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Nobel Prize in Chemistry 2002



John B. Fenn **Koichi Tanaka** **Kurt Wüthrich**

The Nobel Prize in Chemistry 2002 was awarded *"for the development of methods for identification and structure analyses of biological macromolecules"* with one half jointly to John B. Fenn and Koichi Tanaka *"for their development of soft desorption ionisation methods for mass spectrometric analyses of biological macromolecules"* and the other half to Kurt Wüthrich *"for his development of nuclear magnetic resonance spectroscopy for determining the three-dimensional structure of biological macromolecules in solution"*.

Information about winners:

John B. Fenn

Virginia Commonwealth University, Richmond, USA, and

Koichi Tanaka

Shimadzu Corp., Kyoto, Japan

Kurt Wüthrich

Swiss Federal Institute of Technology (ETH), Zürich, Switzerland and The Scripps Research Institute, La Jolla, USA

Summary of research work:

Revolutionary analytical methods for biomolecules

This year's Nobel Prize in Chemistry concerns powerful analytical methods for studying biological macromolecules, for example proteins. The possibility of analysing proteins in detail has led to increased understanding of the processes of life. Researchers

can now rapidly and simply reveal what different proteins a sample contains. They can also determine three-dimensional pictures showing what protein molecules look like in solution and can then understand their function in the cell. The methods have revolutionised the development of new pharmaceuticals. Promising applications are also being reported in other areas, for example foodstuff control and early diagnosis of breast cancer and prostate cancer.

Mass spectrometry is a very important analytical method used in practically all chemistry laboratories the world over. Previously only fairly small molecules could be identified, but John B. Fenn and Koichi Tanaka have developed methods that make it possible to analyse biological macromolecules as well.

In the method that John B. Fenn published in 1988, *electrospray ionisation (ESI),* charged droplets of protein solution are produced which shrink as the water evaporates. Eventually freely hovering protein ions remain. Their masses may be determined by setting them in motion and measuring their time of flight over a known distance. At the same time Koichi Tanaka introduced a different technique for causing the proteins to hover freely, *soft laser desorption.* A laserpulse hits the sample, which is "blasted" into small bits so that the molecules are released.

The other half of the Prize rewards the further development of another favourite method among chemists, *nuclear magnetic resonance, NMR.* NMR gives information on the three-dimensional structure and dynamics of the molecules. Through his work at the beginning of the 1980s Kurt Wüthrich has made it possible to use NMR on proteins. He developed a general method of systematically assigning certain fixed points in the protein molecule, and also a principle for determining the distances between these. Using the distances, he was able to calculate the three-dimensional structure of the protein. The advantage of NMR is that proteins can be studied in solution, i.e. an environment similar to that in the living cell.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2002/popular.html