



- Please sign in
- Please fill out a name tag
- Please write one or two goals you have for this workshop on a Post-It, then add to poster on wall
- Please jot down on Post-Its:
  - 1) something you know about the solar system
  - 2) something you know about the galaxy
  - 3) something you know about the Universe
  - 4) place each Post-It on the corresponding poster on the wall

# NASA STEM Workshop

**Kenton County Public Library  
Erlanger, KY**

**April 8 – 9, 2019**



**Andy Shaner**  
Lunar and Planetary  
Institute  
[shaner@lpi.usra.edu](mailto:shaner@lpi.usra.edu)



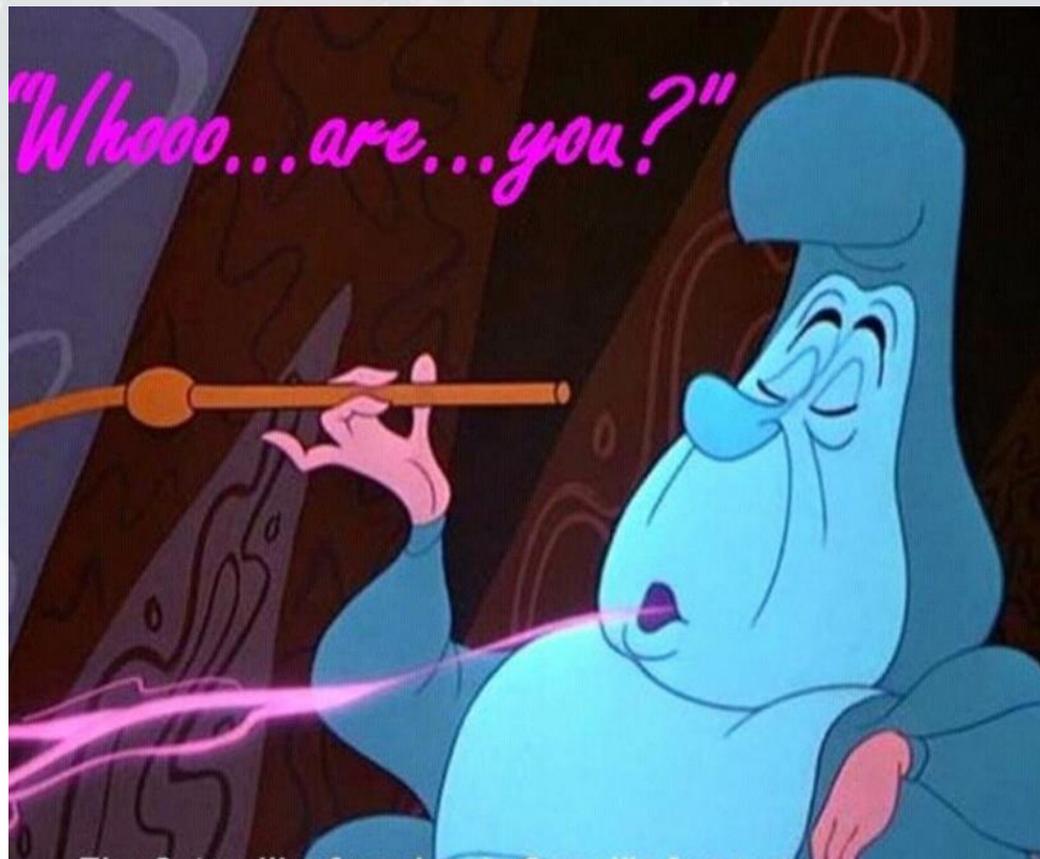
**Wini Ashooh**  
Central Rappahannock  
Regional Library  
[washooh@crri.org](mailto:washooh@crri.org)

# Who Are You?!

**Name**

**Library**

**Role**



# Today's Agenda

- Workshop Goals (ours *and* yours!)
- Parking Lot?
- Our Place in Space
- What We See in the Sky
- Beyond the Solar System
- Dinner here provided by NEKLS
- Night Sky Viewing (6:30pm)

# Goals

- N@ML Goals
- Your goals?



# THE PARKING LOT



What is going well?



What can we improve?



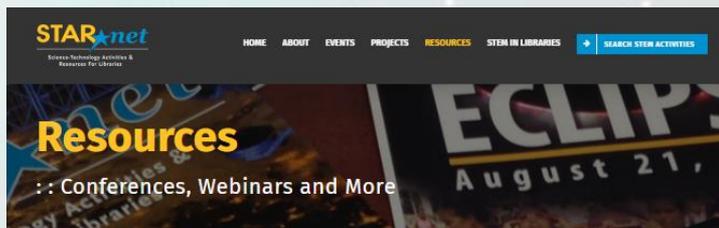
What are the questions?



What are the issues and ideas?

# The STAR Library Network

[www.starnetlibraries.org](http://www.starnetlibraries.org)



Professional development resources, including webinars, newsletters, blogs, forums, videos, and much more!

## Curated Resources For Professional Development

Building the capacity of public libraries and library staff to deliver engaging, inspirational, and educational STEM programs has the potential to transform the STEM education landscape across the country. What started in libraries some years ago as independent experiments in STEM programming has become a national STEM movement.

Across the country, libraries are redefining their roles. They're becoming primary centers of informal learning, especially STEM learning. And this critical transition is being carried out by many dedicated librarians. To help them, the STAR Library Education Network (STAR\_Net) is providing resources to support their efforts to develop new skills and provide quality STEM programming.

Collaboration is the key to transforming libraries into STEM learning centers



Conferences



Webinars



Newsletters



Online Forums



STAR\_Net Blog



2017 Solar Eclipse



Exhibition Posters



Books, Videos & More!



Guides, Facts & Tips

### Recent Blogs

> Watercraft Design

> The Dirt on Soil

> Do You Have Your Solar Eclipse Glasses? Great - Now Try Them Out!

### Upcoming Events

Discover NASA Exhibition (AZ)  
May 3 - July 28

Summer Learning - Build a Better World  
May 15 - August 31

Discover Tech Exhibition (CO)  
May 31 - August 25

[View All Events](#)

# STEM ACTIVITY Clearinghouse

For example:  
[DIY Sun Cookies](#)

STEM Activity Clearinghouse

STARnet Science-Technology Activities & Resources for Libraries

CS Cornerstones of Science accelerating curiosity, enriching lives

Search

# Collections 2017 Total Solar Eclipse

ATTRIBUTES 2017 TOTAL SOLAR ECLIPSE There are 7 items.

Showing 1 - 7 of 7 items

**Content Area**

- Earth Science (0)
- Astronomy and Space (0)
- Chemistry (0)
- Physics (0)
- Engineering (0)
- Mathematics (0)
- Technology and Computing (0)
- Health Science (0)

**Age Group**

- Family (0)
- Infant (0-2) (0)
- Pre-K (0)
- Early Elementary (0)
- Upper Elementary (0)
- Tweens (9-12) (0)
- Teens (0)
- Adults (0)

**Time to Complete Activity**

- Under 10 minutes (0)
- 10-20 minutes (0)
- 20-40 minutes (0)
- 40 minutes to 1 hour (0)
- 1-2 hours (0)
- 2-4 hours (0)
- Long Duration (days to months) (0)

**How Big, How Far, How Hot, How Old?**

This is an activity about scale. Participants will arrange imagery of Earth and many other space objects in order of their size from smallest to largest, their distance from Earth's surface, their temperature from coolest to hottest, and/or their age from youngest to oldest.

[Open Activity](#) Report broken link

**Content Area**  
Earth Science  
Astronomy and Space

**Age Group**  
Upper Elementary  
Tweens (9-12)

**Time to Complete Activity**  
10-20 minutes

**Difficulty Level (by content)**  
Medium

[View Details](#)

**How Can the Little Moon Hide the Giant Sun?**

This is an activity exploring the concept that distance affects how we perceive an object's size, specifically pertaining to the size of the Sun and the Moon as seen from Earth.

[Open Activity](#) Report broken link

**Content Area**  
Earth Science  
Astronomy and Space

**Age Group**  
Early Elementary  
Upper Elementary

**Time to Complete Activity**  
40 minutes to 1 hour

**Difficulty Level (by content)**  
Easy



Like an activity and think other library staff should know how great it is? Didn't like an activity or have modifications to make it better? **Make sure to leave a review!**

# FREE STAR Net Resources

*(take a picture of this slide!!)*

**175+ Activities Specifically for #STEMINLIB**

<http://clearinghouse.starnetlibraries.org/>

**Upcoming and Archived Professional Development  
Webinars**

<https://www.starnetlibraries.org/resources/webinars/>

**Monthly Newsletter**

<https://www.starnetlibraries.org/resources/newsletters/>

**Upcoming STEM Events**

<https://www.starnetlibraries.org/upcoming-events/>

**STAR Net Blog (for library staff and written  
by library staff!)**

<https://www.starnetlibraries.org/blog/>

**Partnership Resources**

<https://www.starnetlibraries.org/stem-in-libraries/collaboration/partnership-opportunities/>

**Community Dialogue Resources**

<http://www.starnetlibraries.org/resources/community-dialogues/>

# Subscribe to Our YouTube Channel!

<https://goo.gl/Wt638F>

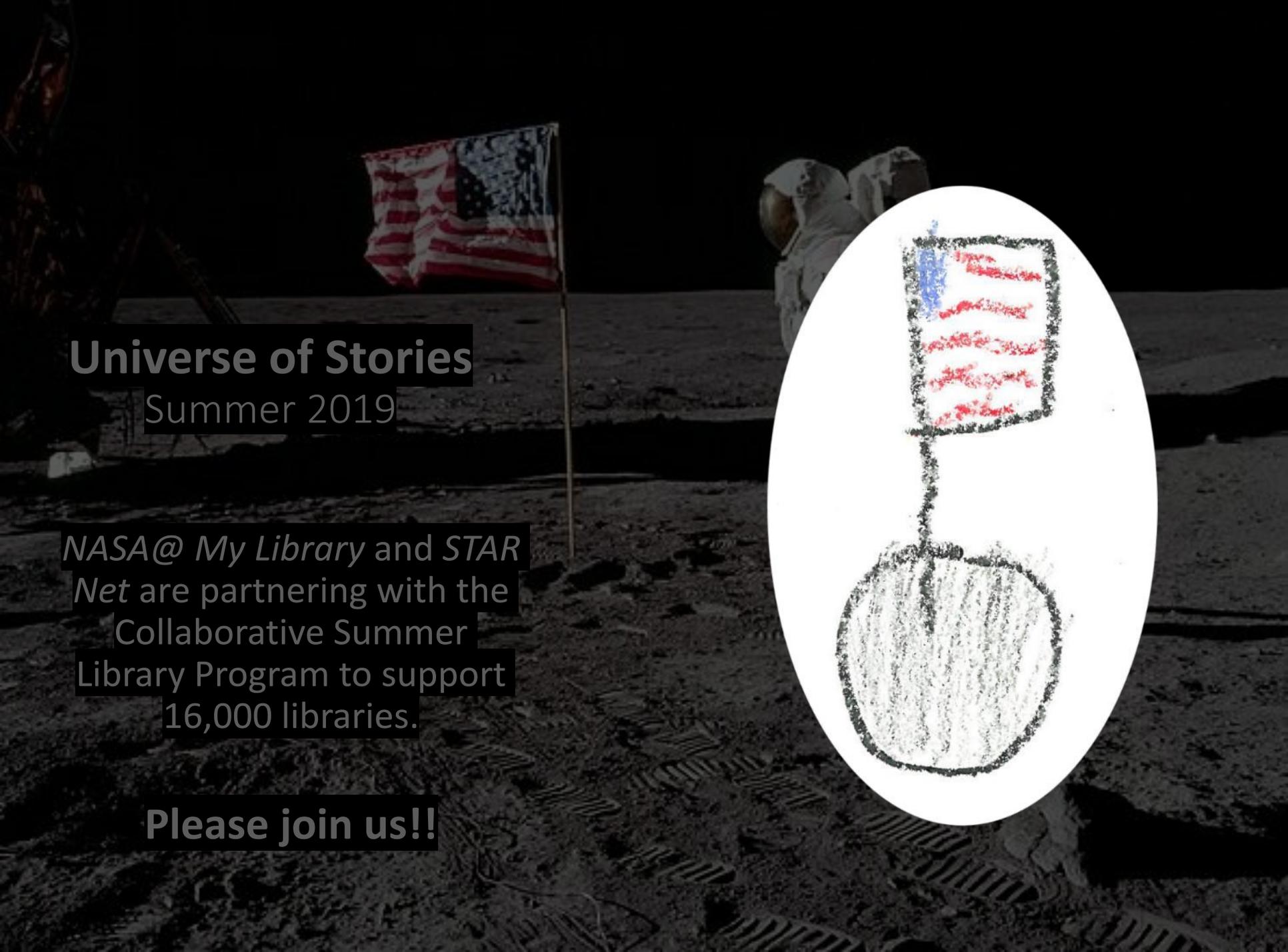
- How-to Videos
- Webinar Recordings
- NASA Mission Videos
- Kid-friendly Video Clips of REAL Engineers and Scientists in action

A black and white photograph of an astronaut in a full spacesuit standing on the lunar surface. The astronaut is positioned on the right side of the frame, facing left. To the left of the astronaut, an American flag is planted in the ground on a thin pole. The lunar surface is covered in dust and rocks, with several distinct boot prints visible in the foreground. The background shows the dark, cratered horizon of the moon against the blackness of space. The lighting is bright, creating sharp shadows on the ground.

