PROFESSOR SMARTT'S GUIDE TO THE UNIVERSE

Presented by smartt science

Photo: NASA/Wikimedia commons

LESSON 1
OUR SOLAR SYSTEM: AN INTRODUCTION

Our solar system is made up of:

- The Sun
- 4 rocky planets (including the Earth)
- 4 gas and ice giants
- At least 5 known dwarf planets, though there could be as many as 200
- Countless asteroids and comets

ROCKY PLANETS

The four innermost planets of our solar system are made up of ice and rock.

Our planet, Earth, is the largest of them.

NASA/Lunar and Planetary Institute

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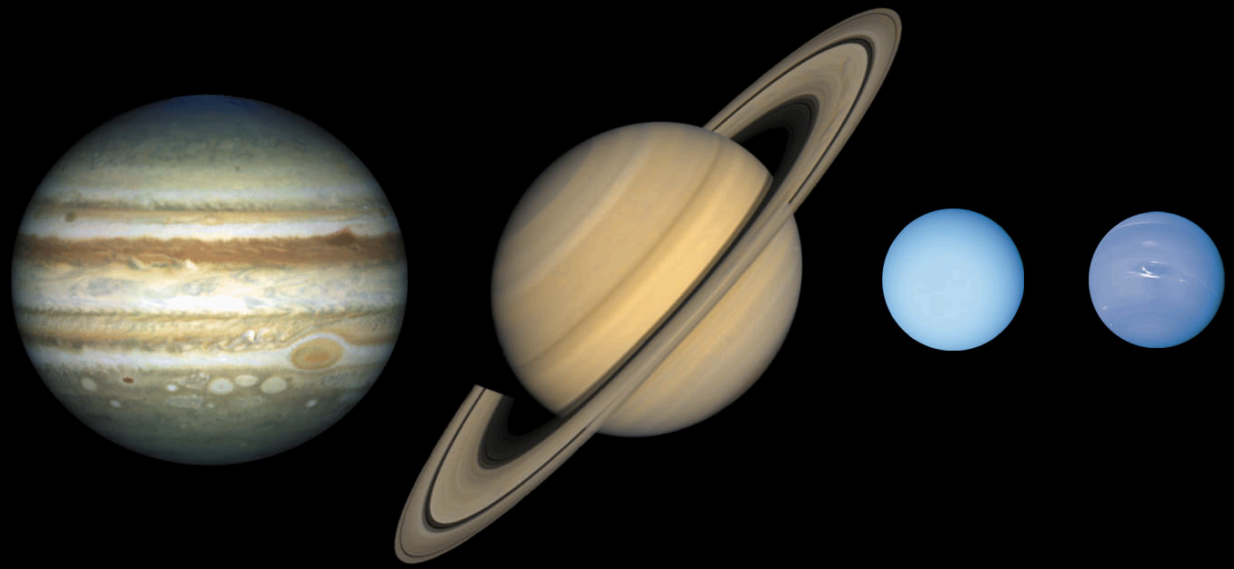
THE GAS GIANTS AND THE ICE GIANTS

Jupiter and Saturn are the Gas Giants mostly made of hydrogen and helium gas with a rocky or metallic core.

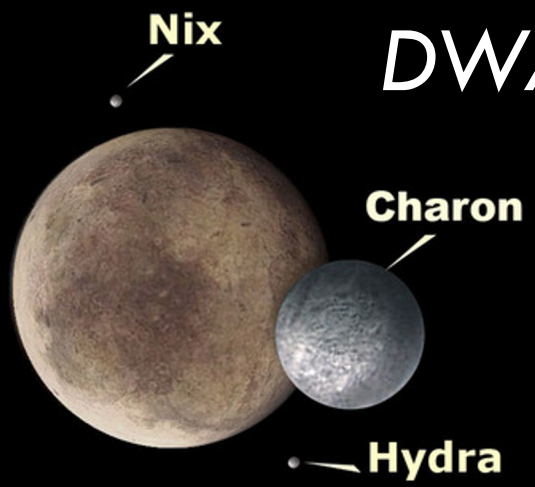


NASA/Lunar and Planetary Institute

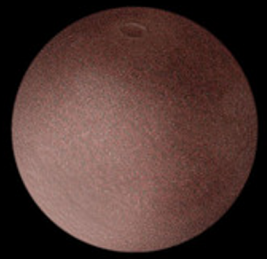
Uranus and Neptune are also made of gas with a rocky core. They are called the Ice Giants as the gas is mostly very cold methane and ammonia.

