

PhD Researcher Position

Intra-Cellular DNA Nanoscience



Key words: DNA Nanoscience, Cell Biology, Self-Assembly, Molecular Machines

BACKGROUND AND SCOPE

DNA nanotechnology is a field of research that has evolved to create sophisticated nanostructures, machines, materials, biosensors, as well as dynamic and information-processing devices. Up to date, such synthetic systems have been developed and tested to function outside of cells, even though DNA and RNA are intrinsic elements inside cells. Currently, cutting-edge therapies including gene silencing strategies or vaccines make use of relatively simple nucleic acids such as siRNA and mRNA. However, complex DNA-based artificial devices created *de novo* and capable of functioning inside of cells and affecting their physiology have not yet been realized. Our laboratory has pioneered approaches for DNA assembly, mechano-sensing DNA hydrogels, life-like DNA protocells, and ATP-fueled DNA systems that have the potential to fulfill this application. In this project, we aim to take the next critical steps and apply our understanding of synthetic DNA assembly and dynamic systems to the interior of mammalian cells. This project thus bridges from the design of DNA devices to their operation inside the cell, with the ultimate goal of understanding regulatory aspects of cell function and to create a new generation of synthetic molecular machines able to instruct cell behavior.

Team. This position is embedded in an ERC Consolidator Grant project within an ambitious team. We provide you with an inspiring and collaborative team atmosphere in a multinational and multidisciplinary environment, and ample opportunities to develop. Brand new, cutting-edge synthetic and analytical infrastructure and facilities are available due to generous support by the University of Mainz and the Gutenberg Research College. We run our own fully equipped cell lab. Prof. Walther (h-index 62, age 42) is a Gutenberg Research Professor, a Max Planck Fellow and a 2 x ERC Awardee. More information on the group can be found here: www.walther-group.com

EXPECTED CANDIDATE PROFILE

As an ideal candidate you are creative, highly self-motivated, ambitious, and communicative to excel in scientific challenges. You hold a M.Sc. in Biomedical Sciences, Biochemistry, Chemistry or similar and have a background at the interface between soft matter and/or cell biology. Previous exposure to DNA nanoscience is a plus. We are willing to train you in complementary skills.

Selected references on our life-like DNA systems in the past:

1. Signal-processing and adaptive prototissue formation in metabolic DNA protocells, *Nat. Commun.* 13, 1 (2022).
2. DNA protocells via signal processing prompted by artificial metalloenzymes *Nat. Nanotechnol.* 15, 914 (2020).
3. Programmable Dynamic Steady States in ATP-Driven Non-Equilibrium DNA Systems *Sci. Adv.*, 5, eaaw0590, (2019).
4. Programmable ATP-Fueled DNA Coacervates by Transient Liquid-Liquid Phase Separation *Chem* 6, 3329 (2020).
5. Modular Design of Programmable Mechanofluorescent DNA Hydrogels *Nature Commun.* 10, 529 (2019).

The position is available from February/March 2023 and has a duration of 3 years.

Application Deadline is January 10th 2023.

Please send your full application as a **single** PDF file containing

- letter of motivation including a summary of your past research experience, in particular a meaningful summary of your master thesis; transcript of records of your Master and B.Sc. program.
- Detail in your letter why you believe you are the right person and what you expect from us
- curriculum vitae and list of publications (if applicable)
- Two contacts for reference letters

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