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SCIENCE ACTIVITY BOOK

Learning About BIRDS

Grades 4 - 8+

• History • Anatomy • Classification • Adaptations • Behavior • Migration
• Conservation • Research • Vocabulary • Observation Activities and More!

Animal Life Series

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Mark Twain Media/Carson-Dellosa Publishing Company, Inc.

Introduction

Welcome to a series of books devoted to the *Chordata Phylum*. A **chordate** is an animal that has a spinal cord and vertebrae (backbone). Most chordates have specialized body systems and paired appendages; all at some time in their development have a notochord, dorsal nerve cord, and gill slits. Every animal in the animal kingdom has been subdivided into two main groups, **invertebrates** (without backbone) and **vertebrates** (with backbone). The invertebrates make up 95 percent of the animal kingdom, while vertebrates make up only five percent. The vertebrates are then divided into seven groups called classes: jawless fish, cartilaginous fish, bony fish, amphibians, reptiles, birds, and mammals. Each **class** (group) has special characteristics all its own. This book is devoted to the class of animals called **Aves** (birds).

Birds are easily seen by people and have become important in religion and folklore. Most people have an interest in birds to some degree. They are important economically, providing both food and products made from their feathers and other parts. Shooting birds has provided many with recreation. The simple joy of birdwatching has also become a popular sport. Many people enjoy watching birds because it is a simple pastime. Birds have also proven to be important to us in biological knowledge. Birds, by their health and well-being, can warn us of dangers in our environment.

Birds live in various habitats and are a diversified class of vertebrates. They are varied in their structures because they must be well-suited for the environments in which they live, or they would not be able to survive. Like each group of animals, birds still have many traits or characteristics they share in common with all other birds. Birds are **endothermic** (warm-blooded) vertebrates that have wings and feathers.

Student observers will use many scientific process skills to learn about and appreciate the fascinating world of birds. Students will learn about the origins of birds, their habitats and behaviors, and gain an appreciation of their natural environments. The reinforcement sheets that follow the lessons contain at least one higher-level thinking question. Students will gain a greater interest in science by increasing their ability to practice various scientific skills. Students will observe, classify, analyze, debate, design, and report as they make discoveries about birds and the complex world in which they live.

* **Teacher Note:** Each lesson opens with a manageable amount of text for the student to read. The succeeding pages contain exercises and illustrations that are plentiful and varied. The lessons may be used as a complete unit for the entire class or as supplemental material. The tone of the book is informal; a dialogue is established between the book and the student.

What Are Birds?

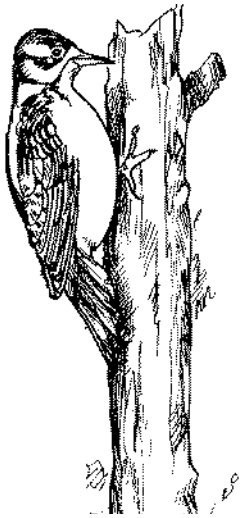
Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Aves* (A veez) means “birds”

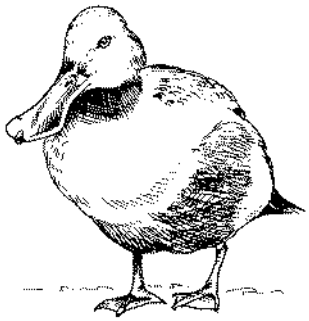
Birds are a class of vertebrates that are more complex than reptiles but less complex than mammals. Birds belong to the only class of animals that have feathers. Scientists are debating the origin of birds and how birds should be interpreted. Fossil evidence suggests to some scientists that modern birds may have come from the **archaeopteryx** (ark ee OP ter rix), a dinosaur with wings and feathers. Scientists aren’t sure the archaeopteryx could fly freely, but its feathers most likely enabled it to at least soar from tree to tree.

Scientists have named over 9,000 different species of birds. Some live in forests, others live in grasslands, in deserts, on mountaintops, and on uninhabited islands. Since they are warm-blooded (able to maintain a constant body temperature regardless of their surroundings), they can live in very hot or very cold climates. Birds are easy to recognize because they are the only animals with feathers; however, not all birds can fly.

