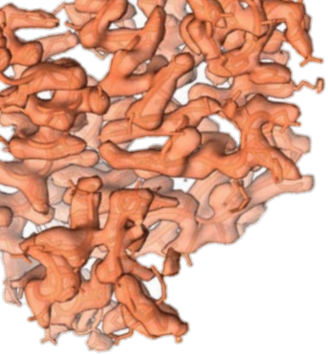




# National Facility for Structural Biology

Paolo Swuec, Head of the National Facility for  
Structural Biology, Human Technopole

For technical enquiries about the services:  
[nf.structuralbiology@fht.org](mailto:nf.structuralbiology@fht.org)



**1 | What is Structural Biology?**

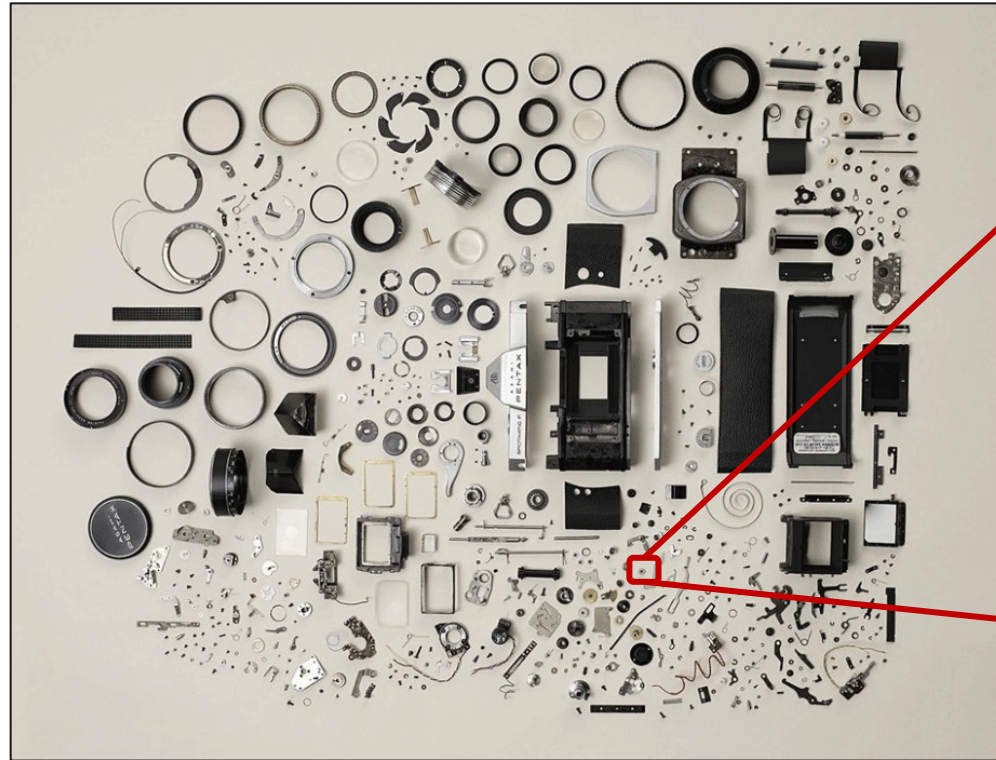
2 | What's the NFSB and its Mission?

3 | What Services do we provide?



# What is Structural Biology and why do we need it?

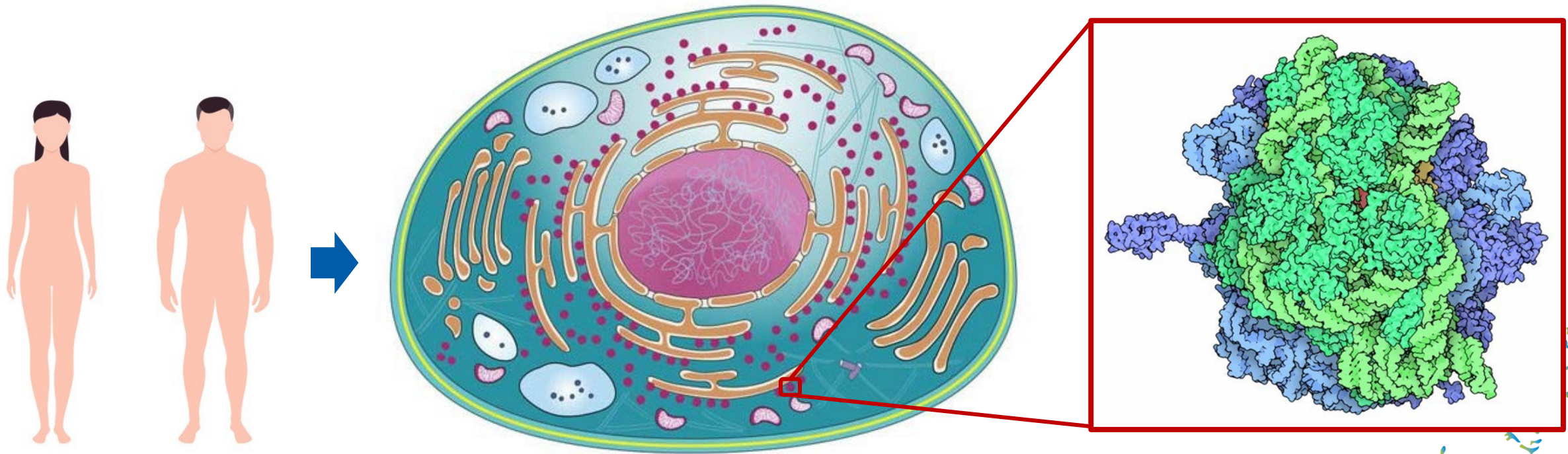
Biology is an *ensemble* of mechanisms, with many “gears” performing specific or general tasks



 We Observe  to Understand  to Fix

# What is Structural Biology and why do we need it?

Biology is an *ensemble* of mechanisms, with many gears performing specific or general tasks



