Lucy H. Daniel
Jay Hackett
Richard H. Moyer
JoAnne Vasquez

About the Cover
Chameleons are known as the masters of camouflage. They have the ability to change their skin color and patterns. Chameleons are slow-moving animals so they rely on protective coloration for defense. For protection, a chameleon might show bright colors, which often means “bad-tasting” or “poison” to predators. If this doesn’t work, they may shift to a dull color and play dead.

[Inquiry] What else would you like to know about chameleons? Write your own question or questions to answer.
Program Authors
Dr. Lucy H. Daniel
Teacher, Consultant
Rutherford County Schools, North Carolina

Dr. Jay Hackett
Professor Emeritus of Earth Sciences
University of Northern Colorado

Dr. Richard H. Moyer
Professor of Science Education
University of Michigan-Dearborn

Dr. JoAnne Vasquez
Elementary Science Education Consultant
Mesa Public Schools, Arizona
NSTA Past President

Contributing Authors
Lucille Villegas Barrera, M.E.d.
Elementary Science Supervisor
Houston Independent School District
Houston, Texas

Mulugheta Tefere, M.A.
St. Louis Public Schools
St. Louis, Missouri

Dinah Zike, M.Ed.
Dinah Might Adventures LP
San Antonio, Texas

The features in this textbook entitled “Amazing Stories,” as well as the unit openers, were developed in collaboration with the National Geographic Society’s School Publishing Division.

Copyright © 2002 National Geographic Society. All rights reserved.

Teacher Reviewers
Michelle Dunning
Birmingham, Alabama

Donna Bullock
Chandler, Arizona

Debra Allen
Davie, Florida

Lora Meade
Plantation, Florida

Roxanne Laird
Miami, Florida

Karen Gaudy
Satellite Beach, Florida

Stephanie Sirianni
Margate, Florida

Heidi Stephens
South Daytona, Florida

Rosanne Phillips
Miami, Florida

Brenda Crow
Miami, Florida

Kari Pingel
Pella, Iowa

Christie Jones
Springfield, Illinois

Diane Songer
Wabash, Indiana

Lee Arwood
Wabash, Indiana

Margarite Hart
Indianapolis, Indiana

Charlotte Bennett
Newburgh, Indiana

Donna Halverson
Evansville, Indiana

Stephanie Tanke
Crown Point, Indiana

Mindey LeMoine
Marquette, Michigan

Billie Bell
Grand View, Missouri

Charlotte Sharp
Greenville, North Carolina

Pat Shane
Chapel Hill, North Carolina

Karen Daniel
Chapel Hill, North Carolina

Linda Dow
Concord, North Carolina
### Life Science

**Consultants**

| Dr. Carol Baskin  |
| University of Kentucky  |
| Lexington, KY  |
| Dr. Joe W. Crim  |
| University of Georgia  |
| Athens, GA  |
| Dr. Pradeep M. Dass  |
| Appalachian State University  |
| Boone, NC  |
| Dr. Marie DiBerardino  |
| Allegheny University of Health Sciences  |
| Philadelphia, PA  |
| Dr. R. E. Duhrkopf  |
| Baylor University  |
| Waco, TX  |
| Dr. Dennis L. Nelson  |
| Montana State University  |
| Bozeman, MT  |
| Dr. Fred Sack  |
| Ohio State University  |
| Columbus, OH  |
| Dr. Martin VanDyke  |
| Denver, CO  |
| Dr. E. Peter Volpe  |
| Mercer University  |
| Macon, GA  |

### Earth Science

**Consultants**

| Dr. Clarke Alexander  |
| Skidaway Institute of Oceanography  |
| Savannah, GA  |
| Dr. Suellen Cabe  |
| Pembroke State University  |
| Pembroke, NC  |
| Dr. Thomas A. Davies  |
| Texas A & M University  |
| College Station, TX  |
| Dr. Ed Geary  |
| Geological Society of America  |
| Boulder, CO  |
| Dr. David C. Kopaska-Merkel  |
| Geological Survey of Alabama  |
| Tuscaloosa, AL  |

