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CELESTRON ECLIPSMART

NEW MAGAZINE DEBUTS IN ADVANCE OF ECLIPSES

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In his cover article Dr. James Dire takes a deep dive into the Celestron EclipSmart products. Also shown on the cover is Solar Astronomy Today, a new magazine our team is debuting, see more about the magazine this issue.

In This Issue

Industry News/New Products

ATT Contributing Writers

Ray Bureau is a retired computer support specialist living in Bossier City , Louisiana , and is a member of the Shreveport-Bossier Astronomical Society. As a long-time avid monochrome landscape photographer and computer user, DSLR astrophotography and infrared landscape photography – both using IR-modified cameras – were natural fits. He is also an Extra-Class Ham Radio operator, AD5ZT.

Dr. Janes Dire has a M.S. degree in physics from the University of Central Florida and M.A. and Ph.D. degrees from The Johns Hopkins University, both in planetary science. He has been a professor of chemistry, physics and astronomy and an administrator at several colleges and universities. He has played a key role in several observatory projects including the Powell Observatory in Louisburg, KS, which houses a 30-inch (0.75-m) Newtonian; the Naval Academy observatory with an 8-inch (0.20-m) Alvin Clark refractor; and he built the Coast Guard Academy Astronomical Observatory in Stonington, CT, which houses a 20-inch (0.51-m) Ritchey Chrétien Cassegrain. Dire is a seasoned visual observer and veteran astro-imager.

Curtis Macchioni is a physicist who spent most of his career in Silicon Valley working on magnetic data storage technology. Now retired he enjoys the extra time under the night sky and writing about astronomy equipment and methods on his web site www.californiaskys.com and producing astronomy helpful videos on his YouTube channel "Astronomy Tips and Reviews with Curtis." He hopes to attend many of the major star parties across the country over the coming years.

Stuart Parkerson has been the publisher of Astronomy Technology Today since its inception in 2006. While working primarily in the background of the company's magazine and website business operations, he has recently taken a more active role in contributing content covering industry news and other company centric topics.

Rob Pettengill, Ph.D. received his first telescope when he was eight and he has been a lover of the night sky ever since. Developing his own astrophotography images was a relaxing way to learn skills he needed for his professional research. He implemented signal processing algorithms as custom integrated circuits for medical applications and digital speech at Stanford and Texas Instruments and later built computer aided design and knowledge management systems for MCC and Schlumberger. He now applies what he's learned in computation, electronics, and imaging as an astrophotographer. He also enjoys urban sidewalk astronomy and traveling with his wife for dark sky adventures.

