

# For Teachers and Parents

One of the most important questions to ask when beginning a course is, "What are our goals for the student?" This question helps us consider what skills or abilities we want students to develop and what beliefs and habits we wish to cultivate in them.

The goal of the science team at Christian Light is to educate and shape young people through their study of science. We want students to love and worship God, love and care for their neighbors, and learn what science is and how it works.

### **Love and Worship God**

The whole creation speaks of its Creator. Psalm 19:1 says, "The heavens declare the glory of God; and the firmament sheweth his handywork." Stars and planets, animals and plants, mountains, plains, and seas—they all reveal the beauty, creativity, order, and design of creation. When we study the natural world through

science, we should experience a greater love for our Creator that leads us to greater worship.

If we want students to see the handiwork of God in creation, we should give them opportunities to observe God's works. We can encourage them to explore the natural world by planning a field trip to a nearby nature preserve, exploring a pond or forest, or scheduling an astronomy night. We must resist the easy route of studying science only through textbooks and in the classroom.

### **Love and Care for Our Neighbors**

The greatest commandment Jesus gave was to love the Lord our God with all our heart, soul, mind, and strength. The second commandment He gave was to love our neighbors as ourselves (Matthew 22:37-39). How can studying science help us love and care for our neighbors? Learning more about how creation works can improve our care for the sick and injured, teach us better ways to grow crops and raise livestock, and enhance the ways we design and construct buildings, machines, roads, and bridges.

Caring for creation is another way the study of science helps us love our neighbors. God gave us a beautiful and precious gift when He set us as stewards over the earth. We can and should use natural resources to provide for ourselves and others, but people have often squandered these blessings or even harmed parts of creation to the point that others can no longer use them. Learning more about the natural cycles and ecological relationships God established can help us minimize the unintentional damage we may cause. We can teach students to care for creation and love their neighbors through practical applications such as picking up trash along the road, helping elderly neighbors with yard work, or planting trees and flowers that beautify the landscape and attract wildlife.

### **Learn What Science Is and How It Works**

Science is often viewed as a body of knowledge. While facts are the product of scientific inquiry, they are not science. Science is instead a systematic way to investigate and understand the natural world.

For students to truly learn science, they must do more than read the textbook and answer workbook questions. They need to learn to use the methods and tools of science to discover the world for themselves. They should perform age-appropriate scientific investigations at all levels of their science education. In this way, they will learn not just facts but the process of science itself.

# For Students

When you think of science, what comes to your mind? Do you think of memorizing facts about animals, plants, rocks, metals, and the weather? Or maybe you think of paging through a textbook and looking at pictures of insects, trees, and clouds. Learning science includes memorizing facts and learning from pictures, but science is much more than facts.

Science is a process, or a method, that we can use to investigate and learn more about the world. This process is often called the *scientific method*. The scientific method helps us ask questions about what we see in creation, think about what might cause the things we see, and then use experiments to test our ideas. If our ideas turn out to be wrong, we may need to start the process over again. The scientific method has been used to develop medicines, determine the cause of many diseases, and help grow more crops to feed hungry people.

Why should we learn science? We should learn it so we can learn more about God, our all-powerful Creator. He created everything we can see, from the smallest insect to the largest star. When we study science, we are learning about God's amazing design for creation. When we look at flowers, seeds, and fruits, we can see how God has designed plants to make more plants. When we study the stars and planets, we can only stand in awe at the vastness of space and the beauty of the night sky. How big is a God who is bigger than the universe?

We should also learn science so we can help people around us who need medical care, food, or shelter. Learning science helps us be thankful for the gifts of God's creation and understand how we can use them to help others.

This course will teach you important facts about God's world, but it will also give you opportunities to explore science for yourself. If you learn how to observe the world and use the scientific method, you can do science in your own backyard!

#### Sidebar Information



- *Did You Know?:* These small boxes in the margins contain interesting facts about something related to the text.
- Sidebar: These larger boxes contain additional information about something interesting related to the text.
- Explore It: These small boxes in the margins, marked by a magnifying glass, suggest a small activity you can try on your own. You can record what you learn in your Nature Notebook.
- a magnifying glass, suggest a larger activity you can try with your class or on your own. You can record the results of the activity in your Nature Notebook.







