

The collection currently includes *Mathematics: Common Core Standards* professional development modules and *STEM: Earth and Space Science* content modules.

# STEM: EARTH AND SPACE SCIENCE CONTENT MODULES



The *STEM: Earth and Space Science* modules are useful in a STEM-based curriculum. Aimed at grades 4–8, these modules are focused on Earth and space science topics from rock composition to how the moon was formed. Take your students on a virtual field trip to a volcano or show them evidence for giant asteroid collisions with Earth. *Produced by the Science Media Group at the Harvard-Smithsonian Center for Astrophysics. 2012.*

## MODULE TOPICS

### Soil Formation • 6 modules / 19:01 minutes

*Topics include: climate, soil composition, soil types, weathering*

### Rock Composition • 4 modules / 11:31 minutes

*Topics include: formation, fossils, minerals, radiometric dating*

### Plate Tectonics • 9 modules / 31:34 minutes ▶

*Topics include: continental drift, effects of temperature and pressure, plate movement, seismic wave demo*

### Volcanoes • 9 modules / 36:03 minutes ▶

*Topics include: gases, Hawaii, lava, volcano types*

### Landforms, Part 1 • 5 modules / 27:27 minutes

*Topics include: metamorphic rock, mountain formation, seashells on Mt. Everest*

### Landforms, Part 2 • 8 modules / 31:50 minutes

*Topics include: Appalachian Mts. age, beach sediment, Cape Cod formation, rock movement in streams*

### The Moon • 3 modules / 5:04 minutes

*Topics include: craters, how the moon formed*

### Earth in the Solar System ▶

2 modules / 5:00 minutes

*Topics include: Solar System formation, planet formation*

## PRICE

• DVD [XPSDVD] = \$39.95

46 programs of varying lengths, module description booklet

## WEB SITE

[www.learner.org/series/modules/express](http://www.learner.org/series/modules/express)

## Classroom Exploration of Flowing Solids

Using hybrid solid-liquid materials in Keedar Whittle's 6th grade classroom at the Epiphany School in Dorchester, MA, students explore the concept of a flowing solid. Students explore the properties and behavior of a fluid solid, and observe how it behaves in response to rapid and slow deformation pressure. ▼



## Volcanic Gases

Scientists believe that our atmosphere was formed as a result of gases released from ancient volcanic eruptions. Geoscientist Chuck Blay, of Teok Investigations, explains that the force of gravity causes gases released during eruptions to cling relatively close to the Earth's surface. In fact, 80% of the Earth's atmosphere is within 15 km of the Earth's surface. Although it is true that some atmospheric gases are continually lost into space, there is enough gas released during present-day volcanic activity to make up for this loss. ▶

## Content modules for elementary and middle school teachers



## Solar System Formation ▲

Teacher Joe Reilly asks the question, "How did our solar system form?" In 1755, a renowned German philosopher, Immanuel Kant, developed the currently-accepted "Solar Nebula" theory. He described how a solar system can develop from clouds of dust and gas that collapse into a flat spinning disk. Dr. R. Hank Donnelly, from the Harvard-Smithsonian Center for Astrophysics in Cambridge, MA, describes in more detail how clouds of dust and gas produced in proto-solar nebulae coalesced under the force of gravity to form our solar system.





# REDISCOVERING BIOLOGY: MOLECULAR TO GLOBAL PERSPECTIVES

*Rediscovering Biology: Molecular to Global Perspectives* explains recent advances in the field to high school biology teachers to update their content knowledge and understanding. The multimedia course materials will help new and veteran biology teachers become familiar with current research methods and tools. The video programs feature interviews with expert scientists involved in groundbreaking research, such as Eric Lander of the MIT Genomics Center and Nobel laureate Leland Hartwell. Animations provide a micro-level view of biological processes and techniques such as mass spectrometry and microarray analysis. The course guide and interactive Web site provide a detailed online text, learning activities, a detailed glossary, annotated animations, and case studies that invite teachers to run their own mini research projects. *Produced by Oregon Public Broadcasting, 2003.*

- ✓ A professional development series for high school, college, and adult learners
- ✓ Distance learning course
- + 3 graduate credits

## 30-MINUTE PROGRAMS

1. Genomics ▶
2. Proteins and Proteomics
3. Evolution and Phylogenetics
4. Microbial Diversity
5. Emerging Infectious Diseases
6. HIV and AIDS
7. Genetics of Development
8. Cell Biology and Cancer
9. Human Evolution ▶
10. Neurobiology
11. Biology of Sex and Gender ▶
12. Biodiversity ▶
13. Genetically Modified Organisms ▶

For individual program descriptions, visit  
[www.learner.org/resources/series187.html](http://www.learner.org/resources/series187.html)

## PRICES

- DVD [RBDVDK] = \$375.00  
13 half-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT  
SERIES GUIDE [RBSGF] = \$39.95

## WEB SITE

[www.learner.org/courses/biology](http://www.learner.org/courses/biology)

### Genomics

Today's research has shifted from DNA nucleotide sequencing to identifying genes and determining their functions. This program reviews the techniques used in BLAST searches, microarray experiments, and other genomics tools.

### Human Evolution

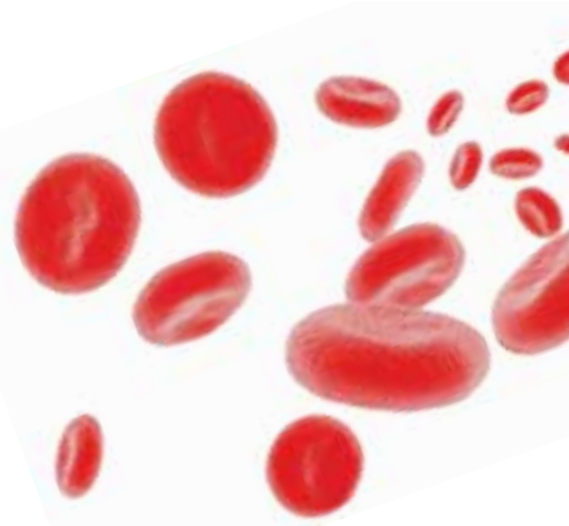
*Homo sapiens* is now the only living representative of the hominid species. This program examines mitochondrial Eve and other fossil clues that increasingly point to Africa as the point of origin of our species. How did humans replace their hominid cousins, including Neanderthal?

### Biology of Sex and Gender

Several genes help determine what makes a human embryo develop female or male sexual anatomy. This program examines recent findings about the roles of anatomy, environment, and genetics in the determination of gender and the evolution of sexual determination.

