NASA Pennsylvania Space Grant Consortium

Supporting STEM education in Pennsylvania: highlights from PA Space Grant sponsored programs for middle school to graduate school students

Erin DiMaggio
Chris House
Jaclyn Stimey
Suzanne Sunday

National Radio Astronomy Observatory
Enabling forefront research into the Universe at radio wavelengths

NRAO team from Penn State Abington visiting NRAO in Greenbank, WV in Nov. 2015

overview

6-12th grade students

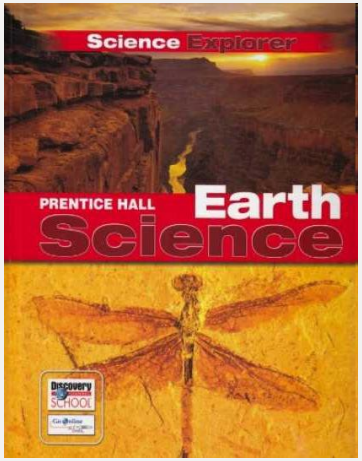
- SciNews
- robotics course
- new opportunities

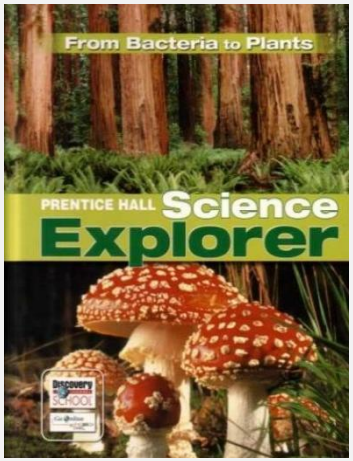
higher education

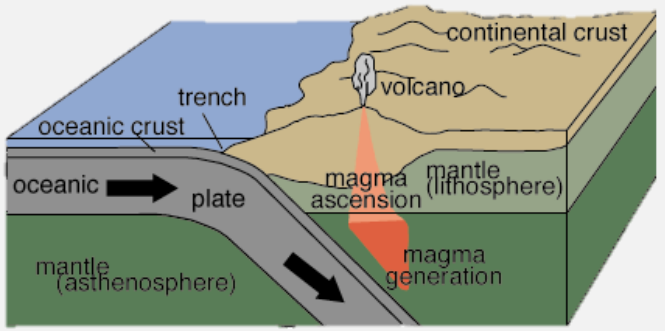
- wiser | mure | furp
- student space exploration lab
- lunar lion
- community college
- solar eclipse ballooning

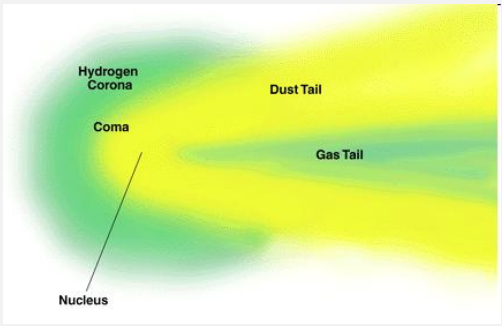
6-12th grade students
online resource SciNews

