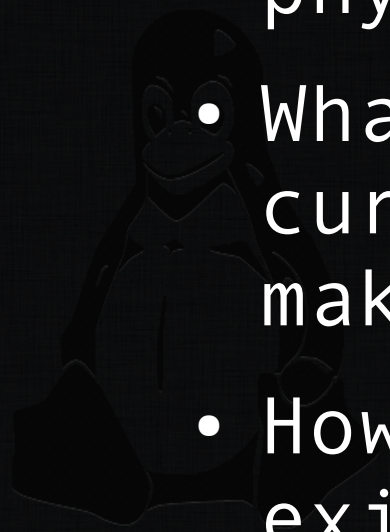
PhD project overview

TECE meeting 2016-09-26

www.github.com/richelbilderbeek/Science

PhD project question

What if reproductive isolation takes time to establish?



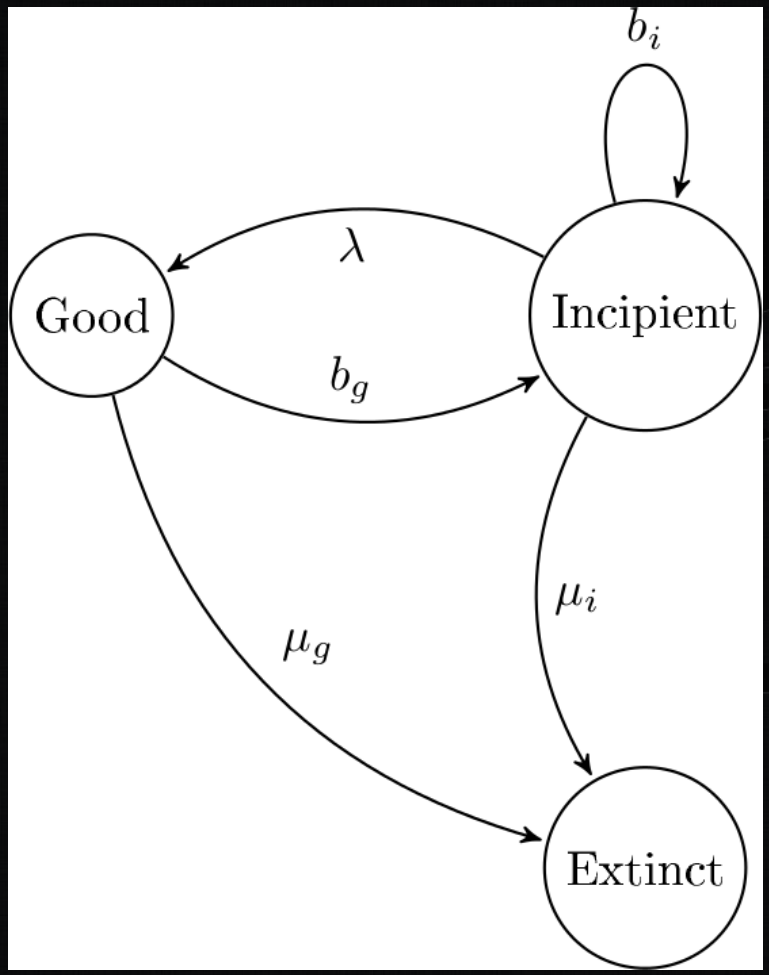
- In the context of phylogenetics
- What errors do our current tools make?
- How good are existing lineage-based models?
- Can we make mechanistic models?