Explore It

Go outside and look around. Make a list

of the different kinds of matter you see. In your Nature Notebook, make two columns

and label them Living and Nonliving. Write each kind of matter in

the correct column.

Scientists study the world around them and write down what they observe. They sketch what they see, collect samples to study, and record the results of their experiments.

You can be a scientist too. The activities in this textbook will help you learn more about God's creation. After you do each activity, write about it in your Nature Notebook. Your teacher might give you a Nature Notebook, or you can start one yourself with a notebook you use to record what you are learning about the world around you.

For most activities, you will need only your notebook and a pencil, but sometimes the activity will list more items you need. For some of the activities, you may need a field guide, magnifying glass, binoculars, or a microscope. These tools can help you observe and learn more about what you see.

# **Table of Contents**



Chapter 1	The Wonder of Science and Animal	s	
	1.1 The Wonder of Creation	. 2	
	1.2 The Wonder of Life	. 6	
	1.3 Ways Animals Survive	.10	
	1.4 Classifying Animals.	.15	
Chapter 2	ertebrates: Animals With Backbones		
	2.1 What Are Mammals?	20	
	2.2 What Are Birds?	.26	
	2.3 What Are Reptiles?	.32	
	2.4 What Are Amphibians and Fish?	.37	
Chapter 3	Invertebrates: Animals Without Backbones		
	3.1 Groups of Invertebrates	42	
	3.2 Arthropods in Abundance	48	
	3.3 An Insect's Design	54	
	3.4 Insect Metamorphosis	60	



Chapter 4	Characteristics of Plants
	4.1 Roots, Stems, and Leaves 68
	4.2 Flowers and Pollination
	4.3 Fruits and Seeds
	4.4 Plants in Different Habitats 85
Chapter 5	Benefits From Plants
	<b>5.1</b> The Gift of Grains 90
	5.2 Edible Plant Parts
	<b>5.3</b> Fabrics and Medicines From Plants 101
Chapter 6	Trees and Tropical Plants
	<b>6.1</b> The Life of Trees
	<b>6.2</b> Evergreen and Deciduous Trees
	<b>6.3</b> Large Plants of the Tropics
	6.4 Food From Tropical Plants



Chapter 7	he Earth Close Up		
	7.1 The Layers of the Earth		
	7.2 The Rocky Earth		
	7.3 Treasures in the Earth's Crust		
	7.4 Metals and Fuels From the Earth		
Chapter 8	The Atmosphere of Earth		
	8.1 Atmosphere and Wind		
	8.2 The Wonder of the Clouds		
	8.3 Powerful Storms		
Chapter 9	Astronomy: The Wonder of the Heavens		
	9.1 Sun, Earth, and Moon		
	9.2 The Solar System: Inner Planets 174		
	9.3 The Solar System: Outer Planets 179		
	9.4 Stars, Constellations, and Galaxies 184		



Chapter 10	Matter		
	10.1 Matter All Around Us		
	10.2 The Three Forms of Matter		
	<b>10.3</b> Matter Changes		
Chapter 11	ter 11 Force, Friction, and Simple Machines		
	11.1 Force, Work, and Power		
	11.2 Simple Machines		
	11.3 More Simple Machines		
	<b>11.4</b> Friction		
Chapter 12	Energy and Heat		
	<b>12.1</b> What Is Energy?		
	12.2 Heat, a Form of Energy		
	12.3 Energy Transfer and Change		
	<b>12.4</b> Sources of Energy		



100			
	Chapter 13	Sound	
100		13.1 What Is Sound?	24
1.20		13.2 Sound and Matter	24
100		13.3 Measuring Sound	25
		13.4 How the Ears Hear Sound	25
220	Chapter 14	Light	
		14.1 What Is Light?	26
* [5]		14.2 How Does Light Interact With Matter?	26
ate		14.3 Types of Light	27
		14.4 How the Eyes See Light	278
	Chapter 15	Magnetism and Electricity	
		15.1 What Is Magnetism?	28
		15.2 What Is Electricity?	28
		15.3 Uses of Magnetism and Electricity	29
	Glossary		. 29
	Index		30
Ackno	wledgments		312