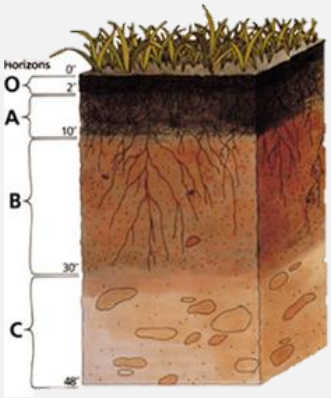
Pennsylvania Space Grant Consortium

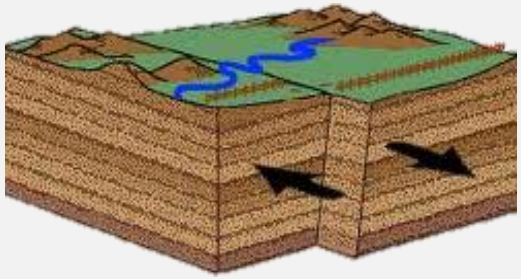












6-12th grade students
online resource SciNews

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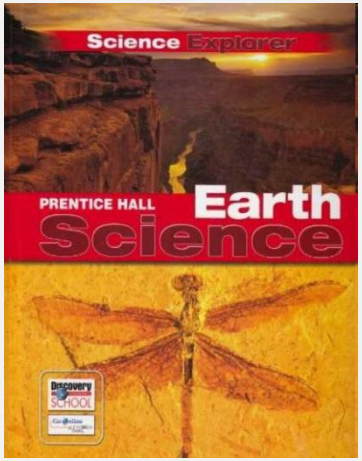
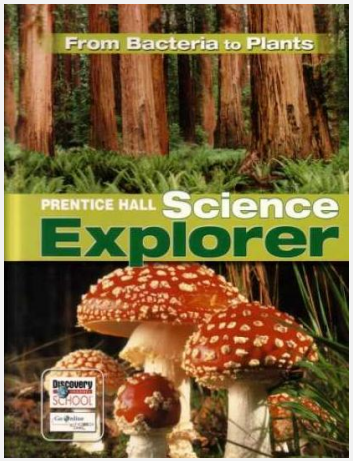
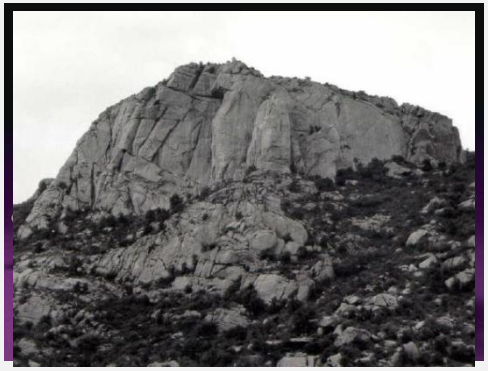
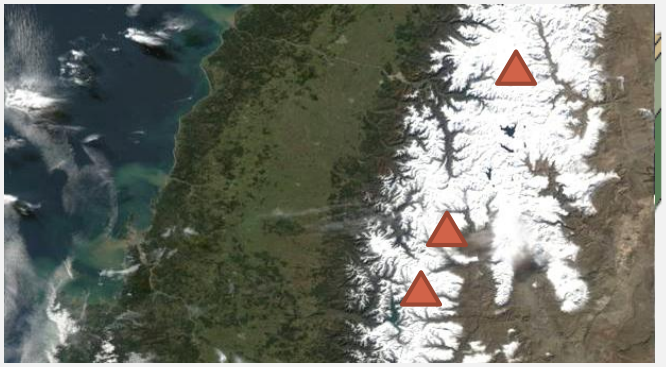
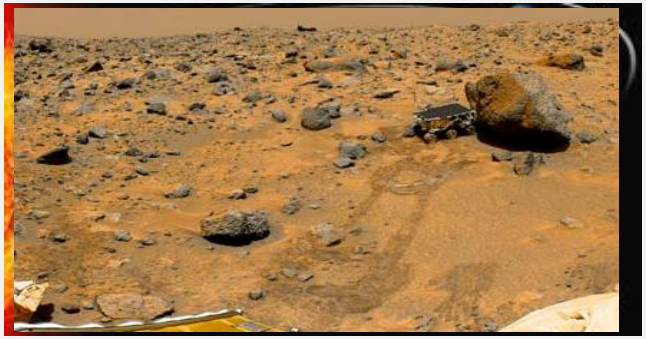
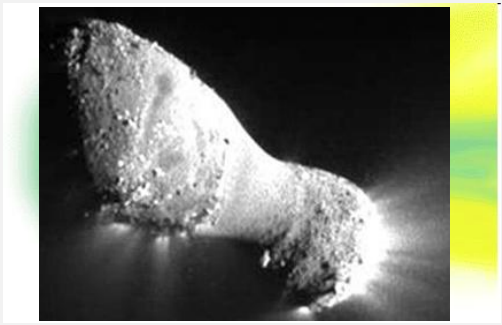


