Maynard F. Jordan Planetarium

FOLLOW THE DRINKING GOURD

Edited by Jenny Worster

Mission Statement:
The mission of the Maynard F. Jordan Planetarium of the University of Maine is to provide the University and the public with educational multi-media programs and observational activities in astronomy and related subjects.

Cosmic Classroom

Looking for fun and interesting space activities? The planetarium staff has prepared a collection of materials we call the Cosmic Classroom for you to use before and/or after your visit. These materials are entirely for use at your own discretion and are not intended to be required curricula or a prerequisite to any planetarium visit. The Cosmic Classroom is one more way that the Jordan Planetarium extends its resources to help the front line teacher and support the teaching of astronomy and space science in Maine schools.

The lessons in this Cosmic Classroom have been edited and selected for the range of ages/grades that might attend a showing of this program at the Jordan Planetarium. Those activities that are not focused at your students may be adapted up or down in level. Our staff has invested the time to key these materials to the State of Maine Learning Results in order to save you time.

The State of Maine Learning Results performance indicators have been identified and listed for the program, the Cosmic Classroom as a package, and each individual activity within the package. The guide also includes related vocabulary and a list of other available resources including links to the virtual universe. We intend to support educators, so if there are additions or changes that you think would improve, PLEASE let us know.

Thank you, and may the stars light your way.

The Maynard F. Jordan Planetarium Staff

The Program – *Follow the Drinking Gourd*

Follow the Drinking Gourd combines the magic and beauty of the stars and constellations with a story of the 19th century escape route called the underground railroad. The program is based on a children's book by Maine author Jeanette Winter and illustrated with her original artwork. Visitors will learn to recognize constellations in the southern and northern sky before traveling through the underground railroad with four slaves as they follow the words of a song towards freedom. Visitors will also learn how the Sun moves through the sky from morning to night, and how the position of the Sun in the sky is different in winter and summer. This planetarium experience interweaves astronomy and history, and enriches the study of both subjects.

We are very glad that you have chosen to visit our planetarium with your group. We hope that this guide either will help you prepare your group or help you review their experience at the University of Maine's sky theater.

State of Maine Learning Results Guiding Principles

The lessons in this guide, in combination with Follow the Drinking Gourd, will help students to work towards some of the Guiding Principles set forth by the State of Maine Learning Results. By the simple act of visiting the planetarium, students of all ages open an avenue for self-directed lifelong learning. A field trip encourages students to think about learning from all environments including those beyond the schoolyard. A Jordan Planetarium visit also introduces visitors to the campus of the largest post-secondary school in Maine and encourages them to think of this as a place which holds opportunities for their future education, enjoyment and success.

Other sites on the University campus, including three museums, explore a variety of subjects, and the Visitors Center is always willing to arrange tours of the campus. A field trip can contribute to many different disciplines of the school curriculum and demonstrate that science is not separate from art, from mathematics, from history, etc. The world is not segregated into neat little boxes with labels such as social studies and science. A field trip is an opportunity for learning in an interdisciplinary setting, to bring it all together and to start the process of thinking. For a more complete discussion of field trips, please visit the Jordan Planetarium web site at http://umainesky.com.

If used in its entirety and accompanied by the Planetarium visit this guide will help students to:

Become **a clear and effective communicator** through

A. oral expression such as class discussions, and written presentations
B. listening to classmates while doing group work, cooperation, and record keeping.

