

Are a peacock's tail (see Fig. 15-7) and a dog's tail homologous structures or analogous structures?

Analogous. Bird tails consist of feathers; dog tails consist of bone/muscle/skin. Birds do have bones (fused to form the pygostyle) that are homologous to the dog's tail bones. (The tail feathers are attached to the pygostyle).

Thinking Through the Concepts

1. Selection acts on individuals, but only populations evolve. Explain why this is true.

Evolution is a change in the genetic makeup of a population over time.

2. Distinguish between catastrophism and uniformitarianism. How did these hypotheses contribute to the development of modern evolutionary theory?

Catastrophism hypothesized that successive catastrophes produced the layers of rock, killing species and fossilizing them in the rock layers. Uniformitarianism hypothesized that ordinary natural processes that occurred repeatedly over long periods of time produced the layers of rock.

3. Describe Lamarck's theory of inheritance of acquired characteristics. Why is it invalid?

Living organisms can modify their bodies through use or disuse of parts, and these modifications can be inherited by their offspring. This theory is invalid because characteristics such as these are not inherited.

4. What is natural selection? Describe how natural selection might have caused differential reproduction among the ancestors of a fast-swimming predatory fish (such as the barracuda).

Natural selection is the process by which the environment selects those individuals whose traits best adapt them to a particular environment. Faster barracuda probably obtain food more easily and therefore are more reproductively successful than slower barracuda.

5. Describe how evolution occurs through the interactions among the following: the reproductive potential of a species, the normally constant size of natural populations, variation among individuals of a species, natural selection, and inheritance.

Natural populations of all organisms have the potential to increase rapidly, because organisms can produce far more offspring than are required merely to replace the parents. Nevertheless, the sizes of most natural populations and the resources available to maintain them remain relatively constant over time; therefore, there is competition for survival and reproduction. In each generation, many individuals must die young, fail to reproduce, produce few offspring, or produce less fit offspring that fail to survive and reproduce in their turn. Individual members of a population differ from one another in their ability to obtain resources, withstand environmental extremes, escape predators, and so on. The most well adapted individuals in one generation will usually leave the most offspring. At least some of the variation in adaptive traits among individuals is due to genetic differences that may be passed on from parent to offspring. Over many generations, differential, or unequal, reproduction among individuals with different genetic makeup changes the overall genetic composition of the population.

6. What is convergent evolution? Give an example.

Convergent evolution is evolution in unrelated organisms that leads to similar structures, given similar environmental demands. An example is the wings of flies and birds.

7. How do biochemistry and molecular genetics contribute to the evidence that evolution occurred?

Basically through DNA similarities among different species.