
**Intersections of Science and Art in the Sky:
“Orbit Pavilion,” “Radiant Beauty,” and
“Beautiful Science” at The Huntington
Activity Guide**

This activity guide is based on three exhibitions at The Huntington.

School Programs and Partnerships



THE HUNTINGTON
Library, Art Museum, and Botanical Gardens

Welcome to The Huntington!

“Orbit Pavilion” is a collaboration between two visual strategists at NASA’s Jet Propulsion Laboratory, a composer, and an architect. The composed sounds heard within the pavilion represent the movement of the International Space Station and 19 satellites orbiting Earth.

“Beautiful Science: Ideas that Changed the World” in The Huntington’s Dibner Hall of the History of Science is a permanent exhibition focusing on four areas of scientific exploration: astronomy, natural history, medicine, and light. The astronomy section includes texts from Nicholas Copernicus, Albert Einstein, Sir Isaac Newton, and Galileo Galilei.

“Radiant Beauty” was an exhibition at The Huntington that focused on the artist and astronomer Étienne Léopold Trouvelot (1827–1895). Trouvelot created more than 7,000 astronomical illustrations that included star clusters, comets, planets, the Milky Way, and celestial phenomena. In addition to astronomical drawings, Trouvelot produced around 50 scientific articles.

Discover the objects in these exhibitions online on The Huntington’s website and in the Huntington Digital Library. Resources and links are provided at the end of this activity guide.

Essential Questions

How are art and science connected?

How is science depicted in art?

How can art help people understand science?

The following resources explore how science can be depicted through art with activities such as drawing what you hear, creating your own planet, and printmaking. While the activities are designed for middle school students, they can be adapted for elementary and high school students.

All activities align with...

The Huntington Framework

Observe and Describe – What do you see?

Explain and Interpret – What does it mean to you?

Reason with Evidence – What makes you think that?

Wonder and Question – What questions do you still have?

Science, Art, and Writing Standards

Next Generation Science Standards

- 1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted.
- 1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year.
- 5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
- 5-ESS1-2. Represent data in graphical displays to reveal patterns that indicate relationships.

VAPA Standards: Dance

1.0 ARTISTIC PERCEPTION

Processing, analyzing, and responding to sensory information through the language and skills unique to dance

VAPA Standards: Art

2.0 CREATIVE EXPRESSION

Creating, performing, and participating in the visual arts

3.0 HISTORICAL AND CULTURAL CONTEXT

Understanding the historical contributions and cultural dimensions of the visual arts

5.0 CONNECTIONS, RELATIONSHIPS, APPLICATIONS

Connecting and applying what is learned in the visual arts to other art forms and subject areas and to careers

- 5.1 Create visual patterns (e.g., line, line, dot; line, line, dot) to match rhythms made by clapping or drumming the beat found in selected poems or songs.

English Language Arts: Anchor Standards for Writing

CCSS.ELA-LITERACY.SL.1.5

Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

CCSS.ELA-LITERACY.CCRA.W.1

Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

CCSS.ELA-LITERACY.CCRA.W.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-LITERACY.CCRA.W.5

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCSS.ELA-LITERACY.CCRA.W.6

Use technology, including the internet, to produce and publish writing and to interact and collaborate with others.

“Orbit Pavilion” Credits:

Created by NASA/JPL in collaboration with STUDIOKCA and Shane Myrbeck

Creative directors: Dan Goods, David Delgado (NASA/JPL)

Pavilion design: Jason Klimoski, STUDIOKCA

Audio composition and sound system design: Shane Myrbeck

3D audio production: Arup SoundLab

Background on the /five initiative

Launched in 2016, /five is a contemporary art initiative centered on five yearlong collaborations between The Huntington and a variety of arts and cultural organizations. The aim is to engage The Huntington’s library, art, and botanical collections in new and thought-provoking ways. Outcomes include site-specific installations, educational programming, performance pieces, sound work, film, and other art forms. “Orbit Pavilion” was the first project of The Huntington’s /five initiative.