Become **a self-directed and life long learner** by

A. introducing students to career and educational opportunities at the University of Maine and the Maynard F. Jordan Planetarium.
B. encouraging students to go further into the study of the subject at hand, and explore the question of "what if?"
C. giving students a chance to use a variety of resources for gathering information

Become **a creative and practical problem solver** by

A. asking students to observe phenomena and problems, and present solutions
B. urging students to ask extending questions and find answers to those questions
C. developing and applying problem solving techniques
D. encouraging alternative outcomes and solutions to presented problems

Become **a collaborative and quality worker** through

A. an understanding of the teamwork necessary to complete tasks
B. applying that understanding and working effectively in assigned groups
C. demonstrating a concern for the quality and accuracy needed to complete an activity

Become **an integrative and informed thinker** by

A. applying concepts learned in one subject area to solve problems and answer questions in another
B. participating in class discussion

State of Maine Learning Results Performance Indicators

In conjunction with the Maynard F. Jordan Planetarium show *Follow the Drinking Gourd* this guide will help you meet the following State of Maine Learning Results Performance Indicators in your classroom.

Grades Pre. K-2

Science and Technology –

A2. **Models**

a. Students will be able to describe ways pictures are like the real things they model.
b. Students will be able to use a model as a tool to describe the motion of objects.

B1. **Skills and Traits of Scientific Inquiry**

a. Students will be able to ask questions and make observations of objects and events in the environment.
e. Students will be able to use writing, speaking and drawing to communicate investigations and explanations.

D1. **Universe and Solar System**

a. Describe how the sun and moon seem to move across the sky.

Mathematics –

C1. **Geometric Figures**

b. Students will be able to know how to put shapes together and take them apart

Grades 3-4

Science and Technology –

D1. **Universe and Solar System**

a. Students will be able to show the locations of the sun, Earth, moon and planets and their orbits.

b. Students will be able to observe and report on observations that the sun appears to move across the sky in the same way every day, but its path changes slowly over the seasons.

c. Students will be able to recognize that the sun is a star and is similar to other stars in the universe.

D2. **Earth**

e. Student will be able to recognize that the sun is the source of Earth's surface heat and light energy.

Grades 6-8

Science and Technology -

A2. **Models**

a. Student will be able to compare different types of models that can be used to represent the same thing in order to match the purpose and complexity of a model to its use.

B1. **Skills and Traits of Scientific Inquiry**

b. Student will be able to design and safely conduct scientific investigations including experiments with controlled variables.

c. Student will be able to use appropriate tools, metric units, and techniques to gather, analyze, and interpret data.

B2. **Skills and Traits of Technological Design**

c. Student will be able to communicate a proposed design using drawings and simple models.

D1. **Universe and Solar System**

c. Student will be able to describe the location of our solar system in its galaxy, and explain that other galaxies exist and that they include stars and planets.

Social Studies -

History

E2. **Individual, Cultural, International, and Global Connections in History**

c. Student will be able to describe major turning points and events in the history of Maine Native

Americans, various historical and recent immigrant groups in Maine, the United States, and other cultures in the world.

English Language Arts -

C1. **Research**

b. Students will be able to locate and access relevant information.

c. Demonstrate facility with note-taking, organizing information and creating bibliographies.

Grades 9-D

Science and Technology –

B1. **Skills and Traits of Scientific Inquiry**

c. Student will be able to use statistics to summarize, describe, analyze, and interpret results.

e. Student will use a variety of tools and technologies to improve investigations and communications.

Performance Indicators Snapshot

The Show

Grades Pre. K-2

Science and Technology
D1.a, c

Grades 3-4

Social Studies – History
E1.a
English Language Arts
B2.a,c

Grades 5-8

Science and Technology
D.a,b

The Guide

Grades Pre. K-2

Science and Technology
A2.b; B1.a,e; D1.a,c
Mathematics
C1.b.

Grades 3-5

Science and Technology
D1.b,c; D2.e

Grades 6-8

Science and Technology
A2.1, B1.c, D1.c

Grades 9-D

Science and Technology
B1.c, e

Numbering the Stars

Objectives and State of Maine Learning Results Performance Indicators:

1. Learners will be able to demonstrate the size of our galaxy (6-8. Science and Technology. D1.c.) (9-D. Science and Technology. D1.c.)
2. Learners will be able to conduct scientific investigations in order to comprehend the number of stars in our galaxy, using appropriate units of measure. (6-8. Science and Technology. B1.c.)
3. Learners will be able to understand that using sand to represent stars is a practical use of a scale model. (6-8. Science and Technology. A2.1.)
4. Learners will be able to form generalizations about other galaxies and make predictions about the number of stars in those galaxies using measurement tools and units appropriately and recognizing limitations in the precision of those tools. (9-D. Science and Technology. B1.c, e.)

