

# Morning Star

Fall 2016



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Gary with his observing chair for binoculars at Stellafane.



## New Members

VAS welcomes the following new member who joined us since the last newsletter:

Mark Toffolo  
Linda Pigion

## Meetings/Presentations

**Meetings are held the first (non-holiday) Monday of the month, at 7:30 P.M. in the Kolvoord Community Room of the Brownell Library, 6 Lincoln St., Essex Jct (2nd building north of Essex 5 corners on the left on Rt. 2A). (see Map on our web site, top of Events page).** Extra parking is available in the Bank North parking lot across from the library. **For inclement weather call Jack St. Louis (802-658-0184) or Paul Walker (work # 802-861-8640) to confirm.**

### October 3

#### Dressing for Observing By Several VAS Members

Proper attire is as important, some may say, more important than the telescope you observe with. About now you may be thinking- since when have astronomers been so fashion conscience. Not to worry, most of us aren't. (not the that you can tell in the dark.) The reason is of course comfort. You don't want to be too warm or too cold.

Not getting too cold is mostly the issue, even in the Summer, believe it or not. It is very easy to underestimate what it takes to keep warm, even on a cool summer night. Keeping warm in the winter in Vermont is of course more of an issue.

If one is observing in their own backyard it is not as big a deal as when at a remote site. Even then, it can be surprising to find oneself so focused on

observing that and hour into it you realize you're freezing.

Find out what it takes to stay warm and comfortable on those clear cool (and sometimes downright cold) nights out with your scope. We will cover some of the basic considerations. You will see specifics of how some of us stay warm.



VAS's first Winter Star Party, Feb. 2002.

### November 7

#### Is the Sun BIG??

By Joel Greene

When we look at the star that powers our world and neighboring planets, it is hard to think of anything dramatically bigger. Let's face it, over ONE MILLION Earths can fit in the Sun! We look at that glowing yellow ball in the sky and think "yep, that's big". If that is what you think, then think again. Our Yellow Dwarf star is not even close to being big as stars go. Stars come in all colors and sizes. Oh, and the Sun... it's actually WHITE. Confused? Don't worry, we are going to sort it all out...

### December 5

#### My Life in Telescopes

By Cathy James

Cathy James has been observing the sky through telescopes for nearly 40 years. She will talk about the many telescopes that she has owned and used, and how her observing life has evolved through many 'scopes and many moves around the country.

## Stargazing and other Events

All observing events -are weather Permitting unless otherwise stated. Bring extra clothes. We want you to have an enjoyable and comfortable experience. Even a summer evening can be chilly after standing still for a couple hours in damp air.

Keep in mind that last minute cancellations may occur even if the weather is good, so please check the web site ([www.vtastro.org](http://www.vtastro.org)) Events page for any last minute cancellations, members will be sent email updates.

You are welcome and encouraged to bring your own scope if you have one.

Events include: Member and Invited Guest Star Gazing and Public Star Gazing / Presentations for schools and libraries.

## New Email List for Member Use of the Hinesburg Observing Site (HOS)

100 Observatory Road, Hinesburg, VT

For impromptu star gazing we now have an email account, [observing@vtastro.org](mailto:observing@vtastro.org), for members interested in observing from the the Hinesburg site ..This will make it easier for members to coordinate going to the Hinesburg Site (and possibly other sites).

If you are interested in being on this email list contact **Paul Walker** at [paulwaav@together.net](mailto:paulwaav@together.net) or [info@vtastro.org](mailto:info@vtastro.org)

See details below and on the following pages  
Contact information for events is highlighted in blue.

### Green Mountain Alliance of Amateur Astronomers (GMAAA)

All events start about sunset.

Contact Ron Lewis for more details

802-779-5913 (cell)

802-247-5913 (home)

[vtpoet@gmail.com](mailto:vtpoet@gmail.com)

Unless otherwise noted, all GMAAA events are at the Hubbardton Battlefield State Historic Site  
5696 Monument Hill Rd,  
Hubbardton, VT 05735

Go to <http://historicsites.vermont.gov/directory/>, at the bottom under "The Sites" to go "Hubbardton Battlefield", "Things to Do", "Events and Happenings"

Tentative - check with Ron  
October 8 (Saturday) First quarter  
Moon present.

### Member and Invited Guest Star Gazing and other events

–Hinesburg Observing Site–  
(HOS) (also known the the Green Mountain Obveratory)  
100 Observatory Rd.

–Shelburne–

–New Haven–

Most are weather permitting, so watch for an email update a few days before the events.

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#### Star Gazing Event

Location: Shelburne

October 21, 22 or 23 (Friday, Saturday or Sunday) 6:30 PM.

#### Star Gazing Event

Location: TBD-

November 4, 5 or 6. (Friday, Saturday or Sunday) 6:30 PM

### Astrophotography Workshop

Location: TBD-

November 12 (Saturday) Time TBD.

Join VAS members who specialize in astrophotography for a workshop. We will talk about equipment, provide information on how to take pictures and do some hands-on processing of images.

All event are organized by the VAS Membership Committee (see below). Please contact a member with any questions. If you are not a VAS member, and would like and invite, contact any of the committee members.

Keith Lawrence  
[sleepingbearwoodworking@yahoo.com](mailto:sleepingbearwoodworking@yahoo.com)  
Jack St. Louis  
[jack.st.louis@comcast.net](mailto:jack.st.louis@comcast.net)

Check your email or the web site for last minute updates and cancellations.

## Public Star Gazing at Schools, Libraries, and other, groups.

Check our website [www.vtastro.org](http://www.vtastro.org) for any updates. Members can watch for emails.

If you know of a group or institution that would like to schedule a star gazing session have them contact:

**Bob Horton 802-879-7802,**  
[rhorton16@comcast.net](mailto:rhorton16@comcast.net)  
**Ron Anstey (802-524-3653)**  
**Joe Comeau (802-238-1664)**  
**Jack St. Louis (802-658-0184),**  
[jack.st.louis@comcast.net](mailto:jack.st.louis@comcast.net)

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### Star Gazing Event

We have been asked to provide public star gazing at *Speakeasy in the Sukkah: Stories, Spirits and Stars*.

**October 15, Saturday.**

**Location:** New Leaf Farm, Bristol, VT. **Overall event festivities start at 4 pm. ALL ARE WELCOME!**

**Star gazing starts about 9:00 -** Moonlight and beyond- Our bonfire will be filled with music and song, kick back and enjoy the stars with telescopes and astronomers from the Vermont Astronomical Society.

For more info see:

[www.livingtreealliance.com/sukkot](http://www.livingtreealliance.com/sukkot) ,  
[www.livingtreealliance.com/schedule](http://www.livingtreealliance.com/schedule)

or Melanie Kessler Living Tree Alliance Program Director 802 385-1039

## Articles

We are partnering with NASA's Space Place ([spaceplace.nasa.gov/](http://spaceplace.nasa.gov/)). We have added the site to our Astro Links page under "Kids Astronomy and Space Sites". For those who do presentations for local schools, you can get small quantities of NASA's Space Place items (bookmarks, stickers, temporary tattoos) to hand out.

"The mission of NASA's Space Place is to engage kids' interest in Space and Earth science, as well as the tech-

nologies that scientists use. Our site offers interactive games and demonstrations, hands-on projects, fun facts and short videos. It is a U.S. government-sponsored website; there are no advertisements or pop-up windows, and NASA's Space Place does not link to any commercial websites. It is a safe place for kids of all ages to visit.

Essentially we provide a free article each month for inclusion your club's newsletter (or posted on your club's website, depending upon the organization's preferred distribution method) and regular mailings of printed materials for sharing with the club's membership. In return, we ask for a copy of the newsletter using our article and a link to our websites be added to your club's web page."



