Abstract Submitted
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A biophysical model of prokaryotic diversity in geothermal hot springs[1] SUZANNE AMADOR KANE, ANNA KLALES, JAMES DUNCAN, ELIZABETH JANUS NETT, Physics Department, Haverford College, Haverford PA 19041 — Photosynthetic bacteria living in geothermal hot spring environments have surprisingly complex ecosystems with an unexpected level of genetic diversity. In particular, their thermal gradients support genetically distinct bacterial strains that differ in their preferred temperatures for reproduction and photosynthesis. Each region along the thermal gradient exhibits multiple strains of photosynthetic bacteria adapted to several distinct thermal optima, rather than the expected single thermal strain adapted to the local environmental temperature. Here we analyze microbiology data from several ecological studies to show that the thermal distribution field data exhibit several universal features independent of location and specific bacterial strain. These include the distribution of optimal temperatures of different thermal strains and the functional dependence of the net population density on temperature. We present a simple population dynamics model of these systems that explains the observed diversity of different strains of the photosynthetic bacteria, the observed thermal population distributions and certain features of population dynamics observed in laboratory studies of the same organisms.

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