

**STUDY GUIDE & WORKBOOK**

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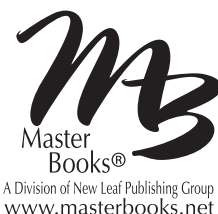
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# 1

## Harmony in Creation

---

**Text:** Pages 6–9

### **Vocabulary Words:**

---

commensalism

harmony

hypotheses

mutualism (symbiosis)

parasitism

Trinity

### **Multiple Choice:**

---

Choose the best answer:

1. “Trinity” is
  - a) a word found in the Bible.
  - b) a concept taught in the Bible that has nothing to do with understanding our world.
  - c) a concept taught in the Bible that can help us understand God and the world He created.
  - d) a recent New Age teaching.
2. In our world today
  - a) we see only perfect harmonious relationships.
  - b) we see not only harmonious relationships but also harmful relationships.
  - c) we don’t see relationships at all.
  - d) we see only harmful relationships.

### **Discussion Questions:**

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The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
- (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
- (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. Explain how an understanding of the Trinity can help us understand the world God created.
2. What happened that broke the harmony found in the original creation?

## **Projects:**

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1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples. You might use these words to help you search for answers to the questions under Reflections at the end of the chapter.
2. Memorize Genesis 1:26–31. You should be able to recite the passage and explain what it means in relation to the material studied in this chapter.

# 2

## Ecology: The Study of “Our House”

---

**Text:** Pages 10-17

### **Vocabulary Words:**

---

abiotic

baraminology

biodiversity

biome

biosphere

biotic

condensation

ecological system (ecosystem)

ecology

evaporation

evapotranspiration

hybridization (hybrids)

population

precipitation

protocol

recharge

species

sublimation

watershed

## Multiple Choice:

---

Choose the best answer:

1. Ecology is
  - a) the study of animals and plants in relation to each other and to their environments.
  - b) an underwater environment.
  - c) a concept opposed to the Bible.
  - d) a and c above.
2. Scientific names (e.g. *Strix varia* for the barred owl)
  - a) have two words which together refer to a single species.
  - b) include a first word naming the genus and a second naming the species.
  - c) are generally in Latin or Greek.
  - d) all of the above.

## Discussion Questions:

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The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. What is baraminology? How does it differ from the species concept?
  2. Compare/contrast the contributions of Ernst Haeckel and William Derham to ecology.

## Projects:

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1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples.
2. Do the Building Memories activity and memorize Isaiah 45:18. Discuss your experiences in light of the memory verse and other things you have learned from your studies.
3. Memorize Jeremiah 14:22. What other passages in Scripture refer to the water cycle? Several were given in the chapter. Use a concordance and see if you can find more. Memorize one of these passages, too

# 3

## The Dominion Mandate

---

**Text:** Pages 18–23

### Vocabulary Words:

---

dominion mandate

organism

protocols

stewardship

### Multiple Choice:

---

Choose the best answer:

1. The dominion mandate
  - a) was given to us by God (Genesis 1:18).
  - b) is a command to rule over the earth and the creatures in it.
  - c) should be carried out in a caring way, just as God cares for us.
  - d) all of the above.
2. Biblical stewardship
  - a) means caring for God's creation in a way that honors Him.
  - b) is a solid vessel for crossing the ocean.
  - c) is an evolutionary idea.
  - d) all of the above.

### Discussion Questions:

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
- 
1. What does it mean to be created in God's image? Are there ways we are like Him? Are there ways we represent Him here on earth?

2. What concepts from this chapter help you understand what it means to be a good steward of God's creation? How would you explain what it means to be a good steward of creation to someone else?

## **Projects:**

---

1. Memorize/review Genesis 1:26–31. You should be able to recite the passage and explain what it means in relation to the material studied in this chapter.
2. Using the resources mentioned under Ecology in Practice or your local parks system, find a citizen science project to participate in.



