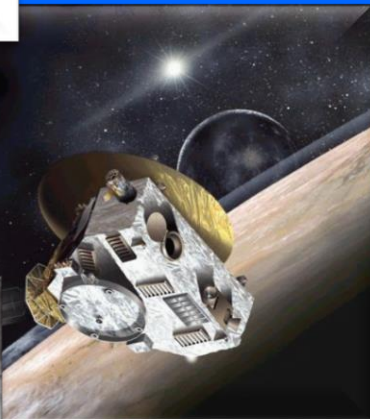




Moons of Jupiter and NASA Resources



- Caitlin Nolby
- North Dakota Space Grant Consortium

NASA Education

- Can search for materials by subject and grade level

NASA Education

For Educators



NASA Education

For Educators

- About NASA Education
- For Educators
 - For Educators
 - Grades K-4
 - Grades 5-8
 - Grades 9-12
 - Higher Education
 - Informal Education
 - Find Teaching Materials
 - Education TV Schedule
 - Current Opportunities
- For Students
 - NASA Kids' Club

Education Image Galleries



View image galleries on a wide variety of NASA topics.

> Go now

Do-It-Yourself Podcasts



Create your own podcast with

Educator Features and Articles



Scientists Recreate Earth's Northern Lights

Scientists have brought the Aurora Borealis into a lab at NASA's Langley Research Center.

> Read More

01 02 03 04 05 ||

> View Archives

Education Calendar

September 2013

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

> Full Calendar

Education Programs



Opportunities for students, educators and faculty:

Special Announcements

- Guidance for Education and Public Outreach Activities Under

NASA for Students

The screenshot shows the NASA Kids' Club website. At the top, there are navigation links: NEWS (News, features & press releases), MISSIONS (Current, future, past missions & launch dates), MULTIMEDIA (Images, videos, NASA TV & more), CONNECT (Social media channels & NASA apps), and ABOUT NASA (Leadership, organization, budget, careers & more). Below this is a search bar and a navigation menu with options: For Public, For Educators, For Students, and For Media. The main content area is titled "NASA Education For Students - Grades K-4" and features a "Stories" section with articles like "What Is the Solar System?", "Farmer's Market Manager", and "What Is Science?". There are also sections for "Homework Topics", "Picture Dictionary", and "Play and Learn". A "NASA Kids' Club" logo is visible in the bottom left corner. The right side of the page features a "Ready For A Challenge?" section with "Exploration Design Challenge" and "Mars FunZone" options, and a "For kids of all ages!" banner with a cartoon character. The entire main content area is highlighted with a green border.



Space Math at NASA



National Aeronautics and Space Administration
Goddard Space Flight Center

[GO](#)
Flight Projects | Sciences and Exploration

Space Math @ NASA

Home	Problem Books	STEM Modules	Inquiry		
Math by Grade Level	Math in Science	Math in Engineering	Math in Press Releases	Math by NASA Mission	Articles

Space Math @ NASA

SpaceMath@NASA introduces students to the use of mathematics in today's scientific discoveries. Through press releases and other articles, we explore how many kinds of mathematics skills come together in exploring the universe.

Partnering NASA Missions

Astrophysics:

- Chandra - [Click here](#)
- Kepler - [Click here](#)
- James Webb ST - [Click here](#)

Earth Science:

- SAGE-III - [Under development](#)

Heliophysics:

- Hinode - [Click here](#)
- IMAGE - [Click here](#)
- MMS - [Click here](#)
- RBSP - [Click here](#)
- THEMIS - [Click here](#)

Planetary:

- Cassini - [Click here](#)
- Dawn - [Mission Math](#)
- EPOXI - [Click here](#)
- InSight - [Click here](#)
- Juno - [Click here](#)

Partnering NASA Programs

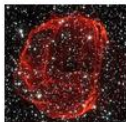
- Eyes on the Solar System - [Click here](#)

SpaceMath@NASA News Updates

March: NASA [Press Release](#) about SpaceMath@NASA- [[Read Press Release](#)]
July: New math guide to [Mars Exploration](#) and the Curiosity Rover - [[Click Here](#)]
August: Expanded and updated math guide on [Black Holes](#) posted- [[Click Here](#)]
November: SpaceMath@NASA served 6,000,000th math problem at the website!
December: New multi-media Grade 6 [Math Modules](#) added- [[Click Here](#)]
February: New multi-media Grade 8 [Math Modules](#) added- [[Click Here](#)]
April: The 7 millionth Space Math problem is downloaded

Math in the News

A behind-the-scenes look at the math in NASA press releases



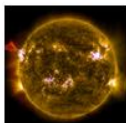
Problem 517: A Distant Supernova Remnant Discovered
Students explore the size and speed of a distant supernova remnant nebula and compare it to the speed of the International Space Station. (PDF)



Problem 516: Hinode Observes Solar Eclipse from Space
Students use the geometry of a solar eclipse to estimate the distance to the sun using simple proportional reasoning. (PDF)



