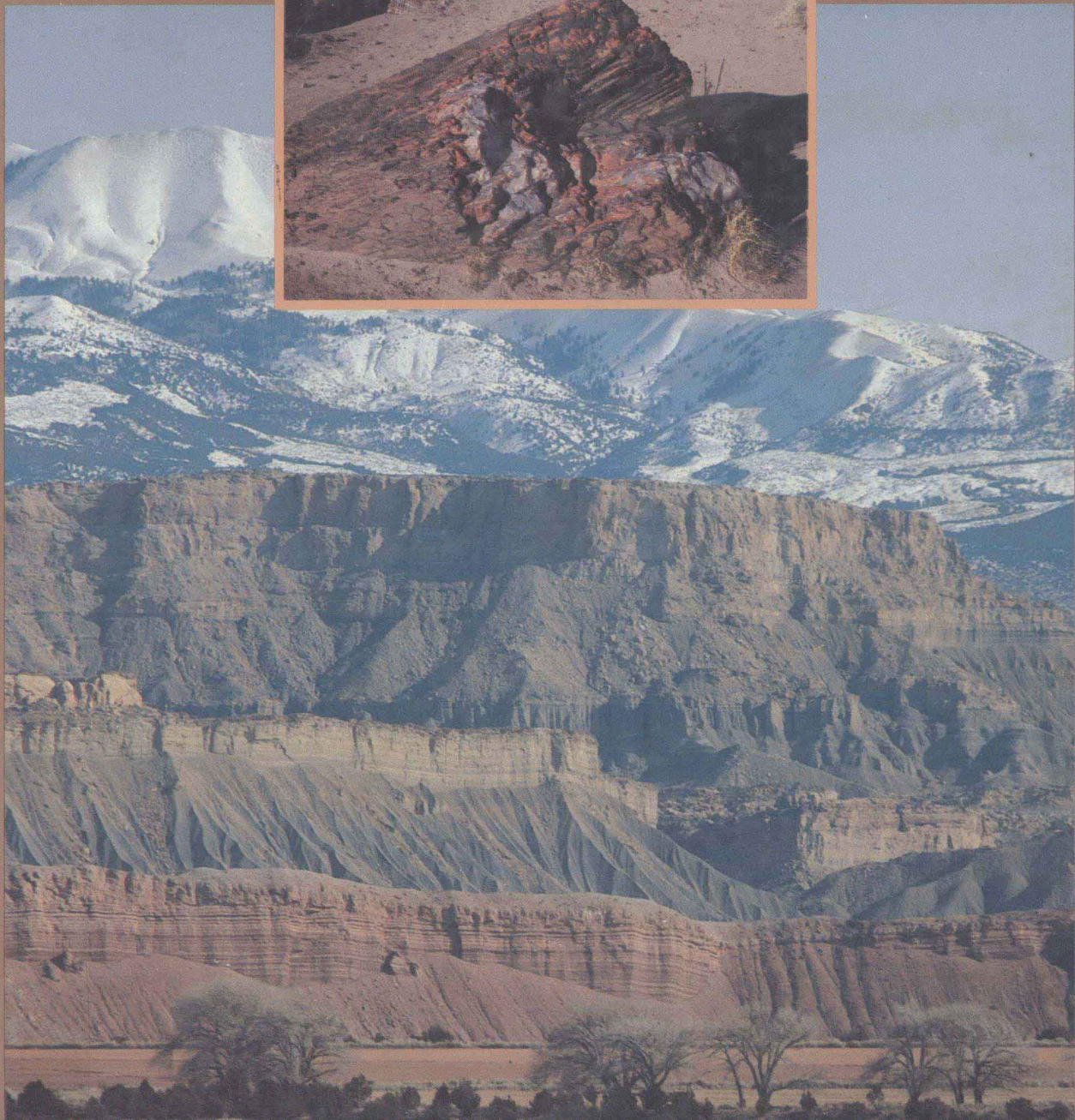
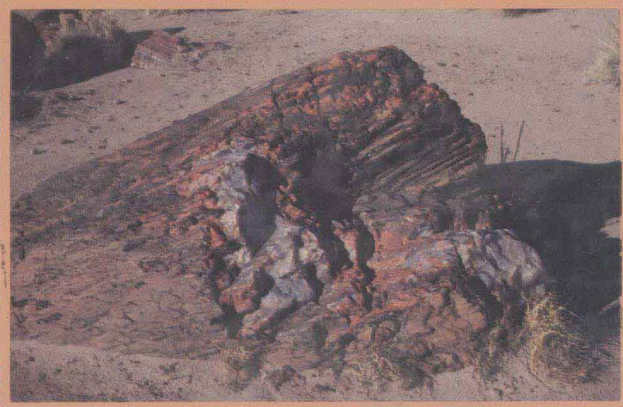