### Is there a super-Earth in the Solar System out beyond Neptune? By Ethan Siegel

When the advent of large telescopes brought us the discoveries of Uranus and then Neptune, they also brought the great hope of a Solar System even richer in terms of large, massive worlds. While the asteroid belt and the Kuiper belt were each found to possess a large number of substantial icy-and-rocky worlds, none of them approached even Earth in size or mass, much less the true giant worlds. Meanwhile, all-sky infrared surveys, sensitive to red dwarfs, brown dwarfs and Jupiter-mass gas giants, were unable to detect anything new that was closer than Proxima Centauri. At the same time, Kepler taught us that super-Earths, planets between Earth and Neptune in size, were the

galaxy's most common, despite our Solar System having none.

The discovery of Sedna in 2003 turned out to be even more groundbreaking than astronomers realized. Although many Trans-Neptunian Objects (TNOs) were discovered beginning in the 1990s, Sedna had properties all the others didn't. With an extremely eccentric orbit and an aphelion taking it farther from the Sun than any other world known at the time, it represented our first glimpse of the hypothetical Oort cloud: a spherical distribution of bodies ranging from hundreds to tens of thousands of A.U. from the Sun. Since the discovery of Sedna, five other long-period, very eccentric TNOs were found prior to 2016 as well. While you'd expect their orbital parameters to be randomly distributed if they occurred by chance, their orbital orientations with respect to the Sun are clustered extremely narrowly: with less than a 1-in-10,000 chance of such an effect appearing randomly.

Whenever we see a new phenomenon with a surprisingly non-random appearance, our scientific intuition calls out for a physical explanation. Astronomers Konstantin Batygin and Mike Brown provided a compelling possibility earlier this year: perhaps a massive perturbing body very distant from the Sun provided the gravitational "kick" to hurl these objects towards the Sun. A single addition to the Solar System would explain the orbits of all of these long-period TNOs, a planet about 10 times the mass of Earth approximately 200 A.U. from the Sun, referred to as Planet Nine. More Sedna-like TNOs with similarly aligned orbits are predicted, and since January of 2016, another was found, with its orbit aligning perfectly with these predictions.

Ten meter class telescopes like Keck and Subaru, plus NASA's NEO-WISE mission, are currently searching for this hypothetical, massive world. If it exists, it invites the question of its origin: did it form along with our Solar System, or was it captured from another star's vicinity much more recently? Regardless, if Batygin and Brown are right and this object is real, our Solar System may contain a super-Earth after all.





*A possible super-Earth/mini-Neptune world hundreds of times more distant than Earth is from the Sun. Image credit: R. Hurt / Caltech (IPAC)*

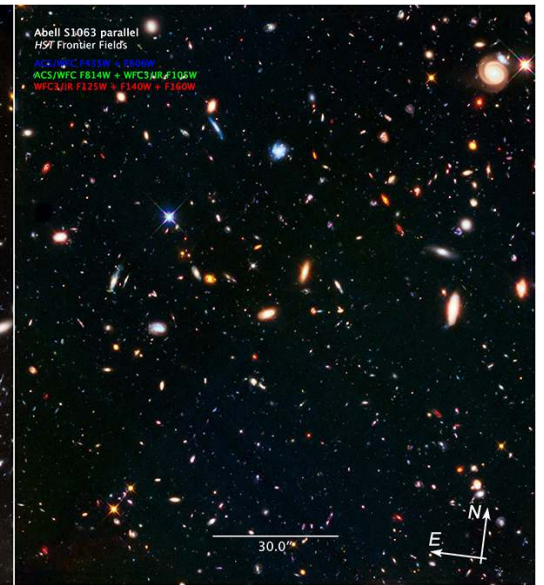
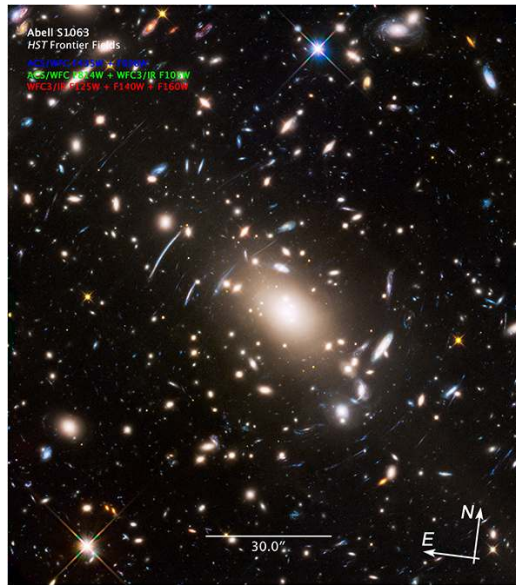
## One Incredible Galaxy Cluster Yields Two Types of Gravitational Lenses

By Ethan Siegel

There is this great idea that if you look hard enough and long enough at any region of space, your line of sight will eventually run into a luminous object: a star, a galaxy or a cluster of galaxies. In reality, the universe is finite in age, so this isn't quite the case. There are objects that emit light from the past 13.7 billion years—99 percent of the age of the universe—but none before that. Even in theory, there are no stars or galaxies to see beyond that time, as light is limited by the amount of time it has to travel.

But with the advent of large, powerful space telescopes that can collect data for the equivalent of millions of seconds of observing time, in both visible light and infrared wavelengths, we can see nearly to the edge of all that's accessible to us.

The most massive compact, bound structures in the universe are galaxy clusters that are hundreds or even thousands of times the mass of the Milky Way. One of them, Abell S1063, was the target of a recent set of Hubble Space Telescope observations as part of the Frontier Fields program. While the Advanced Camera for Surveys instrument imaged the cluster, another instrument, the Wide Field Camera 3, used an optical trick to image a parallel field, offset by just a few arc minutes. Then the technique was reversed, giving us an unprecedentedly deep view of two closely aligned fields simultaneously, with wavelengths ranging from 435 to 1600 nanometers.



With a huge, towering galaxy cluster in one field and no comparably massive objects in the other, the effects of both weak and strong gravitational lensing are readily apparent. The galaxy cluster—over 100 trillion times the mass of our sun—warps the fabric of space. This causes background light to bend around it, converging on our eyes another four billion light years away. From behind the cluster, the light from distant galaxies is stretched, magnified, distorted, and bent into arcs and multiple images: a classic example of strong gravitational lensing. But in a subtler fashion, the less optimally aligned galaxies are distorted as well; they are stretched into elliptical shapes along concentric circles surrounding the cluster.

A visual inspection yields more of these tangential alignments than radial ones in the cluster field, while the parallel field exhibits no such shape distortion. This effect, known as weak gravitational lensing, is a very powerful technique for obtaining galaxy cluster masses independent of any other conditions. In this serendipitous image, both types of lensing can be discerned by the naked eye. When the James Webb Space Telescope launches in 2018, gravitational lensing may well empower us to see all the way back to the very first stars and galaxies.

If you're interested in teaching kids about how these large telescopes "see," be sure to see our article on this topic at the NASA Space Place:

<http://spaceplace.nasa.gov/telescope-mirrors/en/>

*Galaxy cluster Abell S1063 (left) as imaged with the Hubble Space Telescope as part of the Frontier Fields program. The distorted images of the background galaxies are a consequence of the warped space due to Einstein's general relativity; the parallel field (right) shows no such effects. Image credit: NASA, ESA and Jennifer Lotz (STScI)*

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## My First Astrophotos - The Start of a Long Journey

By Mike Stadtmauer

Soon after getting my first telescope about a year and a half ago I discovered video astronomy. The images that a good video astro camera can produce are magical, but very low resolution. The old photographer in me wanted more, and there did not seem to be enough frustration in my life - enter astrophotography! By far, this has proven to be the most technically challenging pursuit I have ever been involved in. It is, in my opinion, the perfect blend of technical challenge and creative license.

