

THE SUNSPOT

All the news under the Sun

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LASASP
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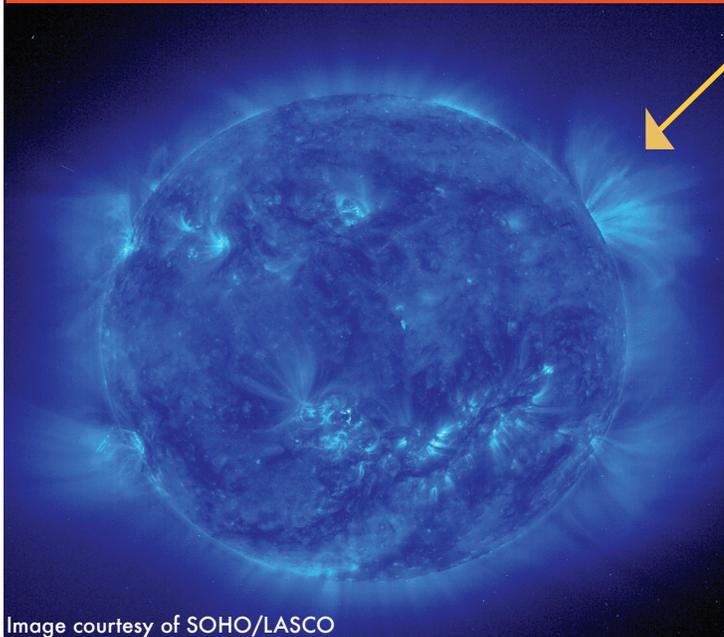
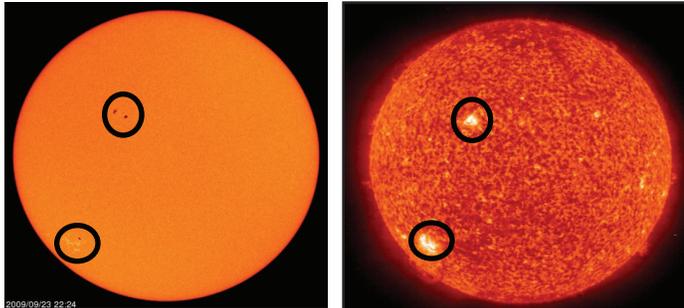


Image courtesy of SOHO/LASCO

Why so **blue**? The EIT (Extreme Ultraviolet Imaging Telescope), an instrument onboard the SOHO spacecraft, was used to create this image. Humans can't see ultraviolet (UV) light, so the image has been falsely colored. Observing the Sun using ultraviolet light helps us see things on the Sun that we can't see using visible light, like these bright loops in the Sun's corona (see arrow).

Sunspots and Flares!



Above, these images show sunspots (circled) observed on September 23, 2009. At left, the image is taken in visible light and the spots look dark. This is how it looks with our eyes. At right, the image is in UV light using a special instrument, so it looks bright. Scientists often use instrumentation to help them see features that aren't normally visible. It is much easier to "see" the sunspots in UV.

Sunspot activity has been increasing, and new sunspots are being discovered every few weeks, but many scientists think there is something different about the Sun these days. Dr. Tom Woods of the Laboratory for Atmospheric and Space Physics thinks this solar cycle, number 24, is different from the last two solar cycles.

Woods explains, "The Sun has an 11-year cycle of activity. When the Sun is at solar maximum it produces more sunspots,

flares and Coronal Mass Ejections (violent eruptions). Then it quiets down for a time called solar cycle minimum. This current cycle minimum appears much quieter than the past 8 cycle minima."

The Sun been mostly spotless for months. In fact, 2008 had 200 days without spots, the fewest since 1954.

"The Sun is acting differently from the previous minimum in 1996. There aren't as many spots as we'd expect right now and appear smaller than expected," says Woods.

Some people believe this means we are headed for a very weak cycle 24, but, Woods says, "We really don't know what it means yet. It could just be off to a slow start and more sunspots could appear soon."

