The Sun is a Star

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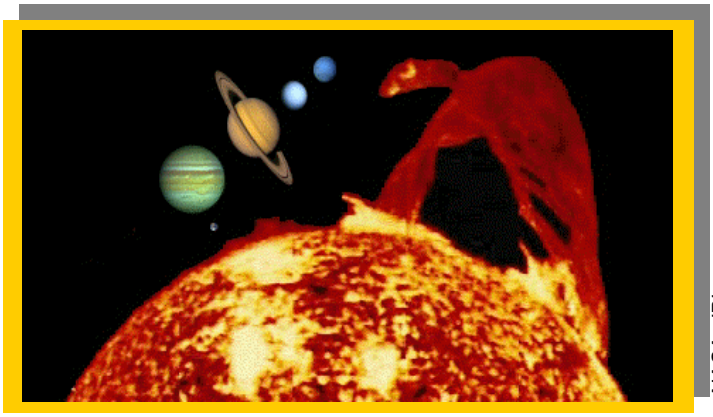
The star nearest to the planet Earth is the sun. The sun's diameter is 1.4 million kilometers and its distance from Earth is 150 million kilometers. But what do numbers that big really mean? To get an idea of size, use a grapefruit to represent the sun. Set it down and walk a dozen steps away. Turn around and hold up a grain of rice to represent the Earth. The sun is not just bigger than the Earth (or any other planet), it's much bigger. It is almost 110 times farther across than the Earth, and contains almost 99.9% of the mass in the whole solar system.

In the high-tech Grapefruit/Rice Model of the Universe, how far from Earth are other stars? The closest star would be another grapefruit placed in London, England. Most of the nearby stars are spaced about that far apart and thus are at distances from Earth even harder to imagine. Although people have been trying to understand the stars for centuries, it has only been in the 20th century that we have recognized the huge variations among stars, and where the sun fits in.



NASA, JPL

Sun and Five Largest Planets, sizes, but not distances, to scale

Like all stars, our sun is made mostly of hydrogen (a little over 73%) and some helium (a little under 25%), with just a few percent of heavier elements, like lithium, calcium, oxygen, and iron. In fact, the nuclear reactions inside the sun (like other stars) produce many of these heavier elements. Though they make up a very small fraction of the sun's composition, and a similarly small fraction of the universe's composition, these other elements are extremely important to us.

The sun is a modest specimen. Full-fledged stars can be as small as roughly one-tenth the mass of the sun. Others are over 100 times as massive as the sun. Differences in stellar mass cause variations in total energy emitted (**luminosity**) and temperature.

The temperature of a star (or any other object) affects that star's color and the wavelengths of radiation it emits. Warm objects (like people) give off radiation, but it takes tools like military night goggles to see this radiation. For an object that is thousands of degrees hot (like a star), the wavelength of radiation emitted is visible. We name different visible wavelengths as colors. The range of star temperatures gives them different colors. Cooler stars are red; the hottest stars are blue-white. The yellow sun is a little below average temperature for a star.

The heat, light, and solar wind from the sun provide an energy source for most processes on the Earth's surface. Heat, absorbed by the atmosphere and oceans, powers storms and other weather and climate phenomena. Fossil fuel energy, like coal and gasoline, comes from chemical bonds that were originally formed by plants absorbing the sun's light (photosynthesis). Finally, solar wind streaming out from the sun energizes the system of magnetic fields and ions that surround the Earth, and can cause great damage to satellites and electrical power networks.