

WINGS

INSIDE



Blue jay

OBSERVING NATURE

A quiet way of being in the wild world

W e are too busy. We don't take time to see the blue jay's eye. Or hear its "jeeh" call. Or watch it build its nest. If we want to observe the natural world the way scientists see it, we must learn to slow down, sit down and be very quiet.

Everything we know comes from our observations. When we observe the natural world, we use all of our senses – sight, smell, hearing, touch and taste. We know the sun comes up in the morning because we see it. We know the ocean is salty because we taste it. We know the flower is a rose because we smell its sweet scent.

Everything scientists know comes from their observations. But they observe the world

in a special way. They use tools – sound recorders, binoculars, microscopes and cameras – to help them hear and see. They use field notebooks and computers to record their observations. They share their observations with other scientists. And they work together to answer questions about nature.

"WINGS" will tell you stories about scientists who study birds. You will read about chickadee language, flying dinosaurs and the search for a special woodpecker. And you will learn how your observations can help scientists answer questions about wild birds.

Scientific observation is not difficult. Just slow down, sit down and be very quiet. Use all of your senses to learn about the wild world.

START USING YOUR SENSES

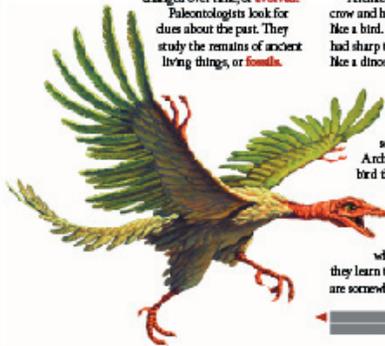
■ It is easy to observe birds that are sitting still. Look closely at the bird photos at www.westol.com/-banding/Past_Pictorial_Highlights.htm. Click on the dates on the left side of the web page. Scroll down to see the photos. Scientists are studying these birds. Learn about bird banding on page 6.

■ You can learn about many birds and hear them at www.birds.cornell.edu/programs/AllAboutBirds/BirdGuide. Go to Select a Species. Then go to Alphabetical in the orange block. Scroll down through the birds and pick one. On each bird's web page, click on Sound. Listen to many birds.

Is it a bird or a dinosaur?

Scientists observe the past to learn about today's birds

Scientists called **paleontologists** study the history of life on Earth. They want to know which plants and animals lived here first and how they have changed over time, or **evolved**. Paleontologists look for clues about the past. They study the remains of ancient living things, or **fossils**.



Fossils can be bones, teeth, eggs, leaves, shells, seeds, feathers, footprints and other things. Many fossils are buried in rock.

In 1861, a paleontologist found a fossil in Germany. The animal lived about 150 million years ago, during the Jurassic period. It was named **Archaeopteryx**, which means "ancient wing" in the Greek language.

Archaeopteryx was as big as a crow and had wings and feathers like a bird. It could fly. But it also had sharp teeth and a long, bony tail like a dinosaur.

The fossil shows that birds are related to reptiles. This is a very important clue. Most scientists believe that Archaeopteryx is an ancient bird that evolved from dinosaurs.

Paleontologists are finding more bird fossils. Each one adds new clues about bird evolution. Scientists have not answered the biggest bird questions – why do birds have feathers, and how did they learn to fly? Paleontologists believe the answers are somewhere on Earth, buried in rock.



Can you find the head, neck, wings and tail on the Archaeopteryx?

DIG DEEP

- Watch the bird evolution cartoon at www.arkatary.org/cusite/becoming.html.
- Make fossils at www.lbbc.co.uk/sn/palehistoric_life/dinosaurs/making_bodies and www.lbbc.co.uk/sn/palehistoric_life/dinosaurs/making_fossils.
- See bird skeletons at <http://digiimorph.org/bird-chunks.pl?mlhttp=bird&name=CommonName>. Click on a bird. Go to the right side of the page at the top. Click on the 3D Volume Rendered Movies.

Audubon's birds Observations of an artist and scientist

John James Audubon was born in 1785 and grew up in France. When he was a boy, he liked to observe plants and animals – especially birds.

He studied their feathers and bodies, eggs and nests. He watched bird parents raise their chicks. He watched birds fly south in the winter and come back in the spring.

Audubon taught himself how to record his observations by drawing and painting what he saw.

In 1803, when he was 18, he left France and sailed to America. He saw many strange birds in his new country. He wanted to paint all of them.

Audubon was a careful observer. This helped him become a great wildlife artist.



