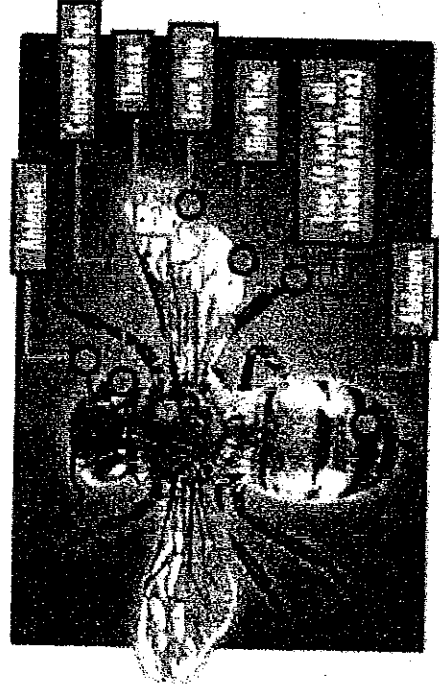
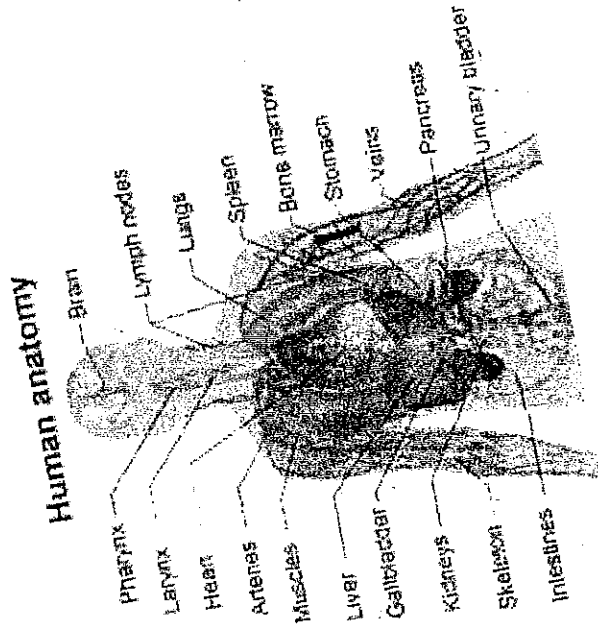
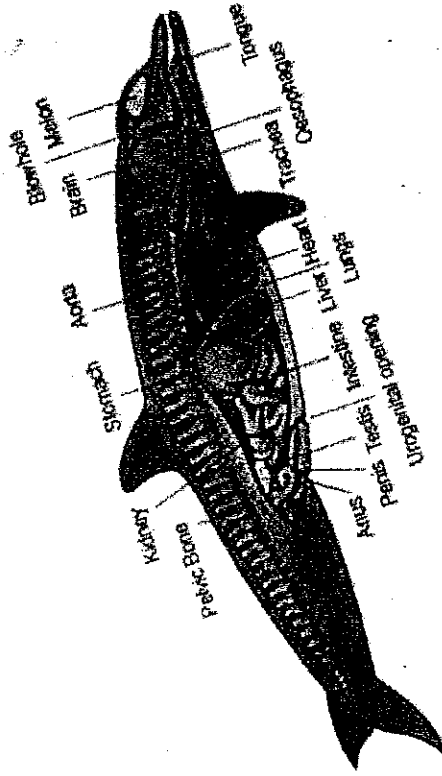
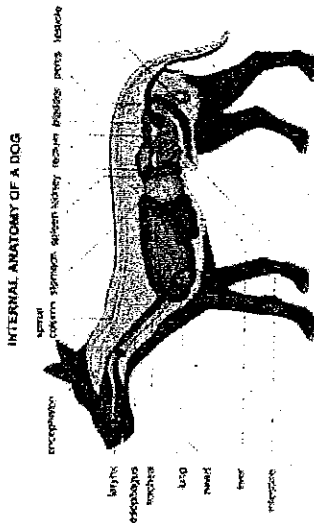


A N A T O M Y

Anatomy is the study of the structure, or parts, of an organism.

