Topic 2 – Changes in Gene Pools
Notes

Genec Dri
- Change in the genec make-up of a populaon resulng from chance
- When populaons are small, genec dri can significantly affect allele frequencies
    - Ex. 1% of whooping cranes have the rare C_1 allele.

    - In a populaon of 10000 cranes, 100 would have the allele, if half of the populaon was wiped out by a severe storm about 50 of the 5000 survivors would sll have the allele

    - In a populaon of 200 cranes, 2 would have the allele, if half of the populaon was wiped out by a severe storm there is a good chance that either both were killed meaning the allele is gone from the populaon or both survived, which means that the allele doubled in frequency

- When few individuals leave a large populaon to start a new populaon, the allele frequencies of the new populaon is likely not the same as the original populaon

- This is called the **founder effect**

- Eg. Amish community in Pennsylvania
    - All are descendents of 30 immigrants from Switzerland (1720)
    - One of the founders had a recessive allele that causes unusually short limbs
    - Now the allele is found in 7% of the populaon compared to 0.1% in most populaons

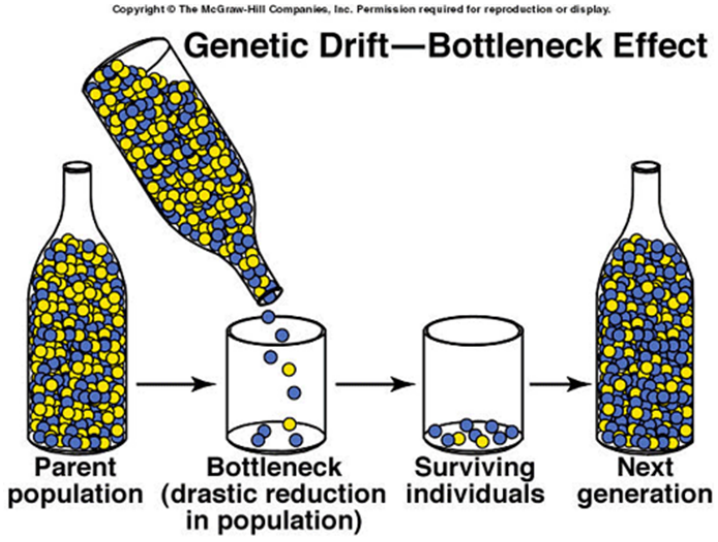
- When a severe event results in a drasc reducon in populaon size, a populaon may experience a **boleneck effect**

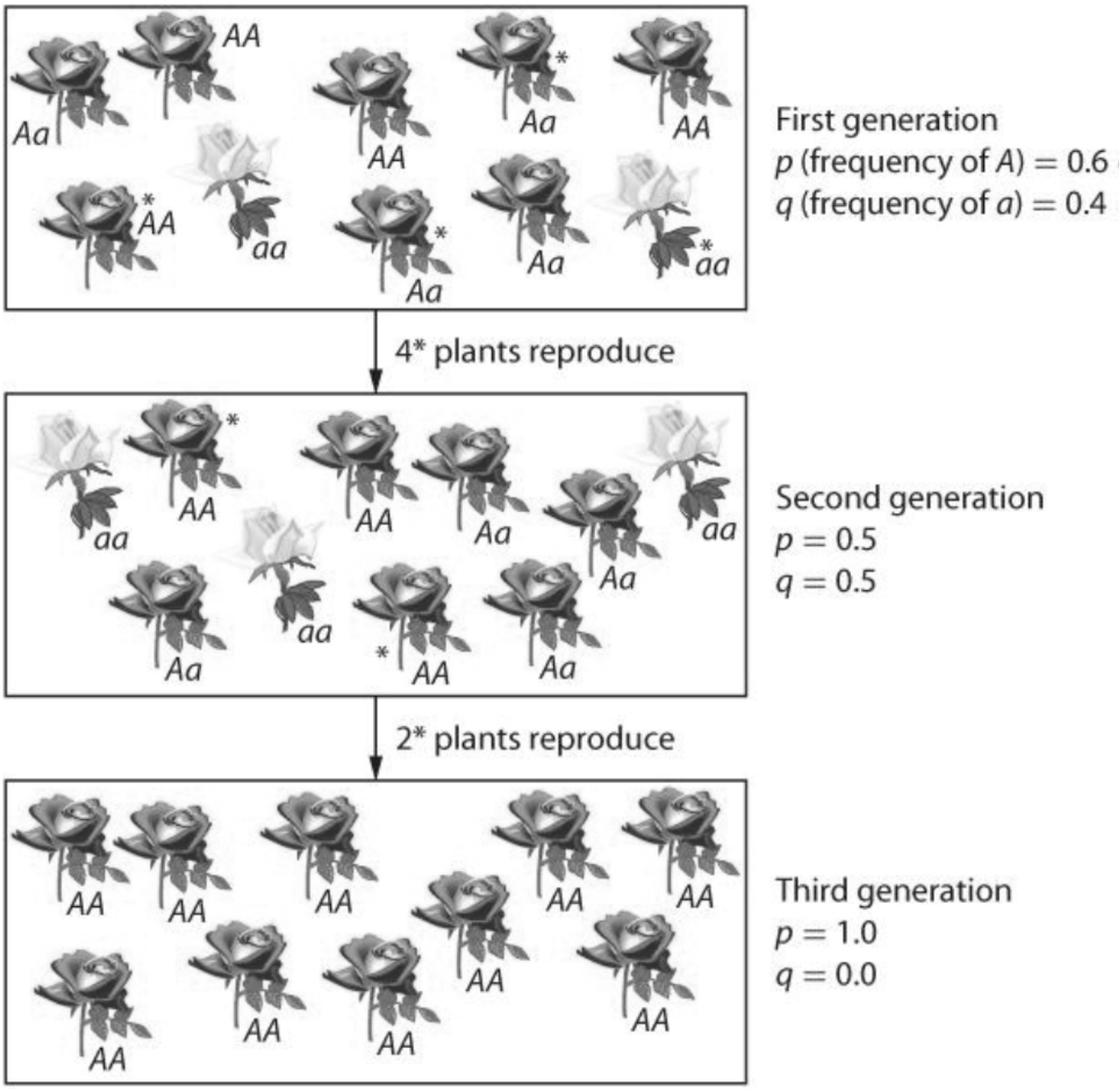
- The frequency of the alleles in the survivors is very different than the original populaon

