

Nobel Prize in Chemistry 1923



Fritz Pregl

The Nobel Prize in Chemistry 1923 was awarded to Fritz Pregl *"for his invention of the method of micro-analysis of organic substances"*.

RESEARCH INFORMATION:

The vast development of chemical science, especially in recent times, is based not only on new concepts and important discoveries, but also on improved experimental equipment and on newly invented and perfected methods. It is also evident that a fundamental improvement of a previously known method can, in certain cases, be of as great a value for further research and for the development of science as a new scientific discovery.

This concept of the significance of an improvement was also expressed by Alfred Nobel, in his great insight, when he stipulated in his will that the Nobel Prize for Chemistry should be awarded to the person "making the most important chemical discovery or improvement" that would most benefit mankind.

The work, which this year has been rewarded with the Nobel Prize for Chemistry by the Royal Academy of Sciences, who awards it to Professor Fritz Pregl of Graz for his

invention of the micro-analysis of organic substances, is not a new discovery either. It is in the main a revision and an improvement of older methods.

Nobel's expression - the most important chemical improvement - means that the improvement must be concerned with a particularly important field of chemistry. It is quite evident that this applies to Pregl's work. This work is devoted to the determination of the contents of the different elements in organic compounds, the aim of which is to determine the quantities of the various elements in organic, so-called carbon compounds - whether these compounds occur ready-formed in the animal and vegetable kingdom or have been prepared in a chemist's laboratory. If one wishes to sum up the significance of the field to which Pregl's work belongs, one could say that without this organic elemental analysis there would be no organic chemistry in the scientific sense, neither would we possess the extensive chemical industry that has arisen out of it. In what does the improvement made by Pregl consist, and what is its significance?

The improvement consists of the fact that Pregl converted previously used methods for quantitative analysis of relatively large quantities of substances to micro-analytical methods. This has made it possible to carry out these analyses of such small quantities of substances, the analysis of which would previously have been impossible, with exactly the same accuracy, but with great savings in time, labour, and expense.

Pregl succeeded, by introducing new apparatus and techniques, in reducing to the almost incredibly small amount of 5-3 milligrams and even less the quantity normally required for the quantitative determination of various elements in organic compounds. The same amount of substances which up to now would have been required for a single carbon-hydrogen determination, is now with Pregl's methods sufficient for up to 50 different analyses. In this way this quantity suffices for several determinations not only of carbon and hydrogen, but also of other elements forming the compound; it also makes possible certain other investigations important for the study of the chemical structure of the compound, its constitution.

When in 1910 Pregl started the investigations which he continued with great skill and success during the following years, he first set himself the task of revising the method for carbon-hydrogen determination, the focal problem of elemental analysis. This part of the work was the most comprehensive and also the one that produced the most difficulties. In close connection with this task he also developed two methods for the micro-determination of nitrogen. Micro-methods for chlorine, bromine, iodine, sulphur, phosphorus, and a great number of metals in organic compounds were developed by him or under his guidance. However, this does not exhaust the range of his many micro-determinations. It is not sufficient to be able to determine with certainty the elemental composition of a substance. The molecular weight must also be known, and for the determination of this he constructed a microapparatus which makes it possible to work with such a small quantity as 7-10 milligrams.

To ascertain the chemical constitution of a substance it may also be necessary to determine the quantity of important groups of atoms included in this substance, and apparatus was designed and methods worked out to deal with such cases.

This, naturally, is not the place to give a detailed account of Pregl's methods. Only an expert can really appreciate and correctly assess the value of the various experimental techniques evolved; the difficulties which he had to overcome; the perspicacity and perseverance which were required in order to achieve a fully satisfactory result by discovering and eliminating countless sources of error. However, already the facts stated here will show the essential significance of Pregl's work.

A method which makes elemental analysis of such small quantities of substances possible must, in many cases, be an inestimable aid for the chemist. If the material to be investigated is hard to obtain, the chemist may be in a very difficult position: the quantity of the product or the products that he has obtained after hard and protracted work is so insignificant that it would have been impossible by the previously known methods even to define the elemental composition, let alone the chemical constitution. This, for instance, arises quite often in work in physiological or pathological chemistry, where the original

material is often only obtainable in quite limited quantities, and where new material cannot be procured at all, or only with great difficulty. Many research workers in this field have confirmed the great value of the Pregl method in coming to the rescue and have found it indispensable for the execution of certain investigations.

Pregl's micro-analysis can be equally well applied in all fields of organic chemistry. It has already proved itself in a great number of cases, and has stood the test in this country as well. It opens promising prospects for research in the future, particularly in the vast field of biochemistry. There is every reason to hope that micro-analysis will make possible fruitful study of a great number of substances which so far, in some respects at least, have been practically inaccessible to exact chemical investigation. Such substances, for instance, include enzymes, vitamins and hormones, the extremely great significance of which for the vital processes is well known.

Our knowledge of these substances at present is in the main limited to their effects or the results of their action and the external conditions for these. Only when we have succeeded in unravelling their chemical character will it be possible to gain a deeper insight into their mysterious function, which is at present concealed from us. A thorough chemical investigation of these substances is therefore one of the most important tasks of biochemistry, and, as far as can now be judged, Pregl's micro-analysis offers an extremely valuable, if not indispensable aid for the solution of such a problem.

As usual, the representative of the Academy of Sciences said some personal words to the laureate, congratulated him and asked him to receive the prize from the hands of His Majesty, but unfortunately these words have not been preserved.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1923/press.html