# SCIENCE

4th Grade

Sample Lesson

CHRISTIAN SCHOOLS INTERNATIONAL

# Science 4

Timothy Eimer
Barbara Ferrier

CHRISTIAN SCHOOLS
INTERNATIONAL

# CSI Science Perspective Statement

The CSI science program centers on the acknowledgment that the world in which we live belongs to God, who created and upholds it. Through scientific inquiry we can perceive a degree of the amazing complexity and orderliness of God's world. With this fuller understanding of creation comes a deepened awareness of the goodness and power of its Creator.

When we study creation, we learn not only about God but also about ourselves. We are a part of God's creation—a very special part. God designed a perfect harmony of relationships among humans, animals, plants, and nonliving things, but our fall into sin disrupted this unity and balance. As God's redeemed people through Christ's renewing power, we have been entrusted with bringing restoration and reconciliation to God's good creation.

God has put his world under our control and made us its caretakers. Caring for God's creation is a task with great responsibility that cannot be taken up lightly or in ignorance. Science is an essential tool for us to use in learning about the natural laws God has established so that we can care for the world wisely.

We live in an age in which scientific knowledge has increased at an explosive rate, and the use of that knowledge changes our lives daily. Some people believe that we can gain complete knowledge of—and mastery over—the world through science. Medical researchers have nearly eradicated some diseases, specialists have developed laser instruments that have revolutionized surgery, astronomers using sophisticated space probes have solved many mysteries of the universe, computer scientists have created machines that seemingly border on human intelligence. The possibilities of science seem endless.

Because science is a human activity, however, the knowledge that it can help us gain is limited. Secular culture tends to reduce the world to the human realm and therefore widely considers scientific inquiry or human reason as the path to all knowledge. But for Christians, ultimate truth is found only in God. Science is one avenue—an important one to be sure, but still only one—toward gaining an understanding of God's creation.

## Science and the Bible

The relationship between science and the Bible has long been an emotionally charged issue. Sometimes non-Christians treat scientific theories as fact and use them to exclude God from scientific inquiry. This practice has led many Christians to believe that science and Christianity are antithetical.

In science textbooks, encyclopedias, library books, and magazines, students often encounter beliefs that do not acknowledge God, such as theories that explain the origin of the universe as a chance occurrence. It is important for students in a Christian school to realize that these kinds of beliefs spring from a worldview that does not include God. That such beliefs exist, however, does not make science itself incompatible with Christianity.

For us as Christians, all science should be conducted within a larger framework, or worldview, based on faith. The Bible is the divinely inspired record of God's redemptive work on behalf of his people; it contains all that is necessary for bringing us to salvation and instructing us about how to live. As the infallible Word of God, it is the only book that has the status of divine authority.

We learn about God through the direct revelation of his Word. We can also learn about God through the general revelation of his creation. As defined by theologian Louis Berkhof, general revelation is the way that "God speaks to man in his entire creation in the forces and powers of nature, in the voice of conscience, and in the providential government of the world in general and of the lives of individuals in particular." As Berkhof also notes, however, general revelation has limitations as a result of the Fall.

The study of science is one method of learning about God as he reveals himself in creation. Science is important for studying direct causes and finite relations in the material world. It can explain how events occur, but it cannot explain why. For this reason, it is vital that scientific study be conducted in the light of biblical revelation; the Bible sets the facts obtained through scientific study in the correct context of ultimate causes and infinite relations. The Bible and science are complementary, together helping us understand God's plan and purpose for creation.

The CSI science program is designed to be used in a school that includes both devotions and Bible study on a daily basis. Throughout the series, students are encouraged to examine a biblical perspective and to discuss Christian responses to issues in science.

## Stewardship

One such issue is our responsibility as stewards of creation. In recent years an increasing number of people have begun to recognize the wisdom of caring for the Earth. Conserving the Earth's resources protects our own health, maintains the natural beauty of our environment, and preserves the Earth for future generations. In addition to these worthy goals, Christians have a more fundamental motivation for protecting the environment, a motivation that lies in our very reason for being.

As human beings created in the image of God, we have a unique position in creation. We are part of nature, yet because of our special relationship with God, we are also above it, sharing in God's dominion over all living things. When God placed Adam and Eve in the Garden of Eden, he commanded them to work the land and take care of it. The use and care of the Earth has been entrusted to us. It is our privilege and responsibility as God's stewards to serve and protect the rest of creation and, in so doing, to glorify the Creator.

We have failed in carrying out the cultural mandate fully because of the fall into sin, but Christ's redeeming grace enables us to continue doing God's work in the world. As Christ's representatives, we must work toward bringing God's peace to all life on the Earth.

Stewardship of the Earth is not a grim, joyless assignment forced upon reluctant Christians. It is rather a task motivated, at least in part, by an awe and appreciation of the extraordinary wonders of the world God created. The fall has affected the world, but it has not completely obscured the matchless handiwork of the Creator. We see evidences of God's

creative genius in massive geological formations, in the intricate relationships of parts within an atom, in old-growth forests, and in the variety and complexity of the creatures that inhabit the land, air, and ocean. We also observe God's providential care for his creation in the cycle of the seasons, in human and animal reproduction, in the provision of foods for nutrition, and in our own with the ability to make positive changes in our environment.

The CSI science series matches a sense of awe at the unity and diversity of creation with an awareness of the delicate balance of interrelationships among its parts and of our responsibility for its welfare. Students are led to examine their own lifestyles and become conscious of the impact that their daily actions have on the myriad forms of life in God's creation. They are encouraged to use their unique abilities as a means to honor and obey God, to serve other humans, and to sustain God's remarkable gift of the Earth and its resources.

## Science and Technology

Another issue in science that demands a Christian response is the application of science in technology. The vast influence and rapid growth of technology has largely shaped our society, institutions, and way of life. Thus, it is essential that today's students have the knowledge and skills to enable them to participate as informed and trustworthy stewards of an increasingly technologized world.

A science curriculum should help students understand how science, technology, and society influence one another. Science is concerned with understanding the way the world works, while technology uses science to change the way the world works, usually in order to meet a societal need or desire. Unfortunately, many technological devices that meet human needs are destructive in other ways. As a result, we now find ourselves in a world of dwindling resources and environmental hazards.

But the very technology that can be so destructive may also provide the means to end such damage. The challenge lies with tomorrow's adults to develop the kind of technology that will preserve the Earth rather than threaten it.

CSI's science program seeks to foster a questioning attitude in students by presenting both the successes and failures of human beings in using technology. In this way, students are led to both appreciate the value of science and technology in society and to understand their limitations.

## Concepts and Content

The world is a place of constant surprise and wonder. Learning about God's world prompts amazement and awe of the One who created and upholds the world.

The CSI science series uses student's natural inquisitiveness and joy of discovery as the basis for further investigation into the beauty, order, intricacy, and variety of God's world. Written from the perspective of "let's find out" about God's world, this curriculum gives structure to their exploration, building on their natural curiosity and eagerness to investigate by initiating activities and discussions that relate directly to their world. The lessons are student-centered and active, encouraging students to make their own hypotheses and devise ways to test them. Science becomes a cooperative activity, with the teacher often guiding—rather than dictating—the exploration of the students.

