





**EMBO**  
Global Exchange  
Lecture Course

# Structural and biophysical methods for biological macromolecules in solution

19 – 26 January 2014 | São Paulo, Brazil

## EMBL Outstation at DESY, Hamburg



1974




40 years later

EMBL integrated facility  
at upgraded Petra-3 ring  
(in operation from 2012)

2 MX beamlines  
1 BioSAXS beamline



## Course aims



The main objective of the EMBO Global Exchange Lecture Course is to teach the young PhD students and postdocs from all areas of biology the **methods applicable to study biological macromolecules in solution**. We aim at a comprehensive coverage of the field including the **major structural and biophysical techniques** employed for the characterization of high and low resolution structure and structural transitions, macromolecular complex formation, protein folding and stability, protein-protein and enzymatic mechanisms.

3



## What will (and what will not) be covered



The two major methods covered are:

- **small-angle X-ray and neutron scattering** (SAXS/SANS)
- **nuclear magnetic resonance** (NMR)

The other methods for solutions include **analytical ultracentrifugation (AUC)**, **light scattering**, **calorimetry**, **spectroscopic approaches**, **bioinformatic tools** etc.

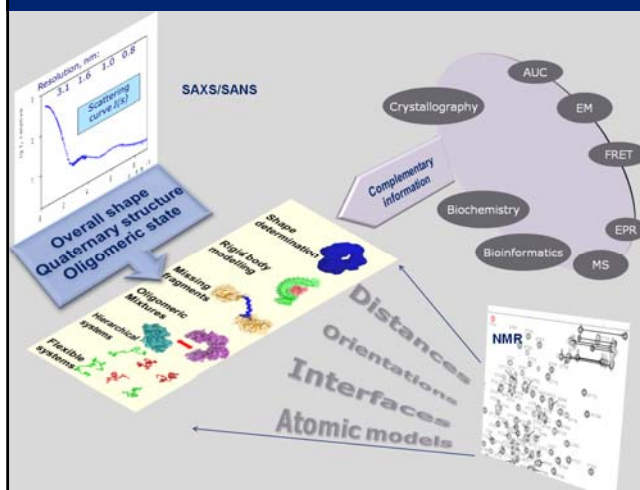
The major structural methods, which will NOT be covered:

- **macromolecular crystallography** (MX),
- **electron microscopy** (EM),
- **mass spectrometry** (MS)

However, attention will be paid to interdisciplinary approaches where SAS and NMR are employed together with these and other non-solution methods.

4

# Joint use of SAS and NMR



- Cross-validation of structural models
- The use of mutual constraints, especially for rigid body modeling
- Comprehensive quantitative analysis of flexible systems and mixtures
- Dynamic (including short-lived and encounter) complexes



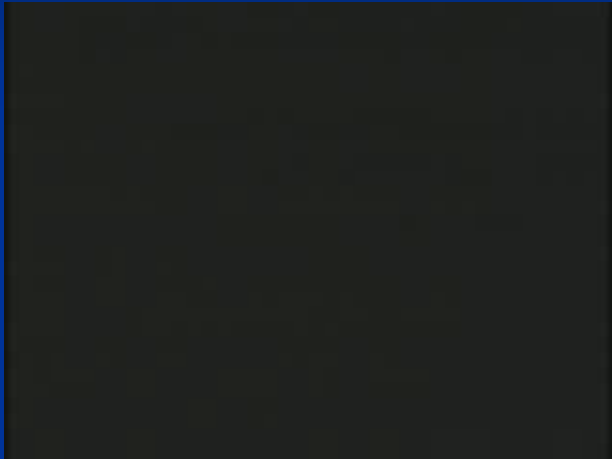


## Overall Course schedule



- Day 1, 19.01 Basics of SAXS and SANS, Poster Session
- Day 2, 20.01 SAXS/SANS - Data processing and analysis
- Day 3, 21.01 Biophysical techniques (light scattering, hydrodynamics, calorimetry)
- Day 4, 22.01 Biomolecular NMR
- Day 5, 23.01 Practical session, Excursion
- Day 6, 24.01 Multidisciplinary approaches (bioinformatics, biophysical methods, spectroscopy)
- Day 7, 25.01 SAXS/SANS: Mixtures, processes, interactions
- Day 8, 26.01 Workshop (scientific talks of the sponsors and selected students presentations)

So, let us go!



7