GRIFFITH OBSERVATORY ONLINE SCHOOL PROGRAM

MODULE 1: EVERYONE IS AN OBSERVER

TEACHER GUIDE

Dear Teacher,

Griffith Observatory's Mission: Inspire everyone to observe, ponder, and understand the sky.

Soon after Griffith Observatory opened in 1935, it initiated one of the first school-visit programs in the region. Generations of Los Angeles-area students made the pilgrimage in buses up Mount Hollywood for an experience under the planetarium stars.

The limitations imposed by the pandemic and Los Angeles schools' subsequent shift to online learning led Griffith Observatory to create a new online school program for fifth-grade students.

Since the program began in the 2020-2021 school year it has facilitated more than 200,000 student interactions. In the 2021-2022 school year, 89% of teachers reported a definite increase in students' S.T.E.A.M. interest. The online school program presents a unique opportunity for students across the nation to engage with Griffith Observatory and S.T.E.A.M.

For the fifteenth year, Griffith Observatory Foundation (formerly Friends Of The Observatory) generously continues to sponsor the Griffith Observatory school program both in its on-line and in-person formats.

https://griffithobservatory.org/support/

The Griffith Observatory online school program is currently being offered and will continue to serve students and teachers in 2023 when the in-person program resumes.

GRIFFITH OBSERVATORY

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GRIFFITH OBSERVATORY FOUNDATION

Griffith Observatory Online School Program

Overview

Griffith Observatory's online school program is a live, interactive, virtual school program for fifth-grade students. The program offers live and prepared elements that feature Griffith Observatory's knowledgeable Museum Guides and Telescope Demonstrators. Like the in-person school program, this on-line program is offered to interested schools on a first-come, first-served basis, and we encourage participation by schools in communities that have limited access to special science-outreach initiatives. The online program was created due to limitations imposed by the pandemic. The program is offered as a global, online resource even as the in-person program resumes. The operation of both programs is funded by Griffith Observatory and Griffith Observatory Foundation.

Griffith Observatory's online school program is hosted entirely through Zoom, is delivered live from Griffith Observatory, and meets current fifth-grade standards (NGSS 2015).

Structure

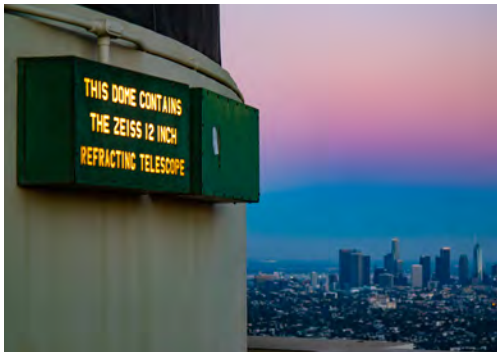
The program is a series of modules, each containing live, recorded, and animated elements. Each module lasts approximately 30 minutes and is followed immediately with a question-and-answer session. The modules are intended to be experienced in order, though not necessarily within a particular time-frame.

Goals

The modules are designed to accomplish three goals:

- inspire students to be observers
- encourage students to appreciate their place in and relationship to the universe
- expose students to the latest astronomical science and technology

The Modules



MODULE 1: EVERYONE IS AN OBSERVER

"Everyone Is an Observer" examines the observational skills everyone uses to navigate life. Through virtual daytime and night observation with Griffith Observatory's historic coelostat and Zeiss telescope, participants learn how astronomers observe, use scientific instruments, and record data to expand their knowledge of the universe. How has systematic observation changed our understanding of objects in space, and how have our findings helped us understand Earth's relationship to them?

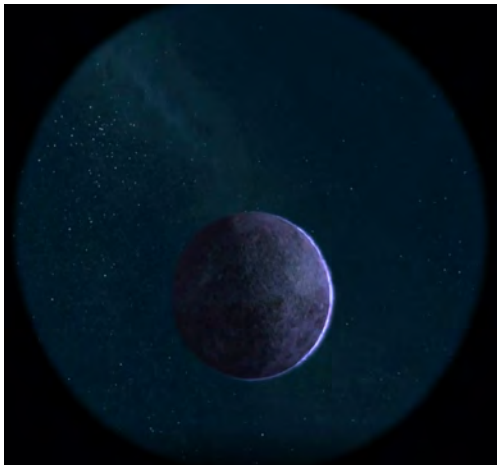
MODULE 2: CLUES FROM COMETS

"Clues from Comets" investigates the process of using observations to understand cause-and-effect relationships between events, exemplified by our understanding of comets over time. Presented live from Griffith Observatory's Leonard Nimoy Event Horizon theater, the program guides students through centuries of records kept on the appearances of comets as people gradually learned about their nature. Midway into the presentation, participants witness the manufacture of a life-ingredient-bearing comet from household supplies. Finally, participants embark on a journey to a real comet in space fashioned from actual photographs from the *Rosetta* mission. What can comets tell us about the solar system and about ourselves?

MODULE 3: THE SEARCH FOR WATER

"The Search for Water" emphasizes that liquid water is essential for life, looks inward at our own planet with thriving life forms, and then outward for other water-lush worlds. Griffith Observatory's *Our Earth*, *Our Moon*, *Elements*, and *Solar System Worlds* exhibits are explored to identify conditions and materials present on our world versus others. The unique properties of water are examined with a variety of demonstrations, and the resilience of life is explored with footage from Earth's extreme places. Students are then guided through the solar system in search of environments that sustain liquid water. The program includes animated elements from Griffith Observatory's planetarium show *Water Is Life* that have been converted to 2-D and enhanced for on-line learning.

Modules continued



MODULE 4: EXOPLANETS ARE EVERYWHERE

"Exoplanets Are Everywhere" outlines the structure of our solar system and shows how a planet's distance from its star, among other circumstances, is essential for making it a habitat for life. Students encounter exoplanet discoveries and what they mean. In this exhibit-based experience with interactive components, participants visit simulated alien worlds and solar systems in search of habitable planets. Students will visit The Gunther Depths of Space, experience the solar system models, see the current exoplanet count, take a tour of The Big Picture, see *Our Sun Is a Star*, and get acquainted with modern exoplanet-hunting technology.

Program Rundown

Module 1 Strategies

- Plant the notion that we're all observers all the time.
- Expand upon daytime and night observing in accordance with school standards.
- Use our instruments to demonstrate enhanced observational techniques.
- Supplement live and recorded content with documents and materials for the classroom and at home, to be used before and after participating in the module.

Module 1 Breakdown

PRE-PROGRAM WAITING ROOM
When logged on early, you encounter a waiting room animation indicating that the program has not yet begun.

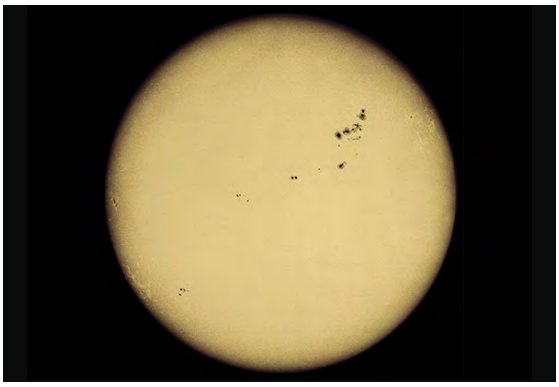
ARRIVAL TO GRIFFITH OBSERVATORY ANIMATION
An animation designed and produced by Griffith Observatory's Satellite Studio brings you from the far reaches of the universe to Griffith Observatory.

LIVE INTRODUCTION TO YOUR MUSEUM GUIDE
A Museum Guide joins you live from Griffith Observatory's Wilder Hall of the Eye. The Guide tells students about the history of observing, how we, too, observe every day, and how instruments like telescopes expand our ability to observe astronomical objects.

NIGHT-SKY OBSERVING DEMONSTRATION WITH A LIVE TELESCOPE DEMONSTRATOR
A Telescope Demonstrator joins us live from the Zeiss 12-inch refracting telescope dome and gives us a tour. We learn about different types of telescopes, the history of the Zeiss telescope, and its operation. A time-lapse video shows highlights from a night of observing at Griffith Observatory. We are presented with a question through Zoom's polling feature. We choose which celestial object we want to know better.

MUSEUM GUIDE TRANSITION WITH SOLAR OBSERVING INTRODUCTION
The live Museum Guide returns and takes us from night-sky observing to observing the Sun. We take virtual tours of Griffith Observatory's sundial and Gottlieb Transit Corridor.

Program Rundown continued



SOLAR OBSERVING DEMONSTRATION AND LIVE VIEW OF THE SUN THROUGH A TELESCOPE

The live Telescope Demonstrator returns and introduces Griffith Observatory's main solar telescope, the Triple-beam Coelostat. We take a tour of the coelostat. If weather permits, the Telescope Demonstrator streams a live image of the Sun from one of Griffith Observatory's solar telescopes. We learn about the Sun's behavior and are presented with a quiz question through Zoom's polling feature.