# 4

## What's on the Menu Today?

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**Text:** Pages 24–31

### **Vocabulary Words:**

---

abiotic

autotroph

biodiversity

biotic

carnivore

chemoautotroph

decomposer

ecological pyramid

food chain

food web

habitat

herbivore

heterotroph

niche

omnivore

photoautotroph

photosynthesis

saprophyte

scavenger

trophic level

## Multiple Choice:

---

Choose the best answer:

1. When God created animals and people, he gave them \_\_\_\_\_.
  - a) nothing
  - b) venison
  - c) every seed-bearing plant and every tree that has fruit
  - d) only wild mushrooms
2. Abiotic refers to
  - a) the non-living part of an ecosystem.
  - b) fungi.
  - c) things like sunlight, temperature, water, rocks, soil, etc.
  - d) a and c above

## Discussion Questions:

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. What did God create that is the source of energy for life on earth? Does this help explain the original diet?
  2. Who was Eugene Odum? What are ways that living things interact? What are abiotic (non-living) aspects of the environment that are important?

## Projects:

---

1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples.
2. Do the Building Memories activity. Memorize Isaiah 11:6–9 or another passage that you find meaningful; be able to explain to a friend why you find it meaningful.
3. Do the Ecology in Practice exercise. You may need to do some library or Internet research to help you through it.

# 5

## Taking a Liking to Lichens

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**Text:** Pages 32–41

### **Vocabulary Words:**

---

asexual reproduction

bioindicator

biomonitoring

fragmentation

hypha (plural hyphae)

lichen

lichenologist

mycelium

mycobiont

photobiont

photomorph

soredia

spore

symbiont

thallus

### **Multiple Choice:**

---

Choose the best answer:

1. Lichens are
  - a) an abiotic factor in the environment.
  - b) people who like to study ecology.
  - c) are made up of two organisms, one of which is a fungus.
  - d) both a and b above.

2. Algae and cyanobacteria
  - a) have no pigment.
  - b) can produce food via photosynthesis.
  - c) are never part of an ecosystem.
  - d) both a and b above

## **Discussion Questions:**

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. Name the symbionts that make up a lichen. Do they look any different when they are together compared to when they are separate? How?
  2. What parallels do you see between how God created us, as the Body of Christ (1 Corinthians 12–14) and how He created lichens?

## **Projects:**

---

1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples.
2. Complete the Building Memories activity. Part of this activity includes completing the Ecology in Practice and/or How to Find a Water Bear activities.

# 6

## A Fungus Among Us

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**Text:** Pages 42–51

### **Vocabulary Words:**

---

arbuscular mycorrhizae

bioremediation

botanist

ectomycorrhiza (plural ectomycorrhizae)

endomycorrhiza (plural endomycorrhizae)

fungus (plural fungi)

hypha (plural hyphae)

mycorrhiza (plural mycorrhizae)

mycoheterotroph

orchid

pelotons

phloem

phytoremediation

succession

symbiosis

vascular plants

xylem

### **Multiple Choice:**

---

Choose the best answer:

1. A mycorrhiza is
  - a) a tiny bug that lives in the water.
  - b) a symbiotic relationship between a fungus and a plant.
  - c) a word that literally means fungus roots.
  - d) both b and c above.

2. Plants can communicate
  - a) using Morse code.
  - b) by talking to each other in French.
  - c) using chemical signals.
  - d) using semaphore.

## **Discussion Questions:**

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. What are some of the important roles played by fungi in a mycorrhiza relationship?
  2. How might arbuscular mycorrhizae be important in biblical stewardship?

## **Projects:**

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1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples.
2. Do the Building Memories activity.

# 7

## The Plant-Bacteria Connection

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**Text:** Pages 52–61

### **Vocabulary Words:**

---

biomatrix/ organosubstrate

diazotroph

endosymbiosis

legume

mutualistic

nitrogen fixation

nutrient

rhizobia

### **Multiple Choice:**

---

Choose the best answer:

1. We get the nitrogen we need
  - a) by breathing it in from the air.
  - b) from eating plants or animals; it is in proteins or other molecules.
  - c) from nitrogen-fixing bacteria that live on our toes.
  - d) we don't need nitrogen.
2. If all bacteria on earth were to suddenly cease to exist
  - a) the world would be a healthier, happier place.
  - b) plants wouldn't be able to grow, but that wouldn't affect us.
  - c) we would die, but plants would be able to survive.
  - d) life on earth would not be possible. Plants could not make proteins for us to eat, and there would be no way to break down proteins when something dies.