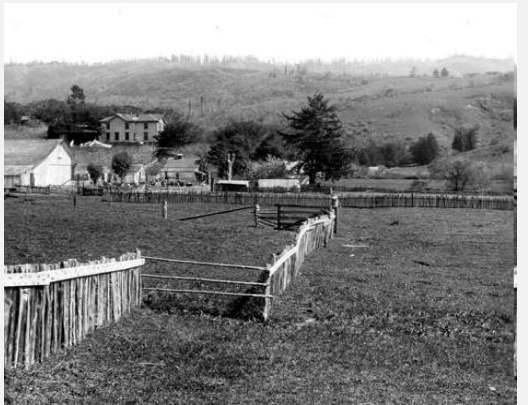












6-12th grade students
online resource SciNews

Pennsylvania Space Grant Consortium

SciNews

to provide educators short and simple lessons that associate textbook concepts with real events in the news

ARIZONA SPACE GRANT CONSORTIUM

ASU

- provides 6-12 grade instructors pre-packaged mini lessons on a science current event
- short (~20 min), easy to implement, and align to state standards
- slide shows, videos, maps, work sheets, widgets, photographs, kml files
- PDF document with event/lesson overview, maps, photos, & standards

6-12th grade students
online resource SciNews

May & June, 2010
Issue 3

Science in the News

TOPIC: *Deepwater Horizon/BP Oil Spill*

Event Dates

April 20th, 2010: Deepwater Horizon drilling rig explodes (11 men killed)
April 20th - July 15th: Oil spills into the Gulf of Mexico (86 days total)
July 15th 2010: Well capped and officially sealed on September 20th

Project website: http://sese.asu.edu/teacher-resources

Event Description

On April 20th, 2010 there was a large explosion on the Deepwater Horizon/BP drilling platform located in the Gulf of Mexico ~50 miles southeast of the Mississippi River Delta. The explosion killed 11 people and caused the rig to sink to bottom of the Gulf. When the platform sank, long sets of pipes (called 'risers') that connect the platform to the 'blow out preventer (BOP)' at the bottom of the Gulf broke in multiple locations. Cracks in the riser caused oil & gas to spill into the water. After multiple attempts to seal the well, a cap was finally placed over the BOP, slowly sealed, and relief wells were drilled to 'kill' the well with cement (see the OilSpillEvents.pdf on the SciNews website for a cartoon diagram of events). The Deepwater Horizon/BP oil spill is the largest marine oil spill in history. The flow of oil gushed for 86 days and an estimated ~5 million barrels were leaked. Oil was reported along the coasts of Louisiana, Mississippi, Alabama, and Florida devastating tourism, the fishing & seafood industries, and the fragile ecosystems and wildlife that call the Gulf home.

Lesson Description

This lesson is focused on understanding 1) the amount of oil that leaked into the Gulf and how far it traveled, and 2) the effect of the oil spill on wildlife and ecosystems. Use either lesson (each ~15 mins) or both if you have the time.

(1) Ask students to calculate the amount of oil that leaked into the Gulf (use worksheet - page 1) and discuss the results. Visit the New York Times website (link on SciNews webpage) & view how far the oil traveled & where it washed ashore.

(2) Have students fill out page 2 of the worksheet. Read over the "Effects on Wildlife" tab on the NYT webpage as a class (A PDF is also on the SciNews website) and watch the short video. Discuss how environmental disasters - such as this oil spill - can be hazardous to animals and how that translates up the food web. Also discuss stratigies for cleaning up after this disaster.

