

# Science On Wheels

# MATH

## ASSEMBLY

Math comes to life in this playful, interactive assembly! PacSci educators invite learners to help them explore permutations, practice spatial reasoning, and predict probability with demonstrations that show the practical—and sometimes silly—applications of math to everyday life.

*Up to 400 students.*

## INTERACTIVE POP-UP EXHIBITS

Math is everywhere, from maps, to quilts, to fitting toys in a box. Observe how beautiful fractals resemble patterns in nature. Piece together puzzles, from pentominoes to 3-D buckyballs. How many ice cream flavor combinations can you make? What are the chances you will pull a matching pair of socks from a dryer?

*English and Spanish*

## CLASSROOM WORKSHOPS

45-minute, hands-on workshops that take place in the classroom. All workshops support NGSS (Next Generation Science Standards).

### GRADES PreK–TK

**The Art of Comparison:** Shapes, sizes, and numbers—oh my! Practice grouping, sorting, and categorizing, while exploring a variety of materials and reading a storybook.

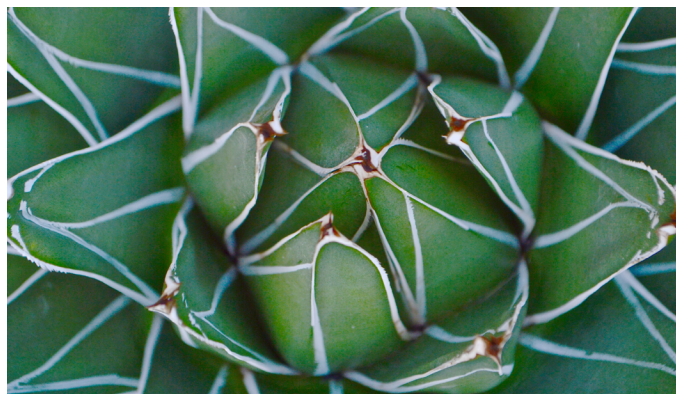
### GRADES K–2

**Mirror Image:** Explore the world of symmetry while playing “The Reflection Game” using PentaBlocks™! Design colorful, symmetrical patterns and find symmetry in the world around you. **Document camera recommended.**

**Sometimes Never:** Take a spin with a colorful probability device to find out the chances of going to recess or visiting the library. Check predictions by recording spinner results with tiles on a wooden tile board to make a bar graph.

**Document camera recommended.**

**Big Things, Little Things:** Our story about chickens in space initiates your exploration of perspective and scale. Match three dimensional objects to aerial photos and discover that close-up objects appear larger and far away objects appear smaller.



### GRADES 3–5

**Puzzling Pentominoes:** Puzzled about pentominoes? A pentomino is a special arrangement of five squares that can make pictures and letters if you piece them together just right. Exercise your spatial reasoning using these cool puzzle pieces.

**Document camera recommended.**

**Collect All 4:** How much money will you have to spend to collect all four of our unique cereal box characters? Dig deeply into “cereal,” graphs and wallets to explore probability through the popular world of collecting. **Document camera recommended.**

**Code Breakers:** Did you know codes and ciphers are based on mathematical reasoning? Discover the math in realworld codes and ciphers by exploring secret messages. Break historical codes, decipher mysteries, and create your own form of communication based on logic and patterns.

**Document camera recommended.**

### GRADES 5–8

**Dynamic Dice:** Explore polyhedrons while designing and playing carnival dice games. Game operators calculate and convert probabilities to choose prizes. Predicted probabilities are compared to results. **Document camera recommended.**

**NetShape Navigator:** Learn to recognize the patterns in geometric solids by using fun Polydron™ manipulatives. Discover the mathematical connections between geometric solids and their “networks” or “nets” – a flat drawing that can be folded to form a 3-D solid. **Document camera recommended.**

**Fabulous Fractals:** What do a seashell and broccoli have in common? Through exploration of everyday objects and exotic art, learn more about this living branch of mathematics that can help us understand chaotic events like weather or geometric patterns in nature.

**Document camera and computer connection recommended.**

# Science On Wheels

# PHYSICS

## ASSEMBLY

This assembly pops with exciting and amazing demonstrations using a mystery liquid (liquid nitrogen) and a Van de Graff generator. Focus on physics as lids mysteriously pop off cans and hairdos become electrified!

