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### Pronunciation Key

/ə/ bat; /ā/ acorn; /är/ star; /e/ pet; /ē/ eagle; /er/ bear; /ər/ her;  
/i/ bit; /ī/ ivy; /ir/ deer; /ä/ top; /ō/ go; /ò/ lost; /òi/ coin; /aù/ out;  
/òr/ corn; /ə/ but; /ü/ boot; /yü/ use; /ù/ foot; /th/ thick; /th/ this;  
/ŋ/ bang; /zh/ measure

# Our Purpose in Teaching Science

At Christian Light, we teach science with the goal of helping students see the world through the lens of Scripture. We believe God created and sustains the universe, and we want students to discover His fingerprints in creation. Our two main guiding principles are simple: *love God* and *love our neighbors* (Matthew 22:37-40). These principles shape everything we do in science class—from what we teach to how we teach it.

## Science Goals

The goals of science instruction help define what we are guiding our students toward. While there are many possible goals, the ones listed below reflect what Christian Light considers most important for students in the lower elementary grades.

### **Loving God Through Science**

We want students to worship God as they explore the natural world. Science is not just about facts—it is about seeing the creativity, order, and beauty God wove into His creation. When students study stars, cells, or ecosystems, they should be amazed—not just at how things work, but at the One who made them. We also want students to develop humility as they realize how much humans still do not understand.

### **Loving Our Neighbors**

Science helps us serve others. We want students to connect what they learn with ways of helping people—whether through clean water, medical advancements, or growing food. Students should learn that science can be a way to bless others and care for creation as God intended.

We also want students to be aware that scientific progress can have unintended consequences. Things like pollution or overuse of chemicals can harm both people and the world around us. Part of loving our neighbors means thinking carefully about how we use science and technology.

### **Fostering Lifelong Curiosity and Learning**

A strong science education should spark a sense of wonder and a hunger to continue learning beyond the classroom. We want students to leave the classroom more curious than when they came in. They should see science as a way to continually discover things about the world God made.

### **Developing Scientific Knowledge and Skills**

On a practical level, students should develop a clear understanding of what science is and how it works. Science is more than a collection of facts—it is a way of asking questions, testing ideas, and building models to explain how things work. Students should learn what the scientific method is and use it to investigate and ask questions about the natural world.

They should also practice the skills scientists use: making careful observations, taking measurements, organizing data, and using math in real-world ways. Students should also learn scientific terms, write about what they discover, and be able to explain what they have learned to others.

## Science Pedagogy

Science goals outline what the result of study should be, but how do we help students get there? The following methods offer some ways you can bring learning to life to help your students achieve the larger goals of the course.

**Let Creation Speak.** One of the best ways to point students to the Creator is to spend time in nature. Whether it is turning over rocks, gazing at the stars, or studying pond water under a microscope, firsthand interactions with the natural world build wonder and understanding. Studying nature is a powerful way to reinforce what students read in textbooks.

**Ask Big Questions.** Good questions can spark curiosity in powerful ways. Ask questions such as *Why do you think God created bacteria?* *Why is the sky blue?* or *What causes the wind?* These open-ended questions often lead to meaningful discussions and help students connect science to everyday life. Encourage students to ask questions as well.

**Encourage Exploration.** Give students space to follow their curiosity—even if it takes them a little off topic. Build an “exploration center” with natural items or science tools. Let students keep a science notebook where they can jot down questions, record what they see, or sketch what they observe. These simple tools go a long way toward making science come alive for students.

**Make Science Hands-On.** Students learn best when they do science, not just read about it. Teach the scientific method, then help them use it. Have students ask a question, form a hypothesis, test it, and make sense of the results. Real investigation helps students see that science is not just about finding the right answer—it is about figuring things out through careful work.

Let students experience the messiness of science. They will learn a lot when an experiment does not go as planned. They will learn even more if they get the chance to troubleshoot and try again.

**Build Strong Skills.** Finally, students need practice with the basics of science: observing, measuring, recording, organizing data, and communicating clearly. Start early with simple tools and terms and build their skills over time. Give them chances to write reports, present their findings to the class, or take part in science fairs or group projects. The goal is to prepare students not only to know scientific content, but to think and work like scientists.

In summary, Christian Light’s science program aims to teach science in a way that glorifies God, fosters wonder, and equips students to serve others. We want students to leave their

science classes with a deeper understanding of creation and a stronger desire to worship the Creator.

## Components of Science 4

The components of this course are the textbook, five LightUnits, the Answer Key, the Quiz & Test Answer Key, and this Teacher’s Guide.

- **Textbook**—provides the text that students will read before answering exercises in the LightUnits.
- **LightUnits**—provide the students with written exercises for the text in the textbook.

- **Answer Key**—contains reproductions of the LightUnit pages with answers.
- **Quiz & Test Answer Key**—contains reproductions of the quiz and test pages with answers.
- **Teacher’s Guide**—contains a reproduction of each textbook page. It also contains detailed lesson plans with useful information for teaching the course.

## How to Use the Teacher’s Guide

### Chapter Overviews

Each chapter includes objectives, an outline, and a chart listing recommendations for additional reading.

#### Chapter Objectives

The chapter objectives identify the main learning goals for the chapter. They outline key concepts and skills students should understand by the end of the chapter. Use these objectives to guide instruction and assessment.

#### Chapter Outline

The chapter outline presents the structure of a chapter at a glance. It lists the title of each lesson, along with its main headings to show the flow of content and key teaching points.

#### Recommended Books

These charts provide a selection of recommended books intended to enrich students’ knowledge and understanding of different scientific topics. While we have noted potential concerns in some of these books, please evaluate whether they align with your school policies or personal standards before using them in the classroom. You can also find many additional resources in the juvenile nonfiction section of your public library.

### Lesson Overviews

Note the following basic features of the daily lesson plans.

#### Objectives

The objectives state the main goals of each lesson. These are the concepts students should understand after they have completed the lesson.

#### Class Preparation

This section lists the material the teacher should gather before class begins. It also includes the guiding question for the lesson—the central question students should be able to answer by the end. Begin class by introducing this question and shape your teaching to highlight the concepts that help answer it.