Lesson Materials:
- *Oil spill worksheet -calculations & wildlife effects- (2-page PDF)*
- *Link to New York Times Interactive website (or download PDF)*
- *A short video on wildlife effects of the oil spill*

Location

The Deepwater Horizon offshore drill rig exploded in the Gulf of Mexico ~50 miles SE of the Mississippi River delta

Photographs

Turtle covered in oil recovered in the Gulf of Meixco by a scientist (NOAA)

Oil along the Louisiana coast (AP photo)

Deepwater Horizon platform on fire (U.S. Coast Guard)

Informational Websites:

Great article from the Encyclopedia of Earth on Oil Spill:
http://www.eoearth.org/article/Deepwater_Horizon_oil_spill

NOAA Education on Wildlife:
http://www.education.noaa.gov/Ocean_and_Coasts/Oil_Spill.html

Lesson Plan Suggestion: *(Ocean Planet Pollution Solution!)*
Pollution Solution (Oil Spill Clean-Up Activity by the Smithsonian)
http://smithsonianeducation.org/educators/lesson_plans/ocean/pollution/essay.html

Targeted Arizona State Standards (7th grade)

Strand 3, Concept 1: Science in Personal and Social Perspectives (PO2) - Analyze environmental risks caused by human interaction with biological or geological systems

Strand 4, Concept 3: Life Science (PO5) - Predict how environmental factors affect survival rates in living organisms.

ARIZONA SPACE GRANT CONSORTIUM

Created by Erin DiMaggio
ASU/NASA Space Grant Fellow
ASU

Funded by ASU/NASA Space Grant (http://nasa.asu.edu/)

To subscribe to the SciNews listserv send a message with your name & email address to: emailSCINEWS@asu.edu

The Deepwater Horizon/BP Oil Spill

Name _____

Date _____ Period _____

1. How much oil leaked into the Gulf of Mexico?

Scientists estimate that a total of 60,000 barrels of oil leaked into the Gulf of Mexico **each day** and the oil spill lasted for a total of 86 days. Calculate the total amount of oil that leaked.

$$\frac{60{,}000 \text{ barrels}}{1 \text{ day}} \times 86 \text{ days} = _____ \textbf{ total barrels}$$

2. How many gallons does that equal?

Predict:
Will the number of gallons you calculate be **higher or lower** than the number of total barrels? _____

Calculate:

_____ total barrels X 31 gallons

= _____ **total gallons spilled**

Conversion: 1 barrel = 31 gallons

3. How many swimming pools full of oil spilled into the Gulf of Mexico?

Predict:
Will the number of swimming pools you calculate be **higher or lower** than the number of total gallons? _____

Calculate:

_____ total gallons spilled

÷ 10,000 gallons in one swimming pool

= _____ **swimming pools!**

Conversion: An average swimming pool holds 10,000 gallons of water

6-12th grade students
online resource SciNews

SciNews

Event: NASA's New Horizons Flies By Pluto!

September, 2015 Issue 17

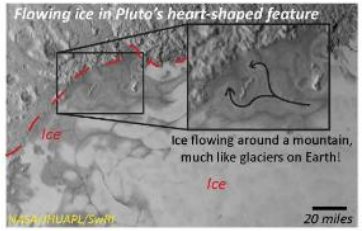
Important Dates:

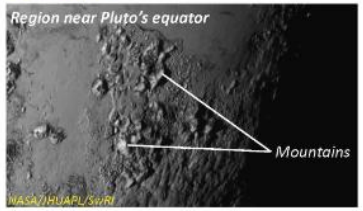
+ January 19, 2006: New Horizons is launched
+ February 2007: New Horizons passes Jupiter for a gravity boost
+ July 14, 2015: New Horizons has its closest approach to Pluto

SciNews is on Facebook!
website: www.sites.psu.edu/scinews

Event Description

The New Horizons mission is exploring Pluto, its moons, and the distant Kuiper Belt. It has given us our very first close up look at Pluto and its largest moon Charon, both considered "ice dwarfs." Unlike the inner rocky planets (e.g., Earth or Mars) and the gas giants (e.g., Jupiter or Saturn), Pluto and Charon's mass is largely icy material. New Horizons seeks to learn more about how icy dwarfs fit into the solar system. Already the mission has discovered 4 new moons of Pluto! The success of this mission lies in the vast amount of new data it has gathered including incredible photos of the surface of Pluto. NASA scientists all over the country are working hard to interpret the new data that streams in daily!