**Structural Biology** studies the 3D structures of biological macromolecules to understand their function.

# Today we talk about Integrative Structural Biology

It's the combination of different advanced techniques to tackle one question



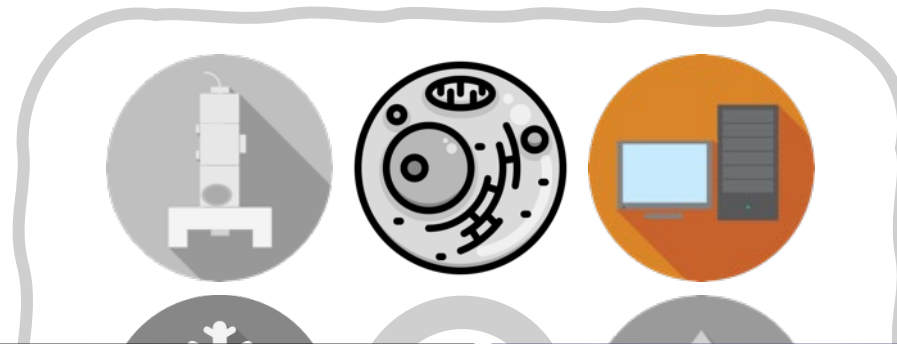
Structural Biology to REVEAL and VALIDATE both structures and functions

# Today we talk about Integrative Structural Biology

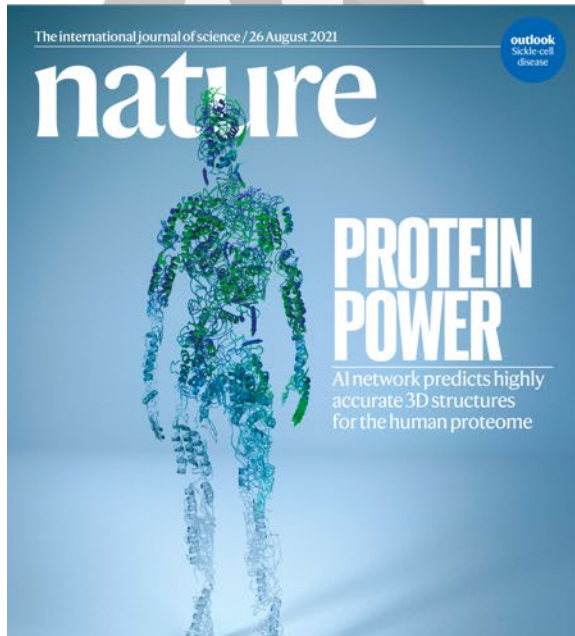
It's the combination of different advanced techniques to tackle one question

## Tools & Expertise

Question



Answer



# AlphaFold to Predict 3D Structure of Proteins

AI can help predicting the 3D protein structure of proteins from their amino acid sequence

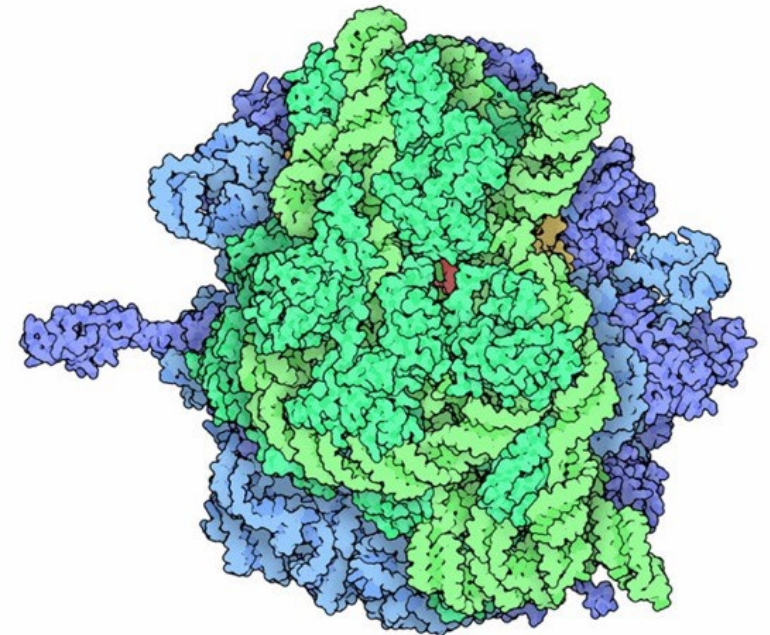
**Amino acid sequence of a Protein:**

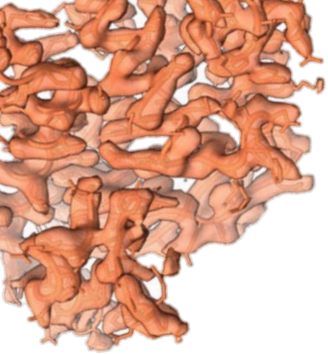
MDITIHNPLIRRPLFSWLAPSRIFD  
QIFGEHLQESELLPASPSLSPFLMS  
PIFRMPSWLETGLSEMRLEKDKF  
SVNLDVKHFSPEELKVKVLGDMV  
EIHGKHEERQDEHGFIAREFNK  
YRIPADVDPITITSSLSLDGVLTVS  
APRKQSDVPERSIPITREEKPAIAG  
AQRKTGHPPYEELSDWLIRET...



**AlphaFold**

**Predicted 3D Structure of a Protein:**





1 | What is Structural Biology?

**2 | What's the NFSB and its Mission?**

3 | What Services do we provide?



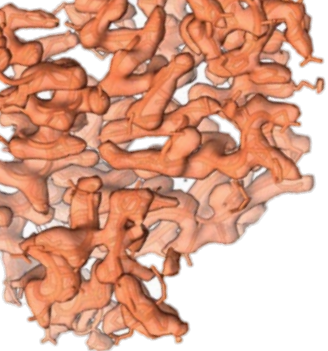


# What is the National Facility for Structural Biology (NFSB)?

NFSB stands as a one-of-a-kind technological hub for Integrative Structural Biology

- NFSB is a **multi-disciplinary** platform providing access to **advanced** and **basic** workflows in the field of **Integrative Structural Biology**
- Our strategic Mission is to:
  1. Offer **SERVICES**
  2. Foster **TECH DEVELOPMENT**
  3. Provide **TRAINING**





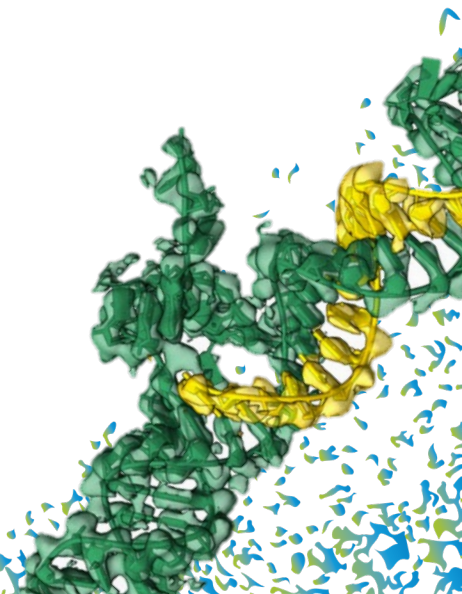
1 | What is Structural Biology?