Background on NASA's "Orbit Pavilion"



The concept of the "Orbit Pavilion" installation comes from Dan Goods and David Delgado, visual strategists at Jet Propulsion Laboratory (JPL). Their job is to create opportunities for people to understand scientific and technological wonders. The sounds within represent the movement of the International Space Station and 19 satellites orbiting the Earth. The visual strategists worked with composer Shane Myrbeck and architect Jason Klimoski of STUDIOKCA to create the sounds and shape of the pavilion.

Stand in the middle of "Orbit Pavilion." The sounds you hear represent the location of NASA satellites orbiting and observing Earth's surface, biosphere, atmosphere and oceans. This installation allows NASA's satellites to say "hello" as they move across the sky by pairing the live trajectory data of each spacecraft to artistically created sounds.

There are two phases of the "Orbit Pavilion" soundtrack. The sounds in phase one represent the real-time motion of satellites. The sounds in phase two include 24 hours of movement compressed into one minute, allowing you to hear a full day's worth of orbits.

Spend 1–2 minutes quietly looking at the installation.

- What do you see?
- Share what you see (either with the group or to a partner). If you are completing this independently, write down what you see. Are there familiar shapes?
- What else do you notice? What does the installation tell you about space?

If you are looking at "Orbit Pavilion" virtually, watch this short video to answer the questions above.

https://www.youtube.com/watch?v=XIOX9l_8VRo

Art Vocabulary

From The Huntington and New York's Museum of Modern Art
https://www.moma.org/learn/moma_learning/glossary/#i

Installation—A form of art which involves the creation of a sensory experience in a particular environment, often inviting active engagement or immersion by the spectator

Lithograph—A work of art created by an artist using a stone plate to make a print (The word “lithograph” means “stone print.”)

Here is a video that shows how a lithograph is made:

<https://www.metmuseum.org/about-the-met/curatorial-departments/drawings-and-prints/materials-and-techniques/printmaking/lithograph>

Pavilion—A type of building or structure

Science Vocabulary

Astronomy—The branch of science that focuses on celestial objects, space, and the physical universe

Atmosphere—The layer of gases surrounding the Earth or another planet

Orbit—An elliptical (or oval) movement around a celestial body, such as Earth orbiting the sun

Remote Sensing—The scanning of the Earth by satellite or high-flying aircraft to obtain information

Satellite—An artificial body placed in orbit around the Earth, moon, or another planet to collect information or for communication

Science—The systematic study of the physical and natural world through observation and experimentation

Solar System—Planets and other bodies (asteroids, comets, meteorites) revolving around the sun

Draw What You Hear

Materials

- Pencils or colored pencils
- Handout
- Audio link

Steps

1. Play this short audio clip of “Orbit Pavilion”: <https://www.instagram.com/p/BMIBY5gBxHJ/>
2. Close your eyes and listen.
3. On the handout on the next page, draw what you hear.

Questions

1. Do you hear any familiar sounds?
2. What is your emotional response to the listening experience? Some people feel calm, while others feel anxious.
3. Are there sounds that you would add? Sounds that you would eliminate?
4. What do you think each of the sounds represents?

The Huntington Connections

“Orbit Pavilion” is a sound experience. This link to The Huntington’s blog, Verso, provides a Q & A with the visual strategists about how they used art and design to explain science.

<https://www.huntington.org/verso/2018/08/hearing-nasa’s-earth-science-satellites>

Student Connection

Each of the sounds represents the movement of a satellite. Listen again to the soundscape. Move around like one of the satellites you hear. Think about what to do with your head, arms, torso, and legs. Are you moving quickly? Slowly? In a circle or a line? Up on your toes or bending your knees?

Does your movement match the drawing? What are similarities and differences?

Curriculum Connections

Next Generation Science Standards

- 1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted
- 5-ESS1-2. Represent data in graphical displays to reveal patterns that indicate relationships

VAPA Standards: Dance

1.0 ARTISTIC PERCEPTION

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VAPA Standards: ART

1.0 CONNECTIONS, RELATIONSHIPS, APPLICATIONS

5.1 Create visual patterns (e.g., line, line, dot; line, line, dot) to match rhythms made by clapping or drumming the beat found in selected poems or songs.

