



# LunarSS: Inspiring the Future



Dana Pugh

ASTE 527

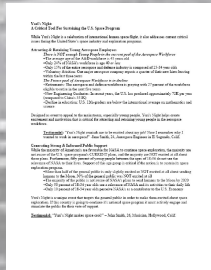
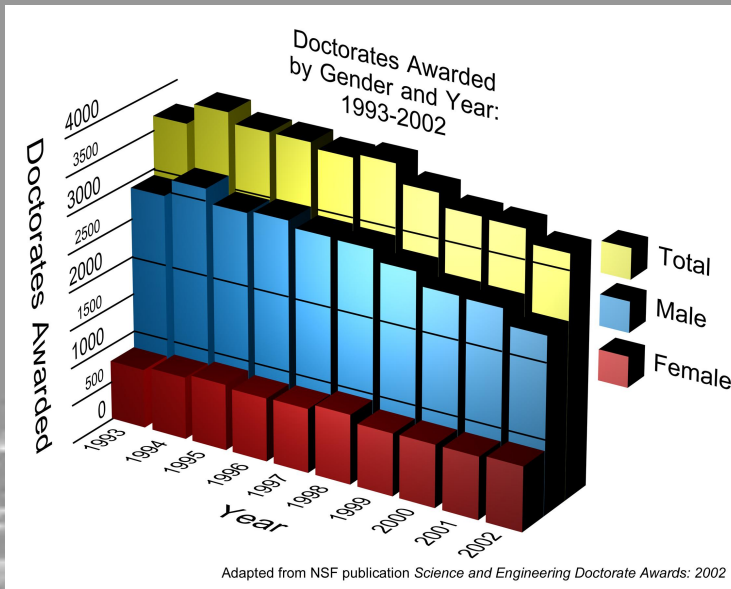
December 15, 2008



# Lack of Science and Engineering Interest

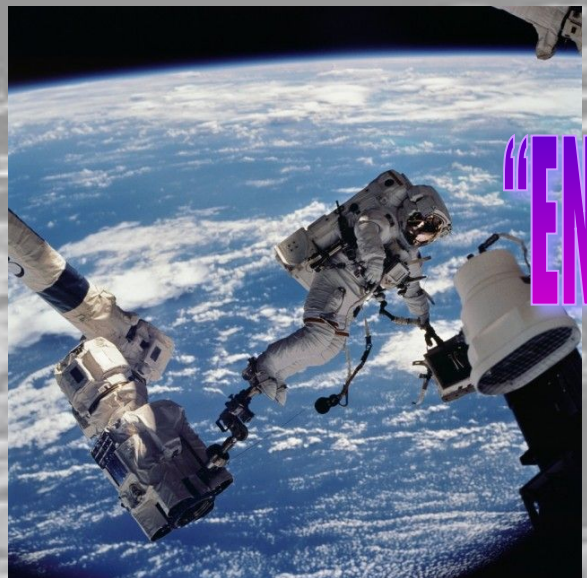


- Where have all the engineers gone?
  - “Between 1986 and 2006, there was a 3 percent decrease in engineering graduates.”
- 5...4...3...2...Yawwwwn
  - “... but it is hard for most Americans to care much about the space program when they are worried about keeping their jobs, making house payments and putting food on the table.”
- Yuri’s Night Rationale Document (embedded)
  - New Engineering Graduates: In recent years, the U.S. has produced approximately 72K per year (compared to China's 351K)
  - Decline in education: U.S. 12th-graders are below the international average on mathematics and science