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Industry News/New Products

GREAT VISUAL AIDS FOR SOLAR VIEWING FROM CELESTRON

By Dr. James R. Dire

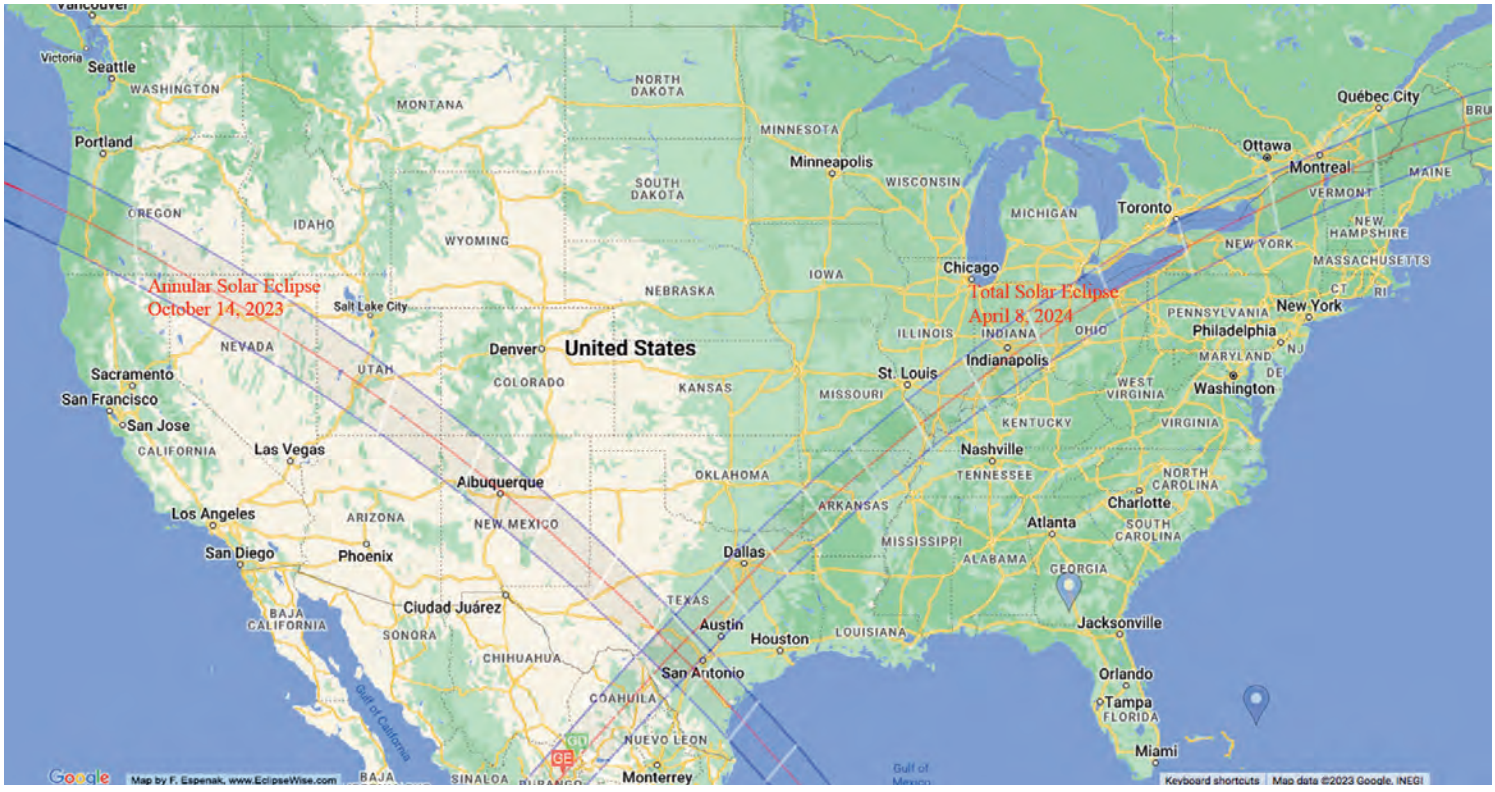

Image 1 - Two central solar eclipse cross the U.S. between October 2023 and April 2024.

With two upcoming solar eclipses occurring in the United Stated, one in the last half of 2023 and one in the first half 2024, its time to start thinking about quality equipment to view these celestial wonders. **Image 1** shows the path of both the October 14, 2023 annular solar eclipse and the April 8, 2024 total solar eclipse (Eclipse Predictions by Fred Espenak, EclipseWise.com).

Annular solar eclipses cannot be viewed with the naked eye. An observer must use a safe solar filter at all times. This is because even though the center of the Moon passes over the center of the Sun, the Moon is far enough away from Earth in its elliptical orbit that it does not cover all of the Sun's disk (**Image 2**). So essentially an annular solar eclipse is a special type of partial solar eclipse, partial referring to the fact the Sun's disk is never totally obscured by the Moon.

You can view a partial solar eclipse by holding a safe solar filter in front of your eyes while looking at the Sun. There is no magnification, but you can follow the eclipse anyway. No detail on the Sun's surface will be visible and only the largest possible sunspot, if any are around, will be resolved.

For a better view, you could buy a tel-

Image 2 - The annular solar eclipse of May 20, 2012 from beginning to end. The images were taken with a Bushnell 4000 Schmidt Cassegrain telescope with a Canon 600D camera and a Thousand Oaks solar filter.

Image 3 - The EclipSmart 2x Power Viewer kit comes with two solar filter binoculars and an eclipse map.

escope, mount, diagonal, eyepieces and solar filter. But perhaps such is not in the budget, or if travelling long distance to see an eclipse, not convenient to carry on an airplane. Celestron has a line of EclipsSmart solar products than can alleviate these problems. I review a few of them here.