DWARF PLANETS

Eris

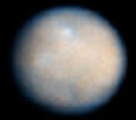


Pluto



Makemake

Haumea



Ceres

There are lots of small celestial bodies in our solar system, too small to be classified as planets.

These are called **Dwarf Planets**.

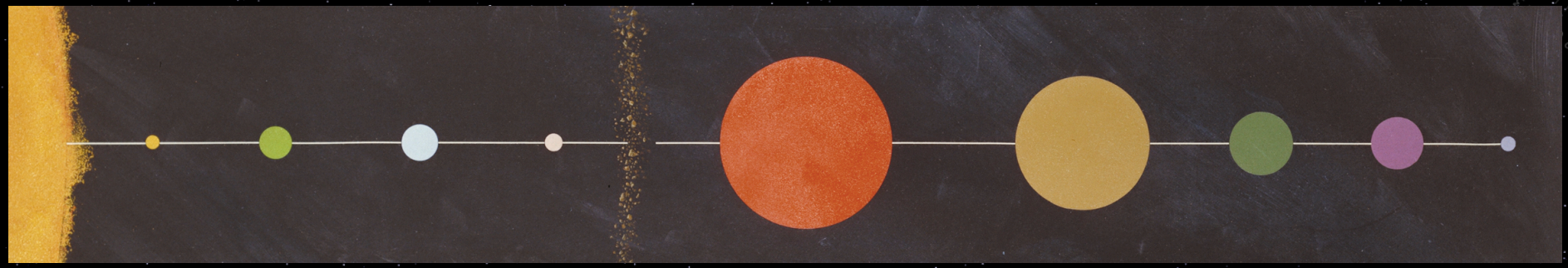
We'll learn a lot more about these strange objects in future lessons.

Image Credit: Nasa

SOLAR SYSTEM MNEMONICS

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.

- My Violent Evil Monster Just Scared Us Nuts
- My Very Educated Mother Just Served Us Nachos



Solar system artwork. NASA ID number AC72-1279.

<u>Before and after Pluto was demoted:</u>

- My Very Easy Memory Jingle Seems Useful Naming Planets
- My Very Easy Memory Jingle Seems Useless Now

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ACTIVITY

Label the planets on your worksheets

Feel free to print out this activity!

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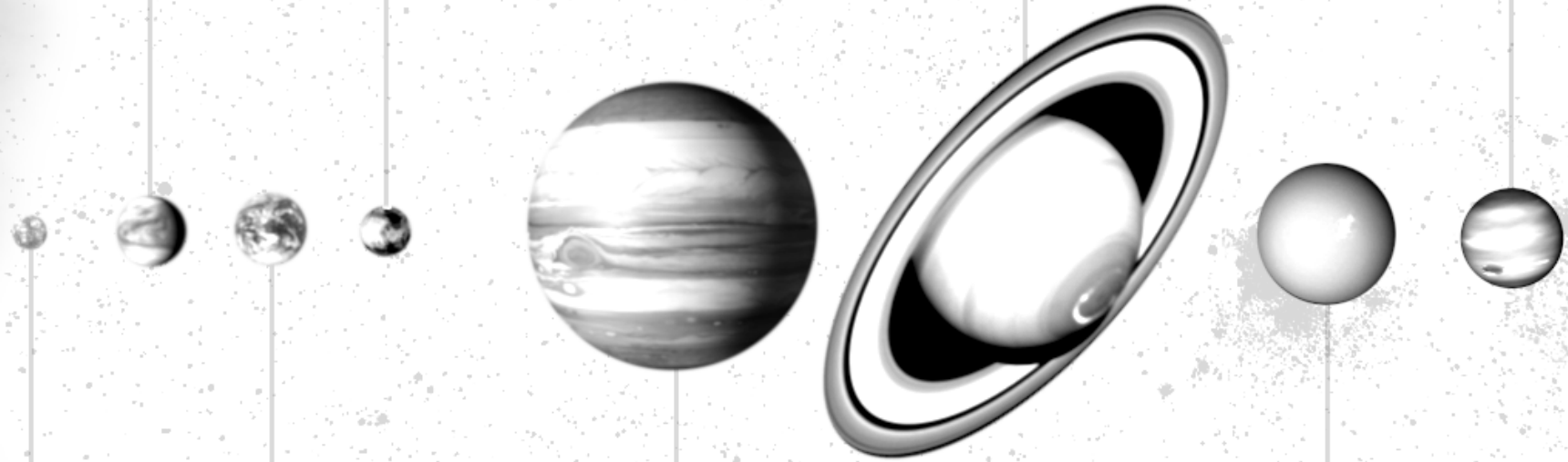
NAME THE PLANETS

