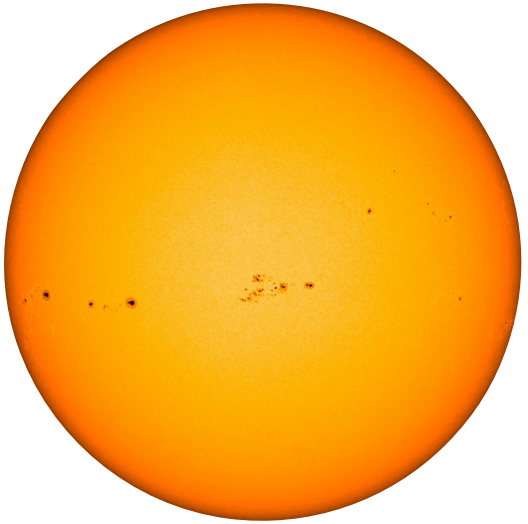
Solar Observing in Schools

Introduction to Solar Observing



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Introductory Remarks for Solar Observing

Warning! Observing the Sun can be extremely dangerous and unless done properly can lead to permanent blindness! *Never look directly at the Sun with the naked eye, or with equipment not designed specifically to do so.*

This warning applies not only for observations through binoculars or a telescope, but also for observations with the naked eye. Since binoculars and telescopes gather much more sunlight than the unaided eye, observing with these instruments is all the more dangerous.

We will be using the **Coronado Personal Solar Telescope (PST)** to look at the Sun.

The Coronado PST is equipped with a built-in solar filter. The filter only lets a small fraction of the incident sunlight through in a narrow wavelength range centered on the Hydrogen-alpha (Hα) line, which lets you view the Sun's chromosphere. This line is in the red part of the spectrum and has a wavelength of 6563Å. These telescopes are excellent for seeing moderate to large sunspots and other features (especially prominences) on the Sun.

