

## Feathers

### SCIENCE CONCEPT:

Birds have between 1,000 and 25,000 feathers, depending upon the species. Obviously, larger birds have more feathers. The swan with its long neck has the most. Feathers can be divided into six categories. Students will be introduced to the various feather types and study them under a magnifying glass.

### STUDENT OBJECTIVE:

For the students to learn the function of the six categories of feathers. After viewing the different types of feathers under a magnifying glass the students will draw them on paper. This will give them a first hand view of the feathers that make up the outer cover of birds and how these feathers help the bird fly.

### OVERVIEW:

The fascination with natural flight is a something that has always captured the minds and imaginations of people. In studying the feathers of birds students will have a closer look at part of the elements that make up the bird's ability to fly. Feathers can be divided into six categories so there is an abundance of viewing for the students to participate in.

### Key Concepts:

Feathers can be divided into six categories. The **contour** feathers are the most abundant and cover the outer surface of the bird, giving the smooth, sleek profile so important to flight. All contour feathers have the same basic structure, with modifications depending upon placement and function. There is a central *rachis*, or shaft, which is hollow. Inside the shaft, dried remains of the pulp form strengthening struts which run crosswise like ladder rungs. The *vanes* are the two halves of the feather that spread out from the shaft. They are made up of hundreds of branches called *barbs*, angling toward the tip of the feather. Each barb has tiny, parallel branches of its own called *barbules*. The vanes are smooth because of the structure of the barbs and barbules. As the feather bends and twists during flight, the barbule hooks slide back and forth retaining the smooth but flexible shape. However, a reverse twist from the tip to the base will separate the barbs and make the feather ragged with spaces in between. *Preening* "re-zips" the barbs and barbules. The barbs at the base of a contour feather have no hooks and so they appear fluffy.

The second type of feather is the **semiplume**. It is shaped like a contour feather, but its' shaft is not as stiff and its' barbs have no hooks so are fluffy. The third type is the **down** feather. It is fluffy like the semiplume but has a very short shaft.

Both the semiplume and the down feathers are important for keeping the bird warm. The fourth feather type is called the **filoplume**. These are tiny and delicate with only a few barbs on the tip. They are sparsely scattered among the other feathers. **Bristles** are stiff, hairlike feathers found only in some birds. This makes up the fifth category of feathers. Their function is specific in each species. Bristles are found around the mouths of birds who scoop insects out of the air. Bristles are found covering the nostrils of woodpeckers, and in ostriches they form eyelashes.

The sixth and last type of feather is only found in a few birds. It is the **powder-down** feather. This feather grows continually. The tip breaks off forming a water resistant powder. The metallic sheen of the heron is caused partly by this powder down. A bird's wing is the basic structure for flight. It is covered with the contour feathers that are specialized for flight. It is the shape of the wing that enables a bird to fly, and the shape is determined by the feathers.

**LESSON TIME:** 30 minutes

**WORDS TO KNOW:**

- contour
- rachis
- shaft
- hollow
- pulp
- vanes
- barb
- barbules
- hooks
- semiplume
- down
- quill
- filoplume
- bristles
- powder-down

**MATERIALS NEEDED:**

- 6 types of bird feathers(or as many as possible of the various types)
- microscope
- magnifying glasses
- artist paper
- pencils and erasers
- stapler



### **STEPS:**

1. Read through the material under the Key Concepts to the class and discuss the concepts presented with the students.
2. Put students into groups of 3-4 students per team.
3. Hand out at least one magnifying glass and one set of 6 feathers to each team.
4. Give each team adequate time to view the feathers under the magnifying glass. Let one team at a time use the microscope if available.
5. As a class take time to discuss the variations and similarities of the 6 type of feathers.
6. Ask students to draw a picture of each type of feather and label.

### **Closure:**

The feathers of a bird are an engineering marvel. The study of them can fascinate students and cause a greater curiosity. It will hopefully motivate students to investigate further into the other aspects that give birds the power and magnitude of flight.

1. Staple the pictures together of each student's art work of the different feather types.
2. As an extra project ask the students to draw a picture of what a theropod (T-Rex, Velociraptor, Carnatorus, Spinosaurus, etc.) with feathers might look like.
3. Discuss how hard it is to find old feathers. Why? Because they break down and decay too quickly to become fossils.