

EVIDENCE OF EVOLUTION

Background

Much evidence has been found to indicate that living things have evolved or changed gradually during their natural history. Scientists have studied fossils, DNA evidence and also living animals for clues about evolution.

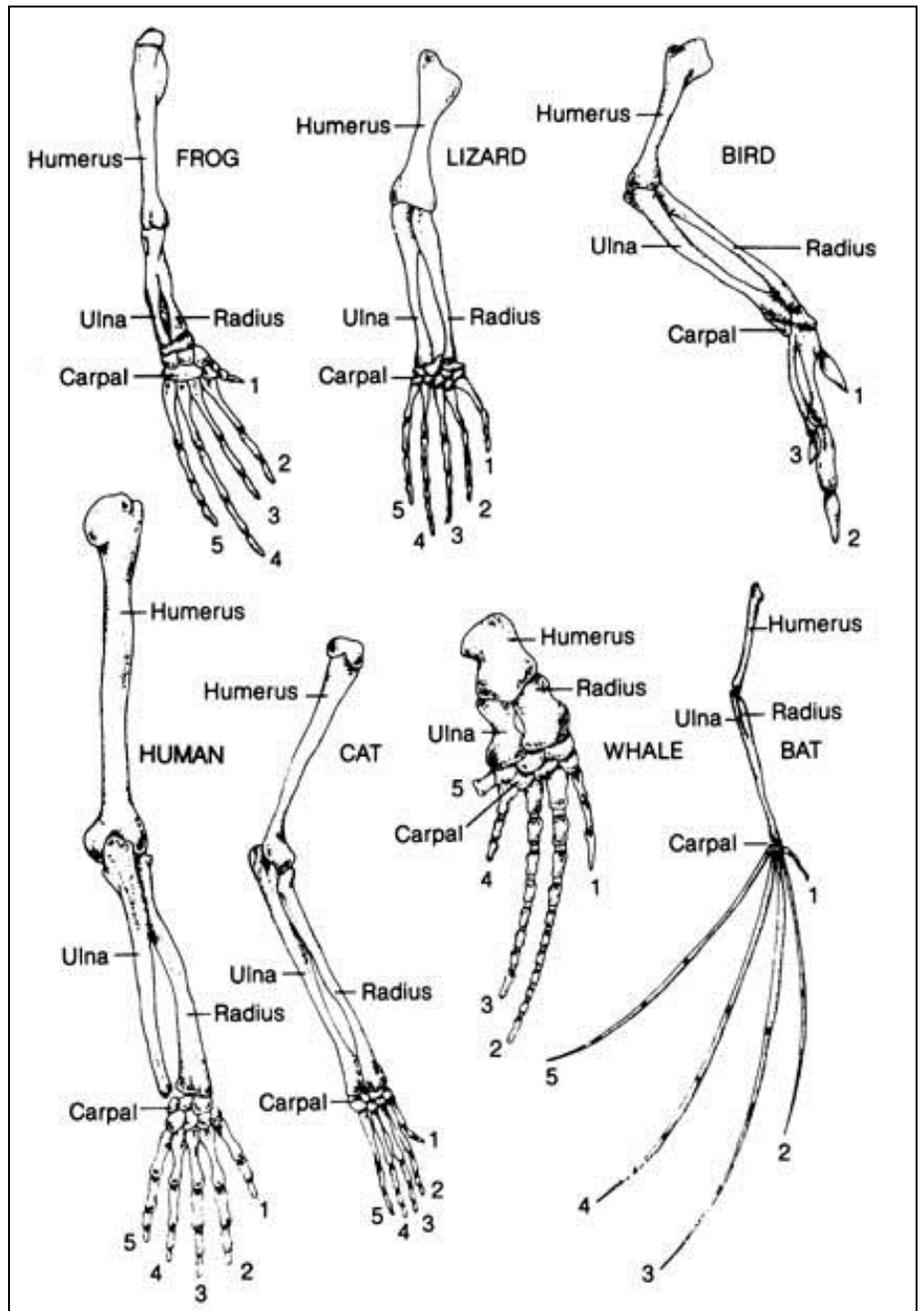
Homologous structures are formed during development in similar ways; however they have different forms and functions.

1. Carefully examine the drawings of the bones below.

2. Color the bones of the human arm as follows:

- Humerus – red
- Ulna – yellow
- Radius – orange
- Carpal – green
- Phalanges – blue

3. Color the corresponding bone in each of the other animals the same color as used in the human arm.



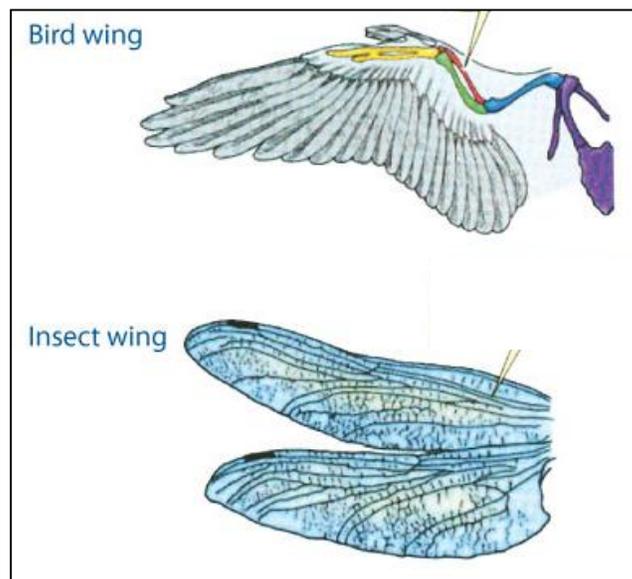
4. Describe the function of each set of bones below. What does the animal use these bones for?

