

## ***Examining Bird Adaptations***

### **Pre-Lab Discussion**

There are many different types of birds. Each type of bird has special adaptations that help it live in its environment. The various shapes and sizes of beaks are adaptations for eating different kinds of food. A bird's legs and feet show adaptations to the bird's native environment. Birds can also have different types of feathers. These feathers, which are actually modified scales, serve many functions. Lastly, the bird egg has many adaptations that allow it to live on land.

In this investigation you will examine bird feathers and eggs. You will also compare the feet and beaks of different birds. You will see how different adaptations enable birds to survive in different habitats.

### **Pre-Lab**

1. Down feathers are found underneath a bird's contour feathers. The down feathers trap air to help keep the bird warm. What would you expect down feathers to look like?
2. What is another name for the claws of a bird?
3. How many toes do most birds in Figure 2 have?
4. How does a bird's beak help you identify its habitat?

### **Materials (per pair)**

- Contour feather
- Down feather
- Hand lens
- Chicken egg
- Figure 2 Pictures
- Data Tables

### **Safety**

Use caution when handling feathers and egg parts. **WASH** your hands after touching materials in this lab.

## Procedure

### Part A: Chicken Egg Observation

1. Obtain a raw chicken egg from your teacher. Hold the raw egg in the palm of your hand. Gently shake the egg back and forth.
  - a. Note whether you feel anything moving inside.
2. Gently crack open the egg over a petri dish. Carefully pour the contents of the egg into the petri dish.
3. Examine the structure and texture of the **shell**. Look at the blunt end of the shell. Locate the membranes and the **air space**.
4. Examine the contents of the egg in the petri dish. Refer to page 825 Figure 28-22 as you work. The **germinal disk** is a small white spot on the top of the yolk. This is the spot where fertilization and the development of the embryo occur.
5. Find the whitish strands attached to both sides of the yolk. These are the **chalazas**. When the egg is intact, the chalazas stretch from the yolk to the membrane located just beneath the shell. The chalazas twist when the egg rolls, keeping the germinal disk and the embryo at the top of the egg.
6. The clear fluid in the petri dish is the **albumen**. In an intact egg, the albumen completely fills the space between the yolk and the membrane beneath the shell.
7. The **yolk** is the yellow material. Note how the yolk appears to form a slightly flattened sphere. The yolk is surrounded by a membrane that helps it maintain its shape. Puncture the membrane surrounding the yolk with the dissection needle. Observe what happens.

### Part A: Observations

1. Draw and label the following parts of the chicken egg: *shell, air space, germinal disk, chalazas, albumen, yolk*.

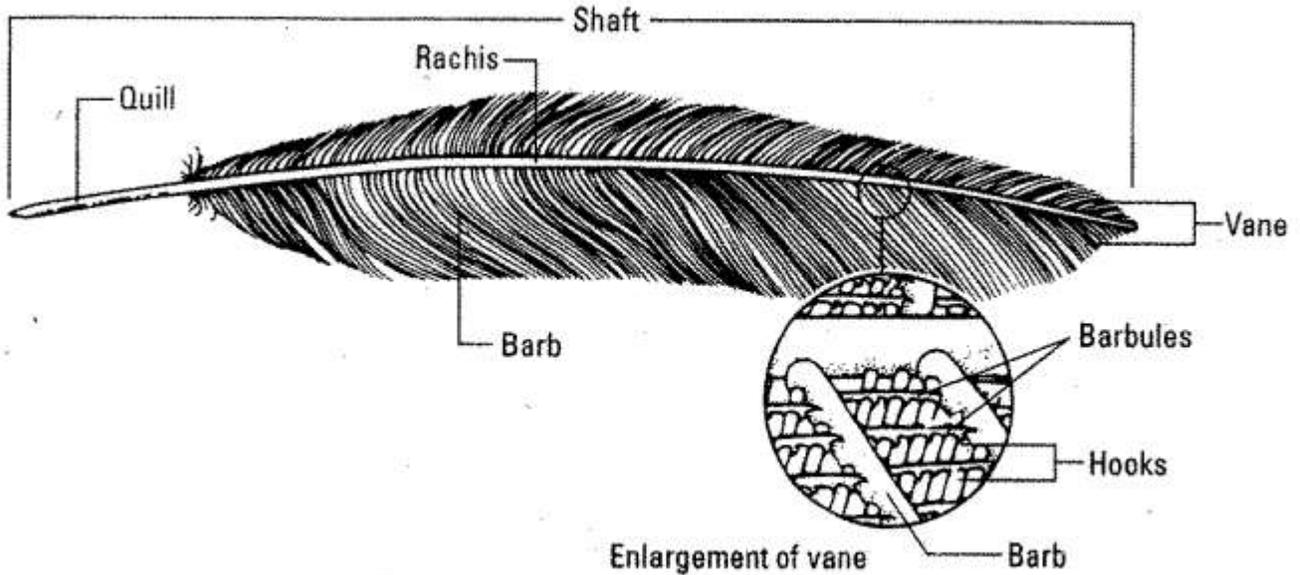
2. What did you observe when you shook the egg back and forth?
3. What are the characteristics of the egg shell?
4. What happened to the yolk when your pierced the membrane?