Lesson Description

Students will create a map of the surface of Pluto based on their observations (colors, textures, crater abundance) of different surface features - just like NASA scientists are doing!

Scientists carefully analyze the images returning from New Horizons to study Pluto's surface features. They are creating maps to show where different types of geologic features are, such as mountains, glaciers, dunes, etc. In this lesson, students are asked to engage with the material in a similar way. They will make observations of Earth's surface (which they are familiar with) to practice, and then look at Pluto's surface and map areas they find similar. At the end of the exercise, the instructor can lead a classroom discussion and create a 'classroom Pluto map' or ask students to present and discuss their (or their groups) observations and maps.

Lesson Materials *(download from the SciNews website)*

(1) Student Mapping Exercise: this is a 2 page handout for students that they will use to map the surface of Pluto and record their observations and interpretations.

(2) Example Pluto Mapping: this is an example of how we mapped Pluto, including some basic observations and possible interpretations of the surface features.

(3) Pluto Photos: a few examples of the high resolution images that have been taken of Pluto so far by New Horizons.

Alternative Lesson Plan: (link provided on the SciNews websites)
Multiple New Horizons lesson plans from NASA:
http://pluto.jhuapl.edu/Participate/learn/Activities.php

Next Generation Science Standards
MS-ESS1-1. Analyze and interpret data to determine scale properties of objects in the solar system.

Created by Michael Hudak & Erin DiMaggio
Pennsylvania State University

Funded by PSU/NASA Space Grant Consortium
http://pa.spacegrant.org

To subscribe to the SciNews listserv send an email with your name, affiliation, and email address to: scinews@ems.psu.edu

Mapping Pluto

In July, 2015 a NASA spacecraft named "New Horizons" flew really close to the dwarf planet Pluto. It flew so close that it was able to take really good photographs of the surface of the planet. Since humans can't yet go to Pluto, scientists rely on photographs to help them figure out what the surface of the planet is like (are there mountains? ice? oceans? rocks? plants?). Below is a comparison between the size and surface features of the Earth, the moon, and Pluto. Take a minute and describe features you see on Earth – I'm sure you are familiar with them!

Now, you are going to use a real photo taken by the New Horizons spacecraft to create a map of the surface of Pluto – the same way scientists are mapping it. In order to do this, you will need to pay very close attention to the slightly different colors, textures, and shapes that you see.

6-12th grade students
online resource SciNews

SciNews

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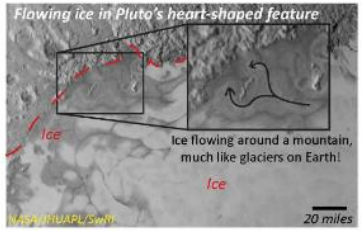

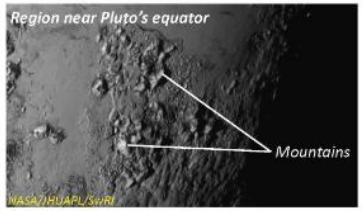

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Mapping Pluto

1. Look at the colors, textures, and shapes you see on the surface of Pluto. Using your pen or pencil, trace out areas that look the same – meaning areas that have the same color, texture, and shapes. You will probably have 3-5 different areas.
2. Label the areas 1-5. For each area list a few (2 or 3) observations that you made. Do you have a guess as to what the area might be based on your observations (mountains? rivers? ice? clouds? oceans? sand? trees?) go ahead and guess and write this down.
3. Places where meteors hit the surface are called 'craters'. Craters are usually circular in shape. See if you can find any small circular features on Pluto – if so, draw an arrow towards them.

6-12th grade students
online resource SciNews

http://sites.psu.edu/scinews/

- website for downloading materials
- listserv
- 10 question surveys for assessment
- geology.com

SciNews

home | about scinews | about us | listserv | lesson surveys | NASA Space Grant Consortium

Welcome to SciNews!

