

# Activity Guide

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## Sorting Games

How Big? How Far? How Hot?

**NASA @**  
My Library

**STAR**net  
Science-Technology Activities &  
Resources For Libraries

# Overview

## Sorting Games: How Big? How Far? How Hot?

This *NASA@ My Library Activity Guide* will help library staff facilitate these sorting activities in large or small groups, with patrons from Pre-K to adult. These simple and engaging activities introduce younger patrons to concepts such as size, distance, and temperature, and allow older patrons to explore these concepts further. They are excellent engagement activities for learners to begin thinking about our place in space.



Image 2016 ALA Conference Credit: ALA

## Key Concepts

### How Big?

- There are many different types of objects in the Universe.
- These objects have different physical sizes and can be organized relative to one another by their size.

### How Far?

- There are many different types of objects in the Universe.
- They are located at various distances from us and can be organized by their relative distance from Earth.

### How Hot?

- Temperature is an important property of an object.
- Objects on our planet and in our Universe have widely different temperatures and can be organized by their average temperature.

**Ages** – Pre-K to family/adult

**Materials List** – 3 card decks in Kit A

**Activity Time** – 10-30 minutes

**Type of Program** – Stations, stand-alone activity, ice-breaker activity

## Simple Instructions - How Big?

- This is the card deck with the Lions on top (marked with green dots on the back).
- Relative size is usually easier for people than relative distance (see How Far?).
- Ask participants to each grab a card (or a few, if you have a small group) and line up in the correct order for the objects (from smallest to largest)
- The correct order for this activity is: Lions, International Space Station, Moon, Mars, Earth, Jupiter, Sun, Solar System, Andromeda Galaxy (see images at the end of this guide).



## Simple Instructions - How Big? (continued)

- When participants get stuck, consider providing the following hints (remember, you're a "guide on the side" – you don't need to provide correct answers, just start a discussion!):
  - The International Space Station is slightly larger than length of a football field.
  - Earth and Mars have the same amount of dry land mass but what extra does Earth have? Answer is water.
  - 1 million Earth's would fit inside the Sun.

### Frequently Asked Questions:

- Why do the Sun and the Moon appear to be the same size in the sky?  
The diameter of the Sun is 400 times greater than the diameter of the Moon. But the Sun is 400 times farther from Earth. That is why you can see a total eclipse of the Sun, during which the Moon blocks the light from the Sun.
- What are the differences between a planet and a star?  
A star is much bigger and much more massive. A star shines with its own light; a planet reflects light from a star. Planets orbit around stars.
- What is the difference between our Solar System and a galaxy?  
Our Solar System has a star at its center called the Sun. There are eight planets that orbit around the Sun and many other objects like asteroids. The Sun is the only star in our Solar System. On the other hand, there are about a trillion stars in the galaxy pictured (Andromeda), and many of them likely have their own planets! Could life exist on any of these planets? Is there life beyond Earth?

## Simple Instructions - How Far?

- This is the card deck with the Soaring Eagle on top (marked with blue dots on the back).
- Ask participants to grab a card (or a few if you have a small group) and line up in the correct order for the objects (from closest to farthest away from Earth).
- The correct order for this activity is: Eagle, Jet, Aurora, Hubble Space Telescope, Moon, Sun, Saturn, Orion Nebula, Andromeda Galaxy (see images at the end of this guide).
- If participants are getting stuck, consider providing the following hints (remember, you're a "guide on the side" – you don't need to provide correct answers, just start a discussion!):
  - Eagles can fly very high (about 10,000 feet) though jets can fly higher (about 35,000 feet).
  - Auroras happen in the highest levels of Earth's atmosphere (about 100 miles up).
  - The Hubble Space Telescope is in space and orbits Earth about 350 miles about the surface.
  - The Moon is 240,000 miles, the Sun is 93 million miles, and Saturn is 1 billion miles from Earth.
  - Constellations are all made up of stars within our own Milky Way Galaxy. Distances at this scale are measured in light-years, the distance light travels in one year (about 6 trillion miles).



### Frequently Asked Questions:

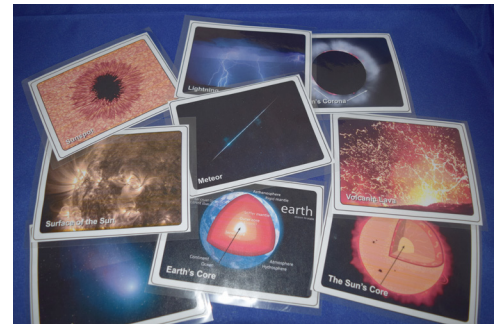
- Why do the Sun and the Moon appear to be the same size in the sky?  
The diameter of the Sun is 400 times greater than that of the Moon, but the Sun is 400 times farther from the Earth than the Moon. That is why you can see a total eclipse of the Sun, during which the Moon blocks the light from the Sun.
- How far from Earth's surface are auroras?  
Auroras are found from 95-190 kilometers (about 60-120 miles) above Earth's surface.

## Simple Instructions - How Far? (continued)

- How far from Earth's surface is the International Space Station?
- The International Space Station orbits around Earth at a distance of 600 kilometers (373 miles).
- How far from Earth is the Sun?  
The Sun is 1 Astronomical Unit = 150,000,000 kilometers (93 million miles) from Earth.
- How far from Earth is Saturn?  
From 9 AU to 11 AU (about 1 billion miles away). It depends on which side of the Sun Saturn is, relative to Earth.
- How far away are the stars we see at night?  
That depends on the star. The brightest stars of the Big Dipper, for example, are between 70 and 100 light-years from Earth. A light-year is about 10 trillion kilometers (6 trillion miles). 10 trillion = 10,000,000,000,000. But the stars we see at night are well within our own Milky Way galaxy.
- How far away is the galaxy in the image from Earth?  
The Andromeda Galaxy, M31, is more than 2 million light-years from Earth.

## Simple Instructions - How Hot?

- This is the card deck with the sunspot on top (marked with red dots on the back).
- Ask participants to grab a card (or a few if you have a small group) and line up in the correct order for the objects (from coldest to hottest)
- The suggested "correct" order is: 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). Remember though, there is a large variance in temperatures, and the discussion is more important than the right answers (see images at the end of this guide).
- If participants are getting stuck, consider providing the following hints (remember, you're a "guide on the side" – you don't need to provide correct answers, just start a discussion!):
  - Comets absorb and reflect solar light, they don't have any light (or heat) source of their own.
  - Sunspots are cooler than the rest of the Sun's surface.
  - Lava can melt metal, but dissipates heat so quickly it can flow through tubes without re-melting them.
  - The Earth's core is actually hotter than the Sun's surface!
  - Lightning bolts can be up to 5x hotter than the surface of the Sun!



### Frequently Asked Questions:

- How hot is lava?  
Up to 2,000 °F, depending on its speed and composition
- Is the Sun's atmosphere (corona) the coolest part of the Sun?  
No! It's actually one of the hotter parts, hotter than the surface and sunspots. The reason is still a mystery, but it may have something to do with the Sun's changing magnetic fields.

## Round 2 - Advanced Instructions

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- For all 3 sets of cards, you'll notice participants sharing information they know about the images. Instead of following the simple instructions described here, ask participants to line up in a different order.
- Ask them to come up with their own order, but if they get stuck suggest average age of object, date discovered, etc.
- Also suggest sorting into groups, rather than a linear order. For example, participants could sort into groups based on man-made vs nature-made. This is a great introduction to categorization and taxonomy for younger participants, and a great ice-breaker/conversation starter for older participants.
- For an even trickier exercise, mix all 3 card sets together to see what participants can come up with! But be sure to return all cards back into their set. The color dots on the back will help keep the card decks organized.

