The Biogeography of Speciation: new genomic insights about reinforcement using biological collections

Stephen A. Sefick

2016-12-02

Outline

Topic

Motivation

1. Speciation

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4. Transform our understanding of the relationship of biogeography with speciation

Types of speciation

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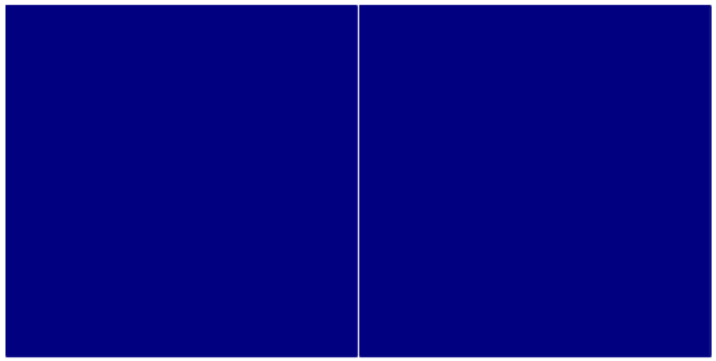

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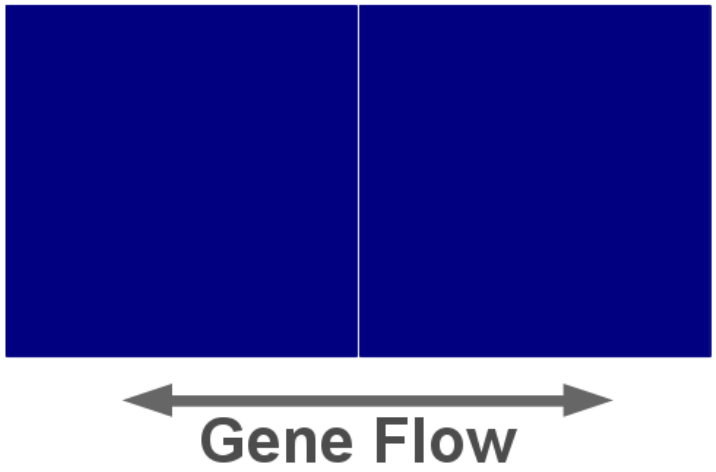

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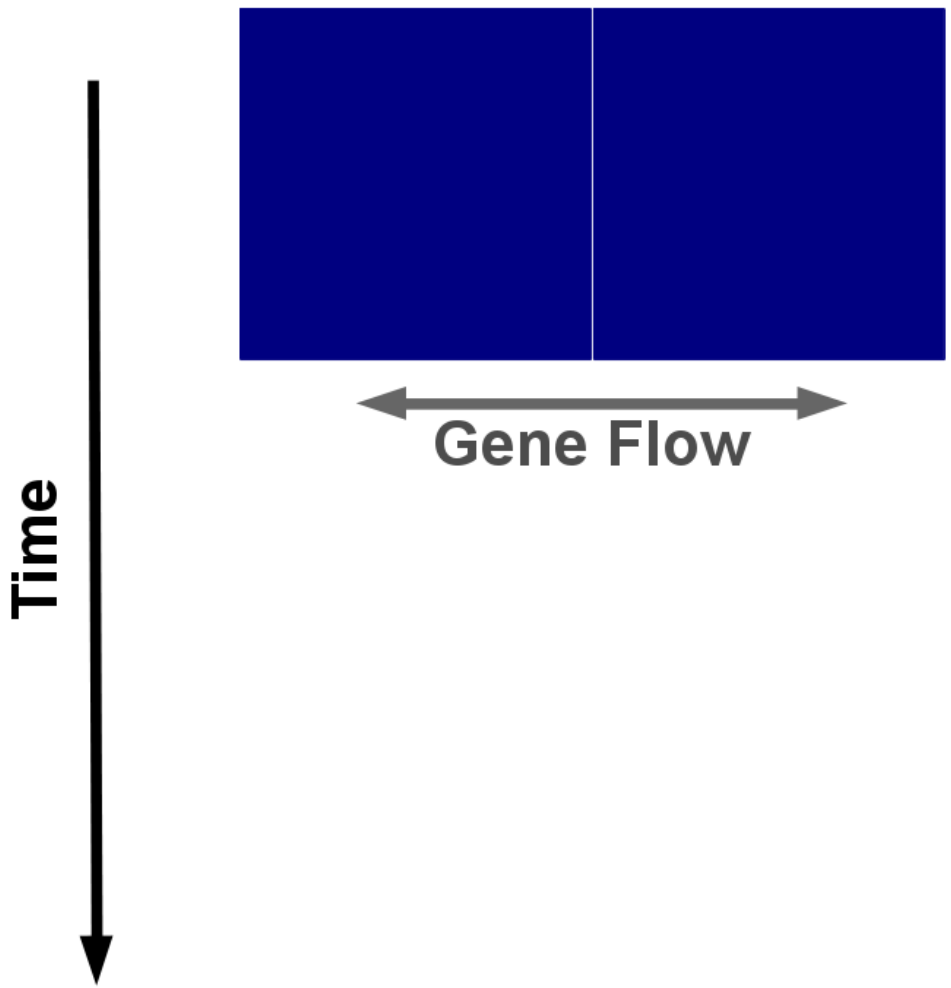

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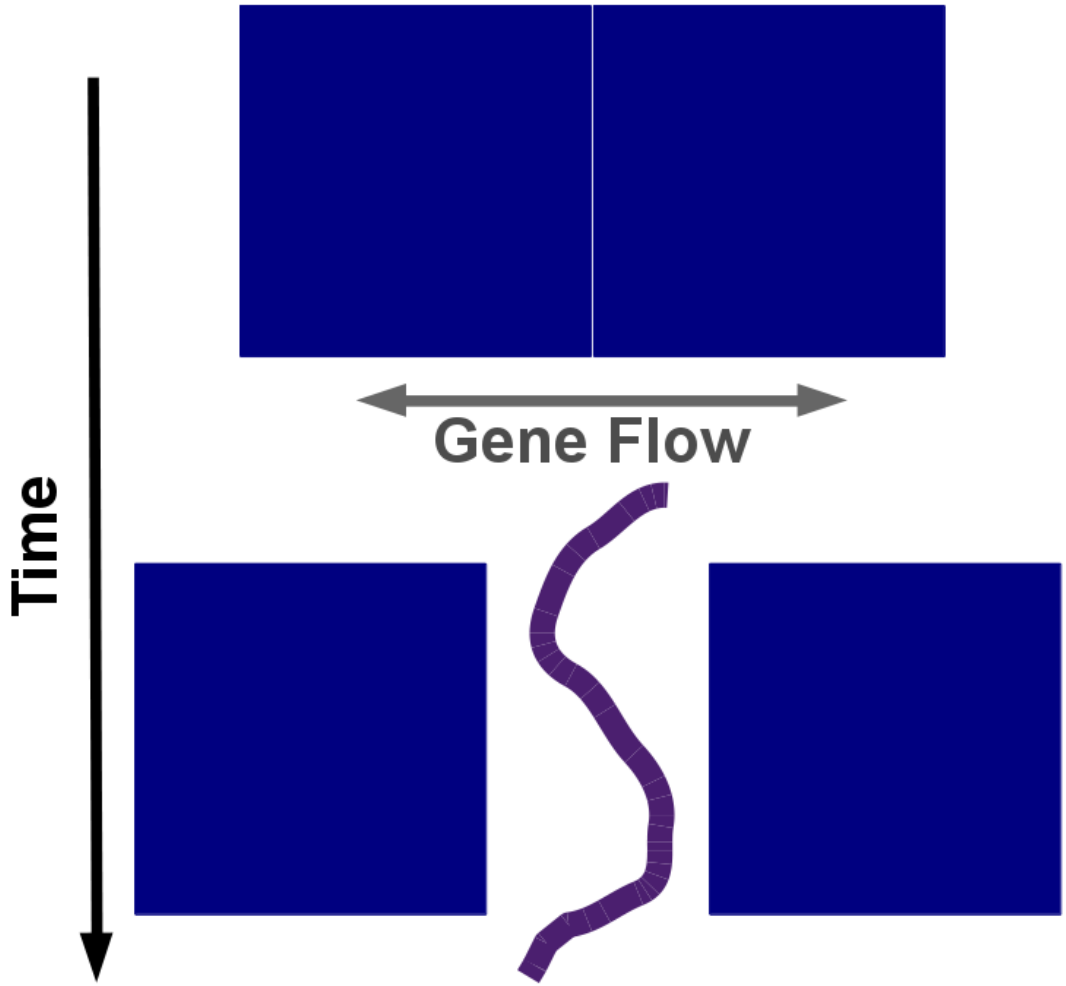