2 | What's the NFSB and its Mission?

3 | **What Services do we provide?**



**Details about Services and Tools in Access Call!**



The synergy of expertise and technological offerings makes the NFStruBio more than the sum of its parts.

**UI1**

**CRYO-ELECTRON  
MICROSCOPY**

**UI2**

**BIOMASS**

**UI3**

**BIOPHYSICS**

**UI4**

**STRUCTURAL  
PROTEOMICS**

**UI5**

**DYNAMIC SINGLE  
MOLECULE**

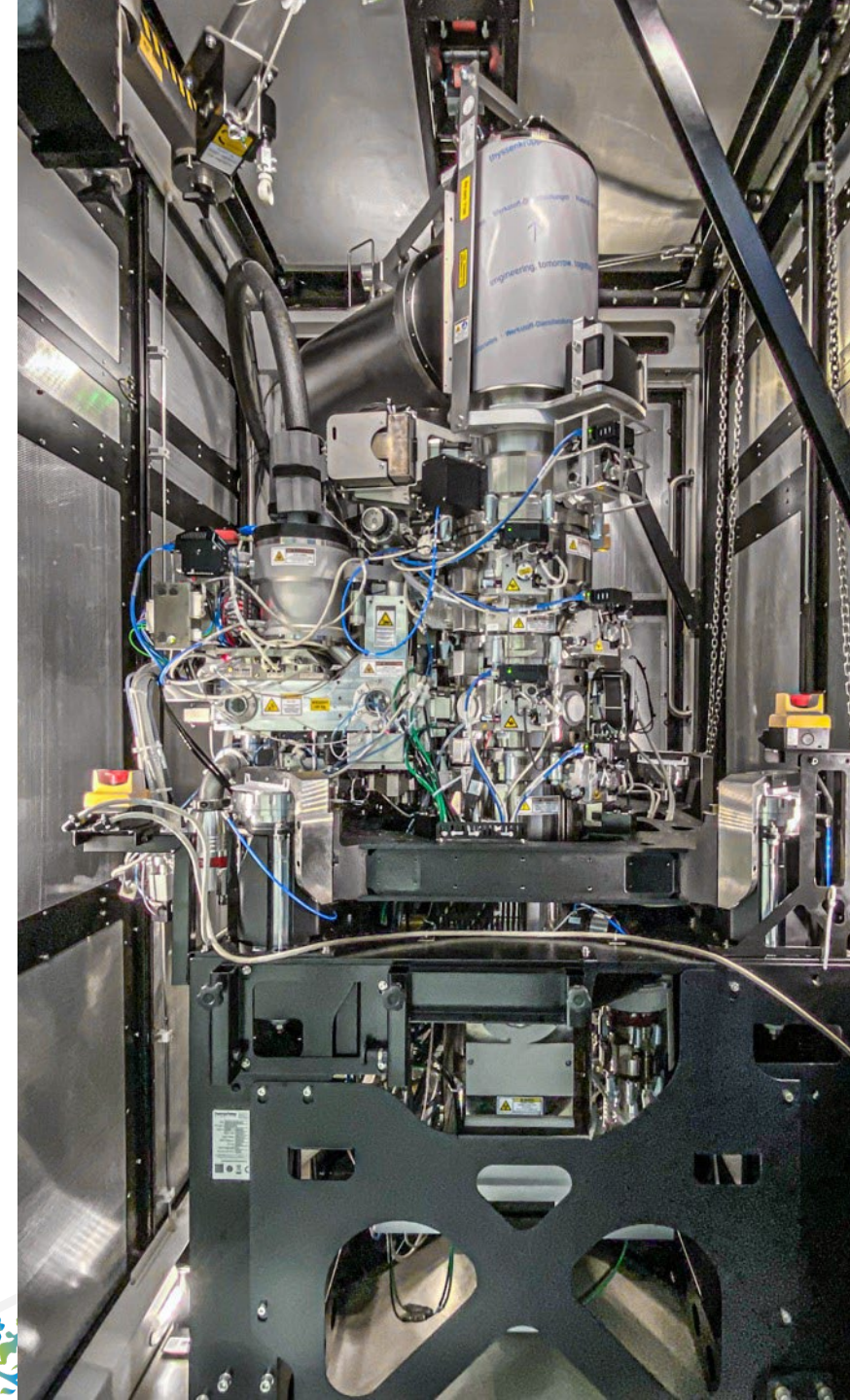
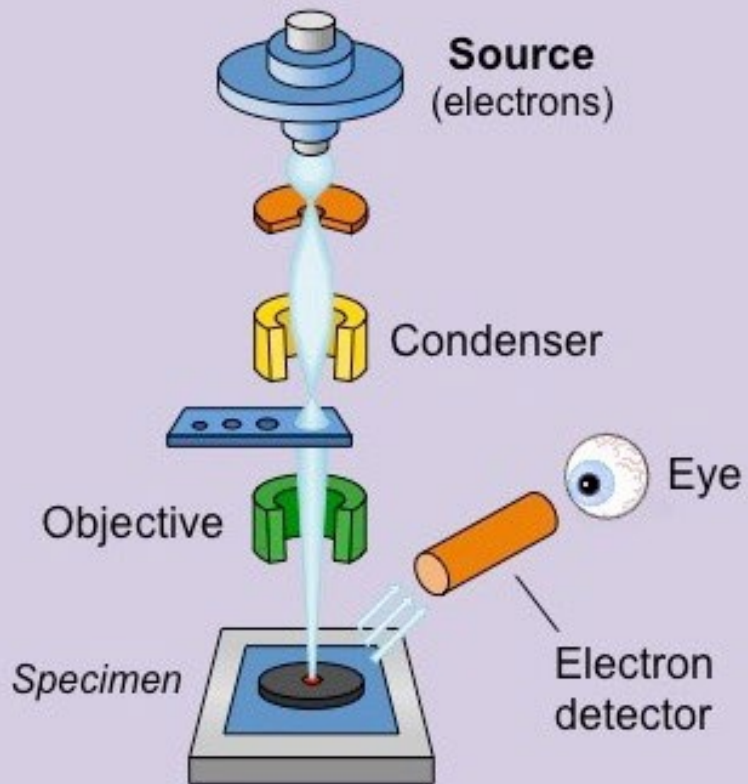
**UI6**

