

## Chapter 23 – Population Genetics (NeoDarwinism)

- **The Evolution of Genetics: (Population Genetics)**
  - o The smallest unit of evolution
    - If is the population, not the individual, that evolves
  - o Gene pool, allele frequencies,
    - Conditions that must be met for a population to remain in Hardy-Weinberg equilibrium
  - o A closer look at Natural Selection
    - Directional, Disruptive, & Stabilizing selection
- **Mutation** – a change in the nucleotide sequence of an organism's DNA
- Only changes in cells that produce gametes can be passed on to their offspring
- **Point Mutation** – Change in a single base pair
- Mutations are rare: 1 in 100,000 genes per generation
- How do we calculate allele frequency?
  - o  $p^2 + pq + q^2 = N$
- **Hardy-Weinberg Assumptions:**
  1. No mutations (they alter the gene pool)
  2. Population must be isolated – Founder's effect (no gene flow)
  3. Population must be infinitely large and made up of sexually reproducing, diploid individuals (small populations show genetic drift)
  4. Mating is random
  5. All individuals must survive and reproduce equally well (no natural selection)
    - o If all of the above occur: **THE POPULATION IS NOT EVOLVING!!**
    - o Of course, that rarely happens. The whole point of the H-W Equilibrium is to prove when a population is evolving. It is meant to be proven wrong.
- **Genetic Drift** – Random change in gene frequencies in small populations do to sampling effect.
  - o **Founder's Effect** – When a few individuals become isolated from a large population, the small group establishes a new population whose gene pool differs from the source population
  - o **Bottleneck Effect** – greatly reduces population, leaving only a few behind. The chance of losing an allele is great. Allele frequency can greatly change.
- **BACK TO THE H-W ASSUMPTIONS!**
  - o 4. Mating is random
    - It NEVER really happens. We look for certain traits. (ex. Humans, birds of paradise)
- **Cline** – gradual change in some trait over a geographical area (do to genetics)
  - o **Example:** Tall plants grow in low altitude, short plants grow in high altitude
- **Polymorphism** – Genetic variation within populations. Somewhat stable frequencies of 2+ phenotypes in a population, maintained by selection

- **Balanced Polymorphism** – Genetic Variation within a population may also be maintained when a heterozygote is an advantage. It sucks to have genotype KK and genotype kk, so there HAS to be a reason why it's there.
  - o (sickle cell anemia vs. malaria)