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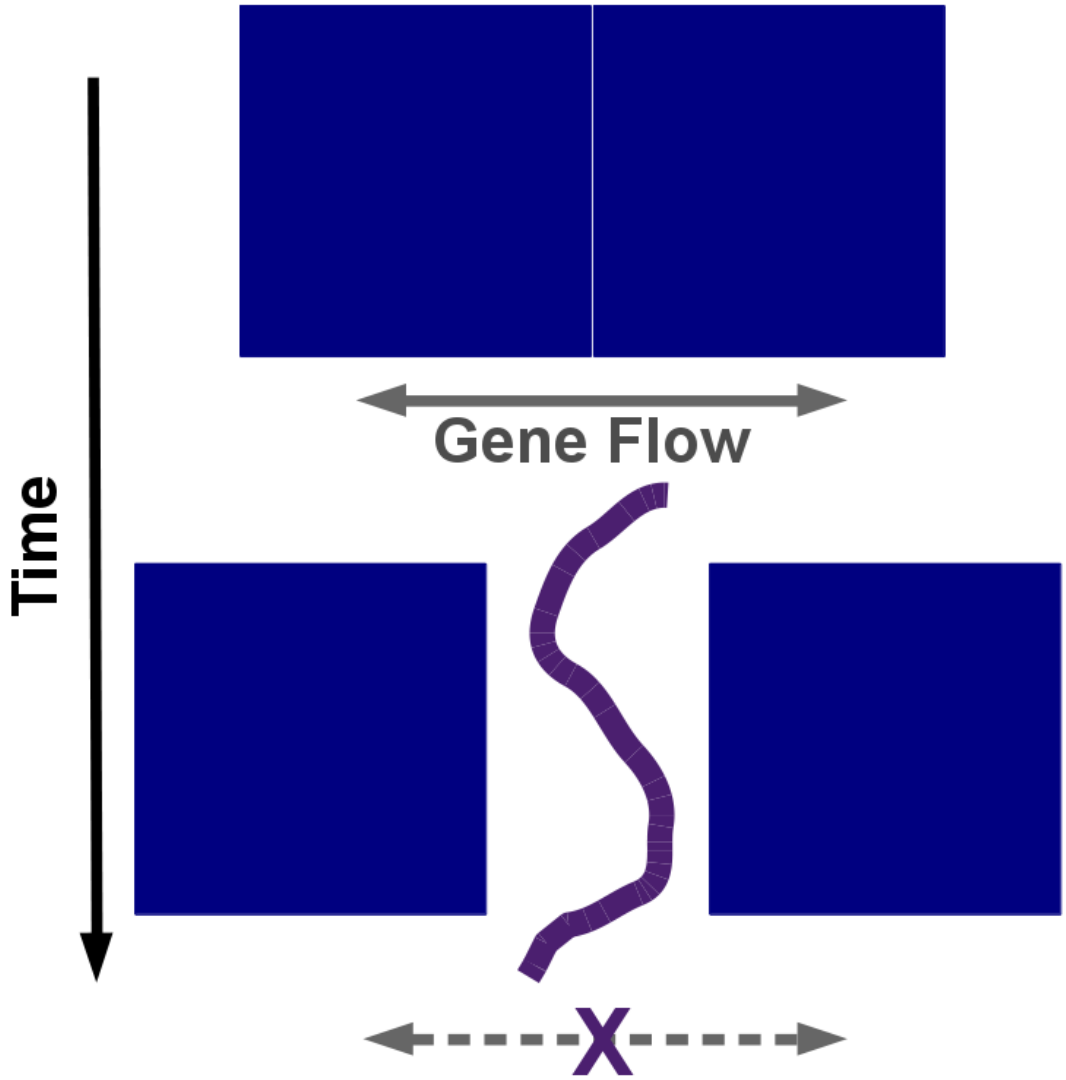

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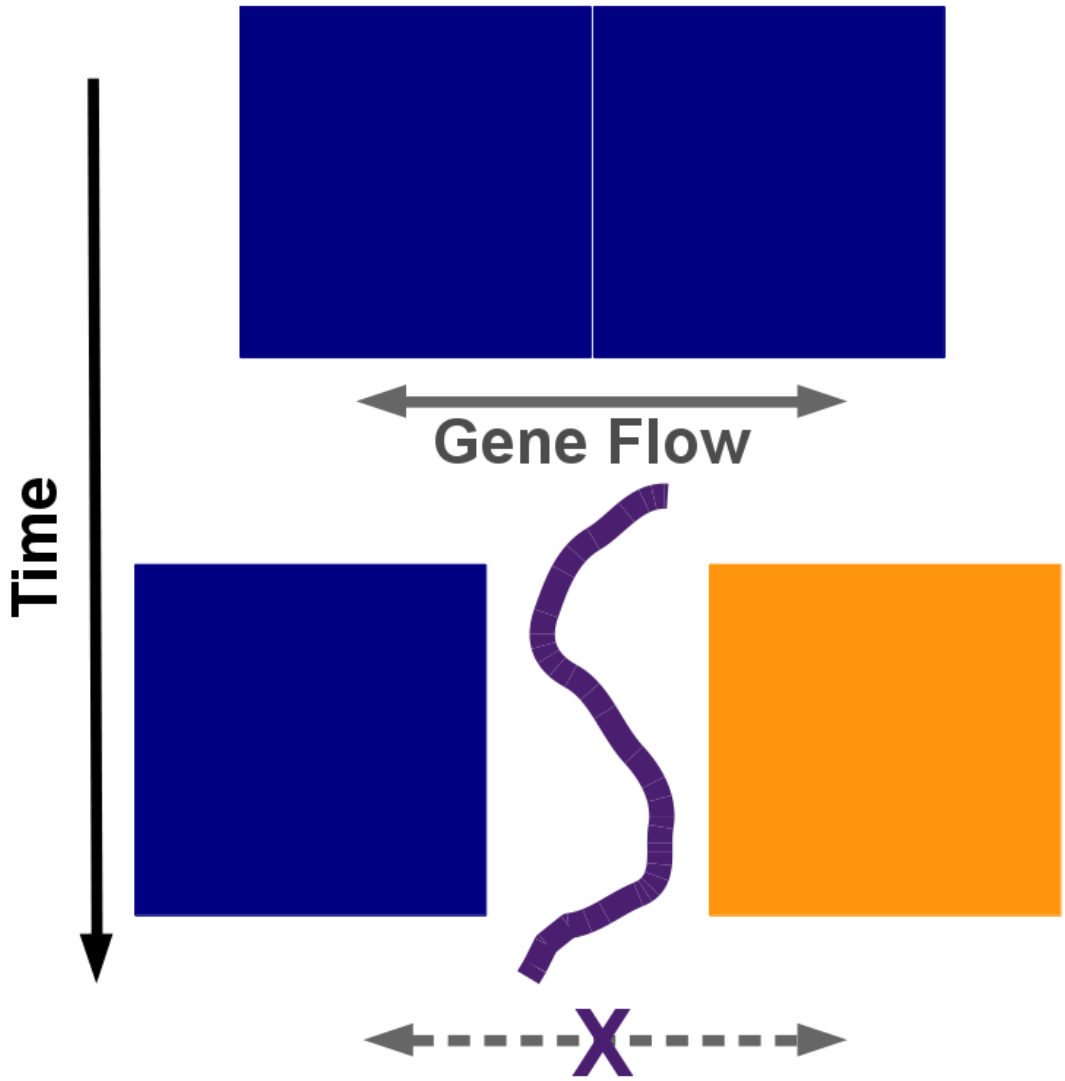

Types of speciation

2 main types of speciation in a biogeographic context

1. Allopatric Speciation
   - interupted species range (i.e., stream)
   - decreased migration and gene flow
   - 2 incipient species

