Synthetic biology approaches towards a deeper understanding of polar growth in Streptomyces

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Propositions accompanying the thesis entitled

“Synthetic biology approaches towards a deeper understanding of polar growth in *Streptomyces*”

1. L-forms provide a promising chassis for morphological engineering of streptomycetes (This thesis: Chapter 3).
2. Localization of DivIVA appears to depend on the combined action of its cardiolipin affinity and its preference for negatively curved membrane regions (This thesis: Chapter 5).
3. Replacing the unstructured domains of DivIVA with those of the phase-separating ARID1A protein maintains hyphal branching, suggesting that hyphal branching in *Streptomyces* may be driven by phase separation (This thesis: Chapter 6).
4. Rational modification of DivIVA domains can be used to rewire growth patterns in filamentous bacteria (This thesis: Chapter 6).
5. Phase separation provides a unifying conceptual framework for understanding how bacteria create intracellular order without membrane-bound organelles (Azaldegui et al. (2021). *Biophysical journal*, 120(7), 1123-1138).
6. Standardization - one of synthetic biology’s core principles - will become increasingly incompatible with engineering multicellular microbes.
7. Besides the availability of more advanced genetic tools, the engineering of streptomycetes also requires a better understanding of their spatial cell biology.
8. A unicellular *Streptomyces* chassis would enable synthetic biology strategies that are currently impossible in filamentous bacteria. However, this would come at the cost of losing multicellular advantages, such as division of labor and regulatory complexity.
9. Societal unwillingness to change behavior makes synthetic biology an essential strategy for solving global challenges.
10. The iGEM competition encourages students to prioritize novelty over scientific rigor, thereby undermining its goal of promoting responsible and reproducible research.
11. Internship students benefit greatly from being included in the publication process and should be encouraged to do so.

Maarten Lubbers, Leiden, September 8th, 2026