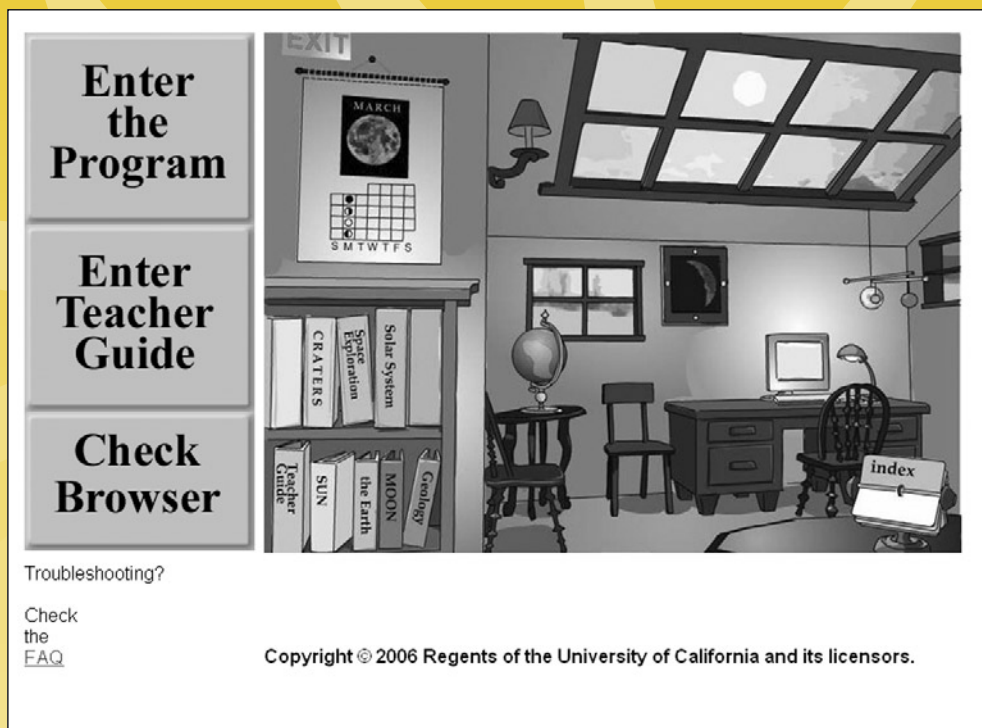


## INTRODUCTION TO THE MULTIMEDIA (VERSION 2.0)



### OVERVIEW

The *FOSS Planetary Science* CD-ROM is an integral part of the **Planetary Science Course**. It provides students with an opportunity to access and interact with simulations, images, videos, and text that can enhance their understanding of planetary science concepts. Different sections of the CD-ROM are incorporated in several activities during the course. You will sometimes use the multimedia to make presentations to the entire class on topics such as crater formation and Moon phases. At other times, individuals or small groups of students will work with the multimedia to review simulations, find readings, and do research. A database of close to 1000 text, video, and image records provides students with an interactive encyclopedia as they search for answers to questions about the celestial bodies found in the Solar System.

This multimedia component is not optional. At a minimum, you should have one computer with either a CD-ROM drive or a local copy of the CD-ROM files, and a large-screen monitor available for use with the entire class. The following guide provides information to help you set up the simulation on your computers, a tour through the components of the multimedia, and some ideas on how to guide student research using the CD-ROM database.

## SYSTEM REQUIREMENTS

### MACINTOSH VERSION

A Power Macintosh G3 or higher, with at least 48 MB of RAM (64 MB recommended), OS 9.x or OS X 10.1 or later, 4X CD-ROM (faster recommended), 16-bit color minimum (thousands of colors) at a resolution of at least 800 × 600.

All of the multimedia is browser-based, so you will need to have a compatible Web browser installed on your system. Compatible browsers are Internet Explorer 5.1 for OS 9 users, Internet Explorer 5.2 for OS X users, and Netscape 7.0 or later for all Macintosh systems.

### PC VERSION

Pentium-based (Pentium II or higher) or compatible computer with 48 MB of RAM (64 MB recommended), Windows 98, ME, 2000, or XP, 4X CD-ROM (faster recommended), 16-bit color video card minimum (thousands of colors) at a resolution of at least 800 × 600.

All of the multimedia is browser-based, so you will need to have a compatible Web browser installed on your system. Compatible browsers are Internet Explorer 5.0 or later for Windows 98 and 2000, Internet Explorer 5.5 for Windows ME, and Internet Explorer 6.0 or later for Windows XP. Netscape 7.0 or later is compatible on all PC systems

## GETTING STARTED

In all cases, your browser will need to have certain plug-ins installed, namely Flash 7 (or later), Shockwave 8.5 (or later), and QuickTime 6 (or later). If you don't already have these plug-ins on your system, they are available either from the CD-ROM or via the internet.

When you run the Planetary Science program, it provides an option to verify that your browser is configured properly. Choosing this option will take you step-by-step through all the important features that may require additional installation, including Flash 7, Shockwave 8.5, and QuickTime 6.

We do not provide support for either Flash or QuickTime. For Flash/ Shockwave updates and support, go to Macromedia's player support homepage.

[www.macromedia.com/support/players](http://www.macromedia.com/support/players)

For QuickTime updates and support, go to QuickTime's homepage.

[www.apple.com/quicktime](http://www.apple.com/quicktime)

or

[www.apple.com/support/quicktime](http://www.apple.com/support/quicktime)

### MACINTOSH

Get your system ready to run the Planetary Science program.

- Turn on virtual memory (OS 9 only). Test the speed and stability of the Planetary Science program with different amounts of virtual RAM. Allocating too much will slow down your machine considerably. Apple recommends running 1 MB of virtual

RAM. You will have to restart your machine each time you change the virtual memory settings.

- Set your monitor to at least thousands of colors. The program runs best with millions of colors, but this setting is not required. You may have to set your monitor to a lower resolution in order to get more colors. For OS 9, use the Monitor Control Panel (accessible either from the Systems Folder or under the Apple on the menu bar) to set color and screen resolution. For OS X, use the Displays setting in the System Preferences (accessible either from the Dock or under the Apple on the menu bar).
- Make sure the sound is turned on and set to the desired level. For OS 9, adjust the sound through the Sound Control Panel. For OS X, use either the Sound System Preferences panel or the volume control buttons on your keyboard.

Insert the CD into your CD-ROM drive. Double-click on the FOSS\_PS disk icon to open the FOSS\_PS folder window, and then open the file named "Planetary Science.htm." This will launch your browser and load it with the program's start page.

1. FOSS Planetary Science icon. Double-click to start the program.

2. Content folder.



The first time you run the program, select the option to Check Browser, which will take you step-by-step through the verification and installation process. If you try to start the program without first going through this process, you could encounter program malfunctions.

**PC**

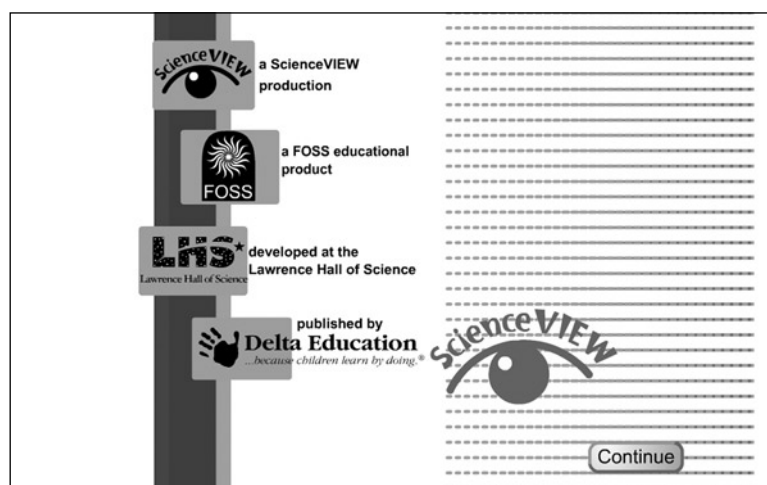
Get your system ready to run the Planetary Science program.

- Set your monitor to at least thousands of colors. The program runs best with millions of colors, but this setting is not required. You may have to set your monitor to a lower resolution to get more colors. Use the Display Control Panel to set color and monitor resolution under Settings, or right-click on the desktop and choose Properties.

- Make sure the sound is turned on and set to the desired level. Adjust the sound through the external speakers.

