SCOPE, SEQUENCE, and COORDINATION

A National Curriculum Project for High School Science Education

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Student Materials

Learning Sequence Item:

905

Structures That Reveal Common Ancestry

August 1996
Adapted by: Lucy Daniel and Tom Hinojosa

Contents

This micro-unit was adapted by **Lucy Daniel** (East Carolina University, Greenville, N.C.) and
Tom Hinojosa (California SS&C Project, Santa Clara)

Student Sheet

Science as Inquiry/Science and Technology

Fly Away

Is there ever just one way to solve a problem?

Overview:

Throughout the 20th century, humans have loved to experiment with flight. Although many designs have been created, successful ones have at least one thing in common—they fly! In this activity, be an inventor and use your imagination to solve the problem.

Procedures:

Design and construct paper airplane gliders of various shapes that will stay in the air for at least five seconds and that will travel a certain linear distance from the starting launch point (your teacher will determine an appropriate distance). Go wild! The challenge is to create designs that are as different as possible but that still meet the criteria.

Questions:

1. Can the gliders be grouped into "families"? Using what characteristics?

2. If the planes were to be produced for marketing and sale in toy stores, what would be the "survivability" criteria that they would have to meet? How might they need to be changed to meet the new criteria?

3. Give three specific directions to accompany your model glider telling the user what to do to get the optimal flying results.

Science as Inquiry

Ideas of Icarus

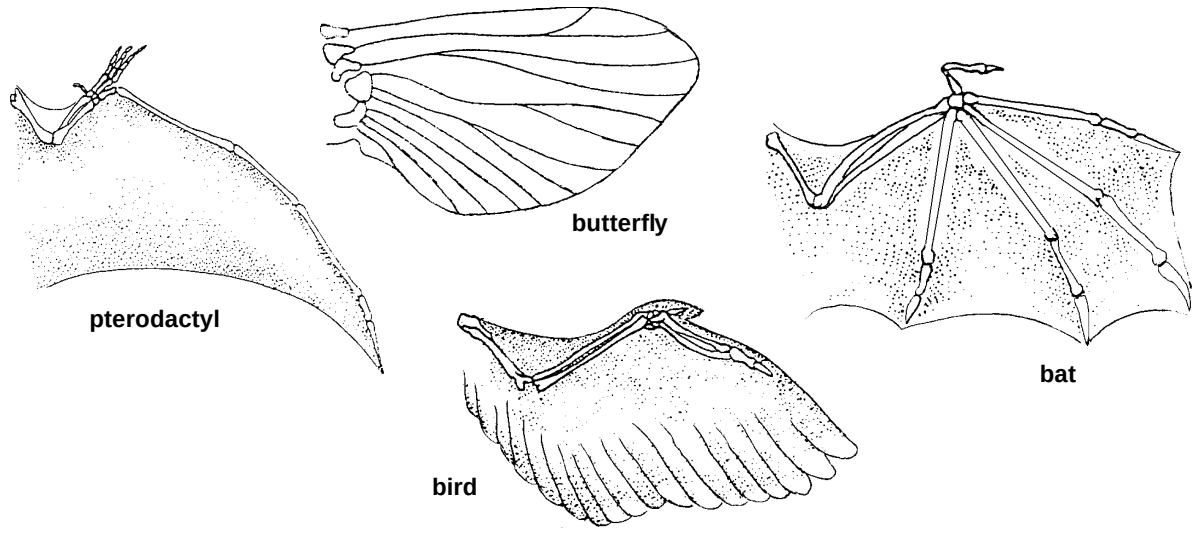
Are all wings alike? Are all winged creatures related?

Overview:

You have seen in Activity 1 that flight can be accomplished in different ways. In this activity you will compare the wings of several creatures who have achieved the ability to fly. As you compare them, consider the natural environment and life-style of each creature. Are all winged creatures related?

