STAR net
Science-Technology Activities & Resources For Libraries

SPACE SCIENCE INSTITUTE
NCIL National Center for Interactive Learning

Out-of-This World Activities, Part 1

September 13, 2017

2:00 P.M. Central

If you experience audio problems, click and highlight the  button at the top of your screen. You can also run the Audio Setup Wizard under the Meeting menu, located on the upper-left corner of the Adobe Connect meeting interface

This webinar will feature video of the presenters and demonstrations as well as this powerpoint. If you cannot see the video, please say so in the chat box.

Christine Shupla and Joey Avila
(demonstrations by Yolanda Ballard, Andy Shaner, Steve Liu)
Lunar and Planetary Institute

Brooks Mitchell, *Space Science Institute*

NSF · Institute of Museum and Library Services · ALA American Library Association · Lunar and Planetary Institute · Afterschool Alliance

Resources

Connect to the STARNet *Space Science* resources!

- Join the online community! Get access to resources, discussions and related opportunities.

Contact: Brooks Mitchell
bmitchell@spacescience.org

- Visit the project website at www.STARNetLibraries.org

Contact: Keliann LaConte
klaconte@spacescience.org

Explore Program

Hands-on activities

- Designed for libraries, camps, and out-of-school time
- Use inexpensive materials
- Highlight engineering and science concepts through investigations, demos, crafts, and facilitated conversations

Provides training and shares resources

www.lpi.usra.edu/education/explore/
www.facebook.com/groups/LPI.Explore/
explore@lpi.usra.edu

Funded by NASA and NSF

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Out-of-This-World Activities:
Part 1

Activity 1: *Jump to Jupiter*
Activity 2: *Investigating the Insides*
Activity 3: *Strange New Planet*

Social!

For families or groups of children
Ages 5-13

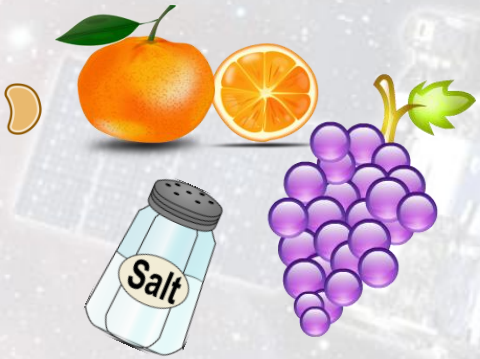
NSF · Institute of Museum and Library Services · ALA American Library Association · Lunar and Planetary Institute · Afterschool Alliance

How BIG is big?

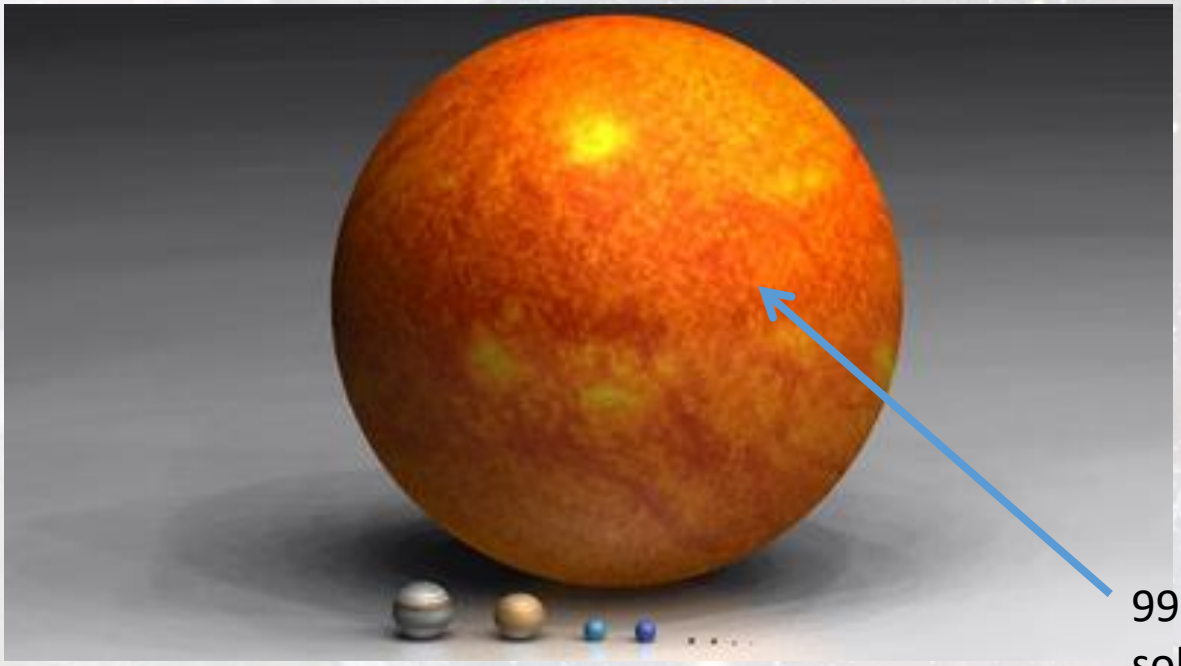
Poll Question:

If the Sun were the size of a grapefruit, which item would represent the size of the Earth?

a. Tangerine
b. Pinto Bean
c. Grape
d. Sea Salt Crystal

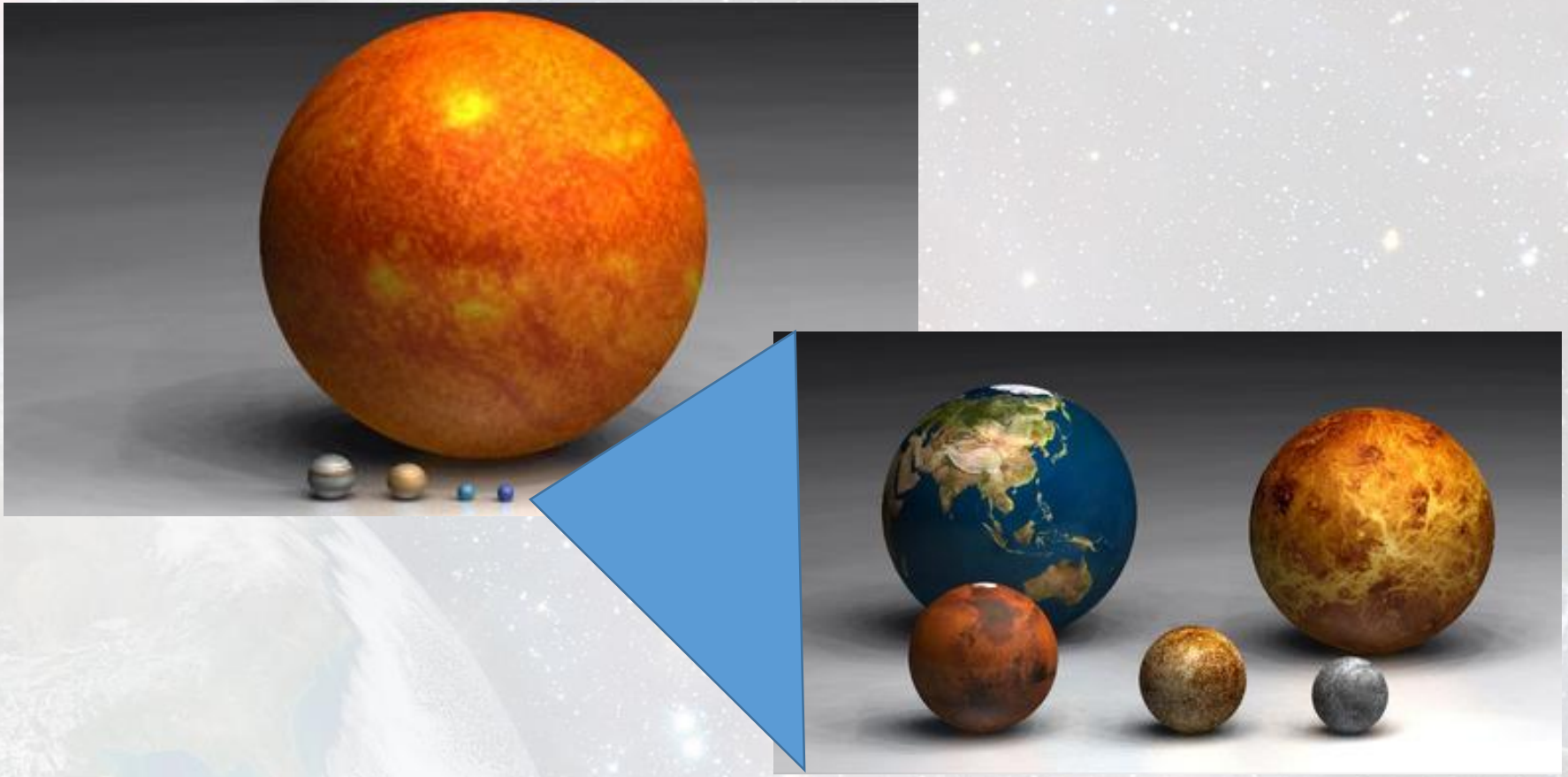


How BIG is big?

