What's Going On?

Checking In

Minds on Mapping My Universe

Action! A Journey Through the Galaxy

Consolidation How Far?

Learning Goal - I will be able to represent distances in space.

Minds on

My Universe

On the sheet of paper I've given you, please draw a "Map of the Universe".

The diagram will not be to scale (obviously)

You should

- brainstorm a list of **all** of the different kinds of objects you know about in the universe

- arrange your objects in the order that you might encounter them on a trip beginning on earth and going to the depths of the universe

Action!

A Journey Through the Galaxy

Today we will take a journey through the Milky Way Galaxy.

We'll start here on Earth, make our way out through our Solar System and beyond!

But first...

Action!

A Journey Through the Galaxy

A few key terms

- Celestial Objects
  - Planet
  - Asteroid Belt
  - Star
  - Solar System
- Binary System
  - Galaxy
  - Universe

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A Journey Through the Galaxy

A few key terms

Nuclear Fusion
Supernova
Nebula

Astronomical Unit (AU)
Light Year (ly)

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A Journey Through the Galaxy

Looking Back in Time

When you look into space, you are really looking back in ___time___.

This is because the light we are seeing, whether from a star or reflected off a planet or the moon, has travelled through space over great distances and over a period of time to reach our eye.

Light travels at about 300,000,000 m/s or about 300,000 km/s.
This might seem fast, but distances in space are incredibly vast!

Remember from yesterday, the moon is about 384,400 km away. This means that when we look at the moon, we see it as it was around 1.5 seconds ago.

When we look at Jupiter, which is farther away, we see it as it was 45 minutes ago.

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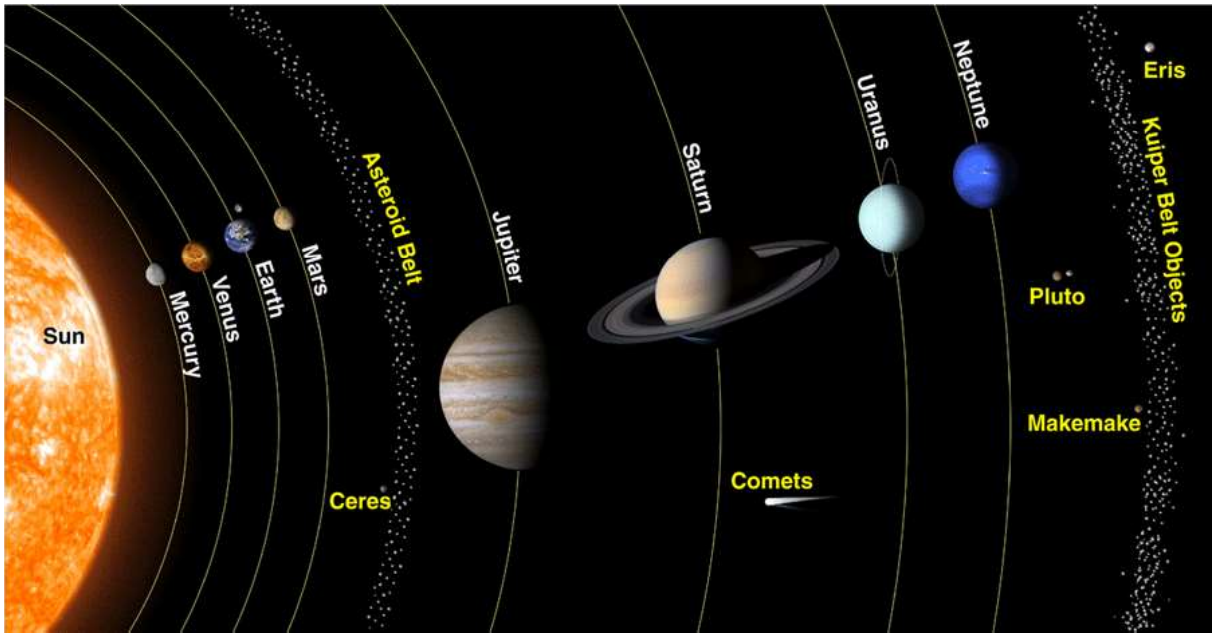
Our Solar System



