BIBLICAL WORLDVIEW SHAPING

in Physics 4th Edition

Is the study of matter in motion just a matter of physical phenomenon?

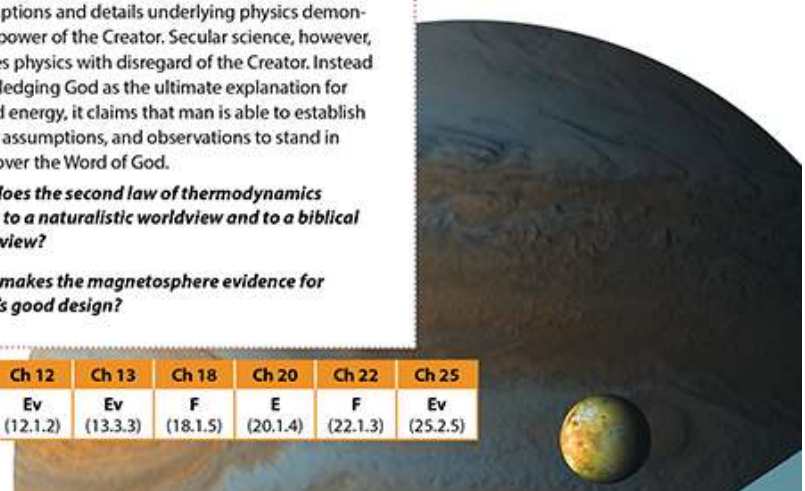
Physics is possible only because the immaterial God spoke the world and motion into existence. As we examine four worldview themes throughout this product, the following represent the many questions that we will be addressing.

Foundations of Physics

The assumptions and details underlying physics demonstrate the power of the Creator. Secular science, however, approaches physics with disregard of the Creator. Instead of acknowledging God as the ultimate explanation for matter and energy, it claims that man is able to establish principles, assumptions, and observations to stand in authority over the Word of God.

- ***How does the second law of thermodynamics relate to a naturalistic worldview and to a biblical worldview?***
- ***What makes the magnetosphere evidence for Earth's good design?***

Ch 1	Ch 12	Ch 13	Ch 18	Ch 20	Ch 22	Ch 25
E (1.1.1), **E** (1.3.1), **Ev** (1.3.2)	**Ev** (12.1.2)	**Ev** (13.3.3)	**F** (18.1.5)	**E** (20.1.4)	**F** (22.1.3)	**Ev** (25.2.5)



Key

- **R** — **Recall** biblical teaching
- **E** — **Explain** biblical teaching
- **Ev** — **Evaluate** controversial concepts
- **F** — **Formulate** a Christian understanding of a controversial concept
- **A** — **Apply** a Christian understanding to life

Implementation of the biblical worldview themes in their respective chapters

Models in Physics

God's creation is so complex and vast that humans must use modeling to explore it. Modeling is a God-given tool for understanding, analyzing, and predicting the activity of God's world. The secular physicist will accept and create models that disregard a Creator and will not allow for a biblical explanation of reality. Model making in these cases is an attempt to be "objective" by assuming a purely material world.

- ***How well do the principles of motion model Saturn's system of moons?***
- ***How should the Christian explain the existence and use of models in physics if they are not mentioned in the Bible?***
- ***How does the development of the quantum theory of energy demonstrate the nature of modeling?***

Ch 1	Ch 2	Ch 5	Ch 7	Ch 10	Ch 15	Ch 18	Ch 20	Ch 21	Ch 24
E (1.1.2)	**E** (2.2.3)	**E** (5.1.1), **Ev** (5.1.5)	**F** (7.3.4)	**F** (10.4.4)	**E** (15.1.4)	**Ev** (18.2.6)	**Ev** (20.3.6)	**Ev** (21.1.4)	**F** (24.1.4)

Environment and Physics

When God commanded man to subdue and rule over the earth, this subduing and ruling in the work of physics would be done by way of conservation, preservation, and production. To the secular physicist the material world is his origin, purpose, and end. This worldview presses the physicist to treat the world not as a gift from God to be used but as that which must be served.

- ***Should Christians support hydroelectric dam construction?***
- ***How should a Christian explain climate change, and do proposed solutions fit within a biblical worldview?***
- ***How should a Christian respond to technologies that create noise pollution near populated areas?***

Ch 7	Ch 8	Ch 10	Ch 12	Ch 14	Ch 19
F (7.2.4)	**Ev** (8.3.4)	**Ev** (10.4.5)	**E** (12.3.4)	**Ev** (14.2.4)	**F** (19.2.4)

Ethics in Physics

Because God made the world, nothing in it, including knowledge, is neutral. Even the study and use of physics affect the world in ethical ways. A secular approach to physics has no grounding ethical principle for determining right and wrong. Without grounding ethical principles, a secular approach to physics must derive its view of right and wrong from human opinion.