*Up to 400 students.*

## INTERACTIVE POP-UP EXHIBITS

It's not magic; it's physics! Explore amazing phenomena, from magnetism to magnification and from pendulums to periscopes. Can you overcome the strength of an electric magnet? Watt does it take to make an electrical circuit? Physics has it all: light, sound, electricity, and motion!

*In English and Spanish*

## CLASSROOM WORKSHOPS

45-minute, hands-on workshops that take place in the classroom. All workshops support NGSS (Next Generation Science Standards).

### GRADES PreK–TK

**The Air of our Ways:** An unseen force exists all around us—air. Investigate how air moves objects and takes up space, then follow the journey of a puff of air in a storybook.

### GRADES K–2

**The Force:** Can a magnet stick to a rock? Be surprised by the attractive force of magnetism! Discover the mysterious properties of magnets through exploration.

**Good Vibrations:** Dive into the wonderful world of sound with tuning forks, musical instruments and more. Investigate how people make and hear sounds. **Please note: This lesson can get quite loud.**

**Leaping Lenses:** Predict and then observe which objects bounce light and which ones bend light as we discover the many places mirrors and lenses can be found. **Room must be darkened for best results.**

### GRADES 3–5

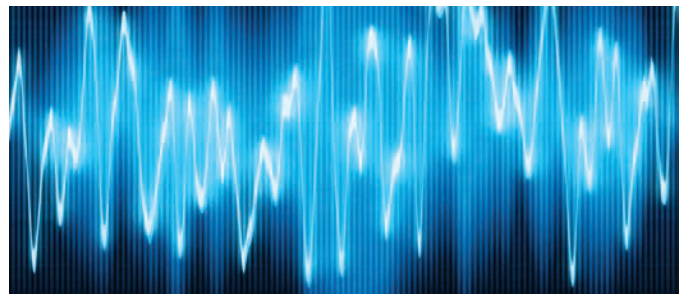
**Charged Up:** What is electricity and how does it travel? Learn about circuits and generators firsthand by designing electric circuits and generating electricity to power lights.

**Good Vibrations:** Dive into the wonderful world of sound with tuning forks, musical instruments and more. Investigate differences in pitch, volume and frequency and explore the ear and its ability to hear. **Please note: This lesson can get quite loud.**

### GRADES 3–5

**Refraction Action:** Observe the behavior of laser light as it interacts with different materials to understand reflection and refraction. Discover the differences between convex and concave lenses. **Room must be darkened for best results.**

**Sensational Sensors:** Investigate energy transfer in sensors. Build your own sensor systems and explore real world sensors as we follow the flow of energy from input to output.



### GRADES 5–8

**Electric Magnets:** How are electricity and magnetism related? Find out by generating electricity with magnets and using electricity to make magnets.

**Refraction Action:** Observe the behavior of laser light as it interacts with different materials to understand reflection and refraction. Discover the differences between convex and concave lenses. **Room must be darkened for best results.**

**Pulley Power:** Learn to lift heavy objects with ease. Design and explore pulley systems to find out how and why this simple machine makes work so much easier. **Document camera recommended.**



# Science On Wheels SPACE ODYSSEY

Image courtesy: NASA/JPL-Caltech/STScI

## ASSEMBLY

Help our astronaut-in-training prepare for a trip to the moon! This assembly takes off with a mind-blowing demonstration about the vacuum of space. Contemplate the real size of the moon and investigate astronomy tools.

*Up to 400 students.*

## INTERACTIVE POP-UP EXHIBITS

Explore meteorites, constellations and Jupiter's storms. You can be an astronomer when you manipulate a robot arm or look at the surface of Mars. What would the Big Dipper look like from the other side of the galaxy? How much do you weigh on Venus? Find out answers to these questions and more when Space Odyssey visits you!

*In English and Spanish*

## CLASSROOM WORKSHOPS

45-minute, hands-on workshops that take place in the classroom (except planetarium workshops). All workshops support NGSS (Next Generation Science Standards). Space Odyssey includes up to two planetarium domes. Planetarium workshop titles may be booked two per timeslot.

### GRADES K–2

**Lighten Up:** Our original story leads students in an exploration of the amazing properties of light as we experiment with a unique collection of objects and flashlights to learn about sunlight, reflection, rainbows, and more. **Room must be darkened for best results.**

**Your Place in Space:** Why is Earth a planet and Pluto a dwarf planet? Explore how astronomers classify objects in our solar system and create your own classification system!