#### Review

These exercises review vocabulary words and core content from the previous lesson. Use this oral review to reinforce what students are learning. If time is limited, you may choose the most necessary items from the review list and skip the ones your students know well. The review section before a quiz or self check includes a comprehensive list of questions and material for you to use as a class preparation or as a game before giving the class the tested materials.

### Teaching Plan

This section includes three subsections: Introducing the Lesson, Discussing the Lesson, and Wrapping Up the Lesson. Each subsection includes several features to guide your teaching.

#### Introducing the Lesson

The guiding question for the lesson is stated here again with several possible ways to think about the answer. Other introductory ideas for the lesson are sometimes included here as well.

#### Discussing the Lesson

This section offers several discussion questions and suggested answers for each section of lesson text. Use the questions to prompt student engagement, encourage critical thinking, and deepen understanding.

#### Wrapping Up the Lesson

This section often includes two points. First, if the lesson includes a graphic organizer, it is explained here. The graphic organizer appears in the gray box on the last page of the lesson, along with suggested answers. Second, the guiding question is repeated and answers included in this section.

A graphic organizer is a visual tool that helps students organize the information they have learned and see how ideas relate to each other. Reproducible versions of the graphic organizers can be found in Appendix A of the Teacher’s Guide.

You may wish to copy one for each student and have them collect the organizers in a binder. Or you could draw the graphic organizers on the board or a wipe-off poster for class discussion and review.

## Study Questions

The study questions are found at the end of every lesson in the textbook. These are designed to provide oral review of key concepts from the lesson. The first three questions test basic recall of lesson content. The fourth question asks students to apply their knowledge. The Teacher's Guide includes answers to the study questions.

## Additional Activities

### Nature Notebook

Some lessons include one or more activities that students can write about in their Nature Notebook. Some Activities or Explore It ideas are found in the textbook, while others are additional activities found only in the Teacher's Guide.

The Nature Notebook is an optional but important part of this course. In it, students can record what they observed and learned, just like real scientists. The Nature Notebook helps students interact and engage with observations and activities so they can better understand and remember what they learned. The Nature Notebook can also help engage students who enjoy writing and drawing.

Any notebook can be used as a Nature Notebook, but a one-subject spiral notebook or composition book with thicker paper is ideal.

### More Activities and Experiments

This section offers a variety of optional activities and experiments that enrich the lesson. These ideas are designed for class participation but can also be adapted for individual exploration. Use these ideas to reinforce key concepts and foster curiosity in your students.

Additionally, this section sometimes mentions activities that teach students more about the scientific method. These activities include worksheets and experiment charts.

*Scientific Method Worksheets.* Six worksheets, included in Appendix B, teach students more about the scientific method. The Teacher's Guide suggests particular days to assign them, but you can choose any day that works for your class. Print or copy these worksheets for your students and discuss the text and questions for each one.

*Experiment Charts.* Some of the experiments listed in the Teacher's Guide are paired with experiment charts, also included in Appendix B. These charts help students work through the scientific method at a basic level. For these experiments, print or copy a reproducible experiment chart for the class or individual students to work through. A completed chart is included for each of the sixteen experiments to show how you might help students fill out their charts.

## Appendixes in the Teacher's Guide

**Appendix A: Graphic Organizers.** This appendix contains the reproducible blacklines for graphic organizers used in many of the lessons in the Teacher's Guide. If you prefer, you can draw these graphic organizers instead, or tell students how to draw them.

**Appendix B: The Scientific Method Strand.** This appendix includes six worksheets to teach students more about the scientific method. It also includes experiment charts to enrich some of the experiments in the Teacher's Guide. These charts help students work through the scientific method at a basic level.

**Appendix C: Review Games and Activities.** Use this appendix to find the materials needed for review games or extra activities noted in various places throughout the Teacher's Guide.

**Appendix D: Glossary.** This appendix contains the vocabulary words and their definitions used in the textbook.

**Appendix E: Index.** Use this appendix to find where Science 4 covers a specific topic.

## How to Use the LightUnits

Each LightUnit has sixteen lessons and is divided into three sections. Each lesson is one day's work. Tests are in the center of each LightUnit. Quizzes are on perforated pages in the back of the LightUnit. Remove the quizzes and test from the book before handing the student a new LightUnit. Give these to the student as directed in the LightUnit.

**Symbols:** Several symbols are included in the LightUnit to guide the student through a lesson. Teach him what these symbols mean:

-  – Indicates the student must obtain the teacher's initials before proceeding. Generally found before quizzes and self checks.
-  – Indicates an exercise that requires teacher involvement. The teacher may need to score or assist the student with the exercise. The student may continue working in the lesson.



– Indicates the student may not continue working in the LightUnit until the exercise has been checked and initialed by the teacher aide or teacher.



– Indicates exercises that need to be checked by the teacher aide or teacher. The student may continue working beyond this symbol even though the exercise has not been checked.



– Indicates the student should check with a teacher for instructions on whether to do this optional activity.

**Vocabulary.** Vocabulary words are the key terms from the lesson text that help students understand important concepts. These words are at the beginning of the reading section in the textbook. They are also in boldfaced type the first time they occur in the text. Students may use the textbook glossary to learn the pronunciations of these words. They should be able to do the vocabulary exercises on their own, but you can also introduce and discuss the words in class.

**Exercises.** The exercises in each lesson test comprehension and understanding of lesson information.

**We Remember.** Exercises in this section review concepts from previous lessons. The goal is for students to do this section with minimal teacher assistance.

**Quizzes.** Lessons 5 and 10 in each LightUnit are quizzes. Students should study on their own by reviewing the We

Remember sections and using the checklist found before each quiz. You may also review with students before giving the quizzes, using the review lists found in the Teacher’s Guide. Students should not have access to the LightUnit when taking the quizzes.

**Self Checks.** Lesson 15 in each LightUnit is a Self Check. The Self Check evaluates students’ mastery of concepts taught in the LightUnit and helps prepare them for the LightUnit Test. Students should review the We Remember sections to prepare for the Self Check. A list of review questions is also included in the Teacher’s Guide for review before the Self Check.

Score the Self Check after students have taken it. If they did well, have them make any corrections and plan to give them the LightUnit Test the following day. If they did poorly, give further instruction in areas where they are weak and do any necessary remedial work to prepare them for the test.

