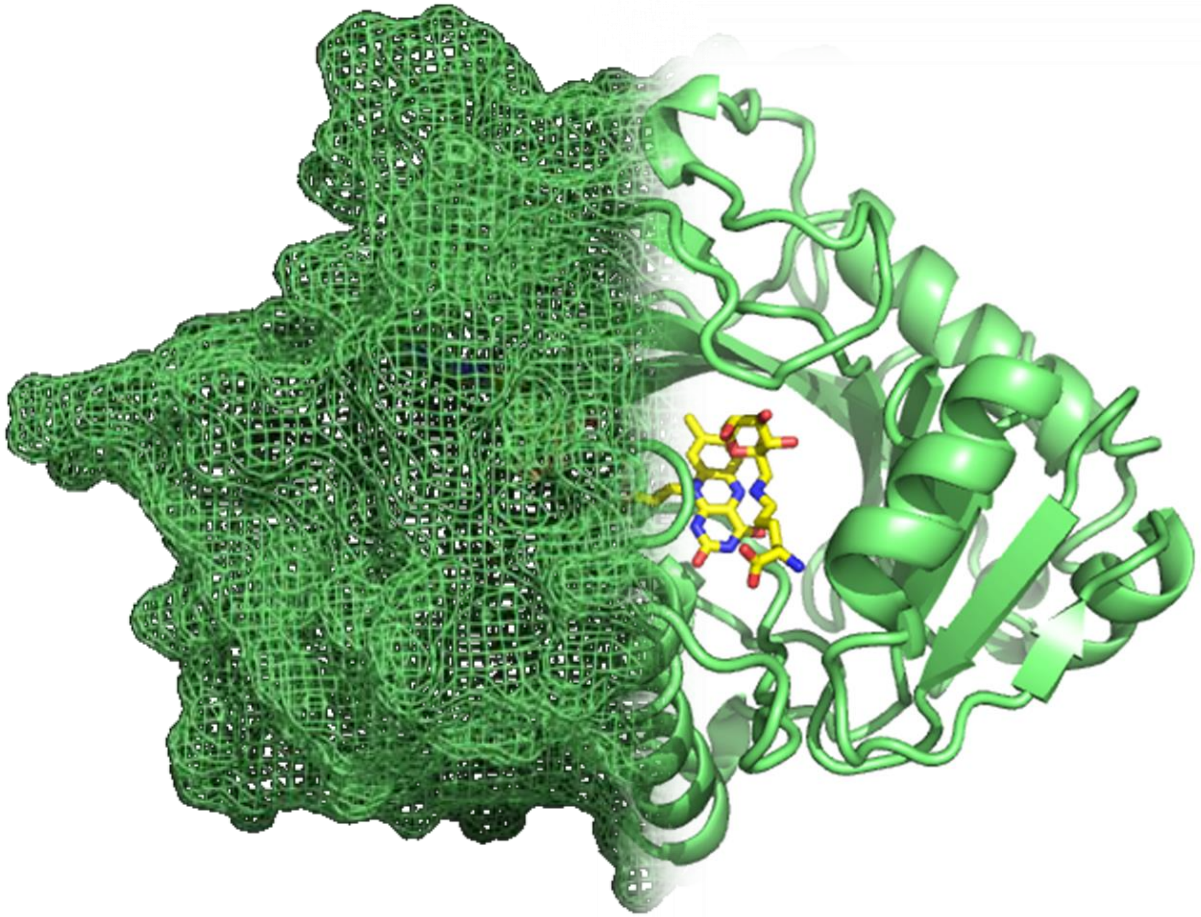
Biomolecular Engineering Lab



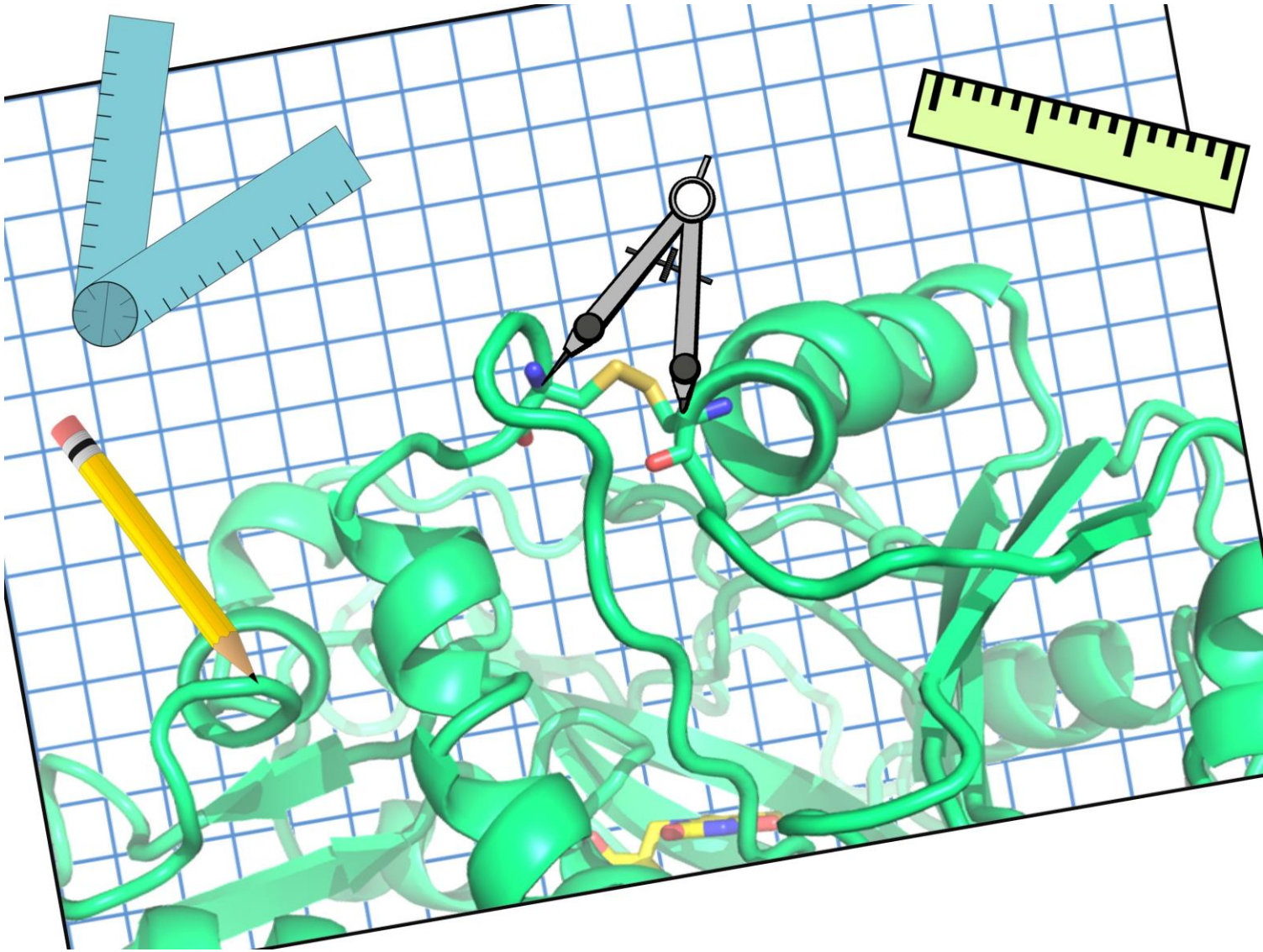
www.biomech.polimi.it/biomol-eng-lab

Biomolecular Engineering

At the **Biomolecular Engineering Laboratory** we

devolep and apply **computational engineering methods** to

study and design **biomolecules and biomaterials.**



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Biomolecular Engineering – Research topic #1

Enzyme engineering - Can we engineer better enzymes?