Procedures:

Compare the structures of the pterodactyl wing, butterfly wing, bat wing, and bird wing shown below. Identify and note similarities as well as differences. Construct a data table to organize your notes and observations.



Questions:

1. Are these organisms related? Explain?

2. Each of these creatures has developed structures for flying (wings). Why do you think these different species have developed this similar adaptation? Give specific examples to support your ideas.

Science as Inquiry

Swim for It!

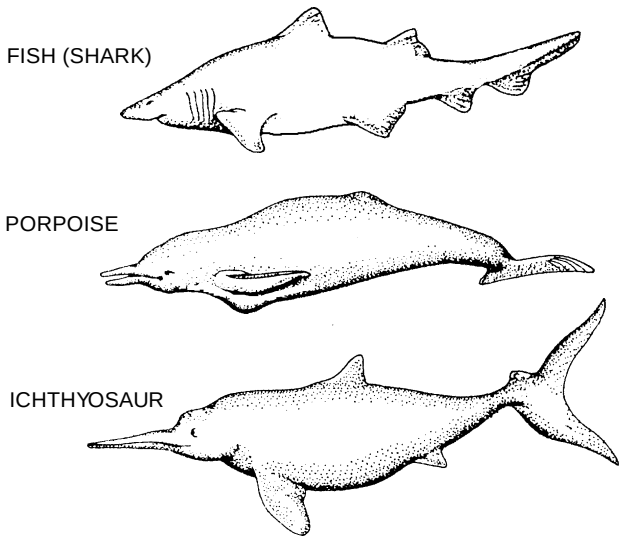
What makes a good swimmer?
Are fish and aquatic mammals related?

Overview:

In this activity we see another example of seemingly similar creatures. But how similar are they really? How can the similarities between the creatures be explained?

Procedures:

Compare the body shapes of the fish and porpoise below and then compare their body shapes with the fossil aquatic ichthyosaur (reptile).



Questions:

1. Where do the organisms live (or did live)?

2. Describe the shape of the organisms.

3. What type of environment is their shape adapted for?

4. Are these organisms closely related? Explain.

5. Are there differences in the animals? Give specific examples.

6. Explain why these different species have developed some adaptations that are similar.

Science as Inquiry

Contents, Covers, and the Stories They Tell

What do the bones of animals reveal about their ancestry?

Overview:

Our understanding of evolutionary history is based in part on the study of bones. In this activity you will examine bone sets of the upper limbs of several different mammals. Your task is to try to identify the animal that each set of bones came from. Do the structure and pattern of the bones reveal anything about which of the animals may be related? What do the bone structures and patterns tell you about their function?

Procedures:

Part I. Carefully examine the bone structures on Lab Sheet 1. (Note: bones are not drawn to scale.) All are forelimbs of mammals. Look for key structural features that give tell-tale clues about which mammal the bones are from. Copy the table below into your lab notebook and fill in the missing information based on your observations.

Bone Set	Key Structural Features	Proposed Animal Source
A		
B		
C		
D	five separate digits or fingers; hand-like structure; long, thin upper and lower arm segments	human
E		
F		
G		

Part 2. Examine the skin- and/or fur-covered limbs on Lab Sheet 2. These are limbs from the same seven mammals whose bones you studied in Part 1. Describe the relationship between each limb struc-

ture and its normal function. For example, number 1 is a mole. The mole's forelimb is structured with short, strong levers and sharp claws for digging (since the mole lives underground). In your lab notebook, name each of the other mammals and similarly describe the relationship between the structure and function of their forelimb.