Problem 515: Telling Time on Mars
Students learn about the difference in time between a martian day and an Earth day, and use this to explore how work schedules change for scientists working with the Curiosity rover on Mars. (PDF)



Problem 514: Solar Flares and the Stormy Sun
Students use simple averaging to explore the sunspot cycle and our sun's changing activity levels in 2012 and 2013. (PDF)

(More problems from 2012-2013)

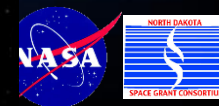
Multi-Media Math Modules



Grades 6, 7 and 8: Standards-based, multi-media math resources featuring NASA eClips video segments, readings from NASA press releases, online interactive resources, and of course math problems!
[\[click here\]](#)

Problem Archives

- I - Problems 1 to 38
- II - Problems 39 to 64
- III - Problems 65 to 101
- IV - Problems 102 to 148
- V - Problems 149 to 233
- VI - Problems 234 to 342
- VII - Problems 343 to 428
- VIII - Problems 429 to 478
- IX - Problems 479 to Current



Year of the Solar System



National Aeronautics and
Space Administration



YEAR OF THE SOLAR SYSTEM

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GLOBE at Night:
Saving Energy, Saving our Night Skies!

Join the campaign to measure night sky brightness.

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GLOBE at Night

Latest News



11 Jun 2013
NASA's Robotic LRO Spacecraft
Provides Data for Human Exploration

11 Jun 2013
Marks On Martian Dunes May Be
Tracks Of Dry-Ice Sleds

7 Jun 2013
Kepler Mission Manager Update -
503 New Planet Candidates

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Topics

[Far-Ranging Robots](#)

[Shadows of the Sun](#)

[Ice!](#)

[New Data, New Ideas](#)

[Discovering New
Worlds](#)

[Got Life?](#)



Got Life?

Join us as we explore one of the most
fundamental questions: are we alone in the
Universe?

[More](#) ▶

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- [News](#) ▶
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FEATURED YSS RESOURCE

NASA App

All of NASA
at your fingertips

FEATURED YSS RESOURCE

Solar System Lithograph Set



FEATURED YSS RESOURCE

Solar System Exploration
website



International Space Station - Live!



About
International Space Station **Live!**

Live Data

Operations

Educators

Resources

Interact



International Space Station **Live!**



Spot the Station



Mars Curiosity Rover

Mars Science Laboratory
Curiosity Rover

HOME

MISSION

NEWS

MULTIMEDIA

PARTICIPATE!

SEARCH

ALL MARS

FOLLOW YOUR
CURIOSITY
EXPLORE
CURIOSITY'S HOME!

EXPLORE MARS
with Curiosity in 3D



Explore Curiosity's Journey in 3D

Follow Curiosity's drive and read about the latest updates on Curiosity's Journey on Mars! [Start Now](#)
[More >](#)

▶ 1/5



What's New?



Recent Images



Recent Videos



Fun



Send Me a Message



Ask Dr. C



Curiosity

FAVORITES

Curiosity's
3D Journey



FREE

DRIVE



Learn About
the Rover



@ MarsCuriosity t f

NASA – Lunar Reconnaissance Orbiter

NASA
National Aeronautics and Space Administration
Goddard Space Flight Center

Search
Flight Projects | Sciences and Exploration

LUNAR RECONNAISSANCE ORBITER

Home | The LRO Mission | Images and Multimedia | Science and Data | Education and Outreach

LRO KIDS!

Get animations, streaming video, cartoon characters, audio narration, interactive games!

SPACE OPERATIONS LEARNING CENTER

NASA | Wall-E Learns About Proportions

Moon Concentration
How Good is Your Memory?

Moon Quiz
Is it a big hunk of cheese? Take a quiz and find out!

Moon Cookies
Make these tasty cookies (no baking required)

Unscramble
Take the Challenge!
Unscramble Moon-related graphics

Wordsearch
Help Us Find Our Lost Lunar Words

Moon Calculator
How much would you weigh if you lived on the Moon?

Crossword Puzzles
Answer clues and solve the puzzle

Ask Dr. Marc
Dr. Marc answers good questions asked by visitors about the Moon and other topics.

Lunar Cryptograms
Decode these important

LRO CRAFTS

Planetary Science Institute

Planetary Science Institute
A Nonprofit Corporation

Extending Human Presence

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NEWS

RESEARCH

EDUCATION

OUTREACH

SUPPORT

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Professional
Development
Workshops

