

# Astronomy

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## Meeting Overview

Planning to have this session partially outdoors. However, if the weather or clouds do not permit viewing, the telescope station will be a little less interesting :) If all goes well we will have met all of the requirements for the Astronomy badge by the end of the session.

6:30 - 6:35 Opening (Kenn)

6:35 - 6:50 Game (Paul/All)

6:50 - 7:40 Stations (~12 min each)

- The moon (Kenn)
  - o impact on tides
  - o phases of the moon
- Telescope & Story (Chris)
- Sky features (Graham)
  - o Eclipses - lunar/solar
  - o Stars/Planets
  - o Constellations
- Create a star map (Paul)
  - o How to use the star map
  - o How to find the north star

7:40-7:55 Viewing (or game if cloudy or weather does not permit)

- Use telescope (Chris) & use star maps (others)
  - o find the north star
  - o try to identify constellations

7:55 - 8:00 Closing (Kenn)

Notes

Gosia will be absent.

Nestor will be absent.

## Opening

Standard opening -- should not take longer than roughly 5 mins.

## Game

### Forest Relay

Divide the group into teams of four or more and have them line up behind a line. When you yell GO!, the first player will run a few meters, and stand with arms out, like a tree. The next player then runs around the tree, runs a few metres further,

and lies down like a log. The third player runs around the tree, over the log and bends over to make an arch (bridge) a few metres past that. The rest of the players go one by one around the tree, over the log, through the bridge and back to the start line. When they are finished, the bridge, log and tree run back to the finish to join their team. First to be sitting down in their line, wins!

## Stations

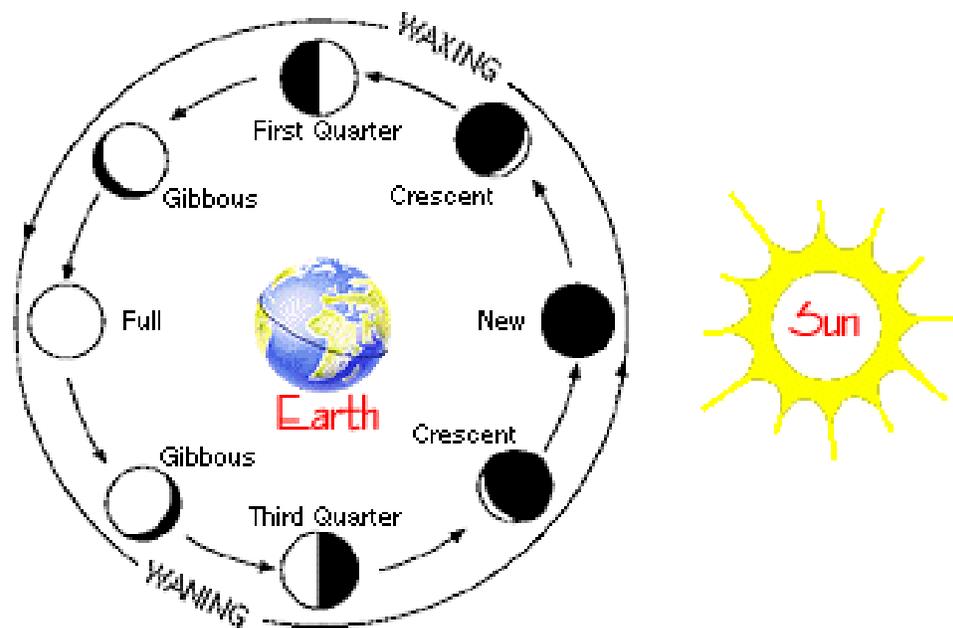
We will divide into 4 similarly sized groups (not necessarily sixes) and rotate every 10 minutes.

### Station 1: The Moon

#### Phases of the Moon

- We can demonstrate the phases of the moon using a couple of balls and a flashlight or a couple of bodies and a flashlight.
- Ever notice that the appearance of the moon changes over time? As the moon travels around the earth and the earth travels around the sun we see a different perspective of the moon each day. The period in which this happens is over 29.5 days.

### The Moon as seen from Earth



A **new moon** is when the moon is positioned between the earth and the sun. They are in approximate alignment. The side of the moon which is lit is toward the sun and away from the side that we can see.

A **full moon** occurs when the earth, moon and sun are in approximate alignment but the moon is on the opposite side of the earth from the sun. The lit part of the moon is facing the earth and we can pretty much see the entire moon.

The first and third quarter moons or, **half moon** happens when the moon is at a 90 degree angle with respect to the earth and the sun. From the earth we see half of the lit part and half of the shadow of the moon.

