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Towards a structural understanding of plant-microbiota interactions using cryo-EM techniques

Liedtke, J.

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Propositions

accompanying the dissertation

Towards a Structural Understanding of Plant–Microbiota Interactions using cryo-EM Techniques

1. Distinguishing between bacterial morphological plasticity and spore formation requires more than just morphological observations. (Chapter 3 of this thesis)
2. Sample preparation remains a critical issue in cryo-EM, as it determines both accessibility and preservation of sample integrity. (Chapter 4 of this thesis)
3. Large-volume plant samples can be made accessible for cryo-EM through both optimized sample preparation and the choice of suitable plant model organisms. (Chapter 5 of this thesis)
4. Computational prophage prediction is a valuable tool, but it is inherently biased due to limitations in data representativeness. (Chapter 6 of this thesis)
5. Morphological appearance alone is insufficient to infer microbial dormancy. (McDonald *et al.*, Trends Microbiol. 32, 142 (2024))
6. Integrated fluorescence microscopy in PFIB/SEM, combined with specific and compatible fluorescent dyes, enables assessment of sample integrity and thus increases throughput in cryo-EM. (Noble and de Marco, Curr. Opin. Struct. Biol. 87, 102864 (2024); Yang *et al.*, bioRxiv 2023, 2023.07.11.548578)
7. Despite recent methodological advances, cryo-EM sample preparation of large-volume plant tissue lags behind that of metazoan tissue, with significant challenges still to be overcome. (Pöge *et al.*, bioRxiv 2025, 2025.02.14.638237; Daraspe *et al.*, bioRxiv 2025, 2025.06.01.657137; Franzisky *et al.*, Plant Physiol Biochem. 220, 109546 (2025))
8. The importance of phage elements within microbial communities is likely underestimated due to limited data and a primary focus on host-phage interactions. (Wang *et al.*, Nat Commun 1, 147 (2010); Wang *et al.*, FEMS Microbiol Ecol 100(5), fiae052 (2024))
9. Scientists and gamers share the same fate: the thrill of uncertainty and the compulsion to keep going despite repeated failures. (inspired by Tarek L., Julia E., and Joan Bolker)
10. Leisure, distance, and mental drifting are not the opposite of effort and diligence, but rather their necessary complements: they create the mental space in which creativity can arise, something that methodical work alone cannot provide. (inspired by Carl O. Sauer)
11. Sugar is more than a commodity – it is a social glue. Sugar, for example, provided in the form of waffles, may foster interaction and cooperation across office floors and serve as a small-scale model of the cooperative dynamics within communities.
12. Nothing is simultaneously more stress-relieving and stress-inducing than having a dog that loves to chase hedgehogs. (inspired by Lasse)

Janine Liedtke
Leiden, 4 December 2025