



PhD Research Position – Walther Lab – University of Mainz - Germany

DNA Artificial Cells

Key words: Artificial Cells, DNA Nanoscience, Catalysis, Reaction Networks

We are searching for a PhD Researcher to join our team on the research line of Artificial Cell Research

Artificial cells are an approach to make minimalistic synthetic life-like systems to on the hand understand how life works and on the other generate interactive systems. In recent years, we have developed a versatile platform to make entirely DNA-based artificial cells that exploit synthetic DNA both for structure formation as well as as an information carrier. These DNA-based artificial cells are unique in the sense that they are composed of a highly crowded interior (like cells) composed of long ssDNA that is stabilized by a DNA hydrogel shell. The different parts (interior and shell) can be easily functionalized by complementary ssDNA sequences to tailor properties and encode functions. In this project we are particularly interested in understanding fusion processes, how catalytic activity (a metabolism) leads to emergent dynamic behavior in the interior (e.g. flow), and how information-processing can be encoded using chemical cascades.

You will have the opportunity to develop your project independently based on a diversity of interesting and engaging research questions, and analyze the systems with a diversity of suitable methods (e.g. fluorescence microscopy techniques; spectroscopy).

We offer:

- a highly engaging and current research topic in an excellently equipped lab infrastructure
- an inspiring environment in an international and ambitious team
- a multidisciplinary lab environment with ample opportunities to develop beyond your core project
- a stimulating local research environment with excellent collaboration possibilities
- support for personal development with attendance to conferences, workshops and soft skill seminars
- excellent and close support of PhD researchers
- possibilities for national and international collaboration

Prof. Walther (h-index 72, 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

- highly motivated candidate with a very good degree in Chemistry or related disciplines
- independent and self-responsible work ethic
- Enthusiasm for basic research, creative experimental approaches, and scientific networking
- Excellent English skills and enjoyment of teamwork
- Background in soft matter, polymer science, supramolecular chemistry, biochemistry or catalysis. Previous exposure to artificial cell research, systems chemistry or DNA nanoscience is a plus. We are willing to train you in complementary skills.

5 Selected references on DNA-based artificial cells in the past:

1. A. Samanta, M. Hörner, W. Liu, W. Weber, **A. Walther** "Signal-processing and adaptive prototissue formation in metabolic DNA protocells", *Nat. Commun.* **13**, 1 (2022).
2. W. Liu, C. Lupfer, A. Samanta, A. Sarkar, **A. Walther** "Switchable Hydrophobic Pockets in DNA Protocells Enhance Chemical Conversion" *J. Am. Chem. Soc.* **145**, 7090 (2023)
3. A. Samanta, V. Sabatino, T. Ward, **A. Walther** "Functional and morphological adaptation in DNA protocells via signal processing prompted by artificial metalloenzymes" *Nat. Nanotechnol.* **15**, 914 (2020).
4. W. Liu, A. Samanta, J. Deng, C. O. Akintayo, **A. Walther** "Mechanistic Insights into the Phase Separation Behavior and Pathway-Directed Information Exchange in all-DNA Droplets", *Angew. Chem. Int. Ed.* **61**, e202208951 (2022).
5. R. Merindol, S. Loescher, A. Samanta, **A. Walther** "Pathway-Controlled Formation of Mesostructured all-DNA Microgels and their Superstructures" *Nat. Nanotech.*, **13**, 730 (2018). (Cover Article, highlighted in Mirkin et al. *Nat. Nanotech.* **13**, 624)

The position is according to the German salary scale (TVL 13/2 65%) with full social benefits. The position is available from Fall Spring/Summer 2024 and has a duration of 3 years. Starting date is flexible.

Application Deadline is April 15th 2024.

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

- letter of motivation including a summary of your past research experience and research interests.
- A meaningful summary of your Master thesis
- Transcript of records of your Master and Bachelor program.
- curriculum vitae and list of publications
- One, or if possible, two contacts for reference letters

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Prof. Dr. Andreas Walther, University of Mainz, Germany