### **Discussion Questions:**

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.

- (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
- (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. Discuss the questions under the Reflections heading.
2. Explain the importance of rotating crops or resting the soil.

## **Projects:**

---

1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples.
2. Memorize Colossians 1:16–17. Give several examples of how God upholds His creation today.
3. Do the Building Memories project for this chapter.
4. Research George Washington Carver and find at least ten uses he found for a peanut.



# 8

## Of Bacteria, Cattle, and Men

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**Text:** Pages 62–69

### **Vocabulary Words:**

---

commensal

fermentation

gnotobiotic

microbiota

pathogenic

### **Multiple Choice:**

---

Choose the best answer:

1. Microbiota
  - a) help the immune system develop normally.
  - b) help the digestive system develop normally.
  - c) help digest food and produce some B vitamins.
  - d) all of the above and more.
2. Fermentation
  - a) is an important process by which bacteria can break down carbohydrates.
  - b) is used to make yogurt, sauerkraut, and pickles.
  - c) can result in short chain fatty acids that are used for energy.
  - d) all of the above

### **Discussion Questions:**

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. Do you believe it is ethical to use animals in research? If so, are there any restrictions you think are appropriate?

## Projects:

---

1. Memorize the words defined in the chapter. Be able to use them in a sentence and/or give examples.
2. Memorize Proverbs 12:10. What do you think it means? Does it apply to animal research? Does it apply anywhere else?
3. Identify at least three different ruminants that are mentioned in the Bible. Use a concordance if you need to. What is special about these animals compared to others?

# 9

## To the Root of the Matter

---

**Text:** Pages 70–75

### **Vocabulary Words:**

---

organism

pantheism

recycled

symbiosis

### **Multiple Choice:**

---

Choose the best answer:

1. Symbiosis is a word that refers to
  - a) organisms living together.
  - b) long-term organic relationships where each organism is benefitted.
  - c) two Greek words meaning “with” (syn) and “life” (bios).
  - d) answers a, b, and c
2. Jesus used the parable of the branches and grapevine to demonstrate
  - a) the vital nature of bearing good fruit.
  - b) the importance of us remaining in a relationship with Him.
  - c) forgiveness and grace in the garden of the world.
  - d) how the fruit of the spirit grows so powerfully in our lives.

### **Discussion Question:**

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
  - (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
  - (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.
1. Read John 15:5–8. How are you abiding in the Lord on a daily basis to ensure that you are bearing much fruit?

## Projects:

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- (1) Plant some seeds or a small plant in a pot. Place this in a window and care for it. Over the days and weeks to come, consider how much one must nurture a single plant for it to thrive, and how much God much care for the whole world.

# 10

## Doing Ecology in God's Creation

---

**Text:** Pages 76–83

### **Vocabulary Words:**

---

anthropic principle

biogeochemical cycles

nephesh hayim

### **Multiple Choice:**

---

Choose the best answer:

1. A worldview
  - a) describes how a person views the world.
  - b) helps to give meaning to what we see.
  - c) is the same for every person.
  - d) a and b above
2. The Bible
  - a) gives us a basis for understanding God.
  - b) gives us a basis for understanding life and the world around us.
  - c) gives us a basis for understanding some important history.
  - d) all of the above

### **Discussion Questions:**

---

The following approaches may be used for answering the questions below:

- (1) The questions may be answered on a sheet of paper as essay questions.
- (2) If the number of children permits, the children may be organized in discussion groups to discuss answers to the questions.
- (3) If the number of children permits, the parent or teacher may guide a class discussion to answer the questions.

1. What is symbiosis? Can you think of any examples?
2. How do worldviews differ? Give some examples.
3. How does the Bible affect your view of the world?

## **Projects:**

---

Memorize Psalm 1:1–6 and John 15:5–15. You should be able to recite these passages and explain what they mean in relation to the material studied in this chapter.