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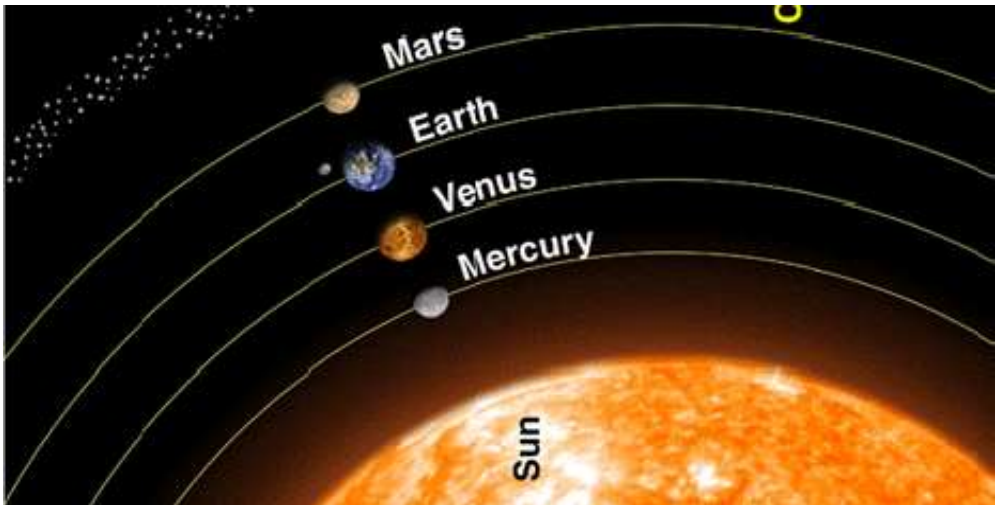
Our Solar System: The Sun and Inner Solar System



At the center of the solar system is the _____ which is a _____.

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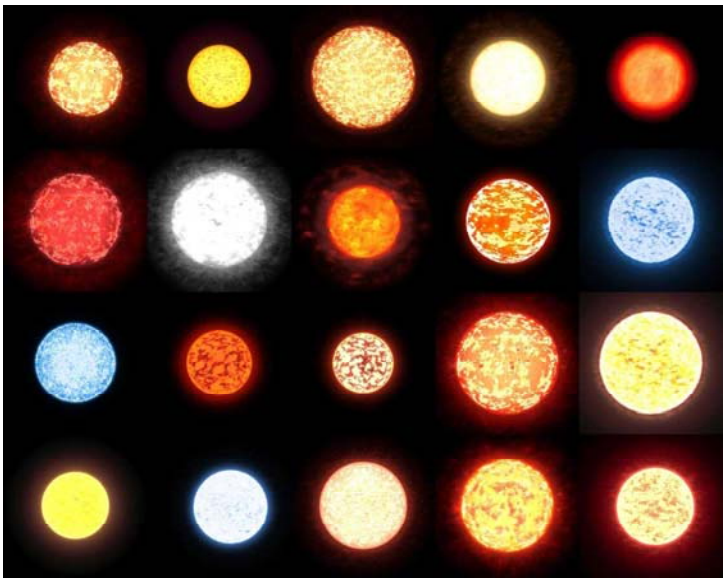
Stars



A star is a hot ball of ___plasma___, an electrically charged gas, that shines because nuclear fusion is taking place at its ___core___.

Nuclear fusion is the process in which the ___nuclei___ of atoms fuse together.

During nuclear fusion, an enormous amount of ___energy___ is released.