So, after getting an equatorial mount, learning how to use it, getting a camera, learning how to use it, getting an auto guider, learning how to use it, learning about flats, darks and bias frames, getting imaging processing software, and starting to learn to use it I was ready to begin sparring with polar alignment, periodic error, focus, mount modeling, naughty software, backlash, and the dreaded meridian flip.

I did some experimental runs to test various aspects of the equipment - getting guiding to settle down to something useable took some time. With all of this equipment and software there are so many options and settings, and no one has the exact same set up, so all you can do is trial and error your own until it starts to behave. I thought I had things mostly figured out and did a few initial imaging runs on some easy targets, but the data was not usable in the end - mostly due to technical difficulties - mostly because of forgetting to do some critical piece of the process. As it turns out, changing the binning mode back to 1x1 after framing and focusing at 4x4 is important!

L: 60s x 90 + 300s x 20, dithered  
R, G, B: 60s x 25 + 300s x 8, dithered  
[LRGB imaging were LRGB stand for Luminescence, Red, Green and Blue image channels respectively. This type of color imaging is much more involved than using a "single shot" color camera]

For my first image ever, I am thrilled with this result. With that said, the image has many, many issues. Primary of which is poor focus.

Focus: this is a side effect of both collimation errors and the big floppy mirror of the C11 flopping around and the fact that focus was done by hand with a focusing mask. It is not sharp. Stars: they are much too big. This is mostly a side effect of mount performance which is negatively affected by

that the clutches can be released and the scope stays still - much tighter stars (ie less guiding error)

Processing: If you look close (actually you don't have to look very close), the stars have a ring around them. This is an artifact created during noise reduction and sharpening techniques, and can be much better controlled. The color balance and saturation employ a bit of artistic license, but I'm okay with that. There are many other errors, but that is to be expected, especially given the learning curve of the software. I decided that, since I didn't already use Photoshop, I would commit myself to starting with PixInsight (PI) from the get go. PI is software made solely for the purpose of astronomical image processing. In over 30 years of owning my own computer, this is by far the most complicated, obtuse and powerful software I have ever used. So much so that I talked my wife into letting me go to a 6 day instructional intensive, put on by one of the developers, in December - can't wait.

Cropping: The image is much too severely cropped. This is not on purpose. The image was captured over 2 nights and I unknowingly had a large rotational mismatch (won't do that again) which required most of the peripheral areas be cropped. Plus, there was much more significant vignetting than I had realized at the time, requiring further cropping.

Long Exposures: 5 minutes was probably too long of an exposure at my current level of expertise - this also contributes to the star bloat.

Even still, all in all - if I don't look too close, I am blown away by the level of detail, considering the distances involved (28Mly).

Perhaps the most interesting thing about this process was learning about what we are really looking at. I had assumed that the two galaxies are currently (well, 28 million years ago, at least) interacting with one another. However, the galaxy on the left, NGC 5195, sits behind and is moving away from M51. This is because NGC 5195 approached M51 and passed through the central disk of the larger galaxy, coming towards us, about 500 million years ago. The galaxy was caught in the



### M51 (Whirlpool Galaxy)

When I finally had all my ducks in a row, we were well into galaxy season and M51 seemed like a great first target.

#### Equipment:

Mount: Celestron CGEM-DX

Scope: Celestron C-11, Astro-physics CCDT67 focal reducer at approx .5x (fl = 1400mm)

Camera: Starlight Xpress SX-814

Guider: Lodestar X2c

Filter Wheel: Starlight Xpress SX Mini+OAG

Filters: Astrodon Gen2 LRGB

Software: Nebulosity4, PHD2, PixInsight

#### Image Details:

the inherent imperfections of the meshing gears of the mount (realized as period error), backlash (another inherent issue with the mount), imperfect polar alignment (creating tracking/guiding issues) and the focus previously mentioned. I do not yet have a permanent pier for the mount and have to polar align (or attempt to) at the start of every session, but this can only get so good unless an unruly amount of time is devoted (at least for me, at this time). Certainly, with time and experimentation I will be able to more fully realize the potential of the mount. Already, I had a major break through when I realized how much difference it makes to balance the scope in the home position so



gravitational pull of M51 and slowed and reversed course to pass through the disk of the larger galaxy again about 75 million years ago, this time heading away from us. This interaction was shown to be the cause of M51's tight spiral structure - it was basically spun like a top by the gravitational fingers of NGC 5195 as it passed through twice. Cool!

background, sharpening the galaxy, enhancing galaxy features, attempting to reduce star sizes, and adjusting color I produced the following:

This object sits in a much denser star field than M51 and is juxtaposed in the image by the nearby cluster, NGC 6939. It is actually very close to the galactic plane, about 18Mly away. The galaxy is about a third of the size of the Milky Way, and contains about half the



### NGC 6946 (Fireworks Galaxy) + NGC 6939

For my next project, I wanted to try my other scope, a 102mm carbon fiber triplet (ES102CF) with a .8x reducer/flattener (fl = 572mm, f/ratio = 5.6). All the other equipment is the same. While speaking with Joe at the annual meeting, it was suggested that 60s subs is the sweet spot for VT skies, and that working with 300+ frames was best. So - that's exactly what I did. L: 60s x 160, dithered. R, G, B: 60s x 60, dithered

After selecting for the best frames I had about 300 to work with. After going through the process of calibrating the images with dark, flat and bias frames, registering, stacking, applying the drizzle algorithm, neutralizing background, color calibrating, masking off the galaxy and stars, reducing background noise, stretching, masking the

stars. Despite this, it has about 10x the amount of supernovae activity. It has produced the most supernovae of any observed galaxy in the last 100 years - 9, as opposed to 1 in our galaxy (which is not a bad thing). NGC 6939 is an open cluster in Cepheus, about 17ly across. It makes for an interesting thought experiment to consider that this object and the galaxy are about the same apparent size, about 10.5 arcmin diameter, but the cluster is only 6kly away. This means that the galaxy is 3,000x farther away, but still the same 'size'

Despite all its flaws, I really like this image. We still see significant issues with the stars - they are too big, they have rings, they are a bit oblong as opposed to round - but overall a better result than the previous image. Are the star colors a bit saturated? Perhaps, but again, I like it.

This time focus and tracking are better, which is both a result of the shorter focal length being more forgiving and a more careful focusing and polar alignment procedure, although focus is still being done by hand. I know that there is plenty of auto-focus capable software out there, but not for the Mac. In this pursuit of astrophotography I have stubbornly refused to cross into the dark side and use virtualization software to run Windows on my computer. I figured I haven't needed Widows in the last 30 years and I don't intend to start now. Yes, this limits my choices, but a number of the better software titles are cross platform (such as the 3 I use) and some new and exciting Mac based astro-software titles (including ones that have auto-focus) are maturing into well-developed, feature rich options using the INDI platform (the open source equivalent to ASCOM, more or less).

### Next Project:

I am inspired by the current trend of people experimenting with stacking hundreds to thousands of very short exposures and leveraging the potential of today's number crunching astro-image processing software. In theory, it should not matter if you take 300 1sec exposures or 1 300sec exposure - the amount of information gathered should, and will, be the same. The reason this did not work so well in the past CCD and/or CMOS chips in the past were so noisy that the signal in the 1sec frame could not be extracted from the noise - you needed a stronger/brighter signal on the chip to get a usable signal to noise ratio. But, things have changed. The newer chips, especially from Sony, are really super-duper low noise making the above technique possible. If you search around, you can find a lot of really nice images taken at 1sec. Currently I am working on gathering data of Andromeda using 10sec subs.

### Board Talk

Board meetings are currently held at BioTek Instruments (Paul's employer) the 3<sup>rd</sup> Tuesday of the month, 7:30 to 9:00 PM. They are open to all mem-



bers, contact any Board Member for info.

### Board meeting summaries:

#### July

No meeting.

#### August

We talked about having work party the the Hinesburg site in September.

