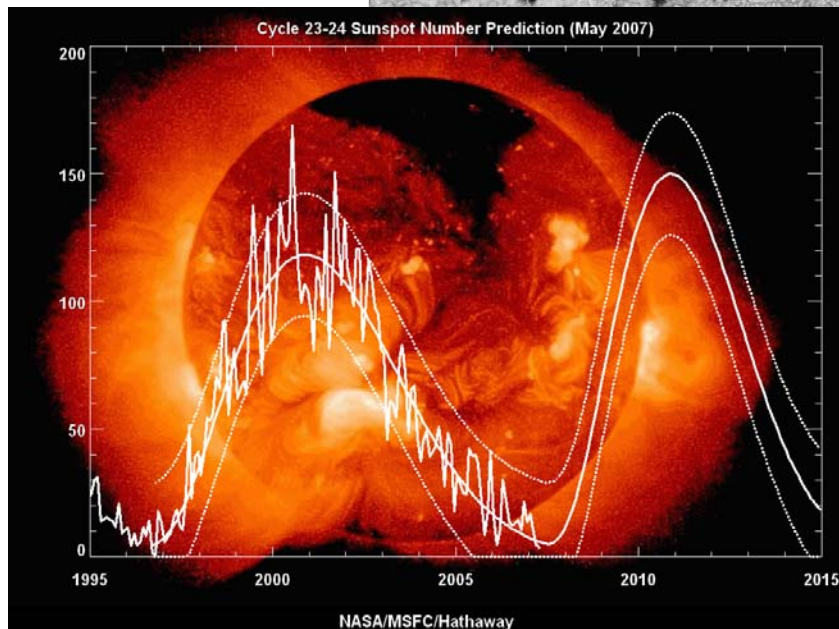
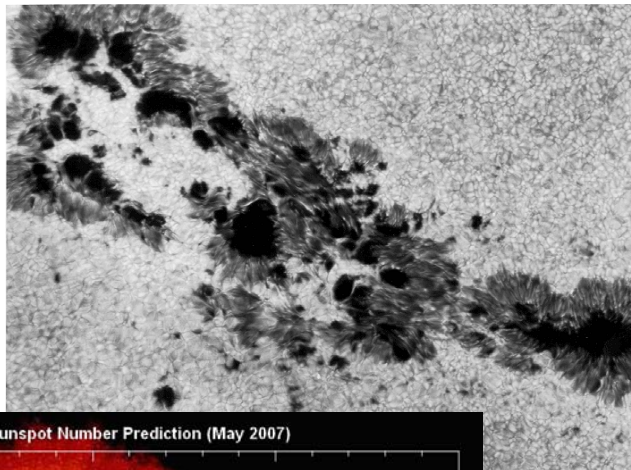


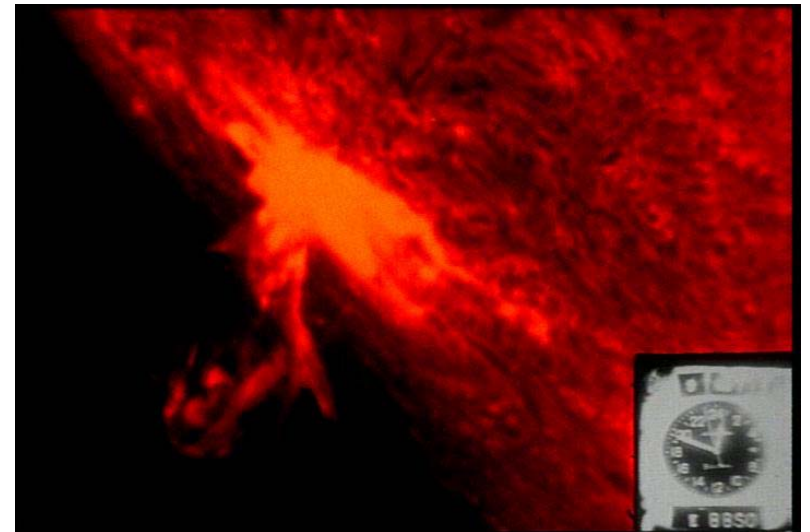
## Sunspots

A sunspot is a dark part of the sun's surface that is cooler than the surrounding area. It turns out it is cooler because of a strong magnetic field there that inhibits the transport of heat via convective motion in the sun. The magnetic field is formed below the sun's surface, and extends out into the sun's corona. The number of sunspots vary in an 11 year cycle with a minimum occurring in 2007.