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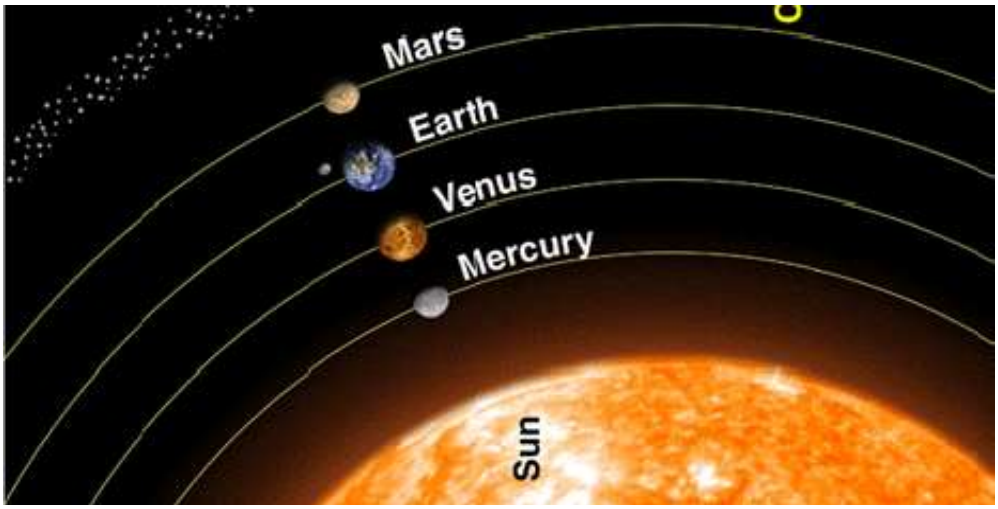
A Journey Through the Galaxy

Our Solar System: The Sun and Inner Solar System



Travelling outward from the sun we pass the four rocky planets.

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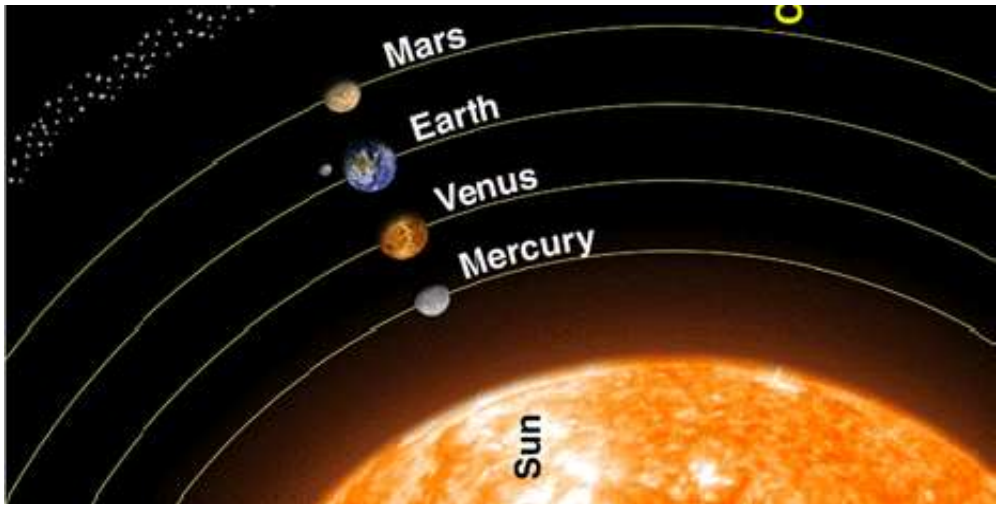
Our Solar System: The Sun and Inner Solar System



Distances in the Inner Solar System, though vast, can still be measured in kilometers. However, it is often useful to use ___scientific___ ___notation___.

Action!

Whiteboards!

