

# **Why don't Ostriches fly?**

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A lesson on how evolutionary mechanisms  
shape the uses of wings

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# Why don't Ostriches fly?

A lesson on how evolutionary mechanisms shape the uses of wings

Why don't ostriches fly? This question bugged me in fifth grade, so I asked my teacher. She said that ostriches are too big to fly. Her answer satisfied me for years until I realized that there are lots of birds that don't fly. Chickens don't fly, kiwis don't fly, ostriches don't fly and dodos didn't fly. On the other hand, some bigger birds do and did fly. In the Mesozoic Era, for example, huge pterodactyls flew. So, what gives?

Slowly, after doing some research at my local library. I learned that flightless birds still use their wings. The ostrich, for example, uses its wings for balance, and penguins 'fly' through the water. I was finally learning that these birds did use their wings for other activities, but what caused this distinction between flying birds and ground loving birds?

Eventually, I was able to answer this simple question of why only some birds fly. Through this activity, you'll learn how to answer this question, too. Within this lesson, you will compare the ostrich to the bald eagle, discovering why these two birds evolved into the creatures they are now.



*Struthio camelus*  
Ostrich



*Haliaeetus leucocephalus*  
Bald Eagle

# **Why don't Ostriches fly?**

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## **Learning Objectives**

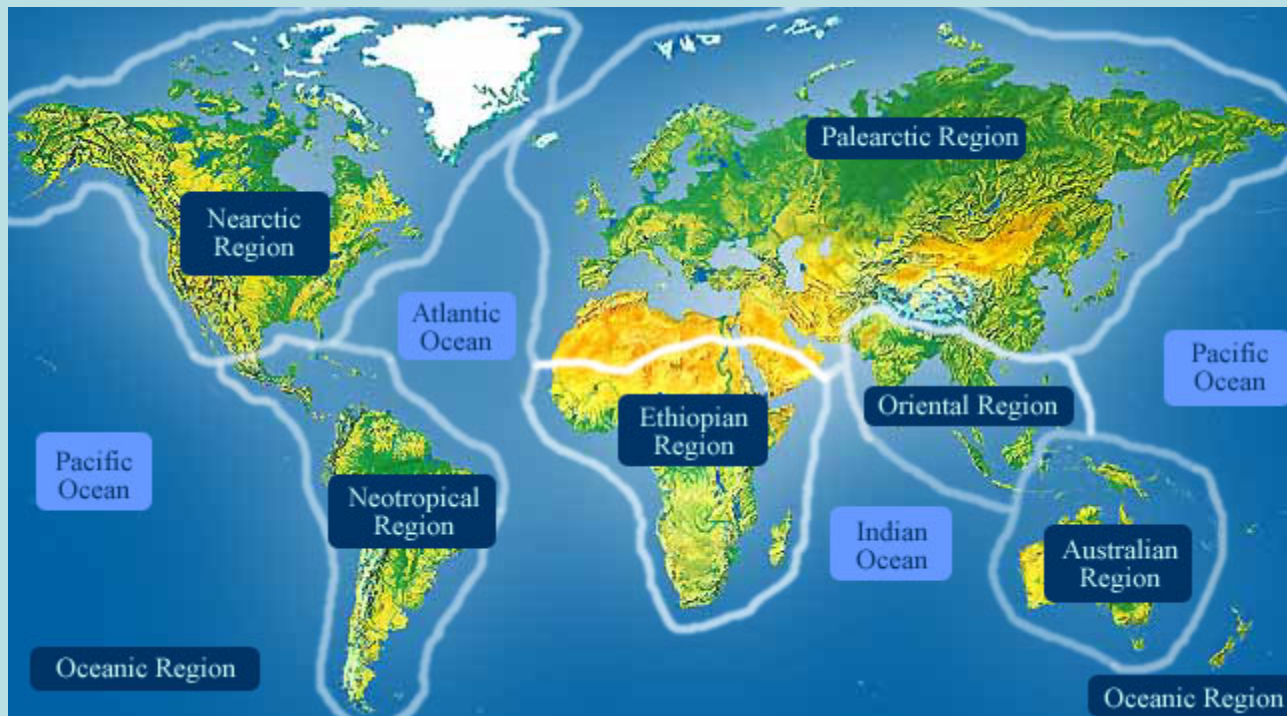
- Understand natural selection as a mechanism of evolution, using the evolution of wings and feathers as examples.
- Compare ostriches and bald eagles with respect to their habitat, predators and diet.
- Compare the way ostriches and bald eagles use their wings and feathers.
- Identify different factors that influence natural selection.

