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Nobel Prize in Chemistry 1947

Sir Robert Robinson

The Nobel Prize in Chemistry 1947 was awarded to Sir Robert Robinson *"for his investigations on plant products of biological importance, especially the alkaloids"*.

RESEARCH INFORMATION:

One of the principal aims of organic chemistry is to make clear the chemical structure of substances found in living nature. Interest has been directed particularly towards substances with vital functions or otherwise obvious qualities. The structure of simpler compounds was largely elucidated during the nineteenth century, the more complicated ones being reserved for our century. Sir Robert Robinson's exceedingly fruitful work treats many groups of such substances. In comprehensive investigations he has dealt with the anthocyans, a group of red, blue, or violet pigments found almost everywhere within the vegetable kingdom, and which we meet with in the cornflower and the lark-spur of the fields as well as in claret and beetroot. He has done important work on sex hormones and synthetic substances of less complicated structure but with similar properties. He has done pioneering work on synthetic drugs against malaria, he has contributed towards the investigation of penicillin and he has successfully attacked fundamental questions concerning the mechanism of organic-chemical reactions. In presenting him with this

year's Nobel Prize in Chemistry, the Royal Academy of Sciences has in mind, however, particularly his work on alkaloids.

By alkaloids we understand a numerous group of nitrogenous basic substances from the vegetable kingdom. They usually have striking, sometimes sensational physiological effects. Among them are quinine, cocaine, and atropine, all of which have important medicinal qualities, further morphine, doubtless well-known, and strychnine known for its medicinal value and - in somewhat larger doses - as an exceedingly active poison. Plants containing alkaloids have generally drawn the attention of primitive peoples, and in the cases where they are met with in countries with ancient culture, the knowledge of their properties often goes back to pre-historic age. They have been used as medicines and means of enjoyment, for ritual and criminal purposes. They can carry our thoughts to poetry and romance - it is not only decadent poets who have sung the praise of opium and poppy juice - but they have also been associated with vice, crime and horror.

During the nineteenth century we began to learn how to isolate the active substances themselves, the alkaloids, and investigation of their chemistry still continues with unabated interest. It was soon found that these alkaloids are usually very complicated in structure; the molecule of morphine contains 40 atoms, that of strychnine 47, each of which has its definite place in relation to the others. To reveal the inner architecture of these complicated systems through different chemical operations is a task as difficult as it is fascinating. It requires great experimental skill, creative power and sharp logic. In this sphere of alkaloid research, Sir Robert stands out as our foremost contemporary. He has solved the riddle of the morphine molecule's structure, in connection with which quite 20 different formulae have been under consideration, he has clarified the essential features of the strychnine formula, even though some details are still uncertain, and he has made decisive contributions towards the investigation of many other alkaloids with strangely sounding names like gnoscopine, harmaline, physostigmine, and rutaecarpine.

It has often been asked how plants build up these singular molecules. Here, Sir Robert has formed a theory which rests upon the amino-acids contained in proteins, and

which seems to present a satisfactory answer to the question. The theory is illustrated by Sir Robert's famous synthesis of tropinone, a substance closely related to cocaine. We have here a case where three rather simple molecules spontaneously unite into a complicated system, which earlier we could only build up step by step through a long series of reactions. We may suppose that here Sir Robert has found the key to nature's own way of working. This theory has also gained great importance as a guide when determining intricate structures, and it has rendered it possible to trace hidden connections within the multifarious group of alkaloidal substances.

The tendency in natural science tends more and more to the removal of the traditional boundaries between the different sciences. The sum of total knowledge constantly increases, human intellect, however, is limited and cooperation therefore becomes a matter of necessity. For the individual scientist it becomes a difficult task to broaden and deepen his science on its own particular basis without turning his back upon productive collaboration. Perhaps this is felt particularly in chemistry; it is there that the threads of research into life and matter run together, and thus chemistry has acquired a key position within the natural science of to-day. Sir Robert has solved the problem with great success. He has devoted his life to organic chemistry, but the importance and the consequences of his work extend far into the fields of biological and medicinal research.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1947/press.html