## Connections to Other Kit Activities

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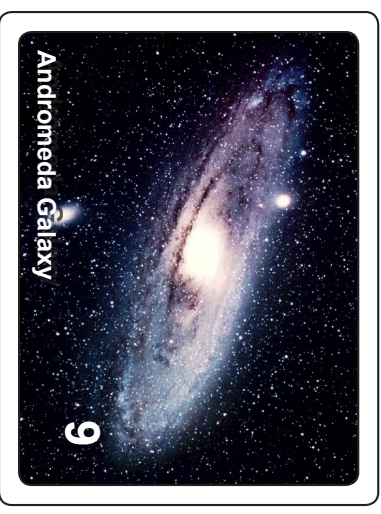
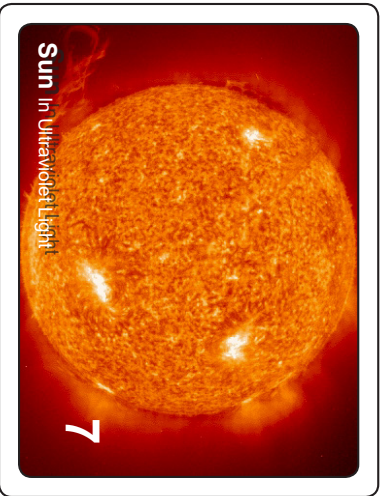
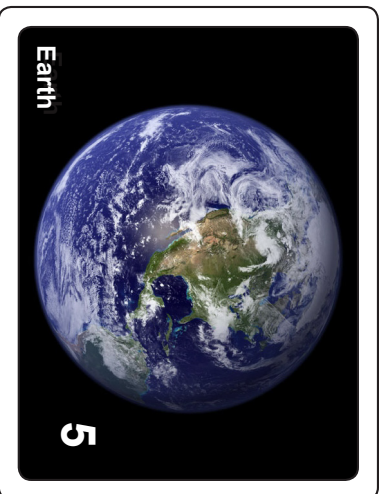
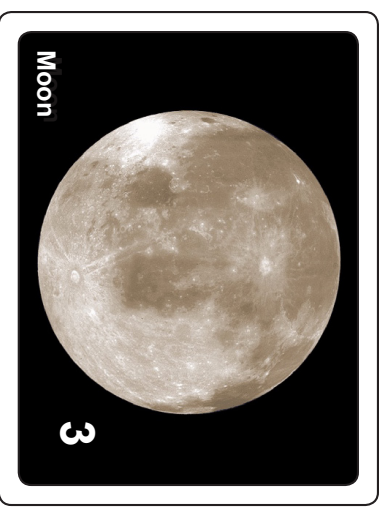
- This activity works well in a station activity with other kit items, and a good “get up and move” activity for story-time.

## Connections to Other *STAR\_Net* Activities

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- This activity, adapted from activities developed by Cherri Morrow and Deborah Scherrer of the Stanford Solar Center (SSC), can be found here: [http://solar-center.stanford.edu/activities/HowBig/How\\_Big-Far-Hot-Old.pdf](http://solar-center.stanford.edu/activities/HowBig/How_Big-Far-Hot-Old.pdf)
- This activity can be found on the *STAR\_Net STEM Activity Clearinghouse* at: <http://clearinghouse.starnetlibraries.org/collections/Astronomy-Space/Sorting-Games-HowBig-HowFar-HowHot.pdf>
- Go to iMeet Central (<https://ssi.imeetcentral.com/nasamylibrarypartners/>) to access digital files of the card set images so that you can print more cards.