The Planetary Science program should launch automatically once the CD is inserted into your CD-ROM drive. If your autorun feature is not turned on or an error has occurred, open the FOSS\_PS CD-ROM and double-click on the file Planetary Science.htm. Your browser will launch and load with the program's start page.

The first time you run the program on a new system, select the option to Check Browser, which will take you step-by-step through the verification and installation process. If you try to start the program without first going through this process, you could encounter program malfunctions.

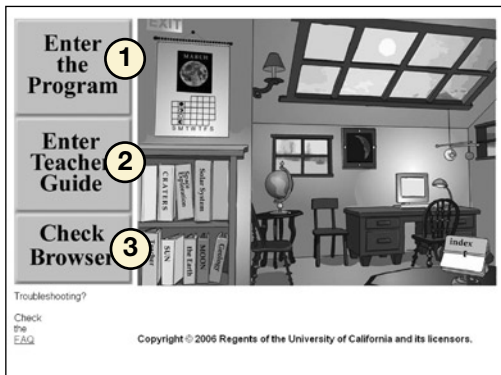


*Credits screen*

# PROGRAM BASICS

## ENTERING THE PROGRAM

Upon launching the program, the user can either enter the CD-ROM or check the browser set up. There are two ways to enter the CD-ROM, either through the Resource Room by clicking Enter the Program, or through the Teacher Guide by clicking Enter Teacher Guide.



*Launch screen*

The Check Browser option verifies that the browser has all the required plug-ins installed and walks through any needed set-up procedure. To quit the program, just exit the browser.

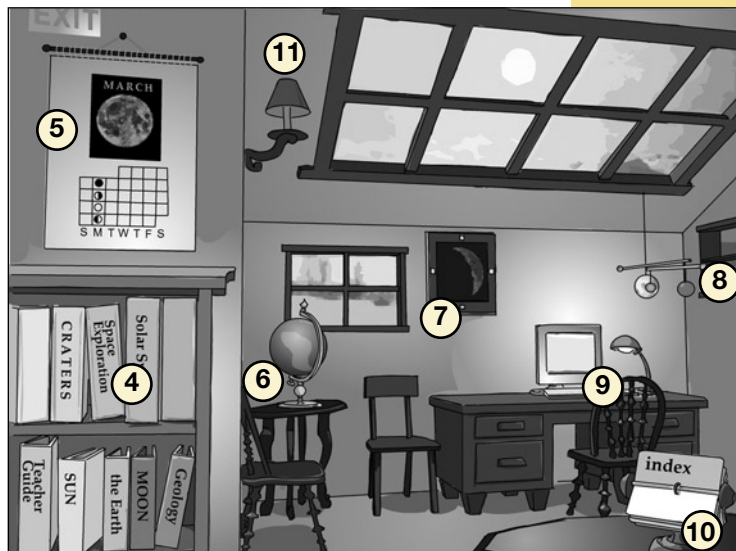
## PLANETARY SCIENCE RESOURCE ROOM

When you click Enter the Program on the launch screen, the Planetary Science Resource Room appears. Rolling the mouse over different active objects in the room causes them to highlight or move, indicating their access to different sections of the CD-ROM. Clicking on such an object will take you to a binder or an activity.

The active objects are

- The bookcase with binders. One binder is a Teacher Guide. Binder subjects contain images and text.
- The Lunar Calendar, which calculates the phase of the Moon for a given date.
- The morphing globe, which brings up the Round Earth/Flat Earth Simulation.
- The Moon picture on the wall, which brings up the Phases of the Moon Simulation.
- The planet mobile, which brings up the Day/Night Simulation.
- The computer screen, which brings up the Digitizer.
- The card file, which is an index to the subject binder pages.
- The wall lamp, which allows you to see the full program credits.

1. Click to enter the Planetary Science Resource Room.
2. Click to enter the Planetary Science Teacher Guide.
3. Click to check browser.
4. Binders
5. Lunar Calendar
6. Round Earth/Flat Earth
7. Phases of the Moon
8. Day/Night Simulation
9. Digitizer
10. Binder index
11. Credits



*Planetary Science Resource Room*

Each of these different parts of the Planetary Science CD is discussed in detail in the following sections.

### GENERAL NAVIGATION AND PRINTING TOOLS

The *FOSS Planetary Science* CD-ROM uses your browser's standard navigational controls, including the Back button, the Refresh button, and opening links in new windows. Additional navigational features specific to the program are described in the remainder of this guide.

To print a page from the CD-ROM, you can use **⌘-P** on the Macintosh or **Control-P** on the PC to print the active window. The window's contents will be printed out and scaled to fill a single page.

1. *Forward play arrow. Click once to play the movie. Click again to stop the movie.*
2. *Fast forward/reverse arrows. Click and hold to fast forward or reverse the movie. Some movies will not run smoothly in fast forward or reverse.*

### QUICKTIME MOVIES

The movies that appear in this program are in QuickTime format. When a control bar appears at the bottom of the movie, click the single right-hand arrow button on the left-hand side of the control bar to run the movie. Click this button a second time to stop the movie. Click and drag the slider on the control bar to move at your own pace through the movie. If the movie has sound, a button with a speaker icon will appear on the far left side of the control bar. Click it and drag to adjust the sound level of the current movie.

### QUITTING THE PROGRAM

To exit the program, just quit your Web browser. You can also accomplish this by using **⌘-Q** on the Macintosh or **Alt-F4** on the PC. If you wish to use your Web browser for other purposes, there's actually no need to quit out of it. In that case, just go to another Web page and the browser will handle everything.



## TROUBLESHOOTING

If you encounter any trouble using this CD-ROM, the first place to look is on the Frequently Asked Questions page, accessible both directly from the program's start page and from within the Check Browser section of the program.

**On Macintosh OS 9**, restarting your computer with minimal extensions (the Base Set for your system) may increase the stability of the program. You can change your extensions through the Extension Manager Control Panel. See the *Macintosh User's Guide* (print) or Macintosh OS Help (located under Help on the menu bar) for more information.

**On the PC**, restarting your computer before you use the Planetary Science program may increase the stability of the program.

If you start experiencing problems while running the program, quit and restart the computer. If problems persist, you may be experiencing systemwide problems on your PC, such as driver conflicts or other errors.

**Technical Support.** If you have problems running the *FOSS Planetary Science* CD-ROM and your technical assistants cannot help, please send an e-mail to [foss@berkeley.edu](mailto:foss@berkeley.edu).

### RUNNING THE PROGRAM FROM YOUR HARD DRIVE

You may find that the limited speed of your system's CD-ROM drive causes the program to delay when loading media. To improve performance in this situation, or simply as a matter of convenience, it is possible to copy all of the program files from the CD-ROM onto your hard drive (see the CD-ROM license agreement). The following instructions apply to both Macintosh and PC users.

Create a new folder on your hard drive, and give it the name FOSS Planetary Science. With the *FOSS Planetary Science* CD-ROM in your CD-ROM drive, copy the entire top-level folder named "Content" from the CD-ROM into the new folder on your hard drive. Then, copy the Planetary Science.htm file from the CD-ROM into this folder.

You should now be able to launch and run the program directly from your hard drive, by double clicking on the Planetary Science.htm file.

## THE TEACHER GUIDE

1. Click a line to learn more about an investigation.
2. Click to return to the Resource Room.
3. Part description or goals.
4. A list of parts. Click a title to learn about the part.
5. Multimedia components for a part. Click title to retrieve component.

You can enter the Teacher Guide at startup from the launch screen or any other time by clicking on the Teacher Guide button in the Resource Room. The Teacher Guide portion of the CD relates the multimedia components of the course to the *FOSS Planetary Science Teacher Guide*.

