MAX PLANCK INSTITUTE FOR DYNAMICS OF COMPLEX TECHNICAL SYSTEMS MAGDEBURG

MAX PLANCK INSTITUTE OF COLLOIDS AND INTERFACES

2 PhD positions

65% TVöD E13 (**3 years**)

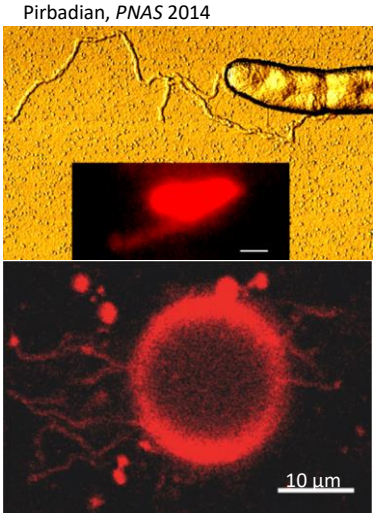
on **Bottom-up nanowiring of primitive neural networks via tubulation**

funded by the Office of Naval Research Global (ONRG)

Project description – the job(s)

Membrane nanotubes (aka tunneling nanotubes) are the hallmark of direct cell-to-cell communication. Some microbes employ them as nanowires in an ingenious strategy to access solid electron acceptors and to conduct current in thick biofilms. This ability for extracellular electron transfer (ET) is the basis for multiple electro-microbiological applications. Here, we aim to build a minimal model of this phenomenon by using only the essential building blocks. To this end, ET proteins will be embedded in the membranes of giant unilamellar vesicles (GUVs). Different approaches to generate membrane curvature will be employed to spin nanotubes, acting as minimal microbial nanowires. In the next step, we will create interconnected vesicle networks to mimic the architecture of biofilms or neural networks. Finally, employing special microfluidic designs to pattern the connectivity, we will assign directionality of the ET. This setup will allow better understanding of the mechanism of extracellular ET and will also lay the foundations for novel biocomputing concepts.

Nanowires of *Shewanella*
Pirbadian, *PNAS* 2014



Nanotubes from a vesicle
Bhatia, *ACS Nano* 2019

Research environment – the groups

One of the PhD students will join the team of Dr. Rumiana Dimova, where they will study the membrane curvature as a molecular basis for the controlled extrusion of nanotubes and connection between GUVs. Dr. Dimova is a worldwide leading expert in the field of membrane biophysics and her international group offers a highly cooperative working environment and cutting-edge experimental facilities. The other PhD student will be embedded in the group of Prof. Kai Sundmacher, which has a diverse engineering portfolio, including technical bioelectrochemistry and fundamental studies on the energy protein apparatus, and will be directly supervised by Dr. Ivan Ivanov. Therein, the student will focus on the reconstitution of membrane proteins and microfluidic manipulation of GUV networks. Both the Max Planck Institute for Dynamics of Complex Technical Systems in Magdeburg and the Max Planck Institute of Colloids and Interfaces in Potsdam are world-class research institutions that offer interdisciplinary and collaborative research environment at national and international level.

Requirements – the candidates

- MSc or equivalent degree in: (bio)physics / (bio)chemistry / (bio)engineering
- interest in: physics of biological systems & biological electron transfer;
- experience with membranes & membrane proteins / microscopy / µ-fluidics will be an advantage
- excellent command of English & ability for independent research

Submit your application via email to ivanov[at]mpi-magdeburg.mpg.de and/or rumiana.dimova[at]mpikg.mpg.de

- motivation letter (why do you apply for this position, what are your research interests, how do you fit)
- detailed CV
- names and email addresses from 2 references, ready to give feedback

Your application will be reviewed as soon as it is received and the positions will be filled asap.

The Max Planck Society strives to ensure a workplace that embraces diversity and provides equal opportunities irrespective of the applicants' gender, nationality or disabilities. The Max Planck Society is committed to increasing the number of individuals with disabilities in its workforce and therefore encourages applications from such qualified individuals.