### Biodiversity

Many biodiversity studies focus on efforts to count the Earth's species before they are lost to extinction. This program explores current field experiments studying complex ecosystems and how environmental and biodiversity changes might affect the ecosystems' functions.



### Genetically Modified Organisms

Scientists now have the tools to insert specific genes from one organism into cells of unrelated species. This program illustrates the processes used and how such genetically transformed organisms are increasingly common, and introduces the ethical considerations of GMO research.



To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)

# UNSEEN LIFE ON EARTH: AN INTRODUCTION TO MICROBIOLOGY

Peer into the microbial world with this comprehensive microbiology series. The series explains basic microbial functions and how microorganisms affect everything from medicine to environmental issues to global politics. The field of microbiology is seen through the eyes of scientists carrying on their investigations in the lab and in the field. Designed for general microbiology courses for majors and allied health students, it is also useful as a resource for life science courses in college and high school. *Produced by Oregon Public Broadcasting in association with Baker & Simon Associates and the American Society for Microbiology. 1999.*

✓ **An instructional series for high school, college, and adult learners**

✓ **Distance learning course**

## 30-MINUTE PROGRAMS

### *Microbial Cell Biology*

1. The Microbial Universe
2. The Unity of Living Systems
3. Metabolism

### *Microbial Genetics*

4. Reading the Code of Life
5. Genetic Transfer

### *Integrating Themes*

6. Microbial Evolution
7. Microbial Diversity

### *Microorganisms and the Environment*

8. Microbial Ecology
9. Microbial Control

### *Microorganisms and Human Life*

10. Microbial Interactions
11. Human Defenses
12. Microbes and Human Diseases

For individual program descriptions, visit  
[www.learner.org/resources/series121.html](http://www.learner.org/resources/series121.html)

## PRICES

- **DVD-R** [ULDVD] ■ \$499.00  
12 half-hour programs on 3 discs
- **TEXTBOOK** [ULSTBE] ■ \$128.95  
Microbiology: An Introduction, 7th ed., by Tortora et al., Benjamin/Cummings Science, 2002
- **STUDY GUIDE** [ULSGSBE] ■ \$30.00  
Microbiology: An Introduction, by Case, Benjamin/Cummings Science, 2000

- **FACULTY GUIDE** [ULSGFBE] ■ \$25.00  
Microbiology: An Introduction, by Case, Benjamin/Cummings Science, 2000
- **TEXTBOOK** [ULSTMC] ■ \$95.00  
Microbiology, 4th ed., with Microbes in Motion CD-ROM, by Prescott et al., McGraw-Hill, 1999
- **STUDY GUIDE** [ULSGSMC] ■ \$55.00  
Microbiology, by Harley, McGraw-Hill, 2000
- **FACULTY GUIDE** [ULSGFMC] ■ \$25.00  
Microbiology, by Harley, McGraw-Hill, 2000
- **TEXTBOOK** [ULSSTBR] ■ \$93.00  
Introduction to Microbiology, by Ingraham and Ingraham, Brooks/Cole, 2000
- **STUDY GUIDE** [ULSGSBR] ■ \$20.00  
Introduction to Microbiology, Brooks/Cole, 2000
- **FACULTY GUIDE** [ULSGFBR] ■ \$25.00  
Introduction to Microbiology, Brooks/Cole, 2000

# INTIMATE STRANGERS: UNSEEN LIFE ON EARTH\*

This PBS documentary provides an overview of the microbial world and offers a clear and exciting picture of the field of microbiology. Meet scientists across the globe investigating microbial worlds everywhere—in a termite's stomach, in a hospital operating room, in an African village, and even in outer space. These programs help increase the microbial awareness of younger students, the general public, and biotechnology workers. *Produced by Baker & Simon Associates in association with Oregon Public Broadcasting and the American Society for Microbiology. 1999.*

\* Distribution of Intimate Strangers through Annenberg Learner is for educational use only.

✓ **A documentary for all audiences**

## 60-MINUTE PROGRAMS

1. The Tree of Life
2. Keepers of the Biosphere
3. Dangerous Friends and Friendly Enemies
4. Creators of the Future

For individual program descriptions, visit  
[www.learner.org/resources/series147.html](http://www.learner.org/resources/series147.html)

## PRICE

- **DVD-R** [ANIIDVD] ■ \$99.00  
4 one-hour programs on 2 discs

## WEB SITE

[www.pbs.org/opb/intimatestrangers](http://www.pbs.org/opb/intimatestrangers)



To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)





# Essential Science for Teachers

## LIFE SCIENCE

Part of the *Essential Science for Teachers* series, this course provides a foundation in key concepts needed to teach standards-based curricula. Using real-world examples, demonstrations, animations, still graphics, and commentary by scientists, the programs provide content in each topic, intertwined with in-depth interviews with children revealing their ideas. Each program also features an elementary school teacher and his or her students working with exemplary science curricula. Use the complete course for teacher education or professional development, or individual programs for content review. *Produced by the Harvard-Smithsonian Center for Astrophysics. 2003.*

✓ A professional development course for K–6 teachers

+ 3 graduate credits

### 60-MINUTE PROGRAMS

1. What Is Life? ►
2. Classifying Living Things
3. Animal Life Cycles ►
4. Plant Life Cycles
5. Variation, Adaptation, and Natural Selection
6. Evolution and the Tree of Life
7. Energy Flow in Communities
8. Material Cycles in Ecosystems ►

For individual program descriptions, visit [www.learner.org/resources/series179.html](http://www.learner.org/resources/series179.html)

### PRICES

- DVD-R [ESDVRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT COURSE GUIDE [ESSGF] ■ \$39.95

### WEB SITE

[www.learner.org/courses/essential/life](http://www.learner.org/courses/essential/life)

*Essential Science for Teachers* courses are designed to help K–6 teachers gain an understanding of some of the bedrock science concepts they need to teach today's standards-based curricula. The series of courses includes *Life Science*, *Earth and Space Science*, and *Physical Science*.



Students explore the characteristics of organisms that are "living," "dead," or "never living."

### What Is Life?

What distinguishes living things from dead and nonliving things? No single characteristic is enough to define what is meant by "life." In this session, five characteristics are introduced as unifying themes in the living world.

### Animal Life Cycles

One characteristic of all life forms is a life cycle—from reproduction in one generation to reproduction in the next. This session introduces life cycles by focusing on continuity of life in the Animal Kingdom. In addition to considering what aspects of life cycles can be observed directly, the underlying role of DNA as the hereditary material is explored.