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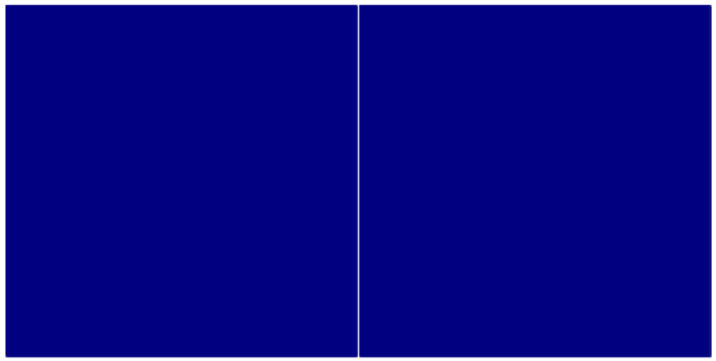

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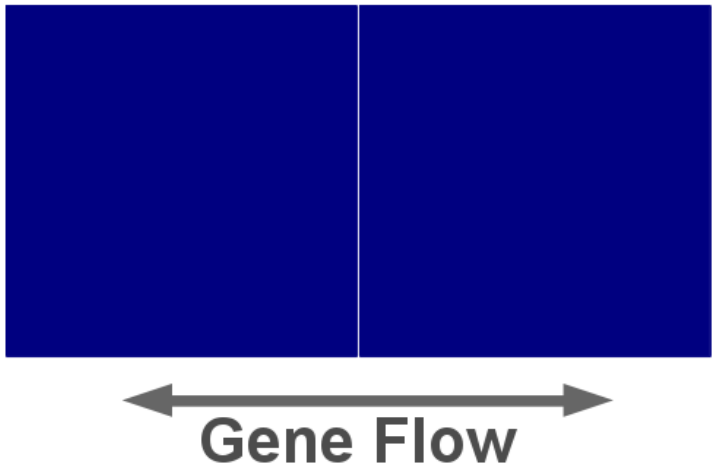

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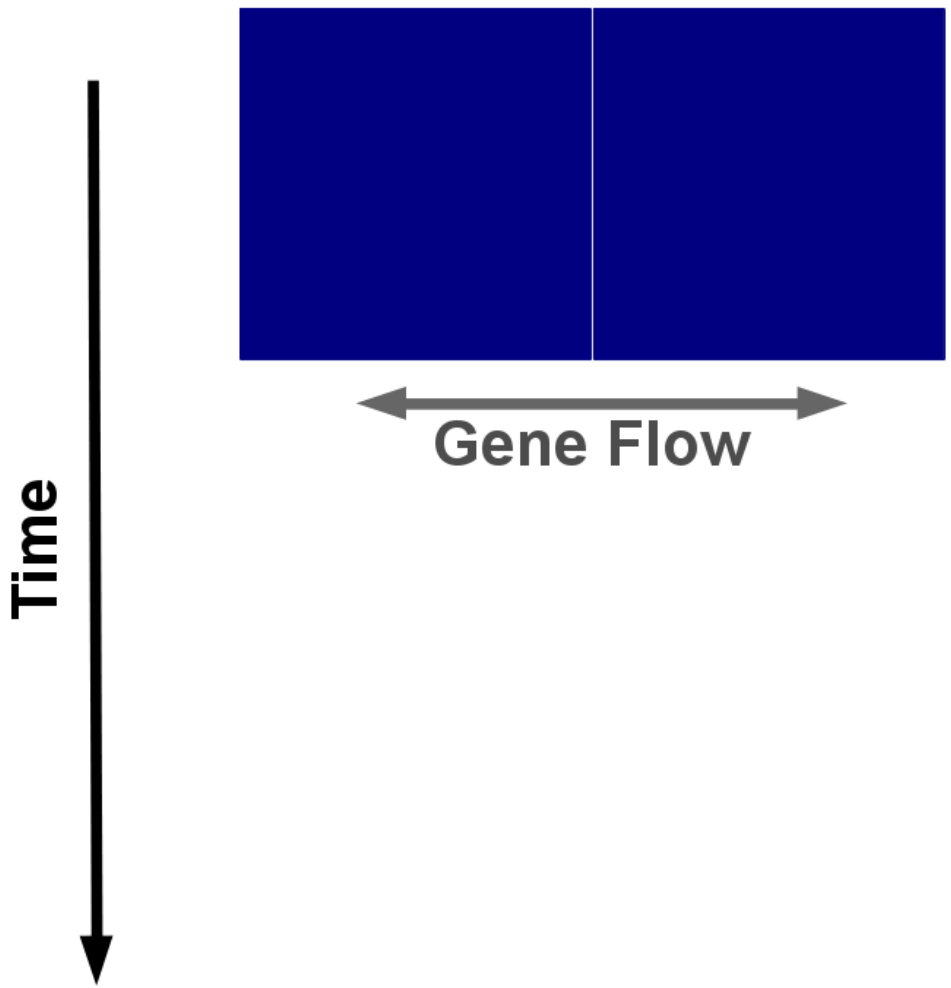

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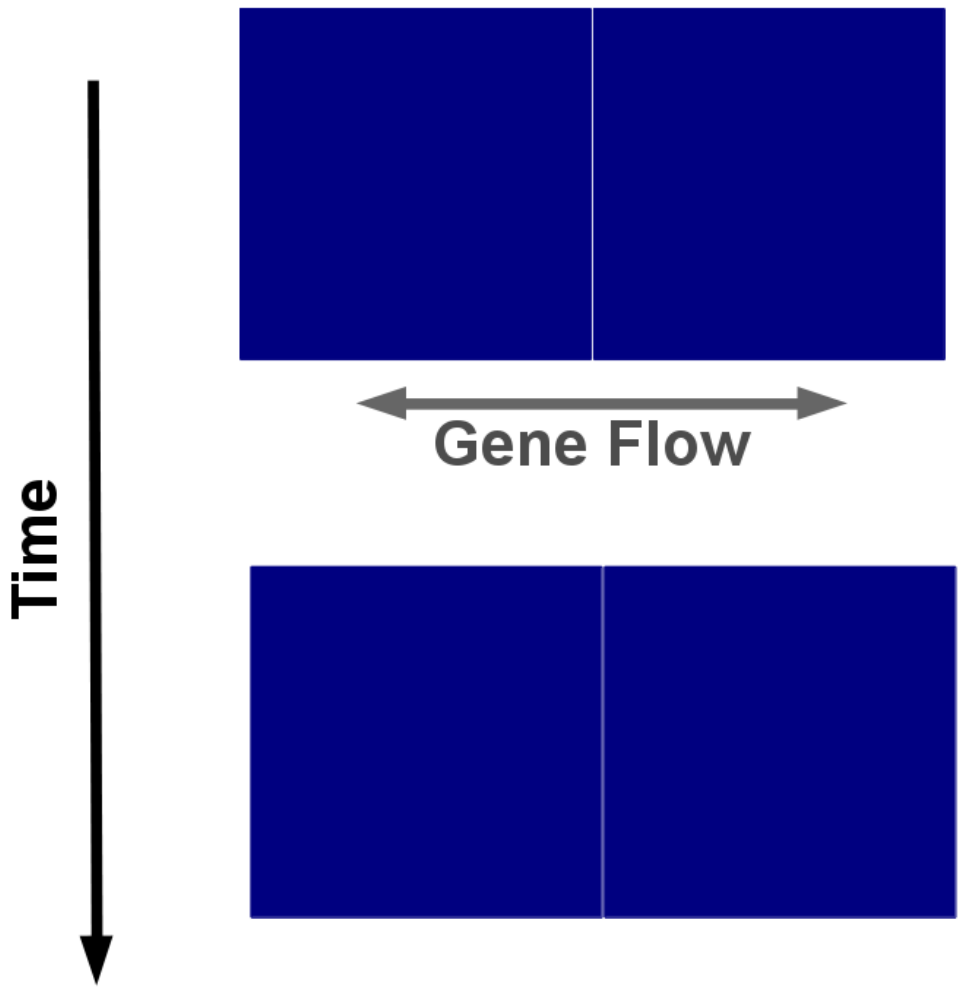

