Appendixes

Suggestions for Cutting Costs

1. **Options.** Omit some or all of the optional materials. These materials are indicated in the tables that follow.
2. **Teams.** We recommend working with students in teams of two, for more hands-on interaction. However, to save money and materials, have students work in teams of four. This will cut the cost of many of the needed materials in half.
3. **Demonstrations.** Do some of the laboratory work as a class demonstration instead of as a hands-on exercise. For example, in mission 3**,** make one Mars Jar for the entire class instead of one Mars Jar per team. Also for mission 3, run one control Petri dish for the entire class instead one per team.
4. **Substitutions.** Many substitutions can be made. These substitutions are indicated in the tables that follow. Baby food jars can be substituted for beakers, Petri dishes, or test tubes. Commercial media can be replaced with homemade nutrient media (which is not recommended because of contamination).
5. **Centers.** It is recommended that each team be given their own materials. In some cases, it is possible to set up central work stations with fewer materials. For example, instead of providing a dropper bottle of iodine to each team, set up one beaker of iodine with two or three eyedroppers. This will add time to the activity, but it will cut down on materials.

Required Materials List

"Living" Materials

Table A. l—Living MaterialsList.

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
MicroKwik Culture Penicillium spores (Carolina)	Penicillium spores from other biological supply houses		3 vials	No	3, 6
Brine shrimp eggs			3 vials (6 drams)	No	9
¼ oz. (7 g.) packages of yeast			24	No	10, 12
Cooked chicken muscle (breast)	Other meat or fish (light-colored best)		1	No	10

Office, Art, and General Supplies

Table A. 2-Office Supplies and Materials List.

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
Ball of string			50 meters	No	1, 3
Meter sticks	Yardsticks	1		Yes	1
Plastic cm. rulers	Meter sticks	1		Yes	3, 11, 12
Scissors		1		Yes	1, 3, 10
Piece of cardboard		1		Yes	1
Compasses	Pencils and string	1		Yes	1
Drawing materials					5, 13
Clay	Oil or water based	1		Yes	1
Straight pins with large heads					1
Masking tape				No	3, 6, 11
Stick-on labels or grease pens				No/Yes	3, 6, 7, 9, 10, 11
Graph paper	Blank paper		32 sheets	No	12
Paper towels			1 roll	No	7
Plastic plant and living plant of similar appearance	Cutting from a big plant, brach of tree, picked flower			Yes	8
12” rings	Use cardboard, plastic, or bent coat hangers	1		Yes	13
Blindfolds	Scarves, rags, or big paper bags	1		Yes	13
Plastic cups	Any comntainers	1		Yes	13
3 colors of paint	Optional			No	1
Brushes	Optional				1
Tiny colored glass beads	optional		4 dozen	Yes	

Audiovisual Equipment

Table A.3-Audiovisual Equipment List.

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
TV and VCR			1	Yes	1
Overhead projector	Photocopy illustrations as handouts		1	Yes	1, 2, 3, 7, 11, 12, 13
Butcher Paper	Chalkboard		1	Yes	8, 10
Polaroid camera(s)	Optional	1		Yes	13

Chemicals and Related Materials

Table A.4--Chemicals and Related Materials List.

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
Jar of glycerin	Liquid soap		1	No	3, 12
Dry ice (optional in 3)	In 7, put alcohol in freezer, and use regular ice cubes		3-4 pounds	No	(3), 7
Alcohol			Variable		7
Mineral oil			Variable		7
Peroxide			Variable		7
Salt			½ tablespoon	No	9
Chemicals to dechlorinate water	Use bottled water		Bottle	No	9
Sugar			3 cups	No	10, 12
Seltzer tablets			17	No	10,12
Organic and inorganic samples	Optional		Variable	No	10
Hydrochloric or sulfuric acid	TEACHER DEMO ONLY		Small amount	No	10
Baking soda	To neutralize acid	Little	No	10	
Ninhydrin powder			5 grams	No	10
Iodine			Bottle	No	10
Dried potato flakes			2 tablespoons	No	10
Ice cybes	Optional	1		No	3
Safety glasses	Recommended		Variable	Yes	10

Microbiology Materials

Table A.5—Microbiology Materials List.