John James Audubon



Audubon's Keywest quail-doves

Some of the birds Audubon painted are **extinct** today. They are all dead. The passenger pigeon and the Carolina parakeet are gone. But their beauty is still alive in Audubon's notebooks and paintings. His observations will live forever.

DIG DEEP

- See Audubon's birds at www.mccq.org/audubon/menu.html. Click on the birds in the picture. Enjoy the music. Then click on the orange word Catalog. Click on Index, then click on different bird names.
- Play art games at www.wildlifeart.org/Frame_Games.cfm. Use wild animal art to tell stories at www.wildlifeart.org/ArtTales/index.html.

Extra brain cells help chickadees find their dinner

Black-capped chickadees live in places that get very cold in the winter months. It is difficult for them to stay alive. They must find food every day or they will die.

Before the weather gets cold, chickadees hide thousands of seeds and insects. They put them in trees or bury them in the ground. They hide 1 or 2 pieces of food in each place.



We would need a map to help us find the food. But chickadees can remember where they hid each meal.

The **hippocampus** is part of the chickadee's brain. It controls memory. Scientists discovered that the birds grow extra cells in the hippocampus in autumn. During winter, this extra brain power helps them remember where they hid their food.

In spring, it's easy to find fresh insects, caterpillars and spiders. Chickadees do not need to hide food or remember where they hid it. Their brains get smaller.

They don't need extra brain power through the summer months. But their brains begin to grow again in the autumn.



This northern pygmy-owl is named DotCom. The chickadees in the big outdoor cage were afraid of him.

Danger!

When predators get too close, chickadees sound the alarm

A cat sees a black-capped chickadee and wants to catch it and eat it. The cat is a **predator**, an animal that kills other animals for food. The mice and birds that it eats are called **prey**.



Raptors like this Red-tailed Hawk have a sharp, curved beak. They catch prey animals and use this natural tool to tear them apart.

The chickadee has many enemies – meat-eating mammals like cats, and hunting birds like owls and hawks. These predator birds are called **raptors**.

If the cat gets too close, the chickadee uses its secret weapon. It screams an alarm call, "Chick-a-dee-dee-dee!" Chickadees and other small birds hear the alarm and come to fight the cat. They fly at the predator and scream their alarm calls.

Sometimes they hit the cat. This noisy attack is called **mobbing**. Chris Templeton is a **biologist**, a scientist who studies living things. He wants to learn about birds' alarm calls and songs.

Templeton watched black-capped chickadees. He observed that they used many different alarm calls when they were afraid. He wondered why. He decided to do an experiment to learn about chickadee language.

Templeton and other biologists built a big cage outdoors. They put trees inside to make a small forest. Then they put black-capped chickadees in the cage.

The biologists had 15 predators – 13 raptors and 2 mammals. They wanted to put each predator in the cage and record the chickadees'



Chris Templeton gently holds the chickadee's legs.

alarm calls. They had big raptors, like the great horned owl and the red-tailed hawk. And small raptors, like the American kestrel and the northern pygmy-owl. They had a cat and a ferret.

Templeton put a predator inside the cage. The predator was tied down and couldn't hurt the chickadees. But the tiny birds were afraid and screamed their alarm calls. Templeton and the other biologists recorded more than 5,000 calls.

The chickadee has 2 kinds of alarm calls. If a hungry raptor is flying in the sky, the chickadee uses a soft "See" call. If a predator is sitting nearby, the bird screams "Chick-a-dee-dee-dee!"

Templeton learned that the birds add "dees" sounds to their "Chick-a-dee-dee" alarm calls when they are very scared. He counted the number of "dees" in their alarm calls. He learned that chickadees are most afraid of small animals that can move very fast.

Pygmy-owls are small and fast. It is easy for them to catch a chickadee. The birds in Templeton's cage were most afraid of the pygmy-owl. One alarm call had 23 "dees"!

Templeton's experiment shows that chickadees use special alarm calls for different kinds of danger. They warn other small birds when there is a dangerous predator nearby.

They tell if the predator is big or small. And they tell if it is moving or sitting still. That's a big language for such a tiny bird.

DIG DEEP

■ Hear chickadees mobbing a pygmy-owl at www.nps.org/templates/story/story.php?storyId=4715569.

A SCIENTIST IN BLUE JEANS

Kate Davis makes a home for hurt birds

DotCom, a northern pygmy-owl, was hit by a car. A hunter shot Nigel in the wing. He's a golden eagle. Arid Miles, a great horned owl, flew into a power line. These hunting birds are members of Kate Davis's teaching team. They travel all over western Montana and teach people about **raptors**, birds that kill other animals for food.

