GHEENS SCIENCE HALL & RAUCH PLANETARIUM

Owsley Brown II Portable Planetarium
K-2 Program Offerings

3 Amigos: The Sun, Earth, and Moon: K-2 *(30-60 minutes)*

Performance Expectations

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. **(1-ESS1-1)**
- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. **(1- ESS1-2)**
- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. **(2-ESS1-1)**
- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. **(2-ESS2-3)**
- Pushes and pulls can have different strengths and directions. **(KPS2-1), (K-PS2-2)**
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **(K-PS2-1), (K-PS2- 2)**
- When objects touch or collide, they push on one another and can change motion. **(K-PS2-1)**
- Sunlight warms Earth's surface. **(K-PS3-1), (K-PS3-2)**
- A bigger push or pull makes things go faster. **(Secondary to K-PS2-1)**
- Objects can be seen only when light is available to illuminate them. Some objects give off their own light. **(1-PS4-2)**
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) **(1- PS4-3)**
- People also use a variety of devices to communicate (send and receive information) over long distances. **(1-PS4-4)**

NGSS Disciplinary Core Ideas: **ESS1.A, ESS1.B, ESS1.C, ESS2.C, PS2.A, PS2.B, PS3.C, PS3.D, PA4.B, PS4.C**

This experience takes advantage of an immersive environment to transport the audience into outer space. The journey begins with a "feet on the ground" perspective that allows a young audience to relate to complex concepts in physics and astronomy. This experience explores the intrinsic relationship between the Sun, Earth, and Moon, targeting foundational ideas at the kindergarten level and incorporating more advanced treatments of key concepts at grade-appropriate levels. The journey ends with a tour of the night sky, highlighting major constellations of the current season. **30-60 minutes**

The Universe and Its Stars
- Patterns of Motion in the Sky

Earth and the Solar System
- Seasonal Patterns

History of the Earth/Force and Motion/Interactions
- Pushing and Pulling (Gravity)
- Collisions

Energy/Electromagnetic Radiation
- The Sun and Its Light

Information Technologies
- Communication over Long Distances

Notes: The 60 minute version of this experience includes "One World, One Sky" for Kindergarten and 1st Grade Students. 2nd Grade Students will receive more complex progressions of Disciplinary Core Ideas. Includes overview of stars in the night sky.