Birds have characteristics that make them well-suited for both flight and life on land. They are warm-blooded vertebrates with wings and feathers, but they also have other characteristics. All birds have beaks (without teeth) that are designed to help them obtain food. They reproduce by laying and incubating fertilized amniotic eggs with hard shells. They are strongly social, as one or both parents provide care for the helpless offspring. Birds also have lightweight, hollow bones that make up their skeletons.

All birds are classified into the class *Aves*. They are then classified even further into five different groups, based on their beaks and **talons** (feet). Bird beaks and talons are modified according to their habitats and the types of food they eat. For example, water birds need webbed feet and a straining beak.





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What Are Birds?: *Reinforcement Activity*

To the student observer: When you think of birds, do you immediately think of an animal that can fly? Would this be true?

_____

_____

Analyze: Birds of prey are those who hunt other animals for food. Do you think webbed feet would be an advantage or disadvantage for this kind of bird? Why?

_____

_____

1. Solve the puzzle below:

B ___ ___ ___ ___	Birds have _____ instead of teeth.
___ I ___ ___	A vertebrate with wings and feathers.
___ ___ R ___ - ___ ___ ___ ___ ___ ___ ___	Birds are _____.
___ ___ ___ D ___ ___ ___ ___	Fossil _____ suggests birds came from reptiles.
___ ___ ___ ___ S	Birds have _____ instead of arms.

Carefully answer the following.

2. Name two adaptations of birds for flight. _____

   _____

3. Some scientists believe _____ may be the ancestors of birds.
4. Birds are more complex than _____ but less complex than _____.
5. Birds are members of the class _____.
6. List five main characteristics of birds.
   a. _____
   b. _____
   c. _____
   d. _____
   e. _____

The History of Birds

Class Aves

Birds, as you've already learned, are animals in the class *Aves.* They are the most beautiful and observable members of the animal kingdom. Birds are different from other animals, because they have hollow bones and feathers. The members of this class are extremely **diversified** (varied). They range in size from 6 cm (a species of hummingbird) to 2.5 m (the ostrich). Since birds are **endothermic** (warm-blooded) and can fly, they can be found living on every continent in every habitat.

Ornithology

The study of birds is very popular. People have always had a fascination with them. Birds have been symbolic throughout time to people of all cultures and religions. Many birdwatchers consider themselves to be **ornithologists**. An ornithologist is someone who studies birds, their origins, their behaviors, and their roles in the biosphere. You might even become a serious birdwatcher yourself after completing this unit!

The Origin of Birds

Some scientists believe reptiles may be the ancestors of birds. Fossils show a link between reptiles and birds. However, fossil records are fragmented and incomplete because birds' feathers and fragile bones do not fossilize well.

Archaeopteryx (Means "Ancient Wing")

The earliest well-preserved fossil known to have feathers is archaeopteryx. Many scientists consider this the first bird. Archaeopteryx had several reptilian features: teeth, a head covered in scales, claws (even on its wings), and a bony tail. Although this early bird was probably only able to glide, not fly, it is very similar to some of the birds we know today.

Hesperornis and Ichthyornis: "A Couple of Early Birds"

These two fossils, **hesperornis** (western bird) and **ichthyornis** (fish bird), were found after archaeopteryx. Hesperornis, a large loon-like flightless bird, had teeth and legs modified for swimming. Ichthyornis, a gull-sized bird, was probably a good flier with well-formed wings. New fossil remains continue to be discovered as **paleontologists** (people who study fossils) continue to seek answers regarding the origin of birds.

Name: _____ Date: _____

The History of Birds: *Reinforcement Activity*

To the student observer: Can you summarize the differences between birds and the other vertebrate animals?

_____

_____

_____

Analyze: Why do you think feathers and hollow bones do not fossilize well?

_____

_____

Directions: Complete the following questions below.