Davis runs Raptors of the Rockies, a ranch in Montana where she takes care of 19 hunting birds.

There are eagles, falcons, hawks and owls. They are hurt and cannot fly. Or they have lived with people and cannot survive without help.

Davis began helping animals when she was 13 years old. She learned how to take care of wild birds and mammals at a zoo. Some of the animals were hurt. And some were very young and did not have parents to protect them.

Davis went to college and became a **zoologist**, a scientist who studies animals. She started Raptors of the Rockies in 1988.

In 2005, Davis and birds from the Raptor Ranch helped scientists study chickadees. (Read the other story on this page.) Today, she is working with other scientists to study golden eagles and peregrine falcons.

At the ranch, Davis keeps the birds healthy. She cleans and repairs their homes. And she chops up meat to feed them.

A northern pygmy-owl like DotCom catches small birds and eats them. But DotCom is hurt and cannot hunt. He eats a few small mice every day at the Raptor Ranch.

In a year, the raptors will eat 400 chickens, 400 ground squirrels, 800 quails, 12,000 mice and about 2,000 pounds (.91 metric ton) of elk and deer meat. People donate money to pay for the food and other needs at the Raptor Ranch.



Chesty is a Harris's hawk who lives at the Raptor Ranch.



Kate Davis holds Sibley, a peregrine falcon.

DIG DEEP

■ Visit the Raptor Ranch at www.raptorsoftherockies.org/default.asp.

Banding lets scientists fly with the birds

Arctic terns fly 22,000 miles (35,400 km) each year. They fly farther than any other bird. Scientists study the terns as they **migrate**, or move from one place to another at the seasons change. The terns raise their chicks in spring in the Arctic. Then they migrate south to the Antarctic for the winter.



Scientists use **banding** to follow the terns. Bird banders catch a bird and put a metal or plastic ring, or **band**, around one of its legs. Some birds wear bands around their necks.

Each band has a different number. Banders record a bird's number, its age, its sex and what kind of bird it is. They gently weigh the bird and measure its wings. Then they let it fly away.

Scientists band thousands of birds each year. They hope some of them will be caught again. People who catch a banded bird – or find it dead or injured – call a phone number that is written on the band. They tell where they found the bird and if it is alive.

Arctic terns can live for 34 years. A young tern that was banded in Alaska in 2005 may be caught again in Africa in 2007. It may be injured in Europe in 2034 and be caught again. Each time the bird is found, the bird bander records new information about its migration path and health.

Banding is an observation tool. It lets scientists fly with birds for a long time without leaving the ground.



Banders catch birds in large nets called mist nets.



A yellow warbler gets a new band. Bird bands come in 26 sizes.

DIG DEEP

- Learn more about bird banding at www.pwnc.usgs.gov/bbl.
- See close-up photos of birds and bird banding at www.wustol.com/~banding/Past_Pictorial_Highlights.htm. Click on the dates on the left side of the web page.

HOOT!



Owl search

Global science team shares observations on the Internet

More than 150 scientists are working on the Global Owl Project, or GLOW. There are GLOW scientists in Malaysia, Israel, Argentina, Finland and 43 other countries.

They speak many different languages. Sometimes it is hard for them to understand each other. The scientists use the Internet and e-mail to talk and share their owl observations, or **data**. The Internet lets them work together as a team.

GLOW scientists test the **DNA** in owl Hood. DNA is the chemical in cells that holds special information about each living thing.

People have studied DNA from about 200 kinds of owls, or **species**. GLOW scientists think there may be 30 or 40 more species living on Earth. They hope they will find DNA from these owls.

The scientists are recording owl sounds. They are also finding the places where owls hunt and build their nests. They want to record data about all of the owls on Earth. The scientists will gather their observations and make a **database**. They will put the database on a website.

Many of the world's owls are in trouble. People are harming the land where owls live – their **habitat**. The GLOW database will help people make plans to protect owls.



An owl wears a small transmitter that sends a signal. Paula Enriquez holds an antenna that hears the signal. Enriquez uses this tool to find the owl and learn where it hunts and makes its nest. She studies barred screech owls in the mountains of Chiapas, Mexico, and Guatemala.



Claudia Minera studies owls in Colombia and Guatemala.

DIG DEEP

- See and hear the world's owls at www.owlpages.com
- Hear owls at www.kennec.org/month/tm/spring/OwlDictionary.html



The Harry Potter books are in Spanish, Korean, Russian and 39 other languages.

Meet the owls of Harry Potter

The Harry Potter books are about magic, witches and wizards. In the books, owls carry the mail. J.K. Rowling wrote the books. Her hero is a boy named Harry Potter.