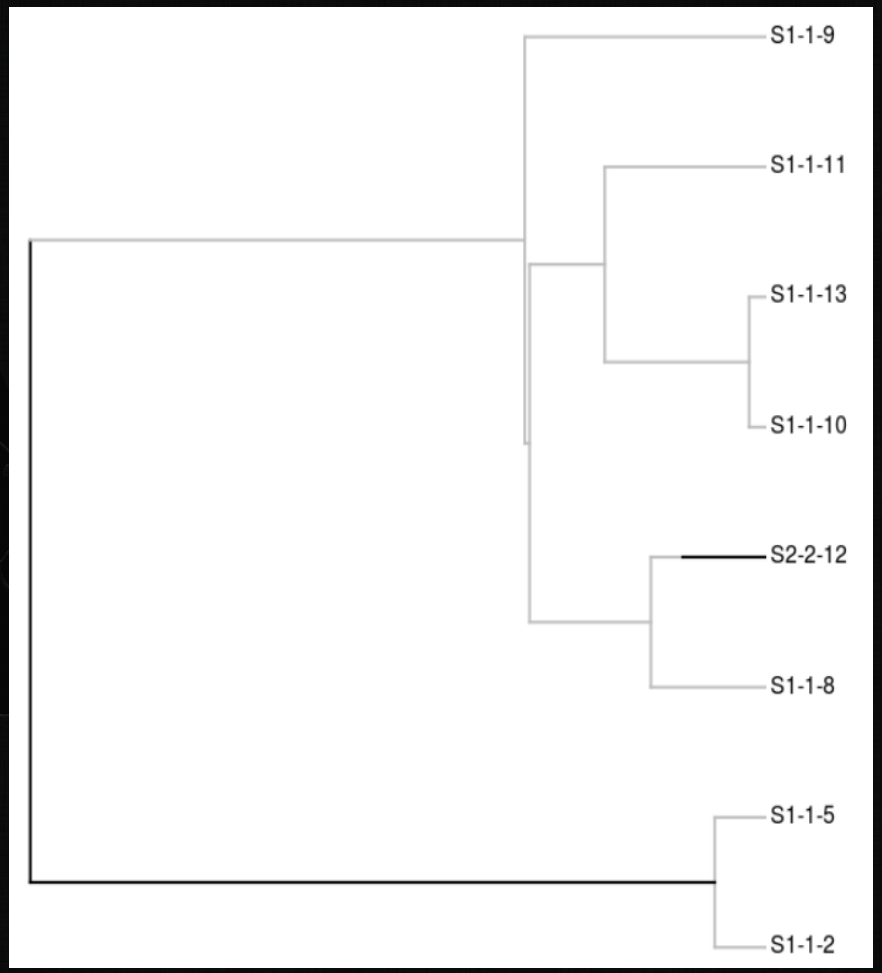
Project 1: BD on PBD

If reproductive isolation takes time to establish, what is the error made today in inferring a phylogeny?

- Under which conditions does it hurt?
- Are these conditions relevant and/or realistic?
- Tool used: BEAST2, assumes speciation is instantaneous

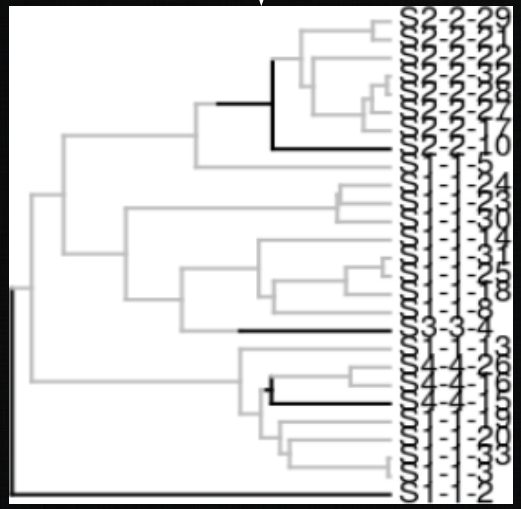
PBD model

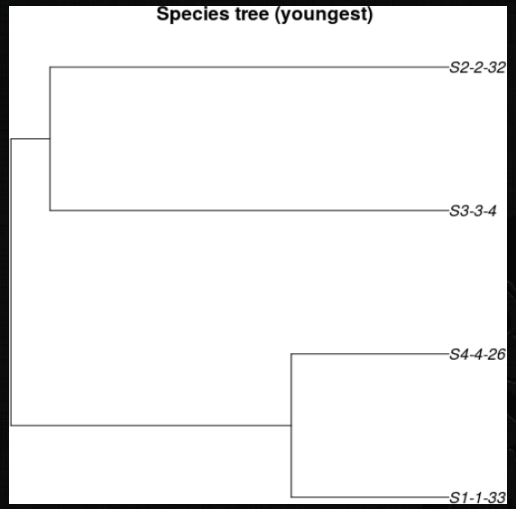


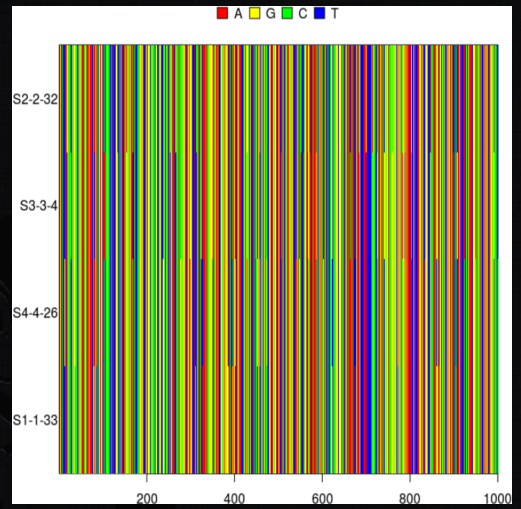


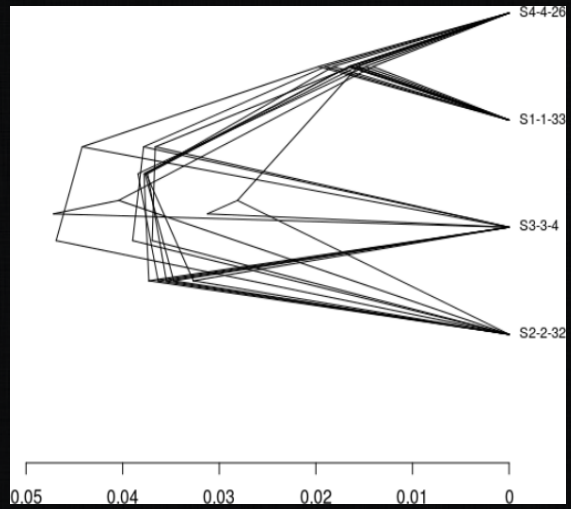
Etienne, Rampal S., and James Rosindell. "Prolonging the past counteracts the pull of the present: protracted speciation can explain observed slowdowns in diversification." Systematic Biology (2011): syr091.