# Inspiring the Next Generation



**"ENGAGE KIDS MORE!!!!"**

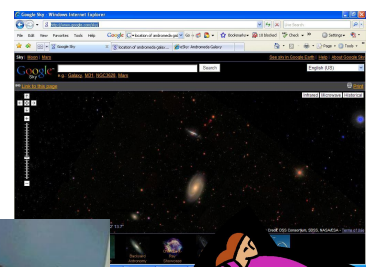
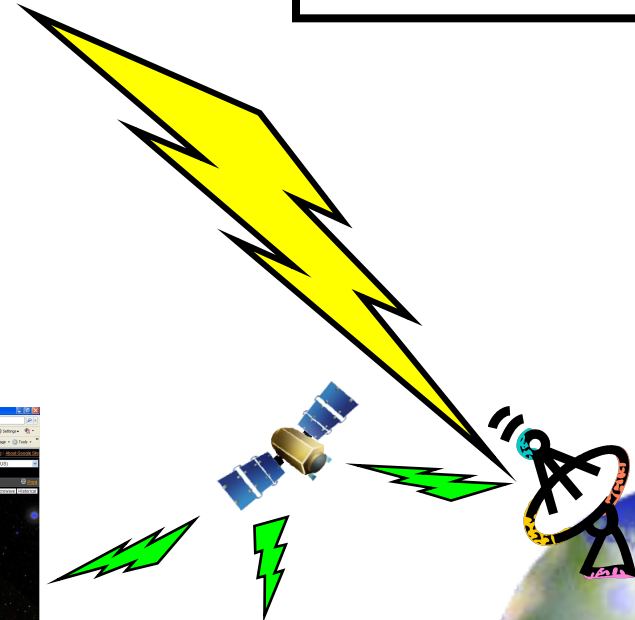
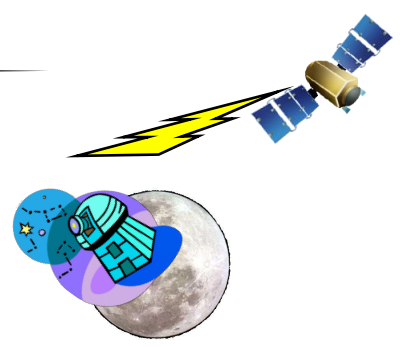
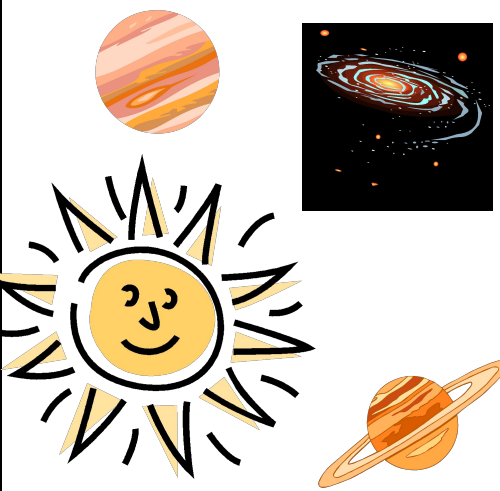




# Lunar Space Scope Architecture



## LunarSS



Nodes: Photo Entry - Data

This user asset has not been used. Please find your profile page.

The Grid Identifier is provided in the first frame.

This information comes from the user page. Be sure to enter your information in the format specified in the right of the input box, including leading zeros, colons, and dashes.

Keep your eye on this!

For security purposes, no carriage returns are allowed. Also only the following characters can be used:

Save Photo Submission

8	hours	Coordinate System for locating Astronomical bodies
30	minutes	
00	seconds	
25	degrees	
This information comes from the user page. Be sure to enter your information in the format specified in the right of the input box, including leading zeros, colons, and dashes.		
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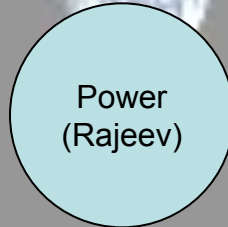




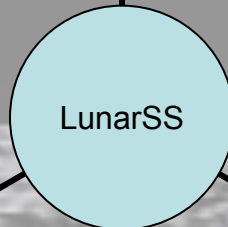
# Interfaces



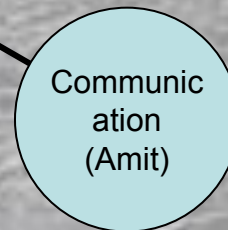
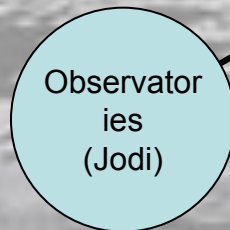
- Computer
- Cameras
- Sensors



- Information
  - Detailed pictures of various frequencies and resolutions
  - Temperature, seismic, radiation data



- Mounting/Set Up Interface
  - Computer
  - Camera
  - Sensors





# Operational Architecture



LunarSS

Observatory  
Operations

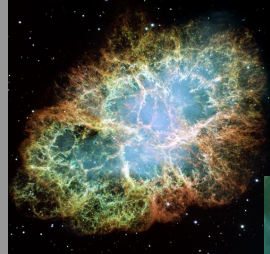
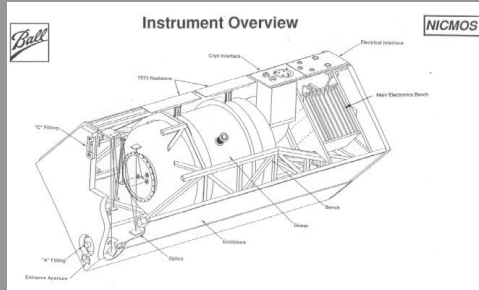
School/Education