**Up in the Sky\* (in the portable planetarium):** Go on a stargazing adventure in our portable planetarium. Inside, learn your way around the giant “connect-the-dot” pictures in the sky. **Maximum 24 participants.**

### GRADES 3–5

**Plan It: Mars:** Explore the science and mathematics behind planning space travel. Work with a team to plan the next rover mission to Mars. Think like a NASA scientist to stay within budget and ensure the successful completion of your team's mission!

**Cosmic Colors:** Become classroom astronomers as you use spectroscopic glasses to view celestial gases and discover the true nature of stars. **Room must be darkened for best results.**

**Star Search\* (in the portable planetarium):** Can you “read” the nighttime sky? Learn how to use a star map and then apply your new skills as you hunt for seasonal constellations across the sky. **Maximum 24 participants.**

**Roving Robots:** How do software engineers program rovers on Mars? Code Ozobot robots on maps of the Mars landscape to simulate data collection and explore NASA's mission goals on Mars. This workshop supports Computer Science standards.

### GRADES 5–8

**Spectacular Spectra:** What can astronomers learn about the lives of the stars from rainbows? Using spectroscopic glasses, analyze star gases to learn about stellar composition and evolution. **Room must be darkened for best results.**

**Lunar Logic:** What are the features of the Moon? And why does the Moon change shape? Students will find out as they delve into lunar phases and then apply their new lunar knowledge to explore other moons in our solar system. **Room must be darkened for best results.**

**Plan It: Mars:** Explore the science and mathematics behind planning space travel. Work with a team to plan the next rover mission to Mars. Think like a NASA scientist to stay within budget and ensure the successful completion of your team's mission!

**Star Search\* (in the portable planetarium):** Can you “read” the nighttime sky? Learn how to use a star map and then apply your new skills as you hunt for seasonal constellations across the sky. **Maximum 24 participants.**

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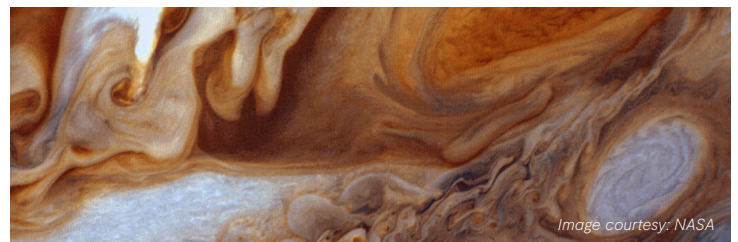


Image courtesy: NASA

*\*Please see Planetarium Requirements on following page.*

Questions? Email [edprograms@pacsci.org](mailto:edprograms@pacsci.org) or call (206) 443-2925

# SCIENCE ON WHEELS

## PORTABLE PLANETARIUM SET-UP REQUIREMENTS

### PLANETARIUM FAST FACTS

- **Footprint:** 25ft x 25ft x 12f
- **Capacity:** 24 guests maximum, including teachers, group leaders, and adult staff
- **Program Length:** 45 minutes
- **Two Domes:** There are two planetarium domes that can be scheduled for workshops at the same time as long as you have adequate space for both.

PacSci's portable planetarium brings the magic of a clear night sky to your learners. "Stars" are projected on the inside walls and ceiling of the darkened dome-shaped planetarium. The dome is inflated by a high-powered fan and is constructed of a durable flame-retardant fabric.

