



# Morning Star

Spring 2014



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## New Members

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

Keith Lawrence  
 Cheryl Lawrence  
 Bob Biegen  
 Apurva Somani  
 Stephanie Feldman

## 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).** 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.**

**April 7**

**Chameleon Star Baffles Astronomers  
 By Dr. Joanna Rankin,  
 a Professor at UVM with a Ph. D. in  
 Astrophysicist**

The title above and text below are used with permission from an article Joshua Brown wrote about the subject. Josh is a physics student at UVM. The full article is posted on the UVM web site at:

<http://www.uvm.edu/~uvmpr/?Page=news&storyID=15196>

For another, well done, story Josh did about Dr. Rankin and her work on pulsars, go to:

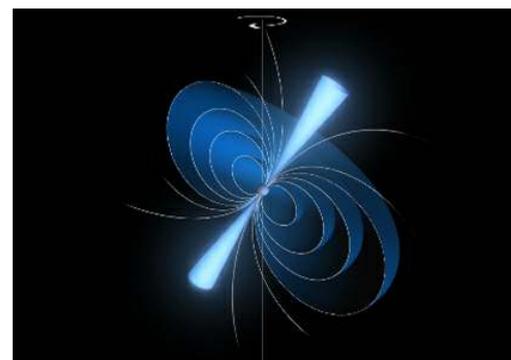
<http://www.uvm.edu/vq/?Page=news&storyID=12610&category=vq2011&SM=featuressubmenu.html>

Pulsars — tiny spinning stars, heavier than the sun and smaller than a city — have puzzled scientists since they were discovered in 1967.

Now, new observations by an international team, including University of Vermont astrophysicist Joanna Rankin, make these bizarre stars even more puzzling.

The scientists identified a pulsar that is able to dramatically change the way in which it shines. In just a few seconds, the star can quiet its radio waves while at the same time it makes its X-ray emissions much brighter.

The research “challenges all proposed pulsar emission theories,” the team writes in the Jan. 25 edition of the journal *Science* and reopens a decades-old debate about how these stars work.



A pulsar with glowing cones of radiation stemming from its magnetic poles. New observations reported in *Science* re-open an old debate about how these spinning stars work. (Image: European Space Agency/ATG medialab)

### Bio:

My focus is in radio astronomy with primary interests in the areas of the pulsar radio-frequency emission problem, pulsars as probes of the interstellar medium, and feminist studies of science. I have published a series of papers describing a phenomenological model of pulsar radio emission, based on the



**Vallis Alpes (Alpine Valley) By Paul Walker**  
 200 frames of HD video, 2014/03/08 7:37 PM

study of the average and individual-pulse emission properties of pulsars. In 1999, my colleague Avinash Deshpande (of the Raman Research Institute in Bangalore) and I found a rotating (carousel) subbeam system in pulsar B0943+10, which has provided remarkable new insights into how pulsars generate their radio radiation. Together with my collaborators, I regularly make new pulsar observations using a number of different instruments. During 2001 and 2002 we conceived and started the Multi-Frequency, Multi-Observatory Pulsar Polarimetry Project (MFO) using instruments in Holland, Germany, England, India, Russian and Ukraine. I collaborate with astronomers in these and other countries and am also interested in science as it is connected to militarism, the position of the so-called "Third-World", and women's emancipation.

I earned my B.S. degree in Physics and Mathematics from Southern Methodist University and my Ph.D. in Astrophysics from the University of Iowa, where I studied under Professor James A. Van Allen.

### May 5



## VAS 50<sup>th</sup> Anniversary

### Annual Meeting/Banquet

No Presentation. Members and invited guests only.

**If you are having the meal please RSVP with your dinner choice- Turkey with all the fixings or Veggie Lasagna to Paul Walker (388-4220 or paulwaav@together.net).**

**The meal is \$15 at the door, no charge if not eating.**

**Location:** St. Johns Club, 9 Central Ave. South Burlington (take Lakeside Ave from Pine St.).

**Social Hour** 6-7. **Dinner** 7-8. Door prizes, awards, annual business meeting 8-9.

**Elections this year are for President, Vice President and 4 Board Members at Large. Any full member interested in any of these positions please contact any of the board members listed at the end of this newsletter.**

### June 2

### Vermont Astronomical Society celebrates its 50th Anniversary By Jack St. Louis

Hear about the beginning days of the Vermont Astronomical Society and the construction of the 5 observatories in Shelburne, Underhill, Williston and Hinesburg, Vermont over the past 50 years. The VAS continues to do much in the areas of public outreach, education, telescope/mirror making and research/discovery through its talented and dedicated members. Current President Jack St. Louis will present the history of the VAS from the first meeting to present day. All past/present members will be encouraged to join in on the discussion to comment/add to the history of the Vermont Astronomical Society.



