

Thesis Changes Log

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PhD Program: Physics

Title of Thesis: Optical and mechanical properties of diatom structures

Supervisor: Professor Dmitry Gorin

Co-supervisor: Professor Alexander Korsunsky

The thesis document includes the following changes in answer to the external review process.

Dear Prof. Fedotov,

Thank you for bringing the minor mistakes in the thesis to my attention. I have addressed all the changes in the revised thesis.

1. Add a synopsis to Chapter 3 providing brief justification (or motivation) for including the material of this chapter into the main body of the thesis.

Response: Chapter 3 provides a detailed account of the methodologies used in the research, encompassing the cultivation of diatoms and the preparation of samples. This chapter presents a comprehensive repository of the processes and techniques employed and provides a strong foundation for the research, ensuring clarity, replicability, and credibility of the findings.

2. Make sure that proper terminology is being used consistently throughout Section 7.4. Stick to either “electric energy density” or “light intensity”, though the former sounds a bit awkward when used in the context of diffraction and interference patterns. Also, make sure that the title of Section 7.4 is consistent with the chosen terminology.

Response: Throughout revised Section 7.4, I have consistently used the term "light intensity" to maintain clarity and coherence in the context of diffraction and interference patterns. I have also ensured that the section title aligns with this chosen terminology.

3. Explain how sub-section 7.4.5 is linked to your work on modelling light intensity distribution in frustules detailed in other sub-sections of Section 7.4.

Response: In this sub-section, I aimed to provide additional context to the distribution of chloroplasts within diatom frustules. While the standard situation, as depicted in Figure 80, illustrates a typical configuration, it is essential to note that under varying light intensity conditions, chloroplasts have been observed to exhibit dynamic migration. This information is pertinent to my overall work on modeling light intensity distribution in frustules, as it contributes to a more comprehensive understanding of the factors influencing the interaction between light and diatom chloroplasts within their periodic frustules. These intricately structured cell walls due to diffraction potentially enhance photosynthetic efficiency, particularly in environments with limited light penetration, such as water bodies. By delving into the mechanisms governing light distribution within frustules, we gain valuable insights into the optimization of photosynthesis under different light regimes. This understanding is closely linked to chloroplast migration patterns, shedding light on how cells adapt to varying light conditions for optimal photosynthesis.

Together, these research avenues contribute to our comprehensive grasp of the intricate relationship between light and photosynthetic organisms. They offer crucial insights into the physical and biological mechanisms employed by these organisms to harness and utilize light energy effectively.

4. Fix the numbering of sections in Chapter 8 – currently, Section 8.2 is followed by Section 8.5.

Response: This comment refers to the revised version of the thesis attached to the Changes Log file. In the final version of the thesis, the numbering of sections in Chapter 8 has been rectified to ensure proper sequence. This correction was implemented prior to the defense.