PhD Thesis Acceptance Report
Research Discipline Council of Biological Sciences
Jagiellonian University in Kraków

Candidate's name and surname: Gerrit Wilkens

PhD Thesis Title: Control of nanostructured biological assemblies using DNA nanotechnology

Thesis Supervisor: Jonathan Heddle

Assistant Supervisor / Second Supervisor/ Co-supervisor (if applicable): N/A

Reviewer: Prof. Elizabeth Bromley

THESIS EVALUATION

1. **Scientific merit of the thesis**
   a. Originality of the research *(25-200 words):*

The thesis presents a number of new innovations in the use of DNA origami to create novel nanostructures not previously seen in nature. This includes the design of linked rings created using topologically operating enzyme, and the creation of a novel mechanism for creating size controlled liposomes that can be easily purified from the reactants. The work is certainly original in both the concepts and the techniques used. The thesis contains a very good explanation of the state of the field and how this work advances that field. The work has been published in an international journal further lending weight to the evidence of originality.

   b. Scientific merit of the chapters / articles *(25-200 words):*

The original work described in chapter 3 and in the published article based on it has significant scientific merit. The novel approach to producing concatenated rings with independently folded DNA origami patterns on each ring will be of significant onwards potential to the field. The work is described clearly and succinctly in a way that will allow it to be reproduced and used effectively in the future. The work in chapter 4 also has significant scientific merit. The development of a novel protocol for purifying DNA-lipid constructs is again extremely well explained and will be of much potential benefit to the field moving forwards. The demonstration that the system is compatible with using cyclodextrin as a delivery mechanism for lipids is also important and well described.

2. **Substantial merit of the thesis**
   (ability to introduce the research topic and clarity of research hypotheses, the choice of research methods and statistical tools for data analysis, presentation and critical analysis of the research data, the ability to discuss research data and the theoretical background, clarity and quality of the conclusions) (25-200 words):

The introduction to the field of DNA nanotechnology was very well structured and clearly written. A wide field was summarized succinctly and in a way that clearly placed the novelty of the work done in this thesis. The tools and techniques used both experimentally and in the data analysis were appropriate to the task. In particular the description of the many developed protocols were clear and will be useful in enabling other researchers to reproduce this technique for their own applications. The results are explained clearly and the conclusions drawn are substantiated by the data presented. Significant vision is indicated in the ideas put forward for the future uses of this technology.

3. **Layout and register**
(layout, register and the clarity of the language, the quality of the visual material etc.) (25-200 words):

The thesis is very well presented in terms of the layout and production. The writing is very clear and makes all scientific points very well. In general, the visual material is very useful and the presentation of data is successful, however there are some issues in figure production noted below in the 'criticism' section. Figures are well captioned and connected to the narrative in the text.

4. **Critical notes**

The thesis would be greatly improved by having more clarity in the figures in general. Many of the figures reproduced from the literature had writing on them that couldn't be read. Some of the results figures were missing details annotating the bands on gels and the scale bars on TEM images. If possible this should be corrected before final publication of the thesis (particularly figures 18, 22, 24,25 and 30) as it will aid the onward value of the thesis to future readers. These issues did not prevent the science from being made clear, and so my assessment of the thesis stands in spite of them.

5. **Final grade** (justification *25-200 words):*

The thesis presented gives a considered view of the field and the place the work sits within it. It introduces original techniques and nanostructure designs. The creation of the target designs is validated with careful clearly explained experiments and results. The value of the work is summarized and a vision for the next steps presented.

I, hereby, declare that the reviewed PhD thesis by **Gerrit Wilkens** meets the criteria pursuant to art. 187 of Act of 20 July 2018 The Law on Higher Education and Science (Journal of Laws of 2018, item 1668, as amended) and request that the Research Discipline Council of Biological Sciences of the Jagiellonian University in Kraków accepts **Gerrit Wilkens** for further stages of doctoral proceedings in the field of exact and biological sciences, in the discipline of biological sciences

YES

I, hereby, request that the thesis is accepted with distinctions. Justification *(25-200 words)*

I have no means to determine the quality of this thesis against the standard of theses presented and so cannot adjudicate whether it is of sufficient quality to gain distinction.

B. Bromley

12/01/2023
date

Reviewer's signature

INFORMATION FOR THE REVIEWER:

A digital copy should be sent to:
nauki.biologiczne@uj.edu.pl

A duly signed original should be sent to:

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