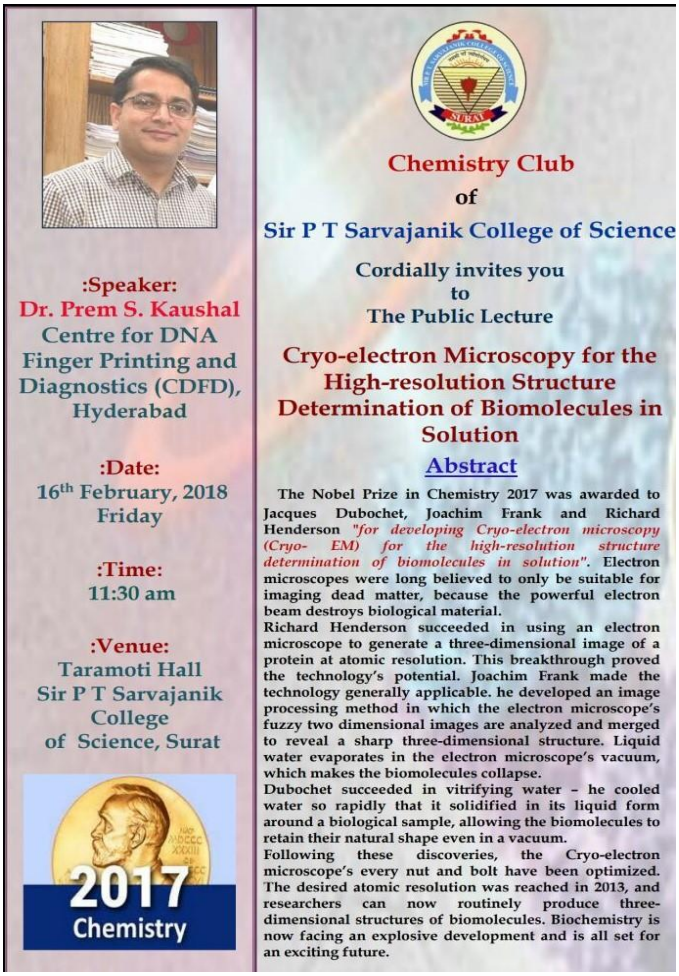
Invited talk on "Nobel Prize in Chemistry - 2017"

Date: 16-02-2018	Participants: 160

Resource Person: Dr. Prem S. Kaushal, Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad



:Speaker:
Dr. Prem S. Kaushal
Centre for DNA Finger Printing and Diagnostics (CDFD), Hyderabad

:Date:
16th February, 2018
Friday

:Time:
11:30 am

:Venue:
Taramoti Hall
Sir P T Sarvajanik College
of Science, Surat

2017 Chemistry

Chemistry Club
of
Sir P T Sarvajanik College of Science

Cordially invites you
to
The Public Lecture

Cryo-electron Microscopy for the High-resolution Structure Determination of Biomolecules in Solution

Abstract

The Nobel Prize in Chemistry 2017 was awarded to Jacques Dubochet, Joachim Frank and Richard Henderson *"for developing Cryo-electron microscopy (Cryo- EM) for the high-resolution structure determination of biomolecules in solution"*. Electron microscopes were long believed to only be suitable for imaging dead matter, because the powerful electron beam destroys biological material.

Richard Henderson succeeded in using an electron microscope to generate a three-dimensional image of a protein at atomic resolution. This breakthrough proved the technology's potential. Joachim Frank made the technology generally applicable. he developed an image processing method in which the electron microscope's fuzzy two dimensional images are analyzed and merged to reveal a sharp three-dimensional structure. Liquid water evaporates in the electron microscope's vacuum, which makes the biomolecules collapse.

Dubochet succeeded in vitrifying water – he cooled water so rapidly that it solidified in its liquid form around a biological sample, allowing the biomolecules to retain their natural shape even in a vacuum.

Following these discoveries, the Cryo-electron microscope's every nut and bolt have been optimized. The desired atomic resolution was reached in 2013, and researchers can now routinely produce three-dimensional structures of biomolecules. Biochemistry is now facing an explosive development and is all set for an exciting future.

Invited talk on "Nobel Prize in Chemistry - 2017"

Date: 16-02-2018	Participants: 160

Resource Person: Dr. Prem S. Kaushal, Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad

Brief Report:

The Royal Swedish Academy of Science awarded the Nobel prize in Chemistry for the year 2017 to Jacques Dubochet from the University of Lausanne, Switzerland; Joachim Frank from Columbia University, New York, US; and Richard Henderson from the Medical Research Council Laboratory of Molecular Biology in Cambridge, UK. for "developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution'. Dr. Prem Kaushal gave a lot of information on many topics, such as, Cryo- EM, science behind it, how Richard Henderson generated 3D image of a protein using TEM, Joachim Frank's efforts to develope computational methods for taking images of multiple, randomly-oriented proteins within a sample and compiling them into sets of similar orientations to obtain sharper 2D images and later on constructed a 3D image from these 2D projections and about the contribution of James Dubochet who developed a method for freezing water-based TEM samples. Such rapid cooling of water forms a disordered glass. Catapulting the sample into a bath of liquid nitrogen-cooled ethane freezes the thin film of water on a TEM sample so quickly that the water molecules don't have time to arrange into a crystalline lattice. In this 'vitrified' sample, the water is disordered but the 3D structure of the biomolecules in the sample is retained. Dubochet created the first images of various viruses using vitrified water samples. He made it interesting using lucid language.