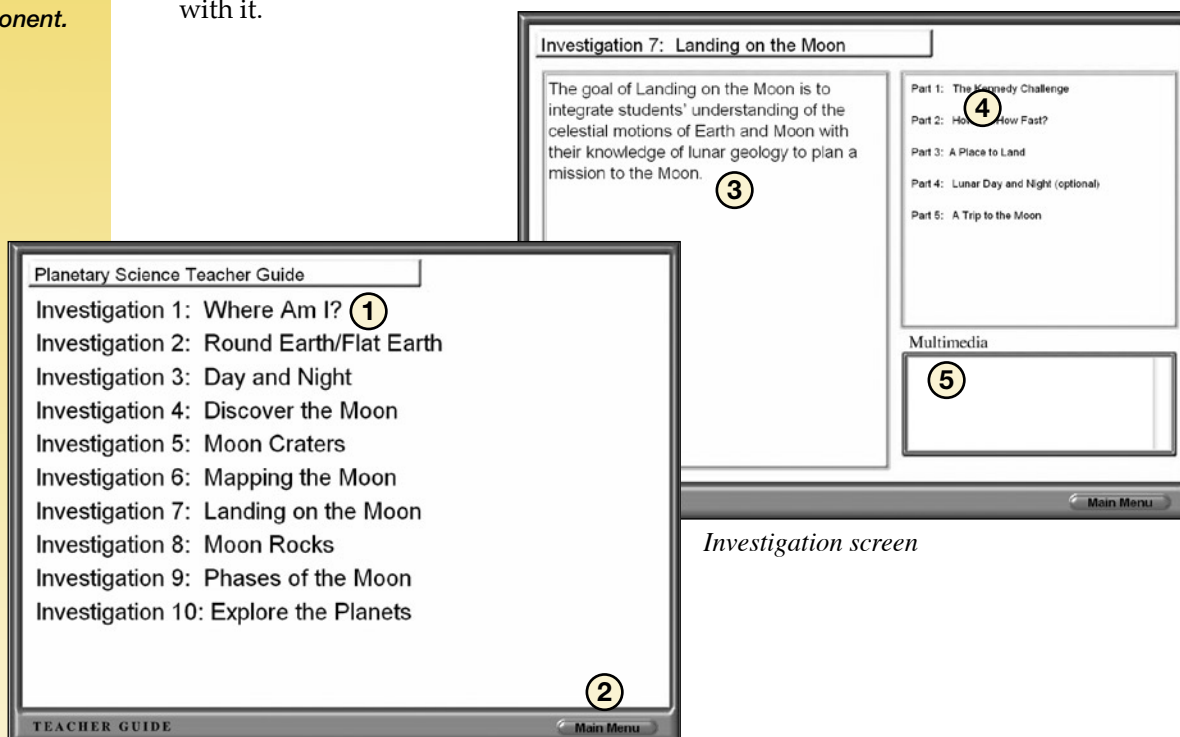
The first screen of the Teacher Guide is a list of all the investigations in the course. Click an investigation to retrieve information about it.

Each investigation screen shows

- A list of the parts in the investigation. Click the part title to bring up a brief description of the part and a list of multimedia components associated with it.

- The goals of the investigation.
- A list of multimedia associated with a part. To go to a multimedia component, click its title in the box. (When you leave the multimedia component, you will return to the Resource Room, not the Teacher Guide.)

Clicking the Main Menu button on the Teacher Guide investigation list takes you to the Resource Room.

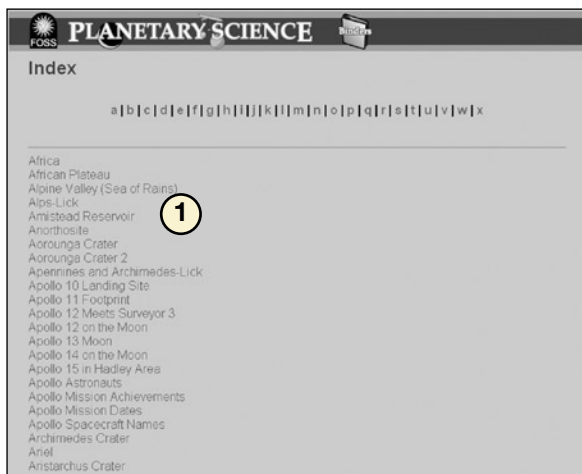


*Investigation screen*

*Teacher Guide investigation list*

## SUBJECT BINDERS

The binders labeled "Craters," "the Earth," "Geology," "the Moon," "Solar System," "Space Exploration," and "Sun" contain pictures, movies, and text concerning a particular subject. You can open a binder by clicking it in the Resource Room or by selecting a page in the Index.



Subject-binder index

Clicking the rotary card file in the Resource Room brings up an index of all the page titles in alphabetical order. Click a title to retrieve the page. Clicking the binder takes you to its table of contents. You can always get back to the table of contents by clicking the Contents link at the top and bottom of the screen.

It is also possible to navigate directly between binders, by clicking on the text labels at the left of the page. This makes it easy to access the information found in all of the binders without having to refer to the Resource Room.

Select a topic by any of these methods.

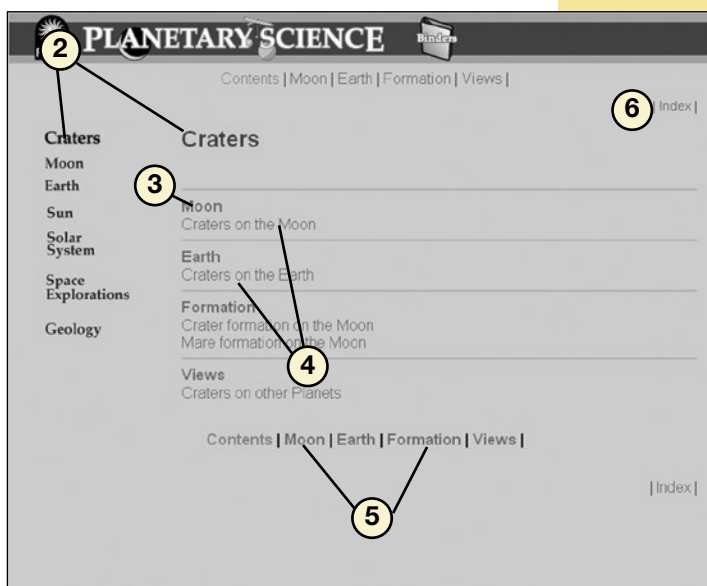
- Clicking a chapter title.
- Clicking a subject title within a chapter.
- Clicking the chapter links at the top or bottom of the screen.

From the topical chapter contents list, choose a title in blue to retrieve that page.

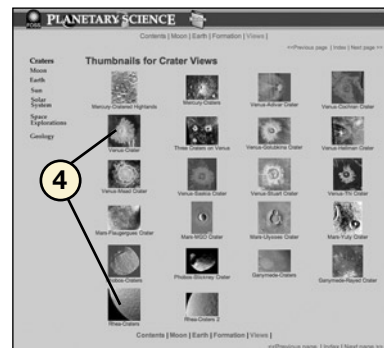
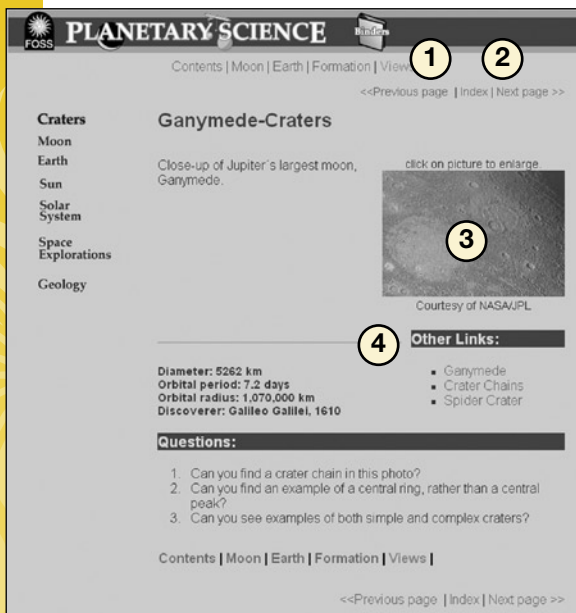
From each binder page you can

- Go to a chapter by clicking its link.
- Turn to the next binder page by clicking the Next page link.
- Turn to the preceding binder page by clicking the Previous page link.
- Skip to any previously viewed page using the browser's back button and recent pages memory.

1. Subject-binder page titles. Click to view page.
2. Binder title
3. Chapter title
4. Subject title
5. Chapter title links
6. Link to Index



Topical chapter contents list



Thumbnail index

**BINDER PAGE DESCRIPTION**

Binder pages come in several formats.

**Picture record pages** have an image, information, questions about the image, and links to other relevant pages in the binder.

- Click a title in Other Links to retrieve that page.
- Click the picture to view a larger copy of the same picture.

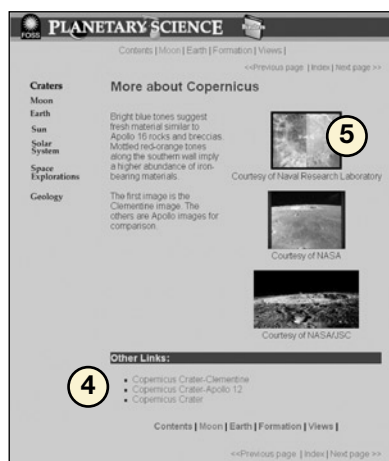
**Text record pages** have more information about a subject. Each image on the right-hand side links to a picture record page. Click either an image or a title under Other Links to retrieve a picture record page.