### Physical Science

**Consultants**

| Dr. Bonnie Buratti  |
| Jet Propulsion Lab  |
| Pasadena, CA  |
| Dr. Shawn Carlson  |
| Society of Amateur Scientists  |
| San Diego, CA  |
| Dr. Karen Kwitter  |
| Williams College  |
| Williamstown, MA  |
| Dr. Steven Souza  |
| Williamstown, MA  |
| Dr. Joseph P. Straley  |
| University of Kentucky  |
| Lexington, KY  |
| Dr. Thomas Troland  |
| University of Kentucky  |
| Lexington, KY  |
| Dr. Josephine Davis Wallace  |
| University of North Carolina  |
| Charlotte, NC  |

**Consultant for Primary Grades**

Donna Harrell Lubcker
East Texas Baptist University
Marshall, TX

### Teacher Reviewers (continued)

| Beth Lewis  |
| Wilmington, North Carolina  |
| Cindy Hatchell  |
| Wilmington, North Carolina  |
| Cindy Kahler  |
| Carrboro, North Carolina  |
| Diane Leusky  |
| Chapel Hill, North Carolina  |
| Heather Sutton  |
| Wilmington, North Carolina  |
| Crystal Stephens  |
| Valdese, North Carolina  |
| Meg Millard  |
| Chapel Hill, North Carolina  |
| Patricia Underwood  |
| Randleman, North Carolina  |
| E. Joy Mermin  |
| Chapel Hill, North Carolina  |
| Yolanda Evans  |
| Wilmington, North Carolina  |
| Tim Gilbride  |
| Pennsauken, New Jersey  |
| Helene Reifowitz  |
| Nesconset, New York  |
| Tina Craig  |
| Tulsa, Oklahoma  |
| Deborah Harwell  |
| Lawton, Oklahoma  |
| Kathleen Conn  |
| West Chester, Pennsylvania  |
| Heath Renninger Zerbe  |
| Tremont, Pennsylvania  |
| Patricia Armillei  |
| Holland, Pennsylvania  |
| Sue Workman  |
| Cedar City, Utah  |
| Peg Jensen  |
| Hartford, Wisconsin  |
When I put on my helmet and climbed into the space shuttle I knew I was in for the adventure of a lifetime. That trip into space was a dream come true. The dream began when I was in elementary school. And studying science made it possible! I've always been interested in science. In the fifth grade, I made a mobile of the planets for a class project. Even then I wondered what it would be like to explore Mars.

Neither of my parents were scientists, but that didn't matter. They encouraged me to read books and to explore the things that interested me. And they encouraged me to be curious, to ask questions, and to think about things for myself. All of these things helped me become a scientist and an astronaut.

Maybe some of you have dreams like mine. Maybe you dream of exploring Mars one day. Whatever you dream of doing, it will help you to have the skills of a scientist—ask questions and explore things for yourself! And always

Reach for the stars!

Sally Ride
Be a Scientist!

What Is Science?

Observation ........................................ S2
Visual Literacy .................................... S3

Question and Hypothesis ......................... S4
Reading in Science .............................. S5

Experiment ........................................ S6
Technology and Information Literacy .......... S7

Collecting Data ................................... S8
Math Literacy ..................................... S9

Conclusion ........................................ S10
Writing in Science .............................. S11

Using Your Book ................................ S12
Life Science

Characteristics of Living Things

CHAPTER 1 Classifying Living Things
Lesson 1 The Basic Unit of Life ........................................ A4
Lesson 2 The Kingdoms of Life ........................................ A12
  Inquiry Skill Builder: Classify ...................................... A20
  ♦ Sally Ride Science: Super Stories: Biodiversity ............ A22
  Chapter Review ....................................................... A24

