university of groningen

5 PhD student positions in biomolecular sciences

University of Groningen

Founded in 1614, the University of Groningen enjoys an international reputation as a dynamic and innovative center of higher education offering high-quality teaching and research. Flexible study program and academic career opportunities in a wide variety of disciplines encourage the 32,000 students and researchers alike to develop their own individual talents. Quality has been our top priority for over four hundred years, and with great success: the University is in the top 100 on several influential ranking lists.

Groningen Biomolecular Sciences and Biotechnology Institute

The Groningen Biomolecular Sciences and Biotechnology Institute is a center for top-noted research and teaching in biomolecular sciences, hosting the subdisciplines biochemistry, bioinformatics, biophysical chemistry, cell biology, chemical biology, enzymology, genetics, microbiology, computational modeling, and systems biology. The focus is on curiosity-driven science, with application outlets into (industrial) biotechnology and biomedicine.

Job description

The 5 PhD students with backgrounds in (bio)physics, (bio)chemistry, systems-, computational- or molecular biology will conduct curiosity-driven biomolecular research to investigate a bold hypothesis, which has potential to radically change our view on the inner working of a cell. The research will be performed in one of five different research groups of the Groningen Biomolecular Sciences and Biotechnology Institute. There will be significant interactions and collaborations between the 5 PhD students and all of the involved research groups. In addition to conducting research, there will be some teaching duties (~10% of your time).

Project

Recent data suggests that there is an upper limit for the amount of work a cell can sustain. In other words: we have indications that during catalysis enzymes start moving in space, that this movement stirs up the cellular content and that too much of such stirring perturbs biomolecular processes. If we can show that this is true, this would radically change how we understand the inner working of a cell and as such, it would have wide-ranging implications for our understanding of a number of diseases and also for applications in industrial biotechnology.

The five PhD students will form an interdisciplinary team, spread across five labs, and will exploit some of the latest state-of-the-art methods comprising both experimental and computational approaches to investigate this hypothesis, with lots of opportunities for excellent and ground-breaking science, and a great learning experience in a very nice team. The individual projects and the respective advisors are:

- Project 1 investigates the *in vitro* diffusion of purified (engineered) enzymes with two different experimental methods (TIRF microscopy, mass photometry) as a function of various conditions, in presence or absence of substrate (Profs. Dirk-Jan Slotboom/Marco Fraaije, https://www.membraneenzymology.com, https://www.fraaije.info).
- Project 2 investigates the mechanisms that lead to enhanced diffusion or self-propulsion of the enzyme using optical tweezers. This will involve single-molecule dynamic force measurements of enzyme domain movements during catalysis (Dr. Kasia Tych, http://www.ktsinglemolecule.com).
- Project 3 determines condition-dependent cytoplasmic diffusivity of macromolecules, for which single-molecule displacement mapping and super-resolution imaging will be used, with the aim of

assessing the correlation between the mobility and the cellular Gibbs energy dissipation rates (Prof. Bert Poolman, https://www.membraneenzymology.com).

- Project 4 uses coarse-grain multi-scale molecular dynamics (MD) simulations to investigate enzyme motion over long time scales (>milliseconds) and to probe the effect of agitation on crowded solutions of proteins mimicking the cytoplasm. (Prof. Siewert-Jan Marrink)
- Project 5 assesses the consequences of enhanced cytoplasmic agitation on various cellular regulatory processes, with genetic perturbation experiments, microscopic experiments, proteomics, and RNA structural analyses (Prof. Heinemann/Dr. Danny Incarnato, https://www.heinemannlab.eu, http://incarnatolab.com).

And, as an added benefit, this overall project also aims to establish novel ways to communicate our fundamental research to the general public, with the help of a dedicated team from the HKU University of Arts in Utrecht.

Qualifications

The candidates are expected to have a (research) master's degree in (bio)physics, (bio)chemistry, and systems-, computational- or molecular biology, or another quantitative discipline, a strong interest in biomolecular mechanisms, good teamwork skills and excellent communication skills in English.

Conditions of employment

The conditions of employment are available at: https://www.rug.nl/about-ug/work-with-us/new-staff/conditions-of-employment?lang=eng. At our Faculty, a PhD project takes four years, during which the PhD student receives a salary. In addition, our PhD students receive an annual training budget of 675 EUR to be spent on courses, conferences, etc.

The preferred starting date should be between July and September 2021.

Application

Do you want to become a member of our team? Please send your application to us, by submitting the following requested documents:

- a motivation letter, in which you indicate for which one (or two) of the positions you wish to apply
- a complete curriculum vitae
- names and email addresses of two referees

You can submit your application until Mar 31st 2021, by sending an email to Matthias Heinemann (the coordinator of the program) (m.heinemann@rug.nl).

We are an equal opportunity employer that values diversity. We are committed to equal employment opportunity regardless of race, color, ancestry, religion, sex, national origin, sexual orientation, citizenship, marital status, disability or gender identity.