Ask An Expert

Visualization
Resources

Explorer's Guide to
Impact Craters

Guía del Explorador de
Cráteres de Impacto

Demonstration Kits

- Impact Rocks
- Meteorites

Special Topics

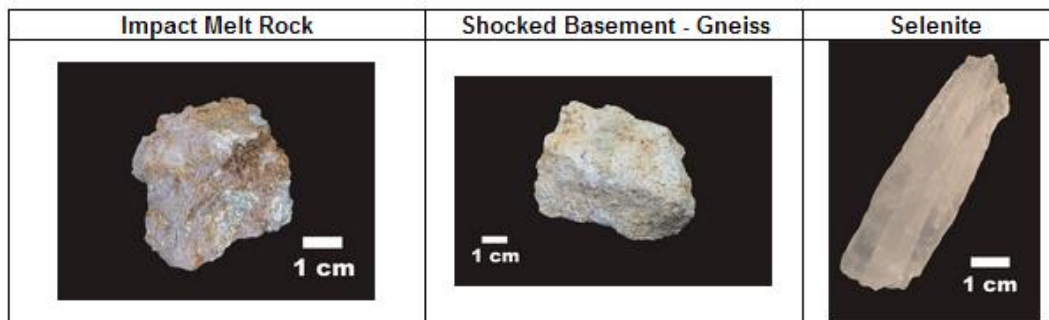
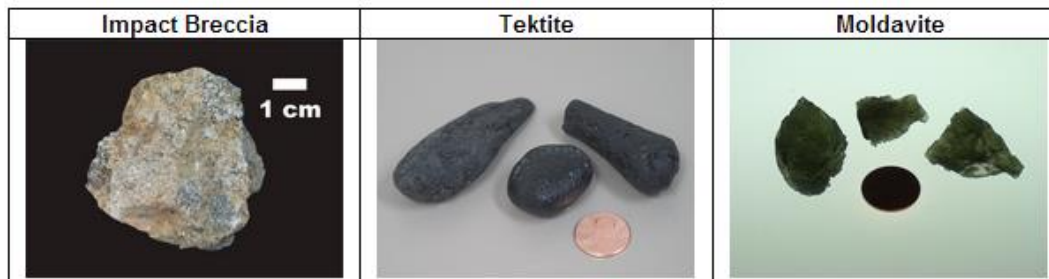
Overview

PSI researchers and education specialists are engaged in taking knowledge about our solar system and beyond to enhance teacher training in science, deepen the educational experience for children, and to improve the public/student understanding of physical processes on Earth and beyond. We do this by offering educational programs, educational resources, instructional rock kits, and more. As PSI's educational activities continue to evolve and grow, we invite you to look at what we have to offer. Please check back often!



Planetary Science Institute

Click on the pictures for information about the impact rocks



Lunar and Planetary Institute

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EDUCATION *and* public outreach

[TEACHERS AND FACULTY](#)[OTHER SCIENCE EDUCATORS](#)[PUBLIC](#)[ABOUT US](#)

Teachers and Faculty

LPI K-12 Teacher Workshops, Institutes, and Field Trips

Exploration of the Moon and Asteroids by Secondary Students

LPI Summer Intern Program

Humans in Space Youth Art Competition

Educator Resources

Education Newsletter

LPI Higher-Education Faculty Programs



Find upcoming LPI teacher trainings in Earth and space science topics, and connect to resources from past workshops and field trips.

NEW AND UPCOMING



Cosmic Explorations: A Speaker Series

The Universe is Out to Get Us and What We Can (or Can't) Do About It



Solar System Exploration Pre-Service Teacher Institute

June 23-27, 2014
Application deadline:
June 2



Mars Through Time Workshop

July 8-11, 2014
at the University of New Mexico

NASA Summer of Innovation

What to Consider When Selecting Content

Themed Units



Life Science



Physical Science



Earth & Space Science



Engineering

Grades 4-6

Life Science

- Body
- Food
- Life Out There?
- Plants
- Survival

Physical Science

- Aeronautics
- Force and Motion
- Gravity
- Properties of Matter
- Waves and Optics

Grades 7-9

Earth and Space Science

- Climate and Seasons
- Destination Mars
- Earth Moon Systems

Engineering

- Aeronautics
- Challenges
- Design Process

Themed Camp Guides



Aeronautics Camp

This camp centers on the mathematical and design principles of flight design.



Designing for Space Camp

This camp centers on developing an appropriate learning progression that focuses on the concepts necessary to learn about engineering.



Life Science Camp

This camp centers on the characteristics of living things, astrobiology, exoplanets and adaptations to the space environment.

NASA Discovery Program

Discovery Program

- Home
- Program
- Missions
- News
- Education
- Multimedia
- Small Worlds

Upcoming Mission Events

Dawn Orbit Insertion



ART &
THE COSMIC
CONNECTION



Mission
Milestone
Interactive



Discovery &
New Frontiers
Newsletter
Archives



Space Thrills
POSTER

HOME

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GO

Discovery & New Frontiers News

Cosmic Art in Action!

New Activity Blends Science and Art,
Spurs Creative Thought Processes

Onward to Ceres

Ion Propulsion Powers Dawn Through
the Asteroid Belt

Looking Back at Us

MESSENGER Takes Image of the
Earth

MESSENGER to Snap Earth

Mercury Orbiter Will Take Images of
Earth and Moon

[Read All about It!](#)

Latest Discovery and New Frontiers
Newsletter Now Online



Space School Musical

Space School Musical
The solar system comes alive!



