A Teacher's Guide to

ONCE IN A BLUE MOON

Presented by the
Cernan Earth and Space Center
Triton College
River Grove, Illinois

Welcome to the
Cernan Earth and Space Center

Introduction

Please take a few minutes to read through this Teacher's Guide before you and your group visit the Cernan Earth and Space Center. It contains important tips and guidelines about your field trip, describes the program that you selected and includes some teacher resources to help you better integrate your Cernan Center visit with your own classroom activities.

The Cernan Earth and Space Center

The Cernan Earth and Space Center of Triton College is a unique and exciting place for persons of all ages. The Cernan Center houses a 100-seat dome theater, a Space Hall with exhibits on space exploration and astronomy and the Star Store gift shop.

The Cernan Earth and Space Center is named for astronaut Eugene A. Cernan, who flew aboard the Gemini 9, Apollo 10 and Apollo 17 space missions. In December of 1972, as the commander of Apollo 17, Captain Cernan became the last human to leave his footprints on the moon. Cernan was born and raised in suburban Bellwood, not far from where the Triton College campus and the Cernan Center now stand. The original Cernan Center building opened in 1974, and in 1984, it re-opened in a new and larger facility.

The Cernan Earth and Space Center's 44-foot diameter dome theater is equipped with a planetarium star projector, a special C-360 motion picture projector, a sophisticated laser projection system, a large format video projection system, a powerful stereo sound system and scores of slide and special effects projectors. Using this equipment, the Cernan Center presents a wide range of educational programs that discuss such diverse subjects as the current night sky, the planets of our solar system, the weather and climate of earth, the space shuttle and the age of dinosaurs. For pure entertainment, the Cernan Center also presents laser light shows that choreograph laser images and planetarium effects to rock music.

The Cernan Earth and Space Center's Space Hall contains a variety of exhibits related to astronomy, space science and earth science. Included are Captain Cernan's Apollo 10 spacesuit and coverall garment, Apollo 17 moon gloves, an Apollo lunar landing diorama, a moon phase exhibit, a weather radar station, a 1/15th scale space shuttle model, a life-size dinosaur footprint model, an Illinois fossil exhibit, a telescope exhibit, an exhibit on recent space discoveries and a variety of other Apollo artifacts. Outdoor exhibits include an Apollo practice capsule and a Nike Tomahawk missile.

The Cernan Earth and Space Center's Star Store gift shop offers an assortment of unique gifts, many related to the popular themes of astronomy, space exploration and the study of our own planet earth. Books, t-shirts, sweatshirts, binoculars, science discovery kits, coffee mugs, posters and unique toys are just a few of the many items for sale. Some items are even $1.00 or less, so even younger patrons can buy a souvenir or two during their visit.

Important Field Trip Information

Listed below are a few tips to help make your trip to the Cernan Earth and Space Center run smoothly and stay on schedule:

1. BEFORE YOU ARRIVE. If for any reason you need to reschedule or cancel your reservation, please call the Cernan Center and let us know as soon as possible. Doing so allows us to better accommodate other groups that may prefer your original time slot and may prevent your group from being charged a cancellation fee.

2. ARRIVAL. Plan to arrive at the Cernan Center at least 15 minutes before your scheduled show. This will give you time to check in your group, use the restrooms if necessary and instruct your group to line up at the entrance to the dome theater. If you are planning to eat lunch or visit the Star Store before your show, you should arrive even earlier. Buses and vans should park along the curb directly in front of the Cernan Center and should remain there for the duration of your visit. Automobiles should park in the North Parking Lot just north of the Cernan Center building after dropping off their passengers.

3. CHECKING IN. When you arrive at the Cernan Center, the group leader should check in at the Star Store. Remember to bring the confirmation card that you received in the mail. Please make a note of the number of students and chaperons that you will be paying for. Remember that you must pay in bulk, so please collect the students' money beforehand or have a check made payable to Triton College. In special circumstances, you can make arrangements in advance to have us bill your school or institution after your visit.

4. ENTERING THE THEATER. Your group should be lined up at the dome theater entrance five minutes before your scheduled show time. Please remind your group that they are on a college campus and must remain quiet because of classes in session nearby.

5. SEATING IN THE THEATER. A Cernan Center staff member will let your group into the theater and instruct you on the best place to sit. Since more than one group is often scheduled at the same time, your group should sit together. No food, drink, candy or gum is allowed in the theater.

6. BEHAVIOR IN THE THEATER. Teachers and chaperons are responsible for the behavior of their group. Since the show operator is seated at the top of the room, he or she is often unable to hear or see minor incidents of disruptive behavior. Although the show operator will certainly stop the show for a disruption in the audience, we would prefer that the group leaders control the behavior of their own group.