TRANSITION WITH LIVE MUSEUM GUIDE

We transition back to the live Museum Guide, who explains the importance of monitoring solar activity and how this is best done from space.

SOLAR EXPLORATION ANIMATION WITH FINAL REFLECTIONS

An animation designed and produced by Griffith Observatory's Satellite Studio plays. We are launched toward the Sun and accompany the *Parker Solar Probe*. We transition to a question-and-answer session with the live Museum Guide and Telescope Demonstrator.

QUESTION-AND-ANSWER SESSION

The live Museum Guide and Telescope Demonstrator answer science questions from students.

2015 Next Generation Science Standards Reflected in the Program

Module 1: Everyone Is an Observer

GRADE	STANDARD	NGSS DESCRIPTION	HOW THE STANDARD IS ADDRESSED
5	5-PS1-4 CCC-2	Cause-and-effect relationships are routinely identified, tested, and used to explain change.	At the beginning of the program, the Museum Guide shares thoughts about how people routinely deduce causes by first noticing their effects. We expand into how different cultures examined cosmic cause-and-effect relationships throughout history. We describe how modern day astronomers examine cause-and-effect relationships.
5	Principle III	Natural systems proceed through cycles upon which people depend, from which they benefit, and which they may alter.	We explore how different cultures observed natural cycles and adapted to them. We talk about the Chumash people, who noticed a link between the sky and the seasons and then used that knowledge to be better prepared for seasonal changes. Later, we place emphasis on the significant role that the Sun plays in Earth's systems and cycles, all of which affect us.
5	5-ESS3-1 SEP-8	Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.	We explain that Galileo Galilei's recordings of telescopic observations inspired other astronomers to use tools like telescopes to improve their ability to observe and do science.
3-5	3-5-ETS1 ETS1.C	Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	We continually emphasize that scientific thought involves checking our assumptions constantly, looking at the bigger picture, and changing or confirming what we understand based on our observations.
5	5-ESS1-1 ESS1.A	The Sun is a star that appears larger and brighter than other stars because it is closer.	We note that the Sun is the closest star to us and is therefore the most important star to observe.
5	5-ESS2-1 ESS2.A	Earth Materials and Systems	We stress the Sun's significance by exploring its relationship to Earth's systems. For example, we note that the Sun contributes to the water cycle by evaporating our surface water which then reforms into clouds.
5	5-LS2 LS2.A	The food of almost any kind of animal can be traced back to plants.	We note that the Sun's light fuels the plants upon which we and other life forms feed to survive.
3-5	3-5-CCC-3	Natural objects and/or observable phenomena exist from the very small to the immensely large, or from very short to very long time periods.	We explain that the Sun will continue to burn for another few billion years and then compare the size of solar prominenses to the size of Earth.

Standards continued

GRADE	STANDARD	NGSS DESCRIPTION	HOW THE STANDARD IS ADDRESSED
5	5-ESS1-2 ESS1.B	The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about an axis between its north and south poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the Sun, Moon, and stars at different times of the day, month, and year.	We examine how the Earth's rotation and orbit affect our relationship to the Sun with Griffith Observatory's sundial and meridian arc. We present visual data that explain the roles of the Sun and Earth in the occurrence of our days, nights, and seasons.
5	5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	We see how Griffith Observatory's sundial uses shadows to tell time and how the ecliptic chart plots the shifting background of stars behind the Sun.
5	5-LS2-1	Science describes the mechanisms for natural events.	We reiterate that anyone can uncover explanations of natural events by using scientific instruments and recording observations over time. We explore how record-making and the use of solar telescopes and have led scientists to understand the link between solar weather patterns and the solar cycle.
3-5	3-5-SEP-4	Analyzing and Interpreting Data	We study what the Sun looks like at different part of the solar cycle. In a poll, participants are asked to select which of two solar images represents the Sun at solar maximum.
5	5-ESS3-1	Obtain and combine information about ways individual communities use scientific ideas to protect the Earth's resources and environment.	We state that solar activity can knock out Earth's communication satellites and power grids when discussing why scientists study the Sun. By monitoring solar activity, we can prevent power outages.
2	2-ETS1-A	A situation that people want to change or create can be approached as a problem to be solved through engineering.	We discuss the ways that scientists use engineering to address problems. For example, we talk about why we must launch probes into space to study the far side of the Sun.

Connecting to the Program

Overview

This section contains all of the information you and your students will need in order to join your online school program webinar session and ensure a successful virtual visit to Griffith Observatory. It is essential that you read and follow these instructions carefully.

Within 24 hours of completing the registration process for our program, you should have received a confirmation email from online.sp@griffithmedia.org. The message includes a **Zoom webinar link**, the **date and time** of your session, a list of all teachers included in your registration, and other important information and links. You are responsible for forwarding the necessary information, according to the instructions in the message, to your students and all included teachers. Shortly before your scheduled Griffith Observatory Online School Program webinar session, you will receive a reminder message.

What You Need to Know

- Please be as punctual as possible. Your session includes a window for arrivals before the actual program begins, but the program will begin regardless of whether every registered classroom shows up or not.
- A Griffith Observatory staff member will be in the Zoom room to assist you if needed, relay some reminders, and will then act as your main point of contact for any questions you may have during the program. Use the chat feature to message the "Host and Panelists."
- The school program now uses Zoom's "webinar" model. Teachers and students are now encouraged enter the webinar all at once. Although you will be muted with your video turned off, you may still use the chat function to message Griffith Observatory staff.
- Students that join the webinar from their individual devices are also not able to unmute themselves or share their video streams. They may not chat with each other. They may, however, use the chat feature to ask for help and use the Q&A feature to submit astronomical questions to staff. Questions submitted in the Q&A feature are not visible to everyone unless a staff member chooses to answer it live.
- You may also choose to project the program to your class. Note: This means you will need to answer the interactive polls and ask questions for the Q&A on behalf of your class.
- In the unlikely event that the Griffith Observatory video stream drops out of the webinar, please instruct your students to wait patiently and remain in the call.

Essential Information for Students

It is your responsibility to make sure your students receive and understand the following information. You may easily copy it and paste it into a message to your students. Make sure you insert your class's registered session **time**, **date**, and unique **Zoom webinar link** into the **orange** areas below. This information may be found in your confirmation email.

Dear Students,

Your class's Griffith Observatory Online School Program webinar time:
[**INSERT YOUR REGISTERED WEBINAR TIME AND DATE**]

Please log on at the time of your scheduled session. Make sure you set your "Zoom name" to contain your first and last name.

Once you enter the webinar, you will be muted with your video off. You will see a video of Griffith Observatory against a sky that cycles between day and night, and you will hear music. If you do not see the video or hear the music, use this time to work with a grown-up to check your internet connection and sound. You may also use Zoom's chat feature to ask one of the Griffith Observatory hosts for help. Once everything is working perfectly, pay attention to the instructions, and have a great online visit to Griffith Observatory!

Click the link below or copy and paste it into an Internet browser to join the meeting.

YOUR CLASS'S ZOOM WEBINAR LINK:
[**INSERT YOUR GRIFFITH OBSERVATORY ZOOM WEBINAR LINK**]

THIS WEBINAR LINK IS YOURS AND YOURS ONLY. DO NOT SHARE IT WITH ANYONE NOT PART OF YOUR CLASS.

Before the program, please make sure you have reviewed your **Student Guide**.

Frequently Asked Questions

How safe are the online school program's meeting rooms?
Your meeting room has a unique **Zoom webinar link** that will only be issued to the teacher/adult contact(s) you indicated during the registration process and to other teachers and students that have registered for that particular session. The email message with the Zoom webinar link also contains necessary information to relay to your students. This information includes a prohibition on sharing the Zoom webinar link, as keeping the webinar session link private guarantees security. At the beginning of the program, staff will state that any inappropriate, rude, or harassing language or spam sent to staff in the chat or Q&A is not tolerated and may result in being dropped from the Zoom session.

Do my students and I need to download the Zoom app to view the program?
No. You may click the Zoom webinar link or copy and paste it into an internet browser. If you do not have the Zoom app, your browser will present you with an option to "join from your browser." If you do have the Zoom app, you will be redirected to the webinar in your Zoom app after searching the link in your internet browser.

Can I access my registration form to make changes?
No. If you need to make a change, however, please email online.sp@griffithmedia.org in advance of your session.

What happens if a participant has poor connection, loses connection, or needs help?
Students will be told early in the Zoom webinar what they should do if they need help or if a connection issue occurs. They may use Zoom's chat feature to talk to Griffith Observatory staff members to report or receive help with technical issues. If a participant's call fails, the participant will be able to use the same Zoom webinar link to rejoin the session.

May I or my students record the program?
No. Like the Observatory's in-person school program, the live webinar is designed and intended to be experienced in the moment. We also need to safeguard the program content, quality, and integrity. In the future, we may consider producing recorded versions of the program, but they would be optimized for that format (vs. a live program.)

Contact

For any concerns or questions, contact online.sp@griffithmedia.org.