**QuickTime record pages** have a QuickTime movie with text information. Click a title in Other Links to retrieve that binder page. See the section called QuickTime Movies on page 456 for more about viewing QuickTime videos.

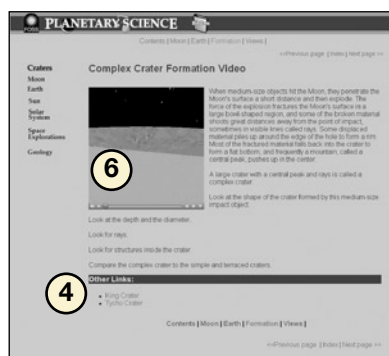
**Thumbnail index pages** have the small images from the picture record pages in the following section. Click an image to retrieve the corresponding picture record page.

1. Click to go back one page.
2. Click to go forward one page.
3. Click to enlarge picture.
4. Links to other binder pages. Click title to retrieve other pages.
5. Click to retrieve picture record page.
6. QuickTime movie

*Picture record*



*Text record*



*QuickTime record*

**CRATER LOCATOR PAGES**

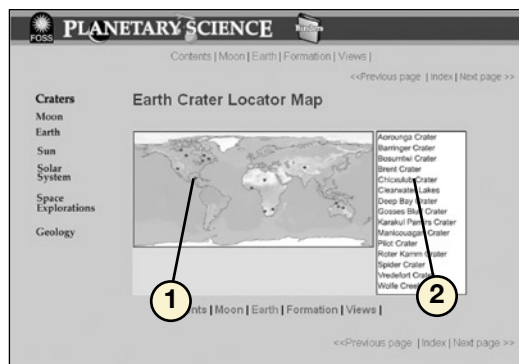
The Earth Crater Locator and Moon Crater Locator give the physical location of terrestrial or lunar craters. The Earth Crater Locator shows up in the Earth, Craters, and Geology binders; the Moon Crater Locator appears in the Moon, Craters, and Geology binders.

To use the Moon Crater Locator,

- Roll the mouse over the Moon to reveal the names of different craters and point to their location.
- Once a name appears, click to retrieve the picture record for that crater.
- Rolling the mouse over a name in blue in the accompanying text box shows a pointer for that crater. Click on the name to retrieve a picture record page.

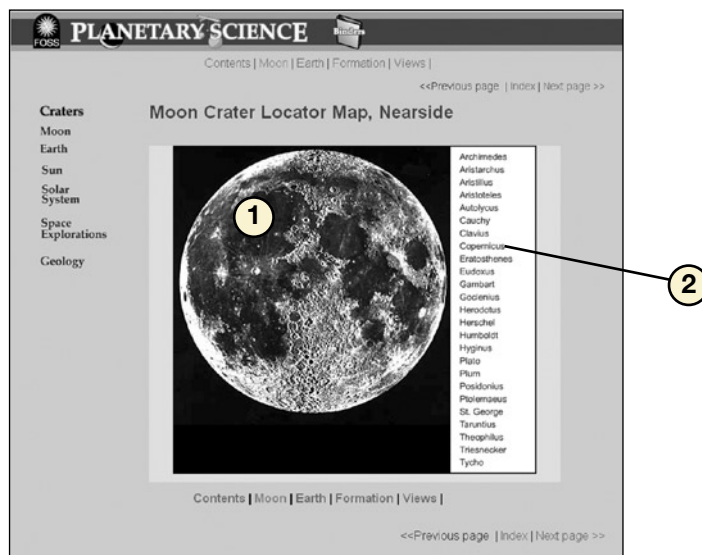
To use the Earth Crater Locator,

- Point to a red spot to reveal the name of the crater in that location.
- Clicking a red spot retrieves the picture record for that crater.
- Rolling the mouse over a name in the accompanying text box shows a pointer for that crater. Click on the name to retrieve a picture record.



*Earth Crater Locator Map*

1. Crater location. Click to retrieve picture record page.
2. Crater name. Roll over for location. Click to retrieve picture record page.



*Moon Crater Locator Map*

1. Click to view contents of binder.
2. Click names to view thumbnail pages.
3. Day and Month sliders. Choose the date by moving the sliders or entering numbers in the boxes.
4. Latitude and Longitude sliders. Choose the latitude and longitude by moving the sliders or entering numbers in the boxes.
5. North/south and east/west toggle buttons. Use with the Latitude/Longitude sliders to indicate direction.
6. Length of shadow at given date, latitude, and longitude.
7. Animated representation of meterstick and shadow.

### SOLAR SYSTEM PLANET LOCATOR

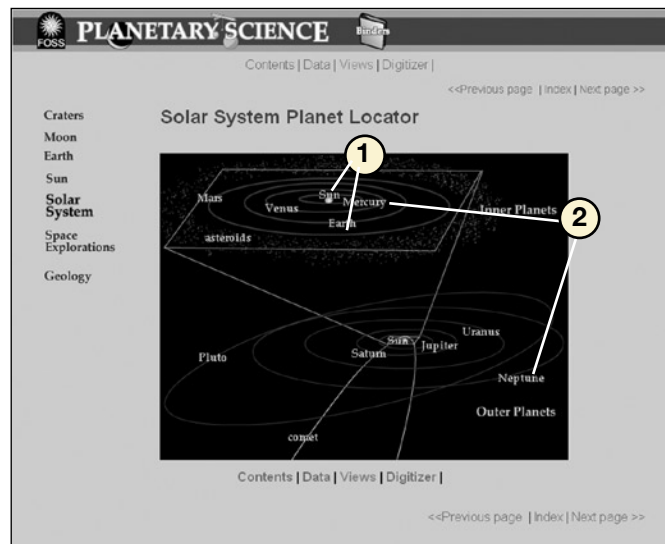
The Solar System Planet Locator is the first page of the Views chapter in the Solar System binder. Clicking Earth and Sun opens their binder to the table of contents. Clicking the names of the other planets and celestial bodies retrieves thumbnails for that object.

### SHADOW DATA

The Shadow Data page calculates the length of the shadow of a meter-long stick on any day at any location. It is in the Shape chapter of the Earth binder.

You can enter the day, month, latitude, and longitude three ways.

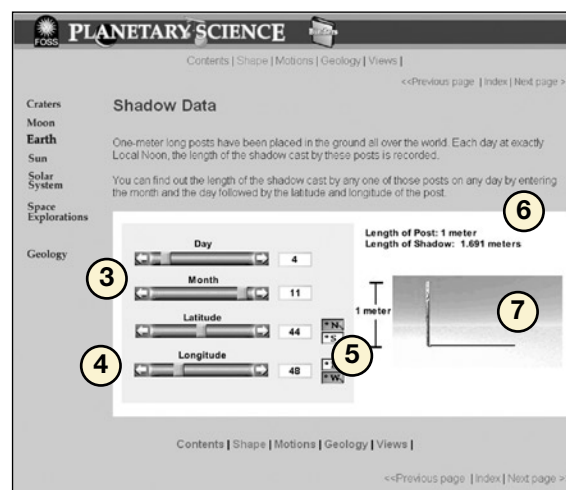
- Click the arrows at the end of the slider bar to change the numbers sequentially by one unit.
- Slide the yellow box on the slider bar to change the units rapidly in sequence.



Solar System Planet Locator

- Enter positive numbers in the boxes next to the slider bars.

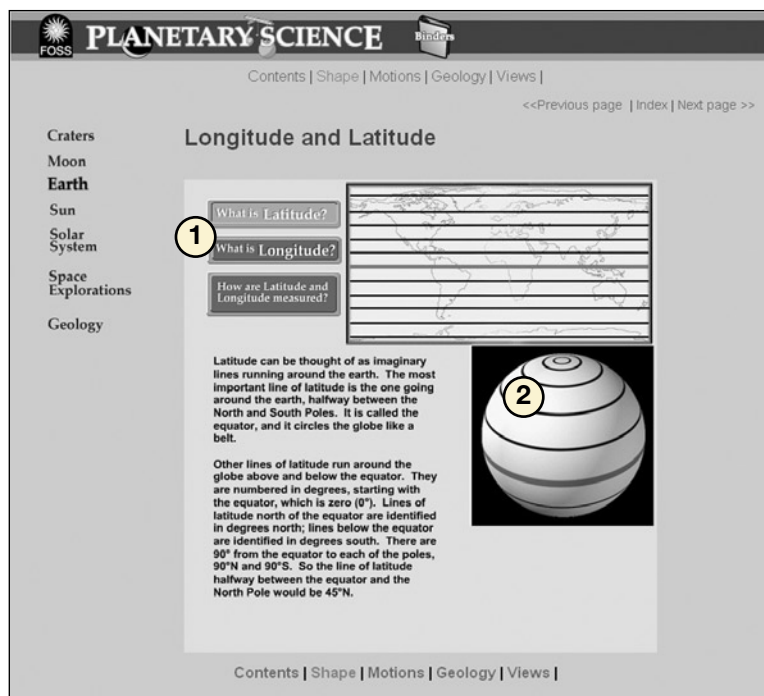
Use the north/south and east/west toggle buttons to indicate direction north/south of the equator and east/west of the prime meridian. The length is given in meters in the box above the representation of the proper shadow length.