# Sorting Game Cards - How Big?





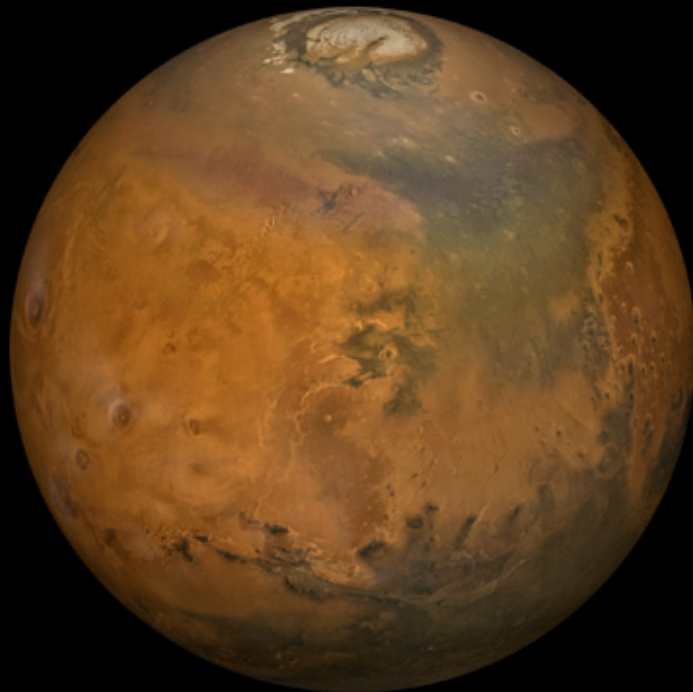
**Lions**



**International Space Station**



**Moon**

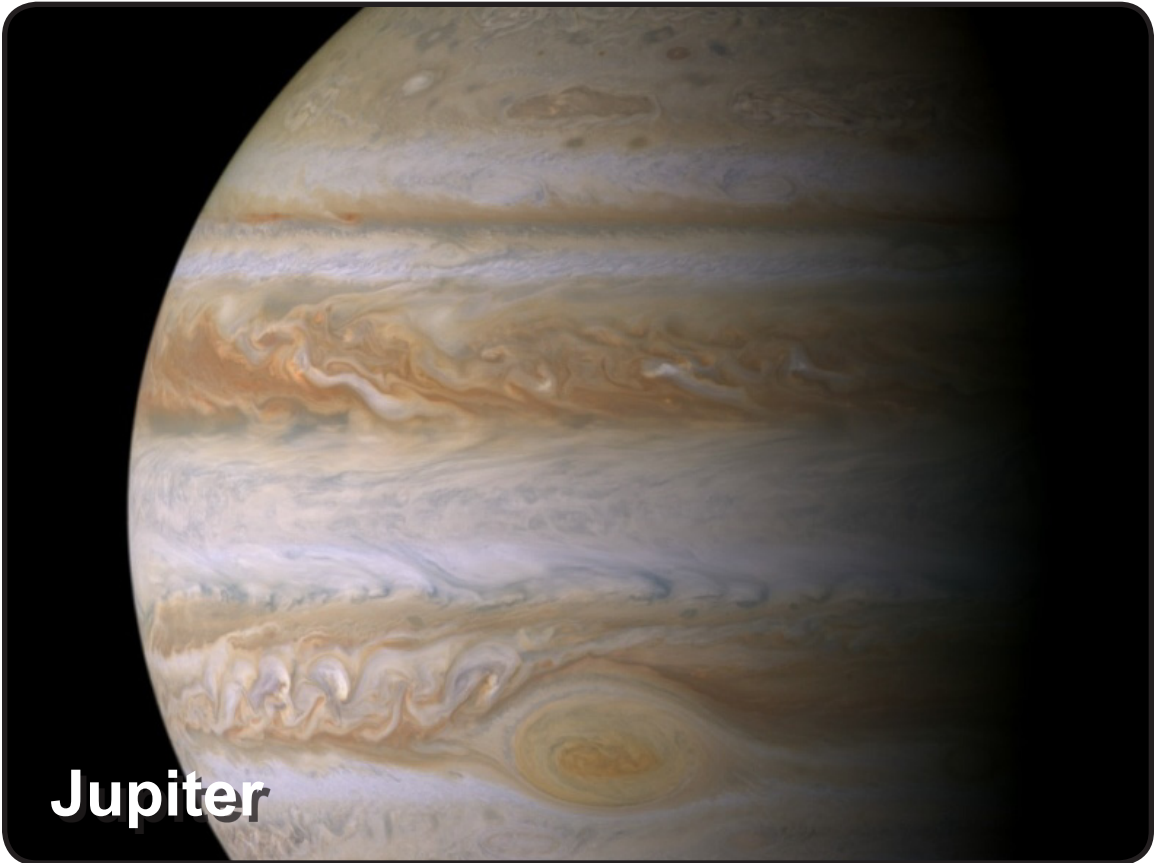


**Mars**

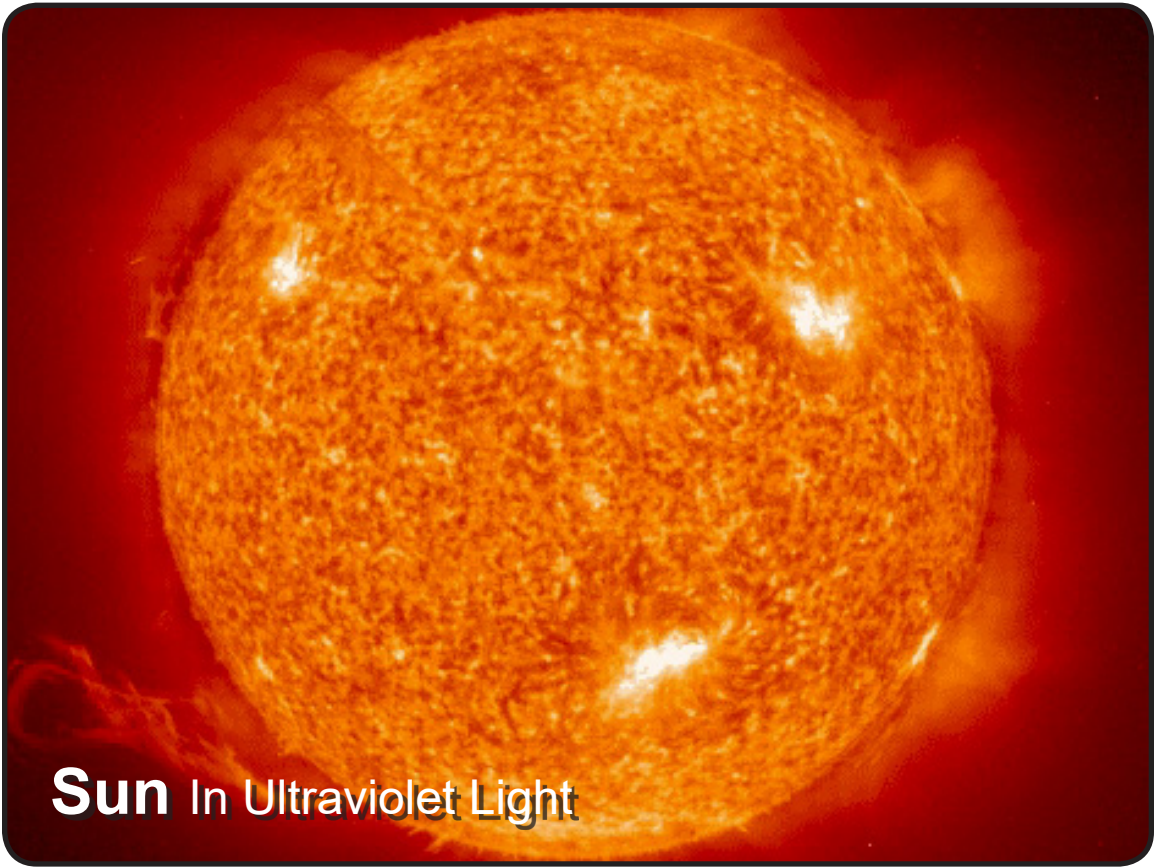




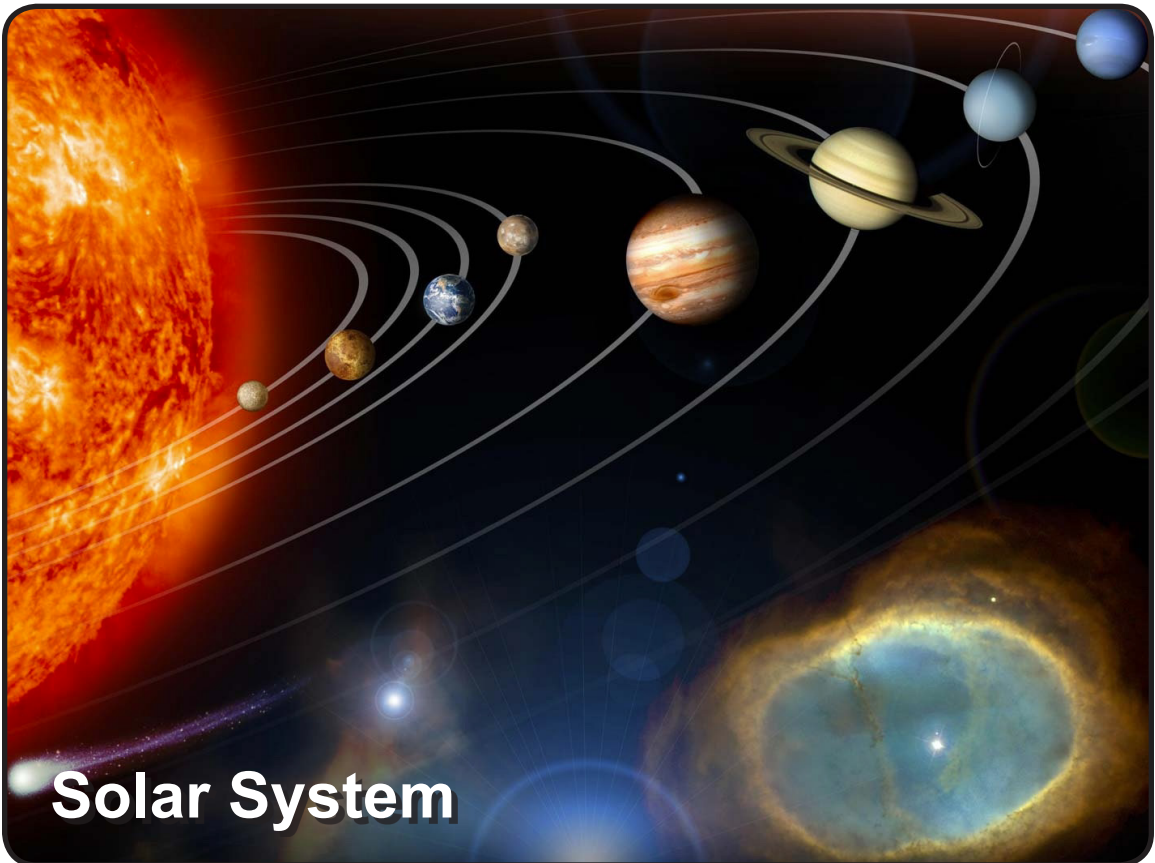
**Earth**



**Jupiter**



**Sun** In Ultraviolet Light

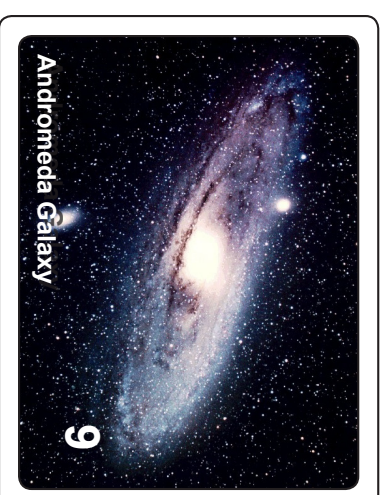