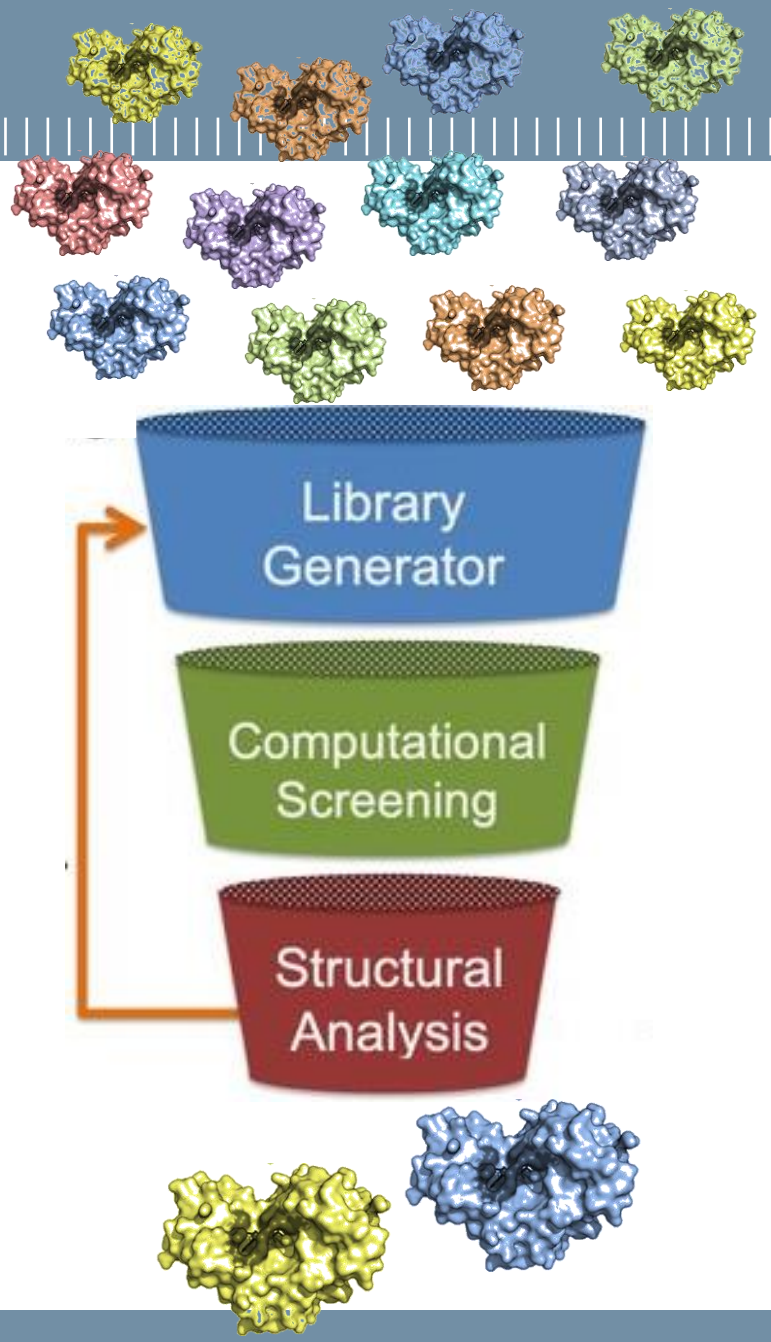
Enzymes are **biological catalysis** with great potentials for many applications.

Naturally occurring enzymes need often to be **improved to be of practical use** (tuning activity, increase stability, …).

At the Biomolecular Modelling Laboratory we develop strategies to

- Generate libraries of enzyme variants
- Screen and rank enzyme variants

The most promising are subject to **experimental characterization in partner laboratories**.