1. What are two characteristics that distinguish birds from the other vertebrates? _____

   _____

   _____

2. What is ornithology? _____

   _____

3. Birds belong to what class? _____

4. Why do some scientists believe reptiles may be the ancestors of birds? _____

   _____

   _____

   _____

5. Who are paleontologists? _____

   _____

6. What reptilian characteristics can you identify from the illustration of the archaeopteryx on the next page?

   _____

   _____

   _____

   _____

   _____

Name: _____ Date: _____

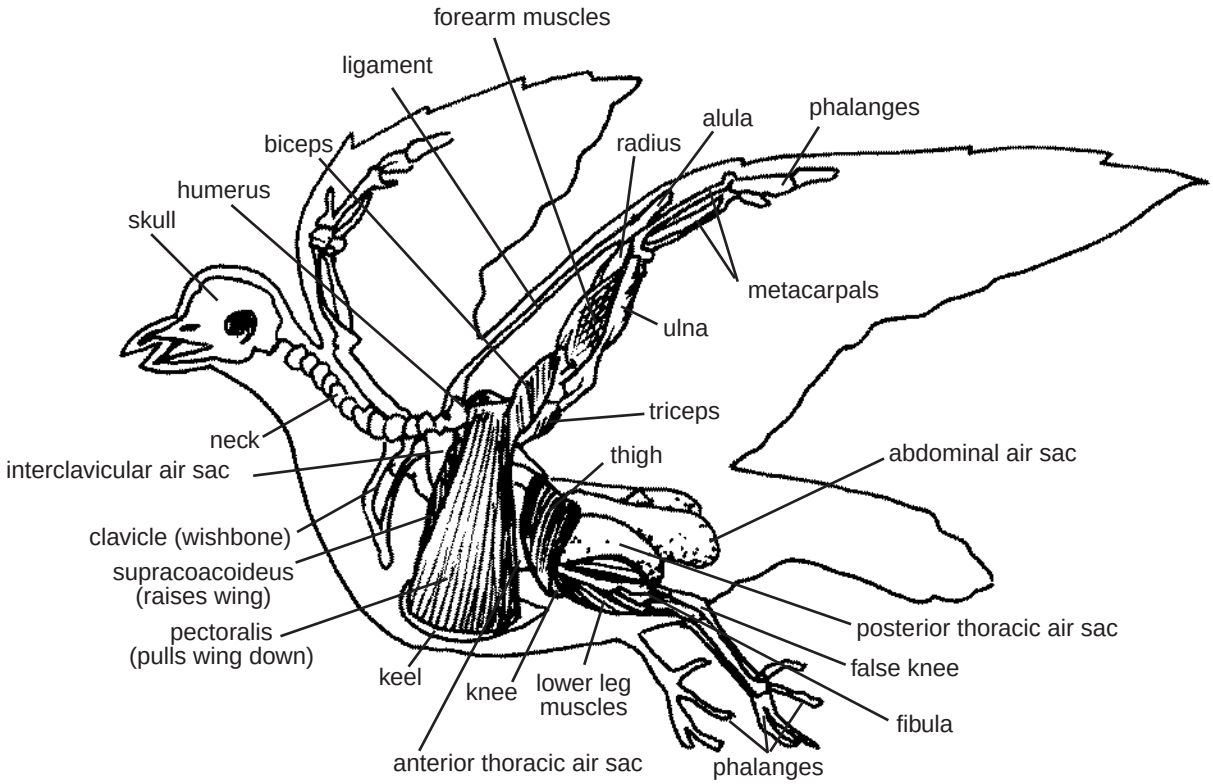
The History of Birds: *Reinforcement Activity (cont.)*

ArCHAEOpTEryX—THE FIrsT BIrD

Birds, Inside-Out: *The Anatomy of a Bird*

The outer surface of a bird's body, except for its bill and feet, is usually covered with feathers. Feathers cover the bird's wings and body and help keep it warm by providing insulation. Some birds, such as the vulture, have bare heads and necks. Another bird, the bald eagle, isn't really bald at all. It has plenty of white feathers on its head and neck. Birds are the only vertebrate animals capable of true powered flight. The wings of a bird are shaped very much like the wings of a plane. They are curved from the front to the back, creating lift for flight. Birds have thin skin and scales on their legs and feet. Birds have small, covered ear openings and a keen sense of hearing.