CCSS.ELA-LITERACY.SL.1.5

Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.



ORBIT

PAVILION

DRAW WHAT YOU HEAR

Activity

Design Your Own Planet

Inspired and adapted from NASA's Art & The Cosmic Connection: Elements of Art Inspire Planetary Image Analysis.
<https://www.jpl.nasa.gov/edu/teach/activity/art-the-cosmic-connection/>

Materials

- Paper
- Images of space, planets, constellations, galaxies, etc.
- Oil pastels *
- Cotton swabs
- Hair spray

*Activity can also be done with colored pencils, paint, crayons, or watercolors

Steps

1. Spend a few minutes exploring images of space, planets, constellations, and galaxies. Use JPL's website (<https://www.jpl.nasa.gov/spaceimages/index.php?category=Universe>) and Google Sky (<https://www.google.com/sky/>) for inspiration.
2. Using the pastels, design your own image of space. You could create a new planet, discover a new constellation, or dream up a new galaxy.
3. Use cotton swabs to blend colors together.
4. Once done, apply hair spray lightly to your paper so the pastels don't smudge.

Questions

1. What did you choose to draw? Explain the parts of your image.
2. What shape is your space image? What does it represent?
3. What types of lines did you use? How do the lines show the movement of the space image?
4. How did you show different textures? What do the textures reveal about how the space image might feel to walk on, float through, or grab hold of?
5. Which colors did you use? Do the colors represent anything about your space image, like temperature (hot/cold) or speed (slow/fast)?



The Huntington Connections

“Orbit Pavilion” brings remote scientific instruments to The Huntington virtually. People can experience what normally cannot be seen or heard. The Huntington’s blog, Verso, invites readers to explore a similar installation during the mid-19th century. John Wyld, a map publisher, constructed a “Colossal Globe.” He used both science and creativity to design a journey through the inside of the Earth.

<https://www.huntington.org/verso/2018/08/knowning-earth-then-and-now>

Student Connections

Your artwork combined scientific images and your own creativity. What you did was much like the work of scientists and artists who created “Orbit Pavilion,” and of John Wyld who created the “Colossal Globe.” Think about other ways in your life that you have combined science and art. Have you ever had to solve a problem that required a creative solution?

Curriculum Connections

Next Generation Science Standards

1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted

VAPA Standards: Art

1.0 ARTISTIC PERCEPTION

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Print Like Trouvelot

Materials

- Images of Trouvelot’s lithographs
- Foam plate
- Pencil
- Paint brush or paint roller
- Paint
- Paper

Steps

1. Explore the images of Trouvelot’s lithographs in the Huntington Digital Library.
<https://hdl.huntington.org/digital/search/searchterm/Trouvelot>
2. Next, launch Google Earth to see satellite images of planets in space.
<https://www.google.com/maps/space/pluto/@31.2932466,-118.5707505,22671584m/data=!3m1!1e3>
3. Pictured below is Trouvelot’s depiction of Mars. Can you find Mars on Google Earth? What looks similar? What is different?
4. Now it is your turn to make your own print of a planet. Using Google Earth and Trouvelot’s lithographs, pick a planet or element in space that you find “out of this world!”
5. Create your own version of the planet or element in space on a piece of paper with a pencil.
6. Once you have sketched your idea on paper, redraw your image on a foam plate with a pencil. This will be your printing plate. Be sure to press hard with the pencil to make deep lines.
7. Then, paint or roll the ink over the plate.
8. Flip the foam printing plate over and place it on a piece of paper. Rub the back of the plate.
9. Remove the foam printing plate and you can see your print.
10. You can wash your printing plate and make another in a different color.



E.L. Trouvelot, *The Planet Mars*, 1881, chromolithograph. The Huntington Library, Art Museum, and Botanical Gardens.



Note: Printmaking produces a mirror image. If you're using letters or numbers in your design, remember to write them backwards!

Questions

1. What planet or cosmic element did you choose? Why?
2. Did you choose to create a more realistic image (similar to Google Earth) or a more artistic print (similar to Trouvelot)? Why?
3. Would you like to visit this planet? Why or why not? If you would like to visit, what would you want to do on the planet?