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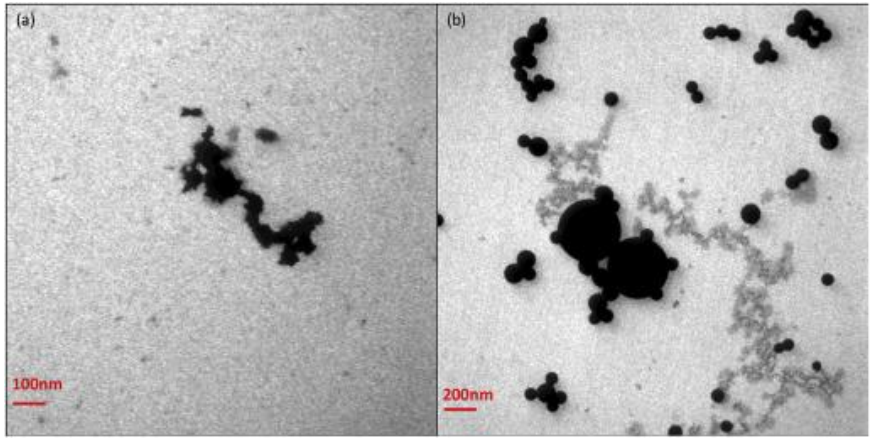
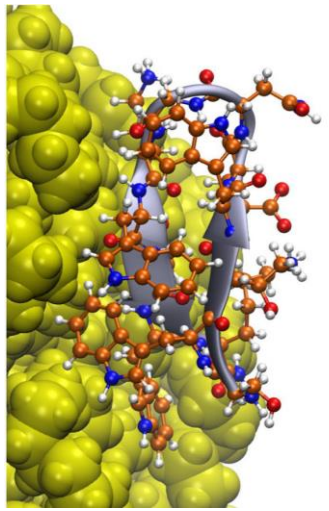
Biomolecular Engineering – Research topic #2

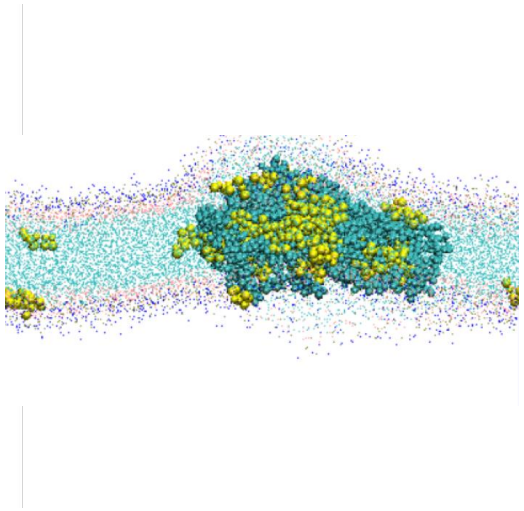
Nanoplastics - What are their effects on health?

Nanoplastics (Ø < 100 nm) are formed by the degradation of polimeric materials and due to their size **easily penetrate in biological systems**.



Plastic nanoparticles may have an **impact on health** by interfering with biomolecular function and celluar stuctures, but the extent is **still unknown**.





The project aims at understanding the effect of **nanoplastics at the molecular level**:

- Influence of protein structure and funtion
- Ability to cross biological barries (e.g., cell membrane)

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Biomolecular Engineering – Research topic #3