Pre-program Materials

To get the most out of Module 1: Everyone Is an Observer, explore the following materials before your visit.

Module 1 Glossary

The glossary identifies and defines important words that are useful for students before they attend "Everyone Is an Observer."

Listen to the Module 1 Glossary

This helps students become familiar with the terms we shall use in the program. This is recommended as an accessibility resource for students with physical and/or language-related challenges. The audio file includes pronunciations and definitions of important terms used in our program (same as in the Glossary above).

Crossword Puzzle and Grading Version

Students recall vocabulary and connect each term to its definition in a crossword.

Draw the Moon

This activity guides students to practice their observational and communication skills independently as they note the Moon's phases and features and follow its movement in the sky over time.

Observer's Questionnaire

The questionnaire invites students to observe over multiple nights. When the activity is completed, students engage in a post-activity discussion and share and compare their observations.

Solar System Match-up and Grading Version

Students familiarize themselves with solar system objects by matching each object with its description.

Sky Report

Griffith Observatory's Sky Report provides up-to-date information about what to see in the skies over Los Angeles and surrounding areas.

Glossary

MODULE 1: EVERYONE IS AN OBSERVER

astronomy – the study of space and everything in it, including, but not limited to, stars, planets, galaxies, nebulae, black holes, supernovae, asteroids, comets, and the search for extraterrestrial life.

atom – a basic unit of matter. An atom has a nucleus containing protons and neutrons and a cloud of electrons surrounding the nucleus.

calculate – to determine something with arithmetic.

comet – a small, icy object from the outer part of the solar system. Comets form tails as they approach the Sun and begin to warm up. The heat vaporizes the icy materials in comets to form tails of gas and dust that point away from the Sun. Comets also contain some of the essential chemistry for life, including carbon and water.

ecliptic – The apparent path of the Sun and all the planets of the solar system through the sky is known as the "ecliptic" because lunar and solar eclipses can occur only when the moon crosses it.

galaxy – a massive collection of stars, gas, dust, and other celestial objects bound together into a single system by gravity. A galaxy may contain from ten million stars to one trillion stars. The Earth and Sun are in the Milky Way Galaxy.


Andromeda Galaxy (M31)

galaxy cluster – a large collection of galaxies bound together by gravity. A cluster may contain hundreds to thousands of galaxies.

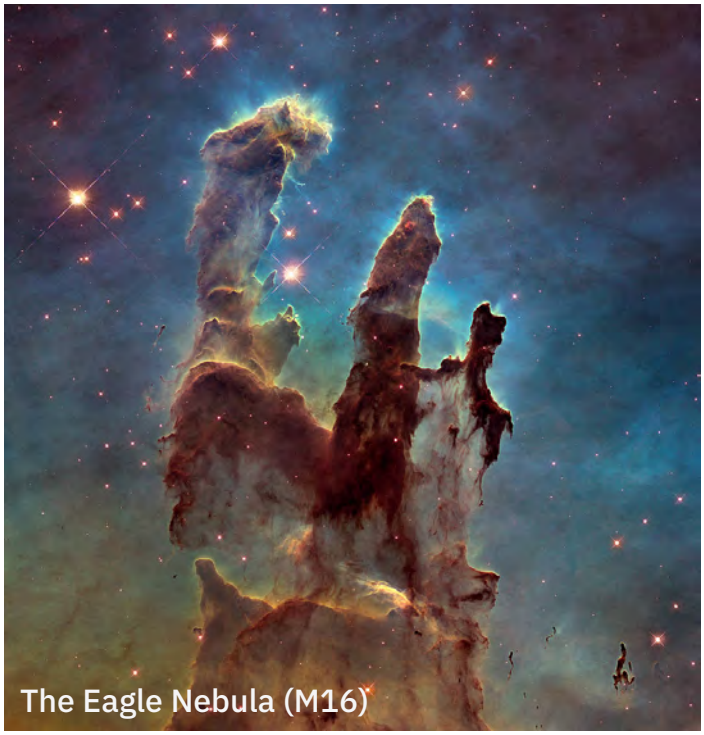
Hubble Space Telescope – a large telescope that orbits Earth. It takes pictures and makes observations, and astronomers study those pictures and observations to learn about distant objects.

light waves – Light travels as a wave. There are types of light we cannot see. They have much shorter or much longer wavelengths than visible light. The types of light include radio waves, microwaves, infrared, visible light (which we can see), ultraviolet, X-rays, and gamma rays.

lunar phases – the different shapes the Moon appears to have over a month. The apparent shape of the Moon depends on the angle at which we see it hit by sunlight.

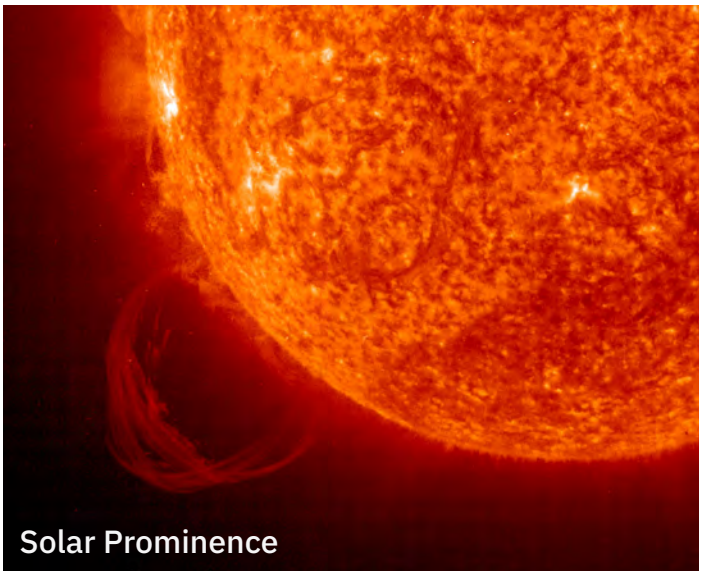
nebulae – plural form of *nebula.* Known as "star nurseries," nebulae are made of large clouds of interstellar gas and dust that look similar to clouds when viewed from far away. Over time, stars and planets can form within some nebulae.

observatory – a place for observing and studying astronomical objects and events.


The Eagle Nebula (M16)

orbit – a path followed by an object under the influence of gravitational force from another body. The Earth orbits the Sun. The Moon and the International Space Station orbit the Earth.

planet – A planet is an object that (a) orbits the Sun, (b) is massive enough to be spherical in shape, and (c) has cleared its neighboring region of other objects. There are eight planets in our solar system: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.


Solar Prominence

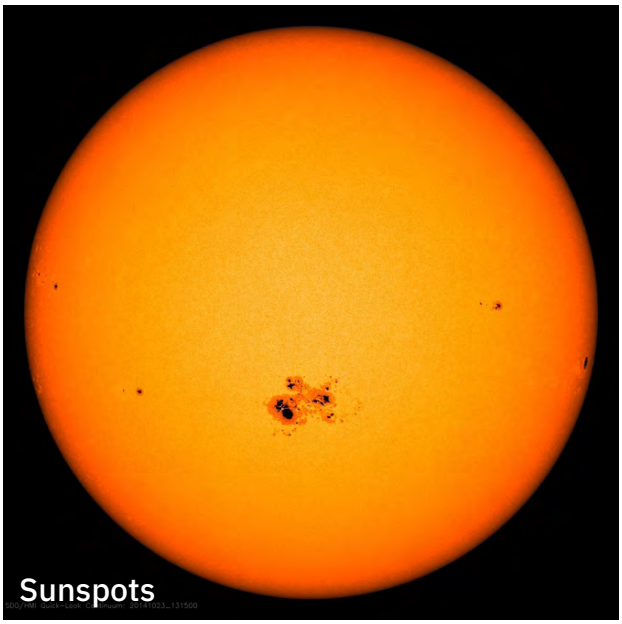
solar filter – a special filter applied to a telescope to dim the Sun's light and allow the viewer to look safely at the Sun.

solar prominences – large structures of luminous hydrogen gas that extend thousands of miles out from the Sun. They are usually loop-like in shape.

solar system – a system of planets, moons, asteroids, comets, and other small objects that orbit a star. The Sun is the star in our solar system.

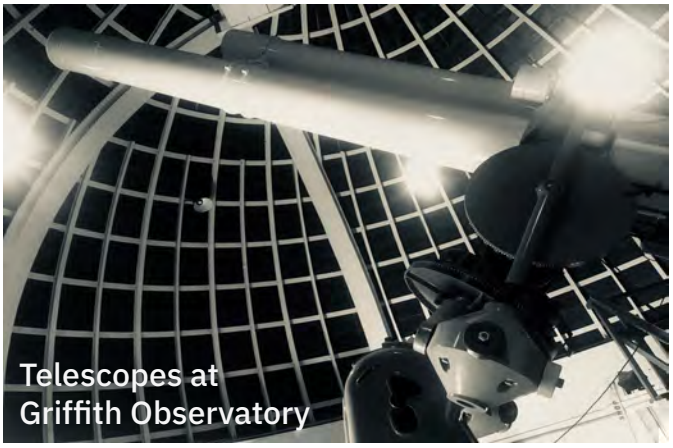
spacecraft – a vehicle or machine that can carry people, instruments, or cargo beyond Earth's atmosphere into space and back home again or to some other destination.

star – a celestial body of gas that generates light and other energy and is held together by its own gravity. The Sun is a star, and while stars look like tiny pinpoints of light to us, many are larger than the Sun. They look tiny because they are so far away.


