Lesson Outline for Teaching

Lesson 3: Biological Evidence of Evolution

A. Evidence for Evolution

1. Evolution does not occur in a straight line with one species replacing another in a series of orderly steps.

a. Living species that are closely related share a common ancestor.

b. How closely related two species are depends when they diverged, or split, from their common ancestor.

2. The study of similarities and differences among structures of living species is called comparative anatomy.

a. Body parts of organisms that are similar in position but different in function are called homologous structures. The forelimbs of different mammals are examples.

b. If species have homologous structures, this suggests that the species are related.

c. The more similar two structures are to each other, the more likely it is that the species have evolved from a recent common ancestor.

d. Analogous structures are body parts that perform a similar function but differ in structure. The wings of flies and birds are examples.

e. The existence of analogous structures indicates that the species are not closely related.

3. Body parts that have lost their original function through evolution are called vestigial structures. The wings of flightless birds are an example.

a. The best explanation for vestigial structures is that the species that have vestigial structures are related to ancestral species that still use the structures for a specific purpose.

b. Whales have a tiny pelvic bone, which is a vestigial structure for walking on land.

4. Studying the development of embryos can also provide scientists with evidence that certain species are related.

a. Embryology is the study of the development of embryos from fertilization to birth.

b. All species of vertebrates have pharyngeal pouches at some stage during their development.

c. The similarities in location and function of the pharyngeal pouches is a sign that the vertebrate species share a common ancestor.

Lesson Outline continued

5. The study of gene structure and function is called molecular biology.

a. The existence of genes provides evidence of evolution because they have been shown to be the source of variation upon which natural selection acts.

b. The more closely related two species are, the more similar their genes and proteins are.

c. Studies in molecular biology have shown that some stretches of DNA that are common to many species change through time at steady, predictable rates like a kind of molecular clock.

d. Scientists use this molecular clock to estimate the time in the past when living species diverged from common ancestors.

B. The Study of Evolution Today

1. Since the publication of Darwin's theory, scientists have confirmed, refined, and extended his work.

2. Scientific studies of fossils, anatomy, embryology, and molecular biology have provided evidence of relatedness among living and extinct species.

3. The continuous discovery of new fossils that have features of species that lived before and after them is strong evidence of evolution of species.

4. Scientists today are studying how genes can be reorganized in simple ways that cause dramatic changes in organisms.

5. Though scientists now study evolution at the molecular level, the basic principles of Darwin's theory of evolution by natural selection have remained unchanged for more than 150 years.

Discussion Question

How could studying the genetic sequence of a dinosaur's DNA provide further evidence of biological evolution?

It might give clues about the ancestor of that species of dinosaur or about the ancestor of dinosaurs in general; it might give clues about which species, if any, arose directly from that dinosaur species or which modern species are most closely related to that dinosaur species.