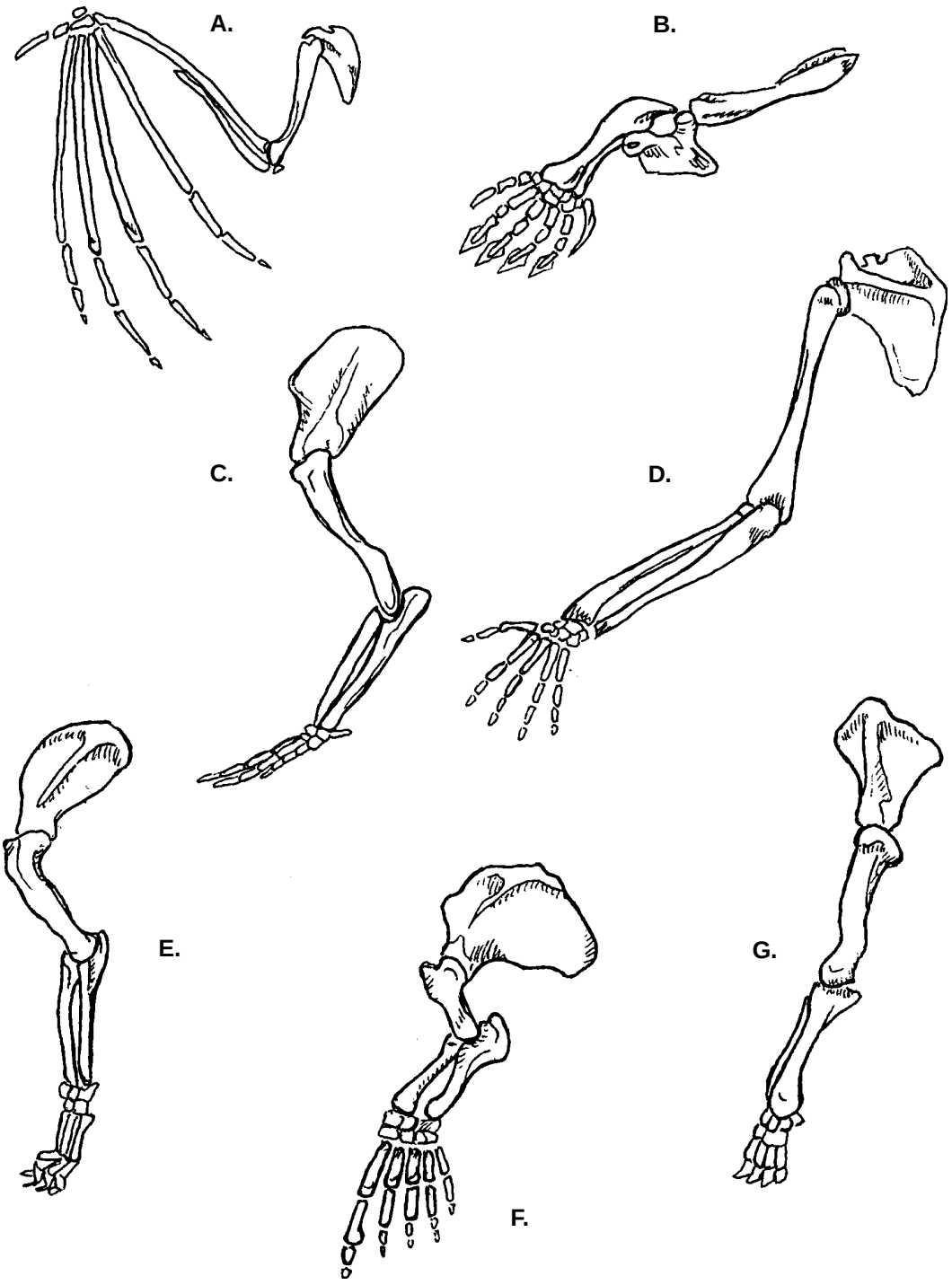
Questions:

1. In Part 1, which of the bone sets were hard to identify? Explain why.

2. Describe any similarities seen among the bone sets of these seven mammals. Be as specific as you can.

3. Considering the illustrations on Lab Sheet 2, propose a general statement explaining why the limbs of these seven mammals show such different outward appearances while maintaining the similarities seen in the bone structures and patterns seen on Lab Sheet 1.

Lab Sheet 1



Lab Sheet 2