CHAPTER 2 Plant Structure and Functions
Lesson 3 Roots, Stems, and Leaves ..................................... A28
Lesson 4 Plant Responses and Adaptations ......................... A42
  Inquiry Skill Builder: Experiment ................................ A48
  ♦ Science Magazine: Cleaning Pollution with Plants .......... A50
  Chapter Review ....................................................... A52

CHAPTER 3 Plant Diversity
Lesson 5 Plants Without Seeds .......................................... A56
Lesson 6 Plants with Seeds ............................................ A66
  Inquiry Skill Builder: Observe ..................................... A73
Lesson 7 Flowers and Seeds ........................................... A76
  ♦ Sally Ride Science: Science Magazine
    It Takes One to Grow One ......................................... A86
  Chapter Review ....................................................... A88

CHAPTER 4 Animal Diversity
Lesson 8 Animal Traits .................................................. A92
  Inquiry Skill Builder: Make a Model .............................. A100
  ♦ Science Magazine: Animal Life Cycles ......................... A102
Lesson 9 Animal Adaptations .......................................... A104
  Chapter Review ....................................................... A116
  ✪ Time for Kids: Meet a Scientist
    Paul Sereno, Paleontologist ....................................... A118
  Unit Performance Assessment ...................................... A120
# Earth Science

## Earth and Its Resources

### CHAPTER 7 Landforms, Rocks, and Minerals

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Earth's Changing Crust</td>
<td>C4</td>
</tr>
<tr>
<td></td>
<td>Science Magazine: The Sound of Earthquakes</td>
<td>C16</td>
</tr>
<tr>
<td>2</td>
<td>Landforms</td>
<td>C18</td>
</tr>
<tr>
<td></td>
<td>Science, Technology, and Society: Waves of Erosion</td>
<td>C28</td>
</tr>
<tr>
<td>3</td>
<td>Minerals of Earth's Crust</td>
<td>C30</td>
</tr>
<tr>
<td>4</td>
<td>Earth's Rocks and Soil</td>
<td>C40</td>
</tr>
<tr>
<td></td>
<td>Inquiry Skill Builder: Define Based on Observations</td>
<td>C48</td>
</tr>
<tr>
<td></td>
<td>Sally Ride Science: Super Stories</td>
<td>C54</td>
</tr>
<tr>
<td></td>
<td>Record in the Rocks</td>
<td>C56</td>
</tr>
<tr>
<td></td>
<td>Chapter Review</td>
<td></td>
</tr>
</tbody>
</table>

### CHAPTER 8 Air, Water, and Energy

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Earth's Atmosphere</td>
<td>C60</td>
</tr>
<tr>
<td></td>
<td>Sally Ride Science: Science Magazine</td>
<td>C68</td>
</tr>
<tr>
<td>6</td>
<td>Earth's Fresh Water</td>
<td>C70</td>
</tr>
<tr>
<td></td>
<td>Inquiry Skill Builder: Form a Hypothesis</td>
<td>C77</td>
</tr>
<tr>
<td>7</td>
<td>Earth's Oceans</td>
<td>C82</td>
</tr>
<tr>
<td></td>
<td>Sally Ride Science: Science Magazine</td>
<td>C80</td>
</tr>
<tr>
<td></td>
<td>Danger: Tsunamis!</td>
<td>C96</td>
</tr>
<tr>
<td>8</td>
<td>Energy Resources</td>
<td>C98</td>
</tr>
<tr>
<td></td>
<td>Chapter Review</td>
<td>C108</td>
</tr>
<tr>
<td></td>
<td>Time for Kids: Meet a Scientist</td>
<td>C110</td>
</tr>
<tr>
<td></td>
<td>Evan B. Forde, Oceanographer</td>
<td>C112</td>
</tr>
<tr>
<td></td>
<td>Unit Performance Assessment</td>
<td></td>
</tr>
</tbody>
</table>
UNIT E