### Material Cycles in Ecosystems

Studying an ecosystem involves looking at interactions between living things and the nonliving environment that surrounds them. Life depends upon the nonliving world for habitat, as well as energy and materials. In this session, material cycles will be explored as critical processes that sustain life in an ecosystem.



★ More on DNA at [www.learner.org/interactives](http://www.learner.org/interactives)

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)

# CHEMISTRY: CHALLENGES AND SOLUTIONS



*Chemistry: Challenges and Solutions* teaches general concepts using real-life challenges in energy, materials development, biochemistry, and the environment. The course zeros in on essential topics that are generally taught in introductory chemistry, providing a strong foundation for learners to pursue further study in science or a liberal education. Videos include lab demonstrations of key principles, interviews with scientists about their related research and explanatory animations. Each video is hosted by a different working chemist—together, they show a diversity of chemistry professionals and the challenges chemistry is addressing for society. The online text covers key concepts with clear text and illustrations, while interactive labs provide simulations of chemical processes. Produced by the Science Media Group at the Harvard-Smithsonian Center for Astrophysics. 2014.

✓ **A multimedia course  
for high school teachers  
and college-level instruction**

## 30-MINUTE PROGRAMS

- 1. Matter and the Rise of Atomic Theory:**  
The Art of the Meticulous
- 2. The Behavior of Atoms:** Phases of Matter  
and the Properties of Gases
- 3. Atoms and Light:** Exploring Atomic  
and Electronic Structure
- 4. Organizing Atoms and Electrons:**  
The Periodic Table
- 5. Making Molecules:** Lewis Structures  
and Molecular Geometries
- 6. Quantifying Chemical Reactions:**  
Stoichiometry and Moles
- 7. The Energy in Chemical Reactions:**  
Thermodynamics and Enthalpy ▶
- 8. When Chemicals Meet Water:**  
The Properties of Solutions ▶
- 9. Equilibrium and Advanced  
Thermodynamics:** Balance  
in Chemical Reactions
- 10. Acids and Bases:** The Voyage  
of the Proton
- 11. The Metallic World:** Electrochemistry  
and Coordination Compounds
- 12. Kinetics and Nuclear Chemistry:**  
The Need for Speed
- 13. Modern Materials and the Solid State:**  
Crystals, Polymers, and Alloys

For individual program descriptions, visit  
[www.learner.org/resources/series218.html](http://www.learner.org/resources/series218.html)

## PRICES

- DVD [ANCHDVD] • \$375.00  
13 half-hour programs on 4 discs, 1 guide
- ADDITIONAL COURSE GUIDES • \$39.95

## WEB SITE

[www.learner.org/courses/chemistry](http://www.learner.org/courses/chemistry)

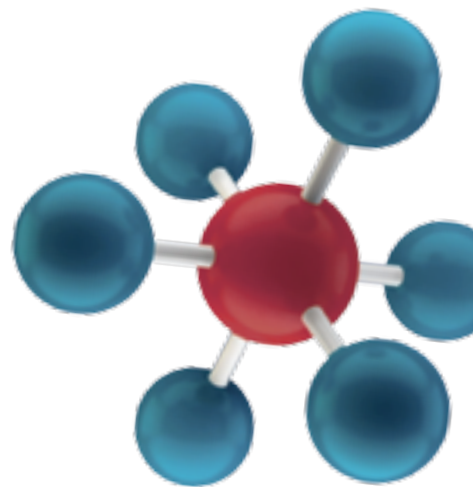
### The Energy in Chemical Reactions:

#### Thermodynamics and Enthalpy

Thermodynamics—the study of how and why energy moves—governs what can happen in a chemical reaction. This program applies thermodynamics to research into making cleaner-burning rocket fuels and more efficient engines.



At a coffee bar we learn how the concentration of a solute, pressure, and temperature come into play in making a great cup of java.



### When Chemicals Meet Water:

#### The Properties of Solutions

While solutions don't have to be liquids, they are fundamental to life and common in inorganic chemistry: the majority of biochemical reactions happen in aqueous solutions. The formation of a solution involves a solute (the substance that gets dissolved) and the solvent (the substance that does the dissolving).



Dan Rosenberg provides informative and dramatic demonstrations not feasible in the average classroom.

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)



# REACTIONS IN CHEMISTRY

*Reactions in Chemistry* is a professional development workshop for high school chemistry and physical science teachers. The workshop blends chemistry content, history, and technological applications with a range of classroom lessons to provide teachers with updated knowledge and new instructional approaches. Teachers will see diverse classes doing hands-on lessons and labs and will hear teachers reflect on their own practice. The programs also present the work of industrial and forensic chemists and researchers. *Produced by Hadassah College, Jerusalem, in collaboration with the Educational Film Center (EFC). 2003.*

✓ A professional development workshop for high school teachers

+ 2 graduate credits

## 60-MINUTE PROGRAMS

1. Atoms and Molecules
2. Macro to Micro Structures
3. Energetics and Dynamics
4. Theory and Practice in Chemical Systems
5. Chemical Design
6. The Chemistry of Life
7. Chemistry and the Environment
8. Chemistry at the Interface

For individual program descriptions, visit [www.learner.org/resources/series168.html](http://www.learner.org/resources/series168.html)

## PRICES

- DVD-R [RCDVDRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT WORKSHOP GUIDE [RCSGF] ■ \$39.95

## WEB SITE

[www.learner.org/workshops/chemistry](http://www.learner.org/workshops/chemistry)



★ More on The Periodic Table at [www.learner.org/interactives](http://www.learner.org/interactives)

# THE WORLD OF CHEMISTRY

This classic series presents a unified view of the science and practice of chemistry. Footage of industrial processes illustrates the application of chemical reactions, while computer animations reveal changes at the molecular level. *The World of Chemistry* is appropriate for students taking high school or college chemistry, from introductory to advanced levels, and is applicable to different teaching approaches. It includes physics and Earth science components and is also valuable for teachers seeking to review the subject matter. *Produced by the University of Maryland and the Educational Film Center. 1990.*

✓ An instructional series for high school, college, and adult learners

✓ Distance learning course

## 30-MINUTE PROGRAMS

- |  |                                      |
|--|--------------------------------------|
| 1. The World of Chemistry                      | 13. The Driving Forces               |
| 2. Color                                       | 14. Molecules in Action              |
| 3. Measurement:<br>The Foundation of Chemistry | 15. The Busy Electron                |
| 4. Modeling the Unseen                         | 16. The Proton in Chemistry          |
| 5. A Matter of State                           | 17. The Precious Envelope            |
| 6. The Atom                                    | 18. The Chemistry of the Earth       |
| 7. The Periodic Table                          | 19. Metals                           |
| 8. Chemical Bonds                              | 20. On the Surface                   |
| 9. Molecular Architecture                      | 21. Carbon                           |
| 10. Signals From Within                        | 22. The Age of Polymers              |
| 11. The Mole                                   | 23. Proteins: Structure and Function |
| 12. Water                                      | 24. The Genetic Code                 |
|  | 25. Chemistry and the Environment    |
|  | 26. Futures                          |