Inside the streamlined, elongated body of the bird, there is a unique skeletal and muscular system. The skull is joined to the backbone by bony vertebrae, and the internal organs are protected by a rib cage as in all vertebrates. The bird's skeleton has been modified for flight. The bones are hollow and lightweight but are fused together for strength. The bone structure of larger birds has a crisscross network of struts that strengthens the hollow center. The huge eye sockets and toothless beak reduce the weight of the skull. A bird has a long neck that enables it to catch food and to reach all parts of its body. The bird's neck has more bones than the other vertebrates. The wishbone, or clavicle, supports the massive **pectoral** (chest) muscles. Although the skeleton is light, the muscles are large and heavy. The pectoral muscles make up 25 percent of a bird's body weight and are used to move the wings. Much of the space inside the bird's body is taken up by air sacs that are connected to the lungs. The air sacs move up into the neck, upper wing bones, lungs, chest, and abdomen.



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Birds, Inside-Out: *Reinforcement Activity*

To the student observer: Do you know why feathers are so important? _____

Analyze: What reptilian characteristic is still present in modern birds? _____

Directions: Complete the following questions.

1. Describe how a bird's skeleton is modified for flight. _____
2. Describe how the wings of a bird are designed for true flight. _____
3. What is the largest muscle in a bird's body? _____
4. What takes up most of the space in a bird's body? How is this helpful to a bird?
5. How is a bird's head designed for flight? _____

Fly, Fly Away

Birds Are Built for Flight

Flight requires a tremendous amount of energy; a light, strong skeleton; wings; and feathers. A bird's entire body is adapted for flight. Some of the adaptations it has for flight are internal. Let's take a close look at the bird's many structures for flight.

Wings

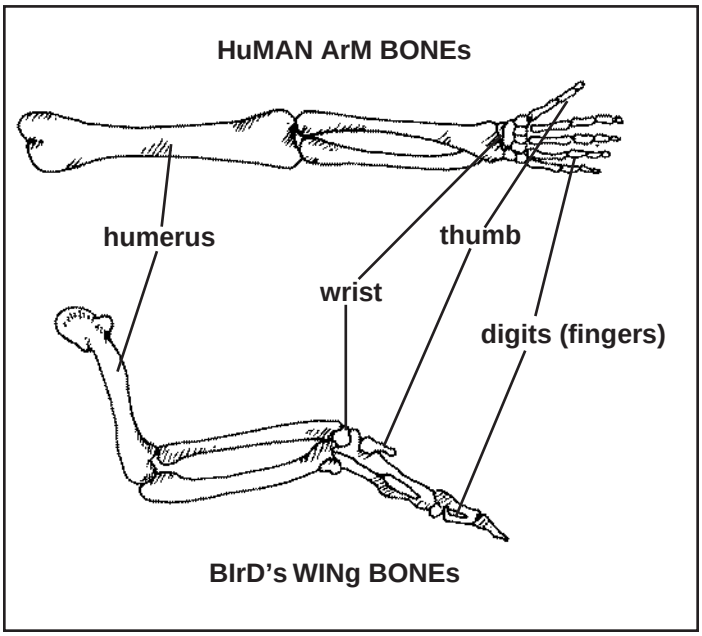
The bones in a bird's wing are very much like a human arm. A bird has a shoulder, an upper arm and elbow, a lower arm and wrist, and a hand with fingers and a thumb. However, our hand is different from a bird's hand. We have more bones and fingers, and we can move all our fingers. A bird has a narrow hand with only two fingers that are joined together so they can't move. Birds can only move their thumbs.