The General Idea:

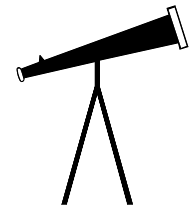
Comprehending the enormousness of 200 billion of anything is difficult for most people. Take the number itself for instance. How long do you think it would take to count to 200 billion? At one number a second, would you believe almost 6,400 years! Or consider height, a stack of 200 billion pennies would stretch 286,000 km, or three-fourths of the distance from the Earth to the Moon.

Astronomers often use 200 billion as the approximate number of stars in our galaxy, but most of us really cannot appreciate a number that large. This activity will help students develop a sense of number scale, understand the concept of volume, and develop scientific estimation, measurement and data analysis skills.

Getting Ready:

1. The day before this activity, have your students make their own one-centimeter cube. You can photo copy the one at the end of this lesson for your students to cut out and glue together, or have them measure and make their own using a metric ruler. If you use the second option, make sure to tell the groups to use the metric rulers to draw the template accurately!
2. Do the activity and calculations yourself before trying it with your class! You need to know how large a resultant volume to expect. This volume can vary drastically depending on the size of the sand grains you are using. The size of the sand grains also affects the length of time the activity takes to do, which needs to be determined in advance. Students may need anywhere from 5 to 30 minutes of counting time, depending on the size of the sand grains. (About 10 minutes is needed for one-millimeter diameter sand grains.)
3. Make a set of three demonstration cubes: one each of 1cm, 10cm, and 1m on a side. You can make the cubic-centimeter cube using the template below. Make a similar template for the 10cm cube. You can tape meter sticks together to make a cubic-meter cube (but you will need 12 of them!) or pick up a box from a furniture store and cut it down to the right size.
4. Filter the sand using a set of screen sieves to eliminate the finer grains. The sand does not need to be uniform, but all the grains need to be large enough to be easily counted (a diameter of one millimeter, on average). A sieve for flour or sugar works well.
5. Introduce your students to galaxies before beginning the activity. This introduction may be handled in many different ways and may combine such elements as class discussion, homework reading selections, viewing and discussion of a video, viewing of slides and photographs, and so on. Your objective with this introduction is to expose students to basic information such as: the description of a galaxy; the general structure of galaxies; and the name of our own Galaxy, the Milky Way.

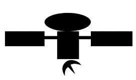
What You Need



Medium to coarse sand, about 200 ml, sifted to obtain fairly large grains
paper cubes
paper and pencils
1cm, 10 cm, 1m demonstration cubes

What To Do:

1. Explain to your students that our galaxy, the Milky Way, consists of approximately 200 billion stars. Ask if anyone can explain their concept of how big a number that is. Ask students how big a box they would need to store 200 billion bricks. (about 525 m on each side). The responses should make the point that students may know that 200 billion is 200 thousand million, but they are not likely to have any idea of the space that would be occupied by that many objects.
2. Tell the students that this activity will help them gain a better understanding of how many stars 200 billion really is. Ask them to imagine that they can take every star in our galaxy and scale it down until it is the size of a grain of sand. Sand grains vary in size and star sizes vary far more drastically, but tell them to imagine that the average star has been shrunk to the average size of a grain of sand which will be used during the following experiment as a model for a star.



3. Count out 10 grains of sand onto a sheet of paper and ask the students to imagine that they continue to count until all 200 billion of them have been piled into a cube. Ask your students to estimate how big a cube they would have in the end. Then show the class the 1cm cube and ask the students to estimate how many would be needed to hold 200 billion grains of sand in total. Do the same with the 10cm cube. Make sure that each student writes down the two estimates records her/his estimates for later reference.