Approach







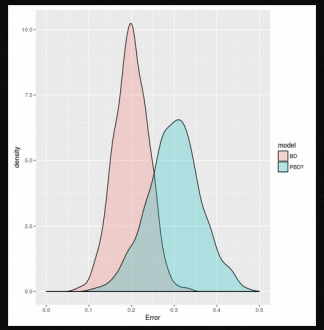


Simulate an incipient species tree

Sample species trees

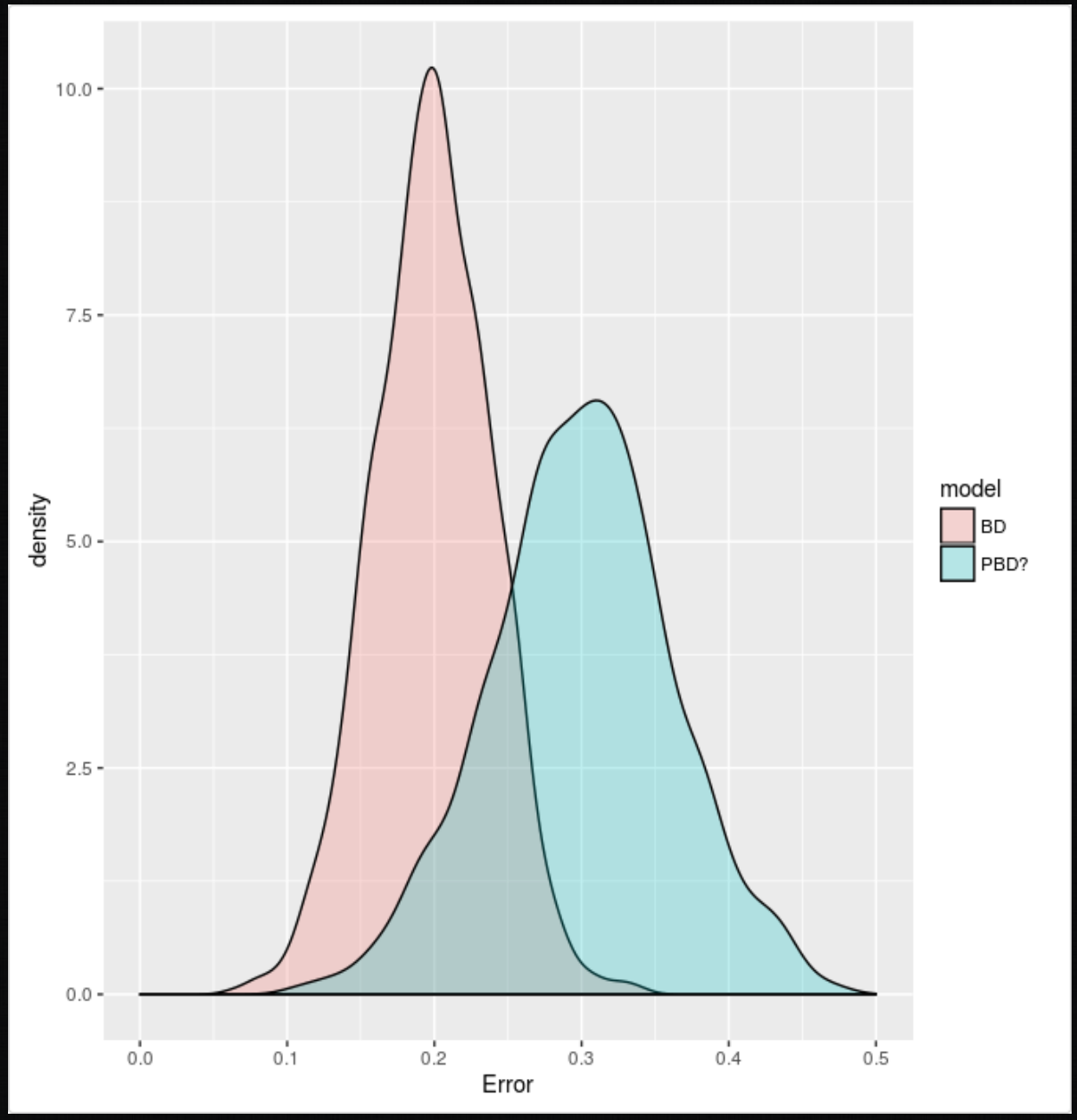
Simulate DNA alignments

Infer species tree posterior

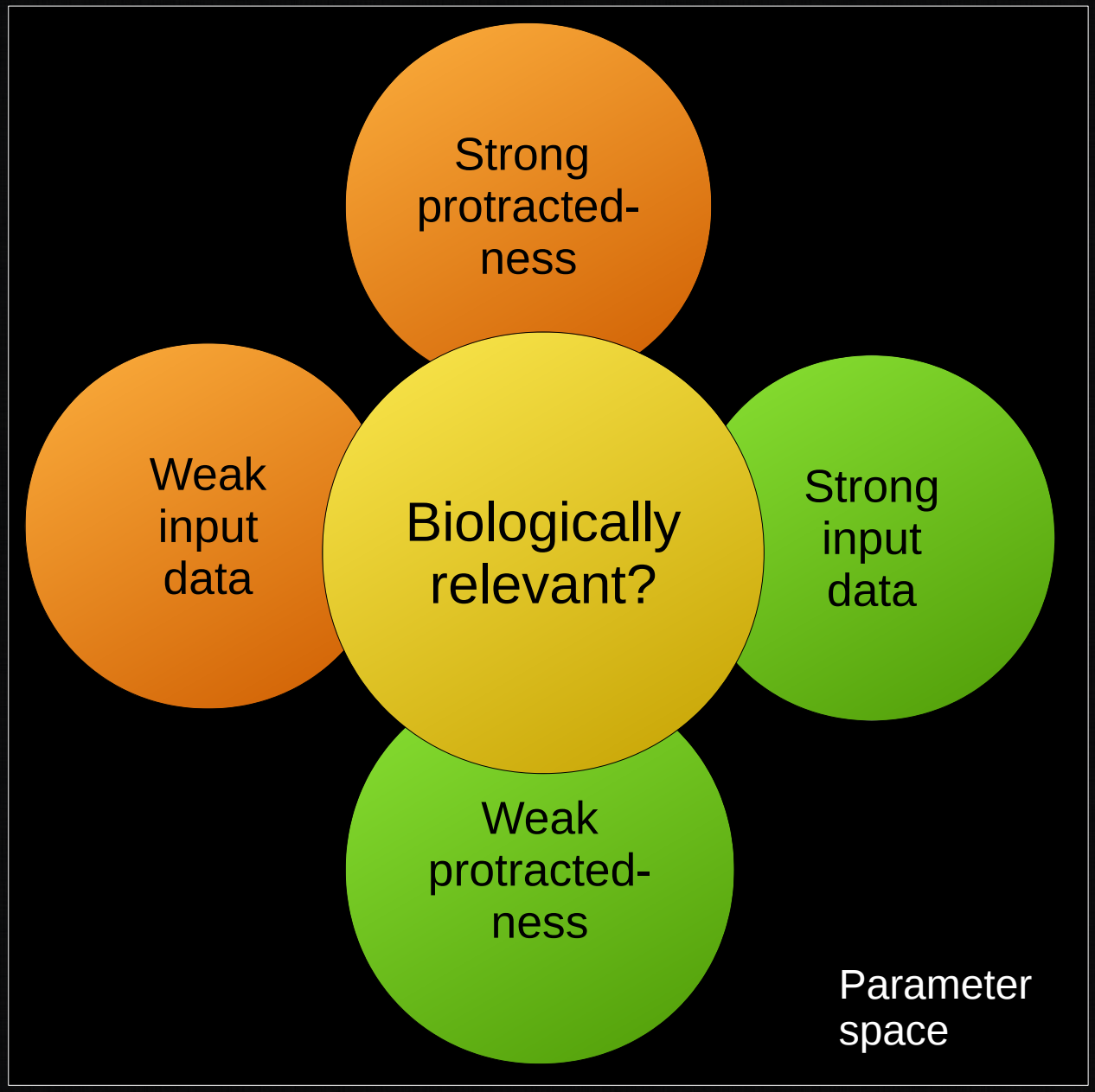