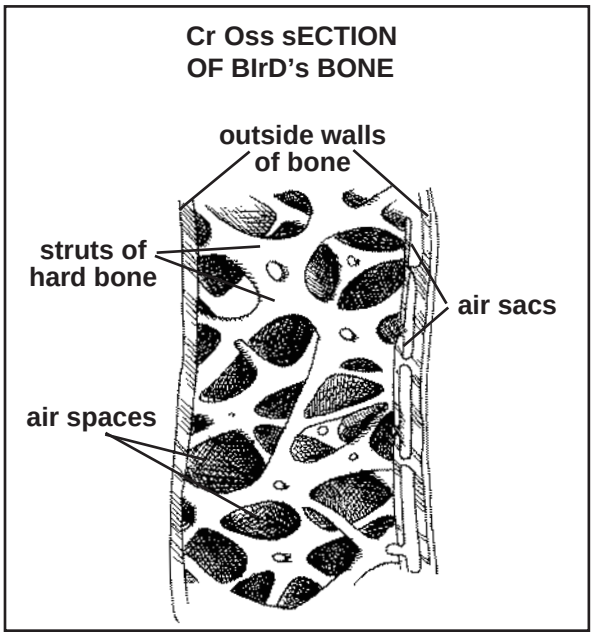
The shape of a bird's wing is one way birds are built for flight. The wing is slightly curved from front to back and is thicker in the front. This allows the air to flow faster above the wing than below it. The difference in air speeds provides the lift.

A Lightweight Body

Beneath the feathers, a bird's body is quite small. It is designed to weigh as little as possible. Inside the body are bubble-like structures filled with air. These air sacs, which are attached to the lungs, spread throughout a bird's body and into its bones. The air sacs help to cool the body and lessen its weight. The body of a bird is compact and has a contoured shape.

Birds have hollow bones that are fused together; this eliminates the need for heavy ligaments. The air sacs inside the bones make them lighter in weight by reducing bone density. Even though a bird's bones are hollow, they are not brittle and weak. In fact, they are very strong due to the cross braces or struts inside them.





Fly, Fly Away (cont.)

Energy

Birds obtain the energy they need for flying from the food they eat. Birds eat large amounts of food and have an efficient digestive system that breaks down food quickly. Quick digestion enables the bird to have constant energy. Birds also have efficient circulatory and respiratory systems that keep their energy levels high and their weights low.

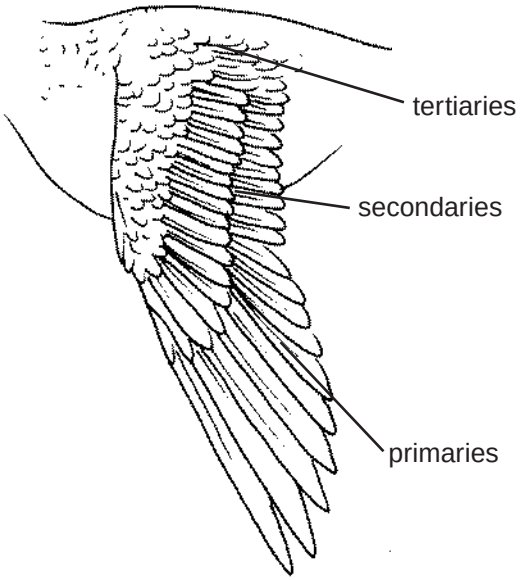
Feathers

Flight feathers must be strong enough to bend without breaking, yet light enough to float in a breeze. Feathers need to lie flat so the air slides over them and the body tapers smoothly from beak to tail. Birds fold their legs in tightly against their bodies, and even their ears are hidden beneath head feathers. The flight feathers are anchored to the wing bones. The longest feathers for flight are called **primaries** and are attached to the hand section. Attached to the lower arm bones are the **secondaries**. The secondaries are a little shorter than the primaries. The **tertiaries** (TER she air eez) are the other feathers that close the gap between the elbow and the shoulder.

Muscles

Flight muscles are attached to the **keel**, or breastbone. The outer set of muscles lowers the wings, while the inner set raises them. The lowering muscles are the largest because the bird must work its hardest to pull its wings down. A bird's body has large, heavy muscles. The pectoral muscles that move the wings make up 25 percent of a bird's body weight.

WINg FLIgHT FEATHErs



MAjOr MusCLEs