Rather than the teacher explaining a concept and then illustrating it with activities, the concepts develop from the students' own concrete experiences. This inductive approach to learning not only makes science more interesting for the students, but also makes it relevant to their lives. With the teacher's guidance, students become creative problem solvers who are able to imagine possibilities and implications, to use a variety of resources and observation skills, to gather information, to form and articulate ideas, and to make responsible decisions.

## The Christian Classroom

At the heart of any study taking place in the Christian school classroom is the Bible. CSI's science program is steeped in a profound biblical perspective that leads students to see God's hand in everything around them. The program materials are filled with interest-provoking pictures, projects, and hands-on activities that serve as a basis for scientific concepts and relate them to everyday life. These concrete, creative learning experiences based on God's Word will enrich students' knowledge of creation, affirm their faith in the Creator, and enable them to use science to the glory of God.

# Using the CSI Science Curriculum

CSI's science curriculum, 2nd edition, is a hands-on program that encourages students to become actively involved in scientific discovery. The curriculum is designed to give teachers as much flexibility as possible. Most units are independent, so they can be used in whatever order is most convenient for teachers, students, and cross-curricular activities planning. Teachers can choose lessons based on the interests of students, the time and materials available, each school's overall science program.

Most lessons can be taught in a single class period, but many contain enough optional and cross-curricular activities to provide a week's worth of lesson material.

This curriculum provides a comprehensive framework for teaching science. It is not meant, however, to prescribe every step of each lesson. Teachers are encouraged to use the built-in flexibility to shape the curriculum to best fit your school's overall goals and objectives, your individual teaching style, and your students' needs and abilities.

## Teacher Guide

### Unit Openers

- The *Unit Overview* allows you to see at a glance all the lessons contained in each unit.
- The *Unit Background* provides Christian perspective or brief scientific background for each unit.
- *Unit Resources* provide you with science resource books and audiovisual materials both for you and for the students.
- *Bulletin Board Ideas* and *Center Ideas* suggest ways to reinforce the unit's topic.

### Lessons

- *Student Objectives* for each lesson tell you that lesson's aims for student learning. These objectives are specific, measurable goals that will enable you to check the progress of your students.
- *Structuring the Curriculum* helps are placed in some lessons to help you with lesson planning.
- The lesson *Background* provides information to help the nonspecialist teacher understand the science concepts of the lesson. While the *Background* may be helpful in answering student questions, it is intended primarily as a teacher resource.
- Each lesson opens with lesson-related *Discover* activities or questions to spark the interest of students, assess their previous knowledge of lesson content, and encourage them to discover for themselves the concepts of the lesson.

- The *Develop* section helps students understand the concepts that they explored in *Discover.* This section may also include additional activities to reinforce or expand the students' learning.
- *Reinforce/Assess* enables you to test students' learning and strengthen their understanding of lesson concepts. A simple reinforcement activity may also be included in this section.
- Many *Extend* activities are provided at the end of each lesson. These activities include additional science experiments and demonstrations, as well as literature, cross-curricular activities, and Bible studies that relate to the lesson concepts. All of the *Extend* activities are optional, but if you have time to do them, they will provide valuable support for student learning.

### Activity Sheets

- The back of the teacher guide contains blackline masters for you to copy. Suggestions for their use are incorporated in the lesson during *Discover, Develop,* or *Reinforce/Assess.*

## New DVD/PDF Option with Supplemental Material

The new Grade K–2 Science DVD/PDF includes:

- Exciting new flexible lessons and units that complement the printed curriculum
- New experiments and activities to reinforce and enhance the new material
- New Glossary terms and updated references
- Integration of up-to-date technology
- New multiple forms of assessments

DVD/PDF is available upon request. To inquire or order, visit the store at www.csionline.com.

## National Science Education Standards

In order to provide teachers and students with the most comprehensive science education curriculum, CSI's 2nd edition materials were updated and expanded in accordance with the National Science Education Standards. Adherence to these standards is charted on pages 17b-17c.

# K–6 Scope and Sequence

## Kindergarten

**Unit 1: Investigating Health**
- Lesson 1: Who Created Me?
- Lesson 2: What Are Families Like?
- Lesson 3: How Does Learning Help Us?
- Lesson 4: What Does Skin Do?
- Lesson 5: How Does Eating Help Our Bodies?
- Lesson 6: How Should We Care for Our Teeth?
- Lesson 7: How Do Rest and Exercise Help Our Bodies?
- Lesson 8: How Can We Avoid Getting Sick?
- Lesson 9: How Can We Treat Illnesses?

**Unit 2: Investigating Living Things**
- Lesson 1: Scientific Investigations
- Lesson 2: How Are Plants Alike and Different?
- Lesson 3: How Do Plants Grow?
- Lesson 4: How Are Plants Useful in God's Creation?
- Lesson 5: How Are Animals Alike and Different?
- Lesson 6: How Do Animals Change As They Grow?
- Lesson 7: How Are Animals Useful in God's Creation?

**Unit 3: Investigating Materials**
- Lesson 1: What Are Wood, Metal, Rubber, and Leather Like?
- Lesson 2: What Is Clay Like?
- Lesson 3: What Are Fabrics and Paper Like?
- Lesson 4: What Are Glass and Plastic Like?
- Lesson 5: What Are Composite Pieces Like?

**Unit 4: Investigating God's Nonliving World**
- Lesson 1: What Are Nonliving Things Like?
- Lesson 2: What Are Rocks and Soil Like?
- Lesson 3: What Is Water Like?
- Lesson 4: How Are Landforms and Bodies of Water Different?
- Lesson 5: How Can We Take Care of the Land and the Water?
- Lesson 6: What Are Sky Objects Like?
- Lesson 7: What Does the Sun Do?
- Lesson 8: What Objects Can We See in the Nighttime Sky?

**Unit 5: Investigating Transportation**
- Lesson 1: What Safety Rules Are Important for Pedestrians?
- Lesson 2: How Does Technology Help with Transportation?
- Lesson 3: How Do We Get around the Neighborhood?
- Lesson 4: How Do We Stay Safe in Cars and Buses?
- Lesson 5: What Are Trucks and Trains Like?
- Lesson 6: What Is Sea Transportation Like?
- Lesson 7: What Is Air Transportation Like?

# Grade 1

## Unit 1: Scientific Investigations

- Lesson 1: How Do We Do Science?
- Lesson 2: What Is Teamwork?
- Lesson 3: How Do We Measure Length?
- Lesson 4: How Do We Use a Ruler?
- Lesson 5: How Do We Measure Temperature?
- Lesson 6: How Do We Measure How Much a Container Holds?

## Unit 2: Investigating the Senses

- Lesson 1: What Are Your Senses?
- Lesson 2: How Do You See?
- Lesson 3: What Happens When People Can't See?
- Lesson 4: How Do You Hear?
- Lesson 5: What Happens When People Can't Hear?
- Lesson 6: How Do You Smell?
- Lesson 7: How Do You Taste?
- Lesson 8: How Do You Feel?
- Lesson 9: How Do You Use All of Your Senses?

## Unit 3: Investigating Living Things

- Lesson 1: How Are Living Things Different from Nonliving Things?
- Lesson 2: How Do Living Things Reproduce Themselves?
- Lesson 3: How Do Living Things Grow and Change?
- Lesson 4: How Do Living Things Move?
- Lesson 5: How Do Living Things Respond to Other Things, and How Do Living Things Show Variety?
- Lesson 6: How Does God Provide for Plants?
- Lesson 7: How Does God Provide for Animals?