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
Petri dishes, 60 x 15 mm (sterile) (1) disposable, (2) reusable	Sterilized glass jars with lids; use small jars to require less medium	7 if disposable 3 if reusable		No if disposable. Yes if reusable.	3, 6, 11
Sterigel Instant Medium	Homemade Knox gelatin medium (see ercipe)		800 ml (four 200 ml units)	No	3, 6, 11
Alcohol swabs	Bottle of rubbing alcohol and cotton			No	1, 6
Spatulas	Plastic utensils	1		Yes	3, 6

Laboratory Equipment

Table A.6—Lab Equipment List

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
Clocks (with second hand)	One wall clock	1		Yes	1, 12
Cathada Syringes, 50 or 60 cc	Syringe that fits; share fewer		1 to 8	Yes	3
Tongs, scoops, gloves	Plastic utensils	1	Share 2	Yes	3, 7, 10
Rubber tubes, 30 cm in length		2		Yes	3, 12
Tube clamps	Strong paper clips	2		Yes	3
Erlenmeyer flasks, 250 ml	Other size with stoppers that fit	2		No in 3. Yes in 12	3, 12
2-holed stoppers		1		Yes	3
Glass tubes	(to fit the stoppers)	2		Yes	3
Short glass tubes		1		Yes	3
Balloons		1		No	3
Beakers	Jars	1		Yes	3
50 ml beakers	Small jars	2	2	Yes	3, 7
Hand lenses	Magnifying glass	2		Yes	9
“Carrying dishes”	Any small dishes	3		Yes	3, 9, 11
Test tubes	Small jars	3		Yes	3, 10, 12
Thermometers		1		Yes	7, 10
Petri dishes	Jars with lids	2		Yes	7, 12
Low-power, stereo microscopes	Magnifying glass (not as good)	1		Yes	9
Probes	Toothpicks	2		Yes	9
Eyedroppers		1		Yes	9
Bowls	Any containers		4	Yes	9
Tablespoon				Yes	10, 12
1-holed stoppers		2		Yes	12
10 cm glass tubes		2		Yes	12

100 ml graduated cylinders	(to fit the stoppers)	2		Yes	12
Water tubs (large)		1		Yes	12
Large beaker	Large jar			Yes	10
Asbestos pad	Kitchen hot pad			Yes	10
Cookie sheet				Yes	10
Dropper bottles		2		Yes	10
Baking pan				Yes	6
Mortar and pestles	Optional	1		Yes	10
Toothpicks	Optional			No	10
Nail files	Optional			Yes	10
Bunsen burners	Optional	1		Yes	10
Mirrors	Optional	1			10

Sand and Soil

Table A.7 Sand and Soil List

Material	Substitutions or Alternatives	Quantity for Pair, Team or Center	Quantity for Each Class of 32	Reusable Each Class?	Used in Activity
Unsprayed, organic topsoil	Soil from garden, forest or meadow		2 cups	No	9
Clean or sterile fine-grained sand			6 cups	No	9, 10, 12
Dry clay and/or sand			1 cup	No	3

Ordering Information

Materials that must be ordered weeks in advance of use are printed in boldface. If you cannot locate suitable syringes locally, 50 cc or 60 cc Cathada syringes can be ordered from:

SAVIISELPH Center for Multisensory Learning
University of California
Berkeley, CA 94720
(510) 642-8941

"Living" materials can be ordered from Carolina Biological Supply Company. (Note: *Penicillium notatum* MicroKwik Culture.)