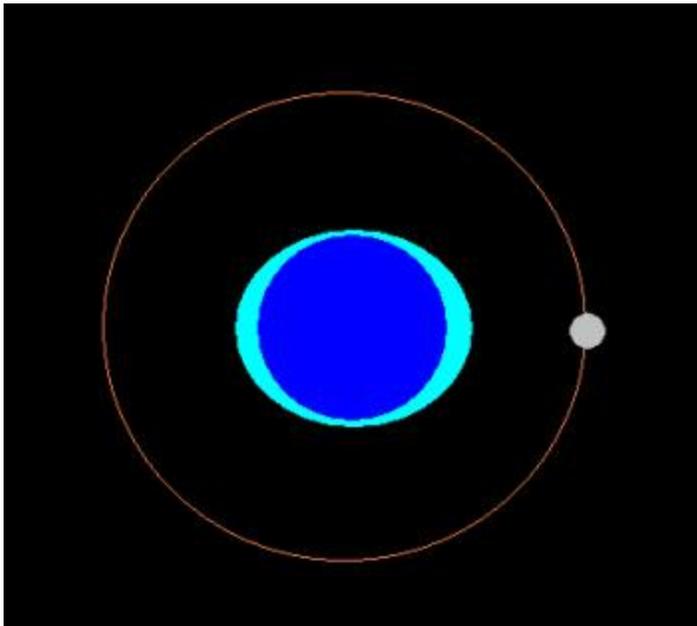
Crescent moon refers to phases where the moon is less than half illuminated.

Gibbous refers to phases where the moon is more than half illuminated.

When the moon is moving away from the sun and the sunlit portion is increasing -- we call it waxing. When the moon is moving toward the sun and the sunlit portion is decreasing -- we call it waning.

### **The moon and tides**

Tides are created because the earth and the moon are attracted to each other. The moon's gravity pulls at the earth. The earth is able to hold on to everything except for the water. Water is always flowing and is drawn to the moon. This causes tides. There are two high tides and two low tides each day.



**Other interesting moon facts:**

- The moon is about 384400km from earth -- would take about 130 days to get there by car or 13 hours by rocket.
- The moon orbits the earth at about 3683km/h
- The moon is about 3476km in diameter
- It is the only celestial body other than the Earth on which humans have set foot
- The Soviet Union was the first to reach the moon with an unmanned spacecraft in 1959
- The first manned mission lunar mission was in 1968 (Apollo 8). There have been six manned landings since then between 1969 and 1972 by the United States.
- Over 380kg of lunar rocks have been brought back to earth by these missions.

## Station 2: Telescope / Story

- Go through the parts and features of a telescope. If possible try to take a look through the telescope to see something hopefully we can see the interesting (i.e. the moon?).

### Story Related to a Constellation

**Orion** (Taken from Windows to the Universe [www.windows2universe.org](http://www.windows2universe.org))

The ancient Greeks saw the figure of the Greek myth Orion in the nighttime sky. There are several different stories about the birth of Orion. According to one version of the myth, Orion was the son of a poor shepherd called Hyrieus. Once, [Zeus](#), Hermes, and [Poseidon](#) stopped by Hyrieus' house. Hyrieus was so generous with his guests that he killed the only animal he had-an ox. Hyrieus was not aware that his guests were gods. The gods wanted to reward Hyrieus'generosity by granting him a wish. Hyrieus' biggest desire was to have a child. The gods told him to bury the hide of the bull he had sacrificed to them and to pee on it. After nine months, a boy was born in that place. The child became a very handsome and strong man.

He was such a good hunter that he was hired by the king Oenopion to kill the ferocious beasts that were terrifying the habitants of the island Chios. Happy for his success, Orion said he would kill all the wild animals on the earth. But the earth goddess [Gaia](#), who was the mother of all animals, was not pleased with Orion's intention.

Then, Gaia set an enormous scorpion on Orion. Orion soon realized that his strength and sword were useless against that mighty beast. He tried to escape, but the scorpion stung him to death. As a reward, Gaia placed the scorpion in the sky as a [constellation](#) which appears to be constantly chasing after Orion whose figure was also placed among the stars.

**Cancer** (Taken from Windows to the Universe [www.windows2universe.org](http://www.windows2universe.org))

According to an ancient Greek legend, the figure of a gigantic crab was placed in the nighttime sky by the goddess Hera to form the constellation Cancer. Hera swore to kill [Heracles](#), the most famous Greek hero. Hera attempted to kill Heracles in many different ways, but each time his incredible physical strength allowed him to survive. The Romans called him Hercules.