Although the Self Check is scored, this grade is not intended to be included with the final LightUnit grade.

**Tests.** The final lesson is the LightUnit Test. Students are given a checklist of items to review. You may also use the Self Check as a review before administering the test. Students should not have access to the LightUnit when taking the test.

**Extra Activities.** An optional extra activity is included after each quiz. It gives informal practice in some skill or content area.

## Scoring and Grading

The score box on quizzes, self checks, and tests show that 80 is the minimum score required to pass. The total score possible is 100. The empty box on the quiz and self check is to be initialed by the person who grades it.

**LightUnit Grade.** To obtain a final LightUnit grade, average the two quiz grades and any other optional grades. Add this average to the LightUnit test grade and divide by two. This average will be the final grade for the LightUnit.

**Equation:**  $\frac{\text{Quiz Average} + \text{Test Score}}{2} = \text{LightUnit score}$

**Example:** Quiz 1: 96% Quiz 2: 98%

Quiz Average:  $\frac{96+98}{2} = 97\%$

Test Score: 93%

LightUnit Score:  $\frac{93+97}{2} = 95\%$

LightUnit score is 95.

**Scores Below 80.** If a student scores 75-79% on a LightUnit Test, review or reteach any weak concepts. Verify that the student understands the material by giving an oral or written remedial assignment.

If a student scores 70-74%, review or reteach the material and then assign the student to take the Alternate LightUnit Test, located in the digital resources.

If a student scores below 70%, assign a thorough review of the LightUnit or ask the student to redo the entire LightUnit. Then assign the Alternate LightUnit Test. If the student scores between 75-100% on the Alternate Test, record the LightUnit score as 80%.

If the student fails to achieve 80% after all procedures are followed, consider possible underlying causes. What is the student’s natural ability? Is an 80% score a realistic expectation? Some students may benefit from one-on-one assistance or evaluation by a trained professional.

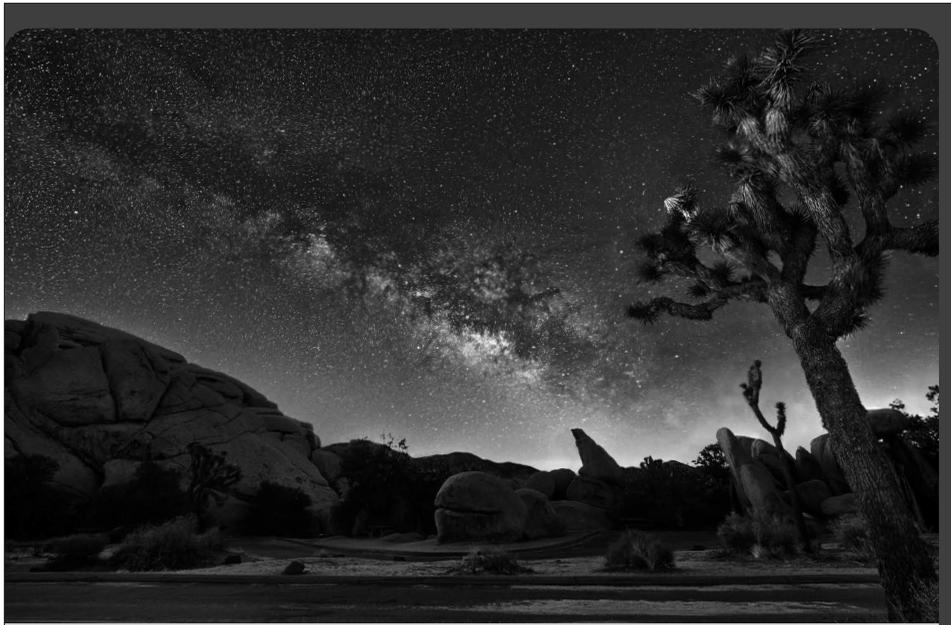
# Scheduling the Science Course

Science 4 contains approximately half a school year's worth of work. Consider the following options for scheduling this course for the school year:

1. Schedule two or three science classes each week to spread the course over the entire school year. Consider alternating science class with another part-time class.
2. Do all five LightUnits during the first or second half of the year, leaving the other half open for another subject.
3. Schedule a short science class each day, and take two days to cover one lesson. Read the textbook and complete

the LightUnit lesson one day; on the second day, do additional activities from the Teacher's Guide or read a recommended book listed on the chapter overviews.

4. Schedule one lesson a day until a LightUnit is completed and then skip two or three weeks before beginning a new LightUnit. Plan other projects or focus on other subjects between science LightUnits.
5. Wait a month or two into the school year to begin science classes and finish before the end of the school year.



