

SCHOOL LAUNCH · EXPLORE TRACKS

EXPLORE TRACKS · TRAIL B

The second trail of three interest tracks for curious Scouts: Animals (birds), Dinosaurs (the dinosaur hunters) and Great Battles of the Middle Ages. Short, self-paced stops with true stories, great pictures, hands-on projects and games.

First edition

The works of the LORD are great, sought out of all them that have pleasure therein.

Psalm 111:2 (KJV)

COURSE GUIDE

Explore Tracks are for children who want more of what they love. Each track is a trail of short stops. At every stop the child hears a true story, studies a great picture, does something with his or her hands, plays a game and adds a page to a Field Notebook.

Trail B is the second trail of each track at the  Scout level (ages 7-9). The Animals track meets the birds, from the eagle of Isaiah 40:31 to a real backyard bird count. The Dinosaurs track meets the dinosaur hunters, from Mary Anning in 1811 to Mary Schweitzer's soft tissue in 2005, and practices telling observations from interpretations, with a creation-friendly view of the dates on museum signs. The Great Battles track visits eight battles of the Middle Ages, from Tours (732) to Lepanto (1571). Trail A is not required first.

WHO IT IS FOR

Written for children about ages 7-9 who are read to by a parent, or who read short passages on their own. Older siblings can join in. Nothing earlier is required.

HOW TO USE THIS COURSE

1. **One stop at a time.** A stop takes 15-25 minutes: read the story aloud, look at the picture, do the hands-on part and play the game. Two or three stops a week works well.
2. **Any order.** The tracks are independent. Do one track at a time, or rotate between them.
3. **Field Notebook.** Every stop ends with a page for the notebook. At the end of the trail the pages become a booklet, and the parent signs the Trail B certificate.
4. **Badge quizzes.** Each track has two short, optional oral quizzes. They are for fun, not grades.

SCOPE AND SEQUENCE

Track 1: Animals  **Trail B: Birds** (Self-paced)

Track 2: Dinosaurs  **Trail B: Dinosaur Hunters** (Self-paced)

Track 3: Great Battles ✕ **Trail B: The Middle Ages** (Self-paced)

MATERIALS

- **Field Notebook (a sketchbook or composition book)** One for the whole trail.
- **Colored pencils, a ruler, scissors and glue** For drawings and maps.
- **Household things** Each hands-on project lists what it needs: blocks, clay, string, toy figures, cups.
- **A Bible (KJV)** For the verse at each stop.

GRADING

Explore Tracks are not graded. A stop is done when the child has heard the story, done the hands-on part and made a notebook page.

Badges and the Trail B certificate are earned by finishing the stops.

A NOTE TO PARENTS

You do not need to be an expert. Read the story aloud, look at the picture together and ask, “What do you notice?” Each stop has a short *For families* note with background and any facts that scholars still discuss.

Dinosaur dates: museums give ages in millions of years. This trail teaches the period names as museum words and explains that the dates are interpretations; many Christian families understand the fossils within a young earth and the Flood. Stop B10 (soft tissue) presents the young-earth reading and the discoverer’s own old-earth reading fairly.

Battles are told for young children: who, where, the plan, what happened and why it mattered, with honor for courage, faith and wisdom and no gory detail. Both sides are described fairly, in the terms of their own time.

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- 1.6 Parrots
- 1.7 Migration: Birds That Know the Way
- 1.8 Nests: Bird Builders
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- 1.10 The Backyard Bird Count

Track 2: Dinosaurs 🦖 Trail B: Dinosaur Hunters

- 2.1 Mary Anning, the Girl Who Found a Sea Dragon
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- 2.3 Gideon and Mary Ann Mantell’s Iguanodon
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Track 3: Great Battles ✂ Trail B: The Middle Ages

- 3.1 Tours (732): Charles Martel’s Wall
- 3.2 Hastings (1066) and the Bayeux Tapestry
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- 3.5 Agincourt (1415): Mud and Longbows
- 3.6 Orléans (1429): Joan of Arc
- 3.7 Constantinople (1453): Walls and Cannon
- 3.8 Lepanto (1571): The Galleys

Each stop takes 15–25 minutes. Tracks may be done in any order, and a child may do just one track.

ANIMALS TRAIL B: BIRDS

The second trail of the Animals track visits the birds: the eagle that “mounts up with wings,” the silent owl, the tiny hummingbird, the penguin, the ostrich of Job 39, parrots, migration, nests, John James Audubon the bird painter and a real backyard bird count. Each stop is a short read-aloud story, a picture to study, something to draw or build, quick questions, a game and a verse of Scripture.

This is the  **Scout** level, written for ages 7 to 9. A parent reads the story aloud, or a strong reader reads it alone. Every stop stands by itself. The  Ranger and  Expert levels of these same stops will add maps, numbers and primary sources later.

Five stops earn the **Bird Scout badge, part 1**, and ten stops earn part 2 and the **Trail B certificate**. The badge quizzes are at the end of the trail and are optional.

BEFORE YOU BEGIN

- Listen to a story of about five minutes and tell it back.
- Sit still and quiet for five minutes while watching something.
- Find North America, Africa, Australia, Antarctica and the oceans on a globe (a grown-up may help).

MASTERY CHECKLIST

- ☐ I can say what makes an animal a bird: feathers, wings, a beak, and eggs with hard shells.
- ☐ I can tell one true and surprising fact about each bird on this trail.
- ☐ I can name three kinds of nests and the birds that build them.
- ☐ I can tell why many birds migrate and one way they find their way.
- ☐ I can name five birds I have seen myself and keep a bird list in my Field Notebook.

OPTIONAL BOOKS AND RESOURCES

- **Cornell Lab of Ornithology: All About Birds** (<https://www.allaboutbirds.org>): Free bird guide with photos and recorded songs; good for checking a bird you saw.
- **Great Backyard Bird Count** (<https://www.birdcount.org>): The free February count used in Stop B10. Families may take part by keeping a paper list.
- **Biodiversity Heritage Library** (<https://www.biodiversitylibrary.org>): Old bird plates by Audubon, Gould and Lear to copy in the Field Notebook.

1.1 EAGLES: “MOUNT UP WITH WINGS”

OBJECTIVES

- Describe how an eagle soars without flapping.
- Name two parts God gave the eagle for hunting: eyes and talons.
- Say Isaiah 40:31 and tell what it promises.

Warm-up. Stretch your arms out as wide as you can. Ask a grown-up to measure from fingertip to fingertip. A big bald eagle’s wings stretch about 6 to 7 feet, wider than most grown-ups can reach!

Video slot. Video coming. Bald eagles soaring, fishing and at the nest; an eagle nest camera. Search the U.S. Fish and Wildlife Service, the National Park Service, the Cornell Lab of Ornithology (Bird Cams).

KEY TERMS

bird

An animal with feathers, wings and a beak that lays eggs with hard shells.

soar

To glide high in the air on rising air without flapping.

talon

A long, sharp, curved claw on a bird of prey.

bird of prey

A bird that hunts other animals with its feet and hooked beak, such as an eagle, hawk or owl.

CORE IDEAS

The story. High over a river in Alaska, a bald eagle spreads its great wings and does not flap them at all. It rides the warm air rising from the ground, round and round, higher and higher, until it is a tiny speck in the sky. Then it tips its wings and glides down toward the water. Its sharp eyes have spotted a fish.

Riding the wind. When the sun warms the ground, warm air rises in columns called thermals. Eagles hold their wings wide and let the rising air carry them up, the way a bit of ash floats up from a campfire. Because they do not need to flap much, eagles can stay in the air for a long time without getting tired.

Eyes and feet. An eagle can spot a rabbit or a fish from very far away. Its eyes are much sharper than ours. When it dives, it swings its feet forward and grabs its food with its **talons**, long curved claws. Rough bumps on the bottom of its toes help it hold a slippery fish.

A bird for a nation. In 1782, the bald eagle was put on the Great Seal of the United States. It is not really bald: “bald” is an old word for white-headed. Young bald eagles are brown all over and do not get their white heads and tails until they are about five years old. Once there were very few bald eagles left in the lower 48 states. People protected them, and now there are many again.

“Wings as eagles.” The prophet Isaiah watched eagles too. He wrote that people who trust God “shall mount up with wings as eagles” (Isaiah 40:31). An eagle does not soar by its own hard work but by resting on the wind. In the same way, God gives strength to tired people who wait on Him.

PICTURE STUDY



*White-headed Eagle (Bald Eagle), Plate 31 of The Birds of America, John James Audubon, 1828 · Hand-colored engraving (from Audubon’s watercolor) · From The Birds of America
Wikimedia Commons · Public domain*

John James Audubon painted every bird in his great book life-size. To fit a bald eagle on the page, he posed it bending down over its catch. Stop B9 tells more about Audubon.

Look closely

- Find the white head and tail. Find the hooked yellow beak.
- Look at the feet. How is the eagle holding the fish?
- Look at the eagle’s eye. What does it seem to be doing?

Talk about it

1. Why do you think Audubon painted the eagle with its wings lifted up?
2. Why might a country choose an eagle for its emblem?

HANDS-ON: SOARING PAPER EAGLE

Make a paper glider with wide eagle wings and see how a wide wing helps a bird glide.

You will need

- A sheet of paper
- Crayons
- A paper clip
- Scissors (with a grown-up)

Steps

1. Fold the paper in half the long way and open it again.
2. Draw an eagle seen from below: a white head and tail and long brown wings spread wide with “finger” feathers at the tips. Cut it out along the outline.
3. Clip a paper clip on the head for weight.
4. Hold it gently and push it forward from shoulder height. Try bending the wing tips up a little. Which way does it glide farther?

Check your work

- My eagle has wide wings, a white head and a white tail.
- I tried my glider at least three times.
- I can tell what a thermal is (rising warm air).

FIELD NOTEBOOK

1. Draw an eagle soaring with its wings spread. Label the head, beak, wing, tail and talons.
2. Copy Isaiah 40:31 in your best handwriting.

Did you know? Bald eagles build the biggest nests of any bird in North America. They add to the same nest year after year, and some weigh as much as a small car. Bald eagles live only in North America. In December 2024 a law made the bald eagle the official national bird of the United States, though it had been the national emblem since 1782.

Goes deeper in. Life Science, Grade 3, Unit 2 “Birds” (coming soon); and Gardening & Animals, for birds of prey.

For families. Bald eagles fell to a few hundred nesting pairs in the lower 48 states by the 1960s and were removed from the endangered species list in 2007 (U.S. Fish and Wildlife Service). The Great Seal was adopted in 1782; the national-bird law was signed in December 2024. The Hebrew word in Isaiah 40:31 may include large vultures as well as eagles; the KJV says “eagles.”

PRACTICE

1. **EASY** What does “bald” mean in the name bald eagle?
2. **MEDIUM** How can an eagle fly high without flapping?
3. **EASY** What are an eagle’s talons?

Make it a game • Eagle Eye. One player hides a small toy somewhere in plain sight in a room or yard. The others stand still in one spot and use only their “eagle eyes” to find it. The first to spot it and point is the next to hide.

Scripture. “But they that wait upon the LORD shall renew their strength; they shall mount up with wings as eagles; they shall run, and not be weary; and they shall walk, and not faint.” (Isaiah 40:31, KJV)

An eagle rests on the wind and rises. When we are tired, we can rest on God and He makes us strong.

Practice: answers

1. White-headed. The eagle has white feathers on its head, not a bare head.
2. It holds its wings wide and rides rising warm air (thermals).
3. Its long, sharp, curved claws.

1.2 OWLS, THE SILENT HUNTERS

OBJECTIVES

- Explain how special feathers let an owl fly silently.
- Tell why an owl turns its whole head to look around.
- Say what an owl pellet is.

Warm-up. Turn your head as far to the left as you can, then as far to the right. Some owls can turn their heads about three quarters of the way around, much farther than you can!

Video slot. Video coming. Barn owls in slow motion: silent flight and hunting by sound. Search the Cornell Lab of Ornithology, the Smithsonian, approved nature channels (vetted per video).

KEY TERMS

nocturnal

Awake and active at night.

owl pellet

A little bundle of bones and fur that an owl coughs up after a meal.

facial disk

The round, dish-shaped face of an owl that gathers sound to its ears.

prey

An animal that is hunted for food.

CORE IDEAS

The story. It is a dark night on a farm. A mouse creeps out from under the barn to look for seeds. High above, a barn owl glides across the field. The mouse hears nothing at all: no flapping, no whoosh. Suddenly the owl drops down out of the dark. The barn owl found the mouse by its tiny rustling sounds, even though it could hardly see it.

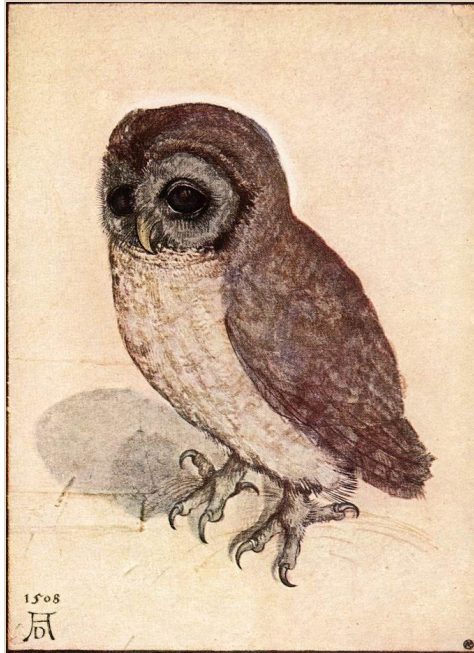
Silent wings. Most birds make a whooshing sound when they fly. But the front edge of an owl's wing feathers has a soft fringe like the teeth of a comb, and the feathers are velvety on top. These special feathers break up the air so gently that the owl's flight is almost silent. Engineers have studied owl feathers to make quieter fans and trains.

A face that hears. Many owls have a round, flat face called a **facial disk**. It works like a satellite dish, gathering sounds and sending them to the ears, which are hidden under the feathers. In barn owls, one ear opening is a little higher than the other. This helps the owl tell exactly where a sound is coming from, up or down, left or right.

Turning heads. An owl's big eyes are shaped like tubes, and they cannot roll around the way yours can. So instead, an owl turns its whole head. It has twice as many bones in its neck as you have, and it can turn its head about 270 degrees, three quarters of the way around.

Owl pellets. Owls often swallow a mouse whole. Later, the owl coughs up the parts it cannot digest, the bones and fur, in a neat little bundle called an **owl pellet**. Scientists open pellets to find out what owls have been eating.

PICTURE STUDY



Little Owl, Albrecht Dürer, 1506 · Watercolor and gouache on paper · Albertina, Vienna
Wikimedia Commons · Public domain

Albrecht Dürer was a great German artist who loved to paint animals exactly as they looked. He painted this little owl about five hundred years ago. You can almost feel how soft its feathers are.

Look closely

- Look at the eyes. Do they look at you?
- Find the tiny light spots on the feathers.
- Find the beak. Is it big or small?

Talk about it

1. How do you think Dürer made the feathers look so soft?
2. If this owl could talk, what would it say to you?

Safety first. Use only owl pellets sold for schools, which have been heated to make them clean. Wear gloves or use tweezers, and wash your hands afterward. Never pick up a pellet or a feather from a wild bird's roost.

HANDS-ON: OWL PELLET DETECTIVE

Open an owl pellet and find out what the owl ate. (If you cannot get a pellet, try "Owl Ears" in the tips.)

You will need

- A clean owl pellet from a school supply store
- Tweezers or a toothpick
- A paper plate
- Gloves
- A bone chart (often comes with the pellet)

Steps

1. Put the pellet on the plate. Gently pull it apart with the tweezers.
2. Separate the fur from the bones. Look for tiny skulls, jaws and leg bones.
3. Use the chart to match the bones. Was it a mouse, a vole, a shrew or a bird?
4. Glue a few bones on a card and label them.

Tips

- Owl Ears: cup your hands behind your ears like a facial disk. Have someone whisper across the room. Can you hear better with "owl ears" or without?

Check your work

- I found at least three bones.
- I can say what the owl ate.
- I washed my hands.

FIELD NOTEBOOK

1. Draw an owl's face with its round facial disk and big eyes. Label the eyes, beak and disk.
2. Write: "An owl flies silently because..." and finish the sentence.

Did you know? The little elf owl of the American Southwest is about the size of a sparrow; the great gray owl can be more than 2 feet tall. The "horns" of a great horned owl are only tufts of feathers, not ears. Snowy owls often hunt in the daytime during the long summer days of the Arctic.

Goes deeper in. Life Science, Grade 3, Unit 2 “Birds” and Grade 5, “Food chains” (coming soon).

For families. The 270-degree figure and the extra neck vertebrae (14, versus 7 in people) follow the Johns Hopkins study of owl necks (2013). Uneven ear openings are best known in barn owls and some other owls, not all. Pellet dissection is a classic science activity; buy heat-sterilized pellets.

PRACTICE

1. **EASY** What is an owl pellet?
2. **MEDIUM** Why does an owl turn its whole head instead of its eyes?
3. **EASY** What does nocturnal mean?

Make it a game • Silent Owl. One player sits blindfolded in the middle as the “mouse.” The others are owls and try to tiptoe up and touch the mouse’s shoulder. If the mouse hears an owl and points at it, that owl must go back to the wall.

Scripture. “I am like a pelican of the wilderness: I am like an owl of the desert.” (Psalm 102:6, KJV)

The writer felt lonely, like an owl alone in a wild place. But in the same psalm he trusts that God hears the prayers of the lonely.

Practice: answers

1. A bundle of bones and fur an owl coughs up after it eats.
2. Its eyes are tube-shaped and cannot move in their sockets.
3. Awake and active at night.

1.3 HUMMINGBIRDS, THE SMALLEST BIRDS

OBJECTIVES

- Tell how a hummingbird can hover and fly backward.
- Explain why a hummingbird must eat so often.
- Describe the long trip ruby-throated hummingbirds make each fall.

Warm-up. Flap your arms up and down as fast as you can for ten seconds. How many flaps did you do? A ruby-throated hummingbird beats its wings about 50 times every second!

Video slot. Video coming. Hummingbirds in slow motion: hovering, flying backward, feeding at flowers. Search the Cornell Lab of Ornithology, the Smithsonian, the National Park Service.

KEY TERMS

hover

To stay in one place in the air.

nectar

The sweet juice inside flowers.

pollen

Yellow dust in flowers that helps them make seeds.

torpor

A deep, cold sleep that saves energy, like a one-night hibernation.

CORE IDEAS

The story. A bright red flower nods in a summer garden. Suddenly, with a buzz like a big bee, a tiny bird zips in and stops in mid-air in front of it. Its wings are a blur. It pokes its long, thin beak into the flower and drinks. Then it flies backward, turns and zooms away. That was a ruby-throated hummingbird.

Wings like a figure eight. Hummingbirds are the only birds that can hover in one place for a long time and fly backward. Most birds push on the air mostly as their wings go down. A hummingbird twists its wings so that it pushes on the air going down and coming back up, tracing a sideways figure eight. That is why it can stay still in the air like a tiny helicopter.

Always hungry. All that flapping takes a lot of energy. A hummingbird's heart can beat more than a thousand times a minute. It must drink **nectar** from hundreds of flowers every day, and it catches tiny insects too. At night, to save energy, it may go into **torpor**, a deep sleep in which its body cools down and its heart slows.

A long trip for a tiny bird. A ruby-throated hummingbird weighs about as much as a penny. Yet every fall, many of them fly from North America to Mexico and Central America for the winter. Some fly straight across the Gulf of Mexico, about 500 miles over water, without stopping!

Helpers for flowers. When a hummingbird drinks, yellow **pollen** sticks to its head. At the next flower, some pollen rubs off, and that helps the flower make seeds. God made the hummingbird and the flower to help each other.

PICTURE STUDY



Hummingbirds, from A Monograph of the Trochilidae, John Gould, 1849–1861 · Hand-colored lithograph ·
From A Monograph of the Trochilidae, or Family of Humming-birds
Wikimedia Commons · Public domain

John Gould was an English bird expert and artist. He loved hummingbirds so much that he made a great five-volume book about them. To show how hummingbird feathers glitter, the printers used gold and shiny varnish under the colors.

Look closely

- Find the long, thin beaks. What are they made for?
- Look for colors that seem to shine.
- Find a hummingbird near a flower or a nest. What is it doing?

Talk about it

1. Why do you think Gould wanted his pictures to shine?
2. Which hummingbird would you most like to see in real life?

HANDS-ON: A HUMMINGBIRD FEEDER

Make a simple feeder and watch for hummingbirds (spring to fall in most of North America).

You will need

- A small clean bottle or a store feeder
- White table sugar and water (no honey, no red dye)
- Red ribbon or red tape
- String
- A grown-up for the stove

Steps

1. With a grown-up, stir 1 part sugar into 4 parts water and bring it to a boil. Let it cool.
2. Fill the feeder. Tie red ribbon around it; red attracts hummingbirds.
3. Hang it in a shady spot near flowers, where you can see it from a window.
4. Change the sugar water every few days, more often in hot weather, and wash the feeder.

Check your work

- My feeder uses 1 part sugar to 4 parts water.
- I hung it where I can watch it.
- I wrote down the date and time of any visitor.

FIELD NOTEBOOK

1. Draw a hummingbird hovering at a flower. Draw a sideways figure eight beside its wing to show how it moves.
2. Make a chart: date, time, and how many hummingbirds came to the feeder.

Did you know? The bee hummingbird of Cuba is the smallest bird in the world, about 2 inches long. A hummingbird nest is about the size of half a walnut shell and is held together with spider silk, so it can stretch as the babies grow. Hummingbirds live only in North and South America and the islands near them.

Goes deeper in. Life Science, Grade 2, “Pollination” and Gardening & Animals, “A garden for birds and butterflies” (coming soon).

For families. The 1:4 sugar recipe and “no red dye” follow the National Audubon Society. The wing-beat rate (about 53 per second), weight (about 3 grams) and Gulf crossing (about 500 miles) are for ruby-throated hummingbirds (Cornell Lab, All About Birds); other kinds differ.

PRACTICE

1. **EASY** Name one thing a hummingbird can do that most birds cannot.
2. **MEDIUM** Why must a hummingbird eat so often?
3. **EASY** What is the smallest bird in the world?

Make it a game • Nectar Relay. Set out paper “flowers” around the yard with a few dried beans on each. Players are hummingbirds and must “sip” (pick up) one bean at a time, buzzing as they fly, and bring it back to the nest cup. Which team fills its cup first?

Scripture. “Behold the fowls of the air: for they sow not, neither do they reap, nor gather into barns; yet your heavenly Father feedeth them. Are ye not much better than they?” (Matthew 6:26, KJV)

God fills the flowers with nectar for the tiny hummingbird. He cares for us even more.

Practice: answers

1. Hover in one place, or fly backward.
2. Its fast wings and heartbeat use a great deal of energy.
3. The bee hummingbird of Cuba.

1.4 PENGUINS

OBJECTIVES

- Explain how a penguin “flies” underwater.
- Tell how emperor penguin fathers keep their eggs warm.
- Find Antarctica on a globe.

Warm-up. Put a ball or a beanbag on top of your feet and try to walk without dropping it. Emperor penguin fathers carry their egg on their feet like this for about two months!

Video slot. Video coming. Emperor penguins: the huddle, the father with the egg, penguins swimming. Search the British Antarctic Survey, the Smithsonian, approved nature channels (vetted per video).

KEY TERMS

flipper

A penguin’s stiff, flat wing, used for swimming.

Antarctica

The icy continent at the bottom of the world, around the South Pole.

huddle

A tight group that stands close together to keep warm.

colony

A big group of birds that nest in the same place.

CORE IDEAS

The story. It is the middle of winter in Antarctica, the coldest place on earth. The sun does not rise for weeks. The wind howls across the ice. Thousands of emperor penguin fathers stand pressed together in a great **huddle**. Each one has a single egg balanced on his feet, tucked under a warm flap of feathered skin. The mothers have gone far away to the sea to eat.

