Lecture 9
Thursday, October 4, 2018
BIO1130

Genetic Drift Summary…

- Small populations are under the influence of genetic drift and will trigger a decrease in genetic variability and in heterozygosity because alleles disappear
- Larger populations are not really under the influence of genetic drift
    - This phenomena is very minor in large populations (not a strong evolutionary force)
    - Ex: if the population is 7 billion individuals, genetic drift is not a strong evolutionary force
- The ultimate process ends up always in the same thing, meaning:
    - One allele will get fixed, all the other ones will disappear (no matter how many you have)
    - In 3 generations we went from the white allele being 0.3 to 0.5 to 0
    - When you are dealing with very small populations, genetic drift will act very quickly
    - The fixation and disappearance of an allele will be very important
- The larger the sample, the smaller the difference is between expected and observed frequencies
    - If u have only 1 try, then you have a 50/50 chance of getting tails vs heads (flipping a coin)
    - If u have 10 trials, then you might get 6 tails, 4 heads
        - Your frequency of tails is 0.6 compared to expected frequency which is 0.5
            - The difference is 0.1 which is 20%
    - If you do 1000 tries, you might obtain 506 tails and 594 heads
        - .506 frequency
        - Difference is .006
            - Small difference compared to the example with 10 treis
    - In conclusion,
        - In large populations, random/chance factors dont have much of an impact on the population
    - Simulation is the effect of genetic drift
    - If you have a larger population size, genetic drift will act more slowly
    - Smaller pops are affected more drastically
    - Probability that u become fixed or disappear:
        - If u have a .5 allele frequency at the start (A1), therefore u have 50% chance of becoming fixed
        - If u have 0.1 frequency of allele 1 (A1), that means u have 10% chance of becoming fixed

- Ur probability of getting fixed is 10% and out of the entire pop, only 1 has become fixed (due to the .1 frequency)
- The same thing for allele A2 (frequency of .9) therefore 90 percent chance of becoming fixed, so most became fixed
- Your probability of becoming fixed = Your frequency
- Consequences:
    - Bottleneck event
        - When you have an original pop thats large with some genetic variability
            - Disease, catastrophe that makes your population go down to a few numbers
            - Surviving pop that may have a little bit of the original genetic variability
            - Because its small, its probability of extinction will be higher
                - This is because there's a higher probability that it's gonna lose the remaining alleles fairly rapidly because of genetic drift
                - When you reduce a population, then genetic drift becomes an important factor in the evolution of that population
                - Summary: the actual process by which a population becomes small
                - Ex: the case of the cheetah:
                    - From a genetic perspective, they are extremely vulnerable
                - Ex #2: the great prairie chicken:
                    - A population of these chickens where the species was widely distributed
                    - Because of hunting and agricultural development, cities, the pop is reduced to 2 small pops
                    - Genetic makeup of both pops:
                    - # of alleles per locus off pop#1 (an indicator of genetic variability) was 5.2

- # of alleles per locus in the small pop was 3.7
- Impact: homozygosity
    - Recessive alleles that become homozygous
    - Might be negative on pop (% of eggs hatched)

○ The Founder Effect

■ Small group of individuals that leave from a mainland pop/ landpop/ mother pop. This pop will then colonize in a new area.

■ Neg impact: Sometimes the colonizer will bear some alleles that won't be represented of the original pop

- Ex of this: Polydactyly: u might have more digits than normal (genetic disease)
    - Prevalent in the Sect (amish)
        - Inbreeding within the group
            - Increasing the probability that these alleles will be shown in the homozygote

- Genetic drift is at random
    - Does not create adaptation
    - **Mutations, assortative mating, gene flow, genetic flow**: will all change allelic and genotypic frequencies from generation to generation
        - The only process that creates adaptation is natural selection
            - ****When talking about natural selection, you need to indicate its heritable trait!****