**TECHNOLOGY  
DEVELOPMENT**

# (IU1) Cryo-Electron Microscopy Unit

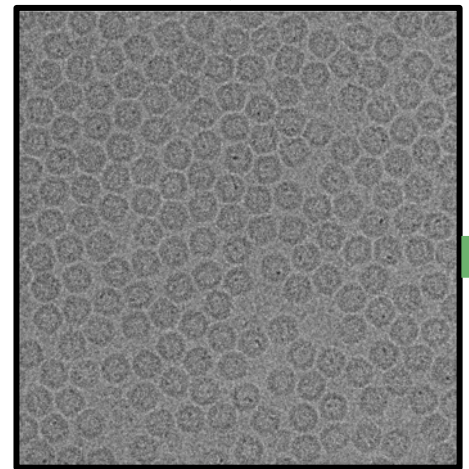
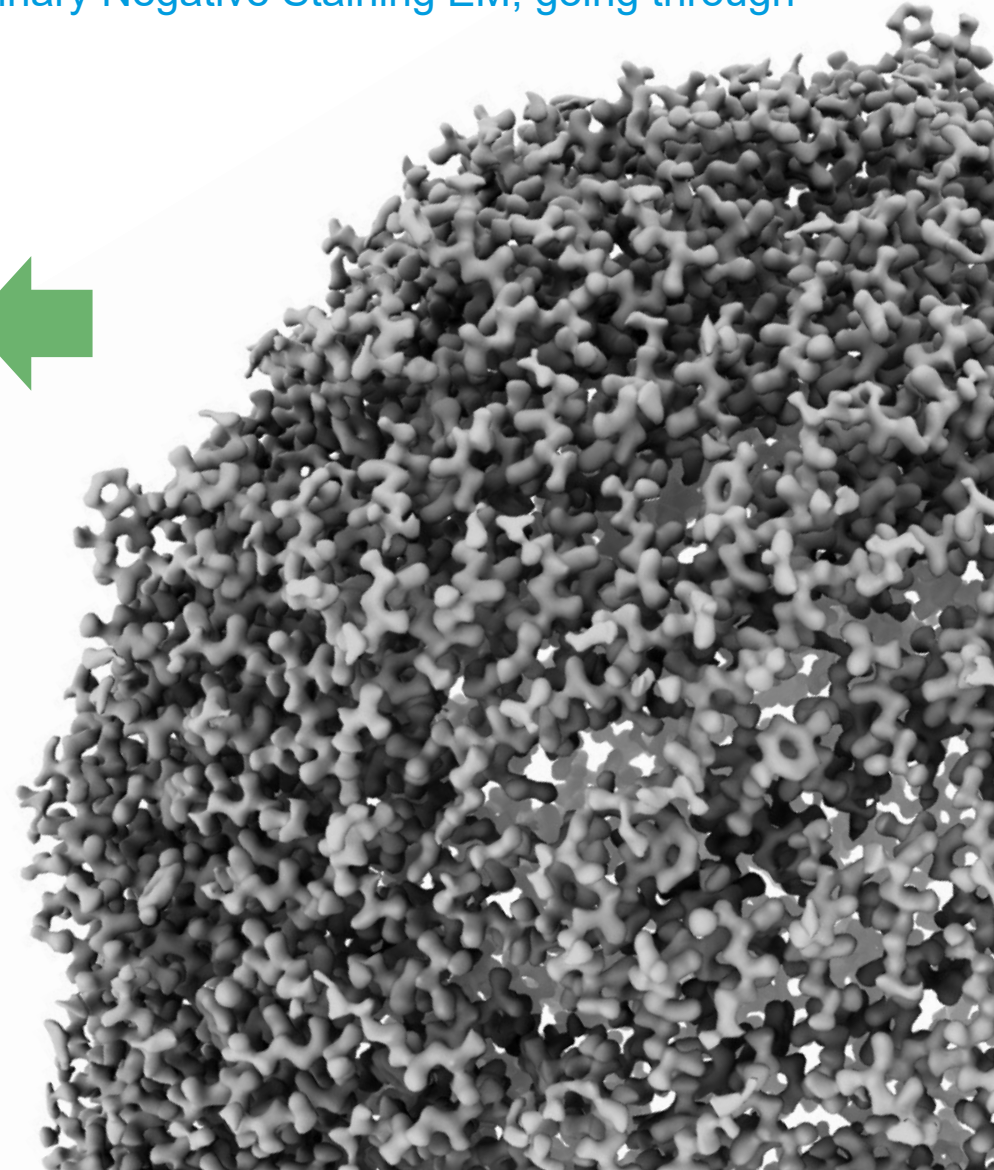
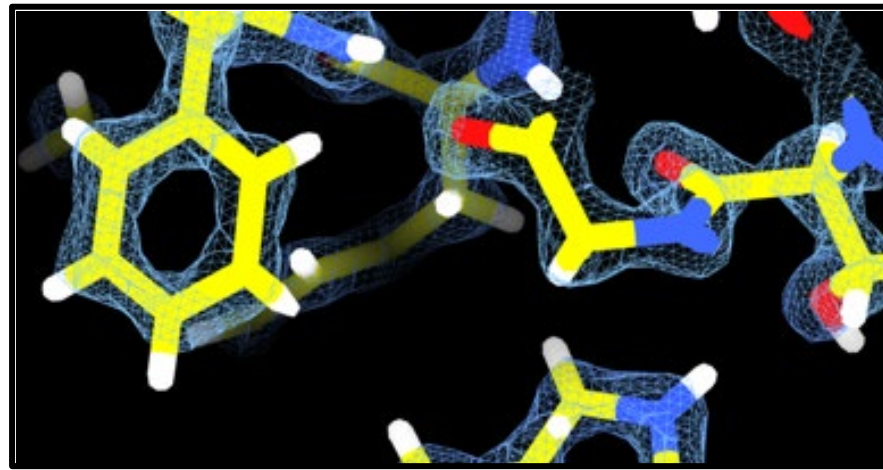
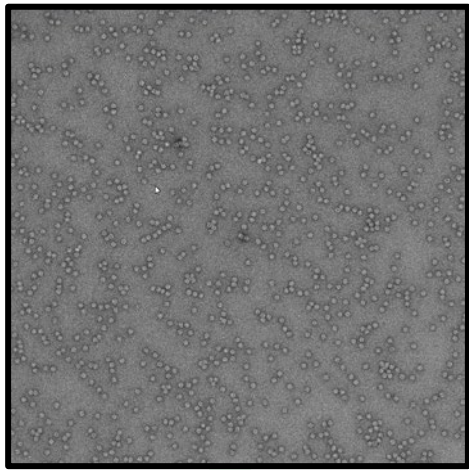
Electron Microscopy to overcome the imaging limitations of Light