Exo's Discovery

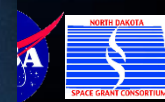
Let the journey begin...

Exo's Discovery
Take the controls and explore with Exo!



Image
Impact

Image Impact
The stories behind the captions.



North Dakota Space Grant



facebook Search for people, places and things North Dakota Space Grant... Home

North Dakota Space Grant... Timeline Recent

Rechal Madden about 3 weeks ago



NORTH DAKOTA SPACE GRANT CONSORTIUM 103 likes · 4 talking about this · 0 were here

Education The North Dakota Space Grant Consortium (NDSGC) is one of 52 consortia of NASA's National Space Grant College and Aerospace Program, established in 1959.

103 likes

What have you been up to?

North Dakota Space Grant Consortium shared a link. August 12 '13

If its clear skies where you're at - don't forget to check out the Perseid meteor shower tonight! With the moon at waxing crescent, and the count at ~50 per hour, its bound to be "out of this world!"

Everything you need to know: Perseid meteor shower | EarthSky.org

In the Northern Hemisphere, the annual August Perseid meteor shower

Like Comment Share

North Dakota Space Grant Consortium shared a link. August 7 '13

Looking for something fun and easy to do in your classroom or in an informal education setting? Check out NASA Digital Learning Network! NDSGC was able to work with the Dakota Science Center and North Valley Career and Technology Center ... See More

NASA Digital Learning Network™ www.nasa.gov

Like Comment Share

North Dakota Space Grant Consortium shared NASA history's photo. August 3 '13

Can you say "nerd watch"? @ThrowbackThursday

Talk about an incredible view!

The Earth shines through the flight deck windows behind STS-85 Commander Curt Brown in this photo taken during his visit in 1997. Brown is wearing the Detailed Supplementary Objective (DSO) 484C wristband. ... See More



Like Comment Share

NORTH DAKOTA
NASA SPACE GRANT CONSORTIUM

Science Technology Engineering Mathematics

Home About Scholarships Fellowships NASA Internships Research Precollege Application System News and Events

You are here: Home Search: Enter Search... Submit

★ News & Events

- The Annual North Dakota Space Grant meeting will occur at Dakota College at Bottineau on Monday, May 6, 2013.
- Deadline Extended for Summer Faculty Fellowship Applications
- Call for Faculty STEM Research Proposals

★ Aurora Newsletter

Latest Issue
Past Issues (archives)

Welcome to the North Dakota NASA Space Grant Website!
Wednesday, August 14, 2013

Near-Space Balloon Competition

The 2013 Near-Space Balloon Competition was a success! The balloon traveled to 87,000 feet! Many pictures of the launch were taken as well as a video of the balloon burst. Images and video of the flight are now posted under the Pre-College tab in the menu bar.




NORTH DAKOTA SPACE GRANT CONSORTIUM

TWEETS 64 PHOTOS/VIDEOS 3 FOLLOWING 366 FOLLOWERS 123 FAVORITES 6 More

Tweets Tweets and replies

NASA ND Space Grant @NDSGC Jun 6

2mrw we're launching sensors 2 the #thermosphere! JK-it's a balloon not a spaceship! #spacejoke #cyaidthestratosphere



