**SOLAR OBSERVING**

With a good solar filter, you can see sunspots, flares, and other hot stuff. // BY MICHAEL E. BAKICH

The Sun, because it’s the brightest sky object, also is the easiest to observe. Put safety first, and even a small telescope will delight you with high-quality views. Plus, you can make good solar observations even when conditions rule out seeing other celestial objects.

**How to observe the Sun**

**Start with the disk**

The **photosphere** is the Sun’s visible surface and is the lowest observable layer of solar atmosphere. Observing the photosphere is easy through visible-light solar filters. If the seeing (atmospheric steadiness) is good, you’ll spot **granulation**, which observers describe as a mottled effect. Gas bubbles, whose centers are rising and edges are sinking, create granules. **Faculae** are bright areas visible on the photosphere. Facula is Latin for “little torch.” Faculae appear all over the disk, but observers most often see them near the solar limb. There, the contrast between the faculae and the darkened limb is highest. Finally, look for a phenomenon called **limb darkening**. We observe limb darkening because the Sun is a sphere. Near what limb darkening occurs, the Sun’s surface is cooler than the photosphere. One Angstrom equals 0.1 nanometer.

**The chromosphere**

The “sphere of color” lies just above the photosphere. Here, hydrogen atoms emit energy called **Hα**. Solar flares range from subflares (smaller than 2 square degrees) to Importance 4 flares, which cover more than 24.8 square degrees. On the Sun, one square degree equals roughly 57 million square miles (150 million square kilometers).

**Dark areas in a sea of light**

Sunspots, which are features of the photosphere, come in many shapes and sizes, according to the whim of the Sun’s magnetic field. The field traps gas, slowing its motion and making it cooler than the surrounding area on the Sun’s surface. Usually, sunspots consist of a dark central region called the umbra surrounded by a lighter region known as the penumbra. The penumbra’s temperature is typically 1,800°F (1,000°C) below that of the photosphere, and of the umbra between 2,700°F (1,500°C) and 3,600°F (2,000°C) cooler than the photosphere. Roughly every 11 years, solar activity peaks, resulting in greater numbers of sunspots and flares. Solar magnet is Heinrich Schwabe (1789–1875) discovered the solar rotation in 1843. This “11-year cycle” plays a 6-inch (150mm) circle — the penumbral region slightly to either side. Mark the four directions, focus the Sun, and fit it to your circle. If it doesn’t fit, either adjust the eyepiece/paper distance or choose an eyepiece with a different focal length. Don’t use eyepieces with lens elements held together by cement because the Sun’s heat will melt them.

**Solar explosions**

Also best seen through Hα filters, solar flares occur when the Sun’s atmosphere suddenly releases built-up magnetic energy. Solar flares emit radiation storms and are the solar system’s largest explosions. Astronomers classify flares by how much area they cover at the time of maximum brightness.

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**Photosphere**

This is the Sun’s visible surface.

**Corona**

This is the Sun’s outer atmosphere, the source of the solar wind.

**Solar wind**

This high-velocity gas speeds away from the Sun.

**Flare**

Flares are sudden releases of energy stored in sunspot magnetic fields. They’re often associated with coronal mass ejections.

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**Core**

The Sun’s energy source, this is where hydrogen fuses into helium.

**Twisted field lines**

The Sun’s rotation twists magnetic field lines deep inside it.

**Faculae**

These bright areas on the photosphere appear brightest near the limb.

**Limb darkening**

Near the Sun’s limb, light must travel farther through the solar atmosphere. This effect darkens the limb.

**Sunspots**

Dark spots mark where magnetic fields, amplified inside the Sun, break through the surface.

**Prominence**

Magnetic fields suspend gas far above the Sun’s surface. Prominences sometimes erupt.

**Hydrogen-alpha (Hα)**

Observing the Sun at the wavelength of Hα light is gaining in popularity. All Hα filters center on 656.3nm. However, such filters have different bandwidth widths. The widest of these can be nearly 2 Angstroms (Å) and the narrowest 0.5 Å. One Angstrom equals 0.1 nanometer. Prominences look great through a 1 Å-bandpass Hα filter, but chromospheric detail is low. Through a filter with a 0.5 Å-bandpass, you’ll see lots of chromospheric detail but few prominences. Some Hα filters are tunable; you can shift the bandpass’ central wavelength slightly to either side.

**Solar observing is addictive. Soon, you’ll find yourself watching the Sun as much as the stars. Don’t forget the sunscreen.**

**To learn how to classify sunspots, be sure to log on to www.Astronomy.com**

**THE CORONADO PST, available from Meade Instruments, is a complete Hydrogen-alpha telescope. ASTRONOMY WILSON BUCKS**

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