# Answer Key

## Chapter 1

---

### Vocabulary Words:

commensalism — a type of symbiosis between two or more different organisms where one is benefited and the other is not affected one way or the other

harmony — a pleasing and beneficial relationship

hypotheses — educated guesses

mutualism (symbiosis) — a type of symbiosis where two or more organisms benefit from one another. Some researchers equate symbiosis and mutualism as the same relationship and others do not.

parasitism — a type of symbiosis of two different organisms where one benefits by the relationship and the other is harmed

Trinity — God exists as a Trinity, so His is, by nature, relational

### Multiple Choice

1. c
2. b

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. The Trinity encompasses the concept that God is relational and Father, Son, and Holy Spirit have always existed in perfect loving harmony. God created the world with harmonious relationships, reflecting who He is.
2. Consult the text where these verses are cited for an explanation of their significance in relation to the material being studied.

### Projects

1. See the glossary for the word definitions. Answers for Reflections question will vary. An Internet search may be helpful if no specific examples come to mind.
2. Consult the text where these verses are cited for an explanation of their significance in relation to the material being studied.

## Chapter 2

---

### Vocabulary Words:

abiotic — the nonliving portion of an ecosystem; examples include water, air, and rocks.

baraminology — a uniquely creationist study of the biodiversity of organisms and how they are grouped from a biblical perspective. The word baraminology comes from the Hebrew: bara [to create] and mín [kind] and means the study of the created “kind.”

biodiversity — the number and variety of organisms and habitats in an area (also includes the genetic differences between creatures in an environment).

biome — a very large ecosystem; examples include the tropical rain forest, desert, and eastern deciduous forest.

biosphere — the living portion of planet Earth.

biotic — the living portion of an ecosystem; examples include bacteria, animals, plants, protists, and fungi.

condensation — the process by which water changes from a gas to a liquid.

ecological system (ecosystem) — location where the relationships of organisms with each other and their environment takes place. It can be as small as a drop of water to as large as earth's biosphere.

ecology — the study of the relationships of living things with each other and with their nonliving environment.

evaporation — the process by which water changes from a liquid to a gas.

evapotranspiration — part of the water cycle where plants lose their water to the atmosphere by the process of evaporation, mostly through the leaves.

hybridization (hybrids) — when two different organisms (different species or genera) mate and have offspring. Examples include tiger/lion, camel/llama, false killer whale/bottlenose dolphin, polar bear/grizzly bear.

population — the population concept is difficult to define, but it can be simply described as the group of one species in an area that have equal chances of mating with one another.

precipitation — water falling from clouds in the form of rain, sleet, hail, or snow.

protocol — a detailed plan for doing a science experiment.

recharge — the process by which water moves down through the soil to the groundwater, which is the part of the soil that is soaked with water.

species — the species concept is complicated and controversial, but most ecologists would agree that, at its basic level, a species is a group of creatures that have a stable structure and that can reproduce with each other. The offspring of these parents are then able to reproduce with each other.

sublimation — the process by which water changes from a solid directly into a gas, without going through the liquid phase.

watershed — the land area that drains into a particular lake, river, or ocean.

## Multiple Choice

1. a
2. d

## Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Baraminology is a uniquely creationist study of the biodiversity of organisms and how they are grouped from a biblical perspective — the word *baraminology* comes from the Hebrew: *bara* [to create] and *min* [kind] and means the study of the created “kind.” It differs from species because different species, especially if they can hybridize, may be from the same baramin or created kind.
2. Ernst Haeckel coined the word ecology (*oecologie*). Despite the fact that he studied creation, he never acknowledged the Creator. William Derham also studied God's creation. He understood it from a biblical worldview. In some ways he could be considered a father (founder) of modern ecology.

## Projects

1. See the glossary for the word definitions.
2. Answers will vary. Consult the text where these verses are cited for an explanation of their significance in relation to the material being studied.
3. Psalms 65:9–13 and 104:10–15 are mentioned in the text. Ecclesiastes 1:7 is probably the most obvious reference to the whole cycle. Isaiah 55:10–11, Matthew 5:45, and many other verses refer to it as well.



## Chapter 3

---

### Vocabulary Words:

dominion mandate — God’s command for the humans He created to take care of and rule over the earth and all the other creatures of the planet.

organism — an individual animal, plant, or single-celled life form.

protocols — a detailed plan for doing a science experiment.

stewardship — comes from the old English word *stigward*, which means “guard of the hall.” The word implies that a steward is responsible for taking care of something for someone else. In this case, humans have been given responsibility to take care of God’s creation for Him.