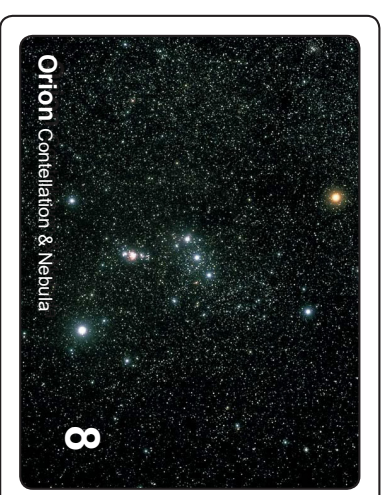
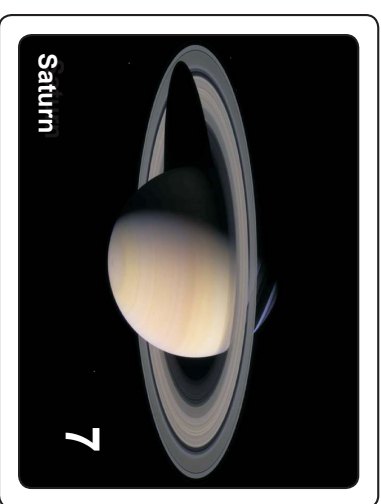
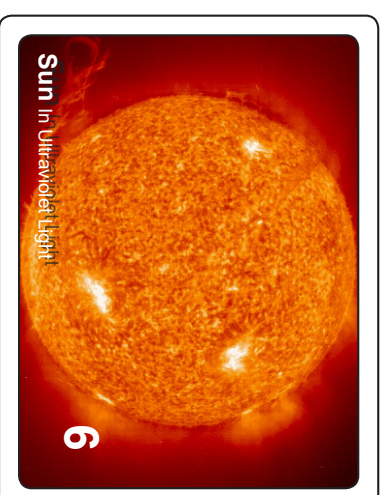
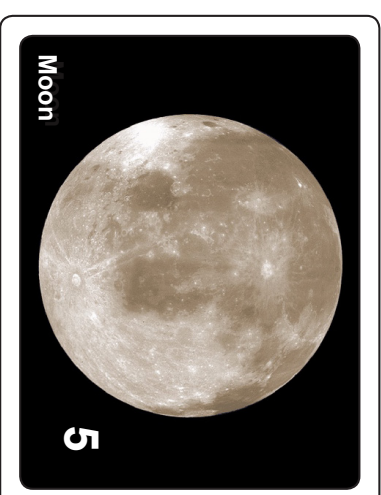
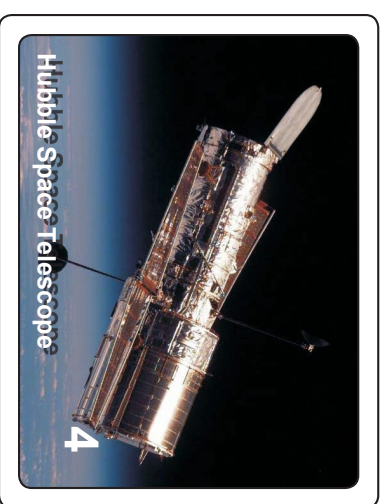
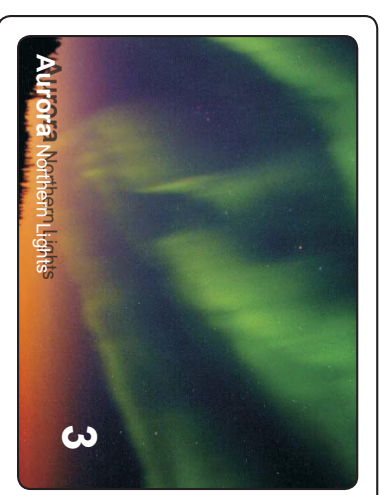
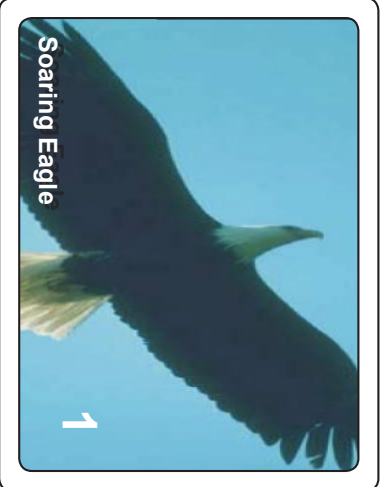