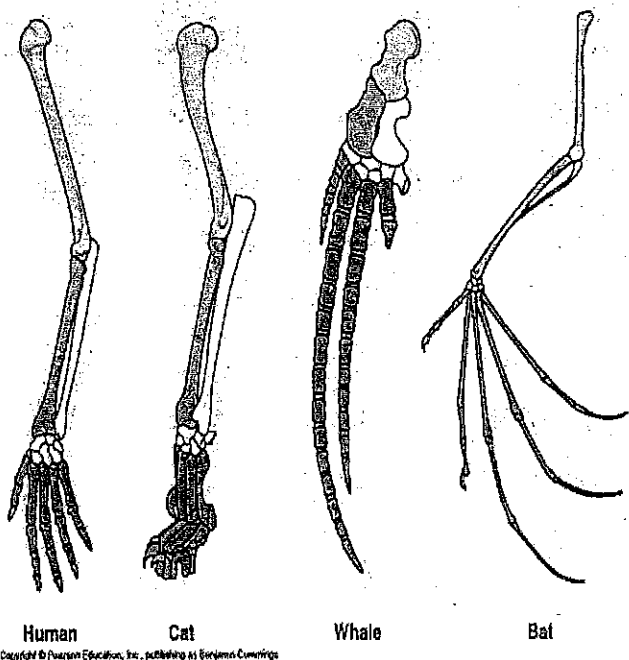


Common Core Reading

HOMOLOGOUS STRUCTURES

In biology, two structures are called **homologous** if they are alike because of shared ancestry. This could be evolutionary ancestry, meaning that the structures evolved from some structure in a common ancestor (the wings of bats and the arms of humans are homologous in this sense) or developmental ancestry, meaning that the structures arose from the same tissue in embryonic (before birth) development.

Homologous structures are parts of the body that are similar in structure to other species' comparative parts. These similarities are evidence that supports the idea that all life on Earth has a common ancient ancestor that the diverse species have evolved from over time. The common ancestry of the species can be seen in the structure and development of these homologous structures, even if their function is different. The more closely the organisms are related, the more similar the homologous structures between organisms. Most examples of homologous structures revolve around the limbs of the species being compared. The bone structure within those limbs is similar between closely related species.



Many mammals have similar limb structures.

The flipper of a whale, the wing of a bat, and the leg of a cat are all very similar to the human arm. All of the mentioned species have a large upper arm bone (the humerus on the human) and the lower part of the limb is made up of two bones - a larger bone on one side (the radius in humans) and a smaller bone on the other side (the ulna in humans). All of the species also have a collection of smaller bones in the "wrist" area (these are called carpal bones in humans) that lead into the long "fingers" or phalanges.

Even though the bone structure in these limbs of the mammals is very similar, the function of the limb itself is very different. The homologous limbs can be used for flying, swimming,

walking, or everything humans do with their arms. These functions evolved through natural selection as the common ancient ancestor underwent speciation to make all of the diversity we have on Earth today.

Originally, when Carolus Linnaeus was formulating his system to name and categorize organisms, how the species looked was the determining factor of which group they would be placed. As time went on and technology became more advanced, homologous structures became more and more important in deciding the final placement. Whales were once classified as a fish since they live in the water and have flippers. However, after it was discovered that those flippers actually contained homologous structures to human legs and arms, they were moved to a part of the tree more closely related to humans. In fact, it seems whales are much more closely related to hippos than fish.

Likewise, since bats fly, they were originally classified as closely related to birds and insects. Everything with wings was put into the same branch of the phylogenetic tree. However, after much more research and the discovery of homologous structures, it was apparent that not all wings are the same. Even though they have the same function, to make the organism be able to fly, they are structurally very different. While the bat wing resembles the human arm structure-wise, the bird wing is very different, as is the insect wing. Therefore, bats are more closely related to humans than birds or insects and were moved to their corresponding branch on the phylogenetic tree of life.