Hera cast a spell of madness on Heracles, causing him to commit a great crime. In order to be forgiven, he had to perform twelve difficult tasks. One of these tasks was destroying the terrible nine-headed water-serpent, [Hydra](#). During the battle between Heracles and Hydra, the goddess Hera sent a giant crab to aid the serpent. But Heracles, being so strong, killed the crab by smashing its shell with his foot. As a reward for its service, Hera placed the crab's image in the night sky.

### Station 3: Sky Features

- will have prepared a set or two of paper/cardboard cut-outs for each of the planets in the solar system. We can have cubs initially arrange them to see if they know the order of the planets

#### **Lunar Eclipse**

When the moon passes directly behind the earth into its shadow. This can only occur on a night of a full moon. These are safe to view without eye protection.

Demonstrate using a flashlight and a couple of balls.

#### **Solar Eclipse**

When the moon passes directly between the earth and the sun. This can only happen at a new moon. Should never view without eye protection -- as you are looking directly into the sun. Demonstrate using a flashlight and a couple of balls.

#### **Stars and the Sun**

A star is a massive, luminous sphere of plasma held together by its own gravity. The nearest star is the sun. Other stars are visible at night

#### **Constellation**

They are patterns formed by prominent stars within apparent proximity to one another in the earth's sky. Usually visible to the naked eye. There are 88 identified constellations. Carry names and take the shapes of gods, hunters, princesses, objects and mythical beasts associated with Greek mythology.

#### **The Solar System**

Comprised of the sun and system of eight planets, dwarf planets, moons and other

objects that orbit the sun. I've made 3 sets of cut-outs. Divide the group into two or three small teams and have a race to see which team can get the order right first.

Afterwards, teach the “My Very Excellent Mother Just Served Us Nachos” as a means of remembering the order. If time allows -- can go through each of the planets and talk about some of their characteristics.

#### Mercury

- 1 year is 88 earth days
- has almost no atmosphere
- 1 day on Mercury is 2 earth years
- average temperature is 364 degrees Celsius

#### Venus

- 1 year is 224.7 earth days
- brightest natural object in the sky after the moon
- average temperature is 462 degrees Celsius (hotter than Mercury)

#### Earth

#### Mars

- 1 year is 687 earth days
- average temperature is -63 degrees Celsius
- approx half the diameter of earth

#### Jupiter

- largest planet in the solar system
- 3rd brightest object in the sky next to Venus and the moon
- mainly hydrogen and helium
- has at least 67 moons

#### Saturn

- second largest planet in the solar system
- has a prominent ring system (mostly ice particles and rocky debris/dust)
- has 62 known moons -- the largest, Titan, is larger than Mercury and is the only moon which has an atmosphere

#### Uranus

- has a ring system and numerous moons

#### Neptune

- has 14 moons
- farthest planet in solar system

Pluto (considered a Dwarf planet in 2006)

#### Station 4: Using the Star Map

- Will have copies of a star map template as well as some cardboard, glue sticks, scissors and tape. Cubs will glue template on to the cardboard and cut out the star wheel along the lines and assemble their own star map.
- Once the star maps are created -- go through how to actually use it.

- Later we will see if we can identify big dipper (ursa major), little dipper (ursa minor), orion, etc...

### Finding the North Star (Polaris)

- has been used as a guiding star for thousands of years
- often a reference point for astronomers and navigators
- lights the way to the true north
- visible from the earth during clear nights



- 1) locate the big dipper
- 2) locate the two stars that form the outer edge of the big dipper
- 3) locate the little dipper -- smaller and more difficult to find in the night sky
- 4) draw an imaginary line straight through the two stars on the outer edge of the big dipper and toward the little dipper.
- 5) The brightest star in the little dipper is at the end of its handle -- this is the north star.

## Viewing

The idea here is to go outside with the cubs and put to use what we have learned. We will try to set up the telescope to see some type of feature in the sky -- cubs can each get a chance to look through.

Also, put to use the star wheels that they have created:

- find a couple of constellations
- find the north star

If weather does not permit we will remain indoors and run a game activity instead.  
(TBD)

## Closing

- Standard closing

## Materials/Resources:

Leaders should likely bring flashlights in order to see the reference material.

Star Wheel/Map copies (Paul)

Cardboard, glue and tape (Paul)

Flashlight, two balls for demonstration of eclipse (Paul)

Flashlight, two balls for demonstration of lunar phases (Paul)

Cut-outs for the planets of the solar system (Paul)