## 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!



# Caterpillar

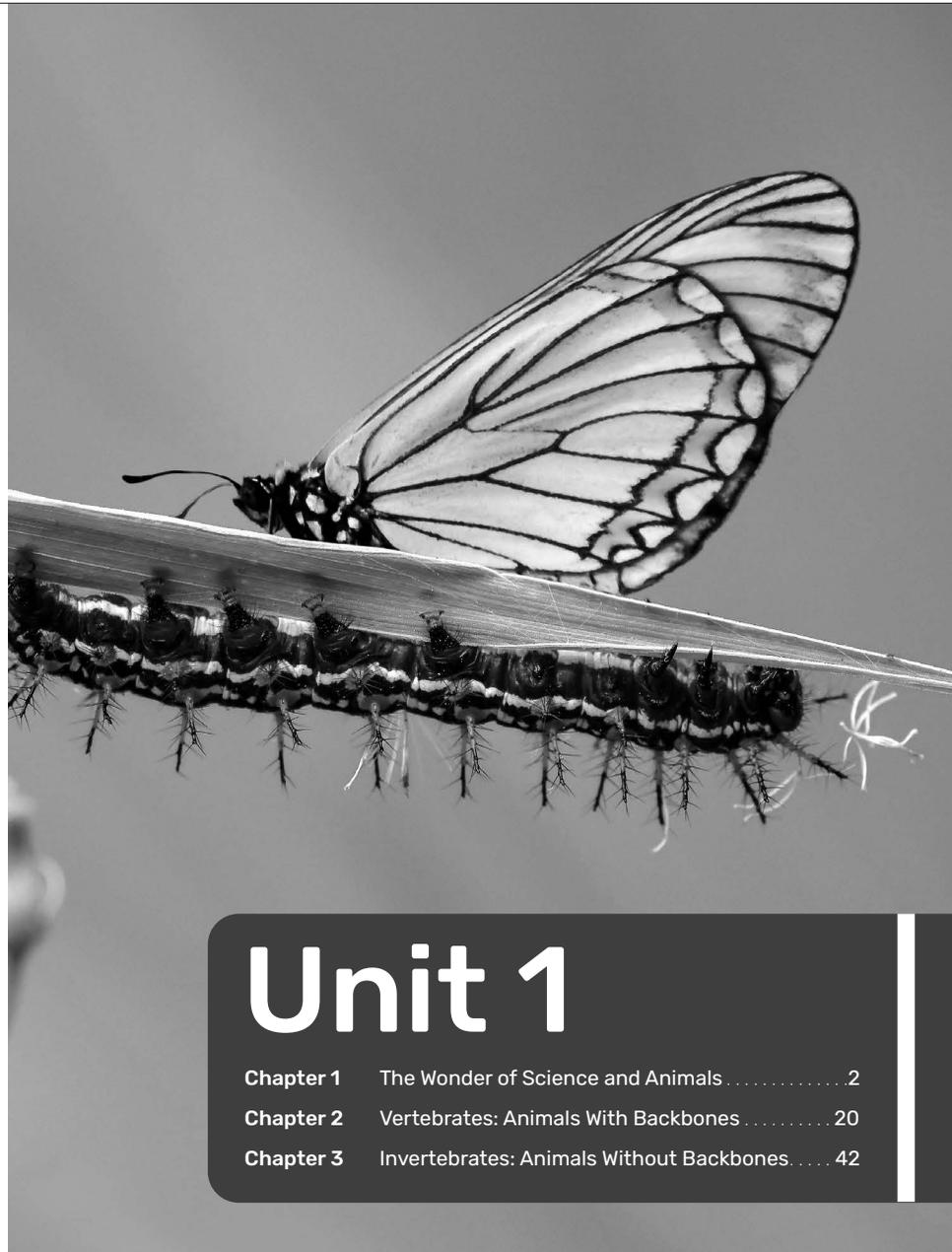
**Christina Rossetti**

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.



## Recommended Books

Lesson	Title	Author	Description
1.1	“Smelly” Kelly and His Super Senses	Beth Anderson	Picture book biography about James Kelly and his work on the New York City Subway; NOTE: artwork is cartoon-style
1.1	Actual Size	Steve Jenkins	Informational picture book showing animals or parts of animals at their actual size; NOTE: the back matter refers to “millions of years”
1.1	My Father’s World	Pablo Yoder	Photos and stories of God’s wonderful world
1.2	Living Things	Adrienne Mason	Book with science activities that help students understand the characteristics of life
1.2	Mimic Makers	Kristen Nordstrom	Picture book about inventors who have created technology by imitating the design of plants and animals
1.3	Great Migrations	Elizabeth Carney	A National Geographic Kids book with full-page photos, graphs, and maps
1.3	All on a Mountain Day; Trapped by the Mountain Storm	Aileen Fisher	Two books with true-to-life stories about wild animals in the Rocky Mountains



# Unit 1

**Chapter 1** The Wonder of Science and Animals ..... 2  
**Chapter 2** Vertebrates: Animals With Backbones ..... 20  
**Chapter 3** Invertebrates: Animals Without Backbones ..... 42

## 1.0

### The Wonder of Science and Animals

#### Chapter Objectives

- Connect observations in nature to an orderly designer
- Compile evidence to show whether something is living or nonliving
- Explain how animals are designed to survive and thrive in their environments
- Categorize animals by diet, temperature, and design

#### Chapter Outline

- 1.1 The Wonder of Creation
  - The Order in Creation
  - Made in God’s Image
  - Using Your Five Senses
- 1.2 The Wonder of Life
  - Characteristics of Life
- 1.3 Ways Animals Survive
  - Colors and Weapons for Survival
  - Warmth and Food for Survival
- 1.4 Classifying Animals
  - Types of Diet
  - Control of Body Temperature
  - Classifying by Design

1.3	Never Smile at a Monkey	Steve Jenkins	Describes weapons and ways animals protect themselves; NOTE: the back matter refers to “millions of years”
1.4	If You Take Away the Otter	Susannah Buhrman-Deever	Informational picture book about plant- and meat-eaters keeping an ecosystem in balance
1.4	Karl, Get Out of the Garden!	Anita Sanchez	Picture book biography about Carolus Linnaeus and his work of naming living organisms

## 1.1

## The Wonder of Creation

Textbook pp. 2–5

LightUnit 401, Lesson 1

## Objectives

- Draw students into the wonder and beauty of creation
- Identify what God created on each day and the significance of that order
- Explain what it means to be created in God’s image
- Identify ways the five senses help people interact with their surroundings

## Class Preparation

- Lesson introduction: A painting, quilt, piece of pottery, or other handmade craft
- Guiding question on the board: “What do we learn about the Creator from observing creation?”
- A spiral notebook for each student to use as a Nature Notebook

## Teaching Plan

## Introducing the Lesson

1. To introduce Science 4, read and discuss the page “For Students” at the beginning of the textbook. Discuss what science is and why it is important to study. Emphasize that science helps us understand how the world works and helps us learn more about the Creator.
2. Look at the Table of Contents and briefly discuss the topics the textbook will cover. Read “Caterpillar” on the Unit 1 opening page. Ask the following questions to introduce the topics in Unit 1.
  - a. What living things does the poem name? (*caterpillar, toad, bird, butterfly*)
  - b. What danger does the caterpillar face? (*being eaten by a toad or bird of prey*)
  - c. What does a caterpillar eat? (*Example: leaves and stems*)
  - d. Does a caterpillar have a backbone? (*no*)  
What about a toad and a bird? (*yes*)
  - e. Do you know what steps it takes for a butterfly egg to turn into a butterfly? (*The egg hatches into a caterpillar. The caterpillar changes into a chrysalis. A butterfly comes out of the chrysalis.*)
  - f. What did God give us that allows us to investigate caterpillars and other things in nature? (*Examples: eyes, fingers, brain*)
3. Refer to the guiding question on the board: “What do we learn about the Creator from observing creation?”