## Unit 4: Investigating Changes

- Lesson 1: How Do People Change?
- Lesson 2: How Do Families Change?
- Lesson 3: What Changes Do Living Things Make When They Do Their Activities?
- Lesson 4: How Does the Earth Change?
- Lesson 5: How Does the Sun Make Changes?
- Lesson 6: How Do the Stars Seem to Change?
- Lesson 7: How Does the Moon Change?
- Lesson 8: How Do Weather Patterns Change?
- Lesson 9: How Does the Wind Change?
- Lesson 10: How Do Temperature and Precipitation Change?
- Lesson 11: What Changes Happen in the Fall?
- Lesson 12: What Changes Happen in the Winter?
- Lesson 13: What Changes Happen in the Spring?
- Lesson 14: What Changes Happen in the Summer?

## Unit 5: Investigating Materials and Objects

- Lesson 1: What Are Materials and Objects Like?
- Lesson 2: How Can We Use Numbers in Observations?
- Lesson 3: What Are the Properties of Different Materials?
- Lesson 4: How Can a Material's Uses and Properties Be Changed through Mixing with Water?
- Lesson 5: How Can a Material's Uses and Properties Be Changed through Manipulating Them?
- Lesson 6: How Can a Material's Uses and Properties Be Changed through Heating or Cooling?

## Unit 6: Investigating Things That Make Sound

- Lesson 1: How Is Technology Useful?
- Lesson 2: How Do Different Sound Systems Make Sounds?
- Lesson 3: How Can I Make a Sound System?
- Lesson 4: How Do Sounds Change?
- Lesson 5: How Can Tools Help Make a Sound System?
- Lesson 6: How Can I Design a Sound System?
- Lesson 7: How Can I Build a Sound System?
- Lesson 8: How Can I Use My Sound System?

# Grade 2

## Unit 1: Scientific Investigations

- Lesson 1: How Do Scientists Do Science?
- Lesson 2: What Is Teamwork?
- Lesson 3: How Are Investigations, Observations, and Explanations Done?
- Lesson 4: How Do We Measure Amounts?
- Lesson 5: How Do We Measure Weight?

## Unit 2: Investigating Bones and Muscles

- Lesson 1: What Are Bones Like?
- Lesson 2: What Bones Are in Your Body?
- Lesson 3: How Should We Care for Our Bones?
- Lesson 4: What Are Joints Like?
- Lesson 5: What Do Skeletal Muscles Do?
- Lesson 6: What Do Involuntary Muscles Do?
- Lesson 7: How Should We Care for Our Muscles?

## Unit 3: Investigating Health and Safety

- Lesson 1: What Fuel Does My Body Need?
- Lesson 2: Why Are Food Groups Important?
- Lesson 3: How Can We Eat a Balanced Diet?
- Lesson 4: What Good Is Exercise?
- Lesson 5: Why Keep Clean?
- Lesson 6: Why Do We Rest?
- Lesson 7: How Can We Stay Safe?

## Unit 4: Investigating Animals

- Lesson 1: What Can We Learn about Animals?
- Lesson 2: What Are Animal Life Cycles Like?
- Lesson 3: Where Do Animals Live?
- Lesson 4: How Do Animals Change Their Habitats?
- Lesson 5: How Does God Prepare Animals for Their Homes?
- Lesson 6: What Do Animals Eat?
- Lesson 7: How Do Animals Behave?
- Lesson 8: Can Behavior Be Learned?
- Lesson 9: How Do Animals Stay Safe?
- Lesson 10: What Is a Fossil?
- Lesson 11: What Animals Lived Long Ago?
- Lesson 12: Why Are Some Animals Extinct?
- Lesson 13: How Can People Protect Animals?

## Unit 5: Investigating Liquids and Solids

- Lesson 1: What Are Solids and Liquids Like?
- Lesson 2: What Do Solids Look and Feel Like?
- Lesson 3: How Can Solids Be Measured?
- Lesson 4: What Do Liquids Look and Feel Like?
- Lesson 5: How Does Surface Tension Affect Liquids?
- Lesson 6: What Is Evaporation?
- Lesson 7: What Are Gases Like?
- Lesson 8: What Happens When Solids and Liquids Are Mixed?
- Lesson 9: What Happens When We Mix Liquids with Other Liquids?
- Lesson 10: How Can We Use and Care for Liquids and Solids?

## Unit 6: Investigating Position and Motion

- Lesson 1: What Is Position?
- Lesson 2: How Do Reference Objects and Distance Describe Position?
- Lesson 3: What Is Motion?
- Lesson 4: How Do Paths Relate to Motion?
- Lesson 5: How Do Different Things Move?
- Lesson 6: How Can Motion Change?
- Lesson 7: How Can We Predict Motion?

## Unit 7: Investigating Buoyancy and Boats

- Lesson 1: What Is Technology?
- Lesson 2: What Makes Things Float and Sink?
- Lesson 3: How Do Floating Things Move?
- Lesson 4: What Are Sailboats Like?
- Lesson 5: How Are Other Boats Propelled?
- Lesson 6: How Are Tools Used?
- Lesson 7: How Are Boats Designed?
- Lesson 8: How Are Boats Built?
- Lesson 9: How Does My Boat Work?

# Grade 3

**Unit 1: Scientific Investigations**
- Lesson 1: How Do Scientists Do Science?
- Lesson 2: What Is Teamwork?
- Lesson 3: How Do We Measure Temperature?
- Lesson 4: How Are Tables and Graphs Used?

**Unit 2: Investigating the Circulatory and Respiratory Systems**
- Lesson 1: What Does the Circulatory System Do?
- Lesson 2: How Can I Care for My Circulatory System?
- Lesson 3: What Does the Respiratory System Do?
- Lesson 4: How Can I Care for My Respiratory System?
- Lesson 5: How Can I Avoid Accidents?

**Unit 3: Investigating Plants**
- Lesson 1: What Is the Life Cycle of Plants?
- Lesson 2: Where Do Plants Live?
- Lesson 3: How Are Plants Structured?
- Lesson 4: What Do Plants Need?
- Lesson 5: How Do Plants Interact with Their Surroundings?
- Lesson 6: How Do Fossils Help Us Learn More about Plants?
- Lesson 7: How Are Plants Grouped?

**Unit 4: Investigating Forces and Electricity**
- Lesson 1: What Is a Force?
- Lesson 2: What Is a Magnet?
- Lesson 3: What Is an Electric Charge?

**Unit 5: Investigating Heat and Temperature**
- Lesson 1: What Is Temperature?
- Lesson 2: What Is Heat?
- Lesson 3: How Is Heat Produced?
- Lesson 4: What Is Conduction?
- Lesson 5: What Is Convection?
- Lesson 6: What Is Radiation?

**Unit 6: Investigating Soil**
- Lesson 1: How Does Soil Form?
- Lesson 2: What Are Different Types of Soil Like?
- Lesson 3: What Are Soil Layers Like?
- Lesson 4: How Do We Depend on Soil?
- Lesson 5: How Can We Care for Soil?

