

Morning Star

Winter 2017



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November's Super Moon. See pages 7-9

New Members

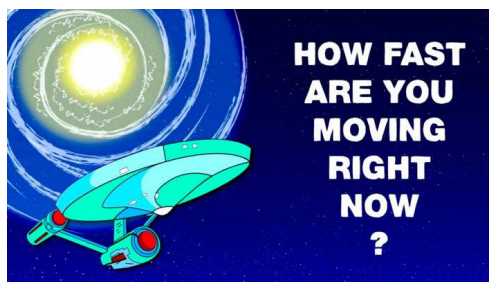
VAS welcomes the following new member who joined us since the last newsletter:

Michael Malone

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.

January 9



By Steve Lupo & John Picanza

When, after a long day of running around, you finally find the time to relax in your favorite armchair, nothing seems easier than just sitting still. But have you ever considered how fast you are really moving when it seems you are not moving at all?

Seems like an easy question, but it's actually quite complicated -- and perhaps best answered by another question: "Relative to what?" Even when you think you're standing still, the Earth is moving relative to the Sun, which is moving relative to the Milky Way,

which is.....you get the idea. Let's unravel the concepts of absolute and relative speed as we move along!

February 6

Collectibles and other Cool Space Stuff
By Several Members

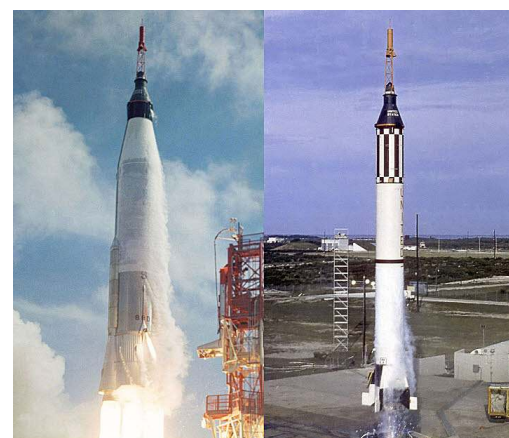


1980's vintage Byers Telescope Mount

Bring your collectibles and other cool astronomy and space related stuff. Anything from antique optics to meteorites to space program items. The skies the limit. (You can bring pictures of items that you would rather not bring or are not practical to bring)

March 6

Project Mercury
By Steve Quigley



Mercury Atlas and Mercury Redstone Rockets

Stargazing and other Events

All observing events -are weather Permitting unless otherwise stated. Bring extra clothes. Even a summer evening can be chilly after standing still for a couple hours in damp air.

Last minute cancellations may occur even if the weather is good, so please check the web site (www.vtastro.org) Events page.

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

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, 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 or info@vtastro.org

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

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

Check our website 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
Ron Anstey (802-524-3653)
Joe Comeau (802-238-1664)
Jack St. Louis (802-658-0184),
jack.st.louis@comcast.net

None Scheduled

 Everyone loves the Hubble Space Telescope. The images we have seen can be breathtaking. But you don't get to have Hubble without manned missions to launch it, repair it, and service it. So instead of looking out at the heavens, in March we'll look back to the start of the US manned space program, Project Mercury. If Mercury had failed, and it had many opportunities to do so, much of today's science would not exist. This presentation will refresh

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

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

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

None scheduled

the memories of the old timers who watched Project Mercury on our tiny black and white TVs in the early '60's, and perhaps give some new perspec-

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–

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
Jack St. Louis
jack.st.louis@comcast.net

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

None scheduled

tives of those momentous times to those who weren't even alive at the time.

Articles

We are partnering with NASA's Space Place (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 technologies 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 Proxima Centauri's 'Earth-like' planet actually like Earth at all?

By Ethan Siegel

Just 25 years ago, scientists didn't know if any stars—other than our own sun, of course—had planets orbiting around them. Yet they knew with cer-

tainty that gravity from massive planets caused the sun to move around our solar system's center of mass. Therefore, they reasoned that other stars would have periodic changes to their motions if they, too, had planets.

This change in motion first led to the detection of planets around pulsars in 1991, thanks to the change in pulsar timing it caused. Then, finally, in 1995 the first exoplanet around a normal star, 51 Pegasi b, was discovered via the "stellar wobble" of its parent star. Since that time, over 3000 exoplanets have been confirmed, most of which were first discovered by NASA's Kepler mission using the transit method. These transits only work if a solar system is fortuitously aligned to our perspective; nevertheless, we now know that planets—even rocky planets at the right distance for liquid water on their surface—are quite common in the Milky Way.

On August 24, 2016, scientists announced that the stellar wobble of Proxima Centauri, the closest star to our sun, indicated the existence of an exoplanet. At just 4.24 light years away, this planet orbits its red dwarf star in just 11 days, with a lower limit to its mass of just 1.3 Earths. If verified, this would bring the number of Earth-like planets found in their star's habitable zones up to 22, with 'Proxima b' being the closest one. Just based on what we've seen so far, if this planet is real and has 130 percent

right temperature for liquid water on its surface, assuming an Earth-like atmosphere. It should have a radius approximately 10 percent larger than our own planet's, assuming it is made of similar elements. It is plausible that the planet would be tidally locked to its star, implying a permanent 'light side' and a permanent 'dark side'. And if so, then seasons on this world are determined by the orbit's ellipticity, not by axial tilt.

Yet the unknowns are tremendous. Proxima Centauri emits considerably less ultraviolet light than a star like the sun; can life begin without that? Solar flares and winds are much greater around this world; have they stripped away the atmosphere entirely? Is the far side permanently frozen, or do winds allow possible life there? Is the near side baked and barren, leaving only the 'ring' at the edge potentially habitable?

Proxima b is a vastly different world from Earth, and could range anywhere from actually inhabited to completely unsuitable for any form of life. As 30m-class telescopes and the next generation of space observatories come online, we just may find out!

Looking to teach kids about exoplanet discovery? NASA Space Place explains stellar wobble and how this phenomenon can help scientists find exoplanets:

<http://spaceplace.nasa.gov/barycenter/en/>



the mass of Earth, we can already infer the following:

It receives 70 percent of the sunlight incident on Earth, giving it the

An artist's conception of the exoplanet Kepler-452b (R), a possible candidate for Earth 2.0, as compared with Earth (L). Image credit: NASA/Ames/JPL-Caltech/T. Pyle.

Dimming stars, erupting plasma, and beautiful nebulae

By Marcus Woo

Boasting intricate patterns and translucent colors, planetary nebulae are among the most beautiful sights in the universe. How they got their shapes is complicated, but astronomers think they've solved part of the mystery—with giant blobs of plasma shooting through space at half a million miles per hour.

Planetary nebulae are shells of gas and dust blown off from a dying, giant star. Most nebulae aren't spherical, but can have multiple lobes extending from opposite sides—possibly generated by powerful jets erupting from the star.

Using the Hubble Space Telescope, astronomers discovered blobs of plasma that could form some of these lobes. "We're quite excited about this," says Raghvendra Sahai, an astronomer at NASA's Jet Propulsion Laboratory. "Nobody has really been able to come up with a good argument for why we have multipolar nebulae."