Photo: the First VAS observatory at the Barr Farm in Shelburne, Vt., 1968.

## Events

## VAS Observing Schedule

**All events - 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 (vtastro.org) Events page for any last minute cancellations, members will be sent email updates.**

### Member and Invited Guest Star Parties at the GMO

(Green Mountain Observatory)  
100 Observatory Road, Hinesburg, VT

**If you not a member, you are welcome contact one of the board members listed on the last page, **one of us would be happy to invite you.****

**April 25 (Friday)** Hosted by Paul Walker. Gate Opens 8:45 PM, full darkness about 9:15 PM.

**April 26 (Saturday)** rain date only.

**May 2 (Friday)** Hosted by Paul Walker. Gate Opens 9:00 PM, full darkness about 9:30 PM (4 day old crescent Moon will be very low by 10:30. **No rain date as the Moon will be brighter and not set until midnight on Saturday.**

**May 23 (Friday)** Hosted by Paul Walker. Gate Opens 9:15 PM, full darkness about 9:45 PM.

**May 24 (Saturday)** rain date only.

Darkness falls too late for June and July GMO star parties.

**August 22 (Friday) (Tentative, Paul will not be available so we need someone to host the event, check the**

**web site under Events for updates).**

Gate Opens 8:45 PM, full darkness about 9:15 PM.

**August 26 (Saturday)** rain date only.

**August 29 (Friday) (Tentative, need someone to host the event, check the web site under Events for updates).**

Gate Opens 8:30 PM, full darkness about 9:00 PM.

**August 30 (Saturday)** rain date only.

**September 19 (Friday)** Hosted by Paul Walker. Gate Opens 8:00 PM, full darkness about 8:30 PM.

**Sept. 20 (Saturday)** rain date only.

**September 26 (Friday)** Hosted by Paul Walker. Gate Opens 7:45 PM, full darkness about 8:15 PM.

**Sept. 27 (Saturday)** rain date only.

**October 17 (Friday)** Hosted by Paul Walker. Gate Opens 7:00 PM, full darkness about 7:30 PM.

**October 18 (Saturday)** rain date only.

**October 24 (Friday)** Hosted by Paul Walker. Gate Opens 7:00 PM, full darkness about 7:30 PM.

**October 25 (Saturday)** rain date only.

**November 14 (Friday)** Hosted by Paul Walker. Gate Opens 7:00 PM, at which time it will be fully dark.

**Nov. 15 (Saturday)** rain date only.

**November 21 (Friday)** Hosted by Paul Walker. Gate Opens 7:00 PM, at which time it will be fully dark.

**Nov. 22 (Saturday)** rain date only.

Since our 18" scope is best suited for deep sky objects we only schedule official observing sessions on nights the Moon will be out of the way.

You are of course welcome to bring your own scope.

**Contact: Paul Walker**  
802-388-4220 (H)

802-861-8640 (W)

paulwaav@together.net (H),  
walkerp@biotek.com (W)

## VAS Public Star Parties

**School, Library and other group requested star gazing parties.**

**If you know of a group or institution that would like to schedule a star gazing session.**

**Contact Bob Horton**  
802-879-7802  
rhorton16@comcast.net

### Weather Permitting.

### **Public Star Gazing at Dorset Park, S. Burlington, VT**

Every Friday night in **May (2, 9, 16, 23 and 30)**. The nights of the 2<sup>nd</sup>, 23<sup>rd</sup> and 30<sup>th</sup> will be Moon free.

Every Friday night in **September (5, 12, 19 and 26)**. The nights of the 19<sup>th</sup> and 26<sup>th</sup> will be Moon free.

**July 17 (Thursday) Solar Observing** at Haston Library, 5167 Main Street, Franklin, VT 05457

**Contact Ron Anstey 802-524-3653, anstyer@myfairpoint.net.**

**August 2 (Saturday) - Public Star Gazing Party at Lake Carmi State Park**, 460 Marsh Farm Rd. Enosburg Falls, Vermont. Sponsored by Haston Library and VAS. **Time is not set yet.**

If you can help out by bringing a scope, manning a scope or just want more info contact **Joe Comeau at 802-238-1664, jkcomeau@hotmail.com or Jack St. Louis at 802-658-0184, jack.st.louis@comcast.net**

### **“Spontaneous Night Under the Stars”**

**July or August.**

Joe Comeau will once again hold public observing at his observatory, Orchard Hill Observatory at 70 Poor Farm Rd. Alburgh VT. The plan is to make a list of interested people and

contact folks up to a few days in advance based on the weather forecast. This event will likely occur in July but it may not happen until August.