Scientific Notation

7
11
12

363,450,000,000 11

3.6×10

365,492,636,132,057

3.7×10^{14}

199,000,000,055,000,050

2.0×10^{17}

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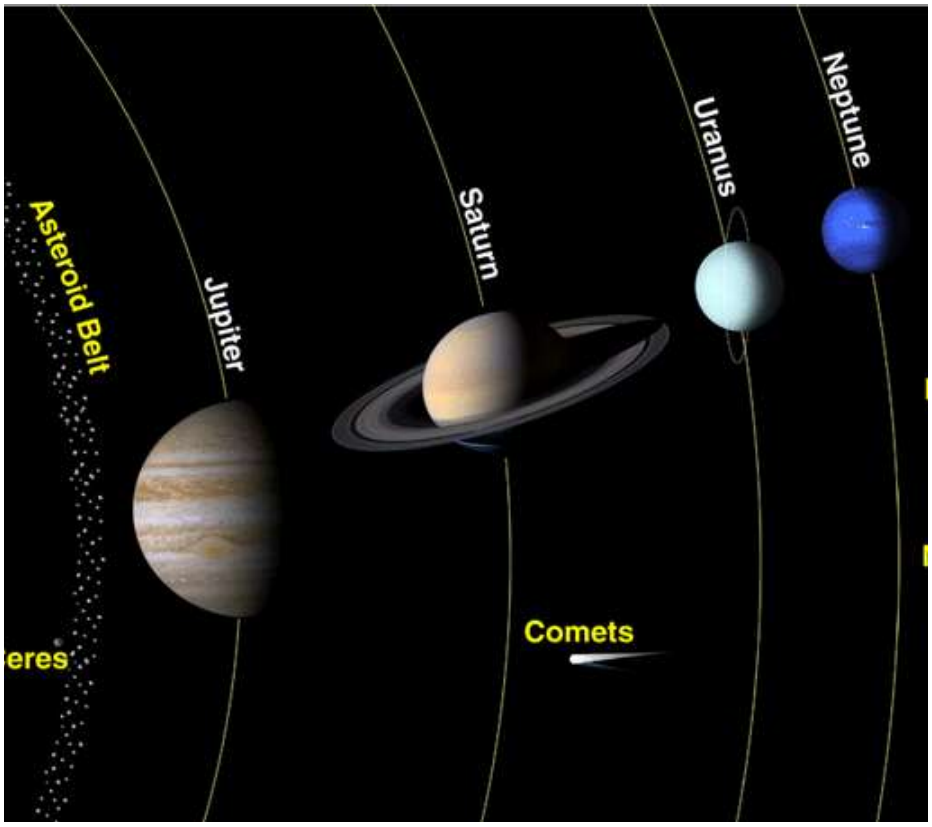
A Journey Through the Galaxy

Our Solar System: The Outer Solar System

Travelling outward from Mars we reach the asteroid belt as well as the four gas giants.



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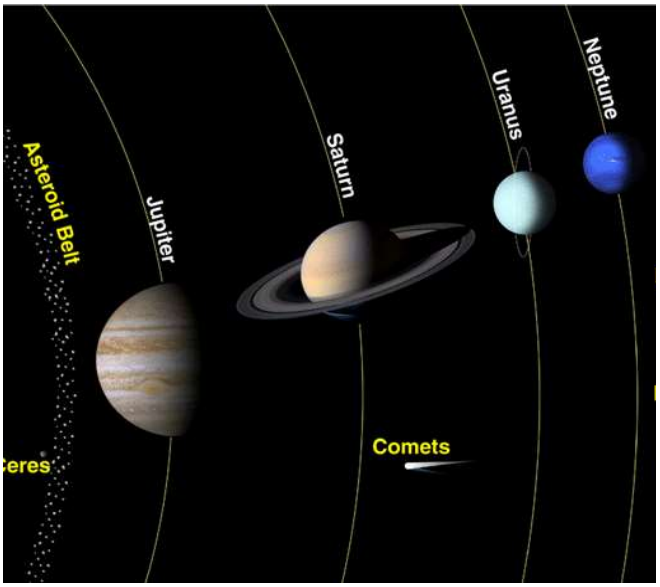
A Journey Through the Galaxy

Our Solar System: The Outer Solar System



As we enter the *outer* solar system, distances become so vast that even scientific notation won't do!

At this point, we turn to astronomical units.

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Astronomical Units

An astronomical unit is the average distance from the Earth to the Sun. This distance is 149,600,000 km.