Sahai and his team discovered blobs launching from a red giant star 1,200 light years away, called V Hydrae. The plasma is 17,000 degrees Fahrenheit and spans 40 astronomical units—roughly the distance between the sun and Pluto. The blobs don't erupt continuously, but once every 8.5 years.

The launching pad of these blobs, the researchers propose, is a smaller, unseen star orbiting V Hydrae. The highly elliptical orbit brings the companion star through the outer layers of the red giant at closest approach. The companion's gravity pulls plasma from the red giant. The material settles into a disk as it spirals into the companion star, whose magnetic field channels the plasma out from its poles, hurling it into space. This happens once per or-

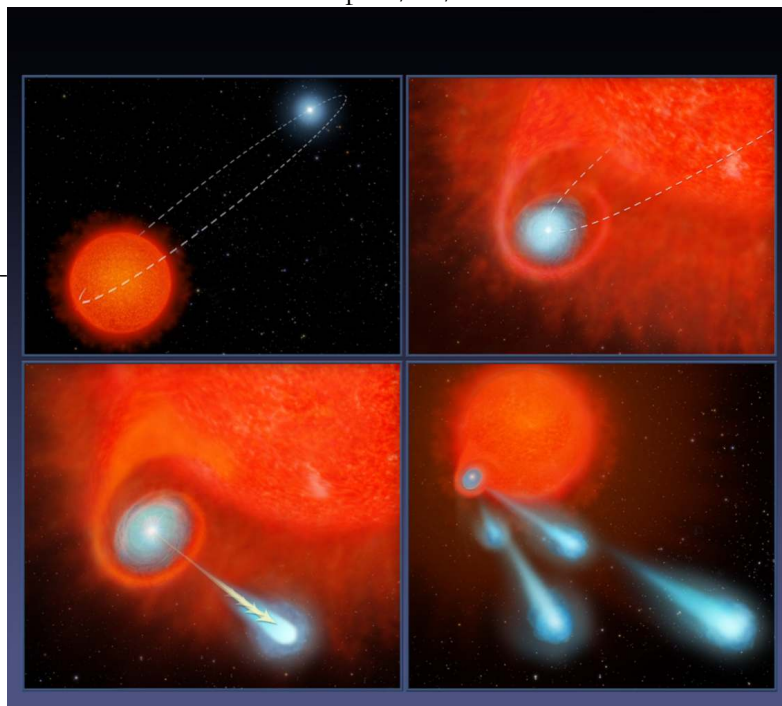
bit—every 8.5 years—at closest approach.

When the red giant exhausts its fuel, it will shrink and get very hot, producing ultraviolet radiation that will excite the shell of gas blown off from it in the past. This shell, with cavities carved in it by the cannon-balls that continue to be launched every 8.5 years, will thus become visible as a beautiful bipolar or multipolar planetary nebula.

The astronomers also discovered that the companion's disk appears to wobble, flinging the cannonballs in one direction during one orbit, and a slightly different one in the next. As a result, every other orbit, the flying blobs block starlight from the red giant, which explains why V Hydrae dims every 17 years. For decades, amateur astronomers have been monitoring this variability, making V Hydrae one of the most well-studied stars.

Because the star fires plasma in the same few directions repeatedly, the blobs would create multiple lobes in the nebula—and a pretty sight for future astronomers.

If you'd like to teach kids about how our sun compares to other stars, please visit the NASA Space Place: <http://spaceplace.nasa.gov/suncompare/en/>



This four-panel graphic illustrates how the binary-star system V Hydrae is launching balls of plasma into space. Image credit: NASA/ESA/STScI

Reclaiming a Vintage Refractor

By Paul Marino

Unlike many in the club, I did not grow up spending my nights in the backyard with a Japanese 60mm department store scope pointed at Jupiter, trying to tease more detail out of a hobby killer of a 6mm Huygens eyepiece. That's a roundabout way of saying that, of all the possible reasons why I noticed a filthy, broken-down little frac just sitting with a pile of junk at an estate sale in Shelburne and why I just couldn't leave it there, nostalgia ain't one of them.

It was abandoned in the corner of the garage behind a badminton set that knew all too well that no one plays badminton anymore. It was an old Sears Discoverer, in classic silver and black styling, but the mount was clearly broken and was missing lots of pieces. "Sorry, little guy...I don't know squat about refractors," I muttered and walked away. Then I found a box with those beautiful colored eyepieces, a barlow, and the finder...in a completely different part of the garage, next to spare oil filters and other automotive miscellany. It was a sign...a cosmic nudge...kismet...or just a stray finding its way into the hands of a guy with a weakness for them. Now I couldn't walk away and be yet another person to just abandon it.

It hadn't even warranted a price tag. So I approached the people running the sale. "This is broken, it's missing parts, and has an objective lens someone thought was the perfect place to grow weeds on. My offer is \$5 and I suggest you take it." Unsurprisingly, they did.

I got home and took stock of my purchase. I'd bought an unloved Sears Discoverer 6307-B, 60mm of aperture and 700mm in FL. An F/11—hmmm, it could be a quick-peek lunar scope, maybe some white light solar, and good for double stars too. The circle T on the focuser label meant it was made by Towa—so the glass should be at least good but likely not spectacular. The design and placement of the JTII stick-er dated it as '68-'72. Dew shield was

AWOL. The focuser wouldn't budge at all. Plastic eyepiece for the 5x24 finder was cracked in half. The tangent arm for the altitude slo-mo control had no place on the mount to attach to. And one of the tension controls on the mount was missing. There was something strangely freeing about all the issues. No one would expect anything of this scope. And you can't screw up something that has no business working in the first place. I didn't have to restore it...just make it usable. So I spent a couple hours researching next steps on Cloudy Nights and then got to work.

I am prone to exaggeration but I didn't about the objective lens—it really was half covered in dirt. If that was shot, so was my stray. So I screwed off the cell, took out a bowl, filled it with distilled water, plopped in the lenses and set it to bathe in the sun. I unscrewed the pinion from the drawtube to check out the focuser. The original grease was basically glue now. So I set the small parts aside and yanked it all out. Then I degreased it, the tangent arm on the OTA, and the, um, whatever that thing is called that the mount turns on. Re-lubed everything with Superlube. Reassembled the focuser. Not silky-smooth but perfectly useable now! Took out cleaning wipes and gave the tripod, mount, and OTA a thorough wipe down. A quick trip to the hardware store yielded the Brasso I needed to attack the pitted and dull chrome bits. Folks, metal polish is a miracle worker. The chrome gleamed! I stepped back and looked at her. She was starting to look like the lady she always was. That made me worry, though—how would the lens come out? Would this all have been for naught?

Sometimes it really is the simple things. Like distilled water and time. All the dirt came off. And there weren't any scratches or fungi underneath to be found! Just some minor coating issues. This was going to work! So I loosened the retaining ring and removed the lenses. No alignment marks on the lens edges—yup, this was an entry level model. (Note—this is where I should have added my own.) It was an air spaced doublet with a single metal spacer between them. So I fully rinsed off both crown and flint and blackened the

lens edges with a Sharpie to help with contrast. Then I put the lenses back together the way they were in the cell and waited for nightfall.