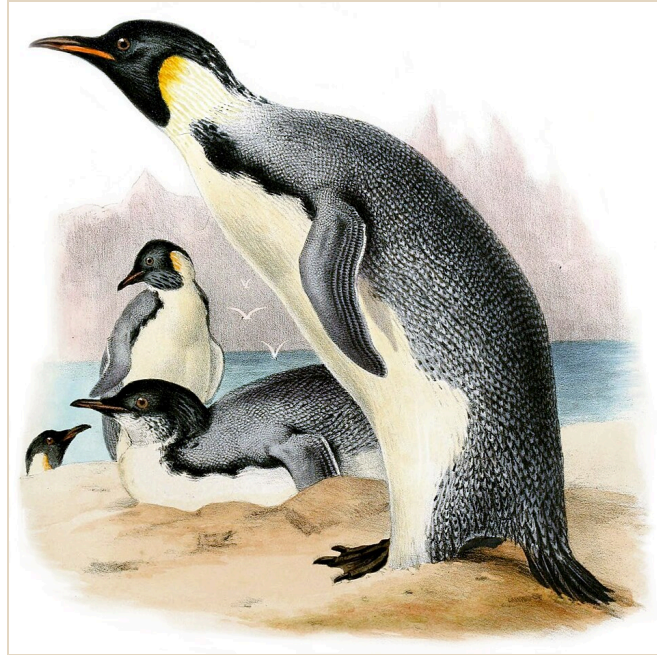
The patient fathers. For about two months, the fathers hold the eggs and do not eat at all. The huddle slowly shuffles, so that birds on the cold outside take turns moving into the warm middle. If the chick hatches before the mother is back, the father feeds it a little milky food from his throat. Then the mothers come back from the sea, full of fish, and find their families by their calls.

Birds that fly underwater. Penguins are birds. They have feathers, beaks and wings, and they lay eggs. But penguins cannot fly in the air. Their wings are stiff, flat **flippers**, and with them penguins “fly” through the water instead. Emperor penguins can dive deeper than 1,600 feet to catch fish and squid.

Dressed for the cold. A penguin's short feathers lie close together like shingles on a roof, keeping out wind and water. Under its skin is a thick layer of fat. Its black back and white front help it hide in the sea: from above it looks like the dark water, and from below it looks like the bright sky.

Penguins of the south. Wild penguins live in the southern half of the world. Some, like the emperor, live in Antarctica. Others live in South America, Africa, Australia and New Zealand. The little Galápagos penguin lives almost on the equator.

PICTURE STUDY



Emperor Penguin (Aptenodytes forsteri), Lithograph printed by Charles Joseph Hullmandel, 1844 · Hand-colored lithograph · From *The Zoology of the Voyage of H.M.S. Erebus & Terror*
Wikimedia Commons · Public domain

In 1839–1843, two British ships, the *Erebus* and the *Terror*, sailed to Antarctica. Scientists on board brought back penguin skins and notes, and artists in London made colored prints from them for a book about the animals of the voyage. This plate shows the emperor penguin.

Look closely

- Find the bright patch of color on the penguin's neck.
- Look at the flippers. Do they look like wings for flying?
- Look at the feet. Why might short legs be good on the ice?

Talk about it

1. Why do you think the artist put the sea behind the penguins?
2. How is a penguin like other birds, and how is it different?

HANDS-ON: PENGUIN EGG WALK AND BLUBBER GLOVE

Find out how hard it is to carry an egg like an emperor dad, and how fat keeps a penguin warm.

You will need

- A plastic egg or a small ball
- Two zip-top sandwich bags
- Solid vegetable shortening
- A bowl of ice water
- Tape

Steps

1. Egg walk: put the egg on your feet and shuffle across the room without dropping it.
2. Blubber glove: with a grown-up, scoop a thick layer of shortening into one bag. Put your hand in the empty bag, then push it into the shortening bag so the fat is all around your hand. Tape the tops together loosely.
3. Put your “blubber” hand and your bare hand in the ice water.
4. Which hand gets cold first?

Check your work

- I carried the egg on my feet.
- I tested the blubber glove.
- I can tell how fat helps a penguin stay warm.

FIELD NOTEBOOK

1. Draw an emperor penguin father with an egg on his feet. Label the flipper, beak, feet and egg.
2. Draw a map of the world and color Antarctica white.

Did you know? The emperor penguin is the biggest penguin. It stands almost 4 feet tall, a little shorter than many seven-year-olds. Penguins slide on their bellies across the ice, pushing with their feet. This is called tobogganing. Penguins can drink salt water. A special gland above the eyes takes the extra salt out.

Goes deeper in. Life Science, Grade 3, Unit 2 “Birds” and Geography, Antarctica (coming soon).

For families. Emperor penguin facts follow the British Antarctic Survey and the Australian Antarctic Program: the male incubates for about 65 days without food; recorded dives exceed 500 m (over 1,600 ft); height up to about 115 cm (45 in). The plate

is from *The Zoology of the Voyage of H.M.S. Erebus & Terror* (1844), printed by Hullmandel (Wikimedia Commons file page).

PRACTICE

1. **EASY** Can penguins fly in the air?
2. **MEDIUM** How do emperor penguin fathers stay warm in the winter?
3. **EASY** Where do wild penguins live: the north or the south of the world?

Make it a game • Penguin Huddle. Everyone huddles in a tight group. The leader calls “Wind!” and the players on the outside must shuffle around to the middle, while the inside ones move out. Keep your “egg” (a beanbag) on your feet the whole time.

Scripture. “He giveth snow like wool: he scattereth the hoarfrost like ashes.” (Psalm 147:16, KJV)

God rules the snow and ice. He made the emperor penguin able to live where almost nothing else can.

Practice: answers

1. No. They “fly” underwater with their flippers.
2. They huddle close together and take turns in the warm middle.
3. The south (the Southern Hemisphere).

1.5 OSTRICHES: JOB 39

OBJECTIVES

- Tell three ways the ostrich is the biggest bird.
- Read Job 39:13-18 and tell what God says about the ostrich.
- Explain why the “head in the sand” story is not true.

Warm-up. Look at your feet and count your toes: ten. Now guess how many toes an ostrich has on each foot. Only two! That helps it run very fast.

Video slot. Video coming. Ostriches running and the size of an ostrich egg. Search the San Diego Zoo Wildlife Alliance, the Smithsonian’s National Zoo, approved nature channels.

KEY TERMS

ostrich

The largest living bird. It cannot fly, but it runs very fast.

flightless

Not able to fly.

plume

A big, soft, fluffy feather.

savanna

A wide, grassy land with a few trees.

CORE IDEAS

The story. Long ago, God spoke to a man named Job out of a whirlwind. He asked Job about the wonders of His creation. One of the animals God talked about was the ostrich. God said that the ostrich does not seem very wise, but “what time she lifteth up herself on high, she scorneth the horse and his rider” (Job 39:18). That means when an ostrich gets up and runs, it laughs at a horse and rider, because it can outrun them!

The biggest bird. The ostrich lives on the dry **savannas** and deserts of Africa. It is the biggest bird in the world. A male can be about 9 feet tall and weigh more than two grown men. It lays the biggest egg of any living bird, as heavy as about two dozen chicken eggs.

Running, not flying. An ostrich has wings but cannot fly. Instead it runs on two long, strong legs. Each foot has just two toes, and one is very big, almost like a hoof. An ostrich can run about 40 miles an hour, as fast as a car on a town road, and keep going a long way. It holds out its wings to help it balance and turn.

Big eyes. An ostrich's eyes are about 2 inches across, the biggest eyes of any land animal, and bigger than its brain! Its height and sharp eyes help it see danger far across the plains. Zebras and antelope often graze near ostriches, which act like lookouts.

Head in the sand? People say that a frightened ostrich buries its head in the sand. That is not true. An ostrich that is nesting may lie flat on the ground with its long neck stretched out, to hide. From far away, it can look as though its head is in the ground. The parents also put their heads down to turn their eggs in the shallow nest.

PICTURE STUDY



Ostrich (Struthio camelus), Plate I of *A Book of Birds*, Color plate in W. P. Pycraft's book, 1908 · Color plate ·
From *A Book of Birds* by W. P. Pycraft, London
Wikimedia Commons · Public domain

This picture comes from a bird book written for families more than a hundred years ago by W. P. Pycraft, a bird scientist at the Natural History Museum in London. It shows a male ostrich, black with white wing and tail plumes, striding along on his long legs.

Look closely

- Find the toes on each foot.
- Look at the feathers. Which ones are fluffy plumes?
- Compare the neck and legs. Which is longer?

Talk about it

1. How would you feel standing next to an ostrich?
2. Why do you think God told Job about the ostrich?

HANDS-ON: LIFE-SIZE OSTRICH AND EGG

See how big an ostrich and its egg really are.

You will need

- Painter's tape
- A tape measure
- A sheet of paper and a pencil
- A chicken egg (to compare)

Steps

1. On a wall or a door, put a piece of tape 9 feet from the floor (a grown-up helps). That is the top of a big ostrich's head.
2. Stand beside it. Mark your own height. How much taller is the ostrich?
3. On paper, draw an oval about 6 inches long and 5 inches wide. That is an ostrich egg.
4. Put the chicken egg on top of your drawing. How many chicken eggs would fit?

Check your work

- I marked 9 feet on the wall.
- I compared my height to the ostrich.
- I drew a life-size ostrich egg.

FIELD NOTEBOOK

1. Draw an ostrich running with its wings spread. Label the two-toed foot, the neck and the plumes.
2. Write: "She scorneth the horse and his rider" (Job 39:18).

Did you know? An ostrich egg shell is so strong that a grown-up can stand on it without breaking it. Ostriches swallow pebbles. The stones help grind up the food in their stomachs. A kick from an ostrich is very powerful, so even lions are careful around them.

Goes deeper in. Life Science, Grade 3, Unit 2 "Birds" and Bible reading, Job 38-39.

For families. Read Job 39:13-18 aloud together. The passage says the ostrich "leaveth her eggs in the earth" and forgets that a foot may crush them; ostriches do lay in shallow ground scrapes, and the passage is God's poetry about how He provides even for a creature that seems foolish. Speed is given as about 40 mph; many sources give up to about 43 mph (70 km/h). Height up to about 9 ft and weight up to about 320 lb (San Diego Zoo Wildlife Alliance; Britannica).

PRACTICE

1. **EASY** Can an ostrich fly?

2. **MEDIUM** Does an ostrich really bury its head in the sand? What does it do instead?
3. **EASY** How many toes does an ostrich have on each foot?

Make it a game • Ostrich Race. Players race with their hands tucked behind them like folded wings. Then race again around a cone with arms held out like wings for balance. Which way is easier to turn?

Scripture. “What time she lifteth up herself on high, she scorneth the horse and his rider.” (Job 39:18, KJV)

God made the ostrich able to outrun a horse. He is the one who gives every animal its gifts.

Practice: answers

1. No, but it can run very fast.
2. No. It may lie flat with its neck on the ground to hide, or put its head down to turn its eggs.
3. Two.

1.6 PARROTS

OBJECTIVES

- Describe a parrot's beak and feet and how it uses them.
- Tell how some parrots can copy words.
- Tell the story of Edward Lear, who painted parrots as a young man.

Warm-up. Try to hold a grape with your toes. Hard, isn't it? Many parrots hold their food in one foot, like a hand, and take bites from it!

Video slot. Video coming. Parrots in the wild: macaws at a clay lick, parrots using beak and feet; an African grey talking. Search the Smithsonian's National Zoo, the San Diego Zoo Wildlife Alliance, approved nature channels.

KEY TERMS

parrot

A bird with a strong, hooked beak and feet with two toes in front and two behind.

mimic

To copy sounds or actions.

macaw

A large, brightly colored parrot with a long tail.

flock

A group of birds that live and travel together.

CORE IDEAS

The story. In 1830, a young man named Edward Lear went to the London Zoo again and again. He was only eighteen. He sat with paper and pencils in front of the parrots and drew the birds from life, feather by feather. Then he made the drawings into big colored prints. His book of parrots made people say he was one of the best bird painters in England. Later, Edward Lear became famous for something else: funny poems, like "The Owl and the Pussy-cat."

A beak like a nutcracker. A parrot has a strong, hooked **beak**. The top part curves down over the bottom part. It can crack hard nuts and seeds that people need a hammer to open. A parrot also uses its beak like a third foot to pull itself up when it climbs through the trees.

Feet like hands. Look at a parrot's foot and you will see two toes pointing forward and two pointing back. This helps it grip branches tightly. Many parrots pick up food with one foot and hold it up to the beak, the way you hold a sandwich.

Copycats with feathers. Some parrots, like the African grey, can **mimic** words, whistles, even a ringing telephone. In the wild, parrots live in noisy **flocks** and learn the calls of their flock. A pet parrot may treat its family as its flock and learn the sounds it hears around the house.

Colors from the Creator. Parrots live mostly in warm places: South and Central America, Africa, Asia and Australia. Many are bright green, red, yellow or blue. A flock of scarlet macaws flying over the rainforest looks like a rainbow with wings.

PICTURE STUDY



Blue and Yellow Macaw, from Illustrations of the Family of Psittacidae, or Parrots, Edward Lear, 1830-1832 · Hand-colored lithograph · From Lear's book of parrots, London · Wikimedia Commons · Public domain

Edward Lear drew this parrot from a living bird when he was still a teenager. He drew the birds himself on lithograph stones, and the prints were colored by hand.

Look closely

- Find the hooked beak.
- Look at the feet. How many toes point forward? How many point back?
- Count the colors you can see.

Talk about it

1. Why do you think Lear drew from live birds, not stuffed ones?
2. What would this parrot say if it could talk?

HANDS-ON: A PARROT TOE GRIP

Find out why two toes forward and two toes back make a strong grip.

You will need

- A broom handle or a thick stick
- A grown-up helper

Steps

1. Hold the stick with all four fingers on one side and nothing on the other (thumb off). Ask a grown-up to gently try to pull it out of your hand.
2. Now hold it with two fingers in front and your thumb and one finger wrapped behind. Try again.
3. Which grip held better?
4. Draw a parrot foot gripping a branch in your Field Notebook.

Check your work

- I tried both grips.
- I can say how many toes a parrot has in front and behind.

FIELD NOTEBOOK

1. Draw a parrot holding a nut in its foot. Label the hooked beak, the two front toes and the two back toes.
2. Write the name Edward Lear and one thing he did.

Did you know? The kākāpō of New Zealand is a parrot that cannot fly. It is the heaviest parrot in the world, and it walks and climbs instead. Macaws in South America gather at riverbanks to eat clay, which scientists think gives them salt they need. The United States once had its own parrot, the Carolina parakeet. The last known one died at the Cincinnati Zoo in 1918.

Goes deeper in. Life Science, Grade 3, Unit 2 “Birds”; Composition, nonsense verse (Lear) (coming soon).

For families. Lear’s *Illustrations of the Family of Psittacidae, or Parrots* came out in parts from 1830 to 1832; he began at 18, drawing living birds, many at the Zoological Society’s gardens in London. Read James 3:7-10 together for the point about the tongue.

PRACTICE

1. **EASY** How are a parrot’s toes arranged?
2. **MEDIUM** Why might a pet parrot learn the words its family says?
3. **EASY** Who was Edward Lear?

Make it a game · Parrot Says. One player is the parrot. Another says a short word or makes a sound, and the parrot must copy it exactly. Take turns making the sounds harder: a whistle, a word in another language, a tongue twister.

Scripture. “For every kind of beasts, and of birds, and of serpents, and of things in the sea, is tamed, and hath been tamed of mankind:” (James 3:7, KJV)

People can teach a parrot to talk. James says the harder job is taming our own tongue, so that we speak kind and true words.

Practice: answers

1. Two point forward and two point back.
2. In the wild, parrots learn the calls of their flock; a pet treats its family as its flock.
3. An English artist who painted parrots as a young man and later wrote funny poems.

1.7 MIGRATION: BIRDS THAT KNOW THE WAY

OBJECTIVES

- Explain what migration is and why many birds migrate.
- Name two ways birds find their way.
- Tell about the Arctic tern, which makes the longest journey.

Warm-up. Go outside and find where the sun is (do not look right at it). Point to it. Birds can use the sun like a compass to find their way.

Video slot. Video coming. Bird migration: geese in V-formation, the Arctic tern, tracking birds. Search the Cornell Lab of Ornithology (BirdCast), the U.S. Fish and Wildlife Service, the Smithsonian Migratory Bird Center.

KEY TERMS

migration

A long trip that animals make each year to a different place and back.

V-formation

The shape of a V that geese fly in to save energy.

compass

A tool that shows which way is north.

season

One of the four parts of the year: spring, summer, fall and winter.

CORE IDEAS

The story. One cool fall morning, you hear honking high overhead. You look up and see a long V of Canada geese flying south. Where are they going? How do they know the way? Long ago, the prophet Jeremiah wondered at the same thing. He wrote that “the stork in the heaven knoweth her appointed times” and that the crane and the swallow “observe the time of their coming” (Jeremiah 8:7).

Why birds migrate. In the far north, summer is full of insects, seeds and long days, a perfect time to raise babies. But winter brings snow and ice, and food is hard to find. So many birds fly south to warmer places for the winter and come back in the spring. This long trip is called **migration**.

How they find the way. Birds do not have maps, but God gave them other ways to find the way. Many birds use the sun by day and the stars by night. Many can sense the earth’s magnetic pull, like a built-in **compass**. They also remember rivers, mountains and coastlines. Many young songbirds make their first trip alone, with no one to show them the way.

The champion traveler. The Arctic tern is a small white bird with a black cap. It nests in the far north in summer, then flies all the way to the seas around Antarctica for the southern summer, and back again. Scientists who tracked terns with tiny devices found that they flew about 44,000 miles in one year. That is like flying around the whole earth more than one and a half times!

The V of the geese. Geese fly in a **V-formation**. Each goose rides on the air stirred up by the wings of the goose ahead, so it does not have to work as hard. When the leader gets tired, it drops back, and another goose takes the front. Teamwork helps the whole flock fly farther.

PICTURE STUDY



Geese Flying Past the Full Moon, Utagawa Hiroshige, 1832-1835 · Woodblock print · San Diego Museum of Art

Wikimedia Commons · Public domain

Utagawa Hiroshige was a famous Japanese artist who made prints from carved wooden blocks. In this print, wild geese fly past a full autumn moon. In Japan, as in America, geese flying overhead were a sign that fall had come.

Look closely

- Count the geese. Are they flying in a line?
- Find the moon. Is it big or small in the picture?
- What time of day is it?

Talk about it

1. How does this picture make you feel: quiet, lonely, happy?
2. What sign of fall do you notice where you live?

HANDS-ON: MIGRATION MAP

Draw the paths of migrating birds on a map of the world.

You will need

- A printed world map or a big sheet of paper
- Colored pencils or yarn
- Glue or tape

Steps

1. Find the Arctic (top) and Antarctica (bottom).
2. Draw an Arctic tern's nest near the top. Draw a long, curving line all the way down the Atlantic Ocean to Antarctica, and another line back up.
3. In a second color, draw a Canada goose path from Canada to the southern United States.
4. In a third color, draw a ruby-throated hummingbird's path from the eastern United States across the Gulf of Mexico (from Stop B3).

Check your work

- My map shows three bird journeys.
- I labeled north and south.
- I can tell which bird goes the farthest (the Arctic tern).

FIELD NOTEBOOK

1. Draw a V of geese flying across the page. Write the date you last saw or heard geese.
2. Copy the first part of Jeremiah 8:7: "Yea, the stork in the heaven knoweth her appointed times."

Did you know? A bar-tailed godwit was tracked flying from Alaska to Tasmania, Australia, without stopping: more than 8,000 miles in about 11 days. Many songbirds migrate at night. On a spring night, thousands of birds may be flying over your house. Before people understood migration, some thought swallows slept at the bottom of ponds all winter.

Goes deeper in. Life Science, Grade 4, "Seasons and animal journeys" and Geography, using a world map (coming soon).

For families. Arctic tern distance follows Egevang et al., *PNAS* (2010): an average of about 70,900 km (about 44,000 miles) a year for terns tracked from Greenland. The godwit record (2022, about 13,560 km, Alaska to Tasmania in about 11 days) was reported by the tracking team and Guinness World Records. "Turtle" in KJV Jeremiah 8:7 means turtledove.

PRACTICE

1. **EASY** What is migration?
2. **MEDIUM** Name two ways birds find their way.
3. **EASY** Which bird makes the longest migration?

Make it a game • Follow the Leader V. Players line up in a V behind a leader and “fly” around the yard. When the leader calls “Tired!”, she moves to the back of one arm of the V and the next player takes the front.

Scripture. “Yea, the stork in the heaven knoweth her appointed times; and the turtle and the crane and the swallow observe the time of their coming; but my people know not the judgment of the LORD.” (Jeremiah 8:7, KJV)

The “turtle” here is the turtledove, a bird. Birds keep the times God set for them. God wants His people to listen to Him too.

Practice: answers

1. A long trip animals make each year to another place and back.
2. Any two: the sun, the stars, the earth’s magnetic pull, landmarks like rivers and coasts.
3. The Arctic tern.

1.8 NESTS: BIRD BUILDERS

OBJECTIVES

- Name four kinds of bird nests and what they are made of.
- Tell how a bird builds a nest with only its beak and feet.
- Explain why we look at nests but do not touch them.

Warm-up. Put two clothespins together like a beak and try to pick up a piece of yarn with them. Birds build whole nests with nothing but a beak and feet.

Video slot. Video coming. How birds build nests: weaver birds, robins and an eagle nest camera. Search the Cornell Lab of Ornithology (NestWatch, Bird Cams), approved nature channels.

KEY TERMS

nest

A home a bird builds to lay its eggs and raise its babies.

weaver

An African bird that ties grass into knots to weave a hanging nest.

clutch

All the eggs a bird lays in one nest at one time.

fledgling

A young bird that has just left the nest.

CORE IDEAS

The story. In the spring, a robin hops across the lawn with a beak full of dry grass. She flies to the fork of a tree, drops the grass and goes back for more. She brings twigs, grass and mud. She sits in the middle of the pile and turns round and round, pressing it into a cup with her breast. In a few days her nest is done. Soon there will be bright blue eggs in it.

Builders without hands. Birds have no hammers and no hands. They build with their beaks and feet alone. Yet each kind of bird builds its own kind of nest, the right shape for its eggs, often the very first time it tries.

Many kinds of nests. Robins make neat cups of grass and mud. Bald eagles pile up sticks into huge platforms high in a tree. Hummingbirds make tiny cups held together with spider silk. Many **weaver** birds of Africa tie real knots in strips of grass to weave a ball that hangs from a branch, with the door underneath. The ovenbird of South America builds a round house of mud that dries hard in the sun, like a little clay oven.

Some birds hardly build at all. A killdeer lays its speckled eggs in a little scrape on the gravel. The eggs look just like stones. Woodpeckers chip a hole in a tree. And the emperor penguin, as you learned, has no nest at all, only its father's feet!

Look, but do not touch. If you find a nest with eggs or babies, stay back and watch quietly. If the parents are frightened away, the eggs can get cold. In the United States, the nests and eggs of most wild birds are protected by law. The best way to help a bird family is to give it space.

PICTURE STUDY



Bird's Nest, Apple Blossom and Primroses, William Henry Hunt, about 1845–1850 · Watercolor · Birmingham Museums Trust, England
Wikimedia Commons · Public domain

William Henry Hunt was an English painter who painted bird nests so often that people nicknamed him “Bird’s Nest Hunt.” He painted every twig and every egg with tiny brushstrokes.

Look closely

- Count the eggs. What color are they?
- Find the different materials in the nest: twigs, grass, moss.
- Look at the plants. What season do you think it is?

Talk about it

1. Why do you think Hunt liked to paint nests?
2. How long do you think it took the bird to build this nest?

Safety first. Never take a nest, egg or feather from the wild. Watch nests from a distance and leave quickly if the parents seem upset.

HANDS-ON: BUILD A NEST WITH A “BEAK”

Try to build a bird’s nest, then put out nesting materials to help real birds.

You will need

- Twigs, dry grass, leaves and moss from the yard
- A little mud or play dough
- Two clothespins (your “beak”)
- A mesh bag or an empty suet cage
- Short pieces of plain cotton string (under 3 inches)

Steps

1. Use only the clothespins to pick up and place twigs and grass. Try to make a cup shape.
2. Press a little mud into the bottom to hold it together. Is it easy?
3. Fill the mesh bag with short string and dry grass and hang it outside in spring for birds to use.
4. Watch the bag from a window. Write down any birds that take something.

Tips

- Do not put out dryer lint, long strings or plastic, which can harm birds.

