



Differences between populations: Effects of gene flow

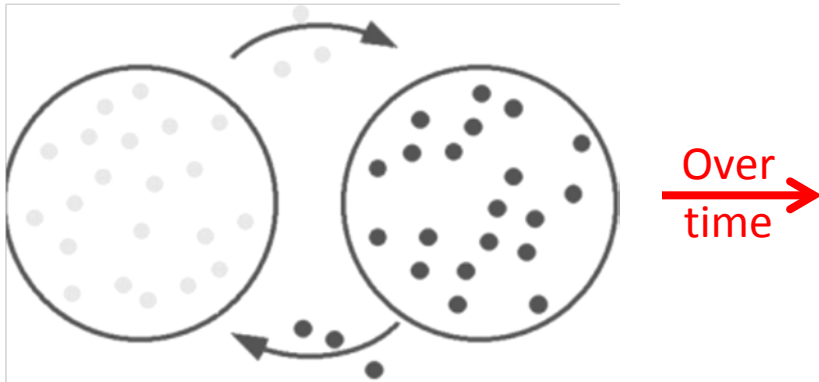


Gene flow!

“The great homogenizing force in evolution”



- Gene flow (migration) makes populations' allele frequencies converge
 - Prevents (and “undoes”) divergence

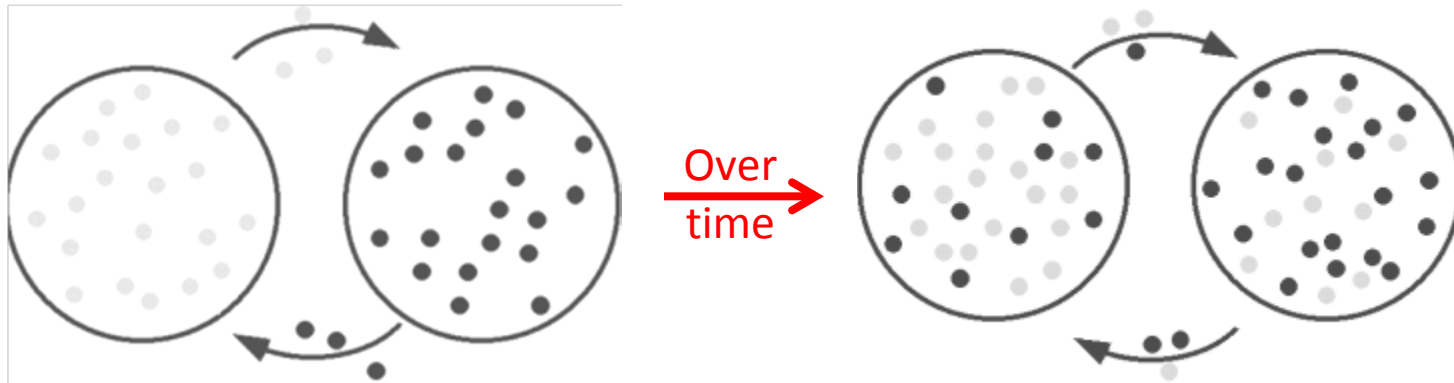


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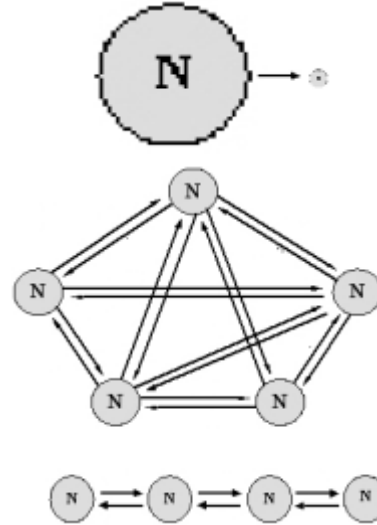
How does gene flow happen?

- Organisms (or gametes) move to new location *and reproduce there*
- Math for it assumes it's “random” with respect to genotype
 - Particular genotypes are not more/less likely to migrate



Some “models” of gene flow

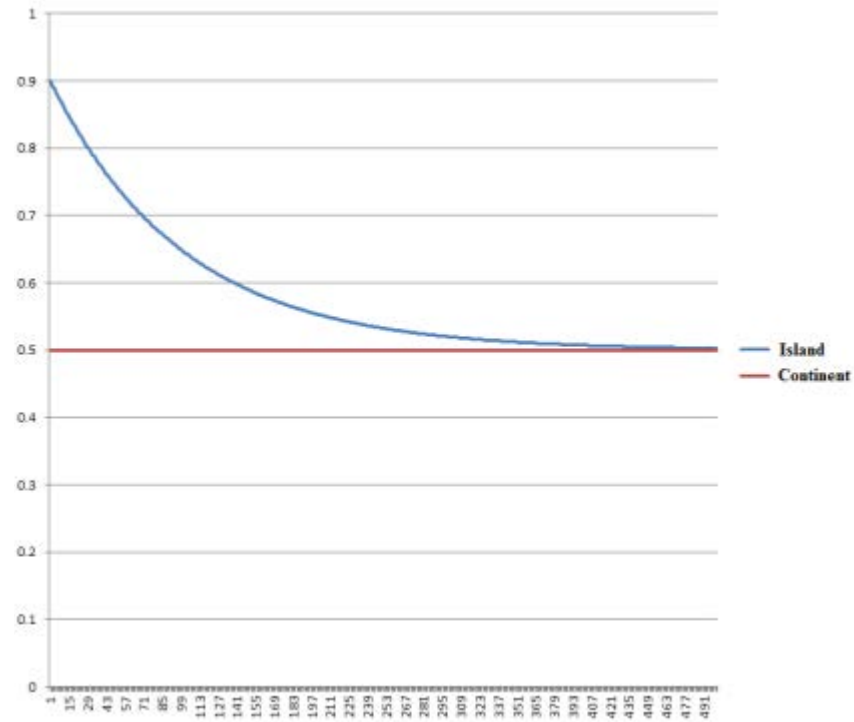
- Continent-island model
 - Huge effect of continent on island, but negligible effect of island on continent
- Island model
 - Multiple populations affecting each others' allele frequencies
 - Stepping-stone model



Outcomes differ...