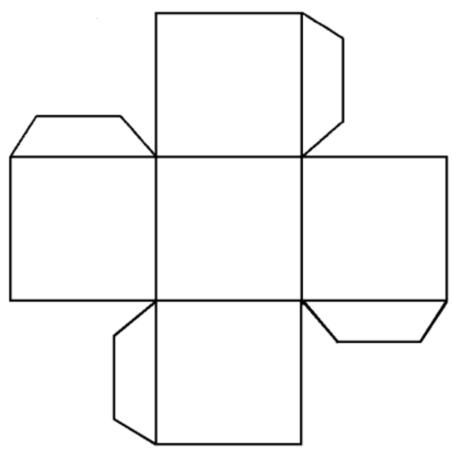
Now we will move on to the "meat" of the activity:

4. Combine your students into groups of two to three students each.
5. Have each group pick up one cubic centimeter of sand by using the cubic centimeter they made the day before.
6. Each group should dump their "stars" onto a piece of scratch paper.
7. Suggest that the groups *do not* count out loud.
8. Record the total count of sand grains from each group in the class, and together with the class calculate a class average for the number of stars in one cubic centimeter.
9. Divide the total number of stars, (200 billion) by the class-average. The number you get is the volume of the pile of stars in cubic centimeters. (i.e. it would take x number of cubic centimeters to hold 200 billion grains of sand). The equation looks like this: 200,000,000,000 / class average.
10. This number is still huge to the point of being meaningless. So a larger unit is needed to express this huge volume in a way that will be more meaningful to the students. The unit one cubic meter should bring the number down to understandable size for the students. To do this, first calculate the number of cubic centimeters in a cubic meter, (there are 100 centimeters in a meter, so the calculation would be 100 X 100 X 100 = number of cubic centimeters in a cubic meter) then use the answer to divide your total (your equation would be answer from first equation X answer from second equation = # of cubic meters needed to hold 200 billion grains of sand).
11. While the results depend entirely on the size of the sand grains being used, your students will generally find that all the stars in our galaxy would be represented by a pile of sand which has a volume of about 500 cubic meters, enough to fill a *very* large classroom to the ceiling!

What To Discuss/Extensions:

1. With the number of cubic meters in mind, ask your students if they think that the room would hold that much sand. Have your students measure the dimensions of your classroom and calculate the room's volume in cubic meters.
2. After the visual image of the room full of sand, or even overflowing, has had some time to sink in, remind students of the true sizes of stars (Most stars like the Sun have an equatorial diameter of about one million kilometers.) and that within our galaxy stars are many trillions of kilometers apart. With this information, your students may finally begin to have some sense of just how big our galaxy is.
3. If the stars were indeed the size of grains of sand, how far apart would they be? You may want to have students do this calculation as homework, using the same math skills developed in this lesson. For this activity students will need to find out how large an average star, such as the Sun, is and also how far apart the stars are, such as from the Sun to the next closest star, Proxima Centauri. (For grains about 1.3 mm on a side, the average spacing of stars in our solar neighborhood would place the grains about 40 miles apart!)
4. Discuss the relationship between the number of stars in our galaxy and the number of stars in the universe. Ask your students to contemplate the fact that there are about as many galaxies in the universe as there are stars in our galaxy. Have them calculate the approximate number of stars in the universe on the assumption that every galaxy has about the same number of stars.
5. Have your students change the scale for a star so that some larger object, such as a baseball, represents a star, and have them calculate the volume of the resulting cube of 200 billion baseballs.

Below is a template for the 1 cm cube. Please note that the size is approximate and that you will need to measure and make your own so that it is exactly 1 cm!