### **Pronunciation Key**

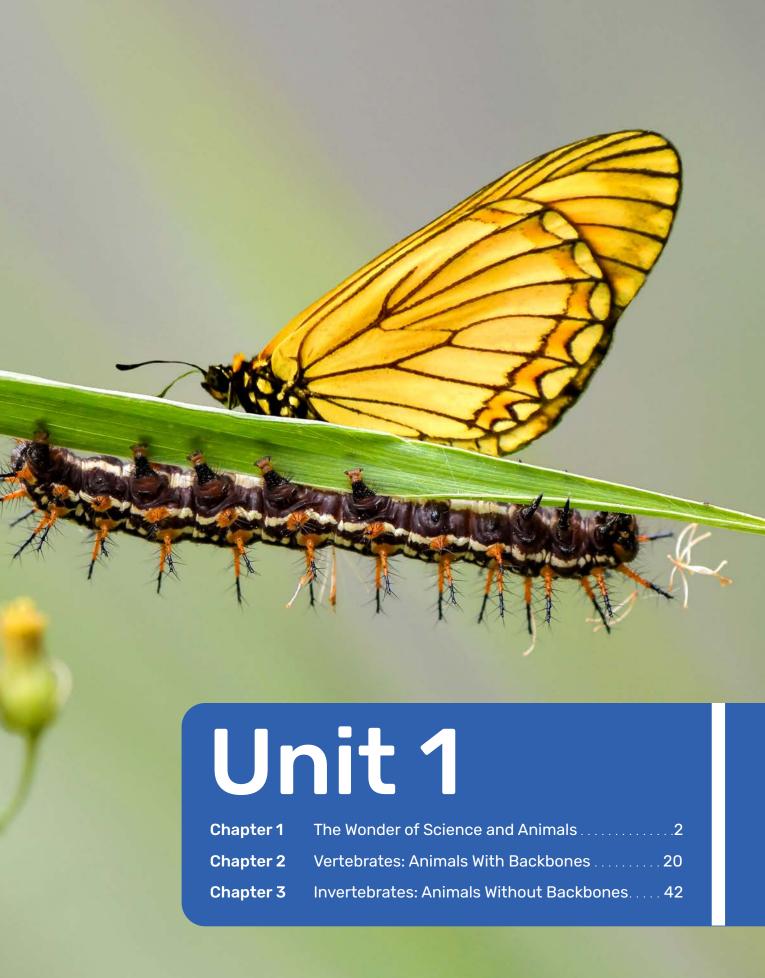
/a/ bat; /ā/ acorn; /är/ star; /e/ pet; /ē/ eagle; /er/ bear; /ər/ her; /i/ bit; /ī/ ivy; /ir/ deer; /ä/ top; /ō/ go; /ö/ lost; /öi/ coin; /au/ out; /ör/ corn; /ə/ but; /ü/ boot; /yü/ use; /u/ foot; /th/ thick; /th/ this; /ŋ/ bang; /zh/ measure

# Caterpillar

### **Christina Rossetti**

Brown and furry
Caterpillar in a hurry,
Take your walk
To the shady leaf, or stalk,
Or what not,
Which may be the chosen spot.
No toad spy you,
Hovering bird of prey pass by you;
Spin and die,
To live again a butterfly.







### 1.1 The Wonder of Creation

Look around you at the beautiful world God created. Every morning the sun rises over mountain peaks, forests, plains, and deserts. Streams and rivers run over rocky beds on their way to the ocean. Birds swoop through the air to catch insects or dive into the water to snatch fish. Land animals of every size hop, trot, or lumber across their territories, searching for food and water. At night, the moon travels across a dark sky dotted with stars. God must have a wonderful mind to have designed so many amazing things.