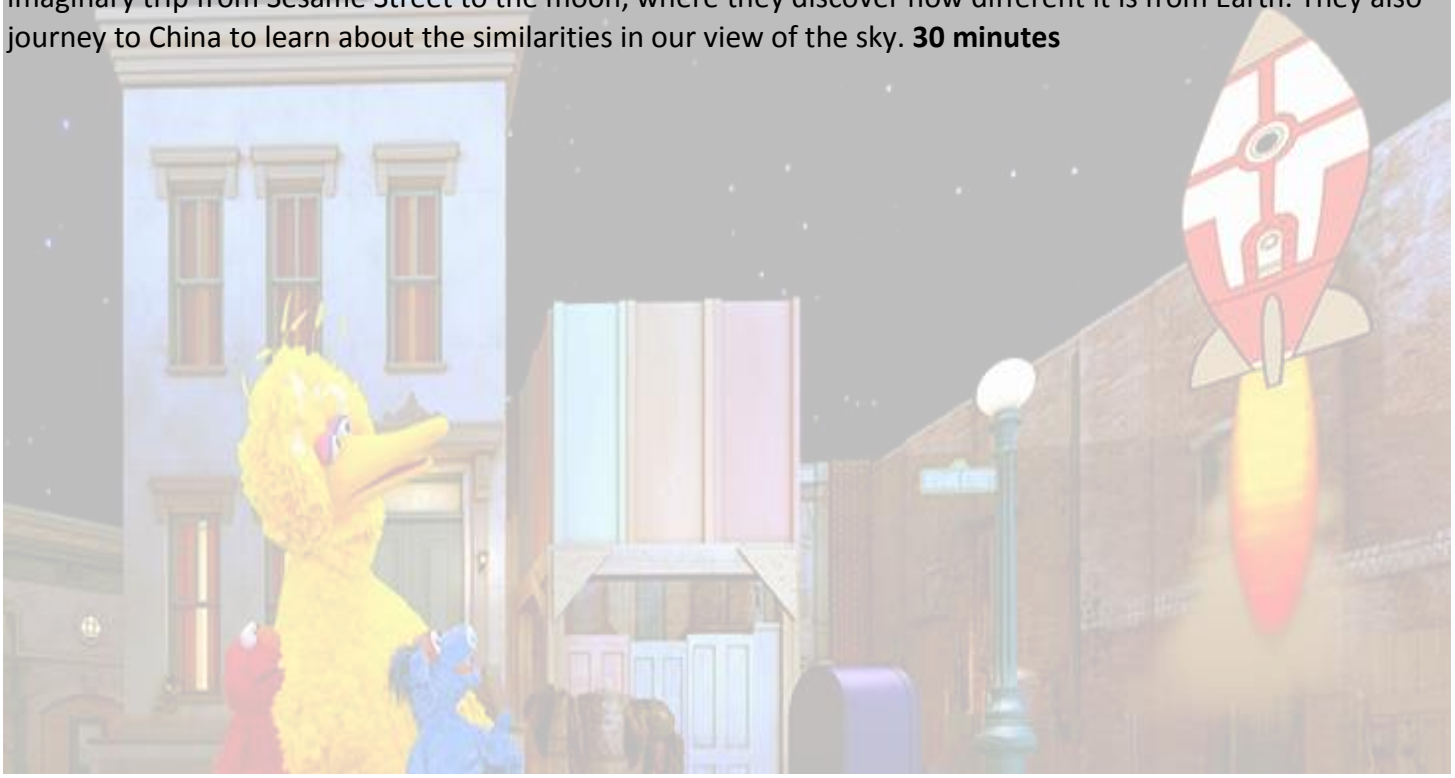
One World, One Sky: K-2 *(30 minutes)*

Performance Expectations

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. **(1-ESS1-1)**
- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. **(1- ESS1-2)**
- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. **(2-ESS1-1)**
- Sunlight warms Earth's surface. **(K-PS3-1), (K-PS3-2)**
- Objects can be seen only when light is available to illuminate them. Some objects give off their own light. **(1-PS4-2)**
- Some materials allow light to pass through them, others allow only some light through and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. (Boundary: The idea that light travels from place to place is developed through experiences with light sources, mirrors, and shadows, but no attempt is made to discuss the speed of light.) **(1- PS4-3)**

NGSS Disciplinary Core Ideas: **ESS1.A, ESS1.B, ESS1.C, PS3.B, PS4.B**

Explore the night sky with your favorite friends from *Sesame Street* in *Big Bird's Adventure: One World, One Sky*. Follow along with Big Bird, Elmo, and their friend from China, Hu Hu Zhu, as they take you on a journey of discovery to learn about the Big Dipper, the North Star, the Sun, and the Moon. Together they take an imaginary trip from Sesame Street to the moon, where they discover how different it is from Earth. They also journey to China to learn about the similarities in our view of the sky. **30 minutes**



Tilted Twist: Seasons: 2-5 *(20-45 minutes)*

Performance Expectations

- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. **(5-ESS1-1)**
- 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. **(5-ESS1-2)**
- The History of Planet Earth **(2-ESS1-1)**
- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. **(5-ESS2-2)**
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. **(3-PS2-2)**
- Objects in contact exert forces on each other. **(3-PS2-1)**
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. **(5-PS2-1)**
- The faster a given object is moving, the more energy it possesses. **(4-PS3-1)**
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **(4-PS3-2), (4-PS3-3)**
- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. **(4-PS32), (4-PS3-3)**
- Light also transfers energy from place to place. **(4-PS3-2)**
- When objects collide, the contact forces transfer energy so as to change the objects' motions. **(4-PS3-3)**
- The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). **(5-PS3-1)**
- An object can be seen when light reflected from its surface enters the eyes. **(4-PS4-2)**
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). **(4-PS4-1)**
- An object can be seen when light reflected from its surface enters the eyes. **(4-PS4-2)**