3 Photos and Videos

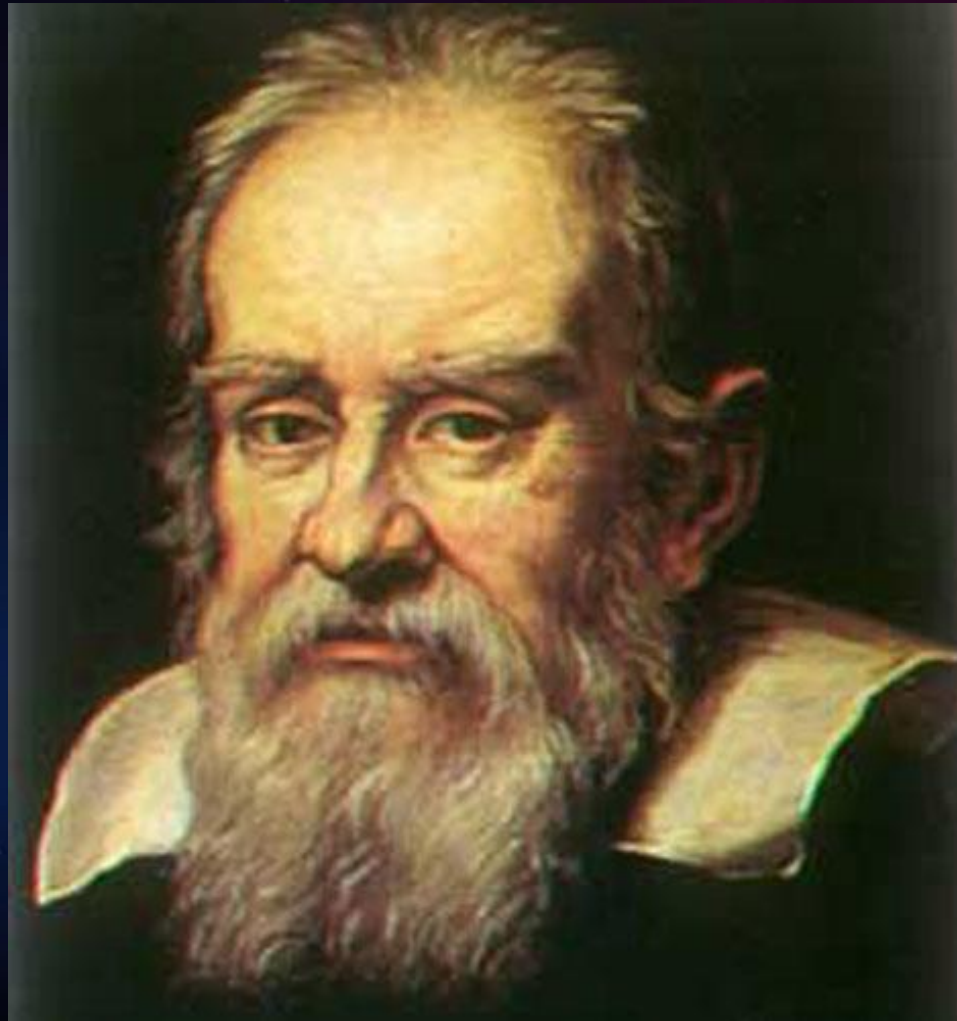



NDSGC K-12 Educator Email Listserv!

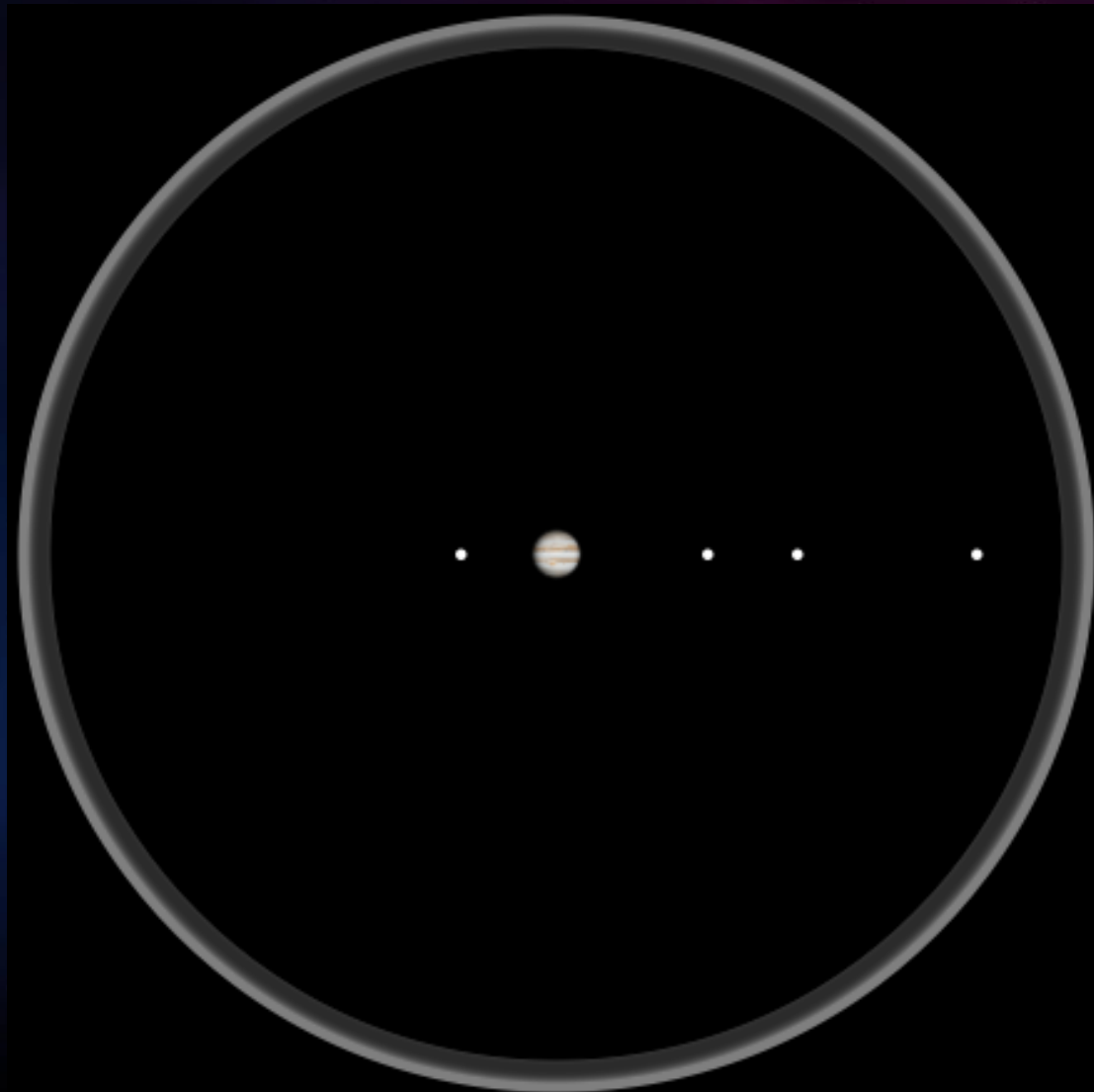
- Workshop opportunities
- New STEM education resources for the classroom
- NASA student contests/team competitions
- Professional Development opportunities
- Emails ~once a week