Sunspots

sunspot – an area of strong magnetic activity in the outer layer of the Sun. Sunspots appear as spots darker than the surrounding area.

telescope – an instrument that uses lenses and/or mirrors to gather and focus light for observation. In astronomy, telescopes allow the viewer to study distant objects in detail by making them appear larger, brighter, and sharper than what is seen with the unaided eye. There are two primary types of optical telescopes: Reflecting telescopes, which use mirrors, and refracting telescopes, which use lenses.


Telescopes at Griffith Observatory

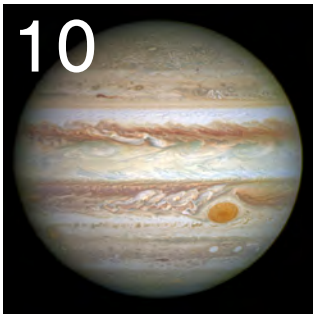
tradition – cultural ideas, beliefs, activities, behaviors, and objects that have existed or have been repeated for a long time.

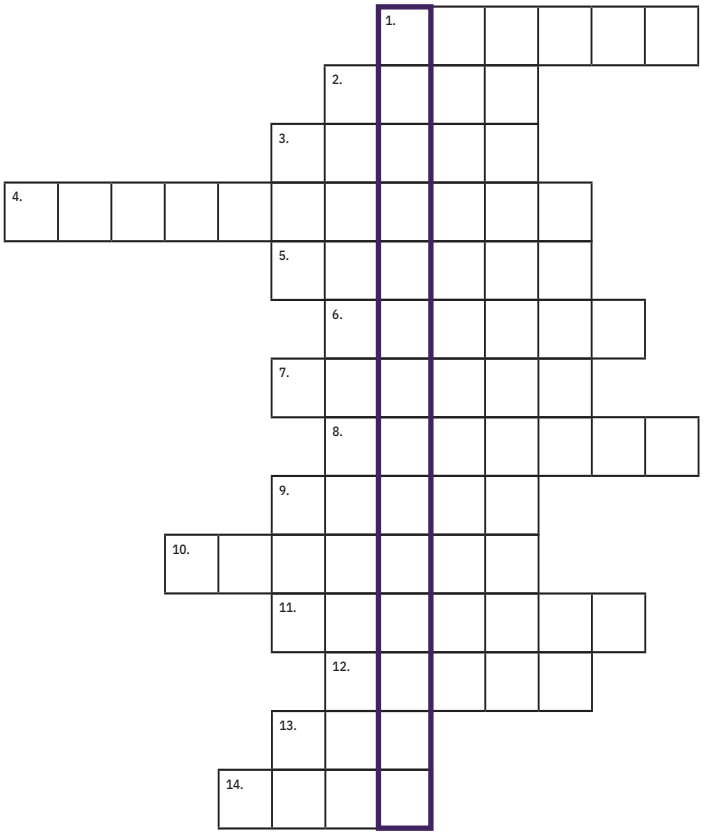
universe – all of space and time and all of its contents, including the solar system and all stars and galaxies.

visible spectrum – the band of colors which the eye can see. They include red, orange, yellow, green, blue, indigo, and violet.

world record – a title that indicates a person, place, or object that is the very best at something. Griffith Observatory's 12-inch Zeiss Refracting Telescope holds a world record: More people have looked through it than any other telescope on Earth.

What can you see in the sky?

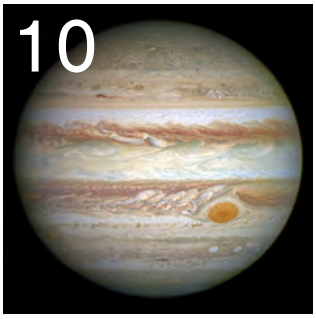




Solve the crossword to discover the hidden word.

There are 88 _____ in the sky.

What can you see in the sky?



					1. C	L	O	U	D	S
				2. M	O	O	N			
			3. V	E	N	U	S			
4. S	T	A	R	C	L	U	S	T	E	R
				5. S	A	T	U	R	N	
				6. N	E	B	U	L	A	
				7. G	A	L	A	X	Y	
				8. P	L	A	N	E	T	S
				9. S	T	A	R	S		
		10. J	U	P	I	T	E	R		
				11. R	A	I	N	B	O	W
				12. C	O	M	E	T		
				13. S	U	N				
			14. M	A	R	S				

Solve the crossword to discover the hidden word.

There are 88 CONSTELLATIONS in the sky.

Draw the Moon

Every four days, try to find the Moon. Sometimes you will find it in the night sky and sometimes in the daytime sky. Color in the circle to match what you see by shading in the darkened part. Enter the date and time you observe the Moon and what phase it has. If you can't find it at all, just write "No Moon."

EXAMPLE:  → 

DATE _____ **DATE** _____

TIME _____ **TIME** _____

PHASE _____ **PHASE** _____

DATE _____ **DATE** _____

TIME _____ **TIME** _____

PHASE _____ **PHASE** _____

DATE _____

TIME _____

PHASE _____

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PHASE _____

DISCUSSION QUESTION

How long does it take the Moon to return to the same shape? _____

To find out more about Moon phases, visit

www.griffithobservatory.org/exhibits/ahmanson-hall-of-the-sky/moon-phases

Observer's Questionnaire

Every time you look up at the Moon, the planets, and the stars, you are observing them, and that makes you an astronomer. Here at Griffith Observatory, we want to help you to understand what you're seeing up there.

Recording what you observe is an important part of science. Here are some questions that might help you to do that.

1. What is the date and time you started your observation?

Date _____/_____/_____ Time _____:_____ a.m. / p.m (Circle one)

2. When you look up tonight, how many stars can you see? Count them and record that number below. If you can see more than 50 stars, just write "50+."

Record the number of stars you can see tonight. _____

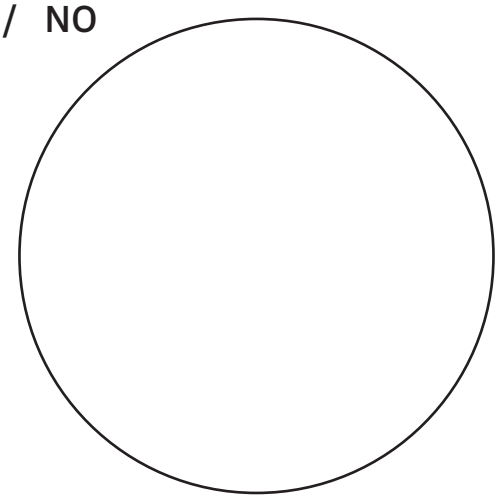
3. Are you sure those are all stars? What else can you see in the night sky (not including things made by people, such as airplanes, jets, helicopters, or blimps)?

What else besides stars can I see in the night sky?

_____

4. Can you see the Moon tonight? (Circle one) YES / NO

If yes, draw a picture of the moon, as you observe it, here.



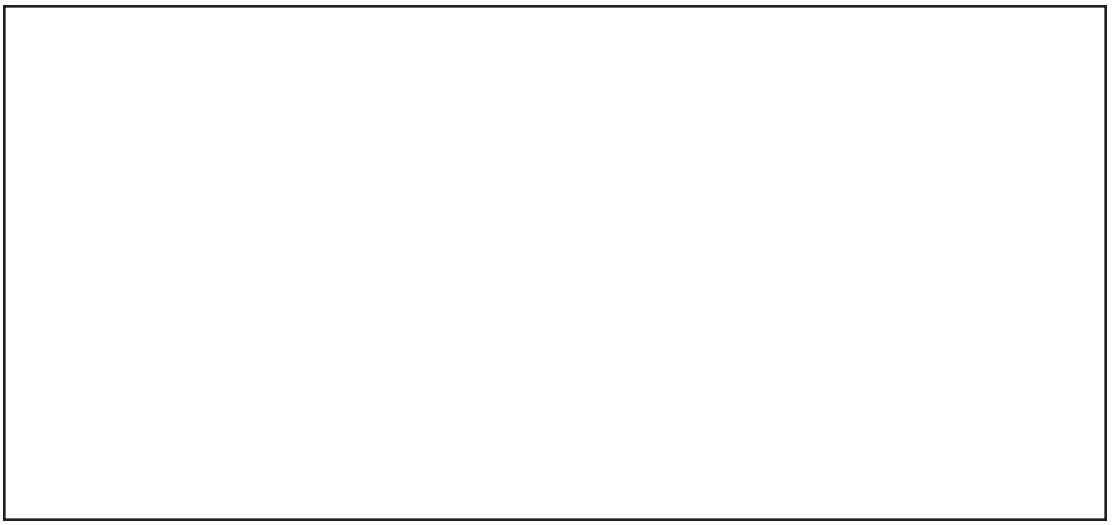
6. Can you tell what phase the Moon is in tonight? If so, record it here.

