

— God's Creation Series —

Exploring God's Creation

Second Edition

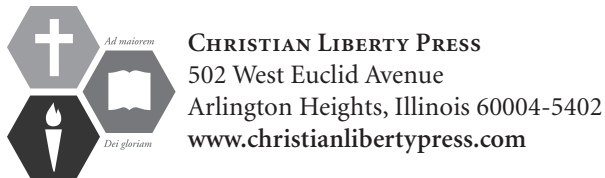


Craig Tuttle

TEACHER'S MANUAL

Second Edition
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Introduction

In *Exploring God's Creation, second edition* (copyright © 2021 by Christian Liberty Press), students are exposed to the ways scientists look at nature, matter, energy, weather, and the universe. This textbook also spotlights hands-on learning. Students will touch and handle, look and prod, feel and hear some of the amazing creatures and objects in God's marvelously designed world.

This teacher's manual contains general teaching tips and a suggested schedule. For many chapters, there are Chapter Notes, giving further information on topics in the student text and/or suggestions or clarifications regarding the hands-on activities. Answers to the Looking Back review sections are given at the end of each chapter in the teacher's manual. At the end of each unit, you will also find field trip suggestions.

God put the world into our care with the commands of Genesis 1:28–29. Our caregiving responsibility requires at least three ingredients: to love God's world, to believe we are empowered to take care of it, and to have the hope that we are equipped to do so. These three ingredients come with our faith, and it is our hope that this book will provide opportunities for your students to develop that love, to strengthen that belief, and to broaden that hope.

A student's wonder at the marvels around us can open our adult eyes to the fact that God really has made a marvelous world. As the Lord Jesus said,

“Assuredly, I say to you, unless you are converted and become as little children, you will by no means enter the kingdom of heaven.”

—*Matthew 18:3*

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GENERAL INSTRUCTIONS AND SUGGESTIONS FOR TEACHING THIS COURSE

1. Keep a flexible schedule.

This teacher's manual does not include daily lesson plans, but the following is a suggested weekly schedule for completing the course in 36 weeks. However, if your student shows an interest in a particular topic, be flexible enough to spend extra time to encourage the interest.

Week	Material	Week	Material
1	Chapter 1: Machines	19	start Chapter 16: The Solar System
2	Chapter 2: Solid, Liquid, Gas	20	finish Ch. 16, Chapter 17: Earth
3	start Chapter 3: Things Join	21	Chapter 18: Stars
4	finish Ch. 3, start Chapter 4: Metals	22	review, test 5, start Chapter 19: Moon
5	complete Ch. 4, review, test 1	23	finish Ch. 19, start Chapter 20: Clouds
6	Chapter 5: Liquids	24	finish Ch. 20, review, test 6
7	Chapter 6: Magnetism	25	Chapter 21: Seasons, start Chapter 22: Weather
8	Chapter 7: Fire & Heat	26	finish Ch. 22
9	Chapter 8: Electricity	27	Chapter 23: Climate
10	review, test 2, field trip	28	review, test 7, field trip
11	Chapter 9: Rocks, start Chapter 10: Volcanoes	29	Chapter 24: Sorting God's Creatures, start Chapter 25: Vertebrates
12	finish Ch. 10, start Chapter 11: Mountains	30	finish Ch. 25, review, test 8
13	finish Ch. 11, review, test 3	31	Chapter 26: Insects, start Chapter 27: Other Invertebrates
14	Chapter 12: Our Watery World	32	finish Ch. 27, review, test 9
15	Chapter 13: Sediment & Erosion	33	Chapter 28: Ecosystems
16	Chapter 14: Plants Grow	34	Chapter 29: Germs
17	Chapter 15: Plants Like Light	35	Chapter 30: Nutrition
18	review, test 4, field trip	36	review, test 10, field trip

2. Plan Ahead.

- a) Before teaching a chapter, read through the activity instructions and note what supplies you will need. Assemble the items before the day of the activity, so the class time can be devoted to the activity, rather than to hunting down supplies.

- b) Some of the activities in chapters 13, 14, and 15 involve growing plants, which will obviously take more time to complete. There are three possible ways to address this.
 - 1) You may want to start the growing process a couple of weeks earlier, for example around week 11 or 12, so that the plants will be ready when the material comes up in the book.
 - 2) You may want to complete these chapters and start their activities before doing chapters 9-12, and then have your student tend to the growing plants while completing chapters 9-12.
 - 3) You may want to do the chapters in sequence with the understanding that the student will still be tending growing plants as he moves on to Unit 3.
- c) A few projects are season-sensitive. For example, plants will grow better in warmer weather. Also, one of the projects in chapter 11 is an outdoor activity. Adjust your schedule according to the seasonal weather in your area.
- d) Before teaching a chapter, check the teacher's manual for any special notes. Some chapters have notes regarding the information and/or activities in the chapter.