Galileo Galilei (1564 – 1642)



Jupiter as Seen by Galileo



Observing Jupiter

Night 1



Day Time



Observing Jupiter

Night 2



Day Time



Observing Jupiter

Night 3



Day Time

Make a Prediction for Night 4 ...



Observing Jupiter

Night 4



Day Time

Make a Prediction for Night 5 ...



Observing Jupiter

Night 5



Day Time

Make a Prediction for Night 6 ...



Observing Jupiter

Night 6



Day Time

Make a Prediction for Night 7 ...



Trying to Observe Jupiter

Night 7

-2

-1

1

2

Day Time

Make a Prediction for Night 8 ...



Observing Jupiter

Night 8



Day Time

Make a Prediction for Night 9 ...



Observing Jupiter

Night 9



Analyzing Jupiter Data

Work with your table group to analyze the Jupiter data.

- What patterns do you observe?
- How would you *describe* the data?

Don't try to explain the data!

Modeling the Jupiter Data

Work with your table group and discuss the following questions:

- What does the data tell us about the motion of the 4 objects?
- Can you build a model that explains the observations?
- What do you think is the nature of these 4 objects?
- Other model ideas?

Reflecting on Galileo's Observations

Video: Galileo's observations of the Moons of Jupiter.

When watching the video, think about what Galileo did as a scientist and why he did it.



Reflecting on the Nature of Science

- Why did Galileo look at Jupiter?
- Why did Galileo repeat his observation?
- What question did Galileo ask?
- What did Galileo do that helped to answer his question?

Understandings about the Nature of Science

- ❑ Scientific knowledge is based on empirical evidence.
- ❑ New technologies advance scientific knowledge.



Reflecting on the Nature of Science

- Did Galileo follow the “scientific method”?

Understandings about the Nature of Science

- Science investigations use *diverse* methods and do not always use the same set of procedures to obtain data.



Reflecting on the Nature of Science

- Why do you think scientific knowledge changes?
- New Technologies allow us to collect new evidence.



Understandings about the Nature of Science

- Scientific explanations are subject to revision and improvement in light of new evidence.
- The certainty and durability of science findings varies.
- Science findings are frequently revised and/or reinterpreted based on new evidence.

Understandings about the Nature of Science

- Science is a human endeavor.
- Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination, and creativity.



Analyzing Data

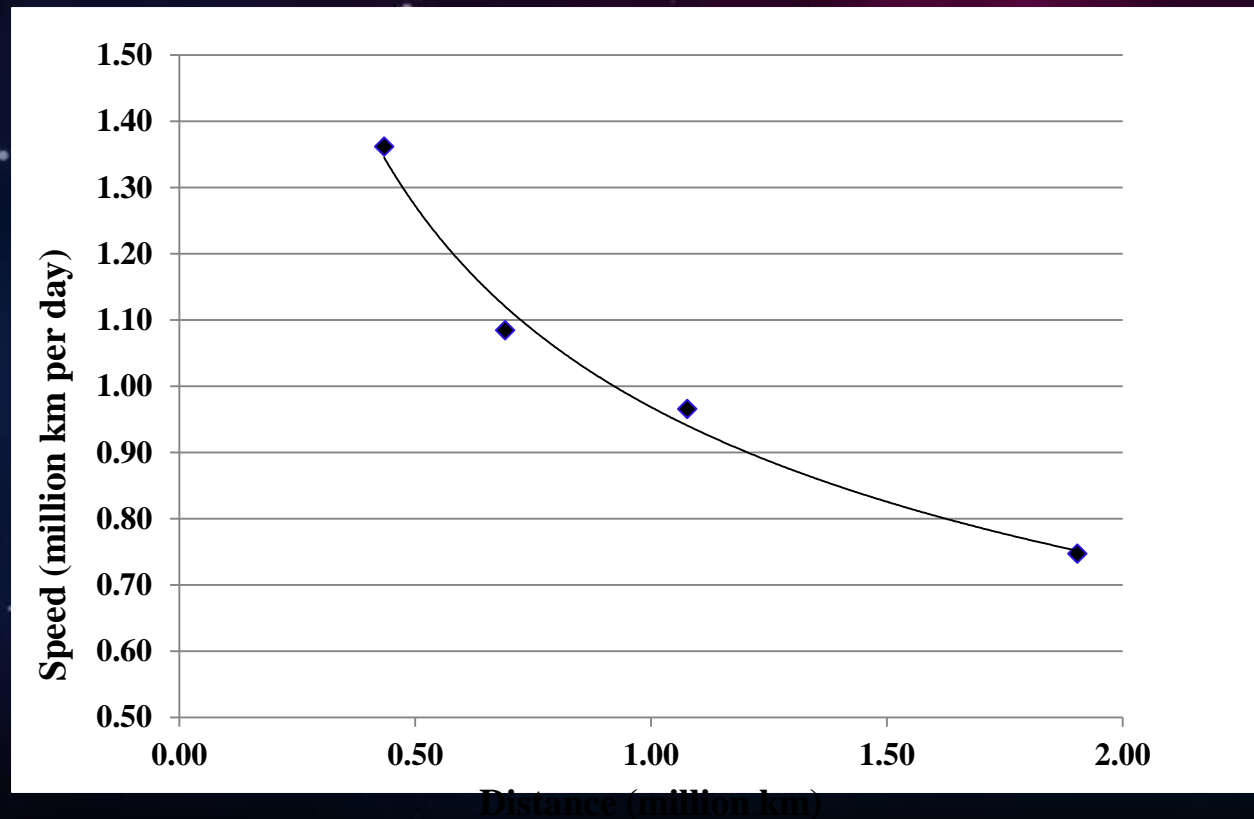
- We will assume circular motion.
- Discuss with your table group how the data can be used to compare the times it takes each moon to complete an orbit.