_____

7. Do you recognize any constellations (stars that form a familiar pattern)?

Circle one: YES / NO

If YES, draw it below.
If NO, mark down some stars just as you see them and connect the stars with lines.



8. What is the name of the constellation you drew? If you had to make up this constellation, what did you name it?

_____

9. Did you see a meteor (also known as a shooting star) tonight?

Circle one: YES / NO

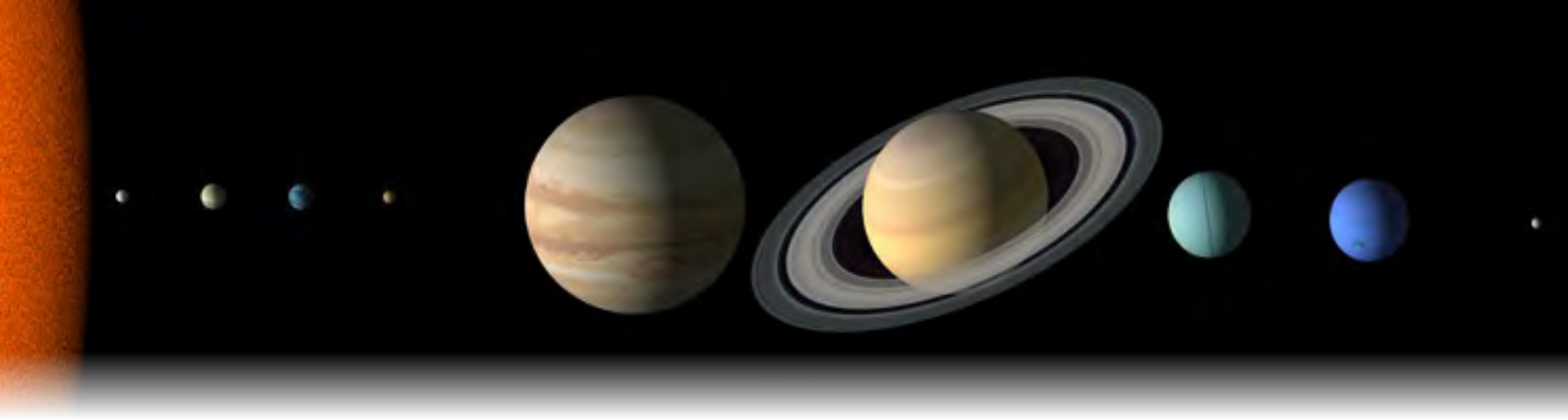
10. If you have any other comments or observations, record them here.

_____

_____

_____

NICE WORK, ASTRONOMER.

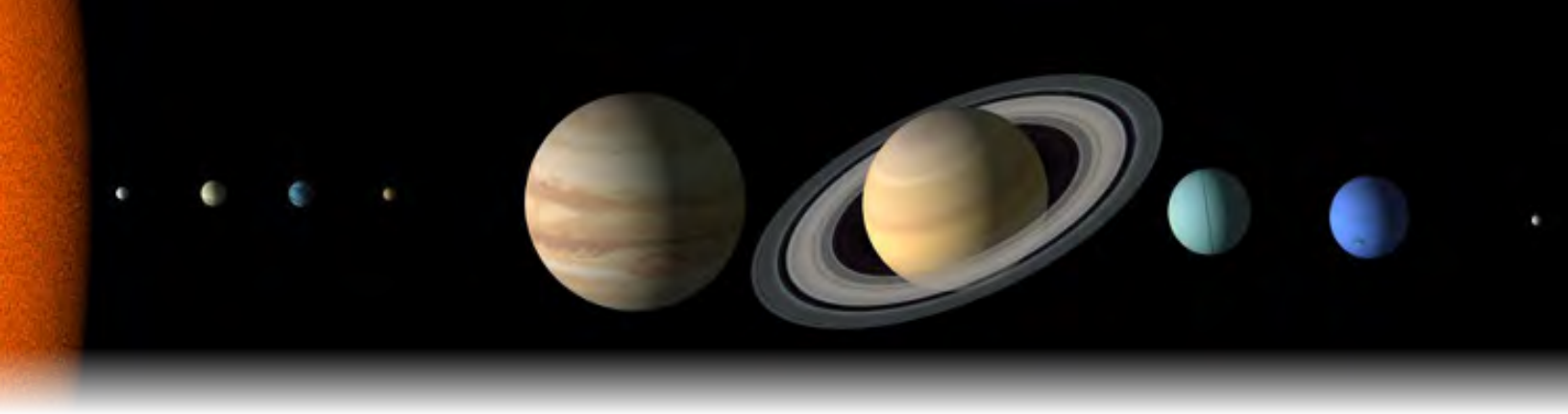


Solar System Match-up

Draw a line from each item on the left to its description on the right.
Hint: If you don't know the answer, it's okay to look it up. That's how we learn!

PLANETS...PLUS PLUTO	DESCRIPTIONS
Mercury	the coldest planet
Venus	it has very visible rings
Earth	the smallest planet
Mars	named for the Greek god of the sky
Jupiter	dwarf planet
Saturn	a planet with wandering robots
Uranus	the hottest planet
Neptune	has a lot of liquid water on its surface
Pluto	the largest planet

ALSO IN THE SOLAR SYSTEM	DESCRIPTIONS
Ceres	It starts at Pluto.
Europa	Many comets live here.
Kuiper Belt	the largest known asteroid
Titan	a moon of Jupiter covered in water ice
Oort Cloud	It has lakes of liquid methane.



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Post-program Materials

We hope you and your class enjoyed Module 1: Everyone Is an Observer of Griffith Observatory's Online School Program. To continue your and your students' lifelong journey as observers, here are some activities and resources.

Module 1 Word Scramble and Grading Version

This worksheet reinforces the new terms students learn in Module 1: Everyone Is an Observer.

Shadows of the Sun: ChumashScience.com

This is a free fifth-grade lesson plan from the Chumash Science Through Time Project. The Chumash people are one of many native California tribes. This lesson plan combines Next Generation Science Standards and Indigenous Knowledge to show students how to measure the movement of a shadow through the day. It also demonstrates how those shadows change from season to season.

Build Your Own Solar Pinhole Projector

This activity includes instructions to help students build their own solar pinhole projector with common household materials in order to observe the Sun safely, never directly. With just two pieces of cardboard or paper and a pin, students will become daytime observers.

Find Planets in the Sky Tonight

This activity brings Griffith Observatory's Sky Report to life from the comfort of home. The Sky Report is updated frequently to let you know what's in the sky. Students visualize the Sky Report by placing common household objects on the floor to represent the positions of visible celestial objects from the current sky chart. Then, they compare what they've laid out to what they see in the night sky.

Coloring the Cosmos

We have provided two coloring-book-style activities for students.

Stellarium Guide

This guide includes instructions to help students learn how to use Stellarium, free planetarium software that shows a realistic simulation of the sky in real time.

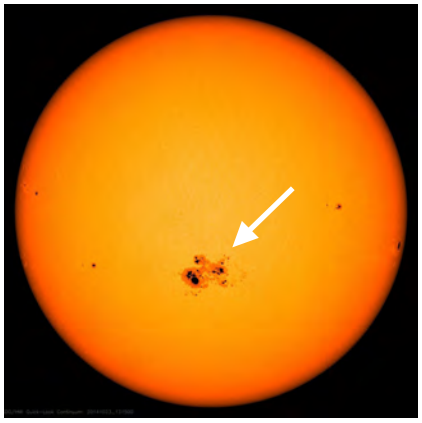
Internet Resources

The Internet may be helpful. This variety of websites will help students expand their astronomical knowledge and have fun doing it.

Can you unscramble the following words?