Website





# Sensory Systems



- Camera:
  - Advanced versions of Hubble imaging systems
    - Wide Field and Planetary Camera 2 (WFPC2)
    - Near Infrared Camera and Multi-object Spectrometer (NICMOS)
    - Space Telescope Imaging Spectrograph (STIS)
- Temperature Monitoring Systems
- Seismic Activities Monitors – study meteor hits
- Radiation Detectors



# Power/Communication/ Integration



- Power
  - Power needed for each sensory system
  - 60W to run laptop
- Communication
  - Images & Sensor information sent in “bursts”
- Interchangeable sensor/camera system
  - Allows technology to be top of the line

Technology rate is fast!



Subaru's primary near-IR camera & Spectrograph





# How are Kids involved



- Request the picture on the website interface
  - Observatory will be pointing to what area
    - Models
    - Simulations
    - Communication closely with LunarSS Observatory Operations
  - Associate the work with the class project
    - Label the different kinds of galaxies
    - Label the names of the stars
    - Astrology
- Something New – *You name it!*





# Sky.google.com



Google Sky - Windows Internet Explorer

http://www.google.com/sky/

File Edit View Favorites Tools Help Google location of andromeda gal. Go 10 blocked Check Settings

Google Sky location of andromeda galax... eSky: Andromeda Galaxy

Sky | Moon | Mars See sky in Google Earth | Help | About Google Sky

Google Sky Search English (US)

e.g.: Galaxy, M31, NGC3628, Mars

Link to this page Print

Infrared Microwave Historical

## Andromeda Galaxy

9h 55m 35.0s 69° 2' 13.7"

POWERED BY Google

Image Credit: DSS Consortium, SDSS, NASA/ESA - Terms of Use

Solar System Constellations Hubble Showcase Backyard Astronomy Chandra X-Ray Showcase GALEX Ultraviolet Showcase Spitzer Infrared Showcase Earth & Sky Podcasts



# Request Webpage Example



**Notes:**

This code word has not been used. Please input your photo request.

The Orbit Number is provided in the MAP PAGE

This information comes from the map page. Be sure to enter your information in the format specified to the right of the input box, including leading zeros, colons, and slashes.

Keep your eye on this!

**Photo Entry - Data:**

School: XYZ Middle School, Toronto, Canada

Codeword: swampy97

Status: Unused

Orbit Number:

9 hours

55 minutes

35.0 second

or

69 degrees

21 '

25.5 "

Coordinate System for locating Astronomical feature

GMT:

Location:

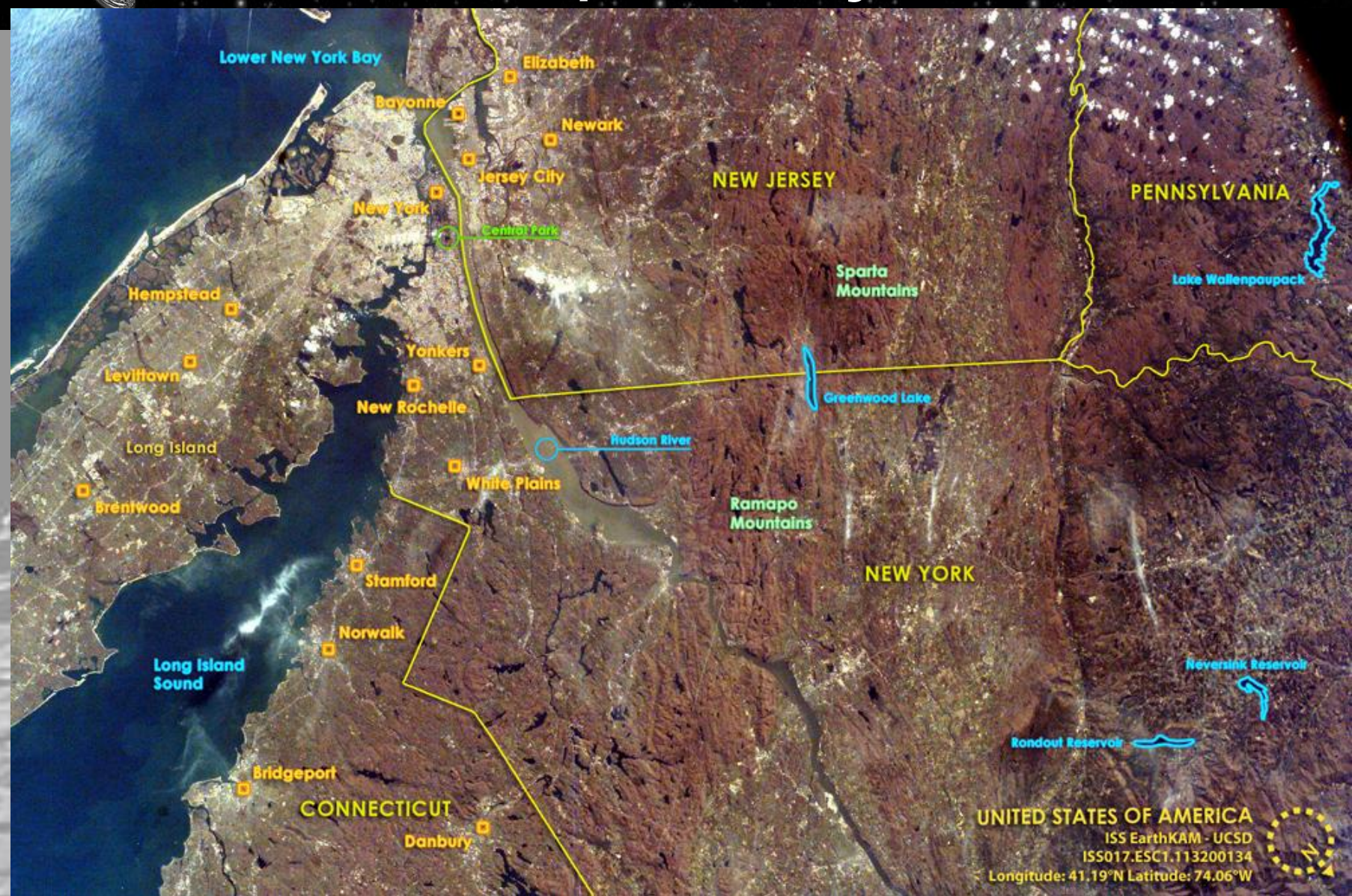
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