### PLANETARIUM FOOTPRINT

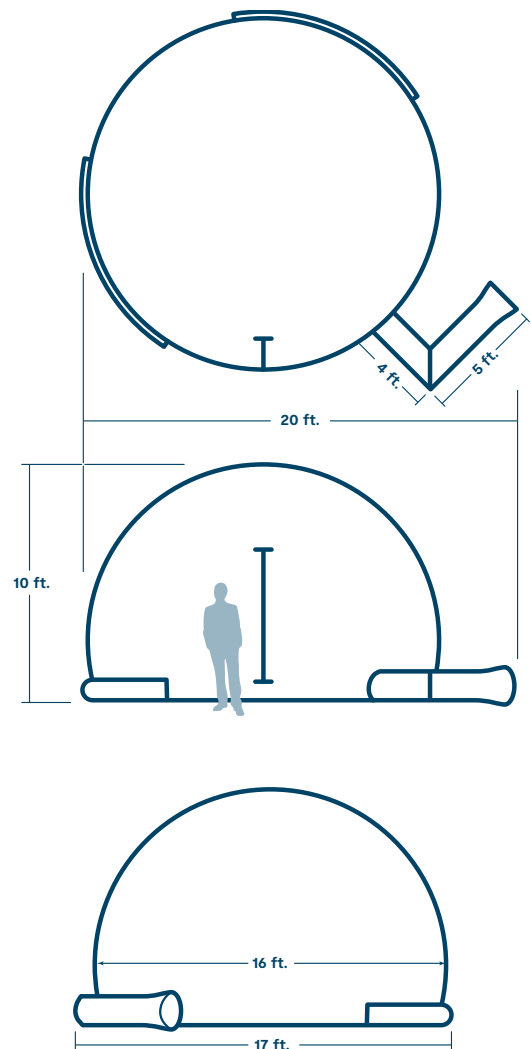
The planetarium dome requires a minimum footprint of 25 ft x 25ft x 12 ft and must be set-up indoors. Vertical clearance should account for any hanging ceiling fixtures, such as lights, signs, and projectors. The planetarium should not be in the same room as non-planetarium workshops or pop-up exhibits.

### PEOPLE IN THE PLANETARIUM

- Maximum capacity is 24 guests. We recommend less than 24 for pre-teen to adult bodies for the best experience
- At least one adult is required to accompany each class or group into the planetarium
- All participants will sit on the floor. Please let Registration know if this will be an issue.
- Please let us know if any participants in your group have accessibility requirements so we can provide the appropriate equipment.

### PREPARING FOR A GREAT EXPERIENCE

- It will become dark inside the planetarium during your programs. Some learners may need help preparing to be comfortable in the darkness.
- For safety, we ask participants to stay seated and minimize movement through the planetarium.
- The dome shape of the planetarium amplifies sounds. To hear everything and get the most out of your experience, remain as quiet as possible when inside the planetarium.



*Fully set up portable planetarium*





# Science On Wheels ENGINEERING

## ASSEMBLY

Help our educators prepare for the science fair as they design, test, and redesign their innovations. Learn about electrical, civil, and aerospace engineering in this interactive show for large audiences, including your whole school.

*Up to 400 students.*

## INTERACTIVE POP-UP EXHIBITS

Discover what engineering is all about! Construct an arch bridge as tall as you, manipulate marble mazes, and make wheels turn using engines and gears. Make connections and creations while exploring all that engineering does to help us solve problems.

*In English and Spanish*

## CLASSROOM WORKSHOPS

45-minute, hands-on workshops that take place in the classroom. All workshops support NGSS (Next Generation Science Standards).

### GRADES K–2

**Machine Makeover:** Become hands-on inventors and create Lego Duplo Toolo® machines to help solve everyday problems. As mechanical engineers, learners will design a machine that will lift beams or scoop rocks!

**Super Structures:** What does it take to build a tall structure? Perform tests to discover what makes a strong and stable building using foam blocks, wooden dowels, and mini foundations.

**Radical Robots:** How can robots help us solve problems? Explore the world of robotics and become real robot programmers. Learners will program Kibos® to move through obstacles and react to the world around them.

**Critter Coders:** As software engineers, learners program a mouse robot to drive through a maze. Design, test and redesign to get to the goal! No coding experience necessary. This workshop supports Computer Science standards.

### GRADES 3–5

**Bridge the Gap:** Will your bridge survive? How much weight can it hold? Test the limits of a K'NEX® bridge and discover what makes an optimal bridge design through various challenges.

**Get In Gear:** How does a mechanical engineer design an amusement park ride so that it spins the fastest? Explore the spinning, whirling world of gears.

**Radical Robots:** How can robots help us solve problems? Explore the world of robotics and become real robot programmers. Learners will program Kibos® to move through obstacles and react to the world around them.

**Wired Up:** Learn what electricity is and how it flows to turn on lights and power the world around us, then test your electrical engineering skills by building circuits.

### GRADES 5–8

**Bridge the Gap:** Will your bridge survive? How much weight can it hold? Test the limits of a K'NEX® bridge and discover what makes an optimal bridge design through various challenges.

**Enviro-Sleuths:** Where should the town build the new mall? As environmental engineers, students determine water quality by testing pH and analyzing the presence of bioindicators. Learners use their data to predict the environmental impact on Yourtown, USA, and construct an argument about where to build the mall.

**Wired Up:** Learn what electricity is and how it flows to turn on lights and power the world around us, then test your electrical engineering skills by building circuits.