## Flares and Prominences

Solar flares are tremendous explosions on the surface of the Sun. Within minutes they heat material to millions of degrees and release as much energy as  $10^{15}$  tons of TNT. They occur near sunspots, usually along the line dividing areas of oppositely directed magnetic fields. Prominences are clouds of gas above the surface held by the Sun's magnetic field.



**Risk of Blindness**—Never look at the sun through binoculars, telescopes or other magnifying instruments unless properly equipped. Equipment includes a special filter before the mirror or lens to reduce light and remove heat — just a filter after the eyepiece will not do the job!

# Our Sun

## What elements make up the Sun (eg. Iron, oxygen....etc)?

The predominant element in the Sun is hydrogen, and then helium: by mass, it is 73.5% hydrogen, 24.7% helium, 0.8% oxygen, 0.3% carbon, 0.1% nitrogen, and 0.5% all other elements. We expect stars of the Sun's size to be composed mainly of hydrogen and helium since these are the elements formed shortly after the Big Bang, whereas all other elements are made during a star's life or death.

## Do you think you know everything about the sun?

There are still many unanswered questions about the Sun which astronomers are trying to find out about. These include how come the corona is so much hotter than the visible surface of the sun, how sunspots form and why their numbers vary on an 11 year cycle, among other things.

## How hot is each one of the layers of the sun?

The **center** of the Sun: about **15 million degrees Kelvin (K)**. Kelvin = Celsius + 273°

**Radiative Zone:** Temperature falls from about **7 to about 2 million K** across this zone.

**Convection Zone:** drops from **2 million K to 5800K** in this zone.

**Photosphere:** **5800K**, although sunspots are about **3800K** - that's why they're dark.

**Chromosphere:** **4300 to 8300 K** from inside edge to outside edge

**Corona:** about **1 million K**

## How big is the Sun?

The Sun has a radius 109 times that of the Earth which means that about 1,300,000 Earths would fit into it! It is  $2 \times 10^{30}$  kg or 333,000 times as heavy as the Earth. It is 9.75 times Jupiter's diameter.

## **How does the earth's sun compare to other stars and star systems?**

The Sun is an average-sized star. The biggest stars are more than 100 times as massive as the Sun, and the smallest stars are less than 1/10th as massive as the Sun.

As far as comparing to other star systems--More than half of all stars are in binary or other multiple star systems, in which two or more stars orbit around each other in a single "system". There have also now been planets discovered around other stars besides the Sun.

## **Like the earth revolves around the Sun, does the Sun revolve around the Milky Way?**

The Sun revolves around the Milky Way on an almost circular orbit with a speed of about 220km per second. It completes one revolution in about 230 million years. The Milky Way also moves - we are moving towards our nearest neighbor, the Andromeda galaxy. Both the Milky Way and Andromeda, which make up most of what we call the *Local Group of Galaxies*, are moving towards the Virgo Cluster which is our nearest cluster of galaxies. Nothing stands still at all!