**Solar System**



**Andromeda Galaxy**

# Sorting Game Cards - How Far?





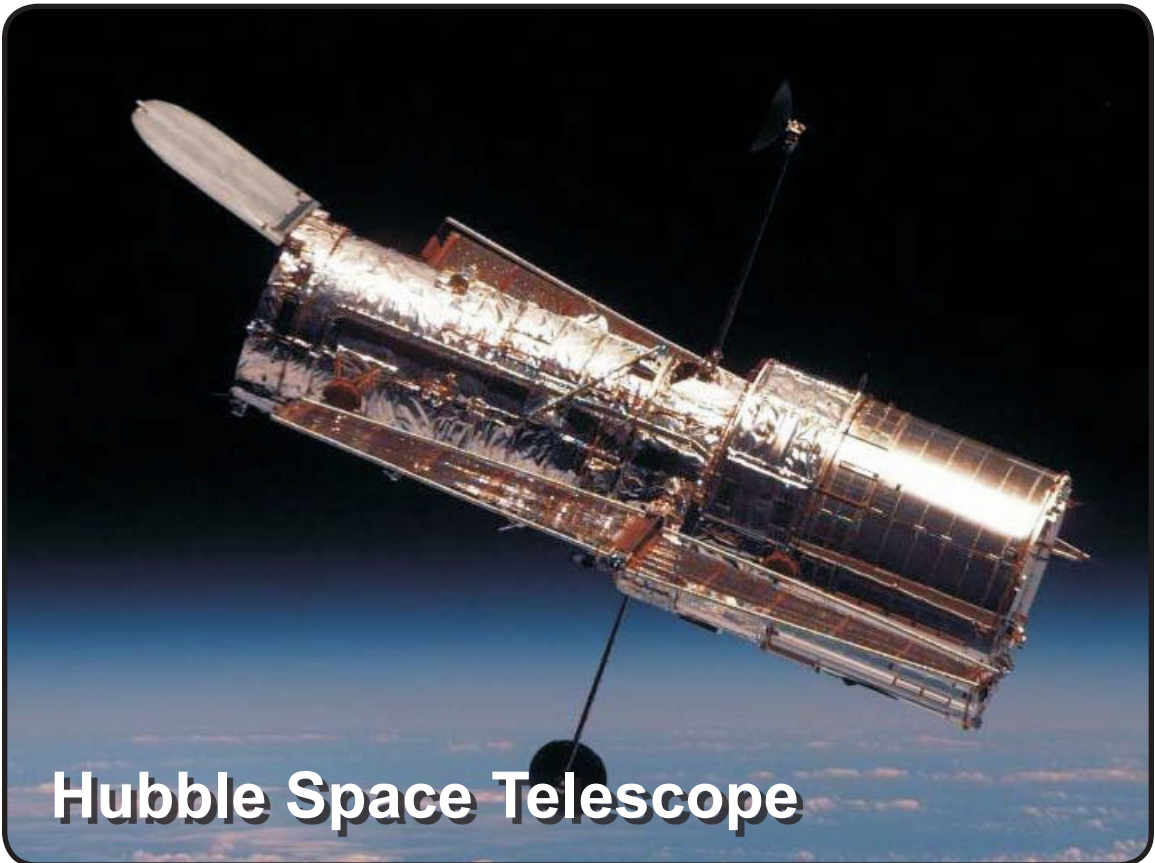
**Soaring Eagle**



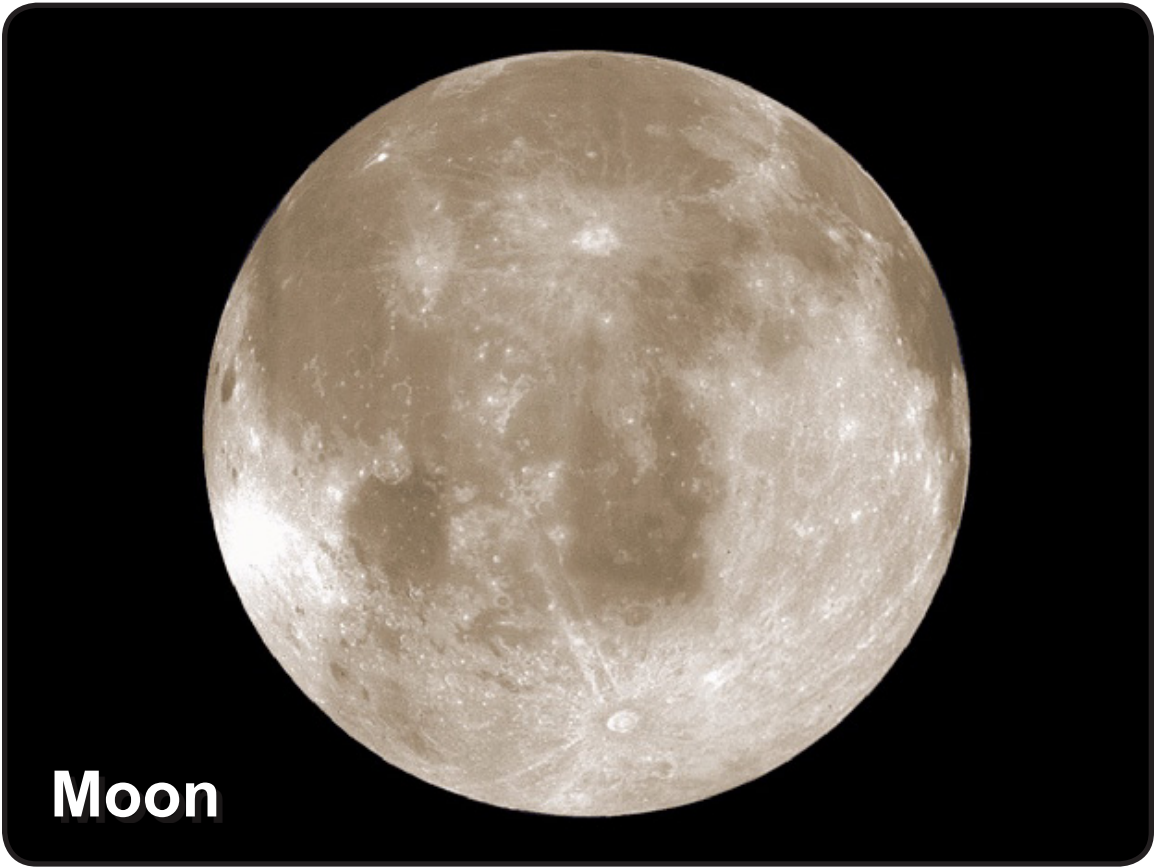
**Jet Airplane** At Cruising Altitude



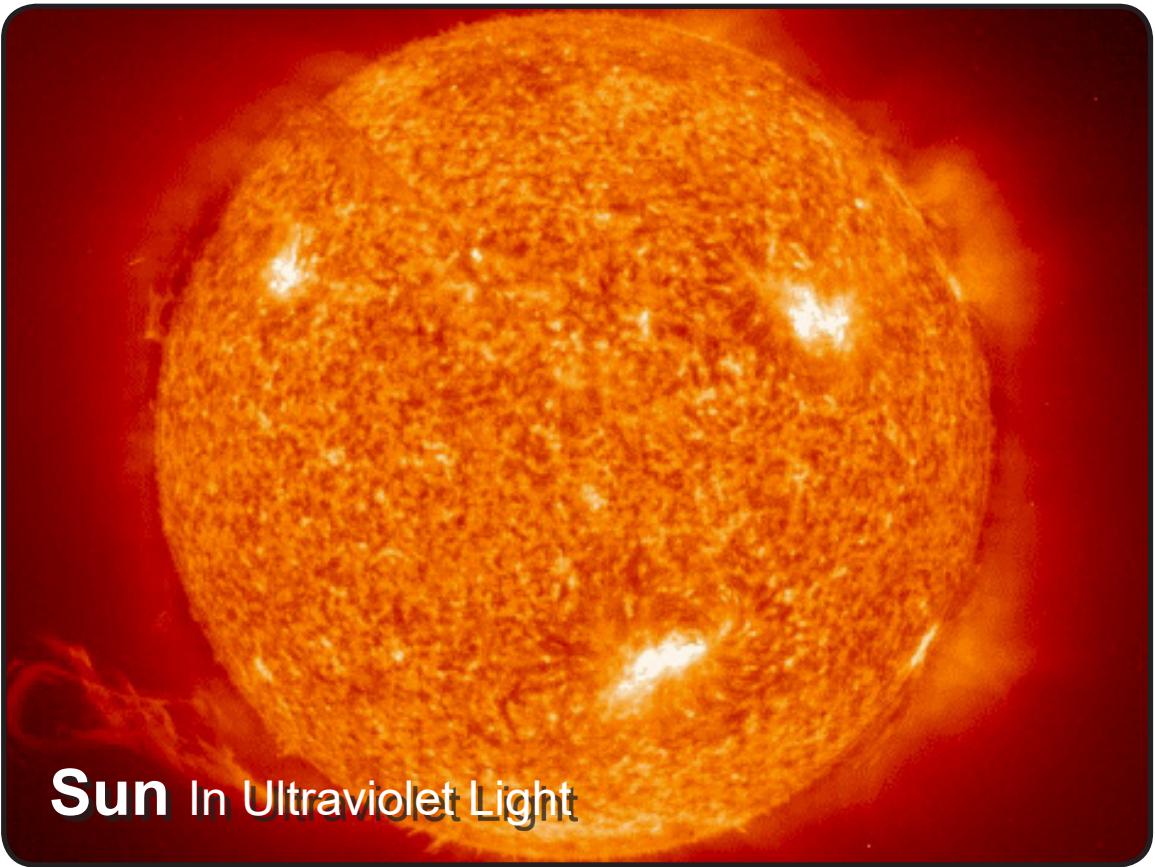
**Aurora** Northern Lights



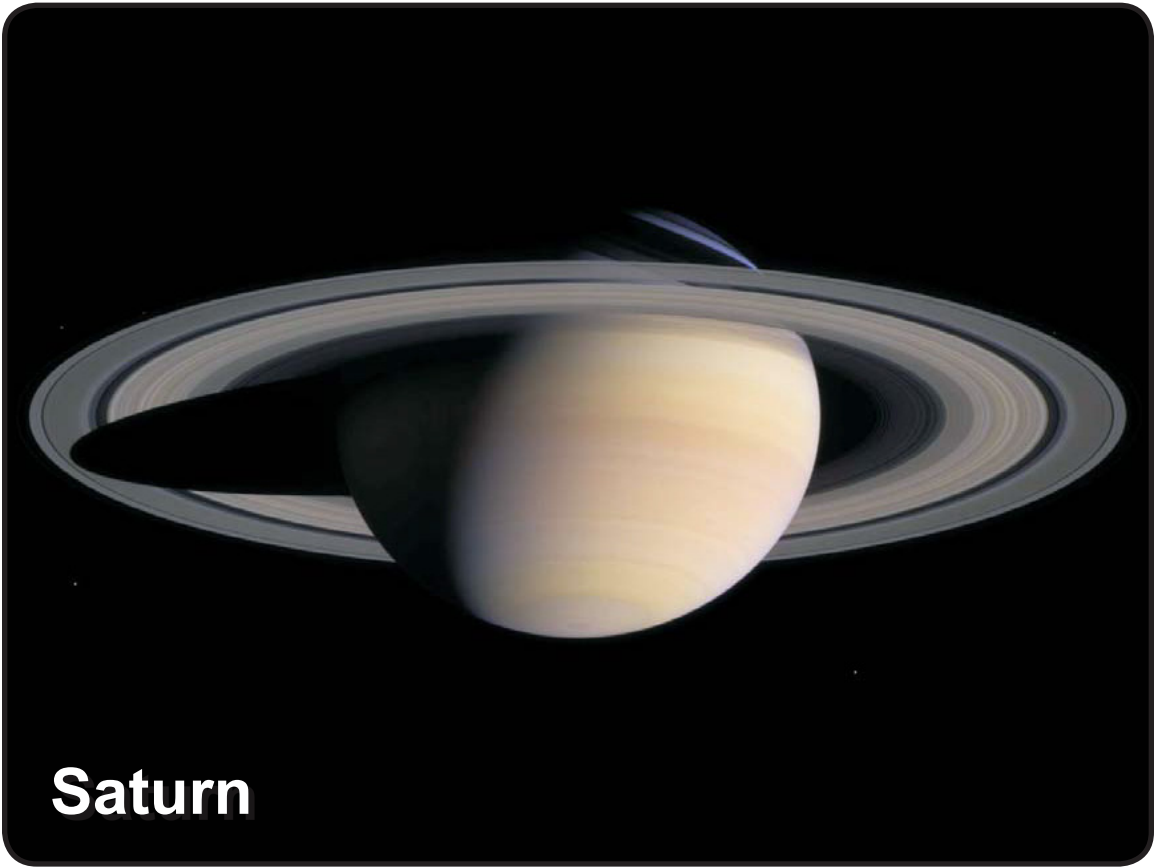
**Hubble Space Telescope**



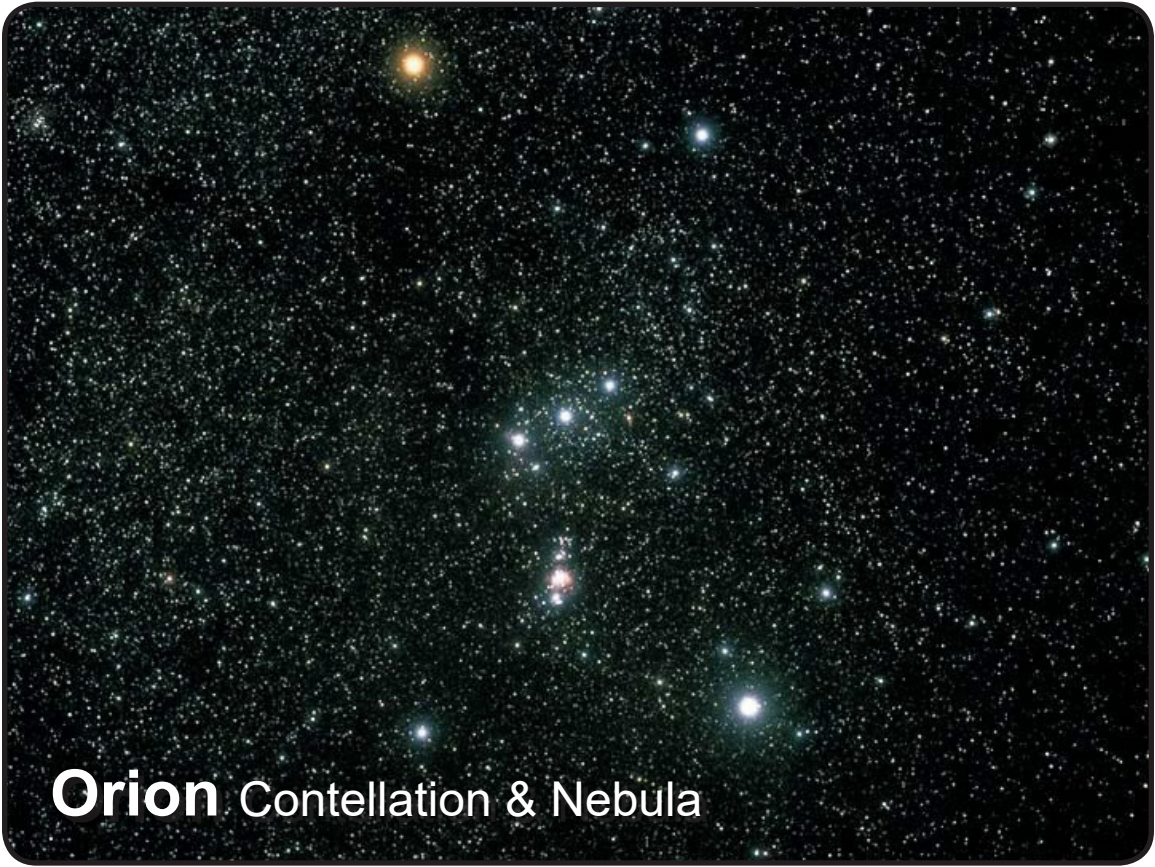