**Universe of Stories**  
Summer 2019

**NASA@ My Library and STAR  
Net are partnering with the  
Collaborative Summer  
Library Program to support  
16,000 libraries.**

**Please join us!!**



**Universe of Stories**  
Summer 2019

*NASA@ My Library* and *STAR Net* are partnering with the Collaborative Summer Library Program to support 16,000 libraries.

**Please join us!!**

# What is a Solar System?

...a galaxy?

...the universe?

# Size & Scale of the Solar System

What is accurate about this depiction of the solar system? What is not accurate?



# How Big, How Far, How Hot?

How would you sort these images?

**Use the images on your tables to discuss in groups  
how you can sort items in the Universe.**

Start by sorting the cards in whatever way makes sense to your group

# How Big, How Far, How Hot? Answers

## How Big?

Lions, International Space Station, Moon, Mars,  
Earth, Jupiter, Sun, Solar System, Andromeda  
Galaxy

# How Big, How Far, How Hot? Answers

## How Far?

Eagle, Jet, Aurora, Hubble Space Telescope,  
Moon, Sun, Saturn, Orion Nebula, Andromeda  
Galaxy

## How Hot?

Comet's surface (171 °F; 77 °C)

Lava (1,832 °F; 1,000 °C)

Meteor (3,100 °F; 1,700 °C)

Sunspot (6,332 °F; 3,500 °C)

Sun's Surface (9,932 °F; 5,500 °C)

Earth's Core (10,832 °F; 6,000 °C)

Lightning Bolt (52,232 °F; 29,000 °C)

Sun's Corona (3.6 million °F; 2 million °C)

Sun's Core (27 million °F; 15 million °C).



Jump to Jupiter

# Jump to Jupiter



# Jump to Jupiter

	Memorable Representative	Scaled Diameter	Scaled Average Distance from Sun	Number of Jumps Between Objects
<b>Sun</b>	Grapefruit or pomegranate	4" (10 cm)	-	-
<b>Mercury</b>	Table salt or sugar crystal	1/100" (0.3 mm)	20' (6 meters)	6
<b>Venus</b>	Sea salt crystal	3/100" (1 mm)	35' (11 meters)	5
<b>Earth</b>	Sea salt crystal	4/100" (1 mm)	50' (15 meters)	4
<b>Mars</b>	Table salt or sugar crystal	2/100" (0.4 mm)	75' (23 meters)	8
<b>Asteroids (e.g. Ceres)</b>	Pollen, milled flour or corn, or gelatin	3/1000" (70 micrometers)	(41 meters)	18
<b>Jupiter</b>	Wooden bead	1/3" (1 cm)	255' (78 meters)	37
<b>Saturn</b>	Pony bead	1/3" (8 mm) (marble)	470' (143 meters)	65
<b>Uranus</b>	Peppercorn	1/10" (3 mm) (peppercorn)	945' (288 meters)	145
<b>Neptune</b>	Peppercorn	1/10" (3 mm) (peppercorn)	1,480' (452 meters)	164
<b>Pluto</b>	Fine sand	7/1000" (170 micrometers)	1,950' (593 meters)	141
<b>Alpha Centauri star system</b>	Grapefruit	-	1,800 miles (3,000 kilometers)	Roughly the distance between Washington, D.C. and Mexico City

+

# BREAK TIME!!!

## 15 minutes....Go



# Loony Lunar Phases



## Books About the Moon

### Faces of the Moon

*Bob Crelin, Charlesbridge, 2009, ISBN 9781570917851*

### The Best Book of the Moon

*Ian Graham, Kingfisher, 2005, ISBN 0753459027*

### How the Moon Regained Her Shape

*Janet Heller, Sylvan Dell, 2007, ISBN 1934359025*

### Dot to Dot in the Sky: Stories of the Moon

*Joan Marie Galat, Whitecap Books, 2004, ISBN  
1552856100*

### The Moon

*David Jefferis, Crabtree Publishing Company, 2008,  
ISBN 0778737314*

### [SkyTellers: "Moon Phases"](#)

### The Moon: Earth's Companion in Space

*Michael D. Cole, 2001, Enslow Publishers, ISBN:  
0766015106*

### The Earth and the Moon

*Linda Elkins-Tanton, Chelsea House, 2006, ISBN  
0816051941*

## Songs and Poems About the Moon

"Moon-catchin' Net," *Shel Silverstein*

"Half Moonshine," *Judith Viorst*

"New Moon," *D.H. Lawrence*

"You know that Portrait in the  
Moon," *Emily Dickinson*

"The Moon And The Yew Tree," *Sylvia  
Plath*

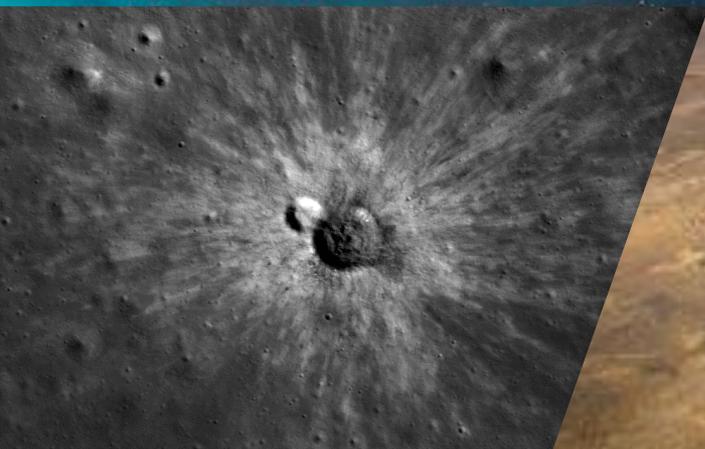
"The Harvest Moon," *Ted Hughes*

"Under the Harvest Moon," *Carl  
Sandburg*

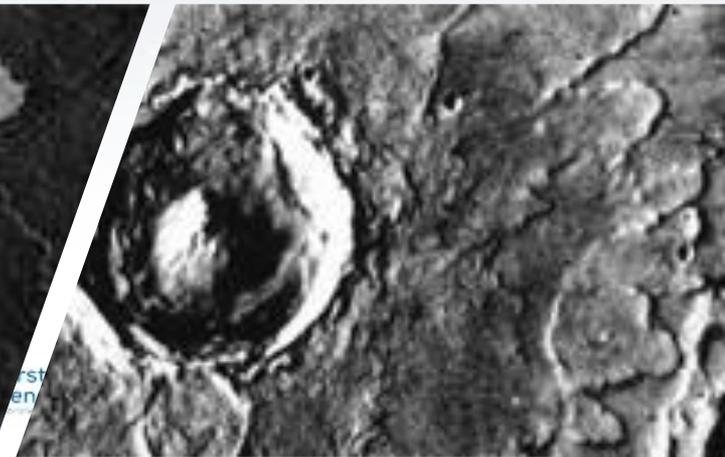
"The Crescent Moon," *Amy Lowell*

"Moon River," "Moonriver" by *Henri  
Mancini*

"Moonlight Sonata," *Ludwig Von  
Beethoven*



# Impact Cratering



**Stations!**

**Crater  
Creations**

**Moon Ooze**

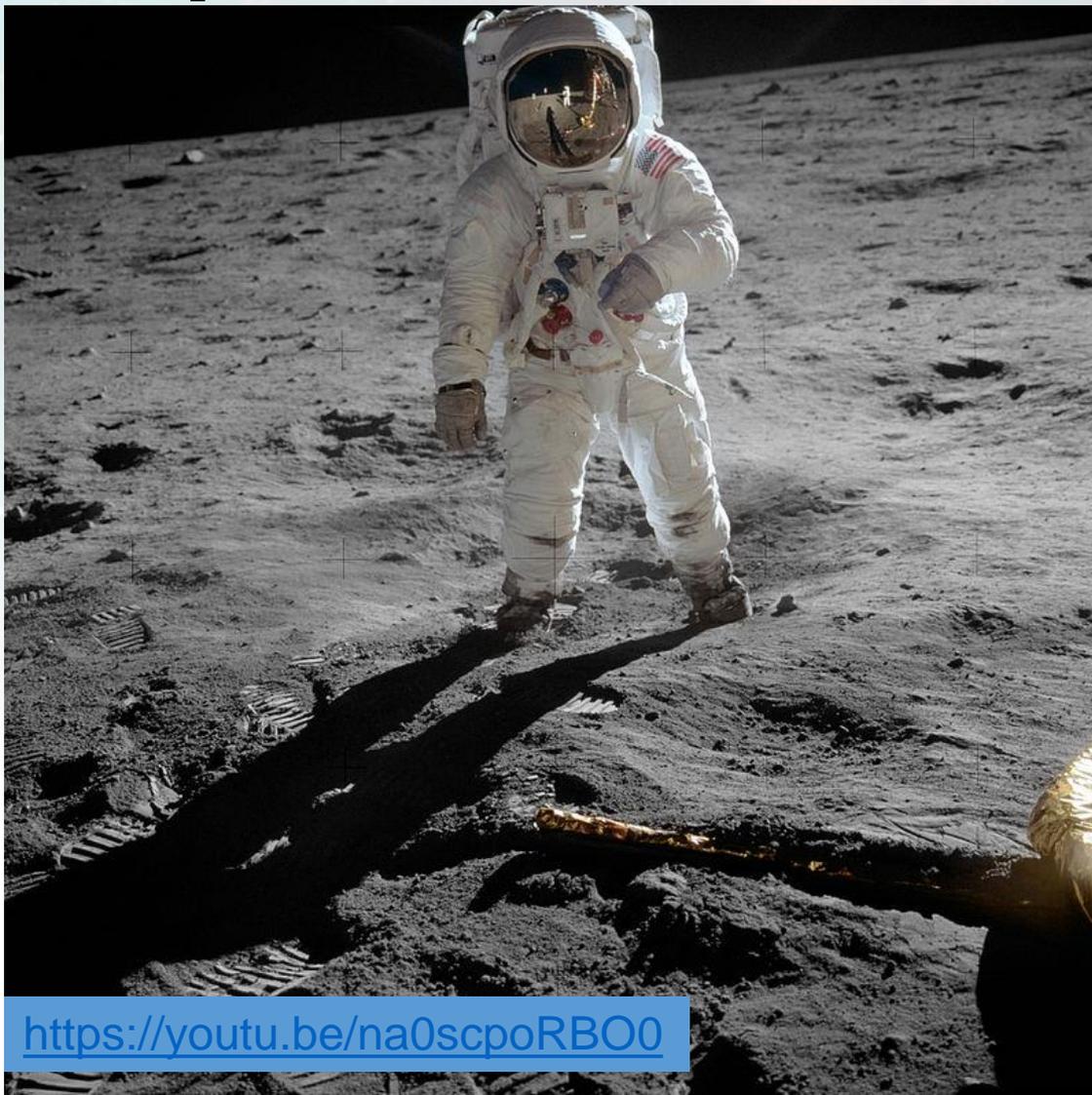


# Apollo Program Accomplishments

- 6 human landings
- 14 EVAs, total 80.1 hours
- Longest traverse 18 km
- 382 kg samples