## **Directions**

Work with a partner as you read each slide and answer the questions on the corresponding worksheet. At the end of the activity there will be a short quiz to evaluate how well you've mastered the learning objectives.

# The Habitats

Where these birds call home



<http://animaldiversity.ummz.umich.edu>

**Ostriches** live in the Ethiopian Region, which consists of savanna and scrub forest biomes

**Bald Eagles** live in the Nearctic Region, which consists of desert, savanna, chaparral, forest, mountains biomes.



# The Ethiopian Region

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Where Ostriches Call Home

Ostriches were once found throughout southwestern Asia, the Arabian peninsula and Africa. But since the mid 20<sup>th</sup> century, they've been restricted to in sub-Saharan Africa, which consist of savanna and scrub forest biomes.



<http://www.naturalhistoryonthenet.com>



<http://www.first-focus.org>



<http://en.wikipedia.org/wiki/Savanna>

# The Nearctic Region

Where Bald Eagles Call Home

Bald Eagles can be found anywhere in North America as long as there are nesting trees, feeding grounds, and open water. Some of the biomes that are located in North America include desert, savanna, chaparral, forest and mountain.



<http://www.fhwa.dot.gov/environment/wetland/scanrpt/txbottoms.jpg>



<http://www.agrnews.org/issues/259/cover.jpg>



[http://www.californiachaparral.com/images/555\\_PS-Chamise-RS-chaparral.jpg](http://www.californiachaparral.com/images/555_PS-Chamise-RS-chaparral.jpg)



[http://www.evcabins.com/resources/\\_wsb\\_308x372\\_Stilesville+5-24-06.JPG](http://www.evcabins.com/resources/_wsb_308x372_Stilesville+5-24-06.JPG)



# The Habitats

## Comparing Ethiopian and Nearctic Regions

### Ethiopian Region



On the worksheet provided by your teacher, write down a list of all the similarities and differences between these two regions. Use the questions below to help you create your list.

- Is one more arid than the other?
- What types of animals live in these regions?
  - Where are these regions located?
- What are the seasons like?
- How much rainfall do they get annually?
  - Do humans live there?

### Nearctic Region



# Predation & Diet

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## Ostriches



<http://animals.nationalgeographic.com/animals/mammals/cheetah.html>



[http://www.wildlife-pictures-online.com/lion\\_pair.html](http://www.wildlife-pictures-online.com/lion_pair.html)



<http://www.amnh.org/exhibitions/permanent/humanorigins/human/tools3.php>

### Predation

Ostriches only have a few natural enemies. Two of these predators are lions and cheetahs. These cats try to sneak up on an ostrich to make the kill. But ostriches have long powerful legs, and they can out run most predators. Ostriches can sprint up to 43 mph and can maintain a steady pace of 31 mph (Zoological Society of San Diego 2007)!

Another predator of the ostrich is the Egyptian vulture who will prey on the eggs (Hawk Conservancy Trust), but again ostriches have evolved a defense. Male ostriches have dark feathers that are difficult to see at night, while female ostriches have lighter brown feathers that blend into their environment. So, the male ostrich will incubate the clutch at night, and the female ostrich will incubate the clutch during the day (Honolulu Zoo 2007).

### Diet

Ostriches are considered mostly herbivorous, but sometimes they will eat small animals (Honolulu Zoo).



# Predation & Diet

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## Bald Eagle



[http://www.wildnatureimages.com/bald\\_eagle%20eating%20fish.htm](http://www.wildnatureimages.com/bald_eagle%20eating%20fish.htm)



<http://concise.britannica.com/ebc/art-55703/A-bald-eagle-swoops-down-to-catch-a-fish-with>

### Predation

Bald eagles are at the top of the food chain, which means that they have no natural predators. These days, the animals that cause them the most harm are humans. People affect them directly or indirectly through their activities such as farming, urban development, and hunting (American Bald Eagle Foundation 2007).