**Unit 7: Investigating Natural Resources**
- Lesson 1: How Do We Use Water, and Where Do We Find Water?
- Lesson 2: What Are the Different Kinds of Water?
- Lesson 3: What Are the Different Forms of Water?
- Lesson 4: What Is the Water Cycle?
- Lesson 5: Where Does Water Come From?
- Lesson 6: How Can We Clean Up Water Pollution?
- Lesson 7: How Can We Take Care of Water?
- Lesson 8: What Is Air Like?
- Lesson 9: How Can We Use and Take Care of Air?
- Lesson 10: What Is Air Pollution?
- Lesson 11: What Is a Natural Resource?
- Lesson 12: How Are Natural Resources Processed?
- Lesson 13: How Can Natural Resources Be Replaced?
- Lesson 14: How Can We Conserve Natural Resources?

**Unit 8: Investigating Structures**
- Lesson 1: What Is Scale?
- Lesson 2: What Materials Are Strong and Stable?
- Lesson 3: What Goes into Structures?
- Lesson 4: How Can I Plan a Structure?
- Lesson 5: How Can I Build a Structure?
- Lesson 6: How Can I Evaluate a Structure?

# Grade 4

## Unit 1: Scientific Investigations

- Lesson 1: What Is Teamwork?
- Lesson 2: How Can Scientific Investigations Answer Questions?
- Lesson 3: How Are Scientific Tools Helpful?
- Lesson 4: How Do I Deal with Data?
- Lesson 5: How Do I Use Results?

## Unit 2: Investigating Organ Systems

- Lesson 1: What Do Organ Systems Do?
- Lesson 2: How Does the Digestive System Work?
- Lesson 3: How Can I Care for My Digestive System?
- Lesson 4: How Does the Urinary System Work?
- Lesson 5: How Can I Care for My Urinary System?
- Lesson 6: How Can I Prevent Injury to My Organs?
- Lesson 7: How Does Organ Donation Work?

## Unit 3: Investigating Living Things and Their Homes

- Lesson 1: What Are Living Things Like?
- Lesson 2: What Is the Importance of Habitats and Niches?
- Lesson 3: What Is Ecology?
- Lesson 4: What Is a Pond Community Like?
- Lesson 5: How Are Living and Nonliving Things Important in an Ecosystem?
- Lesson 6: How Do the Parts of an Ecosystem Interact?
- Lesson 7: How Does Energy Flow in an Ecosystem?

## Unit 4: Investigating Light

- Lesson 1: What Is Light?
- Lesson 2: How Does Light Travel?
- Lesson 3: How Do Shadows Form?
- Lesson 4: How Does Light Reflect?
- Lesson 5: How Does Light Bend?
- Lesson 6: How Do We See?
- Lesson 7: What Is Color?
- Lesson 8: How Is Light Used in Technology?

## Unit 5: Investigating Sound Waves and Hearing

- Lesson 1: How Does Sound Carry Energy?
- Lesson 2: What Causes High and Low Sounds?
- Lesson 3: What Causes Loud and Soft Sounds?
- Lesson 4: How Does Sound Interact with Different Materials?
- Lesson 5: How Do We Hear?
- Lesson 6: What Is Noise?
- Lesson 7: How Is Sound Used in Technology?

## Unit 6: Investigating Minerals, Rocks, and Earth's Structure

- Lesson 1: What Is a Mineral?
- Lesson 2: What Are Rocks Like?
- Lesson 3: How Do Rocks Change Form?
- Lesson 4: How Do Fossils Form?
- Lesson 5: How Do We Use Rocks and Minerals?
- Lesson 6: What Is Earth's Structure Like?
- Lesson 7: How Do Weathering and Erosion Change Earth's Surface?

## Unit 7: Investigating Packaging

- Lesson 1: How Are Packages Designed?
- Lesson 2: How Are Packages Designed to Protect?
- Lesson 3: How Are Packages Designed to Group?
- Lesson 4: How Are Packages Designed to Beautify and Advertise?
- Lesson 5: How Are Packages Designed to Inform?
- Lesson 6: How Are Packages Made?
- Lesson 7: How Do Packages Affect Creation?
- Lesson 8: How Can I Make the Best Package and Evaluate Packages?

# Grade 5

**Unit 1: Scientific Investigations**
- Lesson 1: What Is Teamwork?
- Lesson 2: How Can Scientific Investigations Answer Questions?
- Lesson 3: How Are Microscopes Used?
- Lesson 4: How Are Measurements and Data Determined and Used?
- Lesson 5: How Do Scientists Develop Explanations?

**Unit 2: Investigating the Endocrine and Reproductive Systems**
- Lesson 1: How Does Growth Happen?
- Lesson 2: How Does the Endocrine System Work?
- Lesson 3: What Happens during Puberty?
- Lesson 4: What Is Reproduction Like?
- Lesson 5: How Does the Female Reproductive System Work?
- Lesson 6: How Does the Male Reproductive System Work?
- Lesson 7: How Do Unborn Babies Develop?
- Lesson 8: What Are Sexually Transmitted Diseases?
- Lesson 9: How Can I Protect Myself from Sexual Abuse?

**Unit 3: Investigating Nutrition**
- Lesson 1: What's in the Food I Eat?
- Lesson 2: Why Do I Need Protein?
- Lesson 3: Why Do I Need Carbohydrates and Fats?
- Lesson 4: Why Do I Need Vitamins?
- Lesson 5: Why Do I Need Minerals?
- Lesson 6: Why Do I Need Water?
- Lesson 7: How Can I Get the Nutrients I Need?
- Lesson 8: Why Do I Eat What I Do?
- Lesson 9: Can I Trust Food Advertisements?

**Unit 4: Investigating Cells**
- Lesson 1: Why Are Cells Important?
- Lesson 2: How Do Cells Work?
- Lesson 3: How Are Traits Passed Along?

**Unit 5: Investigating Agriculture and Forestry**
- Lesson 1: Why Do We Need Plants?
- Lesson 2: What Does Agriculture Involve?
- Lesson 3: How Is Food Transported and Processed?
- Lesson 4: What Are Forests Like?
- Lesson 5: How Can We Best Use Plants, the Land, and the Food Supply?

**Unit 6: Investigating Motion and Forces**
- Lesson 1: What Is Motion?
- Lesson 2: What Are the Laws of Motion?
- Lesson 3: What Is Force?
- Lesson 4: How Do Machines Make Work Easier?
- Lesson 5: What Are the Simple Machines?
- Lesson 6: How Do Machines Affect Society?

**Unit 7: Investigating Space**
- Lesson 1: What Is the Solar System Like?
- Lesson 2: What Is the Earth Like?
- Lesson 3: What Is the Moon Like?
- Lesson 4: What Is the Sun Like?
- Lesson 5: What Are the Stars Like?
- Lesson 6: What Is the Universe Like?
- Lesson 7: How Does Technology Help Us Study Space?
- Lesson 8: What Role Did the Heavens Have in Various Civilizations?

**Unit 8: Investigating Things that Move**
- Lesson 1: What Makes Vehicles Work?
- Lesson 2: Why Are Gears Important to Vehicles?
- Lesson 3: How Does Rolling Relate to Movement?
- Lesson 4: What Energy Sources Are Important for Vehicles?
- Lesson 5: How Can I Plan a Vehicle that Moves?
- Lesson 6: How Can I Build a Vehicle that Moves?
- Lesson 7: How Can I Evaluate a Vehicle that Moves?

