

SCHOOL LAUNCH · EXPLORE TRACKS

EXPLORE TRACKS · TRAIL F

The sixth trail of the Animals track for curious Scouts: animals doing amazing things. Ten short, self-paced stops with true stories, great pictures, hands-on projects and games.

First edition

*And out of the ground the LORD God formed every beast of the field, and every fowl of the air; and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof.
Genesis 2:19 (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 F is the sixth trail of the Animals track at the  Scout level (ages 7–9). Instead of one kind of animal, it looks at what animals can do: bats that find their way by sound, creatures that hide in plain sight, sleepers that wait out the winter, beavers and weaver birds that build, animal partners, the sea otter and its rock, and long journeys over land and sea. The child meets the sled dogs who carried medicine to Nome, Alaska, in 1925, sees how engineers copy designs found in animals, and ends in Genesis 2, where Adam names the animals. Each stop links to the full lesson in Life Science, Gardening & Animals, Geography or History. Earlier trails are 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 stops stand alone. Follow the trail from F1 to F10, or start with whatever the child is curious about today.
3. **Field Notebook.** Every stop ends with a page for the notebook. After five stops the child earns a badge; at the end of the trail the pages become a booklet, and the parent signs the Trail F certificate.
4. **Badge quizzes.** The trail has two short, optional oral quizzes, one after each five stops. They are for fun, not grades.

SCOPE AND SEQUENCE

Track 1: Animals  **Trail F: Animals Doing Amazing Things** (Self-paced)

MATERIALS

- **Field Notebook (a sketchbook or composition book)** One for the whole trail.
- **Colored pencils, a ruler, scissors and glue** For drawings, maps and trading cards.
- **Household things** Each hands-on project lists what it needs: sticks, string, paper cups, a blindfold, rocks, clay, a shoebox.
- **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 F 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 scientists still discuss, such as exactly how far some animals travel or how certain partners help each other.

This trail presents the abilities of animals as the handiwork of their Creator, who made each creature “after his kind.” The stop on designs copied by engineers shows how people learn from what God has made. Animal numbers (speeds, distances, sleeping times) are given as careful estimates, and the *For families* note says when sources differ.

Watching real animals is part of the fun. Some hands-on parts go outdoors; their safety lines remind children to watch wild animals from a distance, never to touch or feed them, and to wash hands after handling nests, feathers or soil.

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

ANIMALS TRAIL F: ANIMALS DOING AMAZING THINGS

The sixth trail of the Animals track looks at the amazing things God made animals able to do: bats and dolphins that “see” with sound, hares that change their coats, groundhogs that sleep all winter, beavers and weaver birds that build, partners like the oxpecker and the rhinoceros, the sea otter and its rock, the godwit’s eleven-day flight, the sled dogs of the 1925 serum run to Nome, inventions copied from animals, and Adam naming the animals in Genesis 2. Each stop is a short read-aloud story, a picture to study, something to make, 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, so a family may do them in any order. The  **Ranger** and  **Expert** levels of these same stops will add maps, numbers and primary sources later.

Five stops earn the **Amazing Animals badge, part 1**, and ten stops earn part 2 and the **Trail F 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.
- Find Alaska, Africa and the Pacific Ocean on a globe (a grown-up may help).

MASTERY CHECKLIST

- ☐ I can tell how a bat uses echoes to find food in the dark.
- ☐ I can tell one way an animal hides, one way an animal gets through winter and one thing an animal builds.
- ☐ I can tell how two animal partners help each other and how a sea otter uses a tool.
- ☐ I can tell the story of the Nome serum run and name Togo and Balto.
- ☐ I can name an invention copied from an animal or plant and tell what Adam did in Genesis 2:19.

OPTIONAL BOOKS AND RESOURCES

- **Smithsonian’s National Zoo and Conservation Biology Institute** (<https://nationalzoo.si.edu>): Free animal pages with photos and live animal cameras; good for bats, beavers and many others on this trail.
- **Biodiversity Heritage Library** (<https://www.biodiversitylibrary.org>): Free old books with animal plates, including Lewis Henry Morgan’s *The American Beaver and His Works* (1868) for Stop F4 and Audubon’s animal plates.
- **Iditarod Trail Committee** (<https://iditarod.com>): Maps, photos and the story of the serum run trail for Stop F8.

- **Your public library** (<https://www.worldcat.org>): Search for picture books on hibernation, animal builders, migration and the Nome serum run to borrow and read aloud.

1.1 ECHOLOCATION: SEEING WITH SOUND

OBJECTIVES

- Tell how a bat finds a moth in the dark by listening to echoes.
- Name two animals that use echolocation: bats and dolphins.
- Say Psalm 94:9 and tell who made ears.

Warm-up. Stand facing a wall in a big, quiet room and clap once. Now stand in the middle of a soft, cozy bedroom and clap again. Did the claps sound different? Sound bounces off hard things and comes back. That bounce is called an echo.

Video slot. Video coming. How bats and dolphins use echolocation to find food in the dark. Search approved channels (Smithsonian's National Zoo, National Park Service, PBS Nature, BBC Earth, National Geographic Kids); preview first.

KEY TERMS

echo

A sound that bounces off something and comes back to you.

echolocation

Finding things by making sounds and listening for their echoes.

bat

A furry animal with wings made of skin stretched over long finger bones. Bats are the only animals with fur that can truly fly.

nocturnal

Awake and busy at night and asleep in the day.

CORE IDEAS

The story. The sun has set over a quiet pond. A little brown bat drops from a crack in an old barn and flutters out over the water. It is too dark to see, but the bat is shouting the whole time: tiny squeaks, over and over, too high for your ears to hear. Suddenly it swoops, twists and snaps up a moth in midair. How did it know where the moth was?

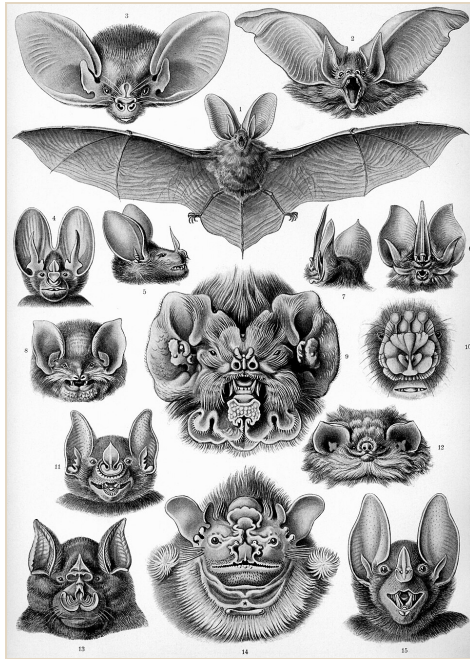
Listening for echoes. Each squeak flies out from the bat's mouth or nose and bounces off whatever is ahead: a tree, a wall, a moth. The bounce comes back as an **echo**. The bat's big ears catch the echo. A quick echo means "something close!" A slow echo means "something far away." This way of finding things is called **echolocation**. It is like seeing with sound.

Faster and faster. When a bat closes in on a bug, it squeaks faster and faster, until the squeaks run together like a buzz. Then it scoops up the bug, sometimes with its wing or the skin between its back legs, and eats it on the wing. A bat can do this again and again all night long, catching many small insects in a single hour.

Clicks under the sea. Dolphins use echolocation too. A dolphin makes fast clicks in its head. A rounded, fatty bump on its forehead, called the melon, sends the clicks out into the water. The echoes come back through its lower jaw to its ears. With clicks a dolphin can find a fish hiding under the sand, even in muddy water.

The One who made the ear. For a long time no one knew how bats flew in the dark. In the 1930s, scientists with a special microphone finally heard the bats' high squeaks. But God knew all along, because He made the bat. The psalm says, "He that planted the ear, shall he not hear?" The God who made such clever ears hears every one of our prayers.

PICTURE STUDY



Chiroptera (Bats), Plate 67 of Art Forms in Nature, Ernst Haeckel, 1904 · Color lithograph (printed picture) from the artist's drawings · From the book Kunstformen der Natur (Art Forms in Nature) Wikimedia Commons · Public domain

Ernst Haeckel was a German scientist who loved to draw. In this page he lined up the faces of many kinds of bats, like a family photo. Look at their ears and noses: those are the parts bats use for echolocation.

Look closely

- Find the bat with the biggest ears. Find one with a leaf-shaped flap on its nose.
- Count how many bat faces you can see.
- Look at the middle of the page. How is the picture arranged?

Talk about it

1. Why do you think so many bats have such big ears?
2. Which bat face do you like best, and why?

HANDS-ON: ECHO CATCH

Use a ball to see how an echo works: the sound goes out, bounces and comes back.

You will need

- A soft rubber ball
- A wall with space in front of it (outdoors or a garage)
- A blindfold or scarf

Steps

1. Stand close to the wall and bounce the ball off it. Count how fast it comes back. Then step far back and try again. Which came back faster?
2. Say to yourself: the close wall is like a close moth. The far wall is like a far tree.
3. Now play bat. Put on the blindfold and stand in an open, safe spot. A grown-up stands somewhere near you. You call out "Squeak!" and the grown-up answers "Echo!" Point to where the echo came from.
4. Try it from three different places. How many times did you point the right way?

