Binocular Universe:

Barlow Bob's Star

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Last month, the community of amateur astronomers lost one of the "good ones" when news came that Robert "Barlow Bob" Godfrey had passed away.

As many of us know, Barlow Bob was tireless in his efforts to encourage people to view our nearest star, the Sun. He was the Johnny Appleseed of solar astronomy, sharing the excitement of the sun with thousands of visitors to the annual Northeast Astronomy Forum (NEAF) in Suffern, New York, as well as many other meetings and conventions. He also penned his "Barlow Bob's Corner" column for several years, which ran in many club newsletters across the country. Today, his enthusiasm lives on through his web site, neafsolar.com.

In his memory, I'd like to devote this month's column to viewing Bob's star, the sun, through binoculars. It's easy enough to find – light pollution doesn't matter and there's no finder chart required! Bob, however, used to distribute solar star charts to all who enjoyed the joke.

A recent NEAF Solar Star Party

Here’s his chart from the 2014 NEAF.

2014 Eleventh Annual NSSP
NEAF Solar Star Party
neafsolar.com

April 12 – 13, 2014

Barlow Bob’s
Solar Star Chart

The Sun

R.A. 01h 23m DEC. + 08° 44’
Magnitude: - 26.8 Spectrum: G 2 V

You don’t have to be a rocket scientist to find the Sun in the sky. If you are a rocket scientist, you can use the R.A. and DEC. coordinates to locate the Sun, with your telescope’s computer. If you are a rocket scientist, you should be smart enough to place a safe solar filter on the front of your telescope, BEFORE you enter these coordinates into your computer. Please create a custom Barlow Bob Solar Star Chart and share this with fellow amateur solar astronomers, at your own solar star party. You can find the solar coordinates at aa.usno.navy.mil or in an amateur astronomy magazine.

Before we begin our journey to Barlow Bob’s star, I must emphasize the critical importance of exercising extreme care. Without proper precautions, an observer may suffer permanent eye damage and even blindness. The sun's ultraviolet rays, the same rays that cause sunburn, will burn's your eyes' retinas much faster than your skin.

Fortunately, there are several safe ways of looking at the sun. If you wish to view the sun directly through binoculars, special solar filters are required. DO NOT use welder's glass, smoked glass, or overexposed film. They can all lead tragically to blindness. The proper filters are commonly made of aluminized Mylar film or glass, and must be securely mounted IN FRONT OF both objective lenses beforehand. In this way, the dangerously intense solar rays are reduced to a safe level prior to entering the binoculars and your eyes.

Never place the filters between the eyepieces and your eyes. Binoculars will not only magnify the sun's light, but its intense heat as well. The concentrated solar heat can quickly crack glass filters or burn through thin Mylar film, allowing undiminished sunlight to burst into your unprotected eyes and cause possible permanent blindness.

Solar filters must be treated with great care or they will quickly become damaged and unsafe to use. Regularly inspect the filters (especially the Mylar type) for damage such as pinholes or irregularities in the coating by holding the filter up to a bright light. If a pinhole develops, it may not be cause to discard the filter just yet. Small holes may be sealed with a tiny dot of flat black paint without the image suffering too greatly. Dab just a bit of paint over the hole using a cotton swab. If, however, more serious damage is detected, then the filters must be replaced immediately.

You can also use your binoculars to project an image of the sun onto a white piece of cardboard, as my daughter Helen is showing here in this photo from my 1990 book Touring the Universe through Binoculars.

First, mount the binoculars on a tripod or other rigid support, if available. Keep a dust cap over one of the objective lenses to prevent two overlapping images. DO NOT look through the binoculars at any time, not even to aim them. You can align the glasses by adjusting the shadows they cast until they are at their shortest.

Once centered on the sun, turn the focusing knob in and out until the image is sharp and clear. If the image is too washed out to be well seen, cut out a cardboard baffle that fits securely over the front of the glasses' barrels as shown in the figure. In this way, sunlight will be prevented from reaching the projection screen and washing out the solar image. The projection surface should also be as white and as smooth as possible. Any irregularities in the projection screen itself will cause the image quality and amount of visible detail to suffer.

I must warn you that projecting the sun through binoculars (or through a telescope, for that matter) will really heat up the interior. I've heard of internal baffles and lenses being damaged by the heat, so only allow sunlight to pass through for a minute or two at most before moving it off and allowing things to cool down. I'd also recommend against using high-end binoculars for solar projection. Better to get a sacrificial pair for the purpose.

Many amateur astronomers enjoy monitoring the constantly changing face of our star. For most, the principal attraction is watching the fluctuating number of sunspots across the photosphere. Sunspots are transient features that apparently result from disruptions in the sun's magnetic field. These disruptions block some of the outward pouring radiation from the sun's core. The resulting temperature of the affected region is over 2,000 K (3,000°F) cooler than the surrounding photosphere, causing the sunspot to appear darker by contrast

Each sunspot consists of a black central portion, the umbra, and an encircling grayish ring called the penumbra. Typically, sunspots range in size from hundreds to thousands of miles in diameter and usually require some magnification to be seen. The largest, however, may be spotted by eye alone provided proper eye protection is used.

How many sunspots are visible at any one time depends on a number of factors. It naturally stands to reason that with higher magnification, smaller spots will be resolved. However, the number seen also depends on where the sun is in its current sunspot cycle. Astronomers in the 19th century determined that sunspot numbers regularly oscillate over approximately an 11-year period. Toward the maximum phase of the cycle, there might be a hundred or so visible; at minimum, the solar disk will be nearly devoid of them.

Observers using super high-power mega-binoculars may also be able to detect faculae, brighter areas set close to major sunspots. Faculae give the false impression of being brighter than the surrounding photosphere only because they actually lie a couple of hundred miles above the visible surface. This increased altitude means that they are less affected by the solar atmosphere's dimming effect than the visible photosphere itself. Faculae are most easily seen near the sun's limb. Here, the contrast between faculae and photosphere is at its greatest, thanks to the effect of "limb darkening". Limb darkening is caused by our looking diagonally through a greater depth of the sun's atmosphere when aimed toward the disk's edge than when we are viewing the central region.

An interesting activity is to draw the solar disk every second or third day over a span of a month. The projection method lends itself very nicely to this. Depending on the size of binoculars used, draw a 3- to 4-inch diameter circle in the center of a piece of paper and attach it to the projection screen. Adjust the binocular/screen distance so that the projected sun exactly fills the circle. Once this is done, simply trace the exact positions and sizes of sunspots. Be sure to note the four cardinal directions on your observation sheet. Remember that over a period of days, sunspots appear to travel from west to east across the sun.

With each successive sketch, sunspots will be observed to form and change in size and shape (some quite radically) as they travel across the solar disk. From this exercise, you can directly estimate the sun's period of rotation in much the same way as Galileo did over 400 years ago. By paying special attention to the exact location of the visible spots relative to each other, it will soon become clear that different latitudes on the sun rotate at different speeds. For instance, the sun's equator rotates once every 25 days, while the polar regions take more than a month to complete one spin.

Yes, Barlow Bob's enthusiasm for viewing the sun was contagious. He enthralled all who spoke to him, whether young or old. I was proud to know him and be able to call him my friend.

Next month, we return to the night, but until then, enjoy Bob's star and please share the excitement of solar astronomy with others as part of Bob's legacy. And of course, please also pass along that two eyes are better than one.

About the Author:

Phil Harrington's latest book is called Cosmic Challenge. Visit his web site www.philharrington.net for more information.