# Grade 6

## Unit 1: Scientific Investigations

- Lesson 1: What Is Teamwork?
- Lesson 2: How Can Scientific Investigations Answer Questions?
- Lesson 3: What Science Skills and Tools Are Important?
- Lesson 4: How Do Computers Help Us Analyze Data?
- Lesson 5: How Do Scientists Develop Explanations?

## Unit 2: Investigating the Immune and Nervous Systems

- Lesson 1: How Does the Immune System Work?
- Lesson 2: What Is a Communicable Disease?
- Lesson 3: What Is a Noncommunicable Disease?
- Lesson 4: How Do Medicines Help the Immune System?
- Lesson 5: How Can I Care for My Immune System?
- Lesson 6: How Does the Nervous System Work?
- Lesson 7: What Things Put the Nervous System at Risk?
- Lesson 8: What Things Attack Your Nervous System?
- Lesson 9: How Can I Care for My Nervous System?

## Unit 3: Investigating the Diversity of Life

- Lesson 1: What Are the Similarities and Differences among Living Things?
- Lesson 2: How Are Living Things Classified?
- Lesson 3: What Are Fish, Amphibians, and Reptiles Like?
- Lesson 4: What Are Birds and Mammals Like?
- Lesson 5: What Are Invertebrates Like?
- Lesson 6: What Are Plants Like?
- Lesson 7: How Do Plants Make Food?
- Lesson 8: What Are Bacteria, Fungi, and Protists Like?
- Lesson 9: How Are Living Things Connected?

## Unit 4: Investigating Energy

- Lesson 1: What Are the Different Forms of Energy?
- Lesson 2: How Does Energy Change Form?
- Lesson 3: What Are Our Sources of Energy?
- Lesson 4: How Can We Use Energy Wisely?

## Unit 5: Investigating Electricity

- Lesson 1: What Is Electrical Energy?
- Lesson 2: How Can We Be Safe around Electricity?
- Lesson 3: How Does Electric Current Flow through Circuits?
- Lesson 4: How Are Electricity and Magnetism Related?
- Lesson 5: How Do We Generate Electrical Energy?
- Lesson 6: How Can We Conserve Electrical Energy?
- Lesson 7: What Is Electronics?

## Unit 6: Investigating Matter

- Lesson 1: What Is Matter?
- Lesson 2: What Are Elements Like?
- Lesson 3: What Are Compounds?
- Lesson 4: How Do the States of Matter Compare?
- Lesson 5: How Do Properties of Different Substances Compare?
- Lesson 6: How Does Matter Change?

## Unit 7: Investigating Weather

- Lesson 1: How Does the Atmosphere Relate to Weather?
- Lesson 2: How Does Moisture Behave in the Atmosphere?
- Lesson 3: What Is the Nature of Weather?
- Lesson 4: What Is Climate?
- Lesson 5: What Factors Make up Weather?
- Lesson 6: How Are Weather Factors Measured?
- Lesson 7: How Do Weather Patterns Help Us Predict Weather?
- Lesson 8: How Do Weather Systems Form?

## Unit 8: Investigating Flight

- Lesson 1: How Do We Do Technology?
- Lesson 2: What Are the Features of Living Things That Fly?
- Lesson 3: How Were Flying Machines Developed?
- Lesson 4: How Does Air Support Flight?
- Lesson 5: How Do Gravity and Lift Relate to Flight?
- Lesson 6: How Do Thrust and Drag Relate to Flight?
- Lesson 7: How Can We Control Flight?
- Lesson 8: How Are Airplanes Designed?
- Lesson 9: How Well Does My Flying Device Perform? (teacher guide only)
- Lesson 10: How Can We Be Good Stewards with Our Airplanes? (teacher guide only)

# Unit 4
# Investigating Light

## Unit Overview

Lesson 1: What Is Light?
Lesson 2: How Does Light Travel?
Lesson 3: How Do Shadows Form?
Lesson 4: How Does Light Reflect?
Lesson 5: How Does Light Bend?
Lesson 6: How Do We See?
Lesson 7: What Is Color?
Lesson 8: How Is Light Used in Technology?

## Unit Background

Genesis 1 tells us that one of God's first creations was light. God's creatures depend on light. All food sources depend on light energy: plants use light to make food, and animals feed on plants or other animals that eat plants. People who live without light often develop symptoms of depression. Light is indeed a vital gift from God.

In the Bible light is often used as a symbol of truth or God's presence. Psalm 36:9b says, "in your light, we see light." The Israelites were guided by a pillar of fire to give them light during the night. Jesus is described as "a light for revelation to the Gentiles" (Luke 2:32), and we as his followers are to be "the light of the world" (Matthew 5:14).

In this unit students will have the opportunity to read about and experiment with light. Throughout the lessons, encourage your students to give thanks to the giver of light as they learn more about the gift.

## Unit Resources

### Books

Burnie, David. *Light*. Eyewitness series. New York: Alfred A. Knopf, 1999.

Challoner, Jack. *Sound and Light*. New York: Larousse Kingfisher Chambers, 2001.

Davidson, Margaret. *Helen Keller*. New York: Scholastic, 1997.

DiSpezio, Michael Anthony, and Catherine Leary. *Awesome Experiments in Light and Sound*. New York: Sterling Publications, 2006.

Gold-Dworkin, Heidi, K. Almadingen, and Robert K. Ullman. *Exploring Light and Color*. New York: McGraw Hill, 2000.

Macaulay, David. *The New Way Things Work*. Boston: Houghton Mifflin, 1998.

Nankivell-Aston, Sally, and Dorothy Jackson. *Science Experiments with Light*. New York: Franklin Watts, 2000.
Prelutsky, Jack, ed. *The Random House Book of Poetry for Children*. New York: Random House, 2000.
Timmer, John. *Once Upon a Time: Story Sermons for Children*. Grand Rapids: Zondervan, 1992.

### Software

*Light.* Discovery Channel School. www.discoveryeducation.com.

### Videos/DVDs

*Light and Color*. Bill Nye, the Science Guy series. Disney Education, 1997. www.disney.go.com.
*Light and Optics*. Bill Nye, the Science Guy series. Disney Education, 1995. www.disney.go.com.

### Web Sites

Counter Rotating Spirals Illusion. http://dogfeathers.com/java/spirals.html.
How Stuff Works. www.howstuffworks.com.
HubbleSite. http://hubblesite.org.
Light History: Learner.Org. www.learner.org/channel/workshops/sheddinglight/lighthistory.html.
Microangela: Electron Microscope Image Gallery. www.pbrc.hawaii.edu/bemf/microangela.
Scanning Electron Microscope. www.mos.org/sln/SEM.
Twinkle and Eyenstien: The Amazing Eye. www.keystoneblind.org/wiseweb/eyeknow.htm.
**Note:** All Web site addresses were active and appropriate at the time of printing.

## Bulletin Board Idea

Have students bring in pictures that show ways that we use light. Pin these to the bulletin board under the heading, “God’s Good Gift of Light.”

## Center Idea

Place flashlights, lenses, prisms, and mirrors in a center. Encourage students to explore the properties and behavior of light. Provide time for them to share their discoveries with the rest of the class.