Physical Science

Properties of Matter and Energy

CHAPTER 12 Properties and Structure of Matter
Lesson 1 Physical Properties ........................................ E4
   Inquiry Skill Builder: Make a Model .......................... E9
   ▶ Science Magazine:
     Animals—Icy Survival ...................................... E18
Lesson 2 Elements and Compounds ............................... E20
Lesson 3 Solids, Liquids, and Gases ............................. E34
   ✶ Sally Ride Science: Super Stories
     The Hunt for Helium ........................................ E44
Chapter Review ...................................................... E46

CHAPTER 13 Forms of Matter and Energy
Lesson 4 Mixtures and Solutions ................................. E50
   ▶ Science Magazine:
     Got Milk? Got Butter? ....................................... E66
Lesson 5 Chemical Changes ....................................... E68
   Inquiry Skill Builder: Experiment .......................... E75
   ▶ Science, Technology, and Society:
     Can Chemical Reactions Make Food Safe or Unsafe?... E78
Lesson 6 Acids and Bases ......................................... E80
Lesson 7 Matter and Energy ....................................... E90
Chapter Review ...................................................... E100
   ✶ Time for Kids: Meet a Scientist
     Dr. Jacqueline K. Barton, Chemist ........................ E102
Unit Performance Assessment .................................... E104
CHAPTER 14 Newton’s Laws of Motion

Lesson 1 Newton’s First Law

Lesson 2 Newton’s Second and Third Laws

Sally Ride Science: Science Magazine
Making It Easy with Machines

Lesson 3 Newton’s Law of Gravitation

Inquiry Skill Builder: Use Numbers

Amazing Stories: “Vomit Comet”

Chapter Review

CHAPTER 15 Sound Energy

Lesson 4 Sound Waves

Lesson 5 Pitch and Loudness

Inquiry Skill Builder: Communicate

Science Magazine: Hit That Note!

Lesson 6 Reflection and Absorption

Sally Ride Science: Science Magazine
Sonograms: Seeing with Sound

Chapter Review

CHAPTER 16 Light Energy

Lesson 7 Light and Mirrors

History of Science: Bulbs: The Bright Idea!

Lesson 8 Light and Lenses

History of Science: Cameras—Say “Cheese”!

Lesson 9 Light and Color

Inquiry Skill Builder: Predict

Lesson 10 Invisible Light

Chapter Review

Time for Kids: Meet a Scientist
Dr. S. J. Gates, Physicist

Unit Performance Assessment
Activities

UNIT A

Explore Activities
What Is the Basic Unit of Life? A5
What Traits Are Used to Classify Plants? A13
How Do a Plant's Parts Help It Survive? A29
How Do Roots Grow? A43
What Are the Parts of Mosses? A57
How Do Seed Plants Differ? A67
How Do Flowers Differ? A77
What Are the Traits of Animals? A93
How Do Sow Bugs Adapt to Their Environment? A105

Quick Labs with FOLDABLES
Plant Parts A9
Leaves A35
Ferns A60
Inside a Seed A82
Find the New Breed A113

Inquiry Skill Builders
Classify: Using a Key A20
Experiment: Why Leaves Change Color A48
Observe: Flowering Plants A73
Make a Model: Model a Backbone A100

UNIT B

Explore Activities
What Do Living Things Need to Survive? B5
How Do Populations Interact? B17
What Controls the Growth of Populations? B33
What Is the Water Cycle? B49
Why Is Soil Important? B63
How Do Ecosystems Change? B79

Quick Labs with FOLDABLES
Changing Environments B13
Getting Food B19
Playground Space B35
Soil Sample B57
Freshwater Communities B72
Predicting Succession B85

Inquiry Skill Builders
Use Variables: Vanishing Bald Eagles B37
Infer: Comparing Ecosystems in Volcanic Areas B87