FOCUS ON Earth Science



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Overall photo—**Henry Mountains in Utah: Michael Collier**

Inset photo—**Section of petrified tree from Petrified National Forest:**

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Earth science is the study of our planet including its features, the nature of its forces, its place in the universe, and the changes that occur naturally on the earth as well as those influenced by people. In the photos, you can readily observe the effects of time on a section of mountains and a remnant of a tree.

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Preface

Focus on Earth Science is a practical study of the earth—its features, its forces, and its place in the universe. This program offers a relevant introduction to the matter and processes of the earth. Complex ideas are presented simply and then developed logically. Scientific principles are reinforced by activities and questions placed within each chapter. The presentation is flexible so that units and chapters may be studied in a variety of sequences.

Focus on Earth Science begins with a discussion of the scientific approach to problem solving. Different levels of scientific observation are presented. Thus, the student gains insight into and appreciation for the way scientific knowledge is gained. The idea that scientific theories are always subject to change based on the accumulation of new evidence is stressed. For example, the origin of the earth and evolution are treated as a series of theories rather than as facts. Basic principles of physics and chemistry are introduced in early chapters. These chapters form the basis for understanding the changes in energy and matter that occur in the earth and universe.

The external and internal forces that shape the earth are then discussed. To extend the student's understanding of the effects of these forces on the earth's surface, landforms are studied. Succeeding chapters discuss the earth's history and the environment, including the role of people in causing and solving today's problems of pollution, conservation, and energy. The last unit introduces the earth as a member of the universe.

Throughout the program, reading level has been carefully controlled. Photographs, illustrations, charts, graphs, and tables enable students to visualize ideas presented in the text and thus

increase their comprehension. New science words are printed in boldface type and are often spelled phonetically.

Focus pages are special pages that feature articles and photographs on current topics. They give additional contemporary emphasis to *Focus on Earth Science*. *Focus on People & Careers* pages point to career opportunities in earth science. *Focus on Frontiers* pages discuss recent developments in earth science. *Focus on Skills* pages are designed to emphasize reading in the content area. These pages enable the teacher to emphasize important skills such as using tables, performing activities, and reading for meaning.

Questions throughout the text provide guides for study, self-evaluation, and review. Margin questions help students identify important concepts as they read. *Making Sure* questions interspersed throughout the chapters enable students to apply newly-learned concepts immediately.

Chapter-end features of *Focus on Earth Science* encourage student involvement and increase the flexibility of the program. These features are *Points to Remember*, *Words to Use*, *Questions for Review*, *More Ideas to Explore*, and *Readings to Discover*.

Focus on Earth Science presents material that is basic for understanding earth science concepts and principles. The material is also meaningful to the everyday lives of the students. Thus, the text involves the students in a relevant, purposeful study of earth science. This program will enhance your teaching experience because of the many teaching aids incorporated into the text. Also, it will bring increased awareness and understanding of the earth's features, forces, processes, and place in the universe.