Amazingly it was somewhat clear that night and I was able to check out the Moon. Wow—were those old eyepieces dirty! But try as I might, I couldn't see any false color on the lunar limb, even at 114x, and just a little on Vega. So the lens was at least “good” and was definitely going to be useable for what I wanted to use it for. Sadly, the rest of it was not. The finder and mount just were unusable. It was 15 minutes of pure frustration trying to find anything and keep it in view. I needed to come up with an alternative.

My daughter wanted a scope for her upcoming birthday so I had already been scanning Craigslist for something suitable. I found a used ETX-70 in great shape with surprisingly good eyepieces a couple towns over from my mom down in Massachusetts (my Molly is smart as a whip and so I thought a computerized scope would be right up her alley). And that's when I saw it—a similar vintage Sears Discoverer also for sale near my mom. It looked, um, really well used (read: beat to heck). But it was another 60mm F/11 made by Towa—just in different colors. And it had a dew shield (would it be the right size and have the same threading??), a finder, and a fully functional yoke mount! A couple e-mails later and my mom was set to pick up my new donor scope for \$20 from the original owner and bring it up to me the following week.

Meanwhile I ordered a spanner wrench to be able to open the eyepieces and ROR to clean them with. While I was at it, I also ordered a hybrid diagonal so I could use my 1.25” oculars. I also got some advice from the really helpful folks in the Classics forum on Cloudy Nights about how to make sure the lenses of a Fraunhofer achromat are properly configured and what targets to use to test the lenses.

When my mom arrived with the two scopes, bad news came with her. We discovered that the sellers lied when they said the ETX-70 worked. (Tip for buying scopes from Craigslist: when the seller says, “you know what, I don't

want any money for this after all here just take it off my hands,” jumps back into their car, and drives off...you may have just gotten a broken scope. Apparently these fine folks had had the ETX's flip mirror break on them so they took it apart and glued an oversized 2nd surface mirror in its place. And then messed up all the gears when they put it back together. So it was now a non-GOTO GOTO scope that gave wonderfully sharp double images of whatever you looked at. Sigh.)

That meant the fun and games were over and I had to get the frankenscope workable as a fallback birthday scope for my disappointed daughter (who, it turns out, wanted no part of the fussing a GOTO scope required). The Sears model 6332 was the perfect donor scope (outside of being the wrong color). Its dew shield and the needed pieces of the finder fit the Sears 6307-B perfectly. So I picked up some Rustoleum semi-gloss black spray paint (note—satin is actually the better choice when trying to match on vintage scopes) and spray painted those bits as well as the trunnions from the 6332 from their original dark teal.

While both the 6332 and the 6307-B were alt-az mounted scopes, the mounts had changed significantly in the few years between their production. The silver and black 6307-B was mounted via a half-cradle screwed to the underside of the OTA like many sold under the Sears, JCPenney, and Scope brands of the late 60's. The teal/dark teal 6332 from the early 70's used the standard yoke mount with bolts fitting into the trunnions on the sides of the OTA. So while the paint dried, I used paper and pencil to carefully transfer where on the 6307-Bs OTA the trunnions needed to be affixed. Then I drilled the screw holes. Then I cleaned the lenses on the 6332 and made sure both those and the lens from the 6307-B were correctly configured in their cells (amazingly, they both were).

Soon enough, I added the dew shield, trunnions, and finder pieces to the silver and black scope and took it back out for a field test. It was once again perfectly useable for astronomical use—within the limitations inherent with that type of entry-level mount—

and produced nice sharp images up to about 125x with very little color using modern plossls via the hybrid diagonal. I tested both cells and found that neither can fully split E Lyra so, as expected, the lenses are good but not exceptional. But one set displayed less flaring on bright stars so those were the lenses I kept in Molly's scope.

How does Molly like it? She really likes how light and simple it is to use. And the eyepiece is right at her height so she gave it a big thumbs up. She also gave it a name: Orion.

Pictures and more information on the silver/black Sears 6307-B can be found at <http://www.cloudynights.com/topic/550658-brought-home-a-stray-and-kinda-joined-the-club/#entry7439049> while pictures and additional info on the teal Sears 6332 can be found at <http://www.cloudynights.com/topic/551601-sears-discoverer6332/#entry7455512>.

Board Talk

Board meetings are currently held at BioTek Instruments (Paul's employer) the 3rd Tuesday of the month, 7:30 to 9:00 PM. They are open to all members, contact any Board Member for info.

Board meeting summaries:

October

Jack received a request from a local Cubs Scout troop. He participated in the requested public star gazing event at New Leaf Farm in Bristol.

Joe is coordinating the Astrophotography Workshop scheduled for November.

Keith reported that the Loaner Scope at the library in Hinesburg sustained some damage (looked like someone tried taking it apart). He repaired and cleaned it and put it back in service.

Doug- Our IDA (International Darksky Association) is due for renewing.

November

No meeting.

Jack has scheduled a meeting with the Hinesburg Select Board for further discussion of our plans for adding a building to house the Russ Chmela Memorial Telescope and the updates to the agreement for using the site.

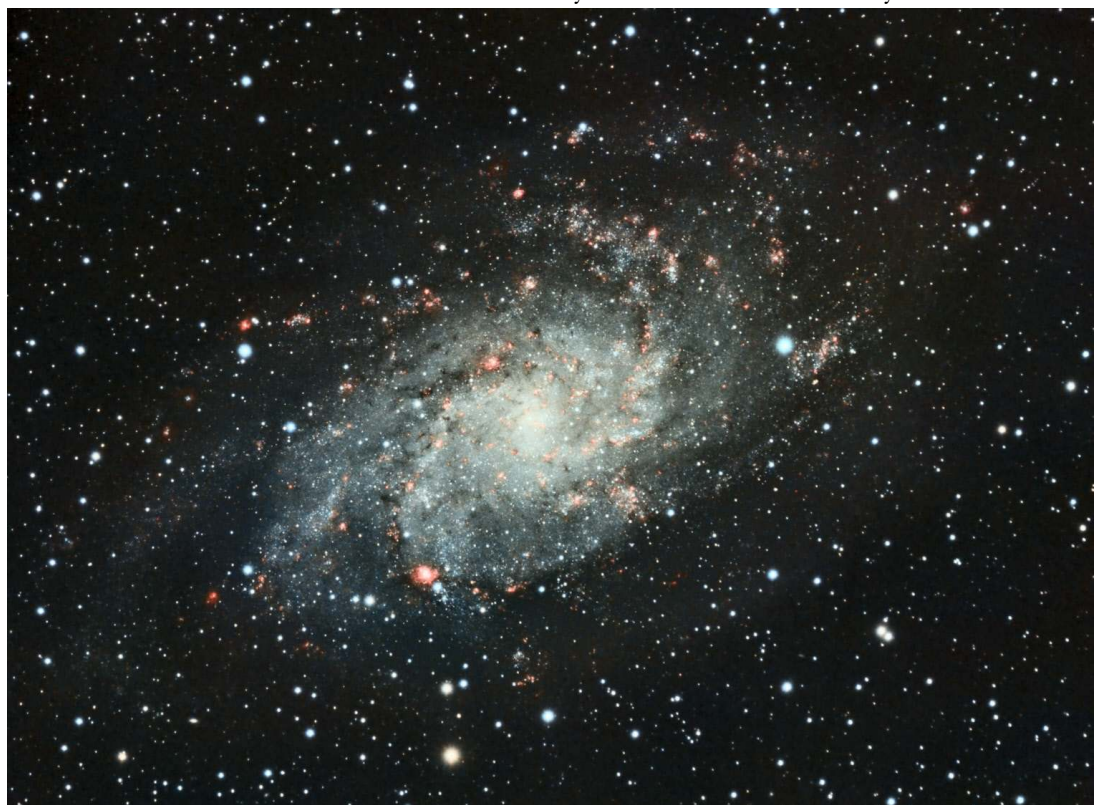
December

No meeting. But the Hinesburg Select Board approved the updated Agreement so we can proceed with getting a permit for observatory #2.

