



TECHNISCHE
UNIVERSITÄT
DRESDEN



MASTER'S COURSES
MOLECULAR BIOENGINEERING/ NANOBIOPHYSICS/
REGENERATIVE BIOLOGY AND MEDICINE
APPLICATION OF MASTER'S THESIS

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Molecular Bioengineering ☒ Nanobiophysics ☐ Regenerative Biology and Medicine ☐

Title of the Master's thesis:

Design and Development of Membranes for Artificial Cells: Toward the Creation of a Synthetic Cellular System

Start date: March 2023

End date: 31.08.2023

Topic of the thesis:

Bottom-up artificial cell assembly is a rapidly developing field within synthetic biology that aims to create functional, self-sustaining cell-like structures using artificial components. These include the use of synthetic biomolecules, such as artificial lipids and proteins, as well as the incorporation of natural biomolecules into artificially constructed cell-like compartments. These structures have the potential to give new insights into fundamental processes occurring in natural cells and would open numerous bio-technological and biomedical applications.


This thesis will focus on the development of a robust and high-throughput method to assemble "surface-bound artificial cells". Dense DNA brushes immobilized on surfaces will be covered with phospholipid bilayers to generate versatile structures of controlled size (1-500µm), shape, DNA composition, and spatial organization. The experimental setup will be based on DNA chips (Buxboim et. al. 2007, Levy et. al. 2021) in microfluidic chambers designed to favor the membrane assembly process. The assembly process will be monitored in confocal and Total Internal Reflection Fluorescence (TIRF) microscopy.

Buxboim et. al. 2007 - <https://doi.org/10.1002/sml.200600489>

Levy et. al - <https://pubs.acs.org/doi/10.1021/acssynbio.0c00613>

Dresden, 10.01.2023

Place, Date


Signature of the student

First assessor:

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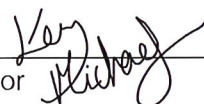
Institution/ Department/ Faculty: Technion - Faculty of Biotechnology and Food Engineering

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I hereby agree to be assessor for the thesis mentioned above. I agree with the title of the thesis. I am aware that the duration of the evaluation process should not exceed four weeks.

Place, Date

Signature of the assessor

**Proposed second assessor:**

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Academic Title: Prof. Dr.
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Institution/ Department/ Faculty: TU Dresden / Chair of Biomaterials and Nanotechnology

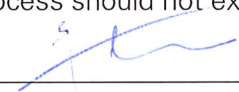
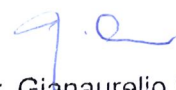
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I hereby agree to be assessor for the thesis mentioned above. I agree with the title of the thesis. I am aware that the duration of the evaluation process should not exceed four weeks.

Dresden, 20.01.2023

Place, Date

Signature of the assessor

Prof. Dr. Gianaurelio Cuniberti
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Technische Universität Dresden
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Remarks:

Start and end date: The thesis will normally take 22 weeks. It can only be extended by up to 2 months upon written request to the examination committee, which must include adequate justification for the requested extension. As an example, health problems documented by medical certificates can be sound reasons for an extension request, while slow progress or problems with the execution of the work will not be accepted.

Assessor: You can choose any assessor for your thesis including members of staff from relevant faculties of the TU; the MPI, or even from institutions outside Dresden. In case, the 1st assessor is not teaching or involved in the Master's program, the 2nd assessor has to be teaching in the Master's program and belonging to TU Dresden.

Title: The title of your thesis is provisional at this stage and the final title that appears in the thesis when you hand it in may be slightly different. Note, however, that a complete change of topic will require written permission.

Topic of thesis: Here you should write a page outlining the topic of your thesis and the approach that you will take. This outline should give a broad introduction into the topic and quote one or two papers relevant to your work. It should list the specific objectives of your thesis proposal and how you are going to achieve those objectives. For more space, please create an additional annex.

