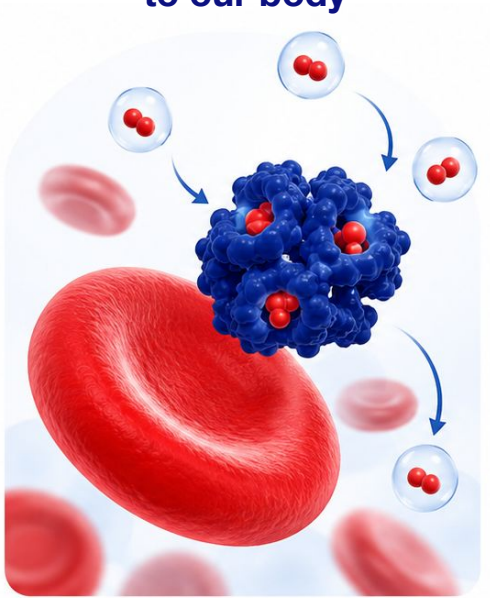
A Binder for Every Protein: Building the Bindome

Anna M. Díaz Rovira

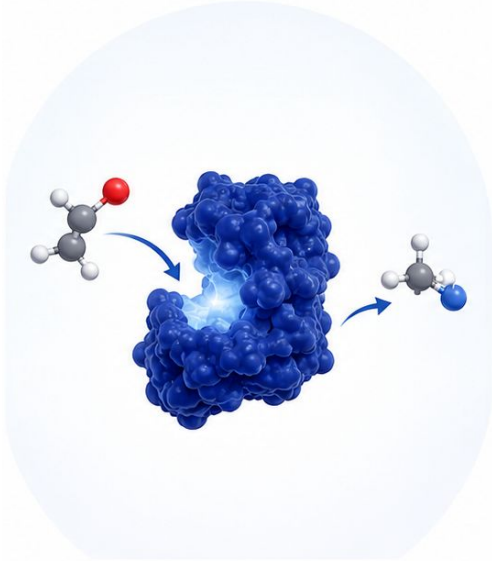
Postdoctoral researcher in Bruno Correia's lab
École Polytechnique Fédérale de Lausanne (EPFL)