Observers Page

A Couple More Captures By Mike Stadtmauer

M33



In early October, I decided to try M33, the Triangulum or Pinwheel Galaxy. After a decent night of LRGB capture (Luminance, Red, Green, Blue channels), another clear night soon followed and the guiding gods decided to smile on my finicky rig. Feeling good about things, I decided to try 5min subs and take my first try at gathering some Narrowband data.

Narrowband data is more difficult to gather because the filters let in much less light than RGB broadband filters. RGB filters let an approx. 100nm band of light wavelengths pass through, centered on the color in question. Narrow-

band filters, as the name implies, have a much narrower band than they allow, in the 3-7nm range depending on the quality (and expense) of the filters. The advantage to this very narrow band of wavelengths allowed through is that almost all light pollution wavelengths will be blocked. This allows people living in the middle of cities to image using narrowband filters, where using standard LRGB would be impossible because of sky glow. The downside is that you need a LOT more time to gather enough data. 5 minutes per exposure is generally considered the absolute minimum for narrowband filters, and most would recommend 10-30 minute exposures. This means you must have a very stable mount with a very low RMS

error (a measure of how well it stays centered on a star) so that pinpoint stars do not become beach balls.

These filters are not centered on the RGB wavelengths, but instead on the wavelengths of light emitted by most celestial objects, corresponding to Hydrogen Alpha (Ha), Oxygen 3 (Oiii) and Sulfur 2 (Sii). Without question, the most dominant of these is the Ha wavelength, which is the main wavelength of light emitted by star formation regions. The Ha signal is in the red visible spectrum and so Ha data is always represented as red in visible spectrum images (as opposed to narrowband images, where

the Ha signal is often represented as green). When imaging with LRGB filters, the red data can be combined with, or enhanced by, the Ha data to strengthen the red signal and bring out the more active star and structure formation regions in a galaxy. This provides a very interesting extra layer of information that is not available in an RGB image. In my M33 image, there is a large red area at around '7 o'clock' on the galactic plane. This is NGC 604, one of the largest Hydrogen-alpha emitting regions in the known universe. It is about 1,500 light years across and contains at least 200 hot, massive, new stars. Below is an incredible Hubble image of the area - direct visual observation of star formation in another galaxy. Why is there more entropic decline in this area (more formation activity) than in another area? What raised the local entropy to allow for this collapse? Things to think about....



Hubble Image of NGC 604

M33, part of our local group is a 5.8 magnitude spiral galaxy, and is moving towards us at around 261km/s. Thankfully, it has about 3 million light years to go before it gets here. It is an average size galaxy, containing around 30 billion solar masses. However, this is tiny compared to our galaxy at approx. 300 billion and Andromeda at 1 trillion (a true giant). It is thought that M33 is a distant satellite of Andromeda.

Tech Specs for image on previous page. Telescope: ES102CF (Triplet refractor), Mount: CGEM-DX, Cameras: SX-814, Lodestar X2, Filters: Astrodon Gen2 LRGB; Astrodon Ha 6nm, Exposures: L: 60s x 120, RGB: 60s x 60, Ha: 300s x 24

NGC 7023, Iris Nebula



NGC 7023 is technically an open star cluster, which happens to be in a very dusty region of the Milky Way, only about 1,300 light years away - you could almost poke it with a stick. The interaction of the large, young hot star in the center and the molecular gas and dust surrounding it creates a reflection nebula which, if you cock your head just right and squint, kinda sorta resembles an Iris. The dominant color of the nebula is blue, which is the color of starlight reflected off dust.

This is my first attempt at imaging a nebula. The image is not as sharp as it could be, but I'm pretty happy with the detail, especially of the dark nebula regions.

Tech Specs: Date: 11/18-19/2016, Telescope: ES102CF (Triplet refractor), Mount: CGEM-DX, Cameras: SX-814, Lodestar X2, Filters: Astrodon Gen2 LRGB; Astrodon Ha 6nm, Exposures: L: 120s x 70, RGB: 120s x 35,

November's Super Moon

It was a great opportunity to get folks to step outside and look up at the night sky.



Image by Paul Walker

Above is a comparison of November's full Moon taken 2016-11-13 at 11:30 PM and one 6 years ago on 2010-11-20. At the time of this November's shot the Moon was 33.72 minutes of

arc across. For the 2010 shot the Moon was 30.65 minutes of arc across.

The largest angular diameter (34.02 minutes) occurred a few hours later at about 4 AM the morning of the 14th.

The comparison shows almost the full size range. The full range being 29.33' – 34.10'

Below is another comparison of this November's super Moon, this time to an last November's full Moon. Last year's shot was taken during the Lunar occultation of Aldebaran on 2015-11-26 about 5:42 AM. The Moon was 33.06 minutes of arc.



Image by Paul Walker

Below is a shot of the rising Super Moon taken by Ron Russotti (a friend of Joe Comeau's) It was shot with a Canon Powershot SX-50HS, about 4:30 PM on Sunday, 11/13/2016, from Lime Kiln Road, near the bridge on St. Michael's side.



Above is a shot taken by Peter Gillette with his Powershot SX-50HS. Taken 11/13/2016 at 4:41PM, f/5.0, 1/10sec., ISO 400, 100mm f.l. This is cropped from the middle of the original image.





Taken by Peter. 11/13/2016, 4:39 PM,
f/6.5, 1/125 sec., ISO 1250, 1000mm f.l.
(effective compared to 35 mm film cam-



Taken by Peter. 11/14/2016, 5:25 PM,
f/6.5, 1/160 sec., ISO 800, 50x optical
zoom (1200mm effective compared to 35
mm film camera) plus 4x digital zoom

The first two shots were taken right after the Astrophoto workshop at Angele's, on my way home, just a little ways off of Shelburne Falls Rd, in Hinesburg. The last shot was taken from a friend's driveway, on Silver St., a little north of the Monkton town line, in Hinesburg.

All photos were taken with a Canon Powershot SX50HS, resting on the hood or roof of my van.

Moon Illusion

By Paul Walker

Going over the Appalachian Gap (Rt 17) on Sunday, November 13, I experienced the Moon changing size in real time. Well, not really, I experienced a Moon illusion in real time.

Coming up from the East, there is a sharp corner at the Mad River Ski Resort where the road heads East North East with another sharp corner just up the hill. Our timing was such that the Super Moon was almost directly in front of us after we passed the resort. The Moon was also behind some trees next to the road. As we drove up the hill I was focused on the Moon. Right before my eyes, the Moon appeared to shrink. It was the first time I had experienced such an illusion so clearly and in such a manner.