Check your work

- I built a nest cup.
- I used only my “beak” for at least part of it.
- I put out nesting materials for real birds.

FIELD NOTEBOOK

1. Draw three kinds of nests: a robin’s cup, a weaver’s hanging ball and an eagle’s stick platform. Label them.
2. If you find a nest, draw it from a distance and write the date and place.

Did you know? All the eggs in one nest are called a clutch. A robin usually lays 3 to 5 blue eggs. The sociable weaver of southern Africa builds giant shared nests with many rooms for many families. Some are used for many years. Some swiftlets in Asia build nests out of their own saliva, which hardens like glue.

Goes deeper in. Gardening & Animals, “Helping birds in your yard” and Life Science,

Grade 2, “Animal homes” (coming soon).

For families. The U.S. Migratory Bird Treaty Act protects the nests, eggs and feathers of most native birds (U.S. Fish and Wildlife Service); a few non-native birds such as house sparrows and starlings are not covered, but the stop simply teaches “look, don’t touch.” Nesting-material tips follow the National Audubon Society and Cornell’s NestWatch.

PRACTICE

1. **EASY** What does a robin use to build its nest?
2. **MEDIUM** Why is a weaver’s hanging nest a safe home?
3. **EASY** What should you do if you find a nest with eggs?

Make it a game • Nest Builders. Teams get a pile of pillows, blankets and soft toys. Each team must build a “nest” big enough for one player to sit in, in three minutes, using only one hand each.

Scripture. “Yea, the sparrow hath found an house, and the swallow a nest for herself, where she may lay her young, even thine altars, O LORD of hosts, my King, and my God.” (Psalm 84:3, KJV)

Birds nested near God’s house. The writer longed to be close to God, as safe as a bird in its nest.

Practice: answers

1. Grass, twigs and mud.
2. It hangs from a thin branch with the door underneath, so snakes and other hunters have a hard time getting in.
3. Stay back, watch quietly, and do not touch it.

1.9 JOHN JAMES AUDUBON, THE BIRD PAINTER

OBJECTIVES

- Tell the story of John James Audubon and his book *The Birds of America*.
- Explain why Audubon painted birds life-size.
- Draw a bird from careful observation.

Warm-up. Look at a picture of a bird for one minute. Then turn the picture over and draw it from memory. Now look again. What did you miss? Audubon spent hours looking at every bird he painted.

Video slot. Video coming. John James Audubon and *The Birds of America*: the giant book and the life-size paintings. Search the National Audubon Society, the Smithsonian, the New-York Historical Society.

KEY TERMS

naturalist

A person who studies plants and animals in nature.

life-size

The same size as the real thing.

engraving

A picture printed from lines cut into a metal plate.

bird banding

Putting a small marked band on a bird's leg to learn where it goes.

CORE IDEAS

The story. In 1804, on a farm in Pennsylvania, a young man named John James Audubon found a pair of little birds called phoebes nesting in a cave near a creek. He wondered: would the same birds come back next year? So he tied a light silver thread around the legs of the young birds. The next spring, two phoebes with silver threads came back to nest nearby! This is often called the first time anyone in America marked birds to follow them, the idea we now call **bird banding**.

A dream to paint every bird. Audubon was born in 1785 on the island now called Haiti and grew up in France. He came to America as a young man and fell in love with its birds. He decided to paint every kind of bird in North America, life-size. He walked and paddled through forests, swamps and rivers for years, watching and drawing.

Starting over. Once, Audubon came home from a trip and found that rats had chewed up about two hundred of his drawings. He was so sad he could hardly sleep for days. But then

he took his notebook and pencils and went back into the woods to draw them all again, better than before.

A giant book. No one in America would print his paintings, so in 1826 he sailed to Great Britain. There his work was turned into copper **engravings** and colored by hand. *The Birds of America* was printed from 1827 to 1838. It has 435 pictures, and the pages are more than three feet tall, so that even big birds like the wild turkey could be shown **life-size**.

Why it matters. Audubon did not just paint birds standing still. He showed them flying, hunting, feeding their young and fighting off danger, as they really live. His pictures helped people love and protect America's birds. Later, people who wanted to protect birds named their club the Audubon Society after him.

PICTURE STUDY



Wild Turkey, Plate 1 of The Birds of America, John James Audubon (engraved by W. H. Lizars, Edinburgh), 1827 · Hand-colored engraving · From *The Birds of America*
Wikimedia Commons · Public domain

The wild turkey male was the very first plate in Audubon's great book. It is shown life-size, standing tall among the cane, and it fills the whole giant page. The first few plates were engraved in Edinburgh by W. H. Lizars; later Robert Havell of London engraved the rest.

Look closely

- Find the red skin on the turkey's head and neck.
- Look at the tail and wing feathers. How many colors can you see?
- Look at the feet. Is the turkey walking or standing still?

Talk about it

1. Why do you think Audubon chose the turkey for the first page?
2. How is this picture different from a photograph?

HANDS-ON: DRAW A BIRD LIKE AUDUBON

Draw a bird from careful looking, the way Audubon did.

You will need

- A bird to look at: a real bird outside, a bird feeder, or a photo in a bird guide
- Pencil, eraser and colored pencils

Steps

1. Look at the bird for two whole minutes before you draw. Notice the shape of the beak, the color of the eyes, the length of the tail.
2. Lightly sketch the big shapes first: an oval for the body and a circle for the head.
3. Add the beak, eye, wings, tail and feet.
4. Color it carefully. Then show the bird doing something: eating, flying or sitting on a branch.
5. Write the bird's name, the date and where you saw it.

Check your work

- I looked for two minutes before drawing.
- My bird shows a beak, an eye, wings, tail and feet.
- My bird is doing something.

FIELD NOTEBOOK

1. Put your Audubon-style drawing in your Field Notebook.
2. Write: "Audubon's book *The Birds of America* has ___ pictures." (435)

Did you know? A complete first set of *The Birds of America* is one of the most valuable books in the world. Audubon painted the Carolina parakeet and the passenger pigeon, two American birds that are now gone forever. The pages of *The Birds of America* are called "double elephant folio" size, about 39 by 26 inches.

Goes deeper in. Art, picture study (Audubon), and Life Science, Grade 3, Unit 2 "Birds" (coming soon).

For families. The phoebe-thread story and the rat story (about 200 drawings, around 1812) are both from Audubon's own *Ornithological Biography*.

PRACTICE

1. **EASY** What was the name of Audubon's great book?

2. **MEDIUM** Why were the pages of his book so big?
3. **MEDIUM** What did Audubon do when rats ate his drawings?

Make it a game · Bird in Action. Like charades: one player picks a bird from this trail and acts it out (an eagle soaring, an owl turning its head, a hummingbird hovering, a penguin sliding). The others guess the bird.

Scripture. “Whatsoever thy hand findeth to do, do it with thy might; for there is no work, nor device, nor knowledge, nor wisdom, in the grave, whither thou goest.” (Ecclesiastes 9:10, KJV)

Audubon worked hard and did not give up when his drawings were ruined. Whatever work God gives us, we should do it with all our might.

Practice: answers

1. The Birds of America.
2. So the birds could be shown life-size.
3. He went back into the woods and drew them all again.

1.10 THE BACKYARD BIRD COUNT

OBJECTIVES

- Take part in a real bird count by watching and counting birds for at least 15 minutes.
- Name five common birds by sight.
- Explain how families who count birds help scientists.

Warm-up. Look out a window for one minute and count every bird you see. Write the number down. At the end of this stop, you will count again for longer.

Video slot. Video coming. How to identify common backyard birds and take part in the Great Backyard Bird Count. Search the Cornell Lab of Ornithology, the National Audubon Society, Birds Canada.

KEY TERMS

bird count

Counting the birds in one place for a set time, so scientists know how many there are.

field marks

Special colors or shapes that help you tell one bird from another.

binoculars

A tool with two eyepieces that makes faraway things look closer.

citizen scientist

An ordinary person who helps real scientists by watching and counting.

CORE IDEAS

The story. Every February, all over the world, families sit by their windows with a notebook, a pencil and a cup of hot chocolate. They watch the bird feeder, the trees and the sky. They count every bird they see for at least fifteen minutes. This is the Great Backyard Bird Count. It started in 1998, and now people in more than a hundred countries take part.

Why count birds? No scientist can be everywhere at once. But if thousands of families each count the birds in their own yard, scientists can learn how many birds there are, where they are, and whether there are more or fewer than before. People who help this way are called **citizen scientists**. A child can be one!

An older count. More than a hundred years ago, on Christmas Day in 1900, a bird scientist named Frank Chapman asked people to go out and count birds instead of hunting them. Twenty-seven people counted that first day. The Christmas Bird Count still happens every winter.

How to tell birds apart. Bird watchers look for **field marks**. Is the bird big like a crow or small like a sparrow? What color is it? Does it have a crest on its head, like a cardinal or a blue jay? Does it have stripes on its wings? How does it move: hopping, walking, or climbing down a tree headfirst like a nuthatch?

Watching God's birds. Jesus said that not one sparrow falls to the ground without our Father (Matthew 10:29). When we sit quietly and watch, we see how many birds God has made and how He cares for each one. Counting them is a way of noticing His work.

PICTURE STUDY



Cardinal Grosbeak (Northern Cardinal), Plate 159 of The Birds of America, John James Audubon, 1832 · Hand-colored engraving · From The Birds of America · Wikimedia Commons · CC0

The northern cardinal is one of the easiest backyard birds to know. Audubon painted a male and a female together, so we can see how different they look.

Look closely

- Find the male (bright red) and the female (brown with red).
- Find the crest on top of each head.
- Look at the thick beak. What do you think a beak like this cracks open?

Talk about it

1. Why do you think the male and female look so different?
2. Have you ever seen a cardinal near your home?

HANDS-ON: MY OWN BIRD COUNT

Do a real bird count, like the Great Backyard Bird Count. You can do it any day, and you can send it in during the February count if your family chooses.

You will need

- A window or a quiet spot outside
- A timer
- A notebook and pencil
- A bird guide or bird app (a grown-up helps)
- Binoculars, if you have them

Steps

1. Set the timer for at least 15 minutes.
2. Watch quietly. For each kind of bird, write its name (or draw it if you do not know the name).
3. For each kind, write down the most you saw at one time, so you do not count the same bird twice.
4. When the timer rings, look over your list.
5. If it is the February count, a grown-up can help you send your list to birdcount.org.

Check your work

- I counted for at least 15 minutes.
- I wrote down each kind of bird.
- I wrote the most of each kind I saw at one time.

FIELD NOTEBOOK

1. Make a page called “My Bird List.” Write every kind of bird you have seen on this trail, with the date and place.
2. Draw your favorite bird from your count.

Did you know? The northern cardinal is the state bird of seven states, more than any other bird. A male cardinal is bright red; the female is mostly tan and brown with touches of red. Many birds that visit feeders in winter also eat weed seeds and insects, which helps gardens.

Goes deeper in. Gardening & Animals, “A bird feeder and a bird list” and Life Science, Grade 4, “Citizen science” (coming soon).

For families. The Great Backyard Bird Count began in 1998 (Cornell Lab of Ornithology and National Audubon Society; Birds Canada is now a partner) and runs four days each February; participants count for at least 15 minutes. Submitting online needs a free

account, which a parent should set up. The first Christmas Bird Count was on December 25, 1900, with 27 counters (National Audubon Society). The cardinal is the state bird of seven states.

PRACTICE

1. **EASY** When is the Great Backyard Bird Count held?
2. **MEDIUM** Why do scientists want families to count birds?
3. **EASY** What are field marks?

Make it a game • Bird Bingo. Make a bingo card of nine common birds (robin, cardinal, crow, sparrow, blue jay, pigeon, goose, chickadee, duck). Take a walk and mark each one you see. Three in a row wins.

Scripture. “By them shall the fowls of the heaven have their habitation, which sing among the branches.” (Psalm 104:12, KJV)

God made places for the birds to live and gave them songs. When we count them, we notice His care.

Practice: answers

1. Every February.
2. They cannot be everywhere at once; many counts from many places show how many birds there are and where.
3. Colors and shapes that help you tell one bird from another.

TRACK I BADGE QUIZZES

The badge quizzes are optional. Read each question aloud; the child may answer by talking, pointing or drawing. Four right out of five earns the badge. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops B1–B5)

1. How does an eagle fly high without flapping?
2. Why can't a mouse hear an owl coming?
3. What can a hummingbird do that most birds cannot?
4. Who keeps the emperor penguin egg warm in winter?
5. What does the ostrich do to "the horse and his rider" (Job 39:18)?

Badge quiz 2 (Stops B6–B10)

6. How are a parrot's toes arranged?
7. Which bird makes the longest migration?
8. Name one bird and the kind of nest it builds.
9. Why did Audubon make his book so big?
10. What are field marks?

TRAIL CERTIFICATE: MY BIRD FIELD NOTEBOOK AND TRAIL B CERTIFICATE

Gather the Field Notebook pages from this trail into one booklet with a cover: "My Bird Field Notebook," your name and the dates you started and finished. Put your bird list from Stop B10 at the front.

When the booklet is done, a parent signs the Trail B certificate.

- **Ten stops:** At least one page for each stop, each with a title and a date.
- **Bird list:** A list of at least five birds the child has seen, with dates and places.
- **Observation:** At least one drawing made from a real bird or a careful look at a picture (Stop B9).
- **Care:** Drawings are labeled and done carefully.

Answer key

1. It rides rising warm air (thermals) with its wings spread wide.
2. The owl's soft, fringed feathers make its flight almost silent.
3. Hover in one place, or fly backward.
4. The father, on his feet.
5. It scorns them: it can outrun them.
6. Two forward and two back.
7. The Arctic tern.
8. Any one: robin, a cup of grass and mud; eagle, a big stick platform; weaver, a hanging woven ball; hummingbird, a tiny cup with spider silk; ovenbird, a mud oven.

9. To show the birds life-size.
10. Colors and shapes that help you tell birds apart.

DINOSAURS TRAIL B: DINOSAUR HUNTERS

The second trail of the Dinosaurs track meets the people who found the dinosaurs: Mary Anning on the beach at Lyme Regis, William Buckland and Megalosaurus, the Mantells and Iguanodon, Richard Owen who named the “Dinosauria,” the Crystal Palace sculptures, the Bone Wars of Cope and Marsh, Barnum Brown, Roy Chapman Andrews and the Gobi eggs, SUE the T. rex and Mary Schweitzer’s soft tissue. Each stop is a true story, a picture, something to make, quick questions, a game and Scripture.

This is the  **Scout** level, for ages 7 to 9. The track is creation-friendly: God made the land animals, dinosaurs among them, on the sixth day (Genesis 1:24–25). Period names such as **Jurassic** and **Cretaceous** are taught as “museum words,” and the dates on museum signs are called what they are: interpretations. Stop B10 has the  box: *What the sign says / What we observe / How Christians read it.*

The hunters on this trail made mistakes and fixed them, worked hard, and sometimes quarreled. Their stories show how knowledge grows: by careful looking, by honest correction and by patience. Five stops earn the **Dinosaur Hunter badge, part 1**; ten earn part 2 and the **Trail B certificate**.

BEFORE YOU BEGIN

- Listen to a short story and tell it back.
- Know what a fossil is (Trail A, Stop A1, or ask a grown-up).
- Know the six days of creation from Genesis 1, or read them together first.

MASTERY CHECKLIST

- ☐ I can name five dinosaur hunters and tell what each one found.
- ☐ I can tell the order of three “firsts”: Megalosaurus was named first (1824), Iguanodon second (1825), and the word “dinosaur” came in 1842.
- ☐ I can tell a story about a scientist who changed his mind when better evidence came.
- ☐ I can read the words Jurassic and Cretaceous on a museum sign and say what they name.
- ☐ I can tell the difference between what scientists observe and how they interpret it.

OPTIONAL BOOKS AND RESOURCES

- **Natural History Museum, London** (<https://www.nhm.ac.uk>): Pages on Mary Anning, Megalosaurus, Iguanodon and Richard Owen.
- **Friends of Crystal Palace Dinosaurs** (<https://www.cpdinosaurs.org>): Photos and history of the 1854 sculptures, which still stand in a London park.
- **Field Museum (Chicago): SUE the T. rex** (<https://www.fieldmuseum.org>): SUE’s story and photos for Stop B9.

2.1 MARY ANNING, THE GIRL WHO FOUND A SEA DRAGON

OBJECTIVES

- Tell the story of Mary Anning and the ichthyosaur she and her brother found.
- Explain what a fossil hunter does on a beach after a storm.
- Say why an ichthyosaur is not a dinosaur.

Warm-up. Fill a tray with sand and hide a few small shells or pasta shapes in it. Pour a cup of water gently over one end, like a wave. What comes out? Storms on the beach at Lyme Regis wash fossils out of the cliffs the same way.

Video slot. Video coming. Mary Anning of Lyme Regis and the Jurassic Coast. Search the Natural History Museum (London), Lyme Regis Museum, Simple History or Homeschool Pop (Alternate) once vetted.

KEY TERMS

fossil hunter

A person who searches for fossils and digs them out carefully.

ichthyosaur

A sea reptile shaped like a dolphin, with big eyes and flippers (say “IK-thee-oh-sore”). It means “fish lizard.”

cliff

A high, steep wall of rock.

Jurassic

The museum word for the rock layers at Lyme Regis where Mary Anning found her fossils (say “joo-RASS-ick”).

CORE IDEAS

The story. Long ago in the little town of Lyme Regis, on the south coast of England, lived a poor girl named Mary Anning. Her father made furniture, and on his days off he took Mary and her brother Joseph to the beach below the crumbling gray cliffs. There they hunted for “curiosities,” stone shells and snakes that we now call fossils, and sold them to visitors to help feed the family.

The sea dragon. In 1811, when Mary was about twelve, Joseph found a strange skull sticking out of the cliff. It had a long snout full of teeth and a huge eye. Over the next months, Mary searched the rocks again and again and dug out much of the rest of the skeleton. It was not a crocodile. It was a sea reptile shaped something like a dolphin. Scientists later named it **ichthyosaur**, “fish lizard.”

Hard, careful work. Fossil hunting at Lyme was dangerous. The best time to look was after a storm, when the waves had torn new rock from the cliffs. But storms also caused landslides. Mary learned to watch the tides, to work quickly and to split the stone so carefully that the bones were not broken.

More discoveries. Mary kept hunting all her life. In 1823 she found the first nearly complete **plesiosaur**, a sea reptile with a long neck and four flippers. She also found a flying reptile and many smaller fossils. Famous scientists came to her shop to buy fossils and to learn from her, because she knew more about the bones than many of them did.

Not a dinosaur, but a start. Mary's sea reptiles were not dinosaurs. Dinosaurs lived on land. But her finds helped people see that God had made many great creatures that no one alive had ever seen. They made people want to look for more, and the age of the dinosaur hunters began.

PICTURE STUDY



Mary Anning with her dog Tray, Unknown artist, before 1842 · Oil on canvas · Natural History Museum, London
Wikimedia Commons · Public domain

This painting shows Mary Anning as a grown woman with her fossil hammer and her dog, Tray. Behind her are the cliffs of Lyme Regis where she found her fossils. The painting now belongs to the Natural History Museum in London.

Look closely

- Find Mary's hammer. What did she use it for?
- Find her dog, Tray.
- Look at the cliffs. What do you think is hidden inside them?

Talk about it

1. Why do you think someone painted a portrait of a poor fossil hunter?
2. What tools would you take to hunt fossils on a beach?

Safety first. On a real beach, stay away from the bottom of cliffs, watch the tide with a grown-up, and never climb on crumbling rock.

HANDS-ON: BEACH FOSSIL DIG

Make a “cliff” with hidden fossils and dig them out carefully, like Mary Anning.

You will need

- Plaster of Paris or a thick salt dough
- A plastic tub or a shoebox lined with plastic
- Small shells, plastic dinosaur bones or chicken bones (boiled clean by a grown-up)
- A spoon, an old toothbrush and a craft stick

Steps

1. A grown-up mixes the plaster or dough. Pour a layer into the tub, press in a few “fossils,” and pour another layer on top. Let it harden overnight.
2. Lift out the block. This is your cliff.
3. Use the craft stick and spoon to chip away gently. Brush away the dust with the toothbrush.
4. When a fossil appears, slow down! Dig around it, not on it.
5. Lay your fossils out and draw them in your Field Notebook.

Check your work

- I dug out my fossils without breaking them.
- I drew each fossil I found.

FIELD NOTEBOOK

1. Draw an ichthyosaur. Label the long snout, big eye, flippers and tail.
2. Write: “Mary Anning of Lyme Regis found an ichthyosaur with her brother Joseph.”

Did you know? People often say the tongue twister “She sells seashells by the seashore” was about Mary Anning, but no one has proved it. Mary’s dog, Tray, went with her on her fossil hunts and is in her portrait. The coast at Lyme Regis is still a great place to find fossils, and families hunt there today.

Museum word. Museum signs put these fossils in the **Jurassic**. That is a name scientists use for a group of rock layers and the fossils found in them. The signs at Lyme Regis give a date such as “about 200 to 195 million years ago.” That number is an interpretation, not

something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. At Lyme the sea creatures lie in thick layers of mud turned to stone. Many Christians read layers like these as laid down in Noah's Flood.

Goes deeper in. Earth Science, Grade 3, "Fossils" and Life Science, Grade 6, "Sea reptiles" (coming soon).

For families. Joseph Anning found the skull in 1811; Mary found most of the skeleton in 1812 (Natural History Museum, London). The first nearly complete plesiosaur was 1823. The "she sells seashells" connection is a popular tradition, not proven. Mary Anning died in 1847; the portrait is dated before 1842. Ichthyosaurs return in Trail E.

PRACTICE

1. **EASY** What did Mary Anning and her brother find in the cliffs in 1811-1812?
2. **MEDIUM** Why was the best time to look for fossils just after a storm?
3. **EASY** Was an ichthyosaur a dinosaur?

Make it a game · Tide's Coming!. Spread paper "fossils" on the floor (the beach). Players hunt and collect them, but when the leader calls "Tide's coming!", everyone must run to the "high ground" (the couch or a rug) before the count of five.

Scripture. "It is the glory of God to conceal a thing: but the honour of kings is to search out a matter." (Proverbs 25:2, KJV)

God hid wonders in the rocks. Searching them out with patience, as Mary Anning did, is an honor.

Practice: answers

1. An ichthyosaur, a "fish lizard" sea reptile.
2. The waves had washed new rock and fossils out of the cliffs.
3. No. It was a sea reptile. Dinosaurs lived on land.

2.2 WILLIAM BUCKLAND NAMES MEGALOSAURUS (1824)

OBJECTIVES

- Tell how Megalosaurus became the first dinosaur to be given a scientific name.
- Explain how a scientist can learn about an animal from only a jawbone.
- Say what Megalosaurus means.

Warm-up. Look at your own teeth in a mirror. Are they all the same shape? From teeth alone, can you guess what you eat? William Buckland did that with the teeth of a giant.

Video slot. Video coming. Megalosaurus and William Buckland at the Oxford University Museum of Natural History. Search the Oxford University Museum of Natural History, the Natural History Museum (London).

KEY TERMS

Megalosaurus

The first dinosaur given a scientific name, in 1824 (say “MEG-a-low-SORE-us”). It means “great lizard.”

jawbone

The bone that holds the teeth.

geologist

A scientist who studies rocks and the earth.

quarry

A place where stone is dug out of the ground.

CORE IDEAS

The story. Near the village of Stonesfield, not far from Oxford in England, workmen dug flat stone out of the ground to make roof tiles. Sometimes they found strange bones in the stone and sold them to collectors. One of those finds was part of a huge lower jaw, with sharp, curved teeth still in it. It came to William Buckland, a teacher at Oxford University.