The Sun Appears to Rise and Set

Based on The Sun Appears To Rise in the East and Set in the West by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

Objectives and State of Maine Learning Results Performance Indicators:

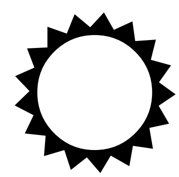
1. Learners will be able to observe that the Sun appears to be in different places in the sky at different times of the day (Pre.K-2. Science and Technology. D1.a.)
2. Learners will be able to demonstrate that the above occurs because the Earth is rotating. (3-4. Science and Technology. D1.b.)
3. Learners will be able to use a model to represent the Sun rising (Pre. K-2. Science and Technology. A2.b.)

The General Idea:

This activity is designed to disprove the geocentric idea that many young students have, the idea that the Sun must be going around us because of how it rises and sets. Through observations of the Sun (please make sure that all you students know that it is dangerous to look directly at the Sun!) and its path through the sky and through teacher demonstration, students will learn how day and night are the result of the Earth rotating rather then the Sun revolving.

Getting Ready:

- Prepare journals for the students to record their observations in
- Set up a light for the demonstration, a bare bulb works well



What You Need:

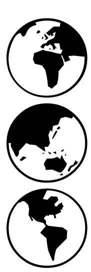
A journal for each student
A lamp with a bare bulb

What To Do:

1. Take the students outside at a set time (9am is good to start) and have them mark in their journals where the Sun is (again, warn students to ***never*** to look at the Sun because it will harm their eyes).
2. Repeat step one at least twice more (11 am and 2pm for instance).

What To Discuss:

1. Was the Sun in the same place each time we looked at it?
2. Why or why not?
3. Did the Sun move or did the Earth move?



What To Do:

1. Have the students stand in a circle around the lamp (while it is turned off).
2. Explain how scientists use models to discover how things happen and how you are going to use a model to discover how the Sun appeared to move in the sky.
3. Tell the students that they are the Earth and that the lamp is the Sun.
4. Have the students turn so that their left side is in the light
5. Tell the students to pretend that it is Sunrise.

6. While staying in the same spot, have the students turn ***slowly*** to their left until their backs are bathed in light.

What To Discuss:

1. Even though it's nighttime on their faces, is it nighttime on the students backs?
2. Did they all see how the "Sun" came up on one side of their face and went down on the other?

Continuations/Extensions:

1. Do the above activity with a globe. You may also want to mark your state with a bit of clay so that the students can watch as it goes from day to night.

Stars Form Patterns in the Sky

Based on Stars can form patterns in the sky. The Big and Little Dippers are examples of star patterns. by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

Objectives and State of Maine Learning Results Performance Indicators:

1. Learners will be able to discover that the stars form patterns in the sky. (Pre.K-2. Science and Technology. A2.a., Mathematics. C1.b.)
2. Learners will be able to make observations about the night sky. (Pre. K-2. Science and Technology. B1.a.)
3. Learners will be able to use pictures to represent the constellations (Pre. K-2. Science and Technology. B1.e.)

The General Idea:

Standing under the sky on a dark night and gazing at the stars is an incredible sight. But how do we tell the difference between this star and that? As adults we use constellations to more easily identify stars and groups of stars. This idea of stars making a picture correlates with young students love of dot-to-dot pictures. After students have become familiar with activities such as dot-to-dot's and geo-boards, you can use the following activity to link these mathematical concepts with science.

Getting Ready:

- Familiarize students with dot-to-dot puzzles and geo-boards

What You Need:

Black construction paper
Popcorn
Glue or paste
Crayons, chalk, etc.

What To Do:

1. On a sheet of black construction paper, have the students put dots of glue or paste at random
2. Have the students place pieces of popcorn on the glue or paste to form a "constellation".
3. When the glue or paste has dried, students can connect the "dot's" of popcorn with chalk or crayon to show others what their constellation looks like

What To Discuss:

1. How are the students "constellations" like the ones in the sky? How are they different?

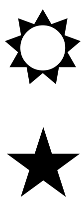
Continuations/Extensions:

1. For older students, have them write a story about their constellation
2. Take photocopies of known constellations and have the students draw their own picture of the constellation (for example, the Big Dipper is part of Ursa Major, the great bear, but students may see a pot, ladle or baseball cap).

