

# 2017 NOBEL PRIZE IN CHEMISTRY



The Nobel Prize in Chemistry 2017 was awarded to **Jacques Dubochet**, **Joachim Frank**, and **Richard Henderson** for the development of cryo-electron microscopy for determining biomolecule structures.

## X-RAY CRYSTALLOGRAPHY



Structures of proteins that form crystals

## NMR SPECTROSCOPY



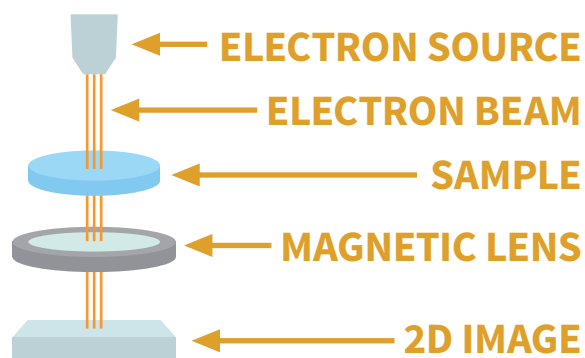
Structures of small proteins in solution

## CRYO-EM

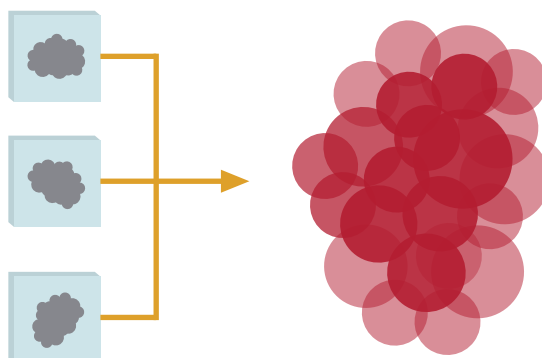


Structures of large, non-crystalline proteins

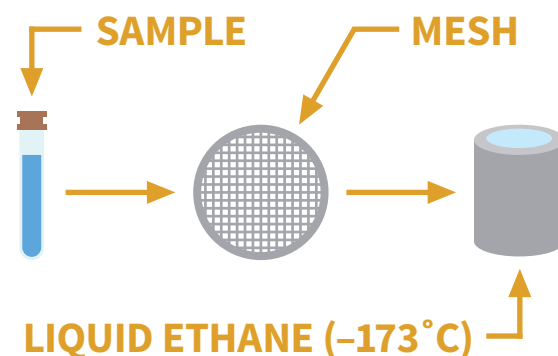
Cryo-electron microscopy (cryo-EM) is a technique that makes it possible to produce 3D images of biomolecules at atomic resolution. It can be used to capture images of biomolecules which could not be visualised with previously existing techniques.



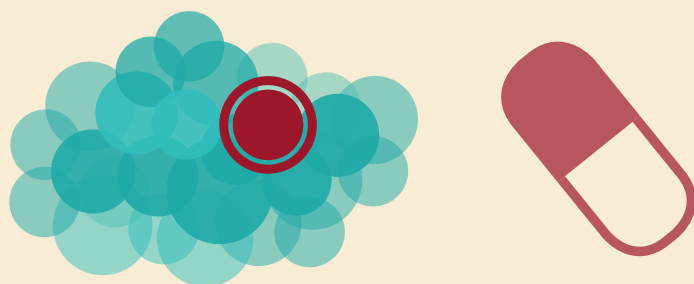
**Henderson** pioneered the use of electron microscopy (EM) to visualise proteins. Using it, he produced the first atomic resolution image of a protein, bacteriorhodopsin, in 1990.



**Frank** developed an image analysis method that allowed computers to assemble a high resolution 3D image from many 2D EM images, improving the quality of biomolecule images.



Biological samples dry out and are damaged when in vacuum during EM. **Dubochet** solved this by rapidly freezing samples in water at  $-173^{\circ}\text{C}$  to form an icy glass instead of crystals.



## WHY DOES THIS RESEARCH MATTER?

Cryo-EM allows scientists to reveal how proteins move and interact with other molecules, freezing and observing them mid-process. It could improve our understanding of drug targets and biological processes.

Nobel Prize in Chemistry Press release: [https://www.nobelprize.org/nobel\\_prizes/chemistry/laureates/2017/press.html](https://www.nobelprize.org/nobel_prizes/chemistry/laureates/2017/press.html)