



# Ahmed Zewail Nobel Prize in Chemistry 1999

"For his studies of the transition states of chemical reactions using femtosecond spectroscopy"

**E**lected **Honorary Fellow** in 2005 into Academy of Sciences of Malaysia, Ahmed H. Zewail was born on 26 February 1946, in Damamhur, Egypt and has the distinction of being the first Muslim to win the Nobel Prize in the sciences category. Currently a faculty member at the California Institute of Technology (Caltech) as the Linus Pauling Chair Professor of Chemistry and Professor of Physics, and the Director of the Physical Biology Center for Ultrafast Science and Technology (UST) and the NSF Laboratory for Molecular Sciences (LMS). His current research is devoted to dynamical chemistry and biology, with a focus on the physics of elementary processes in complex systems. A major research frontier is the new development of "4D ultrafast diffraction and microscopy", making possible the imaging of transient structures in space and time with atomic-scale resolution.

Chemical reactions are too fast, just like a split second scene on television and chemists need a method to see these reactions – a sort of 'slow-motion- camera. Chemists' eagerness to be able to follow chemical reactions in the greatest detail has prompted increasingly advanced technology. Nobel laureate in Chemistry, Ahmed H. Zewail, has studied atoms and molecules in "slow motion" during a reaction and seen what actually happens when chemical bonds break and new ones are created.

Zewail's technique uses what may be described as the world's fastest camera. This uses laser flashes of such short duration that we are down to the time scale on which the reactions actually happen - femtoseconds (fs). One femtosecond is 10<sup>-15</sup> seconds, that is, 0.000000000000001 seconds, which is to a second as a second is to 32 million years. This area of physical chemistry has been named femtochemistry. Femtochemistry enables us to understand why certain chemical reactions take place but not others. We can also explain why the speed and yield of reactions depend on temperature. Scientists the world over are studying processes with femtosecond spectroscopy in gases, in fluids and in solids, on surfaces and in polymers. Applications range from how catalysts function and how molecular electronic components must be designed, to the most delicate mechanisms in life processes and how the medicines of the future should be produced.



Ahmed Zewail receiving his Nobel Prize from His Majesty the King at the Stockholm Concert Hall 1999.



Nobel

#### References:

- [1] [http://nobelprize.org/nobel\\_prizes/chemistry/laureates/1999/zewail-autobio.html](http://nobelprize.org/nobel_prizes/chemistry/laureates/1999/zewail-autobio.html)
- [2] <http://zewail.nobel-link.com/1.htm>
- [3] [http://nobelprize.org/nobel\\_prizes/chemistry/laureates/1999/zewail.html](http://nobelprize.org/nobel_prizes/chemistry/laureates/1999/zewail.html)