The first product I'll discuss is the Celestron EclipSmart 2x Power Viewers Solar Eclipse Kit (**Image 2**). Celestron had a genius idea to pack two solar viewers in the same box with a map of the afore-mentioned solar eclipses. This kit is perfect for an eclipse date for two people. The kit sells for under $13. Of course, this doesn't count the cost of the picnic basket, blanket, and bottle of wine to make this a perfect eclipse date.

Image 4 shows the side of one of the viewers. They are folded up inside the kit and shipped in individual zip-locked bags. Once removed, they can be held as shown to create an inexpensive cardboard set of solar binoculars. **Image 5** shows the solar filters on the front end of the viewers. As expected, they are opaque to any light other than directly from the Sun. The filters are a black polymer material that transmits orange light from the Sun. This is the same material found in many paper eclipse sunglasses. They are 100% safe for viewing.

Image 6 shows the lenses in the viewers. These are fixed-focal length lenses that provide 2x magnification. So, the view will show the Sun twice as big as typical eclipse shades. I believe the lenses are designed for someone with 20/20 vision. I don't have 20/20 distance vision, so I found the image slightly out of focus. But when I used the viewer with my glasses on, the view was much more crisp. Using them with glasses was not a problem at all.

There was ample sunspot activity when I tested these solar products (**Image 7**). Unfortunately, the sunspots were not large enough to resolve with the 2x view-

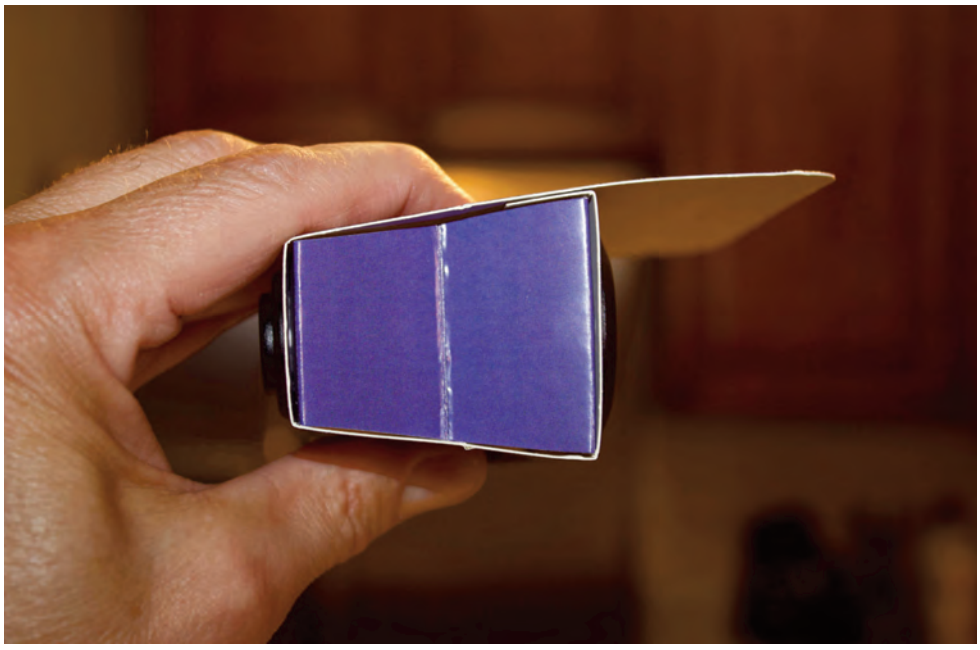

Image 4 - Side view of an EclipSmart 2x Power Viewer.

Image 5 - The skyward side of an EclipSmart 2x Power Viewer has a polymer solar filter for each eye.

ers. Regardless, they will be excellent for tracking the partial phases of any solar eclipse and seeing the "ring of fire" around the Moon during the annual solar eclipse in October 2023.

Image 8 shows the kit's eclipse map for the lower 48 States for both the October 2023 and April 2024 solar eclipses. The flip side of this fold up map (**Image 9**) contains eclipse times for various North American cities.

