

**Evidence for Evolution: Forelimbs of Vertebrate Animals**

According to the theory of evolution, all existing biological species are derived from previous ones; that is, all organisms, past and present, share a common ancestry.

Comparative anatomy is basically the science of comparing the physical features of present-day organisms. The plate presents the forelimb of several organisms. The upper forelimb in the human is the **humerus**, which is also found in all of the other organisms. Below the humerus is the **radius**, and similar bones are found in the other organisms. Parallel to the radius is the **ulna**, and again, we find the same bones in all the animals. Next come a set of small bones in the human wrist called **carpals**, similar bones are found in the other species. The carpals are followed by **metacarpals**, and all the creatures have the same bones. In the human, the metacarpals are found in the palm of the hand. The forelimb is completed with a set of **phalanges**, which are also found on the other organisms.

The science of comparative anatomy shows us that homologous structures composed of the same bones are found in all the animals presented on the plate. At first glance, the forelimbs appear to have little in common. But from an evolutionary standpoint, the similarity of these homologous structures shows that the basic structure of the forelimb has been modified through natural selection into arms in humans, front legs in cats and crocodiles, wings in birds and bats, and fins in whales. The anatomical similarities provide evidence for the evolutionary descent of all the animals from a common ancestor. Modifications for different purposes have occurred through time, but the supporting bones remain very similar.

**Procedures**

1. **Color** each part of the human arm a different color, except the carpals, which should be all one color, the metacarpals a different single color, and the phalanges a single color.
2. **Color** the corresponding bones in each of the other animals the same color as that in the human.

**Analysis Questions**

1. Are all the bones arranged in a similar way in each animal?
2. These structures are formed in similar ways during embryonic development and share like arrangements; however, they have somewhat different forms and functions. These limbs are called *homologous structures*. Describe another example of homologous structures that does not involve the limbs of vertebrate animals.
3. Explain why the homologous structures are evidence of evolutionary relationships.

