Photonic Cleaning Technologies presents:

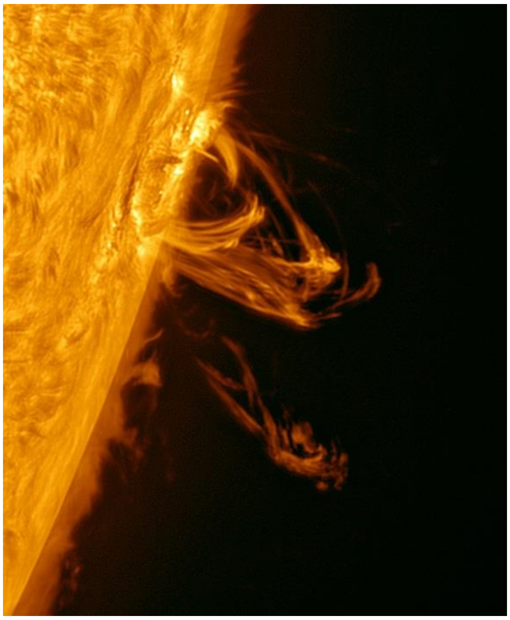
My Solar Life By Randy Shivak

My interest in solar astronomy began when I was 15 years old. The waxing and waning of sunspots and their intricate details fascinated me. At that time much of astronomy for a young amateur astronomer was like watching the grass grow. Things were so far away and moved so slowly that they never seemed to change.

Now the sun was different. I would make daily sunspot drawings watching how the spots would march across the solar disk and changed in appearance. I can remember seeing pictures in Sky & Telescope magazine of prominences, filaments, and solar flares. I couldn't afford to purchase a filter so decided to build my own spectrohelioscope. The spectrohelioscope was an instrument invented in the early 1900's and used to view the sun's atmosphere, the chromosphere, in H-alpha light. This is the light that is visible during total solar eclipses.

I spent the next 10 years designing and building my instrument. I had visited various solar observatories across the country and adopted ideas that I liked from these instruments into my design.   The clam shell dome I adopted, was from the San Fernando Solar Observatory in California, the tower telescope of my 12 inch F24 objective produced a prime focus image of almost 3 inches in diameter. (The lens that George Ellery Hale used on the 60 foot tower telescope on Mt. Wilson was a 12 inch objective F60 producing an image of the sun 7.2 inches in diameter.)

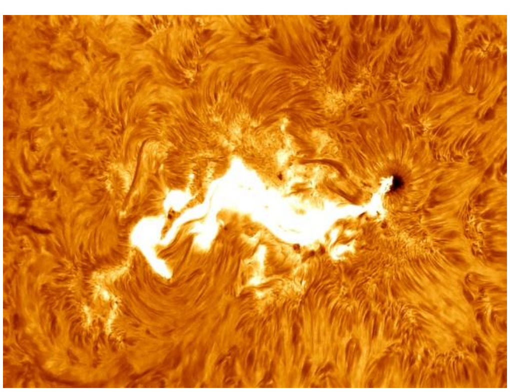
My spectrohelioscope incorporated rotating prisms to view the sun visually and oscillating slits to take images of the sun. A plane reflecting diffraction grating of 64mm x 64mm was used to produce the spectrum which a 4 inch positive meniscus lens was used to focus the spectral lines onto the exit slit. These slits could be controlled in width and also be rotated to remove spectral line tilt.



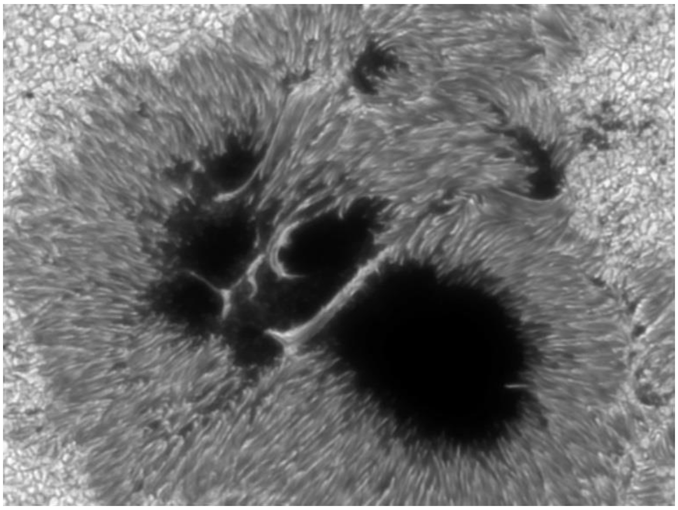
Liking the idea of an evacuated telescope tube, I used a micron vacuum pump to remove the air from the telescope tube thus removing air currents. This proved to be very effective in stabilizing the image. This was an adaptation from the 150 ft. Sac Peak Solar Observatory located in Sunspot, New Mexico. (This observatory has been recently decommissioned) I learned many skills in making this instrument and purchased a lathe and milling machine to facilitate its building. I employed a coelostat consisting of a 12 inch primary and 12 inch secondary flat mirrors to direct sunlight into the 12 inch objective lens. The advantage of using this type of mirror system is that the image produced by the objective lens does not rotate.