# Lesson 1
# What Is Light?

## Objectives

Students will

- explain the basic nature of light
- identify basic forms of electromagnetic radiation
- draw the colors of the visible spectrum in their correct order
- distinguish between luminous and illuminated objects

## Vocabulary

*crest*—the highest point of a wave
*frequency*—the number of waves that pass by a certain spot in a certain amount of time
*trough*—the lowest point of a wave
*visible spectrum*—the light energy that you can see
*wavelength*—the distance from trough to trough or crest to crest

## Structuring the Curriculum

Two weeks before you teach this lesson, plant grass, alfalfa, or some other fast-growing plant in a planting tray. Place a large wide-mouth jar over a section of the seeds in the planting tray, water the seeds regularly (replacing the jar in the same place afterwards), and place the tray in direct sunlight.

## Preparation/Materials

**Try This: Make a Rainbow**

√ dishwashing liquid
√ water
√ flat pans, one per team
√ flashlights, one per team
√ colored pencils or markers
√ CDs, one per team

**Demonstration: Light in a Greenhouse**

√ fast-growing seeds such as grass or alfalfa
√ planting tray
√ potting soil
√ large wide-mouth jar
√ water
√ Prepare the demonstration two weeks ahead of time (see Structuring the Curriculum).

**Intersection with Art: Natural and Artificial Light**

√ art supplies

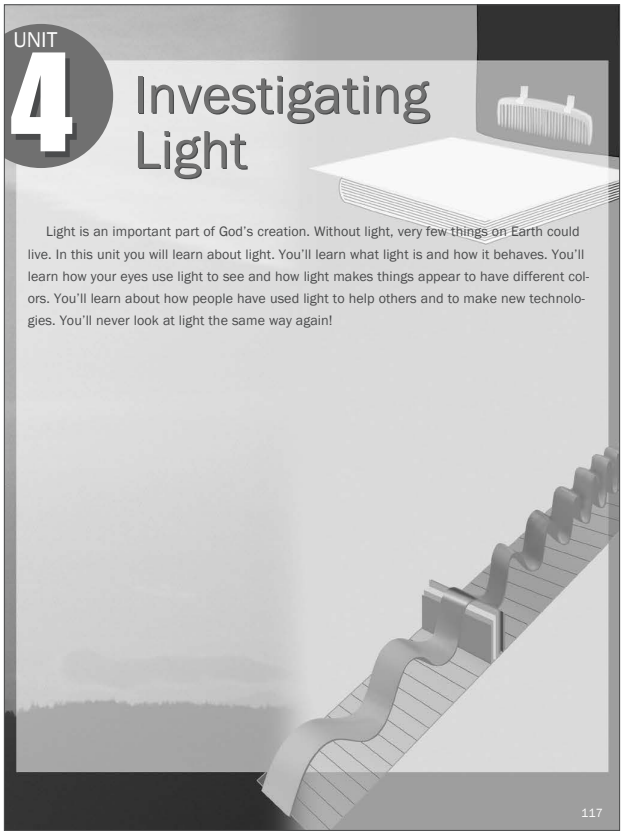
## Background

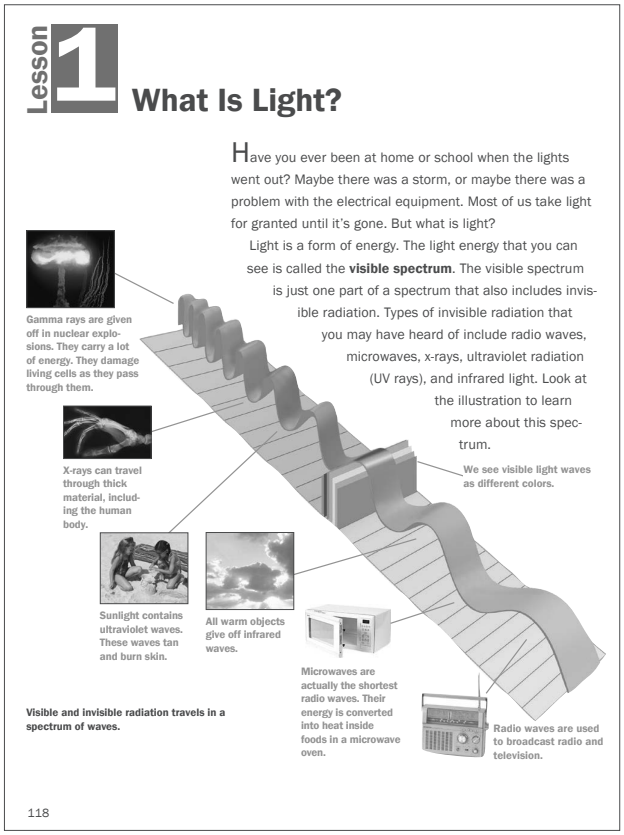
Isaac Newton first used prisms in 1668 to separate white light into the colors of the rainbow. In 1678 Dutch physicist Christiaan Huygens described light as a wave, but his wave theory was dismissed because it contradicted Newton's theory that light was made of particles.

The wave theory was revived in the 19th century, and scientists debated the nature of light until 1905, when Albert Einstein proposed that light exhibits properties of both waves and particles called photons. (Students at this level will study light as waves but not as photons.)

The visible spectrum is just one part of the entire electromagnetic spectrum. The radiation on the spectrum falls in order of increasing energy and decreasing wavelength. Visible light is in the center of the spectrum. Low-energy, long-wavelength forms of radiation such as radio waves, microwaves, infrared light, and radar are to the left of visible light on the spectrum. High-energy, short-wavelength radiation, such as ultraviolet light, x-rays, and gamma rays, are to the right of visible light.

Objects that give off their own light (the sun, for example) are called luminous objects. The two basic types of luminous objects are natural and artificial. Most natural light is from the sun, although the stars also shed small amounts of light on Earth. An object heated to a temperature higher than 500 °C (575 °F) also produces its own light. Some living creatures (such as fireflies and certain ocean creatures) produce their own light (a phenomenon called bioluminescence). This light comes from chemical reactions inside their bodies. Objects that can be seen only by reflected light (the moon, a shirt, or an animal, for example) are called illuminated objects.




## Discover

1. Have students complete **Try This: Make a Rainbow** (page 122) in the student text. Have teams compare their observations and drawings.

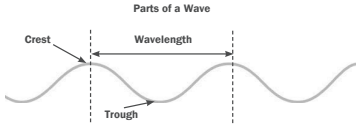
2. **Demonstration: Light in a Greenhouse.** Display the planting tray that you prepared two weeks before teaching this lesson. Ask students why the plants under the jar grew more quickly than the rest of the plants. (The jar acts like a greenhouse, providing additional warmth for the new plants. The glass of a greenhouse allows sunlight in, but the glass traps most of the heat, which can't easily escape.)

   Use this experiment as an opportunity to introduce the fact that the visible spectrum—light that we can see—is only one kind of radiation. Other types include ultraviolet light (which causes sunburn), infrared light (a form of heat), and x-rays. We can't see these types of radiation, but they are there, as evidenced by the heat in the jar.

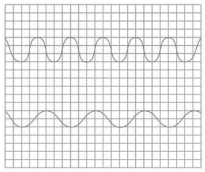
   **Extension.** Place a thermometer among the plants that aren't covered by the jar and among the plants that are under the jar so that students can see the temperature difference.