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7. VISITING THE STAR STORE. If your group plans to visit the Star Store gift shop, please do not allow everyone into the store at once. If you have over 20 students, allow only 10 or 15 students in the store at a time. We also ask that only children with spending money be allowed into the store. This lessens the handling of the merchandise and prevents it from becoming soiled or damaged. We would also appreciate that one teacher or chaperon remain in the gift shop to help maintain order with their group.

8. HAVING LUNCH. With prior notification, the Cernan Center can usually arrange to have Triton College set aside tables on which your group can eat their own bag lunches. Groups can also pre-arrange with the Triton College cafeteria to purchase lunch packages. If your group has reserved this lunch area, we recommend that your group keep the lunches together in boxes or large bags rather than having the students carry them individually. As long as your lunches are in some sort of container, we will be able to provide an area for them to be stored while you are in the dome theater. A staff member will provide you with a campus map to direct your group to the Triton College cafeteria, which is a five-minute walk from the Cernan Center.

9. ANY QUESTIONS? We pride ourselves in offering friendly, personalized service, so if you have any questions pertaining to your trip to the Cernan Center, just give us a call at **(708) 456-0300, Ext. 3372** and we'll be happy to answer them. You can also contact one of our staff astronomers if you have a question related to astronomy, space science or earth science.

WE LOOK FORWARD TO SEEING YOUR GROUP AT THE CERNAN EARTH AND SPACE CENTER!

VISIT THE CERNAN CENTER ONLINE!

Visit the Cernan Center online at: **www.triton.edu/cernan**. To shop our Yahoo! Store online, please visit: **http://store.cernanstore.com/**. You can also e-mail one of our staff astronomers if you have a question related to astronomy, space science or earth science at: **cernan@triton.edu**.

For more information about the Cernan Center, its programs, field trips or events, please call (708) 456-0300, Ext. 3372. For public program information, please call our Program Line at (708) 583-3100.

Earth and Space Exhibits

The Cernan Earth and Space Center has a number of earth and space exhibits in its main lobby, as follows:

APOLLO / MARS LANDSCAPE DIORAMA

This large exhibit, covered by a plastic dome, is a two part exhibit. One half of the exhibit commemorates the successful Apollo missions to the moon, while the other half celebrates the present and future exploration of Mars. The Apollo side of the diorama contains models of the lunar module (the Apollo spacecraft that brought two astronauts to the lunar surface each mission) and the lunar rover, which astronauts used in the final three Apollo missions (15, 16 and 17) to extend the range of their lunar explorations. The Mars side of the diorama re-creates the rocky and sandy Martian landscape, complete with scale model of the Sojourner probe.

APOLLO 10 SPACE SUIT

This was the space suit worn by astronaut Gene Cernan on the Apollo 10 mission. This space suit was never worn on the moon, since the Apollo 10 mission was not designed to land astronauts on the surface. Instead, this mission served as the final “dress rehearsal” before the first lunar landing mission of Apollo 11 two months later.

OTHER APOLLO ARTIFACTS

This case contains other Apollo artifacts, including a coverall garment worn by Gene Cernan en route to the moon and several pieces of Apollo spacecraft navigation equipment.

EARTH VIEW EXHIBIT

This computer generated video exhibit, which updates every five minutes, displays a world map that shows the current day and night hemispheres, along with the locations on earth that have the sun directly overhead and the moon directly overhead.

DOPPLER WEATHER RADAR

On days when there is rain or snow in the Midwest, the Doppler Weather Radar exhibit displays the intensity and movement of this precipitation.

“MOON SHADOWS” EXHIBIT

This interactive exhibit uses a model of the earth-moon system to assist viewers in understanding the phases of the moon. By looking through an eyepiece built into the exhibit, viewers can observe how the moon phase changes as they manipulate the position of the moon along its orbit.

TELESCOPE EXHIBIT

This exhibit shows cutaway models of the major types of telescopes and describes a few of the many celestial objects that can be seen with small telescopes.

DINOSAUR FOOTPRINT

This is a full-scale model of a footprint and lower leg bone of a Brachiosaurus that illustrates the size of these great prehistoric animals. This is not a real footprint, nor was this the footprint from a dinosaur found locally. No dinosaur bones have ever been found in northern Illinois due to the fact that glaciers from the last Ice Age "scoured away" any dinosaur fossils that may have once existed.

FOSSIL EXHIBIT

This exhibit displays a wide variety of Illinois fossils including our state fossil, the "Tully Monster."