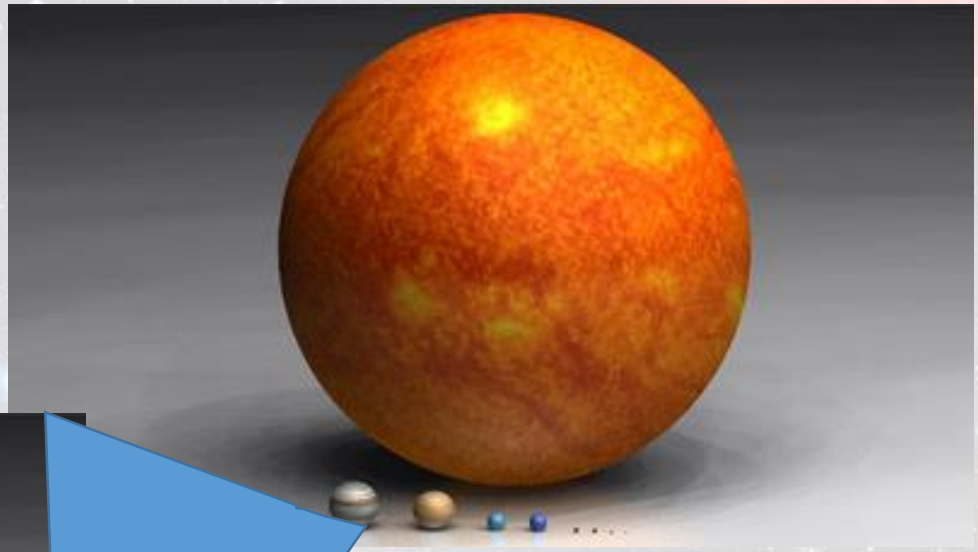


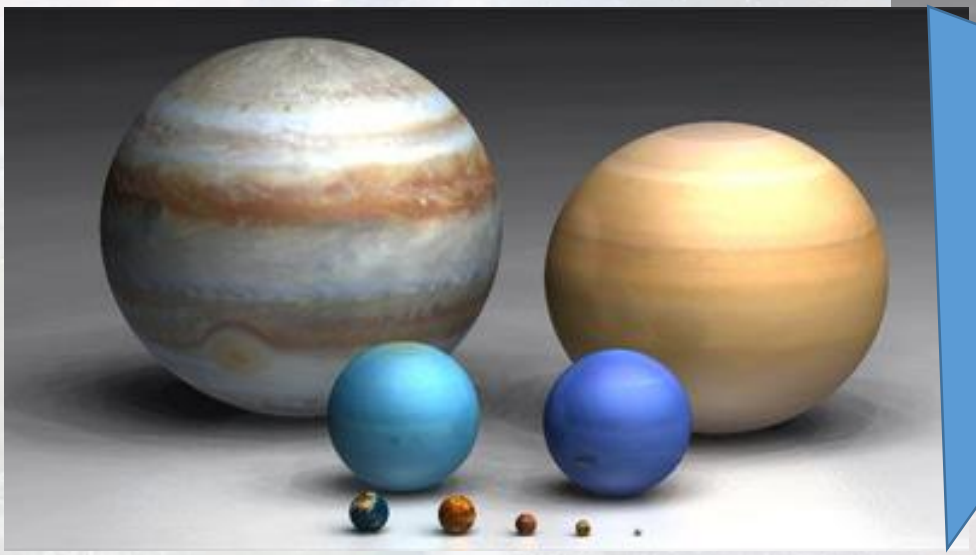
99% of the “stuff” in our solar system!

How BIG is big?



How BIG is big?





How BIG is big?

How BIG is big?

Poll Question:

If the Sun were a grapefruit and the Earth a sea salt crystal, how far apart would they be?

a. 6 inches
b. 1 foot
c. 10 feet
d. 50 feet

Jump to Jupiter

Participants hop along a scale model solar system from the Sun, pass the Earth to Jupiter — and beyond!

Credit: Lunar and Planetary Institute

Credit: Enid Costley, Library of Virginia

Jump to Jupiter

	Memorable Representative	Scaled Diameter	Scaled Average Distance from Sun	Number of Jumps Between Objects
Sun	Grapefruit or pomegranate	4” (10 cm)	-	-
Mercury	Table salt or sugar crystal	1/100” (0.3 mm)	20’ (6 meters)	6
Venus	Sea salt crystal	3/100” (1 mm)	35’ (11 meters)	5
Earth	Sea salt crystal	4/100” (1 mm)	50’ (15 meters)	4
Mars	Table salt or sugar crystal	2/100” (0.4 mm)	75’ (23 meters)	8
Asteroids (e.g. Ceres)	Pollen, milled flour or corn, or gelatin	3/1000” (70 micrometers)	(41 meters)	18
Jupiter	Wooden bead	1/3” (1 cm)	255’ (78 meters)	37
Saturn	Pony bead	1/3” (8 mm) (marble)	470’ (143 meters)	65
Uranus	Peppercorn	1/10” (3 mm) (peppercorn)	945’ (288 meters)	145
Neptune	Peppercorn	1/10” (3 mm) (peppercorn)	1,480’ (452 meters)	164
Pluto	Fine sand	7/1000” (170 micrometers)	1,950’ (593 meters)	141

Juno in Orbit at Jupiter

July 4, 2016

Studying Jupiter's unique characteristics…

- Atmosphere
- Magnetic field
- Gravity field

…To help us understand the origin and evolution of Jupiter – and our solar system

www.missionjuno.swri.edu

Investigating the Insides

Examine mystery balls or balloons as a model for how we study the interiors of planets.

Goal: to use senses and instruments to infer the composition of the unseen materials, and to model how we study planets and asteroids.

Learning Objectives: Participants will:

- Make inferences from observations
- Compare this model of studying composition to how missions examine planetary bodies

http://www.lpi.usra.edu/education/explore/solar_system/activities/insides/

Investigating the Insides

- Tools can include scales, magnets, and paperclips, to test whether the mystery balls have a magnetic field or if they have metal/ iron inside.
- Additional modifications to the models could include putting them in a refrigerator or freezer ahead of time.

