Homology: Where does the evidence lead?

Many living organisms show similarities in their structure and development. Homology is the name given to the scientific study of these similarities. In textbooks, homologies are often uncritically used as evidence for Darwinian evolution. Yet today, a number of scientists have begun to find alternative explanations.

Case Study: Developmental Homologies

In 1868, a scientist named Ernst Haeckel published drawings of early vertebrate embryos which he manipulated to look *more* similar than they actually were. This was because he held preconceived views about evolution. Haeckel's drawings were eventually recognized as fraudulent, but they are *still* found in some biology textbooks as good evidence for common ancestry.

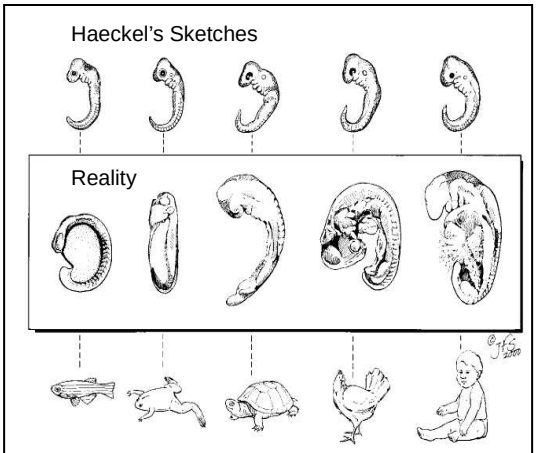


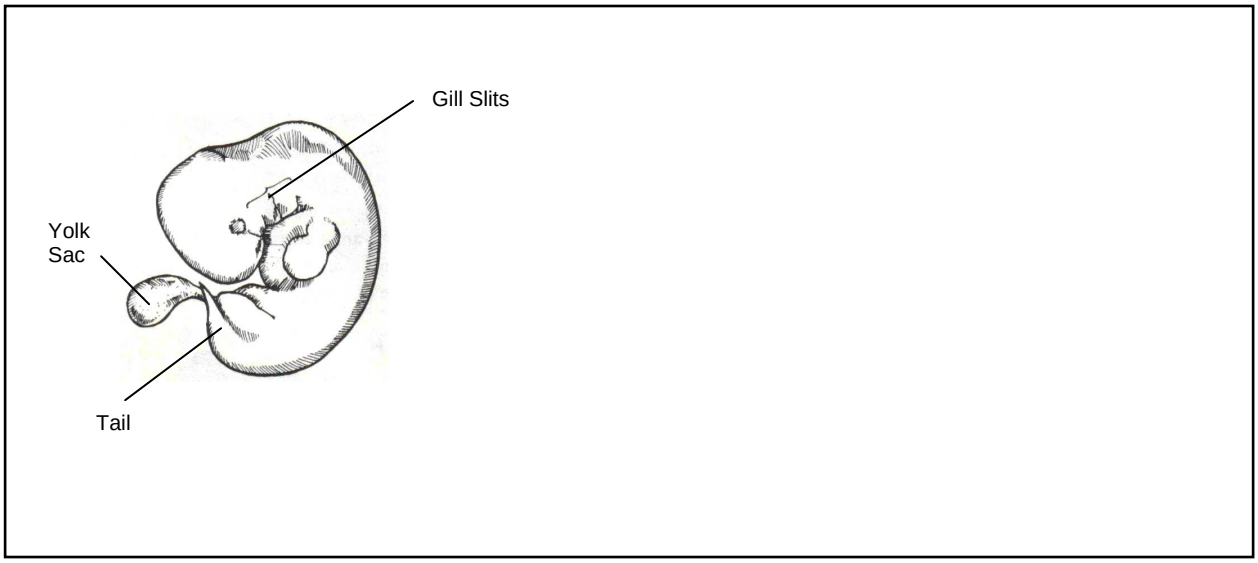
Fig 1: Haeckel's drawings compared with reality

Figure 1 © Jody Sjogren

Haeckel's ideas continue to spread misconceptions today. In humans at one month, there are throat pouches in the skin near the neck. These are sometimes labeled as 'gill-slits', suggestive of a fish ancestry. In fish, these pouches do develop into gills. But in humans and other organisms, the ***middle ear canals*** develop from the second pouch, and the ***parathyroid*** and ***thymus glands*** come from the third and fourth. These labels are therefore quite biased.

Other common misconceptions include the idea that a human embryo has a 'yolk sac' like a chicken and a 'tail' like a primate. These parts have now been identified as the ***blood-forming sac*** and the ***coccyx***: an important point of muscle attachment necessary for our upright posture.

Below is a <u>FALSE</u> human embryo sketch with incorrect annotations. *Using both Fig. 1 and the text above*, redraw this tiny human being in the space provided, to correct the basic body plan and labeling errors.



Questions: Tell Each Other

Briefly discuss the answer to each question with the person next to you.
Be prepared to give your answer to the whole class, if the teacher asks for it.
Once this class discussion is over, write your answers in the spaces provided:

1. What is homology?

2. Why is Ernst Haeckel's story an example of scientific fraud?

3. Evolutionary biologists usually define homologies as 'similarities due to common ancestry'. What other hypotheses might scientists use to explain these similarities?

4. The earliest stages in vertebrate embryos are radically different from one another. Does this new evidence suggest descent from a common ancestor or reproduction according to distinct types? Explain your answer.

5. Homologous structures - such as the vertebrate gut – can arise from very different developmental pathways. How does this contradict predictions arising from common ancestry?