Harry has a snowy owl named Hedwig. Ron Weasley is Harry's best friend. Rorisc owl is a tiny scops owl named Pigwidgeon.

Visit the "Dig Deep" websites. You will see snowy owls and other owls that carry mail in J.K. Rowling's magical books.

DIG DEEP

- J.K. Rowling's website is in 6 languages. Visit www.jkrowling.com.
- Can a snowy owl carry a broom? Find out at www.blackblog.com/bird/Species/Owls/HarryPotter/HarryPotter.html.
- Explore "The Owls of Harry Potter" page at <http://natgeo.org/initiatives/programs/birds/features>.



Killer hats



People killed swans and took their feathers, or **plumes**. They also ate swan meat.

One day in 1886, Frank Chapman went for a walk. He was a scientist who studied birds, an **ornithologist**, and he wondered how many kinds of birds he would find.

But he wasn't looking for birds in a forest or a meadow. Frank Chapman was walking along the busy streets of New York City, and the birds he was looking for were dead ... and stuffed ... and sitting on top of women's heads.

In the late 1800s, many women wore hats that were decorated with parts of wild birds – wings, tails, heads and feathers. Women wore hats with owl heads, stuffed hummingbirds and whole nests of dead warblers.

As Chapman walked, he counted 700 women who were wearing hats, and 542 of those hats were decorated with birds.

The hats had feathers from 40 different kinds of birds, or **species**. There were robins and blue jays, meadowlarks and ospreys. Hundreds of birds had been killed just to decorate the hats Chapman saw when he went for his walk.

Save the birds!

In the 1800s, people built cities and factories all across the United States. They cut down forests and killed many wild animals. In the late 1800s, many Americans believed people should work together to protect the Earth and its plants and animals. These **conservationists** wanted women to stop wearing dead birds on their heads. Harriet Hemenway

was a rich, powerful woman who lived in Boston. She had read about hunters who killed egrets for their feathers. She wanted to stop them.

Snowy egrets and great egrets grow special feathers on their backs each year before they mate. Hunters killed adult birds to get those plumes. The egret parents never returned to their nests, so their chicks also died.

Hemenway and her cousin Minna Hall invited powerful Boston women to tea parties. They asked them to stop buying feathered hats.

Then they started the Massachusetts Audubon Society, a club for conservationists. Women across the country started Audubon clubs. They taught their neighbors about birds and bird protection. They also helped women find hats that weren't decorated with wild bird feathers.

Powerful men – political leaders and scientists – joined the club. Ornithologist Frank Chapman joined the New York club. The Audubon Society and other conservationists won the battle over bird hats. In 1900, Congress passed the Lacey Act, the first American law that protected wild birds from feather hunters.



A stuffed owl head and owl wings decorate this hat.



Many great egrets were killed for their mating feathers, which were worth more than gold.

DIG DEEP

- See more bird hats at <http://americanhistory.si.edu/fathers/index.htm>.
- Explore www.audubon.org.



Scientists are looking for ivory-billed woodpeckers in the wet forest along the Cache River in Arkansas.

The search for the ivory-billed woodpecker

Ivory-billed woodpeckers were the biggest woodpeckers in the United States. Some people called them "The King of the Woodpeckers". They lived in trees that grew in wet forests.

The southeast part of the United States had 52 million acres (about 21 million hectares) of wet forest. People cut down the trees and planted crops on the land.

In 1930, the ivory-bill's wet forest – its **habitat** – was very small. The last time someone saw an ivory-bill was in 1944.

People believed the ivory-bills were all dead, or **extinct**. But in 2004, a man said he saw an ivory-bill in a wet forest in Arkansas. Bird watchers and scientists started looking for it. They believe they have found an ivory-bill. They have a movie of the bird, but it is blurred.

Some people believe the bird watchers saw a pileated woodpecker, not an ivory-bill. The two woodpeckers look alike.

Scientists must find nests of the bird to prove the ivory-bills are alive in America's wet forest. They are placing video cameras and sound recorders in the forest to watch and listen for the woodpeckers.

People are excited about the search for the ivory-bill. If the birds are alive in the wet forest, Americans can protect them and their habitat.

DIG DEEP

- Hear an ivory-bill at www.birds.cornell.edu/programs/AllAboutBirds/BirdGuides. Go to the Alphabetical list. Scroll to Ivory-billed Woodpecker. Click on Sound.
- Watch a 1935 video of the ivory-bill at www.birds.cornell.edu/ivory/multimedia/videos.
- Read news about the search for the ivory-bill at <http://natu.us.org/ivorybill>.