Proteins are the molecular machines of life

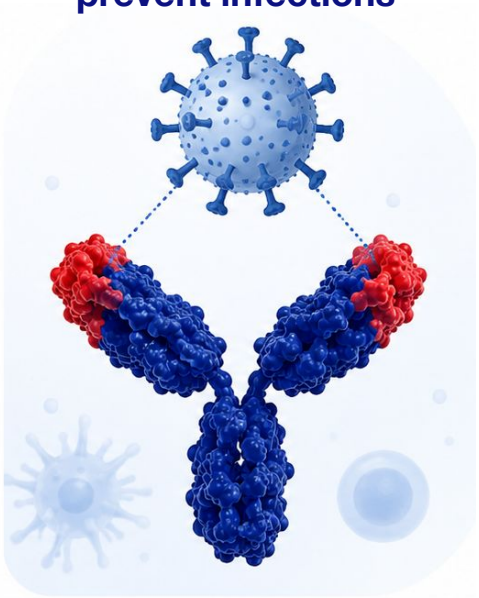
Hemoglobin carrying O_2 to our body



Catalyze chemical reactions to digest nutrients



Molecular recognition to prevent infections

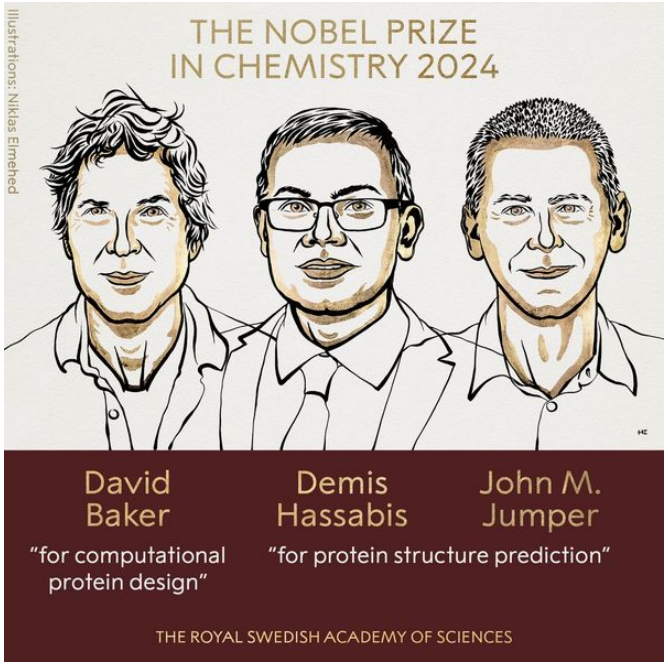


Proteins make life possible

Generated with ChatGPT

Proteins are the molecular machines of life

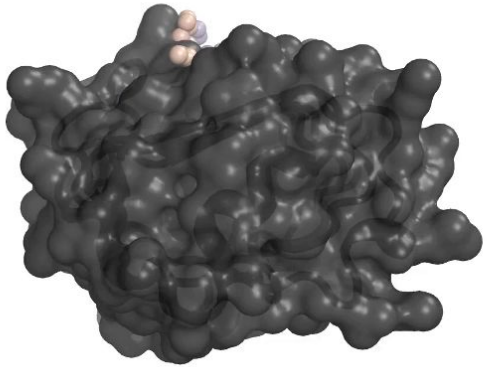
... and now we can design them on a computer using AI algorithms



Design a binder: A protein that recognizes another protein



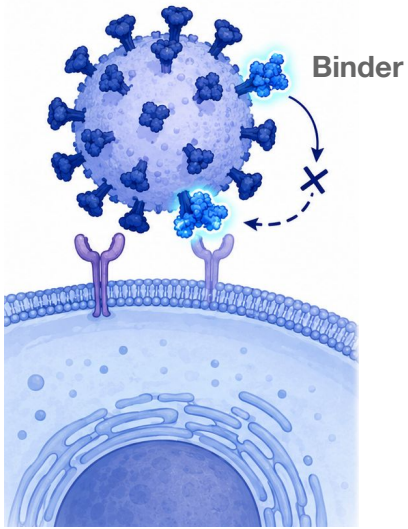
Generated with ChatGPT



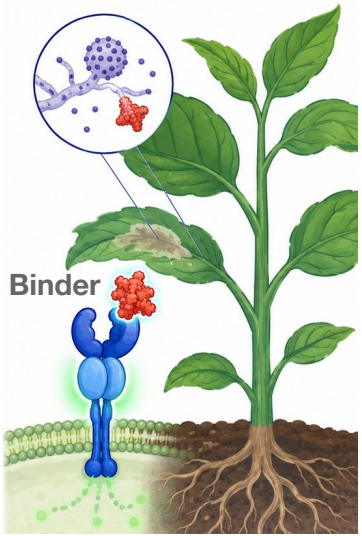
by Hefei Kejing

Why would we want proteins that bind proteins?

Block infections

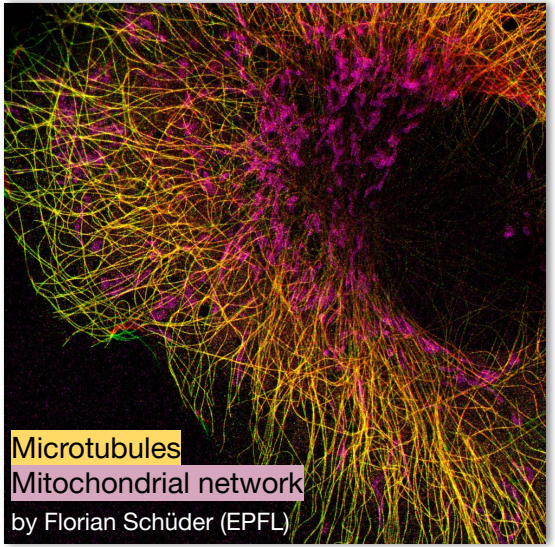


Protect crops



Zhu et al. *Science.* **2026**

Image cells



Schnitzbauer et al. *Nat Protoc.* **2017**

Because by recognizing a protein, **binders can block**, **detect**, or **trigger** a biological response.