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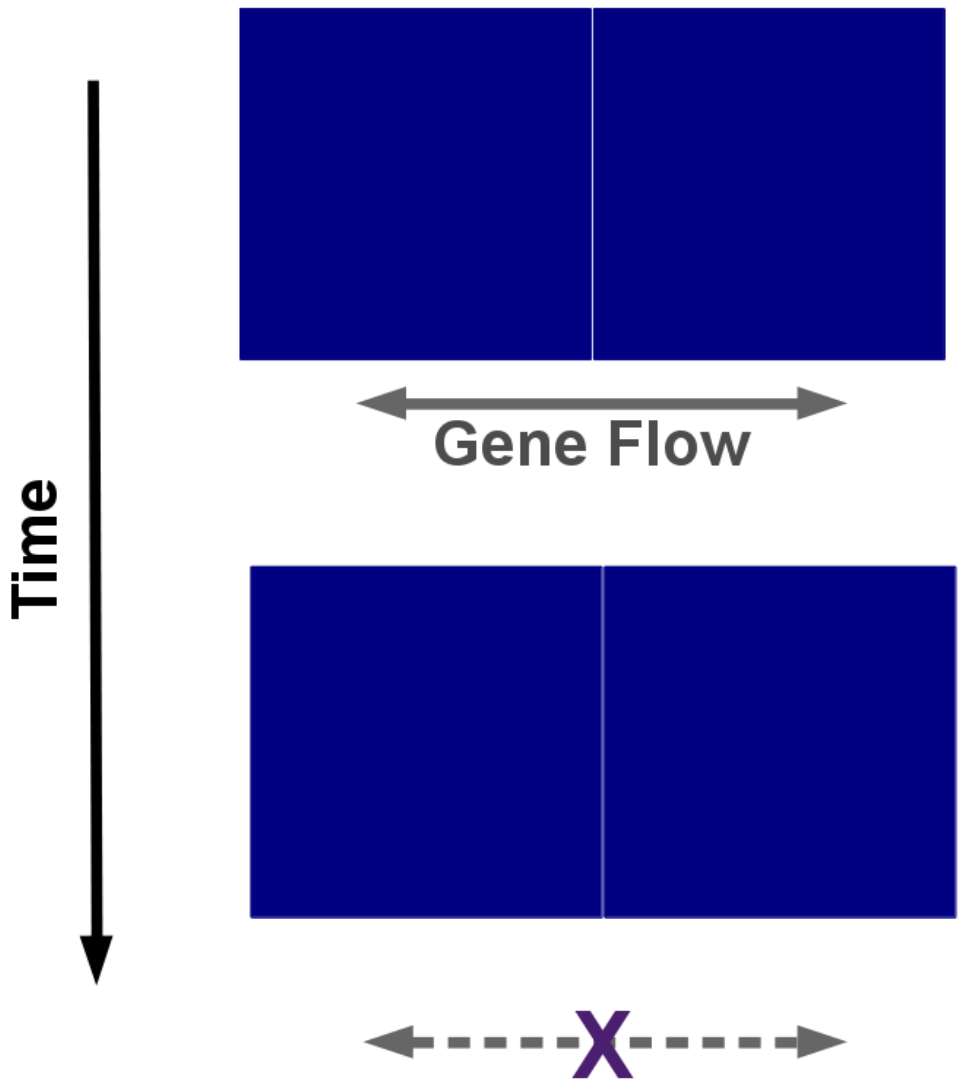

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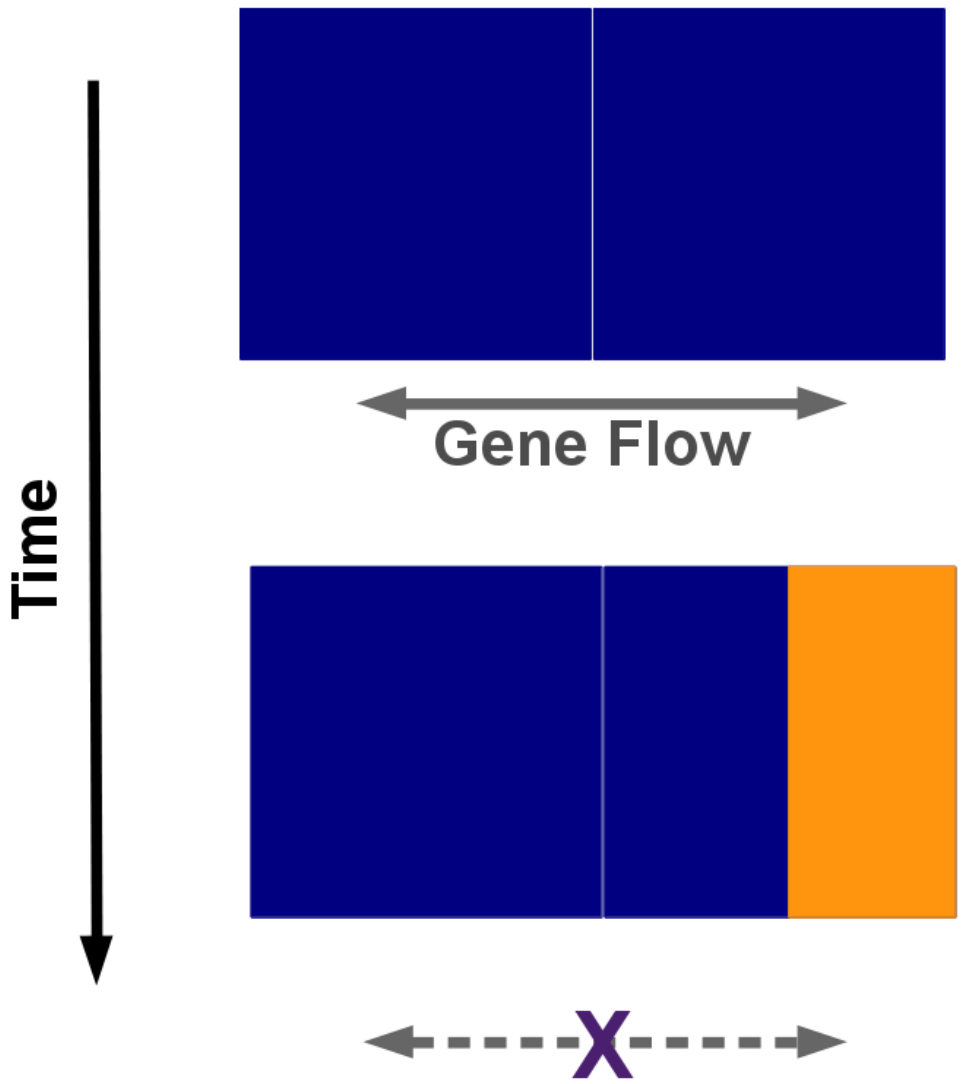

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   - Reinforcement recently shown to be important

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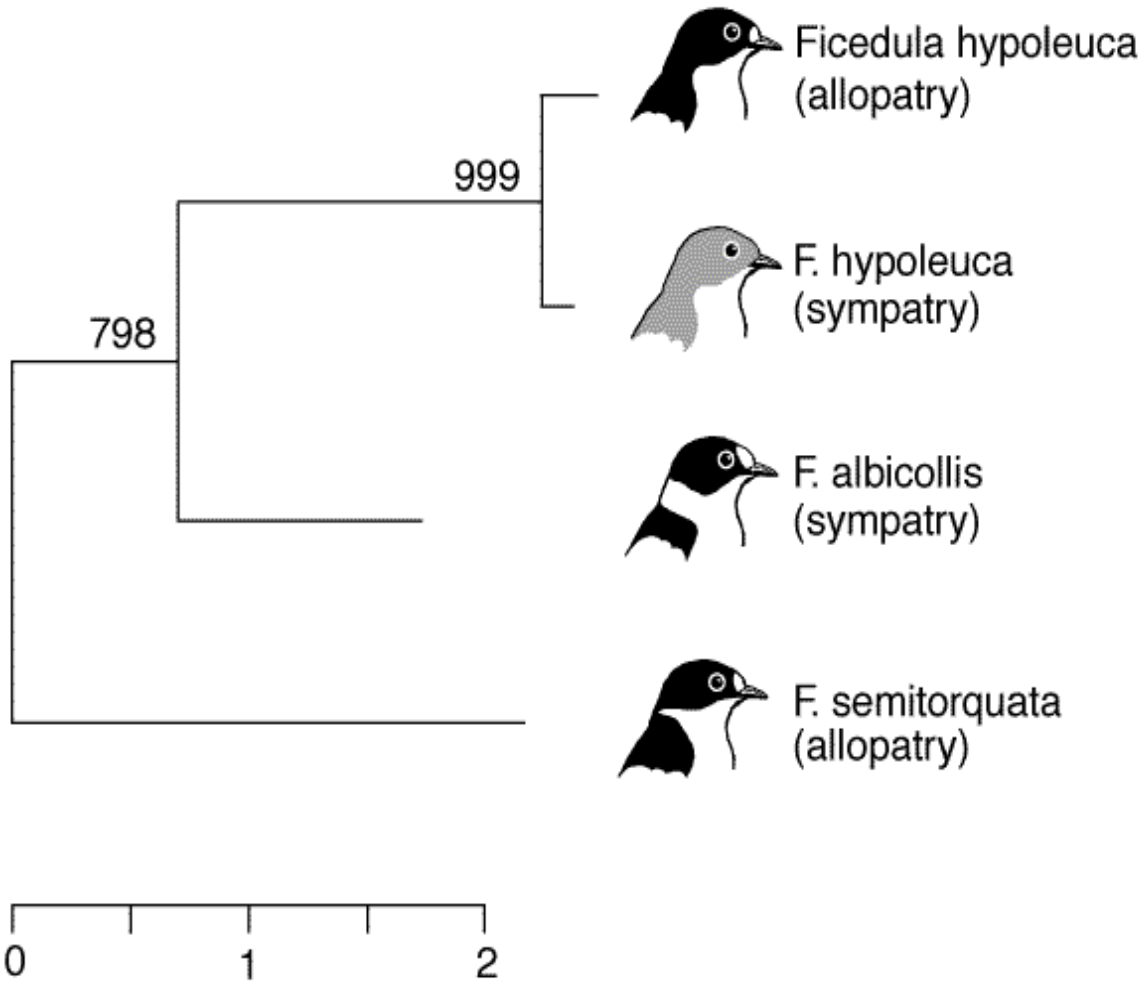
Flycatchers