SPACE EXPLORATION EXHIBIT

This exhibit displays information about the Hubble Space Telescope and other unmanned spacecraft and some of the recent astronomical discoveries that they have made.

CURRENT EVENTS BULLETIN BOARD

This bulletin board contains a current sky map; the latest astronomical images from the Hubble Space Telescope; and news stories featuring recent scientific discoveries, often obtained the same day from Internet sources.

OUTDOOR EXHIBITS

The Nike Tomahawk missile was used to collect weather information in the earth's upper atmosphere. The Apollo Practice Capsule never flew in space, but was used by the U.S. Navy to practice ocean recoveries.

The Cernan Earth and Space Center also offers an **Exhibit Hunt handout** that can be distributed to each student before or after their scheduled program(s). To complete the Exhibit Hunt, students must find answers to the questions among the artifacts and text panels throughout the Cernan Center's lobby exhibit area. The activity takes approximately 20 to 30 minutes to complete.

If you'd like to arrange an Exhibit Hunt for your students, please let the Cernan Center know before your scheduled visit.

The Cernan Center's exhibits are subject to change. Any changes to the exhibit area will be posted to the Cernan Earth and Space Center Online, which can be found at: **www.triton.edu/cernan**. Click on "Exhibits" to access this information.

Once in a Blue Moon

This is the Cernan Center program that you made a reservation to see. Below is some basic information about the show that should help you prepare your class for their upcoming visit.

Show title: *Once in a Blue Moon*
Grade Level: 1st to 3rd grade
Length: 38 minutes

Summary of show:

Once in a Blue Moon is a multimedia planetarium show that answers many of the common questions that children ask about the Moon, including . . . How big and far away is the Moon? Why does the Moon seem to follow you? Where did the Moon come from? What causes the different shapes of the Moon? What is a Blue Moon?

The program is told through the story of a little girl named J.C. and her cat Whiskers, who are camping out under the stars. As J.C. falls asleep, she hears the Moon (in a female voice) call out her name. Surprised by hearing the Moon talk, J.C. is told that the Moon can only be heard speaking "once in a Blue Moon." The Moon then asks J.C. what she would like to know about the Moon. The little girl's questions form much of the remaining show.

J.C. first asks how big and how far away the Moon is. The Moon explains that if the Earth could be shrunk down 50 million times to the size of a basketball, the Moon would be the size of a tennis ball. On that same shrunk-down scale, the Earth-Moon distance would be 25 feet.

J.C. then asks why the Moon always follows her around. The Moon replies that because of her great distance from the Earth, the Moon only <u>seems</u> to follow people around. In reality, the Moon follows the entire Earth, and is held in place by the force of gravity.

Still on the subject of gravity, J.C. tells the Moon that she has heard that gravity is less on the Moon than it is on Earth. The Moon confirms this fact and goes on to explain that the Moon has only 1/6th the gravity of Earth, so a person who weighs 60 lbs. on the Earth would weight only 10 lbs. on the Moon. With less gravity, you'd be able to jump farther on the Moon than you can on Earth.

J.C. turns to her cat Whiskers and tells him that with less gravity, he'd have an easier time catching the mice on the Moon who are eating all the green cheese. Overhearing her remark, the Moon explains that she is <u>not</u> made of cheese, nor are there any mice (or any other life) on the Moon. Instead, the Moon is made of rock and dust, with no water to drink nor air to breathe.

J.C. next asks where the Moon came from. Her question is answered two ways – by a West African mythical story of the Moon's origins, followed by science's best answer to the same question. In the latter answer, the Moon explains that scientists believe that a Mars-sized planet struck the Earth very early in its history, causing a large chunk of our planet to be torn out and flung into space. For a while, this material formed a ring around the Earth, but in time, this ring of material came together to form what would become the orbiting Moon.

J.C. next asks why the Moon has dark spots on its surface. The Moon explains that the dark spots are called "maria" (pronounced **MAR'** EE A), a word that means seas. Early observers, she explained, thought these dark patches <u>were</u> seas, but with the invention of the telescope, this was disproven. A mythical story, describing a Mighty Blacksmith who made all things in the sky,

explains the Moon's dark patches. Today, we know that the bright areas, which are called highlands, contain mountains and craters. We also know that the dark areas (or maria) are actually flat areas created when molten lava broke forth onto the Moon's surface long, long ago.