- ***What is the role of government in civil engineering according to a biblical worldview?***
- ***Does society have an obligation to make new technologies available to all?***
- ***Should mirrors for geoengineering be used to reduce climate change?***

Ch 1	Ch 2	Ch 3	Ch 4	Ch 6	Ch 9
E (1.1.2)	**F** (2.2.4)	**A** (3.3.5)	**Ev** (4.2.3)	**F** (6.4.4)	**F** (9.2.3)
Ch 11	**Ch 13**	**Ch 17**	**Ch 20**	**Ch 24**	**Ch 25**
E (11.3.5)	**E** (13.2.5), **F** (13.3.4)	**F** (17.2.5)	**F** (20.3.7)	**E** (24.3.4)	**F** (25.3.5)

Scan this code for a fuller discussion of these themes.

Features of This Textbook

This textbook is for you, and we've designed it to help you learn. Flip through the following pages to see its features, which we believe will help you succeed in physics. In the back of the textbook you will see other features, including an appendix section, glossary, index, and periodic table. We've designed this textbook with you in mind. We hope that it will help you appreciate the wonders of God's creation even more.

1 Chapter Opener
short articles that highlight issues and developments in physics that demonstrate how physics intersects with your life

2 Essential Question
the big question that you will learn about in a section

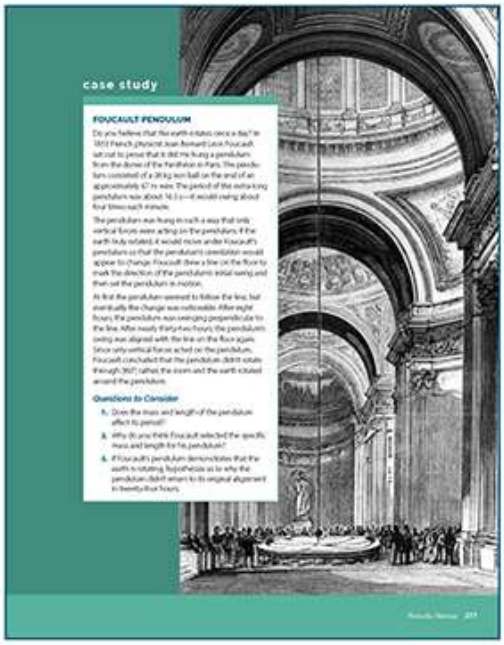
3 Key Questions
the smaller questions that you can ask along the way through a section to help you answer the essential question

4 Vocabulary Terms
the key terms that will be introduced in a section

5 ConnectConcepts
short text connecting the current chapter to previously learned material

6 Bold-Faced Terms
vocabulary terms that you need to know

7 Italicized Terms
terms that will be defined later in the textbook or that are important terms in other scientific fields


case study

FOUCAULT PENDULUM

Do you believe that the earth rotates once a day? In 1851 French physicist Jean Bernard Leon Foucault set out to prove that it did. He hung a pendulum from the dome of the Panthéon in Paris. The pendulum consisted of a 28 kg iron ball on the end of an approximately 67 m wire. The period of the extra-long pendulum was about 16.5 s—it would swing about four times each minute.

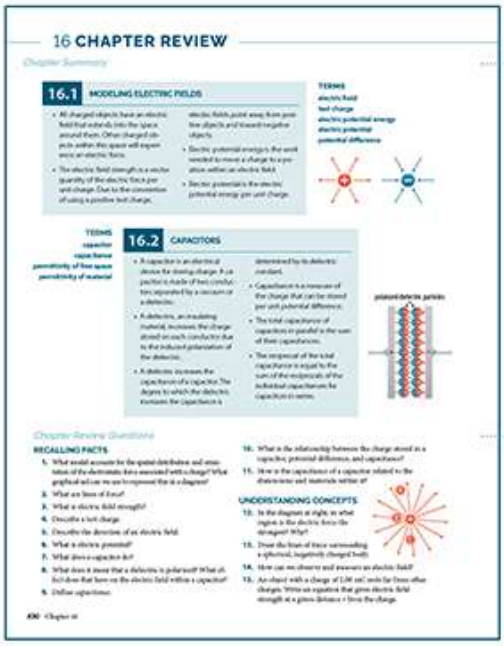
The pendulum was hung in such a way that only vertical forces were acting on the pendulum. If the earth truly rotated, it would move under Foucault's pendulum so that the pendulum's orientation would appear to change. Foucault drew a line on the floor to mark the direction of the pendulum's initial swing and then set the pendulum in motion.