EOCELTEPS

_ _ _ _ _ _ _ _ _



USNTSPO

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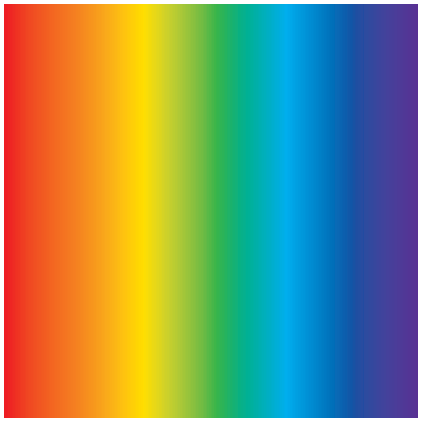
MTCEO

_ _ _ _ _

EROABOVSTRY

_ _ _ _ _ _ _ _ _ _ _



EURCTSPM

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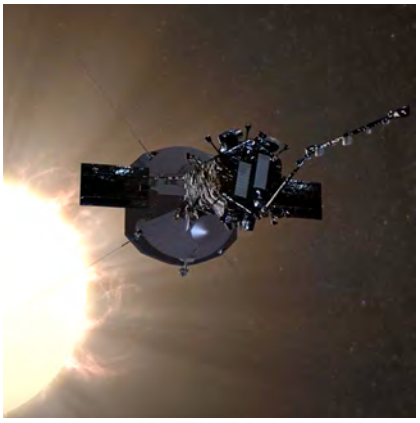


SPFCREACAT

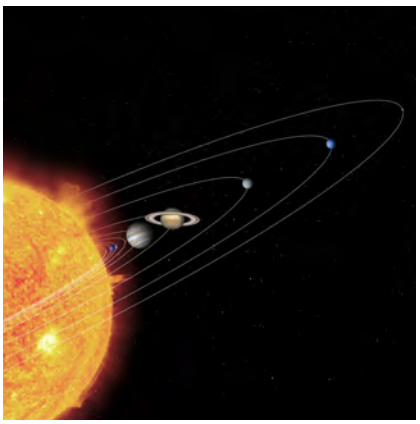
_ _ _ _ _ _ _ _ _ _

ULNRA EPHSAS

_ _ _ _ _ _ _ _ _ _ _ _

ILUNDAS

_ _ _ _ _ _ _



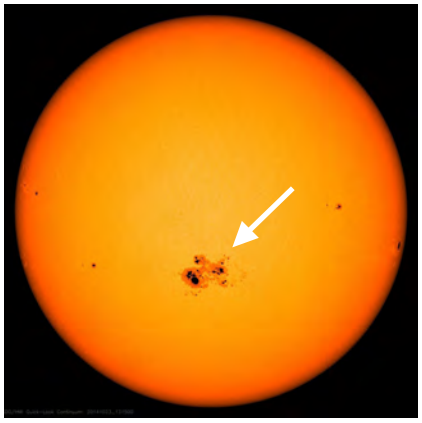
LSRAO ETYSMS

_ _ _ _ _ _ _ _ _ _ _ _

Can you unscramble the following words?

EOCELTEPS

T E L E S C O P E



USNTSPO

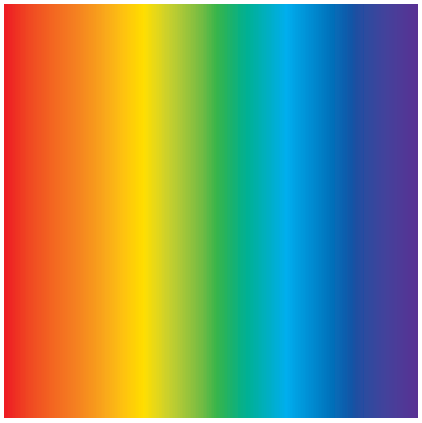
S U N S P O T

MTCEO

C O M E T

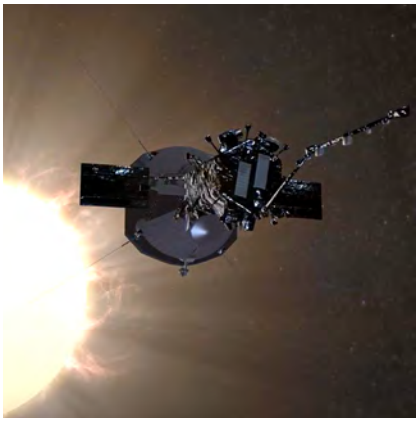
EROABOVSTRY

O B S E R V A T O R Y



EURCTSPM

S P E C T R U M



SPFCREACAT

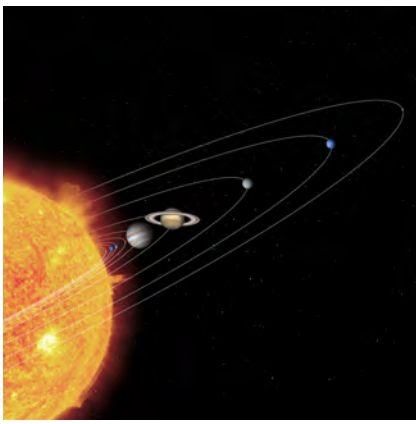
S P A C E C R A F T

ULNRA EPHSAS

L U N A R P H A S E S

ILUNDAS

S U N D I A L



LSRAO ETYSMS

S O L A R S Y S T E M

How to Build Your Own Solar Pinhole Projector

Before you begin, understand that you should ***NEVER, EVER LOOK DIRECTLY AT THE SUN***, not with sunglasses, not through a telescope, not through a tiny hole, never. There are solar glasses, solar telescopes, and solar filters that may be used to look at the Sun, but these are ***NOT*** the same as regular sunglasses, telescopes, and filters. Looking at the Sun with anything but genuinely safe devices may result in blindness. This project is safe because you are looking at an *image* of the Sun projected onto a piece of cardboard or paper. In a solar eclipse, this is a safe way to view the Sun.

MATERIALS NEEDED:

- two pieces of cardboard, ideally one of them non-corrugated (without the ripples and ridges), or two pieces of plain white paper
- a pin, a sharp thumbtack, or a needle

WHAT TO DO:

- Stand one piece of cardboard or paper on the ground by leaning it against a wall or pole. Make sure it is facing the Sun so that the entire surface is opposite the Sun and is illuminated in sunlight. This will act as the screen for your projector.
- Use a pin, thumbtack, or needle to puncture a small round hole in the other piece of non-corrugated cardboard or paper.
- Sometimes puncturing a hole will make little “flaps” that cast rough-edged shadows in the beam of sunlight. Use a finger or thumb to press down any rough edges of the hole you made. You want the hole to be as round as possible.
- Hold the piece of cardboard or paper with a hole in it between the Sun and the screen. Make sure the beam of sunlight going through the hole is shining onto the screen.
- See what happens when you move the piece of cardboard or paper with a hole in it closer and farther away from your screen.

Find Planets in the Sky Tonight

How to Hunt for Planets by Placing Yourself in the Griffith Observatory Sky Report

ITEMS NEEDED FOR THIS ACTIVITY

- access to Griffith Observatory's "Sky Report" section on our website: https://griffithobservatory.org/explore/observing-the-sky/sky-report/
- several plates, cups, or bowls of various sizes
- an open space on the floor to lay out your planets
- a safe place to observe the night sky

HOW TO HUNT FOR PLANETS

1) Visit Griffith Observatory's Sky Report on the Internet.

2) How many planets are visible on the sky chart? Note that sometimes there are none.

3) Find objects around your home like plates or bowls to represent the planets. Ask for permission to use them.

4) Center yourself as Griffith Observatory in the sky chart, and place the planet plates around you in the directions they appear on the chart.

5) Place one final large object behind you to represent the Sun at night. We can't see it, but it is important to remember it is there.

6) Once you have all of the planets placed according to the sky chart, imagine each planet racing around the Sun on its own little racetrack, along with Earth. Some move faster; some move slower.

7) Go outside at the time specified on the chart. Face toward the south.

8) Look for bright, steady, non-twinkling points of light.

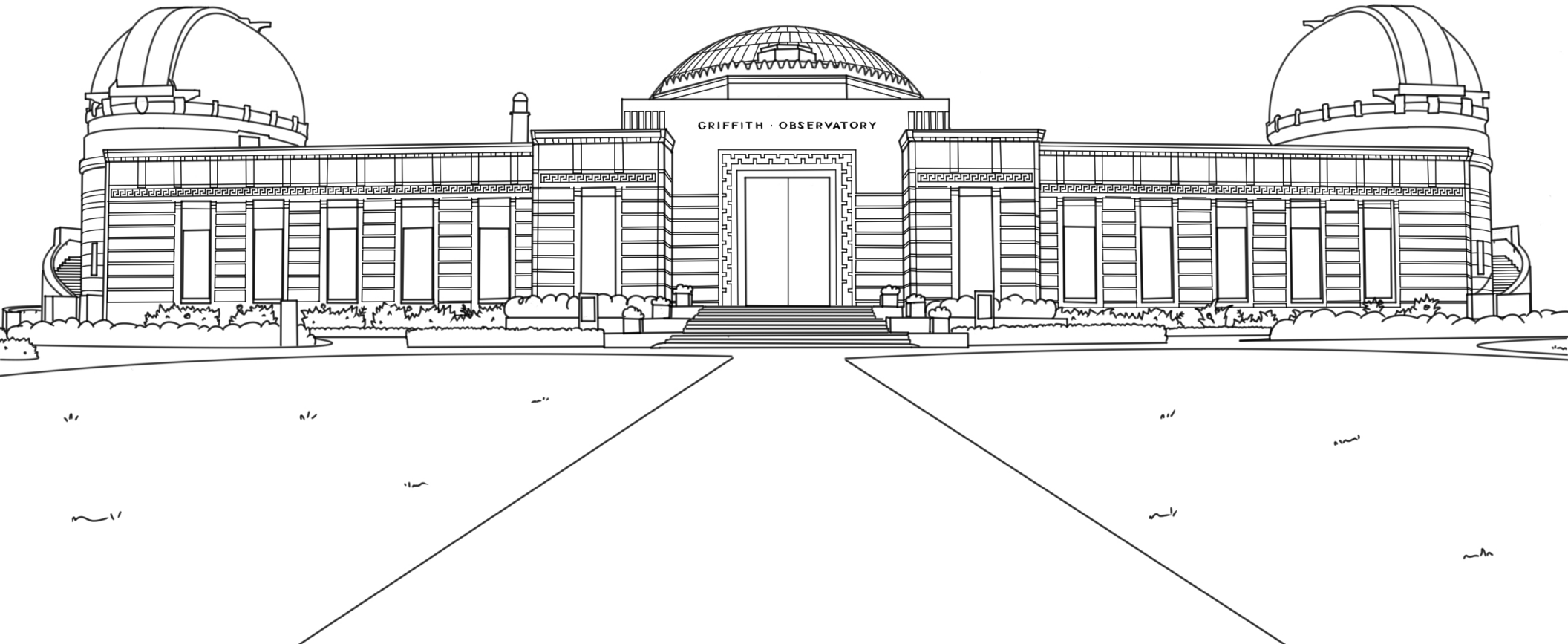
9) If the bright steady points of light in the sky match both the Sky Report and your model, you are probably observing a planet!