Check your work

- I bounced the ball from close and far.
- I found the "echo" with my ears at least once.
- I can tell what an echo is.

FIELD NOTEBOOK

1. Draw a bat flying at night. Draw curved lines coming out of its mouth (the squeaks) and curved lines bouncing back from a moth (the echoes).
2. Copy Psalm 94:9 in your best handwriting.

Did you know? Not all bats use echolocation. Many big fruit bats, called flying foxes, find their food mostly with their large eyes and good noses. A few birds use echoes too: the oilbird of South America makes clicking sounds to find its way in the dark caves where it nests, and people can hear those clicks.

Goes deeper in. Life Science, the animals and senses units (coming soon); and Trail A, Stop A4 "Bats," and Trail D, Stop D5 "Dolphins."

For families. In the 1790s Lazzaro Spallanzani and Louis Jurine showed that bats needed their hearing, not their sight, to avoid obstacles in the dark. In 1938 Donald Griffin and George W. Pierce recorded bat calls with an ultrasonic microphone at Harvard, and Griffin coined the word "echolocation" in 1944. Insect-catch rates for bats vary widely by species and night; the stop says "many" rather than repeat a single number. The oilbird's clicks are audible to people; most bat calls are ultrasonic.

PRACTICE

1. **EASY** What is an echo?
2. **MEDIUM** How does a bat find a moth in the dark?
3. **EASY** Name an animal in the sea that uses echolocation.

Make it a game • Bat and Moth. Play in a clear, safe space. One player is the bat and wears a blindfold. The others are moths. The bat calls “Bat!” and every moth must answer “Moth!” right away. The bat follows the sounds and tries to gently tag a moth. A tagged moth becomes the next bat. Moths may walk, not run.

Scripture. “He that planted the ear, shall he not hear? he that formed the eye, shall he not see?” (Psalm 94:9, KJV)

God made the bat’s wonderful ears. The One who made every ear hears us too, even in the dark.

Practice: answers

1. A sound that bounces off something and comes back.
2. It squeaks and listens for the echo that bounces back off the moth.
3. The dolphin (also whales such as orcas and sperm whales).

1.2 CAMOUFLAGE: NOW YOU SEE ME

OBJECTIVES

- Tell what camouflage is and how it helps an animal.
- Tell how the snowshoe hare changes its coat for winter.
- Find a hidden animal in a picture and tell what made it hard to see.

Warm-up. Lay a green leaf on the grass and a green leaf on a white sheet of paper. Step back three big steps. Which leaf is easier to see? An animal that matches what is around it is hard to find.

Video slot. Video coming. Animal camouflage for children: snowshoe hares, stick insects, flounders and owls that blend in. Search approved channels (PBS Nature, BBC Earth, Smithsonian's National Zoo, National Park Service); preview first.

KEY TERMS

camouflage

Colors, patterns or shapes that help an animal blend in with what is around it.

predator

An animal that hunts other animals for food.

prey

An animal that is hunted by other animals.

molt

To lose old fur, feathers or skin and grow new ones.

CORE IDEAS

The story. In the summer woods of northern Canada, a snowshoe hare sits very still beside a fallen log. Its fur is brown, just like the dead leaves and the bark. A hungry lynx walks right past and never sees it. The hare does not run. It does not even twitch its nose. Being hard to see is how it stays safe.

A new coat for winter. When fall comes and the days grow short, something wonderful happens. The hare begins to **molt**. Its brown fur falls out, and new white fur grows in its place. By the time the snow comes, the hare is white from its ears to its big furry feet. In spring it turns brown again. God gave it two coats, one for each season.

Hiding in plain sight. Matching is called **camouflage**. Many animals use it. A walking stick insect looks like a twig. A flounder lies flat on the sea floor and looks like sand. A screech owl sits by a tree trunk, and its gray, streaky feathers look like bark. Some of these animals are **prey**, hiding from hunters. Others are **predators**, hiding so they can sneak up on their food.

Dark on top, light below. Look at a penguin or a shark. Its back is dark and its belly is light. From above, its dark back matches the deep water. From below, its light belly matches the bright sky. A painter named Abbott Thayer noticed this more than a hundred years ago and wrote about it. It helps many animals hide from both sides.

Kept safe. Camouflage is one of the ways God cares for small, quiet creatures that cannot fight or run very far. The Bible calls God our “hiding place.” Like the hare tucked beside the log, we can be still and trust Him to keep us.

PICTURE STUDY



Young Hare, Albrecht Dürer, 1502 · Watercolor and gouache (thick, chalky paint) on paper · Albertina Museum, Vienna, Austria
Wikimedia Commons · Public domain

Albrecht Dürer was a German artist who lived more than five hundred years ago. He painted this hare so carefully that you can almost count the hairs. This kind of hare stays brown all year, the color of a plowed field or dry grass.

Look closely

- Find the whiskers and the long ears. Which way are the ears pointing?
- Look at the fur. How many colors can you find in it: brown, gold, gray, white?
- Look closely at the hare’s eye. Some people say they can see a window reflected in it. Can you?

Talk about it

1. If this hare sat in a brown field, would a fox see it easily? Why or why not?
2. Why do you think Dürer painted the hare on a plain background instead of in a field?

HANDS-ON: HIDE THE MOTHS

Make paper moths and camouflage them so well that your family cannot find them.

You will need

- Paper
- Crayons or colored pencils
- Scissors (with a grown-up)
- Tape or sticky putty

Steps

1. Cut out five small moth shapes, about as big as your thumb.
2. Walk around the room and pick five hiding places: a bookshelf, a rug, a curtain, a plant, a chair.
3. Color each moth to match its hiding place. Copy the colors and patterns as closely as you can.
4. Tape each moth to its spot, out in the open but matching. Give your family two minutes to find them. Which moth was found last? Why?

Check your work

- I made five moths, each colored to match a different spot.
- I hid them in plain sight, not under or behind things.
- I can tell which moth was hardest to find and why.

FIELD NOTEBOOK

1. Draw a snowshoe hare twice: once brown beside a log in summer and once white in the snow in winter. Label “summer coat” and “winter coat.”
2. Draw a fish that is dark on top and light below, and write “dark on top, light below.”

Did you know? The snowshoe hare gets its name from its huge back feet, which spread out like snowshoes so it can run on top of deep snow. Its coat change follows the length of the days, not the snow. The ptarmigan, a bird of the far north, also turns white in winter, even on its feet.

Goes deeper in. Life Science, the animals unit, “How animals stay safe” (coming soon); and Art, for Dürer and drawing from nature.

For families. Dürer’s *Young Hare* (1502) is in the Albertina, Vienna; because it is light-sensitive it is rarely shown, and a copy is usually on display instead. The “window in the eye” is a common observation about the painting. Abbott Handerson Thayer (1849–1921) described countershading in the 1890s and published *Concealing-Coloration in the*

Animal Kingdom (1909) with his son Gerald. Snowshoe hare molts are triggered by day length (photoperiod). Chameleons have their own stop (Trail C, C5).

PRACTICE

1. **EASY** What is camouflage?
2. **MEDIUM** What color is a snowshoe hare in summer, and what color in winter?
3. **MEDIUM** Why is a shark dark on top and light below?

Make it a game • Freeze, Hare!. One player is the fox and turns around, eyes closed, counting to ten. The others are hares and find a spot to crouch near something their clothes match. When the fox opens its eyes, the hares must freeze. Any hare the fox sees moving is caught. The last hare not caught is the next fox.

Scripture. “Thou art my hiding place; thou shalt preserve me from trouble; thou shalt compass me about with songs of deliverance. Selah.” (Psalm 32:7, KJV)

God gave the hare a coat to hide in. He is our hiding place, and He keeps us safe.

Practice: answers

1. Colors, patterns or shapes that help an animal blend in with what is around it.
2. Brown in summer and white in winter.
3. From above, its dark back matches the deep water; from below, its light belly matches the bright sky.

1.3 HIBERNATION: THE LONG WINTER SLEEP

OBJECTIVES

- Tell what hibernation is and why some animals do it.
- Tell how a groundhog gets ready for winter and what happens to its body.
- Name one animal that hibernates and one that stays awake all winter.

Warm-up. Put your hand on your chest and count your heartbeats while a grown-up watches the clock for 15 seconds. A groundhog's heart beats about as fast as yours in summer. In its winter sleep, it beats only about once every ten or twelve seconds!

Video slot. Video coming. Hibernation for children: groundhogs, bears and bats in winter. Search approved channels (National Park Service, U.S. Fish and Wildlife Service, PBS Nature, Smithsonian's National Zoo); preview first.

KEY TERMS

hibernate

To go into a long, deep winter sleep, when the body cools and slows way down.

burrow

A hole or tunnel in the ground that an animal digs to live in.

fat

Stored food in the body that an animal can live on when it cannot eat.

den

A safe, hidden home where a wild animal rests or sleeps.

CORE IDEAS

The story. All summer long, a groundhog in a Pennsylvania meadow eats and eats: clover, grass, dandelions and the farmer's beans. By fall it is round and fat. One cool day in October it waddles down into its **burrow**, deep under the ground where the frost cannot reach. It pulls dirt across the tunnel behind it, curls into a furry ball and goes to sleep. It will not come out again until the end of winter.