Stre et al. 1997

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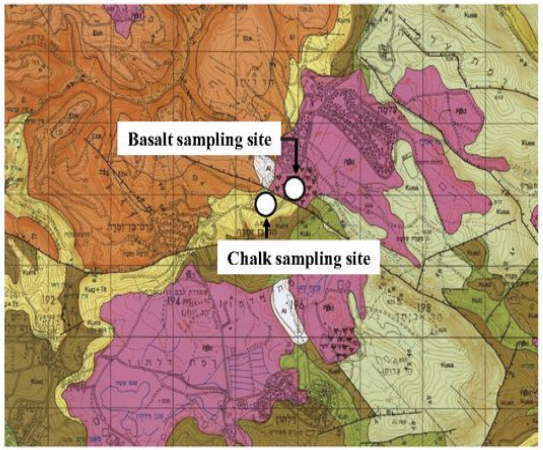
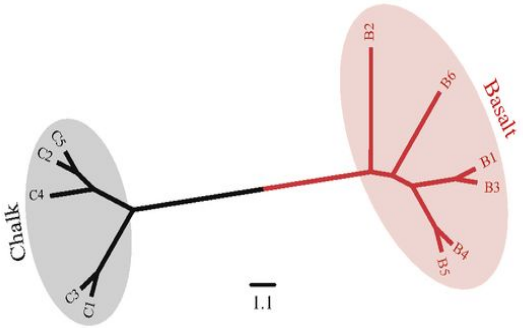
Naked mole rat





Li et al. 2015

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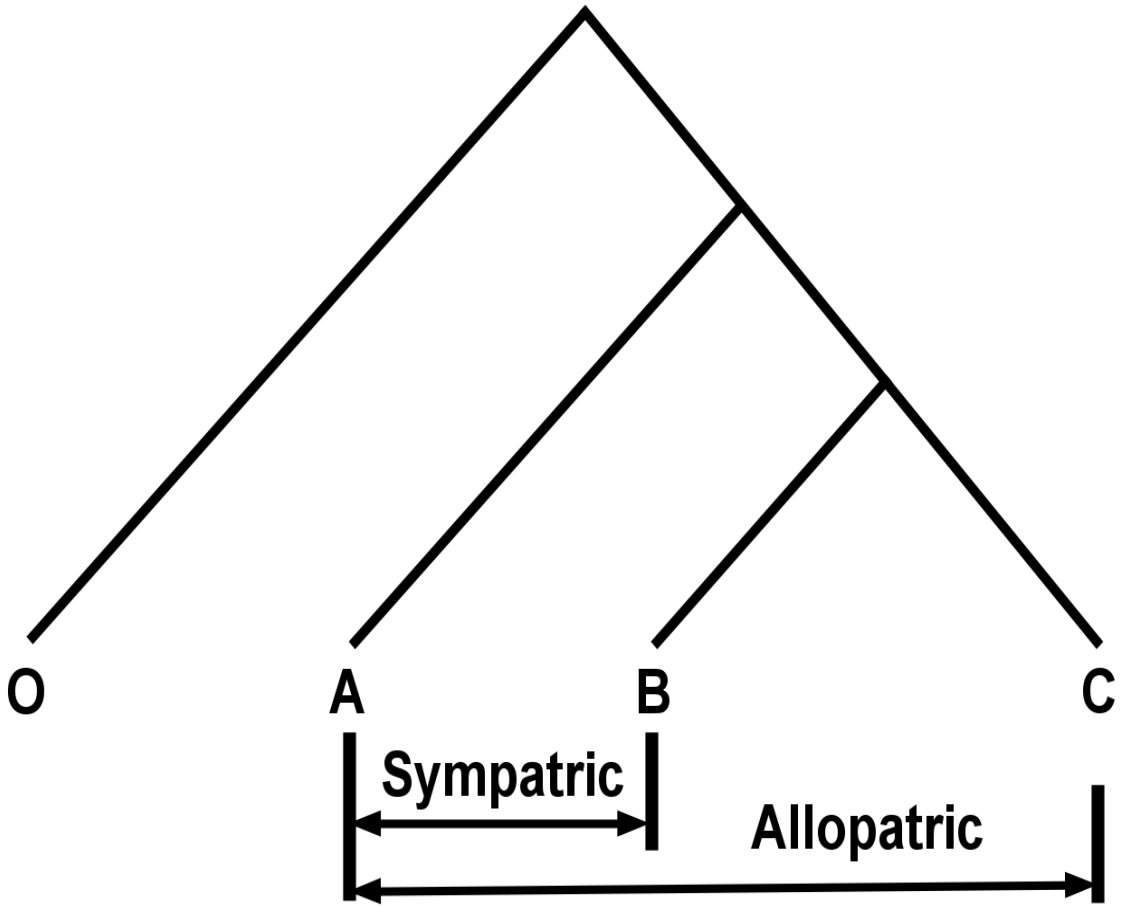
   - Ecological character displacement
4. 2 incipient species result

Biogeographic and phylogenetic test for reinforcement



Noor 1997

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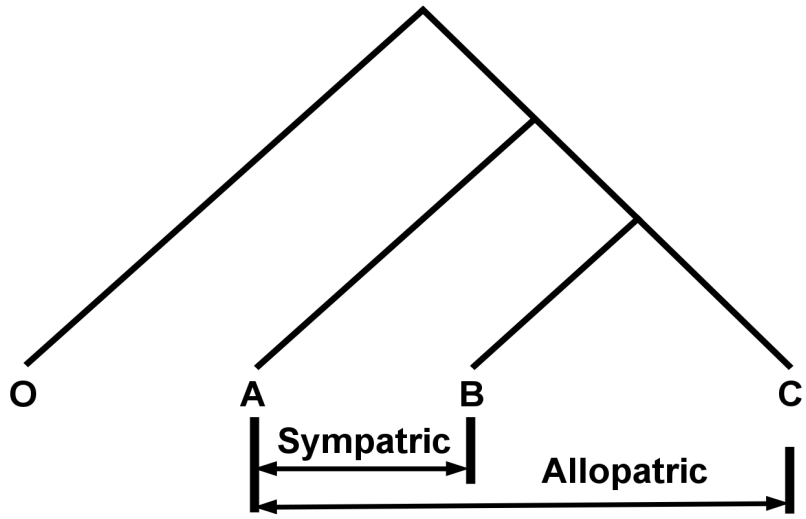