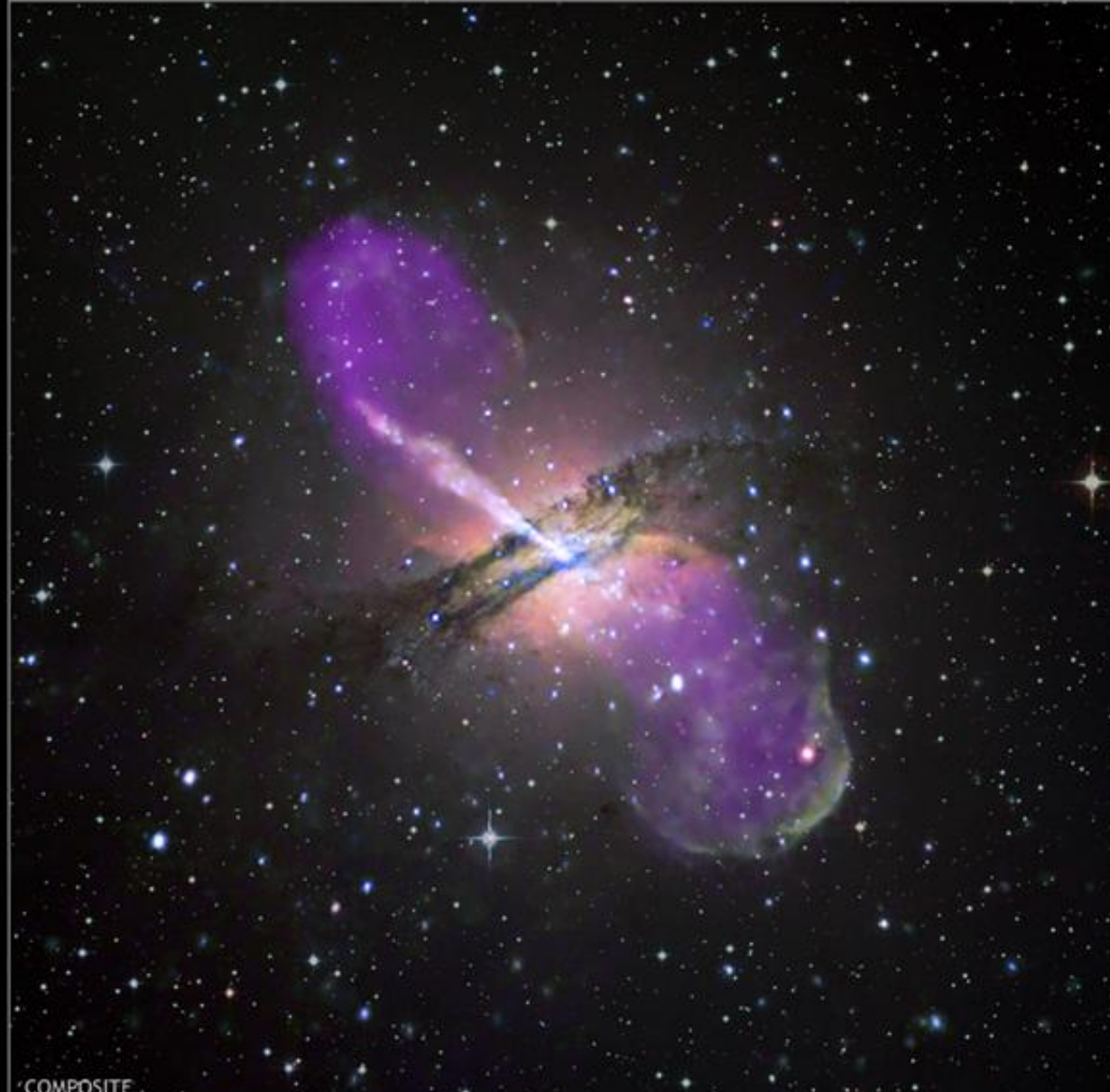