But reliable binders are not available for all proteins

Antibodies are essential, but their poor characterization led to a **reproducibility problem**

US$1 billion per year

of US taxpayers' money

Khan et al. *Nature*. **2023**



nature

NEWS | 29 May 2026

Science sleuths uncover more than 100 suspicious images in Thermo Fisher antibody catalogue

Scientists have long worried about the reliability of commercial antibodies, and the latest findings have sparked fresh concerns.

Garisto. *Nature*. **2026**



nature

News Feature | Published: 19 May 2015

Reproducibility crisis: Blame it on the antibodies

Antibodies are the workhorses of biological experiments, but they are littering the field with false findings. A few evangelists are pushing for change.

Baker. *Nature*. **2015**

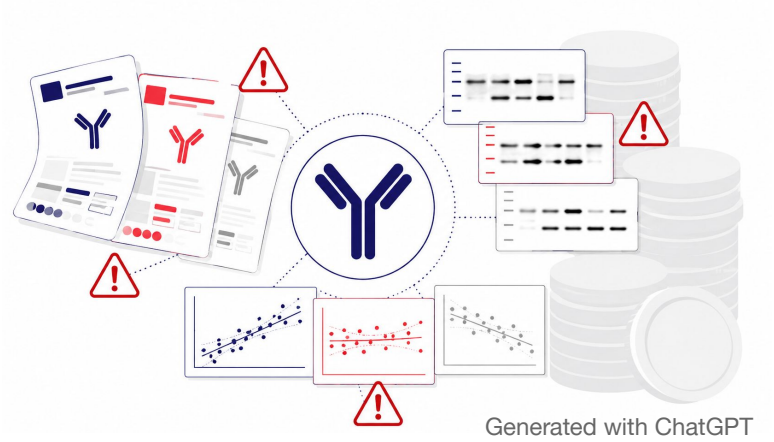
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of US taxpayers' money

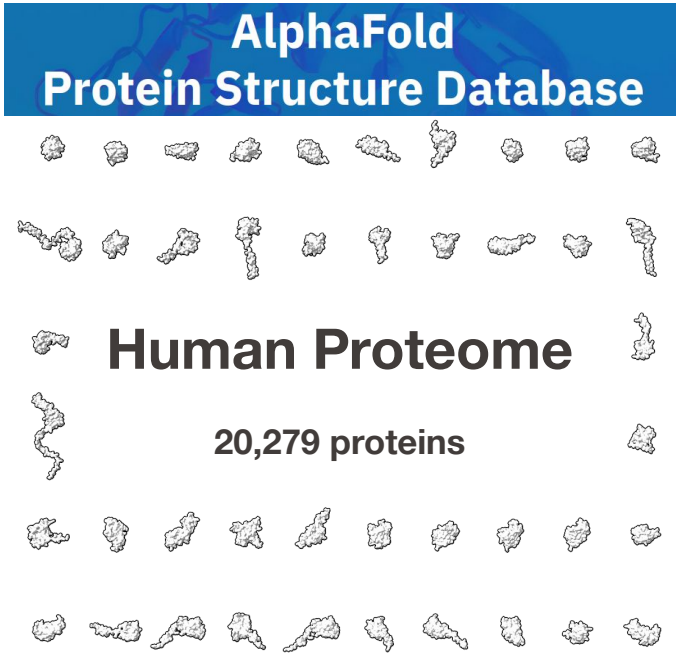
Khan et al. *Nature*. **2023**



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We **aim** make a comprehensive **database with well characterized binders**

Could we design binders for every human protein?