### The Order in Creation

In six days, God changed the earth from a dark, shapeless place to a world swarming with life and bursting with beauty. Before He created any living things, He made light and separated it from darkness. He formed the sky and filled the earth with air. He gathered the water in one place and

divided it from the dry land. When He created plants on the third day, they could survive because He had already prepared the earth with the light, air, water, and dry land they needed.

On the fourth day, God placed the sun, moon, and stars in the sky. He had already made light on the first day, but now He created the sun to shine during the day and the moon and stars to shine at night.

On the fifth and sixth days, God created fish to swim in the seas, birds to fly in the sky, and insects to scurry over the land. He created animals of every kind and formed people to take care of the earth. Because He had already made plants, animals and people had all the food they needed. People could observe the sun and moon to tell when a new day or month began. God had created everything in the universe in the perfect order. On the seventh day, He rested from His work of Creation.





Light and darkness (day and night)

Day 2



Firmament (sky and air) divided from waters

Day 3



Seas, dry land, plants

Day 4



Lights in the heavens: sun, moon, stars

Day 5



Water creatures and birds

Day 6



Land animals and people

Day 7



God rested



Every person is made in God's image.

### Made in God's Image

God created people differently from the animals. After He had made everything else, He formed a man from dust and breathed life into him. God called this man Adam and gave him the Garden of Eden for his home.

When Adam looked around at the animal pairs walking through the garden, he realized he was alone. God knew Adam needed a companion, so He put Adam to sleep, took out one of his ribs, and formed a woman from it. Adam was delighted to see her. She was a human, like him, but she was different because she was a woman. It was God's idea to create these differences as part of His good plan for people.

God made both Adam and Eve in His image and gave them the job of taking care of the earth. Since all people descended from Adam and Eve, all people are made in God's image. Being made in God's image means we can think, plan, create, and take care of His creation the way He meant us to. We can choose to love God and communicate with Him.

### **Using Your Five Senses**

God gave us the five senses of seeing, hearing, smelling, tasting, and feeling. We use all five senses to explore His creation.



Your tongue has between 2,000 and 8,000 taste buds.



### **Using Your Senses**

Go outside with a pencil and your Nature Notebook. Find a good place to observe the world around you. Write down what you experience with your five senses.

Here are some suggestions to help you get started:

- Seeing: What is under you, around you, and above you? Look at things that are close and things that are far away. Notice colors.
- Hearing: What do you hear? Listen for birds, insects, or the wind.
- Smelling: What can you smell? Try sniffing grass, flowers, leaves, bark, or dirt.
- Feeling: Can you feel wind, sun, or rain? Touch plants, bark, and dirt to feel their texture.
- Tasting: What can you taste? Try nibbling on grass or dandelions. Be careful not to eat plants that have been sprayed or plants that could be poisonous.

Imagine walking through a garden and using your five senses to discover what is in it. Rows of onions stand tall, while a squash plant sprawls over the ground. A rabbit nibbles on a bean plant, and a spider spins a web across a garden path. Sparrows sing, beetles buzz, and corn leaves rustle in the breeze. The smell of ripe fruit drifts from a patch of raspberries. You pop a juicy berry in your mouth, touch a smooth pea pod, and rub a fuzzy lavender leaf between your fingers.

Using your senses to enjoy the amazing creation around you honors God, who created it all.

### **Study Questions**

11

- 1. How many days did it take for God to create the world?
- 2. What did God create last?

- 3. What are your five senses?
- ★ 4. How have you used each of your senses today?

### 1.2 The Wonder of Life

# Vocabulary Words

characteristic: a quality that makes one thing different from another

During the winter, a forest is cold and still. Bare trees stand tall against a gray sky, and dead leaves carpet the ground. Snow drifts into a hollow by a fallen tree.

Deep in the hollow lies a mother black bear, curled up in a ball. Her eyes are closed, and she holds very still. Is she dead? No, her sides move slowly up and down. She breathes one or two times per minute.

In the chilly den, two newborn cubs cuddle up against their mother's warm body. When they are hungry, they wake up and drink their mother's milk. Then they snuggle down to sleep again.

Bear cubs stay with their mother for over a year.