To the Student

You share a unique environment—the earth—with all other living things. Based on our current knowledge, no other planet in our solar system sustains life as we know it. What aspects of the earth make life possible? What materials of the earth do people use to alter and better their lives? Where do we find the minerals and fuels that we use to sustain life? What are some of the alternatives to current energy resources? What are we learning about space which can help us to better understand the earth and its processes?

You are about to begin a course in earth science which will help you answer some of these questions. Earth science will help you understand many aspects of your environment. You may or may not ever take another earth science course. However, what you learn in this course will be valuable to you always. You are involved in earth science—you live it every day! Most people would like to make the earth a better place in which to live. The type of knowledge gained in earth science is used to help conserve natural resources and solve environmental problems. An understanding of the earth's processes and the limitations of the earth's materials will help you make informed decisions on environmental and space issues as an adult.

Scientists use certain methods in solving problems and developing new ideas. In this course you will learn about the scientific method and how to use it. You will discover that you can use this method in your everyday life.

Focus on Earth Science contains interesting and up-to-date information. It is designed to help you learn. Each chapter begins with a photograph and brief introduction to the theme of the chapter. A *Goal statement* identifies the major objectives of your study of the chapter. Throughout the

chapter, *margin questions* printed in blue emphasize the main ideas. Use these questions as self-checks to evaluate your progress. Major terms are highlighted in boldface type and are often spelled phonetically. Review questions called *Making Sure* have been placed at the end of many sections throughout the chapters. These questions also provide a means of self-evaluation.

At the end of each chapter, a *Points to Remember* section provides a list of the major points and ideas presented. A word list, *Words to Use*, serves as a reminder of the important new terms. Also at the end of each chapter are sets of questions and problems. A *Questions for Review* section contains questions that are useful as a review of the chapter's concepts and includes questions that require you to apply what you have learned to new but related ideas. In addition, a set of projects and thought-provoking problems is presented in the *More Ideas to Explore* section.

The *Appendices* include information on measurement, laboratory safety, and special map symbols. The *Glossary* contains definitions of major terms in the text. The complete *Index* will help you locate particular topics within the text quickly.

Focus pages, located at the end of each chapter, introduce you to *People & Careers* and *Frontiers* of earth science. *Focus on Skills* pages offer you tips on how to have a successful learning experience in earth science and how to better use certain features of your text such as tables.

This textbook has been written and organized to help you be successful in your earth science class. As you do your classwork and complete your assignments you will gain the satisfaction of understanding earth science and its use in everyday life.

FOCUS ON Skills

Informal Reading Inventory

A student's textbook is his/her primary learning tool. Therefore, an inventory is an excellent way to introduce a new textbook. An inventory introduces the general structure of the book. It also points out the various features of the textbook as well as highlights the different kinds of study aids.

Use your textbook to answer the following questions.

A. Parts of Your Book

1. Where would you find the number of chapters contained in Unit 3?
2. Where would you look to find the page numbers in your book that discuss the topic of sunspots?
3. Turn to "To the Student" on page iv. Read this section and tell how it can help you in the use of your book.
4. What is the purpose of the Goal statement found at the beginning of each chapter?

B. Graphic Aids

5. Turn to page 54 and look at Figure 3-12. What is causing the eclipse of the sun?
6. Look at Table 4-1, page 67, and find the symbol for iron.
7. Turn to page 320 and use the map to determine in which physiographic region you live.

C. Following Directions

8. Turn to the activity on page 145. What is the question that you are to answer?
9. In the activity on page 149, how do the authors of your book help you to follow the written directions accurately?

D. Understanding Symbols

10. Look at page 518. What symbol on a weather map shows a cold front?
11. If you were to see the symbol "cm³," what would it mean?

E. Understanding Vocabulary

12. Turn to page 121 and determine two differences between "disintegration" and "decomposition."
13. On page 113 find two ways that the authors use to call your attention to new words.
14. Read Section 7:9 on pages 134-135. Determine what the four new vocabulary terms are describing.