10) Does the planet you found look different from the stars? If so, how does it differ?

11) Different planets will appear in different locations throughout the year as they and the Earth all move around the Sun.

12) People have been keeping track of the planets' speeds and orbits for a very long time, and we are able to predict when the planets will come into view.

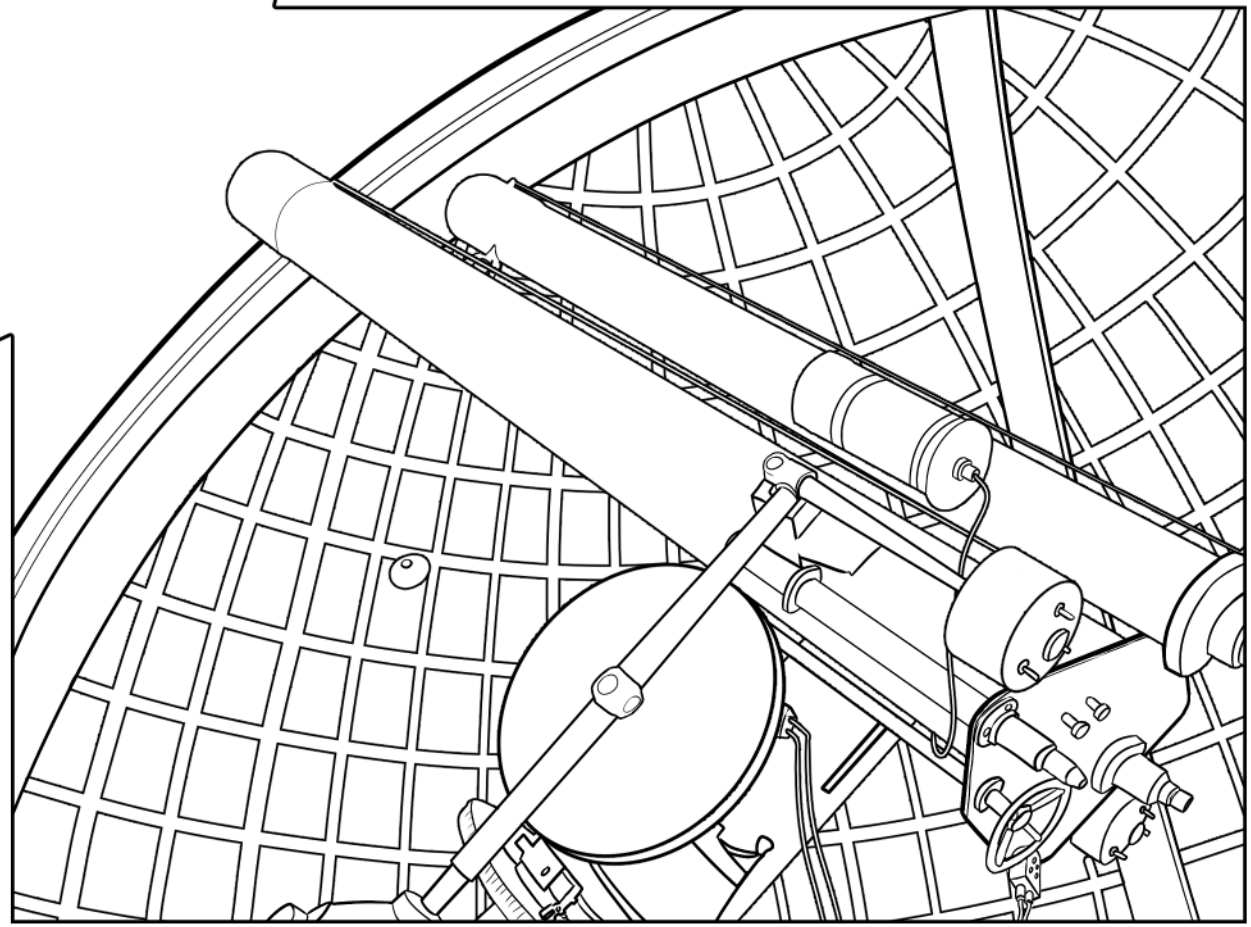
13) What planets do you think we shall be able to see in the night sky next month?


GRIFFITH · OBSERVATORY

The 12-inch Zeiss Refracting Telescope

More people have looked though Griffith Observatory's original 12-inch Zeiss refracting telescope than any other telescope in the world. Located in the roof-top dome on the building's east end, the Zeiss telescope commonly targets the Moon, planets, and brightest showpiece objects of our galaxy.

What shall the Zeiss target tonight? You decide!



Stellarium Guide

Here are two free apps to help you tour the sky.

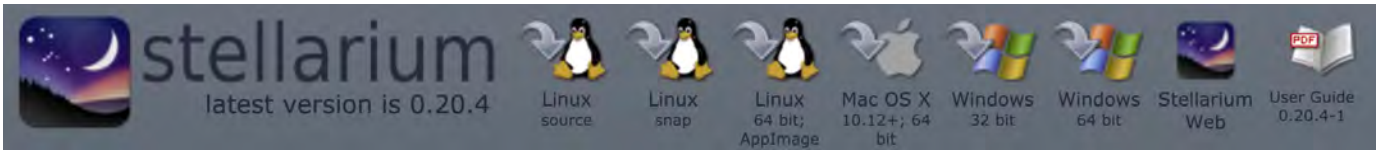
Night Sky

Star Walk

If you are interested in a more accurate sky and advanced controls, Stellarium is for you.

Downloading and Installing Stellarium

With the help of an adult, visit **https://stellarium.org** to download Stellarium to your device. The top of the web page will look like the image below. Be sure to choose the correct version for your computer.



Once you download the file, find it in your “Downloads” folder. To install Stellarium, double-click on the installation file, and follow the installation instructions.

Launching Stellarium

Once installed, double-click on the Stellarium icon to launch the program and begin your stellar exploration. When you start Stellarium, you may see something like the scene below.

You may change your view either by left-clicking and dragging your mouse or by using the arrow keys.

Using Stellarium

Note the small bar at the bottom of the screen. It is possible that the simulated sky represents the sky from a city that is not the same as yours.

To change the location and time of your sky observation, move your cursor down to the lower left side of the screen to make a menu appear. The top four settings are especially useful for exploring the night sky.

Location window [F6]

Date/time window [F5]

Sky and viewing options window [F4]

Search window [F3]

Configuration window [F2]

Astronomical calculations window [F10]

Help window [F1]

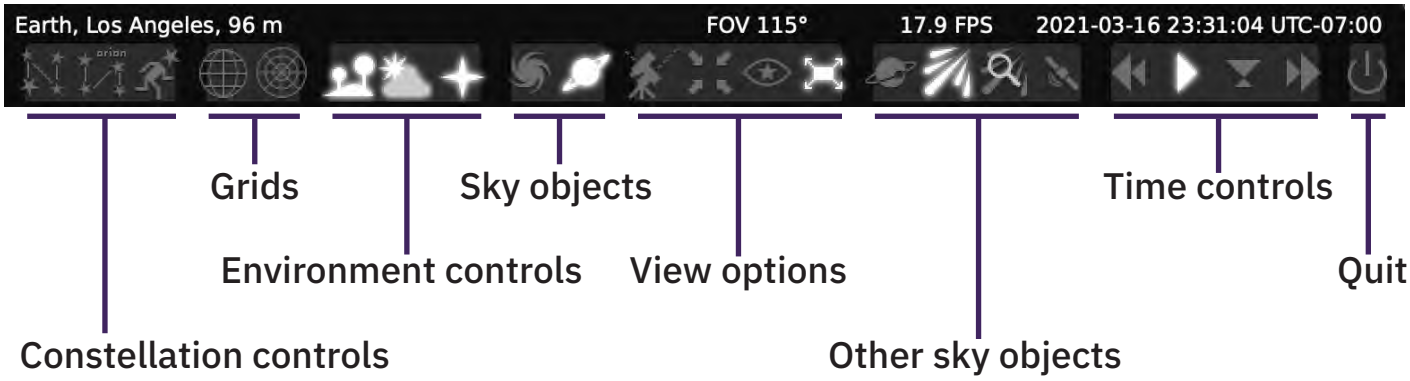
If you click on the **Location window**, you may see what the sky looks like from any place on Earth. You may even move yourself to another planet or moon!