# Example Project





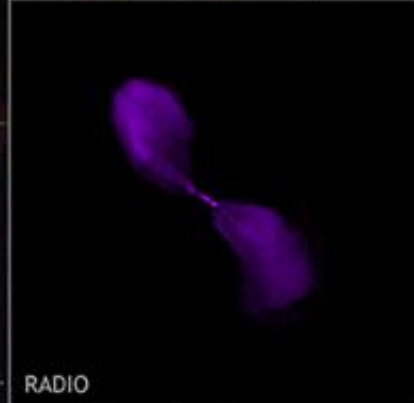
# Active Galaxy Centaurus A



COMPOSITE



X-RAY



RADIO



OPTICAL



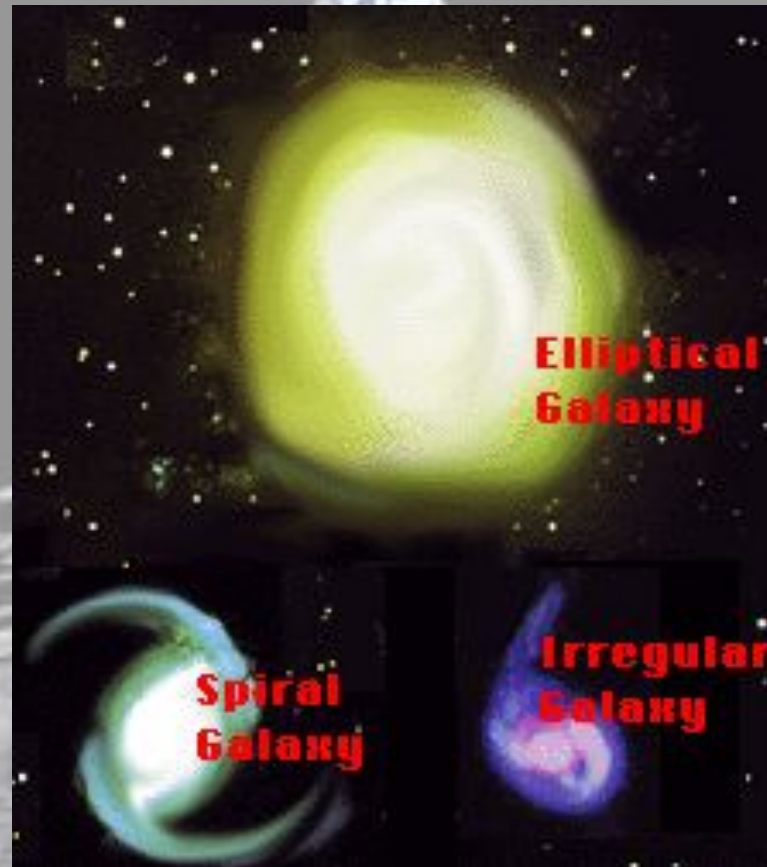
# Example Project

## Active Galaxy Centaurus A X-Ray





# Example Project





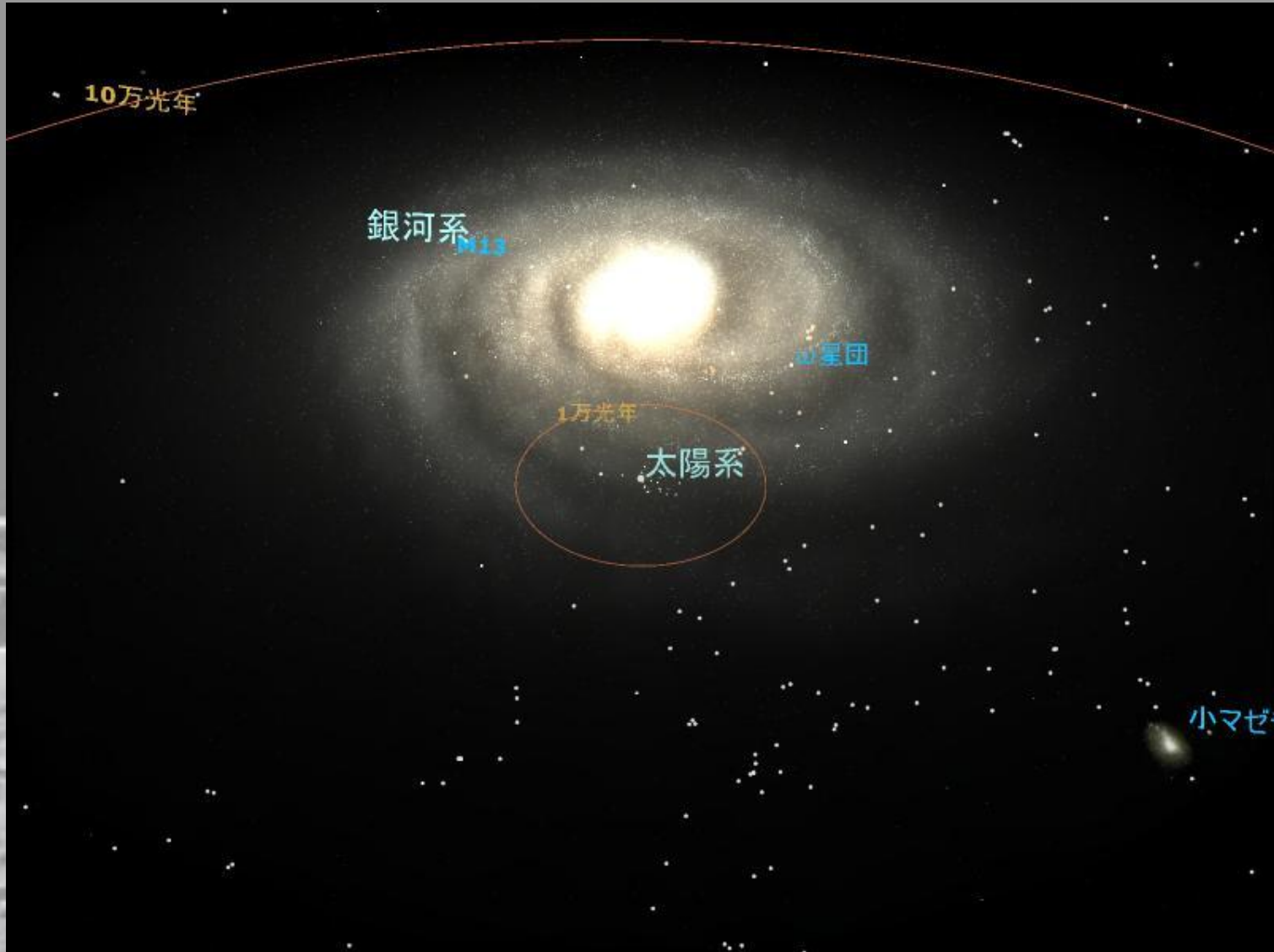
# Example Project







# Example Project





# Further Studies



- Program run by students
- Account for Lunar Wobble
- Other interactive programs
  - Telerobotic rovers
    - Samples Moon for kids to analyze
    - Temperature studies
    - Meteorite studies
    - Radiation studies