## 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

 Additional Activities

## Nature Notebook

1. Give each student a Nature Notebook and explain that it will be a place to record answers for activities or other experiments throughout this course. Read more about the Nature Notebook on the introductory pages of the textbook.
2. Activity (p. 5): Tell students to go outside and use their senses to experience nature. They should write what they experienced with their five senses.
3. Have students imagine watching one of the days of Creation. They should write what they think they would have seen, heard, smelled, tasted, and felt.

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.

**Day 1**



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

- a. Show students a painting, quilt, piece of pottery, or other handmade craft. Ask what they can learn about the person who made the item from looking at the item's beauty and design. What would have happened if the person had tried to make the item without first planning how to do it?
- b. Now discuss the guiding question. Jot down students' ideas and tell them you will talk about the question again at the end of the lesson.

## Discussing the Lesson

Read each section of text in class and discuss it.

### The Order in Creation

1. Why was the order in which God created everything important? (*Plants, animals, and people had what they needed to survive as soon as God made them.*)
2. How is God like an artist? What does His work show us about Him? (*Example: He created a beautiful world. His work shows us He is wise, accurate, and intelligent.*)

## More Activities and Experiments

1. Use this chant to help students memorize the days of Creation.

**On Day 1:** God created light (*jab one finger forward like a ray of light*).

**On Day 2:** God created the sky (*wave two fingers across the sky*) and water (*make waves with two fingers*).

**On Day 3:** God created land (*move one palm down*) and plants (*jab three fingers up like plant stalks growing from the ground*).

**On Day 4:** God created the sun (*hold up four fingers and move them in a circle*), moon (*carve a half-moon formation with four fingers*), and stars (*flex*

*four fingers out and in for stars twinkling*).

**On Day 5:** God created the fish (*swim hands with five fingers out and palms together*) and birds (*fly hands in the air*).

**On Day 6:** God created land animals (*five fingers crawling like animals*) and people (*point with one thumb at self*).

**On Day 7:** God rested (*place two fingers against the palm of the other hand and hands together by face as though sleeping*).

## Made in God's Image

1. What can people do that animals cannot because God created people in His image? (Examples: People can tell right from wrong, communicate with each other and with God through language, and take care of creation as God intended.)
2. How can we take care of creation? (Examples: Give animals and people food, water, and shelter. Plant trees and crops. Don't waste food, water, and other resources.)
3. We should love and respect all people, because everyone is made in God's image. Can you think of any Bible verses that tell us how to treat others? (Example: Ephesians 4:32, "And be ye kind one to another, tenderhearted, forgiving one another, even as God for Christ's sake hath forgiven you.")

## Using Your Five Senses

4. How can you use your five senses to explore God's creation? (Examples: look at insects, plants, and rocks; listen to music, waterfalls, and animal calls; smell food, flowers, and smoke; taste berries, honeysuckle, and vegetables; touch bark, icicles, and earthworms)
5. How do our senses keep us safe? (Examples: We see a bumblebee, hear thunder, smell a fire, taste spoiled food, and feel pain. These warnings help us stay away from danger.)



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.

### Did You Know?

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



2. To help students learn more about the scientific method, give them Worksheet 1: Introducing the Scientific Method (see Appendix B). They can read it on their own or in class. Discuss the questions after they have read the text.
3. Provide each student with a "Days of Creation" graphic organizer from Appendix A. They should write the Creation day number in the first column and what God created on that day in the second column. In the third column, ask them to draw a picture to illustrate the day of Creation.



## 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

1.1

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?

Chapter 1 5

## Wrapping Up the Lesson

1. Return to the guiding question: “What do we learn about the Creator from observing creation?” List any additional ideas students have for answering the question. Answers could include the following:
  - a. God is intelligent.
  - b. God does excellent work.
  - c. God loves beauty.
  - d. God cares for His creation.

## Answers to Study Questions

1. Six
2. People
3. Seeing, hearing, smelling, feeling, tasting
4. Answers will vary.

## 1.1 Graphic Organizer

Days of Creation		
Day	What God Created	My Picture
1	light (day and night)	
2	firmament—sky and air	
3	seas, dry land, plants	
4	sun, moon, stars	
5	water creatures and birds	
6	land animals and people	
7	God rested	

## 1.2

### The Wonder of Life

Textbook pp. 6–9

LightUnit 401, Lesson 2

#### Objectives

- List four characteristics of life
- Know the difference between living and nonliving things

#### Class Preparation

- Guiding question on the board: “What makes something alive?”

#### Teaching Plan

##### Introducing the Lesson

- Work through a pre-reading activity:
  - Instruct each student to write the titles Living and Nonliving at the top of a paper.
  - Under the headings, they should list several things they predict fit in each category.
- Discuss the guiding question: “What makes something alive?” Jot down students’ ideas and tell them you will talk about the question again at the end of the lesson.

##### Discussing the Lesson

Read each section of text in class and discuss it.

## 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.



### Review

#### A. Content

- What did God create on each day of Creation? Refer to the graphic organizer from 1.1 if you used it. (*Day 1 – light separated from darkness; Day 2 – sky and air; Day 3 – seas, dry land, plants; Day 4 – sun, moon, stars; Day 5 – water creatures and birds; Day 6 – land animals and people; Day 7 – God rested.*)
- What are six ways people show they are made in God’s image? (*People can think, plan, create, and take care of God’s creation. People can choose to love God and communicate with Him.*)

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.

An oak tree grows from a tiny acorn.



### Characteristics of Life

1. Why do living things need food, water, and air? (Examples: to grow, to heal, and to have energy to do their jobs.)
2. Why do living things need to grow? (Living things have a life cycle—from being an egg or seed to being a fully grown animal or plant. If they don't grow, they die.)
3. Why do living things need to produce more of their own kind? (If plants and animals did not produce young, they would become extinct. Life continues because God designed living things to produce more of their own kind.)
4. Why is it important that living things respond to their surroundings? (They would get hurt or die if they could not respond to what their senses tell them.)
5. Both plants and animals are alive, but how are they different from each other? (Examples: A plant has roots, stems, and leaves and stays in one place; an animal moves around freely. A plant makes its food in its leaves; an animal needs to find its food. Many plants grow from seeds; animals are born alive or hatch from eggs.) Optional: Draw a Venn diagram to compare plants and animals.

