



# IST Lecture

## Joachim Frank

Columbia University



### Single-particle cryo-EM: Visualization of biological molecules in their native states

The aim of Structural Biology is to explain life processes in terms of macromolecular interactions in the cell. These interactions typically involve more than two partners, and can run up to dozens. A full description will need to characterize all structures on the atomic level, and the way these structures change in the process. Because of the crowded environment of the cell, such characterization is presently only possible when the group of interacting molecules (often organized into processive “molecular machines”) is isolated and studied in vitro. While X-ray crystallography has provided structures of a large number of molecular structures, the need for crystals diffracting to high resolution has severely limited the number of supramolecular assemblies and the range of conformers that can be studied with this technique. Single-particle cryo-electron microscopy is about to fill this gap, allowing functional processes to be studied in great detail without imposing restraints on the structures. There are many examples now for this expansion of Structural Biology toward a full characterization of a functional process.

This presentation will cover concept, history and examples of the present capabilities of single-particle cryo-EM, and its significance for Medicine. It will then briefly cover the future prospects, which include the study of short-lived intermediates in a nonequilibrium system by time-resolved techniques, and the characterization of continuous structural changes using data mining from large ensembles of molecule images.



2020-04-21

**Tuesday | April 21, 2020 | 05:00 pm - 06:00 pm**  
**Raiffeisen Lecture Hall, IST Austria, Klosterneuburg**

**Please register for the lecture and shuttle by April 14:**  
**<https://ist.ac.at/frank-registration>**

Free shuttle buses are provided to / from campus: **IST shuttle #142:** 4:03 pm from U4 Heiligenstadt/public bus stop (return from IST Austria campus at 6:40 and 7:10 pm) – please show this flyer to the driver as ticket! **Special IST Lecture shuttle:** 4 pm from the Schwedenplatz/night bus stop (return from IST Austria campus at 7 pm) – register online!

This invitation is valid as a ticket for the IST Shuttle (#142) from and to Heiligenstadt Station. Please find a schedule of the IST Shuttle on our webpage (note that the IST Shuttle times are marked in dark green): **[https://ist.ac.at/wp-content/uploads/2019/03/IST\\_Shuttle\\_Bus\\_timetable.pdf](https://ist.ac.at/wp-content/uploads/2019/03/IST_Shuttle_Bus_timetable.pdf)**  
The IST Shuttle bus is marked IST Shuttle (#142) and has the Institute Logo printed on the side.

*IST Lectures introduce eminent researchers and their work to a wide audience of scientists and the general public.*