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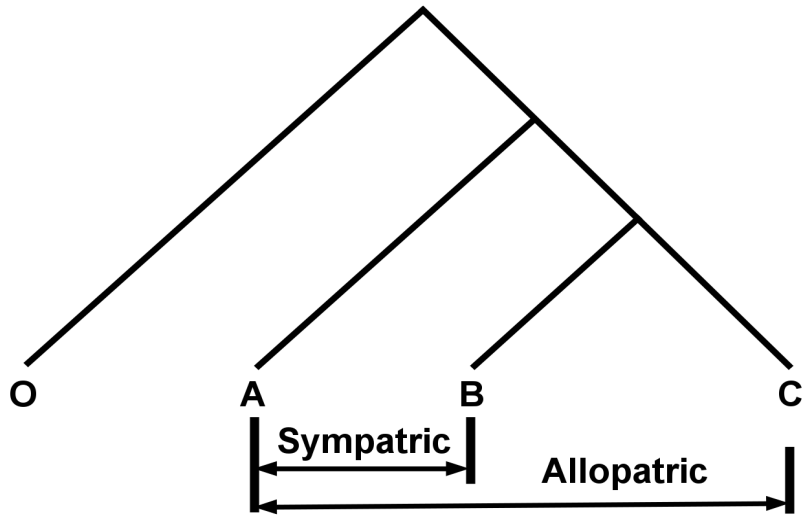
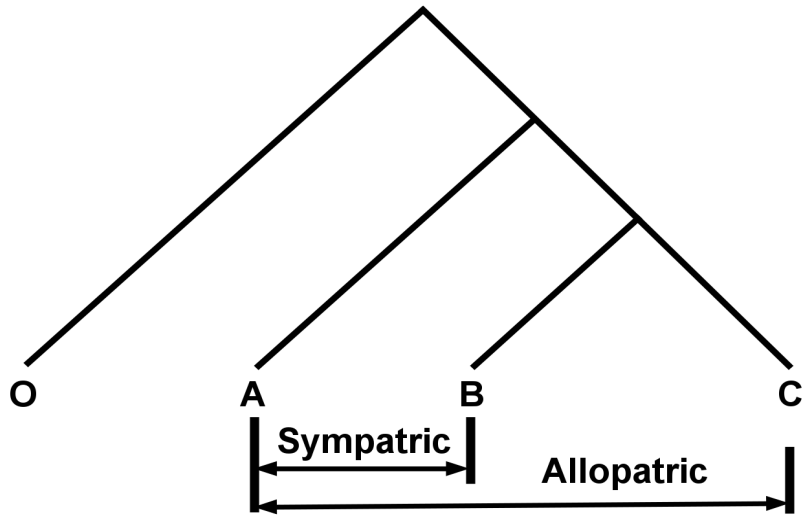


Biogeographic and phylogenetic test for reinforcement

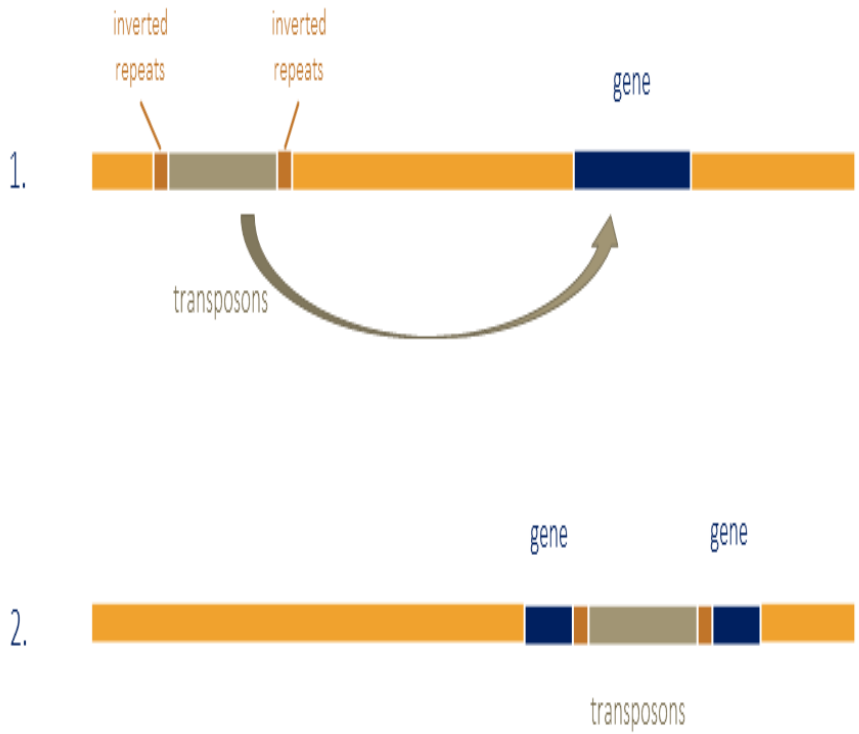
- Species B more often different from A than C
- Originally for reproductive isolation
- Logic of test can be applied to genetic variants



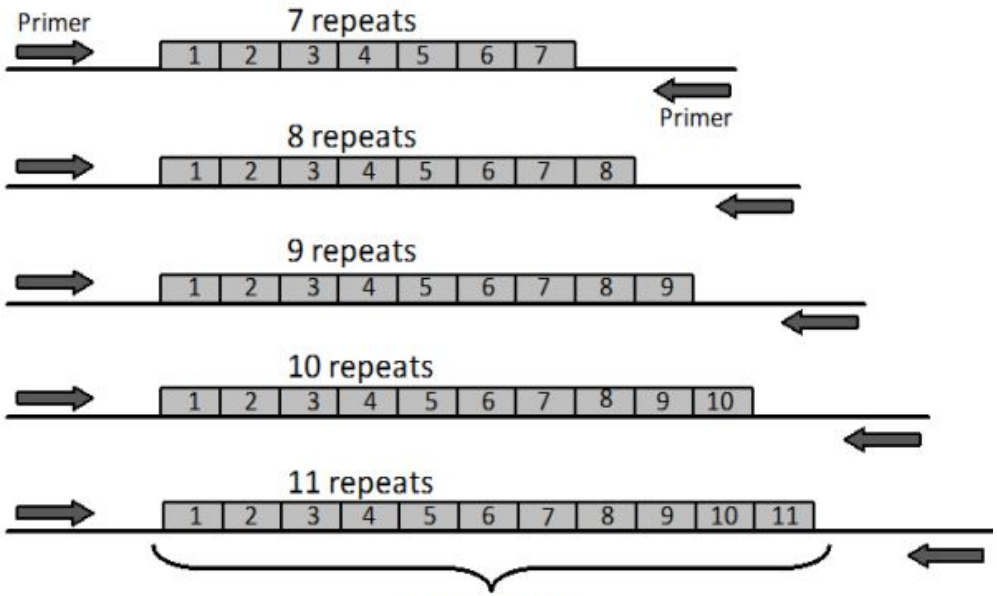
Genetic variants

- What exactly are genetic variants?

