It's all in the bones - evidence for evolution

Introduction

In this activity you will look at the bones in mammalian limbs and discuss how they provide evidence in support of the theory of evolution by natural selection.

The Activity

Part 1 Spot the bones, looking for similarities

Look at the drawings in Figure 1 of bones in the forelimbs of various mammals (not drawn to scale).

1. Make a list of the features of each one. For example; number, size and shape of bones? Do you think the whole limb, including the hand would be long or short? Would it act as a lever to produce a lot of force, or would it be more delicate? Have a guess at which animals these limbs might be from.

2. Now look at the *pattern* of bones in each limb. There are differences of course (they come from very different mammals) but can you see an overall basic pattern? Write out what you think this pattern is and compare it to other groups' answers. The pattern you should see is called the Pentadactyl Limb (*penta* means …..? and *dactyl* means ……?)

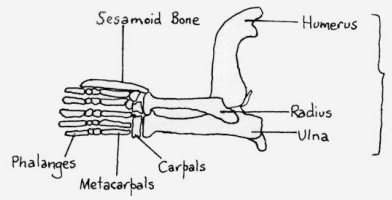
   Darwin made these and other similar observations. This sort of comparison illustrates common features even though the functions may be very different. This 'homology' of structures suggests a relationship between the organisms.

   Mammalian limbs are homologous structures, and there are many other examples of homology. The most important of these is probably the genetic code.

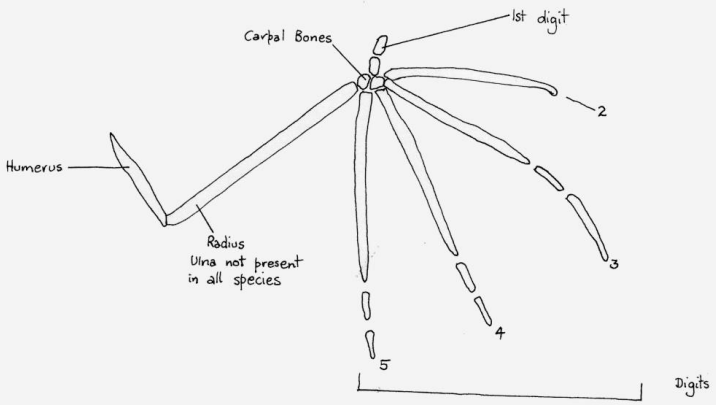
3. What does it mean to say the genetic code is an example of homology?

Figure 1 Bones of mammalian limbs

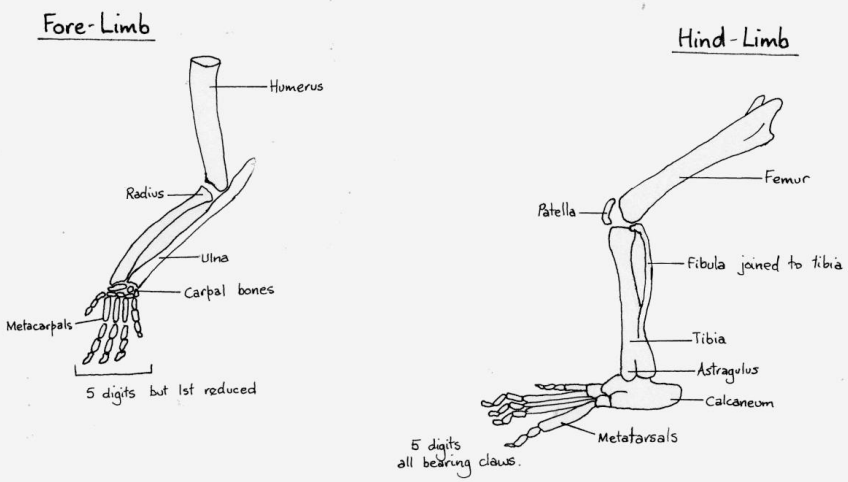
Mammal 1.