At first the pendulum seemed to follow the line, but eventually the change was noticeable. After eight hours, the pendulum was swinging perpendicular to the line. After nearly thirty-two hours, the pendulum swing was aligned with the line on the floor again. Since only vertical forces acted on the pendulum, Foucault concluded that the pendulum didn't rotate through 360°; rather, the room and the earth rotated around the pendulum.

Questions to Consider

1. Does the mass and length of the pendulum affect its period?
2. Why do you think Foucault selected the specific mass and length for his pendulum?
3. If Foucault's pendulum demonstrates that the earth is rotating, hypothesize as to why the pendulum didn't return to its original alignment in twenty-four hours.

8 Case Studies
opportunities to investigate specific areas in physics to apply what you have learned in a chapter


16 CHAPTER REVIEW

Chapter Summary

16.1 MODELING ELECTRIC FIELDS

TERMS
electric field
test charge
electric potential energy
electric potential
potential difference

16.2 CAPACITORS

TERMS
capacitor
capacitance
permittivity of free space
permittivity of material

polarized dielectric particles

Chapter Review Questions

RECALLING FACTS

UNDERSTANDING CONCEPTS

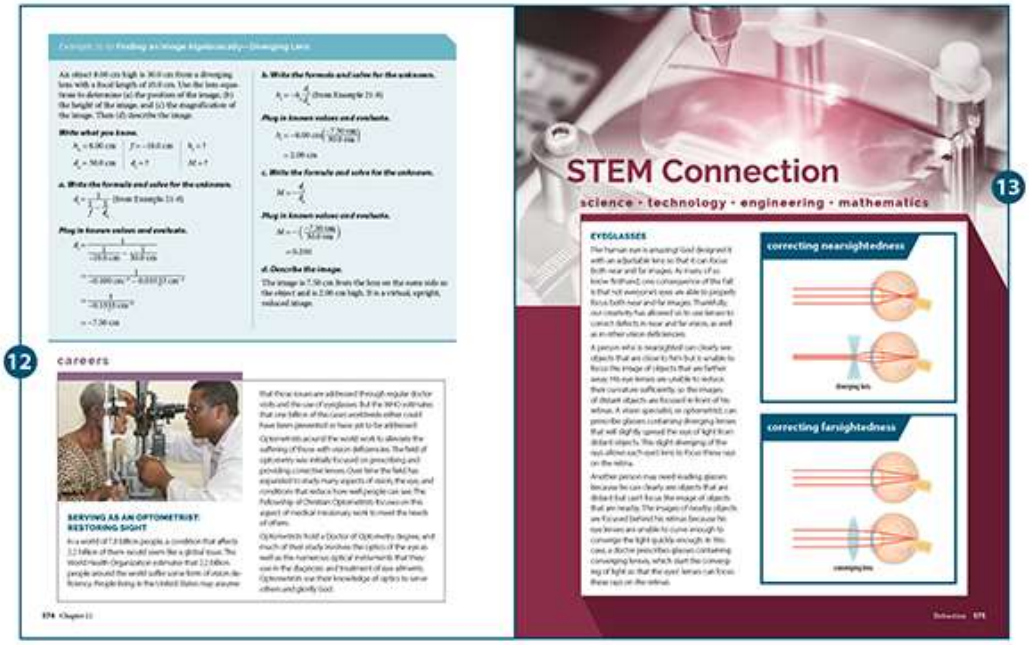
9 Chapter Summary
handy statements of the big ideas of the chapter, including vocabulary lists

10 Review Questions
questions at the end of each section and chapter that will have you recall facts, demonstrate your understanding of concepts, and cause you to use critical thinking