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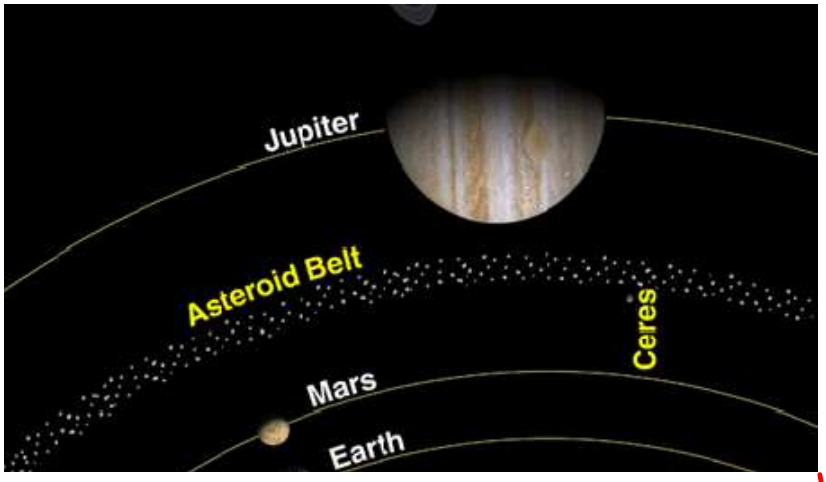
Our Solar System: The Outer Solar System

The Asteroid Belt



Located between Mars and Jupiter, the asteroid belt is a region of rocky debris that forms a ring around the Sun at a distance of about 3 AU.

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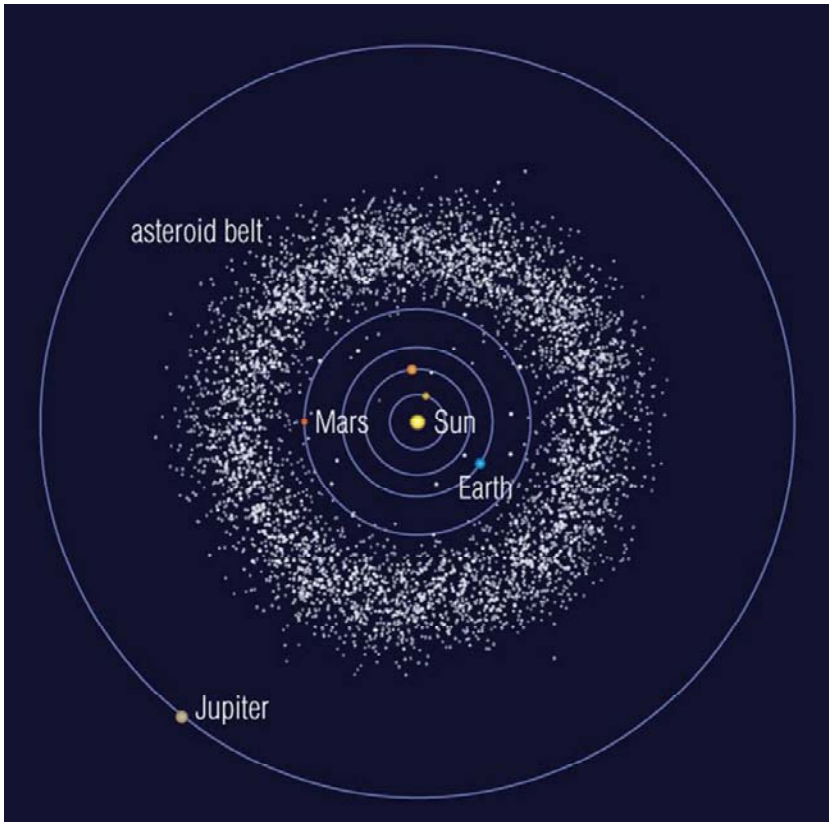
Our Solar System: The Outer Solar System

The Asteroid Belt

The asteroid belt contains billions of pieces of rock. These pieces range in size from that of a grain of sand to more than 1000 km across.