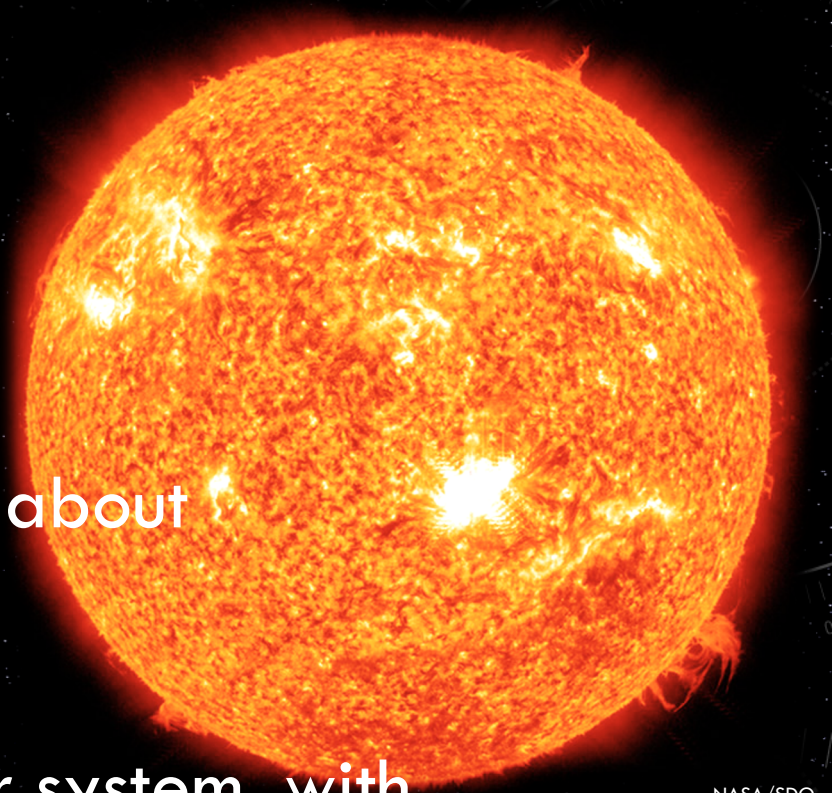


1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Bonus Activity:

Make up your own solar system mnemonic

THE SUN



NASA/SDO

- The Sun is a burning ball of hydrogen and helium, about 15million ℃ at its core.
- The surface is 5500 ℃.
- The sun makes up 99.86% of the mass of our solar system, with most of the remaining 0.14% made up by the two gas giants, Jupiter and Saturn.
- You could fit 1.3 million Earths inside the Sun.
- Just as we rotate around the Sun, the Sun orbits the centre of our own galaxy, **The Milky Way.**

While The Sun is inconceivably huge, it is really only an average-sized star, minute in comparison to red giants such as Arcturus. There are even bigger stars called supergiants which are 30 times bigger than Arcturus !