One early spring day, a warm wind blows through the forest, melting the snow. The forest springs to life. Violets peek from under dead leaves. Ferns unfurl and mushrooms push through damp soil. White beetle grubs squirm under rocks and rotten logs. The mother bear lumbers to her feet, and her cubs tumble after her. She pokes her black nose into the sunshine and sniffs. After her long winter sleep, she is hungry.

The forest looked dead in the winter, but now that spring has come, it is easy to see life everywhere.

#### **Characteristics of Life**

What does it mean to be alive? You are alive, and so are animals and plants. But the wind and sunshine, rocks and soil, and firewood and metal are not alive. They do not have the **characteristics** of living things.

All living things have four basic characteristics.

- ▶ They need food, water, and air.
- They grow.
- They produce more of their own kind.
- They respond to their surroundings.

If something has all four characteristics, it is alive. Living things need food, water, and air. The mother bear eats a huge amount of food in the fall so she can survive the winter without eating or drinking. Her cubs drink her milk to get the food they need. During the winter, while the bears sleep in the den, they breathe the air that drifts in. When spring arrives, the bears leave the den to find more food, water, and fresh air.



Pansies can start to grow even in early spring.





What about trees, flowers, and grass? Do they need food, water, and air? Yes! A plant receives water through its roots and makes food for itself through its leaves. A plant must also have air around it or it will die. A tree that is cut down cannot get water, and its leaves soon dry up.

Living things grow. When bear cubs are born, they measure about 8 inches (20 cm) long and weigh less than 1 pound (0.5 kg). If they get plenty to eat, by fall they will weigh as much as a fourth-grade student (60-100 pounds; 27-45 kg).

Plants also grow. They start off small but grow larger as they make food and take in water and air. Plants such as moss grow no taller than your shoe, while many trees grow to be much taller than a house.

Things that are not alive, such as sand, water, and plastic, cannot grow.

Living things produce more of their own kind. A mother black bear gives birth to black bear cubs. They are much smaller than she is and are helpless at birth. But by the time they leave the den, they have fur, claws, and sharp teeth like she does. When they grow up, they will produce more of their own kind, just as all other animals and people do.

Plants also produce new plants like themselves. Most plants form seeds that can grow into new plants. For example, an oak tree may produce thousands of acorns. If an acorn sprouts and grows, it can become a large oak tree. Acorns from this tree can produce even more oak trees.

Living things respond to their surroundings. All living things are able to respond to changes around them. For example, bears can see, hear, smell, taste,

This curious bear cub is practicing his climbing skills.



and touch things in their surroundings and make changes based on the information they gather through their senses.

The mother bear turns over rocks to find the grubs she has smelled. While she searches for more food, her cubs wrestle with each other. Then a wolf slinks through the trees toward the cubs. They scramble up a big pine tree and scream for their mother. She charges out of the bushes, huffing and snarling. The wolf slips back into the shadows, away from her long claws. Both the wolf and the bears are responding to their surroundings.

Plants also respond to their surroundings. Their roots grow toward water, and their leaves and stems often grow toward the light. As the weather turns warm in the spring, green shoots poke through the soil. Vines reach out tendrils and begin to climb a fence, a stone wall, or another plant.

Both the rocks the bear turns over and the fence the vines climb cannot respond to their surroundings. Rocks and fences are not alive.

Life is a gift from God. When He created the world, He gave life to people, animals, and plants. People cannot create life, but God can. This unit focuses on one group of living things: animals.



Which characteristics of life does each thing in this list have? Remember, a living thing has all four characteristics.

- Book
- Butterfly
- ▶ Car
- Dandelion
- Fire
- Helium balloon
- Worm

### **Study Questions**

1.2

- 1. What do living things need in order to stay alive?
- 2. How are living things different from nonliving things?
- 3. Where does all life come from?
- ★ 4. What is something in your classroom that is alive?