Measure difference/error

Goal



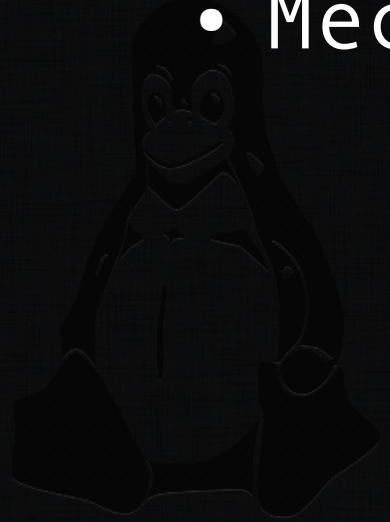
Predictions



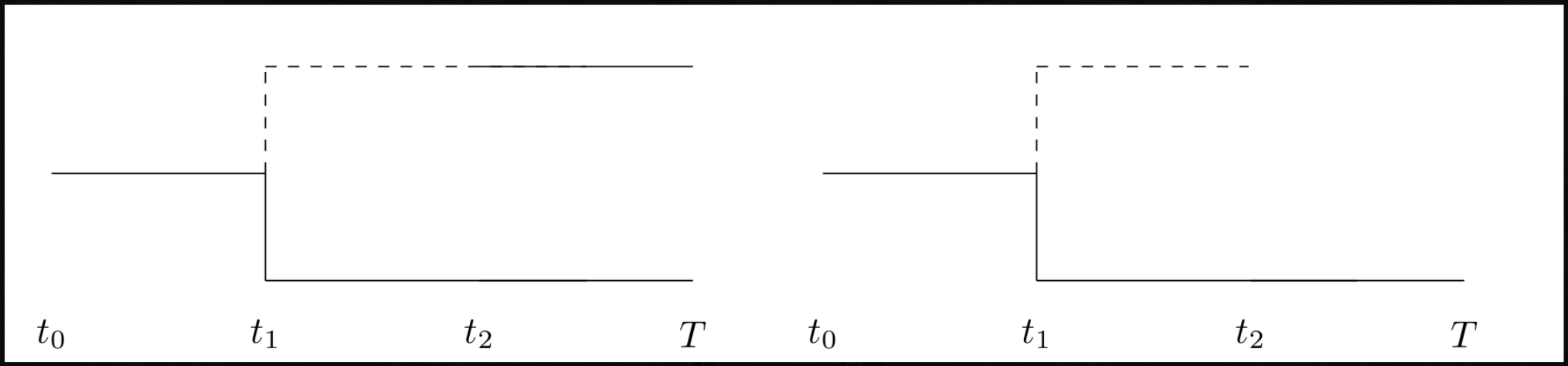
Project 2: phylogenesis

If reproductive isolation in nature takes time to establish, what kind of phylogenies do we expect?