Western United States, Alaska, and Hawaii order from:
Powell Laboratories
Call Toll Free 800 547-1733
FAX 503 656-4208

Eastern United States order from:

Carolina Biological Supply Company
Call Toll Free 800 334-5551 (North Carolina customers call 800 632-1231)
FAX 919 584-3399

There are several alternative suppliers of biological materials for the following items:

Disposable Petri Dishes, Polystyrene, Sterile, 60 x 15 mm (also available from medical supply houses)
Sterigel Instant Medium (also available from science supply stores)
Brine shrimp eggs (also available at tropical fish stores)
Penicillium notatum MicroKwik Culture (also available from science supply stores)
Ninhydrin powder (also available from science supply stores)

Overhead Transparency List

If you wish to use transparencies with this guide, you must make your own from the black-line masters provided in the missions.

Table A.8.

Title	Mission
Comparing the Planets	1
Orbital Model	1
ZOOM! Cards	2
A Mars Jar	3
Growth of Microbial Colonies	3
Ice Bath	7
Experiment and Control	11
Measuring Gas Production	12
Gas Production Graphs	12
The Viking Mission	13
A Summary of Life Detection Tests	14

Teacher Background Information

This section applies to the use of Petri dishes in missions 3,6, 9, and 11; and the use of nutrient gelatin in missions **3,** 6, and 11.

Sterile Dishes

It is important to begin with sterilized Petri dishes when growing microbes. There are microbes in the air, in water, on our hands, on gloves, in paper towels—nearly everywhere. These microbes can contaminate exposed Petri dishes. We recommend purchasing commercial Petri dishes that are easy to use, pre-sterilized, and disposable. However, we provide instructions for sterilizing your own Petri dishes, which will be adequate for the missions in this guide (although some field-test teachers have reported problems of contamination and lengthy setup times for media).

Purchasing Sterile Dishes. Sterile, disposable, polystyrene Petri dishes sealed in plastic sleeves can be ordered from Carolina Biological Supply Company. They remain sterile until the sleeve seals are broken.

Sterilizing Your Own Dishes. This is for glass only; plastic dishes will melt. Use a autoclave if you have access to one. Hospitals and colleges often have autoclaves. If not, use one of the following methods:

- **Microwave**: Use dry, clean plastic or glass Petri dishes (six at a time). Close the lids and microwave them at high power for three minutes. Dishes will remain uncontaminated, at least overnight, if left unopened.

- **Oven:** This is for glass only; plastic dishes will melt. Close the lids and heat the Petri dishes in an oven at 150” F for one hour. Turn off the oven and leave the lids on the dishes while they cool.

- **Boiling water:** Pour boiling water into the Petri dishes, let it stand for a minute, and then pour out the water. Rinse the insides of the lids with boiling water and replace them on the dishes.

Nutrient Gelatin

When growing microbes in Petri dishes, an adequate food source must be provided. We recommend purchasing a commercial, easy-to-use product such as Sterigel. However, we provide instructions for making a homemade nutrient agar, which will be adequate for the missions in this guide. The homemade nutrient agar may not set well, and it becomes contaminated easily. Follow directions closely. A trial run is advised.

Purchasing a Prepared Medium. Sterigel Instant Medium can be ordered from Carolina Biological Supply. This medium is sterile, and it usually sets up quickly enough to be prepared in the classroom as it is needed. Follow the enclosed instructions. Sterigel Instant Medium comes in two parts, a liquid and a powder. Once the two parts are mixed together, the medium will gel in about 20 minutes. Because this gel cannot be melted, make up only enough for one class at a time (300 ml of Sterigel Instant Medium for 30 Petri dishes).

Making Your Own Medium. Recipe for a nutrient medium for 30 Petri dishes:

- 3 114-ounce packets of Knox unflavored gelatin
- 1 box Sure-Jell fruit pectin
  refrigerator space
- glass measuring cup
- roll of plastic wrap
- stainless steel soup pan

Knox unflavored gelatin and Sure-Jell fruit pectin are available in supermarkets. This medium must be prepared the day before class, and it must be refrigerated to become solid enough for students to use or transport it. Use a microwave or an oven. To prepare the nutrient gelatin, bring about six cups of water to a boil. Sterilize the measuring cup and the soup pan. Put three 114-ounce packages of Knox gelatin into the pan. Sprinkle 314 teaspoon of Sure-Jell over the Knox gelatin. Use the measuring cup to add three cups of boiling water. Mix by swirling for a few seconds. Pour enough into each Petri dish to coat the bottom. Cover quickly and refrigerate (do not put into freezer!).