# Apollo 11

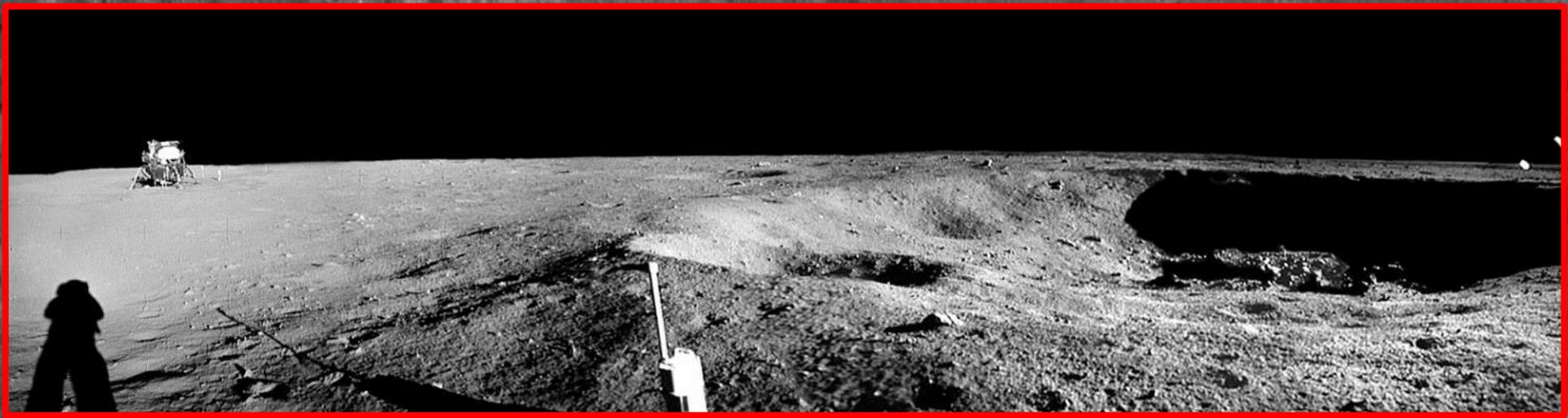
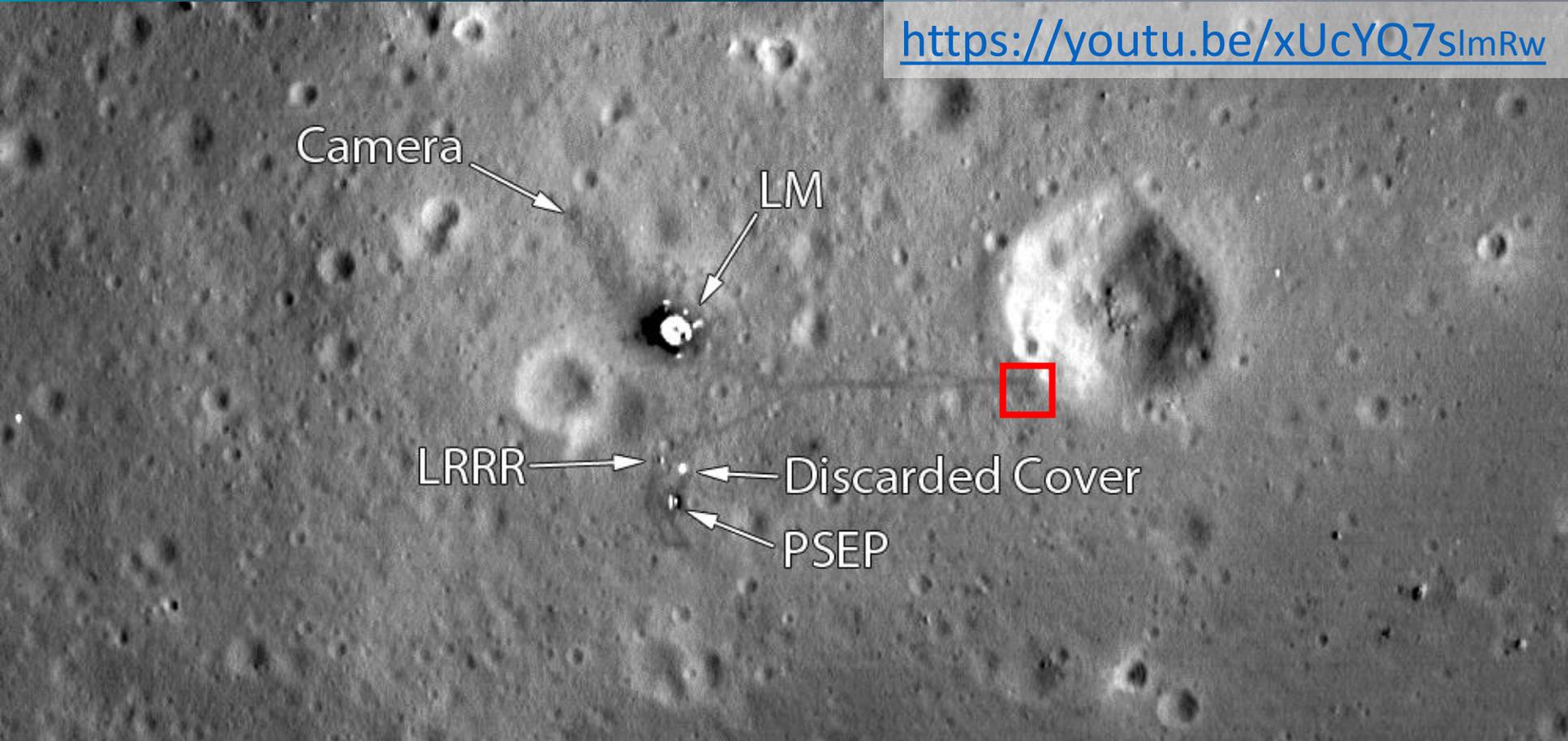


July 20, 1969

Mission  
commander Neil  
Armstrong and  
pilot Buzz Aldrin  
landed the lunar  
module Eagle on  
the Moon,  
becoming the first  
humans to walk on  
the Moon.

Where were you?

<https://youtu.be/na0scpoRBO0>



# Galileo and a Falcon Feather



<https://youtu.be/oYEgdZ3iEKA>

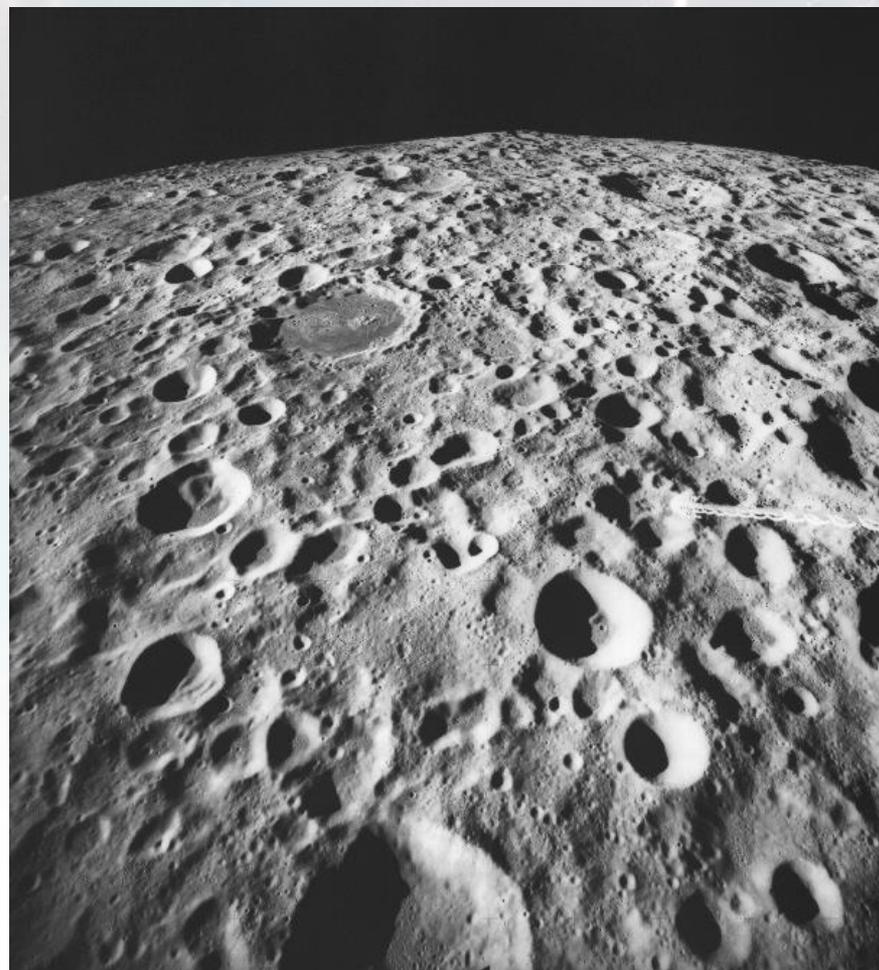
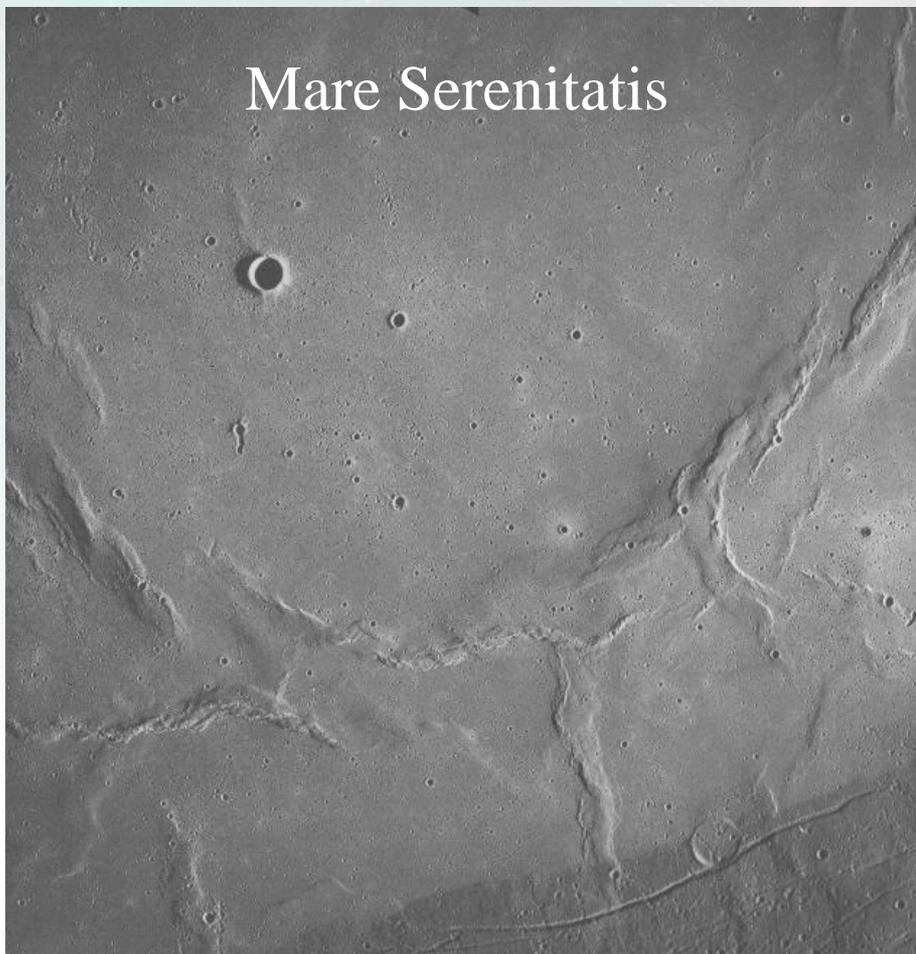
# Sample Collection



**What do  
you see?**



# Lunar Mare and Highlands



# Example Apollo Program

- Contact a local astronomy club to host a night sky viewing!
- Invite patrons to explore Lunar Trek on library computers
  - <https://moontrek.jpl.nasa.gov/>
- Watch the “International Observe the Moon Night” webinar for programming ideas
- Show an [inspiring video](#)
- Facilitate an activity (or two!) from the Clearinghouse “Moon” Collection!

# Discussion

- 1) What kind of activities can you / can't you do in your library?
- 2) What limitations do you encounter?
- 3) Brainstorm!