Jack said Joel Greene had asked about being the moderator of our twitter account. Jack gave him permission.

Keith requested permission to purchase 2 more scopes for the Library Scope Loaner program.

Jack is planning another adult astronomy class at CVU in Hinesburg. He wants VAS to supply planispheres which would be offset by the fee for the class.

Joe reported he was going to hold his "Spontaneous Night Under the Stars" the last week of August.

Bob has made some progress in re-figuring the 14" mirror of the Newtonian that was donated to the club.

Motions:

Bill made the motion that we approve the purchase of 2 more sLibrary scopes, seconded by Joe . Unanimously approved.

#### September

Keith showed a sample of the planisphere he and Jack will use at the Adult astronomy class at CVUHS.

Joe is working on a Messier Object presentation (he has taken digital images of all the Messier objects).

Paul is working on the newsletter.

Keith went over the star gazing parties the Event's Committee has planned for this Fall (see page 2). They are also considering having a winter star party, possibly in January, possibly at Keith's house.

Keith suggested as part of the Library Loaner Scope Program that we list objects on the web site for each month that are suitable for the 4" loaner scopes.

Jack mentioned that October 8 is International Observe the Moon Night. We decided to set up in a few places to invite the public to view the Moon.

Jack picked up some more of Moe Cloutier's astronomy items from his wife Karen. Good stuff for another Auction at the Annual Meeting in May.

## Observers Page

### Persied Meteor Shower By Paul Walker

This year I decided to watch and try to photograph some Persied Meteors. I used my iOptron Sky Tracker on a tripod and 2 Canon XTi cameras. One with an 18-50mm zoom at 18mm, the other with a 50mm lens.

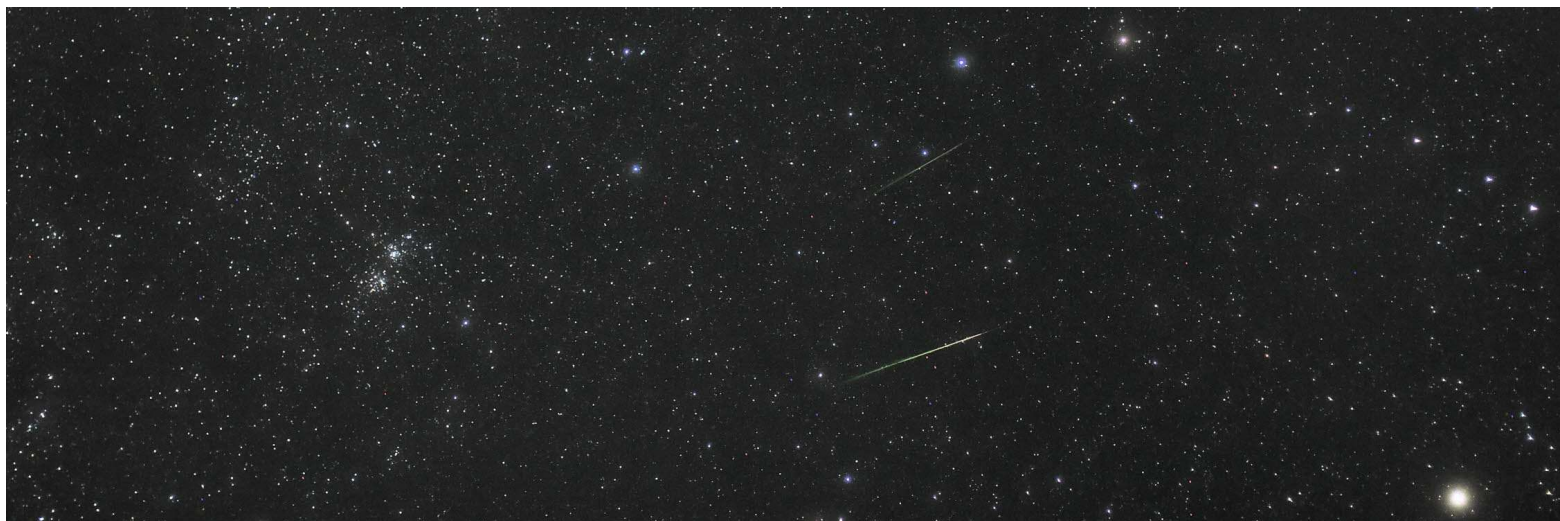
There was a layer of thin clouds and sometimes thicker clouds that interfered with viewing and imaging. From about 12:30 AM to 3:30 PM I only managed to see about a dozen and a half to 2 dozen meteors and imaged 7. Of the meteors imaged, I saw only the brightest one visually. That was the brighter meteor in the image below. No, I was not lucky enough to get 2 meteors in one shot, I combined 2 images into 1.

Over the 3 hour span I took 108 images through the 50mm lens. Of

these, 6 had meteor trails. The 2 in the accompanying picture were taken only 6 minutes apart. 107 images were taken through the 18-55mm zoom of which 3 show meteors, but too faint to bother printing. 2 of the meteors showed up in images from both cameras.

If you draw lines through the meteors back to where they cross you will find the radiant outside the image about 1/2 inch below and 3/4 inch in from the left edge. The 2 star clusters are the Double Cluster in Perseus (NGC 869 & 884).

Details: 50mm lens at f/2, ISO 400, 60 second exposures. The haze around the stars is due to thin clouds that night. The close-up shows more detail and I increased the color saturation to bring out the colors. I was surprised to see such obvious color even in the unprocessed images. You may notice some small red and blue dots, those are not stars, they are "hot" pixels.







### Central Milkyway By Greg Warrington

He's my first pass of a successful catch of the milky way. Galactic center to lower right, lagoon nebula right of middle.

Nikon D200 DSLR + 50mm lens on homemade barn-door tracker (motorized with an Arduino [microcontroller board]). 31 lights at 60s each, ISO 800, f/2.6 dark frames, 15 flat frames, 10 bias frames. Apparent FOV is about 26 X 18 degrees. Stacked in

DeepSkyStacker with adjustments made in Gimp.

See the reference chart below. Greg's image has 10 Messier objects (the large unmarked circle is the star cloud M24) as well as innumerable dark nebulae.

### Pluto By Paul Walker

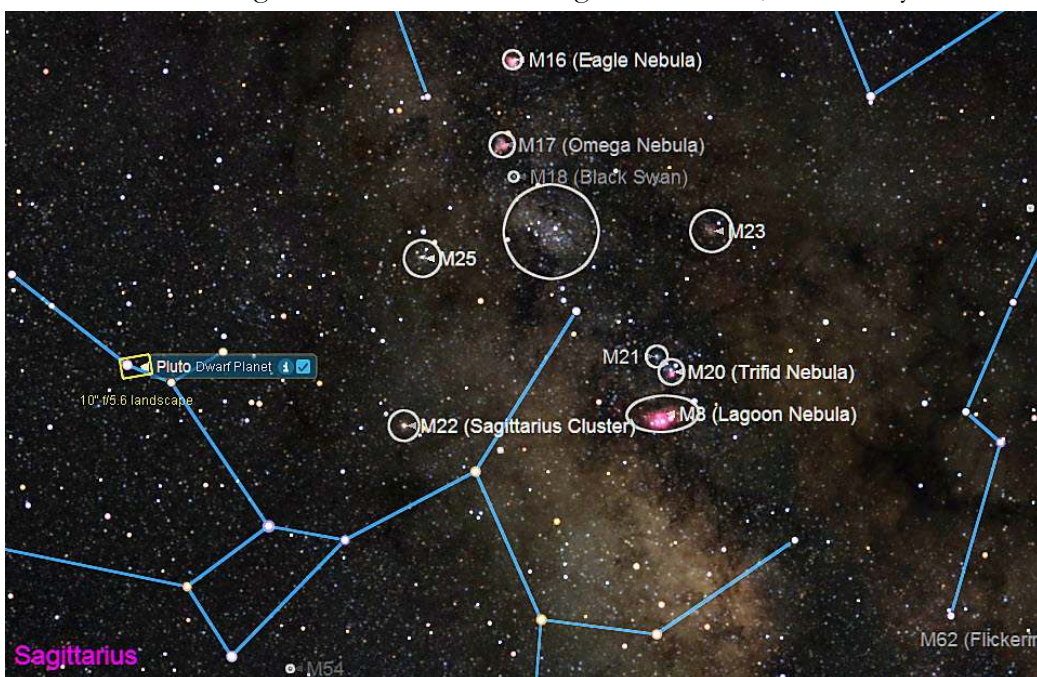
I was smart when it came to imaging Pluto, I did it when it was near a bright star. – OK, I was lucky. With

Pluto in the news and pages of Sky and Telescope and Astronomy magazines, I decided it was time for another image of the former 9<sup>th</sup> planet. It is now known to be the closest Kuiper Belt object. And whether one prefers calling it a planet or dwarf planet, it has turned out to be surprisingly active and diverse.