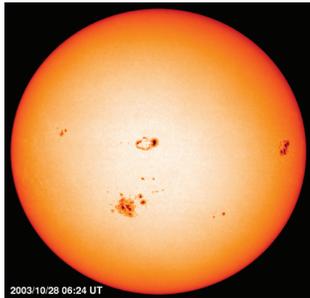
What are sunspots?

Phil Chamberlin of NASA explains, "Sunspots are cool, literally! They're cooler than the area around them, so they look dark."

Even though they are cooler than the rest of the Sun's surface, they are still over 4,000 degrees Celsius (over 7000 degrees Fahrenheit)!

Science Facts

The Sun's Surface



The Photosphere
Image courtesy of SOHO/
LASCO

There's something funny about the surface of the Sun— it doesn't really have one! The Sun is made out of hydrogen gas. The gas is really energetic, forming a sort of thick soup. What we call the surface, or photosphere, is

extremely hot, over 5000 degrees Celsius (over 9000 degrees F). Because it is hot, it glows like a hot coal. It never cools off. The Sun's core, which is like a gigantic nuclear furnace, is the source of this constant heat and light.

There are parts of the Sun we can't see with our eyes that are above and below the visible surface. Instrumentation allows us to see layers of the Sun that aren't normally visible and helps us uncover how the Sun behaves.

Humans can only see in visible light wavelengths: red, orange, yellow, green, blue, and violet. The visible layer of the Sun, the one you can see, is called the photosphere. With special instrumentation you can "image" the Sun in different wavelengths, like ultraviolet, for example. In ultraviolet, or UV, wavelengths, the solar corona, which is just above the photosphere, can be imaged and falsely colored so we can observe it even though it is normally invisible to our eyes.

A Comet's Tale



Image courtesy of NASA, 1997

Left: Comet Hale-Bopp's plasma tail (blue) and dust tail (white) are visible

Comets have two tails. One tail is called the dust tail, which curves in a slight arc behind the body of the comet. The other tail is called the plasma tail. It shoots out straight behind the comet directly away from the Sun because it is pushed by the solar wind.

The plasma tail is made of gases that interact with the solar wind. The dust tail doesn't interact with the solar wind because it doesn't have any gas—it is made of dust and pieces of rock.

Comets don't begin their life with a tail.

If you're lucky enough to see a comet, it looks like a bright blob in the sky with streamers of light cascading behind.

When they are far away from the Sun, they're just a large lump of rock and ices. When a comet gets close to the Sun, just like a snowman on a sunny day, it starts to melt and sublimate (sub-luh-mate). In other words, gas and material comes off of the comet. It forms an atmosphere around the main body of the comet, called the coma (coh-ma).

Even closer to the Sun, about as far as Earth, the two tails begin to appear. If you're lucky enough to see a comet, it looks like a bright blob in the sky with streamers of light cascading behind.

Comets that orbit the Sun turn back into icy, snowy, dirt blobs just as soon as they're far enough away to cool down. Some are not that lucky! Many comets get too close and even run into the Sun and are destroyed. A few even smash into planets.

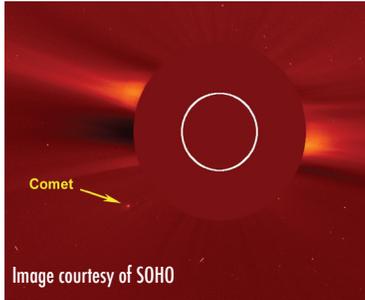
Comets are the pieces of matter left over from when the Solar System formed 4.6 billion years ago.

To learn more about comets, visit:
<http://lasp.colorado.edu/education/outerplanets/>
Click on Kuiper Belt Objects.

Mission News

SOHO: Just a Pretty Face?

By Sarah Stern



A disk blocks out the light from the Sun so the comet is visible

Many of the pictures of the Sun you may have seen come from the SOLar and Heliophysics Observatory (SOHO), but SOHO doesn't just take pretty pictures.

SOHO was launched in 1995 to study the Sun and the solar wind.

SOHO has helped scientists predict space storms by using its electronic eyes to see explosions on the surface of the Sun. It also provided vital information about how the 11-year solar cycle works, how the surface behaves and what the solar interior does during violent storms.

