

Sit with your group from last week.

Have you met to talk about your paper selection?

Perhaps now would be a good time to set a meeting time.

QUIZ TIME!

[http://media.hhmi.org/biointeractive/films/
natural_selection.html](http://media.hhmi.org/biointeractive/films/natural_selection.html)

What force created the difference between the mice?



Types of mutations

- Base substitutions

GCTGTATCGTA

GCTGTTTCGTA

- Indels

GCTGTATCGTA

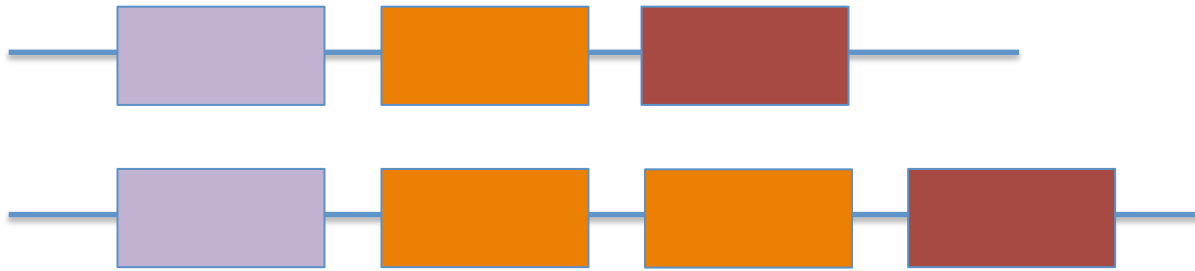
GCTGTTTCGTA

GCTGTATCGTA

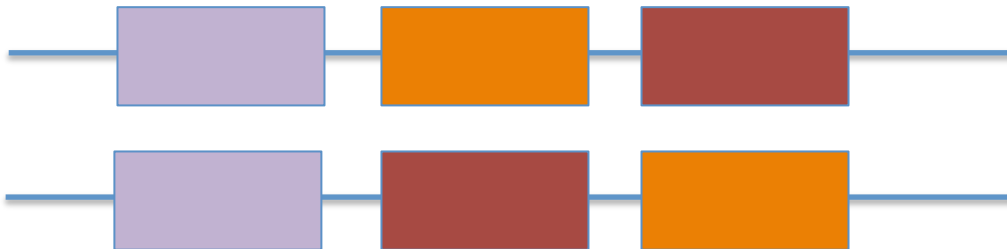
GCTGTAATCGTA

Types of mutations

- Gene duplication



- Inversions



- Caused by transposons, unequal crossing over, and slippage replication

Some mutation rates

- Microsatellite loci (per locus per generation)
 - Mammals 1×10^{-4}
 - Fruit flies 0.7×10^{-5}
- Single Nucleotides (per base per generation)
 - Nuclear DNA 10^{-8} - 10^{-9}
 - mtDNA (mammals) 5-10 times nuclear rate

Answer these questions in your groups

- How long do you think it took for the populations of mice to differentiate?
- How is the difference maintained?
- How could the difference be disrupted?
- Are all mutations bad?
- How can we study it in the lab?

Finish Video

Relevance in Conservation

- How do we measure genetic diversity?
- How are deleterious mutations purged?
- How is genetic diversity regained?
- How long does it take to regain diversity?

Time to Regenerate Diversity

(assuming nothing fun like selection/migration or drift)

- Mutation rate = μ
- Allele Frequency = p
- Generation One, the allele frequency is

$$p_1 = p_0(1 - \mu)$$

- After many generations, the allele frequency is

$$p_t = p_0(1 - \mu)^t$$

- Calculate Regeneration time as

$$t = (\ln p_0 - \ln p_t) / \mu$$

What's a quick way to increase diversity?

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- Migration!

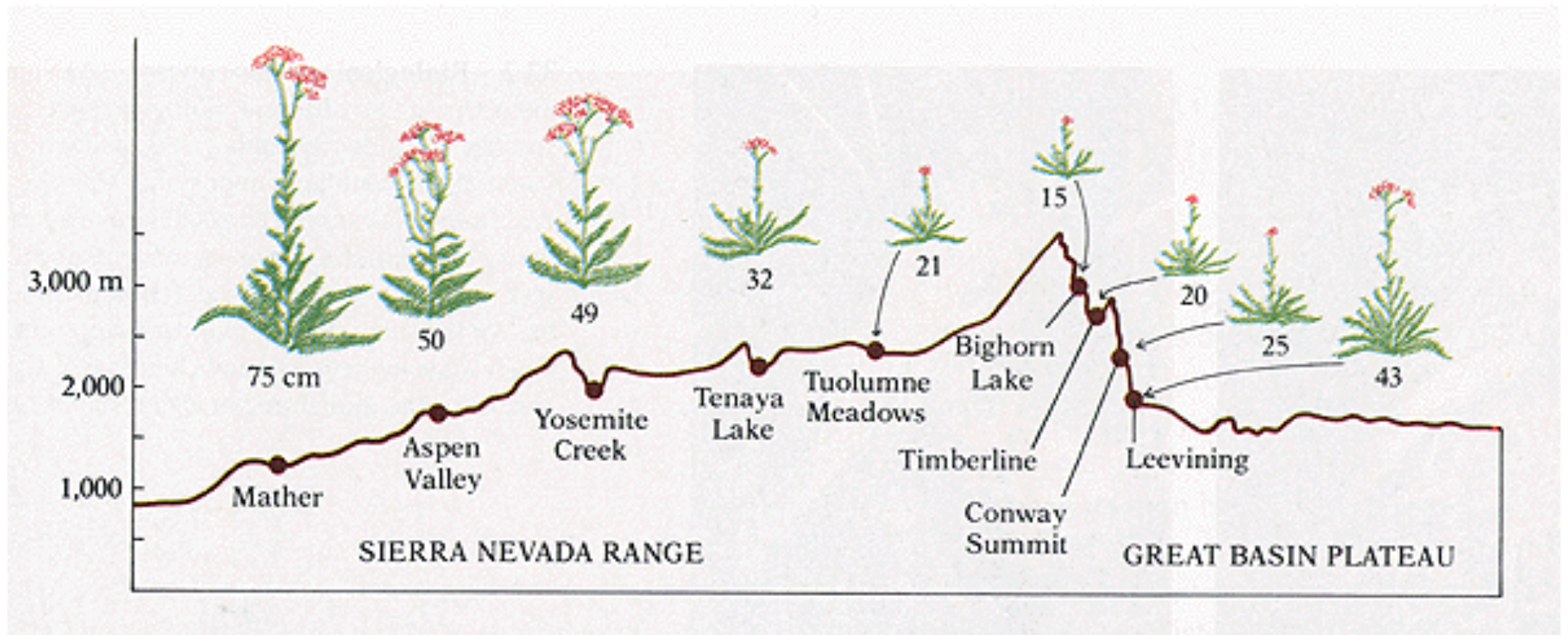
What's a quick way to increase diversity?

- Migration!
- Migration opposes divergence

If m = proportion of migrants, the change in allele frequency due to migration is:

$$\Delta q = m(q_m - q_0)$$

Clines



Answer in groups

- What has to be true to maintain a cline?

Wildlife Management

- Human activity disrupts the balance between mutation/migration/selection.
- What can wildlife managers do to remediate this disruption?