# Beyond the Solar System



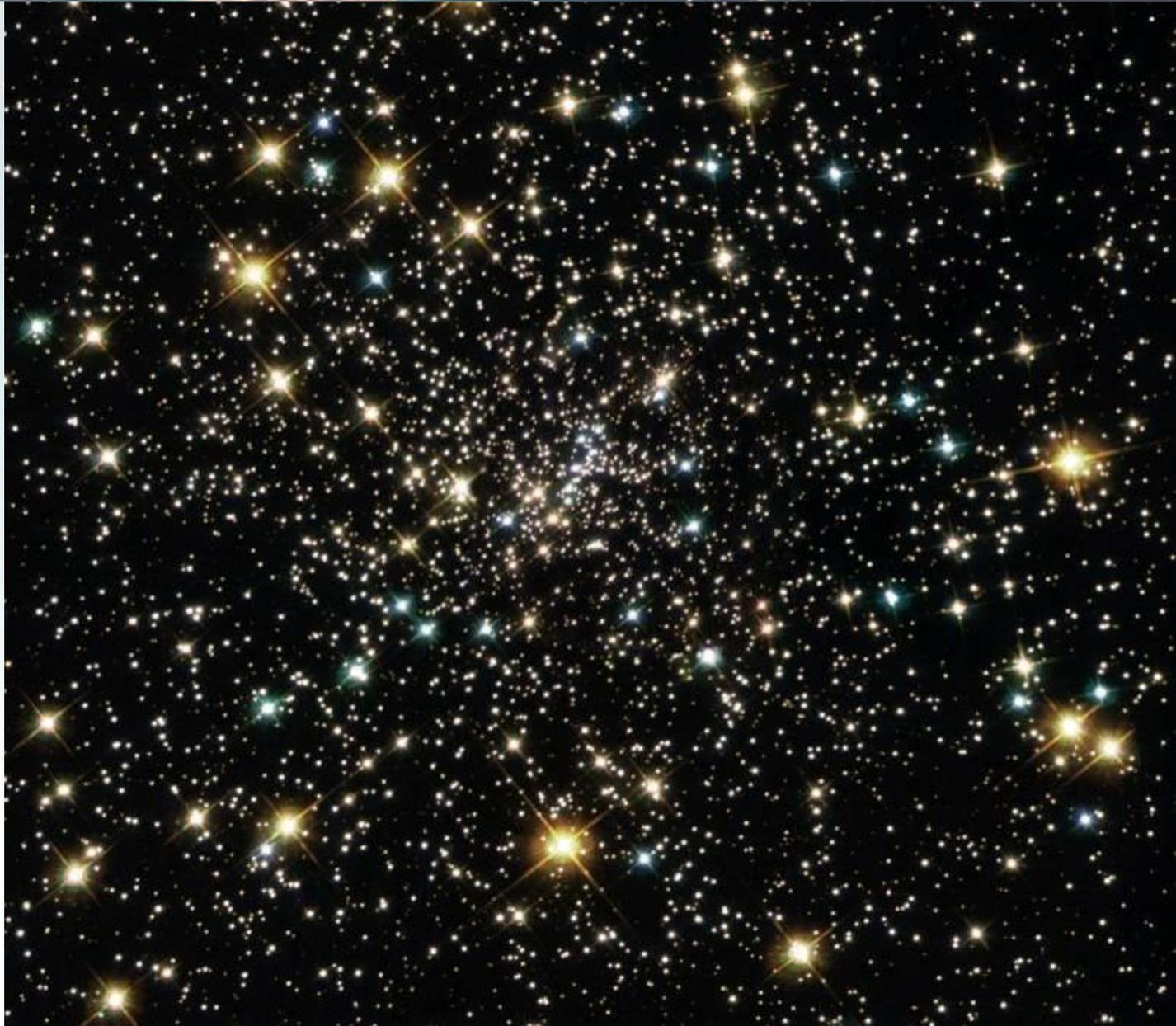
Carl Sagan



~4 billion miles

*“Look again at that dot. That's here. That's home. That's us. On it everyone you love, everyone you know, everyone you ever heard of, every human being who ever was...in the history of our species lived there — on a mote of dust suspended in a sunbeam.”*

