Open Call — Two PhD Positions

Capturing Enzyme Catalysis and Protein Dynamics with Time-Resolved Serial Crystallography

LNLS-Sirius/CNPEM, Campinas, Brazil

About the Positions

Are you passionate about structural biology and the study of enzymatic mechanisms or light-activated proteins? Join us to study the 3D-movie of these systems in action at the **LNLS-Sirius** and **MANACÁ** beamline.

We are seeking candidates for **two PhD positions** within the project *"Capturing Enzyme Catalysis and Protein Dynamics with Time-Resolved Serial Crystallography"*, supported by FAPESP (grant 2025/16859-8). The projects aim to understand enzyme function and reaction mechanisms by combining **time-resolved serial macromolecular crystallography** with complementary biochemical, spectroscopic and conventional structural approaches.

The positions offer opportunities to work at MANACÁ (LNLS-Sirius/CNPEM) and **LNBR/CNPEM**, as well as to participate in experiments at international synchrotron and XFEL facilities. The research will involve the development and application of methods to capture structural changes in enzymes at biologically relevant timescales, including ligand- and light-triggered reactions at room-temperature by serial crystallography experiments.

The two projects are closely integrated but have different primary focuses: biochemical and structural investigation of enzyme dynamics (Position 1) and development/implementation of experimental and computational approaches for time-resolved crystallography (Position 2).

1. PhD — Biochemical and Structural Characterization of Enzyme Dynamics with Time-Resolved Serial Crystallography

This project will contribute to the development of time-resolved serial crystallography (Tr-SSX) at MANACÁ, with the goal of capturing structural changes associated with enzyme catalysis at room temperature.

The student will investigate selected hydrolytic and light-activated enzymes using complementary time-resolved approaches, including ligand-triggered and optical pump–probe Tr-SSX, alongside conventional crystallographic methods. The work will involve protein expression and purification, crystallization and sample optimization, characterization of enzyme activity in solution and in crystallo, data collection, and processing and structural analysis of the resulting datasets. The student will work at LNBR/CNPEM and Sirius/CNPEM, participating in both laboratory-based studies and synchrotron experiments using conventional and serial crystallography. The project will integrate protein biochemistry, macromolecular crystallography, time-resolved experiments and structural analysis, providing an opportunity to investigate enzyme mechanisms and protein dynamics under room-temperature conditions.

Expected profile

- Master's degree or equivalent qualification allowing enrollment in a PhD program in chemistry, biology, biophysics, biochemistry or a related field.
- Interest in structural biology, protein crystallography and/or enzymology.
- Previous experience with X-ray crystallography, protein biochemistry or spectroscopy is desirable, but not essential.
- Interest in applying experimental methods for time-resolved structural biology.
- Ability to work in an interdisciplinary and collaborative environment; good communication skills and proficiency in English or Portuguese.

2. PhD — Development of Experimental and Computational Methods for Time-Resolved Serial Crystallography

This project will focus on the development and implementation of instrumentation and computational methods for time-resolved serial crystallography at MANACÁ, with emphasis on two complementary approaches: microfluidic Mix-and-Inject triggering and optical pump–probe experiments. The student will develop and integrate the tools required to initiate, control, monitor and analyses time-resolved reactions experiments in protein microcrystals for some ongoing projects at MANACÁ beamline.

The project will combine instrumentation development/implementation and data processing and analysis, providing hands-on experience in the development of methods for time-resolved crystallography. The student will work closely with the researchers responsible for the biochemical and structural studies (Position 1), by developing/ implementing the experimental and computational infrastructure required to investigate enzyme catalysis and protein dynamics in crystallo.

Expected profile

- Master's degree or equivalent qualification allowing enrollment in a PhD program in physics, biophysics or a related field.
- Interest in structural biology, protein crystallography and/or enzymology.
- Previous experience with X-ray crystallography and spectroscopy is desirable, but not essential.
- Interest in developing and applying experimental methods for time-resolved structural biology.
- Ability to work in an interdisciplinary and collaborative environment; good communication skills and proficiency in English.
- Basic programming skills (e.g., Python or a similar language) and familiarity with Linux command-line tools (e.g., Bash) are recommended.

Research Environment

The two projects will be carried out at the MANACÁ beamline at Sirius/CNPEM, within a 4th-generation synchrotron facility, and closely with LNBR/CNPEM collaborators. The students will have access to state-of-the-art experimental infrastructure and opportunities to develop expertise in time-resolved structural biology. As part of the projects, students will have opportunities to participate in experiments at international synchrotron and XFEL facilities, including research visits and collaborative experiments with partner institutions. They will also have the opportunity to work with researchers from different disciplines, combining protein biochemistry, macromolecular crystallography, instrumentation, computational methods and data analysis.

These activities will provide students with hands-on experience in experimental design, synchrotron and XFEL experiments, development and application of time-resolved methods, and analysis of structural data, while fostering international collaborations and exposure to the broader structural biology community.

How to Apply

Applicants should send a single PDF file containing: (i) a cover letter describing research interests and relevant experience, indicating which position they are applying for; (ii) a full CV; (iii) academic transcripts; and (iv) contact details of two academic references, to evandro.araujo@lnls.br with the subject line "[PhD MANACÁ-Sirius/CNPEM — Position 1]" or "[PhD MANACÁ-Sirius/CNPEM — Position 2]".

Application deadline: December 10, 2026. Expected start date: February–March 2027 (negotiable for candidates unable to start within this period). Applications will be reviewed until the positions are filled. Shortlisted candidates will be invited for an interview.

Informal enquiries are welcome and should be addressed to the project coordinators: Evandro Araújo, evandro.araujo@lnls.br and Andrey Nascimento, andrey.nascimento@lnls.br . For more information about the MANACÁ beamline and Sirius, visit: https://lnls.cnpem.br/sirius-en/.