Mammal 2.

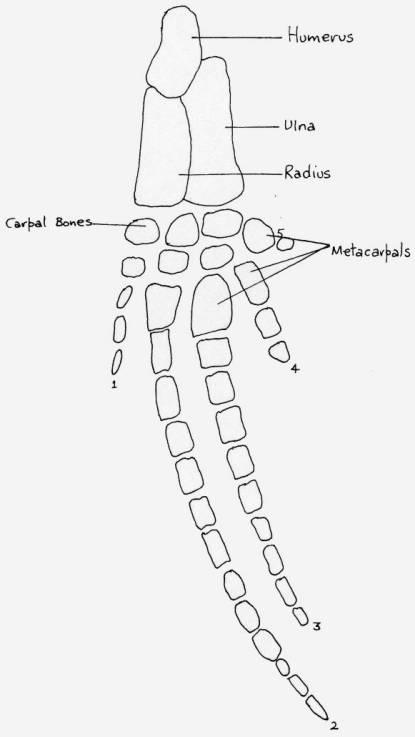


Mammal 3.

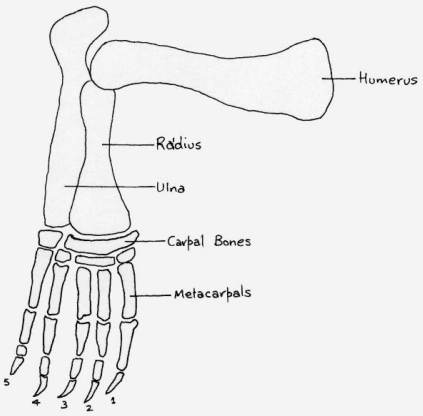


Bones of mammalian limbs

Mammal 4.



Mammal 5.



Part 2 Adaptation, looking for differences

Look at Figure 2. this is another version of the diagrams of limb bones of mammals and should help you to see if you were right in your answers to part 1.