### Diet

Bald eagles' main food source is fish, but they also eat a variety of smaller animals. They have evolved expert hunting skills. Their impeccable eyesight allows them to spot prey from almost a mile away. Their beaks hook at the tip so they can tear flesh, and their sharp talons pierce flesh (American Bald Eagle Foundation 2007).

# Predation & Diet

## Comparing the Ostrich and Bald Eagle

On the worksheet provided by your teacher, write down a list of all the similarities and differences between these two animals. Use the questions below to help you create your list.



[www.britannica.com](http://www.britannica.com)

- What type of food do they eat?
  - Who are their predators?
  - Who do they prey on?
- How do they catch their food?
- How do they avoid predation?



(c) George Jameson

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# Wings

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Wings aren't only for flying



<http://www.talkorigins.org>

Ostriches don't use their wings to fly, but they have found many other uses for them. The main use for their wings are for displays of courtship during mating season and using them for balance while running. Ostriches have evolved claws at the end of their two fingers which they can use for an attack or in defense (San Diego Zoo 2007).



[www.hickerphoto.com](http://www.hickerphoto.com)

Bald eagles mainly use their wings for flying, but sometimes they must use their wings for swimming. This usually occurs when they try to pick up a fish that is too heavy. Instead of letting the fish go, a bald eagle might try to swim to the shore (American Bald Eagle Foundation 2007).



# Wings

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Wings aren't only for flying

On the worksheet provided by your teacher, write down a list of all the similarities and differences between these two animals' wings. Use the questions below to help you create your list.



[www.britannica.com](http://www.britannica.com)

- What are they used for?



(c) George Jameson

[www.audubon.org](http://www.audubon.org)

# How and Why did Wings Evolve?

Most scientist agree that wings were originally used by their ancestors for functions other than flight, later getting co-opted for flight by their descendants. We have three hypotheses to explain the origin of wings (University of Berkeley) :

1. Wings evolved from arms that were used to capture small prey.
2. Wings evolved from bipedal (animals that use two legs to walk) animals that were leaping into the air and wings assisted with leaping high.
3. Wings evolved from ancestors that were gliding and began moving their gliding structures to produce thrust.

Whatever the causes for the emergence of wings, one can safely say that wings were evolved because the animals that had them survived the best.

# Feathers

Birds of a feather, flock together



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**Ostriches** have soft plumage instead of stiff feathers. This soft plumage has almost the same insulating power as down, protecting them from the cold nights and winters that they experience in their environments. Unlike most birds, ostriches don't have feathers that hook together. They also lack the glands that would make their feathers waterproof (Honolulu Zoo 2007).



[http://www.twincitiesdailyphoto.com/2007\\_05\\_01\\_twincitiesphoto\\_archive.html](http://www.twincitiesdailyphoto.com/2007_05_01_twincitiesphoto_archive.html)

**Bald eagle** have feathers that are light and strong. These feathers are made of keratin, the same material that makes up our fingernails. Their feathers are locked together by microscopic hooks which trap air next to the body, keeping the bird warm. Also, they produce oil on their feathers to keep them waterproof (American Bald Eagle Foundation 2007).



# Feathers

Birds of a feather, flock together

On the worksheet provided by your teacher, write down a list of all the similarities and differences between these two animals' feathers. Use the questions below to help you create your list.



[www.britannica.com](http://www.britannica.com)

- What is the texture like?
- What are they used for?
- What are they made out of?
  - Are they waterproof?