The Huntington Connections

This activity will allow students to explore The Huntington's online collection of color lithographs from the artist and astronomer Trouvelot, which were on view in the exhibition "Radiant Beauty."

Student Connections

Students will be able to make comparisons to works of art that illustrate space and to satellite images of space provided by Google Earth.

Curriculum Connections

Next Generation Science Standards

1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted

VAPA Standards: Art

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Activity

Make Your Own Telescope

Inspired and adapted from the National Geographic Kids activity “Make a Telescope.”

<https://kids.nationalgeographic.com/explore/nature/make-a-telescope/>

Materials

- Two to three cardboard tubes (from paper towels or toilet paper)
- One piece of cardboard
- Scissors
- Masking tape
- Markers, crayons, paint (any medium you would like to use to decorate your telescope)
- Two convex lenses (you can use old reading glasses or order lenses online)



Astronomy room in the “Beautiful Science” exhibition.
The Huntington Library, Art Museum, and Botanical Gardens.

Steps

1. Choose one of the cardboard tubes to be the inner tube of your telescope. Cut the cardboard up the length of the tube.
2. Move one edge of the cut tube over the other. The tube should be slightly smaller now.
3. Insert the smaller tube into the tube that has not been cut. The inner tube should expand but still be able to be pulled out a bit from the outer tube.
4. Secure one of the lenses on the outside of the tube with masking tape. The curve of the lens should be facing inside.
5. Secure the second lens to the other side of the tube with masking tape. The curve of the lens should be facing outside.
6. If you want to make a standing telescope, like the one in the image above from the Beautiful Science exhibition, tape a third cardboard tube to the middle of the outer tube.
7. Tape the bottom of the third tube to the piece of cardboard. This will make the standing base.
8. Decorate your telescope.



Questions

1. When you look through the inner tube (the lens curve is facing inside), what do you see? (Caution: Do not look at the sun through the telescope!)
2. When you slide the inner tube closer and further from the other lens, how does the image that you see change?
3. Try looking at plants and animals from different distances. Is it easier to see details closer or farther away? Choose one object. Draw what you see close up and far away.
4. How might this type of technology help scientists understand the universe?
5. How are art and science connected through this activity?

The Huntington Connections

The Huntington's collections include Bern Dibner's Burndy Library, which contains thousands of scientific books and documents. Many of these exciting materials are available in the Huntington Digital Library. Check out the link below to explore!

<https://hdl.huntington.org/digital/collection/p15150coll1/id/9096/rec/2>

Pages 35 and 45 provide information on astronomy and telescopes.



Astronomer Edwin Powell Hubble in front of a model of the 100-inch Hooker telescope (1947). The Huntington Library, Art Museum, and Botanical Gardens.

Astronomer William Henry Christie at the 60-inch telescope ultraviolet spectrograph, Mount Wilson Observatory (circa 1935). Image courtesy of the Observatories of the Carnegie Institution for Science Collection at The Huntington Library, Art Museum, and Botanical Gardens.



Student Connections

What do you think is the future of space exploration? What role do you think art will have in the exploration of the unknown? What is the value of studying what scientists have learned from past research?

How does astronomy play a role in your life? Do you like to look up at the stars? Do you think about your astrological sign based on your birthday? Have you thought about where the stars were in the sky on your birthday? Check out this site to see what the sky looked like when you were born. <https://in-the-sky.org/skymap.php>

Curriculum Connections

Next Generation Science Standards

1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year

5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth

VAPA Standards: Art

3.0 HISTORICAL AND CULTURAL CONTEXT

Understanding the historical contributions and cultural dimensions of the visual arts

Activity: Writing Extensions

The Satellite's Journey

Using your "Draw What you Hear" artwork, write a paragraph that describes the satellite's journey.

- Where does the satellite begin?
- What happens to the satellite as it journeys through space?
- Where does the satellite go at the end of its journey?

Try to include a beginning, middle, and end to your story. Think about action that might lead to an exciting moment for the satellite. What is the goal of the satellite? Is there anything that might prevent the satellite from achieving this goal? You might want to personify your satellite by giving it human characteristics. How does the satellite feel traveling through space?