Dechlorinated Water

More and more communities are switching from pure chlorine to chloramines (chlorine compounds that contain nitrogen) for treating their water supply. The standard methods

for removing chlorine do not remove the far more stable chloramines. Chlorine is a poison for all aquatic animals, including brine shrimp, microbes, and fish. Whenever you use tap water for an aquarium, or for any aquatic animals, you must make sure that it contains no chlorine in any form. If your water has been treated with chlorine or chloramines, take the following steps:

> **Chlorine.** Begin the dechlorinating process two to three days before you need the water.Run tap water into a container and let it stand uncovered. This is called "aging" the water. Providing aeration by running an aquarium "bubbler" in the water will speed up this process by a day. Chlorine may also be removed with a dechlorinating agent that is sold at aquarium stores. Simple chlorine is removed instantly with this mixture.
>
> **Chloramines.** Removing chloramines requires a special dechlorinating mixture. Chloramines are chemically stable and will not leave water, no matter how long it is "aged." The dechlorinating mixture works instantly and can be used just before the water is needed. You may purchase the dechlorinating mixture at aquarium supply stores.

Resources

Popular interest and continuing discoveries about stars and planets have encouraged the production of resources for young people that focus on space topics. Many have excellent pictures, texts, and even interactive components that can help stimulate interest, provide visual models, and encourage further research as students proceed through their search for life on Venus and Mars.

The following is a list of resources that will be helpful. It is organized by topic to help identify those materials that will be the most helpful at any given stage of the search. No doubt, you will find other resources in your local libraries, stores, and media centers as you explore and as more resources become available.

Student Resources

Highlights of Astronomy—From the Ancients to SETI

Amato, Carol. Astronomy. New York: Smithmark, 1992.

A part of the Breakthroughs in Science series, this book provides a simple history of the major events in astronomy from ancient times to the present. It can serve as a connection with the study of ancient history as well as an historical context for the SETI search. (An additional volume in the series, The Earth, is a history of geology from ancient times.)

Darling, David. *Other Worlds: Is There Life Out There?* Minneapolis, Minn.: Dillon Press,
1985.

One of the Discovering Our Universe series, this book explores the question: Is there life on other planets? The author answers common questions and describes the search for life on other planets in the solar system. He concludes by giving evidence that suggests the possibility of life in other stellar systems and the means by which we might detect it.

Fraden, Dennis. Astronomy. Chicago: Children's Press, 1986.

If student or teacher desires an historic overview of the highlights of astronomy, including what puzzles currently engage astronomers, this volume is excellent. Don't be put off by the "textbook" look of this volume. It is full of interesting facts and engaging questions.

Nourse, Alan E. Radio Astronomy. New York: Franklin Watts, 1989.

AVenture book for young adults, it covers astronomy, from Galilee's early experiments with the telescope to the "Big Bang." This book illuminates some of the amazing mysteries of deep space.

The Solar System

Asimov, Isaac. The Asteroids. New York: Gareth Stevens, 1988.

This title is one in the Library of the Universe series, a collection of books with engaging pictures and easy-to-read text. Look for others, such as Comets and Meteors and Our Solar System, as well as books in the How Did We Find Out? series, which includes one about the evidence that led to the discovery of Pluto.

Gallant, Roy. The Macmillan Booh of Astronomy. New York: Aladdin Books, 1986.

An excellent beginning resource and glossary in both hardback and paperback, this book has accurate information and color pictures about all the objects in the solar system, including asteroids, meteoroids, comets, and even the Oort cloud. In addition, it discusses origins of the solar system and types of stars.

Goodman, Susan. Amazing Spacefacts: Solar System-Stars-Space Travel. New York: Peter Bedrick Books, 1993.

This concise paperback lists many facts and uses many excellent full-color photographs and illustrations. Suitable for middle-school to adult levels.