The bright Star is 3<sup>rd</sup> magnitude Albaldah Sagittarius (see image on next page). It made it relatively easy to locate the field that held Pluto on the night of July 5-6. The yellow box in the Starry Night Pro reference chart marks the field of view of the telescope. Once I verified the orientation of the camera it was simply a matter of positioning the star in the correct corner.

Pluto is magnitude 14.1. The faintest stars in the image are about 16.5 to 17.0 magnitude. I noticed about a 6 arc second difference in the position of Pluto on the image verses that shown by Starry Night Pro. The top image is a stack of 21, 1 minute exposures taken through my 10" f/5.6 Newtonian with a Canon XTi camera at prime focus and set to ISO 800.

The image below that is a crop from the of that image. The figure at the bottom was created from Starry





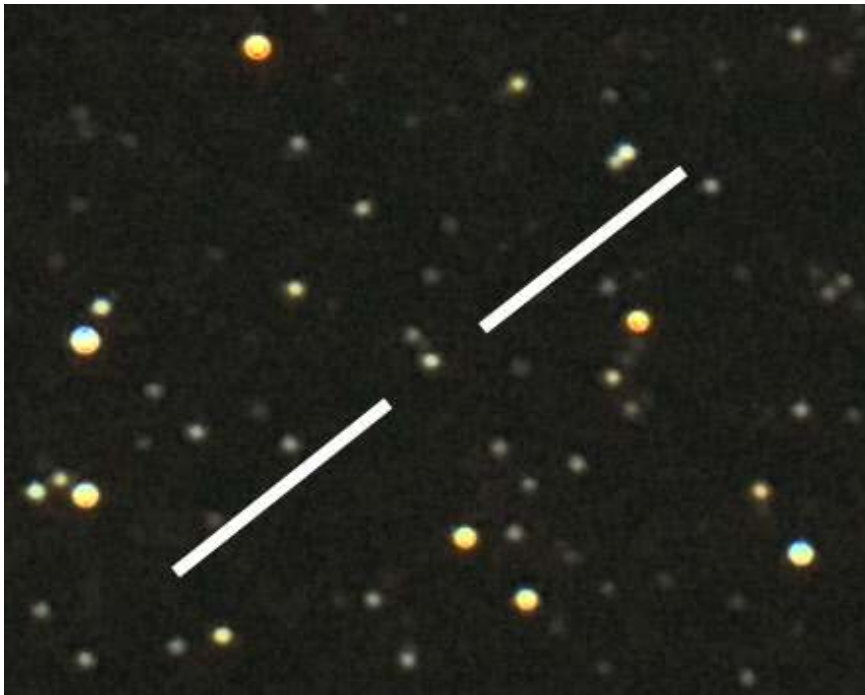


Night Pro. I have added the magnitudes of some of the surrounding stars. If you look closely you can see the discrepancy between the image and Starry Night.

### Parting Shot of Mars

By Paul Walker

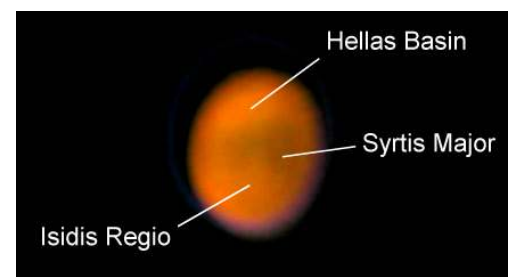
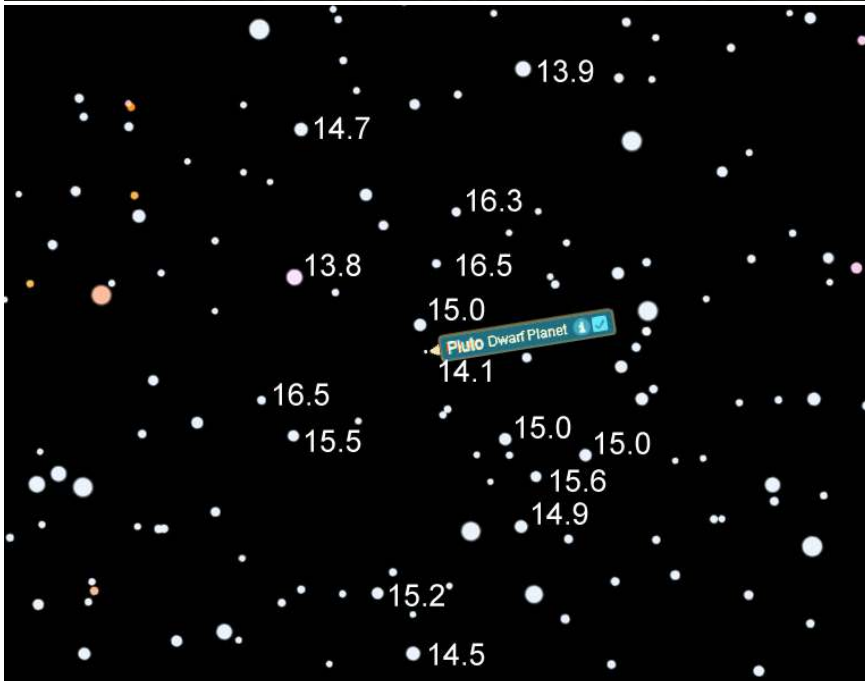
As Mars receded from Earth this Summer I would still peek at it from time to time and be surprised that some nights I could still see markings on it.



This image is from September 4. The seeing (steadiness) was no better than average but I could visually make out Syrtis Major and Hellas Basin from time to time. I think I could even make out the North Polar Hood. The apparent diameter was only 10.2 arc seconds and Mars was only 13 degrees above the horizon. I used a 2 degree wedge prism both for the visual observations and the imaging. For the image I did an additional shifting of the red and blue channels to correct for atmospheric dispersion (refraction).

Details: 10" f/5.6 Newtonian, a 16mm eyepiece 2x Barlow plus a 3x Barlow and 5x zoom on the camera. The camera is a point & shoot Nikon AW-110 that takes High Definition (HD) video. The 5x zoom on the camera is approximately 2.8x relative to the old standard of a 50mm lens on an SLR film camera (Viewing a scene through a Single Lens Reflex camera with a 50mm lens is very close to 1x. If you have one of these cameras give it a try). Total magnification =  $1407\text{mm fl (of telescope)} / 16\text{mm} \times 2 \times 3 = 538\text{x} \times 2.8 = 1477\text{x}$ . I would use a higher magnification eyepiece (shorter focal length) and only the 3x barlow except the camera lens can't get close enough to see into the eyepiece. It needs more "eye relief" like someone wearing glasses.

The image is a "stack" of 500 video frames. The first image is the full frame, the second is cropped.