# Different types of stars



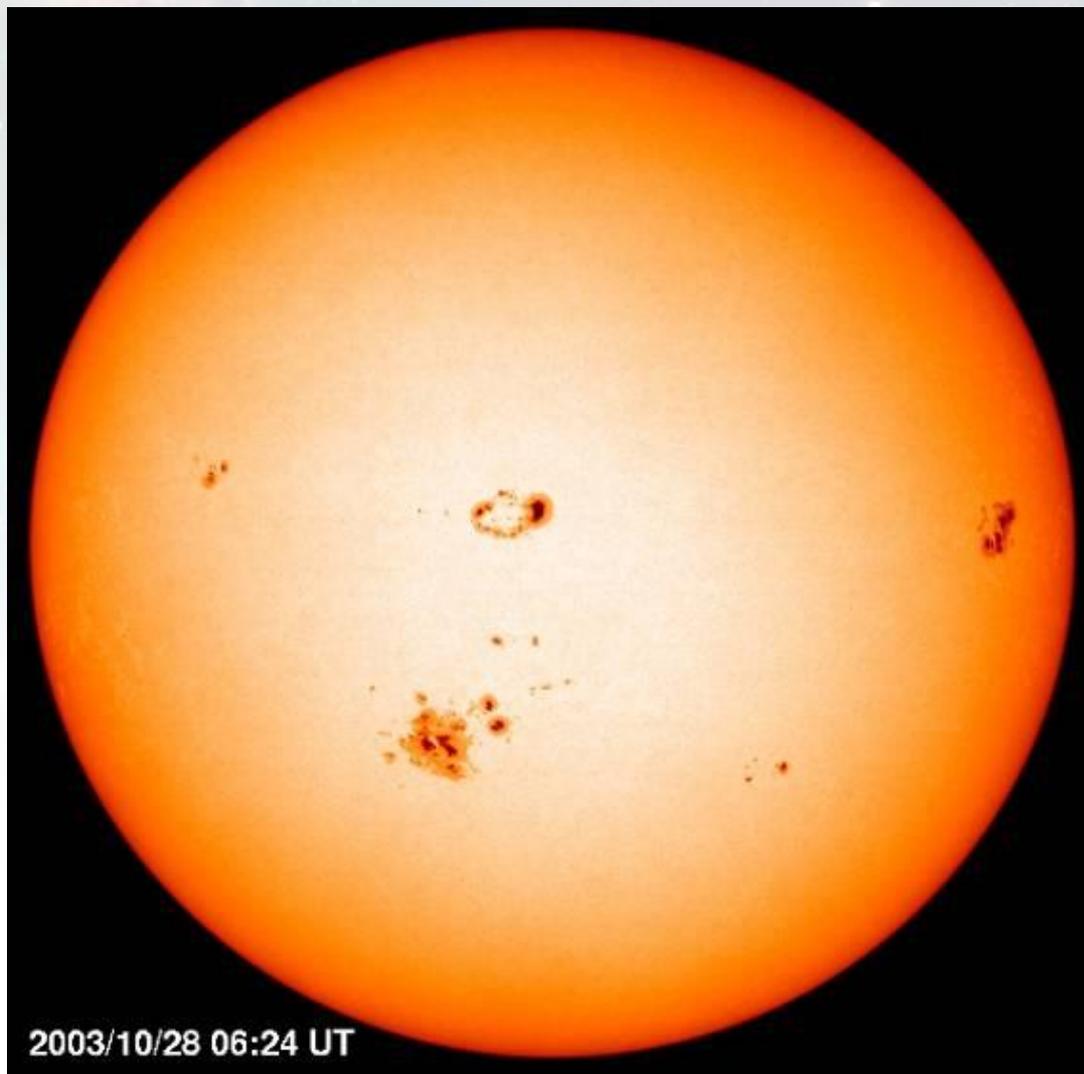
# Types of Stars

- ❖ Big
- ❖ Small
- ❖ Red
- ❖ Blue
- ❖ Yellow
- ❖ In groups
- ❖ Alone

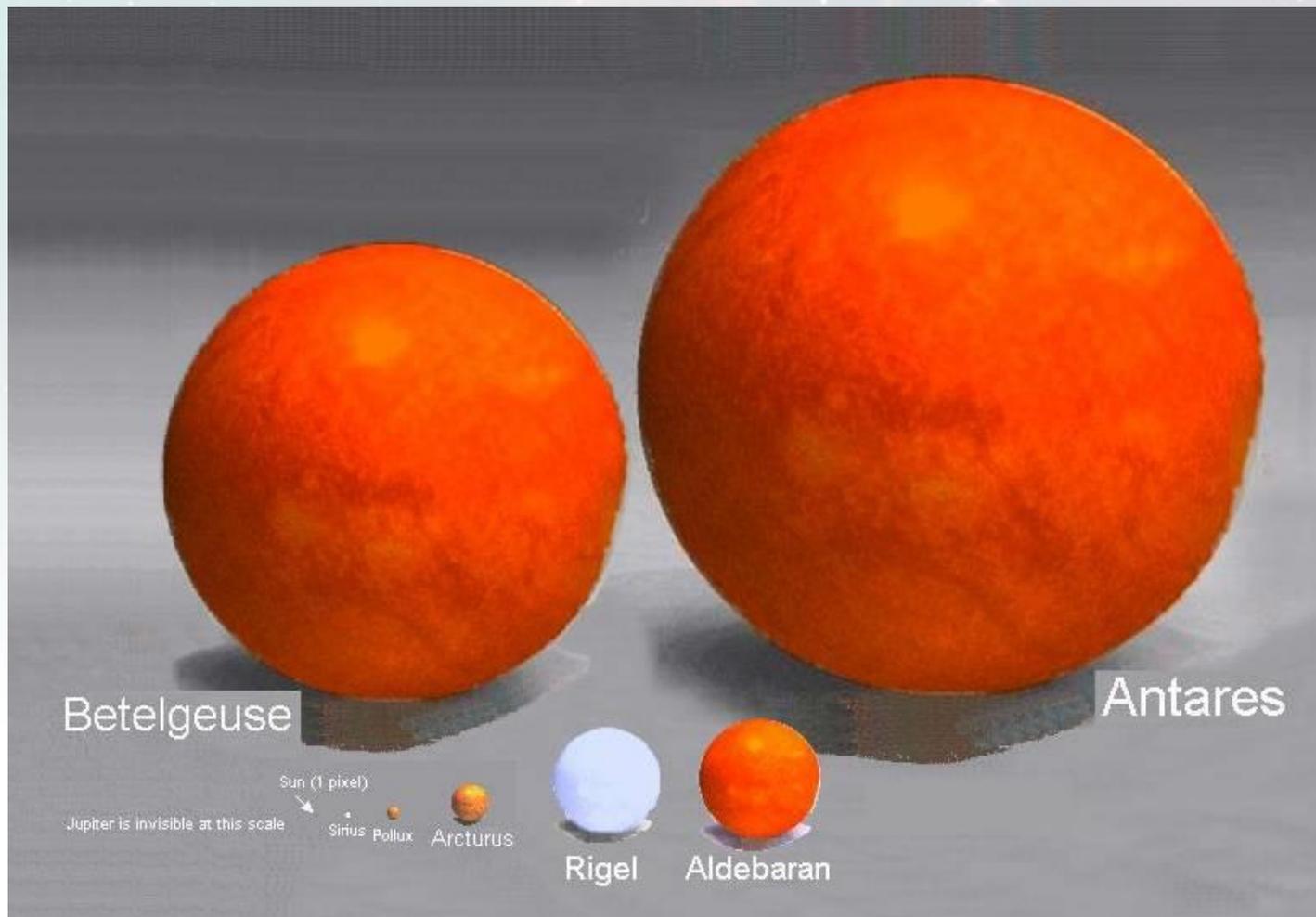
Young  
stars  
form in  
nebulae



# Regular/ Small Star



# Red Giant

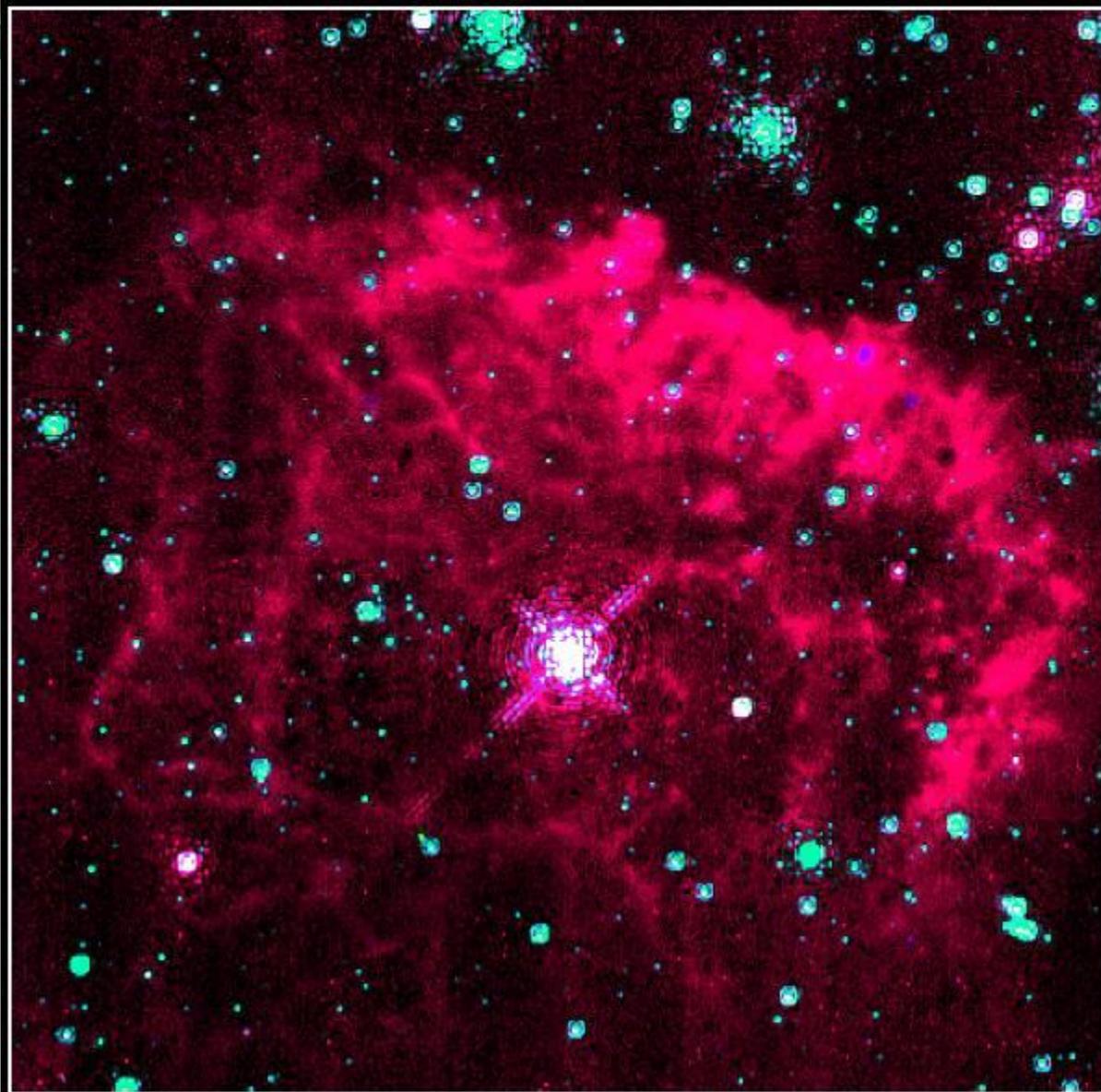


# White Dwarf

*Small, but very hot*



# Massive Stars

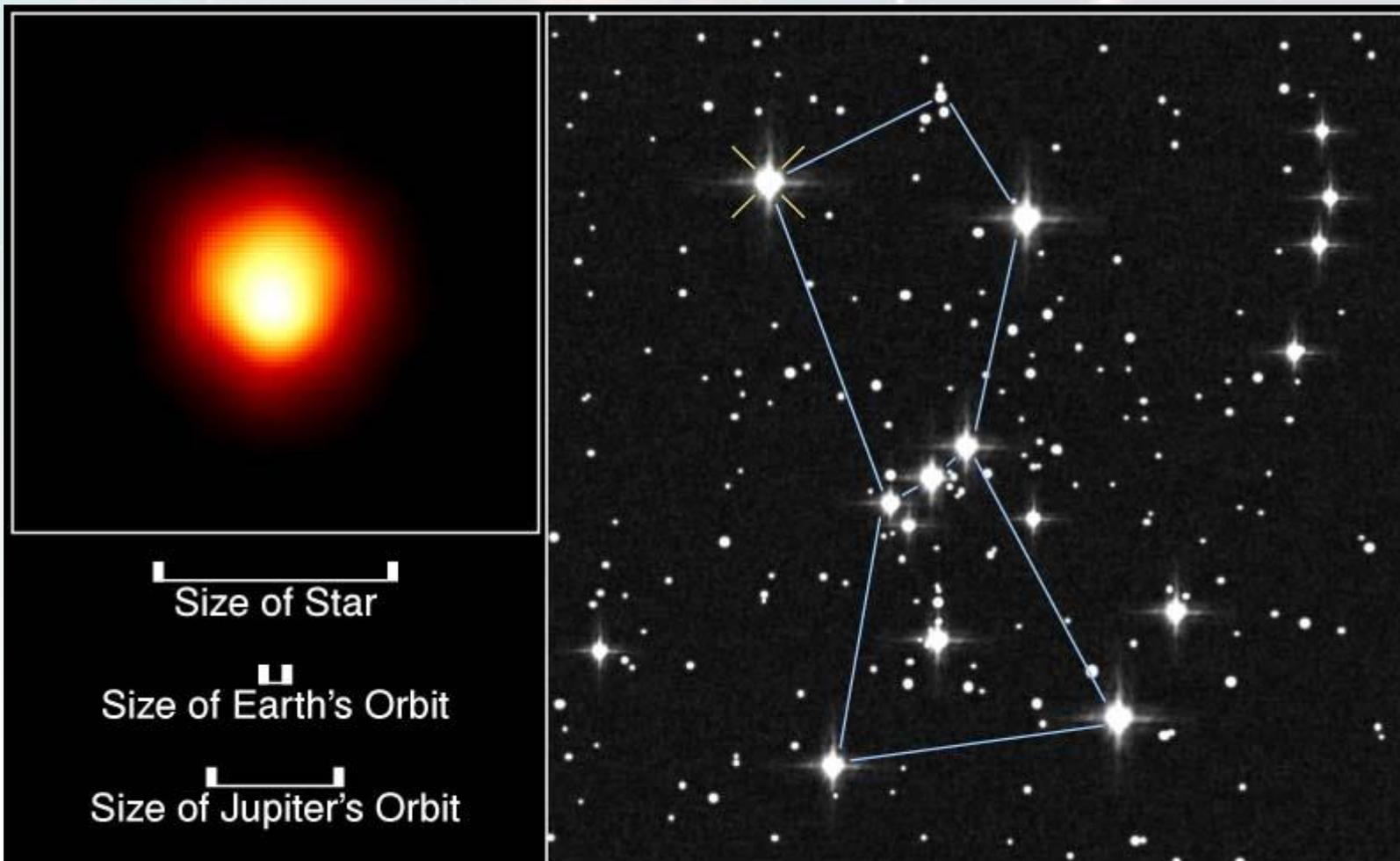


**Pistol Nebula and Massive Star**

HST • NICMOS

PRC97-33 • ST ScI OPO • D. Figer (UCLA) and NASA

# Betelgeuse—Red Supergiant



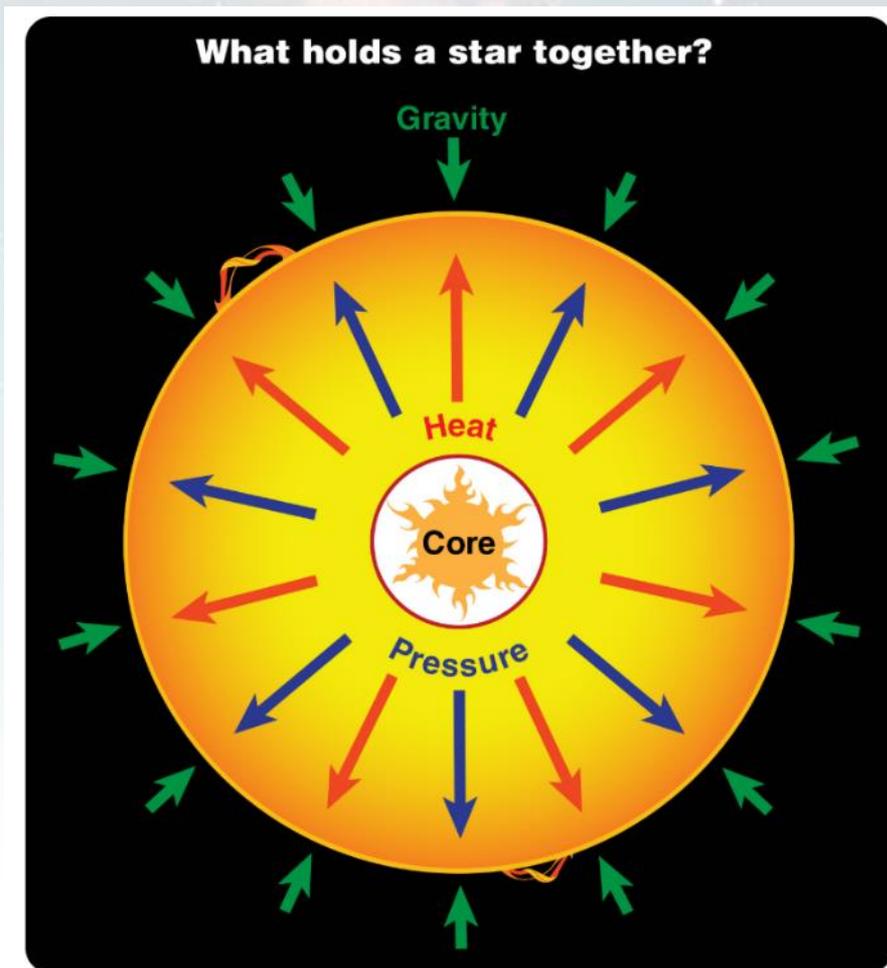
**Atmosphere of Betelgeuse**

**HST · FOC**

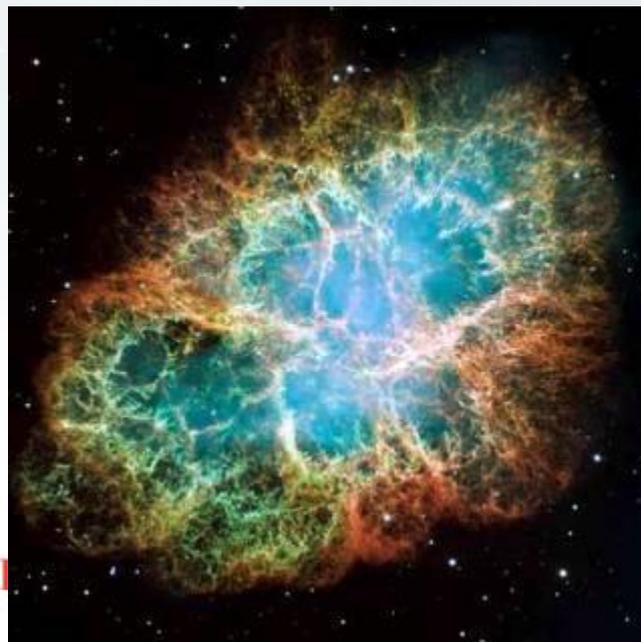
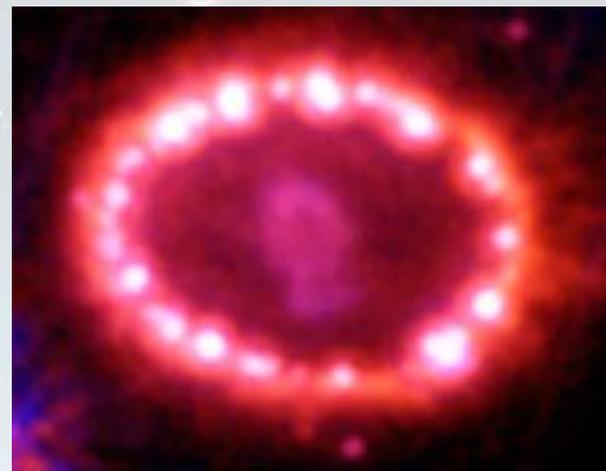
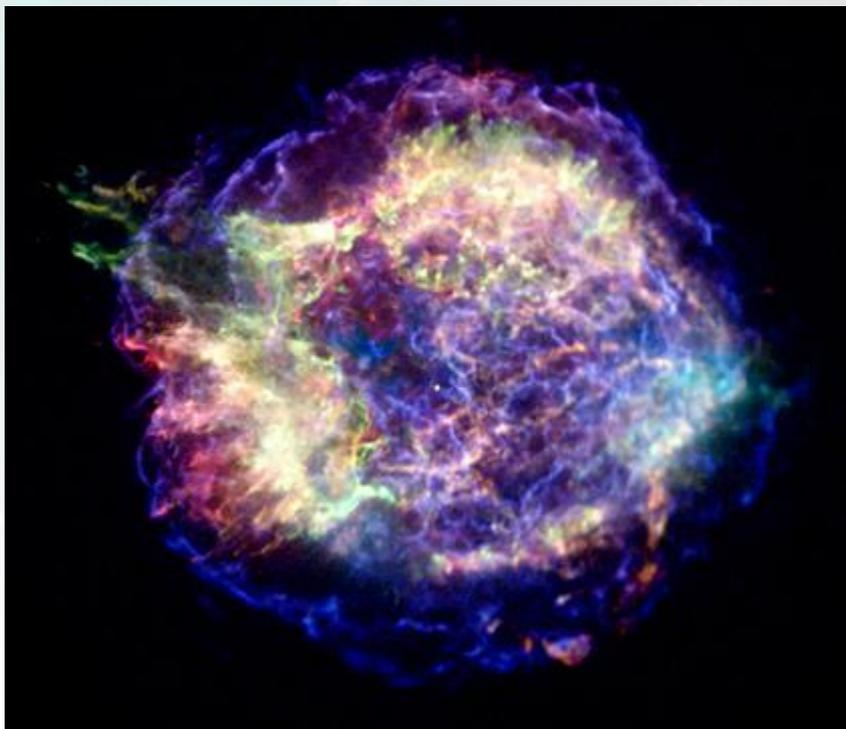
PRC96-04 · ST Sci OPO · January 15, 1995 · A. Dupree (CfA), NASA

