



## Prof. John Charles Polanyi

Professor at the University of Toronto. Nobel laureate in Chemistry, 1986



### **Most important awards, prizes and academies**

*Awards:* Marlow Medal of the Faraday Society, UK (1962); Steacie Prize for the Natural Sciences (1965); Henry Marshall Tory Medal of the Royal Society of Canada (1977); Wolf Prize in Chemistry, shared with G. Pimentel (1982); Nobel laureate in Chemistry (1986). *Academies:* Royal Society of Canada; Royal Society of London; American Academy of Arts and Sciences; National Academy of Sciences, USA; Companion of the Order of Canada; Pontifical Academy of Sciences; Russian Academy of Sciences.

### **Summary of scientific research**

The past decades have seen the birth of a field of chemical physics termed 'reaction dynamics', the study of the atomic and molecular motions underlying chemical reaction. Starting in 1956, J.C. Polanyi's laboratory at the University of Toronto attempted to detect and measure the extent of vibration and rotation in reaction products from gaseous reaction by recording their emission in the infrared. Ultimately these experiments yielded quantitative data concerning the motions in molecules at the instant of their formation, and also the effect on these product motions of systematic alterations in the corresponding motions in the reagents. From these data it was

possible, by means of Monte Carlo trajectory computations performed in this and other laboratories, to obtain some insight into the patterns of motion in the course of transition from reagents into products. More recently Polanyi's laboratory has been involved in an attempt to establish, through theory and experiment, a means of probing the subpicosecond 'transition state' directly, either by recording feeble emission or by laser absorption; this area of research (still in its infancy) constitutes 'transition state spectroscopy'. In a second recent departure this laboratory has turned its attention to the dynamics of simple reactions occurring at surfaces. Following adsorption of submonolayers on the surface, reaction is initiated by ultraviolet light. The present indication is that this procedure can result in reaction between coadsorbed species, both held at the surface, with preferred locations and orientations. Most recently his laboratory has been involved in studying photoreaction one molecule at a time, beneath the tip of a Scanning Tunneling Microscope. The hope, therefore, is to exploit this 'surface aligned photochemistry' as a means of improving our understanding, and therefore our control, over microscopic reaction pathways - the molecular choreography of the reactive process.

### Main publications

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