Light travels in waves. Think about waves in the water. Each water wave has a high point and a low point. The highest point of a wave is called a **crest**, and the lowest point of a wave is called a **trough**. The distance from one trough to the next is the same as the distance from one crest to the next. The distance from trough to trough or crest to crest is called the **wavelength**. The wavelength is important. It tells you how long each part of the wave is. Each color of light on the visible spectrum has a different wavelength. Your eyes can't see the wavelengths of the invisible part of the spectrum, such as x-rays.

Of all the colors, red has the longest wavelength.




Think about water waves rolling onto shore. Sometimes the waves travel quickly and reach the shore one right after the other. Sometimes the waves travel more slowly, and a few seconds pass between waves. All light waves travel so quickly that you can't see light waves traveling by. The number of waves that pass by a certain spot in a certain amount of time is called the **frequency** of the wave. Look at the two waves. Which one has a higher frequency?



Light waves also have a certain brightness. A light wave's brightness depends on the size and strength of the source that the light is coming from. The sun's light, for example, is very bright, but the light from a firefly is quite dim. As you move farther from the source, the light appears even dimmer. A firefly's light can hardly be seen from 1 km away, but



**Fast Fact**

### Heat and Light

Fireflies produce almost 100 percent light and almost no heat. An average incandescent light bulb produces about 10 percent light and 90 percent heat. A CFL bulb (fluorescent bulb) gives off 70 percent less heat than an incandescent bulb.

the sun's light is so strong that it still seems bright when it reaches Earth, which is 150 million km (93 million miles) away.

Some objects—such as the sun, stars, fireflies, light bulbs,

The streetlights that are farther away appear smaller and dimmer than those that are closer.

## Focus On

### Max Planck

Max Planck was a German scientist who lived from 1858 to 1947. He is famous for his theory about energy. Before Planck, scientists thought that energy flowed in continuous waves. But Planck showed that objects release energy in tiny bursts called quanta. All of the quanta released by an object produce energy waves. Later other scientists showed that light is made of quanta. This theory explained many things that scientists had not been able to explain before.

Planck's full name was Max Karl Ernst Ludwig Planck. He was born in the town of Kiel in Germany. When he grew up, he studied at the universities in Munich and Berlin. Later he taught physics at three different universities. In 1918 Planck won the Nobel Prize for physics for his theory about energy.



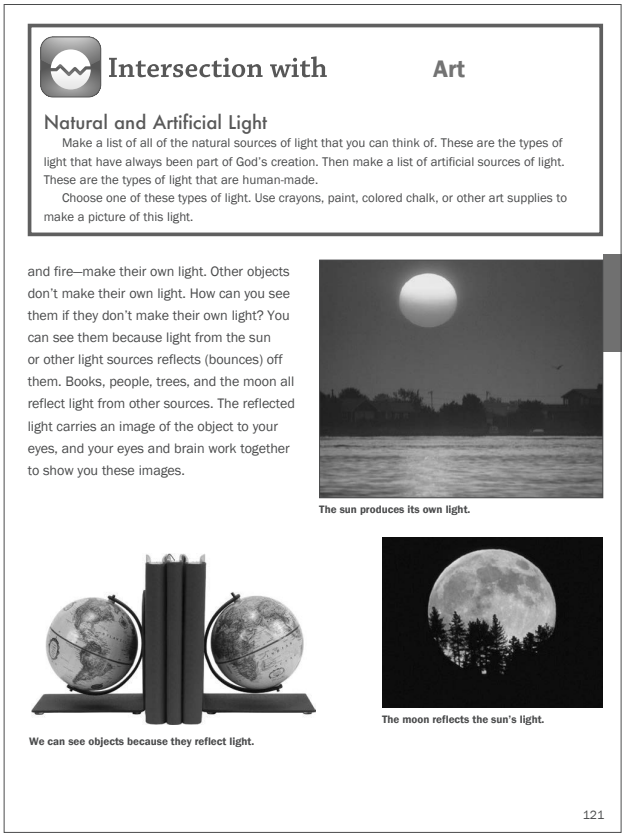
## Develop

**Discussion: Types of Lighted Objects.** Have teams imagine that they are staying at school for a 24-hour period. During that time they are free to move in and out of the building and around the entire schoolyard. Challenge students to list of all of the lighted objects. Have students group these objects into two lists: items that give off their own light and items that shine from the light of other objects (reflected light). Possible answers include:

- Objects that shine by their own light: sun, stars, streetlights, classroom lights, exit signs, fireflies (and other bioluminescent organisms), headlights, city lights, plane lights, radio tower lights.
- Objects that shine from the light of other objects: moon, planets, mirrors, eyes of night animals, glare off metal or polished objects.

## Reinforce/Assess

1. Have students read **What Is Light?** (page 118) in the student text and answer the **Think Back** questions (page 123) as homework.
   1. *What is the visible spectrum? (The light energy that you can see.)*
   2. *Explain the difference between wavelength and frequency. (The wavelength is the distance from trough to trough or crest to crest. The frequency is the number of waves that pass by a certain spot in a certain amount of time.)*



## Intersection with Art

### Natural and Artificial Light

Make a list of all of the natural sources of light that you can think of. These are the types of light that have always been part of God's creation. Then make a list of artificial sources of light. These are the types of light that are human-made.

Choose one of these types of light. Use crayons, paint, colored chalk, or other art supplies to make a picture of this light.

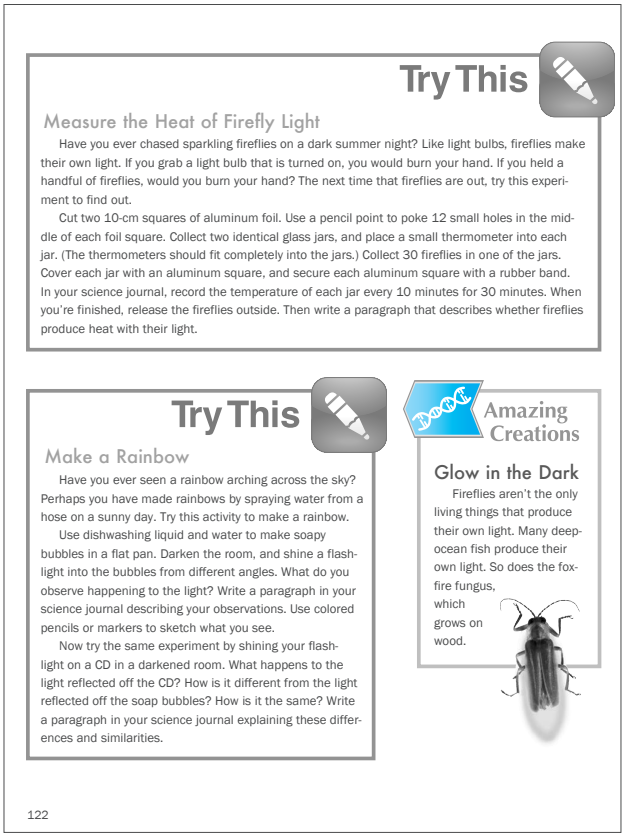
and fire—make their own light. Other objects don't make their own light. How can you see them if they don't make their own light? You can see them because light from the sun or other light sources reflects (bounces) off them. Books, people, trees, and the moon all reflect light from other sources. The reflected light carries an image of the object to your eyes, and your eyes and brain work together to show you these images.