## Additional Activities

### Nature Notebook

1. Explore It (p. 9): From the list, students write which items have all four characteristics of life.
2. Tell students to list products made from things that used to be alive. First, they should draw a line down the center of a page and title the left side "Product" and the right side "From What?" Then they should list examples.

Product	From What?
desk	tree
leather	animal skin
bread	wheat



## A Closer Look

### More About Animals' Needs

Why do animals need food?

- Cells are tiny building blocks that make up all parts of an animal's body, such as muscles, skin, hair, and bones.
- Animals need protein to build muscles and other body parts.
- Cells use proteins as building and repair materials.
- Carbohydrates (mostly from plants) give energy to each cell to help it do its job.
- Each cell has an energy center called mitochondria. The mitochondria use carbohydrates to make energy for the cells.

Why do animals need water?

- Water forms about 80 percent of blood, which carries food, oxygen, and moisture to each cell.
- When cells use proteins and carbohydrates, they produce waste. Water helps remove these wastes from the body.

Why do animals need air?

- Air contains oxygen. Just as a fire needs oxygen to burn, cells need oxygen to burn carbohydrates for energy.
- When cells use oxygen to produce energy, they create carbon dioxide as waste, similar to how a fire gives off smoke. Exhaling carbon dioxide removes it from an animal's body.

This curious bear cub is practicing his climbing skills.



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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,

### More Activities and Experiments

1. Show students that yeast can grow and respond to its surroundings. To reinforce the scientific method with this activity, work through an experiment chart from Appendix B.

#### Supplies Needed

- 2 teaspoons dry yeast
- Warm water
- Spoon
- 2 glass baby food jars
- 1 teaspoon sugar
- 2 balloons

#### Procedure

- a. Sprinkle one teaspoon of dry yeast in a jar of warm water. In the other jar of warm water, sprinkle one teaspoon of dry yeast and one teaspoon of sugar. Gently stir the mixture in both jars.
- b. Observe what happens to the yeast in each jar. The yeast with food (sugar) will begin to reproduce through budding. In this process, a small bud forms on the yeast cell, grows, and then separates to form a new cell.
- c. Place a balloon over both jars and allow them to set for several hours. On the jar with sugar, the balloon will inflate as the yeast cells reproduce and release carbon dioxide while they consume and digest the sugar. This shows that the yeast cells are alive—they are growing, using energy, and reproducing.

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.

### Explore It

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

## Wrapping Up the Lesson

1. Print the graphic organizer from Appendix A for students or draw one on the board. Ask students to fill in the four characteristics of life as well as examples of living things. Point out that the graphic organizer answers the guiding question: “What makes something alive?”

### 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?

## Answers to Study Questions

1. Food, water, air
2. All living things need food, water, and air. They grow and produce more of their own kind. They respond to their surroundings. But nonliving things do not have these characteristics.
3. God
4. Answers will vary. Could include people, a plant, a class pet.

Chapter 1 9

## 1.2 Graphic Organizer

Characteristics of Life	
<ol style="list-style-type: none"> <li>1. Living things need food, water, and air.</li> <li>2. Living things grow.</li> <li>3. Living things produce more of their own kind.</li> <li>4. Living things respond to their surroundings.</li> </ol>	
Living Things Around Us	
Plants	Animals
Students should list types of plants they are familiar with.	Students should list types of animals they are familiar with.

# 1.3

## Ways Animals Survive

Textbook pp. 10–14

LightUnit 401, Lesson 3

### Objectives

- Identify predators and prey
- Explain how camouflage, bright colors, and weapons help animals survive
- Explain how animals stay warm in winter
- Explain how migration and hibernation help animals survive

### Class Preparation

- Guiding question on the board: “How does God take care of the animals He created?”

### Teaching Plan

#### Introducing the Lesson

1. Look at the pictures of the animals on pages 11–14 of the textbook. Discuss the guiding question: “How does God take care of the animals He created?” Jot down students’ ideas and return to the question at the end of the lesson.

#### Discussing the Lesson

Read each section of text in class and discuss it.

#### Colors and Weapons for Survival

1. How does camouflage help prey like rabbits and moths? (*It hides them from predators.*)
2. How does camouflage help predators like lions and tigers? (*It hides them as they hunt.*)
3. What do bright-colored animals warn predators about? (*They often have a dangerous bite, bad smell, or can sting.*)
4. What animal weapons can you think of that the lesson does not mention? (*Examples: A cat has sharp claws, an emu can give a powerful kick, and a bee has a stinger.*)

## 1.3 Ways Animals Survive



### Vocabulary Words

**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



## Review

### Content

#### A. Vocabulary

1. What are some **characteristics** of a zebra, horse, and pony? (*Examples: They have hair, hooves, four long legs, a mane, and babies that look like them.*)
2. What are some **characteristics** of a cardinal, bluebird, and mockingbird? (*Examples: They have wings, feathers, two legs, and lay eggs.*)

#### B. Content

1. What are four characteristics of living things? Refer to the graphic organizer from 1.2 if you used it. (*Living things need food, water, and air. They grow. They produce more of their own kind. They respond to their surroundings.*)



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.



## Additional Activities

### Nature Notebook

1. Explore It (p. 14): After students observe animals, they should describe what forms of protection they have.
2. Tell students to write a story about an animal that can survive extreme conditions. They should include details about this animal's survival methods.

### More Activities and Experiments

1. Show students how blubber keeps animals warm. To reinforce the scientific method with this activity, work through an experiment chart from Appendix B.