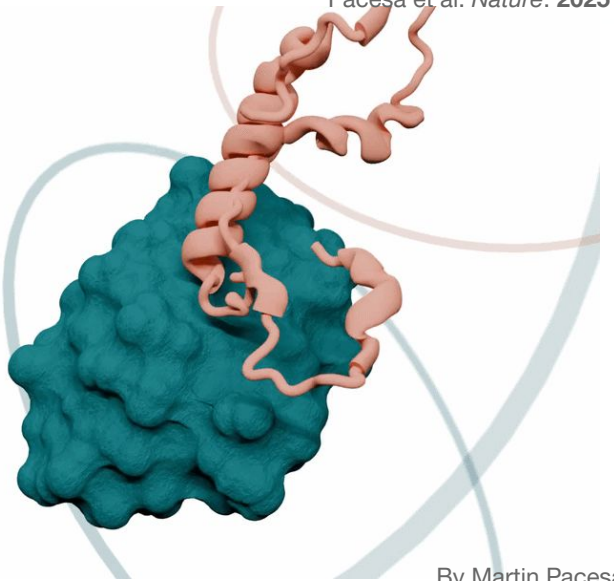
Varadi et al. *Nucleic Acids Res*. **2021**

Article | Open access | Published: 27 August 2025

nature

One-shot design of functional protein binders with BindCraft

Pacesa et al. *Nature*. **2025**

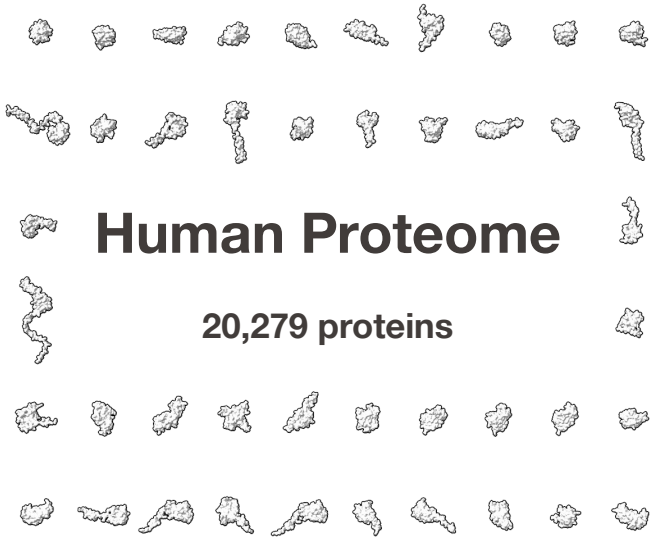


By Martin Pacesa

Experimental success rates between 10–100%

EuroHPC enabled proteome-scale binder design

AlphaFold Protein Structure Database



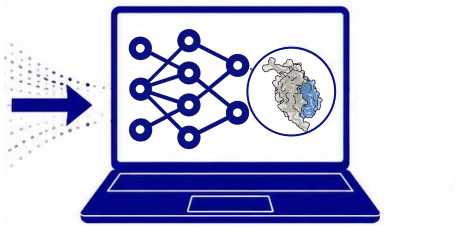
Human Proteome

20,279 proteins