For individual program descriptions, visit [www.learner.org/resources/series61.html](http://www.learner.org/resources/series61.html)

## PRICES

- DVD [WCDVD] ■ \$389.00  
26 half-hour programs on 4 discs
- TEXTBOOK [WCST] ■ \$140.95  
World of Chemistry, 4th ed., by Joesten et al., Harcourt College Publishers, 1996
- STUDY GUIDE [WCSGS] ■ \$56.95  
World of Chemistry, 2nd ed., Harcourt College Publishers, 1996
- TEACHER'S GUIDE [WCSGT] ■ \$15.00  
The World of Chemistry in the Classroom, The Annenberg/CPB Project, 1996

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)



# PHYSICS FOR THE 21<sup>ST</sup> CENTURY



Dark matter, string theory, particle accelerators, and other big topics in modern physics come together in this 11-part multimedia course for high school physics teachers, undergraduate students, and all adults who are fascinated by physics and the cosmos. The course covers a broad scale, from sub-atomic particle physics, through atomic and molecular physics, to cosmology. The 11 video programs feature 22 case studies of researchers from leading research labs and universities who are breaking new ground in their fields. An extensive companion Web site provides background information and concepts found in a printable online textbook, interactive simulations, a course facilitator's guide, and multiple other resources. *Produced by the Harvard-Smithsonian Center for Astrophysics Science Media Group in association with the Harvard University Department of Physics. 2010.*

## 30-MINUTE PROGRAMS

1. The Basic Building Blocks of Matter
2. The Fundamental Interactions
3. Gravity
4. String Theory and Extra Dimensions
5. The Quantum World
6. Macroscopic Quantum Mechanics
7. Manipulating Light ▶
8. Emergent Behavior in Quantum Matter
9. Biophysics ▶
10. Dark Matter ▶
11. Dark Energy ▶

**Video Demonstrations** (short physics demonstrations related to program topics):

Tabletop Cavendish Experiment  
NIST Atomic Clocks  
The Meissner Effect  
The Cyclotron  
Pencil Beam Scanning

For individual program descriptions, visit  
[www.learner.org/resources/series213.html](http://www.learner.org/resources/series213.html)

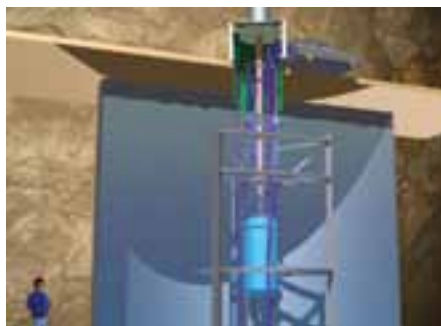
## PRICES

- DVD-R [PHDVDRK] ■ \$375.00  
11 half-hour programs and 5 video demonstrations on 3 discs

- ADDITIONAL PROFESSIONAL DEVELOPMENT WORKSHOP GUIDE [PHSGF] ■ \$39.95

## WEB SITE

[www.learner.org/courses/physics/](http://www.learner.org/courses/physics/)



Model of LUX detector, which searches for evidence of dark matter.

## Manipulating Light

Physicist Lene Vestergaard Hau stopped a pulse of light in a cloud of atoms and then released it, along with the information it contained. Paul Kwiat is creating photons “to order” by carefully manipulating their quantum properties. Explore how light interacts with matter at the quantum level, and learn about the concepts of entanglement and action at a distance.

## Biophysics

Biophysics brings together many disciplines. Molecular biophysics (Vinothan Manoharan of Harvard) opens the possibility of manipulating DNA and proteins, perhaps leading to nanofabrication of biologically active molecules. And medical physics (Harald Paganetti at Mass General Hospital) is already providing novel ways of imaging living tissues as well as curing disease with proton radiation therapy.

- ✓ A professional development series for high school, college, and adult learners

- ✓ Distance learning course

- + 3 graduate credits

## Dark Matter

Swiss astrophysicist Fritz Zwicky first inferred the existence of dark matter in 1933. Today, astrophysicists are seeking evidence for dark matter at the center of the Milky Way galaxy (Doug Finkbeiner of Harvard). The LUX detector almost a mile underground is looking for dark matter particles within the Earth (Rick Gaitskell of Brown).



© X-ray: NASA, CXC, CfA, M. Markevitch et al.; Optical: NASA, STScI; Magellan, U. Arizona, D. Clowe et al.; Lensing Map: NASA, STScI; ESO WFI; Magellan, U. Arizona, D. Clowe et al.

## Dark Energy

Cosmologists have known since the 1920s that the universe is expanding in all directions. Recent measurements have shown that the cosmic expansion has been speeding up, attributed to dark energy. Robert Kirshner measures the history of cosmic expansion more precisely, and Princeton's David Spergel looks at the cosmic microwave background for new clues about the nature of dark energy.

# THE MECHANICAL UNIVERSE...AND BEYOND

This series helps teachers demystify physics by making complex concepts more accessible through field trips to hot-air balloon events, symphony concerts, bicycle shops, and other locales. Inventive computer graphics illustrate abstract concepts such as time, force, and capacitance, while historical reenactments of the studies of Newton, Leibniz, Maxwell, and others trace the evolution of theories. *The Mechanical Universe* shows the elegance of mechanics and cosmology to non-science majors and drives home core concepts in physics to science and engineering majors. This series is also valuable for teacher professional development. *Produced by the California Institute of Technology and Intelecom. 1985.*

## The Law of Falling Bodies

Galileo's imaginative experiments proved that all bodies fall with the same constant acceleration.

## Fundamental Forces

All physical phenomena of nature are explained by four forces: the strong and weak nuclear forces, gravitational, and electromagnetic.

## Static Electricity

Eighteenth-century electricians knew how to spark the interest of an audience with the principles of static electricity.

## Mass, Momentum, Energy

The new meaning of space and time make it necessary to formulate a new mechanics.