A very deep sleep. This is **hibernation**. It is much deeper than your sleep at night. The groundhog's body cools down until it is almost as cold as a refrigerator. Its heart beats only about five times a minute, and it breathes only now and then. If you picked it up, it would not wake. Its body burns its stored **fat** very slowly, like a candle that burns all winter.

Why sleep all winter? In winter, the plants a groundhog eats are buried in snow. There is almost nothing to eat. Staying awake and warm takes lots of food. So God gave the groundhog a way to "turn down" its body and wait. Some bats hibernate in caves. Chipmunks hibernate, waking now and then to nibble from their store of seeds.

Bears and the others. Black bears sleep in a **den** all winter and do not eat or drink for months, but they do not cool down as much as a groundhog, and they can wake up quickly. Mother bears even have their tiny cubs in the den! Many animals do not hibernate at all. Deer, foxes, rabbits and chickadees stay awake and find food all winter.

A time for everything. When spring comes, the groundhog wakes up thin and hungry and crawls out into the sunshine. God made the seasons: summer for eating and growing, winter for resting and waiting. The Bible says, "To every thing there is a season."

PICTURE STUDY



The Fox Hunt, Winslow Homer, 1893 · Oil on canvas · Pennsylvania Academy of the Fine Arts, Philadelphia
Wikimedia Commons · Public domain

Winslow Homer was an American painter who lived by the sea in Maine. In this big painting, a fox is out in the deep winter snow. The fox does not hibernate. It must keep hunting all winter, and so must the hungry crows.

Look closely

- Find the fox. How deep is the snow on its legs?
- Count the crows. What are they doing?
- Find the red berries. Why might they be important to animals in winter?

Talk about it

1. How would this winter day be different for a groundhog asleep in its burrow?
2. How does Homer make the snow look cold and deep?

HANDS-ON: A BURROW IN A BOX

Make a cutaway model of a groundhog's winter burrow, so you can see under the ground.

You will need

- A shoebox, set on its long side
- Brown and white paper, or crayons
- Cotton balls (snow)
- Clay or playdough (the groundhog)
- Glue and scissors (with a grown-up)

Steps

1. Color or glue brown paper on the inside of the box. This is the dirt. Glue cotton balls along the top edge for the snow.
2. Draw a tunnel going down and sideways through the dirt, with a round room at the end.
3. Make a groundhog out of clay, curled into a tight ball, and put it in the room. Add a little dried grass for its bed if you have some.
4. Show a grown-up and tell them three things that happen to the groundhog's body while it hibernates.

Check your work

- My burrow is below the snow, where the frost cannot reach.
- My groundhog is curled up in a ball.
- I told three things about hibernation.

FIELD NOTEBOOK

1. Draw a line across your page for the ground. Above it, draw winter snow and a deer finding food. Below it, draw a groundhog asleep in its burrow. Label "awake" and "hibernating."
2. Copy Ecclesiastes 3:1.

Did you know? The common poorwill, a bird of the American West, is the only bird known to go into a long hibernation-like sleep. In 1946 a scientist named Edmund Jaeger found one sleeping in a crack in a rock in California, cold and still, and it came back to the same spot for several winters. And every February 2, on Groundhog Day, people in Punxsutawney, Pennsylvania, watch a groundhog to see if it sees its shadow. That is a fun old custom, not a real weather forecast!

Goes deeper in. Life Science, the animals unit, "Animals in winter" (coming soon); and Earth Science, for the seasons; and Trail A, Stop A7 "Bears."

For families. Woodchuck (groundhog) heart rates fall from roughly 80 beats a minute to about 4–10 in deep hibernation, and body temperature falls from about 99°F to around 40°F; sources vary slightly. Scientists debate whether bears are “true” hibernators: their body temperature drops only several degrees, but they go months without eating, drinking or passing waste. Jaeger’s poorwill observations were published in *The Condor* (1948–1949). Homer’s *The Fox Hunt* was painted at Prouts Neck, Maine; hungry crows sometimes harry a fox in a hard winter. The picture is not graphic, but some children may want to talk about winter hunger.

PRACTICE

1. **EASY** What does it mean to hibernate?
2. **MEDIUM** Why does a groundhog eat so much in summer and fall?
3. **EASY** Name an animal that stays awake all winter.

Make it a game • Groundhog, Wake Up!. Everyone curls up on the floor like a hibernating groundhog, breathing slowly and staying perfectly still. The leader walks around calling out seasons: “Fall!” “Winter!” “Still winter!” Anyone who moves before the leader calls “Spring!” is out. On “Spring!” everyone pops up and stretches.

Scripture. “To every thing there is a season, and a time to every purpose under the heaven:” (Ecclesiastes 3:1, KJV)

God made a season for the groundhog to eat and a season for it to sleep. He gives us times to work and times to rest too.

Practice: answers

1. To go into a long, deep winter sleep, when the body cools and slows way down.
2. To store fat that its body lives on all winter while it sleeps.
3. Any one: deer, fox, rabbit, chickadee, squirrel (gray), owl.

1.4 ANIMAL BUILDERS: BEAVERS AND WEAVER BIRDS

OBJECTIVES

- Tell how a beaver builds a dam and a lodge.
- Tell how a weaver bird weaves its nest out of grass.
- Say Psalm 127:1 and tell who must build the house.

Warm-up. Take three long pieces of yarn or grass and try to braid or tie them together using only one hand and your mouth. (Just pretend with your mouth!) Hard, isn't it? A weaver bird ties knots with only its beak and feet.

Video slot. Video coming. How beavers build dams and lodges; weaver birds weaving nests. Search approved channels (PBS Nature, BBC Earth, National Park Service, U.S. Fish and Wildlife Service, Smithsonian's National Zoo); preview first.

KEY TERMS

dam

A wall built across a stream to hold back the water and make a pond.

lodge

A beaver's home: a dome of sticks and mud in the pond, with doors under the water.

weave

To make something by passing strands over and under each other.

gnaw

To bite and chew on something hard again and again.

CORE IDEAS

The story. Night falls on a little stream in the north woods. A beaver swims to the bank, stands up on its back feet and begins to **gnaw** a young aspen tree. Chip, chip, chip. Its big orange front teeth cut a ring around the trunk until the tree tips over with a crash. The beaver cuts the tree into pieces and drags the branches down to the water.

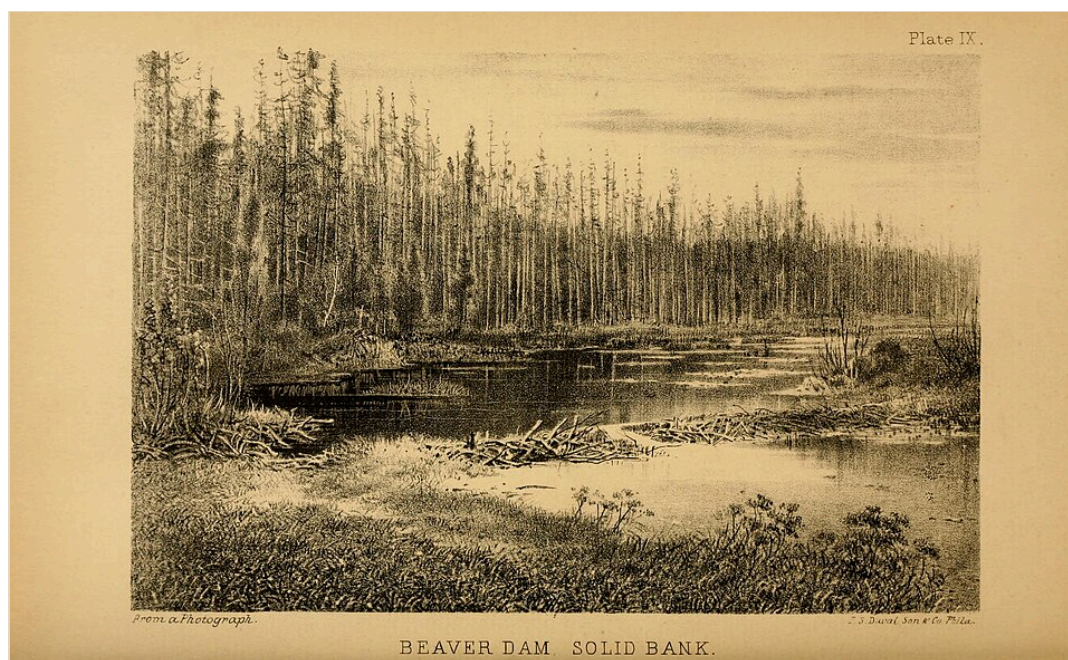
A wall of sticks. The beaver pushes sticks into the stream bed and piles on more sticks, stones and mud, which it carries in its front paws. Night after night the wall grows. This is a **dam**. It holds back the stream, and a pond spreads out behind it. When the beaver hears water trickling through a leak, it hurries to patch it with mud.

A house with an underwater door. In the middle of the pond the beavers build their **lodge**, a dome of sticks plastered with mud. The doors are under the water, so wolves and coyotes cannot get in. Inside, above the water, is a dry room where the beaver family sleeps. In winter the mud freezes as hard as stone, and the beavers stay snug inside.

The weaver bird. Far away in Africa, a little yellow weaver bird builds a different kind of home. He tears long strips from grass and palm leaves. Holding one end with his feet, he pokes the strip in and out with his beak and even ties real knots. Bit by bit he **weaves** a round, hanging nest with a door at the bottom, so snakes have a hard time getting in. If the mother bird does not like his nest, he may pull it apart and build it again!