Varadi et al. *Nucleic Acids Res*. **2021**

EuroHPC Joint Undertaking

LEONARDO CINECA

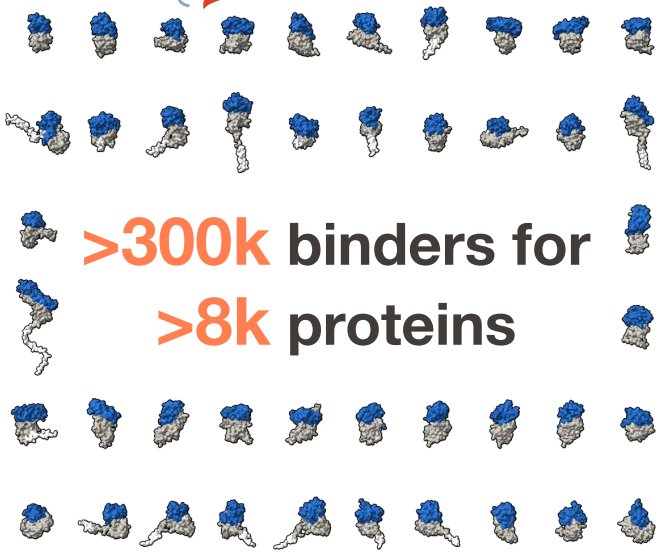


Adapted from ChatGPT

~2M A100 GPU hours

Pacesa et al. *Nature*. **2025**

Bindome



>300k binders for >8k proteins

Wenckstern & Diaz-Rovira et al. *bioRxiv*. **2026**

2M GPU hours are only useful if people can access the results

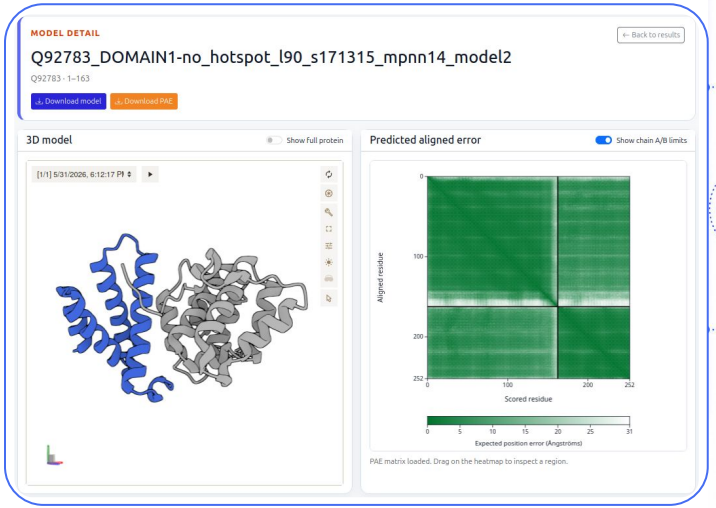
LEONARDO CINECA

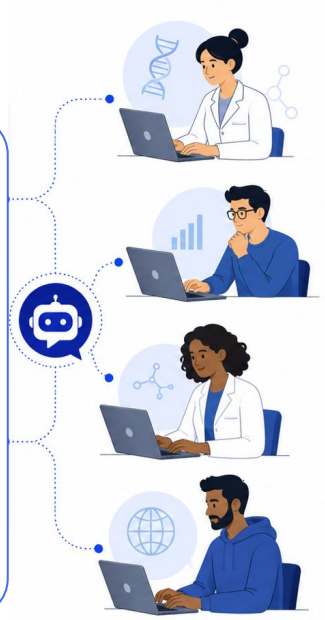
EuroHPC Joint Undertaking



Bindome