Investigating the Insides

Ask participants to use their observations (their senses, tools) to describe:

- What type of mass is inside?
- How is it distributed?
- What does it sound like or feel like?
- Does it have a magnetic field?
- What do they think is inside?

How is this similar to how spacecraft study objects in the Solar System?
Spacecraft use the changing gravitational field and the magnetic field to make similar observations. Scientists use the observations to infer a planet or asteroid's structure and composition.

Investigating the Insides

Preparing the "Planets"

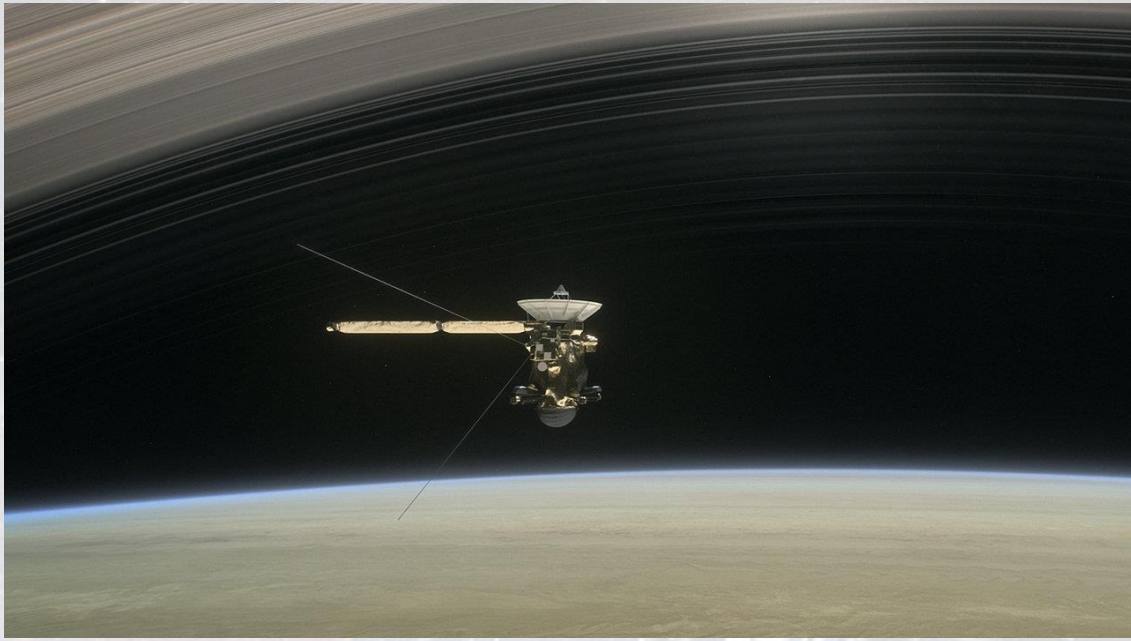
Models can be made with balloons, oversized plastic eggs, plastic ornaments, or other materials. Ensure models are opaque; plastic models may be covered with aluminum foil or other materials.

For balloons, make the models opaque by using two balloons:

- Use large dark-colored balloons (such as red, dark blue, dark green, purple).
- Stretch both balloons, then insert one un-inflated balloon inside the other.
- Stuff materials inside the inner balloon, such as marbles, beads, magnets, paper clips, bb's, or a small amount of water.
- Inflate the inner balloon and tie it, pushing it into the outer balloon.
- Inflate and tie the outer balloon.

Cassini Grand Finale

- The Cassini mission launched for Saturn almost 20 years ago, and has been orbiting Saturn since 2004.
- On Sept. 15, 2017, the spacecraft will dive into Saturn's atmosphere, to burn up and disintegrate like a meteor.