# Red Giant





# Supernova—Massive Star Explodes



# Remnants



# Let's Make a Supernova

<https://rmpbs.pbslearningmedia.org/resource/nvbh-sci-stellarlife/wgbh-nova-black-hole-apocalypse-stellar-life-cycles/>



# Big Dipper Star Clock

- Cut out and place “The Time Is” on top of the month/time disk
- Go outside and face north, holding the Star Clock so the current month is at the top of the outer circle.
- Turn the black disk until the small picture of the Big Dipper matches the real Big Dipper's position The current time will appear in the cutout.
- Note: If daylight-saving (summer) time is in effect, you'll need to add one hour to the indicated time.

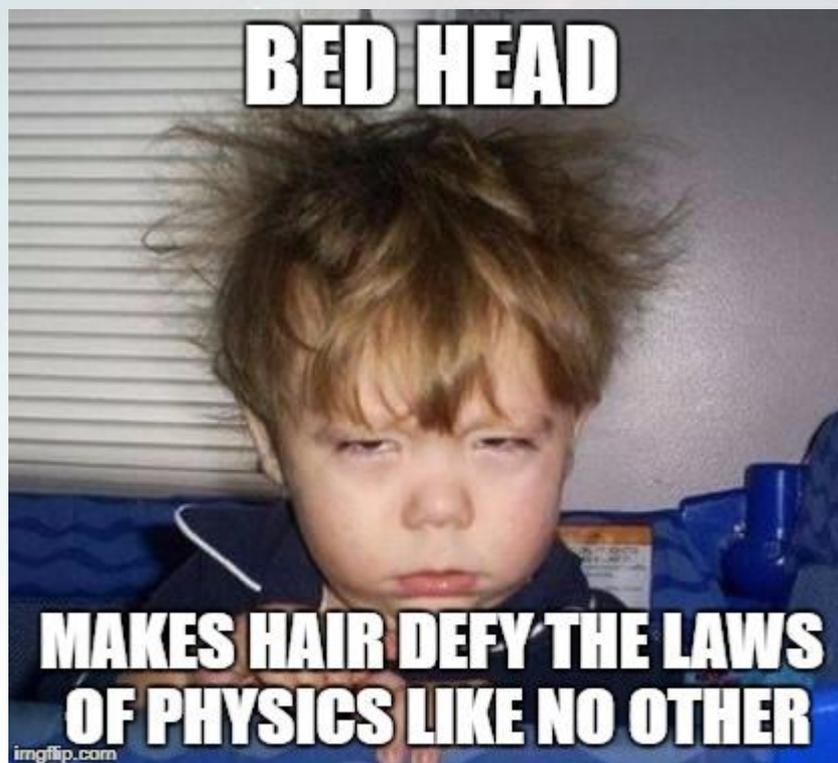
A photograph showing the silhouettes of four people engaged in stargazing at night. On the left, a person stands holding a camera. In the center, another person uses binoculars. To the right, a third person is positioned next to a large telescope mounted on a tripod. On the far right, a fourth person stands looking towards the sky. The background features a dark blue night sky with a few stars, a horizon line over a body of water, and a colorful sunset or sunrise glow in shades of orange, red, and purple. The text "Night Sky Viewing Events" is overlaid in white in the center of the image.

# Night Sky Viewing Events



Come back after dinner for some night sky viewing through telescopes!

# Good morning?



# What burning questions do you have?



# LPI Explore Series

<https://www.lpi.usra.edu/education/explore/>

## Explore!

Free fun space science activities for child and pre-teen programming

Explore provides hands-on space science activities and supporting resources for out-of-school time programs at libraries, camps, museums, planetariums, librarians, and clubs. Use Explore to engage children and pre-teens in the wonders of lunar exploration; the planets Earth, Jupiter, and Mars; rockets; staying healthy in space; and more!

- The hands-on activities are easy, use readily available materials, and require little preparation time.
- The topics are designed to be flexible for different programs, including summer sessions, after-school programs, festivals, science days, and family events.
- Activities can be modified to fit the time available.

View activities by category



5-10 Minutes



Less than 30 Minutes



Longer Experiments

### Explore Themes

Jupiter's Family Secrets

Life on Mars

Marvel Moon

Shaping the Planets

Health in Space

Mars: Inside and Out!

Explore! Ice Worlds!

Explore Earth's Climate

All About Ice

To the Moon

Space Exploration

# LPI Traveling Exhibits

<https://www.lpi.usra.edu/exploration/education/exhibits/>

*Meteorites: Messengers of Mayhem*

*Protecting our Home*

*Treasure Hunt in Earth's Attic*

*Earth's Daughter*

*A Storm of Asteroids*

*Impacts: Delivering Death and  
Fostering Life*

*Moon Rocks*

*Moon Views: Rabbits in the Rocks*

*The Moon: Cosmic Decoder Ring*

*Our Molten Moon: The Story of the First*

## **About the CLSE Lunar/Asteroid Traveling Exhibits**

Each exhibit consists of 3 single-sided banners, each of which measure 32 inches wide by 83 inches tall when displayed. Each is packed inside a padded bag, and shipped in a large cylindrical plastic graphics case, 40 inches high. Each banner consists of a stand, a telescoping pole, and the banner itself; all of these components are in one unit. The stands should be arranged side by side.



National Aeronautics and Space Administration

# Solar System Ambassadors Program

Home

Logout

Directory

Event Calendar

News & Nuggets

Resources

NASA Nationwide

Program Management



Who We Are



Richard Stember is a NASA Solar System Ambassador volunteer who shares his passion for space with the public.

## Solar System Ambassadors

[www.solarsystem.nasa.gov/ssa/home.cfm](http://www.solarsystem.nasa.gov/ssa/home.cfm)



**Jet Propulsion Laboratory**  
California Institute of Technology



**ALA** American Library Association

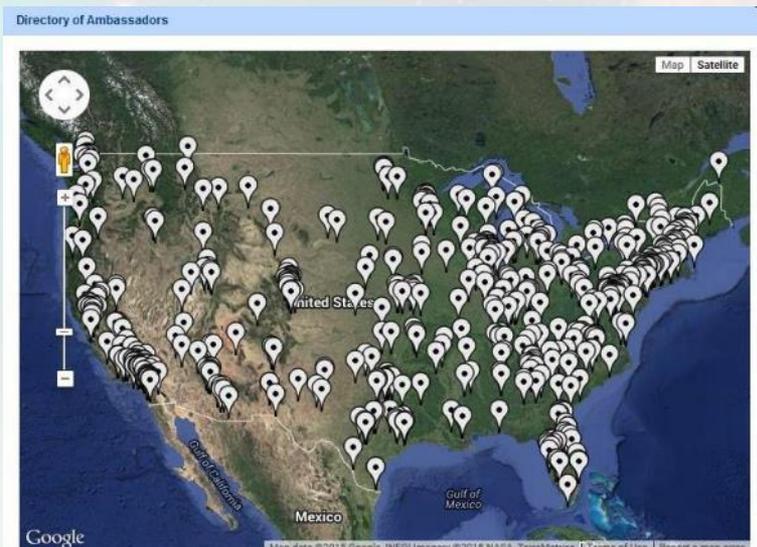
**CS** Cornerstones of Science

**PACIFIC SCIENCE CENTER**

**EDC** Learning transforms lives.

Chief Officers of **COSLA** State Library Network

# Who We Are



Directory of Ambassadors: Lonnie Morgan



**Lonnie Morgan Jr.**  
Member Since 2002

New Albany, Ohio

[Click here to contact this Ambassador.](#)

**Biographical Information:**

Lonnie Morgan Jr. is an avid space enthusiast. His goal is to share his joy and excitement about the missions of JPL and NASA in hopes of inspiring the next generation to become future space explorers. A graduate of Eastmoor High School and The Ohio State University, Lonnie resides in the Columbus, Ohio area with his wife Nicole, and two children, Isaiah and Journey.

**Past Events Hosted By This Ambassador:**

**Space Day 2001**  
Cockrell Hill Elementary School

**What's Up @ NASA**  
New Albany Library

**What's Up @ NASA - Your Solar Family**  
Licking County Public Library

**Think Big 2006**  
Columbus Public Library - Shepard Branch

**Space Expedition**  
The Charles School

**Past Events Collaborated On By This Ambassador:**

None So Far

[Click here to view all upcoming events](#)

Ambassador Directory: M  
Ambassador Directory: Ohio

- **SSA is 21 years old, having started as the Galileo Ambassador program in 1997**
- **908 space enthusiast volunteers**
- **50 states, DC, Puerto Rico, Guam, US Virgin Islands and US citizens living abroad: Canada, Germany, Haiti, Netherlands, New Zealand, Republic of Korea, Singapore, United Kingdom**

## What We Do



- Public engagement in a variety of venues
- CY2017 Events: 3,820
  - Direct Audience: 1,037,795
  - Indirect Audience: 20,067,574 readers/viewers/listeners
- Library events since 2001: 2,473 events reaching 282,569 people
- Some of us specialize...

# How to Find A Local Solar System Ambassador

National Aeronautics and Space Administration

## Solar System Ambassadors Program

Home  
Login  
Directory  
Event Calendar  
News & Nuggets  
Resources  
NASA Nationwide  
Program Management

Return to Solar System Exploration

Directory of Ambassadors: Caitlin Ahrens

**Caitlin Ahrens**  
Member Since 2017  
Fayetteville, Arkansas

Click here to contact this Ambassador.

**Biographical Information:**  
Caitlin Ahrens is a graduate of West Virginia University with bachelor of science degrees in Geology and Physics with an emphasis in Astrophysics. She also holds a patent in earthquake sciences. Caitlin entered the graduate program in Space and Planetary Science at the University of Arkansas in Fall 2015. Her talks are customized depending on the group and the topic of interest, including anything astronomy-related. Sometimes she brings her personal meteorite collection for demonstrations. She has given numerous talks, in person and radio-based, involving children and adults and always looks for opportunities to bring excitement into the general public about space sciences. In her spare time, she knits for charity and collects minerals.

**Past Events Hosted By This Ambassador:**  
All About Mars  
Kirksey Middle School  
Star Quest XIV  
Green Bank Observatory  
Solar Eclipse 2017  
Prism Education Center  
Space in the Movies  
Fayetteville Public Library  
Solar Eclipse 2017  
Fayetteville Public Library

**Past Events Collaborated On By This Ambassador:**  
Hands on the Sun  
Explore Scientific

National Aeronautics and Space Administration

## Solar System Ambassadors Program

Home  
Login  
Directory  
Event Calendar  
News & Nuggets  
Resources  
NASA Nationwide  
Program Management

Return to Solar System Exploration

Directory of Ambassadors: Caitlin Ahrens

Fields marked with an asterisk (\*) are required.