## Electron Microscope



# (IU1) Cryo-Electron Microscopy Unit

We offer and support the whole single-particle pipeline, starting from preliminary Negative Staining EM, going through sample screening by plunging, down to high-res data collection



## Titan Krios G4

- + Selectris X energy filter
- + Falcon 4 (bottom mounted)
- + Falcon 4i (EF-mounted)
- + EPU
- + Tomography
- + SerialEM

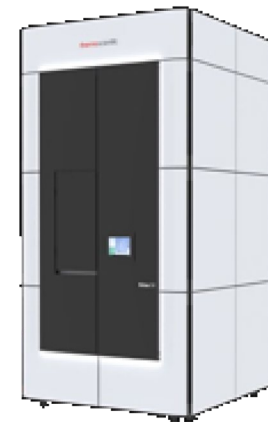
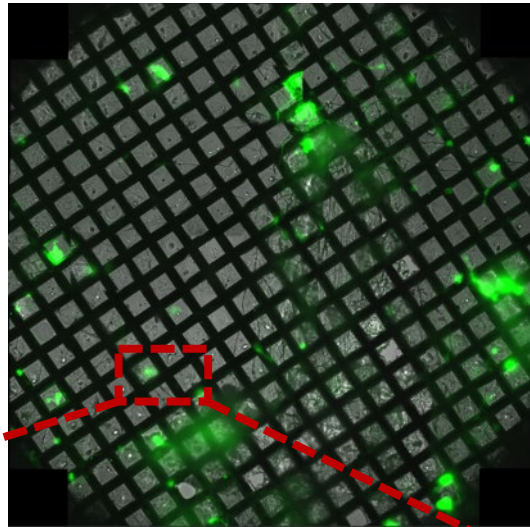
+ CryoSPARC Live on-the-fly processing (GPU)

# (IU1) Cryo-Electron Microscopy Unit

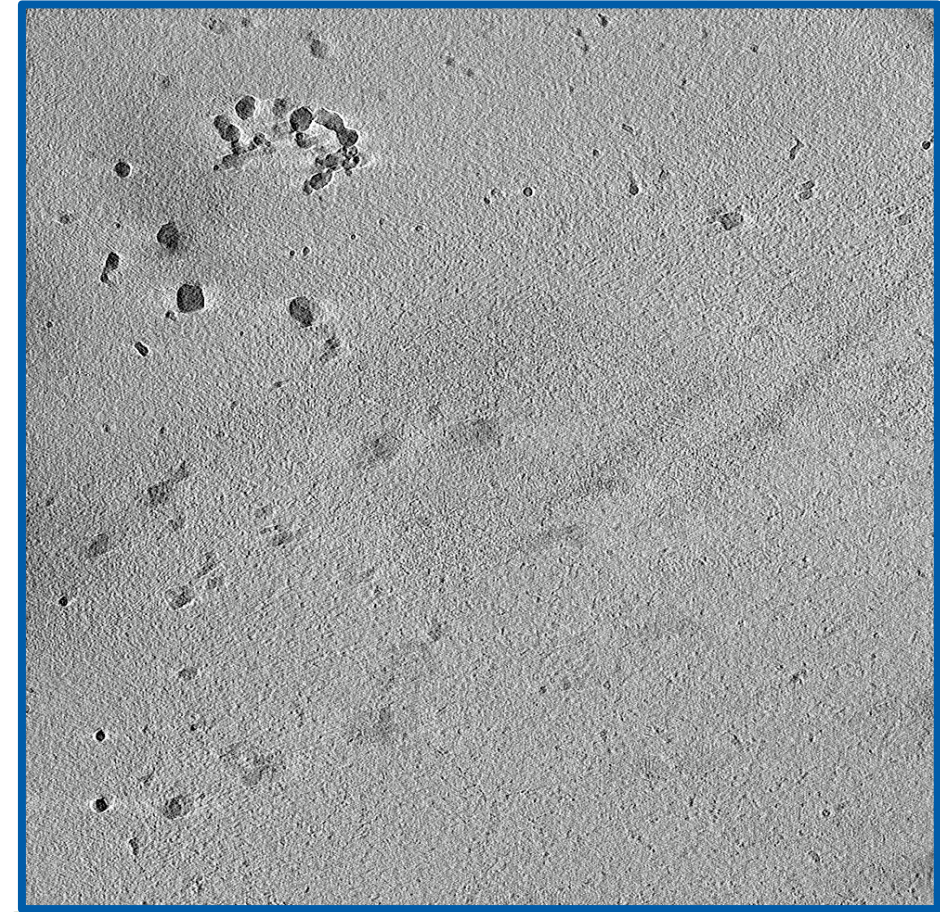
Access to only cryo-CLEM systems of the country, when combined to cryo-ET this allows for unprecedented precision in imaging and localization of sample of interest.



Cryo-CLEM



Cryo-Electron Tomography



The synergy of expertise and technological offerings makes the NFStruBio more than the sum of its parts.

