

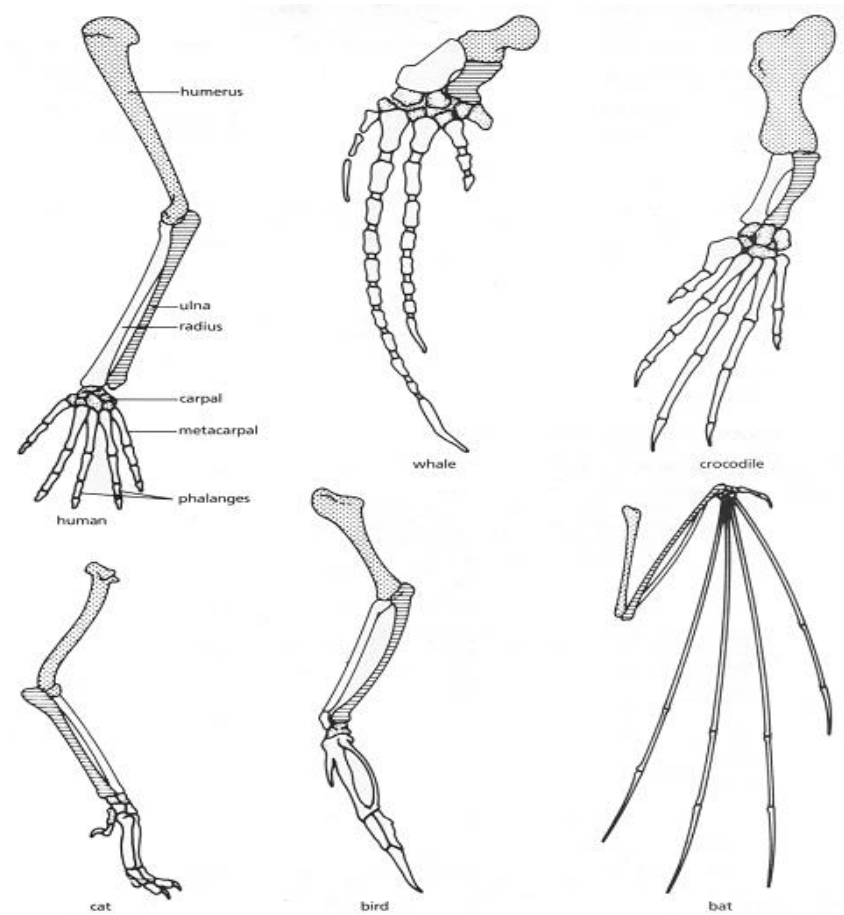
In our studies of the anatomy and development of animals we have discovered that many living creatures that look quite different on the surface have similarities underneath their skin that suggest that they are related to each other. This is evidence that living creatures have evolved, or gradually changed over time. In this lab, you will learn about homologous, analogous, and vestigial structures and their value as evidence for evolution.

### A. HOMOLOGOUS STRUCTURES

There are many examples of body structures that are formed in similar ways during embryonic development and that share similar patterns of bone structure, even though they take on different forms and perform somewhat different functions. These structures are called homologous structures. **Homo-** means same, and **-logous** means information, so **homologous** means “same information”. Homologous structures mean that the animals share a relatively recent common ancestor.

1. Carefully examine the drawings of forelimb skeletons shown in Figure 1. Look for similarities in the bones amongst the various animals.
2. **Color in the human arm first.** Color the bones of the arm (the humerus, ulna, and radius) **blue**. Color the bones of the hand (the carpal, metacarpals, and phalanges) **yellow**.
3. Color the corresponding bones in each of the other animals the same color as the human bones.
4. Observe each of the skeletons again, and describe the function of each limb in the table below

Animal	Function
Human	
Whale	
Cat	
Bat	
Bird	
Crocodile	



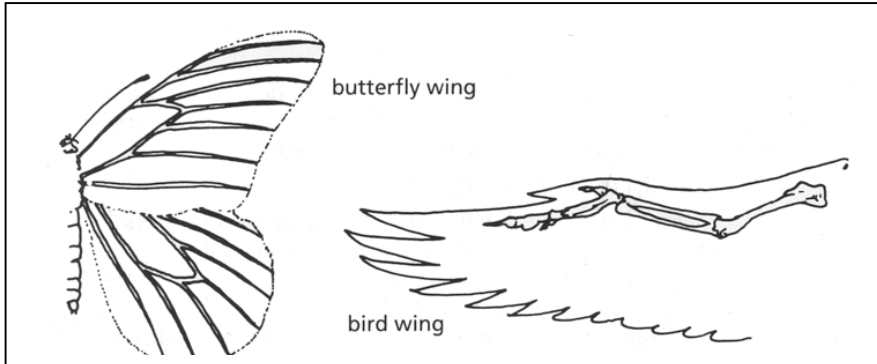
**Figure 1**

1. Are the bones arranged in a similar way in each animal? Are the functions of the limbs of each of the animals illustrated the same or different?
2. Explain why the homologous structures are evidence of evolutionary relationships.
3. Does the similarity in bone structure suggest a common ancestry amongst these animals?

## B. ANALOGOUS STRUCTURES

There are also many examples of body structures in animals that are very similar in function and superficially similar in form and but develop very different and have very different internal structures and embryonic development. These structures are called analogous structures. Analogous structures mean that the animals do not share a recent common ancestor.

1. Examine the butterfly wing and the bird wing shown in Figure 2.
2. Look for any similar bone structure.

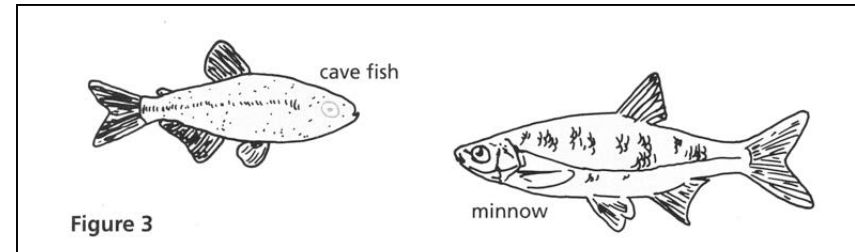


4. What function do the butterfly and bird wings share?
5. How do the structures differ internally and externally? (give me three)
6. Do birds and insects share any structural similarities that would suggest they are closely related in the single tree of life that includes all organisms? Explain.
7. Explain why these are considered analogous structures and not homologous structures.

## C. VESTIGIAL STRUCTURES

There are also many examples of body structures in animals that show gradual changes over time. In some cases, these changes have reduced or removed the function of some body parts and organs. These reduced or lost structures are called vestigial structures. The wings of penguins and the leg bones of snakes are examples of this phenomenon.

1. Observe the drawings of the cavefish and the minnow shown in Figure 3. The fish are related to each other but the cave fish is blind and only has the remnants of an eye.



8. How do you think vestigial structures came about?
9. What do you think has become the most important adaptation of the cave fish (think about senses)? (Explain your answer)
10. Does the appearance of the cavefish and the minnow suggest a common ancestry? Why?

### Summary

Identify the following as Homologous (H), Analogous (A), or Vestigial (V)

- \_\_\_\_\_ 11. Tail of a shark and a tail of a whale
- \_\_\_\_\_ 12. Leg of a cow and leg of a horse
- \_\_\_\_\_ 13. Appendix in a human
- \_\_\_\_\_ 14. Penguin wings and fish fins
- \_\_\_\_\_ 15. Wings of a bat and wings of a bird

Must be checked off before moving on. \_\_\_\_\_