A test of diversifying selection for a trait from within and between species variations

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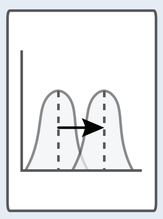
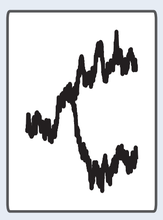
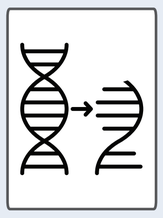
Are you familiar with....



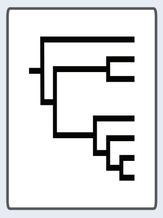
- **Quantitative-genetics across populations**
  Extending Q_{ST}-F_{ST} methods at the phylogenetic scale across species.



- **Phylogenetic comparative method**
  Comparing the rate of evolution (Brownian) of a trait to its neutral expectation.



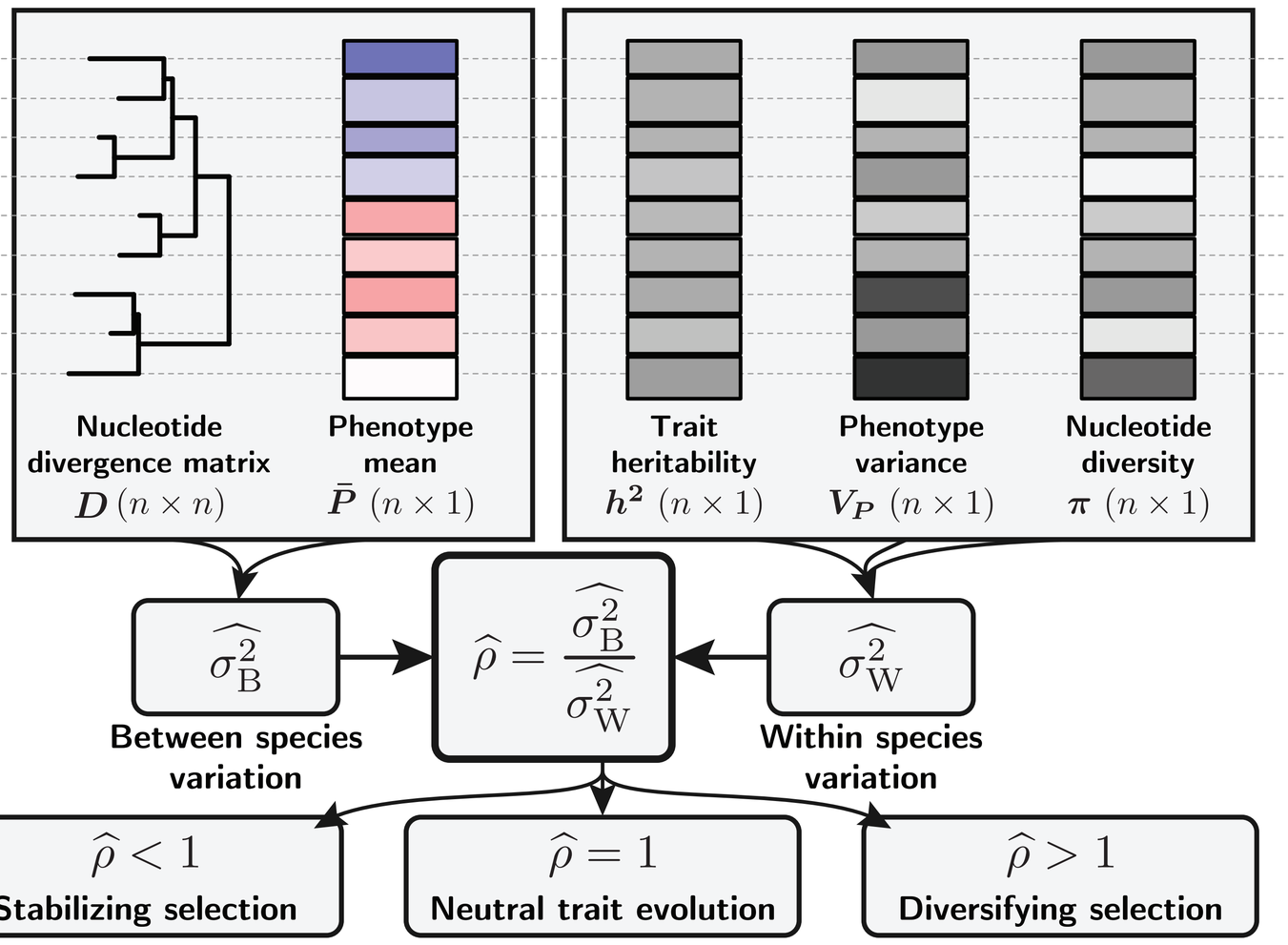
- **Gene-expression evolution**
  Extending the EVE model with a threshold for neutrality by including sequence variations.



