

## PhD position in Marie Skłodowska-Curie Doctoral Network (DN) Monalisa: Motorized Nanomachines: Fundamentals, Innovations, Applications

Technical University Munich (TUM) is offering a PhD position on the topic “Autonomous Brownian Rotors Based on DNA Origami”

The project is funded by the MARIE SKŁODOWSKA CURIE Doctoral Network “MonaLisa”, within the Horizon Europe Programme of the European Commission. The project aims to structure a training network for doctoral students in the field of Artificial Molecular Machines for a period of 48 months. Monalisa is a consortium of 20 partners composed of high-profile universities, research institutions and companies located in 5 European countries, and will train 15 Doctoral Candidates.

This particular PhD will be based at the Department of Bioscience of the TUM School of Natural Sciences in Garching, Germany.

### ELIGIBILITY CRITERIA:

In order to be eligible, each applicant must fulfill the following criteria:

**Nationality:** Candidates may be of any nationality.

**Mobility:** At the date of recruitment, the applicant must **NOT** have resided or carried out his/her main activity (work, studies etc.) in Germany for more than 12 months in the last 3 years immediately prior to his/her recruitment. Compulsory national service and/or short stays such as holidays are not considered.

**Qualifications and research experiences:** the applicant must fulfill the requirements defined for Doctoral Candidates (DCs): DCs are researchers who **at the date of recruitment have NOT yet been awarded the doctoral degree and are in the first 4 years (full time equivalent) of his/her research career.**

Full-time research experience is measured from the date when a researcher obtained the degree which formally entitled him or her to embark on a doctorate, either in the country in which the degree was obtained or in the country in which the researcher is recruited or seconded, irrespective of whether or not a doctorate is or was ever envisaged.

### PROJECT DESCRIPTION:

DNA origami is a programmable self-assembly technique that allows the creation of complex machine-like molecular assemblies made from DNA. In the absence of an external driving force, DNA origami machines will diffusively explore all available conformations. Currently, one of the major challenges is the realization of autonomous, chemically driven, directional movement in such devices. The doctoral researcher will explore strategies to generate such motion based on Brownian ratchet mechanisms. Origami structures will be designed with multiple energy minima and strategically placed binding sites for chemical fuel molecules that will block the movement of the devices in one direction, leading to preferential diffusion in the other. Degradation of the fuel will enable free movement. The doctoral researcher will study the movement of the devices using single molecule fluorescence tracking and super-resolution microscopy. Using computational modelling, the energy landscapes of the devices will be optimised and the dynamics of the structures will be studied. The DC will focus on rotatory devices which are easier to implement but later attempt to also generate directed linear motion.

Principal supervisor is Prof. Friedrich C. SIMMEL

Enquiries about this position can be made at the following address: [simmel@tum.de](mailto:simmel@tum.de)

### **DC KEY RESPONSIBILITIES:**

The position is available for 36 months and the key tasks as a PhD student are:

- To manage and carry out research projects
- To attend and participate in research and training activities within the MonaLisa network and local courses
- To write articles for peer reviewed scientific journals
- To write a PhD thesis
- To teach and disseminate research in the scientific community (international conferences) and non-scientific community, by outreach and public engagement
- To be involved in departmental and group activities

### **FORMAL REQUIREMENTS:**

Applicants should hold MSc degree (or equivalent) with good grades and good English skills. As criteria for the assessment of your qualifications, emphasis will also be laid on relevant work experience and previous publications (if any).

### **BACKGROUND OF SUCCESSFUL CANDIDATE:**

The projects will involve DNA origami design, chemical modification of DNA, biochemical characterization, single-molecule fluorescence and other biophysical experiments. Successful candidates ideally have a physics/biophysics or chemistry/biochemistry background who are exceptionally strong in (bio)physical experimentation and data analysis, have good knowledge in statistical physics and who are capable of working in a wet lab.

Candidates will be integrated in an international multi- disciplinary environment and will have to integrate in other laboratories of the network for training periods. The candidate must therefore have excellent personal skills and be able to work in a team.

Women are especially encouraged to apply.

### **TERMS OF EMPLOYMENT:**

The successful candidates will receive an attractive salary in accordance with the MSCA regulations for doctoral candidates (approximate total gross monthly remuneration €3500). The generous financial package includes a living allowance, a mobility allowance as well as a family allowance (if eligible). The guaranteed PhD funding is for 36 months.

A career development plan will be prepared for each fellow of the network in accordance with his/her supervisor and will include training, planned secondments and outreach activities in partner institutions of the network. The DC fellows are supposed to complete their PhD thesis by the end of the 3rd year of their employment.

More information can be found on the CORDIS page: <https://cordis.europa.eu/project/id/101169136>