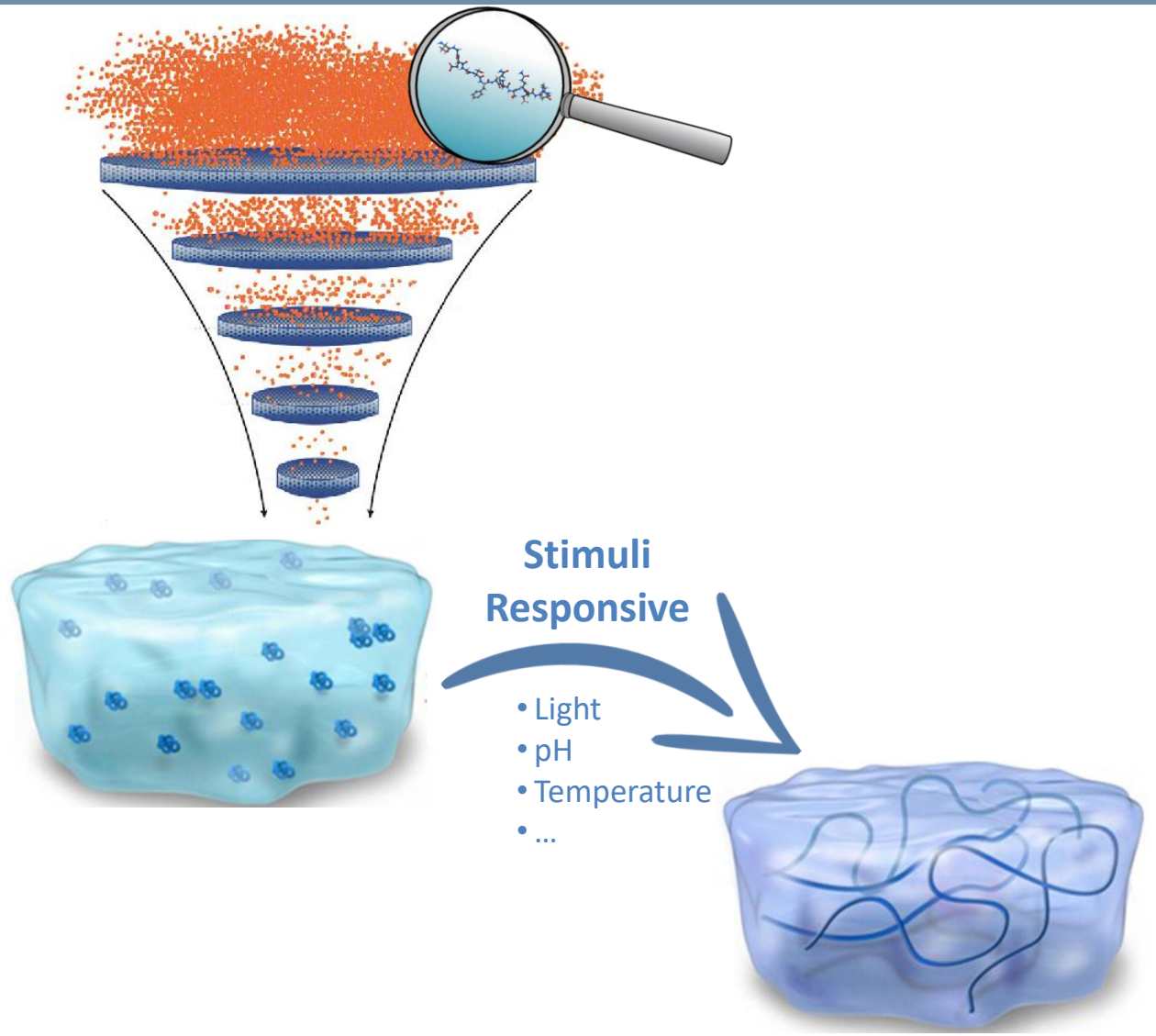
Self-Assembling Peptides - Can we design tunable peptides?

Self-assembling peptides are a category of peptides which undergo spontaneous **assembling into ordered nanostructures**.

These designer peptides have attracted interest in the field of nanotechnology for their potential for application in areas such as **biomaterials and cell culturing**.

The frontier in the field is to design **stimuli-responsive** self-aggregating peptides

Sequence space of a pentapeptide: $20^5 \approx 3M$ sequences -> we need a **computational filter**



Biomolecular Engineering – Courses

Biomolecular Modelling Laboratory (1 Semester)

The objective is to introduce atomistic modeling techniques and motivate its potential for solving problems in molecular biology and biomolecular engineering.

BioArtificial Systems at the Micro and Nano Scale (2 Semester)

The course is focused on methods, technologies and operating principles that enable the manipulation and control of biological entities at the microscale (lab-on-chips, bioMEMS, organs-on-chips) and nano-scale (carbon nanotubes, dendrimers, liposomes, and biological nanostructures obtained from peptides and proteins)