(c) George Jameson

[www.audubon.org](http://www.audubon.org)

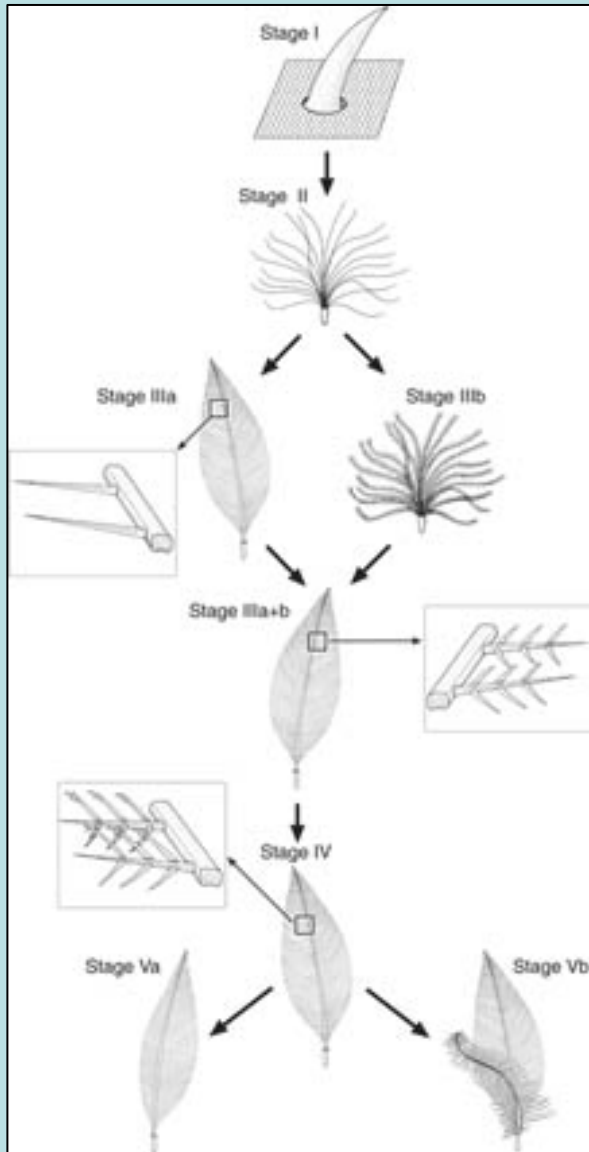
# Why did Feathers Evolve?

Studies have shown that feathers evolved before the appearance of birds or flight, but originated and evolved from terrestrial, bipedal, carnivorous dinosaurs called theropods (Prum & Bush 2002). Some feathered theropods, like *Caudipteryx* and *Protopteryx* had a “fan” of feathers at the tips of their tails, suggesting that modern bird plumage evolved from them.

This evidence indicates that feathers did not evolve primarily for flight. One reason they could have evolved is for insulation. Remember the down jacket that you wear when it's cold outside? Feathers have incredible insulation ability. Feathers also may have evolved for water repellency, courtship, or camouflage (Prum & Bush 2002).

We made never know what the exact reason why feathers evolved, but we do know that the earliest feathers provided some type of advantage to surviving in their environment.

# The Evolution of Feathers



Most scientists agree today that feathers evolved in five separate stages:

1. A unbranched, hollow cylinder.
2. A bunch of unbranched barbs.
3. Two kinds of feathers emerged: one was a bunch of barbs that attached to the base, and the other was a series of unbranched barbs attached to a central rachis or the stem like central shaft.
4. Microscopic hooks joined the different barbs.
5. The feather became asymmetrical.

**Draw a concept map for the evolution and development of feathers using the space provided on your worksheet.**



# Why don't Ostriches fly?

Darwin once wrote that the driving force behind evolution is natural selection and that natural selection changes as the habitat changes. If an organism is better suited to survive in its environment, it will reproduce more often than compared to an organism that is not so well-suited. The well-suited individuals will have more offspring, and the offspring will inherit those well-suited traits.

As you can see, the Ethiopian and Nearctic Regions greatly differ from one another. The ostriches' Ethiopian habitat consist of dry open grasslands, while the bald eagles' Nearctic habitat greatly varies but always has an open water source nearby.

The habitats that these birds occupy have changed through the years, and these birds have changed with them. Ostriches have adapted with feathers that look like their surroundings, long necks to reach food in the trees and on the ground and powerful legs to chase after small prey or run away from predators. Bald eagles have adapted to their environment with sharp eyesight and the ability to dive quickly to catch prey.

Why don't ostriches don't fly when bald eagles do? Because their ancestors had to adapt to their environments, which allowed the evolution of feathers and wings and for some birds to take to the sky and while others stayed behind on the ground.

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