October 4, 2015 by Erin DiMaggio

SciNews is an education outreach project funded by the NASA Space Grant Consortium. Below are the most recent issues of SciNews, a program providing short lessons (<30 mins) for use in K-12 classrooms that are based on current scientific events/findings that are in the news. To learn more about the SciNews project click here -or- click on the "about scinews" tab in the menu above. ENJOY!

**After a hiatus in funding, SciNews is back in 2015! We have archived our past lessons here so please download and use the materials. Don't forget to take a short survey if you do use the lessons, this is imperative for our continued funding!*

Issue 30: Magnitude 7.8 Earthquake in Ecuador

April 26, 2016 by Michael Ryan Hudak

The Pacific Coasts of South America, North America, and Asia are on the infamous Ring of Fire of volcanoes. The Ring of Fire is also associated with large earthquakes, which like the volcanoes, result from the interactions between tectonic plates. On April 16, 2016, a magnitude 7.8 earthquake rocked the tiny country of Ecuador,

This project is funded by the NASA Pennsylvania Space Grant Consortium.

Like Us on Facebook!

Categories

- agriculture
- earthquakes
- ecology
- geobiology
- geochemistry
- geophysics
- health
- humans & environment
- NASA
- natural disasters

6-12th grade students
robotics course 2016

Pennsylvania Space Grant Consortium

Designed to:

(1) encourage high school students to enter higher ed institutions

(2) introduce students to the field of electrical and computer engineering

- offered for the past 25 years; over 625 students
- PSGC funds used as scholarships to provide financial assistance

TEMPLE UNIVERSITY

6-12th grade students
robotics course 2016

Pennsylvania Space Grant Consortium

Hello Dr. Helferty, I am emailing you to check up with you and to thank you for all you did for me. I am enrolled in Penn State's Aerospace Engineering Department. Thank you for all that you did to help me achieve this goal.

Sincerely,
Ashley

TEMPLE UNIVERSITY

6-12th grade students
robotics course 2016

Pennsylvania Space Grant Consortium

Note from a happy parent: *John Helferty is truly a blessing to the children of Philadelphia. This program is awesome!!! His personality and efforts to get youth involved in college and thinking about careers is amazing. This experience has been invaluable and will help our son as he begins to focus on his future college/ career.*

TEMPLE UNIVERSITY

new opportunities…

high school – college links

Federally funded from the U.S. Department of Education & designed to strengthen the math and science skills of low-income, first-generation potential college students.

*Goal: help students recognize and **develop their potential to excel in math and science** and to encourage them to **pursue postsecondary degrees in math and science**, and ultimately careers in the math and science profession.*

Upward Bound MATH & SCIENCE

higher education
wiser | mure | furp

Pennsylvania Space Grant Consortium

WISER
women in science and engineering research
(open to freshmen women)

MURE
minority undergraduate research experience
(open to all minority students)

FURP
freshman undergraduate research program
(those with economic hardship are encouraged to apply)

higher education
wiser | mure | furp

Pennsylvania Space Grant Consortium

- Predominately freshman students working with PSU professors on research projects
- Learn specialized lab techniques, equipment, and computer programs
- Get an early start on doing research that may carry throughout their time at Penn State!
- Enhances research skills (and resumes!)
- Provides an avenue to be mentored early on by a professor in the students field of study

higher education

wiser | mure | furp

Pennsylvania Space Grant Consortium

Program stats

- 531 students in past 10 years
- Currently 47 students
  31 WISER | 11 MURE | 5 FURP
- Future expansion?