**Moon**



**Sun** In Ultraviolet Light



**Saturn**



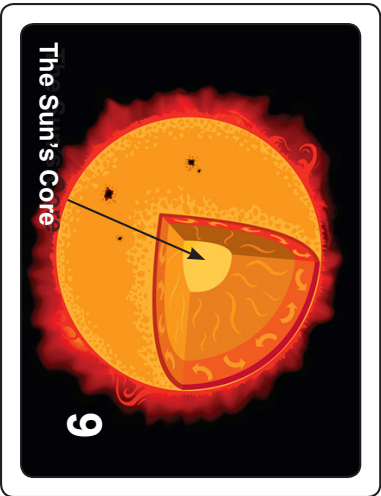
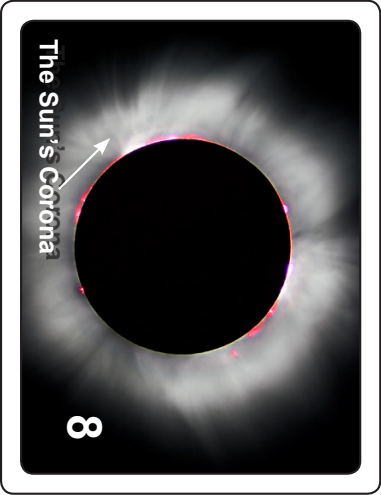
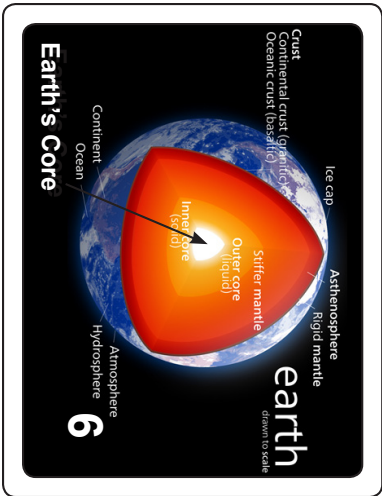
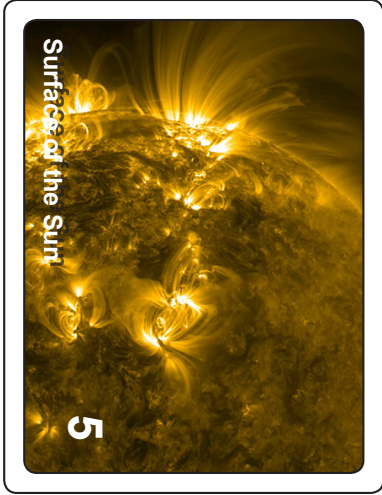
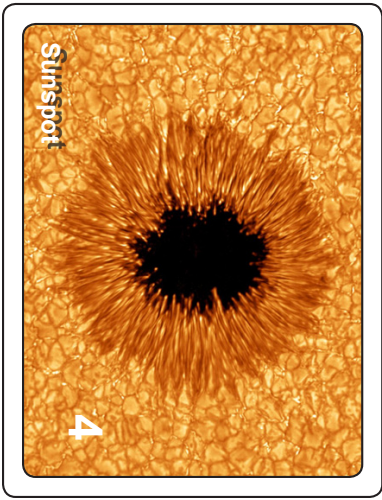
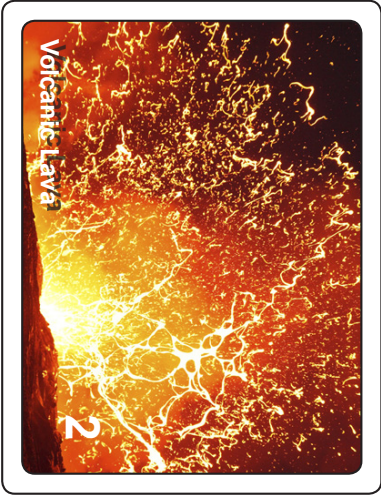
**Orion** Contellation & Nebula