NGSS Disciplinary Core Ideas: **ESS1.A, ESS1.B, ESS1.C, ESS2.C, PS2.A, PS2.B, PS3.A, PS3.B, PS3.C, PS3.D, PS4.D, PS4.A**

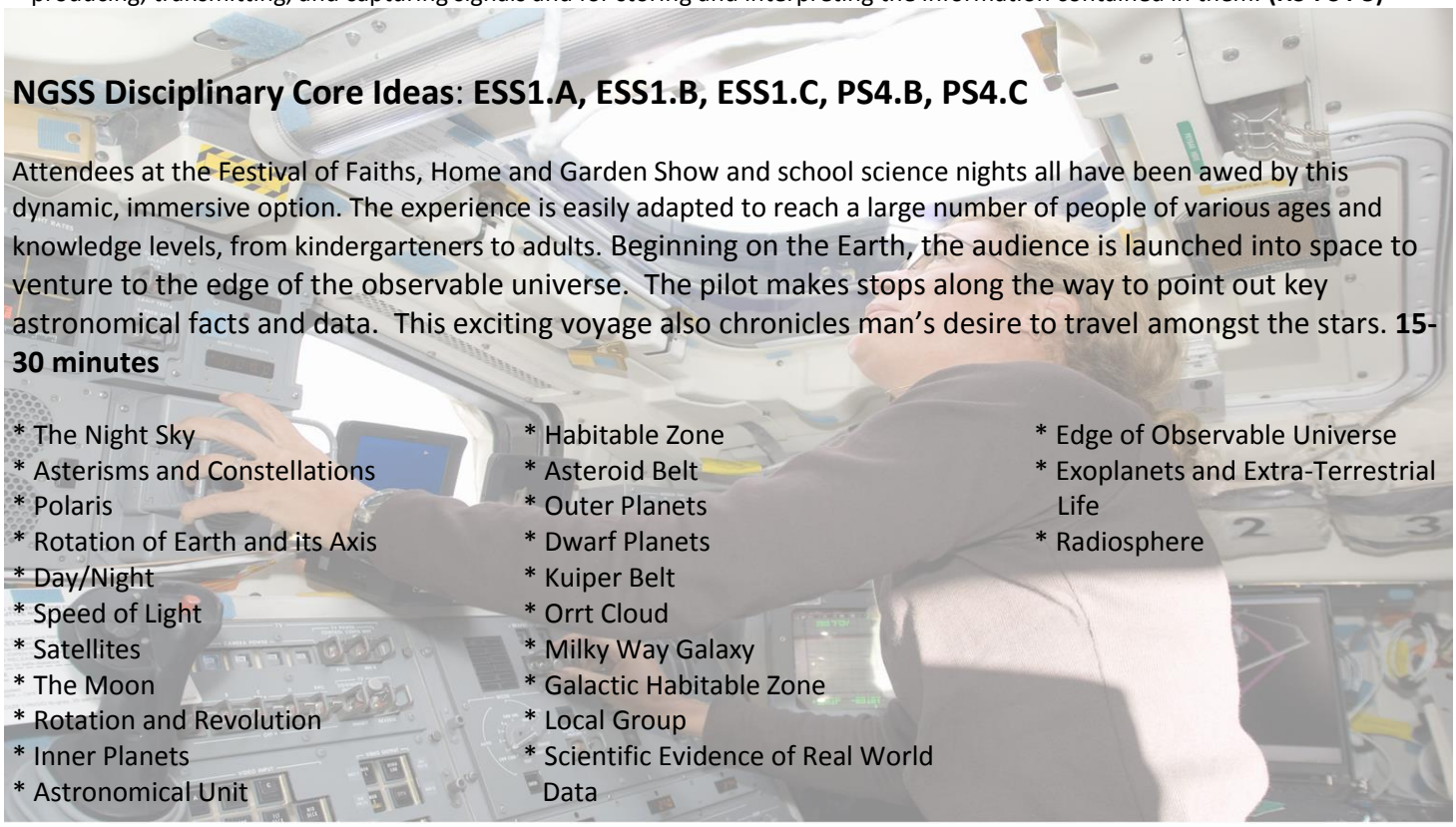
Beginning the experience from an observational perspective of seasonal differences, board a virtual spaceship to explore how Earth seasons are caused by a complex 3-dimensional interplay between the Sun and Earth. Fly above the plane of the Solar System to examine Earth's orbit around the Sun and the tilt of its axis and how this causes our predictable seasonal variation. Discover that this tilt, and associated seasons, is a major factor in keeping extreme global temperature swings under control – potentially vital for enabling life to develop on Earth and a possible feature to look for in the search for extra-solar planets that might sustain life. Extend the investigation throughout the solar system to consider the science behind planetary motion and encounter other planets with differing axial tilt to compare what that might mean for 'seasons' on other planets. The journey ends with a tour of the night sky, highlighting major constellations of the current season. **20-45 Minutes**