Stars Give Off Light

Based on <u>Stars give off light. The moon and planets reflect light.</u> by Susan Reynolds and Onondaga-Cortland-Madison Board of Cooperative Educational Services math, Science and Technology.

<u>Objectives and State of Maine Learning Results Performance Indicators:</u>



1. The learners will be able to explain that stars give off light (PreK-2. Science and Technology. D1.a.)
2. The learners will be able to demonstrate an understanding that moons and planets in our solar system get their light from the Sun. (3-4. Science and Technology. D2.e.)
3. The learners will be able to show that the Sun is a star(3-4. Science and Technology. D1.c.)

<u>The General Idea:</u>

To the untrained eye, the night sky is ablaze with the light of thousands of tiny dots. From here on Earth it is sometimes hard to tell the stars from the planets. This activity will help students understand that while both the stars and planets appear to shimmer in the night sky, they are very different objects indeed.

<u>Getting Ready:</u>

Provide half of the students with Styrofoam balls of varying sizes and the other half with flashlights of varying brightness.

<u>What You Need:</u>

Styrofoam ball
Flashlights
Slide projector
Penlight

<u>What To Do:</u>

1. Hand out the Styrofoam balls and flashlights
2. Darken the room
3. Have the students with the flashlights (the “Stars”) shine away from the Styrofoam balls (the “planets”)
4. Now have the “stars” shine ON the “planets”

<u>What To Discuss:</u>

1. Are the “planets” easy to see?
2. Is it easier to see the “planets” with the “stars” shining on them?
3. Do moons and planets give off light of their own?

What To Do:

1. Have a student hold a penlight next to a an unlit slide projector
2. Ask the students how easy it is to see the light from the penlight (easy)
3. Turn on the slide projector (warn students NOT to look into the light from the slide projector because it could hurt their eyes)
4. Ask the students if it's still easy to see the penlight or if they can see it at all now (no)

What To Discuss:

1. Why couldn't we see the penlight as well when the projector was on?
2. If the slide projector is the Sun and the penlight is a star, what effect does the Sun have on our ability to see stars during the day?
3. Why can't we see stars during the day?

Extensions/Continuations:

1. Have students create "legends" about why we cannot see stars during the day, perhaps putting them together into a class book or a book for the library.

Vocabulary List

Astronomer	A person who studies and contributes to the science of astronomy.
Atmosphere	A layer of gases that surround a body such as a planet.
Axis	An imaginary straight line around which an object rotates.
Constellation	A grouping of stars, considered by humans to form a picture in the sky. Often related to mythology.
Day	The time it takes for a planet to make one full rotation (on Earth, 24 hours).
Galaxy	A cluster of stars, dust, and gas held together by gravity.
Milky Way galaxy	large spiral galaxy consisting of several billion stars, one of which is the Sun.
Moon	A natural satellite orbiting a planet.
Orbit	A specific path followed by a planet, satellite, etc.
Planet	A massive object orbiting a star.
Revolution	The circling of a smaller object around a larger object.
Rotation	The spinning of an object on its axis.
Solar System	The system of planets, moons, and other objects revolving around a star (in our case, the Sun).
Star	a massive, self-luminous celestial body of gas that shines by radiation derived from its internal energy sources.
Sun	Sol, the star that is closest to Earth and from which we get heat and light energy.
Universe	The vast expanse of space which contains all of the matter and energy in existence.
Year	The period for a planet to make one full revolution around a star (in our case the Sun, 365.25 days).

Some good books to use with *Follow the Drinking Gourd*

The Big Dipper.
Branley, Franklyn Mansfield. 1991, HarperCollins.
Explains basic facts about the Big Dipper, including which stars make up the constellation.

The Big Dipper and You
Krupp, E. & R. 1989, Morrow.
A delightful illustrated book on stars and constellations for ages 6 - 12.