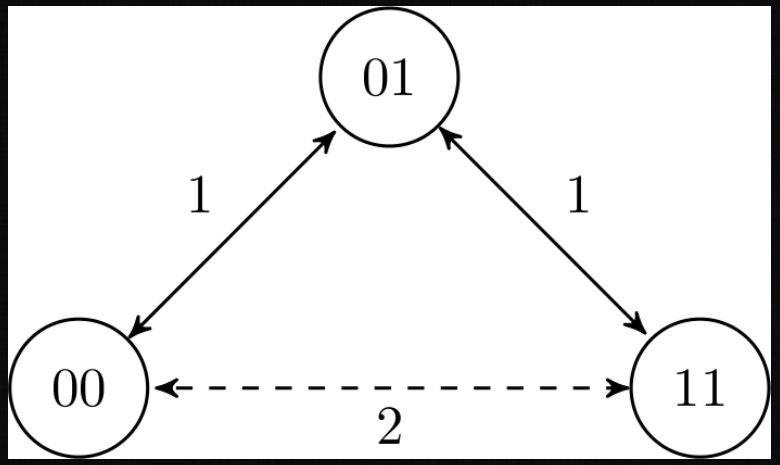
- Lineage-based
- Mechanistic

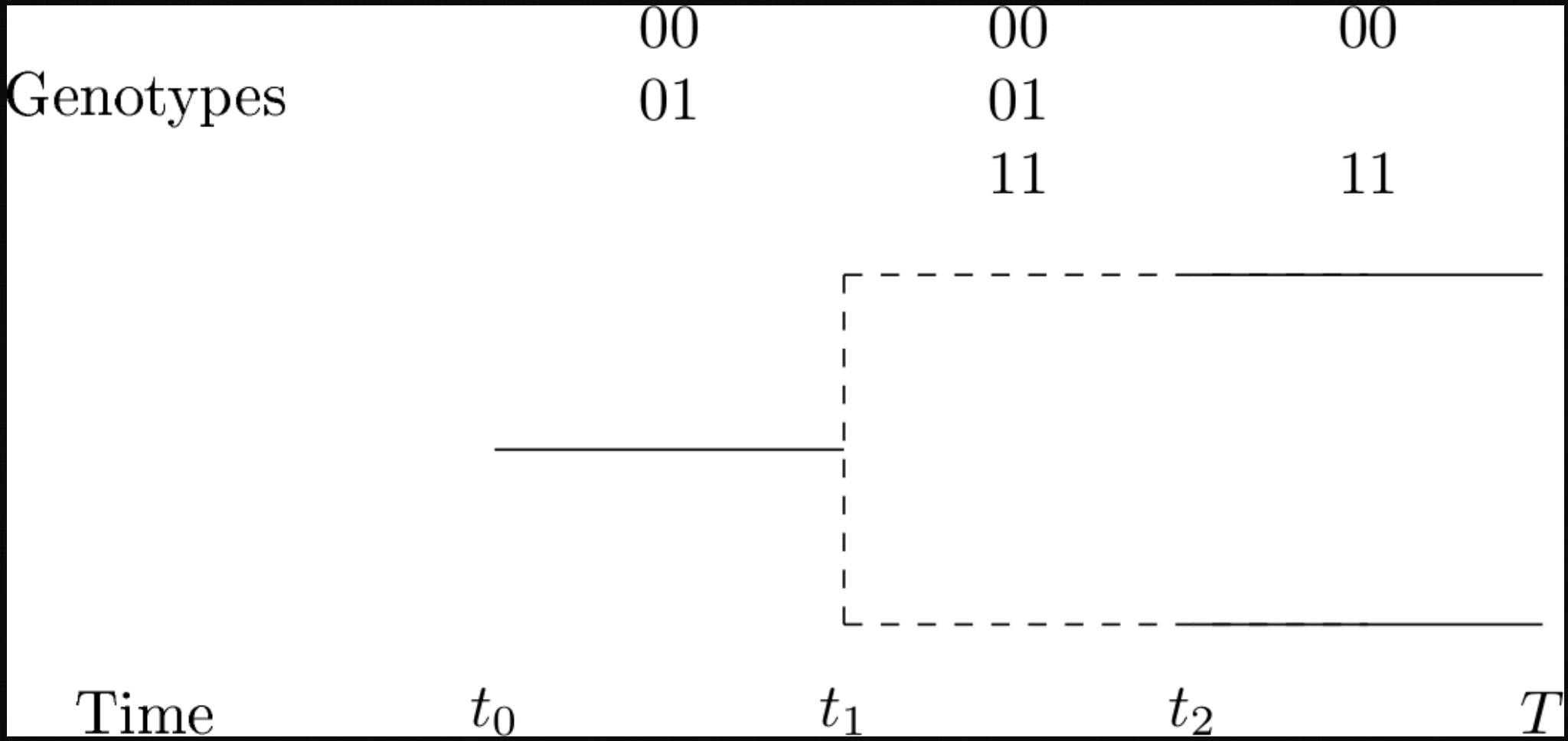


Interesting phylogenies