UNIT C

Explore Activities
What Makes the Crust Move? C5
How Does Steepness of Slope Affect Stream Erosion? C19
How Can You Identify a Mineral? C31
How Are Rocks Alike and Different? C41
What Makes Air Dirty? C61
How Can Salt Water be Made Usable? C71
How Do Ocean and Fresh Water Compare? C83
How Do People Use Energy? C99

Quick Labs with FOLDABLES
Model of Earth C7
Erosion Challenge C23
Growing Crystals C37
Acids C65
Salt Water and Fresh Water C85
Fuel Supply C103

Inquiry Skill Builders
Define Based on Observations:
Define Soil C48
Form a Hypothesis: How Do Wastes from Land Get into Lakes and Rivers? C77
UNIT D

Explore Activities
How Are Earth and the Sun Held Together? D5
How Do the Distances Between Planets Compare? D15
Does the Sun's Angle Matter? D29
Where Does the Puddle Come From? D37
Why Do Clouds Form? D43
What Can Change Air Pressure? D53
How Can You Compare Weather? D69
Where Do Tornadoes Occur? D75
What Do Weather Patterns Tell You? D83

Quick Labs with FOLDABLES
Orbit Times D7 • Investigating Angles D31
• Transpiration D39 • Feel the Humidity
D48 • Weather Prediction D72 • Tornado in a Bottle D77

Inquiry Skill Builders
Make a Model: Making a Model of the Solar System D17
Interpret Data: A Weather Station Model D60
Measure: Modeling Climates D85

UNIT E

Explore Activities
Which Is More? E5
How Do We Know What's "Inside" Matter? E21
What Happens When Ice Melts? E35
How Can You Take Things Apart? E51
How Can You Recognize a Change? E69
Which Are Acids and Which Are Bases? E81
How Well Do Batteries Provide Energy? E91

Quick Labs with FOLDABLES
Modeling Molecules E31
Collapsing Bottles E41
Solubility E58
Kitchen Colloids E61
Mystery Writing with a Base E85
Measuring Electricity E93

Inquiry Skill Builders
Make a Model: How Metal Boats Float E9
Experiment: Preventing Rust E75

UNIT F

Explore Activities
How Fast Does a Spring Move Objects? F5
How Does Force Affect an Object's Motion? F17
Does Weight Affect How Fast an Object Falls? F33
What Makes Sound? F49
How Can You Change a Sound? F55
Do Sounds Bounce? F65
Can You See Without Light? F81
What Can Light Pass Through? F95
What Is Color? F107
How Do Waves Move? F115

Quick Labs with FOLDABLES
Using a Position Grid F10
Racing Balloon Rockets F22
Sound Carriers F52
Clap! Clap! F68
Follow the Bouncing Light F86
Seeing Through a Lens F100
Water Waves F117

Inquiry Skill Builders
Use Numbers: Your Weight on Other Worlds F39
Communicate: Making Tables and Graphs F59
Predict: Mixing Colors F111
### Science Handbook

- Units of Measurement .................................. R2
- Use a Hand Lens ......................................... R4
- Use a Microscope ........................................ R5
- Measure Time ............................................ R6
- Measure Length .......................................... R7
- Measure Mass ............................................ R8
- Measure Volume ......................................... R9
- Measure Weight/Force .................................. R10
- Measure Temperature .................................... R11
- Use Calculators .......................................... R12
- Use Computers ........................................... R14
- Make Graphs to Organize Data ....................... R16
- Make Maps, Tables, Charts ............................ R18

### Health Handbook

- The Human Body ......................................... R20
- The Nervous System ..................................... R21
- The Senses ................................................ R22
- The Skeletal System ..................................... R24
- Joints ...................................................... R25
- The Muscular System .................................... R26
- The Circulatory System ................................ R28
- The Heart ................................................ R29
- The Respiratory System ................................ R30
- The Digestive System ................................... R32
- The Excretory System ................................... R34
- The Endocrine System .................................. R36
- The Reproductive System ............................... R37
- The Immune System ...................................... R38
- Staying Healthy .......................................... R40

### Foldables by Dinah Zike

- .............................................................. R41

### Glossary

- .............................................................. R45

### Index

- .............................................................. R61
Using Foldables for Data Collection

A Foldables organizer is a 3-D, interactive graphic organizer. It can be a valuable learning tool to help you organize, review, and remember information. You will find suggestions for using Foldables organizers to help you collect and record data in Quick Lab activities throughout this book.

