

Nobel Prize in Chemistry 1975



John Warcup Cornforth



Vladimir Prelog

The Nobel Prize in Chemistry 1975 was divided equally between John Warcup Cornforth "for his work on the stereochemistry of enzyme-catalyzed reactions" and Vladimir Prelog "for his research into the stereochemistry of organic molecules and reactions".

Information about winners:

John Warcup Cornforth,

England

Vladimir Prelog,

Switzerland

RESEARCH INFORMATION:

Cornforth has been awarded the Prize for his work on the stereochemistry of enzyme-catalyzed reactions. This subject is difficult to explain to the layman as it is a question of geometry in three dimensions; it is concerned with the delicate mechanism of important reactions in biological systems, where a group of atoms takes the place of a certain hydrogen atom among two or three, which may appear to be equivalent. The problem is to decide which of the hydrogen atoms is replaced and if nearby groups retain

their positions or if they are rearranged in some way. The enzyme leads the process in a quite uniform way. Without this guidance, chaos would break out in the biological system.

Cornforth "marks" the hydrogen atoms by making use of hydrogen's three isotopes; ordinary hydrogen (mass 1), heavy hydrogen or deuterium (mass 2) and radioactive hydrogen or tritium (mass 3). He then makes use of their differing reaction speeds (the lightest reacts the quickest). Only trace quantities of tritium can be used; no more than a millionth or so of the molecules involved in the reaction are marked. The planning of this research is an outstanding intellectual achievement. Among the biologically significant reactions the stereochemistry of which has been clarified is the synthesis of steroids from mevalonic acid via squalene and the condensations of acetate with glyoxylic acid to malic acid and with oxalylacetic acid to citric acid. Since Cornforth has shown the way similar research has been initiated in other quarters.

The Prize has been awarded to Professor **Prelog** for his research into the stereochemistry of organic molecules and reactions, i.e. the connection between the course of chemical reactions and the geometric form of the participating molecules. His research spans a wide field.

One area of study has been "medium-sized rings" - ring-shaped molecules with 8-12 carbon atoms. A ring of this kind is fairly mobile one might almost say "flaccid"; apparently remote parts of the molecule can come into close contact with each other thus causing unexpected reactions. Medium-sized rings are not unusual in nature.

Another important area of his research is that concerned with chiral molecules, formerly called asymmetric molecules. The word "chiral" comes from the Greek meaning "hand" and signifies that the molecules can have two forms differing from one another as the right hand does from the left. Prelog has done very significant research on reactions between chiral molecules. This research is of fundamental importance to an understanding of biological processes. Prelog has also led a very penetrating discussion of the conditions governing chirality in complex molecules.

Prelog has experimented with enzymes acting on simple molecules, where the result depends on how the compound and the enzyme "suit one another". Systematic experiments with simple compounds of well-defined structures give valuable information about the structure of enzymes and the way they act.

It should perhaps be mentioned that Professor Prelog has also done extensive research on special groups of natural products, e.g. alkaloids and antibiotics from microorganisms, where his profound knowledge of stereochemistry has been of great advantage.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1975/press.html