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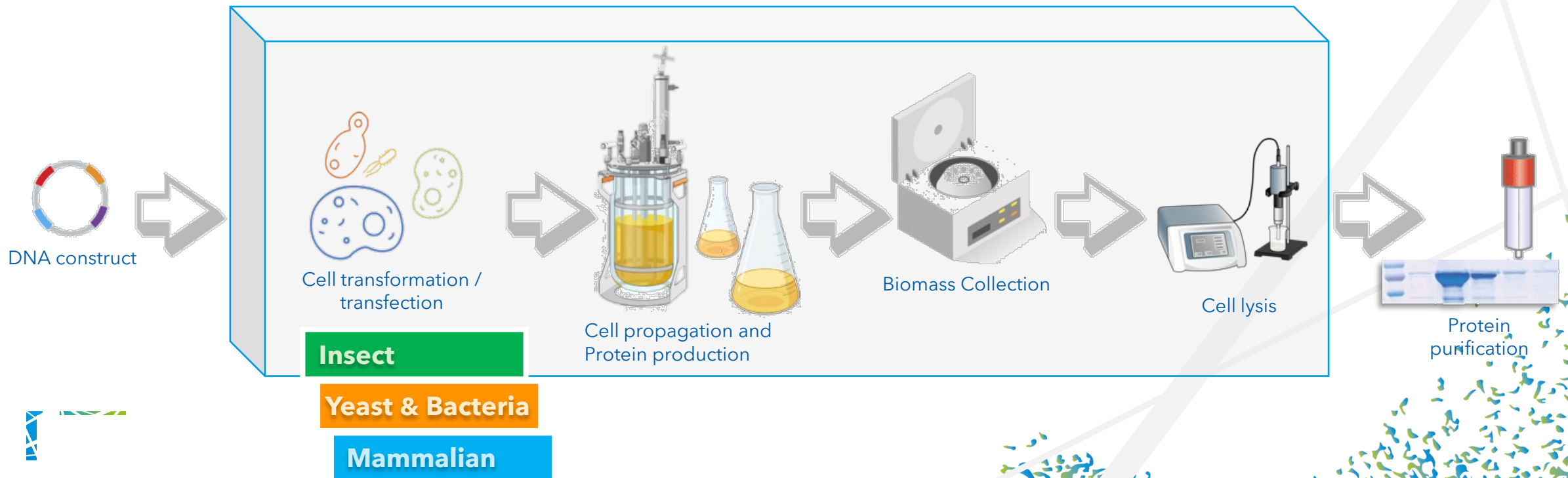
**UI6**

**TECHNOLOGY  
DEVELOPMENT**

# (IU2) Biomass Unit

The Unit centralizes biomass routine tasks, optimizing time and resources

- The unit provides services in protein expression (using different cell lines) both in terms of accessibility to cell cultures and scalability to large-scale productions:





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**TECHNOLOGY  
DEVELOPMENT**

# **(IU3) Biophysics Unit**

This Unit performs biophysical characterization of macromolecules and their interactions

- **Applications and equipment:**

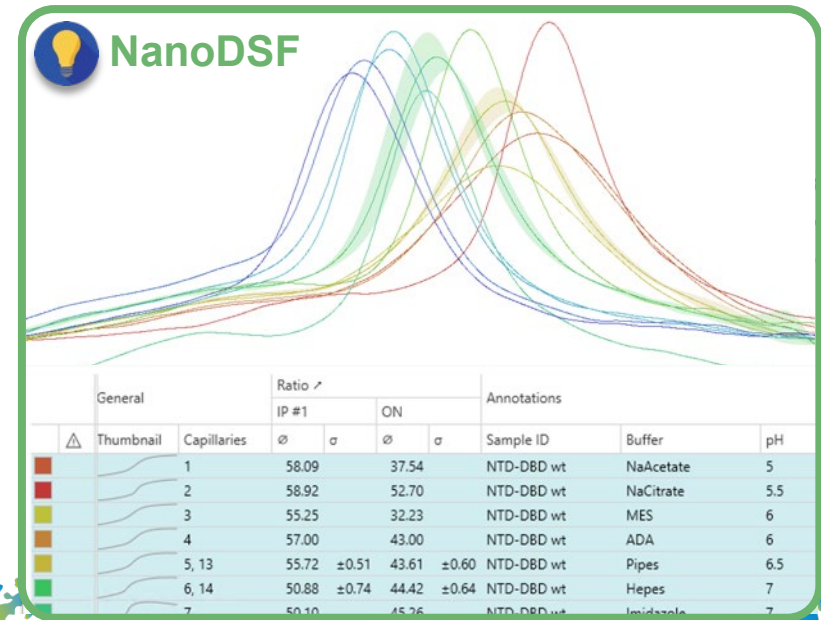
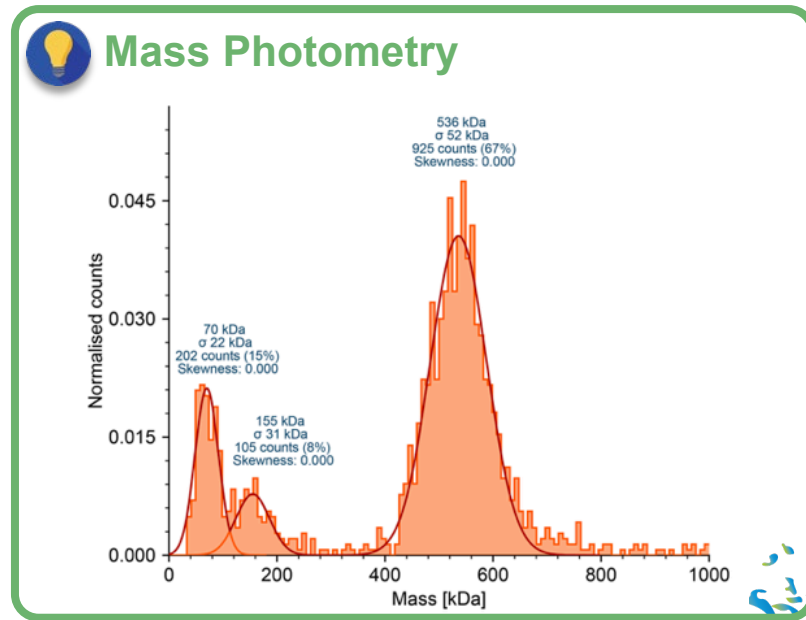
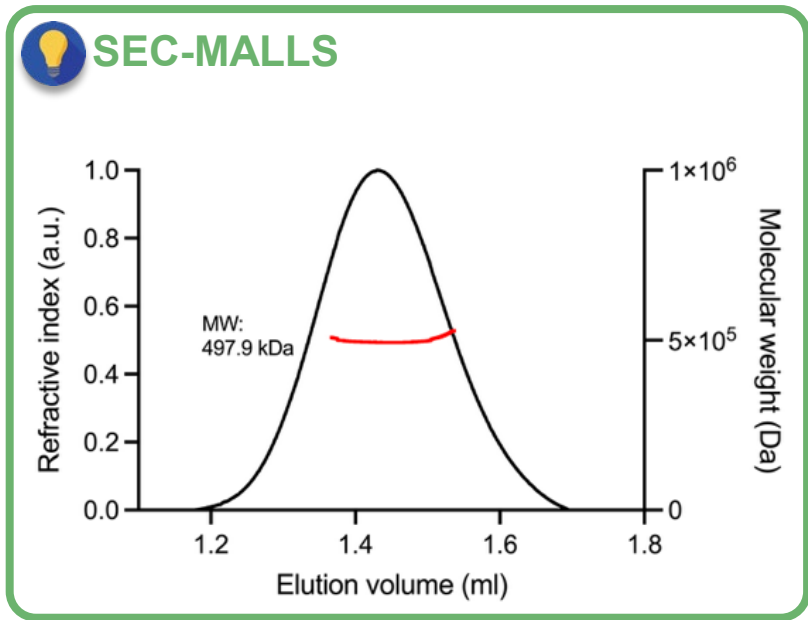


# (IU3) Biophysics Unit

This Unit performs biophysical characterization of macromolecules and their interactions



- Is my sample properly folded or **aggregated**?
- What is its **oligomeric** state?
- What is its **molecular weight**?
- Is the sample **stable**?
- Is the purification **reproducible**?
- Which buffer confers higher **stability**?