Sarnoff, Jane, and Reynold Ruffins. Space: A Fact and Riddle Book. New York: Charles Scribner's Sons, 1978.

Detailed information about each solar object is combined with diagrams, colorful illustrations, and witty riddles about space topics in general.

Schwartz, David. How Much Is a Million? New York: Lothrop, Lee & Shepard, 1985.

The immense dimensions of the solar system and the universe pose a real problem for students to imagine. This book can help students visualize these large numbers.

Yenne, Bill. The Atlas of the Solar System. New York: Exeter Books, 1987.
A comprehensive reference on the solar system.

In addition, the following authors have written a number of books on individual solar objects: Isaac Asimov, Franklin Branley, David Darling, Roy Gallant, David Lambert, and Seymour Simon.

Evolution of Our Solar System, Earth, and Life on Earth

Benton, Michael. *The Story of Life on Earth.* New York: Warwick Press, 1986.
Michael Benton's book traces the origins and development of life on Earth. It focuses on the use of evidence from ancient rocks to determine the age of Earth, how continents are moving, and what life-forms have existed. It also includes useful diagrams of the arrangement of the continents during key eras.

Branley, Franklin. *The Beginning of the Earth.* New York: Crowell, 1972.
This is a simple version of the formation and evolution of Earth. Use this book for its lively illustrations or read it without showing illustrations so that students can make their own storyboard drawings of Earth's early formation.

Burton, Virginia. *Life Story.* Boston: Houghton Mifflin, 1962.
Although this classic is often used with young children, its five-act-play format with prologue and epilogue introduces life in the Milky Way Galaxy in an easily told story. It can be used as a springboard for discussion of questions about the evolution of Earth and its life, or as a format for a student play or just as enjoyable literature.

Gonick, Larry. *The Cartoon History of the Universe.* 7 vols. New York: Doubleday, 1990.
A tongue-in-cheek cartoon history that appeals to the young adolescent mind, this paperback volume is filled with facts. This is the kind of book that gets lost in a desk because the borrower won't give it up.

Minelli, Giuseppe. *The Evolution of Life.* New York: Facts on File, 1986.
Another picturesque history of the formation of our planetary system and the development of life on Earth.

Teacher Resources

Books and Articles

Gallant, Roy. *Before the Sun Dies: The Story of Evolution.* New York: Macmillan, 1989.
Although this is considered a children's book, it is a complete, well-written volume on the evolution of the solar system, Earth, and life. It is an excellent resource for a teacher about to plunge into these subjects.

Goldsmith, Donald. *The Quest for Extraterrestrial Life: A Book of Readings.* Mill Valley, Calif.: University Science Books, 1980.

This is a complete reference for adults that explains many of the scientific concepts that make a search for extraterrestrial life plausible. It covers the historical perspective, the origins of life, and the search for life in the solar system, as well as intelligent life outside our solar system. This is a good, very technical reference *book.*

Goldsmith, Donald, and Tobias Owen. *The Search for Life in the Universe.* Redding, Mass.:Addison-Wesley, 1980.

This is a complete reference explaining many of the scientific concepts that make a search for extraterrestrial life plausible.

McDonough, Thomas. *The Search for Extraterrestrial Intelligence: Listening for Life in the Cosmos.* New York: John Wiley, 1987.

Thomas McDonough has written a history of the search for extraterrestrial beings, including the hoaxes, the connections with science fiction, the many discoveries, and the people who have made the search reality. The book is written in a humorous and accessible style.

Regis, Edward, ed. *Extraterrestrials: Search and Alien Intelligence.* New York: Cambridge University Press, 1985.

This book is a series of thought-provoking essays on the possible existence of extraterrestrial intelligence and the methods, meanings, and consequences of contact.

Sagan, Carl, et al. *Murmurs of Earth: The Voyager Interstellar Record.* New York: Ballantine Books, 1978.

This classic book tells the story of the *Voyager* Record, Earth's only attempt to send a message describing humanity to the stars. This book is out of print, but it is still available when purchased with a CD-ROM that contains all the photographic images and music sent with *Voyager*.