Who taught them? No one gives a young beaver building lessons out of a book, and a young weaver bird never went to weaving school. God made them able to build. People are builders too. The Bible reminds us, “Except the LORD build the house, they labour in vain that build it.” Whatever we build, we need God’s help.

PICTURE STUDY



*A beaver dam, plate from The American Beaver and His Works, Lewis Henry Morgan (author); the plates were drawn and printed for his book, 1868 · Printed plate (lithograph) in a book · From Morgan’s book; free to view at the Biodiversity Heritage Library
Wikimedia Commons · Public domain*

Lewis Henry Morgan worked for a railroad in the woods of northern Michigan in the 1860s. He became so curious about beavers that he spent years walking the streams, measuring their dams and drawing maps. He found and studied more than sixty beaver dams near the town of Ishpeming. His book was filled with pictures like this one.

Look closely

- Find the dam. Which side is the pond, and which side is the stream running away?
- Look at the sticks. Are they neat or tangled?
- Find something in the picture that shows how big the dam is.

Talk about it

1. Why do you think Morgan drew the dams instead of just writing about them?
2. What would you want to measure if you found a beaver dam?

Safety first. Building with water and mud is best done outdoors or in a large pan on a towel. Stay with a grown-up near any real stream or pond.

HANDS-ON: BUILD A BEAVER DAM

Build a little dam in a pan and see if you can make a pond like a beaver.

You will need

- A long baking pan or a plastic tub
- Sand or dirt
- Small sticks and twigs
- Pebbles
- Mud (dirt mixed with a little water)
- A cup of water

Steps

1. Fill the pan with sand and dig a little stream bed down the middle, from one end to the other.
2. Tip the pan a little by putting a book under one end. Pour water at the high end and watch it run down.
3. Now build a dam across the middle: push sticks in first, then add pebbles, then pack mud into the gaps.
4. Pour water again. Does a pond form behind your dam? Find a leak and patch it with mud, just like a beaver.

Check your work

- My dam has sticks, stones and mud.
- My dam held back water and made a little pond.
- I found a leak and patched it.

FIELD NOTEBOOK

1. Draw a beaver pond from the side, cut open like a cake: the dam, the pond, the lodge, the underwater door and the beavers in their dry room.
2. Draw a weaver bird's hanging nest with the door at the bottom.

Did you know? A beaver's front teeth are orange because they have iron in them, which makes them strong. They never stop growing, so all that gnawing keeps them from getting too long. One of the longest beaver dams ever found is in Wood Buffalo National

Park in Canada. It is about half a mile long and was first spotted in pictures taken from space.

Goes deeper in. Life Science, the animals unit (coming soon); Gardening & Animals, for ponds and wildlife; and Trail B, Stop B8 “Nests.”

For families. Lewis Henry Morgan (1818–1881) published *The American Beaver and His Works* in 1868 after studying beavers near Ishpeming in Michigan’s Upper Peninsula, where he was a director of a railroad; his map showed 64 dams. The book is free at the Biodiversity Heritage Library; choose any dam plate for the picture study. The Wood Buffalo dam (about 850 m, or 2,790 ft) was found on satellite images in 2007. The weaver described is a village or southern masked weaver; males build and the female inspects.

PRACTICE

1. **EASY** What does a beaver use to build its dam?
2. **MEDIUM** Why are the doors of a beaver lodge under the water?
3. **EASY** How does a weaver bird make its nest?

Make it a game • Patch the Leak. Players sit in a circle, shoulder to shoulder: they are the dam. One player is the water and walks around the outside. When the water taps someone, that player stands and steps out, making a “leak.” The two players beside the gap must scoot together to close it before the water can slip through. Then the leak becomes the water.

Scripture. “Except the LORD build the house, they labour in vain that build it: except the LORD keep the city, the watchman waketh but in vain.” (Psalm 127:1, KJV)

God made the beaver and the weaver bird able to build. When we build a home, a family or anything good, we need Him to help us.

Practice: answers

1. Sticks, stones and mud.
2. So wolves, coyotes and other hunters cannot get in.
3. It weaves strips of grass and leaves in and out with its beak and feet and ties knots.

1.5 ANIMAL PARTNERS: BETTER TOGETHER

OBJECTIVES

- Tell how the oxpecker and the rhinoceros help each other.
- Tell how the clownfish and the sea anemone help each other.
- Say Ecclesiastes 4:9 and give an example of “two are better than one.”

Warm-up. Try to scratch the very middle of your back. Can you reach it? Now ask someone to scratch it for you. Some animals have a friend to reach the places they cannot!

Video slot. Video coming. Animal partners for children: oxpeckers on rhinos and buffalo, clownfish in anemones, cleaner fish. Search approved channels (BBC Earth, PBS Nature, Smithsonian’s National Zoo, Monterey Bay Aquarium); preview first.

KEY TERMS

partners

Two who work together and help each other.

oxpecker

A small African bird that rides on big animals and eats the bugs on their skin.

tick

A tiny bug-like creature that clings to an animal’s skin and drinks its blood.

sea anemone

A soft sea animal shaped like a flower, with stinging arms called tentacles (say “uh-NEM-uh-nee”).

CORE IDEAS

The story. On a hot African plain, a huge rhinoceros munches grass. Hop, hop, hop: a little brown bird with a red beak walks right up the rhino’s leg, onto its back and even onto its face! The rhino does not mind. The bird is an **oxpecker**, and it is busy eating breakfast: the **ticks** and flies hiding in the rhino’s thick skin.

Help for both. The oxpecker gets a meal and a ride. The rhino gets rid of the bugs that bite it. And there is more. Rhinos cannot see very well. When a person or a lion comes near, the oxpeckers flutter up and call out loudly, “Hiss-s-s! Danger!” The rhino lifts its head and gets ready. In the Swahili language of East Africa, one name for the oxpecker means “the rhino’s guard.” Oxpeckers ride on buffalo, giraffes and zebras too.

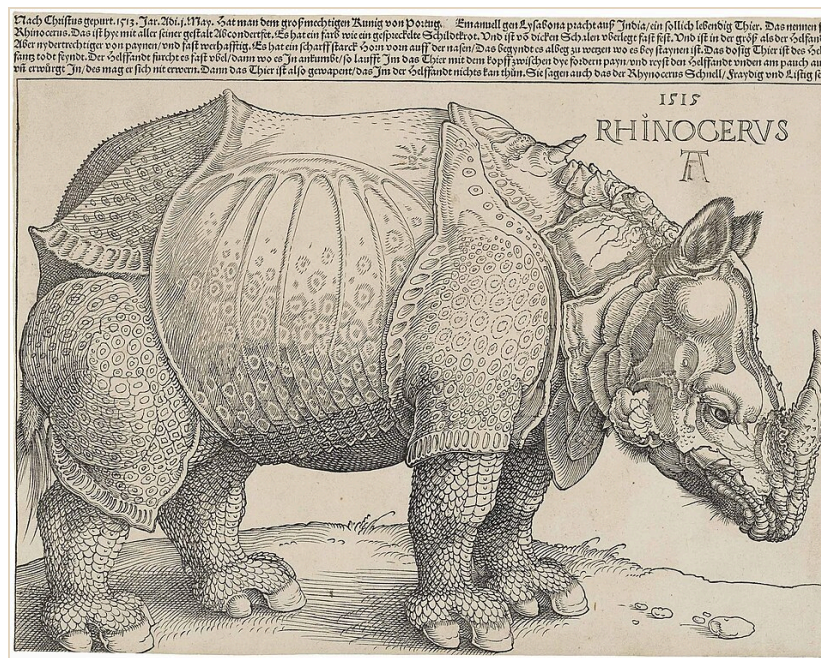
Partners in the sea. Under the ocean, a bright orange clownfish lives among the waving arms of a **sea anemone**. Those arms sting other fish, but a special slimy coat on the clownfish keeps it from being hurt. The anemone gives the clownfish a safe home. The

clownfish chases away fish that come to nibble the anemone and helps keep it clean. They are **partners**.

A cleaning station. On a coral reef, big fish line up at a “cleaning station,” where little cleaner fish swim right into their mouths and gills to pick off tiny pests. The big fish open wide and wait. They could swallow the little cleaners in one gulp, but they don’t! Each one helps the other.

Two are better than one. God made many creatures to need each other. He made people that way too. Brothers and sisters, friends and neighbors help each other carry things, find things and stay safe. The Bible says, “Two are better than one; because they have a good reward for their labour.”

PICTURE STUDY



Rhinoceros, Albrecht Dürer, 1515 · Woodcut (a print made by carving a picture into a block of wood) · Prints are in many museums, among them the British Museum, London, and the National Gallery of Art, Washington

Wikimedia Commons · Public domain

In 1515 a live rhinoceros from India arrived in Portugal as a gift for the king. People in Europe had not seen one in more than a thousand years. Albrecht Dürer never saw it himself. He made this famous picture from a letter and a sketch someone sent him.

Look closely

- Find the horn on the nose. Now find the little extra horn on the back. Real rhinos do not have that one!
- Look at the skin. What does it look like: armor, a turtle shell, or something else?
- Look at the legs and feet. What patterns did Dürer draw?

