# Corso di dottorato in Scienze Biomolecolari
# PhD in Biomolecular Sciences
# Ciclo 42 / Cycle 42
# A.Y. 2026-2027

## Borse a tematica vincolata / *Reserved scholarships and fellowships*

## Borse aggiuntive / Additional places with scholarship

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| **G** | *Lysosomal mechanisms of neurodegeneration and translational approaches in brain-relevant in vitro models* |
| **H** | *Integrating Genotype Imputation and Oral Microbiome Data for Cardio-Metabolic Health* |
| **I** | *Quantification of information and noise in artificial living systems* |

## Scholarship G

**Lysosomal mechanisms of neurodegeneration and translational approaches in brain-relevant in vitro models**

**Funded by:** EURAC Research - Bolzano

**Principal Investigator:** Mattia Volta (mattia.volta@eurac.edu)

**Synthetic description of the activity and expected research outcome**
The project will focus on the generation and characterization of iPSC-derived neuron and brain organoid models to study neurodegeneration, with particular attention to Parkinson's disease. Intracellular processes involving lysosomes will be investigated with a combination of cell biology, imaging and neurophysiological techniques. Translational development will be pursued using such disease-relevant characterization to test neuroprotective properties of small molecule compounds, biotechnological approaches and natural products or extracts.

**Descrizione sintetica dell'attività e dei risultati attesi**
Il progetto si focalizzerà sulla generazione e caratterizzazione di modelli di neuroni ed organoidi cerebrali derivati da iPSC per studiare la neurodegenerazione, con particolare attenzione per la malattia di Parkinson. I processi intracellulari che coinvolgono i lisosomi verranno indagati tramite una combinazione di tecniche di biologia cellulare, microscopia e neurofisiologia. Gli sviluppi traslazionali saranno perseguiti utilizzando queste caratterizzazioni, rilevanti per la malattia, per testare le proprietà neuroprotettiva di piccole molecole organiche, approcci biotecnologici e prodotti od estratti naturali.

**Candidate's profile (skills and competencies)**
The ideal candidate will have skills in sterile techniques of cell and tissue culture and basic working knowledge of molecular biology. Previous experience in microscopic imaging, electrophysiological recording and a background in neurodegeneration are a plus.
Fluency in the English language is required.

**Profilo del/la candidato/a**
Il candidato ideale possiederà capacità di lavoro con tecniche di sterilità nella coltivazione di cellule e tessuti ed una conoscenza di base nella biologia molecolare. Precedente esperienza in microscopia, registrazione elettrofisiologiche e conoscenza di neurodegenerazione costituiscono un vantaggio.
Richiesta conoscenza della lingua inglese.

## Scholarship H

**Integrating Genotype Imputation and Oral Microbiome Data for Cardio-Metabolic Health**

**Funded by:** EURAC Research - Bolzano

**Principal Investigator:** Christian Fuchsberger (christian.fuchsberger@eurac.edu) & Nicola Segata (nicola.segata@unitn.it)

**Synthetic description of the activity and expected research outcome**
The oral microbiome forms a crucial interface between the human body and its environment, significantly impacting both oral and systemic health. Despite its established importance, much remains to be explored to harness this knowledge for the development of innovative diagnostics and targeted therapies. The CHRIS study offers a unique resource, combining human genomic data, serum metabolomic and proteomic profiles, comprehensive clinical assessments, and detailed lifestyle surveys. Within this framework, a subset of participants has undergone oral microbiome profiling using shotgun metagenomic sequencing.

This PhD project aims to investigate the complex interactions between the human genome and the oral microbiome (microbiome-GWAS), as well as associations between the microbiome and cardio-kidney-metabolic health indicators. A key objective is to use the human genetic information from the metagenome sequencing to extract whole-genome genetic information for each individual and to create a CHRIS specific reference panel for genotype imputation.

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| Extensive microbiome-GWAS will explore the influence of host genetics and environmental factors. Comparative analyses with regional and global datasets will contextualize the findings. Ultimately, this research is expected to contribute to the development of novel diagnostic tools for cardio-kidney-metabolic health and advance our understanding of microbiome-mediated health. |
| **Candidate's profile (skills and competencies)**<br>- Bioinformatics and statistical analysis skills.<br>- General biology background is recommended.<br>- Mastering of at least one programming language, such as Python, Perl, Java, or C++.<br>- Experience in workflow managers, e.g., Snakemake or NextFlow is highly recommended.<br>- Very good English skills. |

## Scholarship I

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| **Quantification of information and noise in artificial living systems** |
| **Funded by:** University of Trento – Department CIBIO<br>Laboratory for Artificial Biology (https://www.cibio.unitn.it/118/laboratory-for-artificial-biology) |
| **Principal Investigator:** Martin Michael Hanczyc (martin.hanczyc@unitn.it) |
| **Synthetic description of the activity and expected research outcome**<br>The PhD position will involve the execution and analysis of artificial cell models with respect to information content, information flow and entropy. The data will be gathered in video form and analysis will be done using a workflow of image analysis. The project will be led by Prof Hanczyc but in collaboration with physicists from the University of Trento and also from abroad. |
| **Candidate's profile (skills and competencies)**<br>-Experience in Biological Sciences with a master's degree in quantitative and computational biology or similar. |