

**ELEGANCE:** machinE LEarning for inteGrated multi-parAmetric eNzyme and bioproCess dEsign

DC3: Engineering redox chains to support cytochromes P450 biocatalysis

### Organization

The University of Torino is one of the most ancient and prestigious Italian Universities. Hosting more than 80.000 students and with 120 buildings in different areas in Torino and in key places in Piedmont, the University of Torino can be considered as “city-within-a-city”, promoting culture and producing research, innovation, training and employment. The University of Torino is today one of the largest Italian Universities, open to international research and training. It carries out scientific research and organizes courses in all disciplines. UNITO is also partner of UNITA - Universitas Montium, an alliance of six comprehensive research universities from five countries.

The doctoral candidate (DC) will work in the laboratory of Structural and Functional Proteomics, that focuses on protein engineering as well as structural and functional studies to investigate and manipulate biological systems at molecular level. We study enzymes involved in drug metabolism, bioremediation, bioenergetics, biocatalysis, with particular emphasis on understanding protein structure–function relationships. Research combines biochemical, biophysical, and computational approaches to explore enzyme mechanisms and optimize their performance for biotechnological applications. It integrates a variety of techniques, including recombinant DNA technology, protein expression and purification, enzymatic assays, X-ray crystallography, spectroscopy, mass spectrometry, electrochemistry, calorimetry and computational modeling. Through the integration of these strategies, our group aims to advance the understanding of protein function and to develop innovative and sustainable biocatalysts, biosensors, and bioconversion processes with applications in the health, environmental and energy sectors.

### Roles and responsibilities

The doctoral (PhD) course will be carried out over 3 years at the University of Torino under the supervision of Prof. Gianfranco Gilardi. Within this time, it is expected that three research stays (3 months) will be conducted, one in academic group in Denmark and one industrial stay in Austria. The selection procedure will take place in spring 2026 and the successful candidate will start the PhD project in autumn 2026. The PhD degree will be awarded on the basis of the successful completion of the research work at UNITO. The successful candidate will also be required to participate in the training events organized by the DN and he/she is expected to contribute to the dissemination of the PhD results.

### The PhD project will focus on:

- Engineering new fusions between hydrogen peroxide-producing enzymes and cytochrome P450 peroxxygenases based on computational modelling and prediction of protein-protein interactions.
- Functional characterization of the engineered proteins in terms of kinetic parameters and electron flow (rate constants and coupling efficiency).
- Structural characterization of the engineered proteins through modelling protein-protein interactions, calorimetry, and x-ray crystallography.
- Optimization of the biocatalytic performances with purified enzymes as well as whole-cells systems. Focus will be on fatty acid substrates and their use as biofuels and biopolymers.

**Main supervisor:** Gianfranco Gilardi, University of Torino

**Co-supervisor 1:** Giovanna Di Nardo, University of Torino

**Co-supervisor 2:** Bettina Nestl, Innophore, Austria

**Co-supervisor 3:** John Woodley, Technical University of Denmark, Denmark

### Qualifications:

- MSc in biotechnology, biochemistry, biology, chemistry, biophysics, or related area
- Experience in biochemistry, protein expression and purification
- Experience in assay development and enzyme kinetics
- Excellent English proficiency in written and oral form
- Excellent communication skills for working within an interdisciplinary research team
- Strong analytical skills and ability to work independently

### Preferred qualifications but not mandatory:

- Experience in protein engineering
- Experience with techniques for structural and functional characterization of proteins
- Experience with protein software tools like AlphaFold3, PyMOL, Chimera, etc.
- Interest in entrepreneurship to make a positive impact on environmental and human health

### Conditions of employment

Candidates must have a two-years master's degree (120 ECTS points) or a similar degree with an academic level equivalent to a two-years master's degree.

### Approval and Enrolment

The scholarship for the PhD degree is subject to academic approval, and the candidate will be enrolled in one of the general degree programmes at UNITO. For information about our enrolment requirements and the general planning of the PhD study programme, please visit:

<https://www.dott-sbc.unito.it/do/home.pl#submenu>

### We offer

The PhD Program in Bio-Chemical Sciences has as its primary objective the training of highly qualified PhD for research and development activities, to be carried out in the University (in the theoretical aspects of biology and chemistry as well as in the more applied ones) and in companies, public and private research institutions in Italy and abroad, in public agencies and in the cultural and educational system.

The PhD Program is characterized by the propensity towards scientific excellence in all sectors of Biochemistry, also taking up the new challenges that come from artificial intelligence, microbiology, and specific research in the field of molecular environmental sustainability.

### Salary and appointment terms

The preferred starting date is 1<sup>st</sup> November 2026 or according to mutual agreement. The position is full time. The average gross yearly salary is approximately 38,000 Euros for a 3 year term.

### Further information

Further information may be obtained from Prof. Gianfranco Gilardi: [gianfranco.gilardi@unito.it](mailto:gianfranco.gilardi@unito.it)

Website about MSCA doctoral network ELEGANCE: <https://elegance.dtu.dk/>

Google Scholar profile: <https://scholar.google.com/citations?hl=en&user=MPM3cmwAAAAJ>

More information about UNITO PhD programmes:

<https://www.phd.unito.it/do/home.pl/View?doc=Enrollment.html>

<https://www.dott-sbc.unito.it/do/home.pl/View?doc=Admission.html>

Research group website: <https://www.biochemistry-scienze.unito.it>

### Application procedure

Your complete online application must be submitted no later than **January 31<sup>st</sup>, 2026 (23:59 Italian time)**. Applications must be submitted as **one PDF file** containing all materials to be given consideration.

To apply, please send an e-mail to [gianfranco.gilardi@unito.it](mailto:gianfranco.gilardi@unito.it) and [giovanna.dinardo@unito.it](mailto:giovanna.dinardo@unito.it)

and attach **all your materials in English in one PDF file**. The file must include:

- A letter motivating the application (cover letter)
- Curriculum vitae
- Grade transcripts and BSc/MSc diploma (in English) including official description of grading scale

You may apply prior to obtaining your master's degree for a conditional offer.

Applications received after the deadline will not be considered.

All interested candidates irrespective of gender, disability, race, religion, age or ethnic background are encouraged to apply.