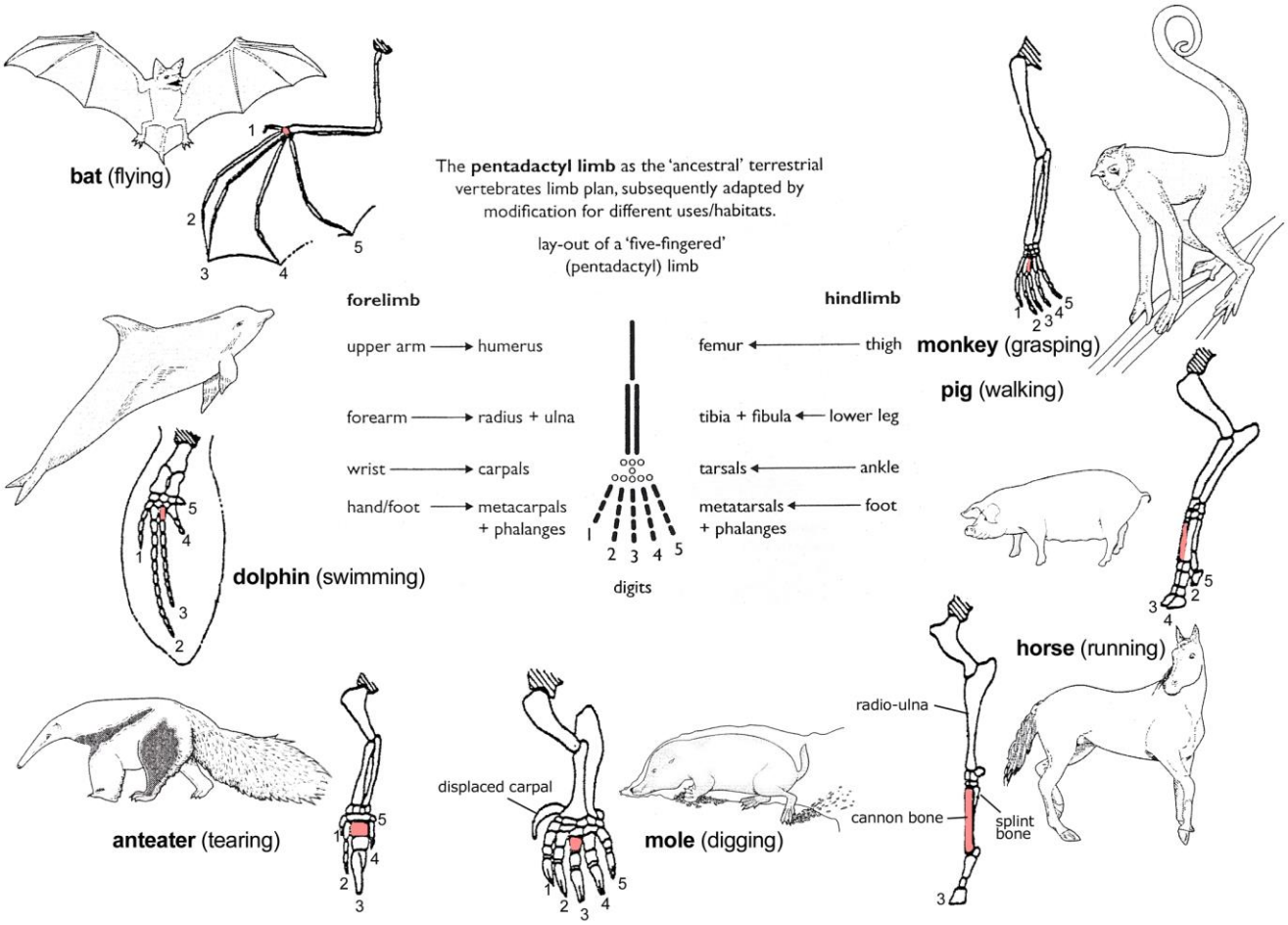


Fig 2 http://en.wikipedia.org/wiki/Image:Evolution_pl.png

1. How has the pentadactyl pattern been modified as an adaptation for flight in the bat?
2. How has the pentadactyl pattern been modified as an adaptation for swimming in the dolphin?
3. Comment on any other adaptations you have observed in Figure 2.

Part 3 But why is this evidence for evolution?

Homologous mammalian limbs demonstrate a pattern in the bones which has become adapted for different functions. Why did Darwin and others see this as evidence for evolution?

"*What could be more curious than that the hand of man formed for grasping, that of a mole, for digging, the leg of a horse, the paddle of a porpoise and the wing of a bat, should all be constructed on the same pattern and should include similar bones and in the same relative positions?*" C.Darwin

To understand this you need to consider for yourself how homologies came about.

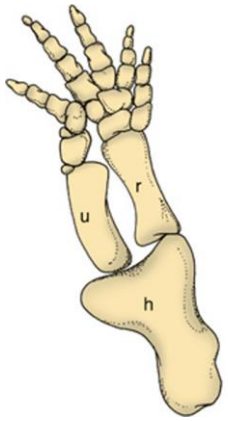
1. Explain how the bone patterns in mammalian limbs came about, using the theory of evolution from a common ancestor.

2. Creationist or intelligent design ideas say that each species developed or was created separately. How would these ideas explain the homology of the bone structures in different species?

3. Based on the theory of evolution, what prediction would you make about the bone structures of
   i) the limbs of fossils of early mammals
   ii) the limbs of creatures that came before mammals?

4. Figure 3 shows the bones of one of the first creatures to live on land, long before there were any mammals. Does it fit the predictions made by the theory of evolution by natural selection?

Figure 3



"Molecular homologies, such as the genetic code, now provide the best evidence that all life has a single common ancestor." Mark Ridley in *Evidence for Evolution*.