**First Quarter Moon  
and Straight Wall Cameo  
By By Paul Walker**

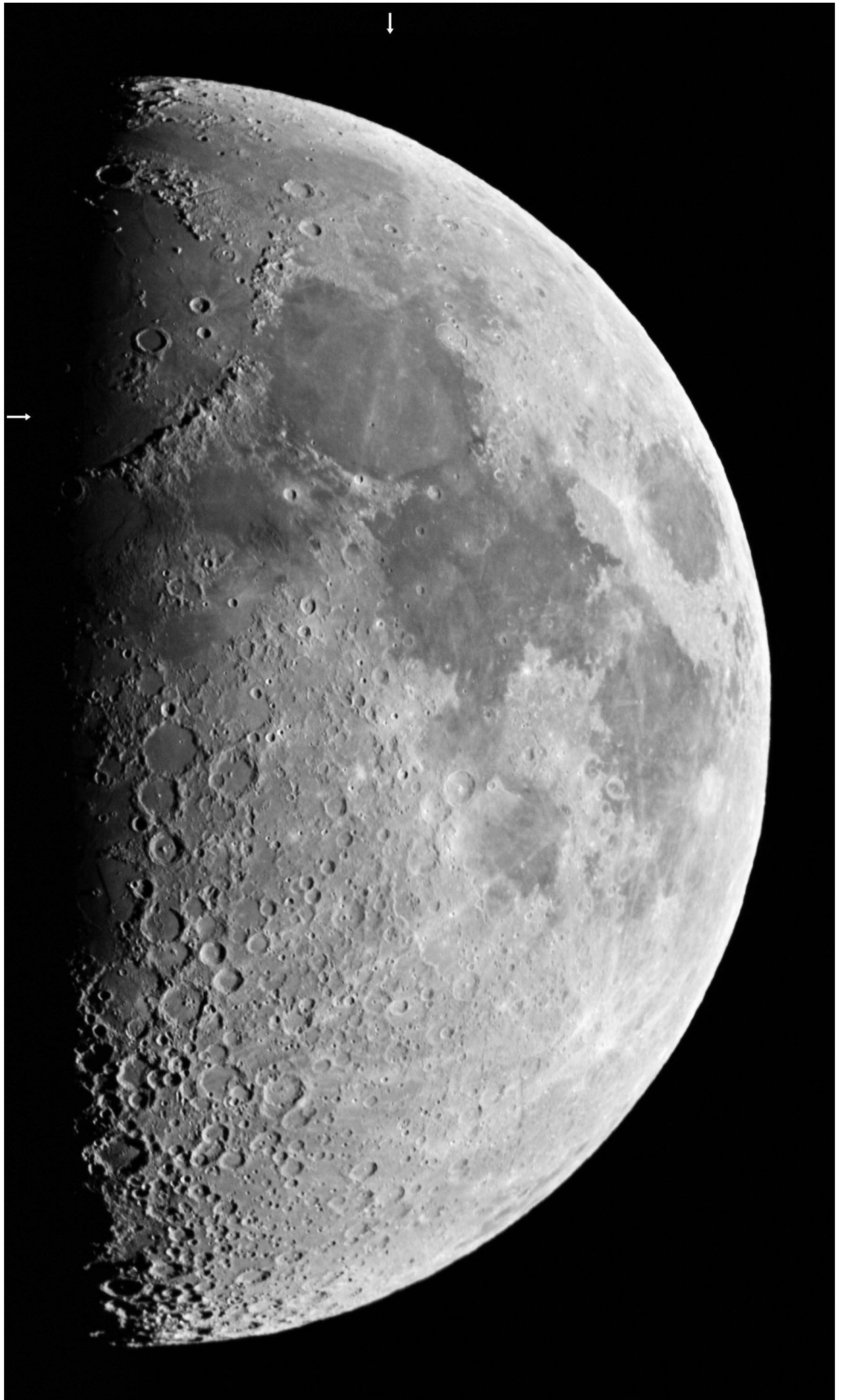
I should have sent this picture of the Moon to Larry for his Lunar Gazette. I may still do so or have done so by the time your read this.

The Bessel Ray (Lunar 100 feature #41) that Larry picked as the Focus Feature of the Month (2 Gazette issues ago) is marked by the 2 small arrows on the top and left edges of the image. As Larry mentioned, this appears to be debris splashed out during the formation a large crater. The only problem no one has been able to find a large crater that lines up well enough. Near the middle of the ray is small Bessel crater, the crater after which the ray is named. There appears to be a ray to the north that is almost but not quite lined up with Bessel Ray.

This is a mosaic of 6 images through my 10" f/5.6 Newtonian. Normally if I want to take a picture of the whole Moon I take what's called a prime focus image. Even the Full Moon fits nicely in the camera's field of view. However, to get a higher resolution image I use a 2", 2x Barlow. This is called negative projection imaging because a concave or "negative" lens is used to project a magnified image on the camera's sensor.

Now for the cameo, if you look about 1/3 the way up on the terminator (left edge) you may be able to make out the Straight Wall, Lunar 100 feature #15.

The Sun angle is the lowest it has been for any of the times that I have observed this feature. The close-up image (top of next page) shows well the undulations of the floor of the crater

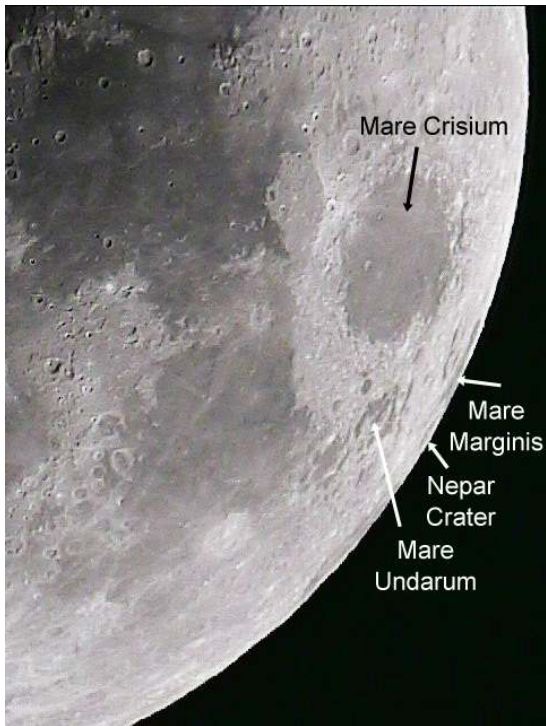






within which the wall sits. Considering how obvious it appears that the wall is in a large crater is in this picture, this crater has no name. It is considered just part of Mare Nubium.

### Moon Picture By Al Boudreau



A favorable libration allowed me to photograph Mare Undarum (just below Mare Crisium) plus Neper on the horizon.

Taken with a Mallincam operated at 1/1000 second. Telescope - 6-in Celestron SCT mounted on my 14-in SCT "spotting" scope.

### 3 Summer Open Clusters (M23, 25 & 39)

By Paul Walker

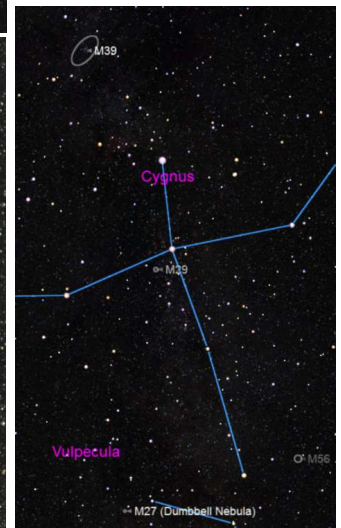
Last summer it was globular clusters, this summer I focused on open clusters. Top and middle are M23 and M25 in (for us) the southern Milkyway (see chart on page 7). The bottom is M39 way up in Cygnus (see chart below). These are all visible in binoculars. Even though they tend to be thought of as Summer objects, because the time of sunset is creeping earlier at almost the same rate the stars are creeping West, they stay visible overhead well into the Fall.