### Multiple Choice

1. d
2. a

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Being created in God’s image means we are like Him in some ways. We are to rule the earth in a compassionate way that reflects how He rules. Our spirits are created to exist eternally. Other answers are possible, too (e.g., we are creative like our Maker).
2. Answers will vary.

### Projects

1. Consult the text where these verses are cited for an explanation of their significance in relation to the material being studied.
2. Available projects may vary with locality.

## Chapter 4

---

### Vocabulary Words:

abiotic — the nonliving portion of an ecosystem. Examples include water, air, and rocks.

autotroph — organisms that can take in energy from the sun or other chemicals and use them to make important nutrients for life.

biotic — the living portion of an ecosystem. Examples include bacteria, animals, plants, protists, and fungi.

biodiversity — the number and variety of organisms and habitats in an area (also includes the genetic differences between creatures in an environment).

carnivore — consumers that kill and eat other consumers.

chemoautotroph — organisms that convert sulfur compounds into carbohydrate nutrients where there is no light.

decomposer — organisms that break down chemical compounds into important nutrients and make them available for other organisms in the ecosystem. They are God’s recyclers.

ecological pyramid — a model used by ecologists to show how energy moves through an ecosystem.

food chain — a simple model showing how energy moves through a simple feeding relationship.

food web — a model showing many interconnected food chains.

habitat — where an organism lives.

herbivore — a consumer organism that eats only plants.

heterotroph — organisms that must get their energy by eating other organisms.

niche — the role or position the organism has in its environment. It can be defined as how the organism feeds, finds shelter, and reproduces. It can also be defined as what the creature needs in terms of living space, amount of water, temperature, and other environmental conditions.

omnivore — consumer organisms that eat both plants and animals.

photoautotroph — organisms able to produce organic compounds, like carbon nutrients, using light.

photosynthesis — the process by which producers (like plants) get their energy from light in order to build important carbon nutrients.

saprophyte — a heterotrophic organism that grows on formerly living organisms and gets needed nutrients from them.

scavenger — a heterotroph that eats already dead organisms.

trophic level — each step in a food chain or food web. For example, autotrophs make up the first trophic level in all ecosystems.

### Multiple Choice

1. c
2. d

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. The sun provides the energy for life on earth. Plants were created to capture the energy from the sun and make food, which can be used by the plant itself, animals, and/or people. Therefore, plants are the logical food source for life on earth.
2. See the discussion in the text on Eugene Odum and the paragraph preceding it. In this chapter, interactions have focused largely on food webs and the niche of living things. Abiotic factors include temperature, sunlight, water, and type of soil.

### Projects

1. See the glossary for the word definitions.
2. Answers will vary. Consult the text where the passage is cited for ideas about its significance in relation to the material being studied.

## Chapter 5

---

### Vocabulary Words:

asexual reproduction — a way of making new individuals without sexual relations between a male and female.

bioindicator — a living creature that can be used to determine the health of an environment and how the environment changes over time.

biomonitoring — the process of studying areas where bioindicators live, and over time, measuring how changing environmental conditions affect them.

fragmentation — a type of asexual reproduction in lichens that happens when a little piece of lichen breaks off, gets blown away to a new location, and a new lichen grows from it.

hypha (plural hyphae) — a long, thin, and branching structure of most fungi. It may be involved with processes like digesting and/or absorbing food nutrients, asexual reproduction, or protection, depending on the fungus.

lichen — an organism made of two or three organisms working as one. A lichen can be a relationship with a fungus and alga, fungus and cyanobacterium, or a fungus, alga, and cyanobacterium.

lichenologist — a scientist who studies lichens.

mycelium — a large number of hyphae on a fungus.

mycobiont — the fungal partner or symbiont of a lichen.

photobiont — the photosynthetic partner or symbiont (alga or cyanobacterium) of a lichen.

photomorph — different forms of the same lichen depending on photobiont.

soredia — an asexual method for making new lichens — made of one or more algal cells surrounded by fungal hyphae. Wind can blow them great distances, and if they land in the right habitat, they can produce new lichens.

spore — a small, asexual reproductive cell that can develop into a new individual.

symbiont — an organism that is a partner in a symbiotic relationship.

thallus — the body of a lichen.