Genetic variants: Transposable elements



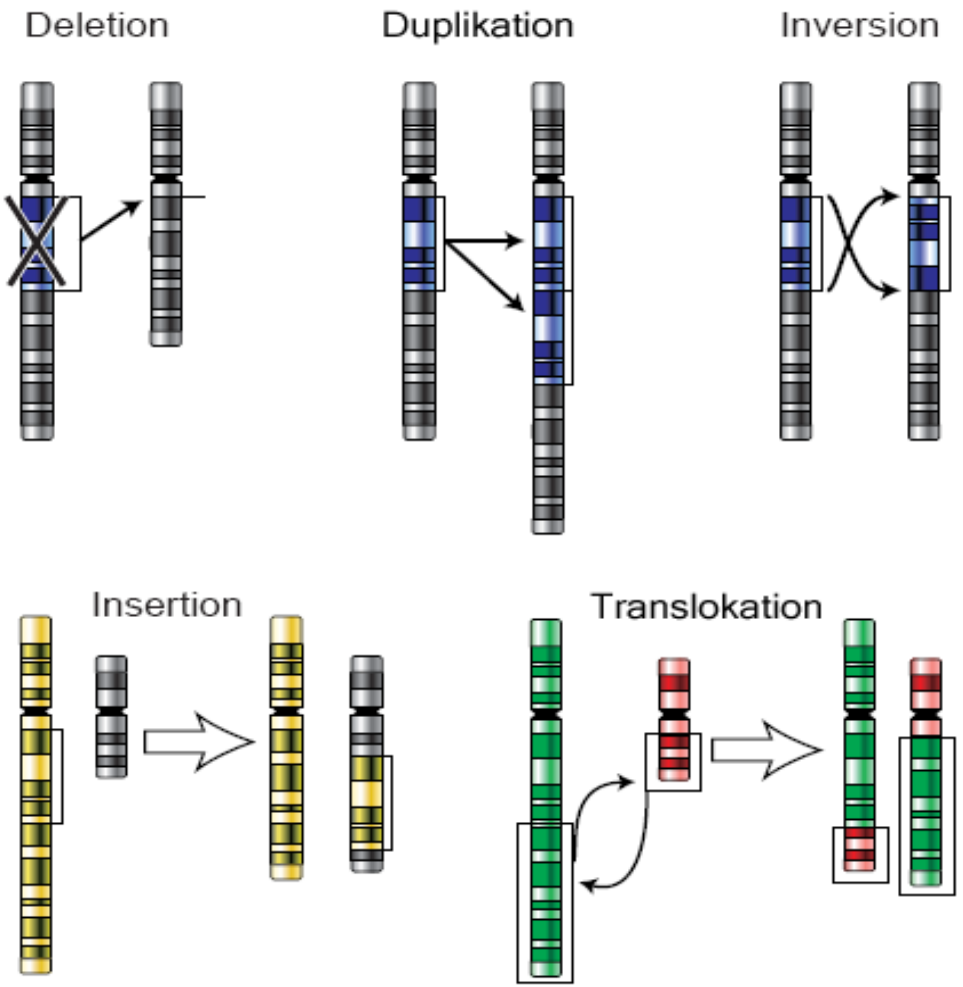
Genetic variants: Short tandem repeats



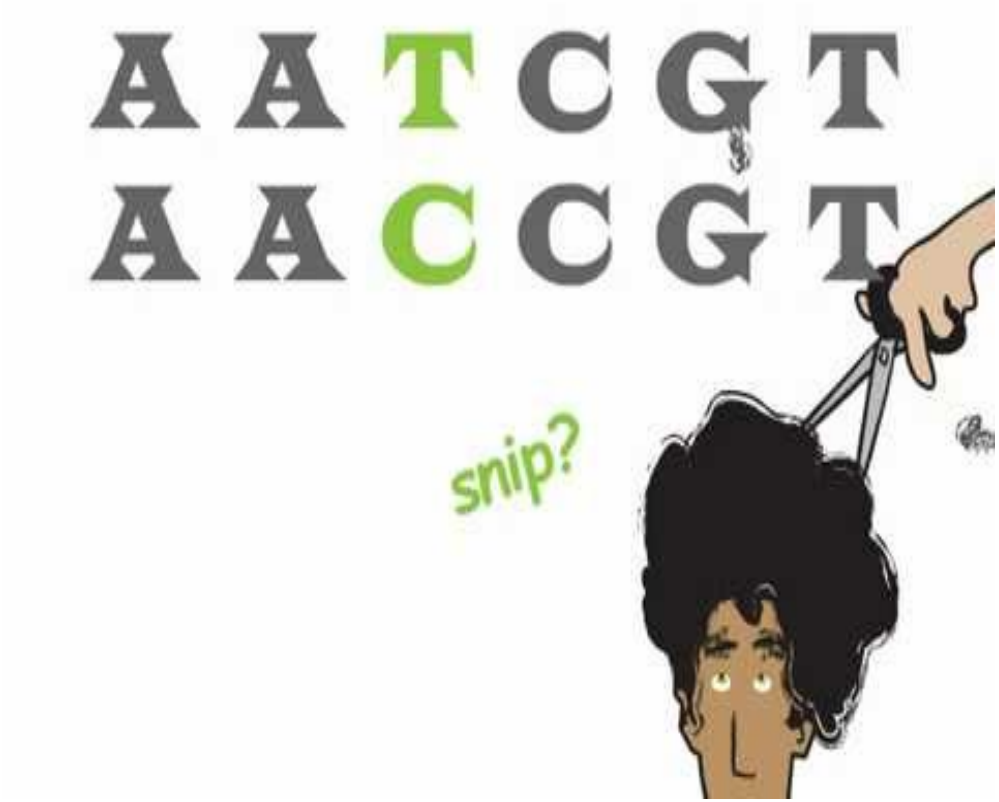
1 2 3 ...

- 2-nucletotide repeat unit : (CA)(CA)(CA)····
- 3 -nucletotide repeat unit : (GCC)(GCC)(GCC) ····
- 4 -nucletotide repeat unit : (AATG)(AATG)(AATG) ····
- 5 -nucletotide repeat unit : (AGAAA)(AGAAA) ····

Genetic variants: Structural Variants



Genetic variants: Single nucleotide polymorphisms



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- Appropriate phylogeny, biogeographic context, and whole genome sequencing

Organism	Acession Numbers
Mosquitoes (Anopheles)	NCBI: PRJNA6751 and PRJNA254046
Horses (Equus)	ENA: PRJEB7446
Butterflies (Heliconius)	ENA: ERP002440
Flycatchers (Ficula)	ENA: PRJEB7359
Dogs (Canis)	Authors Contacted
Cichlids	NCBI: PRJNA78915, PRJNA60369,PRJNA60363, and PRJNA78185

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Phylogenetic test for reinforcement

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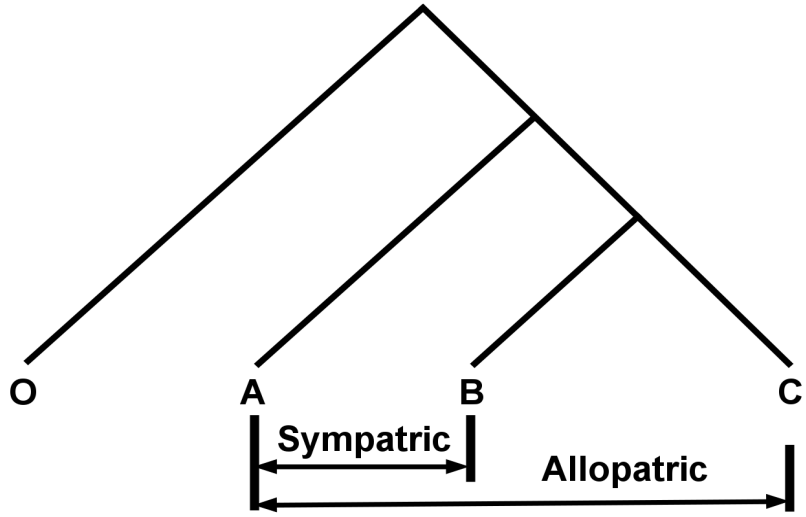

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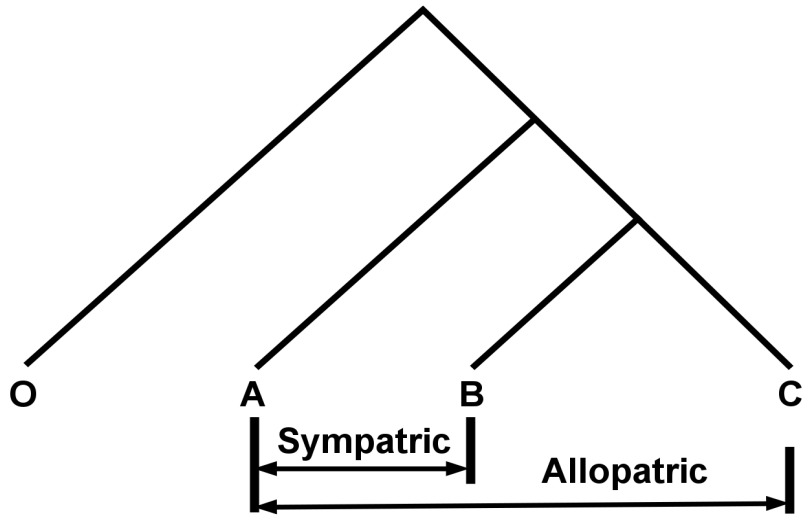