### **Part A: Analysis and Conclusions**

1. What characteristics of the egg shell help the egg survive on land?
2. How are birds eggs adapted for reproduction on land?
3. Using your knowledge of the structures you observed in the egg, explain what happened when you shook the egg back and forth.
4. For what purpose do people use egg yolks? For what purpose do developing chicks use egg yolks?

## Part B: Examining Feathers

1. Obtain feathers from your teacher. Examine the contour feather. Use Figure 1 to locate the different parts of the feather. The shaft of the feather has two parts: the **quill** and the **rachis**. The rachis supports the hairlike **barbs** that make up the **vane**.



**Figure 1**

2. Use the hand lens to closely examine the quill.
3. Use the hand lens to examine the feather's vane. Gently ruffle the edge of the feather, and find the **barbules** on the **barbs**. Smooth the feather with your finger. Notice how easily the barbs can be smoothed back into place.
4. Obtain a down feather. Identify the **quill**, **rachis**, and **barbs** of this feather. Draw what you see in the space below. Label: **quills**, **rachis**, **barbs**.
5. Notice the length, width, and flexibility of the shaft of the down feather. Examine the down feather with a hand lens. Try to smooth the down feather as you did the contour feather.

## Part B: Analysis and Conclusions

1. Is the quill of a contour feather solid or hollow?
2. How does the down feather shaft compare to the contour feather shaft?
3. Do barbs of the down feather stick together when you smooth it? Explain.
4. How does the structure of a contour feather shaft make it well adapted for flight?
5. How do hooks increase the strength of a contour feather?

## Part C: Comparing Bird Feet and Beaks

1. Observe the drawings of the birds in Figure 2. Count the number of toes on the foot of each bird and record this information in the Data Table 1.
2. Examine the foot of each bird in Figure 2. Notice the position (front or back of foot). Record this information in Data Table 1.
3. Describe the talons, or claws, as large, medium, small, long, thin, and so on.
4. Determine the function of each foot from the following list. Record this in Data Table 1.
  - *Scratching foot*: Rake like toes for finding food in soil.
  - *Perching foot*: Long back toe that can hold onto a perch tightly
  - *Swimming foot*: Webbed, paddlelike
  - *Running foot*: Three toes rather than four
  - *Wading foot*: Large foot and long leg for wading in shallow water
  - *Specialized foot*: Long talons and toes for running over leaves of large water plants
  - *Climbing foot*: Two hind toes for support when climbing upward to prevent falling backward
  - *Grasping foot*: Large curved claws to grab and hold such prey as fish, mice and other small animals

5. Examine the relative shape and size of the beak of each bird in Figure 2. Use this list to describe the function of each beak. Record this information in Data Table 2.
- *Chisel*: Used for drilling into trees
  - *Short and Stout*: Used to eat insects, seeds, small crustaceans; multipurpose
  - *Tabular*: Used to obtain nectar from flowers
  - *Hooked*: Used to tear flesh
  - *Flat, broad, and slightly hooked*: used to strain algae and small organisms from water
  - *Cracker*: Used to crack seeds; short and stout; sometimes curved upper portion
  - *Scoop*: Used to scoop fish from the water; long and stout
  - *Spear-shaped and stout*: Used to spear fish
  - *Trap*: Used to trap insects in midair