Continent-island model

- Continent allele frequency $p=0.5$
- Island allele frequency = 0.9
- Migration rate = 1%
- 500 generations
 - Converge on continent value!

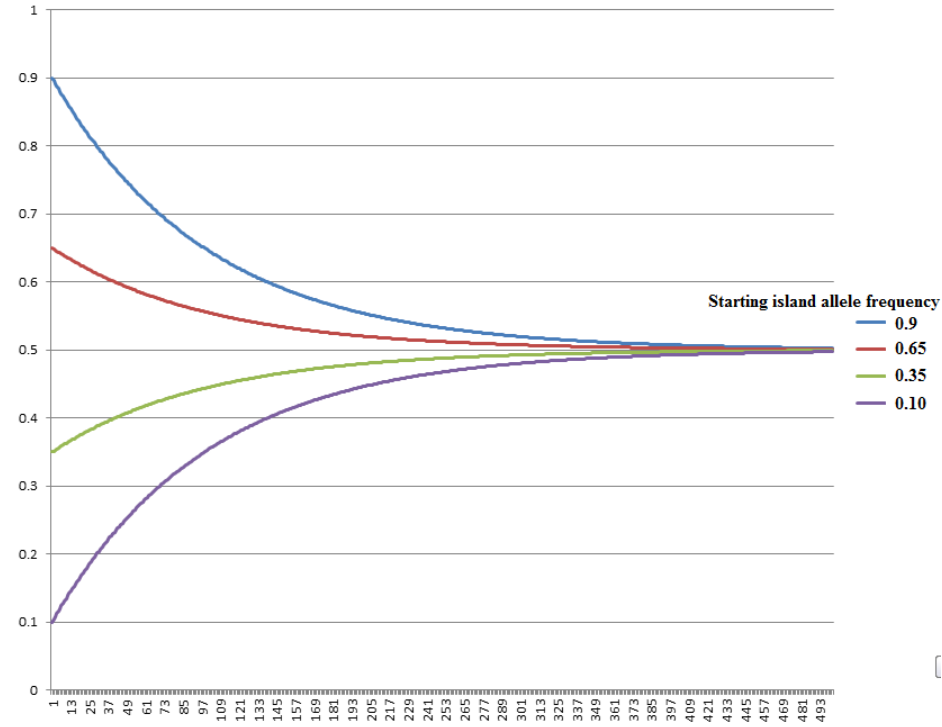




Island model

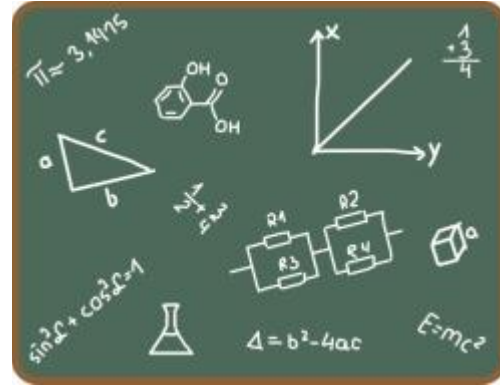


- 4 islands exchanging genes with each other
 - $p = 0.9$
 - $p = 0.65$
 - $p = 0.35$
 - $p = 0.1$
- Migration rate
= 1%
- 500 generations
 - Converge on
mean value!



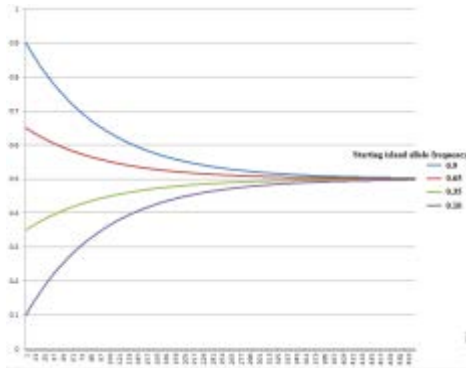
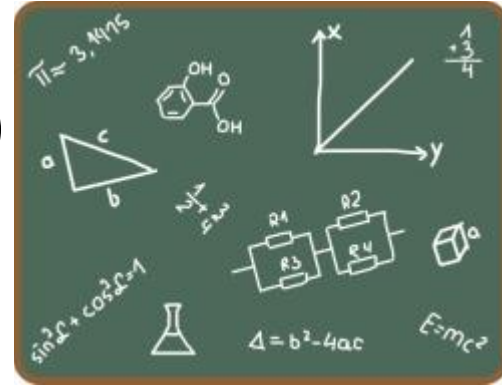
Relevant variables

- What affects the speed of convergence?
(how fast the allele frequencies become similar)



Relevant variables

- What affects the speed of convergence?
(how fast the allele frequencies become similar)
 - Migration rate (how many migrants move)
 - More migration leads to bigger changes
 - How different the allele frequencies are
 - More different allele frequencies causes bigger changes



**Number of generations
obviously important, too!**



Example application



- Glass & Li estimated European “gene flow” into African-Americans
 - Study done in 1950’s, estimated 10 generations
 - Got PTC allele frequencies of
 - Europeans $p(T)=0.455$
 - West Africans $p(T)=0.835$
 - African Americans $p(T)=0.697$
 - Some very simple math
 - Per generation estimate: 0.0358 (3.58%)
 - Total contribution: ~31%



Image Credits, Unit 6-2

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