Shadow Data page

**LATITUDE AND LONGITUDE**

The Latitude and Longitude page is found in the Shape chapter of the Earth binder. Clicking the boxes containing the questions “What is latitude?,” “What is longitude?,” or “How are latitude and longitude measured?” will answer the questions by changing the graphics and text.



*Latitude and Longitude page*

1. Click buttons to learn about latitude and longitude.
2. Pictures help answer a question.

## SIMULATIONS

The *FOSS Planetary Science* CD-ROM has several simulation programs: Round Earth/Flat Earth (Earth binder), Day/Night (Earth binder), Lunar Calendar (Moon binder), Phases of the Moon (Moon binder), and Digitizer (Solar System). Accessing a simulation through a binder or the Index brings up its overview page. Accessing a simulation from the Resource Room bypasses the overview page.

**1. Simulation button. Click to go to the simulation.**

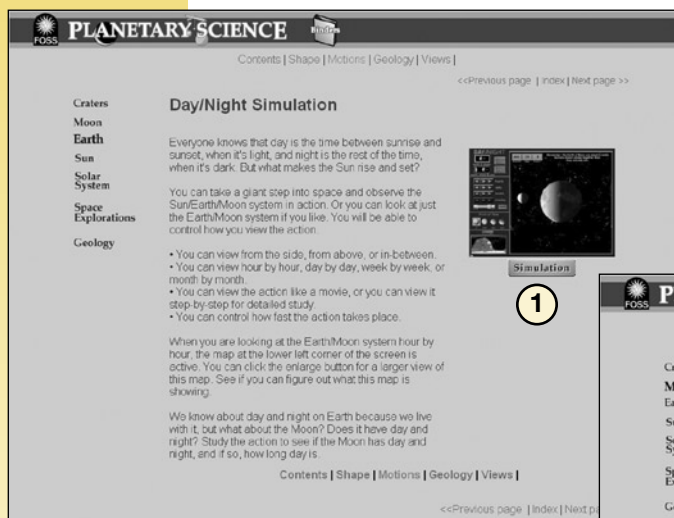
The Overview pages briefly describe each simulation. They include

- Detailed instructions on how to operate the simulation.
- A Simulation button to reach the simulation screen.
- An image of the simulation screen.

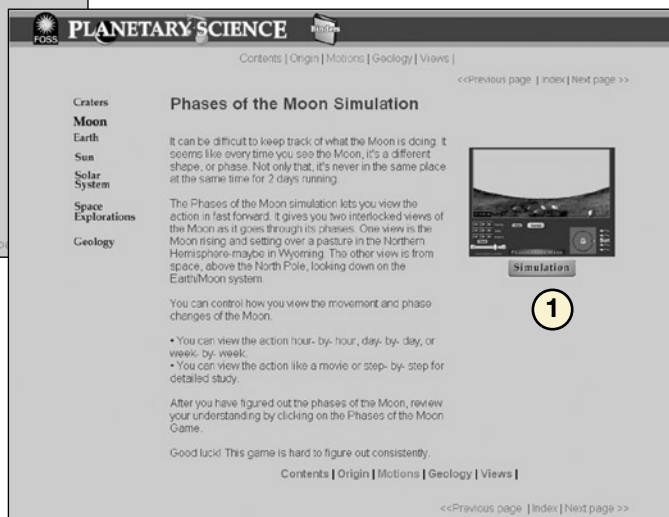
Many of the simulations provide a Help button, which will take you to a Help page. Use the Return button to return to the simulation from the Help page.

To use a Help page, roll your cursor over the feature you want to learn about. The text that appears explains that feature.

Most simulations have movies. You control them using forward and reverse arrows, similar to QuickTime controls. These movies do not start automatically. You need to click on the right arrow control to start playing a movie.



*Overview page for Day/Night Simulation*



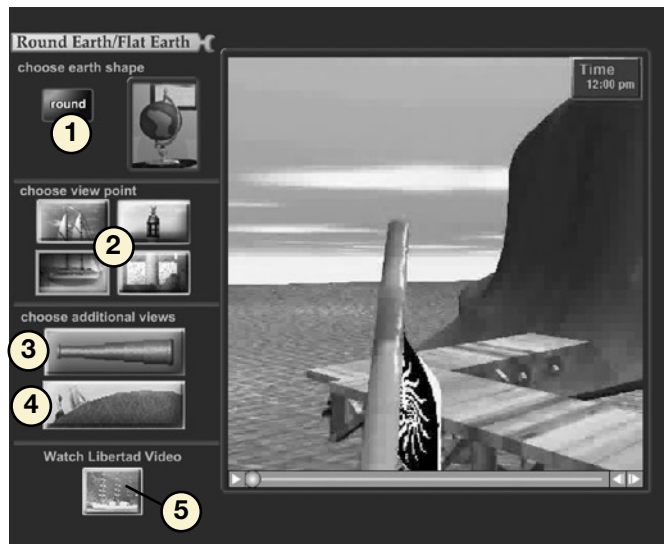
*Overview page for Phases of the Moon Simulation*

### ROUND EARTH/FLAT EARTH

The Round Earth/Flat Earth simulation demonstrates the different observations one would make of a sailing ship on a round Earth versus a flat Earth, introducing the concept of line of sight.

You can enter the simulation directly through

- The morphing globe in the Resource Room.
- The Overview page, accessed through the Index or through the Round Earth/Flat Earth chapter in the Earth binder.



Round Earth/Flat Earth screen

There are two types of Earth—round and flat. You can toggle between these Earth types by clicking the round (flat) button in the top left-hand corner.

Each type of Earth has four viewpoints.

- From the deck of the boat
- From the crow’s nest of the boat
- From the beach deck (the dock)
- From the lighthouse

You can choose any of these views with the four buttons under “choose view point.”

Each viewpoint has a telescopic view, which overlays the movie. You can toggle this view on/off with the telescope button under “choose additional views.”

A line-of-sight view can be chosen with the side-view button under “choose additional views.” The view overlays the movie.



The movie is controlled through the QuickTime control bar. If you stop the movie at any time and change the view, the new movie will pick up where the first movie left off. The timer in the upper right-hand portion of the movie verifies that the movie resumes at the same point.

In addition to the animated movies of a sailing ship, you can watch real footage of the *Libertad* sailing away from San

Francisco harbor. View this QuickTime movie by selecting the Libertad button at the bottom of the screen. This movie is also accessible from the Earth binder.

1. Round Earth/Flat Earth Selector button. Toggles between round and flat.
2. Viewpoint buttons. Choose between crow's nest, beach deck, ship deck, and lighthouse.
3. Telescopic viewpoint
4. Line-of-sight viewpoint
5. Click to view Libertad movie.

1. Earth & Moon, and Earth, Moon, & Sun selector. Click the view you want to observe.
2. Movie controls like those in QuickTime. Hourly controls are grayed out during Sun/Earth/Moon model. Monthly controls are grayed out for Earth/Moon model.
3. Movie speed control slider
4. Point-of-view selectors. Click on the viewpoint you want to observe; 30° and 60° are grayed out for the Sun/Earth/Moon model.
5. Enlarge button to watch larger Mercator shadow map.
6. Mercator shadow map
7. Timer
8. Help button
9. Reset button

**DAY/NIGHT SIMULATION**

The Day/Night simulation demonstrates the celestial geometry of day and night. You can enter the simulation directly through the planet mobile in the Resource Room or through the Overview page, accessed through the Index or through the Motions chapter in the Earth or Moon binders.

There are two views of celestial rotations, a close-up of Earth and the Moon, and a close-up of Earth, the Moon, and the Sun. You can toggle between these by clicking the appropriate button in the upper left-hand corner of the screen.