Ambassador's Name: Caitlin Ahrens

Your Name:

Your Email:

Comments:

\* To confirm you are a human visitor, please check the box below.  
(If the captcha does not display, [click here](#))

I'm not a robot

reCAPTCHA  
Privacy - Terms

Submit

- **SSA Website:** <https://solarsystem1.jpl.nasa.gov/ssa/home.cfm>
- **Directory Search by State or by SSA Name**
- **Email Ambassador using website form**
- **If seeking several Ambassadors in an area, contact SSA Leads at:** [ambassad@jpl.nasa.gov](mailto:ambassad@jpl.nasa.gov)

## How We Can Serve Your Library



- **NASA Milestones: InSight Landing, New Horizons MU-69 Flyby**
- **Speakers: NASA Presentations, Summer Reading Programs**
- **Hands-on Activities: Science Days, Summer Camps**
- **Celestial Viewing: Solar Viewing, Evening Star Parties**
- **Your suggestions...**

# **Night Sky Network**

Astronomy Clubs bringing the wonders of the universe to the public



## Resources and Potential Partnerships with Astronomy Clubs

Vivian White

[nightskyinfo@astrosociety.org](mailto:nightskyinfo@astrosociety.org)

Astronomical Society of the Pacific

# Night Sky Network

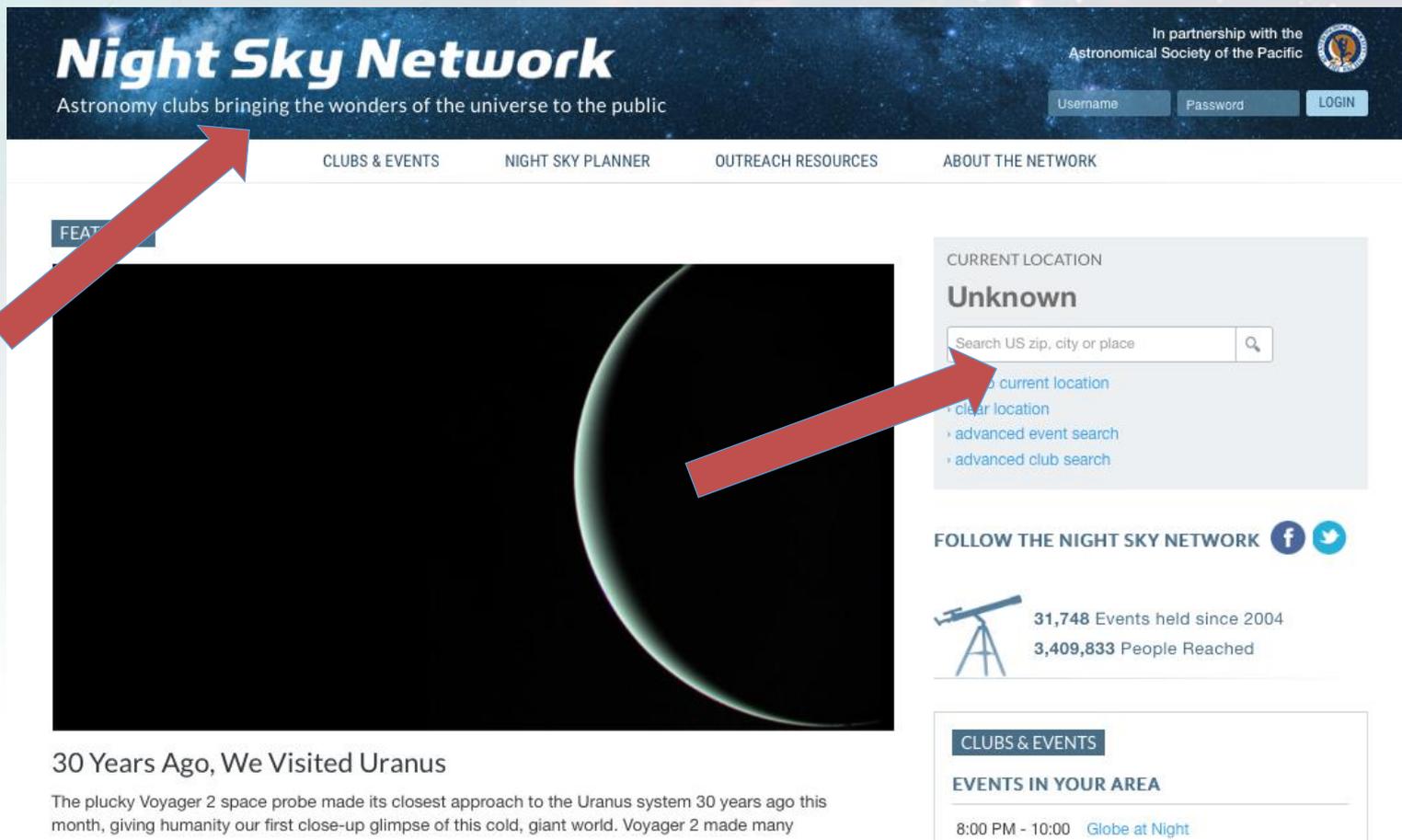
Astronomy Clubs bringing the wonders of the universe to the public



More than 450 clubs in the network



# nightskynetwork.org



**Night Sky Network**  
Astronomy clubs bringing the wonders of the universe to the public

In partnership with the  
Astronomical Society of the Pacific

Username Password LOGIN

CLUBS & EVENTS NIGHT SKY PLANNER OUTREACH RESOURCES ABOUT THE NETWORK

FEAT

Unknown

Search US zip, city or place

- current location
- clear location
- advanced event search
- advanced club search

FOLLOW THE NIGHT SKY NETWORK

31,748 Events held since 2004  
3,409,833 People Reached

CLUBS & EVENTS

EVENTS IN YOUR AREA

8:00 PM - 10:00 [Globe at Night](#)

## 30 Years Ago, We Visited Uranus

The plucky Voyager 2 space probe made its closest approach to the Uranus system 30 years ago this month, giving humanity our first close-up glimpse of this cold, giant world. Voyager 2 made many

# Find Local Clubs

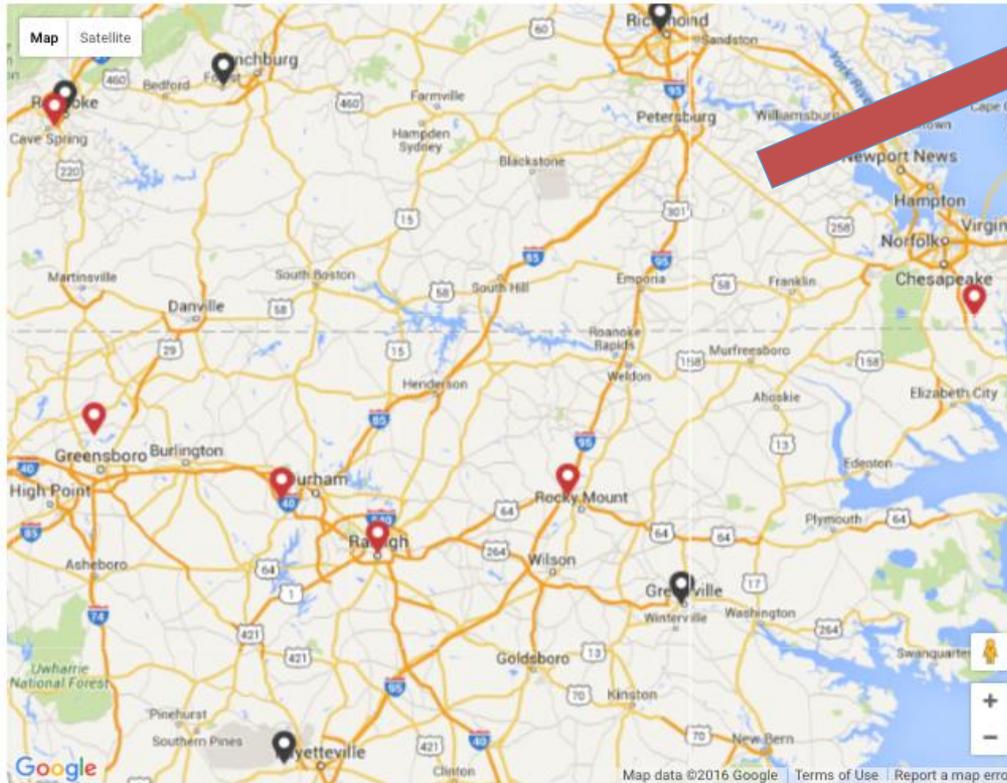
CLUBS & EVENTS

NIGHT SKY PLANNER

OUTREACH RESOURCES

ABOUT THE NETWORK

## ASTRONOMY CLUBS IN YOUR AREA



### CLUBS NEAR YOU

- 4 miles [Tar River Astronomy Club](#)  
ROCKY MOUNT, NC 27804

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- 33 miles [Carolina Skies Astronomy Club](#)  
Greenville, NC 27834

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- 49 miles [Raleigh Astronomy Club](#)  
Raleigh, NC, NC 27603

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- 70 miles [Chapel Hill Astronomical and Observational Society](#)  
Chapel Hill, NC 27514

[+ more clubs](#)

This website uses GeolIP2 JavaScript from MaxMind.

club with upcoming events Night Sky Network member club

[+ more clubs](#)

# Astronomy Demos and Activities

## Night Sky Network

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LOGIN

CLUBS & EVENTS

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OUTREACH RESOURCES

ABOUT THE NETWORK

SITE SEARCH

FEATURED



CURRENT LOCATION

Unknown

- › set to current location
- › clear location
- › advanced event search
- › advanced club search

FOLLOW THE NIGHT SKY NETWORK

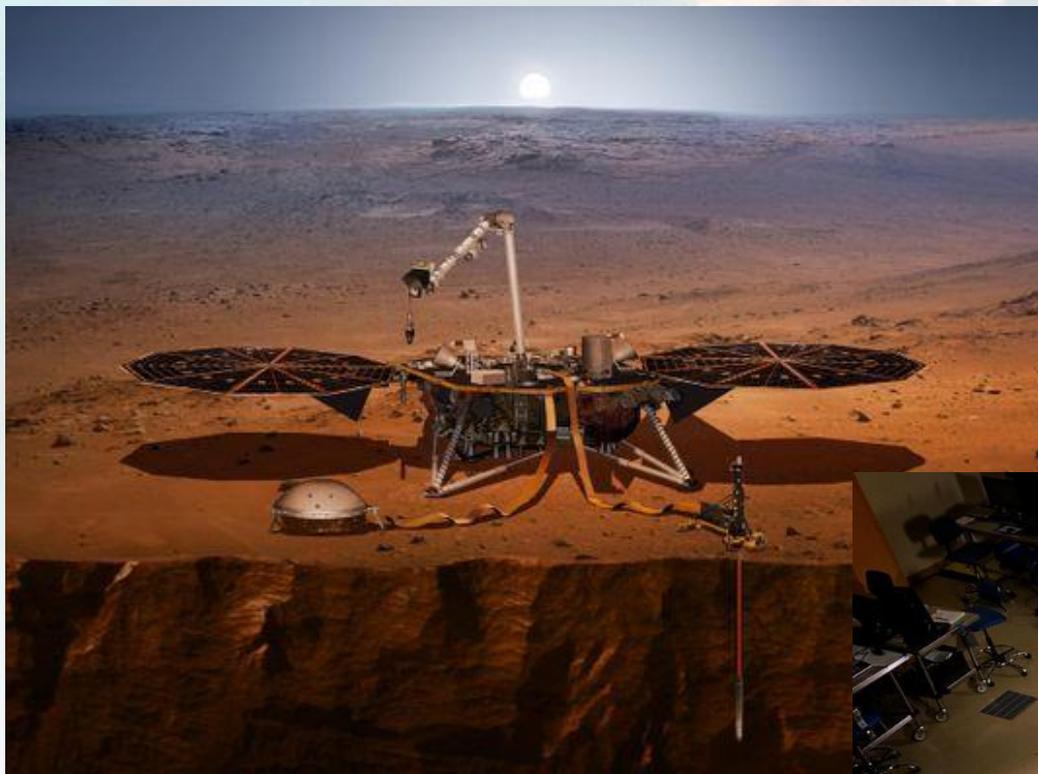


36,601 Events held since 2004  
4,004,950 People Reached

# My Trip to Mars

Play a game to learn about the factors and personnel involved in a human mission to Mars.