Basic Shapes

The figures on this page illustrate the basic folds that are the building blocks for all Foldables organizers used in the Quick Labs. The basic folds have friendly names, such as "hot dog fold," so that you can easily visualize and remember what they look like. Step-by-step folding instructions for each type of Foldables organizer used in the Quick Labs are given on pages R41-R44.
Science Safety Tips

In the Classroom

- Read all directions. Make sure you understand them. When you see **BE CAREFUL!**, be sure to follow the safety rule.
- Listen to your teacher for special safety directions. If you don’t understand something, ask for help.
- Wash your hands with soap and water before an activity.
- Be careful around a hot plate. Know when it is on and when it is off. Remember that the plate stays hot for a few minutes after it’s turned off.
- Wear a safety apron if you work with anything messy or anything that might spill.
- Wipe up a spill right away or ask your teacher for help.
- Tell your teacher if something breaks. If glass breaks, do not clean it up yourself.
- Keep your hair and clothes away from open flames. Tie back long hair, and roll up long sleeves.
- Keep your hands dry around electrical equipment.
- Don’t eat or drink anything during an experiment.
- Put equipment back the way your teacher tells you.
- Dispose of things the way your teacher tells you.

- Wear safety goggles when your teacher tells you to wear them. Wear them when working with anything that can fly into your eyes or when working with liquids.
- Clean up your work area after an activity and wash your hands with soap and water.

In the Field

- Go with a trusted adult—such as your teacher or a parent or guardian.
- Do not touch animals or plants without an adult’s approval. The animal might bite. The plant might be poison ivy or another dangerous plant.

Responsibility

- Treat living things, the environment, and one another with respect.
Be a Scientist!

What on Earth is this?
Science is a way of understanding the world around us. The work of scientists often begins when scientists ask questions about something they observe. Asking and answering questions is the basis of inquiry.

In this section, you will see how scientists use inquiry skills, visual literacy, reading skills, technology and information literacy, math skills, and writing skills as they study volcanoes.
Inquiry Skills

These are the inquiry skills scientists use. You can use these skills, too.

Observe
Infer
Classify
Measure
Use numbers
Communicate
Predict
Interpret data
Form a hypothesis
Use variables
Experiment
Make a model
Define based on observations
The diagram on this page shows what is usually called the “scientific method.” Scientists don’t always follow all these steps in the same order, but they often start with an observation about the world around us.

You, too, are constantly making observations every moment you are awake. You might look out the window to see if it is raining. You might listen for the sound of thunder to find out if a storm is coming.
Visual Literacy

More than half the information you get comes from pictures, or visuals. Pictures, maps, graphs, charts, and diagrams are tools. When you use them to improve your observation skills and to understand what you read, you are increasing your visual literacy.

This photograph shows the town of St. Pierre on the island of Martinique. It sits at the base of Mt. Pelée, an active volcano. Why do you think scientists might want to closely observe this volcano?
The work of scientists often starts with an unanswered question. If scientists cannot find an answer to a question, they go one step further. They propose a possible answer that can be tested experimentally. This is known as forming a hypothesis. A good hypothesis must

- be based on what you observe.
- be testable by performing an experiment.
- be useful in predicting new findings.