Animal	Function
Human	
Whale	
Cat	
Bat	
Bird	
Lizard	
Frog	

5. Are these bones arranged in a similar way in each animal? Explain. _____

Analogous structures perform similar *functions*, but are very different in their *structure* and form.

1. Examine the butterfly wing and the bird wing shown in the picture below.



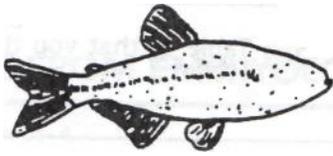
2. What function do these structures perform for the butterfly and the bird? _____

3. What is the butterfly wing made of? _____ Does it have bones? _____

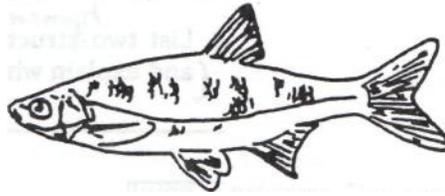
4. What is the bird wing made of? _____ Does it have bones? _____

5. What kinds of structures are the bird wing and butterfly wing? _____

Vestigial structures are structures that have gradually changed through time. The organism may have the structure but it is not used. Or they may not have the structure anymore.



Cave Fish



Minnow

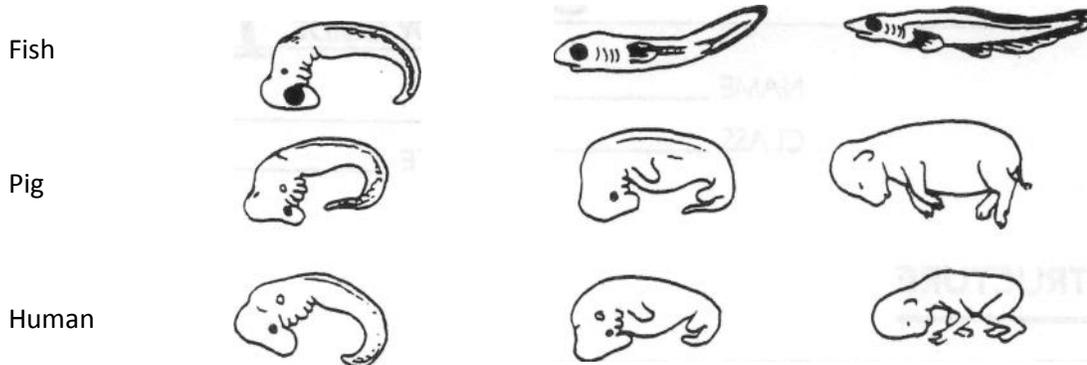
1. The cave fish lives in an underground cave where there is no light. The minnow lives in a pond where there is light.
2. Why is eyesight not an important adaptation to life in a cave? _____

3. Humans have several vestigial structures. Suggest a possible function for each structure in the chart below. (Use your imagination)

Structure	Possible Function
Appendix	
Coccyx (tail bones)	
Muscles that move ears	
Muscles that make hair stand up	
Little toe	
Wisdom teeth	

Evidence from Embryology

Evolution occurs slowly. In most cases it is not possible to observe evolution in progress. However, evidence of evolution can be found by observing the early stages of development in vertebrates. All vertebrate embryos start out quite similar in appearance. This similarity has led scientists to infer that these organisms are related through a common ancestor. The diagram below illustrates stages in the embryonic development of a fish, a pig, and a human.



1. How does a comparison of these embryos provide evidence of evolution? _____

Evidence From Molecular Biology

Amino acid sequences of certain proteins can be used to determine how closely related different species are. If the amino acid sequences for a certain protein are very similar in two species, one can assume that those two species had a common ancestor. All 104 amino acids in the protein cytochrome C are identical in humans and chimpanzees.

Animal	Number of Amino Acid Differences in Cytochrome C from Humans
Dog	8
Shark	24
Rattlesnake	12
Rhesus Monkey	1

1. Which organism is most closely related to humans? Why?

2. Which organism is least closely related to humans? Why?

CONCLUSION

Complete the chart by checking the kind of evidence described (one✓ per row)

Evidence	Type of Evidence				
	Homologous Structures	Analogous Structures	Vestigial Structures	Embryological Development	Genetic Comparisons
In the earliest stages of development, a tail and gill slits can be seen in fish, birds, rabbits, and mammals.					
Similarities in the forelimbs of bats, penguins, lizards, and monkeys.					
The forelimbs of flightless birds					
DNA and RNA comparisons indicate descent from a common ancestor.			-		
Bird and butterfly wings have same function but different structures.					
A body structure reduced in function but may have been used in an ancestor.					