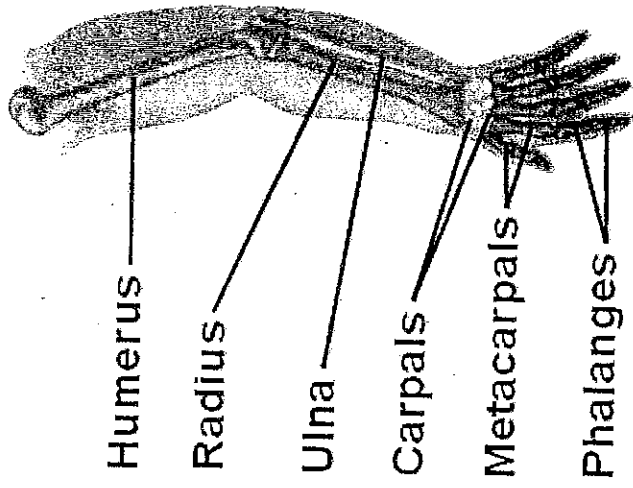
While the evidence of homologous structures has been known for quite some time, it was only fairly recently that it was widely accepted as evidence for evolution. It took the back up of evidence from DNA to support the idea of the evolutionary relatedness of species with homologous structures.

ASSIGNMENT

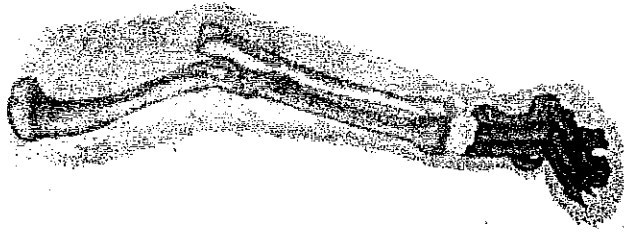
1. Explain the term homologous (COMPREHENSION RI 8.1).
2. What role does DNA play in understanding homologous structures, and how is it used to support the Theory of evolution? (COMPREHENSION AND ANALYSIS RI 8.1, RI 8.2)?
3. Using homologous structures and any other information (from notes, activities, etc), explain your opinion on the THEORY OF EVOLUTION in 8 sentences. Be sure to cite evidence (supporting details) for your ideas (EVALUATION RI 8.8).

HOMOLOGOUS STRUCTURES

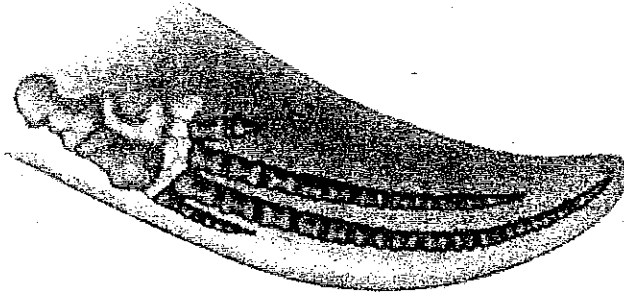
Homologous structures are formed in similar ways during embryonic development and share like arrangements, however they can have different forms and functions.