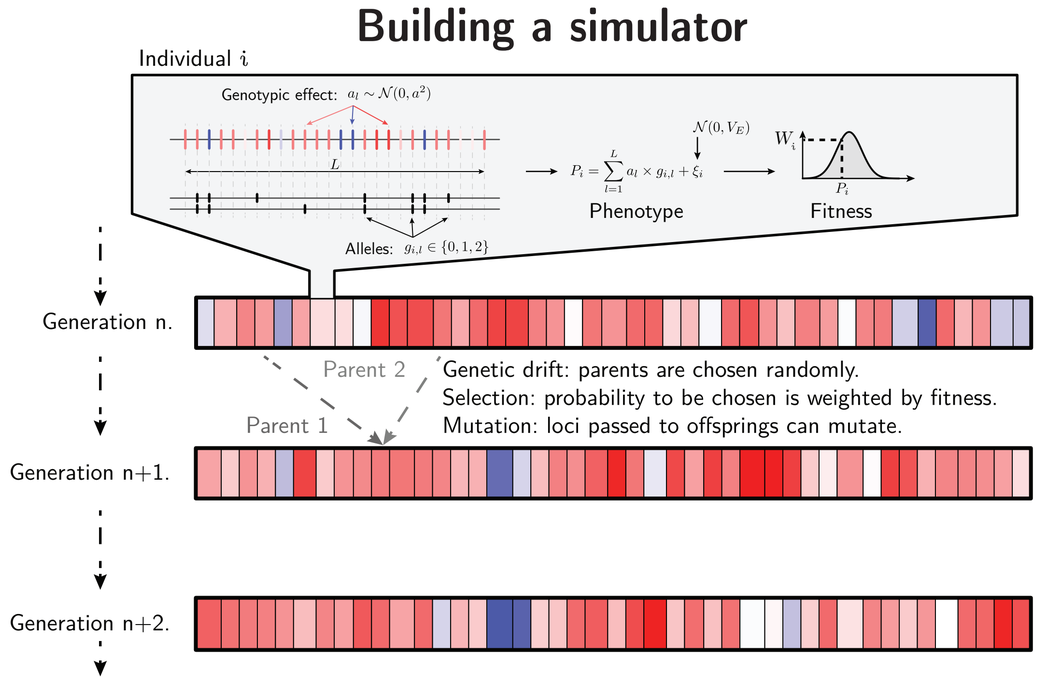
- **Phylogenetic DNA evolution**
  Adapting d_N/d_S ratio for trait variations across species while including within species variations.

- **Contrast polymorphism/divergence**
  Adapting McDonald & Kreitman test for a trait, deriving an analogous test of $d_N/d_S > p_N/p_S$.