**\*The Mechanical Universe was discontinued on June 30, 2016 and is no longer available for purchase.**



## 30-MINUTE PROGRAMS

### Part I

1. Introduction
2. The Law of Falling Bodies ▲
3. Derivatives
4. Inertia
5. Vectors
6. Newton's Laws
7. Integration
8. The Apple and the Moon
9. Moving in Circles
10. Fundamental Forces ▲
11. Gravity, Electricity, Magnetism
12. The Millikan Experiment
13. Conservation of Energy
14. Potential Energy
15. Conservation of Momentum
16. Harmonic Motion
17. Resonance
18. Waves
19. Angular Momentum
20. Torques and Gyroscopes
21. Kepler's Three Laws
22. The Kepler Problem
23. Energy and Eccentricity
24. Navigating in Space

25. Kepler to Einstein
26. Harmony of the Spheres

### Part II

27. Beyond the Mechanical Universe
28. Static Electricity ▲
29. The Electric Field
30. Potential and Capacitance
31. Voltage, Energy, and Force
32. The Electric Battery
33. Electric Circuits
34. Magnetism
35. The Magnetic Field
36. Vector Fields and Hydrodynamics
37. Electromagnetic Induction
38. Alternating Current
39. Maxwell's Equations
40. Optics
41. The Michelson-Morley Experiment
42. The Lorentz Transformation
43. Velocity and Time
44. Mass, Momentum, Energy ▲
45. Temperature and Gas Laws
46. Engine of Nature
47. Entropy

48. Low Temperatures
49. The Atom
50. Particles and Waves
51. From Atoms to Quarks
52. The Quantum Mechanical Universe

★ More on Amusement Park Physics at [www.learner.org/interactives](http://www.learner.org/interactives)

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)



## Science in Focus

# FORCE AND MOTION

Explore science concepts in force and motion and come away with a deeper understanding—key to engaging your students in their own explorations. With science and education experts as guides, learn more about gravity, friction, air resistance, magnetism, and tension through activities, discussions, and demonstrations. Extensive footage shot in real classrooms shows students learning and building on ideas as they explore the relationships among motion, force, size, mass, and speed. Observe how students develop understanding through activities that connect science concepts to real-world phenomena. *Produced by the Harvard-Smithsonian Center for Astrophysics. 2001.*

### 60-MINUTE PROGRAMS

1. Making an Impact
2. Drag Races
3. When Rubber Meets the Road
4. On a Roll
5. Keep On Rolling
6. Force Against Force
7. The Lure of Magnetism
8. Bend and Stretch

For individual program descriptions, visit  
[www.learner.org/resources/series136.html](http://www.learner.org/resources/series136.html)

### PRICES

- DVD-R [SMDVDRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT  
WORKSHOP GUIDE [SMSGF] ■ \$39.95

### WEB SITE

[www.learner.org/workshops/force](http://www.learner.org/workshops/force)

✓ A professional development workshop for K–6 teachers

+ 2 graduate credits



Seventh-graders measure the impact of a ball dropped to form a crater.



## Essential Science for Teachers

# PHYSICAL SCIENCE

By exploring topics that range from the essential properties of aluminum foil to the plasma that makes up the sun, this professional development course helps teachers enhance their understanding of science content and connect the science to elementary and middle school classroom curricula. Each program includes real examples, demonstrations, animations and graphics, and interviews with science experts. Also featured are elementary science classes which reveal students' deeply held ideas about the topics presented. *Produced by the Harvard-Smithsonian Center for Astrophysics. 2004.*

### 60-MINUTE PROGRAMS

1. What Is Matter? Properties and Classification of Matter
2. The Particle Nature of Matter: Solids, Liquids, and Gases
3. Physical Changes and Conservation of Matter
4. Chemical Changes and Conservation of Matter
5. Density and Pressure
6. Rising and Sinking
7. Heat and Temperature
8. Extending the Particle Model of Matter

For individual program descriptions, visit  
[www.learner.org/resources/series200.html](http://www.learner.org/resources/series200.html)

### PRICES

- DVD-R [PSDVDRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT  
COURSE GUIDE [PSSGF] ■ \$39.95

### WEB SITE

[www.learner.org/courses/essential/physicalsci](http://www.learner.org/courses/essential/physicalsci)

✓ A professional development course for elementary and middle school teachers

+ 3 graduate credits





# JOURNEY NORTH

*Journey North* is an Internet-based adventure that engages students in investigations of wildlife migration and seasonal change. Each year, thousands of students and their teachers across North America come together to experience the annual cycle through observation, inquiry, research, and the sharing of data. This professional development video resource shows how to use *Journey North* in the classroom. Second- through seventh-grade classes participate in *Journey North* investigations. *Produced by Twin Cities Public Television, Inc. 2001.*

✓ **Professional development video for K–8 teachers**

## 15-MINUTE VIDEO MODULES

1. Introduction
2. Seasonal Migrations: Monarch Butterflies ▶
3. Plants and the Seasons: Tulip Gardens ▶
4. Sunlight and the Seasons: Mystery Class

For individual program descriptions, visit [www.learner.org/resources/series127.html](http://www.learner.org/resources/series127.html)

## PRICES

- DVD-R [JNDVDRK] ■ \$39.95  
4 modules on 1 disc, 1 guide
- ADDITIONAL GUIDES [JNSGF] ■ \$15.00

### Seasonal Migrations: Monarch Butterflies

One of *Journey North*'s most popular migrations—that of the monarch butterflies—is featured in this program.

### Plants and the Seasons: Tulip Gardens ▶

Join several *Journey North* classrooms as they become engaged in the study of tulip bulbs, and track their growth from fall to spring.

Students record data on their tulip gardens.



**[www.learner.org/jnorth](http://www.learner.org/jnorth)**

✓ **A Web-based learning adventure for K–12 classrooms**

*Journey North* engages K–12 students in a global study of wildlife migration and seasonal change. Students share their own field observations with peers across North America. They track the coming of spring through the migration patterns of monarch butterflies, robins, hummingbirds, whooping cranes, gray whales, bald eagles, and other species; the budding of plants; changing sunlight; and other natural events. Find migration maps, pictures, standards-based lesson plans, activities, and information to help students make local observations and fit them into a global context. *Produced by Journey North.*

**Take *Journey North* outdoors with a new mobile app!**

Learn more at:  
[www.learner.org/jnorth/mobile](http://www.learner.org/jnorth/mobile)

## EXPLORE.ORG ANIMAL CAMERAS SAFELY BRING THE WILD INDOORS

Take your young citizen scientists into the field without the need for a travel budget or hazard insurance. Now, your students can observe nature from the classroom with one of many Explore.org animal cams. Students can observe puffins and osprey in Maine and brown bears in Alaska. Also, use selected Explore.org animal cams on the *Journey North* Web site to observe how animals respond to seasonal change.

