SEGMENT TWO, LECTURE THREE: EVOLUTION INFORMS BIOLOGY

The patterns and processes of evolution have explanatory power in the biological sciences. Example:

Homology is similarity due to common ancestry. Many of the similarities between different species of organisms are due to common ancestries. For example, structures with different functions may have the same underlying anatomies (Fig. 22.17).

Not all similarity is due to common ancestry. Some coincidental similarities occur because of **convergent evolution**, which is caused by selection in similar environments (Fig. 22.20). To distinguish homology from convergent evolution, some kind of independent information of relationships is needed.

Vestigial structures are nonfunctional remnants of features that are functional in other organisms. The vestigial structure generally indicates that there was an ancestor with the fully developed structure.

For example, many cave-dwelling organisms (crickets, mold beetles, bats, fish salamanders etc.) have nonfunctional eyes. In some cases there is an eye early in development that is partially "removed" by apoptosis. **Apoptosis** is programmed cell death, a normal developmental process.

Fossil biogeography may be predicted by evolution. For example, the existence of fossil marsupials in Antarctica that migrated from South America to Australia was predicted before discovery (Fig. 25.13). These continents were once joined into the southern continent, Gondwana.

The form and color of organisms can be explained by evolution due to natural selection (Fig. 22.13).

The evolution of drug resistance in strains of HIV can be explained by evolution due to selection by the anti-HIV drug (Fig. 22.14).

Nested patterns of characteristics in organisms are predictable by evolutionary trees (see tree of tetrapods and related species, Fig. 22.19; edition eight only).