Scientists who study volcanoes are called volcanologists. This volcanologist is examining lava as it flows into the ocean. What do you think happens to the lava when it flows into the ocean water? Form a hypothesis to answer this question.
**Reading in Science**

Before doing an experiment to answer a question, scientists often read to try to find the answer or to find what others have learned from their experiments. You can use these reading strategies and skills to help you understand science. While you read, ask yourself these questions:

- **Compare and Contrast** How are two things alike? How are they different?
- **Main Idea and Supporting Details** What is the paragraph about? Which details add more information?
- **Predict** What do you think will happen next?
- **Cause and Effect** Why did something happen? (This is the cause.) What happened as a result? (This is the effect.)
- **Draw Conclusions** What do I know from the evidence?
- **Sequence of Events** What happened first, next, and last?
- **Summarize** What is this lesson or paragraph about?

**Inquiry Skills**

When you ask questions and form hypotheses, you use these skills.

- **Infer** Form an idea from facts or observations.
- **Form a hypothesis** Make a statement that can be tested to answer a question.
- **Define terms based on observations** Put together a description that is based on observations and experiences.
A scientific test, or experiment, is used to test a hypothesis. Although scientists don’t always wear lab coats and work in a laboratory, every good experiment must

- be able to be repeated.
- change only one variable at a time.

Why are these two rules important? First, scientists must be able to check each other’s work for accuracy. Second, if more than one variable changes in an experiment, it may be difficult to find the variable that was responsible for the results. For example, scientists might measure the temperature of lava at different locations on a volcano. What would happen if they changed both the depth and the location at which they measured the temperature?
**Technology Literacy**

In an experiment, scientists use tools to collect and analyze data. They may use simple tools, such as clocks and rulers. They also use more powerful tools, such as microscopes and computers.

**Information Literacy**

Information literacy begins with knowing how to search for and use books, magazines, newspapers, and other media. Today, information literacy also includes searching for information on CD-ROMs, DVDs, and the Internet.

**Inquiry Skills**

- **Experiment** Perform a test to support or disprove a hypothesis.
- **Use variables** Identify things in an experiment that can be changed or controlled.
- **Predict** State possible results of an event or experiment.
- **Make a model** Make something to represent an object or event.
In an experiment a scientist tries to observe carefully and collect good data. Once all the information has been gathered, it is time to interpret the data. Collecting and interpreting data often requires working with numbers.

These volcanologists are taking samples of gases escaping from vents on the side of a volcano. They are careful to wear protective clothing and gas masks. Why is it important to know what gases are produced by a volcano?
**Math Literacy**

Scientists often use math skills when they collect and interpret data as part of their experiments. A Math Link in each lesson of this book asks you to use several types of math skills, including:

- **Number Sense and Operations** This includes estimation, addition, subtraction, multiplication, and division.

- **Measurement** This includes using and converting standard and metric units of size, distance, time, volume, area, mass, weight, or temperature.

- **Data Analysis and Probability** This includes calculating the likelihood that an event will happen, and making and interpreting bar graphs and line graphs.

- **Problem Solving** This means using skills and strategies to solve problems.

**Inquiry Skills**

When you collect and interpret data, you use these skills.

- **Use numbers** Order, count, add, subtract, multiply, and divide to explain data.

- **Measure** Find the size, distance, time, volume, area, mass, weight, or temperature of an object or an event.

- **Interpret data** Use the information that has been gathered to answer questions or solve a problem.
After interpreting the data, it is time to draw a conclusion. A conclusion is a statement about whether or not the hypothesis is valid based on the data collected. Sometimes the data do not support the hypothesis. Perhaps different experiments and observations are needed. A new question may result.

Scientists also tell other scientists, as well as members of the public, about what they have discovered. The United States Geological Survey (USGS) operates five volcano observatories. They observe activity leading to eruption, provide emergency information about future and ongoing eruptions, identify hazardous areas around active and potentially active volcanoes, and improve public understanding of how volcanoes erupt and change our environment.
Writing in Science

Writing is a tool you can use to communicate, or share information, about science. A Writing Link in each lesson of this book asks you to use one of these types of writing:

- A Personal Narrative tells about an event in your life.
- Writing a Story uses characters, setting, and a sequence of events.
- Persuasive Writing tries to get your readers to agree with your opinion.
- Explanatory Writing tells how to make or do something.
- Writing That Compares tells how two things are alike and different.
- Expository Writing presents facts and explains ideas.
The Explore Activity is a hands-on way to learn about the lesson. The title is in the form of a question that you will answer in the activity.