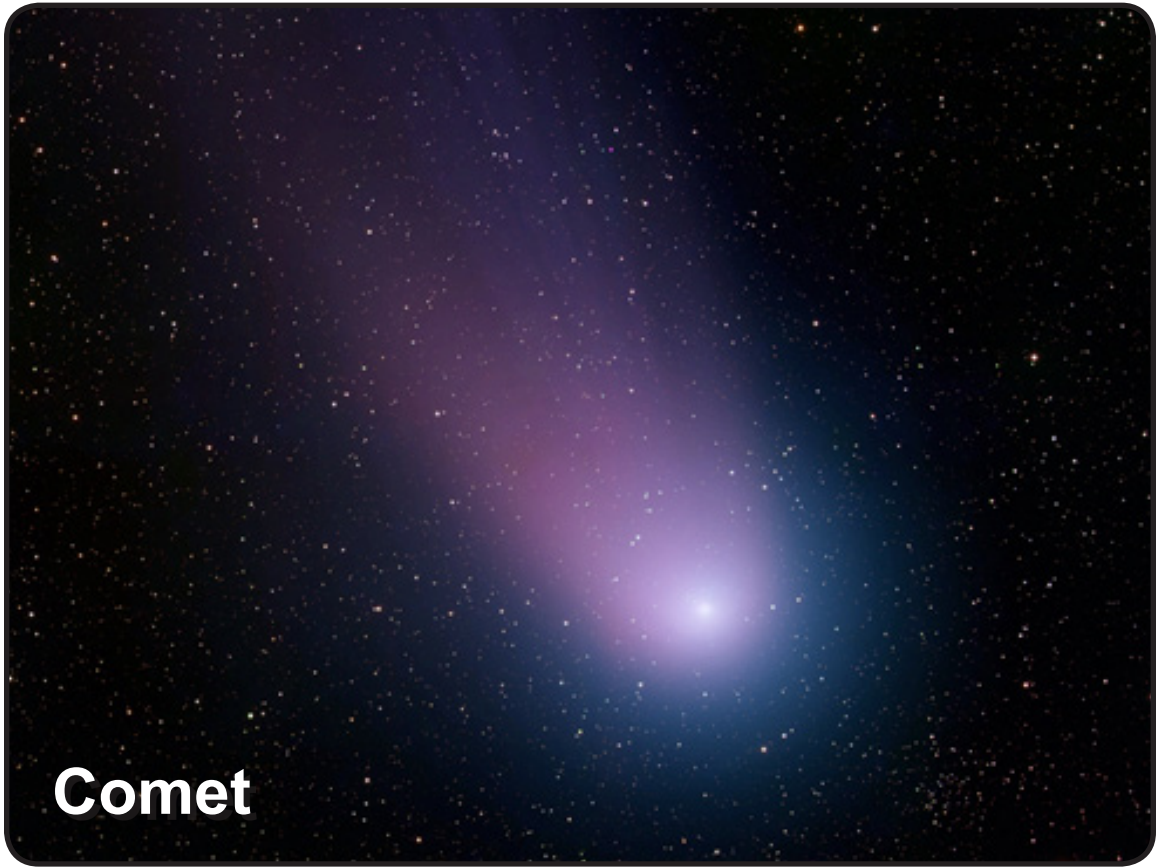




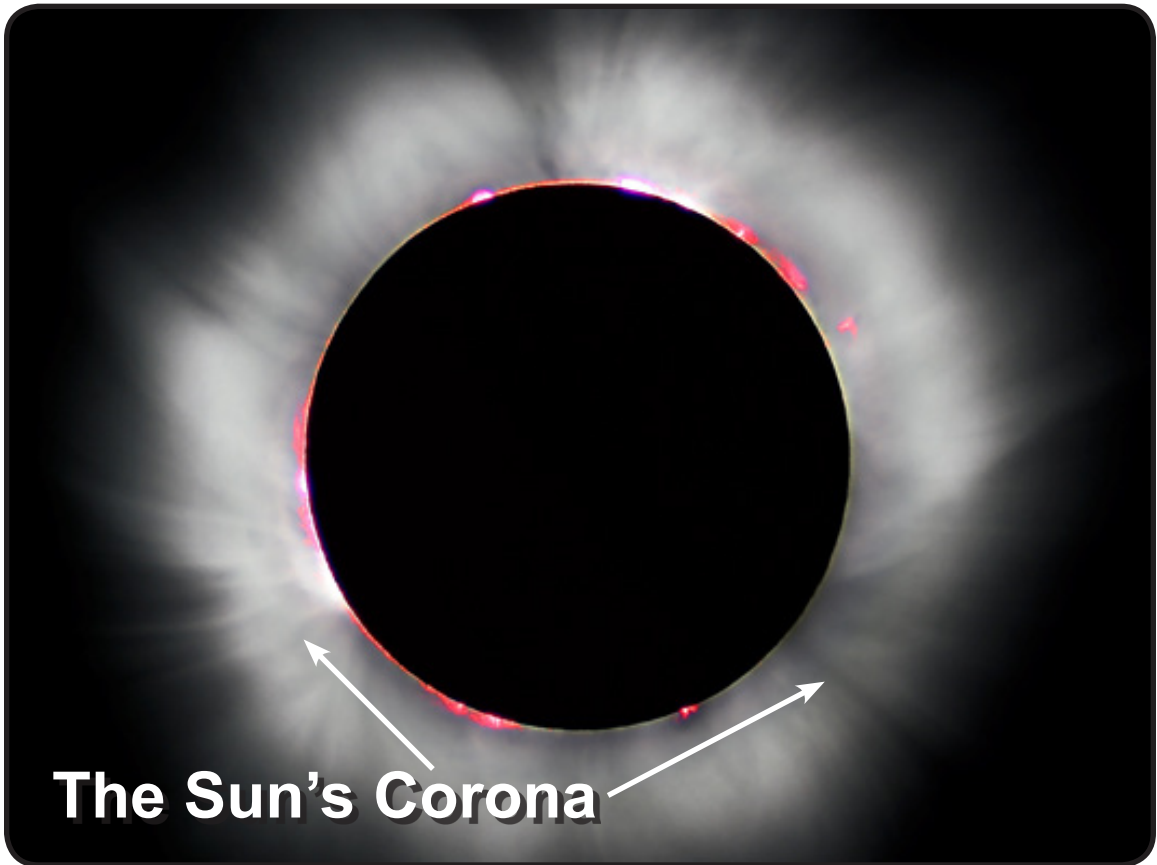
**Andromeda Galaxy**

# Sorting Game Cards - How Hot?

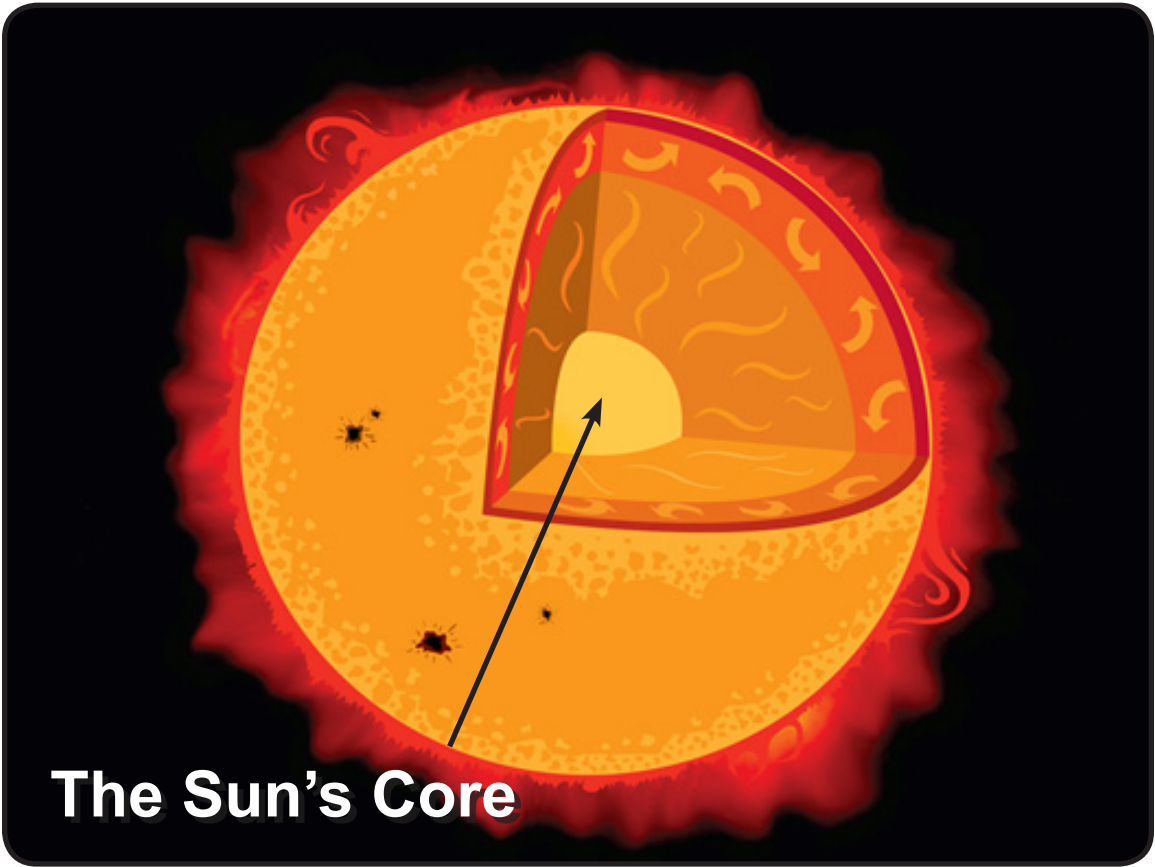




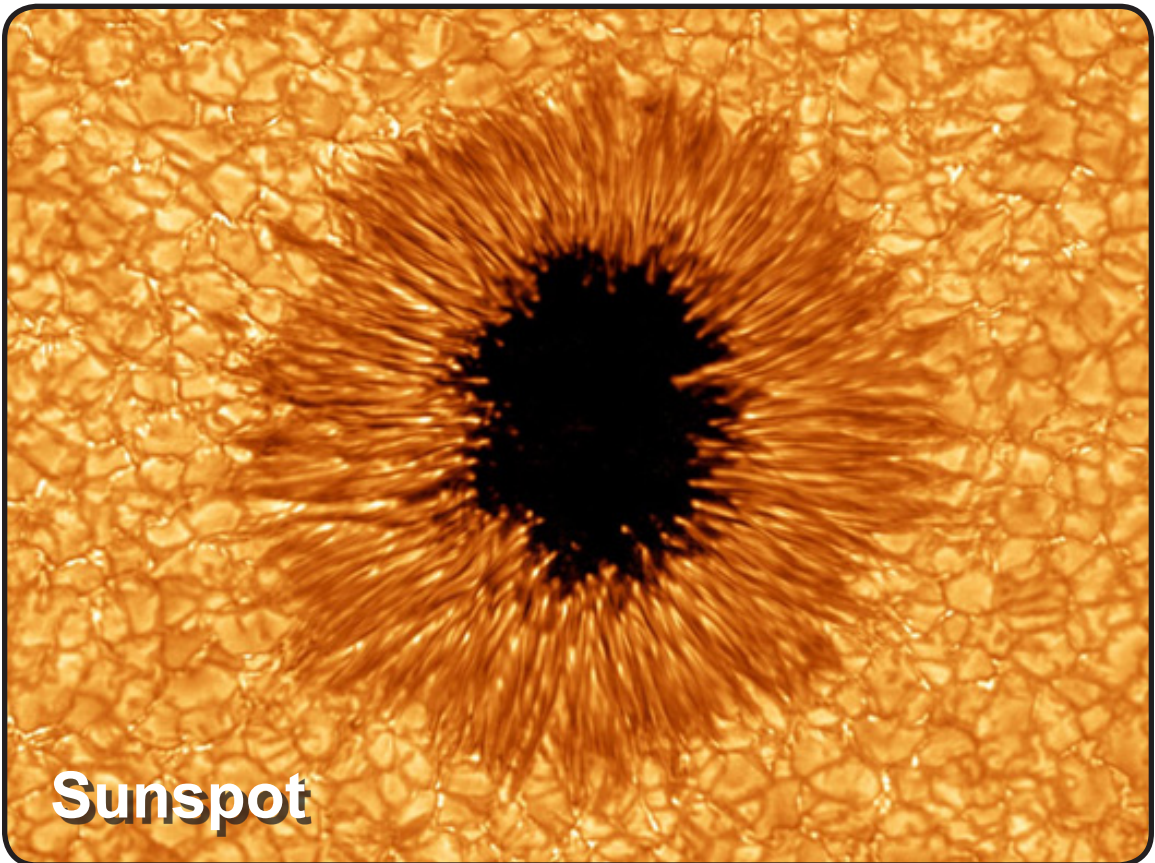