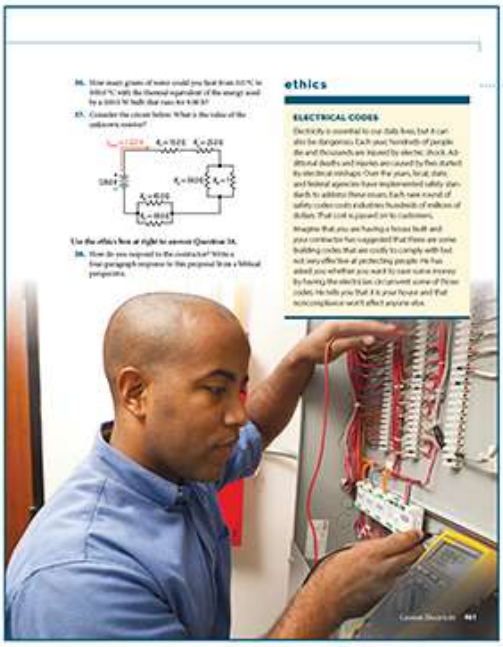
11 Mini Labs
short hands-on activities to get you thinking and working like a scientist

12 Career Boxes
information about careers in physics (that could be yours!) that can be followed to wisely use God's world and help people!

13 STEM Connection Boxes
descriptions of how science, technology, engineering, and mathematics (STEM) work together to solve real-world problems



14 Worldview Investigation Boxes
inquiry-based investigations that help you think through controversial areas of physics through the lens of Scripture



15 Ethics Boxes
opportunities to apply a biblical worldview to ethical issues in physics

Using Your TEACHER EDITION

Welcome to BJU Press Physics 4th Edition!

Your students are about to discover and explore the incredible richness of the universe that God has created. During this journey students will find that people's views of physics vary drastically, depending on worldview—the overarching narrative that a person uses to see and interpret the world. Everyone has one. It shapes our beliefs and values, and each of us will make choices in life that are based on worldview.

Since physicists all have worldviews, conflicts arise about their interpretations of what they observe. What is the origin of matter and energy? How do we determine the proper use of a new technology? What is our duty in the way that we treat the creation? *Physics* Student Edition 4th Edition helps students grapple with these questions from a biblical standpoint.

Though a good textbook is important, you as the teacher are essential to successful learning. Your job is to guide your students to learn through the lens of the Bible's narrative. Physics class should be a time of discovery for both you and them. Your emphasis on glorifying God by obeying the Creation Mandate and helping other people through science will keep physics exciting and will impact your students. These are the most important lessons that you can teach.

Make this course fit the needs of your students. *Physics* Student Edition and *Physics* Lab Manual both include more material than most teachers will be able to cover in one school year. You decide whether you will spend extra time on a particular topic, a lab activity, or a project.

New to This Edition

If you have used previous editions of *Physics* Student Edition, you will notice some changes in the 4th Edition.

- The writing style, vocabulary, and amount and distribution of content have been refined to better facilitate student learning at a twelfth-grade level.
- The text focuses on big ideas identified by essential questions.
- Each section starts with key questions and a vocabulary list to facilitate prereading of the material. Students will know the important terms to learn and the questions that the section will answer.
- Emphasis has been placed on clearly explaining concepts and demonstrating how problems in physics are solved.
- Each chapter is identified as foundational, key, or enrichment. Foundational chapters are crucial for students to develop a basic understanding of physics. Key chapters are very important and may contain material that appears on standardized tests. Enrichment chapters may be skipped with little adverse effect on students; use them if a significant portion of your class is interested or if you have gifted students who need differentiated instruction.
- Case studies, worldview investigations, STEM connection boxes, and career boxes engage students' interest.
- Expanded examples model the problem-solving process and provide necessary scaffolding for student mastery of the content.
- Every chapter includes a mini lab. These short lab activities reinforce the objectives of the section and generally require less time and fewer materials than the activities in the Lab Manual.
- Ethics boxes found in many chapters present ethical dilemmas related to current fields of physics. Students formulate a biblical understanding of the issues and apply it to those issues. Students are provided with a good deal of support early in the Student Edition and become more independent as they continue through the remainder of the book.
- Each chapter ends with a chapter summary and review that presents in a few brief sentences the primary concepts of each section. This is followed by a set of chapter review questions. The reviews are divided into questions that require students to recall facts, those that compel them to demonstrate a thorough understanding of concepts, and those that require them to apply critical thinking.
- The teaching material consists of teacher notes, background notes, clarifying notes, and differentiated instruction notes with a teaching cycle (see page xxiii). Teacher notes begin with an introductory sentence consisting of a directive to use a **teaching strategy** (in bold) and the purpose of the note itself.

BACKGROUND
Additional Information
Background notes provide extra information that you can share with your students to enhance their learning.

Clarifying Notes
Clarifying notes provide additional information that may facilitate teaching the material.

DIFFERENTIATED INSTRUCTION NOTES
These distinctive notes highlight methods to help all students be successful in the class. These notes will always be in the lower outboard corners of the Teacher Edition margin.