## 1.3 Ways Animals Survive



blubber: the layer of fat in sea mammals

camouflage: the color or shape of an animal that helps it blend with its background

hibernate: to spend the winter in a deep sleep

migrate: to move from one place to another at different times of the year

predator: an animal that hunts and kills other animals

prey: an animal that is hunted and killed by another animal for food

A mouse is a small animal with many enemies. It must constantly look out for the owls, hawks, cats, foxes, and snakes that want to catch and eat it. A mouse is the **prey** that larger animals hunt for food. Any animal that hunts and kills a mouse or other animal is a **predator**.

The most important job any animal has is staying alive. To stay alive, animals need enough food to eat and a way to stay safe from predators. The color of some animals' bodies helps them hide from predators or lets them sneak up on their prey without being seen. The color of other animals warns predators to stay away. Some animals even fight off their attackers.

During cold winter weather, many animals cannot find food as easily. Some animals curl up in a protected place and fall into a deep sleep for the winter. Others move to an area that has more food.

### **Colors and Weapons for Survival**

Camouflage helps animals hide. The colors and shapes of some animals allow them to blend in with



A bald eagle grasps prey with its hooked claws.

their backgrounds. This **camouflage** hides them from predators. Fawns can hide in the forest because the sunlight falling through leaves creates a pattern similar to the fawns' spots. Some moths are difficult to see when they rest on a tree because they are colored like tree bark. Walking stick insects are shaped like twigs, which allows them to easily hide on plants.

Some animals change color to match their surroundings. Snowshoe hare have brown fur in the summer and white fur in the snowy winter. Some types of octopuses can change color in a fraction of a second to blend in with the rocks or coral around them.

Camouflage also allows predators to sneak up on their prey. Mountain lions are light brown, which lets them hide among rocks and bushes to watch for prey. Tigers have stripes that help them blend in with tall grass as they creep toward their next meal. The light and dark brown spots on rattlesnakes allow them to hide among rocks or dead



A gray tree frog uses camouflage to hide from predators.

A poison dart frog can release poison through its skin.





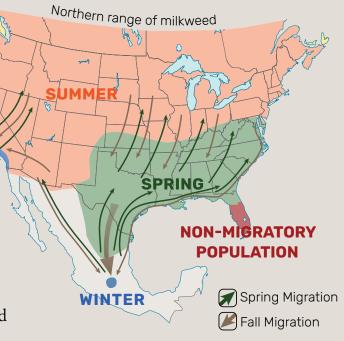
Have you seen monarch butterflies flitting near milkweed plants during late summer? Soon the weather will be too cold for them to survive. What will they do?

Monarch butterflies escape winter by taking a long trip. They may travel 2,000 miles (3,200 km) from Ontario, Canada, to their winter home in Mexico. In August and September, monarchs gather in great clusters. As soon as the first frost touches the land, they begin to fly south. They travel by day and rest at night. Strong winds help them fly up to 200 miles (320 km) a day.

When the butterflies reach Mexico over a month later, the air is damp and cool but not freezing. The butterflies huddle together and cover the tree trunks like a speckled carpet of orange, black, and white.

When spring comes, sunshine warms the bodies of the butterflies that are still alive. They begin to migrate north again. All along the way, female monarchs find milkweed plants where they can lay their eggs. After laying their eggs, the females die. But soon the eggs hatch. The young caterpillars feed on the juicy green milkweed plants, form chrysalises, and change into new butterflies.

The new butterflies continue the journey north. They have no maps to follow, and they have never been to Canada before. God designed them to know where to go. By the time they reach Canada, summer has come again, and the monarch life cycle continues.





leaves. These colors, stripes, and spots make the predators hard to see.

Bright colors warn of danger. Instead of camouflage that hides them, some animals have bright colors that make them easy to spot. These animals are often poisonous or can bite, sting, or give off a bad odor. The bright green, yellow, red, orange, or blue skin of poisonous jungle frogs warns predators to leave them alone. The yellow and black stripes of yellow jackets advertise their painful sting. The distinct white stripes or spots on a skunk warn other animals to stay away or be treated to a horrible smell.

Weapons hurt or confuse attackers. Some animals have body parts that serve as weapons to fight back when they are attacked. Deer, moose, and elk use their antlers to defend themselves. Wild pigs, walruses, and African elephants use sharp tusks. Porcupines and hedgehogs protect themselves with long sharp quills or spines.