3. Participate in the activities.

Some of the experiments will have risks of spills; and some, especially those around the stove, will require close adult supervision. These are marked with a Safety-First symbol.

Some activities will have you rolling up your sleeves to assist students in making things that may be challenging. These are opportunities to model careful work and enjoyment of the activity.

If more than one student is participating, they should take turns. In no case should anyone sit and just watch! Of course, some students may need a few demonstrations of how much fun the activities are before participation becomes willing and eager.



4. Encourage practice in reasoning.

At this age, merely learning facts is not the primary goal. Most primary grade children cannot reason with the same agility as adults can. Reasoning requires practice and “muscle building” in very much the same way as physical skills. A logical connection that you can see without effort may seem no more plausible to young students than a fabricated answer.

If a question proves challenging, students should at least try to reason out the answer, but they should not reach the point of frustration and discouragement. The following motto may help you know when enough is enough: The question should prove to students that they can think and get an answer—but not be too difficult for them to comprehend. Suggest the correct answer before the point of frustration is reached, check for understanding, and then move on.

5. Use the bolded words for review.

The bolded words in the text are generally new vocabulary words or important terms in the chapter. They are usually bolded within the sentences that give the definitions. They can be useful when reviewing the chapter.

6. Take field trips.

Field trip suggestions appear in this teacher's manual at the end of each unit. We have tried to consider all parts of the country in our suggestions and hope you find one or two that you can use in each list, but you are by no means limited to the trip suggestions provided. We suggest that field trips be used as refreshers and rewards on the last week of a unit.

UNIT 1

THE MYSTERY OF GOD'S WORLD: PHYSICS AND CHEMISTRY

In Unit 1, the student will explore God's creation, including matter, energy, and how the universe works. Simple machines, the three states of matter, compounds, chemical change, the usage of metals, magnetism, power, and electricity will be covered, as well.

The main concepts that the student should grasp by the end of the unit are:

- ◆ What a simple machine is
- ◆ The three states of matter
- ◆ The difference between a simple mixture and a chemical reaction
- ◆ How metals transfer heat
- ◆ The surface of liquids
- ◆ Basic principles of magnetism and electricity
- ◆ Effects of fire and heat

Pay attention to your student's interest as you progress through the material. If your student is interested in a particular topic, spend extra time. Think about encouraging an interest that may turn into a career at a later age.

Chapter 1: Machines

Chapter Notes

Take as much time as necessary on the lesson for the student to learn the six types of simple machines. Make sure that the student understands that any bar that pivots is a lever.

Simple Machines Around You activity (page 4)

Here are a few suggestions, if the student is not able to find examples by observation.

Wheel and axle: doorknob, fan, some chairs, some drawers, some faucet handles

Pulley: window blinds, tow truck, exercise equipment, toys, some garage doors

Inclined plane: roof, slides, sink

Wedge: doorstop, any cutting utensil, most digging tools, bulldozer, toys

Screw: screw top jars, mechanical pencil, some adjustable chairs, toys, screw-in light bulbs

Lever: certain door handles, certain types of faucet handles, toilet handles, nut cracker, bottle opener, nail clippers, tongs, tweezers, can crusher, baseball bat, golf club, many types of garden tools

Balance activity (pages 6–7)

A quick note about the pennies to be used with this activity: In 1982, the formula for pennies was changed. The current pennies are much lighter than the older pennies. Although this balance will not be very precise, it is recommended that for a better degree of accuracy you use a set of pennies that are all from the same era, either all from before 1982 or all from after 1982.

You may want to use nickels or quarters instead of pennies, if you would like to have heavier items that may give more movement in the balance. However, the cardboard tube may not support a large number of heavy items, so your student will need to be judicious in the number of items that go into the “bags.”

This “scale” will not be very precise, but it will provide a good start on one of the basic ideas of mechanics. Try several combinations with your student until the following becomes clear:

- ◆ The same number of pennies at the same distance balance.
- ◆ A different number of pennies at the same distance does not balance.
- ◆ The same number of pennies at a different distance does not balance.

