

## DEVELOPMENT OF FIBER OPTIC PROBES FOR MONITORING CRITICAL QUALITY ATTRIBUTES OF BIOPROCESSES

### PhD Research Project Available

A PhD project is offered within the research teams of Professors Younès Messaddeq (Department of Physics, Engineering Physics, and Optics; <https://ymlab.ca/>) and Alain Garnier (Department of Chemical Engineering) at Université Laval. This project is part of an initiative supported by the Eastern Canada Pandemic Preparedness Hub to accelerate vaccine production in Canada. It focuses on developing innovative strategies for monitoring the quality of cell cultures used in the production of viral vectors and recombinant proteins. The research environment is enriched by collaborations with renowned research centers such as CERVO, as well as by strategic partnerships with governmental and industrial organizations, including the National Research Council of Canada, INO, and Ivano Biosciences.

### Research Project

The main objective of this research project is to develop fiber optic probes for in situ and real-time monitoring of bacterial cultures in bioreactors. These probes will aim to measure critical parameters of biomanufacturing processes, such as biomass, culture medium components, and metabolites, to promote efficient optimization and rigorous production control. Specifically, probes based on Raman spectroscopy will be designed, manufactured, and tested. Performance will be validated on various bioreactor formats and different bioprocesses. Tasks include:

- Fabrication of fiber optic probes
- Optical spectroscopy (Raman)
- Bioprocess monitoring
- Data acquisition and chemometric analysis

### Research Environment

The research will be conducted at the Center for Optics, Photonics, and Lasers (COPL) and the [Department of Chemical Engineering](#) on the Université Laval campus.

### Research Areas

Optical fibers – Sensors – Optical spectroscopy – Raman spectroscopy – Biomanufacturing – Process analytical technology (PAT)

## Requirements

Applicants must hold a master's degree in one of the following disciplines: chemistry, physics, chemical engineering, physical engineering, electrical engineering, or a related one.

## Desired Profile

- Experience in any of the following areas is an asset: sensors, optical characterization (Raman, UV/Vis), optical fibers, programming and multivariable analysis.
- Proficiency in spoken and written English is highly desirable.
- Interested individuals must possess a strong work ethic.
- We are looking for an organized and proactive individual who can work effectively in an interdisciplinary and multicultural team.

## Financial Support

Funding of \$35,000/year (for 3 years) will be offered to students enrolled in the PhD program at Université Laval, conditional on their commitment to complete the entire STAIR biomanufacturing training program.

## Other Funding Sources Available:

<https://www.fesp.ulaval.ca/appui-a-la-reussite/bourses-et-soutien-financier/bourses-de-reussite-de-la-fesp>

## Submit Your Application Now !!

This project offers a unique opportunity to integrate diverse disciplines such as optics, bioprocesses, and data analysis, while contributing to major innovations in biomanufacturing.

Interested individuals are invited to contact Professor Younès Messaddeq by email ([Younes.Messaddeq@copl.ulaval.ca](mailto:Younes.Messaddeq@copl.ulaval.ca)) and send a motivation letter, a CV, and an academic transcript.

*(Recommendation letters will be requested from shortlisted candidates during the second evaluation round)*