**Data Table 1**

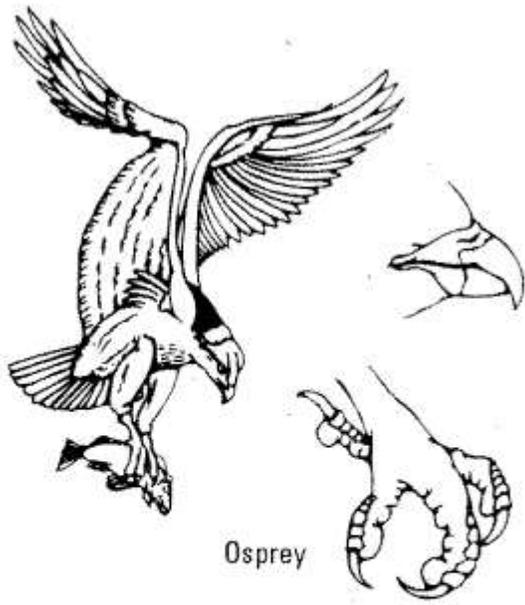
<b>Bird</b>	<b>Number of Toes</b>	<b>Toe Position</b>	<b>Size of Talons</b>	<b>Type or Function</b>
Heron				
Osprey				
Woodpecker				
Duck				
Jaçana				
Quail				
Pelican				
Hummingbird				
Rhea				
Wippoorwill				

**Data Table 2**

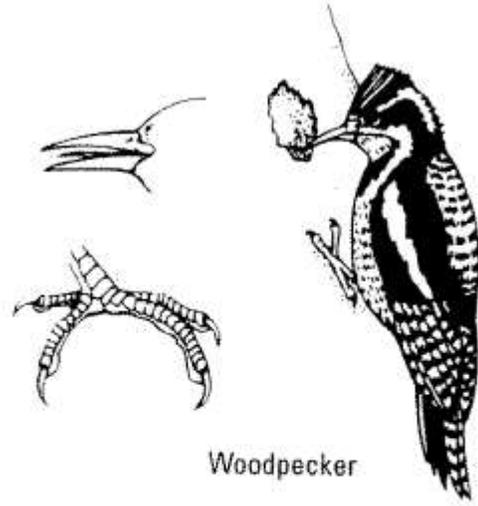
<b>Bird</b>	<b>Structure of Beak</b>	<b>Function of Beak</b>
Heron		
Osprey		
Woodpecker		
Duck		
Jaçana		
Quail		
Pelican		
Hummingbird		
Rhea		
Wippoorwill		