### Multiple Choice

1. c
2. b

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. The fungus is the mycobiont. The alga and/or cyanobacterium is the photobiont. They look different when growing together; the hyphae from the fungus grows around and into the photobiont.
2. Each part has its own task to do for the benefit of all.

### Projects

1. See the glossary for the word definitions.
2. Responses will vary.

## Chapter 6

---

### Vocabulary Words:

arbuscular mycorrhizae — fungal symbionts of plants that form branching structures from their hyphae called arbuscles. These arbuscles form in little compartments within root cells and are the location of nutrient transfer between the fungus and plant.

bioremediation — the technology that uses organisms to clean polluted environments.

botanist — a scientist who studies plants.

ectomycorrhiza (plural ectomycorrhizae) — fungal symbionts of plants that generally form on the outside of roots by making a sheath or covering over the root.

fungus (plural fungi) — lives within a mutual relationship with plants.

hypha (plural hyphae) — a long, thin, and branching structure of most fungi. It may be involved with processes like digesting and/or absorbing food nutrients, asexual reproduction, or protection, depending on the fungus.

mycoheterotroph — a plant that does not photosynthesize and has to get its carbon nutrients from mycorrhizae, who must get them from photosynthesizing plants.

mycorrhiza (plural mycorrhizae) — a fungal symbiont of plants — literally means “fungus root.”

orchid — a flowering plant that is absolutely dependent on fungal mycorrhizae for its survival.

pelotons — fungal hyphae of orchid mycorrhizae found in orchid cells. They are short lasting and digested by the orchid to get nutrients provided by the fungus.

phloem — a type of vascular tissue where groups of cells are working together to transport sugars and other materials throughout a vascular plant.

phytoremediation — is a form of bioremediation where plants are used to take toxins out of soil, as in the case with arbuscular mycorrhizae.

succession — a process that demonstrates God as sustainer; the changing of ecological communities of a particular area over time.

symbiosis — a long-term relationship between two or more organisms.

vascular plant — a plant that contains the vascular tissue of xylem and phloem.

xylem — a type of vascular tissue where groups of cells are working together to transport water up the plant from the roots.

### Multiple Choice

1. d
2. c

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. The fungi communicate with the plants to set up a relationship, get water and minerals from the soil, and share nutrients with the plants, including nitrogen and phosphorus.
2. Arbuscular mycorrhizae have the ability to absorb toxins and heavy metals from the soil and may be useful in restoring polluted soils.

### Projects

1. See the glossary for the word definitions.
2. Experiences will vary.

## Chapter 7

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### Vocabulary Words:

biomatrix/ organosubstrate — a creation biology term that refers to organisms, like nitrogen-fixing bacteria, that bridge the gap between the living and nonliving — also called an organosubstrate.

diazotroph — bacteria that have special enzyme systems that allow them to directly use nitrogen gas and make it available to plants. Azo comes from the French word for nitrogen (azote).

endosymbiosis — a symbiosis in which one organism lives inside the body of another and both work together as a single organism.

legume — plants like beans, peas, clover, and alfalfa that form small nodules (little balls) on their roots where nitrogen-fixing bacteria live and fix nitrogen for the plant to use.

mutualistic — a type of symbiosis where two or more organisms benefit from one another. Some researchers equate symbiosis and mutualism as the same relationship and others do not.

nutrient — a substance, like nitrogen, that provides nourishment for an organism.

nitrogen fixation — the process done by bacteria or cyanobacteria in which nitrogen is combined with other elements so it is in a form that plants can use.

rhizobia — certain nitrogen-fixing bacteria that form a very close relationship with legume plants.

### Multiple Choice

1. b
2. d

## Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Natural cycles are impressive and enable life on earth to exist. They must have been created/sustained by a wise and powerful Creator who cares about life. Understanding relationships between rhizobia and legumes may help us better manage soils for good productivity.
2. Both rotating crops and resting the soil are means to preserve soil fertility. See text for a fuller explanation.

## Projects

1. See the glossary for the word definitions.
2. Answers will vary, though any of the cycles (water, nitrogen, etc.) would make a good example.