[www.learner.org/jnorth/livecam/](http://www.learner.org/jnorth/livecam/)

**explore**<sup>™</sup>  
explore.org



To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)





# THE HABITABLE PLANET: A SYSTEMS APPROACH TO ENVIRONMENTAL SCIENCE

What makes Earth unique among the planets? This professional development course explores the natural functions of Earth's systems: geophysical, atmospheric, oceanic, and ecological; Earth's ability to sustain life, especially human life; and the effects that human actions have had on the different natural systems. Components include 13 half-hour video programs featuring two documentary case studies describing current environmental science research and an extensive Web site providing content, activities, and resources to help educators deepen their understanding of environmental science. *Produced by the Harvard-Smithsonian Center for Astrophysics in association with the Harvard University Center for the Environment. 2007.*

✓ A professional development series for high school teacher, college and adult learners

+ 3 graduate credits

✓ Distance learning course

## 30-MINUTE PROGRAMS

1. Many Planets, One Earth ▶
2. Atmosphere
3. Oceans
4. Ecosystems ▶
5. Human Population Dynamics ▶
6. Risk, Exposure, and Health
7. Agriculture ▶
8. Water Resources
9. Biodiversity Decline
10. Energy Challenges
11. Atmospheric Pollution
12. Earth's Changing Climate
13. Looking Forward: Our Global Experiment

For individual program descriptions, visit [www.learner.org/resources/series209.html](http://www.learner.org/resources/series209.html)

## PRICES

- DVD [HPDVDK] ■ \$375.00  
13 half-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT GUIDES [HPSGF] ■ \$39.95

## WEB SITE

[www.learner.org/courses/envsci](http://www.learner.org/courses/envsci)

### Many Planets, One Earth

The early Earth was a much different planet than the one we know today. Ancient rocks provide evidence of the emergence of oxygen in the atmosphere and of a frozen Snowball Earth. Scientists Paul Hoffman and Andrew Knoll look at these clues to help explain the rise of complex animal life.



Poster advertising China's one-child policy to address population growth.

### Ecosystems

Scientists from the Smithsonian Center for Tropical Research document the astounding abundance of diversity in tropical rainforests to discover why so many species co-exist that are competing for the same resources. In North America, the Yellowstone Wolf Reintroduction project explores why removing just one species dramatically changed the distribution of plants and animals up and down the food web.



### Human Population Dynamics

The human population of our planet now exceeds 6.5 billion and is rising. Much of this growth is projected for the most environmentally fragile regions of the world. Will studying the history of the world's population growth help predict the Earth's "carrying capacity"?

### Agriculture

Will world population outrun food resources? The "Green Revolution" of the 20th century multiplied crop yields, in part through increasing inputs of pesticides and fertilizers. How can farmers reduce their use of agricultural chemicals and still produce enough food?



2010 Winner  
of the  
AAAS Spore Award

See **THE POWER  
OF PLACE**

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CURRICULUM CONNECTION

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)





# Essential Science for Teachers

## EARTH AND SPACE SCIENCE

Part of the *Essential Science for Teachers* series, this course provides teachers with the background needed to teach standards-based curricula. Real-world examples, demonstrations, animations, still graphics, and interviews with scientists make up content segments, which are intertwined with in-depth interviews with children that uncover their ideas about each topic. Each program also features an elementary school teacher and his or her students using exemplary science curricula. Use the complete course for teacher education or professional development, or individual programs for content review. *Produced by the Harvard-Smithsonian Center for Astrophysics. 2004.*

✓ A professional development course for elementary and middle school teachers

+ 3 graduate credits

### 60-MINUTE PROGRAMS

1. Earth's Solid Membrane: Soil
2. Every Rock Tells a Story
3. Journey to the Earth's Interior ▶
4. The Engine That Drives the Earth ▶
5. When Continents Collide ▶
6. Restless Landscapes ▶
7. Our Nearest Neighbor: The Moon
8. Order Out of Chaos: Our Solar System

For individual program descriptions, visit [www.learner.org/resources/series195.html](http://www.learner.org/resources/series195.html)

### PRICES

- DVD-R [EBDVDRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT COURSE GUIDE [EBSGF] ■ \$39.95

### WEB SITE

[www.learner.org/courses/essential/earthspace](http://www.learner.org/courses/essential/earthspace)



The course Web site includes detailed explanations of scientific phenomena.

### Journey to the Earth's Interior

How do we know what the interior of the Earth is like if we've never been there? In this session, participants learn about the internal structure of the Earth and learn how it is possible for entire continents to move across its surface.

### The Engine That Drives the Earth

What drives the movement of tectonic plates? In this session, participants learn how plates interact at plate margins, how volcanoes work, and the story of Hawaii's formation.

### When Continents Collide

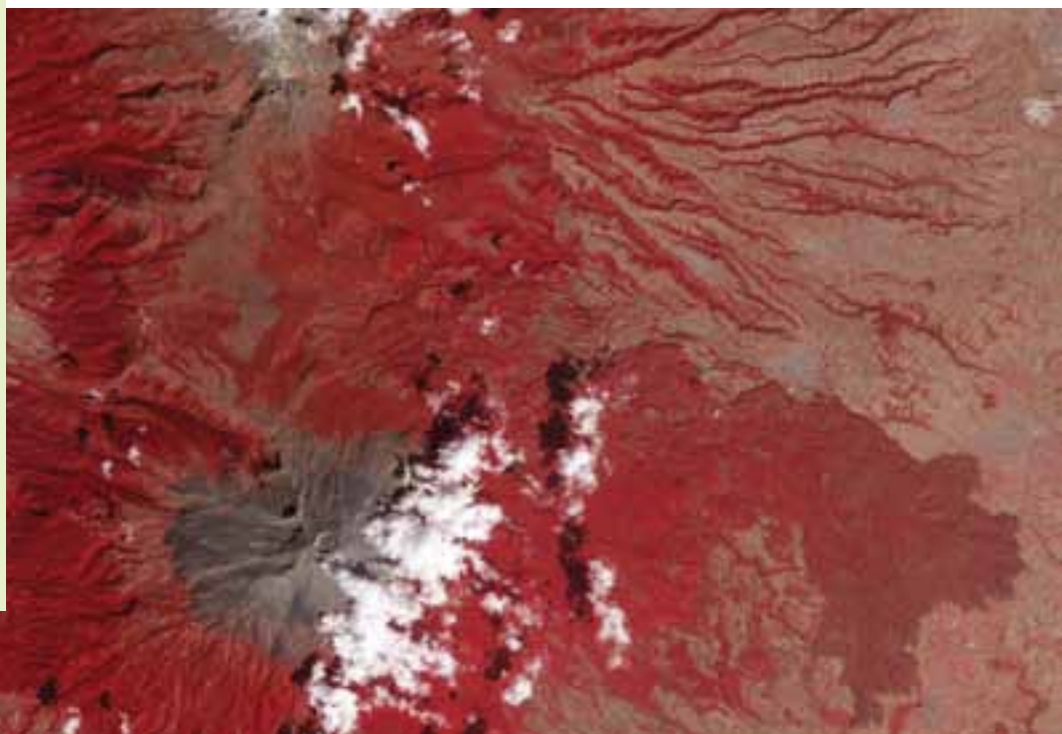
How is it possible that marine fossils are found on Mount Everest, the world's highest continental mountain? In this session, participants learn what happens when continents collide and how this process shapes the surface of the Earth.