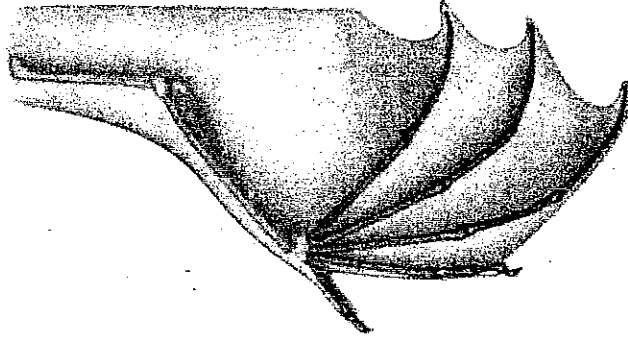
Human



Cat



Whale

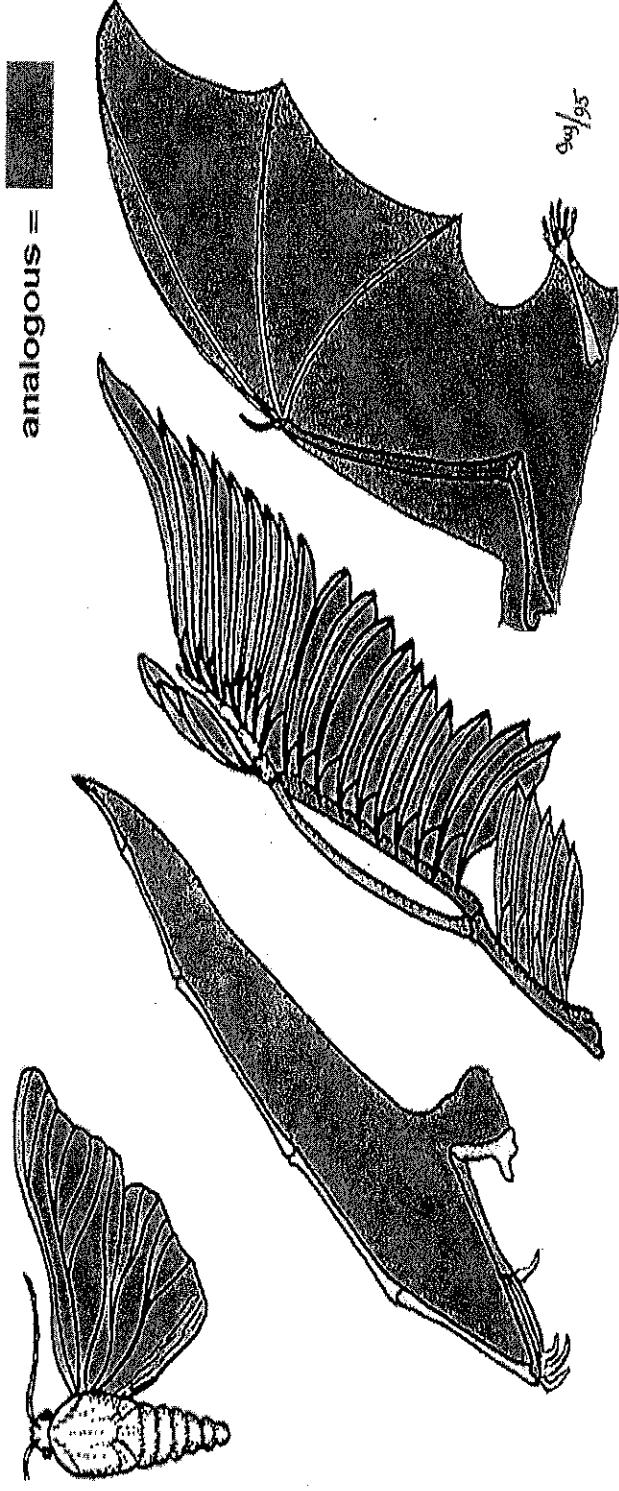


Bat

A N A L O G O U S S T R U C T U R E S

Some apparently unrelated animals have **organs with similar functions**, yet are **very different in structure and form**, and **do not come from the same embryological tissues**.

These structures are called analogous structures.



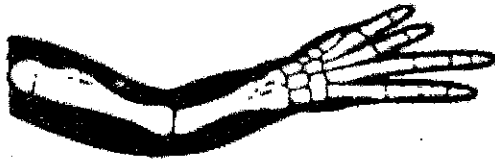
HOMOLOGOUS & ANALOGOUS STRUCTURES

Below there are limbs of seven different organisms. Analyze them and answer the questions in your activity booklet.