For those who want to see more detail on the Sun, Celestron has a series of EclipSmart solar binoculars. They come is sizes 10x25mm, 10x42mm, 12x50mm and 20x50mm. I tested two of the four. They range in price from $44 to $130 dollars.

The first pair I tried was the 10x25mm roof prism EclispSmart binoculars (**Image 10**). These binoculars use multi-coated BK7 glass. The eye relief is a decent 10.5mm. They are adjustable for inter-pupillary distances from 56 to 72mm. The binoculars are almost pocket-sized and weigh only 11.46 oz (325 g). They are also water resistant and have a 5.7-degree field of view. The binoculars come with a soft carrying case with a belt loop, a lens cloth and an instruction manual (**Image 11**). The manual has specifics on all four EclipSmart binoculars.

Image 12 shows a close-up view of these binoculars. The solar filters are built-in in front of the objective lenses (left side). The focusing knob is in the middle. Like most binoculars, the right eyepiece has a helical focuser to ensure both eyes are in focus simultaneously. Finally, the binoculars have a lightweight neck cord. The solar filters block out all harmful infrared and ultraviolet light and block 99.999% of visible light.

My first astronomical binoculars were 10x50mm. Over the years I switched to 7x50mm as I could no longer hold the 10x50mm steady enough. But I had no difficulty steadying the lightweight EclispSmart 10x25mm binoculars.

When using solar binoculars, it is important to put them in front of one's eyes before pointing them at the Sun. Likewise, one should look away from the Sun before removing the binoculars from in front of the eyes. This ensures not accidently looking at the Sun without the protection of solar filters.

The view through these binoculars is perfectly black until the Sun enters the field of view. I had no difficulty finding the Sun in these binoculars and focusing them for both eyes. The magnification is sufficient to see many large sunspots. I could also make out some granular detail in the Sun's

Image 6 - The 2x lenses on an EclipSmart 2x Power Viewer.

photosphere. The Sun's image in the binoculars is white, close to the true color of the Sun.

The last EclipSmart product I tried was the 12x50mm porro prism binoculars (**Image 13**). The binoculars come with a soft case, strap, and dust caps for all of the optics (**Image 14**). Like all the binoculars in this series, they are waterproof, use multi-coated BK7 glass, and have solar filters in front of the objective lenses that meet all the required safety standards. This pair has 12.0mm eye relief and is adjustable for 56 to 72mm interpupillary distances. The binoculars weigh 31.5 oz (892 g) and have a 5-degree field of view.

While the field of view and magnification are not that much different between the 10x25mm and 12x50mm binoculars, the larger set should provide twice the resolution since the lenses have twice the diameter. Both pairs provide filtered white Sun images about the same brightness.

With 12x magnification, I knew I could not hand hold these binoculars steady. Some people might be able to, but not me. So, I decided to mount them on a tripod. I chose to use a Celestron Regal tripod (**Image 15**). This tripod is lightweight (6 pounds or 2.74kg) and sturdy. It can hold up to 8.8 pounds of equipment, more than enough for these and larger binoculars. The tripod can extend up to 1746mm (68.75"), which is the height of my eyes when standing wearing normal shoes.

The tripod has two leveling bubbles, one on the two-way pan head and the other at the top of one of the legs (**Image 16**). Two of the legs come with padded wraps for carrying over the shoulder. The legs also have retractable spiked feet for use on grass or dirt and rubber feet for use on flat surfaces. The tripod also has a quick release that can be left on equipment while the tripod is stored in its soft case (**Image 17**). I

love everything about this tripod except that it requires a flat head screwdriver (**see Image 18**) to attach it to a camera or pair of binoculars.

There is a removable cap on the front of the binocular bridge that exposes a 1/4-20 threaded slot for attaching the binoculars to a tripod. Take care not to lose the cap when removing it (I have misplaced several over the years). A bracket is required to mate the binoculars to the tripod. I just happen to have such a bracket that I won as a door prize at a star party many years ago. **Image 20** shows the binoculars attached to my Z bracket and the Z bracket attached to the tripod. The binoculars are pointed 50 degrees above horizontal and the eyepieces are at the perfect height for my eyes without bending my knees (I am 5'10").