With the Earth and Moon observation, you can pick a point of view (5°, 30°, 60°, or 90°) from the plane of the equator of Earth. Click on the appropriate square to select a point of view. The current view is surrounded by an orange square; a rolled-over view is surrounded by a blue square.

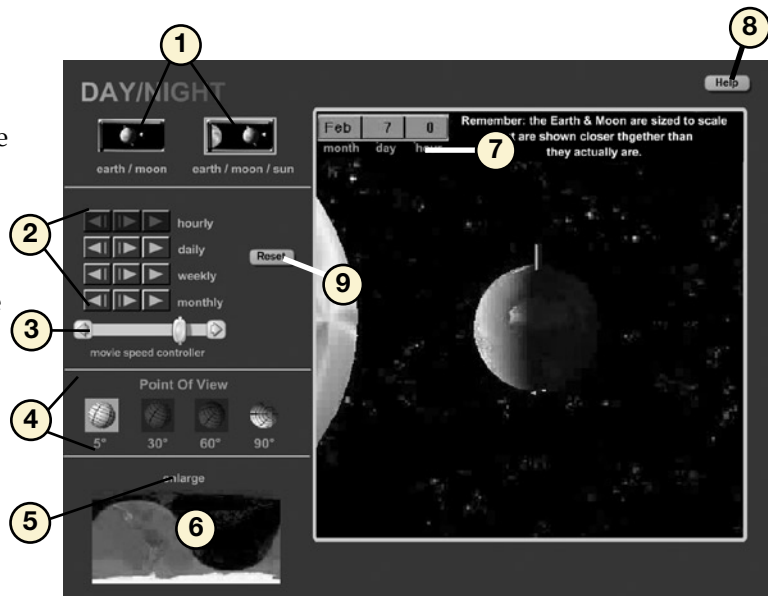
With the Earth, Moon, and Sun observation, you can choose between two points of view (5° or 90°) from the plane of the equator of Earth. Click on the appropriate square to select a desired point of view.

The three time units in which you can view the rotation of Earth and the Moon are hourly, daily, and weekly. The movie controls are like those in QuickTime. Earth's rotation can be observed only when it moves in an hourly time frame.

When the hourly time frame is selected, the shadow map at the bottom of the screen shows the progression of day and night over a Mercator projection of Earth. For other time frames the shadow map doesn't operate. To view a large projection of this movie, click the Enlarge button just above the movie. Re-select the Earth and Moon or Earth, Moon, and Sun observation to return to the original size of the shadow movie.

The three time units in which you can view the rotation of Earth, the Moon, and the Sun are daily, weekly, and monthly. Earth does not appear to rotate in this simulation because of the time frame. In this simulation the shadow movie is unusable.

The movie speed controller allows you to continuously vary the rate at which the movie plays. The rate depends on the speed of the processor of your computer. On fast machines, the daily, weekly, and monthly time frames run rapidly. By



Day/Night simulation

moving the slider to the left, you can slow down the movie. The simulation starts with the slider all the way to the right, at the fastest speed.

The Reset button resets the movie to its first frame. If you change the time frame and switch to a different point of view, the new point of view will pick up where the first movie left off. The timer in the left-hand corner of the movie verifies that the movie resumes at the same point. If you change from Earth and Moon observation to Earth, Moon, and Sun, the movie will automatically reset.

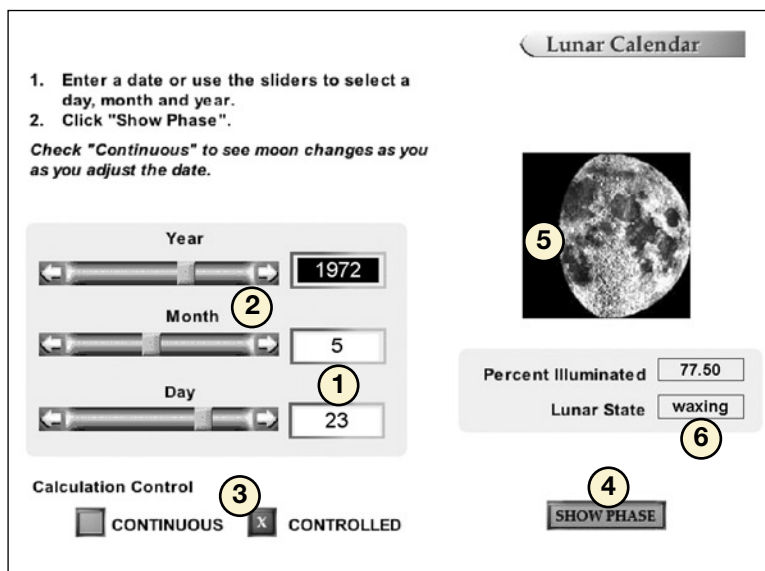
Click the Help button to access the Help page. To leave the Help page, click the Return button to go back to the simulation.

### LUNAR CALENDAR

The Lunar Calendar calculates the phase of the Moon for any day from 1 to 3000 C.E. Click the wall calendar in the Resource Room to retrieve the Lunar Calendar, or enter via the Moon binder.

There are two modes of interaction: Continuous, which changes the phase simultaneously with the variables, or Controlled, which shows the phase only after you click the Show Me the Phase button in the Controlled Mode. The picture changes to an image that best reflects the percentage of illumination (noted in the Percent Illuminated box).

The Moon-phase calculations are based on noon GMT. Only 28 images are available to portray the phase (whereas the percentage illumination goes from 1 to 100). So sometimes phases will be out of sync with what can be seen in the sky, particularly during the newest and oldest Moon phases, when small crescents are visible but the program shows nothing. Use the percent illumination at these times to get a better estimate of how much of the Moon can be seen.



Lunar Calendar page

1. Boxes to enter numbers.
2. Choose the date by moving the sliders.
3. Continuous and Controlled buttons
4. Button to show Moon phase in Controlled mode.
5. Picture representation of Moon phase for given date.
6. Description of Moon phase for given date.

**PHASES OF THE MOON SIMULATION**

The Phases of the Moon simulation illustrates the changing Moon phase during a month and tests your knowledge of the spatial relation of the Moon to Earth during the lunar cycle. It relates the Moon's changing phase as seen from Earth to the rotation of the Moon around Earth. You can enter the simulation directly through the changing Moon-phase picture in the Resource Room or through the Overview page in the Motions chapter of the Moon binder.

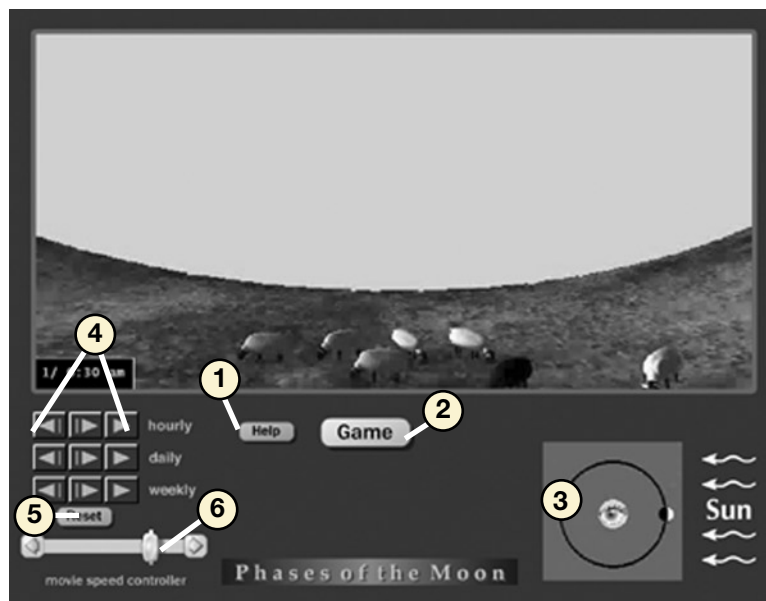
This simulation has an observation screen and a game screen, and it always opens to the observation screen first.

**Observation Screen**

There are two movies, the planetarium view with the sheep and pasture and the Earth/Moon representation, with the eye representing a viewer on Earth and a sphere representing the Moon. The movie controls are like those in QuickTime. The two movies are controlled simultaneously. The Reset button resets both movies to the beginning. The movie-speed controller changes the speed at which the movie plays. When using the weekly continuous-play button on a fast machine, it might be useful to slow down the movie by moving the slider to the left.

Clicking the Help button takes you to the Help page for the observation screen. To leave the Help page, click the Return button to go back to the simulation. Switch to the game screen by clicking the Game button.