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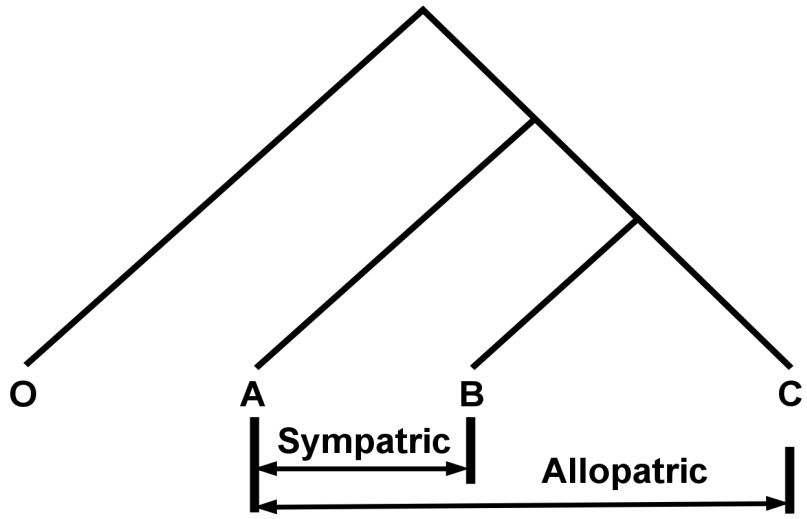

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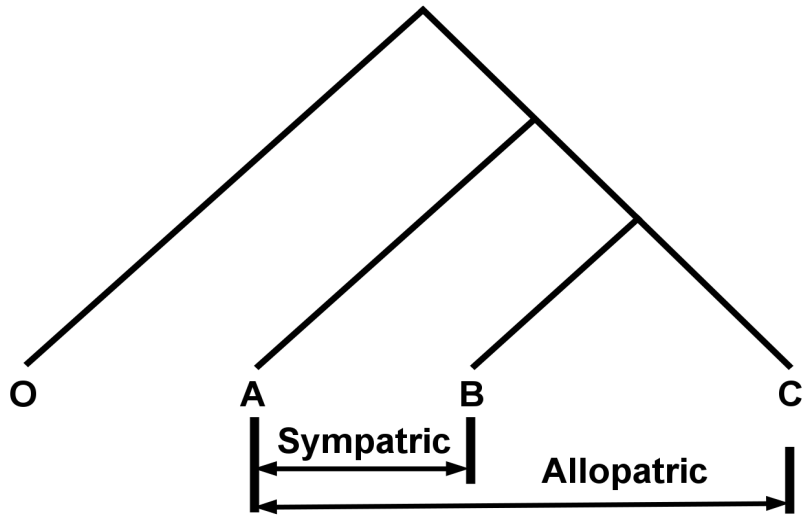

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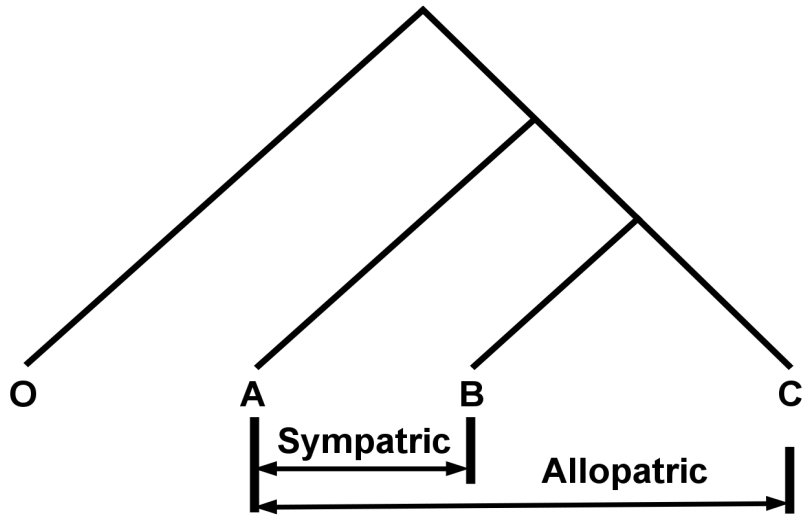

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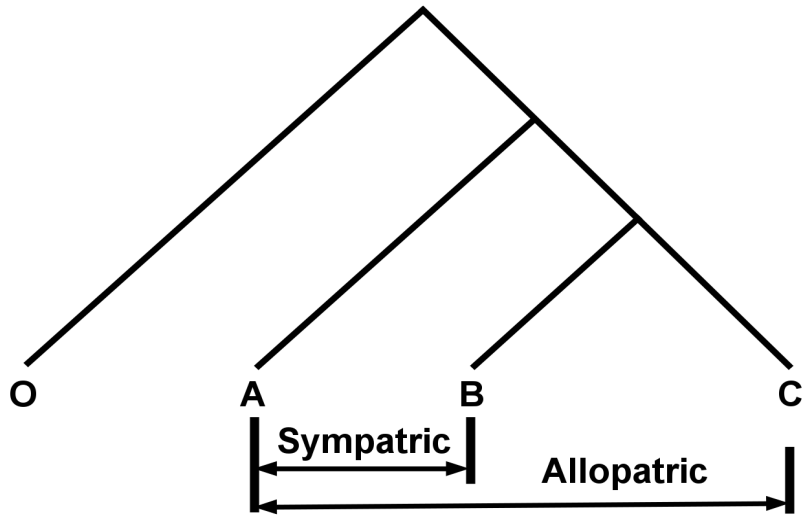

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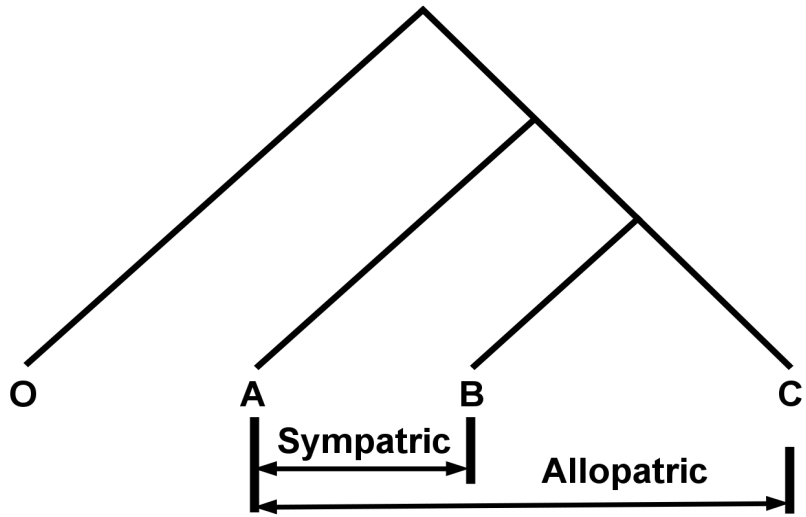

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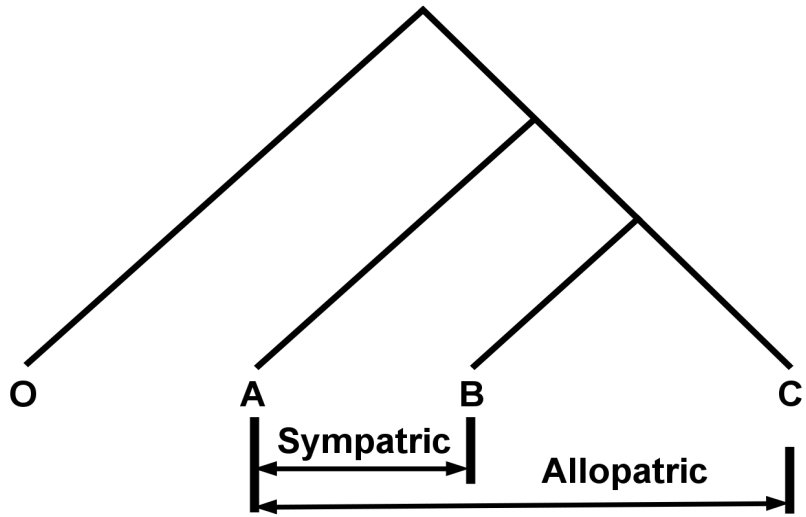

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Topic

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- Reveal impotant basic insights into how biodiversity is produced through speciation

Topic

7th/8th Graders

- Speciation module AUMNH Junior Curator Camp

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- Computer Based Bioinformatics lesson

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- Speciation module AUMNH Junior Curator Camp
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- Program to connect online and traditional biological collections

Topic

Questions