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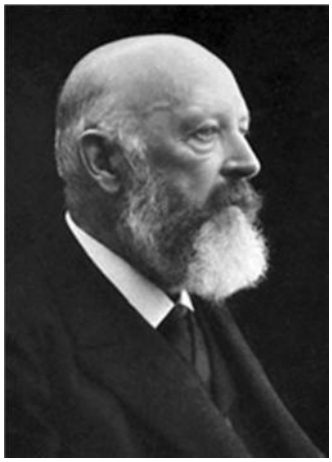
Nobel Prize in Chemistry 1905



Johann Friedrich Wilhelm Adolf von Baeyer

The Nobel Prize in Chemistry 1905 was awarded to Adolf von Baeyer *"in recognition of his services in the advancement of organic chemistry and the chemical industry, through his work on organic dyes and hydroaromatic compounds"*.

RESEARCH INFORMATION:

A characteristic feature of chemical science is the close interaction between theory and practice, between pure science and technology, which is here assuming ever greater importance. This feature became especially prominent during the last decades of the nineteenth century. Many a time has a reaction, carried out with small quantities of substances in the research worker's test tube, by being correctly evaluated and systematically applied, achieved a revolution in the chemical industry, and in such fashion that emphasis has shifted from one industrial centre to another, or that completely new branches of industry have been created.

One such new branch which was hardly dreamed of fifty years ago, but which now provides work for many thousands and spreads its products all over the world, is the preparation of organic dyestuffs from coal tar.

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Among the living research workers who have contributed directly or indirectly to the unique development of the tar-dyestuff industry the place of honour goes to the Professor at Munich University, Adolf von Baeyer, for his researches into the composition of *indigo* as well as into the *triphenyl methane dyestuffs*.

Indigo, the gorgeous pigment of the indigo plant, has been considered the most important of all organic pigments on account of its beauty and colour fastness, and the annual tribute which the West used to pay India for it amounted to a very considerable sum. To reproduce the pigment by synthetic methods and make it more easily obtainable was therefore an exceptionally inviting task for chemical research.

The complex and unique composition of indigo, however, made this also one of the hardest of tasks. Here there could be no question of one of those casual discoveries, which by happy accident seem to achieve half the work. Years of work were required for even von Baeyer's acumen and experimental skill to achieve the necessary insight into the pigment's chemical composition and to be able to manufacture it from simpler constituents. Even after the purely scientific part of the work had been completed it still took a number of years to make the results obtained from research applicable to technology.

Von Baeyer succeeded in producing indigo synthetically in three principal ways, namely from *ortho*-nitrophenylacetic acid, from *ortho*-nitrocinnamic acid and from *ortho*-nitrobenzaldehyde and acetone. This paved the way for the reproduction of indigo from raw material obtainable without much difficulty from coal tar. And if the problem of producing indigo industrially has now been solved from the technical as well as the economic point of view, this is entirely due to von Baeyer's basic work in the fields in question.

The result is striking. Already the price of indigo has fallen to a third of its former price, and Germany's export of synthetic indigo in 1904 could be valued at over 25 million marks. This shows that the synthetic product has been able to compete with decisive success against the natural product. The effects of this discovery, which was made in the

Munich University laboratory, can already be traced as far as the banks of the Ganges, and the time is probably not far distant when the immense fields, which up to now have been used for cultivation of the indigo plant will instead become available to produce cereals and other foodstuffs for India's starving millions.

Simultaneously with his analyses within the indigo group, analyses moreover which exerted a far-reaching influence upon the development of organic chemistry and directed research into new channels, von Baeyer was active with no less success in another sphere of the chemistry of organic dyestuffs. The stimulus was given by his discovery of a new group of beautifully coloured compounds, the so-called *phthaleins*, of which only the eosin pigments, highly important to industry, and the rhodamin dyes derived from them, may have particular mention here. In a series of masterly experiments von Baeyer demonstrated several years ago the chemical nature of the phthaleins and showed that, just like the already known rosaniline dyes, they may be classified as derivatives of the hydrocarbon triphenylmethane. In recent years - more exactly, from 1900 on - von Baeyer has resumed his work on triphenylmethane, and from this a new conception of the chemical composition of pigments and in general of the connection between the optical properties of organic substances and their interior atomic structure has been to a high degree prepared.

The dyestuffs studied by von Baeyer belong to the main category of organic substances usually classified under the name of aromatic compounds, which differ decisively from the other organic substances - the so-called aliphatic or fatty acid series - both in their properties and in their behaviour in reaction. In fact this difference has been considered so great that it has caused the division of the whole of organic chemistry into two separate halves: the chemistry of aliphatic, and of aromatic substances. Nevertheless, one of the main tasks of scientific research is to try to bridge the gulfs dividing different sciences, or different branches of the same science. In this respect, too, von Baeyer has carried out notable work in his research, remarkable alike from the experimental as well as from the theoretical point of view, on the so-called *hydroaromatic compounds*. With these

compounds, he has found the transitional form between the two main series just mentioned and by application of the new conception and the new method to the terpenes and the species of camphor occurring in nature and also important for technology, he has opened up fields for synthetic work which were previously inaccessible.

The research-worker's way to a discovery varies according to the nature of his goal. He may, after quite a short period of trial-and-error, see unsuspected vistas open up before him, but he may as well have to cut a slow and certain path to his goal by stubborn persistence.

Von Baeyer's work in the fields here mentioned has been of this latter variety. His relevant work is spread out over a long period of time and has continued up to the present day, but only in recent years has it been possible to appreciate and survey in its full extent its exceptional importance. The Royal Swedish Academy of Sciences therefore feels it is acting in full accord with the Nobel Charter in awarding this year's Nobel Prize for Chemistry to the Professor at the University of Munich, Geheimrat Adolf von Baeyer, *for the services he has rendered to the development of organic chemistry and the chemical industry through his work concerning organic dyes and hydroaromatic compounds.*

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1905/press.html