Some animals have weapons that confuse predators or drive them away. Skunks spray smelly liquid that irritates a predator's eyes, nose, and mouth. An octopus can spray black ink that clouds the water and keeps an enemy from seeing or smelling it.

### **Warmth and Food for Survival**

Thick fur and fat keep animals warm. Some animals grow thick fur to protect themselves from winter cold. They may also develop a thick layer of fat under their skin to help keep them warm. A layer of fat called **blubber** keeps seals, walruses, whales, and other sea animals warm in cold water.

A porcupine has about 30,000 quills.



The tusks of a walrus can grow up to 3 feet (1 m) long.





Observe animals near your home or in your neighborhood. In your Nature Notebook, list the ways they protect themselves from cold and predators.



Wildebeests migrate about 500 miles (800 km) each year.

the winter, animals work hard to find food. To survive, some animals like bears and groundhogs hibernate, or spend the winter in a deep sleep. A groundhog prepares to hibernate by eating as much as it can in the fall. When the weather gets cold, it finds a hole and curls up to sleep. The groundhog's heartbeat and breathing slow; it might take only a few breaths per minute. This uses less energy, and the groundhog survives by living off the fat stored in its body. When warmer weather comes, the groundhog wakes from hibernation.

Migration is one way animals find food. Instead of hibernating when food is scarce, some animals migrate. In the fall, animals travel to warmer areas where they can find food. Caribou migrate long distances over land. Geese, robins, and many other birds fly south every winter. Monarch butterflies migrate to Mexico. Even some whales swim to warmer water when winter comes.

God cares about all the creatures He has made. He designed animals to fit their environments, protect themselves from predators, and find food. He has given every animal ways to survive.

### **Study Questions**

1.3

- 1. What three things help animals escape predators?
- 2. Why do some animals hibernate during the winter?
- 3. Why do some animals migrate?
- ★ 4. How many animals can you name that hibernate?

# 1.4 Classifying Animals



## Vocabulary Words

carnivore: an animal or plant that eats animals

classify: to arrange in groups based on the way things are alike

cold-blooded: having a body temperature that changes with the

outside temperature

herbivore: an animal that eats only plants

invertebrate: an animal without a backbone

omnivore: an animal that eats both plants and animals

vertebrate: an animal with a backbone

warm-blooded: having a body temperature that does not change with the

outside temperature

If someone asked you to divide all the animals in the world into groups, how would you do it? Would you divide them by their size? By their number of legs? Or by whether they live on land or in the water?

For hundreds of years, people have worked to divide animals according to their similarities. Animals eat different diets and control their body temperatures in different ways, but the main way to group animals is by the design of their bodies.

### **Types of Diet**

Animals eat three main types of diets. Some animals eat only meat, while others eat only plants. Some animals eat both meat and plants.

A **carnivore** is a predator that eats animals. Tigers sneak up on their prey and then pounce onto it, often biting its neck to kill it. Frogs catch insects, slugs, and snails with their long sticky tongues.



Meerkats stand guard outside their burrows to watch for predators.





Carnivores eat other animals, including herbivores. Herbivores eat only plants.

Hawks perch high in a tree and then dive through the air and sink their sharp claws into their prey. With their sharp beaks, they tear off pieces of meat.

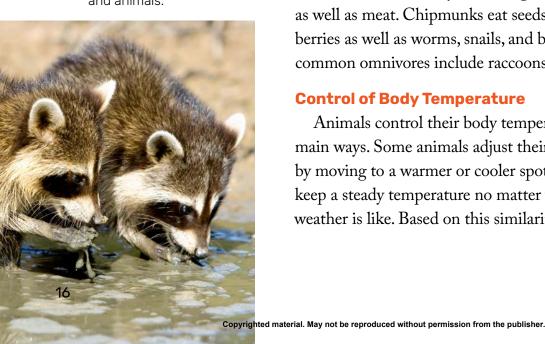
A **herbivore** eats only plants and parts of plants such as roots, leaves, bark, fruits, and seeds. Many animals with hooves, such as zebras, sheep, and deer, are herbivores. Their teeth are designed to tear and grind plants, and their stomachs are designed to digest this food. Other herbivores include parrots, which eat fruits and seeds, and butterflies, which sip sweet liquid from flowers.