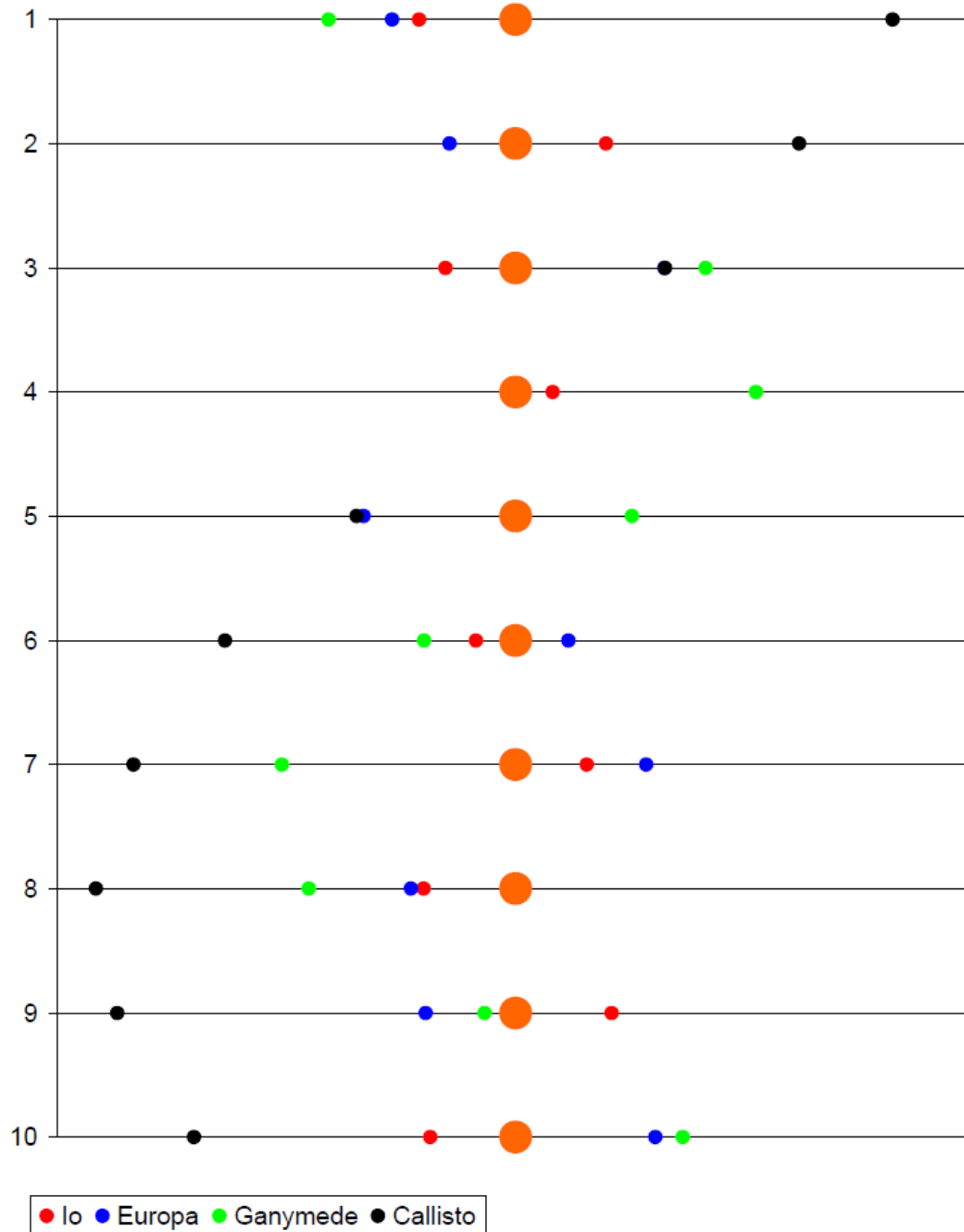
Data Analysis Steps

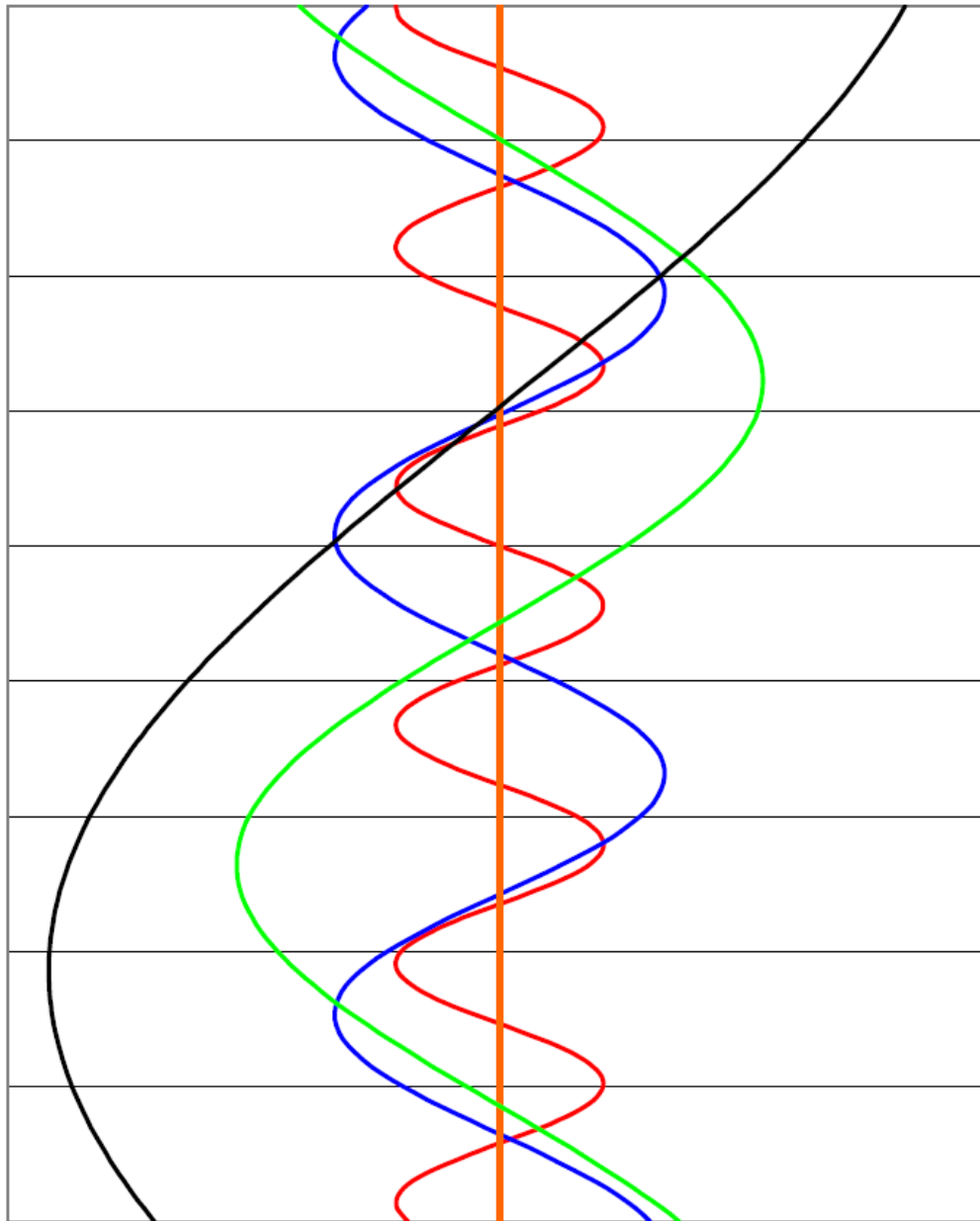
1. Determine the time it takes for your moon to complete one orbit. [*unit = day*]
2. Determine the distance to Jupiter (or the radius of the orbit). [*unit is million km*]
3. Determine the length of the orbital path for your moon. [*unit is million km*]
4. Calculate the speed by dividing the length of the orbit by the time it takes the moon to complete it. [*unit = million km / day*]

Graphing the Data

Graph the data for speed versus distance and describe what this graph tells you.







— Io — Europa — Ganymede — Callisto