Be a citizen scientist!

Citizen scientists are people just like you who observe birds, weather, frogs and other things in nature. They record their observations, or **data**. Then they e-mail their data to scientists. The scientists put all of the data together in a **database**. Citizen scientists all over the country—or the world—can work on one project.

Scientists are studying pigeons. Their project is called PigeonWatch. There are white, grey, brown and black pigeons, and they have different-colored stripes. The scientists want to know why there are so many pigeon colors. They also want to know if pigeons choose their mates because of color.

You can become a Pigeon Watcher. You will count pigeons in your neighborhood and watch the



Become a volunteer Pigeon Watcher. See DIG DEEP for the PigeonWatch web address.

birds as they look for mates. Your observations will help the scientists answer their questions.

There are many citizen science projects for people who like to observe birds.

Many bird watchers volunteer to do **bird counts**. They count each bird they see, and they record each kind of bird, or **species**.

Scientists use this data to learn where birds **migrate**, or move from one place to another with the seasons. They also study **bird populations**, the

number of birds in an area or country.

Citizen scientists are **volunteers**. They don't get paid for their work. They observe nature because they enjoy it. They know their observations will help scientists learn about the Earth.

DIG DEEP

■ Journey North follows animals as they **migrate**, or move from one place to another as the seasons change. Citizen scientists share data on birds and other animals. Explore www.journey.org/jnorth. It is a RIG, beautiful website.



■ Watch playful crows and magpies. Then send your data to Crossy Court at www.btds.cornell.edu/programs/urbanbirds/subs_CRCMainEN.html. (The site is also in Spanish.)

■ Why are pigeons so colorful? Help the PigeonWatch scientists find the answer. Learn more at www.btds.cornell.edu/programs/urbanbirds/subs_PIWMainEN.html. (Also in Spanish.)

■ If you like watching city birds, volunteer with Urban Bird Studies, www.btds.cornell.edu/programs/urbanbirds. (Also in Spanish.)

■ Cornell Lab of Ornithology has many citizen science projects, including Project FeederWatch and The Great Backyard Bird Count. Read about them at www.btds.cornell.edu/LabPrograms/CitSci.



A white-tailed deer fawn rests in the sunshine.



The Colorado columbine blooms during spring.



A red squirrel eats seeds from a pine cone.



This male mountain bluebird is all blue. Females are gray and blue.



Tiny hairs grow on the leaves of the woolly actines.

Walk gently and quietly in the wild world

When we are in wild places, we are visitors in the natural world. We must work together to protect the land and the plants and animals that live there.

A person who takes care of wild places is called a **steward**. Good stewards follow these rules when they are outdoors ...

■ **Put all of your trash in a trash can.** Sometimes people throw food wrappers on the ground. The wrappers smell like food. Hungry animals eat them. The wrappers can clog their stomachs and kill them.

■ **Walk on the trail, not on wild plants.** If there is no trail, try to walk on rocks, snow, pine needles or dry grasses.

■ **Enjoy wildflowers, but don't pick them.** Leave plants, pine cones, nests and other natural things where you find them.

■ **Don't get too close to birds' nests.** If you scare the parents, they may fly away and leave their chicks. Or a hungry animal may follow your scent to the nest and eat the chicks.

■ **Don't feed wild animals.** Animals are afraid of people. They run away from us. If you feed a wild animal, it may look for food in places where people live. The animal may be hit by a car. Or it may hurt someone. Wild food is the best food for wild animals.

■ **If you find a baby animal, don't touch it.** The animal may look like it needs your help, but its mother is probably hiding nearby. She will come back after you leave.

■ **Don't scare animals away from their drinking water.** Animals won't come to drink at their watering hole if you are there.

■ **Be quiet.** Noises scare animals. It is especially important to be quiet and walk slowly when you are outdoors in winter. It is hard for animals to survive during cold weather. If they run away from you, they waste energy. They need all of their energy to survive in the cold. (WARNING! It is good to make noise if you are walking in a place where bears live. Talk, sing or ring a bell to scare bears away.)

■ **Watch wild animals from far away** so you don't scare them:

- A scared animal ...
 - Stops eating and raises its head to look at you.
 - Points its ears at you.
 - Gets up from resting and runs away.
 - Suddenly changes direction to get away from you.
- If you scare an animal ...
 - Sit quietly or move slowly away from the animal.
 - Don't look into its eyes.
 - Let the animal see you. When you do this, the animal will know you are not mending up on it.



The red wood fly grows in the Rocky Mountains.