Students explore Earth science concepts using exemplary science curriculum materials.

### Restless Landscapes

If almost all mountains are formed the same way, why do they look so different? In this session, participants learn about the forces continually at work on the surface of the Earth that sculpt the ever-changing landscape.



NASA Earth Observatory image by Jesse Allen and Robert Simmon, using NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team data. Found at Visible Earth (<http://visibleearth.nasa.gov>).

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)

# EARTH REVEALED

*Earth Revealed* shows the physical and scientific processes that shape our planet. From earthquakes and volcanoes to the creation of sea-floor crusts and shifting river courses, this series offers stunning visuals that explain plate tectonics and other geologic concepts and principles. Follow geologists in the field as they explore the primal forces of Earth. This series can also be used as a resource for teacher professional development. *Produced by Intelcom. 1992.*

- ✓ An instructional series for high school, college, and adult learners
- ✓ Distance learning course

## 30-MINUTE PROGRAMS

### Introduction

1. Down to Earth
2. The Restless Planet

### Plate Tectonics

3. Earth's Interior
4. The Sea Floor
5. The Birth of a Theory
6. Plate Dynamics
7. Mountain Building
8. Earth's Structures
9. Earthquakes

### Geologic Time and Life

10. Geologic Time
11. Evolution Through Time

### The Rock Cycle

12. Minerals: The Materials of Earth
13. Volcanism
14. Intrusive Igneous Rocks
15. Weathering and Soils
16. Mass Wasting
17. Sedimentary Rocks: The Key to Past Environments
18. Metamorphic Rocks
19. Running Water I: Rivers, Erosion, and Deposition
20. Running Water II: Landscape Evolution

### Carving the Landscape

21. Groundwater
22. Wind, Dust, and Deserts
23. Glaciers
24. Waves, Beaches, and Coasts

### Living With Earth

25. Living With Earth, Part I
26. Living With Earth, Part II

For individual program descriptions, visit [www.learner.org/resources/series78.html](http://www.learner.org/resources/series78.html)

## PRICE

- DVD [ERDVD] ■ \$389.00  
26 half-hour programs on 5 discs
- Coordinated books and guides are also available. For more information, call 1-800-learner® or visit [www.learner.org](http://www.learner.org).

- ★ More on Rock Cycles at [www.learner.org/interactives](http://www.learner.org/interactives)
- ★ More on Volcanoes at [www.learner.org/exhibits/volcanoes](http://www.learner.org/exhibits/volcanoes)

# PLANET EARTH

This series presents visually spectacular tours of the seven continents as it makes connections between our solar system and Earth's oceans, climate, and mineral and energy sources. It unifies Earth science, astronomy, and comparative planetology into an integrated discipline that relies on common scientific methods. A flexible instructional resource, *Planet Earth* provides course material for nonscience students and science majors. *Produced by WQED/Pittsburgh in association with the National Academy of Sciences. 1986.*

## 60-MINUTE PROGRAMS

1. The Living Machine
2. The Blue Planet
3. The Climate Puzzle
4. Tales From Other Worlds
5. Gifts From the Earth
6. The Solar Sea
7. Fate of the Earth

For individual program descriptions, visit [www.learner.org/resources/series49.html](http://www.learner.org/resources/series49.html)

## PRICE

- DVD-R [PLDVDK] ■ \$220.00  
7 one-hour programs on 4 discs, 1 guide
- Coordinated books and guides are also available. For more information, call 1-800-learner® or visit [www.learner.org](http://www.learner.org).

- ✓ An instructional series for high school, college, and adult learners
- ✓ Distance learning course



To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)



# LEARNING SCIENCE THROUGH INQUIRY

Inquiry-based teaching, central to the Next Generation Science Standards, should be a comprehensive and ongoing approach. To help teachers feel comfortable with this approach, the workshop shows inquiry teaching and learning in action, with real teachers and students. For teachers who have experimented with inquiry teaching and want to enhance their practice, or are new to the approach and want to know how to make it work, this workshop will show how to teach using inquiry and present effective strategies to try in the classroom. *Produced by Thirteen/WNET New York in collaboration with the Education Development Center (EDC). 2000.*

✓ **A professional development workshop for elementary and middle school teachers**

⊕ **2 graduate credits**

## 60-MINUTE PROGRAMS

1. **What Is Inquiry and Why Do It?**
2. **Setting the Stage: Creating a Learning Community**
3. **The Process Begins: Launching the Inquiry Exploration**
4. **Focus the Inquiry: Designing the Exploration**
5. **The Inquiry Continues: Collecting Data and Drawing Upon Resources**
6. **Bring It All Together: Processing for Meaning During Inquiry**
7. **Assessing Inquiry**
8. **Connecting Other Subjects to Inquiry**

*For individual program descriptions, visit [www.learner.org/resources/series129.html](http://www.learner.org/resources/series129.html)*

## PRICES

- **DVD-R** [I6DVDRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- **ADDITIONAL PROFESSIONAL DEVELOPMENT WORKSHOP GUIDE** [I6SGF] ■ \$39.95

## WEB SITE

[www.learner.org/workshops/inquiry](http://www.learner.org/workshops/inquiry)

# TEACHING HIGH SCHOOL SCIENCE

This video library will help new and veteran science teachers integrate national science standards and inquiry learning into their curricula. Showing science classrooms around the country, the modules cover topics in life science, physical science, integrated science, and Earth and space science. They also show a range of teaching techniques and student/teacher interactions. *Produced by WGBH Boston. 2000.*

✓ **A professional development library for high school teachers**



## PROGRAMS

1. **Introduction** (10 min.)
2. **Thinking Like Scientists** (27 min.) ▶
3. **Chemical Reactions** (46 min.) ▶
4. **Investigating Crickets** (54 min.) ▶
5. **Exploring Mars** (44 min.) ▶
6. **The Physics of Optics** (55 min.) ▶

*For individual program descriptions, visit [www.learner.org/resources/series126.html](http://www.learner.org/resources/series126.html)*

## PRICES

- **DVD-R** [THDVDRK] ■ \$275.00  
6 video programs (varying lengths) on 3 discs, 1 guide
- **ADDITIONAL PROFESSIONAL DEVELOPMENT LIBRARY GUIDE** [THSGF] ■ \$39.95

### Thinking Like Scientists

Footage of classrooms and of scientists in the field explain and illustrate the concept of inquiry.