Talk about it

1. Where would an oxpecker like to hide and hunt for ticks on this rhinoceros?
2. Why do you think Dürer made some mistakes? What would have helped him draw it better?

HANDS-ON: PARTNER MATCH CARDS

Make a set of cards that match animal partners, then play a matching game with them.

You will need

- Eight index cards
- Crayons or colored pencils

Steps

1. On four cards, draw one partner on each: oxpecker, clownfish, cleaner fish, honeyguide bird.
2. On the other four cards, draw the other partner: rhinoceros, sea anemone, big reef fish, honey hunter (a person) with a bee nest.
3. On the back of each pair, write one word about how they help: “bugs,” “home,” “clean,” “honey.”
4. Mix the cards face down and play a memory game to find the pairs. When you find a pair, tell how the two help each other.

Check your work

- I made four pairs of partner cards.
- I can tell how each pair helps each other.
- I played the matching game at least once.

FIELD NOTEBOOK

1. Draw a rhinoceros with oxpeckers riding on its back. Write: “The oxpecker eats the ticks. The rhino gets clean.”
2. Draw a clownfish peeking out of a sea anemone.

Did you know? In parts of Africa, a bird called the honeyguide leads people to wild bees’ nests. Honey hunters call to it with a special sound, the bird flies ahead from tree to tree, and the people open the nest and take the honey. The honeyguide then eats the leftover wax, which it loves. Scientists have recorded the honeyguide answering the hunters’ calls.

Goes deeper in. Life Science, the animals and habitats units (coming soon); Trail D, Stop D3 “Coral reefs”; and Art, for Dürer’s prints.

For families. Oxpeckers are not purely helpful: they sometimes peck at wounds and drink blood, so scientists debate how much the rhino gains. The stop keeps to the well-documented benefits (tick removal and alarm calls). A study by Plotz and Linklater (*Current Biology*, 2020) found black rhinos with oxpeckers detected approaching people far more often. Swahili *askari wa kifar*, “the rhino’s guard,” is widely reported. The honeyguide study is Spottiswoode, Begg and Begg, *Science* (2016), with Yao honey hunters in Mozambique. Dürer’s rhinoceros was sent to King Manuel I of Portugal in 1515; it later died in a shipwreck on its way to the pope in 1516.

PRACTICE

1. **EASY** What does the oxpecker eat off the rhinoceros?
2. **MEDIUM** How does the oxpecker help the rhino besides eating bugs?
3. **MEDIUM** How do the clownfish and the sea anemone help each other?

Make it a game • Rhino and Oxpecker. Play in pairs. One player is the rhino and wears a blindfold (rhinos see poorly). The other is the oxpecker and stays beside the rhino. A grown-up quietly walks toward them. The oxpecker must hiss “Danger!” and the rhino must turn to face the sound before the grown-up taps them. Then switch.

Scripture. “Two are better than one; because they have a good reward for their labour.” (Ecclesiastes 4:9, KJV)

The oxpecker and the rhino are better together. God gives us families and friends so we can help each other too.

Practice: answers

1. Ticks and other bugs.
2. It calls out loudly when danger comes near, warning the rhino.
3. The anemone gives the clownfish a safe home; the clownfish chases away fish that would eat the anemone and helps keep it clean.

1.6 ANIMAL TOOLS: THE SEA OTTER'S ROCK

OBJECTIVES

- Tell how a sea otter uses a rock to open its food.
- Name one other animal that uses a tool.
- Tell how people helped sea otters come back after they were nearly gone.

Warm-up. Lie on your back on the floor and put a book on your tummy. Can you hold it steady with your hands while you lie there? That is how a sea otter eats its lunch: floating on its back, using its tummy as a table!

Video slot. Video coming. Sea otters cracking shells with rocks, floating in kelp, and other animal tool users. Search approved channels (Monterey Bay Aquarium, U.S. Fish and Wildlife Service, PBS Nature, BBC Earth); preview first.

KEY TERMS

tool

Something used to help do a job, like a hammer, a spoon or a rock.

sea otter

A furry sea animal of the Pacific coast that floats on its back and eats shellfish.

kelp

A very tall seaweed that grows in thick underwater forests.

shellfish

Sea animals with shells, such as clams, mussels, crabs and sea urchins.

CORE IDEAS

The story. Off the rocky coast of California, a sea otter dives down, down, down to the sea floor. It feels around with its front paws and grabs a big clam. Then it grabs something else: a flat, smooth rock. Up it pops to the top of the water, rolls onto its back and lays the rock on its chest.

Bang, bang, crack! The otter holds the clam in both paws and bangs it down on the rock. Bang! Bang! Bang! The shell cracks open, and the otter licks out the soft clam inside. Using something to help do a job is using a **tool**. Few animals use tools, and the sea otter is one of the best at it.

A pocket for the rock. A sea otter has a loose fold of skin under each front leg, like a little pocket. When it finds a good rock, it can tuck the rock into the pocket and keep it for the next dive, along with extra food. Some otters keep a favorite rock for a long time.

The thickest fur. Sea otters have no blubber to keep them warm in the cold sea. Instead, God gave them the thickest fur of any animal, so thick that the water never reaches their skin. At night they wrap themselves in **kelp** so they do not drift away while they sleep, and sometimes they float together holding paws. Long ago hunters took so many otters for their fur that only a few were left. In 1911 nations agreed to protect them, and today there are many again in places.

Taught by the beasts. Other animals use tools too. Some crows bend twigs into hooks to pull bugs out of holes. Some dolphins carry a sponge on their noses to protect them while they dig. The Bible says, “Ask now the beasts, and they shall teach thee.” When we watch an otter crack a clam, we learn about the wise God who made it.

PICTURE STUDY



Sea Otter, Plate 137 of *The Viviparous Quadrupeds of North America*, John Woodhouse Audubon (son of John James Audubon), 1849 · Hand-colored lithograph (printed picture colored by hand) · From *The Viviparous Quadrupeds of North America*, by John James Audubon and John Bachman
Wikimedia Commons · CC BY 2.0

John James Audubon, the famous bird painter, also made a big book of North American animals with fur, working with his friend John Bachman and his two sons. His son John Woodhouse Audubon drew this sea otter. In those days few artists had ever seen a live sea otter.

Look closely

- Find the whiskers. What do you think the otter uses them for?
- Look at the fur. How did the artist show that it is thick and soft?
- Look at the front paws and the back feet. Which ones look better for swimming?

Talk about it

1. This otter is resting on the rocks. Where would you rather draw a sea otter, and what would it be doing?
2. Why might a book of animal pictures have been very important before there were cameras?

Safety first. Do the tool test on a towel on the floor or a sturdy table, with a grown-up. Keep fingers clear of the rock. Check for nut allergies first; use pistachios in their shells only if everyone is safe with nuts, or use the crackers instead.

HANDS-ON: OTTER TOOL TEST

Find out why a rock makes a sea otter's job easier.

You will need

- A few pistachios or walnuts in their shells (or hard crackers wrapped in a paper napkin, if there are allergies)
- A smooth, fist-sized rock, washed
- A folded towel
- A spoon

Steps

1. Lie on your back like an otter with the folded towel on your tummy.
2. Try to open a nut with only your fingers. Was it easy or hard?
3. Sit up. Put the rock on the towel. Hold the nut in your fingertips and tap it gently on the rock, the way an otter does, until it cracks. A grown-up stays beside you.
4. Try the spoon too. Which tool worked best? Tell why a rock is a good tool for an otter.

Check your work

- I tried with no tool and with a tool.
- I worked safely with a grown-up.
- I can tell how a sea otter uses its rock.

FIELD NOTEBOOK

1. Draw a sea otter floating on its back with a rock on its chest and a clam in its paws. Label "rock," "clam," "paws" and "thick fur."
2. Draw a second picture of an otter wrapped in kelp, asleep.

Did you know? A sea otter has up to about a million hairs on a patch of skin the size of a postage stamp, more than on your whole head. Otters eat a lot: about a quarter of their

own weight every day. They love to eat sea urchins, spiky animals that chew on kelp, so where there are otters, the kelp forests often grow thick and healthy.

Goes deeper in. Life Science, the animals unit (coming soon); Gardening & Animals, for caring for creation; and Trail D “Ocean Life.”

For families. The maritime fur trade (1700s-1800s) reduced sea otters to perhaps 1,000–2,000 animals in scattered groups; the International Fur Seal Treaty of 1911 protected them, and populations recovered in Alaska, Canada and parts of California, though some groups remain small. Fur density is commonly given as 600,000 to 1,000,000 hairs per square inch. Plate 137 was drawn by John Woodhouse Audubon and issued in 1849 (printed by J. T. Bowen, Philadelphia). New Caledonian crows and the Shark Bay sponging dolphins are well-documented tool users. Conservation is told here as good stewardship (Genesis 2:15).

PRACTICE

1. **EASY** What tool does a sea otter use, and what does it use it for?
2. **MEDIUM** How does a sea otter stay warm in cold water without blubber?
3. **EASY** Why does a sea otter wrap itself in kelp at night?

Make it a game • Otter Raft. Everyone lies on their backs on the floor, “floating.” Holding paws (hands) with the players beside you, the raft must stay together while the leader calls out waves: “Small wave!” (wiggle) or “Big wave!” (rock side to side). If anyone lets go, the raft starts over. Can your raft last through ten waves?