Constellations
Sipiera, Diane M. 1997, Children's Press.
Identifies the groups of stars known as constellations and discusses their origin, uses, and observation.

Follow the Drinking Gourd
Winter, Jeanette. 1988, Knopf.
By following the directions in a song, "The Drinking Gourd," runaway slaves journey north along the Underground.

The Glorious Constellations: History and Mythology
Sesti, Giuseppe Maria. 1991, Abrams.

The Sky is Full of Stars
Branley, Franklyn Mansfield. 1981, Crowell.
Explains how to view stars and ways to locate star pictures, known as constellations, throughout the year.

The Star Book
Burnham, R. 1983, Astromedia/Cambridge U. Press.
Book of cardboard star maps & instructions for beginners for ages 12 to adult.

Starwatch
Mayer, B. 1984, Putnam.
An eccentric but clever guide on constructing star-finders from simple household materials.

Universe Guide to Stars and Planets
Ridpath, I. & Tirion, W. 1984, Universe.
Compact guide to sky with constellation maps.

Whitney's Star Finder
Whitney, C., 4th ed. 1985, Knopf.
Clear, basic primer on sky phenomena & constellations.

Some good web sites to use with *Follow the Drinking Gourd*

www.astro.wisc.edu/~dolan/constellations/constellations.html
A constellation information page compiled by Chris Dolan at the University of Wisconsin-Madison Department of Astronomy

www.seds.org/messier/CONindex1.html
The Munich Astro Archive Constellation pages, which include links to information about the 88 constellations, the constellation families, star tables, image maps and pictures of the constellations.

www.dibonsmith.com/stars.htm
The 88 constellations with mythological background, data on the stars, things to observe, and star chart, compiled by Richard Dibon-Smith.

Lessons From The World Wide Web

Also, a wide variety of lesson plans and activities can be found on the World Wide Web. These sites are dedicated to lesson planning in a variety of subjects.

cse.ssl.berkeley.edu
The Center for Science Education at U. C. Berkeley Space Science Laboratory home page with a link to the Science Education Gateway, Lesson Plans

btc.montana.edu/ceres
Maintained by the Burns Telecommunications Center, this page links to educational activities and classroom resources.

spaceplace.jpl.nasa.gov/spacepl.htm
This California Institute of Technology and NASA Jet Propulsion Laboratory site for kids offers information and activities .

school.discoveryeducation.com/
This Discovery Channel education site allows teachers to search for lesson plans by grade and subjects.

www.eduref.org/
The Educator's Reference Desk, which takes place of the "Ask Eric" website, including resource guides, lesson plans, question archives, and a link to search GEM/ERIC (the Education Resources Information Center).

www.thegateway.org
Sponsored by The U.S. Department of Education's National Library of Education and ERIC Clearinghouse on Information & Technology, this site offers lesson plans for all subjects and all grades.

Astronomy Web Sites Worth a Visit

www.galaxymaine.com
The Maynard F. Jordan Planetarium and Observatory home page.

www.galaxymaine.com/SA/SA2.htm
The teacher resources and bibliography page on the Maynard F. Jordan Planetarium web site

tes.asu.edu/dsn_solarsyst.html
An astronomy information page compiled by Ken Edgett, Arizona State University

ssd.jpl.nasa.gov
A site about our solar system maintained by the Solar System Dynamics Group of the Jet Propulsion Laboratory.

seds.lpl.arizona.edu/nineplanets/nineplanets/nineplanets.html
A Multimedia Tour of the Solar System from the Students for the Exploration and Development of Space

hawastsoc.org
The Hawaiian Astronomical Society's home page

www.nss.org
The official website of the National Space Society

www.stardate.org
Learn what's going on TODAY in astronomy on the "Star Date" web page, maintained by the University of Texas' McDonald Observatory

The Maynard F. Jordan Planetarium does not guarantee that the information given on the above web sites to be accurate, accessible, or appropriate for students.

DG Worksheets

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