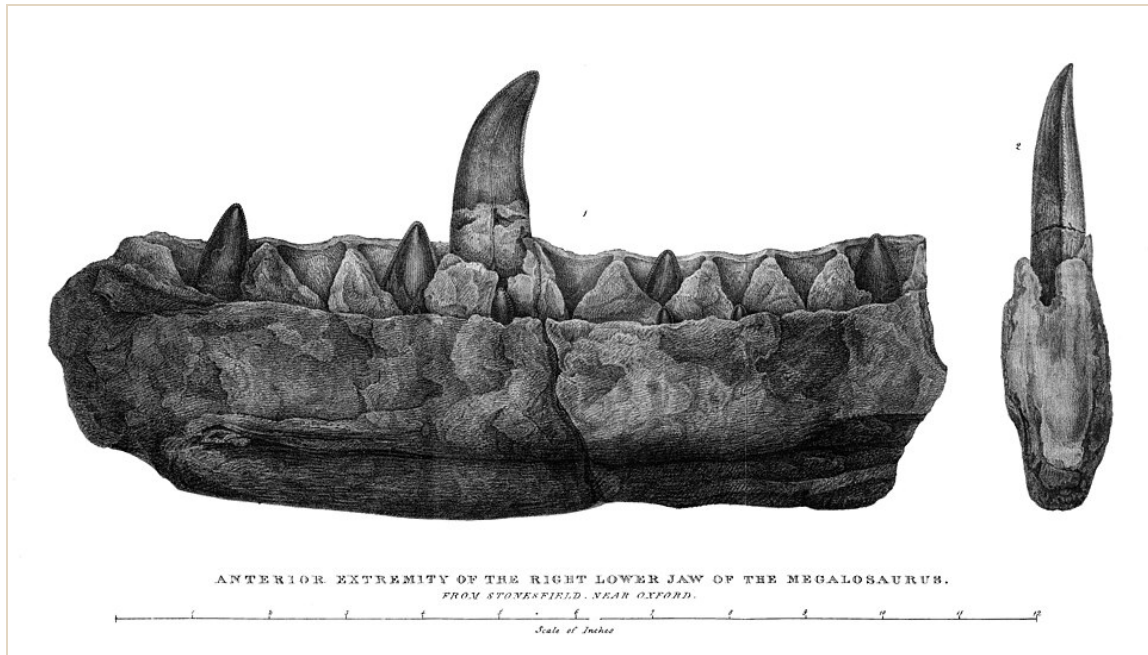
A minister who studied rocks. William Buckland was a minister of the Church of England and a **geologist**. He loved the Bible and he loved rocks, and he taught his students at Oxford about both. He was also a funny, lively man. He gave lectures on horseback, kept a pet bear for a time and filled his house with fossils.

Reading the jaw. Buckland studied the jaw carefully. The teeth were long, flat and curved backward, with tiny saw-like edges, like a steak knife. They grew new teeth as old ones fell out. Buckland could tell it was a giant meat-eating reptile, much bigger than any lizard alive. Some bones of the hip and leg were found too.

The first name. In 1824, Buckland gave a talk in London about the animal. He named it *Megalosaurus*, which means “great lizard.” It was the first dinosaur ever to be given a scientific name, years before anyone used the word “dinosaur” at all.

What we know now. Buckland thought *Megalosaurus* walked on four legs like a giant lizard. Later, when more bones were found, scientists saw that it walked on two strong back legs, more like *T. rex*. This is how science works: people make their best guess from what they have, and when better evidence comes, they change their minds.

PICTURE STUDY



The Megalosaurus jaw, from Buckland's 1824 paper, Engraved plate from William Buckland's paper, 1824 · Engraving · Transactions of the Geological Society of London · Wikimedia Commons · Public domain

This engraving was printed with Buckland's paper on *Megalosaurus*, so that scientists who could not travel to Oxford could see the jaw. Engravers cut the picture into a metal plate line by line.

Look closely

- Count the teeth you can see.
- Look at the tip of one tooth. Is it straight or curved?
- Find a tooth that looks shorter or newer than the others.

Talk about it

1. What do these teeth tell you about what *Megalosaurus* ate?
2. Why was a careful drawing so important in 1824?

HANDS-ON: TOOTH DETECTIVE

Learn to tell meat-eaters from plant-eaters by their teeth, as Buckland did.

You will need

- Clay or play dough
- A plastic knife
- Pictures of a dog's teeth and a horse's or cow's teeth (a book or a grown-up's phone)
- A paper plate

Steps

1. Look at the dog's teeth: pointed and sharp, for meat. Look at the horse's teeth: flat and wide, for grinding plants.
2. Make two clay teeth: one long, curved and pointed, like Megalosaurus; one flat, like a plant-eater's.
3. Use the plastic knife to press tiny notches along the edge of the pointed tooth, like a saw.
4. Label them on the plate: "Meat-eater" and "Plant-eater."

Check your work

- I made a meat-eater tooth with saw edges.
- I made a flat plant-eater tooth.
- I can say which kind of tooth Megalosaurus had.

FIELD NOTEBOOK

1. Draw the Megalosaurus jaw with its curved teeth. Write "Megalosaurus = great lizard, named 1824."
2. Draw Megalosaurus two ways: on four legs, as Buckland first thought, and on two legs, as we know now.

Did you know? Buckland's Megalosaurus jaw is still kept at the Oxford University Museum of Natural History. Charles Dickens put a Megalosaurus in the first lines of his novel Bleak House, "waddling like an elephantine lizard up Holborn Hill." Gideon Mantell gave Megalosaurus its full two-part name, Megalosaurus bucklandii, in Buckland's honor.

Museum word. Museum signs put these fossils in the **Jurassic**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs for Megalosaurus often give a date such as "about 166 million years ago." That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Earth Science, Grade 3, "Fossils" (coming soon).

For families. Buckland described *Megalosaurus* to the Geological Society of London in February 1824; the species name *bucklandii* was added by Mantell in 1827 (Natural History Museum; Oxford University Museum of Natural History). Buckland was an Anglican clergyman (later Dean of Westminster). He first argued for the Flood as the cause of certain deposits (*Reliquiae Diluvianae*, 1823) and later moved to an old-earth view; the Ranger level says so. His pet bear is a well-known Oxford story.

PRACTICE

1. **EASY** What does Megalosaurus mean?
2. **MEDIUM** What could Buckland tell from the teeth?
3. **MEDIUM** What did scientists later change their minds about?

Make it a game · First! Second! Third!. Make three cards: “Megalosaurus named, 1824,” “Iguanodon named, 1825” and “The word dinosaur, 1842.” Shuffle them and race to put them in order. Add more cards as you go along the trail.

Scripture. “The works of the LORD are great, sought out of all them that have pleasure therein.” (Psalm 111:2, KJV)

This is our tracks verse. Buckland took pleasure in seeking out God’s works in the rocks.

Practice: answers

1. “Great lizard.”
2. That it was a giant meat-eater: the teeth were sharp, curved and saw-edged.
3. Megalosaurus walked on two legs, not four.

2.3 GIDEON AND MARY ANN MANTELL'S IGUANODON

OBJECTIVES

- Tell how the Mantells found the teeth of Iguanodon.
- Explain why the name Iguanodon means “iguana tooth.”
- Tell the story of the “horn” that turned out to be a thumb.

Warm-up. Put your thumb up, like “thumbs up.” Now put it on your nose. Silly! But that is just where scientists first put the thumb spike of Iguanodon.

Video slot. Video coming. Iguanodon and Gideon Mantell: the teeth, the thumb spike and the changing pictures. Search the Natural History Museum (London), the Royal Belgian Institute of Natural Sciences (the Bernissart Iguanodons).

KEY TERMS

Iguanodon

A big plant-eating dinosaur, the second dinosaur ever named (say “ig-WAN-oh-don”). It means “iguana tooth.”

iguana

A large plant-eating lizard that lives in warm places today.

thumb spike

A big, cone-shaped bone on Iguanodon’s hand.

reconstruction

A drawing or model of what an animal looked like, made from its bones.

CORE IDEAS

The story. Gideon Mantell was a busy country doctor in the town of Lewes, in the south of England. When he was not caring for sick people, he hunted fossils in the rocks of the Sussex countryside. His wife, Mary Ann, helped him. She was a skilled artist and drew many of his fossils for his books.

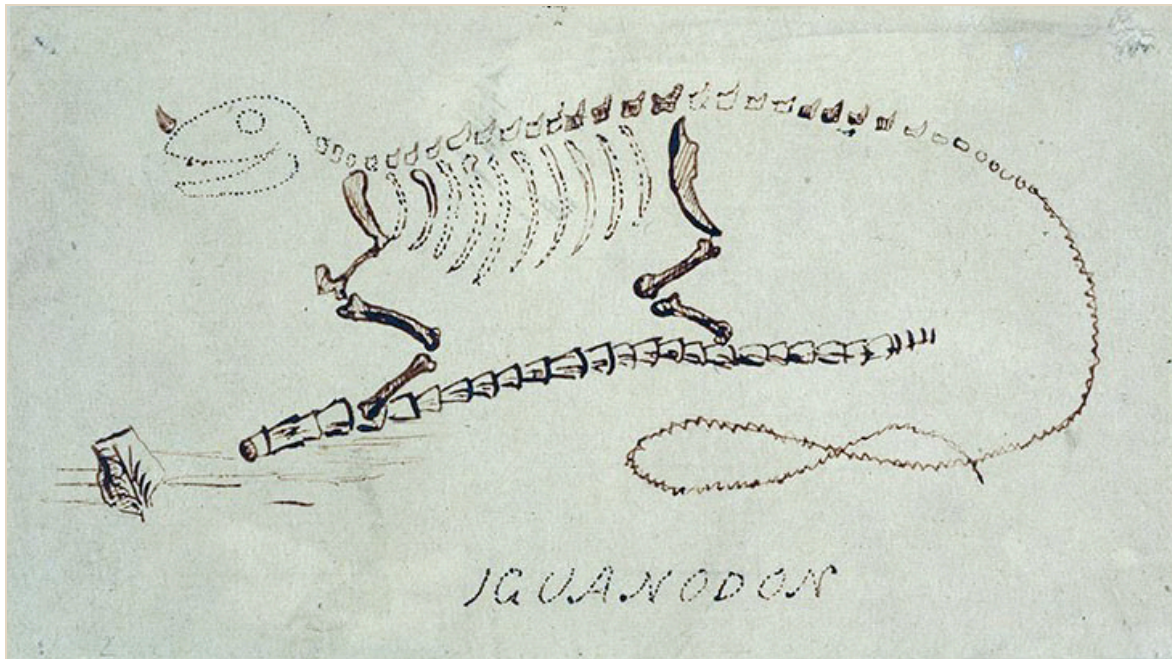
The strange teeth. Around 1822, the Mantells found some large, worn teeth in a pile of road-building stone. They looked like the teeth of a plant-eater, but they were much too big for any animal Gideon knew. A family story says that Mary Ann found the first ones while Gideon was visiting a patient. Whoever saw them first, Gideon set out to learn what they were.

The iguana clue. Gideon showed the teeth to experts. Some said they were from a fish or a mammal. Then, at a museum in London, a young scientist showed him the skeleton of an iguana, a plant-eating lizard. Its teeth had the same shape, only tiny! In 1825, Gideon named the animal *Iguanodon*, “iguana tooth.” It was the second dinosaur to be named.

The horn that was a thumb. Later, more bones were found, including a cone-shaped spike. Gideon guessed it was a horn and drew it on Iguanodon's nose, like a rhinoceros. Many years afterward, in 1878, miners in Belgium found more than thirty Iguanodon skeletons together in a coal mine. Now scientists could see the whole animal. The "horn" was really a big spike on its **thumb**!

Patient and humble. Gideon Mantell worked hard all his life and was often tired and poor. Still, he kept studying. His story shows that the first guess is not always right, and that is all right. A good scientist keeps looking and is willing to say, "I was wrong."

PICTURE STUDY



Mantell's sketch of Iguanodon, Gideon Mantell, about 1834 · Pen and pencil sketch · Natural History Museum, London
Wikimedia Commons · Public domain

Gideon Mantell made this sketch of what he thought Iguanodon looked like, using the bones he had. He put the spike on its nose. We know now that the spike was on its thumb.

Look closely

- Find the spike. Where did Mantell put it?
- How many legs is the animal standing on?
- Does it look more like a lizard or a dinosaur you know?

Talk about it

1. Why did Mantell make a mistake about the spike?
2. What would you change in this drawing now that you know more?

HANDS-ON: FIX THE IGUANODON

Draw Iguanodon twice: the way Mantell first thought it looked, and the way scientists picture it now.

You will need

- Paper folded in half
- Pencil and crayons
- A ruler

Steps

1. On the left half, draw a long, low lizard on four sprawling legs with a horn on its nose. Write “1834.”
2. On the right half, draw a big dinosaur standing on strong back legs with its front hands touching the ground, a stiff tail held out, and a spike on each thumb. Write “Today.”
3. Circle the thumb spike in red on both drawings.
4. Tell a grown-up what changed and why.

Check your work

- I drew both Iguanodons.
- I circled the thumb spike.
- I can tell why the picture changed: more bones were found.

FIELD NOTEBOOK

1. Draw an Iguanodon hand with its thumb spike.
2. Write: “Iguanodon means iguana tooth. Named 1825.”

Did you know? Iguanodon may have been about 30 feet long. The Belgian Iguanodons from the coal mine at Bernissart still stand in a museum in Brussels. One of Mantell’s Iguanodon bones was found in a quarry in Maidstone, and the town now has an Iguanodon on its coat of arms.

Museum word. Museum signs put these fossils in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs for Iguanodon often give a date such as “about 125 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. Notice that the Belgian Iguanodons were found together, many at once. Many Christians see mass burials like this as a sign of sudden flooding.

Goes deeper in. Earth Science, Grade 3, “Fossils” and Life Science, Grade 2, Lesson 7.2 “Plant-eating dinosaurs” (coming soon).

For families. The teeth were found around 1822; the story that Mary Ann found them first comes from Gideon's later accounts and is doubted by some historians, so the stop presents it as a family story (Natural History Museum, London). The name *Iguanodon* was published in 1825. The Bernissart Iguanodons were found in 1878 (Royal Belgian Institute of Natural Sciences). The iguana comparison was made with help from Samuel Stutchbury at the Hunterian Museum.

PRACTICE

1. **EASY** What does Iguanodon mean?
2. **MEDIUM** Where did Mantell first put the spike, and where was it really?
3. **EASY** How did Mary Ann Mantell help her husband?

Make it a game · Pin the Spike on the Iguanodon. Draw a big Iguanodon on paper and tape it to the wall. Players are blindfolded and try to stick a paper thumb spike in the right place: on the thumb, not the nose!

Scripture. "The heart of the prudent getteth knowledge; and the ear of the wise seeketh knowledge." (Proverbs 18:15, KJV)

Gideon Mantell kept seeking knowledge all his life. A wise person keeps learning and listening.

Practice: answers

1. "Iguana tooth."
2. He put it on the nose like a horn; it was really on the thumb.
3. She hunted fossils with him and drew them for his books.

2.4 RICHARD OWEN COINS “DINOSAURIA” (1842)

OBJECTIVES

- Tell who made up the word “dinosaur” and when.
- Say what “dinosaur” means.
- Name the three animals Owen used to make the new group.

Warm-up. Make up a new word for a group of things, like “fluffacorns” for fluffy animals with horns. Richard Owen made up a new word for a group of giant reptiles, and now the whole world uses it.

Video slot. Video coming. Richard Owen and the Natural History Museum in London; the word “dinosaur.” Search the Natural History Museum (London), Simple History, Homeschool Pop (Alternate) once vetted.

KEY TERMS

Dinosauria

The name Richard Owen gave in 1842 to a new group of reptiles. It means “terrible lizards” or “fearfully great lizards.”

anatomist

A scientist who studies how bodies are built.

group

A set of animals that are alike in important ways.

museum

A building where important things are kept and shown so people can learn.

CORE IDEAS

The story. By 1841, scientists in England knew of three giant reptiles from the bones in the rocks: Megalosaurus, Iguanodon and an armored animal called Hylaeosaurus. Were they just huge lizards? Richard Owen, a brilliant **anatomist** in London, did not think so.

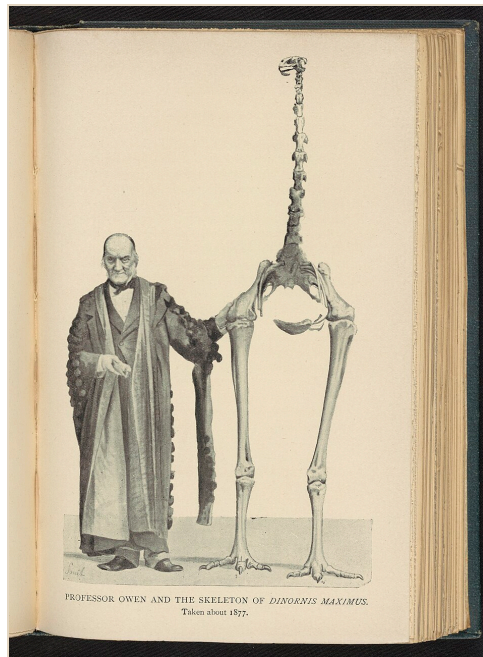
A new kind of reptile. Owen looked closely at the bones. He saw that these animals had legs that stood straight under the body, like an elephant’s, not sprawled out to the side like a lizard’s. Their hip bones were joined together strongly to carry great weight. He decided they were a new **group**, different from any reptile alive today.

A name for the group. Owen made up a name from two Greek words: *deinos*, meaning “terrible” or “fearfully great,” and *sauros*, meaning “lizard.” In his report, printed in 1842, he called the group **Dinosauria**. That is where our word “dinosaur” comes from.

A home for the bones. Owen wanted everyone, rich and poor, to be able to see God's works in nature. He worked for many years to build a great museum in London for fossils, animals, plants and rocks. The Natural History Museum opened in 1881. It is so grand that people call it a "cathedral of nature," and carvings of animals cover its walls.

A man with faults too. Owen was very clever, but he could also be proud and unkind. He sometimes took credit for other people's work, including some of Gideon Mantell's. The Bible teaches that pride goes before a fall, and many people in Owen's day came to dislike him for it. We can honor his good work and learn from his mistakes.

PICTURE STUDY



*Richard Owen with a moa skeleton, Photograph, about 1877 · Photograph · From Owen's Memoirs on the Extinct Wingless Birds of New Zealand
Wikimedia Commons · Public domain*

Richard Owen studied the giant moa, a huge bird of New Zealand that is gone now. Here he stands beside a moa skeleton, holding a bone like the one he first studied. Owen was an anatomist, so bones were his books.

Look closely

- Compare the man and the bird skeleton. Which is taller?
- Find the bone Owen is holding.
- Look at the legs of the moa. Are they thick or thin?

Talk about it

1. What could Owen learn from a single bone?
2. Why do you think he wanted his photograph taken with the skeleton?

HANDS-ON: LIZARD LEGS OR DINOSAUR LEGS?

See why Owen thought dinosaurs were different from lizards.

You will need

- Your own body
- A toy lizard and a toy dinosaur, or pictures
- A piece of paper and pencil

Steps

1. Do a push-up position with your elbows bent out to the sides. Walk on hands and feet like this. That is how a lizard's legs sprawl.
2. Now stand up straight, with your legs right under your body. That is how a dinosaur's legs stood.
3. Which way could hold up more weight? Which way could you walk farther?
4. Draw a lizard from the front with sprawling legs, and a dinosaur from the front with straight legs.

Check your work

- I tried both ways of walking.
- I drew sprawling legs and straight legs.
- I can say why straight legs help a heavy animal.

FIELD NOTEBOOK

1. Write the word DINOSAUR in big letters. Under "DINO" write "terrible / fearfully great." Under "SAUR" write "lizard."
2. Draw Megalosaurus, Iguanodon and Hylaeosaurus, the first three dinosaurs.

Did you know? Hylaeosaurus, the third dinosaur in Owen's group, means "woodland lizard." It had spikes and armor on its back. Owen also studied the giant moa birds of New Zealand, and there is a famous photograph of him with a moa skeleton. Some people prefer to translate "dinosaur" as "fearfully great lizard," because Owen wanted to show how wonderful they were, not only how scary.

Museum word. Dinosaurs are sorted into a group by their bones, especially the hips and legs. That part is observation. Signs that say dinosaurs "ruled the earth for 165 million years" add an interpretation of time. Read the bones; question the dates.

Goes deeper in. Earth Science, Grade 3, "Fossils" and Composition, "Word roots" (coming soon).

For families. Owen presented the idea in his 1841 report to the British Association, published in 1842 (Natural History Museum, London). The three founding genera were

Megalosaurus, *Iguanodon* and *Hylaeosaurus*. The museum opened at South Kensington in 1881. Owen opposed Darwin's theory of natural selection; at the Scout level the stop does not go into that debate. His treatment of Mantell is well documented.

PRACTICE

1. **EASY** Who made up the word "dinosaur"?
2. **MEDIUM** What does "dinosaur" mean?
3. **MEDIUM** How were dinosaur legs different from lizard legs?

Make it a game • Dino or Not?. The leader names an animal: Triceratops, ichthyosaur, crocodile, Stegosaurus, plesiosaur, T. rex, iguana. Players stand straight like a dinosaur if it is a dinosaur, and sprawl on the floor if it is not.

Scripture. "I will praise thee; for I am fearfully and wonderfully made: marvellous are thy works; and that my soul knoweth right well." (Psalm 139:14, KJV)

Owen's word means "fearfully great." The Bible says we too are "fearfully and wonderfully made." All God's works are marvelous.

Practice: answers

1. Richard Owen, in 1842.
2. "Terrible lizard" or "fearfully great lizard."
3. They stood straight under the body instead of sprawling out to the sides.

2.5 HAWKINS' CRYSTAL PALACE DINOSAURS (1854)

OBJECTIVES

- Tell the story of the first life-size dinosaur sculptures.
- Explain what the sculptures got right and what they got wrong.
- Make a model dinosaur from a skeleton drawing.

Warm-up. Look at a bone from a chicken dinner (washed clean). Can you imagine what the whole chicken looked like from just that bone? Benjamin Waterhouse Hawkins had to do that for whole dinosaurs.

Video slot. Video coming. The Crystal Palace dinosaurs today, in Crystal Palace Park, London. Search the Friends of Crystal Palace Dinosaurs, Historic England, the Natural History Museum (London).

KEY TERMS

sculptor

An artist who makes statues and models.

life-size

The same size as the real thing.

model

A copy of something, often to show how it looks.

restoration

A picture or model showing how a living thing may have looked.

CORE IDEAS

The story. In 1852, a great glass building called the Crystal Palace was moved to a new park in south London. The owners wanted something amazing for the park. They asked an artist named Benjamin Waterhouse Hawkins to make life-size models of the great animals known only from their bones. No one had ever tried such a thing.

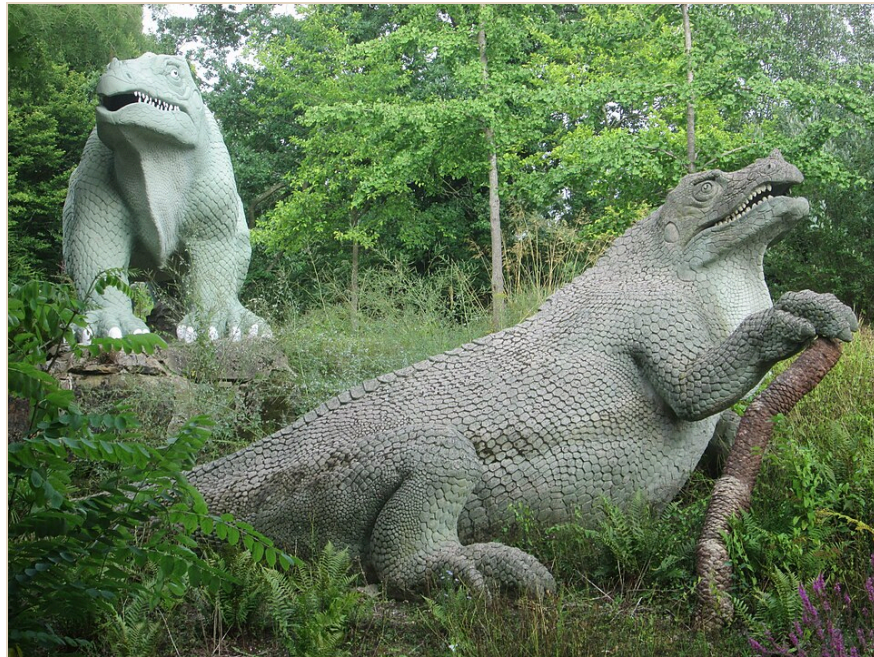
Building giants. Hawkins worked with Richard Owen, who told him what the bones showed. Then he built the models with iron frames, bricks and tiles covered with cement, like small buildings. Some were as long as a bus. He made Megalosaurus and Iguanodon, the sea reptiles of Mary Anning, flying reptiles and great mammals.