**Comet**



**The Sun's Corona**



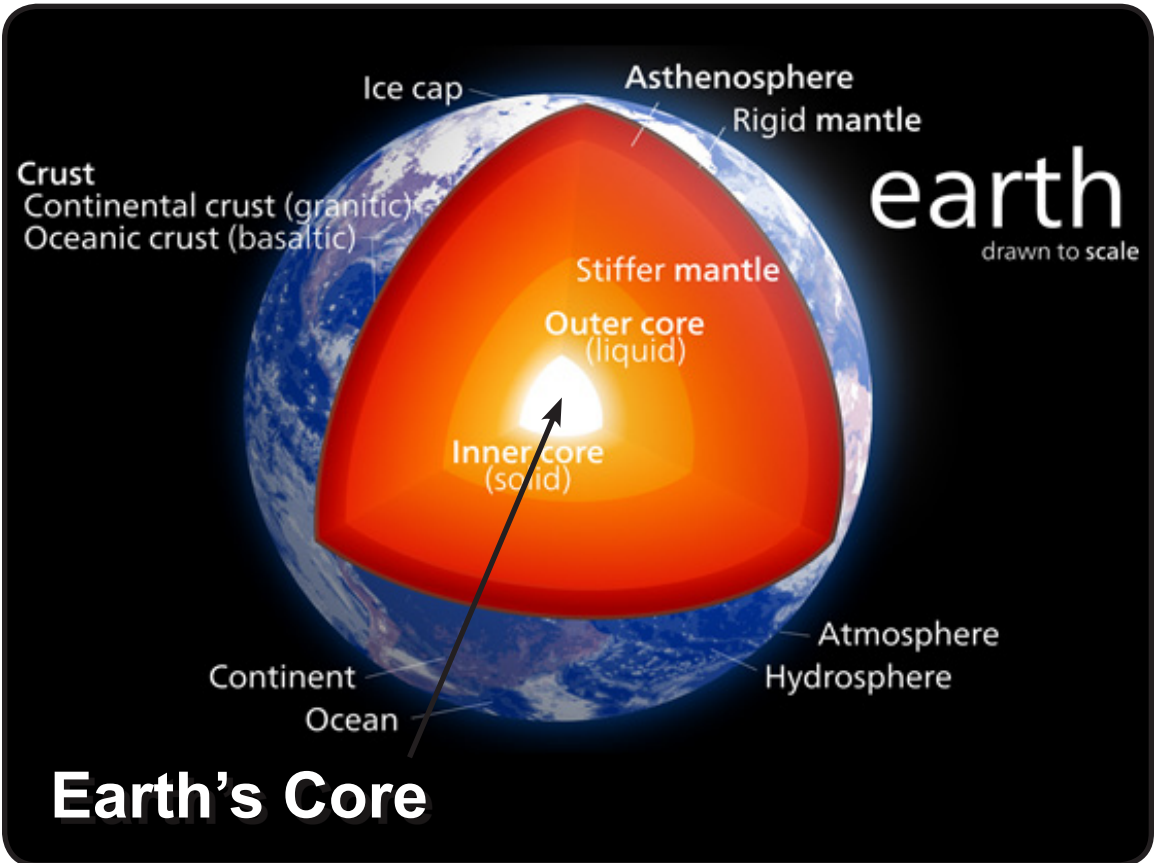
**The Sun's Core**



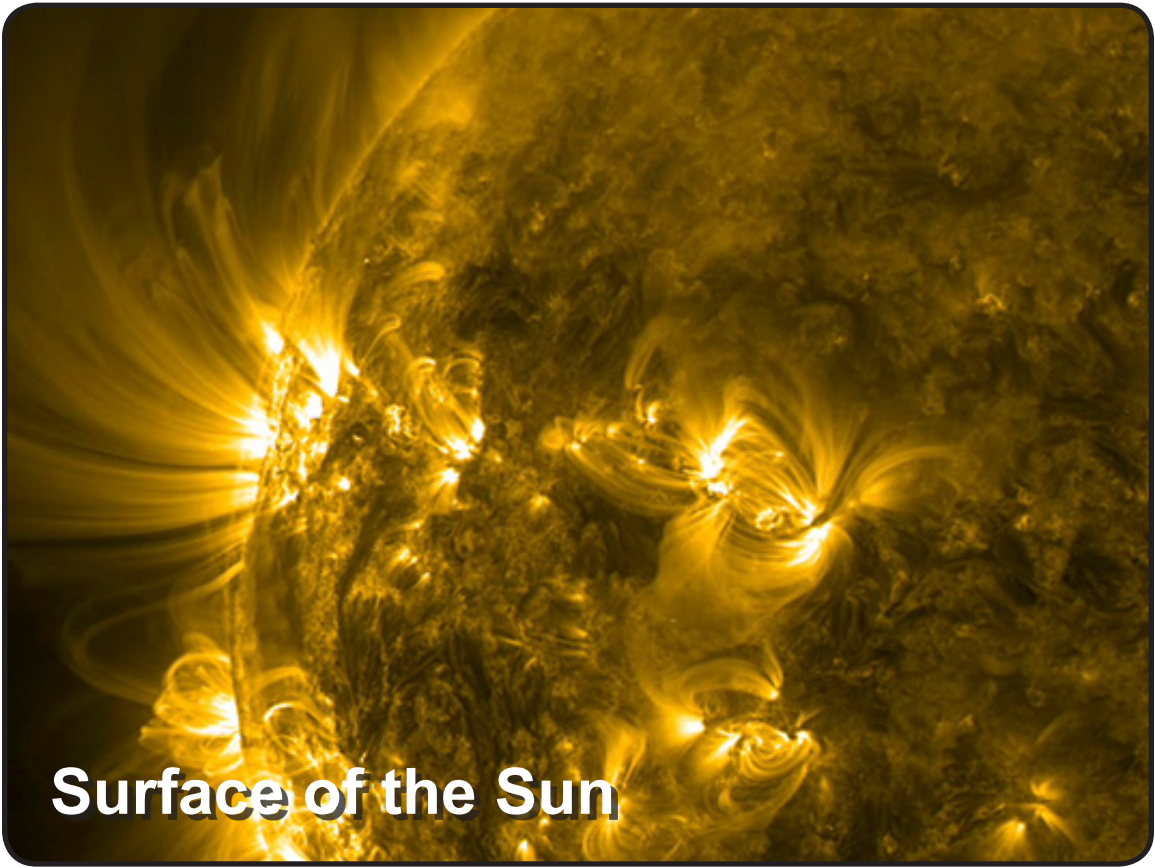
**Sunspot**



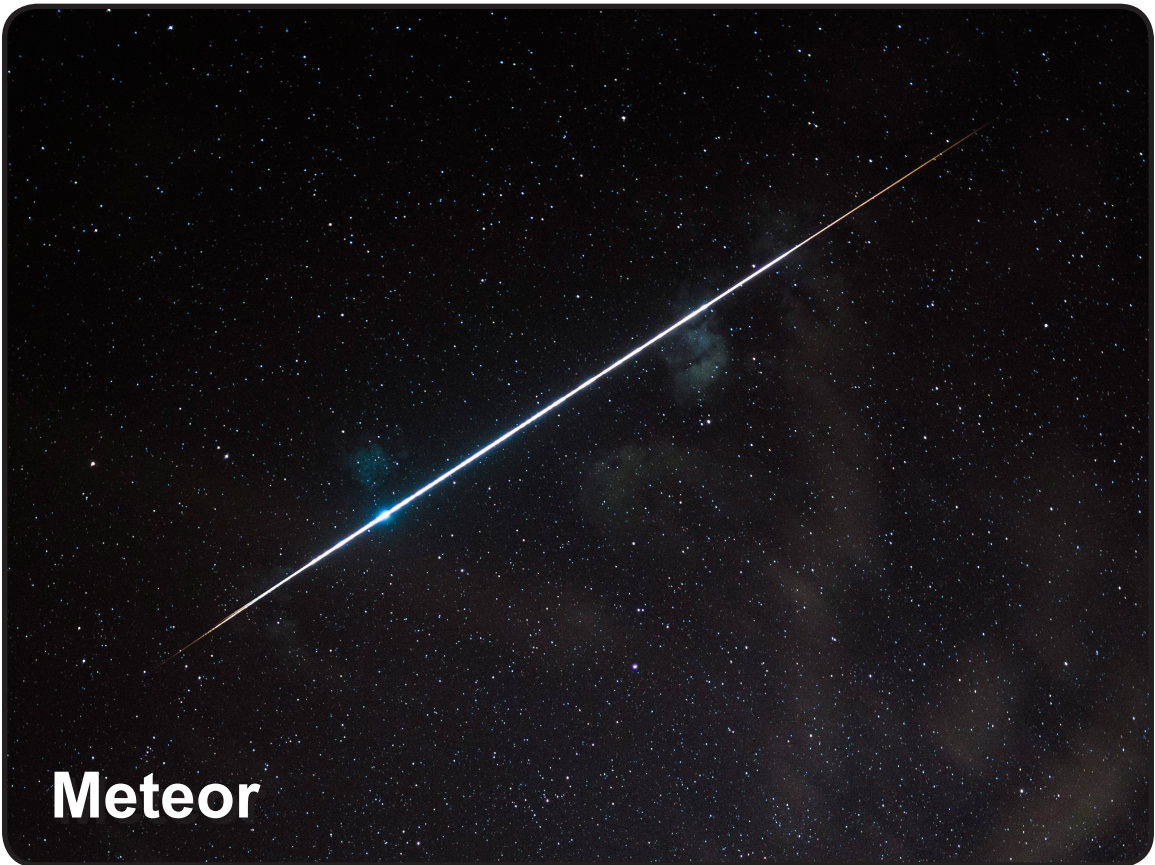
**Lightning**



**Earth's Core**



**Surface of the Sun**



**Meteor**



**Volcanic Lava**