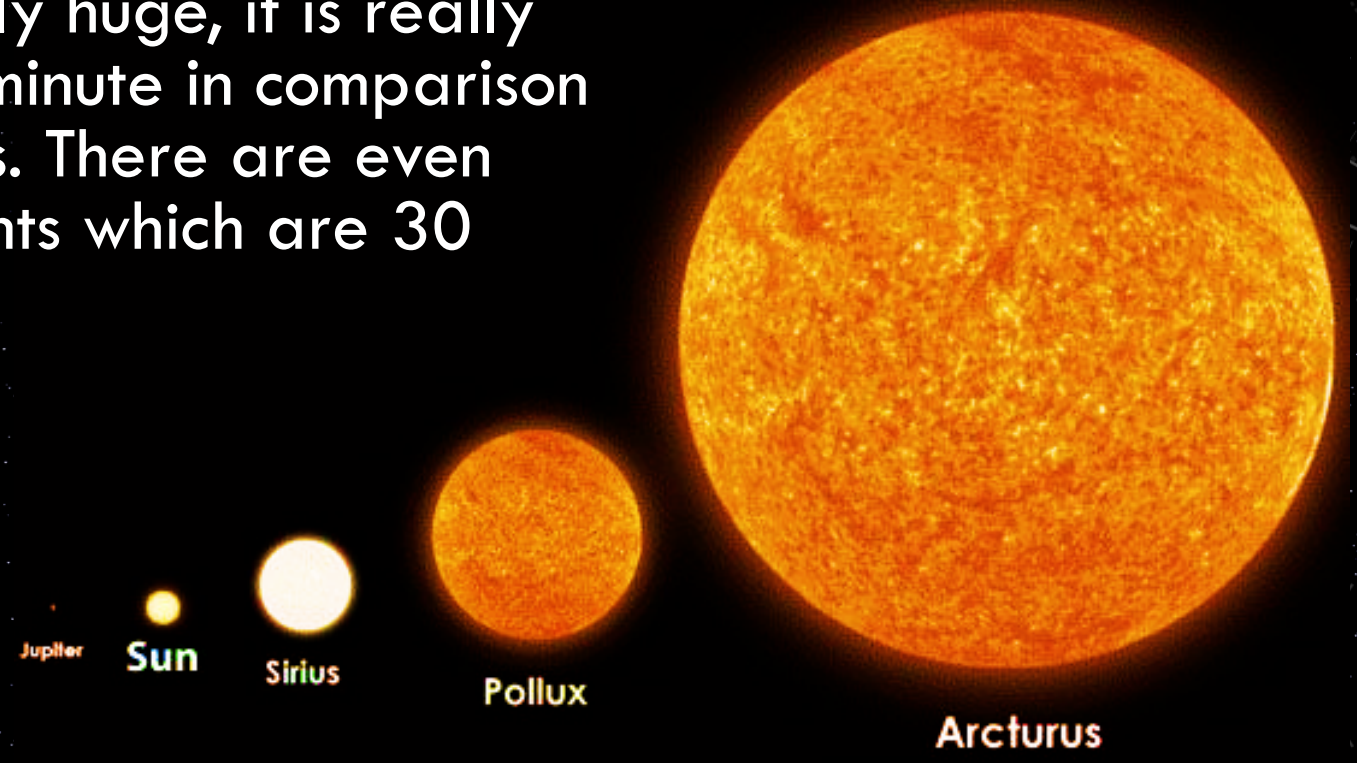


Image Credit: universetoday.com

SOLAR FLARES

- Solar flares are huge bursts of magnetic energy from the sun that occur during **magnetic storms on the Sun.**
- They can affect Earth's magnetic field.
- The largest one that hit Earth was in 1859. Known as the **Carrington Event,** this geomagnetic storm produced Auroras around the world. Those over the Rocky Mountains in the U.S. were so bright that the glow woke gold miners, who began preparing breakfast because they thought it was morning. Telegraph systems failed. Some operators received electric shocks while some telegraph pylons produced sparks.