- Roll one of the dice at each poster and follow the instructions for the corresponding team member.
- Keep playing until everyone successfully completes a mission!



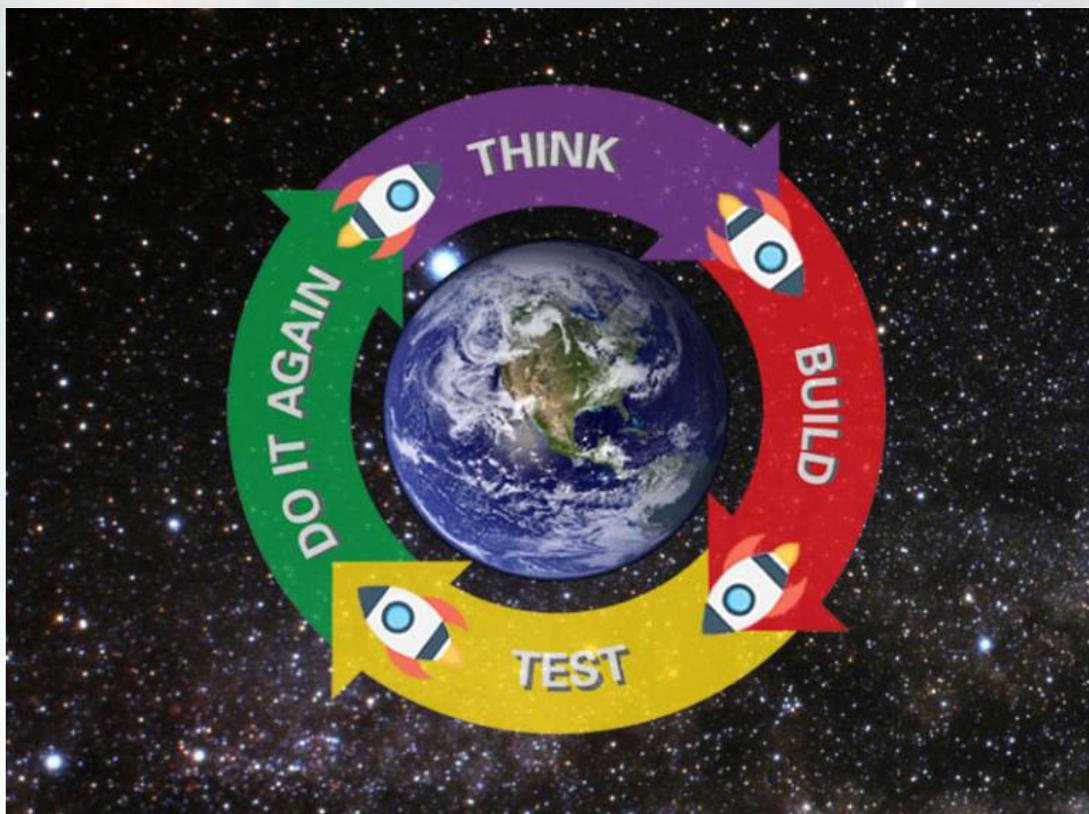
## Mars InSight

<https://mars.nasa.gov/insight/>



# Engineering Design Process

...in SPACE!



# Touchdown!

Build a shock-absorbing system that will protect two "astronauts" when they land.

Follow the engineering design process to design and build a shock-absorbing system out of paper, straws, and mini-marshmallows; attach the shock absorber to a cardboard platform; and improve the design based on testing results.

...use materials that can help cushion a landing.

- How will you make sure the lander doesn't tip over as it falls through the air?

## BUILD

- 1. First, design a shock-absorbing system.**  
Think springs and cushions.
- 2. Then, put your spacecraft together.**  
Attach the shock absorbers to the cardboard platform.
- 3. Finally, add a cabin for the astronauts.**  
Tape the cup to the platform. Put two astronauts (the large marshmallows) in it. (NOTE: The cup has to stay open—no lids!)



**A lander under construction**

- Materials (per lander)
- 1 piece of stiff paper or cardboard
  - 1 small paper or plastic cup
  - 3 index cards
  - 2 regular marshmallows
  - 10 miniature marshmallows
  - 3 rubber bands
  - 8 plastic straws
  - scissors
  - tape

Remember: No Lids!



**STAR**★*net*  
**Hands-on**

Tested & Approved STEM Activities

# Strange New Planet

# Takeaways

- 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.

## Your Goals Are To:

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

# Telescope View from Earth



Background Image Credit: NASA/JHU APL/SwRI  
Inset Image Credit: Dr. R. Albrecht, ESA/ESO Space Telescope  
European Coordinating Facility: NASA

# Telescope View from Space



Background Image Credit: NASA/JHU APL/SwRI  
Inset Image Credit: NASA, ESA, and M. Buie (Southwest Research Institute)

## Space Probe



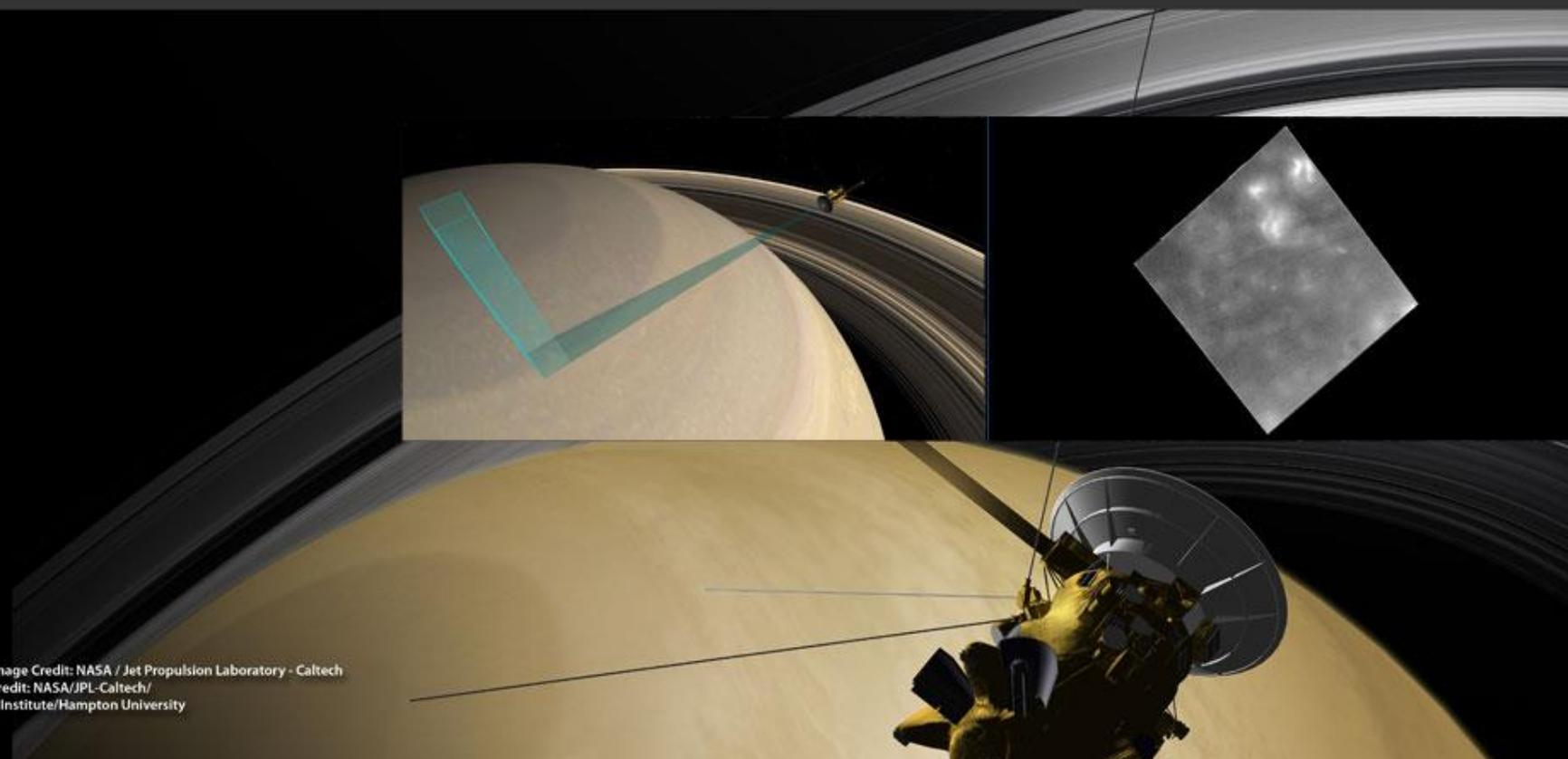
Background Image Credit: NASA  
Inset Video Credit: NASA

# Space Probe



Credit: NASA/Johns Hopkins University Applied  
Physics Laboratory/Southwest Research Institute

# Orbiter: Cassini at Saturn



Background Image Credit: NASA / Jet Propulsion Laboratory - Caltech  
Inset Videos Credit: NASA/JPL-Caltech/  
Space Science Institute/Hampton University

# Lander: Curiosity Rover on Mars



Credit: NASA/JPL-Caltech/MSSS

# Make Your Own Strange New Planet

## Preparing the “Planets”

- Use a large (4”-8”) Styrofoam ball as the base
- A strong magnet (such as a cow magnet) could be inserted if campers will examine the planet’s magnetic field
- Use modeling clay in a variety of colors to depict features
- Planet surface features such as clouds, craters, ice caps, and volcanoes can be created or added using clay, cotton balls, gauze, toothpicks, and other craft materials
- Decorate the planet with beads, stickers, sequins, candy, marbles, scents (optional), etc., to make the object interesting to observe
- Optional “life” samples can be added, such as whole cloves or small edible green leaves (i.e. thyme), candies, etc.
- A grape “moon” could be attached with toothpicks





# Health in Space



Radio



AM radio



Amateur  
radio



Aircraft  
communication

Microwave



Microwave  
oven

Infrared



TV Remote  
Control



Night vision  
goggles

Visible



Ultraviolet



UV light  
from the Sun

X-ray



Airport security  
scanner

Gamma-ray



PET  
scan



Terrestrial  
gamma-ray  
flashes



# UV Kid

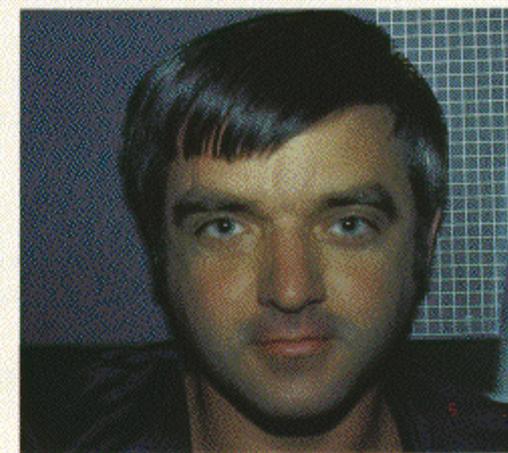
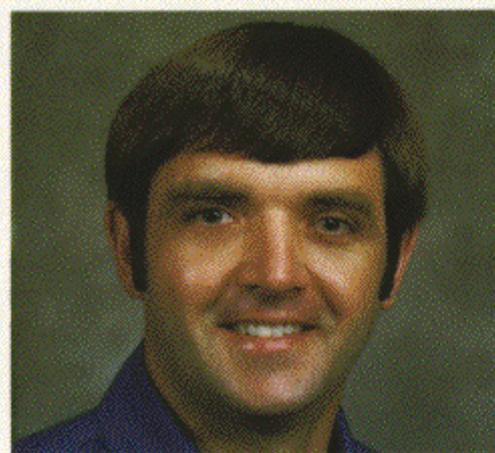
- After creating a UV kid from chenille sticks and UV beads, design and test clothing or other protection from the Sun's ultraviolet light.
- *Conducting science—creating a hypothesis and testing it*



- **Use to connect concepts:**
- *Conducting science—creating a hypothesis and testing it*
- *Just like we need to keep ourselves safe from sunburn, astronauts need to protect themselves from radiation in space*
- *Our Earth's atmosphere helps to shield us from some radiation*
- *Other ideas and connections?*



# Health in Space



# Implementation Discussion Collaboration/Reflection

- What 2019 Summer Reading programs are you currently planning/thinking about
- What barriers may present themselves?
- How can you modify activities to suit your needs? (ie, for younger or older patrons)

# How Can We Help YOU?

- Have you planned any programs already? Please share!