Changing your location will not change the landscape, but you may do that by selecting the **Sky and viewing options window** and clicking on the **Landscape** tab to choose from a list of landscapes.

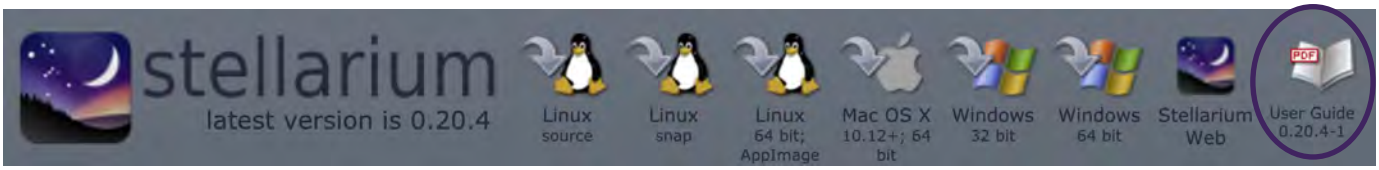
If you click on the **Date/time window**, you may change the date and time to anything you want. If you choose a time after the Sun sets, you will see the night sky. You may also view the sky thousands of years in the past or future!

Click on the **Search window** and search any sky object to inspect it. Get a closer look at what you have selected by zooming in.

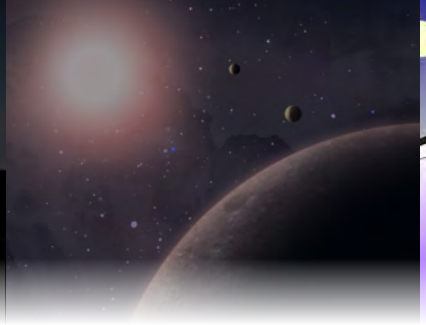
Move your cursor down to the lower side of the screen to access additional settings. These are useful for controlling the movement of the sky and selecting what you want to see in the sky.



For more thorough information including how to use Stellarium's more advanced functions, visit **https://stellarium.org** and download the official User Guide.



The wonder of space is yours to discover.


Internet Resources

ASTRONOMY CLUBS

Astronomy clubs are wonderful resources. Amateur (and some professional) astronomers are happy to share their telescopes, their enthusiasm, and their knowledge. Find an astronomy club near you! A list of local clubs and more information may also be found on our website:

https://griffithobservatory.org/explore/observing-the-sky/astronomy-resources/

CITIZEN SCIENCE PROJECTS

You may make a real contribution to astronomy by participating in these scientific projects.

Help scientists with their research into stars, Mars, Earth, galaxies, astronautics, the Sun, and black holes! Multiple projects are listed at this website:

https://spacehack.org/

Another useful site that lists multiple Citizen Science projects:

https://www.zooniverse.org/

GREAT WEBSITES FOR SPACE FANS

Check out games and projects for budding space scientists:

https://spaceplace.nasa.gov/menu/play/

Explore space with NASA's remarkable app, "NASA's Eyes:"

https://eyes.nasa.gov/

Watch NASA on television (or on another device with an internet connection):

https://www.nasa.gov/multimedia/nasatv/#public

GREAT WEBSITES FOR SPACE FANS CONTINUED...

Visit websites dedicated to learning for grades 5 through 8:
https://www.nasa.gov/stem-at-home-for-students-5-8.html

Pre-K through Grade 4: Meet the astronauts on the International Space Station (ISS). Make your own rocket out of a straw, or test your driving skills – on Mars:
https://www.nasa.gov/kidsclub/index.html

RESOURCES ON THE GRIFFITH OBSERVATORY WEBSITE

Sky Report:
https://griffithobservatory.org/explore/observing-the-sky/sky-report/

Give yourself a tour of the Observatory, and check out the exhibits:
https://griffithobservatory.org/explore/exhibits/

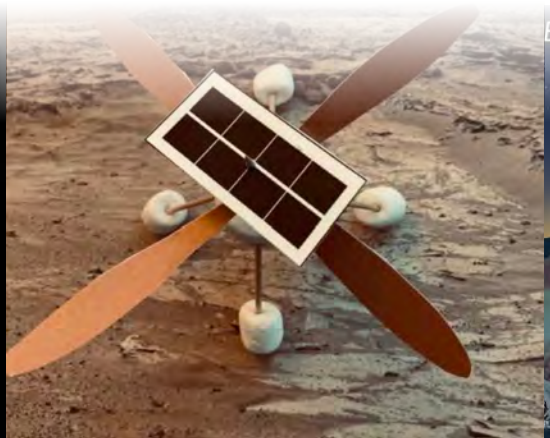
Watch the *All Space Considered* space news update:
https://griffithobservatory.org/visit/calendar/all-space-considered/

RESOURCES FOR TEACHERS

Free lesson plans and activities for K-12 from Jet Propulsion Laboratory:
https://www.jpl.nasa.gov/edu/teach/

NASA Wavelength is a collection of resources that incorporates NASA content:
https://science.nasa.gov/learners/wavelength

Search NASA's educational resources by subject, type, and grade level:
https://www.nasa.gov/education/materials



Acknowledgments

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The Griffith Observatory Online School Program is made possible by Griffith Observatory Foundation. The primary role of the Foundation is supporting and promoting Griffith Observatory in its mission to inspire everyone to observe, ponder, and understand the sky.

Thanks to support from the Foundation, the Griffith Observatory School Program has served tens of thousands of students each year free of charge, and many schools have been awarded bus scholarships to further offset the cost of the visit. The onsite program includes 2.5 hours of STEM activities in the Observatory's exhibit halls, live observing with Observatory instruments, and presentations in the Leonard Nimoy Event Horizon theater and the Samuel Oschin Planetarium.

In response to the pandemic and subsequent building closure, the Foundation secured the funding and resources required to adapt the school program to an online environment. The online option also presents an opportunity to serve significantly more students even as the building operates and the onsite program resumes.

The Foundation's donors, members, and supporters are a network of passionate people who believe in the value of free public astronomy. To be a part of that legacy, please visit **GriffithObservatoryFoundation.org** to join or make a donation today.

Staff Acknowledgments

PROGRAM MANAGER	Dr. David Reitzel	
DEPUTY PROGRAM MANAGER	Allan Ault	
PROGRAM CONTENT COORDINATOR	Ella Ritts	
LEAD TECHNICIAN	Matthew Burlando	
LEAD PHOTOGRAPHER	Jarred Donkersley	
LEAD VIDEO EDITOR	Brendan Fay	
ANIMATION / VFX	Dawn Fidrick Patrick So Jay Taylor Benjamin Roudenis Tom Bradley	Chris Butler Fred Kolouch Don Dixon Shirley Mims
2D CONTENT	Jeff McKibben Hannah Parsons Sarah Vincent Sarah Al-Ahmed	Molly Ruhl Ella Ritts Katie Flynn Angelica Ruiz
SCRIPTING / EDITORIAL	Dr. David Reitzel David Maddox Dr. E.C. Krupp	Ella Ritts Fred Quillin Chris Butler
ADMINISTRATIVE EXECUTIVE	Mark Pine	
STAFF COORDINATION	Allan Ault Jessica Townsend Jannet Flores	Marcie Hale Juan Gutiérrez Patrick So
LIVE PROGRAM LEADS	James Becaria April Eden	Steven Whitacre Jeff McKibben
PROGRAM MATERIALS	Ella Ritts	Bill Grueneberg
RESEARCH & SPECIAL PROJECTS	Eric Gabaldon Geovanni Somoza Isa Hopkins	Radka Dancikova Sara Townsend
REGISTRATION PLATFORM	Allan Ault Troy Powers	Kaitlynn McGuire Blackbaud Altru

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Additional Media Credits

In addition to Griffith Observatory's content production staff, we'd like to thank staff members David Pinsky, Anthony Perkic, and Blake Estes for the use of their photography and footage.

We thank the following individuals and organizations for the use of their imagery and footage to supplement our educational program.

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EUROPEAN SOUTHERN OBSERVATORY (ESO)

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SOLAR DYNAMICS OBSERVATORY (SDO)

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

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MT. WILSON OBSERVATORY
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W.M. KECK OBSERVATORY

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HARVARD LIBRARY

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PALOCK POKPAK

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