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Optimal management of nutrient reserves in microorganisms under time-varying environmental conditions

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Highlights

- We present a stoichiometrically consistent macro-chemical model of microbial growth and metabolism that accounts for variable stores as well as adaptive allocation of building blocks to various types of catalytic machinery.
- The model posits feedback loops linking expression of assimilatory machinery to reserve density; the precise form of the “regulatory law” at the heart of such a loop expresses how the cell manages internal stores.
- We demonstrate how this “regulatory law” can be recovered from experimental data using several empirical data sets.
- We find that stores should be expected to be negligibly small in stable growth-sustaining environments, but prominent in environments characterised by marked fluctuations on time scales commensurate with the inherent dynamic time scale of the organismal system.

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