61 Cygnus

By Paul Walker

Update on my 61 Cygnus project to image the double star over several years as the pair pulls away from a 10



2014-10-21



2015-10-18



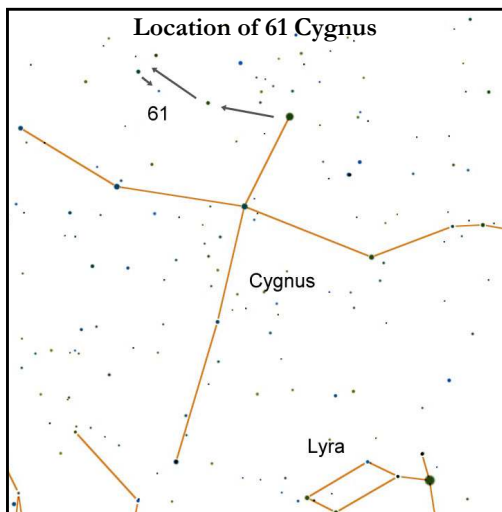
2016-10-06

magnitude background star. I now have 3 years worth of images.

If you want to see the double star yourself and maybe even sketch it's position relative to the background, there is still time before Cygnus drops too close to the northwestern horizon. 61 Cygni consists of 5.2 and 6.0 magnitude stars putting them in range of the unaided eye and making them easy to find. The 10th magnitude star is bright enough to see in small telescopes. See the map below.

As a side note, it is amazing how faint today's cameras can go with even very short exposures. Though the exposure time for the images is only 5 seconds the faintest stars in the image are less than magnitude 15.5. Granted that is through a 10" scope and requires enhancing the image (not posted) to make them visible, but still...visually it would likely take a 18 inch scope to reach this magnitude reliably. Some sources say a 10 inch scope would be sufficient under very good conditions. In my earlier days of variable star observing using my 10" f/5.6 Newtonian, the faintest star I recorded seeing was a 15.8 magnitude comparison star on the chart for TY Pisce on September 11, 1990. This was at a dark site in the hills South of Bristol where I lived at the time, on a night of good seeing. It was also a time when I was routinely observing stars in the 14.5 – 15.0 magnitude range (and my eyes were younger).

The field of view (these are cropped images) is 3.7 minutes by 2.5 minutes of arc. That is the equivalent of 800X in an eyepiece with a 50 degree apparent field of view.



Technical Details: 5 sec x 15 images at ISO 1600, Camera- Canon Rebel XTi, North - up, 10 inch f/5.6 (1407mm fl) Newtonian with a 2 inch, 2X Barlow that gives photographic magnification factor of 2.65X (the focal plane of the camera is farther out than the focal plane of an eyepiece making the projection distance greater). This gives the system a 3730 mm fl at f/14.8 and a field of view of 0.21 x 0.33 deg

M37 (Open Star Cluster)

By Paul Walker

M37 (top image) is a bright cluster in the constellation Auriga. At magnitude 5.6 it is visible with the unaided eye in a dark sky and a nice view through binoculars or a telescope.

It is about 500 million years old and 4500 ly away in the constellation of Auriga.

Taken 2016-11-19, 10 inch f/4.0 (1000mm fl) reflector (Meade LXD55), Field of view: 0.79 X 1.21 deg., north down, Canon Rebel XTi, Exp 3 min X 6 (18 minutes total), ISO 400, Transparency (sky brightness) at target 20.65 mag/arc sec (Sky Quality Meter), Seeing 4 (scale of 1-10), Limiting Visual Magnitude 5.8 (near Polaris).

Double Cluster (Open Star Clusters)

By Paul Walker

NGC 869 & 884 (bottom image) are my favorite open star clusters. The handful of relatively bright stars makes the dim stars appear farther



away giving these clusters a distinctive 3-d effect through my 10" scope. I would be curious as to how small of a scope one can see this effect. In my 10" it especially noticeable for NGC 884. At 4.3 and 4.4 magnitude they are easy to spot with the unaided eye.

They are both about 7500 ly away and 12.5 million years old.

Taken 2016-11-19, Exp 3 min X 33 (1hr 39min total), ISO 400, north down, 10 inch f/4.0 (1000mm fl) reflector (Meade LXD55), Field of view: 0.79 X 1.21 deg., SkyWatcher EQ-6 German Equatorial Mount, Camera - Canon Rebel Xti, Baader Coma Corrector, Autoguider- Celestron NexGuide, Guide Scope - 90mm f/13.3 1200mm fl Mak-sutov-Cassegrain, Transparency (sky brightness) at target 20.87 mag/arc sec (Sky Quality Meter), Transparency at zenith 20.84, Transparency at Polaris 20.74, Seeing 4 (scale of 1-10) Limiting Visual Magnitude 5.8 (near Polaris)

The Wizard Nebula

By Joe Comeau

NGC 7380 (below) (also known as the Wizard Nebula) is an open cluster discovered by Caroline Herschel in



1787. William Herschel included his sister's discovery in his catalog, and labeled it H VIII.77. It is also known as 142 in the 1959 Sharpless catalog (Sh2-142). This reasonably large nebula is located in Cepheus. It is extremely difficult to observe visually, usually requiring very dark skies and an O-III filter.

Located 7200 light years away, the Wizard nebula, surrounds developing

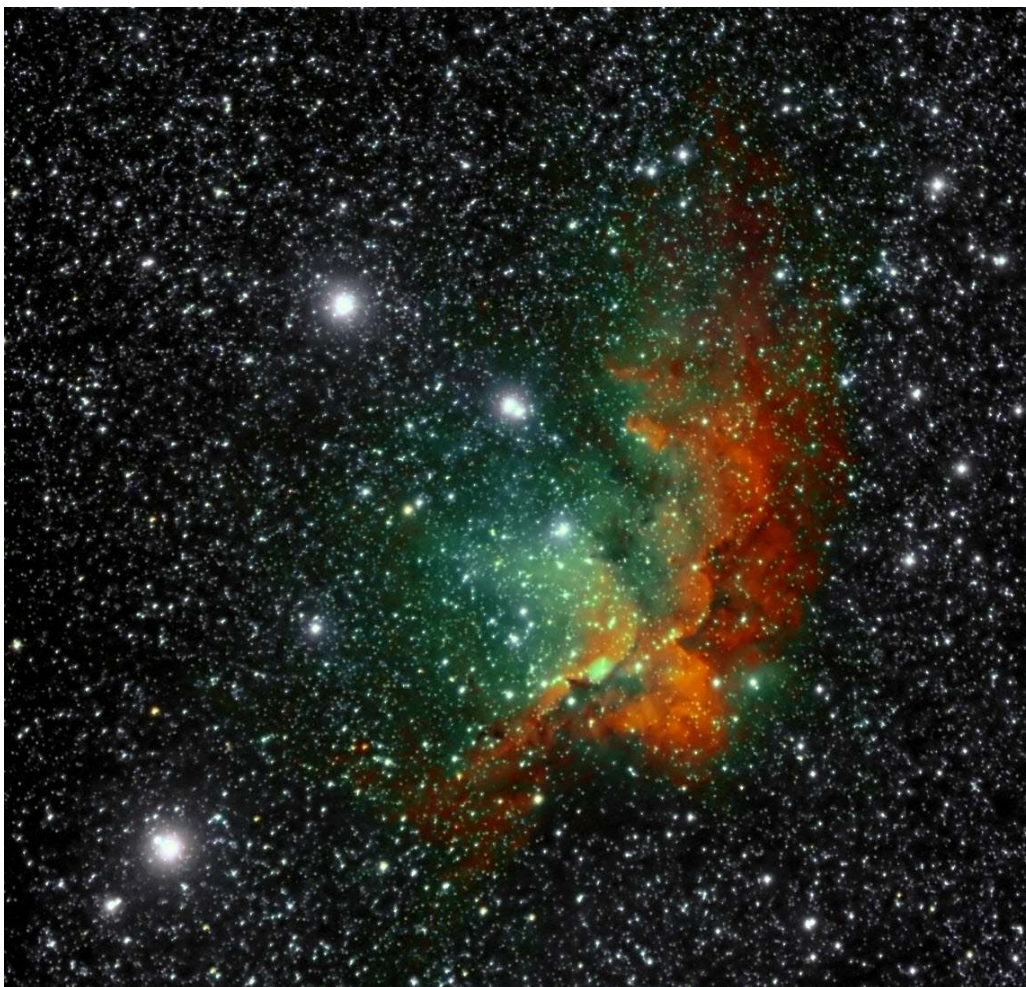
open star cluster NGC 7380. Visually, the interplay of stars, gas, and dust has created a shape that appears to some like a fictional medieval sorcerer. The active star forming region spans about 100 light years, making it appear larger than the angular extent of the Moon. The Wizard Nebula can be located with a small telescope toward the constellation of the King of Aethiopia (Cepheus). Although the nebula may last only a few million years, some of the stars being formed may outlive our Sun. (Text credit: Wikipedia)