F. Noting Main Ideas

15. Read Section 9:1, pages 163-165. What is the position of the North Pole in regards to the sun when it is summer in the Northern Hemisphere?
16. Read Section 9:4, pages 171-172. To what are changes in the weather related?

G. Noting Details

17. Using Section 9:7, page 176, tell what a meteorologist does.
18. Read Section 9:4, pages 171-172. Where do moist, warm air masses develop at the lower latitudes?
19. Using the same section, what kind of weather do we usually associate with a front?
20. Read Section 9:1, pages 163-165. How long must the weather conditions for a region be observed and averaged in order to determine the climate of the region?

H. Critical and Interpretive Reading

21. Read Section 9:2, pages 165-166. Why does the temperature near large bodies of water tend to be more even than over inland areas?
22. In which climate zone must you live in order to experience all four seasons?
23. In referring to Section 9:5, pages 173-174, what kind of weather can you expect when the barometer is falling?

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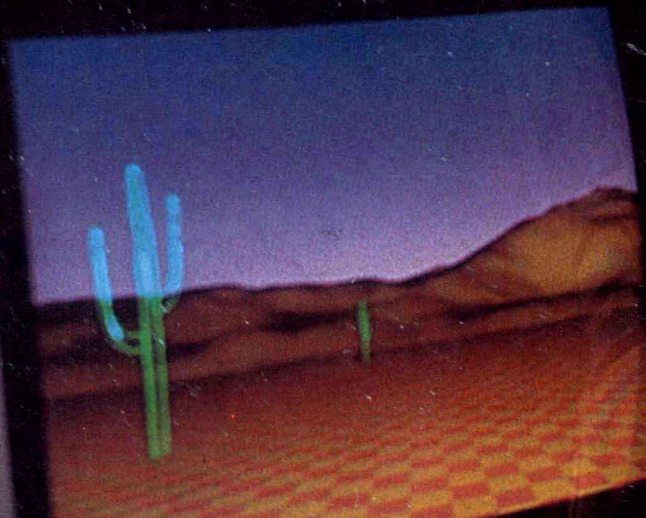
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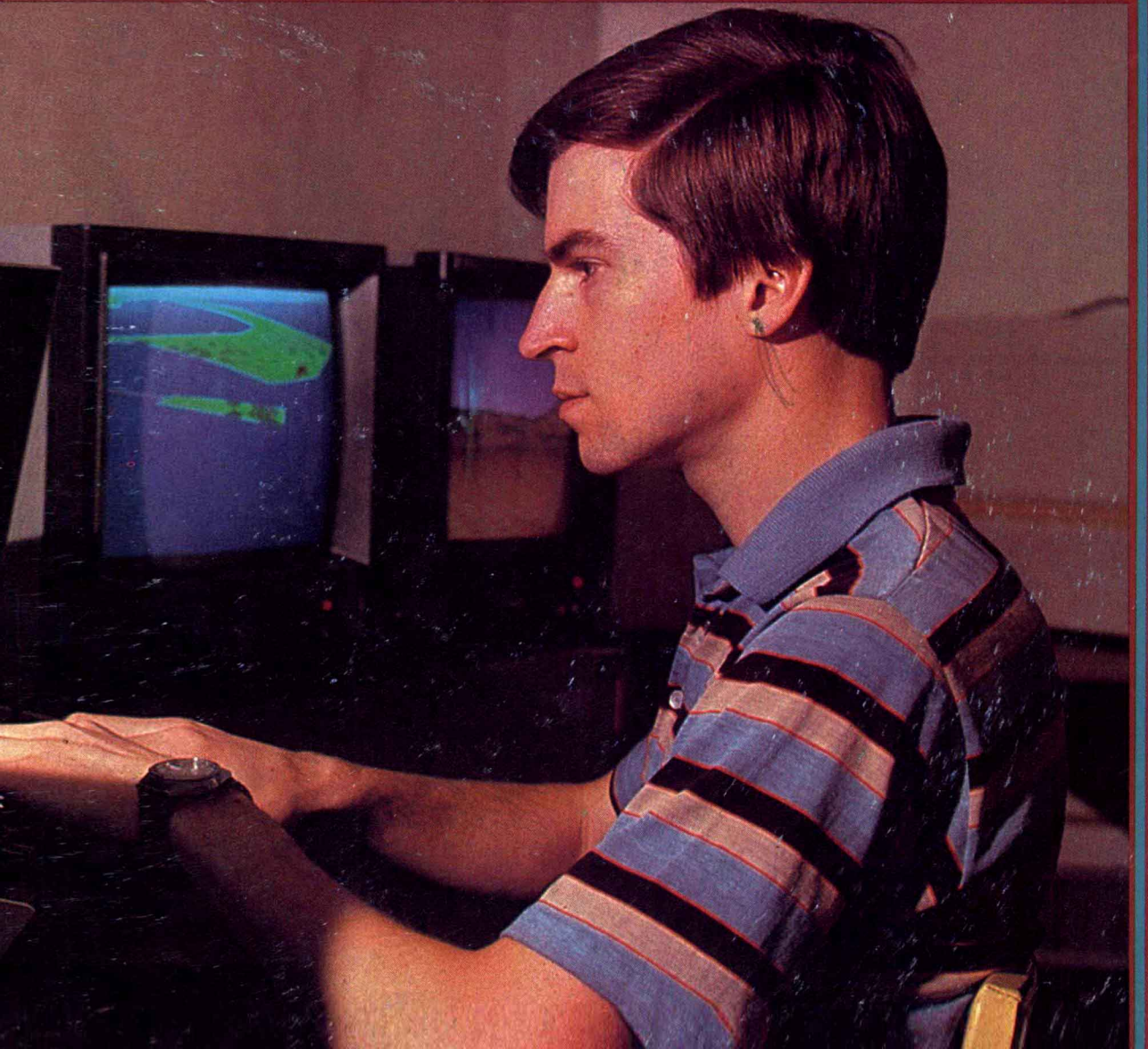
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Earth Science