Image 21 and **Image 22** provide a better view of the binoculars attached to my Z bracket. Note the Z bracket has a dovetail plate on the top to attach a small finder. Image 22 also shows the large focusing knob on the binocular bridge and the helical focuser on the right eyepiece.

The views of the Sun through the binoculars were quite impressive. Despite having only 20% more magnification than the 10x25mm set, the increased resolution allowed me to see all of the sunspots in Image 7. While the detail wasn't as great as I can see in a large telescope with a solar filter, two eyes are always better than one. These solar binoculars cost a fraction of a small telescope system and a telescope solar filter. They are much more portable, especially if travelling by airplane, and do not require the setup and tear down time of a telescope.

So, whether viewing a solar eclipse or just tracking sunspots any day of the year, the Celestron EclipSmart line of solar instruments provides great performance and exceptional value. I'll definitely have them with me for the upcoming solar eclipses and beyond! ATT

Image 7 - Myriad sunspots dotted the Sun's photosphere as the author tested three EclipSmart solar instruments.

Image 8 - The eclipse map that comes with the EclipSmart 2x Power Viewer kit.

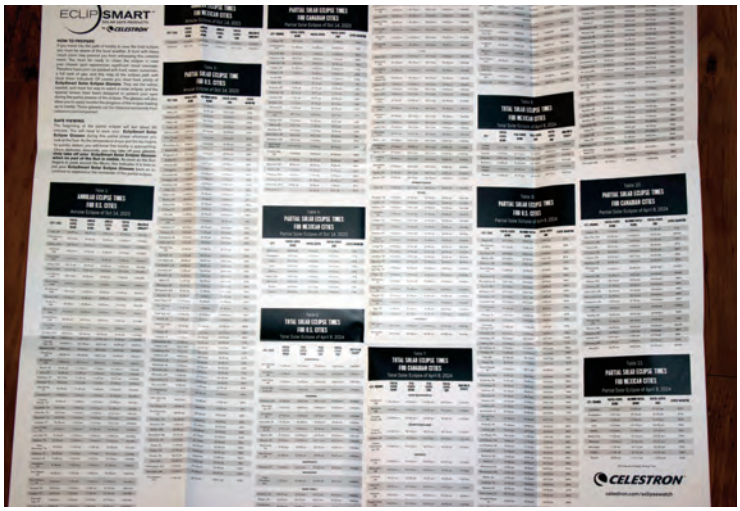

Image 9 - The back of the EclipSmart 2x Power Viewer kit map has eclipse times for both the October 14, 2023 and April 8, 2024 solar eclipses for various North American cities.

Image 10 - The 10x25mm solar binoculars are the smallest set of four binoculars in the EclipSmart series.

Image 11 - The EclipSmart 10x25mm binoculars come with a soft case, lens cleaning cloth and user manual.

Image 12 - Close-up view of the EclipSmart 10x25mm binoculars.

Image 13 - These 12x50 EclipSmart solar binoculars provide twice the resolution of the 10x25mm binoculars for seeing sunspot details.

Image 14 - The EclipSmart 12x50mm binoculars come with a soft case, next strap and lens covers. It also comes with a lens cleaning cloth and manual identical to the EclipSmart 10x25mm binoculars.

Image 15 - The Celestron Regal tripod with its soft case. The tripod is great for holding small binoculars that have a ¼-20 threaded tripod slot.

Image 16 - Top view of the Celestron Regal tripod.

Image 17 - Quick release shoe from the Regal tripod.

Image 18 - The bottom of the quick release shoe shows that a user-supplied flat screwdriver is required to attach a camera to the unit.

Image 19 - Tripod adaptable binoculars often have a ¼-20 slot on the front side of the binocular bridge.

Image 20 - The EclipSmart 12x50mm binoculars attached to the Regal tripod.

Image 21 - This view shows how the binocular Z bracket attaches to both the tripod and binoculars.

Image 22 - Side view of the EclipSmart 12x50mm binoculars.