+40k queries so far





Website

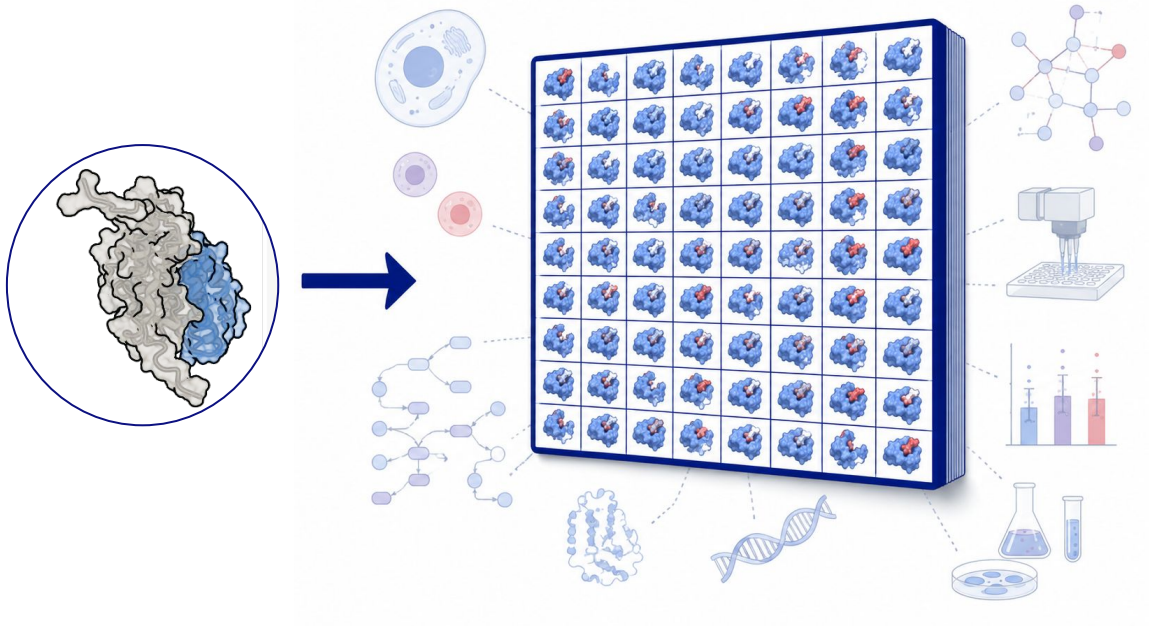
LLMs

ML splits

Wenckstern & Diaz-Rovira et al. *bioRxiv*. **2026**

Adapted from ChatGPT

From studying proteins one at a time…
to asking questions across the proteome.



Discover protein function

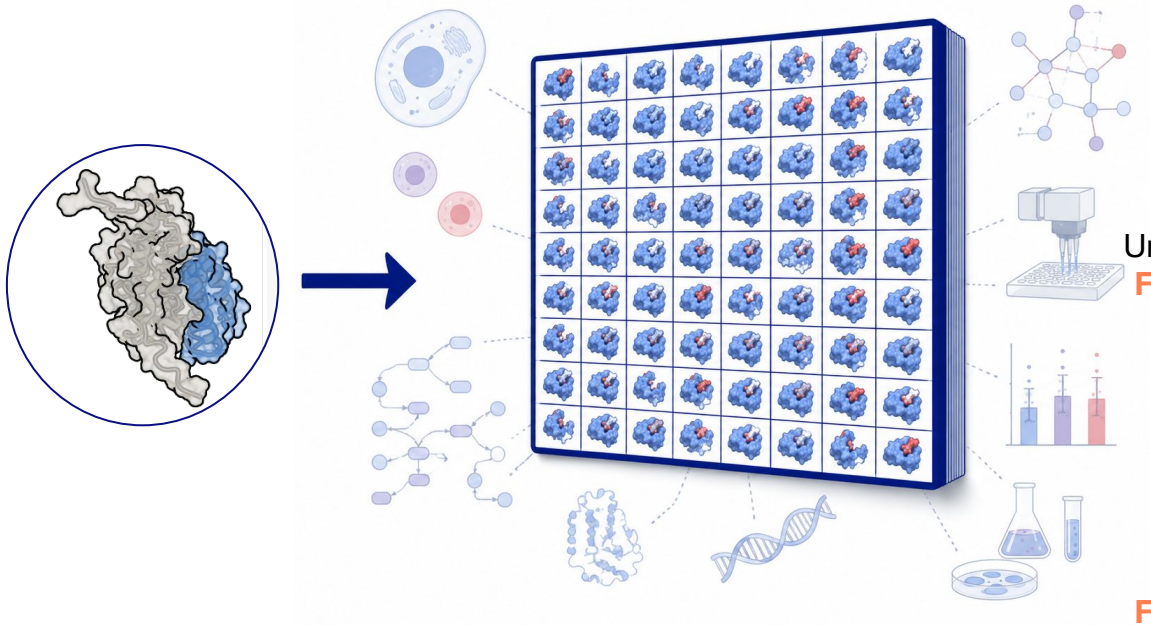
Map protein interactions

Build new AI tools

Unveil new therapeutic targets, faster

Adapted from ChatGPT

From studying proteins one at a time…
to asking questions across the proteome.