Dinner in a dinosaur. On New Year's Eve, 1853, Hawkins held a party. He invited twenty-one scientists and guests to dinner, and eleven of them sat at a table inside the mold of the Iguanodon! Richard Owen sat in the head. They ate a fine meal, made speeches and sang songs into the night.

Opening day. In June 1854, Queen Victoria opened the new Crystal Palace. Thousands of people walked through the park and saw the dinosaurs standing by the lake. For the first time, ordinary people could look a dinosaur in the eye.

Right and wrong. Hawkins and Owen did their best with the few bones they had. They made the dinosaurs big, heavy and standing on straight legs, and that was right. But they put the Iguanodon on four legs with a horn on its nose, like a giant rhinoceros, and that was wrong. The models still stand in the park today, and they are a reminder that our pictures of the past can change.

PICTURE STUDY



*The Crystal Palace Iguanodons today, Benjamin Waterhouse Hawkins (sculptor); photograph by Peter S (geograph.org.uk), sculptures 1852-1854; photograph 2017 · Brick, iron and cement sculptures; color photograph · Crystal Palace Park, London
Wikimedia Commons · CC BY-SA 2.0*

This photograph shows Hawkins' Iguanodons as they stand today in Crystal Palace Park. They have been repaired and repainted over the years, but they are the same models people saw in 1854.

Look closely

- Find the horn on the nose. Where should it really be?
- Count the legs touching the ground.
- Look at the plants and water around them. Why do you think Hawkins put them by a lake?

Talk about it

1. How would you feel seeing these as a child in 1854?

2. Should the park fix the mistakes, or keep them as they are? Why?

HANDS-ON: BONES TO BODY

Make a model dinosaur the way Hawkins did: from the skeleton out.

You will need

- Pipe cleaners or aluminum foil (the frame)
- Clay or salt dough (the body)
- A picture of a dinosaur skeleton (from Trail A or a library book)
- Paint (optional)

Steps

1. Look at the skeleton picture. Bend pipe cleaners into a backbone, four legs and a tail. This is your iron frame.
2. Cover the frame with clay, a little at a time, following the shape of the bones.
3. Add the head, eyes and claws.
4. When it is dry, paint it any color you like. (Remember, we do not know dinosaur colors!)

Check your work

- My model has a frame inside.
- I followed the skeleton picture.
- I can tell what Hawkins got right and wrong.

FIELD NOTEBOOK

1. Draw Hawkins' Iguanodon (four legs, nose horn) and the Iguanodon of today (thumb spikes). Label the differences.
2. Write: "On New Year's Eve, 1853, eleven men ate dinner inside an Iguanodon."

Did you know? The Crystal Palace building burned down in 1936, but the dinosaurs survived. The Crystal Palace dinosaurs are protected by law as Grade I listed monuments, the same as famous castles. Later, in 1868, Hawkins helped put together a Hadrosaurus skeleton in Philadelphia, one of the first dinosaur skeletons ever mounted in a museum.

Museum word. The sculptures were made by men who believed God created all things. Owen's signs did not need big numbers to amaze people; the bones themselves were enough. On a museum sign today, look for two parts: what the bones show (size, teeth, legs) and the dates added to them.

Goes deeper in. Art, "Sculpture" and Earth Science, Grade 3, "Fossils" (coming soon).

For families. Dinner facts (21 guests, 11 inside the mold, Owen at the head, December 31, 1853) follow the Friends of Crystal Palace Dinosaurs and the *Illustrated London News*

report of January 1854. The Crystal Palace at Sydenham opened on June 10, 1854. The sculptures were upgraded to Grade I listed in 2007 (Historic England). The Hadrosaurus mount (Academy of Natural Sciences, Philadelphia) was 1868. Trail A's Stop A10 mentioned the dinner briefly.

PRACTICE

1. **EASY** Who made the Crystal Palace dinosaurs?
2. **EASY** Where did the famous New Year's Eve dinner take place?
3. **MEDIUM** Name one thing the models got right and one they got wrong.

Make it a game • Statue Park. Players are Crystal Palace dinosaurs. When the music plays, they move like dinosaurs; when it stops, they freeze as statues. The leader walks through the "park" and tries to make a statue laugh.

Scripture. "O LORD, how manifold are thy works! in wisdom hast thou made them all: the earth is full of thy riches." (Psalm 104:24, KJV)

The crowds in 1854 marveled at the dinosaurs. The Psalm reminds us whose works they really are.

Practice: answers

1. Benjamin Waterhouse Hawkins, with advice from Richard Owen.
2. Inside the mold of the Iguanodon model.
3. Right: big, heavy, straight legs. Wrong: Iguanodon on four legs with a horn on its nose.

2.6 THE BONE WARS: COPE AND MARSH

OBJECTIVES

- Tell the story of Edward Drinker Cope and Othniel Charles Marsh.
- Name three dinosaurs they found.
- Explain how envy hurt the two men, even while their work helped science.

Warm-up. Think of a time you wanted to win so badly that you were not kind. How did it end? Two great dinosaur hunters let that feeling run their whole lives.

Video slot. Video coming. The Bone Wars of Cope and Marsh and the dinosaurs of the American West. Search the Yale Peabody Museum, the Academy of Natural Sciences (Philadelphia), Simple History or Extra History once vetted.

KEY TERMS

rival

Someone you are trying to beat.

envy

Being unhappy that someone else has something you want.

expedition

A long trip to explore or to collect things.

badlands

Dry, rocky land with steep hills and gullies, where fossils are easy to see.

CORE IDEAS

The story. In the 1860s, two young American scientists became friends. Edward Drinker Cope lived in Philadelphia. Othniel Charles Marsh taught at Yale College. They had both studied fossils in Europe, and they even named fossil animals after each other. But soon their friendship turned into a bitter rivalry, and it lasted the rest of their lives. People call it the **Bone Wars**.

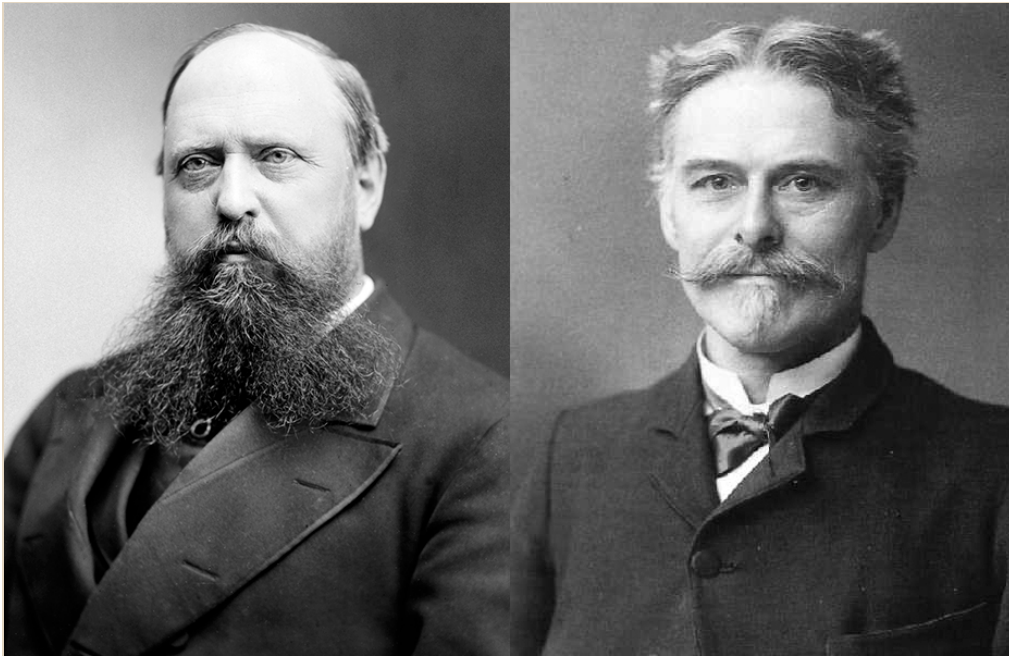
The head on the wrong end. Cope put together the bones of a long-necked sea reptile called *Elasmosaurus*. But he put its head on the end of its tail! When other scientists pointed it out, Marsh made sure everyone heard about it. Cope was embarrassed and angry. Marsh also paid Cope's fossil diggers to send bones to him instead. The two men became **rivals**.

A race across the West. In the 1870s, railroads were reaching the American West, and huge bones were being found in the **badlands** of Colorado, Wyoming and Montana. Cope and Marsh sent out teams to dig as fast as they could. Their teams spied on each other, and some even smashed bones they could not take so the other side could not have them.

So many dinosaurs. In their race, the two men named many new dinosaurs. Marsh named Stegosaurus, Triceratops, Allosaurus and Diplodocus. Cope named Camarasaurus and Coelophysis. Marsh named about 80 new kinds of dinosaurs, and Cope about 56. Before them, only a handful of dinosaurs were known in North America.

What envy costs. But the Bone Wars cost the two men dearly. They spent their money, lost friends and attacked each other in the newspapers. Both died poorer and less honored than they could have been. Their bones fill museums today, but their story is a warning. The Bible says, “Envy the rottenness of the bones” (Proverbs 14:30). Envy eats a person up from the inside.

PICTURE STUDY



Othniel Charles Marsh (left) and Edward Drinker Cope (right), Photographs (Marsh by the Brady-Handy studio; Cope by Frederick Gutekunst), before 1897 · Two photographs side by side · Library of Congress and other collections (via Wikimedia Commons)
Wikimedia Commons · Public domain

These are photographs of the two rivals. On the left is Othniel Charles Marsh of Yale. On the right is Edward Drinker Cope of Philadelphia. Both were brilliant and hardworking, and both were proud.

Look closely

- Which man has the bigger beard?
- Look at their faces. How do they look to you: friendly, serious, proud?
- Look at their clothes. Are they dressed for a dig or for the city?

Talk about it

1. If these two men had been friends, what might they have found together?

2. Is it ever right to be glad when someone else makes a mistake?

HANDS-ON: DIG AND SHARE

Play a fossil dig two ways, first as rivals and then as partners, and see which works better.

You will need

- Two trays of sand or dirt
- Small toy bones, pasta or shells buried in each
- Two spoons and two brushes
- A timer

Steps

1. Round 1 (rivals): two players each dig in their own tray for two minutes. No sharing tools, no helping. Count the fossils each found.
2. Round 2 (partners): bury the fossils again. This time the two players work together on one tray at a time, one digging and one brushing.
3. Count again. Which round found more fossils? Which was more fun?
4. Talk about it: what might Cope and Marsh have found if they had worked together?

Check your work

- I played both rounds.
- I can tell which way worked better.
- I can name one dinosaur Marsh named and one Cope named.

FIELD NOTEBOOK

1. Draw two men pulling a big bone in a tug-of-war. Write: “The Bone Wars, Cope and Marsh.”
2. List three dinosaurs Marsh named and two Cope named.

Did you know? Some of Marsh’s and Cope’s boxes of bones were still unopened many years after they died. Marsh’s fossils are in the Yale Peabody Museum and the Smithsonian; many of Cope’s are in New York and Philadelphia. Marsh named a sauropod *Brontosaurus*, “thunder lizard,” in 1879. Scientists argued for years about whether it was really *Apatosaurus*.

Museum word. Museum signs put these fossils in the **Jurassic**. That is a name scientists use for a group of rock layers and the fossils found in them. Many of the Bone Wars dinosaurs come from a rock layer in the West called the Morrison Formation. Signs often give it a date such as “about 150 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land

animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. At places like Como Bluff, Wyoming, bones of many dinosaurs lie jumbled together.

Goes deeper in. Earth Science, Grade 5, “The American West” and History, “The railroads” (coming soon).

For families. Species counts (Marsh about 80 new dinosaur species, Cope about 56) follow the UC Museum of Paleontology and standard histories; totals vary by how species are counted. Joseph Leidy first pointed out the Elasmosaurus error (1868–1870); Marsh publicized it. The newspaper attacks peaked in the *New York Herald* in 1890. The Brontosaurus/Apatosaurus question was reopened in 2015.

PRACTICE

1. **EASY** Who were the two rivals in the Bone Wars?
2. **MEDIUM** Name three dinosaurs Marsh named.
3. **MEDIUM** What did envy do to Cope and Marsh?

Make it a game · Bone Wars Tag (Friendly Version). Hide paper bones around the yard. Two teams race to find them, but every bone must be shared at the end to build one big skeleton on the ground together. The team that adds the head gets to name the dinosaur.

Scripture. “A sound heart is the life of the flesh: but envy the rottenness of the bones.” (Proverbs 14:30, KJV)

A dinosaur hunter’s verse! Envy rotted the friendship of Cope and Marsh. A heart at peace is healthy.

Practice: answers

1. Edward Drinker Cope and Othniel Charles Marsh.
2. Any three: Stegosaurus, Triceratops, Allosaurus, Diplodocus, Brontosaurus.
3. It made them waste money, lose friends and attack each other; both ended their lives poorer and less honored.

2.7 BARNUM BROWN FINDS T. REX (1902)

OBJECTIVES

- Tell the story of Barnum Brown and his discovery in Montana.
- Explain how a dinosaur skeleton is dug up and carried to a museum.
- Say why the first T. rex skeleton is now in Pittsburgh.

Warm-up. Wrap a toy or a cookie in wet paper towel, then cover it with strips of paper and glue or tape. Let it dry. You have just made a field jacket, like the ones Barnum Brown used to protect dinosaur bones.

Video slot. Video coming. Barnum Brown and the T. rex at the American Museum of Natural History; how a field jacket is made. Search the American Museum of Natural History, the Carnegie Museum of Natural History.

KEY TERMS

field jacket

A hard shell of plaster and cloth wrapped around a fossil to protect it on the trip to the museum.

excavate

To dig something up carefully.

Hell Creek

The name of the rock layers in Montana where T. rex was found.

specimen

One fossil or skeleton that scientists study.

CORE IDEAS

The story. Barnum Brown was born on a farm in Kansas in 1873. His parents named him after P. T. Barnum, the famous circus showman. As a boy he collected fossils and shells he found when the plow turned up the earth. He grew up to be a fossil hunter for the American Museum of Natural History in New York, and he was so good at finding bones that people called him “Mr. Bones.”

Bones in the badlands. In the summer of 1902, Brown was searching the dry hills and gullies of **Hell Creek**, in eastern Montana. There he found the bones of a giant meat-eater: part of the skull, the backbone and the hips. In 1905 the museum named it *Tyrannosaurus rex*, the “tyrant lizard king.” (Trail A, Stop A1, tells about T. rex itself.)

Hard work. Digging out a dinosaur is hard. The rock was so heavy that Brown sometimes used dynamite to blast away the top layers. Then his team dug with picks and brushes. They wrapped each bone in burlap soaked in plaster to make a hard **field jacket**, like a cast for a

broken arm. The bones went by horse-drawn wagon to the railroad and then by train to New York.

An even better T. rex. In 1908 Brown found a second T. rex with a much better skull. That skeleton was put together and still stands in the American Museum of Natural History in New York, where millions of people have seen it.

Kept safe. In 1941, during World War II, the museum sold the first T. rex, the one from 1902, to the Carnegie Museum in Pittsburgh. Brown said he was worried that New York might be bombed, and this way the two skeletons would not be in the same place. (The museum also needed money for more digging.) That first T. rex is still in Pittsburgh today.

PICTURE STUDY



Barnum Brown doing field work in Montana, Photograph, 1914 · Photograph · American Museum of Natural History expedition photograph (via Wikimedia Commons)
Wikimedia Commons · Public domain

This photograph shows Barnum Brown in 1914, at work in the badlands of Montana. Look at his famous long fur coat! The rocks behind him are the kind of crumbly cliffs where fossil hunters search for bones.

Look closely

- What is Barnum Brown wearing?
- Look at the rocks. Are they hard and smooth, or crumbly and full of layers?
- Where would you start looking for bones in this place?

Talk about it

1. Would you like to be a fossil hunter? What part would be hardest?
2. Why is it important to write down where each bone was found?

HANDS-ON: MAKE A FIELD JACKET

Protect a “fossil” for the trip to the museum, the way Barnum Brown did.

You will need

- A “fossil”: a cookie, a clean chicken bone or a clay bone
- Wet paper towel
- Strips of newspaper or cloth
- Flour-and-water paste or white glue mixed with water
- A bowl

Steps

1. Lay the fossil on a tray. Cover it with wet paper towel, so the jacket will not stick to the bone.
2. Dip the strips in the paste and lay them over the fossil, crisscrossing, until it is covered on top and sides.
3. Let it dry until hard (overnight).
4. Flip it over and jacket the bottom.
5. Later, “open it at the museum”: cut the jacket carefully with a grown-up and see if your fossil survived the trip.

Check your work

- My jacket covered the whole fossil.
- My fossil came out without breaking.
- I can tell why fossil hunters use field jackets.

FIELD NOTEBOOK

1. Draw Barnum Brown in his long coat, digging out a T. rex skull.
2. Make a map: Montana (where T. rex was found), New York (the museum) and Pittsburgh (where the first T. rex is now). Draw lines between them.

Did you know? Barnum Brown often wore a long fur coat, a tie and a hat while hunting fossils, even out in the badlands. Brown also traveled down the Red Deer River in Canada on a flatboat, finding dinosaurs along the riverbanks. Brown worked for the American Museum of Natural History for more than sixty years.

Museum word. Museum signs put these fossils in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs about the Hell Creek rocks often give a date such as “about 66 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago.

Goes deeper in. Earth Science, Grade 3, Lesson 6.2 “Sue the T. rex” (coming soon).

For families. The 1902 Hell Creek find (later the holotype, CM 9380) went to the Carnegie Museum of Natural History in 1941; the 1908 skeleton (AMNH 5027) is on display at the AMNH (Carnegie Museum; AMNH). The sale price was \$7,000. Brown gave fear of wartime bombing as the reason; NPR (2011, quoting Mark Norell) reports that his letters suggest the museum also wanted cash for fieldwork, so the stop gives both (Carnegie Magazine, Fall 2021, also cites a dwindling budget). Osborn named the animal in 1905. Brown’s use of dynamite and his fur coat are well documented in photographs and biographies.

PRACTICE

1. **EASY** Who found the first T. rex skeleton, and where?
2. **MEDIUM** What is a field jacket for?
3. **MEDIUM** Why did Brown say the first T. rex should go to Pittsburgh in 1941?

Make it a game • Bone Train. Players carry “jacketed” bones (pillows) one at a time from the “dig” across the yard to the “railroad” (a line of chairs). Each pillow must be carried by two players together. Load the whole skeleton onto the train!

Scripture. “And whatsoever ye do, do it heartily, as to the Lord, and not unto men;” (Colossians 3:23, KJV)

Barnum Brown worked hard for more than sixty years. Whatever our work, we do it heartily, for the Lord.

Practice: answers

1. Barnum Brown, at Hell Creek in Montana, in 1902.
2. It protects fossil bones on the trip from the dig to the museum.
3. He was worried New York might be bombed in World War II, so both T. rex skeletons should not be in one place.

2.8 ROY CHAPMAN ANDREWS AND THE GOBI EGGS (1923)

OBJECTIVES

- Tell the story of the expedition that found the first nest of dinosaur eggs known to science.
- Find the Gobi Desert and Mongolia on a map.
- Tell how Oviraptor got a name that turned out to be unfair.

Warm-up. Hold a raw egg (carefully!) and a hard-boiled egg. Can you tell which is which by looking? Scientists had to work hard to find out what was inside the Gobi eggs too.

Video slot. Video coming. Roy Chapman Andrews, the Flaming Cliffs and the Gobi dinosaur eggs; Oviraptor on its nest. Search the American Museum of Natural History.

KEY TERMS

Gobi Desert

A large, dry, rocky desert in Mongolia and China.

Mongolia

A country in Asia between Russia and China.

nest

A place where eggs are laid.

embryo

A baby animal growing inside an egg.

CORE IDEAS

The story. In the 1920s, an explorer named Roy Chapman Andrews led a great expedition into the Gobi Desert of Mongolia for the American Museum of Natural History. The team drove Dodge cars across the desert, and a long caravan of camels carried gas, food and supplies. Andrews wore a wide hat and carried a pistol, because there were bandits about. He loved adventure!

The Flaming Cliffs. One evening the team came to tall red sandstone cliffs that glowed like fire in the setting sun. They named them the Flaming Cliffs. The cliffs were full of fossils, especially a small horned dinosaur that was later named Protoceratops.

“Eggs are eggs.” On July 13, 1923, a team member named George Olsen came back to camp at lunch and said he had found fossil eggs. The others laughed. Surely they were just odd-shaped rocks! But they went to look, and there lay several long eggs with wrinkled shells, broken out of the rock. Andrews wrote that at last they had to admit “eggs are eggs.” It was the first nest of dinosaur eggs known to science.

The “egg thief.” Lying right on top of the nest was the skeleton of a small, toothless dinosaur. Scientists thought the eggs belonged to Protoceratops and that this little dinosaur had died while stealing them. So they named it *Oviraptor*, which means “egg thief.”

The truth comes out. Seventy years later, in 1993, scientists in Mongolia found an egg just like these with a tiny **embryo** inside. The baby was an Oviraptor! And later they found Oviraptor-like dinosaurs sitting on nests with their arms spread over the eggs, like a mother hen. Oviraptor was not stealing the eggs. It was probably guarding its own. Its name is still “egg thief,” but now everyone knows it was a parent.

PICTURE STUDY



A nest of oviraptorid eggs from Mongolia, Photograph by “Gerbil”, 2006 · Photograph of fossil dinosaur eggs · Senckenberg Museum, Frankfurt, Germany · Wikimedia Commons · CC BY-SA 3.0

This photograph shows a fossil nest of long eggs from Mongolia, like the ones the 1923 expedition found. The museum’s sign says these eggs were first thought to belong to Protoceratops, until embryos and parents on nests showed they were laid by Oviraptor’s family. The eggs lie in a ring, in pairs.

Look closely

- Count the eggs you can see.
- Look at the shape of the eggs. Are they round or long?
- Look at the way the eggs are arranged. Is there a pattern?

Talk about it

1. Why would a parent dinosaur arrange its eggs in a circle?
2. How do you think the scientists felt when they found an embryo inside?

HANDS-ON: A DINOSAUR NEST

Make a nest of “dinosaur eggs” and guard it like an Oviraptor parent.

You will need

- Salt dough or clay (2 cups flour, 1 cup salt, about 3/4 cup water)
- A paper plate
- Brown paint or cocoa powder
- A toothpick

Steps

1. Shape 8 to 12 long eggs, each about as long as your finger.
2. Scratch little wrinkles into the shells with the toothpick.
3. Arrange the eggs in a circle on the plate with their narrow ends pointing to the middle, in two rings if you can.
4. Let them dry, then paint them brown and gray like fossil stone.
5. Make an Oviraptor from clay sitting in the middle with its arms spread over the eggs.

Check your work

- My eggs are long, not round.
- They are arranged in a circle.
- My Oviraptor is guarding the nest, not stealing it.

FIELD NOTEBOOK

1. Draw the Oviraptor sitting on its nest with its arms spread. Write: “Oviraptor means egg thief, but it was a parent.”
2. Draw a map of Asia and mark Mongolia and the Gobi Desert.

Did you know? The first nest found at the Flaming Cliffs had about 13 eggs. Each egg was about 6 to 8 inches long, longer than a chicken egg but much narrower than an ostrich egg. The team also found the first Velociraptor skull there, in 1923 (see Trail A, Stop A5).

Museum word. Museum signs put these fossils in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. Signs for the Flaming Cliffs often give a date such as “about 75 million years ago.” That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. Notice that whole nests and a parent were buried in place by sand. Something covered them very suddenly.

Goes deeper in. Geography, “Asia: Mongolia and China” and Life Science, Grade 2, “Eggs and babies” (coming soon).

For families. Date (July 13, 1923), finder (George Olsen) and Andrews’s “eggs are eggs” are from the AMNH and Andrews’s *The New Conquest of Central Asia* (1932). Dinosaur eggshell had been found earlier in France, so “first nest known to science” is the careful wording. The embryo (found 1993, published by Norell and others in *Science*, 1994) and the brooding oviraptorids (1995) are AMNH work. The common claim that Andrews inspired Indiana Jones is not included because it is unconfirmed.