Scripture. “But ask now the beasts, and they shall teach thee; and the fowls of the air, and they shall tell thee:” (Job 12:7, KJV)

When we watch a sea otter use its rock, the animal is teaching us about the wise God who made it.

Practice: answers

1. A rock, to crack open clams and other shellfish.
2. Its fur is the thickest of any animal, so the water never reaches its skin.
3. So it does not drift away while it sleeps.

1.7 LONG JOURNEYS: THE GODWIT'S GREAT FLIGHT

OBJECTIVES

- Tell the story of the bar-tailed godwit's nonstop flight from Alaska across the Pacific.
- Name two other animals that make long journeys.
- Find Alaska, New Zealand and the Pacific Ocean on a globe.

Warm-up. How long can you flap your arms like wings without stopping? Try it while a grown-up counts. Now imagine flapping for eleven days and nights without ever stopping to eat, drink or sleep. One little bird did just that!

Video slot. Video coming. Bar-tailed godwit nonstop flight from Alaska to New Zealand; gray whale migration; wildebeest migration. Search approved channels (U.S. Fish and Wildlife Service, U.S. Geological Survey, PBS Nature, BBC Earth); preview first.

KEY TERMS

migration

A long trip that animals make each year to find food, warmth or a place to raise their young.

nonstop

Going all the way without stopping.

godwit

A shorebird with long legs and a long, slightly upturned beak for probing in mud.

fuel

Something that is burned to give energy. A bird's fuel is the fat stored in its body.

CORE IDEAS

The story. On the muddy shores of western Alaska, a flock of brown shorebirds called bar-tailed **godwits** is eating and eating. They poke their long beaks into the mud for worms and clams. All summer they raised their chicks here. Now autumn is coming, and they are getting ready for one of the longest trips any animal makes.

Filling the tank. Before they go, the godwits eat until they are round and heavy with fat. That fat is their **fuel**. Then, on a day when the wind blows the right way, they rise into the sky and head south, out over the wide Pacific Ocean. There are no islands to rest on for most of the way, and godwits cannot swim or land on the water to rest.

Eleven days in the air. The godwits fly day and night, **nonstop**, for about eight to eleven days. They do not eat. They do not drink. They do not land. They fly more than 7,000 miles until at last they reach New Zealand or Australia, thin and tired, on the other side of the

world. In 2022, a young godwit wearing a tiny tracking tag flew more than 8,000 miles in about eleven days without stopping, farther than any bird ever measured.

Other great journeys. Godwits are not the only long travelers. Gray whales swim from warm lagoons in Mexico to the cold seas near Alaska and back again each year. In East Africa, great herds of wildebeest and zebras walk in a giant loop, following the rains to find fresh grass. This kind of yearly trip is called **migration**.

Who shows the way? How does a young godwit, on its very first trip, know when to leave and which way to go? Scientists are still learning. The Lord asked Job, “Doth the hawk fly by thy wisdom, and stretch her wings toward the south?” No man taught the birds. God made them and guides them, and He guides us on our journeys too.

PICTURE STUDY



Wild Geese Flying across the Moon, Utagawa Hiroshige, c. 1830s · Woodblock print · Copies are in many museums

Wikimedia Commons · Public domain

Hiroshige was a Japanese artist who made prints by carving pictures into wooden blocks and pressing them onto paper, one color at a time. In autumn, wild geese fly south across Japan, and he showed them crossing the full moon at night. Many birds fly their long journeys in the dark.

Look closely

- Count the geese. Which way are they flying?
- Find the moon. How much of the picture does it fill?
- Look at the shape of the whole print. Is it tall, wide or square? Why might the artist choose that shape?

Talk about it

1. Why might birds travel at night?
2. How does this picture make you feel: calm, busy, lonely or something else?

HANDS-ON: MEASURE THE GREAT FLIGHT

Use a globe and a string to follow the godwit's journey across the Pacific.

You will need

- A globe (or a world map)
- A piece of string or yarn
- Two small stickers or bits of tape
- A marker

Steps

1. Find Alaska and put a sticker on its west coast. Find New Zealand and put a sticker there.
2. Stretch the string from Alaska to New Zealand across the Pacific Ocean. Mark the string at each sticker.
3. Look along the string. How many big pieces of land does it cross? Where could a godwit stop to rest?
4. Now use the same string to measure from your home to somewhere far away. Is the godwit's trip longer or shorter?

Check your work

- I found Alaska, New Zealand and the Pacific Ocean.
- I measured the godwit's flight with string.
- I can tell why the godwit cannot stop to rest on the way.

FIELD NOTEBOOK

1. Draw a map with Alaska at the top and New Zealand at the bottom and a big blue Pacific Ocean in between. Draw a dotted line for the godwit's flight and write "11 days, nonstop!"
2. Draw a godwit with its long beak. Copy Job 39:26 underneath.

Did you know? Before their long flight, the parts of a godwit's body used for digesting food shrink, making it lighter, while its heart and flying muscles grow bigger. During the flight it can rest half of its brain at a time, which may help it keep going. When it reaches New Zealand, it may have burned up nearly half of its body weight.

Goes deeper in. Geography, for maps and oceans (coming soon); Life Science, the animals unit; and Trail B, Stop B7 "Migration."

For families. The 2022 record bird, a juvenile tagged “234684” in Alaska, flew about 13,560 km (8,425 miles) to Tasmania in 11 days and 1 hour (reported by Birds Tasmania and Pūkorokoro Miranda Naturalists’ Trust). Typical southbound flights are about 11,000–12,000 km (7,000+ miles) over 8–10 days (U.S. Geological Survey Alaska Science Center). Organ shrinkage before migration was documented by Piersma and Gill (1998). Unihemispheric sleep in godwits is likely but not yet directly measured, so the stop says “can” and “may.” Gray whale round trips are about 10,000–12,000 miles.

PRACTICE

1. **EASY** What is migration?
2. **MEDIUM** Why can’t a godwit stop to rest on its flight across the Pacific?
3. **EASY** Name another animal that makes a long journey.

Make it a game • Godwit Fuel. Scatter 20 dried beans or paper scraps (worms) on the floor. Each player is a godwit and has one minute to “eat” as many as they can carry in one hand. Then the leader calls “Fly!” and everyone flaps around the room. Every time the leader claps, each godwit must drop one worm (burning fuel). The godwit with fuel left when the leader calls “New Zealand!” makes it across.

Scripture. “Doth the hawk fly by thy wisdom, and stretch her wings toward the south?” (Job 39:26, KJV)

God asked Job who teaches birds to fly south. No person did. God made them, guides them, and guides us too.

Practice: answers

1. A long trip animals make each year to find food, warmth or a place to raise their young.
2. There is almost no land to rest on, and it cannot swim or land on the water to rest.
3. Any one: gray whale, wildebeest, zebra, Arctic tern, monarch butterfly, salmon, sea turtle, caribou.

1.8 ANIMALS THAT HELPED PEOPLE: THE SLED DOGS OF NOME (1925)

OBJECTIVES

- Tell the story of the 1925 serum run to Nome.
- Name the two famous lead dogs, Togo and Balto, and tell what each one did.
- Find Alaska, Nenana and Nome on a map.

Warm-up. Go outside on a cold day, or open the freezer and put your face near it for a few seconds. Brrr! The sled dogs of Nome ran through cold so bitter it was colder than the inside of your freezer, in the dark and the wind.

Video slot. Video coming. The 1925 serum run to Nome: Togo, Balto and the sled dog relay. Search approved channels (Smithsonian, National Park Service, Iditarod Trail Committee, The History Guy, Simple History); preview first.

KEY TERMS

sled dog

A strong dog trained to pull a sled across snow and ice.

musher

The person who drives a dog sled.

relay

A race or trip in which one team carries something part of the way and hands it to the next team.

serum

A medicine that helps the body fight a sickness.

CORE IDEAS

The story. In January 1925, the town of Nome, Alaska, was in trouble. Children were getting sick with diphtheria, a dangerous sickness of the throat, and some had already died. Dr. Curtis Welch had medicine called **serum** that could help, but his old supply was used up. The nearest new serum was in Anchorage, nearly a thousand miles away. It was the middle of winter. The sea was frozen, and no road or train went to Nome.

A relay of dogs. The serum was sent by train as far as the town of Nenana. From there, the only way left was by dog sled. Twenty **mushers** and about 150 **sled dogs** made a **relay**. Each team ran its part of the trail and handed the package to the next team. Many of the mushers were mail carriers, some of them Alaska Native men, who knew the trail well. It was so cold, down to 50 degrees below zero, that some mushers got frostbite, and at the stops along the way the serum was warmed by the stove to keep it safe.

Togo and the ice. The longest and hardest part was run by Leonhard Seppala and his lead dog, **Togo**, who was twelve years old. To save a whole day, Togo led the team straight across Norton Sound, a bay of the sea covered with ice that could crack and float away. In the dark and the wind, Togo found the way. Not long after they crossed, the ice broke up behind them.

Balto brings it home. The last part of the trail was run by Gunnar Kaasen with his lead dog, **Balto**, through a howling snowstorm. Kaasen could hardly see his own dogs, but Balto kept to the trail. Early in the morning of February 2, 1925, they pulled into Nome. The serum had come 674 miles in about five and a half days. The sickness was stopped, and many children lived.