### Chemical Reactions

A ninth-grade principles of science and technology class formulates and explores their own questions about a chemical reaction.

### Investigating Crickets

Biology students design and conduct experiments about crickets.

### Exploring Mars

Students in an 11th-grade integrated science class explore how the Mars landscape may have formed.

### The Physics of Optics

An 11th- and 12th-grade physics class looks at light, lenses, and the human eye.



To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)



# SHEDDING LIGHT ON SCIENCE

This workshop uses light as a theme to explore topics in physics, chemistry, biology, space science, and Earth science. A common thread through many areas of science, light lends itself to interdisciplinary science study. Make connections to real phenomena by exploring the transformation of energy, the behavior of light, and light's role in the weather, the seasons, and the production of food by plants. *Produced by the Harvard-Smithsonian Center for Astrophysics in partnership with the Association for Science Teacher Education (ASTE). 1999.*

### 60-MINUTE PROGRAMS

1. Shine and Shadow ►
2. Laws of Light
3. Pigments, Paint, and Printing
4. Color, Cones, and Corneas
5. Sunlight to Starch
6. Energy and Ecosystems
7. Sun and Seasons
8. Wind and Weather

For individual program descriptions, visit [www.learner.org/resources/series118.html](http://www.learner.org/resources/series118.html)

### PRICES

- DVD-R [SHDVRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT WORKSHOP GUIDE [SHSGF] ■ \$39.95

### WEB SITE

[www.learner.org/workshops/sheddinglight](http://www.learner.org/workshops/sheddinglight)

★ More on Weather at [www.learner.org/interactives](http://www.learner.org/interactives)



✓ A professional development workshop for elementary school teachers

+ 2 graduate credits



### Shine and Shadow

Light is a form of energy that affects all facets of our lives. This workshop explores how light travels and how shadows are formed.

## Science in Focus

# ENERGY

Understanding the concept of energy is crucial to the comprehension of many ideas in physical science, Earth and space science, and life science. The video programs, print guide, and Web site of this workshop provide a solid foundation, distinguishing clearly between the way "energy" is commonly understood and its meaning in science. Examine energy's role in motion, machines, food, the human body, and the universe as a whole. Learn how energy can be converted from one form to another and transferred over space and time. And explore the notion of "conservation of energy"—the idea that energy can be neither created nor destroyed. Return to the classroom with a new focus on the important concept of energy. *Produced by the Harvard-Smithsonian Center for Astrophysics. 2002.*

### 60-MINUTE PROGRAMS

1. What Is Energy?
2. Force and Work
3. Transfer and Conversion of Energy ►
4. Energy in Cycles
5. Energy in Food
6. Energy and Systems
7. Heat, Work, and Efficiency
8. Understanding Energy

For individual program descriptions, visit [www.learner.org/resources/series160.html](http://www.learner.org/resources/series160.html)

### PRICES

- DVD-R [SFEDVRK] ■ \$220.00  
8 one-hour programs on 4 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT WORKSHOP GUIDE [SFESGF] ■ \$39.95

### WEB SITE

[www.learner.org/workshops/energy](http://www.learner.org/workshops/energy)



✓ A professional development workshop for elementary and middle school teachers

+ 2 graduate credits



A student investigates what kind of container transfers heat best.

To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)



# A PRIVATE UNIVERSE

From its famous opening scene at a Harvard graduation, this classic of education research brings into sharp focus the dilemma facing all educators: Why don't even the brightest students truly grasp basic science concepts? This award-winning program traces the problem through interviews with Harvard graduates and their professors, as well as with a bright ninth-grader who has some confused ideas about the orbits of the planets. Equally useful for education methods classes, teacher workshops, and presentations to the public, *A Private Universe* is an essential resource for science and methodology teachers. *Produced by the Harvard-Smithsonian Center for Astrophysics. 1989.*

- ✓ A documentary on education research for grades 5–12 educators

*"This program has been the single most convincing argument for inquiry teaching that I know of."*

—Don Yost, retired physics teacher and workshop leader

## ONE 20-MINUTE PROGRAM

### *A Private Universe*

Hear the backstory of the making of *A Private Universe* online at [www.learner.org/resources/series28.html](http://www.learner.org/resources/series28.html)

### PRICES

- DVD-R [PVDVDRK] ■ \$39.95  
1 20-minute program on 1 disc, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT GUIDE [PVSGT] ■ \$9.95

### WEB SITE

[www.learner.org/teacherslab/pup](http://www.learner.org/teacherslab/pup)



# MINDS OF OUR OWN

These video programs pick up on the questions asked in *A Private Universe* and further explore how children learn. Based on prominent research, as well as the pioneering work of Piaget and others, *Minds of Our Own* shows that many of the things we assume about how children learn are simply not true. For educators and parents, these programs bring new insight to debates about education reform. *Produced by the Harvard-Smithsonian Center for Astrophysics. 1995.*

- ✓ A documentary series for K–12 educators



## 60-MINUTE PROGRAMS

1. Can We Believe Our Eyes?
2. Lessons From Thin Air ▶
3. Under Construction ▶

For individual program descriptions, visit [www.learner.org/resources/series26.html](http://www.learner.org/resources/series26.html)

### PRICES

- DVD-R [MODVDRK] ■ \$109.00  
3 one-hour programs on 2 discs, 1 guide
- ADDITIONAL PROFESSIONAL DEVELOPMENT GUIDE [MOSG] ■ \$39.95

### Lessons From Thin Air

Despite the fact that photosynthesis is one of the most widely taught topics, few people really understand the central idea underlying this process. Program 2 explores why key concepts taught in school can go unlearned.

### Under Construction

A series of portraits shows how six teachers from across the country are working to revamp their teaching and their schools and are struggling against a variety of obstacles that might thwart their efforts.



To order: 1-800-LEARNER® or [www.learner.org](http://www.learner.org)