10 Genetics and evolution

10.2 Inheritance

Punnett squares for dihybrid traits

- dihybrid cross: inheritance of two genes is investigated
- independent assortment: chance of a gamete containing S or s will not affect the chance of containing Y or y; chance of the gamete containing each allele is 1/4; theory that alleles of two genes pass into gametes without influencing each other
- punnett square combines every possible combination of maternal and paternal allele
- phenotypic ratio of dihybrid cross with independent assortment is always 9:3:3:1

Implications of Morgan's discovery of sex linkage

- Morgan breeds many fruit flies and notices one with white eyes (usual is red)
- mates white-eyed with red-eyed; first generation produces three flies with white-eyes but second generation produces many more and all white-eyed ones are male
- possibility that association of eye color and sex has a physical basis in chromosome
- chromosomal theory can explain why sex an eye color did not assort independently

Environmental influence

- variation due to polygenic inheritance is found to be continuous (complete range): differences are subtle and effects of the environment blur these differences (skin color as example)

10.3 Gene pools and speciation

Patterns of natural selection

- selection pressures: environmental factors that act selectively on certain phenotypes resulting in natural selection
- three types of natural selection: stabilizing, disruptive and directional
- stabilizing selection: selection pressures act to remove extreme varieties
- disruptive selection: selection pressures act to remove intermediate varieties, favoring extremes
- directional selection: population changes as one extreme of a range of variation to another that is better adapted

Polyploidy has occurred frequently in *Allium*

- *Allium* genus includes onions, leeks, garlic, chives; challenge to taxonomists as polyploidy events are common within the genus: result is a number of reproductively isolated but otherwise similar populations
- many species of *Allium* reproduce asexually and polyploidy may confer an advantage over diploidy under certain selection pressures