The sun produces its own light.

We can see objects because they reflect light.

The moon reflects the sun's light.

121



## Try This

### Measure the Heat of Firefly Light

Have you ever chased sparkling fireflies on a dark summer night? Like light bulbs, fireflies make their own light. If you grab a light bulb that is turned on, you would burn your hand. If you held a handful of fireflies, would you burn your hand? The next time that fireflies are out, try this experiment to find out.

Cut two 10-cm squares of aluminum foil. Use a pencil point to poke 12 small holes in the middle of each foil square. Collect two identical glass jars, and place a small thermometer into each jar. (The thermometers should fit completely into the jars.) Collect 30 fireflies in one of the jars. Cover each jar with an aluminum square, and secure each aluminum square with a rubber band. In your science journal, record the temperature of each jar every 10 minutes for 30 minutes. When you're finished, release the fireflies outside. Then write a paragraph that describes whether fireflies produce heat with their light.

## Try This

### Make a Rainbow

Have you ever seen a rainbow arching across the sky? Perhaps you have made rainbows by spraying water from a hose on a sunny day. Try this activity to make a rainbow.

Use dishwashing liquid and water to make soapy bubbles in a flat pan. Darken the room, and shine a flashlight into the bubbles from different angles. What do you observe happening to the light? Write a paragraph in your science journal describing your observations. Use colored pencils or markers to sketch what you see.

Now try the same experiment by shining your flashlight on a CD in a darkened room. What happens to the light reflected off the CD? How is it different from the light reflected off the soap bubbles? How is it the same? Write a paragraph in your science journal explaining these differences and similarities.

## Amazing Creations

### Glow in the Dark

Fireflies aren't the only living things that produce their own light. Many deep-ocean fish produce their own light. So does the fox-fire fungus, which grows on wood.

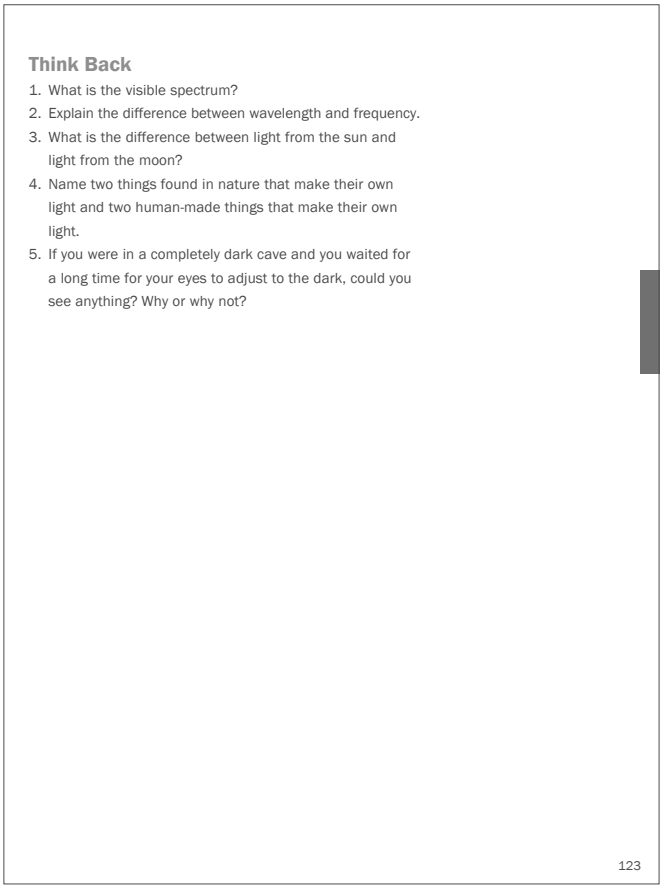
122

3. *What is the difference between light from the sun and light from the moon? (The sun makes its own light; the moon reflects light from the sun.)*
4. *Name two things found in nature that make their own light and two human-made things that make their own light. (Answers will vary. Things found in nature may include the sun, stars, and fire; human-made things may include light bulbs and glow-sticks.)*
5. *If you were in a completely dark cave and you waited for a long time for your eyes to adjust to the dark, could you see anything? Why or why not? (No. There would be no light to reflect off an object so that it can be seen.)*

2. Have students complete **Intersection with Art: Natural and Artificial Light** (page 121) in the student text. You may want to have each student choose a different kind of light to draw. Display the finished products.

## Extend

- To help students understand the relationship between wavelength and frequency, give them each a long rope or string. Have them tie colored yarn at regular intervals along the rope or string and then tie one end of the rope or string to a table or chair leg. One student should hold the unattached end and slowly move it up or down to make waves. Have students experiment with making longer and shorter wavelengths. The colored yarn will make the wave motion more apparent. Students should note that the faster they move the rope, the shorter the wavelengths are.




- Have students look up references to light in the Bible. Discuss God's glory and light. Possible references include God filling the tabernacle, Moses' face reflecting God's glory on Mount Sinai, and Jesus' displaying his true glorious nature at his transfiguration.
- Have students use prisms to separate white light into its colored components.
- Combine the visible spectrum back into white light. Cover a window with a sheet of heavy paper that has a small hole punched in it so that a thin beam of light comes through the hole, and completely darken the room. Hold a prism in the beam of light until a rainbow is produced. Have a student hold a hand lens in the spectrum band on the other side of the prism so that the students can observe the spectrum converge back into white light.

# Thank you for your interest in Christian Schools International's 2nd Edition Science curriculum!

This sample serves as a great reflection of the other engaging material available for kindergarten through grade 8.


The curriculum tools represented below work great together to assist you as you explore God's creation, promote effective learning, and provide a clear biblical perspective to your students.

**Teacher Guide** - a comprehensive guide that is informative and easy-to-use with detailed teaching strategies, reduced student text pages, numerous inquiry-based activities, cross-curricular activities, and activity sheets that involve investigating, making observations, experimenting, researching, charting, mapping, and more.

**Student Textbook** (grades 1-8) - colorful textbook includes sidebars with hands-on experiments, information about God's work in creation, readings to reinforce concepts presented in classroom, and questions to promote both recall and synthesis of ideas and concepts.

**Test Bank** (grades 3-8) - test banks are sent electronically in two formats—PDF and Microsoft Word allowing teachers to develop or modify their own tests.

**New eCurriculum** - access to download a copy of CSI's Bible and science curriculum teacher guides to use in many different electronic platforms, allowing additional teacher notes, highlighting of text, insertion of other supplemental curriculum, print-on-demand, and accessing the curriculum's live Web links.

**Science Supplements** (grades K-8) - available in DVD or download, these supplements feature additional units, lessons, and experiments to support CSI's 2nd Edition Science material.

## Contact CSI to:

**Request more information** — Our sales team can provide more details about our products and answer questions you may have. Call 800-635-8288 or 616-957-1070 to connect with a team member.

**Take a closer look** — Materials can be sent to you for a 60-day examination period. Request a preview order online or by phone.

**Order classroom quantities** — Orders can be placed 24/7 at the CSI online store at store.csionline.org or go through the CSI website by visiting csionline.org and clicking the "Online Store" link.