EVOLUTION, LECTURE 5: NATURAL SELECTION AND ADAPTATION (487–498, 523–525)

The **normal distribution** in statistics describes a data set that clusters around a mean in a bell-shaped curve (**bell curve**), and many quantitative organismal traits are distributed normally within a population.

Natural selection alters the distribution of heritable traits in a population in three main ways, depending on which phenotypes are favored: **directional selection**, **stabilizing selection**, and **disruptive selection** (see Figure 23.13).

I gave examples of each of these modes of selection in lecture: an example of directional selection is the high mortality of small-bodied swallows after a frigid winter; an example of stabilizing selection is the higher mortality suffered by human newborns at the extreme ends of the body mass spectrum; and an example of disruptive selection is the relatively lower fitness of black-bellied seedcrackers with intermediate-sized bills (described on p. 481 in your book).

The classical/balance controversy in genetics. In the **classical view**, selection reduces allelic variation over time, promoting uniformity at most loci. In the **balance view**, selection often preserves variation, promoting heterozygosity.

Four ways in which genetic variation may be preserved in a population: diploidy (masking of recessive alleles), neutral variation, **heterozygote advantage**, **frequency dependent selection**.

In 1871, Darwin wrote an influential book entitled, ***The descent of man, and selection in relation to sex***. The second half of that book was devoted to the phenomenon of **sexual selection**. Sexual selection can be divided into **intersexual selection** (**mate choice**) or **intrasexual selection**.

Females tend to be the choosy sex, in part as a result of **anisogamy**, but more broadly as a result of the greater investment of the females of many species in the reproductive process. Please review the experimental test of the "good genes hypothesis" in Figure 23.16.

In some cases sexual selection seems to run counter to natural selection, producing **epigamic traits** that threaten the survival of the bearer. For example, consider the long tail feathers in male birds such as the peacock: they render the male more conspicuous and less mobile in the face of predators. However, these same feathers help him to attract females and thereby increase his fitness overall.

Recall that **fitness** is not merely a question of survival, it is question of the contribution that an individual makes to the gene pool of subsequent generations (relative to other individuals).

A fit organism is usually well adapted to it local environmental context. Adaptation to local physical conditions can lead to geographical variation if the physical conditions vary spatially. Adaptation of an organism to the local biological environment can lead to various forms of **coevolution**, for example in the arms race between newts and garter snakes in California.

No organism is perfectly adapted to its environment. Why not?

Mimicry is readily observed in nature, and it occurs in two main forms. In **Batesian mimicry**, a palatable or harmless species mimics an unpalatable or harmful model, and in **Müllerian mimicry**, two or more harmful species mimic each other.