The image was taken in RGB with a Celestron UHC filter. I used a Meade 10" F/4 Schmidt Newtonian telescope and a modified Canon 350 XT camera. It is 79 X 120 seconds (2 hr 38 min) and autoguided with an Orion Starshoot Pro autoguider. I took it in September but just got around to processing it. I processed it in the Hubble palette.

Crescent Nebula

By Paul Walker

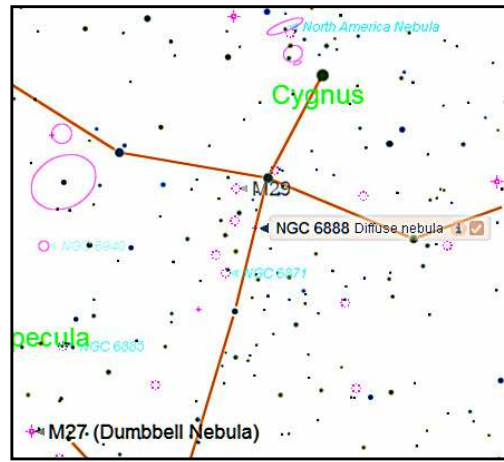
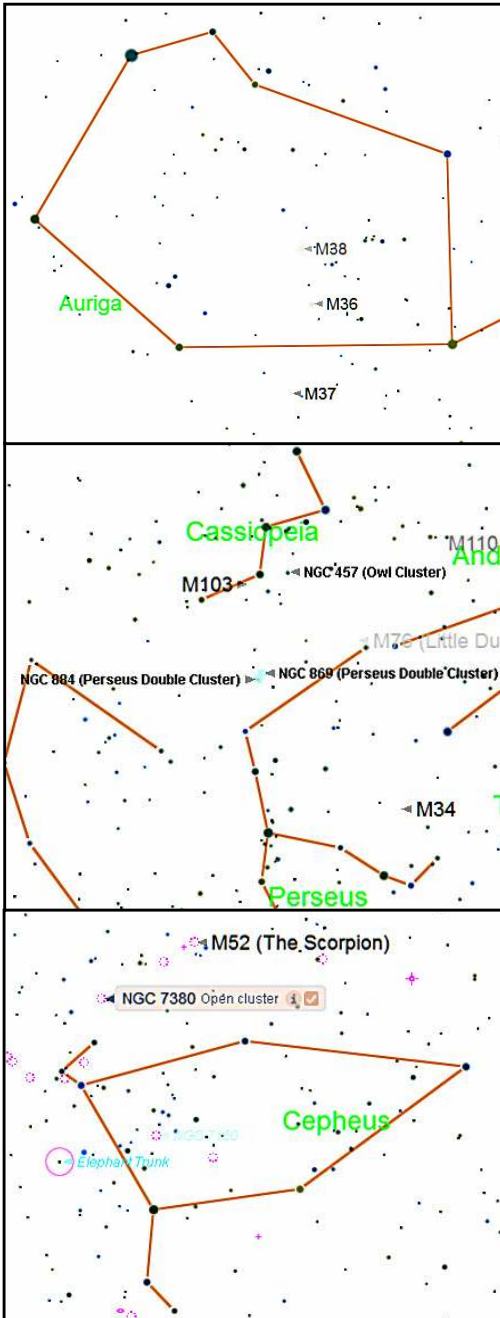
NGC 6888 (above) is an emission nebula powered by a Wolf-Rayet star. This is the bright star a little to the lower right of center. The nebula is listed as 7.4 magnitude but it is spread out and rather faint in my 10" f/5.6 scope. Though it is in the Milkyway where there are lots of potential stars for guiding one's way it is surprisingly hard to locate. I can only see the brighter edge



and is best viewed using a nebula (light pollution) filter.

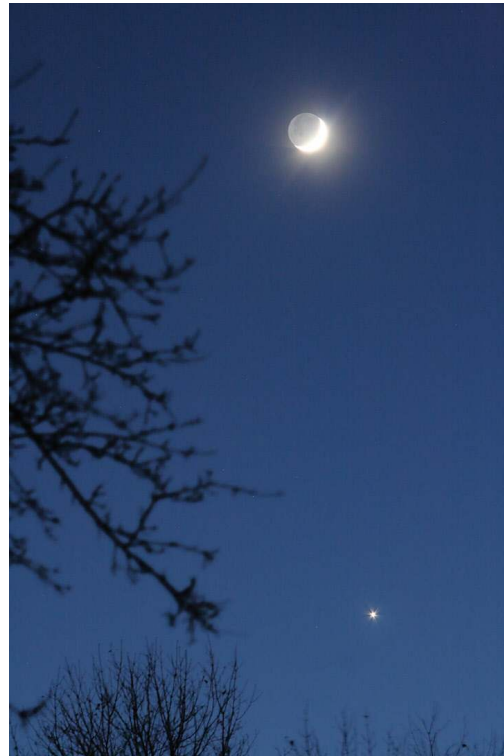
Taken on 2016-11-18, Exposures 5 min X 12 (1 hr), ISO 400, north right, 10 inch f/4.0 (1000mm fl) reflector (Meade LXD55), Field of view: 0.79 X 1.21 deg., SkyWatcher EQ-6 German Equatorial Mount, Camera - Modified Canon Rebel XT, Orion Broadband Light Pollution Filter, Baader Coma Corrector, Autoguider- Celestron NexGuide, Guide Scope - 90mm f/13.3 1200mm fl Maksutov-Cassegrain, Camera Temperature: 35 degree F, Transparency (sky brightness) at target 20.50 mag/arc sec (Sky Quality Meter), at Polaris 20.91, Seeing 5 (scale of 1-10), Limiting Visual Magnitude 5.8 (near Polaris)

The following sky maps show the locations of the object in the images.