PRACTICE

1. **EASY** Where was the first nest of dinosaur eggs found in 1923?
2. **MEDIUM** Why was Oviraptor named “egg thief”?
3. **MEDIUM** What showed that Oviraptor was really a parent?

Make it a game • Guard the Nest. One player is the Oviraptor parent and sits by a “nest” of balls or beanbags. The others try to sneak up and take an egg. If the parent tags you, you freeze. Can the parent guard every egg?

Scripture. “He that is first in his own cause seemeth just; but his neighbour cometh and searcheth him.” (Proverbs 18:17, KJV)

The first story about Oviraptor sounded right. When people searched more, the truth came out. We should be careful before we judge.

Practice: answers

1. At the Flaming Cliffs in the Gobi Desert of Mongolia.
2. Its skeleton was found on a nest, and scientists thought it was stealing eggs.
3. An embryo of an Oviraptor-like dinosaur was found inside an egg like these, and others were found sitting on nests.

2.9 SUE THE T. REX (1990)

OBJECTIVES

- Tell the story of how SUE was found.
- Describe why SUE is so important.
- Measure and compare SUE’s size with things you know.

Warm-up. Pick up your heaviest book. Now think: SUE’s skull alone weighs about 600 pounds, as much as three or four grown men!

Video slot. Video coming. SUE the T. rex at the Field Museum: the skeleton, the skull and how SUE was found. Search the Field Museum.

KEY TERMS

SUE

The name of the most complete Tyrannosaurus rex skeleton found so far, named after Sue Hendrickson.

complete

Having all or nearly all of its parts.

auction

A sale where people bid against each other and the highest bid wins.

injury

A hurt or wound. SUE’s bones show old injuries that healed.

CORE IDEAS

The story. On a hot August morning in 1990, a team of fossil hunters was camped near the town of Faith, South Dakota. Their truck had a flat tire, so most of the team drove to town to fix it. Sue Hendrickson stayed behind with her dog. She walked to a sandstone cliff she had been wanting to explore. At its foot she saw pieces of bone, and when she looked up, there were huge bones sticking out of the cliff. It was a T. rex!

A very complete T. rex. The team dug out the skeleton over many days. It was the biggest and most **complete** T. rex anyone had ever found. They named it SUE, after Sue Hendrickson. Scientists still do not know whether SUE was a male or a female; “SUE” is just its name.

Who owns a dinosaur? Then came a problem. The bones were found on land where a rancher lived, but the government held that land in trust for him. Who owned SUE? The question went to court. In 1992, officers took the bones away and stored them while the judges decided. At last the court ruled that SUE belonged to the rancher.

Sold to Chicago. In 1997, SUE was sold at an **auction** in New York. The Field Museum in Chicago, with help from companies and friends, bought SUE for more than eight million dollars. Scientists spent years cleaning the bones and putting them together. In 2000 SUE was shown to the world.

What SUE tells us. SUE is about 40 feet long and stood about 13 feet tall at the hips. Its bones show many old **injuries** that healed: broken ribs, a hurt leg, and holes in the jaw that may have come from an infection. SUE lived a hard life, but its body healed again and again. God made bodies able to mend.

PICTURE STUDY



SUE the T. rex at the Field Museum, Photograph by Michael Gray, 2006 · Photograph · Field Museum, Chicago

Wikimedia Commons · CC BY-SA 2.0

This photograph, taken in 2006, shows SUE standing in the great hall of the Field Museum in Chicago. In 2018 SUE moved to a new room of its own in the museum.

Look closely

- Find the skull. Is it the real one or the lighter copy? (The copy is on the skeleton.)
- Count the toes on one foot.
- Find the tiny arms. How long are they compared with the legs?

Talk about it

1. How would you feel standing under SUE?
2. Why do you think so many people wanted to own SUE?

Safety first. Stay out of the street. Measure in a yard, park or quiet driveway with a grown-up.

HANDS-ON: HOW BIG IS SUE?

Mark out SUE's length and height outside.

You will need

- A tape measure or a 10-foot string
- Sidewalk chalk
- A grown-up helper

Steps

1. Mark a starting line for SUE's nose. Measure 40 feet (four times your 10-foot string) and mark the tip of the tail.
2. Mark where the skull ends, about 5 feet from the nose.
3. Find a wall or a tree and have a grown-up measure 13 feet up. That is the top of SUE's hips.
4. Walk from nose to tail and count your steps.

Check your work

- I marked 40 feet.
- I found 13 feet up on a wall or tree.
- I counted my steps.

FIELD NOTEBOOK

1. Draw SUE's skull. Write: "SUE, found August 12, 1990, by Sue Hendrickson, South Dakota."
2. Write one injury that SUE's bones show.

Did you know? SUE's skull is so heavy that the real skull is kept in its own case, and a lighter copy sits on the skeleton. SUE has about 250 of the bones a T. rex body would have had, about 90 percent by bulk. SUE was found on August 12, 1990.

Museum word. Museum signs put these fossils in the **Cretaceous**. That is a name scientists use for a group of rock layers and the fossils found in them. The Field Museum's sign gives SUE an age of about 67 million years. That number is an interpretation, not something anyone saw. This course reads Genesis as teaching that God made the land animals, dinosaurs included, on the sixth day of creation, only thousands of years ago. SUE was found mostly together, in a sandstone that had been a river or flood deposit.

Goes deeper in. Earth Science, Grade 3, Lesson 6.2 “Sue the T. rex” (coming soon).

For families. Facts follow the Field Museum: found August 12, 1990, near Faith, South Dakota; about 40.5 feet long and 13 feet at the hips; about 90 percent of the skeleton by bulk; bought at Sotheby’s in October 1997 for about \$8.4 million; unveiled May 2000. The ownership case is told simply (the land was held in trust by the federal government for the rancher Maurice Williams; the court awarded SUE to him). SUE’s sex is unknown.

PRACTICE

1. **EASY** Who found SUE, and where?
2. **MEDIUM** Why was there a court case about SUE?
3. **EASY** Which museum has SUE now?

Make it a game • Flat Tire!. Play like Red Light, Green Light. The leader calls “Drive!” and players walk, and “Flat tire!” and everyone stops. The first player to reach the leader “finds SUE” and becomes the next leader.

Scripture. “Bless the LORD, O my soul, and forget not all his benefits: Who forgiveth all thine iniquities; who healeth all thy diseases;” (Psalm 103:2-3, KJV)

SUE’s bones show wounds that healed. God made living things able to heal, and He heals us, body and soul.

Practice: answers

1. Sue Hendrickson, near Faith, South Dakota, in 1990.
2. People disagreed about who owned the bones, because the land was held in trust by the government for a rancher.
3. The Field Museum in Chicago.

2.10 MARY SCHWEITZER'S SOFT TISSUE (2005)

OBJECTIVES

- Tell the story of the soft tissue found inside a T. rex bone.
- Tell the difference between what scientists observe and how they interpret it.
- Read a museum sign and sort it into “what we see” and “what people think.”

Warm-up. Bend a rubber band. It stretches and snaps back. Now tap a rock. It does not bend at all. Scientists expected dinosaur bones to be all rock inside. What Mary Schweitzer found bent like the rubber band!

Video slot. Video coming. Mary Schweitzer and soft tissue in a T. rex bone. Search the Smithsonian (Smithsonian Magazine “Dinosaur Shocker”), North Carolina State University; for creation-friendly framing, Answers in Genesis or Institute for Creation Research videos once vetted.

KEY TERMS

soft tissue

Body parts that are soft, like skin, blood vessels and muscles, not hard like bone.

blood vessel

A tiny tube that carries blood through the body.

observe

To see, measure or test something for yourself.

interpret

To explain what something means. Two people can observe the same thing and interpret it differently.

CORE IDEAS

The story. In 2000, a fossil hunter named Bob Harmon was eating his lunch in a canyon in Montana when he looked up and saw a bone sticking out of a cliff. It was a T. rex! The team dug it out over three summers. The bones were so heavy in their plaster jackets that the helicopter could not lift them, so the workers had to break one big thighbone into pieces.

A surprise inside. The broken pieces were sent to Mary Schweitzer, a scientist in North Carolina. She soaked a piece in a gentle acid to take away the hard minerals. Usually nothing is left. But this time, something soft and stretchy remained. Under the microscope she saw tiny, clear, branching tubes, like **blood vessels**, and small round shapes like cells. When she pulled the material, it stretched and sprang back.

The world hears. In 2005, Dr. Schweitzer and her team reported their find in a science journal. People were amazed. Most scientists had taught that soft tissue could not last for

millions of years. Dr. Schweitzer said she checked her results again and again before she believed them, because she wanted to be sure.

Observe and interpret. Here is a big lesson for every dinosaur hunter. To **observe** is to see or test something for yourself: “This material is soft and stretchy.” To **interpret** is to explain what it means: “It is millions of years old” or “It is only thousands of years old.” Good scientists, and good students, keep the two apart.

Two ways of reading it. Many Christians who believe the earth is young say soft tissue fits with bones buried in Noah’s Flood only thousands of years ago. Dr. Schweitzer, who is a Christian too, thinks something in the bone, like iron from the blood, may have kept the tissue for millions of years. Scientists keep testing. As you read the box below, notice which part is the observation and which parts are interpretations.

PICTURE STUDY



The skull of “B. rex” (MOR 1125), Photograph by Tim Evanson, 2015 · Photograph · Museum of the Rockies, Bozeman, Montana
Wikimedia Commons · CC BY-SA 2.0

This is the skull of the very T. rex whose thighbone held the soft tissue. It is nicknamed “B. rex” after Bob Harmon, who found it. It is on display at the Museum of the Rockies in Montana.

Look closely

- Count the teeth you can see on the bottom jaw.
- Find the big openings in the skull. What do you think filled them in life?
- Look at the color and the surface. Does it look like stone or like bone?

Talk about it

1. What would you expect to find inside a bone this old?
2. Why is it important to look for yourself instead of only being told what is there?

HANDS-ON: OBSERVE OR INTERPRET?

Practice keeping what you see apart from what you think it means.

You will need

- Six index cards and a pencil
- A museum sign: from a museum visit, a museum website, or the sample in the box below
- Two bowls labeled “I observe” and “Interpretation”

Steps

1. A grown-up writes these on cards: “This bone is 4 feet long.” “This dinosaur lived 68 million years ago.” “The bone has soft, stretchy tissue inside.” “This T. rex was a mother.” “The teeth are sharp and curved.” “Dinosaurs ruled the earth.”
2. Read each card and drop it in the right bowl. Can you see or measure it? Then it is an observation. Is it an explanation or a guess about the past? Then it is an interpretation.
3. Read a real museum sign. Underline the observations in one color and the interpretations in another.
4. Talk about it: which parts of the sign does everyone agree on?

Tips

- “This T. rex was a mother” is an interpretation of an observation: Dr. Schweitzer saw a special kind of bone that female birds make before laying eggs.

Check your work

- I sorted all six cards.
- I can give one example of an observation and one of an interpretation.
- I marked a real museum sign in two colors.

FIELD NOTEBOOK

1. Make two columns: “I observe” and “Interpretation.” Write two sentences in each about the soft tissue.
2. Draw a magnifying glass looking at a tiny branching blood vessel.

Did you know? Dr. Schweitzer’s team later found tiny bits of protein called collagen in dinosaur bones, the same protein that is in your own bones. Since 2005, other teams have reported soft tissue or traces of protein in other dinosaur fossils too. Dr. Schweitzer first studied to be a teacher before she became a scientist.

 **What the sign says / What we observe / How Christians read it.**  **What the sign says:** “This Tyrannosaurus lived about 68 million years ago.” **What we observe:** inside a T. rex thighbone from Montana, Mary Schweitzer’s team found soft, stretchy material and tiny branching tubes like blood vessels; later tests found traces of protein. **How Christians read it:** many young-earth Christians see soft tissue as a sign that the bones are thousands, not millions, of years old, buried in the Flood. Dr. Schweitzer, who is herself a Christian, thinks the tissue may have lasted millions of years because iron from the blood helped preserve it. Scientists are still testing both ideas. What everyone agrees on is the observation: something soft was found inside a dinosaur bone.

Goes deeper in. Earth Science, the creation and dating units, and Trail D, Stop D9 “Soft tissue and dating” (coming soon).

For families. This is a  stop. The find was published by Schweitzer, Wittmeyer, Horner and Toporski in *Science* 307 (March 25, 2005); the specimen is MOR 1125, found by Bob Harmon in 2000 in the Hell Creek Formation, and the femur was broken for helicopter transport (Smithsonian Magazine, 2006). The iron-preservation hypothesis is Schweitzer et al., *Proc. R. Soc. B* (2014). Dr. Schweitzer has spoken publicly about her Christian faith; she holds an old-earth view. Young-earth organizations (e.g., Answers in Genesis, Institute for Creation Research) read the finding as evidence for a young earth. The stop presents both fairly and teaches the observation/interpretation distinction.

PRACTICE

1.  What did Mary Schweitzer find inside the T. rex bone?
2.  Is “This tissue is stretchy” an observation or an interpretation?
3.  Is “This bone is 68 million years old” an observation or an interpretation?

Make it a game · See It or Say It?. The leader says a sentence about something in the room: “The cup is blue” (see it!) or “Someone was thirsty” (say it!). Players touch their eyes for an observation and their chin for an interpretation.

Scripture. “Prove all things; hold fast that which is good.” (1 Thessalonians 5:21, KJV)

To “prove” means to test. Dinosaur hunters test what they find, and Christians test every idea and hold fast to what is true.

Practice: answers

1. Soft, stretchy tissue with tiny branching tubes like blood vessels.
2. An observation: it can be seen and tested.
3. An interpretation: no one saw the dinosaur alive; the date is an explanation.

TRACK 2 BADGE QUIZZES

The badge quizzes are optional. Read each question aloud; the child may answer by talking, pointing or drawing. Four right out of five earns the badge. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops B1–B5)

1. What did Mary Anning and her brother find at Lyme Regis?
2. Which dinosaur was the first to get a scientific name?
3. Where was *Iguanodon*'s "horn" really?
4. Who made up the word "dinosaur," and what does it mean?
5. Where did guests eat dinner on New Year's Eve, 1853?

Badge quiz 2 (Stops B6–B10)

6. What sin hurt Cope and Marsh in the Bone Wars?
7. Who found the first *T. rex* skeleton?
8. Was *Oviraptor* really an egg thief?
9. Who was SUE named after?
10. What is the difference between an observation and an interpretation?

TRAIL CERTIFICATE: MY DINOSAUR HUNTERS NOTEBOOK AND TRAIL B CERTIFICATE

Gather the Field Notebook pages from this trail into one booklet with a cover: "My Dinosaur Hunters Notebook," your name and the dates you started and finished.

Add a timeline page with the ten discoveries in order, from Mary Anning (1811) to Mary Schweitzer (2005).

Add one "Observe or Interpret?" page from Stop B10.

When the booklet is done, a parent signs the Trail B certificate.

- **Ten stops:** At least one page for each hunter, each with a title and a date.
- **Timeline:** The ten discoveries are in the right order with their years.
- **Observe or interpret:** The child can sort sentences into observations and interpretations.
- **Care:** Drawings are labeled and done carefully.

Answer key

1. An ichthyosaur, a "fish lizard" sea reptile (and later Mary found a plesiosaur).
2. *Megalosaurus*, named by William Buckland in 1824.
3. On its thumb.
4. Richard Owen (1842); "terrible lizard" or "fearfully great lizard."
5. Inside the mold of Hawkins' *Iguanodon* model.
6. Envy (and pride).

7. Barnum Brown, in Montana, in 1902.
8. No. It was a parent guarding its own eggs.
9. Sue Hendrickson, who found it.
10. An observation is what we can see or test; an interpretation is an explanation of what it means.

GREAT BATTLES ✕ TRAIL B: THE MIDDLE AGES

The second trail of the Great Battles track visits eight battles of the Middle Ages, from Tours in 732 to the great sea battle of Lepanto in 1571. Each battle is taught through **the map** (the land or sea), **the plan, the people** (their courage and faith) and **why it mattered**.

This is the ● **Scout** level, for ages 7 to 9. Battles are told plainly and gently: who fought, where, the plan, what happened and why it mattered. Numbers of soldiers and losses are given as numbers, deaths are stated plainly but not described, and pictures are chosen for their story, not for violence. Both sides are described fairly and in the terms of their own time.

Every stop has a **terrain map** to draw, a **tabletop** activity, and a “**Choose your move**” puzzle in which the child makes the commander’s choice before learning what happened. Five stops earn the **Battle Scout badge, part 1**; eight earn part 2 and the **Trail B certificate**.

BEFORE YOU BEGIN

- Listen to a story of about five minutes and tell it back.
- Find Europe, the Middle East and North Africa on a globe (a grown-up may help).
- Trail A is helpful but not required.

MASTERY CHECKLIST

- ☐ I can put the eight battles of this trail in order on a timeline.
- ☐ I can find each battle on a map of Europe and the Mediterranean.
- ☐ I can tell how the land, the weather or the water helped one side win at three of the battles.
- ☐ I can name a leader from this trail and one virtue he or she showed.
- ☐ I can draw a simple terrain map with a title, a key and both armies.

OPTIONAL BOOKS AND RESOURCES

- **Bayeux Museum: the Bayeux Tapestry online** (<https://www.bayeuxmuseum.com>): The whole tapestry can be viewed scene by scene; use it for Stop B2.
- **Royal Armouries (Leeds)** (<https://royalarmouries.org>): Pictures of longbows, armor and the great Turkish bombard; good for Stops B5 and B7.
- **Project Gutenberg** (<https://www.gutenberg.org>): Free old read-alouds such as H. E. Marshall’s *Our Island Story* and *Scotland’s Story*, which tell Hastings, Bannockburn and Agincourt for children.

3.1 TOURS (732): CHARLES MARTEL'S WALL

OBJECTIVES

- Find Tours and Poitiers on a map of France.
- Tell how the Franks stood firm like a wall.
- Explain why many people think this battle mattered for Europe.

Warm-up. Stand shoulder to shoulder with your family in a tight line, arms linked. Have someone gently try to push through. Is it easy or hard? A tight, steady line was the Franks' plan at Tours.

Video slot. Video coming. The Battle of Tours (Poitiers), 732, for young viewers: Charles Martel and the Frankish line. Search approved history channels (Kings and Generals, Simple History, The History Guy); preview first.

KEY TERMS

Franks

A people who lived in what is now France and Germany. France is named after them.

Charles Martel

The leader of the Franks. "Martel" means "the Hammer."

Umayyad

The family of rulers (caliphs) of a great Muslim empire that stretched from Arabia to Spain (say "oo-MY-yad").

cavalry

Soldiers who fight on horseback.

CORE IDEAS

The map. In the year 711, armies of the Umayyad empire crossed from North Africa into Spain and conquered most of it. Twenty years later, a governor of Spain named Abd al-Rahman led a large army north over the Pyrenees Mountains into the land of the Franks. His horsemen rode fast and far, and they were headed for the rich church of Saint Martin at Tours.

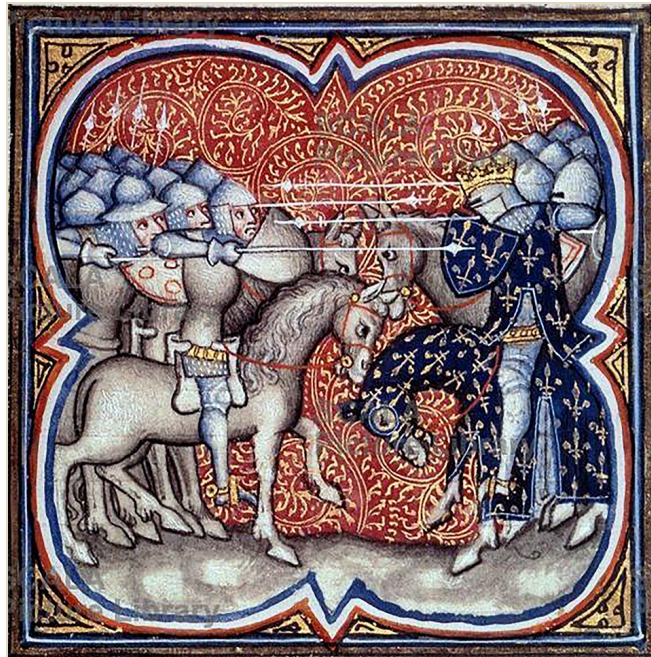
The people. The leader of the Franks was Charles, later called **Martel**, "the Hammer." He gathered his army, mostly foot soldiers, many of them tough men who had fought with him for years. Between the towns of Poitiers and Tours, he found a good place: higher ground with trees on either side, where horsemen could not easily ride around him.

The plan. The Umayyad army's strength was its swift **cavalry**. So Charles did not try to chase them. He formed his men into a great, tight block, shields together, and told them to stand. An old chronicle says the Franks stood "like a wall," as still and firm as ice.

What happened. For a long day the horsemen charged again and again, but the Frankish wall held. Late in the day Abd al-Rahman was killed. That night the Umayyad army quietly left its camp. In the morning the Franks found the tents empty. They had held their ground, and the army from Spain did not come so far north again.

Why it mattered. Many historians have said that Tours helped keep Western Europe Christian. Others think the raid would have turned back anyway. Either way, Charles Martel became the strongest man in the land of the Franks. His grandson was Charlemagne, the great king who later united much of Europe.

PICTURE STUDY



Charles Martel at Tours-Poitiers, from the Grandes Chroniques de France, Unknown French illuminator, 14th century · Ink, paint and gold on parchment · Bibliothèque nationale de France (MS français 2813)
Wikimedia Commons · Public domain

This little painting comes from the *Great Chronicles of France*, a history book copied by hand for a French king more than six hundred years after the battle. The artist dressed everyone like knights of his own time. The man in blue with gold lilies, the sign of the French kings, stands for the Frankish leader.

Look closely

- Find the man in the blue coat with gold lilies. What is he wearing on his head?
- Count the lances.
- Look at the background. Is it a real place or a pattern?

Talk about it

1. Charles Martel was never crowned king. Why do you think the artist gave the leader a crown?

2. How is this picture different from a photograph?

HANDS-ON: TABLETOP TOURS: STAND LIKE A WALL

Set up the battle and test whether a tight block can stop charging horsemen.

You will need

- About 30 blocks or toy soldiers in one color (Franks)
- About 15 in another color (horsemen)
- Two strips of green paper or toy trees (the woods)
- A book under one end of a towel (the higher ground)

Steps

1. Make the higher ground with the towel and book. Put the woods on both sides.
2. Set the Franks on the higher ground in a tight block, five rows deep.
3. Roll a small ball (the horsemen's charge) at the block. Do the Franks fall over?
4. Now set the Franks in one long thin line and roll the ball again. Which held better?

Check your work

- My Franks stood on the higher ground between woods.
- I tested a block and a thin line.
- I can tell why Charles chose a tight block.

FIELD NOTEBOOK

1. **Terrain map.** Draw France with the Pyrenees Mountains at the bottom. Mark Spain, Poitiers and Tours. Draw the Franks' block on higher ground between two woods.
2. Write: "Charles Martel, the Hammer, 732."

Did you know? No one knows exactly how many soldiers fought at Tours. Old writers gave huge numbers that historians do not trust. The battle is also called the Battle of Poitiers, because it was fought between the two towns. The church of Saint Martin at Tours was one of the most famous churches in Europe, named for a kind bishop who once cut his cloak in half to share with a beggar.

Goes deeper in. Geography, Grade 5 and the high-school course "Geography and History" (France and Spain) (coming soon).

For families. The date is traditionally October 732 (some scholars argue for 733). The "wall of ice" image comes from the Mozarabic Chronicle of 754. Numbers are unknown; the stop does not repeat medieval figures. Historians disagree about how much the battle mattered (Gibbon and others called it decisive; many modern historians call it one turning

point among several); the stop says so. Both sides are described in their own terms, and the Umayyad conquest of Spain (711) is stated as fact.

PRACTICE

1. **MEDIUM Choose your move.** You are Charles Martel. Your enemy has fast horsemen; you have mostly foot soldiers. Will you (a) chase the horsemen across the open plain, (b) stand in a tight block on higher ground with woods on your sides, or (c) split your army into small groups?
2. **EASY** What does “Martel” mean?
3. **EASY** Who was Charles Martel’s famous grandson?