- Ex. Northern elephant seals were over hunted unl only 20 individuals were le.

    - The populaon is now over 30,000 but genec tesng shows that 24 genes are homozygous in every individual

hp://www.youtube.com/watch?v=Q6JEA2olNts





In every generation, only some of the plants in this population reproduce. When the light pink and heterozygous roses in the second generation did not reproduce, the allele for light pink petals was quickly lost from the gene pool.

Migration (gene flow)
- Migration occurs when individuals leave one population and join another

- Alleles may be lost from one population and added to the other

- Can also occur when individuals from two different populations mate and then move back to their original populations

- Gene flow reduces the difference between two populations

Mutation
- A mutation is a **random** event that changes the DNA of an individual

- Mutations introduce new genes and alter the frequencies of alleles in a population at equilibrium

- In order for a mutation to become common in a population it must be beneficial and help increase the likelihood of survival

Natural Selection
- the process by which favorable traits that are heritable become more common in successive generations of a population of reproducing organisms, and unfavorable traits that are heritable become less common

- Mutations provide new genetic variations among individuals

- Natural selection acts on these variations

- If a new variation helps an organism survive, that variation will be passed on through reproduction

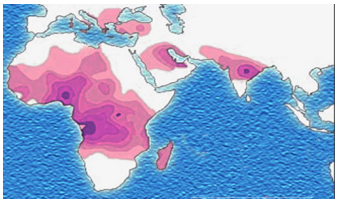
- The allele for sickle cell anemia differs from the normal gene by a single base pair mutation

- Individuals homozygous for this condition rarely reach reproductive age

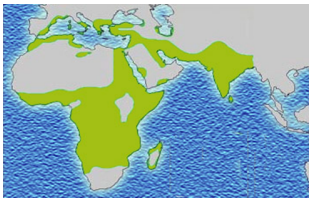
- Individuals heterozygous for this condition are only mildly affected and are much more resistant to the disease malaria than people with normal hemoglobin

- In areas where malaria is uncommon, the sickle cell allele is selected against and is less frequent

- In areas where malaria is common, the sickle cell allele improves the likelihood of survival of heterozygous individuals and the frequency of the allele increases



Distribution of Sickle cell anemia in Africa and the Middle East



Distribution of Malaria in Africa and the Middle East

- Harmful mutations occur frequently in a population, but they are selected against and, therefore, these mutant alleles remain extremely rare

- Beneficial mutations are rare, but they are selected for and, therefore, these mutant alleles may accumulate over time and lead to evolution of a species

Non-Random Mating
- Sexual selection occurs when an individual mates more because of a certain trait

  - This will cause those individual that mate more to pass their genes on, while individuals who don't have that trait mate less or not at all

  - Most common types of sexual selection are:
    - Female mate choice – females choose mates based on physical traits (brigh coloration, courtship displays/songs)
    - Male vs. male competition

  - Sexual selection has produced traits that are beneficial for mating but may otherwise not be beneficial (bright coloration?)

http://glencoe.mcgraw-hill.com/sites/9834092339/student_view0/chapter20/animation_-_mechanisms_of_evolution.html