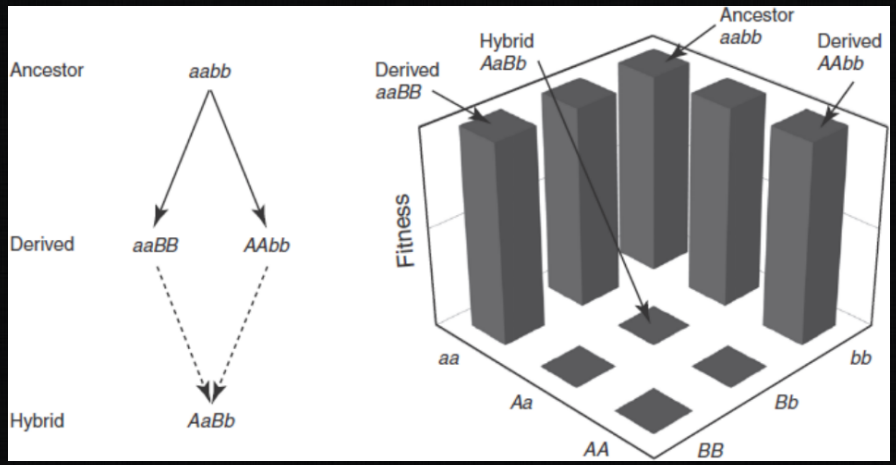


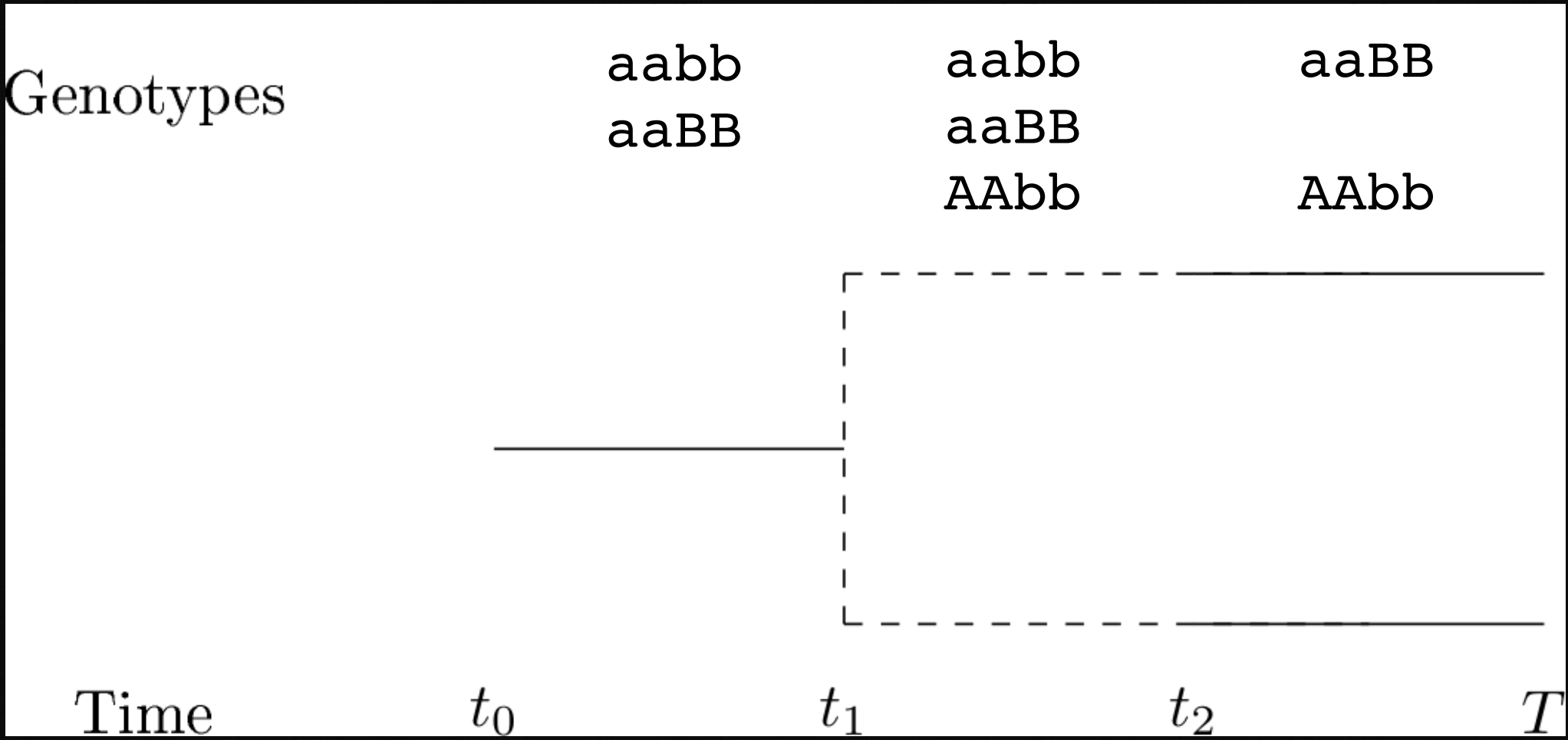
- Allopatric, peripatric, sympatric?
- What happens at t1 and t2?