Sobel, Dava. “Is Anybody Out There?” *Life,* September 1992, 60-64.

This *Life* magazine article begins with a quote by Jill Tarter's eight-year-old daughter that puts into perspective what her mother and other SET1 scientists do every day and why they do it. Nice graphics and pictures of Jill Tarter and Frank Drake. Following the article is a one-page opinion by Arthur C. Clarke entitled “Why Is It Important?” that discusses the human need to know if we are really alone.

Wilford, John Noble. *Mars Beckons: The Mysteries, the Challenges, the Expectations of Our Next Great Adventure in Space.* New York: Alfred A. Knopf, 1990.

A complete history of our involvement with the red planet, including analyses of what Mars is like today, what it may have been like in the past, and the possibility of life on Mars.

Magazines

Sky and Telescope. Sky Publishing Corporation. Monthly. Belmont, Mass.
Full of excellent photography and up-to-date articles, this magazine is aimed primarily at the hobbyist astronomer. A good source of practical information about small telescopes.

Additional Activities

Exploratorium Teacher Institute. *The Exploratorium Science Snackbook.* San Francisco: The Exploratorium Teacher Institute, 1991.

This book has 107 "snacks," which are short activities based on display exhibits in the Exploratorium, a hands-on science museum. Snacks are not limited to astronomy, but include excellent demonstrations and activities for a variety of science courses. These are excellent! Order by calling 1-800-359-9899, or mail to Exploratorium, Mail Order Department, 3601 Lyon Street, San Francisco, CA 94123. Call (415) 561-0393 for more information.

Gardner, Robert. *Projects in Space Science.* New York: Simon and Schuster, 1988.

This book has a number of additional educational activities, such as measuring the Sun's diameter and building a spectroscope, as well as explanations of the scientific principles of motion and their relevance to space travel. This reference is for the student (or teacher) who wants more.

Schaaf, Fred. Seeing the Sky: 100 Projects, Activities, and Explorations in Astronomy. New York: John Wiley, 1990.

This book is a hands-on introduction to the art and science of astronomical observation written for the middle-school level and up. All activities are no-cost experiments that require only the naked eye and common household materials.

Shields, John Potter. The Amateur Radio Astronomer's Handbook. New York: Crown, 1986.

This book is not meant for the classroom. It is a practical guide to building your own radio telescope to "listen" to the sounds of stars and the electromagnetic disturbances of the Sun and Jupiter, to detect meteors, and to conduct your own search for extraterrestrial intelligence. This might be used as a class, school, or neighborhood project.

Sutter, Debra, et al. The Moons of Jupiter: Teacher's Guide. Berkeley: Lawrence Hall of Science, University of California at Berkeley, 1993.

This is one volume in the fantastic Great Explorations in Math and Science (GEMS) series. Each volume has many hands-on lesson plans. This volume is for grades 4-9. Other titles in this series include Earth, Moon, and Stars (for grades 5-9) and Experimenting with Model Rockets (for grades 6-10). Call (510) 642-7771 for more information.

Tennessee Space Week. Lesson Plan Booklet. Nashville: Tennessee Space Week, 1992.

Tennessee Space Week, NASA, and the U.S. Space Camp have compiled 64 space-related activities for various grade levels from K through 12. These activities are based on language arts, social studies, art, and math tie-ins. Order from Tennessee Space Week Mission Control, Tennessee Education Association, 801 Second Ave. North, Nashville, TN 37201-1099; Call (615) 242-8392 for more information.