Make it a game • The Wall Holds. Players link arms in a tight line (the Franks). One at a time, others walk up and try to gently squeeze through. Then the line spreads out with arms apart. Which way is harder to get through? Play gently: no running or shoving.

Scripture. “Blessed be the LORD my strength, which teacheth my hands to war, and my fingers to fight:” (Psalm 144:1, KJV)

David wrote this. Holding firm when others are frightened takes training and strength, and the Bible says that strength comes from God.

Practice: answers

1. Charles chose (b). His men stood like a wall on higher ground, and the horsemen could not break them.
2. “The Hammer.”
3. Charlemagne.

3.2 HASTINGS (1066) AND THE BAYEUX TAPESTRY

OBJECTIVES

- Tell why Harold and William both wanted to be King of England.
- Explain how the Normans broke the English shield wall.
- Read part of the story in the Bayeux Tapestry.

Warm-up. Make a comic strip of four boxes. In each one, draw one thing you did today. You have made a picture story, like the Bayeux Tapestry, which tells the story of 1066 in pictures more than 200 feet long.

Video slot. Video coming. The Battle of Hastings, 1066, and the Bayeux Tapestry for young viewers. Search approved history channels (Simple History, Kings and Generals, The History Guy), the Bayeux Museum; preview first.

KEY TERMS

Normans

People from Normandy, in the north of France.

shield wall

A line of soldiers standing close together with their shields overlapping.

tapestry

A long cloth with pictures sewn or woven into it. The Bayeux Tapestry is actually embroidered (stitched).

feigned retreat

Pretending to run away to trick the enemy into chasing you.

CORE IDEAS

The map. In January 1066, King Edward of England died without a son. Harold Godwinson, the most powerful English nobleman, was crowned king. But across the sea, Duke William of Normandy said that the throne had been promised to him. William built a great fleet of ships and got ready to cross the English Channel.

Two invasions. At the same time, a Norwegian king, Harald Hardrada, invaded the north of England. King Harold marched his army north as fast as he could and beat the Norwegians at Stamford Bridge. Just a few days later, he heard that William had landed in the south! Harold's tired army marched about 250 miles back south to meet him.

The plan. On October 14, 1066, near the town of Hastings, Harold set his men along the top of a ridge in a **shield wall**. Their shields overlapped like the scales of a fish. William's Normans had archers, foot soldiers and knights on horseback. All morning they charged up the hill, and all morning the shield wall held.

What happened. Then something happened that changed the battle. Some of William’s men ran back down the hill, and some of the English broke out of their wall to chase them. The Normans turned and surrounded them. The old writers say the Normans then tried this more than once on purpose, a **feigned retreat**. As the English line grew thinner, the Normans broke through. By evening, King Harold had been killed, and the English army scattered.

Why it mattered. William became King of England and is called William the Conqueror. The Normans brought new castles, new laws and many French words into English. Words like “castle,” “court” and “judge” came into English after 1066. About ten years later, a great embroidered cloth, the Bayeux Tapestry, was made to tell the whole story in pictures.

PICTURE STUDY



The Bayeux Tapestry, Scene 38: the Norman fleet crosses the Channel, Unknown English embroiderers, 1070s · Wool embroidery on linen · Bayeux Museum, Normandy, France
Wikimedia Commons · Public domain

This part of the Bayeux Tapestry shows William’s ships crossing the English Channel. The ships look like Viking ships, because the Normans were descended from Vikings. The words above, in Latin, tell what is happening, like the captions in a comic book.

Look closely

- Count the horses in the ships.
- Find the striped sails and the carved heads at the front of the ships.
- Look at the border at the top and bottom. What animals do you see?

Talk about it

1. Why do you think the people who made the tapestry told the story in pictures?
2. If you made a tapestry of your family’s story, what would the first picture be?

HANDS-ON: TABLETOP HASTINGS: THE SHIELD WALL

Build Harold’s ridge and test the feigned retreat.

You will need

- A pillow or a folded blanket (the ridge)
- About 20 blocks or toy soldiers in one color (English)
- About 20 in another color (Normans)
- Paper shields: circles of paper taped to the English blocks

Steps

1. Lay the English blocks shoulder to shoulder along the top of the ridge, shields overlapping.
2. Move the Normans up the slope. Can they get through while the wall stays tight?
3. Now have a few Normans “run away” down the hill, and move some English out of the wall to chase them.
4. Close the Normans around the chasers. Is the wall still strong? Where is the gap?

Check your work

- My English shield wall stood on the ridge.
- I showed the feigned retreat.
- I can explain why leaving the wall was dangerous.

FIELD NOTEBOOK

1. **Terrain map.** Draw the ridge with the English shield wall on top and the Normans at the bottom. Mark Hastings and the sea. Draw arrows for the feigned retreat.
2. Draw a comic strip of four pictures, like the Bayeux Tapestry, telling the story of 1066.

Did you know? The Bayeux Tapestry is about 230 feet long and 20 inches high, and it is stitched with colored wool on linen. The tapestry shows Halley’s Comet, which was seen in the sky in the spring of 1066. At one point in the battle, a rumor spread that William had been killed. He pushed up his helmet so his men could see his face. The tapestry shows this.

Goes deeper in. Geography, the British Isles; Composition, “Picture stories” (coming soon).

For families. Dates and sequence (Stamford Bridge, September 25; Hastings, October 14, 1066) follow standard histories (e.g., the Anglo-Saxon Chronicle, William of Poitiers). Whether the first retreat was planned or a real rout that William turned to advantage is debated; the stop says the old writers describe it as a trick. How Harold died is uncertain (the famous “arrow in the eye” is debated); the stop says only that he was killed. The tapestry is about 68–70 m long, probably made in England in the 1070s.

PRACTICE

1. **MEDIUM Choose your move.** You are an English soldier in the shield wall. The Normans in front of you suddenly turn and run down the hill. Will you (a) break out of the wall and chase them, or (b) stay in your place in the wall, even though it is hard to wait?
2. **EASY** Who won the Battle of Hastings?
3. **EASY** What is the Bayeux Tapestry?

Make it a game · Hold the Line. Players stand in a line with pillows for shields. A “Norman” runs toward them and then suddenly runs away. Anyone who steps out of the line is “out.” The last ones still in line win.

Scripture. “A time to love, and a time to hate; a time of war, and a time of peace.” (Ecclesiastes 3:8, KJV)

Solomon wrote that there are seasons for everything, even war and peace. After 1066 came war, and then a long time of rebuilding.

Practice: answers

1. The wise choice is (b). The English who chased the Normans were surrounded, and their leaving made the shield wall weaker.
2. Duke William of Normandy, William the Conqueror.
3. A long embroidered cloth that tells the story of 1066 in pictures.

3.3 HATTIN (1187): WATER AND HEAT

OBJECTIVES

- Find the Sea of Galilee and the Horns of Hattin on a map.
- Explain how water and heat decided the battle.
- Tell why good advice matters to a leader.

Warm-up. Go outside on a warm day, or stand in a warm room, and do twenty jumping jacks. Now wait five minutes before you drink. How do you feel? Imagine marching all day in armor in July with no water.

Video slot. Video coming. The Battle of Hattin, 1187, for young viewers: Saladin, the march across the hills and the Horns of Hattin (no gore). Search approved history channels (Kings and Generals, Simple History, The History Guy); preview first.

KEY TERMS

Crusaders

Christian soldiers from Europe who went to the Holy Land. Their kingdom there was called the Kingdom of Jerusalem.

Saladin

The Muslim sultan of Egypt and Syria (say “SAL-a-din”).

springs

Places where fresh water flows out of the ground.

counsel

Advice from a wise person.

CORE IDEAS

The map. About a hundred years before this battle, armies of knights from Europe, the **Crusaders**, had captured Jerusalem and set up a Christian kingdom in the Holy Land. Now a great Muslim leader, **Saladin**, had united Egypt and Syria. In the summer of 1187 he led a large army across the Jordan River and attacked the town of Tiberias, on the Sea of Galilee.

The people. King Guy of Jerusalem gathered nearly all the knights and soldiers of his kingdom at the springs of Sephoria, where there was plenty of water and grass. In Tiberias was the wife of Count Raymond of Tripoli, one of Guy’s own lords. Even so, Raymond gave the king **counsel**: “Stay here by the water. It is summer. Let Saladin come to us across the dry land.”

The plan. But other lords told Guy that staying would look cowardly. Guy changed his mind and ordered the army to march east across the dry, rocky hills toward Tiberias, in the heat of July, with almost no water on the way. That was just what Saladin hoped for.

What happened. Saladin's horsemen rode around the marching army, shooting arrows and blocking the way to the water. That night the Crusaders camped on the dry hills without water. Saladin's men set the dry grass on fire, and smoke blew over the thirsty camp. The next day, July 4, 1187, the exhausted Crusaders were trapped near two hilltops called the Horns of Hattin. Most of their army was killed or taken prisoner, and King Guy was captured.

Why it mattered. When King Guy was brought to Saladin's tent, Saladin gave him a cup of cool water, a sign that his life would be spared. A few months later, Jerusalem surrendered to Saladin, and he allowed many of its people to leave in peace by paying a ransom. Hattin shows that even brave soldiers can lose when their leader ignores wise advice and forgets the simple things, like water.

PICTURE STUDY



The Horns of Hattin, Modern photograph, · Photograph · Lower Galilee, Israel
Wikimedia Commons · CC BY-SA 3.0

This photograph shows the Horns of Hattin as they look today. In July, the hills are dry and brown, with few trees and no water. Imagine thousands of knights in heavy armor here on a hot summer day.

Look closely

- Find the two “horns,” the two tops of the hill.
- Look for trees, streams or shade. Do you see many?
- What color is the ground?

Talk about it

1. Why would this be a hard place for a thirsty army?

2. Where would you have camped if you were King Guy?

HANDS-ON: TABLETOP HATTIN: FOLLOW THE WATER

Map the march and see why water mattered most.

You will need

- A large sheet of paper or a sand table
- Blue paper or a bowl of water (the Sea of Galilee and the springs)
- Brown paper or small rocks (the dry hills)
- Toy soldiers or blocks in two colors
- A cup of water for each player

Steps

1. Put the springs of Sephoria at the left edge and the Sea of Galilee at the right. Fill the space between with “dry hills.” Put Tiberias on the shore.
2. Set the Crusaders at the springs and Saladin’s army near the sea.
3. March the Crusaders across the hills one step at a time. With each step, everyone takes one sip of water from their cup. How much is left halfway?
4. Move Saladin’s horsemen around the marching army so they cannot reach the water.

Check your work

- My map shows the springs, the dry hills and the Sea of Galilee.
- I marched the army across the hills.
- I can tell why Raymond’s advice was wise.

FIELD NOTEBOOK

1. **Terrain map.** Draw the springs of Sephoria, the dry hills, the Horns of Hattin and the Sea of Galilee with Tiberias. Draw the Crusaders’ march as a dotted line.
2. Write: “Where no counsel is, the people fall” (Proverbs 11:14).

Did you know? The Horns of Hattin are the two peaks of an old volcano hill near the Sea of Galilee. This land is near where Jesus taught by the Sea of Galilee more than a thousand years earlier. After Hattin, kings from Europe, including Richard the Lionheart of England, came on the Third Crusade to fight Saladin.

Goes deeper in. Geography, “The Holy Land” and Bible maps of Galilee (coming soon).

For families. Sources: the date (July 3–4, 1187), Raymond’s advice, the waterless camp, the brush fires and the cup of water (iced or cooled) for Guy appear in both Christian and Muslim accounts (e.g., Ibn al-Athir, Imad al-Din and the Old French continuations of William of Tyre). Saladin had Reynald of Châtillon, who had broken truces, executed in the same tent; the Scout story does not include this, and the Expert level does. Jerusalem

surrendered on October 2, 1187. Both sides are described fairly; the Crusades' wider history is for the Ranger and Expert levels.

PRACTICE

1. **MEDIUM Choose your move.** You are King Guy. It is July. Your army is at the springs with plenty of water. The enemy is across a day's march of dry hills. Will you (a) stay by the water and let the enemy come to you, as Raymond advises, or (b) march across the dry hills right away?
2. **EASY** Who won the Battle of Hattin?
3. **MEDIUM** What did Saladin give King Guy in his tent?

Make it a game • Water Carriers. Two teams must carry water in spoons across the yard to fill a cup. One team gets to start right next to the bucket (the springs); the other must start far away (the dry hills). Which team fills its cup first? Talk about why.

Scripture. "Where no counsel is, the people fall: but in the multitude of counsellors there is safety." (Proverbs 11:14, KJV)

King Guy did not follow the wise counsel he was given. A wise leader listens to good advice.

Practice: answers

1. Guy chose (b) and lost his army. Raymond's advice, (a), was the wiser plan.
2. Saladin.
3. A cup of cool water, a sign that his life would be spared.

3.4 BANNOCKBURN (1314): ROBERT THE BRUCE

OBJECTIVES

- Find Stirling Castle and the Bannock Burn on a map of Scotland.
- Explain how the Scots used spear rings and soft ground.
- Tell how Robert the Bruce showed courage and patience.

Warm-up. Have you ever tried something over and over until you finally did it? There is an old story that Robert the Bruce, hiding in a cave, watched a spider try again and again to spin its web, and decided not to give up either.

Video slot. Video coming. The Battle of Bannockburn, 1314, for young viewers: Robert the Bruce, the schiltrons and the boggy ground (no gore). Search approved history channels (Simple History, Kings and Generals, The History Guy), the National Trust for Scotland Bannockburn Visitor Centre; preview first.

KEY TERMS

schiltron

A tight ring or block of Scottish spearmen with their long spears pointing out like a hedgehog (say “SHIL-tron”).

burn

A Scottish word for a stream. The Bannock Burn is a stream near Stirling.

bog

Soft, wet, muddy ground where horses sink.

independence

Being free to rule yourselves.

CORE IDEAS

The map. In 1314, the English held Stirling Castle, the key to central Scotland. The castle stood on a high rock above the River Forth. The Scots had surrounded it, and the English commander had agreed to surrender if no English army came to help by midsummer. So King Edward II of England marched north with a huge army, many thousands of knights and foot soldiers, to rescue it.

The people. The King of Scots was Robert the Bruce. For years he had fought to free Scotland from English rule. He had lost battles, hidden in the hills and seen his brothers and friends killed or captured. But he had never given up. His army was much smaller than Edward’s, so he chose his ground with great care.

The plan. Bruce placed his army in a wood beside the road to Stirling, near a stream called the Bannock Burn and wet, boggy ground. His men dug small pits along the road and

covered them to trip horses. Most of his soldiers were spearmen who stood in **schiltrons**, tight blocks with long spears pointing out, like a giant hedgehog that horses would not charge into.

What happened. On the first day, June 23, an English knight named Henry de Bohun saw King Robert riding a small pony in front of his army and charged at him with his lance. Bruce waited, stepped his pony aside at the last moment, and struck the knight down with his axe. The Scots cheered! That night, the English camped on soft ground between the streams. The next morning, before the battle, the Scots knelt to pray. The schiltrons then marched forward and pressed the English knights back into the boggy ground, where they could not move or turn. When Scottish camp-helpers came running down the hill with flags, the English thought another army was coming and fled.

Why it mattered. Bannockburn was Scotland's greatest victory. It did not end the war at once, but it made Robert the Bruce secure as king. Six years later, Scottish leaders wrote a famous letter to the Pope, the Declaration of Arbroath, saying that they fought not for glory or riches but for freedom.

PICTURE STUDY



The Battle of Bannockburn, from the Scotichronicon, Unknown artist (manuscript of Walter Bower's Scotichronicon), 1440s · Pen drawing with a little color on parchment · Corpus Christi College, Cambridge
Wikimedia Commons · Public domain

This drawing is the oldest picture of Bannockburn that we know of. It was drawn in a book of Scottish history about 125 years after the battle. Stirling Castle sits on its hill at the top. Below, Scottish spearmen stand close together, facing English knights on horseback.

Look closely

- Find Stirling Castle at the top.
- Find the long spears. How many can you count?
- Find the knights on horses. Which way are they facing?

Talk about it

1. How is this picture different from a modern painting or photograph?
2. Why do you think the writer put a picture in his book?

HANDS-ON: TABLETOP BANNOCKBURN: HEDGEHOGS AND BOGS

See why a ring of spears and soft ground beat heavy cavalry.

You will need

- A tray of wet sand or a towel soaked in water and laid flat (the bog)
- Toothpicks and small balls of clay (the spearmen)
- Larger toy horses or blocks (the English knights)
- Blue yarn (the Bannock Burn)

Steps

1. Lay the blue yarn across the table for the Bannock Burn. Put the wet “bog” beside it.
2. Make schiltrons: stick toothpicks all the way around a few clay balls so they point out like a hedgehog. Set them in a tight group.
3. Push a “knight” at a schiltron. Would a horse charge into that?
4. Now push the schiltrons forward slowly toward the knights so the knights must back into the bog. What happens to them?

Tips

- Use the blunt ends of the toothpicks outward if younger children are helping.

Check your work

- I made at least three schiltrons.
- I showed the knights being pushed into the bog.
- I can tell how the ground helped the Scots.

FIELD NOTEBOOK

1. **Terrain map.** Draw Stirling Castle on its rock, the road, the wood, the Bannock Burn and the boggy ground. Draw the Scottish schiltrons as circles with spikes and the English army in the boggy ground.
2. Write: “Robert the Bruce, King of Scots, Bannockburn, 1314.”

Did you know? After he struck down de Bohun, Bruce’s captains scolded him for taking such a risk. Bruce only said that he was sorry he had broken his good axe. The spider

story is a legend. It was first written down long after Bruce lived, but it is still a good lesson. A statue of Robert the Bruce on horseback stands on the battlefield today.

Goes deeper in. Geography, the British Isles: Scotland (coming soon).

For families. Sources: John Barbour's *The Brus* (c. 1375) for de Bohun, the broken axe, the Scots kneeling (and King Edward's remark that they knelt for mercy, "but not from us") and the "small folk" coming down the hill; modern histories (e.g., the National Trust for Scotland) for the ground. Numbers are uncertain: English perhaps 15,000–20,000 and Scots perhaps 6,000–9,000. De Bohun's death is told without detail. The spider story first appears much later (Sir Walter Scott popularized it) and is called a legend. The Declaration of Arbroath is 1320.

PRACTICE

1. **MEDIUM Choose your move.** You are Robert the Bruce. The English army is much bigger and has many knights on heavy horses. Will you (a) meet them on a wide, dry, open field, (b) fight near woods, streams and soft, boggy ground, or (c) wait inside Stirling Castle?
2. **EASY** What is a schiltrons?
3. **EASY** What did the Scots do just before the battle on the second day?

Make it a game • Hedgehog. A few players stand back to back in a tight circle holding pool noodles pointing out (the schiltrons). The other players try to tag someone in the middle without touching a noodle. Then let the circle walk slowly forward. Play gently.

Scripture. "Some trust in chariots, and some in horses: but we will remember the name of the LORD our God." (Psalm 20:7, KJV)

The English trusted in their great horses. The Scots knelt and prayed before the battle. Our trust belongs to the Lord.

Practice: answers

1. Bruce chose (b). The woods, streams and bog stopped the English knights from using their strength.
2. A tight ring or block of spearmen with spears pointing out, like a hedgehog.
3. They knelt to pray.

3.5 AGINCOURT (1415): MUD AND LONGBOWS

OBJECTIVES

- Find Agincourt on a map of northern France.
- Explain how mud, woods and longbows helped a small, tired army.
- Say the famous lines Shakespeare wrote for King Henry V.

Warm-up. Walk across a muddy yard in rain boots, or try to walk through a pile of pillows. Now imagine doing it in armor weighing as much as a big dog. That was the French knights' problem at Agincourt.

Video slot. Video coming. The Battle of Agincourt, 1415, for young viewers: the longbow, the mud and Henry V (no gore). Search approved history channels (Simple History, Kings and Generals, The History Guy), the Royal Armouries; preview first.

KEY TERMS

longbow

A tall bow, about as tall as a man, made of yew wood. English archers trained with it from boyhood.

men-at-arms

Soldiers in full armor who fought with swords, axes and lances.

stake

A pointed wooden pole pushed into the ground.

Saint Crispin's Day

October 25, the feast day of two early Christian brothers, Crispin and Crispinian.

CORE IDEAS

The map. In 1415, King Henry V of England crossed to France to claim lands he said belonged to him. He captured the port of Harfleur, but the siege took weeks, and many of his men grew sick. Henry decided to march his tired army north to the English town of Calais. On the way, a much larger French army blocked his road near the village of Agincourt.

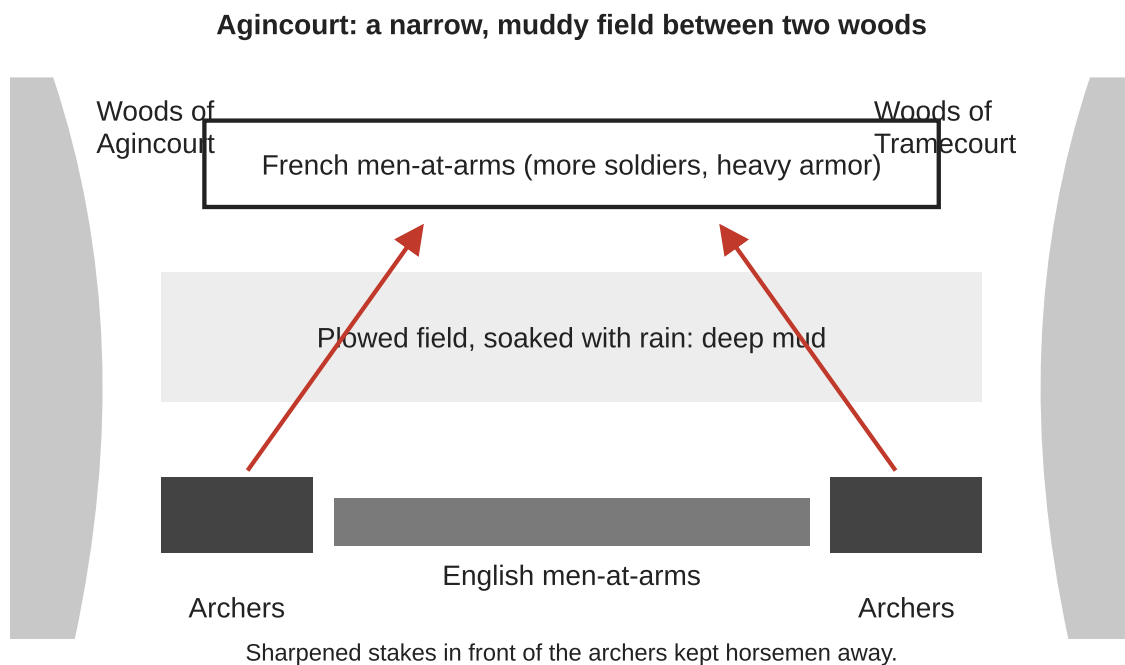
The people. Henry's army was small, perhaps six to nine thousand men, and most of them were **archers** with the English **longbow**. They were hungry and wet from days of marching in the rain. The French had many more men, including thousands of knights and **men-at-arms** in heavy armor. They were sure they would win.

The plan. Henry chose a narrow field between two woods, so the French could not spread out and go around him. The field had just been plowed, and a night of heavy rain had turned it to deep mud. Henry put his men-at-arms in the middle and his archers on the sides. Each

archer hammered a sharpened **stake** into the ground in front of him, pointing toward the enemy, so horsemen could not reach them.

What happened. On the morning of October 25, 1415, Saint Crispin's Day, Henry's archers moved forward and shot a great cloud of arrows. The French horsemen charged, but the stakes and the arrows turned them back. Then the French men-at-arms advanced on foot through the deep mud. Their heavy armor made them slow and tired, and the narrow field squeezed them together so tightly that many could hardly lift their arms. The English won a great victory. Thousands of French soldiers were killed or captured; the English lost only a few hundred.

Why it mattered. Agincourt made Henry V a hero in England, though the war with France went on for many more years. Almost two hundred years later, William Shakespeare wrote a play about Henry. In it, Henry tells his outnumbered men before the battle: "We few, we happy few, we band of brothers." People still say those words about friends who face hard things together.



Agincourt: woods on both sides, a muddy field in the middle, archers with stakes on the English flanks.