**Web links:** check <http://smpa.jacktechie.com> for latest info

<http://solarscience.msfc.nasa.gov/SunspotCycle.shtml>

<http://solarscience.msfc.nasa.gov/flares.shtml>

<http://www.nso.edu>

<http://curious.astro.cornell.edu>

<http://skytonight.com>, <http://www.astronomy.com>

<http://www.celestron.com>, <http://www.meade.com>

<http://backyardastronomer.com>

<http://sjaa.net>

NASA sunspots

NASA solar flares

National Solar Observatory, Arizona

Ask an Astronomer at Cornell University

Astronomy resources

telescope basics and astronomy news

Paul Mortfield's website

San Jose Astronomical Association

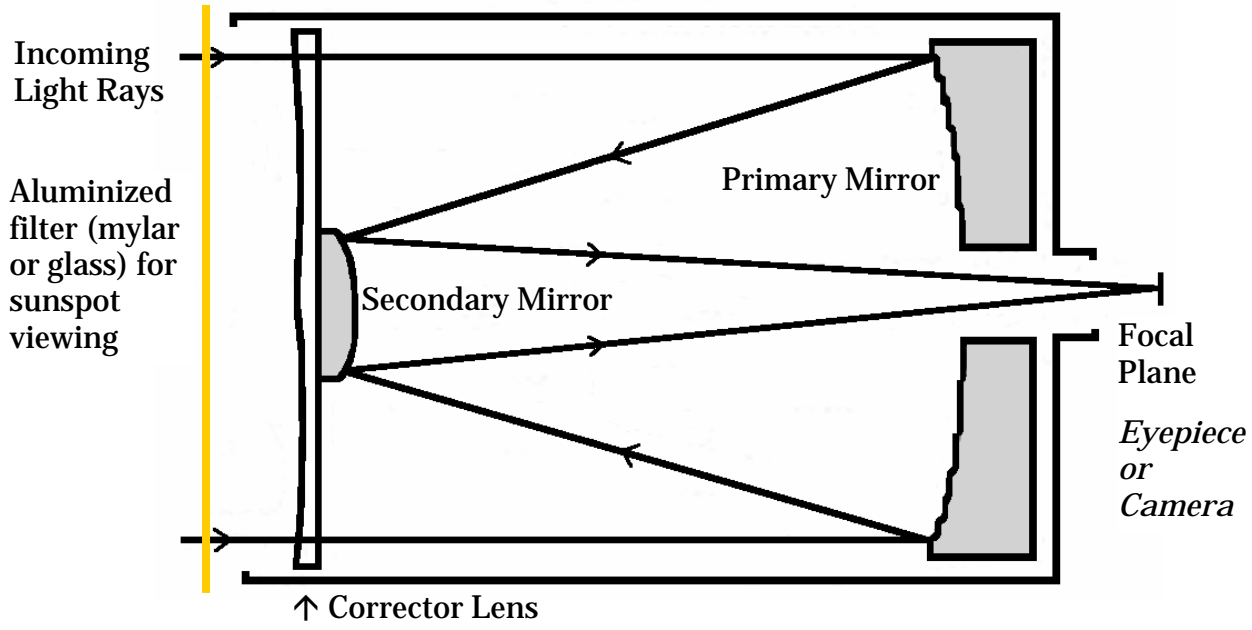
### **General science sites:**

<http://www.exploratorium.edu>

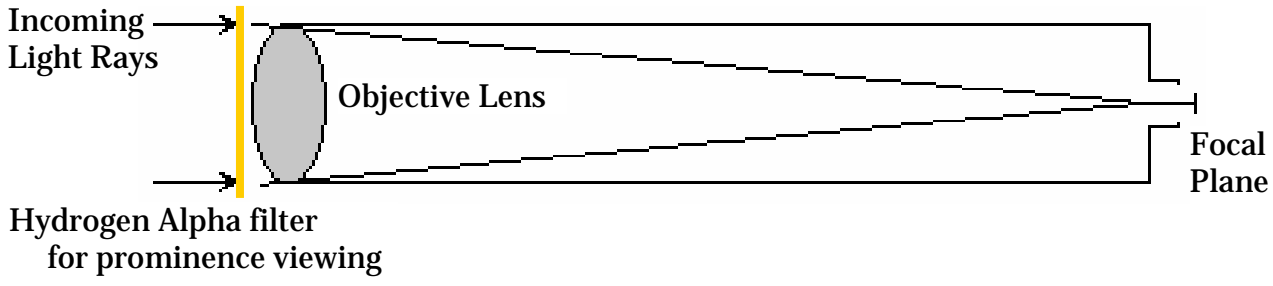
<http://www.nasa.gov/audience/forkids/home/index.html>

*Exploratorium* in San Francisco

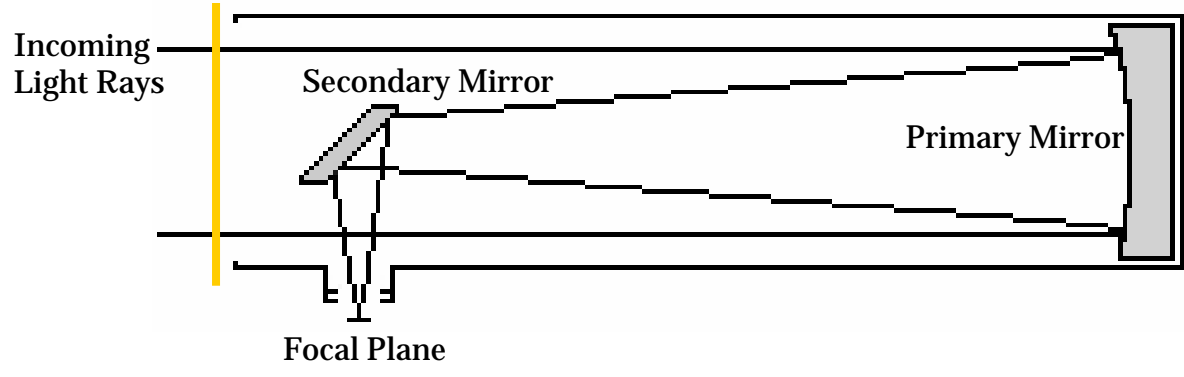
NASA Kids—for teachers and parents also



***Catadioptric telescopes use a combination of mirrors and lenses***



***Refractor telescopes use only lenses***



***Newtonian or Dobsonian reflector use only mirrors***