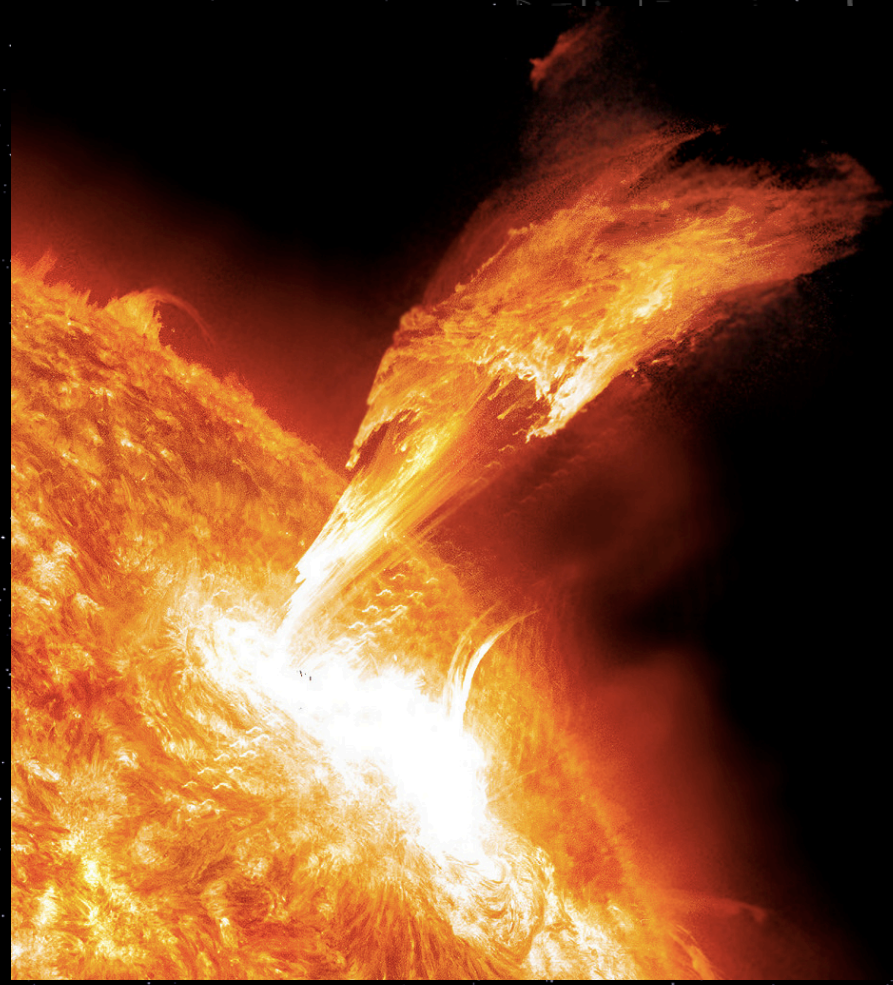


Image credit: NASA/SDO

ACTIVITY

Fill in the question sheet

(Answers can be found at the end)

Our Solar System

1. *What is the closest planet to the Sun?*
    a. Mars
    b. Jupiter
    c. Mercury

2. *How many Earths could you fit inside the Sun?*
    a. 13
    b. 1300
    c. 1.3 million

3. *What is the farthest planet from the Sun?*
    a. Neptune
    b. Saturn
    c. Earth

4. *Tick the two main gases inside the Sun.*
    - Oxygen
    - Hydrogen
    - Nitrogen
    - Helium

5. *Compared to all the stars in the sky, which of these statements best describes the Sun?*
    a. One of the biggest stars
    b. One of the smallest stars
    c. An average sized star

6. *What is the name of our galaxy?*
    a. The Silky Bay
    b. The Milky Way
    c. The Mars Bar

7. *What is a solar flare?*
    a. A burst of magnetic energy
    b. A meteor
    c. An explosion on earth

8. *What temperature is the surface of the sun?*
    a. 150 ℃
    b. 1000 ℃
    c. 5500 ℃

9. *The temperature of the Sun's core is:*
    a. 150 ℃
    b. 15 000 ℃
    c. 15 million ℃

10. *Which type of object is the most numerous in our solar system?*
    a. Stars
    b. Planets
    c. Dwarf Planets
    d. Asteroids

Score: /10

BONUS ACTIVITY

As a class, come up with some questions about the solar system and tweet them to Professor Smartt.

@smarttscience

smartt science

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Our Solar System

Lesson 1 – Extra Advanced activity

Here are the sizes of the planets. These values are the radius of each of the planets in kilometres (all rounded to 2 significant figures)

Jupiter 70,000 km
Saturn 58,000 km
Uranus 26,000 km
Neptune 25,000 km
Earth 6400 km
Venus 6000 km
Mars 3400 km
Mercury 2400 km

Option 1

Make a drawing of each of the planets to scale to show their difference sizes. You can paint, colour and bring the planets to life to make a wall display.

For example, start with an A3 sheet of paper and make a circular Jupiter with a diameter of 28 cm (or radius 14 cm). You can do this with a drawing pin, a pencil and string with length of the radius of the circle.

Now work out what the relative size of the other planets are compared with Jupiter. Draw them on this sheet or make them from other sheets of paper (you'll need to work out what paper size you need) and compare their sizes.

Aim to make a montage for wall display.

Hint - if Jupiter has a diameter of 28cm, then relatively speaking, Mercury will be tiny! But how big exactly is down to you to work out.

Option 2

Instead of making a drawing/painting of the planets, identify objects that have the correct relative size to make a model solar system.

Examples could be to combine balls (core-exercise ball, beach ball, basket ball, tennis balls, ping pong balls) with fruit (oranges, mandarins, grapes, blueberries) or anything else you can find that is (roughly) spherical. Start with the biggest spherical object you can lay your hands on and work down. You might want to identify the things first and make a list with what you think their sizes are, then collect them from around the school (or home for next day) and see how close you can get.

Teachers' notes

Here are the sizes they should be aiming at if they make Jupiter on an A3 sheet with 14cm radius.

Planet	Actual size (radius)	Relative radius in cm (if Jupiter is set at a radius of 14 cm to fit on an A3 sheet)
Jupiter	70,000 km	14.0
Saturn	58,000 km	11.6
Uranus	26,000 km	5.2
Neptune	25,000 km	5.0
Earth	6400 km	1.3
Venus	6000 km	1.2
Mars	3400 km	0.7
Mercury	2400 km	0.5

And if you just want the relative sizes, where Jupiter is 100% then here you go.

Planet	Actual size (radius)	Relative size (Jupiter = 100%)
Jupiter	70,000 km	100%
Saturn	58,000 km	83%
Uranus	26,000 km	37%
Neptune	25,000 km	36%
Earth	6400 km	9%
Venus	6000 km	8.6%
Mars	3400 km	5%
Mercury	2400 km	3%

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