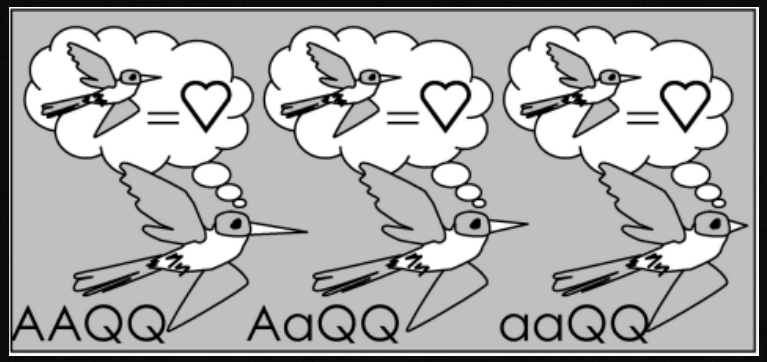


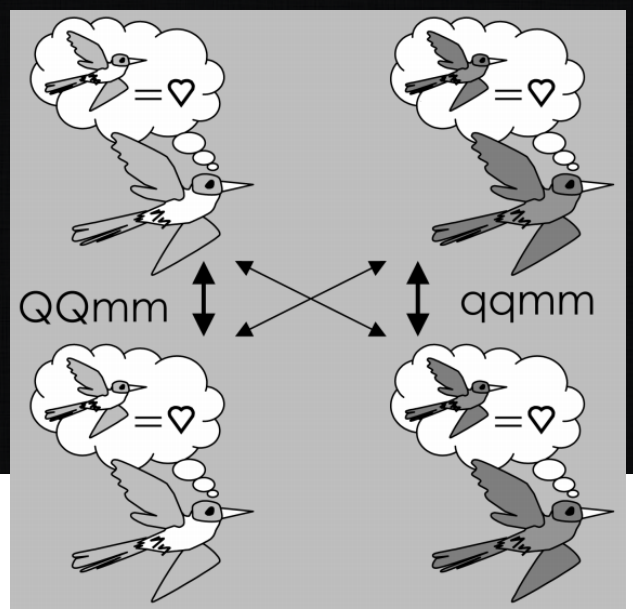
Mallet J (2008) A species definition for the Modern Synthesis. Trends Ecol Evol 10: 294–299.