Today I use a Daystar Quantum PE .5 Angstrom, H-alpha filter. This type of filter requires power to control the internal oven which keeps the mica etalon at the correct temperature. Power can be supplied with either a 12 volt battery or 120 volt with an inverter. I like the temperature controlled etalon because it allows me to control the etalon so that I can move the passband into the wings of the H-alpha line by .1 angstrom increments up to plus or minus 1 angstrom. This is useful when studying different layers of the chromosphere and its associated details. Fibrils, spicules, and the super granulation cells are easily seen “off band”. The amount off band correlates to different layers in the solar atmosphere and also to the velocity of the feature being observed.

I use a Baader telecentric lens, the TZ lens system, which was specifically made to be used with the Daystar type H-alpha filters. The lens system comes in 2, 3, and 4 times your focal length so you can choose which one will work best with your telescope and focal length. This lens system screws onto the end of the telescope focuser and enables the H-alpha filter and camera to be screwed into the lens system via a barrel carrying the telecentric lens. This system allows the lens to “float” with no weight or attachment of the filter and camera onto the lens. This is a big advantage in reducing sagging in the optical train.



I like to use high magnification and large aperture which requires steady seeing, and clear skies. It is amazing how many details there are on the sun. Many are transient and come and go within minutes, others are very small. I use a ZWO asi174mm video camera capturing up to 164 frames per second. Depending on the seeing conditions I will process between 5 and 25 percent of the 3,000 frames captured. The captured video is then processed in a stacking program, sharpened, and the final processing done in Photoshop resulting in the best image.

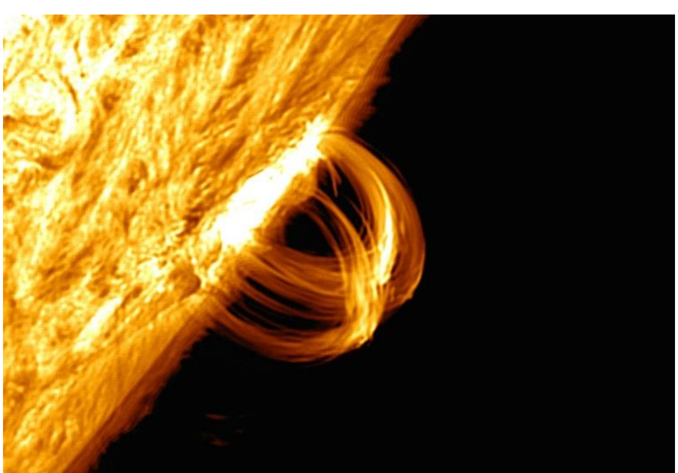


I can't stress the importance of capturing a large number of video frames to process since it will give you a much better image than trying to get a "lucky" single shot of the solar features. Do not use a color camera in imaging the sun in a single wavelength of light. All you will be doing is adding noise to your final image. There is NO other color in H-alpha light so using a color camera is of no advantage and a Big disadvantage. You can add color in Photoshop when desired. It's taken many amateurs a long time to learn that lesson.

For good resolution I use my Astro-Physics 152mm F8 refractor. This telescope is fitted with a Baader type D-ERF (energy rejection filter) in front of the objective. This multi-layer pre-filter keeps the objective and all other elements down train cool. This Baader ERF is highly recommended. I use either the TZ-3 or TZ-4 with this set up. This gives me an effective focal length of either 3,600mm F24 or 4,800mm F32 respectively. Daystar manufacturer recommends their filters to be used at F30 but I have had very good results with F ratios as low as F16.

When even more resolution is desired and the seeing conditions permit I use my home-built 228mm F9 refractor, I call "Leviathan". This telescope uses an Istar doublet lens with special H-alpha coatings. On those special days the TZ-4 lens system produces spectacular views with high contrast.

Don't forget the mount. I use an Astro-Physics 1200 mount. This mount works well with the 152mm F8 but the 228mm F9 is not as stable. This is mostly due to the tube acting as a long lever and the mount being portable. The scope had been used on a permeate mount with good results.



I use Photonic Cleaning Technologies' solution for cleaning my Astro-Physics 152mm objective lens along with my many Tel-Vue eyepieces. I had visited Photonic Cleaning Technologies' booth at NEAF several years ago and saw your lens cleaning demonstration. I know a good thing when I see it and was hooked after that. Using your "First Contact Polymer" solves all my delicate optical cleaning problems. I have done a lot of public outreach and for some reason the children just love to stick their fingers into the eyepiece. I don't get it, but your cleaning products work wonders on removing all traces of their little fingers. I have highly recommended your products to my astronomy friends and even Daystar filters. Many thanks for a fantastic product!

Sincerely,
Randy Shivak
A customer for life.