

Prominence of Reward-selected Mutations in Rewarded Versus Non-rewarded Environments



Black Mamba
LB 145
Section 002

Student #1
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Question - Why Do We Care?

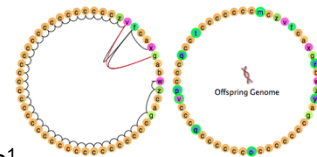
Do bacterial populations with a mutation favorable for a specific environmental reward, propagate faster in an environment containing that reward?

We Will be able to:

- See how organisms react to their environment
- The diversity of organisms will result in independent results
- Mutations effect on society

Background:

- Environmental factors can influence specific mutational events¹
- Organisms in varying environments may adapt based upon resource abundance²



Hypothesis

We argue that organisms with a resource favourable mutation will propagate quicker in an environment containing that resource when containing no resource, due to their selective advantage they obtain from the mutation.

- Organisms with resource-favorable mutation:
 - propagate quicker in environment containing that resource
 - selective advantage
 - propagate slower in environment with no resources
 - level playing field
 - higher competition

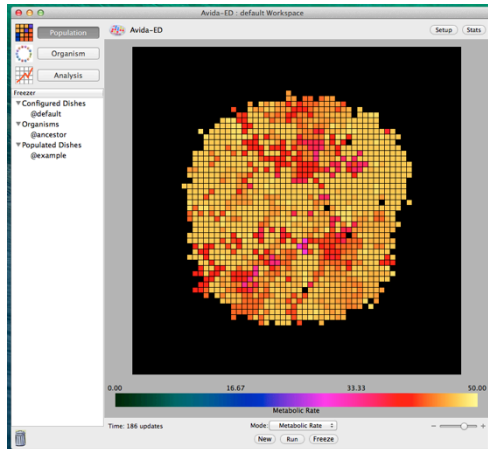
Experimental Methods



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| <ul style="list-style-type: none"> ● Control (Non-rewarded): <ul style="list-style-type: none"> ○ 60x60 cells ○ 2% mutation rate ○ @ancestor ○ all rewards turned off ● Run experiment (20 trials) <ul style="list-style-type: none"> ○ pause after 1st, 25th, 50th, and 100th notose individual appears ○ record update number for each | <ul style="list-style-type: none"> ● Rewarded Environment <ul style="list-style-type: none"> ○ 60x60 cells ○ 2% mutation rate ○ @ancestor ○ notose only reward ● Run experiment (20 trials) <ul style="list-style-type: none"> ○ pause after 1st, 25th, 50th, and 100th notose individual appears ○ record update number for each |
|--|---|
-

Predictions

We predict the 25, 50, 100 notose-individuals will have fewer updates in the environment containing notose than in the environment with no resource available



Data Analysis

- Start From Initial Mutation
 - Compare differences in updates
 - prevents randomness of initial mutation from skewing data
- ANOVA
 - followed by Tukey test



Expected Data

Mutations vs Environment	No Reward	Notose
Initial	400	530
25	470	590
50	600	650
100	810	680

- The Rows represent the number of cells performing notose.
 - The Columns Represent the Environment
 - Data was collected based on number of updates in colony
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References

1. Massey, R. C., Rainey, P. B., Sheehan, B. J., Keane, O. M., and Dorman, C. J. 1999. Environmentally constrained mutation and adaptive evolution in *Salmonella*. *Current Biology* 24: 1477-1480.
 2. Burger, R. 1999. Evolution of genetic variability and the advantage of sex and recombination in changing environments. *Genetics* 153: 1055-1069.
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Questions?