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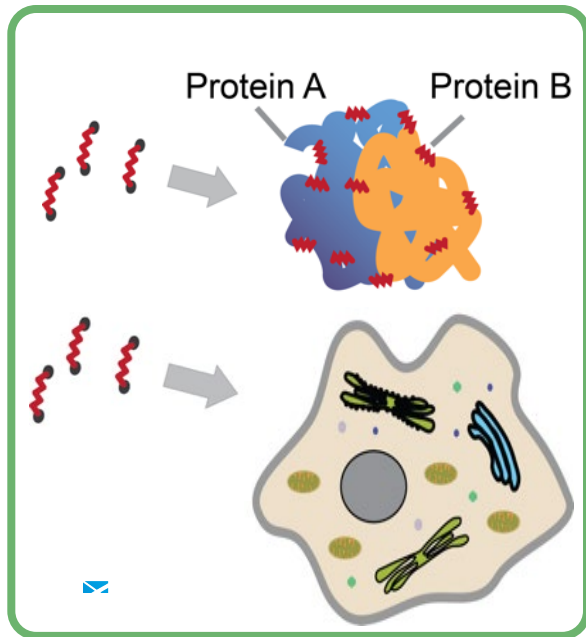
**TECHNOLOGY  
DEVELOPMENT**

# (IU4) Structural Proteomics Unit

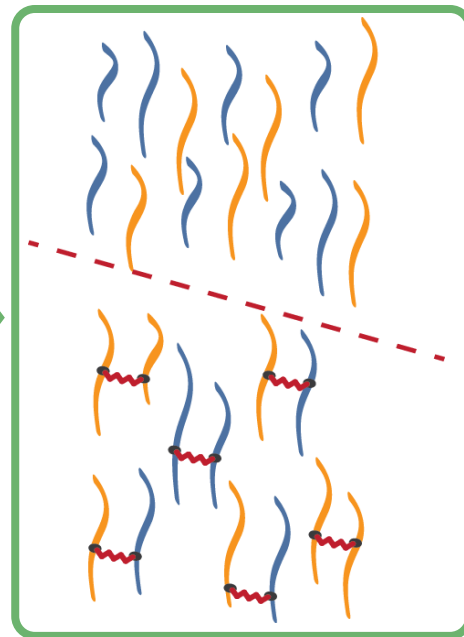
A powerful technique to both reveal or validate protein-protein interactions and networks