1. Help button
2. Game button
3. Earth/Moon movie
4. Movie controls. You cannot run the movie in the daily mode.
5. Reset button. Click to start the movie at the beginning.
6. Movie speed slider. Move to increase or decrease speed.



*Phases of the Moon observation screen*

**Game Screen**

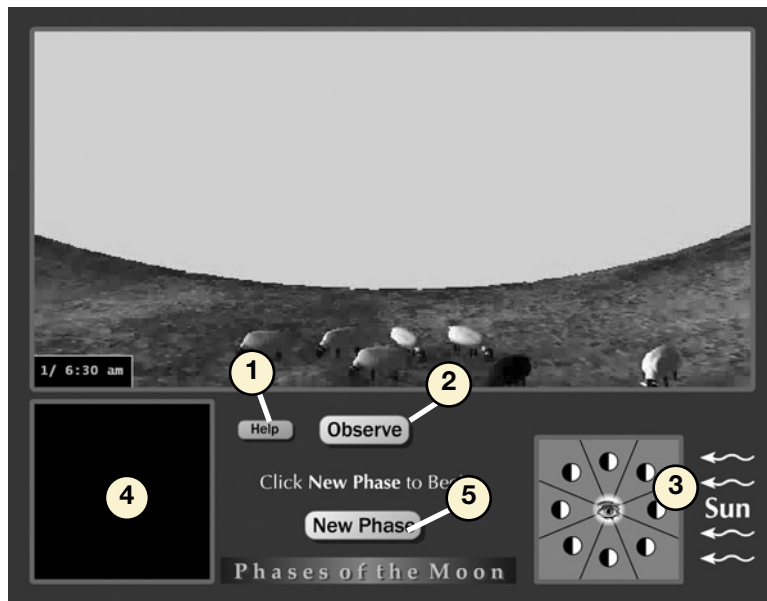
In the game screen, you can test your knowledge of the relationship between the Moon’s phase as viewed on Earth and the Moon’s position in its orbit around Earth.

To play the game,

- Click New Phase to begin. A phase of the Moon appears above the Moon-phase selector, and the planetarium movie shifts to the day and time when the phase would be highest in the sky.

- Click one of the eight sections in the Moon-phase selector that correctly represents the Moon’s orbital position in this phase.
- If your selection is incorrect, try again.

Clicking the Help button takes you to the Help page for the game screen. To leave the Help page and go back to the game, click the Return button. Switch to the observation screen by clicking the Observe button.



*Phases of the Moon game screen*

1. Help button
2. Observe button
3. Moon-phase selector. Click the position of the Moon that corresponds to the given phase.
4. Moon-phase frame
5. Start Game. New Phase button. Click to play the game.

1. **New Transmission button**
2. **Number of image**
3. **Threshold slider. Change the limits to define black, gray, and white.**
4. **Grid size slider. Move the triangle to set how many pixels make up a square.**
5. **Draw grid over digitized image.**
6. **Click and hold to peek at imported image.**
7. **Help button**
8. **Print button. Click to go to print screen.**

**DIGITIZER**

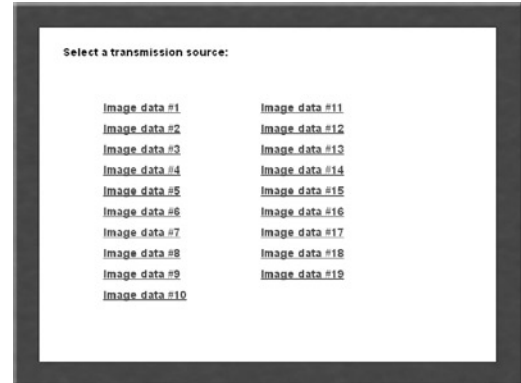
The Digitizer is a simple tool that simulates how image information is received from space. It loads one of 19 transmission images; analyzes the image with an overlay grid; and converts (digitizes) the information to the three-color system of black, white, and gray.

You can enter the simulation directly through the computer in the Resource Room or the Collecting Images from Space chapter in the Solar System binder.

The opening default Digitizer screen contains a picture of Image data #1, used with a default grid of 30 by 30 squares. This grid and the digitized information duplicate the information in the Teacher Guide. Click and hold the Peek button to see the original image.

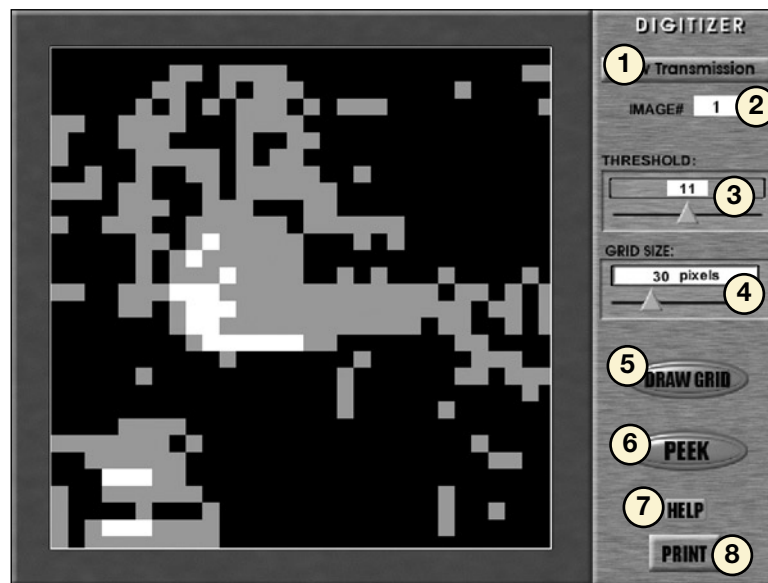
To load a new image, click on the New Transmission button and select an image from the list. The default grid size is

used whenever an image is imported. To change the grid size, slide the arrow below the grid-size indicator until you see the grid size you want. The lower the grid size, the coarser the interpretation will be.



*Opening an image*

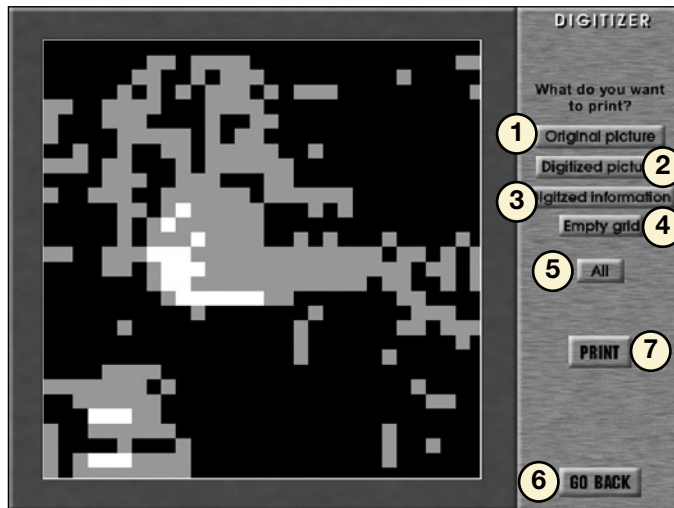
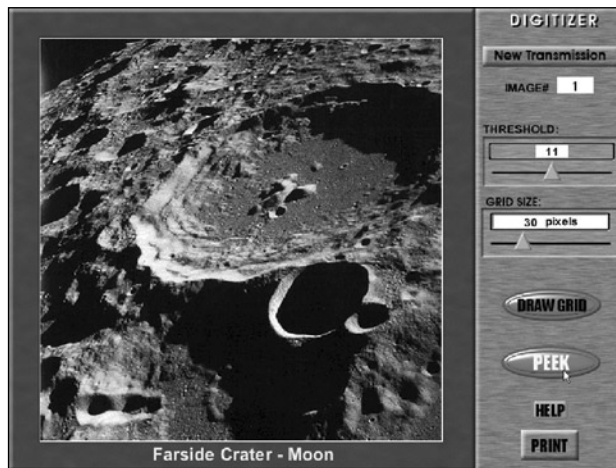
The range in which the pixels in the grid are interpreted as black, gray, or white is changed on a sliding scale, located above the grid scale. By clicking and holding the arrow, you can alter the level of the thresholds. (For more information about



*Digitized image*

what the Digitizer is doing, read the background information for Investigation 10 in the Teacher Guide.)

**Printing.** Clicking on the Print button takes you to the print screen, where you can print the different formats of the Digitizer information. In order to print, you must have Shockwave 8.5 properly installed in your browser before running the Planetary Science program. (See the Getting Started section on page 453.)



Print screen

Choose one (or multiples) of these buttons.