Charts created with Starry Night Pro

Crescent Moon & Venus

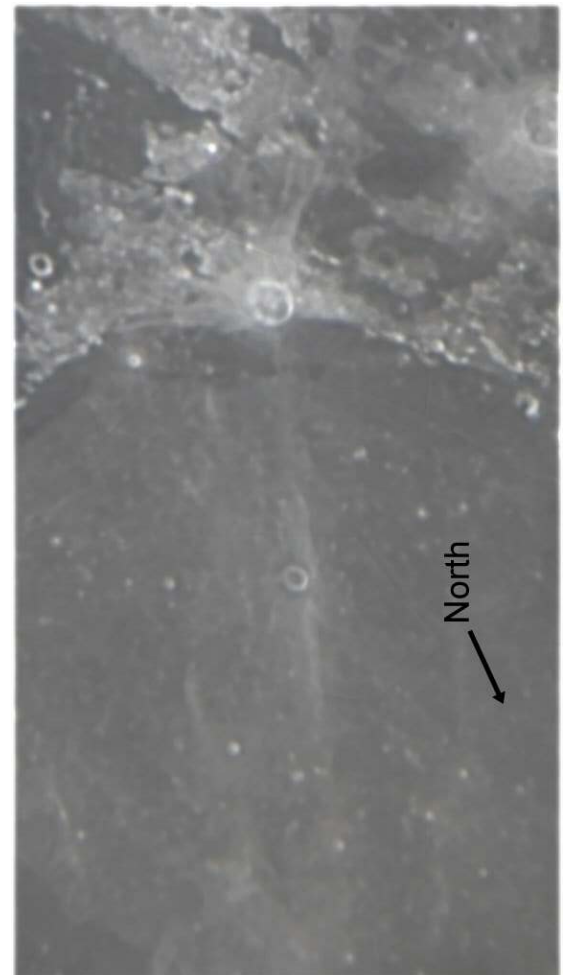


4.23day old crescent Moon and Venus taken on 2016-12-03 by Paul Walker from South Portland, ME. Canon XTi camera on a tripod. 125mm f.l. (200mm equivalent), f/7.1, ISO 1600, 2 sec. exposure.

Typically I do shots like this with the lens aperture wide open (smallest f/number). For this shot, because I wanted the foreground branches more in focus, I “stopped” the lens down by 1.6 f/stops. From f/5.6 to f/7.1. Doing so, I noticed the star effect (spikes of light) around Venus. Being into photography I “knew” this would happen but wasn’t thinking about it at the time. I usually shoot wide open so I can keep the exposure times short and ISO setting low for less noise in the background sky.

The star effect is diffraction spikes caused by the camera’s “aperture stop”. The adjustable aperture in cameras is made of multiple leaves (typically 6). When the aperture is wide open (smallest f/ratio number) it is round. The light diffracted by the edge of the aperture is evenly spread around the image of the star or planet. When the aperture is stopped down (larger f/ratio) the aperture forms a hexagon. The sides of this hexagon concentrate the diffracted light into 6 evenly spaced directions causing the spikes. This is similar to what the spider vanes in a Newtonian reflector do. It doesn’t matter whether the edges doing the diffracting are aligned radial or perpendicular to the lens or mirror, the diffracted light is concentrated toward the direction of the edges. The difference it makes is whether the diffraction spikes are narrow or broad. If you look closely the spikes around Venus they are broad and become wider further out. Looking carefully at the Moon you can see the same spikes.

Bessel Ray By Paul Walker



This was going to be a follow-up to the image of Bessel Ray (Lunar 100 feature #41) that was posted in Larry's October 4, 2016 Lunar Gazette, issue #19. Since Larry put the Lunar Gazette on hold, I decided to include it here.

In that issue of the Gazette I provided a "wide angle" image of Bessel Ray. I took a close-up image on the night of October 12.

Brighter minds than mine, working with more data, have surely studied this ray. Bessel ray lines up at least somewhat with Menelaus Crater. As some of you may have noticed, not all rays follow straight lines.

I have marked several features that look like rays from Menelaus, though some may not be (see below). Bessel Ray itself appears to be one of those less than straight rays. I think it may actually be 2 separate rays or created from a splash of pulverized rock that had 2 clumps that went in slightly different directions. Drawing lines back to Menelaus through the 2 parts of Bessel show that they line up better separately than assuming it is 1 ray. I don't know the relative ages of the features in this

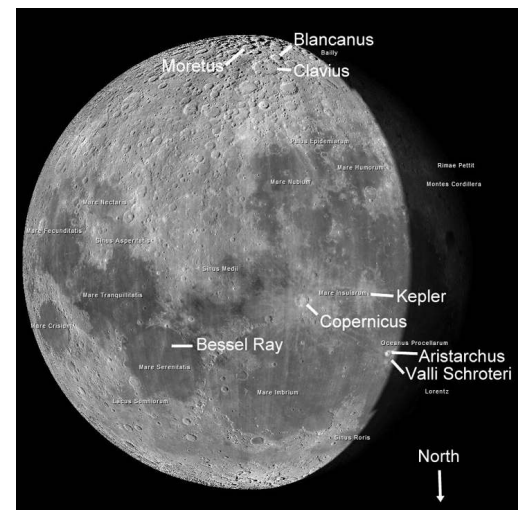
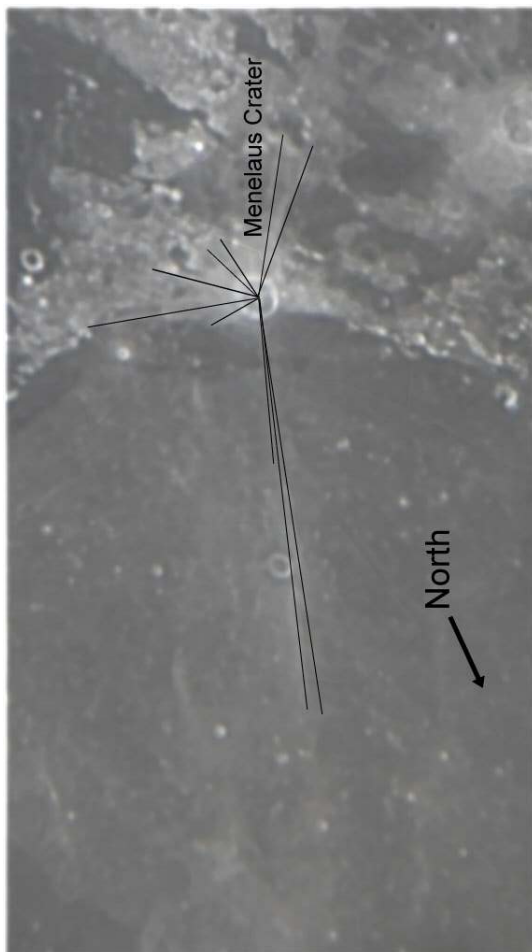
area. This would be very helpful in interpreting the features.

Technical info: 10" f/5.6 Newtonian, 24mm Konig eyepiece, 2.8x Klee Barlow, Canon AW-110 camera @ 5x optical zoom, High Definition video mode. 600 frames of video, stacked using Registax.