Design Your Own Planet

Using your pastel art work as inspiration, write a story that describes your planetary surface. You could add to your paragraph by writing about an exploration of the planet you created! Think about the senses:

- What does the planet feel like when an astronaut steps on the surface?
- What sounds would the astronaut hear while exploring your planet?
- Are there places on the planetary surface that the astronaut could feel or smell?

The more details you include, the more interesting your story will be. Would you like to travel to the planet you created?

Write an Argument

Thinking about how the activities in this guide demonstrate the intersection of art and science in the sky, write a paper that argues whether art and science are related. You should define art, define science, and argue if they overlap. Use examples from this activity guide, research from the links provided, and your own knowledge of science and art.

Student Connections

These writing activities provide a cross-curricular extension for the activities in this guide.

Curriculum Connections

CCSS.ELA-LITERACY.CCRA.W.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-LITERACY.CCRA.W.5

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCSS.ELA-LITERACY.CCRA.W.6

Use technology, including the internet, to produce and publish writing and to interact and collaborate with others.

CCSS.ELA-LITERACY.CCRA.W.1

Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

Apps

JPL's Spacecraft AR

<https://www.jpl.nasa.gov/missions/>

<https://www.jpl.nasa.gov/apps/>

Google Earth

<https://www.google.com/earth/>

Music

The Huntington's "Radiant Beauty" playlist on Spotify

Lectures

"Aerospace in Southern California"

<https://soundcloud.com/thehuntington/aerospace-in-southern-california>

"First Light: The Astronomy Century in California, 1917–2017"

<https://www.huntington.org/videos-recorded-programs/first-light-astronomy-century-california-1917-2017>

"Strange Science of Astronomy: Past and Present"

<https://www.huntington.org/videos-recorded-programs/strange-science-astronomy-past-and-present>

Web Links

About /five

<https://www.huntington.org/five>

"Beautiful Science"—Dibner Hall of the History of Science

<https://www.huntington.org/beautiful-science>

"Beautiful Science"—Astronomy

<https://www.huntington.org/beautiful-science-astronomy>

Trouvelot's Lithographs in the Huntington Digital Library

<https://hdl.huntington.org/digital/search/searchterm/Trouvelot>

"Hearing NASA's Earth Science Satellites" by Diana W. Thompson

<https://www.huntington.org/verso/2018/08/hearing-nasa's-earth-science-satellites>

The History of Science, Medicine, and Technology Collections at The Huntington

<https://www.huntington.org/collections/science-medicine>

"Knowing the Earth, Then and Now" by Melissa Lo

<https://www.huntington.org/verso/2018/08/knowning-earth-then-and-now>

NASA's Eyes on the Earth

<https://eyes.nasa.gov/eyes-on-the-earth.html>

"Orbit Pavilion" at The Huntington

<https://www.huntington.org/orbit>

Radiant Beauty Exhibition

<https://www.huntington.org/radiant-beauty>

“Radiant Beauty” by Linda Chiavaroli

<https://www.huntington.org/verso/2018/08/radiant-beauty>

“Solar Eclipse Observations” by Jay M. Pasachoff

<https://www.huntington.org/verso/2018/08/solar-eclipse-observations>

Huntington Digital Library: History of Science Collections

<https://hdl.huntington.org/digital/collection/p15150coll1/id/9096/rec/2>

The Observatories of the Carnegie Institution for Science Collection

<https://hdl.huntington.org/digital/search/searchterm/%20The%20Observatories%20of%20the%20Carnegie%20Institution%20for%20Science%20Collection>

“The Sounds of Satellites” by Adam Voiland

<https://earthobservatory.nasa.gov/blogs/earthmatters/2018/06/28/the-sounds-of-satellites/>

“What is the ‘Orbit Pavilion?’”

<https://www.youtube.com/watch?v=MxEFe91K9Nc>

“Orbit Pavilion” at The Huntington (Caltech)

<https://www.youtube.com/watch?v=5dbxVp-gaXk>