An **omnivore** eats both plants and animals. Bears are often thought of as carnivores, but they are omnivores because they eat fruit, grasses, and roots as well as meat. Chipmunks eat seeds, nuts, and berries as well as worms, snails, and bird eggs. Other common omnivores include raccoons, pigs, and rats.

### **Control of Body Temperature**

Animals control their body temperature in two main ways. Some animals adjust their temperature by moving to a warmer or cooler spot, while others keep a steady temperature no matter what the weather is like. Based on this similarity, scientists

Omnivores eat both plants and animals.



divide animals into two groups: **cold-blooded** animals and **warm-blooded** animals.

Cold-blooded animals have body temperatures that change with the temperature of the air or water around them. When the air or water is warm, their bodies are warm and active. When the air or water is cold, their bodies are cold and they cannot move fast. To warm up, they need to move to a warmer spot. Cold-blooded animals include turtles, snakes, fish, and insects.

Warm-blooded animals have bodies that stay nearly the same temperature all the time. Even when the weather turns cold, they stay warm. Warm-blooded animals use energy from the food they eat to keep their bodies warm and active. Their feathers, hair, or fur also keep them warm when the air is cold. When the air is hot, they may sweat or



Turtles often sun themselves on cool days.

# **What About Humans?**

Humans are similar to animals, especially vertebrates, in several ways. We eat some of the same foods, are warm-blooded, and have a backbone and a skull. But we are different in other ways. We can use words to communicate with others, read and write books, solve math problems, design houses, and study nature. We can communicate with God and worship Him.

Genesis 1:27 says that God created people in His own image, which means He made us to be like Him in some ways. One important way we are like God is that our souls keep living after we die. Animals are not made in God's image, and they do not have souls like people do.

Although you are a warm-blooded vertebrate and most likely an omnivore, you are more than an animal. You are a human who can choose to love and obey God.

pant to cool down. Humans, birds, and many land animals are warm-blooded.

### **Classifying by Design**

Scientists **classify** animals by their body characteristics, or design. Animals with backbones are called **vertebrates**. A vertebrate is any animal with a skeleton inside its body. The skeleton includes a backbone that protects the spinal cord and a hard skull that protects the brain. Scientists have classified about 40,000 kinds of vertebrates.

Some vertebrates, such as goats and deer, are covered with hair and live on land. Other vertebrates, such as crocodiles and fish, live in the water. Still others, such as frogs and toads, spend part of their lives in the water and part on land. Birds are vertebrates with a special design that allows them to fly.

Many kinds of animals do not have backbones. These animals are called **invertebrates**, and scientists have classified more than one million kinds. Examples of invertebrates include earthworms, spiders, ants, squids, and sponges.

A skeleton gives a horse's body its shape.

A hard shell protects a crayfish's body.







A hermit crab has no backbone and no shell of its own. Most hermit crabs move into empty seashells. Once they outgrow a shell, they look for a larger one.

The bodies of invertebrates come in a huge variety. Most insects have wings that allow them to fly. Jellyfish are soft and squishy and float along with ocean currents. Sea stars and sand dollars are covered with hard spines, while clams, oysters, and snails are protected by hard shells.

As you study groups of animals, you will learn about their diets, type of body temperature, and more importantly, the design of their bodies. What a wonderful variety of animals God has designed!



Choose an animal such as a beaver, porcupine, or otter. Make a list in your Nature Notebook of the foods it eats. Then identify the animal you chose as a herbivore, carnivore, or omnivore.

### **Study Questions**

1.4

- 1. How are carnivores and omnivores alike? How are they different?
- 2. Are humans warm-blooded or cold-blooded?
- 3. What is the difference between a vertebrate and an invertebrate?
- ★ 4. What would happen if all animals were herbivores?