Supported Colleges

Engineering | Agricultural Science | Earth and Mineral Science | Info Sci. & Tech | Liberal Arts | Health and Human Dev. | Eberly College of Science

higher education
student space exploration lab

Pennsylvania Space Grant Consortium

TEMPLE UNIVERSITY

- created in 2009 to support undergrad student driven projects

- each year ~30 students are involved

Many projects using the lab…

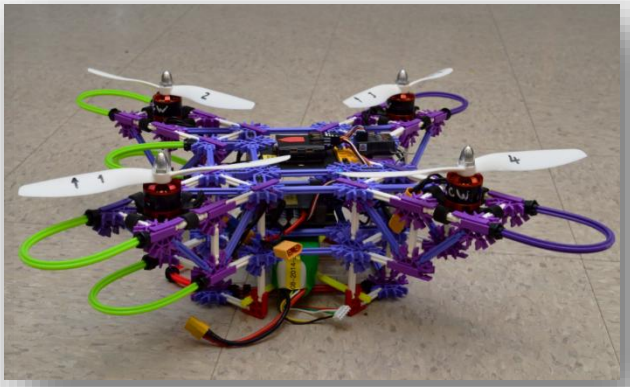
higher education
student space exploration lab

Rocksat

2014/2015

Robotic Mining Competition

Intro engineering course



fall 2016 freshmen design quadcopters out of K'nex

2015/2016

Solar eclipse team

TEMPLE UNIVERSITY

higher education
penn state lunar lion

Pennsylvania Space Grant Consortium

Summer Milestones

- Move Puma into new Lunar Lion Headquarters
- Connect Plumbing Manifold
- Ship test stand to Headquarters
- Fit-check Puma on test stand
- Replace S-brackets that yielded during lift with new design
- Repair actuated valves that were damaged during replacement
- Remove engines from plumbing for H_2O testing
- H_2O Fills from 20-400 psi
- Operational Procedures Review
- Build first revision of the printed circuit boards
- Complete Puma Assembly
- Baseline Functional Test
- Ship Puma to Track
- Arrival Functional Test
- N_2 Pressurant Leak Test at 800 (both) psi
- 30% H_2O_2 Decomposition Test (5 gal)
- Full Pressure H_2O Test at 800 & 4500 psi
- Static Fire Test w/ High Test Peroxide (proof of concept)
- Static Fire Test w/ High Test Peroxide (low-range throttle sweep)

- Large interdisciplinary student team
- Developing a rocket system for planetary exploration
- Workforce development
  I.e., Michael Policelli (2011 Lunar Lion) is a Propulsion Engineer at SpaceX

higher education

penn state lunar lion

Pennsylvania Space Grant Consortium

testing full thrust capability (including pressure drop in the main tank)

trying to determine where “fully closed” really is with our throttle valves (which is why the engines whistle in between instead of really shutting off).

higher education
community colleges

Pennsylvania Space Grant Consortium

engineering research class: responsible to redesign a fully autonomous quadrotor and its open source Android-based Ground Control Station.

Montgomery County Community College

secondary outcomes

high school summer workshop: college students in mechanical engineering from MCCC are mentoring high school students during a summer workshop building a rover land vehicle.

high school outreach: designed & built quadrotors as efficient as commercial ones; can be rebuilt if crashed; used as flying tests for JROTC cadets & may be used nationally

higher education

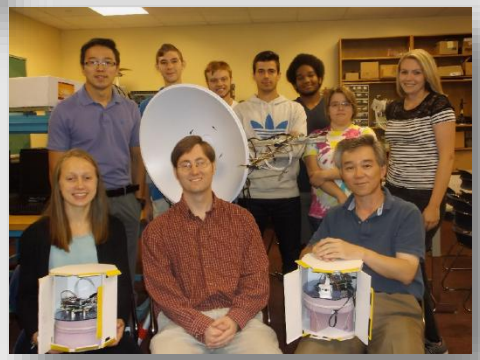
2016 solar eclipse ballooning

Pennsylvania Space Grant Consortium

August 21, 2017 → 1st total eclipse since 1979 visible in the continental US

Teams of students from across the country will conduct high altitude balloon flights from 9-12 locations along the eclipse path

Balloons will capture live video & images from near space, sending them to NASA & will fly their own payload



PSGC is supporting 3 teams from Pennsylvania

→ *teams traveled to workshop at Montana State University in July 2016*

Montgomery County Community College

Gannon University

Temple University