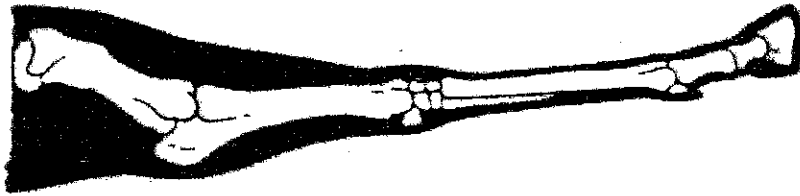
Whale



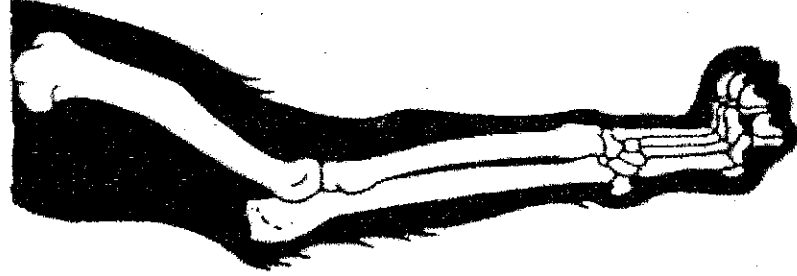
Frog



Horse



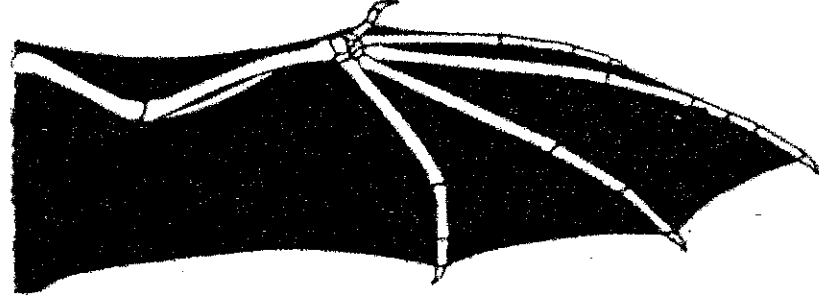
Lion



Human



Bat



Bird



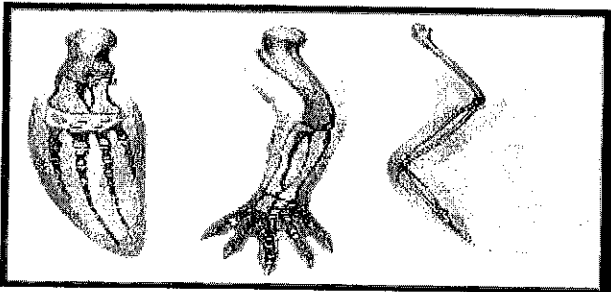
Name _____

Station #2 - Homologous vs. Analogous structures

Gathering Information:

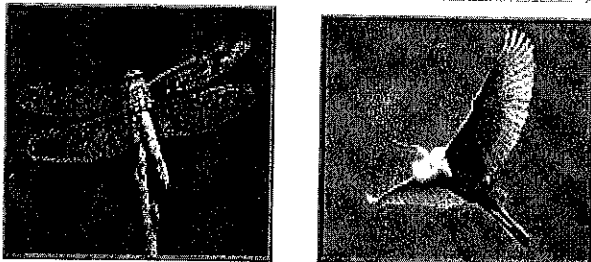
Using COMPLETE SENTENCES answer the following questions.

1. What is anatomy?
2. How does anatomy provide evidence for evolution?
3. What is a homologous structure?
4. Give an example.
5. What is an analogous structure?
6. Give an example.
7. Decide if the anatomical structures listed below are examples of *homologous structures* or *analogous structures*:



A.

Answer: _____



B.

Answer: _____

- C. Evolved from the same ancestor but now have different functions.

Answer: _____

- D. Evolved from different ancestors, but because they were placed in the same environment, they have the same function.

Answer: _____

- E. A poisonous spider and a poisonous snake both have venom sacs.

Answer: _____

F. A whale and a fish both have fins to swim underwater, however, a whale is a mammal and a fish isn't.

Answer: _____

G. A house cat and a lion evolved from the same ancestor but no longer look alike (the house cat is much smaller than the lion).

Answer: _____

Comparing Homologous Structures:

Purpose: In this activity you will observe parts of different animals and look for evidence that these animals are related to each other (that is, that they could have evolved from the same common ancestor).

Procedure:

1. With your partner, observe the seven limbs in the picture that was given to you.
2. Right your observations in the chart below.
3. Answer the conclusion questions.

animal	shape of limb	# of bones in the upper limb	# of bones in the lower limb	function of the limb (what does it help the organisms do?)
Frog front leg				
Whale flipper				
Horse front leg				
Lion front leg				
Human arm				
Bat wing				
Bird wing				