

# Birds

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Printed: November 12, 2015

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# CHAPTER 1

# Birds

- Define endothermic.
- Describe the characteristics of birds.
- Summarize the adaptations in birds for flight.
- Explain the role of the aerofoil.



## Can all birds fly?

No, not all birds can fly. And not all birds have wings. This penguin is a good example. Their wings have evolved into flippers, adapted for swimming instead of flying. The kiwi of New Zealand is another bird without wings.

## Characteristics of Birds

How many different types of birds can you think of? Robins, ostriches, hummingbirds, chickens, and eagles. All of these are birds, but they are very different from one another. There is an amazingly wide variety of birds. Like amphibians, reptiles, mammals, and fish, birds are **vertebrates**. What does that mean? It means they have a backbone. Almost all birds have forelimbs modified as wings, but not all birds can fly. In some birds, the wings have evolved into other structures.

Birds are in the class Aves. All birds have the following key features: they are **endothermic** (warm-blooded), have two legs, and lay eggs.

Birds range in size from the tiny two-inch bee hummingbird to the nine-foot ostrich ( **Figure 1.1**). With approximately 10,000 living species, birds are the most numerous vertebrates with four limbs. They live in diverse habitats around the globe, from the Arctic to the Antarctic.



**FIGURE 1.1**

The ostrich can reach a height of nine feet! Pictured here is an ostrich with her young in the Negev Desert, southern Israel.

## Features of Birds

The digestive system of birds is unique, with a **gizzard** that contains swallowed stones for grinding food. Birds do not have teeth. What do you think the stones do? They help them digest their food. Defining characteristics of modern birds also include:

- Feathers.
- High metabolism.
- A four-chambered heart.
- A beak with no teeth.

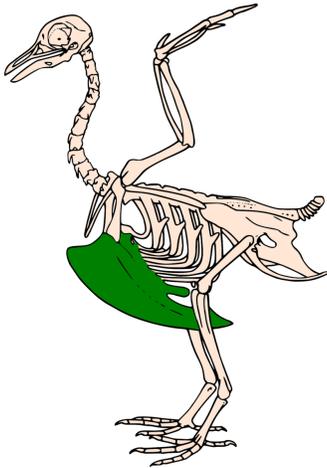
- A lightweight but strong skeleton.
- Production of hard-shelled eggs.

Which of the above traits do you think might be of importance to flight?

## Adaptations for Flight

In comparing birds with other vertebrates, what do you think distinguishes them the most? In most birds, flight is the obvious difference. Birds have adapted their body plan for flight:

- Their skeleton is especially lightweight, with large, air-filled spaces connecting to their respiratory system.
- Their neck bones are flexible. Birds that fly have a bony ridge along the breastbone that the flight muscles attach to ( **Figure 1.2**). This allows them to remain stable in the air as they fly.
- Birds also have wings that function as an **aerofoil**. The surface of the aerofoil is curved to help the bird control and use the air currents to fly. Aerofoils are also found on the wings of airplanes.



**FIGURE 1.2**

A bony ridge along the breastbone (green) allows birds to remain stable as they fly.

What other traits do you think might be important for flight? Feathers help because they're more lightweight than scales or fur. A bird's wing shape and size will determine how a species flies. For example, many birds have powered flight at certain times, requiring the flapping of their wings, while at other times they soar, using up less energy ( **Figure 1.3**).



**FIGURE 1.3**

One bird's flight.

About 60 living bird species are flightless, such as penguins, as were many extinct birds. Flightlessness often evolves when birds live on isolated islands. The absence of land predators might make flying no longer necessary. Other birds evolved into new niches where flying was no longer necessary. This may have been in response to limited resources. For example, the flightless cormorant can no longer fly, but its wings are now adapted to swim in the sea ( **Figure 1.4**).



**FIGURE 1.4**

A flightless cormorant can no longer fly, but it uses its wings for swimming.

## Summary

- Birds are endothermic (warm-blooded), have beaks, and lay eggs.
- Adaptations for flight include a lightweight skeleton and flexible neck bones.

## Explore More

Use the resources below to answer the questions that follow.

### Explore More I

- **Birds Vertebrates** at [http://www.youtube.com/watch?v=jGkP7IrDp\\_4](http://www.youtube.com/watch?v=jGkP7IrDp_4) (5:19)



### MEDIA

Click image to the left or use the URL below.

URL: <http://www.ck12.org/flx/render/embeddedobject/57393>

1. What benefits do birds gain from being able to fly?
2. Where do you see scales on birds?

3. What do scientists think was the first use of feathers?
4. How are the feathers of birds similar to the fur of mammals? Consider this question in terms of form and function.
5. How do the oxygen requirements of birds differ from the oxygen requirements of reptiles? Why does this difference exist?

## Explore More II

- **Emperor Penguin** at <http://animals.nationalgeographic.com/animals/birds/emperor-penguin/>

1. Where do Emperor penguins live?
2. How do they conserve warmth?
3. What do they eat?

## Review

1. Can all birds fly?
2. What are three key features of birds?
3. What is unique about a bird's digestive system?
4. How are birds adapted for flight?

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## References

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2. User:mario modesto/Wikimedia Commons, modified by CK-12 Foundation. [A bony ridge along the breastbone allows birds to remain stable as they fly](#) . CC BY 2.5
3. Pravine Chester. [A flying bird](#) . CC BY 2.0
4. Mike Weston. [A flightless cormorant](#) . CC BY 2.0