studies"*.

RESEARCH INFORMATION:

The Royal Academy of Sciences has decided that the Nobel Prize for Physics for the present year is to be awarded to Lord Rayleigh, Professor at the Royal Institution, London, for his investigations on the density of the most important gases, and for his discovery of argon, one of the results of those investigations.

Among the problems in physico-chemical science that have more especially taken up the attention of scientists, the nature and composition of atmospheric air has always held a prominent position. For centuries this problem has been the object of both keen enquiry and extensive experimental investigation, consequently its history affords a very striking picture of the gradual development of those sciences in their entirety, closely connected as it is with the progress made in the various departments of physics and chemistry. The retarding influence, which in former times was continuously exercised not only by incorrect opinions that had become firmly established but also by insufficient

experimental groundwork, is plainly observable, and this explains the fact that during the seventeenth century the solution of the problem was not, and could not, be arrived at by such scientists as Boyle, Mayow, and Hales; it was only obtained a hundred years later, after the discoveries of Priestley, Black, Cavendish, and above all Lavoisier, in a manner which not only then, but up to quite a recent date, was considered final.

Under such circumstances it is but natural that the discovery of a new component of the air, one that is present to the considerable amount of about one per cent, excited great and justifiable astonishment. How was it possible, people asked, that in the face of all the improvements in both physical and chemical methods of observation of the present day this gas should for so long have remained unobserved? The answer to this question lies not only in the strange indifference to chemical investigations by which the age is characterized, but also in the investigations on the physical properties of atmospheric gases not having then reached that high degree of accuracy which Lord Rayleigh has since succeeded in attaining. This is specially the case in determining densities. It has been shown that nitrogen, when separated from the air, is invariably heavier than when produced from its chemical compounds. As the difference is no less than one half per cent, there is no doubt as to the existence of this divergence, since the accuracy of the weigher was such that the possible fault could only be 1/50 thereof. Since between these two kinds of nitrogen- on the one hand the atmospheric, on the other that obtained from chemical compounds - there is a definite difference in density, the question arose: What could be the cause of this peculiar state of things? All the circumstances of the investigation which might be supposed to have any influence in this respect having been carefully examined, and their influence being found insufficient to explain the difference observed, there remained, in Lord Rayleigh's opinion, but one possibility, viz. that the atmospheric nitrogen was not a simple element, but was a combination of pure nitrogen and some new, hitherto unknown, heavier gas. If so, this gas could be isolated in some way or other. The methods, physical or chemical, available for this isolation were already known in principle, and the problem now was to obtain the new gas not only in the purest form possible, but also in a sufficient

quantity to allow of a thorough investigation of its essential properties. These both difficult and tedious tests have been carried out conjointly by Lord Rayleigh and Sir William Ramsay, and have resulted not only in completely proving that the new gas occurs in a ready state in the air, but also in establishing a thorough knowledge of its chief physical and chemical characteristics.

The time at my disposal does not permit of my giving a detailed account of these questions, interesting and important as they undoubtedly are, but I venture to call attention to the fact that besides the great importance always adherent to the proving of the existence of a new element, this one is of special interest owing to the purely physical investigations on which it is based, investigations which - embracing not only nitrogen but several other important gases-are characterized by a delicacy and precision that is very rarely met with in the history of physical research. Considering also that to the discovery of argon we may trace one of the causes of Sir William Ramsay's brilliant discovery of helium and the other so-called "noble gases" which followed shortly after, we may truly aver that Lord Rayleigh's work is of that fundamental character that the award to him of the Nobel Prize in Physics must be greeted with sincere and fully justified satisfaction, more especially since this section of his work is but a single link in a long chain of remarkable investigations with which from various points of view he has enriched Physical Science, and which are of such a nature that they will ensure him a prominent position in its history for all time to come.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/physics/laureates/1904/press.html