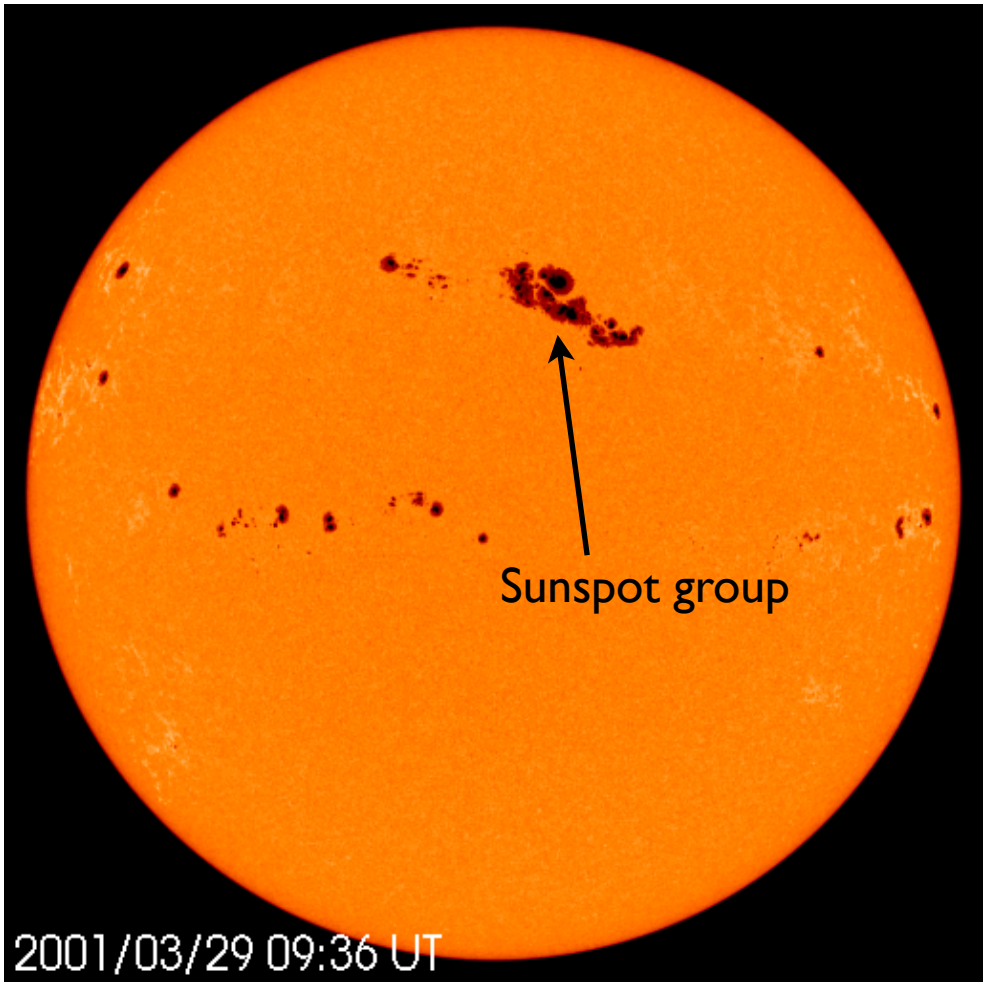
Sunspots

The proximity of the Sun, the nearest star, allows for detailed observations that are impossible to make for the other, far more distant stars. Early observations of the Sun by Galileo (starting in 1610) revealed the presence of dark spots on the surface of the Sun, known as **sunspots**.

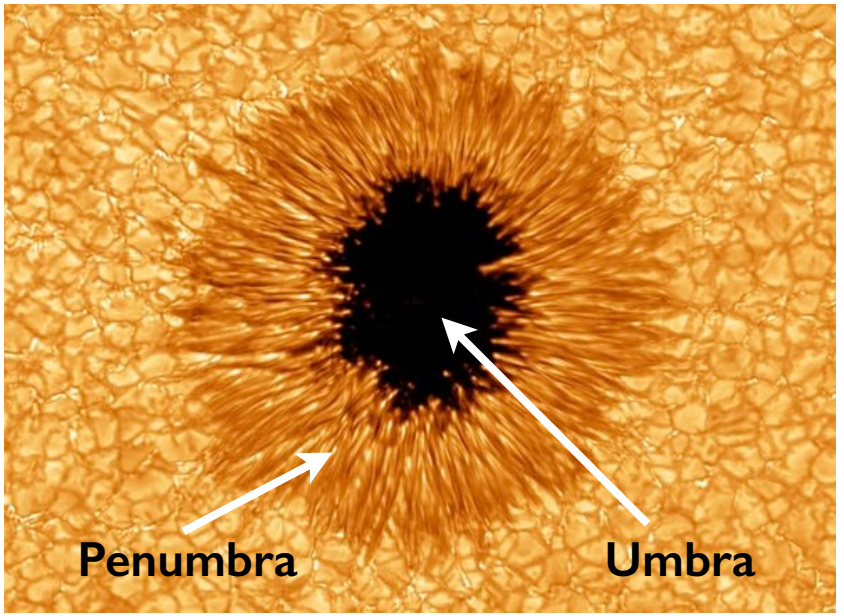
Sunspots appear dark by contrast with the surrounding surface of the Sun because they are cooler. The surface, or photosphere, of the Sun has a temperature of about 5800K while sunspots are typically 1800K cooler and therefore less luminous. Note that this puts the sunspot temperature at about 4000K, enough to make any metal white hot! This localized drop in surface temperature is due to enhanced magnetic fields in sunspots, up to about 10000 times greater than the field at the surface of the Earth.

Sunspots come and go, isolated or in groups, and can be large or very small. The number of sunspots visible follows a cycle of solar activity of approximately 11 years. The last maximum may have occurred in late 2013, though was the weakest (least number of sunspots) in 100 years. Sunspots also reveal that the Sun is **rotating**!