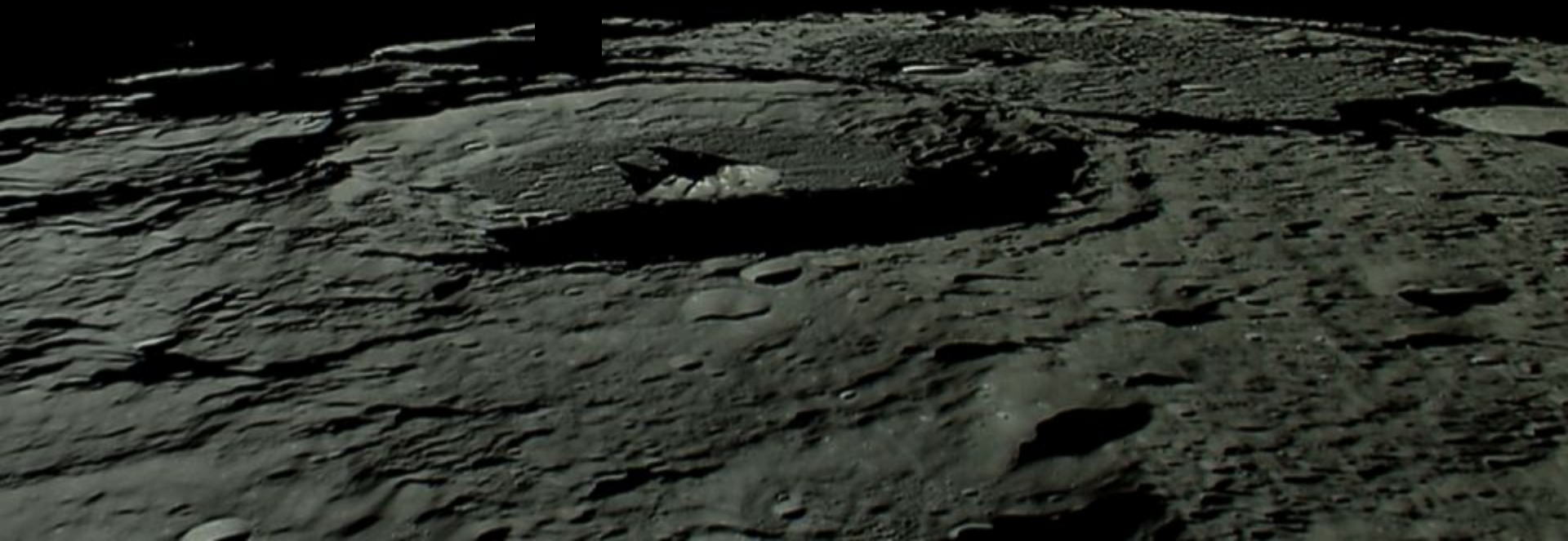
# References



- Picture of NASA employee teaching kids
  - <http://coop.jsc.nasa.gov/biography/grafx/watsond3.jpg>
- Picture of Kid in spacesuit:
  - [http://shopping.redorbit.com/images/thumbs/t\\_16420.jpg](http://shopping.redorbit.com/images/thumbs/t_16420.jpg)
- Astronaut doing a spacewalk
  - [http://www.gerhards.net/albums/space/eva\\_sts112\\_709\\_073k.sized.jpg](http://www.gerhards.net/albums/space/eva_sts112_709_073k.sized.jpg)
- Kids love science picture:
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  - [http://www.dnr.mo.gov/geology/images/dgls\\_dixonsm.jpg](http://www.dnr.mo.gov/geology/images/dgls_dixonsm.jpg)
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  - <http://www.rickpeterson.com/Images-News/Keck.starfall.jpg>
- NASA ISS EarthKAM Example Project
  - [http://www.earthkam.ucsd.edu/public/images/graphics/annotated/NewYork\\_andLongIsland\\_LARGE.jpg](http://www.earthkam.ucsd.edu/public/images/graphics/annotated/NewYork_andLongIsland_LARGE.jpg)
- Hubble Telescope Information
  - <http://science.howstuffworks.com/hubble3.htm>
- Labeled Galaxies
  - [http://starchild.gsfc.nasa.gov/Images/StarChild/universe\\_level1/galaxies.gif](http://starchild.gsfc.nasa.gov/Images/StarChild/universe_level1/galaxies.gif)
  - [http://antwrp.gsfc.nasa.gov/cgi-bin/apod/apod\\_search?elliptical+galaxy](http://antwrp.gsfc.nasa.gov/cgi-bin/apod/apod_search?elliptical+galaxy)
  - <http://antwrp.gsfc.nasa.gov/apod/ap080110.html>
- Camera and sensors
  - <http://www.spaceaholic.com/wfpccameras.jpg>
  - [http://www.nasa.gov/centers/goddard/images/content/204997main\\_MIRI\\_Verif\\_Iq.jpg](http://www.nasa.gov/centers/goddard/images/content/204997main_MIRI_Verif_Iq.jpg)
  - [http://www.stsci.edu/hst/nicmos/images/GRAPHIC\\_Instrument\\_Cutaway.GIF](http://www.stsci.edu/hst/nicmos/images/GRAPHIC_Instrument_Cutaway.GIF)
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  - [http://www.publicagenda.org/files/images/pages/2008KansasBoyPC\\_m.jpg](http://www.publicagenda.org/files/images/pages/2008KansasBoyPC_m.jpg)
  - [http://images.spaceref.com/news/hand\\_moon.jpg](http://images.spaceref.com/news/hand_moon.jpg)
  - [http://subarutelescope.org/Introduction/instrument/img/IRCS\\_300.jpg](http://subarutelescope.org/Introduction/instrument/img/IRCS_300.jpg)