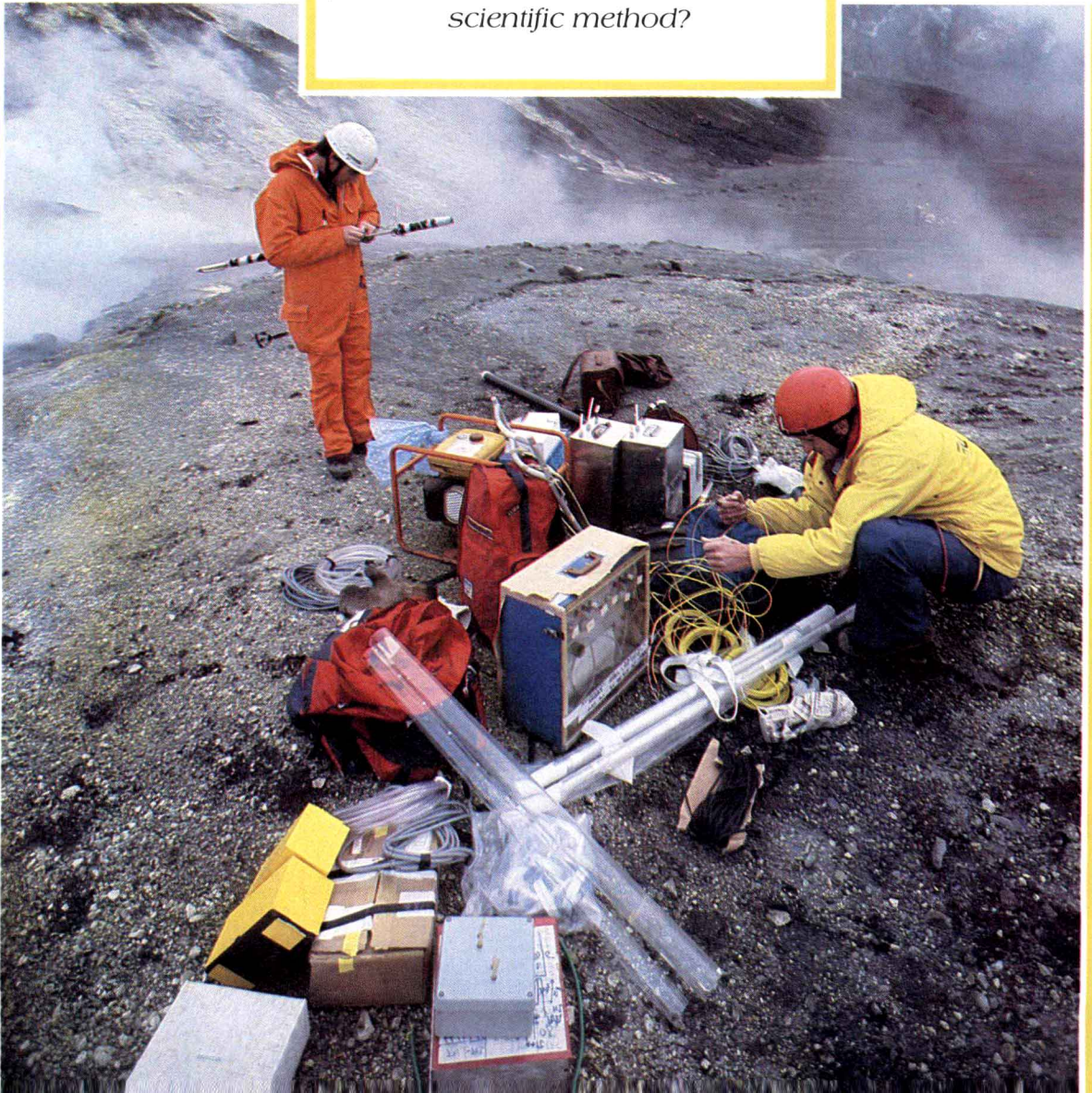


UNIT 1

Mountains may take thousands of years to wear away. However, using computers earth scientists can study this process in only a few minutes. Earth scientists also study the moon and relationships between the earth and moon. What other types of studies are involved in earth science?



*Earth
scientists use special
instruments to measure the
temperature of the earth near
a volcano. What problems do
earth scientists encounter
in their work? How do
scientists solve problems?
What system do scientists use
to take measurements and to
record data? What is the
scientific method?*



CHAPTER 1

Earth Science

1:1 Early Explanations

An early myth tells that Apollo, god of the sun, once let his son drive the sun chariot across the sky. The boy was too weak to control the wild horses that pulled the chariot. The horses left their usual course. They raced high into the sky over some areas. These areas became covered by ice. In another place, the horses almost touched the earth. A large desert appeared in this area and the Nile River dried up. Large cracks opened in the earth's surface and flaming rock poured out. Forest fires spread over the mountains. Finally the gods asked their king, Jupiter, to do something to save the earth. He hurled a thunderbolt that threw the boy from the chariot and stopped the horses. The boy fell flaming to the earth.

What events and observations were explained by this myth? What was the falling boy? Was Africa's desert once a fertile land? Were cold climates once warmer? Are there better explanations than myths of earth events and changes?

GOAL: You will gain an understanding of the different sciences as well as the methods and goals of science.