# Chapter 8

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## Vocabulary Words:

commensal — a type of symbiosis between two or more different organisms where one is benefited and the other is not affected one way or the other.

fermentation — the process by which certain bacteria or fungi break down carbohydrates to produce an acid (as in yogurt) or an alcohol (as in winemaking).

gnotobiotic — the study of living things that have never been exposed to microorganisms except those selected by the researcher.

microbiota — the microorganisms that normally live on the skin or inside the digestive system. Microorganisms are so tiny a microscope is needed to see them.

pathogenic — an organism that causes disease.

## Multiple Choice

1. d
2. d

## Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Answers may vary. The Dig Deeper section provides an explanation of why animal research can be acceptable biblically.

## Projects

1. See the glossary for the word definitions.
2. Consideration for the well-being of animals is important for anyone keeping them. This is true for pets, livestock, and research animals.
3. Cattle, sheep, goats, deer, and gazelle are mentioned in the Bible. They are clean animals and may be eaten (Leviticus 11:1–8).

# Lesson 9

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## Vocabulary Words:

organism — an individual animal, plant, or single-celled life form.

pantheism — suggests that all creation is part of the divine.

recycled — an item that has been reprocessed for another use.

symbiosis — a long-term relationship between two or more organisms.

### Multiple Choice

1. d
2. b

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

Answers may vary.

### Projects

1. See the glossary for the word definitions.
2. Consideration for the well-being of animals is important for anyone keeping them. This is true for pets, livestock, and research animals.
3. Cattle, sheep, goats, deer, and gazelle are mentioned in the Bible. They are clean animals and may be eaten (Leviticus 11:1–8).

## Chapter 10

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### Vocabulary Words:

anthropic principle — principle that earth and the universe seem designed with man in mind.

biogeochemical cycles — cycles created by God to make nutrients available at the right time, right place, and in just the right amounts.

nephesh hayim — Hebrew words meaning “soul life”; the life given by God to animals and men only. Can be thought of as biblical or soul life.

### Multiple Choice

1. d
2. d

### Suggested Answers for Discussion Questions

The answers below are condensed. Actual discussion or essay answers may be much longer.

1. Symbiosis is a long-term relationship of two or more organisms. If one organism is harmed and the other benefits then it is a symbiotic relationship called parasitism. If one benefits and the other is neither harmed nor helped, it is a commensal symbiosis, and if both benefit then it is called a mutualistic symbiosis. (Note: some researchers equate symbiosis and mutualism as one and the same.) One of many examples of mutualistic symbiosis is the lichen where an alga and fungus live together.
2. Worldviews differ in their history and in the understanding of the world that logically follows. A biblical worldview recognizes God as a Creator who knows everything and can tell us what to do. An atheistic worldview requires that life came about by chance and there is no god to answer to.
3. Individual responses will vary.

### Projects

Consult the text where these verses are cited for an explanation of their significance in relation to the material being studied.

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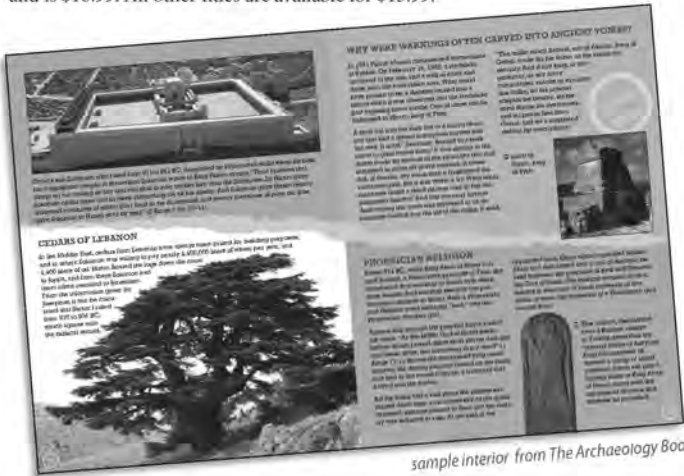


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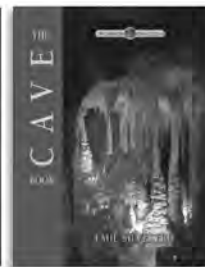
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