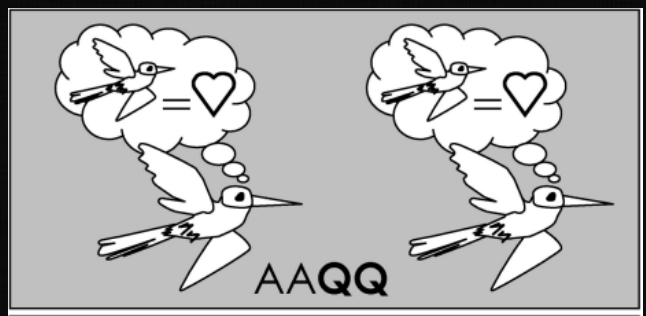


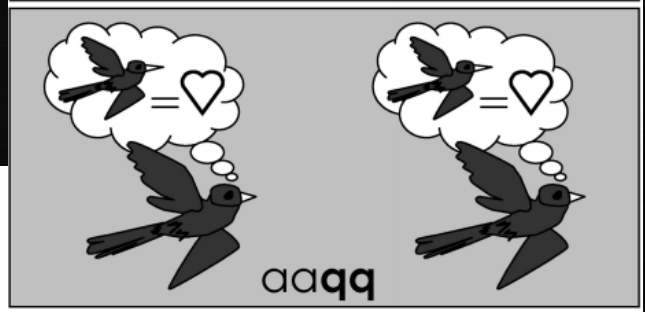


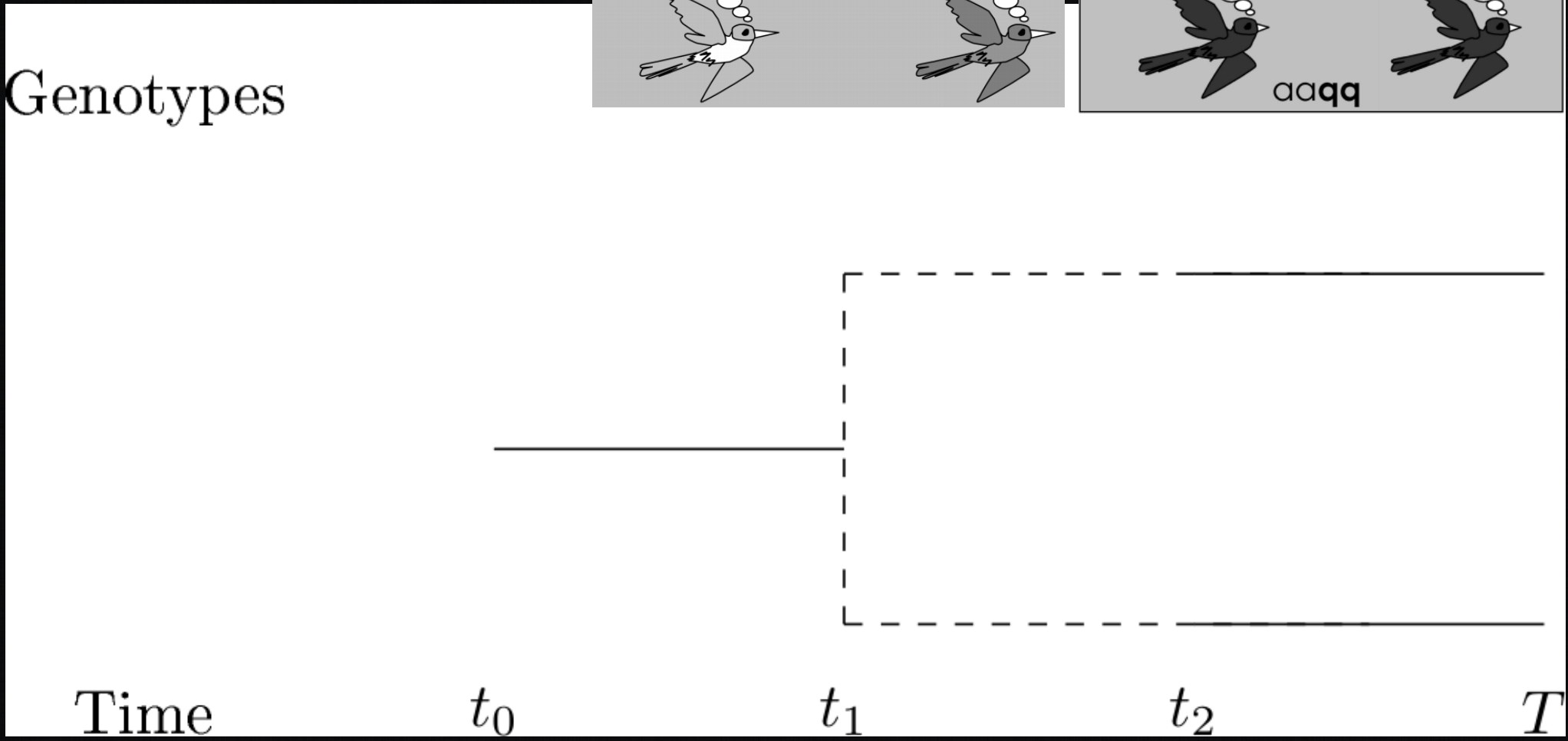
Gavrilets, Sergey. Fitness landscapes and the origin of species (MPB-41). Princeton, NJ: Princeton University Press, 2004. Part 2: 'The Bateson-Dobzhansky-Muller Model'









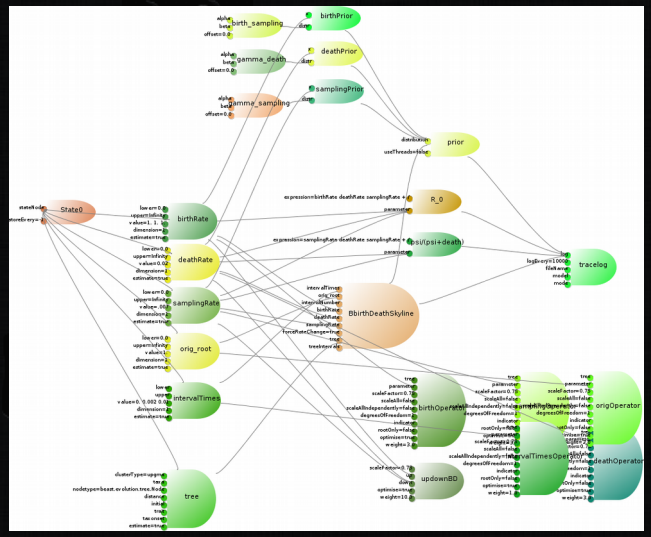


Van Doorn, G. S., & Weissing, F. J. (2001). "Ecological versus sexual selection models of sympatric speciation." Selection, 2, 17 - 40.

Project 3: time

If reproductive isolation in nature takes time to establish, how well can we infer it?

- Put PBD model in phylogenetic tool



BEAST 2: A Software Platform for Bayesian Evolutionary AnalysisBouckaert, R., Heled, J., Kühnert, D., Vaughan, T., Wu, C-H., Xie, D., Suchard, MA., Rambaut, A., & Drummond, A. J. (2014). BEAST 2: A Software Platform for Bayesian Evolutionary Analysis. PLoS Computational Biology, 10(4), e1003537. doi:10.1371/journal.pcbi.1003537

Project 4: question

If reproductive isolation in nature takes time to establish, what could be a fourth research question?

- Unknown