Image Details:

M23 - 10" f/5.6 Newtonian, 1 min x 14, Canon XTi camera, ISO 800, field of view 0.90 x 0.60 deg., 7/5/16.

M25 - 10" f/4 Schmidt-Newtonian, 1 min x 32, Canon XTi camera, ISO 800, field of view 0.79 X 1.21 deg., Baader Coma Corrector (MPCC), 7/5/16.

M25 - 10" f/4 Schmidt-Newtonian, 3 min x 11, Canon XTi camera, ISO 400, field of view 0.79 X 1.21 deg., Baader Coma Corrector (MPCC), 9/3/16.





### Fireball over Canada

On 9/21/16, Peter Gillette and Mark Moyer saw the light from a fireball that passed over Quebec Providence not far from the border.

**Peter** - Super-nice night tonite, but I've had to call it quits, what with my agenda tomorrow.

However, not before asking if anyone else was out tonite, and, at 9:41, also saw an incredibly bright light, for a few seconds, in the north, at about 15 degrees elevation? It was so bright that it cast brilliant rays of light through the trees, and sharp shadows. No sounds, no shock waves.

**Mark** - I was out too. I was looking into the eyepiece at that time but the flash was bright enough that I looked up to try to figure out what the heck it was. It seemed to me to come roughly from the north, but because I was looking in the eyepiece, that was about all I could say.

Looking on the fireball logs just now, I see that so far 115 people have reported this (that's huge for the logs!), people from "NY, ME, MA, VT, NH, Québec, Ontario, New Brunswick" (as far west as Toronto; as far east as Deer Island, ME). People were reporting it as a quite bright fireball with some reporting fragmentation and some hearing sound.

**Peter** - That's huge! By far, the brightest I've ever seen. I was imaging, at the time, so while the camera was going, I was just looking at the scope, with my back to the north. Suddenly, the scope, the inside of the observatory, and the trees beyond me, all lit up like daylite. I, too, said, "What the heck?", and spun to the north. Through the pines, pretty much directly below Polaris, about half-way up, was an incredibly bright light. Too high to be a neighbor, too low to be an aircraft, and then gone.

Glad to see I was not the only one to catch it!

### Rosetta Lander, Philae Found From ESA and Sky & Telescope

A trio of Rosetta images zooms in on the Philae lander, which was finally located on the surface of Comet 67P/Churyumov-Gerasimenko after many months of searching. The context image (upper right), taken April 15,

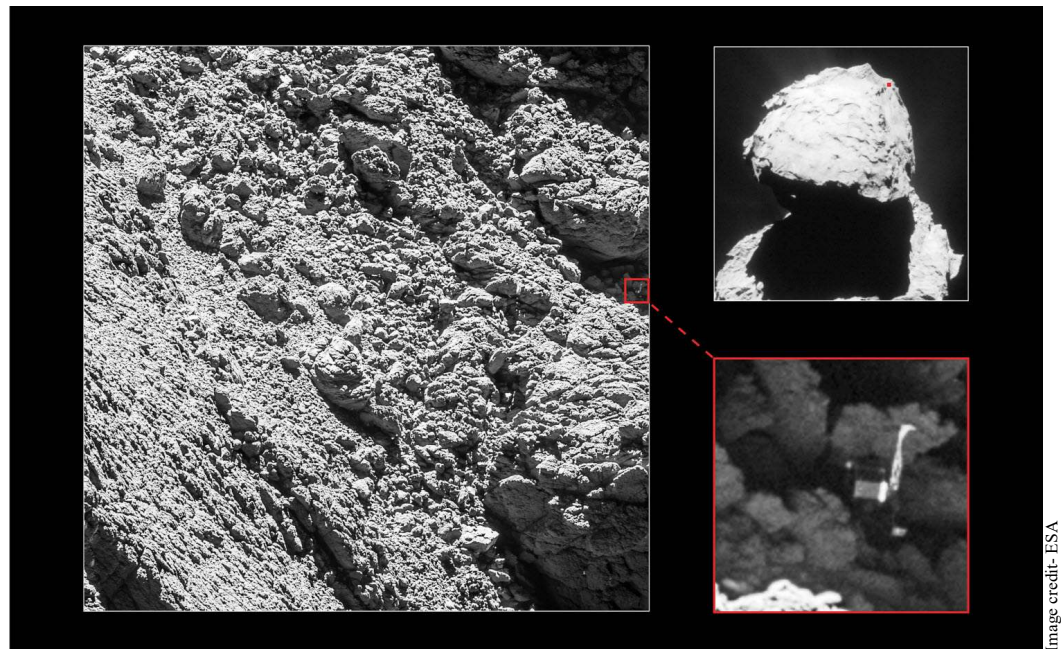


Image credit - ESA

2015, shows the lander's location on one of the comet's two lobes; Rosetta's OSIRIS camera took the long-sought discovery image (left and lower right) on September 2, 2016, from an altitude of just 2.7 km. The image scale is about 5 cm/pixel.

Philae's 1 m-wide body and two of its three legs can be seen extended from the body. The images also provide proof of Philae's orientation.

### Gary's Astronomical Events for the Month

can be viewed via WCAX at [www.wcax.com/story/6330547/astromical-events](http://www.wcax.com/story/6330547/astromical-events)

### Angele on the Radio

Listen to Angele's astronomy update on radio station WJOY AM (AM 1230) on Ginny McGehee's 'Breakfast Table' morning show. Airs the first Wednesday of the month at 8:40 AM.

### For Sale

**4 inch, 550mm f.l. brass Televue Renaissance scope** with carrying case  
Equatorial mount with oak tripod

2", 20mm Nagler type 2  
2" 45deg. righting prism  
2" Big Barlow  
2", 4.8mm Nagler  
1-1/4", 26mm Plossl  
2", 45deg. Prism camera adapter

**Price \$2450 - will negotiate.**

Contact Richard Cummings at [Rick@vsbmetal.com](mailto:Rick@vsbmetal.com)  
Or you can contact Ron Anstey [anstey@myfairpoint.net](mailto:anstey@myfairpoint.net)

### Celestron SP-C80 refractor telescope and tripod, rarely used.

Comes with the original manuals, and 3 books on astronomy and a viewing the universe tool.

**Asking \$350 or best offer.**

Contact Aimee Green, [leftlanegreen@yahoo.com](mailto:leftlanegreen@yahoo.com)

### Feather-touch focuser for a Schmidt-Cassigrain.

Brand new, hardly used. For specs go to [http://starlightinstruments.com/store/index.php?route=product/product&product\\_id=51](http://starlightinstruments.com/store/index.php?route=product/product&product_id=51). **Asking \$200** for it.

Stephen Scaravella, 802-434-3884 or [englishnotation@gmail.com](mailto:englishnotation@gmail.com)



### 5" Newtonian Telescope (Vixen R130SF)

#### and Vixen Porta II Mount

The R130SF comes standard with the 6 x 30 optical finder scope and a dovetail plate that fits very well on all the Vixen mounts.

650 mm focal length operating at a fast f/5 focal ratio for a wide, true field of view. Weighs only 9 pounds. This lovely telescope and mount are brand new and have no blemishes whatsoever.

The Vixen Porta II is a great grab and go alt azimuth Mount! It has a 15 lb payload capacity and features Slow Motion Flexible Handles. The Porta II accepts various dovetail mounted optical tubes and binoculars.

Total Value: \$969, **Selling price \$550 OBO**. Must sell as complete set, with case. You must arrange for pick up.