J.C.'s next question involves the phases of the Moon. The Moon explains that she orbits the Earth every 30 days, which defines the month (shortened from "moonth"). The underlying cause of phases is first described by a myth involving two sisters – the Sun and the Moon – and the movement of the Heavenly Bear, which changes the appearance of the Moon's face. Next, Moon phases are explained scientifically by using a flashlight (representing the Sun), a ball (representing the Moon), and J.C. herself (representing our vantage point from the Earth). As the Moon circles the Earth, eight stages (i.e. phases) of the Moon's circular path are described in turn – the Waxing Crescent phase, the First Quarter, the Waxing Gibbous, the Full Moon, the Waning Gibbous, the Last Quarter, the Waning Crescent, and the New Moon. J.C. then recites a poem that she wrote to describe the Moon's changing phases – "First you grow **face right** and **wax** until we see you at your max. Then you shrink **face left** and **wane** and disappear when New again."

The Moon recalls that in the 1950s and 1960s, numerous objects were hurled in her direction from Earth. Some spacecraft merely flew by, while others crashed onto her surface and still others gently landed. Although there is no such thing as the "Man in the Moon," there have been men on the Moon – 12, in fact. The first lunar landing was Apollo 11. Images and audio from that mission's landing, first footsteps, and the reading of its inscribed plaque are next presented.

J.C.'s final question involves the Moon's earlier reference to the rarity of a "Blue Moon." As the Moon explains, a "Blue Moon" is simply the second Full Moon in the same month, which happens approximately every 2 ½ years. The Moon reminds J.C. that only during the "Blue Moon" can her voice be heard. Shortly thereafter, J.C. awakens from her sleep, with Whiskers still beside her.

Pre-visit Preparation:

Like all the dome theater shows presented at the Cernan Center, no preparations are needed for students to enjoy and learn from their visit. If, however, you would like to conduct some pre-visit class discussions, you can start by using information contained in the "Summary of Show" and/or the "Post-visit Activities" sections of this Teacher's Guide.

Post-visit Activities:

After your visit to the Cernan Center, you may wish to discuss one or more of the following topics with your class, or perhaps have your students research the topics themselves and prepare a report or oral presentation.

- Research the Moon's contribution to literature and our culture. Find examples of the Moon in paintings, classic literature, children's books, poetry, and science fiction stories. Find examples of how space photographs are used in advertising.
- As was done in the program, create a classroom model of the Earth-Moon system. Using a larger ball (or Earth globe) to serve as the Earth, a smaller ball to serve as the Moon, a flashlight to serve as the Sun, and a darkened classroom, have volunteers from your class demonstrate the motion of the Moon around the Earth and the Moon's changing phases as observed from the Earth's position.

- Using two students posing as the Earth and Moon, try to demonstrate how the Moon must rotate to keep the same face toward earth. If the Moon didn't rotate, it would always face toward the same spot in the classroom. Show how if this happened it wouldn't always face the Earth, and we would be able to see all sides of the Moon as it orbits the Earth.
- During a one-month period, try to observe the changing location of the Moon in the sky. Note its location with respect to the Sun, stars and constellations; what time of day you were able to see it; and what its phase was. Perhaps you could sketch or draw its appearance as well.
- Discuss with your class what future missions to the Moon may be like. Where else in the solar system might people visit in the future? Describe what you think such a mission would be like.
- The following is a list of upcoming "Blue Moon" dates. Notice that number of months between "Blue Moons" is not consistent, but averages about 33 months (2 years + 9 months). Also notice that every so often, when a "Blue Moon" falls on January 31st, there may be another "Blue Moon" in March, only 2 months later. This last happened in 1999 and will happen again in 2018 and 2037 (but then not until 2094). Also, please note that "blue" is not meant to suggest a change in the Moon's appearance. The Moon looks no different on a "Blue Moon" date than on other Full Moon dates.

FUTURE "BLUE MOON" DATES:

DATE	LUNATION	M
May 31, 2007	1044	--
December 31, 2009	1076	32
August 31, 2012	1109	33
July 31, 2015	1145	36
January 31, 2018	1176	31
March 31, 2018	1178	2
October 31, 2020	1210	32
August 30, 2023	1245	35
May 31, 2026	1279	34
December 31, 2028	1311	32
September 30, 2031	1345	34
July 31, 2034	1380	35
January 31, 2037	1411	31
March 31, 2037	1413	2
October 31, 2039	1445	32
August 30, 2042	1480	35
May 30, 2045	1514	34
January 30, 2048	1547	34
September 30, 2050	1580	33

DATE = date of the "Blue Moon," which is the second Full Moon in the same calendar month. The date of "Blue Moon" is calculated for an observer located in the Central time zone.

LUNATION = Every Moon cycle has an assigned Lunation Number, starting with New Moon.

M = number of months that have elapsed since the previous "Blue Moon."