- **Is a trait neutrally evolving or under selection?**
- **For a selected trait, is it stabilizing or diversifying selection?**
- **Is the trait variation between species greater than within species?**
- **How to compute variance, and how to normalize it?**



Building a simulator



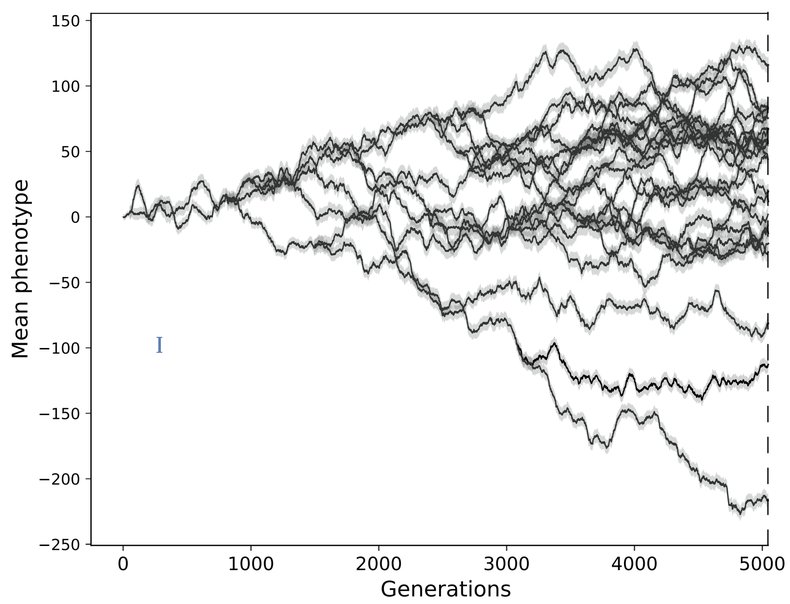
Simulating different scenarios

Neutral trait
No fitness function.

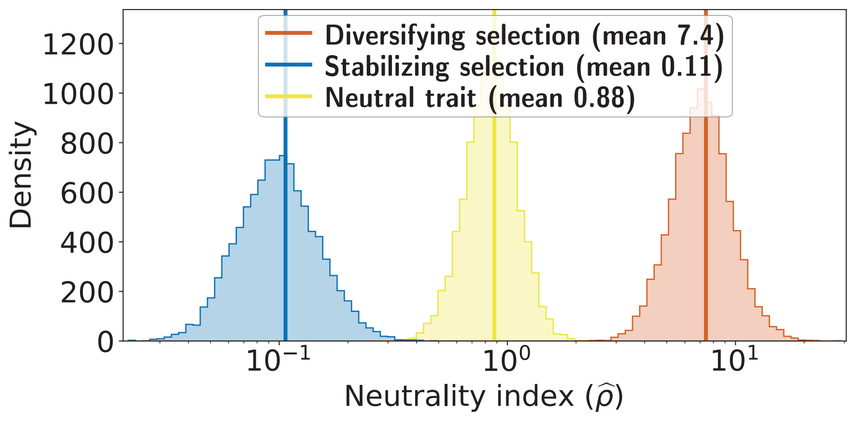
Stabilizing selection
An optimal value for the trait

Diversifying selection
An optimal value for the trait, changing randomly.

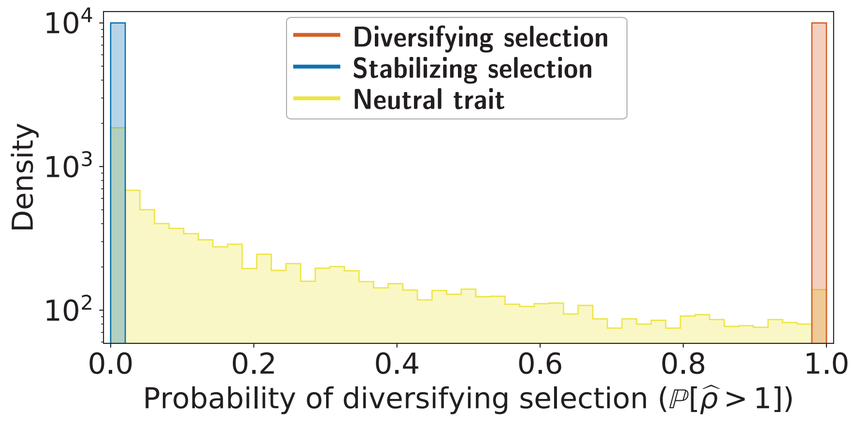
Running simulations along a phylogeny



Neutrality index under different scenarios



Test of selection under different scenarios



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In mammals, brain size and body mass are evolving under diversifying selection