



UNIVERSITÄT
LEIPZIG

Faculty of Physics and Earth
Sciences
**Peter Debye Institute for
Soft Matter Physics**
Prof. Dr. Frank Cichos

Department Molecular Nanophotonics, Linnéstraße 5, 04103 Leipzig, Germany

PhD position available
“Thermal ratcheting hybrid DNA-orgami plasmonic structures and nanopores”

A PhD position is available to work at the department Molecular Nanophotonics at Leipzig University under the supervision of Frank Cichos on thermal ratcheting hybrid DNA-orgami plasmonic structures and nanopores. This experimental PhD project is part of the Marie Skłodowska-Curie Doctoral Networks HORIZON-MSCA-DN-2021 project called DYNAMO.

Description of the PhD project

Objectives: The project aims at designing hybrid DNA-orgami plasmonic structures to provide a reversible local melting of DNA for conformational control of larger DNA origami structures. The targeted systems shall allow in the long run the design of nanopore systems that have a fast switchable permeability and trapping capability for objects in the nanopore. In combination with multiparticle plasmonic coupling and electrokinetic driving this could lead to controlled ratchet-like translocation of objects through the nanopore.

The candidate will design in collaboration inside the DYNAMO network a first simple proof-of-concept hybrid plasmonic DNA origami structure with weak structural elements that allow reversible local melting by plasmonic heating to change the conformation of the construct. The candidate will confirm the heating of the plasmonic structures as well as local conformation changes by FRET, fluorescence imaging as well as scattering microscopy and spectroscopy. The structures will be further advanced to provide switchable pore systems. In a final step more complex multiparticle plasmonic systems will be constructed that integrate feedback between conformation change and plasmonic coupling.

Expected Results: A hybrid plasmonic DNA-orgami structure that allows thermal switching of conformation that can be used to control the permeability of DNA-orgami nanopores.

Planned Secondments: To become familiar with DNA nanopore fabrication and handling the student will visit the Italian Institute of Technology for 3 months during year one. The candidate will work closely with CNRS for the development of enhanced plasmonic trapping and the quantification of local temperature fields in the second year. The candidate shall spend additional 3 months at HU Berlin in the third year to learn about different types of plasmon enhanced spectroscopies including the experimental conditions that are relevant.

The working language is English. The PhD position is offered for a period up to three years. The position is to start as soon as possible and on June 1, 2023 at the latest.

Please visit our group website for more details about our research: <https://www.uni-leipzig.de/~mona>

Requirements and application

We are seeking a highly motivated PhD candidate with an excellent Master's degree in Physics with excellent English proficiency. According to the rules for the position, the candidate must not have resided or carried out the main activity (work, studies, etc.) in Germany for more than 12 months in the 36 months immediately before the recruitment date. No restrictions of citizenship apply to the PhD position. The candidate should be committed to collaborative and interdisciplinary work and have excellent oral and written communication skills (records of creative and independent scientific research and active participation in its dissemination in peer-reviewed journals are welcome). Experience with modern single molecule optical microscopy and spectroscopy techniques as well as image and statistical analysis would be useful.

Applications including 1) a letter of interest (max. 1 page), clearly stating the specific motivation of the candidate to join the group, work on this project, career goals, etc., 2) a CV, 3) grade transcripts or equivalent record of excellent academic performance, clearly indicating courses taken and grades in each course (for MS and BS), 4) the names of at least two consenting referees should be sent to cichos@physik.uni-leipzig.de. The application deadline is **April 15, 2023**.

DYNAMO

DYNAMO is designed as an innovative and pioneering training network, with the unique vision of developing the next-generation hybrid nanopore technology exploiting DNA nanostructures integrated with multifunctional solid-state platforms, by:

- Bringing together a unique team of 6 world-leading academic groups, at the forefront of nanoscience and single molecule sensing and manipulation, and 1 high tech company, to translate the innovations into real-world applications.
- Training 10 Junior Researchers on a unique mix of experimental and computational skills at the physics/chemistry/biotechnology interface.
- Enabling technological advances through the combination of enhanced optical spectroscopies, plasmonics and DNA nanotechnology. This will lead to the development of nanopore technologies with unprecedented functionality and single molecule control.
- Reaching single molecule capturing and tweezing functionality in solid-state nanopore in a way that has not been possible before. This will pave the way to fascinating new discoveries into the fundamental structures of biomolecules and the interaction forces among them.

Opportunities when joining DYNAMO

- Participate in a highly committed network of academic and industrial leaders in the field of nanopore technology, single molecule spectroscopies and advanced nanostructures design and fabrication.
- Participate in a worldwide unique training program, comprising individual research projects, interactive and hands-on courses, workshops, and secondments covering the entire route to application of material sciences:
- In-depth knowledge on the potential and limitations of state-of-the-art nanopore technologies.
- In-depth knowledge on single molecule spectroscopies and single molecule electrical measurements.
- Training in intellectual property, business models, and regulatory approval pathways.
- Personalized training with room for development of personal and transferable skills (leadership, analytical, communication, interpersonal, free thinker mindset, creativity).
- Initiate network-wide events, such as workshops and symposia.
- Prepare for excellent performance in academia, industrial R&D, project management, consultancy and beyond.