Teacher Resource Pages

Whether your class is studying astronomy, dinosaurs or earth science, the dome theater programs offered by the Cernan Earth and Space Center serve as an excellent supplement to your classroom instruction. However, if you would like to further research your subject area, or are looking for additional information on the topics presented in our shows, please refer to the following list:

ASTRONOMY AND SPACE SCIENCE

A wide variety of online resources can be found at the Cernan Center's Astronomy/Space Links page by visiting www.triton.edu/cernan and clicking on "Space Links."

NASA -- Educational materials including fact sheets, newsletters, slides, and videotapes.

1. NASA Educator Resource Center; Museum of Science and Industry; 57th Street & Lake Shore Drive; Chicago, IL 60637. Phone: (773) 684-9844, Ext. 2426. FAX: (773) 684-5580.
Website: **www.msichicago.org**. It has an extensive NASA video collection. Copies available free of charge if you provide blank tape. Many other resource materials available.

2. NASA Glenn Research Center; NASA Educator Resource Center; 21000 Brookpark Rd., MS 8-1; Cleveland, OH 44135. Phone: (216) 433-2017. FAX: (216) 433-3601.
Website: **www.nasa.gov/centers/glenn/education/**. NASA Teacher Resource Centers are established to provide educators with NASA-related educational materials for use in the classroom. These materials can be references or duplicated at the Center; they include classroom activities, lesson plans, teacher guides, laser disks, slides, audio and video tapes. Most materials and services are also available at Chicago's Museum of Science and Industry.

3. "Report to Educators" Free quarterly periodical about NASA for educational use. Request subscription on school letterhead by writing:

NASA Report to Educators
Education Affairs Division
Code XE
NASA
Washington, D.C. 20546

ASTRONOMICAL SOCIETY OF THE PACIFIC – "The Universe in the Classroom." A quarterly newsletter on teaching astronomy. You may request a free subscription by completing the electronic subscription form at **www.astrosociety.org/education/publications/tnl/tnl.html.**

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PERIODICALS:

1. SKY AND TELESCOPE Magazine. Monthly periodical. For subscription information, please write or call:

Sky Publishing Corporation
49 Bay State Road
Cambridge, MA 02138
(800) 253-0245 Website: **skyandtelescope.com**

2. ASTRONOMY Magazine. Monthly periodical. For subscription information, please write or call:

Kalmbach Publishing Co.
21027 Crossroads Circle
P.O. Box 1612
Waukesha, WI 53187
(800) 533-6644 Website: **www.astronomy.com**

3. ABRAMS SKY CALENDAR. Monthly sky map and astronomy events calendar. For subscription information, please write:

Abrams Sky Calendar
Abrams Planetarium
Michigan State University
East Lansing, Michigan 48824
Website: **www.pa.msu.edu/abrams/SkyCalendar/Index.html**

4. ODYSSEY Magazine. Children's monthly astronomy periodical. For subscription information, please write:

Cobblestone Publishing Company
30 Grove Street, Suite C
Peterborough, NH 03458
(800) 821-0115 Website: **www.odysseymagazine.com**

Please help us keep our information current. If you discover an address, phone number, or Internet address in our Teacher's Resource Pages that has changed, please inform the Cernan Center at **(708) 456-0300, Ext. 3372.** Thank you very much.

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EARTH SCIENCE

A wide variety of online resources can be found at the Cernan Center's Earth Science Links page by visiting www.triton.edu/cernan and clicking on "Earth Links."

DINOSAURS:

The best local resource for educators is the Field Museum of Natural History in Chicago. Call (312) 922-9410 and ask for the Teacher Resource Department. Website: **www.fmnh.org**

GEOLOGY:

U.S. Geological Survey (USGS) Website: **www.usgs.gov**
Boulder, Colorado

WEATHER:

National Climatic Data Center Website: **lwf.ncdc.noaa.gov/oa/ncdc.html**
NOAA Environmental Data Services
Federal Building
Asheville, North Carolina 28801

National Weather Service Website: **www.nws.noaa.gov**
Public Affairs Office
Silver Springs, Maryland
(301) 899-3296

Illinois Emergency Services and Disaster Agency
100 E. Adams
Springfield, Illinois 62706
(217) 782-2700

MISCELLANEOUS:

National Geographic Society Website: **www.nationalgeographic.com**
Educational Services
Department 38
Washington, D.C. 20036
(800) 368-2728

Please help us keep our information current. If you discover an address, phone number, or Internet address in our Teacher's Resource Pages that has changed, please inform the Cernan Center at **(708) 456-0300, Ext. 3372.** Thank you very much.