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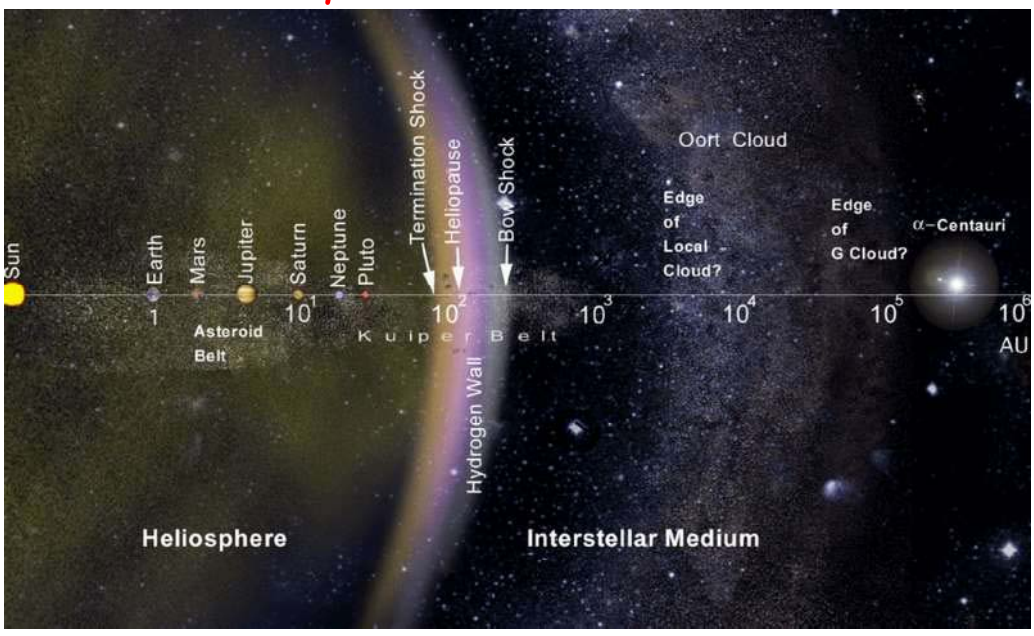
Beyond Our Solar System

As we leave our solar system we find ourselves among the stars. The first one we come to (Proxima Centauri) is about 272,000 AU away. Interestingly, it is not the brightest!

You can imagine that at this point, even Astronomical Units won't do! So we use light years.



Action!

A Journey Through the Galaxy

Light Years

A light year is the distance that light travels in one year.

One light year is equal to 63,240 or 63,000 AU or 9.5×10^{12} km.

9 500 000 000 000

9.5 T km

Action!

A Journey Through the Galaxy

Beyond our Solar System

As we continue to travel deeper into space, we would come across more and more stars and we would notice that over half of the Solar/star systems we come across are binary systems, meaning they are systems with two stars.

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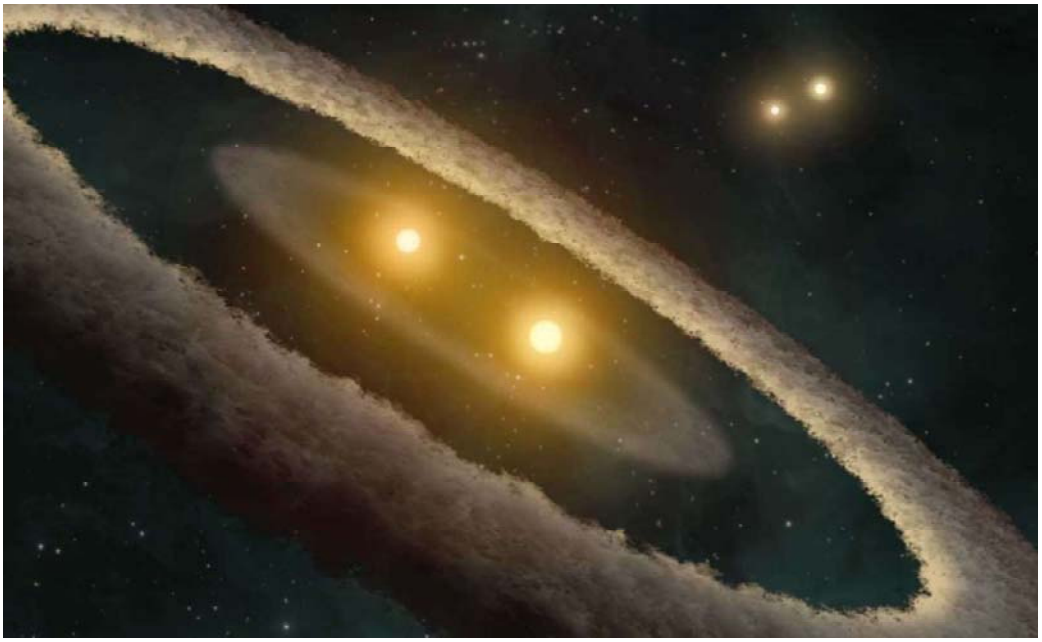
A Journey Through the Galaxy

Binary Systems

If the stars of a system are close enough together, it might be possible for planets to orbit around both of them.