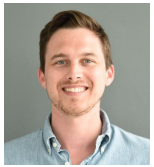
Taipale lab
University of Toronto
Functional assays



Ablasser lab
EPFL
Mass Spec.



Picotti lab
ETH Zurich
Mass Spec.



Winter lab
AITHYRA
Functional assays



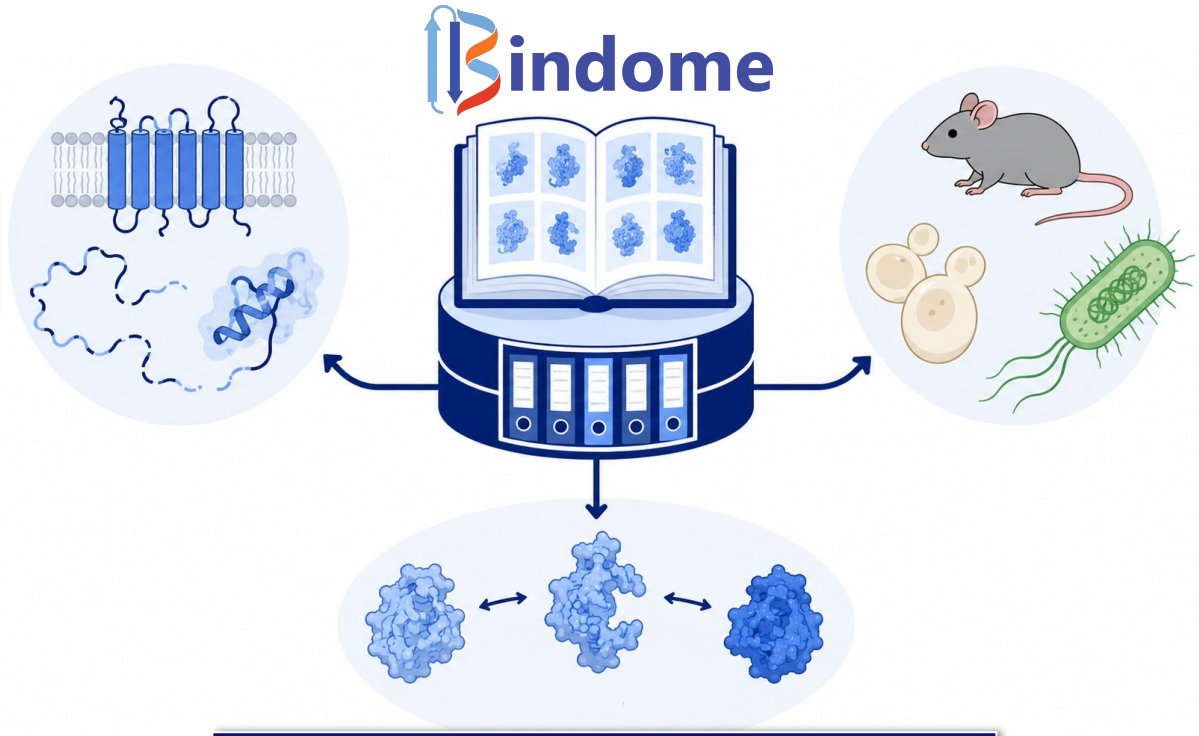
Schueder lab
EPFL
Imaging



Thoma lab
EPFL
Functional assays

Adapted from ChatGPT

What's next?



Expand to more challenging proteins

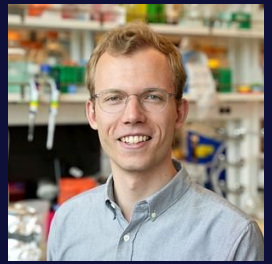
Cover new organisms

Recognize different states of the same protein

Adapted from ChatGPT

Thanks!

EPFL Bindome team:



Julius Wenckstern



Anna M. Díaz Rovira



Julia Aiko Kuhn



Arvid Ban



Rahma Hamdani



Bruno Correia

https://bindome.epfl.ch