Inclined Plane activity (page 8)

The fact to be experienced is that a ramp (an inclined plane) makes work easier. The details of how and how much are not important at this age. See if you can lead your student to statements like “it’s easier with a ramp” or “ramps help you do work.”

Fill in the Blank activity (page 9)

Wheelbarrow:

1. lever
2. wheel and axle
3. inclined plane

Crane:

1. pulley
2. lever
3. wheel and axle

Looking Back (page 10)

1. A machine is something that makes work easier.
2. A force is a push or a pull.
3. I have a scale that balances. If I move the weight on one side closer to the center, that side will go up.
4. The pivot point for a lever is called the fulcrum.
5. Mechanical advantage means that a simple machine can increase the amount of force.
6. A compound machine combines one or more simple machines.
7. Identify the simple machines shown below.

slide: inclined plane

door knob: wheel and axle

bulldozer: wedge

light bulb base: screw

UNIT 2

THE BEAUTY OF GOD'S WORLD: GEOLOGY AND BOTANY

In Unit 2, the student will explore the things God made on the third day of creation, the dry land and the plants. The earth and its features and some basic concepts of plant life will be covered. The student will also learn basic differences between living and nonliving things. In addition, the basic concepts of the water cycle and the carbon cycle will be presented.

The main concepts that the student should grasp by the end of the unit are:

- ◆ Types of rocks and minerals
- ◆ The internal structure of the earth
- ◆ What a volcano is
- ◆ How mountains are formed
- ◆ How an earthquake happens
- ◆ Some properties of rivers
- ◆ How the earth's water is distributed
- ◆ How the water cycle functions
- ◆ The importance of topsoil as a resource for human beings
- ◆ Basic facts about erosion and how erosion is controlled
- ◆ The main differences between living and nonliving things
- ◆ The importance of plants in the food chain and in the earth's oxygen supply
- ◆ The process of photosynthesis
- ◆ Basic facts about the carbon cycle
- ◆ Phototropism (the growth of plants toward the sun)

Take a little extra time to plan for the activities in chapters 13, 14, and 15. These involve growing plants, so they will take more time than the activities that have appeared in the book so far.

Chapter 9: Rocks and Minerals

Chapter Notes

Hardness testing activity (pages 54–55)

At the time that the chart was developed, United States pennies were harder than they are now. Modern pennies actually rate closer to 2.5. Therefore, you can save your fingernails by using a modern penny as

the 2.5 tester. If you do this, you will have a gap between the 2.5 and the 5.5 tester. If you have access to a wheatback or an Indian head penny, it will be closer to the 3.5 rating.

If you wish to take this activity further, there are Mohs testing kits available for purchase that have a sample of each of the minerals listed on the left side of the chart.

Looking Back (page 56)

- | | |
|--------|---------|
| 1. Yes | 6. Yes |
| 2. No | 7. No |
| 3. No | 8. Yes |
| 4. Yes | 9. No |
| 5. Yes | 10. Yes |

Chapter 10: Volcanoes

Chapter Notes

None

Looking Back (page 62)

- When the melted rock is thin (or runny), it just flows from the volcano.
- The melted rock can be thrown high in the air when there are gases in it.
- The most common type of volcano is a cinder cone.
- A shield volcano is wider than it is high.
- A composite volcano is very large and can have more than one vent.

cone	underground melted rock
eruption	melted rock that comes out of a volcano
lava	when melted rock pushes its way to the surface
magma	deep crack in the earth's surface
magma chamber	underground area where melted rock collects
vent	mountain that forms from cooled rock

UNIT 3

THE MAJESTY OF GOD'S WORLD: ASTRONOMY AND WEATHER

In Unit 3, the student will review what God created on the second and fourth days: the stars, the moon, and the planets in the heavens; and the “waters above the firmament”—in other words, the weather and climate.

The main concepts for the student to grasp in this unit are as follows:

- ◆ The sun's composition and some of its basic properties
- ◆ Basic descriptions of the eight planets in the solar system
- ◆ Earth as a planet, and how it moves through space
- ◆ That the sun is a star
- ◆ The different sizes and temperatures of stars
- ◆ The difference between constellations and galaxies
- ◆ The vast size of the universe
- ◆ What causes the phases of the moon
- ◆ How a cloud is formed
- ◆ The different kinds of clouds
- ◆ How the seasons occur
- ◆ The protective properties of the atmosphere
- ◆ Some basic weather terms, and some ways that weather is studied
- ◆ The earth's climate zones
- ◆ Some factors that influence climate

If your student's interest is high in this unit, you may have a budding astronomer or meteorologist on your hands. Look for ways to encourage that interest if it exists. There is certainly nothing wrong with taking extra time with a lesson if the student wants to explore a topic more thoroughly!

