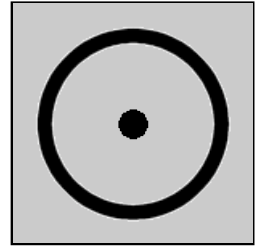


Sun Station

Learn about the formation of the solar system and discover interesting information about the Sun.



Look over the five signs at this station and record several bits of information you find intriguing:

Examine the large model of the Sun:



What characteristics of the model are similar to what you already know about the Sun?



What characteristics of the model do you believe are different than what the Sun is really like?



Pairs Share-Pairs Compare-Numbered Heads Together:

- Find a partner and take turns sharing the information you learned at this station. After sharing, decide on 3 pieces of information you and your partner want to share with other students.
- Find another pair and take turns sharing the 3 pieces of information you and your partner though were interesting.
- As a group of four, choose three of your six pieces of information that you could share with the entire group.
- Make sure everyone on your team is prepared to share an idea from your group. Do not repeat information that has been previously shared by another group.

Count the number of steps you take as you walk from the Sun sign to the Mercury sign. Record that number at the top of the Mercury Traveler's Log page as you arrive.



Welcome to the Anchorage Light Speed Planet Walk

You are about to embark on an incredible journey through space and time. The Anchorage Light Speed Planet Walk displays the Sun and the planets in an accurate scale of both size and distance.

The scale was chosen so that with each step you take, you simulate the distance a light beam travels in one second (300,000 kilometers or 186,000 miles).

Beginning here at the Sun Station, you will learn about the evolution of our solar system and discover fascinating facts about our star, the Sun.

As you navigate the planet stations along 5th Avenue and the Coastal Trail, you will experience the relative sizes and distances of the planets. Each planet station displays facts, images, and a scale model of the planet.

Overview of Our solar system

Our solar system consists of one **star**, nine **planets**, more than 130 **moons**, and millions of **asteroids** and **comets**.

The **inner planets** – **Mercury, Venus, Earth, and Mars** – are the **terrestrial** or **Earth-like** planets. They are small, dense, rocky worlds composed of heavy elements.

The **outer planets** – **Jupiter, Saturn, Uranus, and Neptune** – are the **gas giants**. They are large worlds with no solid surface, composed of the lightest elements, hydrogen and helium.

The **outermost planet, Pluto**, composed mainly of ice, is more comet-like than planet-like.

The **Oort Cloud**, extending to the end of the Sun's gravitational influence, completes our solar system. This vast spherical cloud of millions of comets reaches halfway to the nearest star.



Sun Station

Origin of the Solar System

(a) Five billion years ago, a dark formless nebula floated within a graceful spiral arm of the Milky Way Galaxy. This cloud was one of thousands that populated the galaxy. While some dispersed, this one underwent a remarkable transformation, a metamorphosis that was to become **our solar system**

(b) As the cloud contracted, its center became hotter and denser. The future sun was now a seething ball of hot gas stoked by the crushing pressure of gravity. When the temperature and pressure reached the ignition point for nuclear reactions, **the Sun was born.**

(c) Meanwhile, the cloud material around the Sun swirled into a disc, called a **solar nebula.**

(d) The particles in the cloud combined over the next few million years like adhering snowflakes, eventually becoming larger bodies called **planetesimals.**

(e) The planetesimals collected into planets, moons, asteroids, and comets. Close to the Sun, radiation swept away the light gases, leaving rocks and metals - **Mercury, Venus, Earth, and Mars** formed here. Farther out, **Jupiter and Saturn** formed mainly from hydrogen, helium, and water-ice. The most remote realm was frigid enough for ammonia, methane, and carbon monoxide "snow" to form - **Uranus and beyond.**

(f) Over millions of years, gravity from the planets and moons swept up leftover rocks and dust, leaving mainly themselves, the asteroid belt, and empty space.



Sun Station Imaginary Voyage

Let's take an imaginary journey through the Sun – from the inside out.

The Core

16,000,000 degrees C

We begin in the core, the Sun's engine room, where **all of the Sun's energy** is produced. Here unimaginable heat and pressure trigger **nuclear fusion**. Hydrogen nuclei fuse together to create helium nuclei releasing huge amounts of high-energy radiation.