# Backup Slides

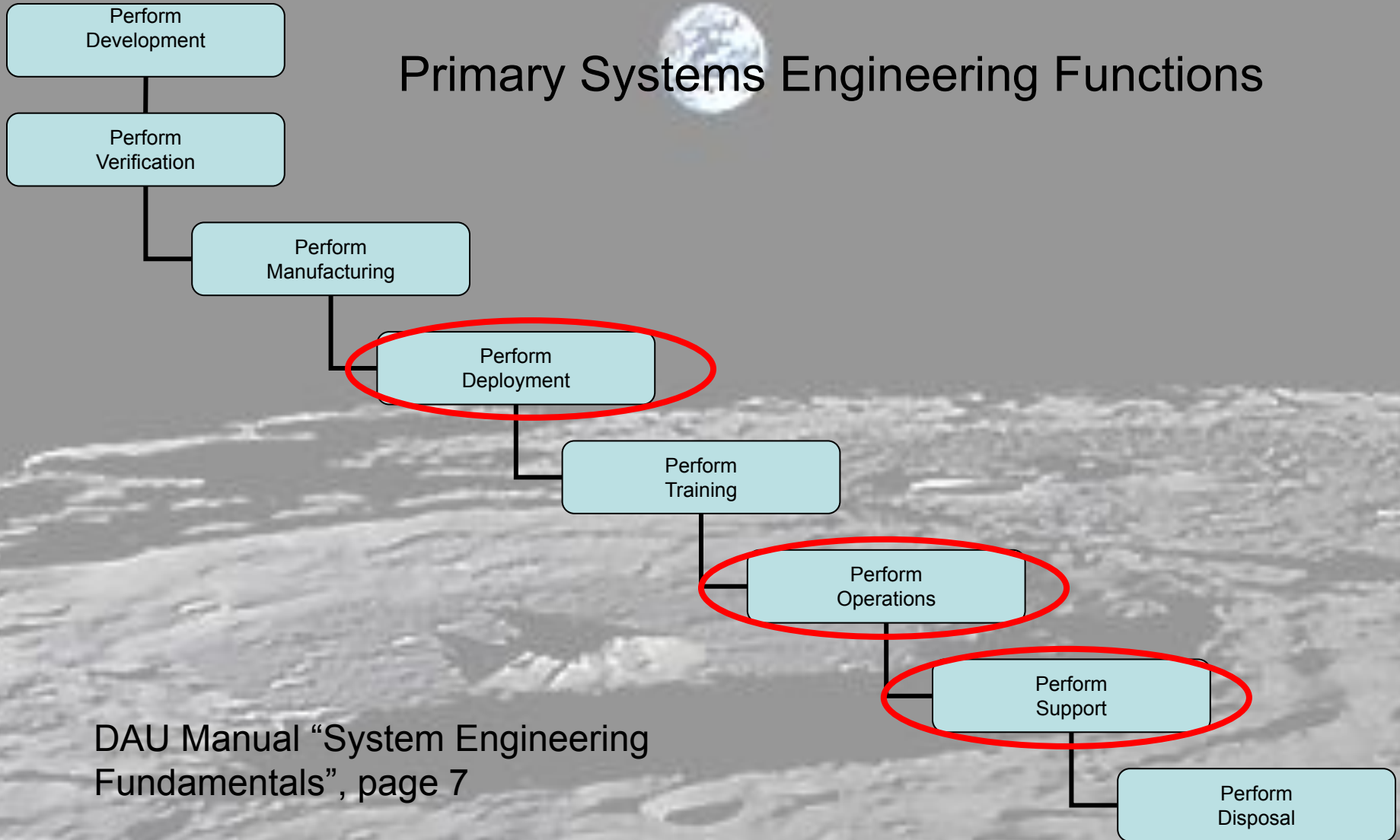




# Overall Return to the Moon: Lunar Observatories



## Primary Systems Engineering Functions



DAU Manual "System Engineering Fundamentals", page 7



# Looking Glass 2014 Architecture