Bearing burdens. Each musher and each dog team carried the load for a while and then passed it on. No one could have done it alone. The Bible says, "Bear ye one another's burdens." God made dogs strong and faithful, and in Nome they helped save many lives.

PICTURE STUDY



*Leonhard Seppala and his Siberian racers, Ruby, Alaska, Lomen Brothers (photographers in Nome, Alaska), 1916 · Black-and-white photograph · University of Washington Libraries, Special Collections, Seattle
Wikimedia Commons · Public domain*

Leonhard Seppala came to Alaska from Norway to dig for gold and became one of the best dog mushers in the world. His dogs were small, fast Siberian huskies. This photograph was taken in 1916, nine years before the serum run, when Seppala and his dogs won a big race called the All-Alaska Sweepstakes. You can see how the dogs were hitched in a line, with the lead dog out in front.

Look closely

- Find the musher. What is he wearing to keep warm?

- Count the dogs. Can you tell which one is the lead dog?
- Look at the harnesses. How are the dogs hitched to each other?

Talk about it

1. What do you think the dogs need from their musher to be ready for a long run?
2. Why might a musher trust his lead dog to find the trail in a storm?

Safety first. Ask the owner before petting any dog, and let the dog sniff your hand first.

HANDS-ON: THE SERUM RUN RELAY

Carry the “serum” in a relay around your home or yard and mark the route on a map.

You will need

- A small box wrapped in a towel (the serum)
- Paper and crayons for a map
- Two or more players (or one player and a stuffed animal at each stop)

Steps

1. With a grown-up, find Alaska on a map. Find Nenana and Nome, or ask the grown-up to point to them. Draw a simple map with Nenana on one side and Nome on the other, and a frozen bay (Norton Sound) near Nome.
2. Set up the relay: each player stands at a different “roadhouse” around the room or yard.
3. The first player carries the serum to the next roadhouse and hands it over gently. Keep going until the serum reaches “Nome.”
4. Talk about it: what would happen if one team gave up?

Check your work

- I drew a map with Nenana, Nome and the frozen bay.
- I carried the serum in a relay and handed it on.
- I can tell what Togo and Balto each did.

FIELD NOTEBOOK

1. Draw a dog team crossing the ice in the dark, with the lead dog out in front. Label “musher,” “sled,” “lead dog” and “serum.”
2. Write: “1925: 20 mushers, about 150 dogs, 674 miles.”

Did you know? Later in 1925, a bronze statue of Balto was put up in Central Park in New York City, and Balto himself came to see it. You can still visit it today. Togo’s story became famous later. Today the Iditarod sled dog race in Alaska helps people remember the serum run and the mushers and dogs who carried mail and medicine across Alaska.

Goes deeper in. History, the twentieth century (coming soon); Geography, for Alaska; and Gardening & Animals, for working dogs.

For families. The relay ran from Nenana on January 27 to Nome on February 2, 1925 (about 127½ hours, 674 miles); the serum had come about 298 miles by train from Anchorage. Seppala and Togo ran about 91 miles of the relay itself (plus the long run out from Nome to meet it), the longest and most dangerous leg; Kaasen and Balto ran the final 53 miles. The Balto statue by F. G. R. Roth was dedicated in December 1925. Death counts are uncertain, and Dr. Welch believed some earlier deaths had been diphtheria; the stop says “some.” Several of the early relay mushers were Athabascan mail carriers. Exact photo dates vary; choose a public-domain photograph from before 1931.

PRACTICE

1. **EASY** What did the dog teams carry to Nome in 1925?
2. **MEDIUM** What was hard and dangerous about Togo’s part of the trail?
3. **EASY** Which lead dog brought the serum into Nome?

Make it a game • Gee and Haw. Mushers steer dogs with words: “Gee!” means turn right, “Haw!” means turn left, “Hike!” means go and “Whoa!” means stop. One player is the musher and calls the commands; the others are the dog team, walking in a line with hands on the shoulders of the dog in front. The lead dog listens and turns the right way. Anyone who turns the wrong way moves to the back of the line.

Scripture. “Bear ye one another’s burdens, and so fulfil the law of Christ.” (Galatians 6:2, KJV)

Each musher and dog team carried the serum for a while and passed it on. We help each other carry hard things too.

Practice: answers

1. Serum, a medicine to stop a sickness called diphtheria.
2. He led his team across the frozen sea ice of Norton Sound, which could break, in the dark and wind.
3. Balto, with musher Gunnar Kaasen.

1.9 DESIGN COPIED BY ENGINEERS

OBJECTIVES

- Tell how burrs on a dog gave George de Mestral the idea for Velcro.
- Tell how a bird's beak and a bird's wings helped engineers build a train and an airplane.
- Name one animal or plant design that people have copied.

Warm-up. Find a shoe or jacket with a hook-and-loop strap (Velcro). Pull it open and listen to the rip. Press it closed again. Look closely: one side is scratchy and one side is soft. Where do you think the idea came from?

Video slot. Video coming. Inventions copied from nature for children: Velcro and burrs, the kingfisher bullet train, the Wright brothers and birds. Search approved channels (Smithsonian National Air and Space Museum, PBS, Science Channel kids clips, BBC Earth); preview first.

KEY TERMS

engineer

A person who designs and builds machines, bridges, roads and other useful things.

design

A plan for how something is made so that it works well.

burr

A prickly seed case that sticks to fur and clothes.

invent

To make something new that no one has made before.

CORE IDEAS

The story. In 1941, a Swiss **engineer** named George de Mestral came home from a walk in the mountains with his dog. Both of them were covered with prickly **burrs**. As he picked them off, he wondered: why do these stick so well? He put a burr under his microscope and saw hundreds of tiny hooks. The hooks caught on the little loops of thread in his clothes and the fur of his dog.

Hooks and loops. George had an idea: what if he made one strip covered with tiny hooks and another covered with tiny loops? Press them together, and they would hold. It took him years of trying to get it right. At last he **invented** Velcro. He named it from two French words, *velours* (velvet) and *crochet* (hook). Today it is on shoes, jackets and even space suits.

A train with a bird's beak. In Japan, a very fast train made a loud boom every time it rushed out of a tunnel. An engineer named Eiji Nakatsu loved to watch birds. He thought of

the kingfisher, which dives from the air into the water with hardly a splash. Its long, pointed beak slips smoothly from air into water. So the engineers gave the train a long nose shaped like a kingfisher's beak. The boom grew quieter, and the train used less electricity.

Wings that twist. Long before that, two brothers in Ohio, Wilbur and Orville Wright, wanted to build a flying machine. Wilbur watched big birds soaring and saw that they twisted the tips of their wings to keep their balance. The brothers built wings that could twist the same way. On December 17, 1903, their airplane flew at Kitty Hawk, North Carolina.

Copying the best Designer. When engineers copy a burr, a beak or a wing, they are copying the work of the greatest **designer** of all. The psalm says, "O LORD, how manifold are thy works! in wisdom hast thou made them all." God's creatures are full of good ideas, waiting for careful people to notice them.

PICTURE STUDY



First Flight, John T. Daniels (who pressed the camera button for the Wrights), December 17, 1903 · Black-and-white photograph (from a glass plate negative) · Library of Congress, Washington, D.C.
Wikimedia Commons · Public domain

Orville Wright set up his camera on a tripod and asked John Daniels, a man from the nearby lifesaving station, to squeeze the bulb if the airplane flew. Daniels had never taken a picture before. He snapped this one just as the Flyer lifted off. It is one of the most famous photographs ever taken.

Look closely

- Find Orville lying on the lower wing. He is the pilot.
- Find Wilbur, standing on the sand. What does he look like he is doing?

- Look at the wings. Are there two or one? What are they made of?

Talk about it

1. How are the Flyer's wings like a bird's wings? How are they different?
2. How do you think Wilbur felt at that moment?

HANDS-ON: NATURE'S IDEA LAB

Look closely at nature, like George de Mestral did, and invent something from what you find.

You will need

- A magnifying glass
- A hook-and-loop strap (Velcro)
- Things from outdoors: a burr if you can find one, a feather, a leaf, a pinecone
- Paper and a pencil

Steps

1. Look at the Velcro under the magnifying glass. Find the hooks and the loops. Draw them.
2. Look at the burr (or a feather or pinecone) the same way. Draw what you see. Does the burr have hooks like the Velcro?
3. Pick one thing from nature. Think: what does it do well? (A feather is light. A pinecone opens when dry.)
4. Draw an invention that copies it, and give your invention a name. Explain it to your family.

Check your work

- I looked at Velcro and something from nature with a magnifying glass.
- I drew what I saw.
- I drew and named my own invention copied from nature.

FIELD NOTEBOOK

1. Make two columns: "God's design" and "What people made." Draw a burr and Velcro, a kingfisher and the bullet train, a soaring bird and the Wright Flyer.
2. Copy Psalm 104:24.

Did you know? Engineers have copied many other creatures. Owls fly silently because of the soft, comb-like edges on their feathers, and the same Japanese engineer used that idea to make part of the train quieter. Gecko feet, which stick to walls without glue, have given scientists ideas for new kinds of sticky tape.

Goes deeper in. Life Science, the animals unit (coming soon); History, for the Wright brothers; and Trail B, Stop B2 “Owls.”