### Supplies Needed

- 2 sandwich bags per student
- Vaseline or Crisco (alternate: use cotton wool)
- Ice water



## Mystery of the Monarch

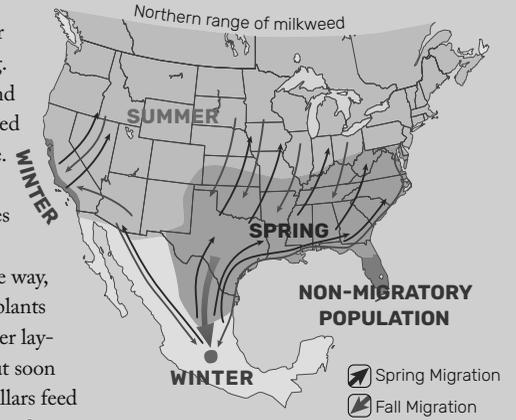
Have you seen monarch butterflies flitting near milkweed plants during late summer? Soon the weather will be too cold for them to survive. What will they do?

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.



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### Procedure

- a. Each student should put a sandwich bag over one finger on each hand.
  - b. Spread a thick layer of Vaseline or Crisco over the bag on one finger. (If using cotton wool, fill one bag with a thick layer of it.)
  - c. Submerge both fingers in the ice water.
  - d. Ask which finger gets cold first. The finger with the Vaseline or Crisco should stay warmer. This demonstrates how blubber insulates against the cold, just like the blubber in some animals keeps them warm in icy waters.
    - Alternative: apply Vaseline directly on their hand and submerge it in ice water. The temperature difference may be more dramatic.
2. Give students different colors of paper to cut insects, butterflies, and worms that match colors outside. Ask them to hide their creations in camouflaged spots. Students can look for each other's creatures.

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.



### Warmth and Food for Survival

1. What are the similarities and differences between migration and hibernation? *(Examples: Animals hibernate by sleeping in the winter and living from stored fat. Animals migrate by traveling to warmer areas to find food and warmer waters. Migration and hibernation are two ways animals survive the winter.)*
2. How did God design hibernating animals to save energy during the winter? *(Their heartbeat and breathing slow down.)*
3. How do groundhogs and geese survive cold winters in different ways? *(Example: Geese migrate because they have wings to fly long distances. Groundhogs could not travel a long way with their short legs, but they can hibernate underground.)*

## Wrapping Up the Lesson

1. Print the graphic organizer from Appendix A for students or draw one on the board. Ask students to list a survival method in each section and give at least two examples of animals that use the method. Point out that the graphic organizer answers the guiding question: “How does God take care of the animals He created?”

### Explore It

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.

**Hibernation helps animals save energy.** During 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.

## Answers to Study Questions

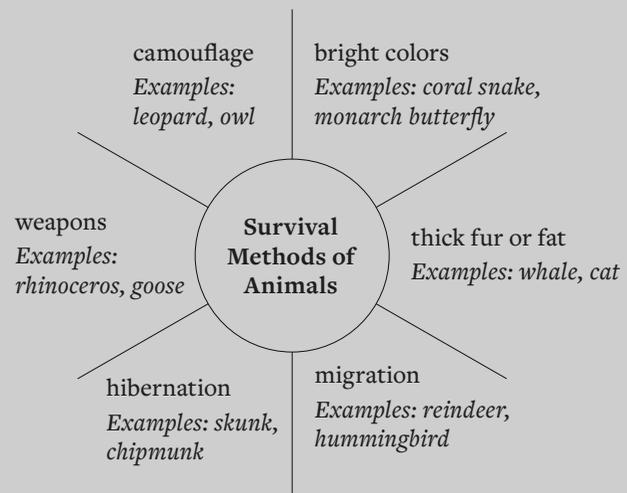
1. Camouflage, bright colors, and weapons
2. They hibernate so they can survive when there is not much food available.
3. They migrate to find food in warmer areas.
4. Answers will vary.

### 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?

## 1.3 Graphic Organizer



## 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.

Chapter 1 15

## 1.4

### Classifying Animals

Textbook pp. 15–19

LightUnit 401, Lesson 4

### Objectives

- Compare the diets of carnivores, herbivores, and omnivores
- Explain the difference between cold-blooded and warm-blooded animals
- Explain the difference between vertebrates and invertebrates
- Classify animals into categories

### Class Preparation

- Guiding question on the board: “What are some ways animals could be classified?”

### Teaching Plan

#### Introducing the Lesson

- Discuss the guiding question: “What are some ways animals could be classified?”
  - List students’ suggestions such as size, color, habitat, diet, and body shape.
  - Using the classification suggestions given, list animals that fit each group.
  - Discuss any problems with the classification systems. For example, if you classified by size, was it hard to decide if animals were large or small? If you classified by color, were animals in the same group very different from each other?
- Ask students to find the three main lesson headings in the text. Then discuss the following questions:
  - What groupings does this lesson give for classifying animals?
  - What clues do the vocabulary words give about ways to classify animals?
  - To expand classification, introduce information from the Teacher’s Guide sidebar, “More About Classification.”

#### Discussing the Lesson

Read each section of text in class and discuss it.

#### Types of Diet

- Carnivore, herbivore, and omnivore all share the root *vore*, which means “to eat.”
  - Carnivore* begins with *carn-* and means “meat” or “flesh.” Other words that include *carn-* are carnage, carnal, and carne asada (a Mexican meat dish). What carnivores can you name? (Examples: wolf, owl, snake, praying mantis)

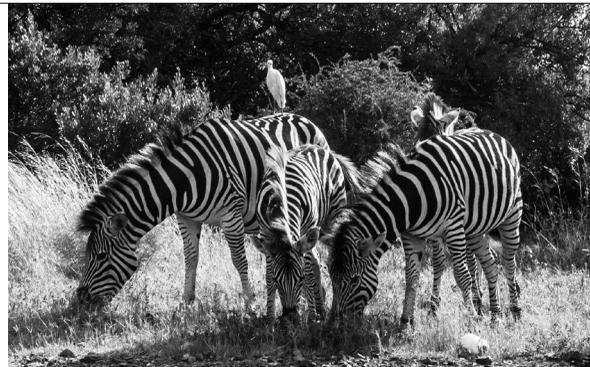
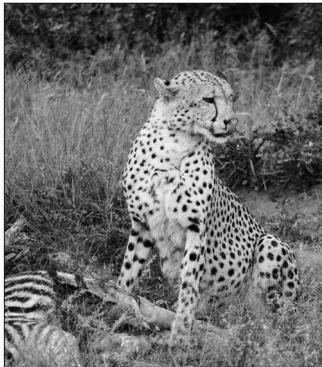


### Review

#### A. Vocabulary

- What are examples of **predators** and **prey**? (Examples: owl and mouse, wolf and rabbit)
- What are examples of **camouflaged** animals? (Examples: snowshoe hare, tiger, rattlesnake)
- How do bears stay alive as they **hibernate**? (They live off the fat from the food they have eaten.)
- Why do some animals like geese, caribou, and whales **migrate**? (to find food in warmer areas)
- What does **blubber** do for seals and walruses? (It keeps them warm in cold water.)