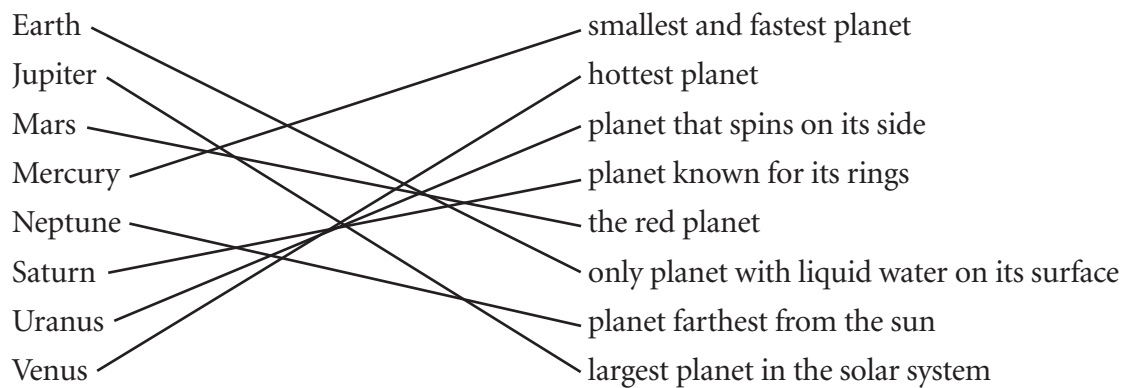
Chapter 16: The Solar System

Chapter Notes

None

Looking Back (page 101)

1. The sun is mostly made of which gas? hydrogen
2. The bright circle around the sun is its corona.
3. Are sunspots warmer or cooler than the rest of the sun? cooler
4. Our solar system is located in the Milky Way galaxy.
5. All the planets in the solar system have elliptical (or oval) orbits.
6. The Kuiper Belt is located beyond Neptune.
7. The asteroid belt is located between the planets Mars and Jupiter.



Chapter 17: The Earth

Chapter Notes

None

Looking Back (page 107)

1. Earth's mantle is made of hot, soupy rock.
2. Earth's core is made mostly of iron.
3. Most of the earth's surface is under water.
4. How many oceans are there on Earth? five
5. Name two things that the air does for the earth. *The student should answer with two of the following:*
 - (1) Air protects us from the strongest rays of the sun.
 - (2) Air keeps in moisture that might otherwise disappear into space.
 - (3) Air moves moisture and plant seeds around.
 - (4) Air allows birds and insects to fly.
 - (5) Air removes poisons.
 - (6) Air holds in the sun's heat.

8. Insects help humans in the following ways: *The student should name one of these.*
- (1) They clean up garbage.
 - (2) They help plants make seeds.
 - (3) They help plants put seeds in the ground.
 - (4) They get rid of pests.
 - (5) They make food.
 - (6) They make material for cloth (silk).
9. Insects bother humans in the following ways: *The student should name one of these.*
- (1) They ruin wood.
 - (2) They damage crops.
 - (3) They carry diseases.
 - (4) They are parasites.
10. A spider is not an insect. We know because spiders have eight legs, but insects have six legs.
The student may also name any of the other differences, but the number of legs is the most obvious.

Chapter 27: Other Invertebrates

Chapter Notes

If your student finds that the Research Report form on page 175 does not give enough room for writing, you may want to have him use a separate sheet of paper.

Looking Back (page 176)

1. Arthropods and mollusks have bilateral symmetry. *The student should name one of these.*
2. Echinoderms have radial symmetry as adults.
3. Because it does not make its own food, we know that a sponge is an animal, not a plant.
4. Arachnids have eight legs, two body parts, and no antennae.
5. Polyp and medusa are the two body forms that a coelenterate can have.
6. All invertebrates have no backbone and are cold-blooded. *The student should name one of these.*

Arthropod	mouth surrounded by stinging tentacles
Coelenterate	soft body, usually with a shell
Echinoderm	jointed feet and exoskeleton
Mollusk	spiny skin, internal skeleton
Sponge	pores in body, anchored to something