For families. George de Mestral’s walk is usually dated to 1941; he patented hook-and-loop fastening in the 1950s (Swiss patent 1955). The kingfisher-nosed train is the JR West 500 Series Shinkansen (1997); Eiji Nakatsu’s team reported a quieter tunnel exit and lower power use. Wilbur Wright wrote to Octave Chanute on May 13, 1900: “My observation of the flight of buzzards leads me to believe that they regain their lateral balance ... by a torsion of the tips of the wings.” The famous photograph was taken by John T. Daniels of the Kill Devil Hills Life-Saving Station.

PRACTICE

1. **EASY** What plant part gave George de Mestral the idea for Velcro?
2. **MEDIUM** Why did engineers shape a Japanese train’s nose like a kingfisher’s beak?
3. **EASY** What did Wilbur Wright learn by watching birds?

Make it a game • Copycat Inventor. One player names an animal: “Duck!” The others take turns inventing something people could make by copying it: “Flippers for swimming, like a duck’s webbed feet!” Every good idea earns a point. Then the next player names an animal.

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)

“Manifold” means many and different. Engineers find good ideas in God’s works because He made them all with wisdom.

Practice: answers

1. Burrs, prickly seed cases covered with tiny hooks.
2. The kingfisher dives into water with hardly a splash, so the beak shape made the train quieter coming out of tunnels.
3. Birds twist the tips of their wings to keep their balance.

1.10 ADAM NAMES THE ANIMALS (GENESIS 2:19)

OBJECTIVES

- Tell what happened when God brought the animals to Adam.
- Tell why giving a good name means looking carefully.
- Make a set of animal-fact trading cards from this trail.

Warm-up. Look out the window or around the room and find one living thing you do not know the name of: a bug, a weed, a bird. Make up a good name for it that tells something true about it. That is what Adam did for every animal!

Video slot. Video coming. Genesis 2 for children: God brings the animals to Adam to be named; Carl Linnaeus and scientific names. Search approved channels (The Bible Project kids clips once vetted, Answers in Genesis Kids, Christian Light, Smithsonian for Linnaeus); preview first.

KEY TERMS

Adam

The first man, whom God made from the dust of the ground (Genesis 2:7).

name

A word we call a person, animal or thing by. A good name often tells something true about it.

kind

A group of creatures God made to have young “after his kind,” like dogs or cats (Genesis 1).

steward

Someone who takes care of what belongs to another. God made people stewards of His world.

CORE IDEAS

The story. In the beginning, God planted a garden in Eden and put the first man, Adam, there “to dress it and to keep it.” Then God did a wonderful thing. He formed the beasts of the field and the birds of the air, and He brought them to Adam “to see what he would call them.” One by one they came: the lion with its mane, the eagle with its sharp eyes, the little mouse, the long-necked giraffe.

Looking carefully. To give a good name, Adam had to look closely. How does it move? What sound does it make? What color is it? What does it eat? Adam was the first person to study the animals. Whatever Adam called each living creature, the Bible says, “that was the name thereof.” God let Adam’s names stand.

Names that tell the truth. Many animal names still tell us something true. A hummingbird hums. A woodpecker pecks wood. A snowshoe hare has feet like snowshoes. A sea otter lives in the sea. When you learn an animal's name and why it has it, you are doing a little of what Adam did.

A scientist who named. Thousands of years later, a Swedish scientist named Carl Linnaeus, who loved God and His creation, set out to give every plant and animal a clear name. In the 1700s he gave each one a two-part Latin name, like a last name and a first name. The gray wolf is *Canis lupus*, and the house cat is *Felis catus*. Scientists all over the world still use his kind of names today.

Stewards of God's animals. Naming the animals showed that God had given people a special job: to know, rule over and take care of His creatures. On this trail you have met bats that see with sound, hares that change coats, otters with tools, dogs that saved a town and birds that cross oceans. Every one of them is God's work. Like Adam, we are to know them, name them and take good care of them.

PICTURE STUDY



Adam Naming the Animals, from the Aberdeen Bestiary (folio 5 recto), Unknown English illuminator, c. 1200
 · Ink, paint and gold leaf on parchment · University of Aberdeen Library, Scotland (MS 24)
 Wikimedia Commons · Public domain

A bestiary is an old book about animals. This one was copied and painted by hand in England about eight hundred years ago. On this page, Adam sits like a teacher and points to the animals as he names them. Behind them shines a background of real gold.

Look closely

- Find Adam. What is he doing with his hand?

- Count the animals. Which ones can you name?
- Look at the background. What makes it shine?

Talk about it

1. Compare Adam's size with the animals'. Why might the artist have drawn him that way?
2. Which animal on this trail would you most like to have seen Adam name, and what might he have called it?

HANDS-ON: ANIMAL-FACT TRADING CARDS

Make a set of trading cards for the animals on this trail, one card for each stop.

You will need

- Ten index cards
- Crayons or colored pencils
- A pencil
- A small envelope or rubber band to keep them together

Steps

1. On the front of each card, draw one animal from the trail: bat, snowshoe hare, groundhog, beaver, oxpecker, sea otter, godwit, sled dog, kingfisher, and one animal of your own choosing for this stop.
2. Write its name at the top. Under the name, write why the name fits, if you know.
3. On the back, write one amazing fact: "I see with sound." "I crack clams on a rock." "I flew 11 days nonstop."
4. Trade cards with a family member, or quiz them: read the fact and let them guess the animal.

Check your work

- I made ten cards, each with a drawing, a name and a fact.
- My facts are true and come from this trail.
- I can tell what Adam did in Genesis 2:19.

FIELD NOTEBOOK

1. Draw Adam naming three animals. Under each animal, write the name Adam might have given it.
2. Copy Genesis 2:19 in your best handwriting.

Did you know? Scientists are still finding and naming new kinds of animals every year, especially insects, deep-sea creatures and tiny frogs. Whoever describes a new animal

first gets to give it its scientific name. Linnaeus also gave people a name: *Homo sapiens*, which means “wise man.”

Goes deeper in. Life Science, “Classifying living things” (coming soon); Literature, for the creation account; and Gardening & Animals, for caring for animals (Genesis 2:15).

For families. Genesis 2:19–20 names cattle, fowl and beasts of the field; the text does not say how long the naming took. Carl Linnaeus (1707–1778) published *Systema Naturae* (first edition 1735); the 10th edition (1758) is the starting point for animal names. He was the son of a Lutheran pastor and wrote of the Creator in his works. The Aberdeen Bestiary page shows Adam clothed; if you choose a different picture of this scene, check it, since many paintings show Adam unclothed. The University of Aberdeen has the whole bestiary online.

PRACTICE

1. **EASY** Who brought the animals to Adam, and why?
2. **MEDIUM** Why did Adam need to look carefully at each animal?
3. **EASY** What scientist gave plants and animals two-part Latin names?

Make it a game · Name That Creature. One player acts out an animal without words: how it moves, eats or hides. The others must give it a good, true “Adam name” that describes it, like “Long-Ears-That-Hops” for a rabbit. Then someone guesses its real name. The best describing name wins a turn to act.

Scripture. “And out of the ground the LORD God formed every beast of the field, and every fowl of the air; and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof.” (Genesis 2:19, KJV)

God made every animal and let Adam name them. We know God’s creatures by looking carefully, and we care for them as His stewards.

Practice: answers

1. God brought them, to see what Adam would call them.
2. To give each one a good name that fit it, he had to see how it looked, moved and lived.
3. Carl Linnaeus.

TRACK 1 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 1–5)

1. How does a bat find a moth in the dark?
2. What does the snowshoe hare do to hide in winter?
3. What does a groundhog live on while it hibernates?
4. Why are the doors of a beaver lodge under the water?
5. How does the oxpecker help the rhinoceros?

Badge quiz 2 (Stops 6–10)

6. What does a sea otter use a rock for?
7. How long can a bar-tailed godwit fly without stopping?
8. Name the two famous lead dogs of the 1925 serum run.
9. What gave George de Mestral the idea for Velcro?
10. What did God bring to Adam, and what did Adam do?

TRAIL CERTIFICATE: MY AMAZING ANIMALS NOTEBOOK AND TRAIL F CERTIFICATE

Gather the Field Notebook pages from this trail into one booklet with a cover: “My Amazing Animals Notebook,” your name and the dates you started and finished.

Put your animal-fact trading cards from Stop F10 in an envelope glued to the back cover.

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

- **Ten stops:** At least one page for each stop, each with a title and a date.
- **Trading cards:** Ten cards, each with a drawing, a name and one true fact.
- **Hands-on:** At least one project was built or tested and told about (the burrow, the dam, the tool test or the relay).
- **Care:** Drawings are labeled and done carefully.

Answer key

1. It squeaks and listens for the echo bouncing back (echolocation).
2. It molts and grows a white coat to match the snow.
3. The fat stored in its body.
4. So hunters like wolves and coyotes cannot get in.
5. It eats ticks off its skin and calls out to warn of danger.
6. To crack open clams and other shellfish on its chest.
7. About eight to eleven days, from Alaska across the Pacific to New Zealand or Australia.
8. Togo (who crossed the sea ice) and Balto (who ran the last leg into Nome).
9. Burrs with tiny hooks stuck on his dog and his clothes.

10. God brought the animals, and Adam named them (Genesis 2:19).