- b. *Herbivore* has the word *herb* in it. Herbs are plants. What herbivores can you name? (Examples: deer, rabbit, mourning dove)
- c. *Omnivore* begins with *omni-*, meaning “all.” God is omnipresent, or present in all places. Omnivores eat all foods. What omnivores can you name? (Examples: human, squirrel, seagull)
- d. What do you think an *insectivore* eats? (insects)



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

2. Genesis 1:30 says that when God created the world, He gave plants to all living things as their food. At this point, how were all animals classified according to their diet? (as herbivores)

### Control of Body Temperature

3. What is the difference between a warm-blooded and cold-blooded animal? (A warm-blooded animal stays about the same temperature all the time. A cold-blooded animal has a body temperature that changes with the temperature of its surroundings.)
4. Do you predict that a polar bear is warm- or cold-blooded? Why? (warm-blooded because it does not freeze in its cold environment)
5. Why does a fly sitting on a cold window move very slowly? (The fly is cold-blooded, so when it sits on a cold window, its body gets cold. This keeps it from moving fast.)

Omnivores eat both plants and animals.



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

### B. Content

1. What are six methods God designed to help animals survive? Refer to the graphic organizer from 1.3 if you used it. (camouflage, bright colors, weapons, thick fur and fat, hibernation, migration)
2. What are two ways camouflage helps animals? (It helps them hide from predators or sneak up on prey.)
3. What do bright colors warn other animals about? (They warn of poison, a bite or sting, or a bad smell.)
4. What weapons help animals survive? (Examples: antlers, tusks, quills)
5. What characteristics protect some animals from the cold? (thick fur and fat)

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.



## A Closer Look

### More About Classification

Scientists sort all living things into five groups or kingdoms.

1. Fungi (Example: mushrooms)
2. Protists (Example: algae in ponds)
3. Monera (tiny bacteria we can see only with a microscope)
4. Plants
5. Animals
  - A. Vertebrates (animals with backbones)
    1. Mammals (Example: elephants)
    2. Birds (Example: orioles)
    3. Reptiles (Example: alligators)
    4. Amphibians (Example: bullfrogs)
    5. Fish (Example: salmon)
  - B. Invertebrates (animals without backbones)
    1. Mollusks (Example: snails)
    2. Echinoderms (Example: starfish)
    3. Cnidarians (Example: jellyfish)
    4. Annelids (Example: worms)
    5. Arthropods (Example: insects)
    6. And many more

## 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.

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## Additional Activities

### Nature Notebook

1. Explore It (p. 19): Tell students to choose an animal and classify it by its diet. They can look it up in the encyclopedia if they need help making a list of what it eats.
2. Many humans are omnivores, but some choose to eat only plants while others prefer only meat. Tell students to write three lunch menus, one for herbivores (plant-based eaters), one for carnivores (meat-based eaters), and one for omnivores.

### More Activities and Experiments

1. Copy the animal classification game from Appendix C pages 373 to 376. Cut apart the animal cards with the clues on the back. Students work in groups to decide which space on the cards each animal fits. They should consider the animal's diet, body temperature, and design to classify it properly. Answer Key: (1) giraffe, (2) lion, (3) raccoon, (4) tortoise, (5) snake, (6) catfish, (7) butterfly, (8) praying mantis, (9) earthworm

## Classifying by Design

1. Point to the horse's skeleton on page 18 of the textbook. The class *vertebrate* includes all animals with backbones. What are people classified as? (*vertebrates*)
2. The class *invertebrate* includes all animals without backbones. Do you predict a worm is an invertebrate? What about a fish? (*A worm is an invertebrate; its body is soft and has no bones. A fish is a vertebrate; if you catch a fish and cut it up to eat, you can see its bones.*)
3. Teach students this chant:

Vertebrates, vertebrates, all have backbones.  
(*move hand up and down in a straight line to show a spine*)

Invertebrates, invertebrates, they have none.  
(*shake head and move hand from side to side to show no backbone*)

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 hard shell protects a crayfish's body.



A skeleton gives a horse's body its shape.



2. Ask students to choose an animal to research (in an encyclopedia or informational book). They should classify the animal by its diet, body temperature, and body design.
3. Give each student a picture of an animal. Students with herbivores should stand at the front of the room, carnivores at the back, and omnivores in the middle. Then regroup with warm-blooded and cold-blooded animals. Regroup a final time with vertebrates and invertebrates.



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!

### Explore It

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?

## Wrapping Up the Lesson

1. Print the graphic organizer from Appendix A for students or draw one on the board. Ask students to describe each term and then give examples of animals that can be classified each way. Point out that the graphic organizer gives three possible answers to the guiding question: “What are some ways animals could be classified?”

## Answers to Study Questions

1. They are alike because they both eat meat. They are different because carnivores don’t eat plants.
2. Warm-blooded
3. A vertebrate has a backbone, but an invertebrate does not.
4. Example: All the plants would die, and we would not have food to eat. Then the animals would also die.

## 1.4 Graphic Organizer

	Diet			Temperature		Body Design	
	Carnivores	Herbivores	Omnivores	Warm-Blooded	Cold-Blooded	Vertebrates	Invertebrates
Description	eat meat	eat plants	eat meat and plants	body temperature stays about the same	body temperature changes with the outside temperature	backbone	no backbone
Examples	Examples: lion shark	Examples: giraffe beaver	Examples: giraffe beaver	Examples: robin goat	Examples: fly trout	Examples: toad monkey	Examples: butterfly snail