Surprisingly, SOHO has studied comets as well. The spacecraft observed tiny moving specks around the Sun that, upon inspection,

turned out to be comets. Before SOHO, scientists had no idea that so many comets existed that travel close to the Sun. Over 1,500 comets have been discovered over the past 13 years.

"Comets are interesting because they are unique samples of the early Solar System," Gosling said.

Comet enthusiasts have been able to see how they get smaller with each pass around the Sun, losing dust, ice, and rock. Some are even "sunstriker," plunging into the Sun.

There are millions of comets in the Solar System, but they are usually not visible unless they travel close to the Sun. If a comet is too close we can't see it from Earth since the comet is dim compared to the Sun. It's like shining a flashlight in the daytime—it doesn't look very bright.

SOHO can block out the center of the Sun with a disk which allows us to see comets, and the solar corona, against the bright light from the Sun.

Mars Phoenix Lander

by Sarah Stern



Artist drawing of Phoenix
Credit: NASA/JPL- Caltech/
University of Arizona

The Phoenix Lander ended communication on November 2, 2008. The Phoenix uses solar panels which take the light and heat energy from the Sun to create electricity.

As the panels heat under the sunlight, an electrical current is built up that can power anything from a light bulb to a gigantic spacecraft. The sunnier it is, the more power it has. In cloudy or darker weather, it is difficult to get enough energy from the Sun to keep the Lander running properly.

As the Lander entered the dark and cold Martian winter, a huge dust storm deposited a layer of dust on the solar panels, shading the Lander from sunlight.

Phoenix is at a high latitude, similar to

northern Alaska on Earth. On Earth, the Arctic has nearly five winter months without any sunlight at all because the north pole of Earth tilts away from the Sun. Likewise, during the summertime, the north pole is tilted toward the Sun so the Sun doesn't set for five months. Mars also has a tilt, so the Martian Arctic experiences winter months without any sunlight.

Phoenix was only expected to communicate for three months before it lost power, but it stayed on for five months instead. In that time, the Lander used its robotic arm to dig, scoop, bake, sniff and taste the soil of Mars to understand its water and climate history. This information will help scientists answer questions about how Mars evolved and whether it ever had life.

During this amazing mission, Phoenix uncovered water ice just below Mars' surface when it landed and scientists even detected falling snow by pointing a green laser toward a layer of clouds.

Who's Who Under the Sun

Meet Scientist Stefan Eriksson!



The Laboratory for Atmospheric and Space Physics (LASP) has a group of dedicated scientists and engineers who help figure out what makes the Sun-Earth system tick. Dr. Stefan Eriksson works as a scientist at LASP. THE SUNSPOT got an exclusive interview.

What do you do at LASP?

I'm a researcher and I study data from satellites in space. I look at space weather and study particles and magnetic fields. We use spacecraft close to Earth to understand how the Earth's magnetic field interacts with the solar wind. I collaborate with other scientists by writing articles and discussing and defending my research at conferences all over the world.

How is your research useful to the public?

The Sun affects us all. My science is not important to everyone on the street, but it is about the human quest for knowledge,

and who knows where that knowledge might lead to in future generations? We're pushing the boundary of science.

When did you decide to become a solar scientist?

Viking [the first successful landing on Mars] was on the back of a cereal box when I was 15. I didn't know back then that I wanted to become a scientist, but when I read that box, it became important. I went to engineering school thinking that I would become an engineer like my dad. At the university I attended, I looked at data from an Earth-orbiting satellite. I used these measurements to understand how the Earth was affected by the solar wind. Because I liked this research, I still study this today.

What do you do in your spare time?

I like to spend time with my daughter and family. I enjoy traveling, whether it is a long trip to Europe or Japan to see family, or a short camping trip. I travel quite a lot for work to visit scientists around the world.

What do you like about being a scientist?

It gives me a flexible life. Generally speaking, you decide when you want to work.

Sometimes you work very hard, and need to finish papers. In the end, it is all about the joy of understanding the world around us. ✨

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Dr. Stefan Eriksson, LASP