Contact Ron Lewis, 247-5913,  
[vt poet@gmail.com](mailto:vt poet@gmail.com)

### Lumicon EC Diagonal - 96%

LD1010 paid \$100, selling for **\$50**

### Cosmo Comfort Observing Chair

paid \$180, selling for **\$75**

### Lumicon Deep Sky Filter LF3010

paid \$120, selling for **\$65**

### Lumicon OIII Filter LF3040

paid \$120, selling for **\$65**

### Lumicon UHC Filter LF3025

paid \$120, selling for **\$65**

**Lumicon Lunar & Planetary Filter Set (Light) LF5080** paid \$85, selling for **\$40**

### Package Deal:

Lumicon ND50 Density Filter LF1090

Lumicon 23A Light Red Filter LF1035

Lumicon 80A Blue Filter LF1070

Lumicon 12 Deep Yellow Filter LF1020

Paid \$25 each.

Sell 4 Filter Package for **\$50**

Contact Sean Sullivan,  
[spsullivan1970@gmail.com](mailto:spsullivan1970@gmail.com)  
(518) 795-5635

### 10" Meade Schmidt-Cassegrain (LX200 GPS UHTC), Autostar II High Precision Drive, tripod and JMI hard case

Includes equatorial wedge for astrophotography. This is a heavily accessorized observing package. The scope looks brand new and the optics are perfect. This package is flawless. I only used this scope a few times a year. It has been carefully maintained. I will only sell everything as a complete bundle.

### Specifications:

Optical Design: Schmidt Cassegrain

Autostar Suite Software CD

Clear Aperture: 254mm (10")

Focal Length: 2500mm

Focal Ratio: f/10

Resolving Power: .045 arc sec

Primary Mirror Coatings: Equipped with the Optional Meade Super Multi-Coatings (UHTC: Ultra-High Transmission Coating) (\$300 value)

Mounting: Cast-aluminum, double-time forks

Gears: 5.75" diameter worm gears.

Periodic Error Correction: Both Axes

Slew Speed: 1x sidereal to 8 degrees/sec

Power: 8 C-cell batteries (supplied)

Variable height, heavy duty field tripod

Meade 8X50mm rear-focus finder-scope

4-speed Zero Image-Shift Microfocus-er

16-channel GPS receiver

Net telescope weight: 62 pounds

Net tripod weight: 20 pounds

### Alt-Az mount and scope.

Both are practically new and are in new condition.

### Explore Scientific **Twilight I Mount & Tripod** (MAZ01-00). New - \$230.

Explore Scientific 80mm f/6 Apochromatic Triplet Refractor Telescope (FCD100 ED). New - \$1000.

**Asking \$700 for the pair.**

Stephen Scaravella, 802-434-3884 or  
[englishnotation@gmail.com](mailto:englishnotation@gmail.com)

Color: Norwegian Blue and Black

Accessories (Totaling \$1,532):

Meade Equatorial Wedge (\$289 value)

12v power supply (\$100 value)

ScopeSaver plate/tray with hardware (\$200+ value)

Orion electronic eyepiece (color) (\$95 value)

Meade broadband sky glow filter - never used (\$100 value)

Peterson EZ Focus Kit (Focus Upgrade)(\$30 value)

Peterson EZ Clutch Kit (Declination Clutch Upgrade)(\$30 value)

Flexible Dew Shield (\$50 value)

JMI Hard Case (\$589 value)

Meade DC 607 Adaptor cable (\$25)

Meade Interface Cable (\$24 value)

**Only \$3,300 OBO** – a tremendous deal! With over \$1,500 in accessories! (Must be picked up, as I will not ship.) Payment can be made only by Cash, Certified Cashiers Check, Bank Check, or Treasurer's Check. Everything offered here would cost over \$5,000 if purchased new. A brand new Meade 10" LX200 GPS w/ UHTC coatings will cost you \$3,500.

### Additional Items for sale:

A f/6.3 focal reducer/field flattener that you may need for astrophotography, which improves edge-of-field correction and reduces exposure times by a factor of 2.5. (\$125 value)

Contact Ron Lewis, 247-5913,  
[vt poet@gmail.com](mailto:vt poet@gmail.com)

**Meade 6" LXD55 telescope** with the following: 26mm eye piece, Spotting Scope, Anniversary eye piece kit with 15mm; 6.4mm; 9.7mm; 12.4mm; 40mm; 32mm; and 20mm. Solar filter, Dew cap, Autostar Instruction Manual, Martin Preston users guide

**Asking \$595 (new price)** with the accessories listed

Contact Bruce Harmon, 802-876 7535 or [bdhinv@yahoo.com](mailto:bdhinv@yahoo.com).

### Meade LX 80 heavy-duty go-to mount.

Capable of holding two telescopes at once, or being used as an equatorial mount with one scope. Used only once. Selling because it's too heavy for an old guy like me.

Original price \$1000.

Selling for **\$200 OBO (new price).**



Contact Al Boudreau at [astromanvt@gmail.com](mailto:astromanvt@gmail.com) or 802-349-8308

### Celestron Omni XLT 120mm Refractor Telescope with Equatorial Mount.

In great condition as it has been barely used

Full accessories include padded cases, 5 eyepieces, 2 planetary filters, dew zapper, wheelie

Original price \$550 for telescope; \$150 for accessories

Yours for **\$300 OBO,**

**130mm tabletop Newtonian** from Astronomers Without Borders. Everything intact including 2 eyepieces and collimating piece. **Price \$40 ONO.**

Location South Burlington.

Call Gary Glick at 203-247-5354

### Celestron 23mm Axiom

Basically unused and very clean condition. Buyer to pay for shipping of their choice and PayPal fees. **\$100**

Contact Douglas Duncan

[douglasd@3w3d.com](mailto:douglasd@3w3d.com)

PO Box 8, West Glover, VT 05875

(802) 525-4904

### Meade DS-2114S (early 2000's vintage)

Dia. =114mm, f.l.=1000mm focal ratio f/8.8

Automated, computerized with Meade Autostar handbox

Automatic tracking, guided tours, many other features

Excellent, like new condition, on a tripod, three eyepieces, original hand-book

I called the company (Meade) and they say it is similar to their current Polaris 114 (\$170-\$200), but automated and computerized like their ETX 90 (currently \$500. Their ETX series doesn't have a 114, but if they did it would cost more). So I am asking a "hybrid", used (once or twice) **price of \$175 (new price).**

Contact Paul Cameron at [paulcameron1@msn.com](mailto:paulcameron1@msn.com), 802-249-3595 or 802-223-2204

## Wanted

Wanted: **8-10" f/4 imaging Newtonian**

Send emails to [bvtguy@yahoo.com](mailto:bvtguy@yahoo.com). Mike Stadtmauer (704-609-1432)

For selling & buying also check out:  
[www.marketplace.skyandtelescope.com](http://www.marketplace.skyandtelescope.com)

## Dues

Associate Members \$15

Full Members \$25

Contact Paul Walker or Doug Williamson

or Send your address (and email) and dues to

VAS, PO Box 782, Williston, VT 05495.

## Announcements

Associate Members interested in becoming full members make your interest known to one of the board members.

\*\*\*\*\*

### 50th ANNIVERSARY PATCHES

are still available. Pricing \$3 each or 2 for \$5. You can get them at the monthly meetings.

## Club Info

### Observing Certificates

Several certificates (beginner to advanced) are available to members as encouragement to get out under the stars and hone their observing skills. Follow the link on our web site.

### Wanted - Webmaster

### Also wanted PR person

If interested in either position contact Jack St. Louis or Paul Walker.

**Looking for 5-10 minute product reviews for the monthly meetings.**

### Moving or Changing Email?

Please send changes to Paul Walker, 53 Valley View, Middlebury, VT 05753, [paulwaav@together.net](mailto:paulwaav@together.net)

### Web Site

[www.vtastro.org](http://www.vtastro.org)

Email: [webmaster@vtastro.org](mailto:webmaster@vtastro.org)

Paul Walker is acting webmaster.

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Joe Comeau	VP	238-1664
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Paul Walker	Sec'y	388-4220
Bob Horton		879-7802
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