Resource Centers

SETI teacher resource guides, posters, and videos will be available from the following source as they are produced. Presently, there are two posters produced by SETI artist Jon Lomberg. For information, write to:

SETI Institute
515 North Whisman Road
Mountain View, CA 94043

For additional NASA teacher materials, including available videos on Mars and Venus and information about educational programs, contact the following or the NASA Teacher Resource Center nearest you:

Ames Research Center
Teacher Resource Center
Moffett Field, CA 94035
(650)-604-3574

Education Horizons is a free newsletter. It's chock full of the latest NASA information, research, and educational resource materials for teachers. Write to:

Educational Horizons
NASA
Educational Publications Services, XEP
Washington, D.C. 20546

The Jet Propulsion Laboratory, through its Public Education Office, sponsors educators conferences and provides materials on planetary missions. To be put on their mailing list, write to:

Public Education Office
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109-8099

The Astronomical Society of the Pacific produces an excellent, free, quarterly newsletter for teachers of grades 3-12 that supplies clear, nontechnical articles on developments in astronomy, practical lessons for the classroom, and lists of books and audiovisual resources. The Society also has a catalog of slide sets, video and audio tapes, computer

software, posters, and gifts, all related to astronomy. To be put on their mailing list, or to receive a catalog, write to:

Astronomical Society of the Pacific
Teachers' Newsletter, Dept. N
390 Ashton Avenue
San Francisco, CA 94112

The Planetary Society is a nonprofit organization for people interested in space exploration. Members receive *The Planetary Report*, a bimonthly magazine with beautifully illustrated articles. The Society has an annual catalog of books, slide sets, video tapes, models, computer software, posters (including Jon Lomberg lithographs), T-shirts, and gifts, all related to astronomy. To join, or to receive a catalog, write to:

The Planetary Society
65 North Catalina Avenue
Pasadena, CA 91106

Films, Videos, Laser Discs, and Computer Software

Consult your local audiovisual sources and/or the NASA Teacher Resource Center in your area for additional audiovisual materials.

Distant Suns. IBM compatible. San Luis Obispo, Calif.: Virtual Reality Labs, Inc., 1994. A complete astronomy-reference program for ages 12 to adult that allows its user to see the stars that will be visible on any given date.

The Great Solar System Rescue. [IBM and Macintosh compatible]. Watertown, Mass.: Tom Snyder Productions, 1992. Laser disc.

This interactive laser disc for grades 5-8 is an excellent learning extension that requires cooperative problem solving as students become teams of experts searching for lost probes in the solar system. It also contains a video library and hands-on experiments. This is a challenging and exciting resource for those with laser disc and computer capabilities. Call 800-342-0236 for more information.

Images of Mars. [Macintosh]. Baltimore, Md.: Space Science Telescope Institute, 1994. CD-ROM, 2 discs.

This electronic picture book contains reprocessed photos of the red planet take during the Viking mission. Students will find this an informative introduction to Mars and its beautiful, but hostile, terrain.

Magellan Highlights of Venus. [Macintosh]. Baltimore, Md.: Space Science Telescope Institute, 1993. CD-ROM, 2 discs.

This electronic picture book is a geologic tour of Venus using images from Magellan's first 243-day mapping cycle.

Powers of Ten. [Eames Demetrios and Shelly Mills]. 8 min. Santa Monica, Calif.: Pyramid, 1989. Videocassette.

From a picnic on the ground to the outer reaches of space by powers of 10, this video for grades K-12 graphically supports the large numbers involved in solar sizes and distances.

Sim Earth. [Maxis Software]. Orinda, Calif,: Maxis, 1990.

This is a popular computer simulation that allows players to manipulate the conditions of Earth's environment. Students learn through experience the delicate balance that exists between each of the variables that allow Earth to remain a habitable planet. Call 800-23 MAXIS for more information.

The Solar System. [Allied Film and Video]. 20 min. Chicago, Ill.: Britannica, 1978. Videocassette and 16mm filmstrip.

Using animation and NASA footage, students take a voyage through space, view the origins of the solar system and learn the geologic makeup of each planet.

Where in Space Is Carmen Sandiego? [DOS and Macintosh]. Novato, CA: Br~rderbund, 1993. Software.

This new product in the Carmen Sandiego software series exploits the urge to solve a mystery by weaving in clues that require players to know or find out information about the solar system. Students find this adventure an enjoyable way to use their knowledge. Call 800-521-6263 for more information.