Radiative Zone

5,000,000 degrees C

Leaving the nuclear furnace behind, we enter the radiative zone. Here radiation travels in zigzag paths, bouncing randomly until reaching the convective zone. It takes energy rays **over a million years** to pass through this zone! However, this is a good thing, because during their long journey, the dangerous rays weaken to become the heat and light we need for life on Earth.

Convective Zone

5,800 degrees C

We ride the energy waves from the radiative zone into the convective zone. In this layer the energy no longer radiates, instead it travels to the surface by a churning motion, similar to water boiling in a pot. The "bubbles" at the top of the convective zone appear as **granulation** in the next layer – the **photosphere**.

Photosphere 6,000 degrees C

We rise upward to the bright solar surface - the **photosphere**. In this thin layer we see **granules and sunspots**.

Granules cover the entire photosphere. These convection "bubbles" last only 5 to 10 minutes before being replaced by newly emerging ones.

Sunspots are huge, Earth-sized, magnetic storms in the photosphere. They appear dark because they are slightly cooler than the surrounding granules.



Sun Station You're a Star!

Birth

Imagine yourself as a star. You are born in an immense nursery cloud of hydrogen gas and dust. Gravity pulls portions of the cloud into clumps forming **proto-stars**. When the temperature and pressure inside the proto-star becomes great enough for nuclear fusion, it begins to glow, and *voila!* – A star is born!

What happens next depends on your birth weight or mass:

Low mass stars may live trillions of years, slowly using up their hydrogen until they simply burn out.

Medium mass stars like our Sun live for billions of years, ending their lives as planetary nebulae and white dwarfs.

Heavy mass stars live less than a billion years, ending their lives as supernovas, neutron stars and black holes.

Life

As a star you live most of your life converting hydrogen to helium by nuclear fusion. This is your **stable phase**, when you balance gravity's inward pressure with your core-fusion's outward pressure. The heavier you are, the longer you spend on this activity, but sooner or later you will use up your hydrogen. Then, you will undergo a dramatic change. Medium mass stars live long, burn slowly, and die peacefully. After you burn all your hydrogen, your core can no longer balance gravity, and it begins to collapse. Tremendous heat is produced, causing your outer layers to expand. During this **red giant** phase, our Sun will envelop Mercury, Venus, and possibly Earth. When your core temperature reaches 100 million degrees, intense energy blows your outer layers far into space to form a beautiful **planetary nebula**. Meanwhile, your core collapses into a hot, dense **white dwarf** star about the size of Earth. No longer able to produce energy, you slowly cool, like a dying ember, eventually becoming a **black dwarf** cinder.

Epitaph: The Sun

"She came, she burned, she died"
5 billion B.C. – 5 billion A.D.

She is survived by five of her nine planets – Jupiter, Saturn,
Uranus, Neptune and Pluto

The End



Life Continued:

High mass stars (greater than 8 solar masses) live fast, burn bright, and die young. You will convert your hydrogen to helium rapidly and become a **red super-giant**. Because your core is hotter and under greater pressure than Sun-sized stars, fusion continues, creating heavier and heavier elements. Your core compresses and heats up, fusing one element after another until iron is formed. Core temperature is now three billion degrees, but instead of releasing energy, iron **absorbs** it. At this point, energy production suddenly stops, and you undergo an instantaneous and catastrophic collapse.

The speed at which you collapse is astounding. In the blink of an eye, your Earth-sized core zooms inward on itself to form an incredibly dense sphere the size of Los Angeles. Your outer portion rapidly falls onto the collapsed core, then instantly bounces off. The result is a **supernova**, a spectacular explosion visible halfway across the universe. For a brief moment, you can outshine all the other stars in the galaxy put together. Your blast wave blows your outer remnants into space, leaving a densely packed, rapidly spinning core – a **neutron star** – at the center. The ejected remnants contain the heavy elements that eventually will form new stars, planets, and even life!

Since you weigh over twenty solar masses, your gravity overwhelms your core. Your entire star collapses into a point called a **singularity**. Here gravity is so great even light cannot escape – You have become a **Black Hole!**

The Crab Nebula in Taurus is the remnant of the supernova seen from Earth in the year 1054.