**Copernicus
Kepler
Aristarchus
Valli Schroteri**
By Paul Walker

I have been having some fun here speculating about Bessel Ray. The picture below is a case in point for how complex crater rays can be. Copernicus, the biggest crater in this image has very chaotic rays. Kepler's rays (right of Copernicus) are more orderly but still not perfectly straight and not perfectly lined up to the crater. Kepler and Menelaus (see Bessel Ray) are similar in size at 19 miles and 16 miles respectively. Some of the rays on Kepler extend at least as far as Bessel Ray does from Menelaus.

I can think of a few things that would affect the direction and amount of material ejected from an asteroid blast. Variations in the rock density of the area struck would affect how energy of the blast was transmitted and absorbed as the energy propagated outward. Variation in density within the asteroid and its shape could cause variations in the amount of energy generated in different parts of the impact zone. The topography of the area struck would affect the directions of least resistance for the ejected material. The angle of



Moon map showing location of features.



impact would have some affect on the directionality the released energy, though experiments with high velocity projectiles show the angle has little affect except at very shallow angles.

Technical info for image that includes Copernicus, Kepler, Aristarchus and Valli Schroteri: 10" f/5.6 Newtonian, 24mm Konig eyepiece, 2.8x Klee Barlow, Canon AW-110 camera @ 1.5x optical zoom, High Definition video mode. Did not record the number of frames of video stacked, stacked using Registax.

Aristarchus/Valli Schroteri close-up image: Same as above except 5x optical zoom and 200 frames. North is down on all images.

Clavius and Friends Paul Walker

Below is a 2 image mosaic at the same magnification as the Aristarchus / Valli Schroteri and Bessel Ray close-ups. I found the "notch" at top of the image rather striking. Due to a crater or two in



shadow no doubt, but it looks more like a canyon. The south pole is over the terminator about 1/3 the way from left to right. Follow a line from the center of Moretus Crater (see map on previous page) through the center of the crater (Short) just above it.

All the close-up Moon images were taken on 2016-10-12.

3 Strange Objects By Paul Walker

On 11/13/2016 starting about 6:08 PM EST I saw 3 strange objects pass overhead in the sky. I had just stepped out the front door to let my cat in and, being clear, I looked up. An airplane caught my eye coming from the South with it's landing lights on (It is very common sight from Middlebury, VT). That was my initial thought anyway. It even had blinking lights. However, as I watched I realized there were problems with that interpretation. The overall color was reddish not white. And the "blinking" was actually a flickering, not the steady blinking of wing lights. I quickly went inside, grabbed a pair of binos and went out the back door, but it was gone. If it was an airplane I should still have been able to see it even if the landing lights were turned off or facing away from me. That's when I

realized it was likely something else, maybe space junk burning up in the atmosphere? I had never seen anything quite like it. It's track was from SSW to NNE. It would have passed a little West of Mars in the South. I first spotted it maybe 40 degrees up and followed it for 40-50 degrees before going for the binos. I would say it was dimmer than

Venus, maybe -2 magnitude, about the typical brightness of the landing lights on an airplane coming into Burlington. As I mentioned, this is a common sight from my yard.

Then it gets more interesting. I went back to setting up my 10" f/4 on a Goto mount to test out a new widget

I built to help in astroimaging. I keep glancing up. Soon I saw a 2nd object virtually identical to the first, similar track as the first only about 20 degrees further East. I watched this one move across about 80 degrees of sky. It passed almost directly overhead. As it flickered and faded between the zenith and Cassiopeia it disappeared and reappeared a couple of times before disappearing for good.

A few minutes later I saw a third object about 20 degrees West of the first one's track. It was well up when I spotted it. I looked through binos but they are a poor pair (the 2 halves aren't well aligned) and I didn't get a good look. Between views through the binos and without, it disappeared. So I don't know just how quickly this one faded, but definitely quicker than the 2nd one. It was gone before it reached due West. This would indicate it was not a satellite in orbit as, being that far West, it would likely have gotten further North before fading.

The timing was about 6:08 PM EST for the first, 6:12 PM (within 30 sec) for the 2nd and 6:16:00 to about 6:16:45 for the 3rd. Very close to 4 minutes between each. They moved faster than a low Earth orbit satellite and maybe a little faster than a typical jet landing at Burlington. I estimated the 2nd one's movement at 80 degrees of sky per minute or a little faster. At no time did I see any sign of debris coming off any of them. I have not seen any incoming space junk exhibit a reddish color. The brightness of all 3 were very similar.

Anyone else see any of these or something similar?

I sent an email to several of co-workers, to whom I send my astro-images, about these sightings. One of the Service Engineers said about a year ago he saw something very similar a number of times while walking his dog.

Gary's Astronomical Events for the Month

can be viewed via WCAX at
www.wcax.com/story/6330547/astro-nomical-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. Aired the first Wednesday of the month at 8:40 AM.

For Sale

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

(518) 795-5635

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.

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

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

Celestron CG 4 equatorial mount

and tripod with clock drive. Great for small telescope or astrophotography.

Rated load 20 lbs.

\$100 OBO.

Bonus – For an additional \$75 comes with electronic setting circles with "Push To" alignment for finding dim objects.

Keith Lawrence 802-453-5496 or sleepingbearwoodworking@yahoo.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, vtpoet@gmail.com

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

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 handbook

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, 802-249-3595 or 802-223-2204

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

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

Or you can contact Ron Anstey

ansteyr@myfairpoint.net

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

PO Box 8, West Glover, VT 05875

(802) 525-4904

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, vtpoet@gmail.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. **Asking \$200** for it.

Stephen Scaravella, 802-434-3884 or englishnotation@gmail.com

Telescope mirrors and a couple mounting cells

3.5" f/10 with 3/4" diagonal.

6", probably f/8.

8", probably f/8, in nice **cast aluminum cell.**

10" f/9, 1/10 wave (measured by Bob several years ago), Beral coating that is in good condition though the edge has several chips (edge not beveled) and a note from the coater says there are a few scratches and it is not fully polished (may be saying that because of the scratches). From St. Michael's College.

12", probably f/8, plate glass mirror in **nice 18 point mirror cell.** The cell is worth more than the mirror. If I remember correctly this came from St. Michael's College, from the old scope they had in their observatory.

Other than the 10" f/9 I cannot vouch for the figure of the mirrors.

The only one that may be Pyrex is the 8" mirror, I'd have to pull it out of the cell and look again. The rest have a slight greenish-yellow tint.

Make an offer on any of the items.

Paul Walker 802-388-4220 or paulwaav@together.net

Wanted

Wanted: 8-10" f/4 imaging Newtonian

Send emails to bvtguy@yahoo.com. Mike Stadtmuer (704-609-1432)

For selling & buying also check out:
www.marketplace.skyandtelescope.com

Dues

Renewal Time for Annual Dues
Members with email will get an email reminder.

Associate Members \$15

Full Members \$25

Contact Paul Walker

802-388-4220

paulwaav@together.net

Send dues and
any updates to your address (or email)
to
VAS, PO Box 782, Williston, VT 05495.

Or bring to any monthly meeting.

Thanks

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

Web Site

www.vtastro.org

Email: webmaster@vtastro.org

Paul Walker is acting webmaster.

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(My apologies if I missed anyone)