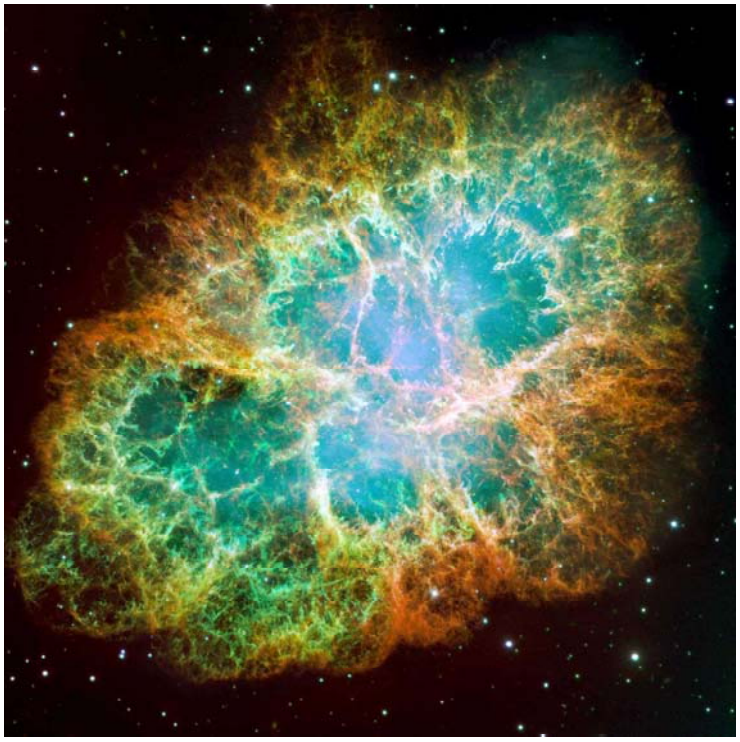
Action!

A Journey Through the Galaxy

Exploding Stars

On our journey, we may even be lucky enough to see a star explode! This is called a

Supernova.



Action!

A Journey Through the Galaxy

Supernova

Though a star may exist for millions or even billions of years, they can suddenly come to an end in just a few minutes. The gradual build up of heavy elements in the star's core causes the core to explode. This also causes the outer layers of the star to be pulled into the star by gravity.

Action!

A Journey Through the Galaxy

Exploding Stars

As the star rips apart, debris from the explosion provides the matter for a nebula.

Action!

A Journey Through the Galaxy

Nebula

A nebula is a large cloud of dust and gas. They are often called star nurseries because it is from their dust and gas that stars develop.

Action!

A Journey Through the Galaxy

The Milky Way

And so we finish our journey at the edge of the galaxy. We look back at the Milky Way, an astonishing 100,000 light years across, swirling around a common center.

Consolidation

Homework

1. **Complete your term table.**
2. **Pg. 267: 1, 8, 9, 12**

Attachments

- 1 - Intro to Space - 1 - Contact Opening Scene.mp4
- Intro to Space - The Beginning of the Universe.mp4
- 1 - Intro to Space - 1 - Celestial Objects.mp4
- 1 - Intro to Space - 2 - How Many.mp4
- 1 - Intro to Space - 4 - What Makes a Planet.mp4
- 1 - Z - Intro to Space - How Many Universes.mp4
- A - Intro to Space - 1 - Contact Opening Scene.mp4
- A1 (To the Stars) - Hubble Ultra Deep Field.mp4
- A1 (Our Galaxy) - Light Years.mp4
- A1 (Our Galaxy) - Scientific Notation.mp4
- A1 (Our Galaxy) - Astronomical Units.mp4
- A1 (Our Galaxy) - Light Years 2.mp4