PICTURE STUDY



*The Battle of Agincourt, from a French manuscript, Unknown French illuminator, about 1470–1480 · Ink and paint on parchment · Bibliothèque nationale de France
Wikimedia Commons · Public domain*

This picture was painted in a French book of history some years after the battle. Look how the artist fills the whole picture with knights, lances and banners. The painter wanted to show how crowded and confused the battlefield was.

Look closely

- Find the archers. What are they holding?
- Look at the banners. How many colors can you find?
- Find the armor. Does it look heavy or light?

Talk about it

1. Why would it be hard to fight with so many people pressed close together?
2. How can you tell which side is which?

HANDS-ON: TABLETOP AGINCOURT: THE NARROW FIELD

Build the narrow field between the woods and see how mud and stakes helped the smaller army.

You will need

- A baking tray with damp sand or play dough spread thin (the muddy field)
- Broccoli or paper trees (the two woods)
- Toothpicks pushed into small lumps of clay (the stakes)

- Toy soldiers or blocks in two colors (more for the French)

Steps

1. Put the two woods on either side so the field is narrow in the middle.
2. Set the English at one end: men-at-arms in the middle, archers on both sides with stakes in front.
3. Set the French at the other end, many rows deep.
4. Push the French forward through the “mud.” What happens as the field gets narrower? Do they bunch up?
5. Look at the diagram. Point to where the archers stood.

Check your work

- My field is narrow, with woods on both sides.
- My archers have stakes in front of them.
- I can tell how the mud and the narrow field slowed the French.

FIELD NOTEBOOK

1. **Terrain map.** Copy the Agincourt diagram: the two woods, the muddy field, the English line with archers on the sides, and the French army. Add a key.
2. Write: “We few, we happy few, we band of brothers.” (Shakespeare, Henry V)

Did you know? English law once said that men should practice archery on Sundays and holidays. Archers trained so long that their bones changed shape. Old chronicles say that after the battle Henry had his chaplains sing a psalm, and every man knelt at the words “Not unto us, O LORD” (Psalm 115:1), to give the glory to God. A longbow arrow could fly more than 200 yards, about two football fields.

Goes deeper in. Geography, France; Literature, Shakespeare’s *Henry V* (Expert level) (coming soon).

For families. Numbers are debated: English perhaps 6,000–9,000; French estimates range widely (often 12,000–25,000 or more). Losses follow standard histories (Anne Curry; Juliet Barker): several thousand French dead and many captured; English dead in the hundreds. The psalm after the battle is reported in the Tudor chronicles of Hall (1542) and Holinshed (1587): the chaplains sang *In exitu Israel* (Vulgate Psalm 113, which includes KJV Psalm 115) and all knelt at “Non nobis, Domine,” followed by the *Te Deum*. The *Gesta Henrici Quinti* stresses giving the glory to God but does not name the psalm, so the stop says “old chronicles say.” Henry’s order to kill some prisoners during the battle is a real and grim part of the story; it is left to the Expert level. Shakespeare’s *Henry V* dates from about 1599.

PRACTICE

1. **MEDIUM Choose your move.** You are King Henry. Your army is small and tired; the French army is much bigger. Will you (a) fight on a wide open plain, (b) fight in a narrow field between two woods, with your archers protected by stakes, or (c) try to run past the French in the night?
2. **EASY** What weapon did most English soldiers at Agincourt carry?
3. **MEDIUM** How did the rain help the English?

Make it a game · Through the Mud. Lay pillows and cushions across the floor for “mud.” One team walks through it wearing heavy backpacks (armor); the other walks around it with nothing. Who is more tired at the end? Talk about the French men-at-arms.

Scripture. “Not unto us, O LORD, not unto us, but unto thy name give glory, for thy mercy, and for thy truth’s sake.” (Psalm 115:1, KJV)

The chronicles say Henry’s men knelt at these words after the battle. They gave the glory for their victory to God.

Practice: answers

1. Henry chose (b). The narrow field kept the French from going around him, and the mud and stakes slowed them down.
2. The longbow.
3. It turned the plowed field to deep mud, which slowed the heavily armored French.

3.6 ORLÉANS (1429): JOAN OF ARC

OBJECTIVES

- Find Orléans on the Loire River in France.
- Tell how Joan of Arc helped end the siege of Orléans.
- Name the virtues of courage and faith that Joan showed.

Warm-up. Think of a time you were the youngest person in a room of grown-ups. Was it hard to speak up? Joan of Arc was about seventeen when she went to talk to the future king of France.

Video slot. Video coming. Joan of Arc and the siege of Orléans, 1429, for young viewers (no gore). Search approved history channels (Simple History, The History Guy), Homeschool Pop (Alternate); preview first.

KEY TERMS

siege

When an army surrounds a town or castle to make it give up.

Dauphin

The title of the eldest son of the King of France, the prince who would be king (say “DOE-fan”).

banner

A flag carried in front of an army.

fort

A strong building made to defend a place.

CORE IDEAS

The map. By 1429, France and England had been at war on and off for more than ninety years. The English and their allies held much of northern France. Now they had besieged the city of Orléans, on the Loire River, building **forts** around it. If Orléans fell, the road to the rest of France would be open.

The people. In a small village in the east of France lived a farm girl named Joan. She could not read or write, but she loved God and prayed often. When she was about thirteen, she said that she heard the voices of saints telling her that God wanted her to help the **Dauphin** Charles save France and be crowned king. At about seventeen, she set out to find him.

The plan. Joan convinced a captain to take her to Charles. She told him that God had sent her, and after his churchmen had questioned her, Charles let her go with an army to help Orléans. Joan wore armor and carried a white **banner** painted with the names of Jesus and

Mary. She said she carried her banner instead of a sword so that she would never have to kill anyone.

What happened. Joan entered Orléans at the end of April 1429. The French soldiers had been discouraged, but Joan's courage gave them new heart. She urged the captains to attack the English forts one by one. At the strongest fort, called the Tourelles, she was wounded by an arrow. She had the wound cared for, then came back to the fight, and the fort was taken. On May 8, the English left their forts around Orléans. The siege was over after more than six months.

Why it mattered. Two months later, Joan stood beside Charles in the great cathedral at Reims as he was crowned King of France. The next year, Joan was captured by enemies and handed over to the English. A court of churchmen on the English side found her guilty, and she was put to death in 1431, when she was about nineteen. Twenty-five years later, another church court declared that she had been innocent. France remembers her as one of its greatest heroes.

PICTURE STUDY



Joan of Arc at the Coronation of King Charles VII, Jean-Auguste-Dominique Ingres, 1854 · Oil on canvas ·

Louvre Museum, Paris

Wikimedia Commons · Public domain

Jean-Auguste-Dominique Ingres, a great French painter, imagined Joan at the coronation of Charles in the cathedral of Reims, two months after Orléans. She stands by the altar in her armor with her banner, her helmet set down on the floor. Beside her a priest reads from a prayer book.

Look closely

- Find Joan's banner. What does she do with it?
- Find her helmet. Why might she have taken it off in church?
- Find the crown on the altar.

Talk about it

1. Why do you think Ingres painted Joan looking up?
2. Joan said she loved her banner even more than her sword. What does that tell you about her?

HANDS-ON: TABLETOP ORLÉANS: BREAK THE RING OF FORTS

Build the city on the river and its ring of English forts, then lift the siege one fort at a time.

You will need

- A strip of blue paper (the Loire River)
- A paper cup or box (the city of Orléans)
- Six small blocks or cups (the English forts)
- Toy soldiers in two colors
- A small paper banner on a toothpick

Steps

1. Lay the river across the table. Put Orléans on the north bank.
2. Set the English forts in a ring around the city, with one strong fort (the Tourelles) on the south bank at the bridge.
3. Put the French and Joan's banner inside the city.
4. Move the French out to take the forts one by one, ending with the Tourelles.
5. When the last fort falls, the siege is lifted!

Check your work

- My map shows the river, the city and the forts.
- I took the forts one by one.
- I can tell what a siege is.

FIELD NOTEBOOK

1. **Terrain map.** Draw the Loire River, the city of Orléans, the ring of English forts and the Tourelles at the bridge.
2. Draw Joan's white banner and write one word that describes her (brave, faithful, determined).

Did you know? Joan dictated a letter to the English commanders before the battle, asking them to go home in peace. The people of Orléans still hold a festival every May to remember the day the siege ended. Joan was only about seventeen years old at Orléans.

Goes deeper in. Geography, France: the Loire Valley (coming soon).

For families. Dates follow standard histories: Joan entered Orléans on April 29, 1429; the Tourelles fell on May 7, when she was wounded by an arrow; the English withdrew on May 8; Charles VII was crowned at Reims on July 17, 1429. Joan was captured in 1430 and executed at Rouen on May 30, 1431; the nullification trial ended in 1456, and she was canonized in 1920. Her statement about carrying the banner so as not to kill is from her trial testimony. Her “voices” are told as her own account, as the trial records give them; families can discuss them together.

PRACTICE

1. **MEDIUM Choose your move.** You are Joan at Orléans. The French captains want to wait inside the walls and hope the English go away. Will you (a) agree and wait, or (b) urge them to attack the English forts one by one?
2. **EASY** What did Joan carry instead of a sword?
3. **EASY** What happened to Charles two months after Orléans?

Make it a game • Lift the Siege. Set six cups in a ring around a “city” (a pillow). Players take turns rolling a soft ball to knock over the “forts,” one at a time. The last one is the Tourelles: you must knock it over to win.

Scripture. “Let no man despise thy youth; but be thou an example of the believers, in word, in conversation, in charity, in spirit, in faith, in purity.” (1 Timothy 4:12, KJV)

Paul told young Timothy not to let anyone look down on him for being young. Joan was young too, and she was brave and faithful.

Practice: answers

1. Joan chose (b). The French took the forts one by one, and the siege was lifted.
2. Her banner.
3. He was crowned King of France at Reims, with Joan beside him.

3.7 CONSTANTINOPLE (1453): WALLS AND CANNON

OBJECTIVES

- Find Constantinople (today's Istanbul) on a map, between Europe and Asia.
- Describe the great walls and the giant cannon.
- Tell how the Ottoman ships got around the chain in the harbor.

Warm-up. Build the tallest wall you can with blocks. Now roll a ball at it gently, then harder. What happens? For a thousand years, Constantinople's walls stopped every army. Then a new weapon came.

Video slot. Video coming. The fall of Constantinople, 1453, for young viewers: the Theodosian Walls, the great cannon and the ships moved over land (no gore). Search approved history channels (Kings and Generals, Simple History, The History Guy); preview first.

KEY TERMS

Constantinople

A great city on the water between Europe and Asia, the capital of the Eastern Roman (Byzantine) Empire. Today it is Istanbul, in Turkey.

Ottoman

The Turkish empire ruled by the family of Osman. Its ruler was called the sultan.

cannon

A large gun that fires heavy balls of stone or iron.

Golden Horn

The long harbor on one side of Constantinople.

CORE IDEAS

The map. Constantinople sat on a point of land with water on three sides: the Sea of Marmara, the Bosphorus and a long harbor called the **Golden Horn**. On the land side stood the mighty Theodosian Walls, built a thousand years earlier: a moat, then a wall, then a taller wall with great towers. For a thousand years, no enemy had broken through them.

The people. In 1453 the city was small and poor, all that was left of the old Eastern Roman Empire. Its emperor was Constantine XI. He had only about seven or eight thousand defenders. Outside the walls came the young **Ottoman** sultan, Mehmed II, only twenty-one years old, with a huge army, perhaps sixty thousand or more, and a powerful fleet.

The plan. Mehmed had a secret weapon: giant **cannons**. One, built by a cannon-maker named Orban, was so big that it took many oxen to pull it, and it fired stone balls weighing

more than half a ton. Day after day the cannons pounded the walls. And every night, the defenders worked to fill the holes with earth, wood and stones.

The ships over the hill. The defenders had stretched a great iron chain across the mouth of the Golden Horn, so enemy ships could not get in. So Mehmed did something amazing. His men built a road of greased logs over the hill behind the harbor, and in a single day they pulled about seventy ships over the land and slid them into the Golden Horn behind the chain! Now the city was threatened from that side too.

What happened and why it mattered. After fifty-three days, on May 29, 1453, the Ottoman army broke through. Emperor Constantine died fighting at the walls with his men. Mehmed made the city his capital, and the great church of Hagia Sophia was made into a mosque. The Eastern Roman Empire, which had lasted more than a thousand years, was gone. Many scholars fled west to Italy, carrying old Greek books with them, and helped spark a new age of learning in Europe.

PICTURE STUDY



The Theodosian Walls of Constantinople, Modern photograph, · Photograph · Istanbul, Turkey
Wikimedia Commons · CC BY-SA 4.0

This photograph shows part of the Theodosian Walls as they stand in Istanbul today. Look at the towers and the layers of wall. Imagine stone cannonballs crashing against them.

Look closely

- Find a tower. How tall do you think it is?
- Look for the lines of red brick between the stones.
- Can you see more than one wall?

Talk about it

1. Why do you think these walls stood for a thousand years?
2. How did cannons change the way people built walls?

HANDS-ON: TABLETOP CONSTANTINOPLE: SHIPS OVER THE HILL

Map the city and move the ships over the land.

You will need

- A large sheet of paper
- Blue paper (the water)
- Blocks (the walls)
- A piece of string or yarn (the chain)
- Paper boats
- Pencils or round sticks (the log road)
- A book (the hill)

Steps

1. Make the city on a point of land with water on three sides. Build the walls with blocks on the land side.
2. Lay the chain across the mouth of the Golden Horn.
3. Put the Ottoman ships outside the chain. Can they get in?
4. Put the book (the hill) beside the harbor and lay pencils across it like a road of logs. Roll a paper boat over the pencils into the Golden Horn.

Check your work

- My map shows the walls, the water and the chain.
- I rolled a ship over the log road.
- I can tell why the chain no longer protected the harbor.

FIELD NOTEBOOK

1. **Terrain map.** Draw Constantinople with water on three sides, the land walls, the chain across the Golden Horn and the log road over the hill.
2. Draw a cannon and write: "Orban's great cannon, 1453."

Did you know? Constantinople was named after the Roman emperor Constantine the Great, who made it his capital in the year 330. Some of the great Ottoman cannons still exist. One cast in 1464, the Dardanelles Gun, is in the Royal Armouries museum in England. Parts of the Theodosian Walls still stand in Istanbul today.

Goes deeper in. Geography, "Where Europe meets Asia: the Bosphorus" (coming soon).

For families. Numbers follow standard histories (e.g., Steven Runciman, *The Fall of Constantinople 1453*): about 7,000–8,000 defenders and perhaps 60,000–80,000 Ottoman troops (older sources give larger figures). The ships were moved overland on April 22 (about 70 ships); the city fell on May 29 after a 53-day siege. Constantine XI's death in the fighting is the generally accepted account, though details are uncertain. The sack of the city is not described at the Scout level. Mehmed and the Ottomans are described plainly and without caricature.

PRACTICE

1. **MEDIUM Choose your move.** You are Sultan Mehmed. A great chain blocks your ships from the harbor. Will you (a) try to break the chain with your ships, (b) give up on the harbor, or (c) carry your ships over the land on a road of logs?
2. **EASY** What is Constantinople called today?
3. **EASY** What new weapon helped break the great walls?

Make it a game • Wall Builders. One team builds a wall of blocks or cardboard boxes. The other team rolls soft balls at it for one minute (the cannons). Then the builders get one minute to fix it (the night repairs). Switch sides. Can the wall last three rounds?

Scripture. “Greater love hath no man than this, that a man lay down his life for his friends.” (John 15:13, KJV)

Emperor Constantine stayed with his people to the end. Jesus showed the greatest love of all when He laid down His life for us.

Practice: answers

1. Mehmed chose (c). About seventy ships were pulled over the hill into the Golden Horn behind the chain.
2. Istanbul.
3. Giant cannons.

3.8 LEPANTO (1571): THE GALLEYS

OBJECTIVES

- Find the Gulf of Patras and Lepanto on a map of Greece.
- Describe a galley and a galleass.
- Tell how the battle set thousands of captives free.

Warm-up. Sit on the floor in a line with your family, each holding a broom. Try to “row” all together. It is hard to keep the beat! A galley had hundreds of rowers who had to row as one.

Video slot. Video coming. The Battle of Lepanto, 1571, for young viewers: galleys, galleasses and Don John of Austria (no gore). Search approved history channels (Kings and Generals, Simple History, The History Guy); preview first.

KEY TERMS

galley

A long warship moved mostly by oars, with many rowers.

galleass

A big, heavy galley with many cannons on its sides (say “GAL-ee-ass”).

Holy League

A group of Christian states, led by Spain, Venice and the Pope, that joined together against the Ottoman fleet.

captive

A person who is held prisoner.

CORE IDEAS

The map. In the 1500s, the Ottoman Empire was the strongest power in the Mediterranean Sea. Its fleets attacked islands and coasts, and in 1571 its army captured the island of Cyprus from Venice. Many Christian countries were afraid that the Ottomans would control the whole sea. So Spain, Venice, the Pope and several smaller states joined together in the **Holy League** and built a great fleet.

The people. The leader of the Holy League fleet was Don John of Austria, a young prince only twenty-four years old, the half-brother of King Philip II of Spain. The Ottoman fleet was led by Ali Pasha, a brave and skilled admiral. On October 7, 1571, the two fleets met near the mouth of the Gulf of Patras, off the coast of Greece, near the town the Italians called Lepanto. More than four hundred warships took part.

The plan. Most of the ships were **galleys**, long ships rowed by many men. They fought by ramming and boarding each other. But the Venetians had brought six huge **galleasses**, with

many cannons along their sides. Don John placed them in front of his line like floating castles. As the Ottoman galleys rowed forward, the galleasses fired, breaking up the Ottoman line before the fleets met.

What happened. The fleets crashed together in a great, crowded battle on the water. Don John's flagship, the *Real*, fought Ali Pasha's flagship, the *Sultana*, ship against ship. After hours of fighting, the Holy League captured the Ottoman flagship, and Ali Pasha was killed. By evening the Holy League had won. Most of the Ottoman galleys were captured or sunk.

Why it mattered. Many of the rowers in the Ottoman galleys were Christian **captives**, chained to their oars. When the ships were captured, thousands of them were set free. Lepanto showed that the Ottoman fleet could be beaten, and all over Europe people gave thanks. One young Spanish soldier in the battle, Miguel de Cervantes, was wounded in his left hand. Years later he wrote the famous book *Don Quixote*.

PICTURE STUDY



The Battle of Lepanto, Paolo Veronese, about 1572 · Oil on canvas · Gallerie dell'Accademia, Venice
Wikimedia Commons · Public domain

Paolo Veronese was a great painter of Venice. He made this painting soon after the battle. The bottom half shows the galleys fighting in clouds of smoke. The top half shows saints, with the lion of Saint Mark, asking Mary for help, while an angel throws flaming arrows down toward the enemy fleet. The painter wanted to show that the people of Venice believed God had helped them win.

Look closely

- Find the two halves of the painting. What is happening in each?
- Find the oars sticking out of the galleys.

- Find the light. Where does it come from?

Talk about it

1. Why do you think Veronese painted heaven above the battle?
2. How does this painting show what people believed about prayer?

HANDS-ON: TABLETOP LEPANTO: GALLEYS AND GALLEASSES

Make a paper fleet and see how the galleasses broke up the enemy line.

You will need

- Paper or craft sticks for galleys (about 10 for each side)
- Two colors of paper or markers
- Six larger boxes or blocks (the galleasses)
- A blue towel or sheet (the sea)
- Cotton balls (the smoke)

Steps

1. Make long thin galleys with toothpick oars along each side. Color one fleet for the Holy League and one for the Ottomans.
2. Line up the two fleets facing each other in long lines on the blue towel.
3. Put the six galleasses in front of the Holy League line, in pairs.
4. Move the Ottoman galleys forward. As they pass the galleasses, put cotton-ball “smoke” beside them and push some galleys out of line.
5. Now the two lines meet. Is the Ottoman line still straight?

Check your work

- I made two fleets of galleys.
- I placed the galleasses in front.
- I can tell how the galleasses broke the Ottoman line.

FIELD NOTEBOOK

1. **Terrain map.** Draw the coast of Greece, the Gulf of Patras and the two fleets in long lines, with the six galleasses in front of the Holy League. Label Lepanto.
2. Draw a galley with oars and write the name Don John of Austria.

Did you know? Lepanto was one of the last great battles fought mostly between galleys rowed by oars. All across Christian Europe, people had been praying for the fleet. October 7 is still remembered in many churches. The Ottomans quickly rebuilt their fleet, but they never again ruled the whole sea as before.

Goes deeper in. Geography, “The Mediterranean Sea” and Literature, Cervantes (Expert level) (coming soon).

For families. Sources: standard naval histories (e.g., Roger Crowley, *Empires of the Sea*; Jack Beeching, *The Galleys at Lepanto*). Approximate numbers: Holy League about 206 galleys and 6 galleasses; Ottoman about 220–230 galleys and some 50 smaller galliots. Freed captives are usually given as about 12,000–15,000. Losses were very heavy on both sides; the stop does not describe them. Rowers on the Holy League side included convicts and slaves too; the Expert level says so. Pope Pius V’s call to prayer and the later feast of Our Lady of the Rosary (October 7) are Catholic traditions; the stop simply notes that Christians prayed. Veronese’s painting is dated about 1572.

PRACTICE

1. **MEDIUM Choose your move.** You are Don John. You have six big, slow galleasses full of cannons. Will you (a) keep them safely behind your fleet, (b) put them in front of your line to fire on the enemy before the fleets meet, or (c) send them home because they are too slow?
2. **EASY** What is a galley?
3. **MEDIUM** Who was set free when the Ottoman galleys were captured?

Make it a game • Row Together. Two teams sit in lines on the floor, one behind another, each holding a pool noodle or broom “oar.” A “drummer” beats a slow rhythm, and everyone must row together. The leader speeds up the beat. Which team stays together longest?

Scripture. “They that go down to the sea in ships, that do business in great waters; These see the works of the LORD, and his wonders in the deep.” (Psalm 107:23-24, KJV)

Sailors and rowers at Lepanto saw the power of the sea. The Psalm reminds us that the sea and everything in it belong to God.

Practice: answers

1. Don John chose (b). The galleasses fired first and broke up the Ottoman line.
2. A long warship rowed by many oars.
3. Thousands of Christian captives who had been chained to the oars.

TRACK 3 BADGE QUIZZES

The badge quizzes are optional. Read each question aloud; the child may answer by talking, pointing or drawing. Four right out of five earns the first badge; three right out of four earns the second. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops B1–B5)

1. What was Charles Martel's nickname, and what does it mean?
2. What long cloth tells the story of the Battle of Hastings in pictures?
3. What did the Crusaders run out of on the march to Hattin?
4. What did the Scots stand in at Bannockburn, like giant hedgehogs?
5. Name two things that helped the English win at Agincourt.

Badge quiz 2 (Stops B6–B8)

6. Which city did Joan of Arc help to free in 1429?
7. How did Mehmed's ships get past the chain at Constantinople?
8. What were the big gun ships at Lepanto called?
9. Who was set free after Lepanto?

TRAIL CERTIFICATE: MY BATTLE MAP BOOK AND TRAIL B CERTIFICATE

Gather the terrain maps from this trail into one booklet: "My Battle Map Book: The Middle Ages," with your name and dates. Add a timeline page with all eight battles in order, from Tours (732) to Lepanto (1571).

Pick one person from the trail (Charles Martel, Robert the Bruce, Henry V, Joan of Arc, Constantine XI or Don John) and write or tell one sentence about a virtue they showed: courage, patience, faith, loyalty or wisdom.

When the booklet is done, a parent signs the Trail B certificate.

- **Eight maps:** A labeled terrain map for each battle, with a title and a date.
- **Timeline:** The battles are placed in the right order.
- **Virtue:** One person's virtue is named and explained.
- **Care:** Maps are neat and labeled.

Answer key

1. "Martel," the Hammer.
2. The Bayeux Tapestry.
3. Water.
4. Schiltrons (rings of spearmen).
5. Any two: longbows, mud, the narrow field between woods, sharpened stakes.
6. Orléans.
7. They were pulled over the land on a road of greased logs.
8. Galleasses.

9. Thousands of Christian captives who had been rowing the Ottoman galleys.