The Sun...the star in the solar system

The Sun provides us with a chance to see a star up close

Question for SGU graduates (or anybody else): what kind of star is the Sun?

18 Scorpii...
The "solar twin"

One emphasizes (somewhat) different aspects of the Sun in a solar system astronomy class

Reign of Akhenaten and Nefertiti (~1350 BCE)
Point to make: when observed in the light of ultraviolet lines, the Sun is not a constant, static object.

Because the Sun is the type of star it is...

- It produces the “right luminosity” for us (3.85E26 Watts)
- This luminosity is believed to have been stable for the last several billion years
- It shines at this luminosity long enough for us to arrive on the scene and enjoy it

Let’s begin exploring the Sun as a solar system object.

The Sun is a beautiful illustration of Wien’s Law.

The solar spectrum is a good match (although not perfect) to a blackbody spectrum.

What we see as the disk of the Sun is a layer in its atmosphere called the photosphere.
Let's take a closer look at the solar photosphere... it isn't as featureless as it seems.

Granules in the Solar Atmosphere
Granules are convection cells; the outer layer of the Sun is carrying heat by "boiling."

It is particularly interesting if you look in the light of the hydrogen alpha line (656 nanometers).

The physics of convection is common in nature as a way of moving heat from one place to another.

The observation of convection means the Sun gets hotter the deeper you go.

Luminosity (or power output) of 3.85E26 Watts
Next topic: solar activity

The Sun doesn’t always look like it does today

Closeup of a sunspot

Sunspots are regions of strong magnetic fields (0.2 - 0.4 Tesla)

Sunspots and their strong magnetic fields are related to more mysterious aspects of the Sun

Above the photosphere are more rarefied and hotter parts of the solar atmosphere

The Chromosphere-region above the photosphere, and substantially hotter
The Solar Corona

What is it? How did it get that way?

The X-Ray Sun

The Temperature Profile in the Solar Atmosphere

The process or processes responsible for heating the solar corona almost certainly involve the solar magnetic field.

We just don’t know how.
The hot, rarefield, magnetically-dominated parts of the solar atmosphere show continual activity and energy release

erupting solar prominence...April 21, 2010