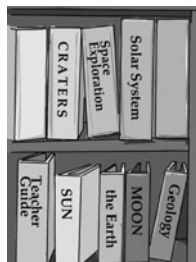
- The Original Picture button prints the picture at its full size and tonal resolution.
- The Digitized Picture button prints the digitized picture at the last grid size and threshold level.
- The Digitized Information button prints the digitized information in a format that allows drawing of the data by hand on an empty grid.

To return to the Digitizer screen, click the Go Back button.

- The Empty Grid button prints the empty grid at the last size selected. Printing the empty grid is useful if the digitized information has been printed. Do not print grids containing less than three pixels per square. Useful printed grids have more than five pixels per square.
- The All button prints all choices listed above.

1. Click to print original picture.
2. Click to print digitized picture.
3. Click to print digitized information.
4. Click to print empty grid used to digitize image.
5. Click to print all information.
6. Go back to Digitizer screen.
7. Click to print choices.

## USING THE CD-ROM AS A RESEARCH TOOL



### INTRODUCTION

There are several ways to use the Planetary Science database on the CD-ROM, either teacher-directed or student-directed. Opportunities for using the CD-ROM with the entire class are described in the individual activities in the Teacher Guide. You might also provide exploration time for individuals or small groups of students, either stemming from a class session with the CD-ROM or from individual interest.

Students might search the database randomly, going from record to record by clicking on links. Or they could search through an entire category (planet, satellite, section of a binder) by scrolling from record to record until the end of that section is reached. A third way to use the database is to help students generate a question they would like to answer and then have them establish a strategy by which the database can be used to find the answer. All three of these methods are useful at different times during the course.

### RANDOM EXPLORATION

The first use of the CD-ROM involves a somewhat random search with the students traveling from link to link depending on which ones capture their interest. Through this initial exploration, students become familiar with what is available through the database and what information is included in the different types of records.

Random exploration is an important first step in the use of the CD-ROM and is comparable to allowing time for students to become accustomed to a new manipulative when it is introduced in science or mathematics. It helps overcome the novelty of the CD as well as in piquing interest in various planets, satellites, or processes. This day or two of free exploration towards the beginning of the course could culminate with a whole-group discussion of what is known about Earth, Moon, craters, planets, satellites, and the Solar System.

If this is your first time teaching the course, you will also find it productive to explore the CD-ROM in this manner and become familiar with how the written activities and the CD-ROM simulations and database are related.

### STRUCTURED EXPLORATION

The second, more-structured use of the CD-ROM leads naturally from the random exploration. This is an optional activity that you might want to use to give the students more practice navigating the CD-ROM. This could be done sometime during the middle of the course, before students begin Investigation 10, *Explore the Planets*.

Start the activity by assigning different groups of students to different binders and to different chapters within binders. Using the Next page link in the bottom right of each record, students can scan the entire set of records for information.

Too many records scanned in this manner will be exactly like reading a book and may bring boredom. Asking each group to report seven things that are interesting about their specific topic might make the task more interesting.

Specific information for a known landform can be obtained in the alphabetical Index. For example, the record to Manicouagan Crater or to Mauna Loa Volcano can be located alphabetically in this index. The index does not contain subject headings.

**NOTE:** Students may be able to find the same information about some subjects in more than one binder.

### POSSIBLE CATEGORIES FOR EXPLORATION

#### SET 1:

- Craters
- Earth
- Geology
- Moon
- Solar System
- Space Exploration
- Sun

#### SET 2:

- Craters on Earth
- Craters on the Moon
- Craters throughout the Solar System
- Landforms on Earth
- Landforms on other planets
- Satellites of planets
- Space Exploration

### SEARCHING FOR ANSWERS

Once students are familiar with what is available on the CD-ROM and how it is organized, they are ready to use the database to answer specific questions. The teacher or the students can generate questions based on the information they know to be present. Two examples of questions are:

- *How is the surface of Mars like that on Earth? How is it unlike Earth?*
- *Do the landforms found on Earth appear on any other planetary body? How are they alike or different from those on Earth?*

In the first case, students are simply comparing the other planet to Earth. The second question, however, requires a more complex search strategy. Both questions involve students in navigating through an online source, but the second set of questions is more open-ended and to find the answers on the CD-ROM database takes some more creative searching efforts.

**NOTE:** You might want to use the following exercise before starting Investigation 10, *Explore the Planets*. Or you can apply the following strategy to help your students conduct the necessary research to complete their projects.

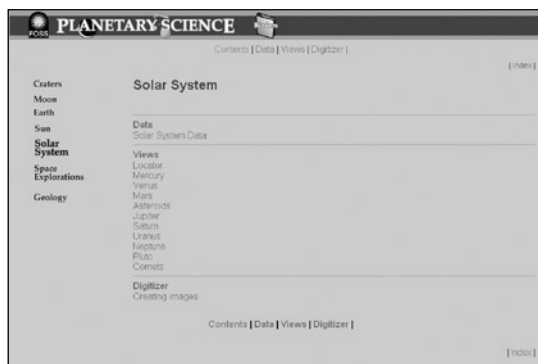


An Example: Searching for Information about the Martian Environment

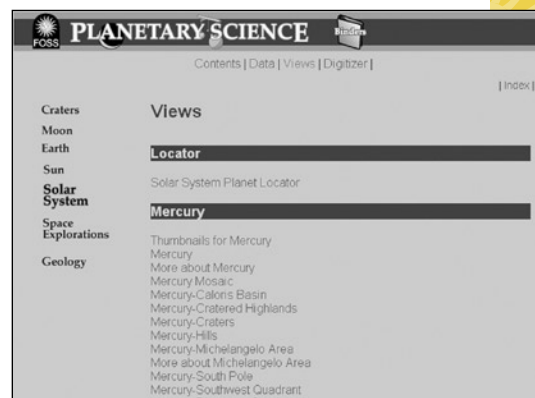
The following sequence describes one way you might guide students in a search on the topic of Mars.

- Enter the CD-ROM on the page that shows the Planetary Science Resource Room. In the bottom left side of the room, look for a bookcase with binders in it. Click on the **Solar System Binder**. This will take you to the **Table of Contents** for the Binder.
- Continue by clicking on the **Locator** under the **Views** category.
- Under the **Locator** category, click on **Solar System Planet Locator**.
- Click on the word **Mars** on the inner planets view at the top of the page. This will take you to a page of thumbnail images.
- Scan the images and select the images you wish to view in depth. The **Other Links** category on the picture record pages should lead you to related information.

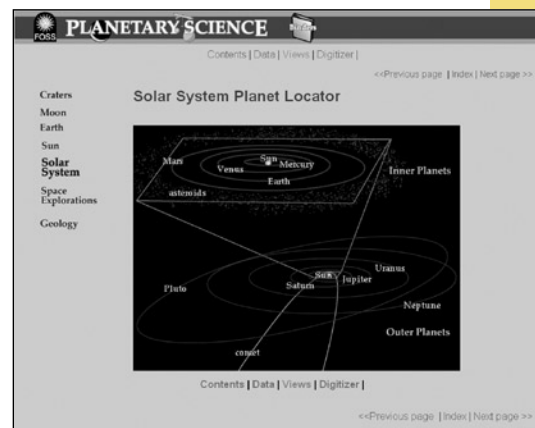
- Other places to start your research on Mars include the **Solar System Data** link from the **Data** category in the **Solar System** binder table of contents or the Mars link under the **Views** category of the **Solar System** binder.



Solar System Table of Contents



Views Table of Contents



Planet Locator



Thumbnails

## EXTENDING THE RESEARCH EXPERIENCE

### MORE QUESTIONS

If you would like your students to have more experience conducting research using the *FOSS Planetary Science* CD-ROM, consider using the following questions as starters.

- What conditions on each planetary body must be taken into consideration before humans could explore and colonize the body?
- What geologic processes can cover up, erase, or otherwise obliterate impact craters?
- Are there any processes that can generate new crust? What are they?
- How might Earth's atmosphere have influenced cratering on Earth? What other planets have an atmosphere that might influence impact cratering?
- Compare the number of impact craters on Earth and the Moon. What factors might have caused the differences?
- Which planets show evidence for volcanism at some time in their histories? What is the evidence? What are the similarities and differences?
- Is planetary size in any way related to tectonic and volcanic activity?
- What is the color and composition of the surfaces of each planetary body?
- Select a landing site for your spacecraft to go to a specific planet (e.g. Venus). Make a list of what you believe are the most important factors to consider in choosing a landing site and your reasons for that choice.