## Cross-linking + Mass Spectrometry to reveal or validate protein-protein interaction networks

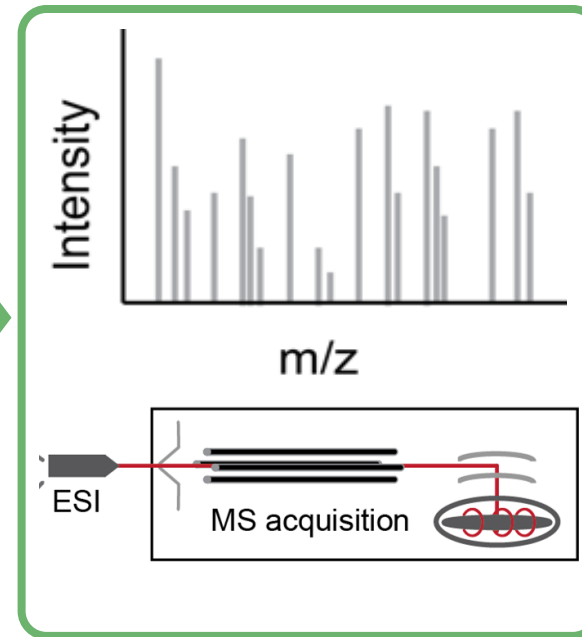
Reaction



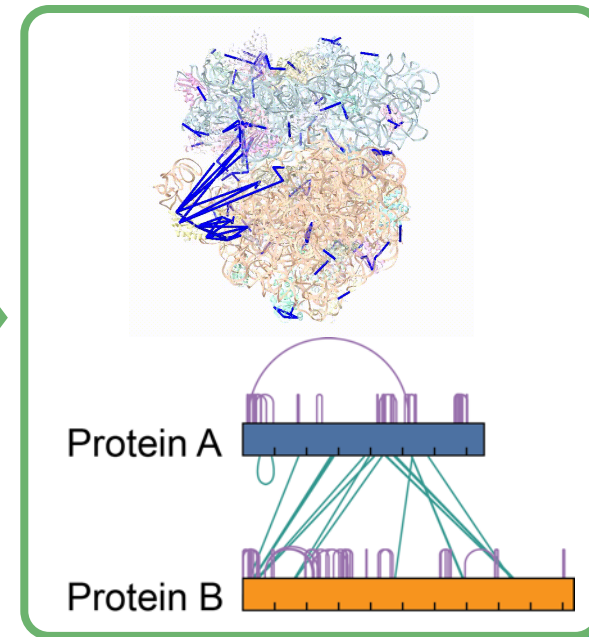
Digestion + Enrichment



Data acquisition



Visualisation

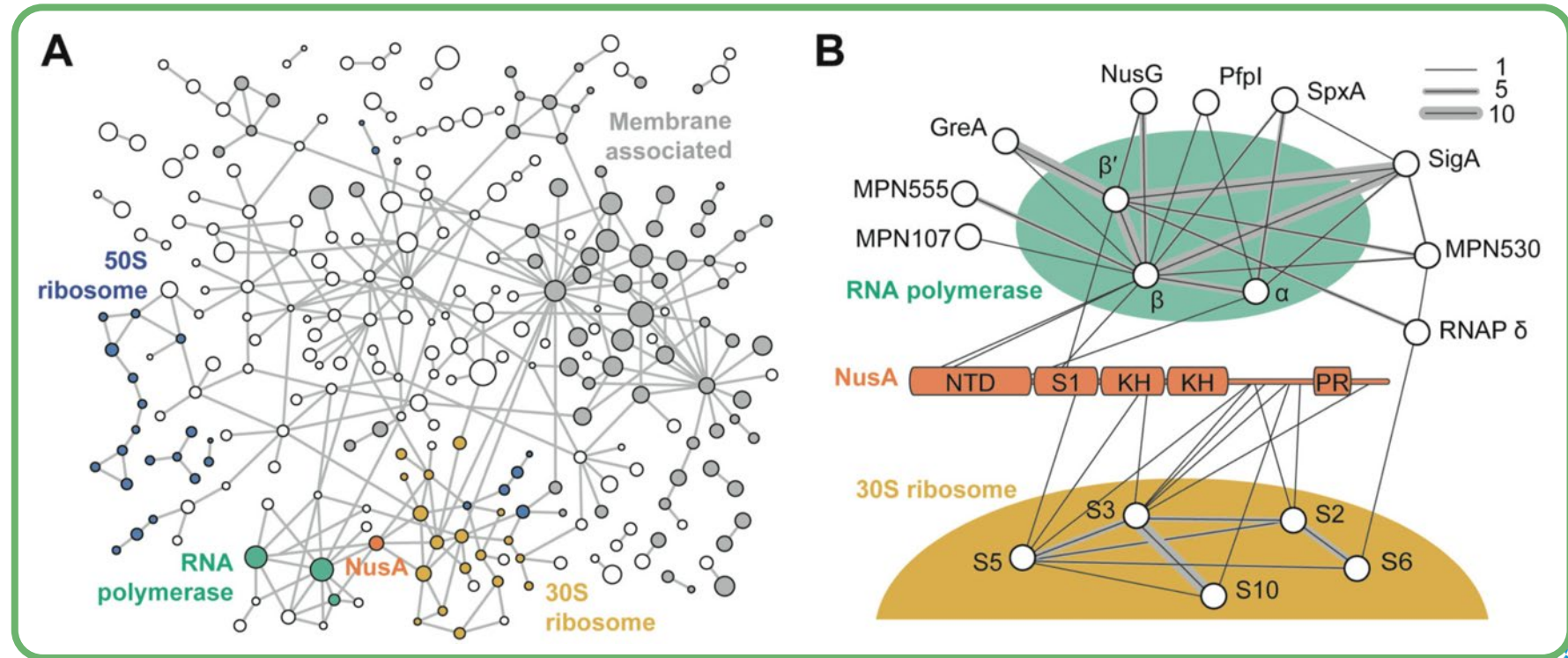
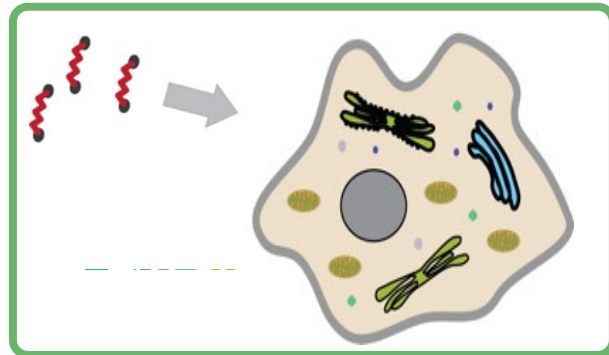
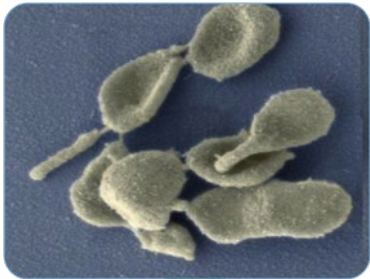


# (IU4) Structural Proteomics Unit

Example: in-cell crosslinking mass spectrometry to map protein-protein interactions *in situ*

 Can we use in-cell **crosslinking mass spectrometry** to analyse transcription-translation coupling inside cells?

*M. pneumoniae*



The synergy of expertise and technological offerings makes the NFStruBio more than the sum of its parts.

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**UI6**

**TECHNOLOGY  
DEVELOPMENT**

## **(IU5) Dynamic Single Molecule Unit**

Unravelling dynamics underlying molecular processes with single molecule technique

Dynamic single-molecule (= high-resolution optical tweezers + fluorescence microscopy) to reveal functions of proteins in real time



## **(IU5) Dynamic Single Molecule Unit**

Unravelling dynamics underlying molecular processes with single molecule technique

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MOLECULE**

**UI6**

**TECHNOLOGY  
DEVELOPMENT**

# Meet the Faces of the National Facility for Structural Biology

A pool of experts not only in technical workflows but also in Facility Management



**Paolo Swuec**  
Head of National Facility for Structural Biology



**Joanna Jadwiga Andrecka**  
Senior Manager - Single Molecule Support Unit



**Si Hui Elisa Chen**  
Electron Microscopy Specialist



**Nataliya Danilenko**  
Technician, Biophysics Scientific Service Unit



**Gaetano D'Urso**  
Electron Microscopy Specialist



**Andrea Graziadei**  
Senior Manager - Structural Proteomics



**Sebastiano Pasqualato**  
Senior Manager Biophysics



**Alessandro Scardua**  
Senior Manager Biomass Production & Kitchen



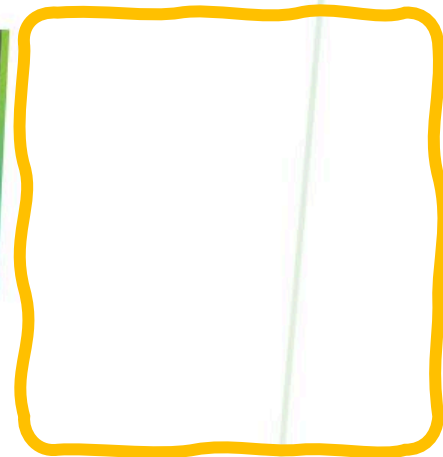
**Malan Silva**  
Electron Microscopy Specialist



**Simona Sorrentino**  
Electron Microscopy Specialist



**Janine Weber**  
Senior Technician Biomass Production



## Take home messages:

- Structural Biology is powerful in revealing the structure and function of biomolecules
- NF-SB offers access to a state-of-the-art platform for integrative structural biology
- Not only services, our mission is also training and pushing forward the technological barrier



**Details about Services and Tools in Access Call**



# Thank you

Human Technopole

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Viale Rita Levi-Montalcini, 1 - 20157  
Milan, Italy

[humantechnopole.it](http://humantechnopole.it)