Sunspots

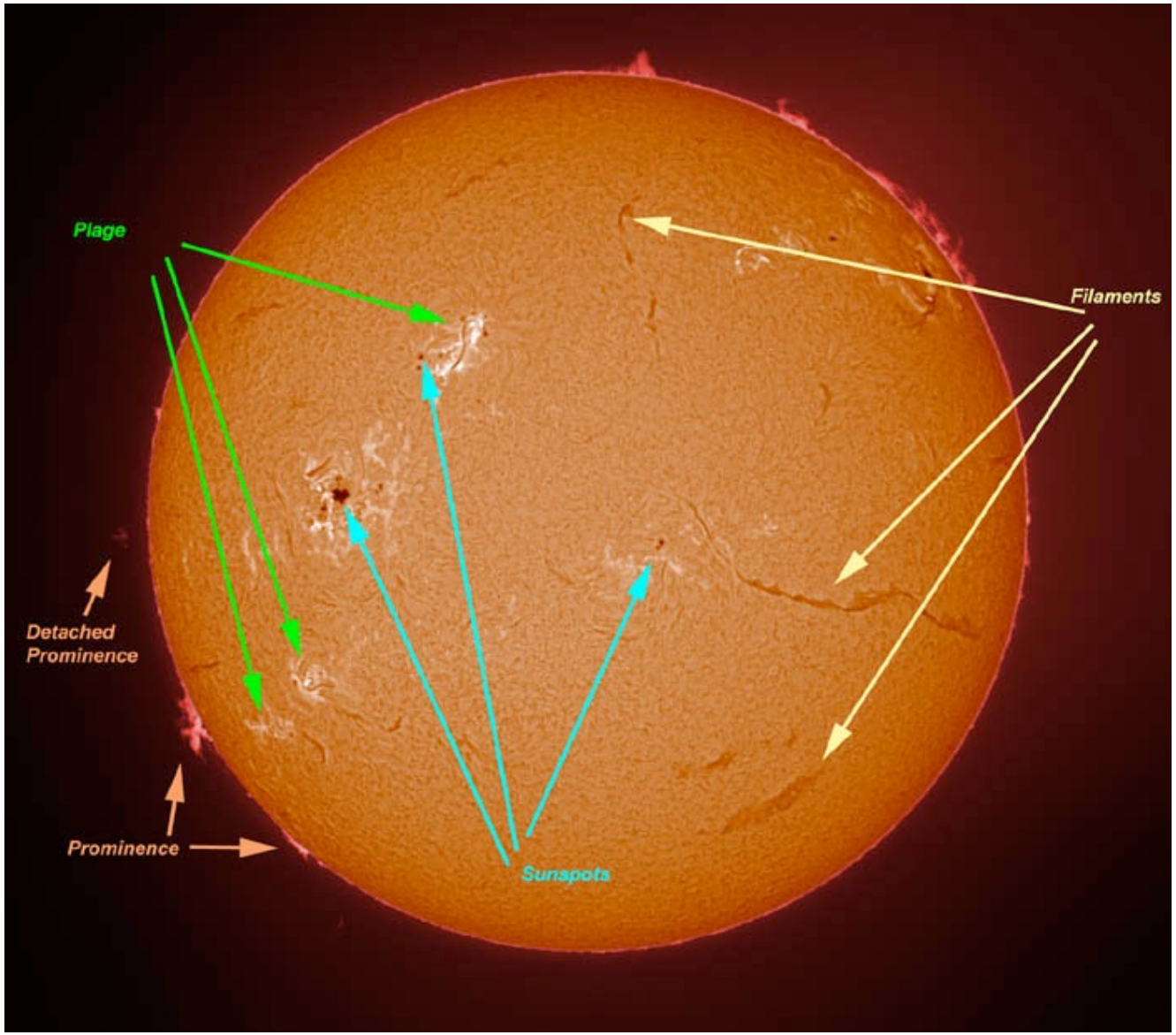


Sunspots can often appear in groups



This zoom-in on a sunspot shows the darker central region called the **umbra**, and a lighter outer region called the **penumbra.** The bumpy structure elsewhere (not part of the sunspot) is seen all over the Sun and are called **granules**.

Other features on the Sun



Surrounding the sunspots or in their near vicinity are bright regions known as **plages**.

Silhouetted against the blackness of space can be seen the **prominences**, incandescent jets of gas extending from tens to hundreds of thousands of miles above the surface of the Sun.

When viewed against the disk of the Sun the prominences appear as dark streaks and are known as **filaments**.