*The Sun and Distant Stars
* Day and Night
* Rotation and Revolution of Earth
* Water on Earth *(How it helps regulate temperature and how did it get here)*
* History of Earth – Formation Theory
* Collision with Mars Sized Planet
* Observable Seasonal Patterns
* Light Energy from Sun
* Light Waves

Our Place in Space: K-12 *(15-30 minutes)*

Performance Expectations

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. **(1-ESS1-1)**
- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. **(5-ESS1-1)**
- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. **(MS-ESS1-1)**
- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. **(MS-ESS1-2)**
- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. **(HS-ESS1-1)**
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. **(HS-ESS1-2), (HS-ESS1-3)**
- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. **(1- ESS1-2)**
- 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. **(5-ESS1-2)**
- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. **(MS-ESS1-2), (MSESS1-3)**
- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. **(HS-ESS1-4)**
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. **(HS-ESS1-6)**
- An object can be seen when light reflected from its surface enters the eyes. **(4-PS4-2)**
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. **(MS-PS4-2)**
- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. **(HS-PS4-5)**



NGSS Disciplinary Core Ideas: ESS1.A, ESS1.B, ESS1.C, PS4.B, PS4.C

Attendees at the Festival of Faiths, Home and Garden Show and school science nights all have been awed by this dynamic, immersive option. The experience is easily adapted to reach a large number of people of various ages and knowledge levels, from kindergarteners to adults. Beginning on the Earth, the audience is launched into space to venture to the edge of the observable universe. The pilot makes stops along the way to point out key astronomical facts and data. This exciting voyage also chronicles man's desire to travel amongst the stars. **15-30 minutes**

* The Night Sky
* Asterisms and Constellations
* Polaris
* Rotation of Earth and its Axis
* Day/Night
* Speed of Light
* Satellites
* The Moon
* Rotation and Revolution
* Inner Planets
* Astronomical Unit
* Habitable Zone
* Asteroid Belt
* Outer Planets
* Dwarf Planets
* Kuiper Belt
* Orrt Cloud
* Milky Way Galaxy
* Galactic Habitable Zone
* Local Group
* Scientific Evidence of Real World Data
* Edge of Observable Universe
* Exoplanets and Extra-Terrestrial Life
* Radiosphere

Each experience/program within the astronomical experiences offered by Gheens Science Hall and Rauch Planetarium is focused upon the Disciplinary Core Idea Progressions. Each core idea is presented at the appropriate grade band with overlapping of more than one sub-idea, to allow a transition period for understanding and meeting performance expectations.

Teacher/Educator Resources:

3 Amigos: Sun, Earth, and Moon

- **Activities and Lesson Plans from NASA**

One World, One Sky

- **Trailer**
- **Teacher Guide**

Tilted Twist: Seasons

- **Interactive Classroom Materials**

Our Place in Space

- **Jet Propulsion Laboratory Activities and Resources**

NASA

NOAA

Multiple Activities and Simulators: University of Nebraska – Lincoln

- **Class Action**
- **Class Action Version 2**

Astronomy.com

Kidsastronomy.com

Next Generation Science Standards