The inquiry skills in the Explore Activity are the same skills that scientists use.

The last step of the activity provides an opportunity for further inquiry.

You can use different kinds of Foldables™ organizers to collect and record data in the Quick Lab.

Inquiry skills are also used in the Quick Lab.

Each Inquiry Skill Builder focuses on a specific inquiry skill.

Other inquiry skills are also reinforced in the Inquiry Skill Builder.
Learn Through Visuals

Visuals include both photographs and graphics. This question will help you get information from the photograph at the beginning of each unit of this book.

Throughout all chapters of this book you will get information by reading graphics. Graphics are pictures such as:
- diagrams
- charts
- maps
- graphs
This box contains the **Main Idea** of the lesson. Keep the main idea of the lesson in mind as you read.

**Before Reading** Read the large red question before you read the page. Try to answer this question from what you already know.

**During Reading** Look for new **Vocabulary** words highlighted in yellow. Look at the pictures. They will help you understand what you are reading.

**After Reading** This arrow points to a question. It will help you check that you understand what you have read. Try to answer the question before you go to the next large red question.

---

**Why Is Diversity Important?**

Would you rather have a mini or a purebred dog? Purebred dogs—or other animals—look very much like their parents. They are bred to have certain traits. Mutts, on the other hand, may not look much like their parent. However, they do have a great mix of traits.

A group of dogs made up of mutts is a good example of animal **diversity**. Diversity means “different.” Animal diversity refers to a group of the same kind of animal—the dogs—in which there are lots of animals with different traits. A group of mutts is made up of individual dogs with very different traits. Is there an advantage to being a mutt? The answer can be yes! Mutts may be healthier than certain purebred dogs. Some purebred dogs are known to have breathing problems. Some have big problems. However, other purebred dogs come from very healthy breeds.

Animal diversity is important. When an environment changes, only those animals that can adapt to the change will survive. If the population is made up of animals with the same traits—and these traits do not help the animals survive in changing environments—the whole population may die out. This illustrates the diversity of Africa. However, if the population holds animals with different traits, it is more likely that some will survive to keep the population going.

---

**Chapter Reading Skill**

On one page in each lesson, you will find a question that practices the **Chapter Reading Skill**. In any chapter, you will find one of these skills:

- compare and contrast
- main idea and supporting details
- predict
- cause and effect
- draw conclusions
- sequence of events
- summarize
Learn Through Writing and Technology

At the end of every lesson, you can log on to e-Journal for tips and suggestions about how to write a research report.

Think and Write questions at the end of every lesson give you an opportunity to write about what you learned in the lesson.

A Writing Link at the end of every lesson allows you to express yourself through several different types of writing:
- Personal Narrative
- Writing a Story
- Persuasive Writing
- Explanatory Writing
- Writing That Compares
- Expository Writing

A Technology Link at the end of every lesson gives you an opportunity to log on to our Web site www.science.mmhschool.com for additional links.

Write About It questions on selected Sally Ride Science, Time for Kids, and magazine-style features give you an opportunity to write about what you learned.

A LogOn reference on every Sally Ride Science, Time for Kids, and magazine-style feature allows you to learn more about each topic.
There are What Did I Learn? questions on selected Sally Ride Science, Time for Kids, and magazine-style features. Answering the questions gives you an opportunity to practice using a standardized test, multiple choice format.

A two-page review at the end of each chapter allows you to show what you know using a variety of assessment formats:
- fill-in
- multiple choice
- short answer

Performance Assessment at the end of every unit provides an opportunity to demonstrate what you've learned through hands-on activities and projects.