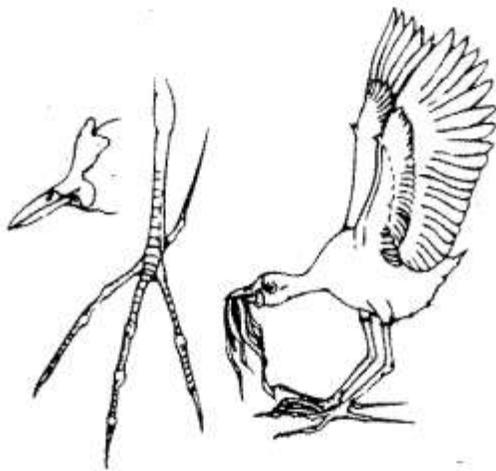




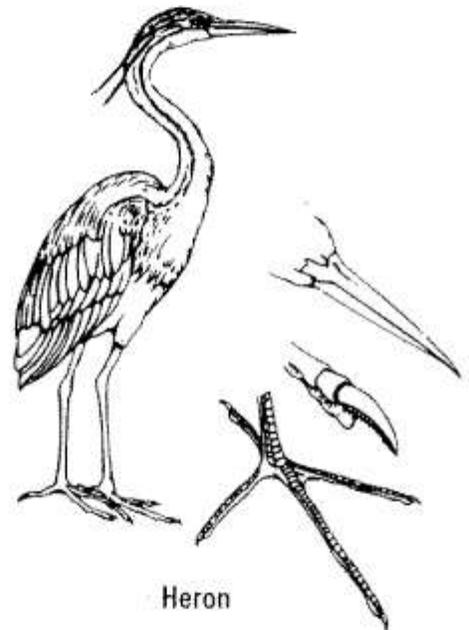
Osprey



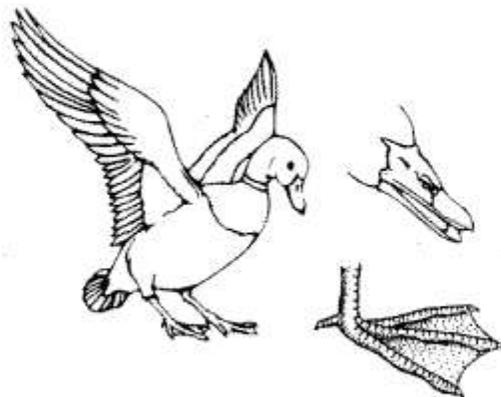
Woodpecker



Jaçana

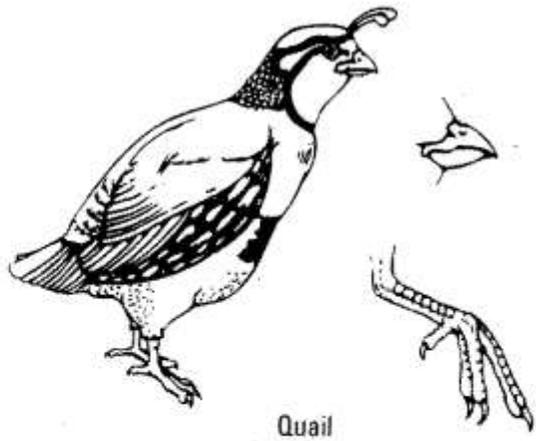


Heron

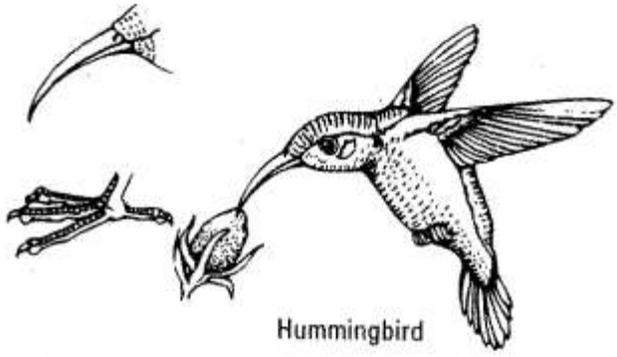


Mallard duck

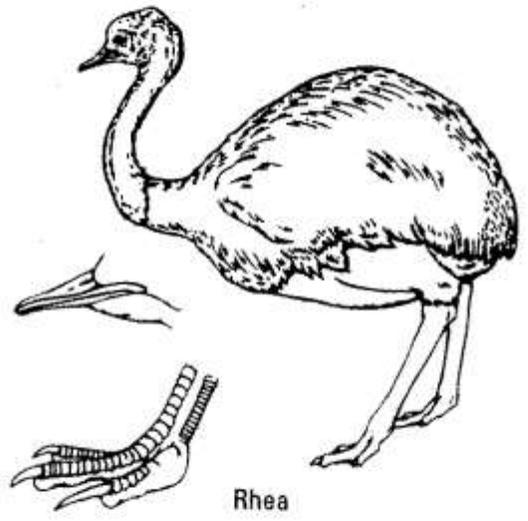
Figure 2



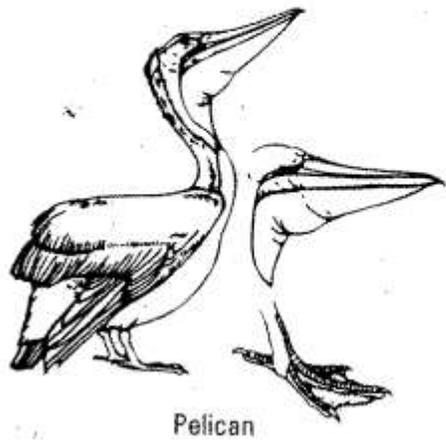
Quail



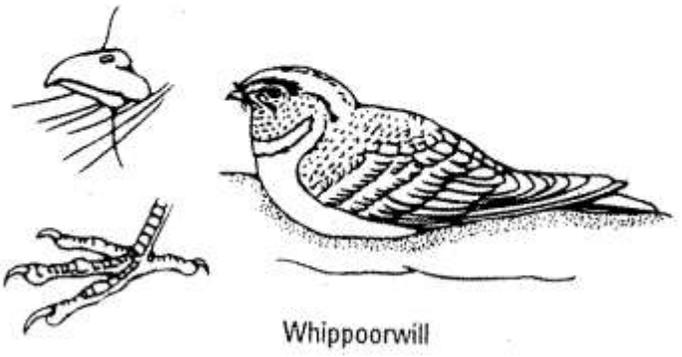
Hummingbird



Rhea



Pelican



Whippoorwill

Figure 2 continued