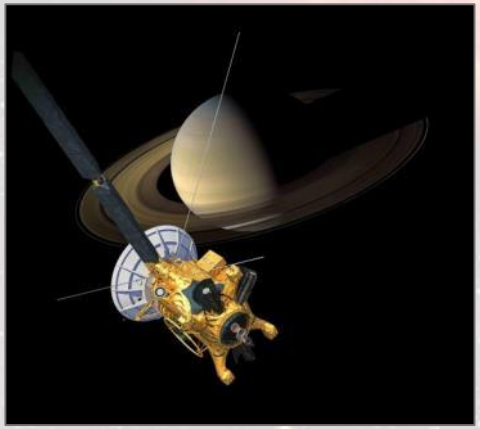
Poll Question:

Scientists explore the solar system using which of the following?

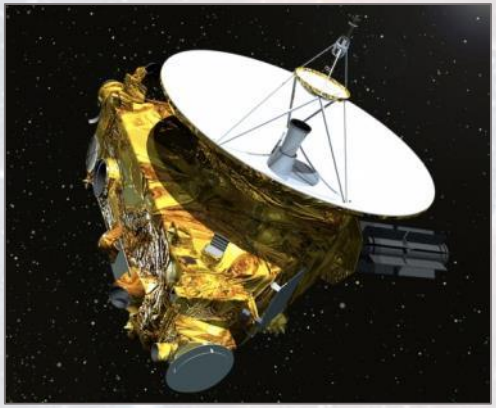
a. Telescopes on the Earth
b. Telescopes in space
c. Spacecraft orbiting objects
d. Spacecraft landing on the surfaces of objects
e. All of the above

Kitt Peak National Observatory, Arizona

Hubble Space Telescope



Cassini Orbiter at Saturn



New Horizons Flyby of Pluto

Curiosity Rover on Mars

Strange New Planet

In this simulation of space exploration, participants conduct missions to a "planet" and communicate their discoveries to their team.

Goal: participants learn about the different stages of planetary exploration, while using communication and collaboration skills.

Learning Objectives: Participants will:

- Make inferences from observations
- Communicate their observations, inferences, and resulting questions to their team
- Model the progression of space exploration missions

http://www.lpi.usra.edu/education/orexlaunch/Strange-New-Planet.docx

Strange New Planet

- Participants work in small groups (3 to 6 participants in each group). They take turns being the observer, who communicates what they see to the others in their group.
- Groups explore one or more new “planets” as if they are looking through a telescope from Earth or traveling to the planet as a space probe, orbiter, or sample return mission.

Strange New Planet

Steps (give the observers them 10 to 20 seconds)

- For telescopes on Earth: the observers look through a paper towel tube with blue cellophane covering it, about 30 feet away from the “planets” while everyone else looks away.
- Telescopes above the atmosphere: repeat without the cellophane.
- Fly-by: the observers walk past one side of the “planets” looking through the paper towel tubes
- Orbiter: the observers walk around just one of the “planets” looking through the tubes
- Return Sample Mission: the observers remove one tiny piece of one planet for further analysis

Strange New Planet

For each step, the observers return to report their observations to their team.

The team needs to develop hypotheses and new questions about one of the planets that will justify "funding" the next mission.

OSIRIS-REx Mission

- Launched September 3, 2016
- Arrive at asteroid Bennu in 2019
- Study Bennu for 1 year; return a sample in 2023

OSIRIS-REx
ASTEROID SAMPLE RETURN MISSION

www.asteroidmission.org

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Implementation Discussion

--the interactive part!

Explore Further Resources

www.lpi.usra.edu/explore

HANDS-ON SCIENCE ACTIVITIES

Lunar exploration
The planets Earth, Jupiter, and Mars
Rockets
Health in space

STARNET Activities

clearinghouse.starnetlibraries.org/index.php

Be sure to take the final survey!

https://www.surveymonkey.com/r/STAR_Net

And print your personalized certificate of completion

And now … time for the drawing!

Thank you! Keep in Touch!

Please join us at 3:45 Eastern/12:45 Pacific for *Part 2*

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