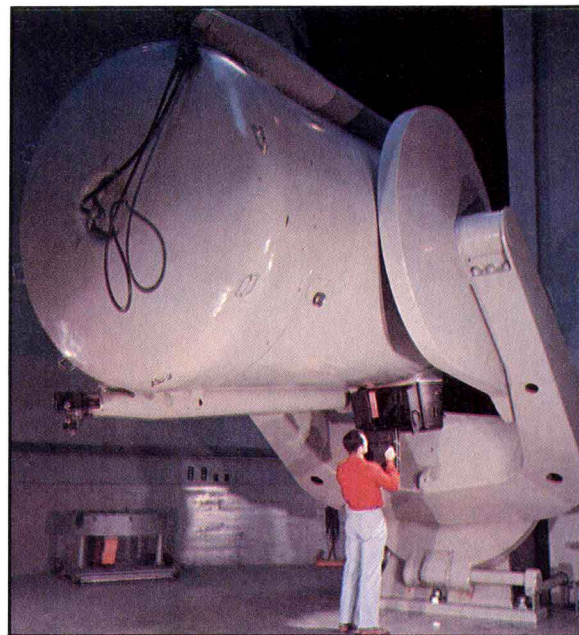
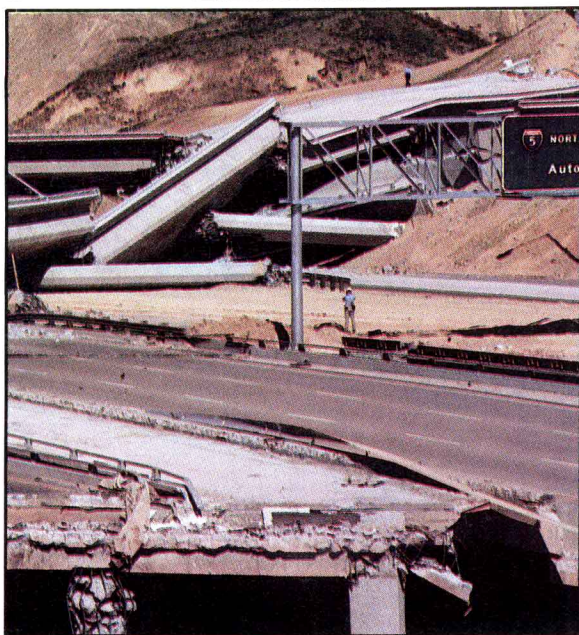
FIGURE 1-1. Throughout history humans have gathered knowledge about the earth and universe.

What is the difference between a hypothesis and a theory?

1:2 Modern Explanations

We still try to explain natural events we observe. In science, an explanation is called a hypothesis (hi PAITH uh sus). A **hypothesis** is an educated guess about a problem that is based on some observed facts. This explanation is not the final answer because it has not been proven. Many times the discovery of more information shows that an early hypothesis is wrong and needs to be changed. When there are more data from experiments or tests to support the explanation, we feel more sure of it. An explanation backed by facts is called a **theory**. A hypothesis may become a theory when all new information gathered supports the original explanation.

Each generation gathers new knowledge. Gradually, scientists learn how the universe works. This does not mean that we have all the answers. What you learn in science are theories that are based on a large number of facts gathered over many years. We have progressed from observations made by the unaided eye to ones made through complex scientific instruments. We are able to see very small objects by using microscopes. Satellites send us pictures of the earth and other planets. Radio telescopes probe the depths of space. Computers help us put all this information together. Yet, we still do not understand all the processes of the universe.



a
FIGURE 1-2. Some geologists study the forces that cause earthquakes (a). Astronomers use many tools to make observations and collect data (b).

What is astronomy?

What is biology?

What is geology?

Astronomy is the study of cosmic bodies. These are bodies in the universe beyond the earth's atmosphere. Before telescopes were invented, astronomy was mostly descriptions of the positions of the stars and planets. Now astronomers seek evidence for the beginning of the universe. We need to understand some astronomy to answer questions about the earth's origins.

Biology is the study of living things. Life exists on the earth and perhaps elsewhere in the universe. We learn how the earth supports life by studying biology. Why has life not been found on the moon? What caused the dinosaurs to disappear? An understanding of biology helps to answer these and other questions about living things.

Geology is the study of the earth and the processes that form and change the earth. How do geologists know where to look for oil? How are mountains formed? Where will a new volcano erupt? The study of geology can help us answer these questions.

Making Sure

3. Why are astronomy and physics related?