Activities will begin at dusk. This will be a no-cost event for people of all ages. Families with children are welcome. VAS members are invited to bring their telescopes to show participants around the summer sky. There will be a slide show of pictures taken by Astronomical Society members. Invite your friends for an exciting evening.

**Contact Joe at 802-238-1664 or jkcomeau@hotmail.com**

**Hinesburg Community School.** Details to be worked out. Contact **Jack St. Louis at 802-658-0184, jack.st.louis@comcast.net**

Keep an eye out for email announcements / updates for these and other events, also check the Events page on our web site, vtastro.org.

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

**Contact Ron Lewis for more details**  
802-779-5913 (cell)  
802-247-5913 (home)  
vtpoet@gmail.com

### Weather Permitting.

### **Events at the Hubbardton Battlefield State Historic Site.**

5696 Monument Hill Rd, Hubbardton, VT 05735  
<http://historicsites.vermont.gov/directory/>, “Directory of Sites”, “Hubbardton Battlefield”, “Things to Do”, “Events and Happenings”

**May 24 (Saturday) - Meteor Shower Night** Opens 8:00 PM, Sunsets 8:21, full darkness 10:00. Predicted meteor storm, as debris from Comet 209P/LINEAR, discovered in 2004,

burn up in Earth's atmosphere. Predicted peak will be 3-4 AM on May 25. **(Note: for those willing to stay, this will be an "all nighter")**

**July 20 (Sunday) - Lunar Event** On the 45th anniversary of the first lunar landing, enjoy the waning moon and night sky with members of the Green Mountain Alliance of Amateur Astronomers. They bring telescopes and reveal the magic of moon and star light in Vermont. If you like, bring binoculars, blankets, and flashlights. We provide marshmallows. If inclement weather, inside illustrated program. **(Note: the waning crescent Moon rises about 2:30 AM so this is planned as an all nighter for those willing to stay).**

**August 28 (Thursday) - Deep Sky Event** Opens 7:30 PM, sunsets at 7:40, full darkness about 9:00.

## Articles

### Vermont Astronomical Society Celebrates its 50th Anniversary By Jack St. Lois

"At a regular meeting of the Vermont Astronomical Society held, in Burlington, Vermont, on Wednesday evening, May 6, 1964, the acting chairman in the chair was Mr. Robert B Jones Jr, and Mr. Leo R. Kirby Jr, acting as Secretary. As the Society was not completely organized, no minutes, per se, were read from the previous meeting, however Mr. R. Jones outlined what had transpired, namely that the name of the Society should be "The Vermont Astronomical Society", and that meetings would be held on the first Wednesday on each month."

"There were 12 members present at the meeting on May 6, 1964."

"A motion was made by Mr. Leo Kirby, Jr., seconded and adopted that the annual dues for members would be \$6.00, which would include, in addition to membership, an annual subscription to the magazine, Sky & Telescope."

"A motion was made by Jay Freeman, seconded and adopted unanimously that the Society Executive board consist of four (4) offices; President, Vice-President, Secretary and Treasurer, and that nominations be opened."

"A nomination from the floor was made for Mr. Robert B Jones, Jr., for president, and was seconded."

"A nomination from the floor was made for Brother David Bryan for Vice-President and was seconded."

"A nomination from the floor was made for Mr. Leo R. Kirby, Jr., for Secretary and was seconded."

"A nomination from the floor was made for Mr. Jay Freeman for Treasurer and was seconded."

"A motion was made that the nominations for officers be closed and was seconded and passed."

"A motion was made from the floor to vote on the slate of officers as nominated, seconded and approved by unanimous show of hands."

"Professor Dominique Cassavant was introduced by the president. He commented on the observatory at St. Michael's College and that it would be available to the Society. Also that arrangements would be made for access to the observatory key for members."

"Guest Speaker:

Mr. John Pierce, President of the Springfield Telescope Makers and of the Woodstock School, spoke on the origination of the Springfield club Amateur Astronomer's contribution to Astronomy, Junior Clubs and telescope building."

"Several members accompanied Brother Bryan to St. Michael's Observatory where they looked at the famous star cluster M13 in Hercules, and the Ring Nebula in Lyra thru the twelve and a half inch reflector."

On motion of Mr. Jones the Society adjourned at 11:40pm."

### So began the first 50 years of the Vermont Astronomical Society.

The above text is in quotes as it is taken directly from the notebook containing meeting minutes, copied from the original meeting notes, by Amelia

"Millie" Swanwick on 11 October, 1964. If Millie had not copied the original notes, we may have never known the details of the beginnings of the VAS. Thanks Millie!

50 years has a lot of history to cover, so this article will focus on the various VAS observatory sites constructed by many of its members. Corrections to any historical errors are welcomed.

At the start, the VAS had no observatory, but did have the use of the Holcomb Observatory, which still stands on the campus of St. Michael's College in Colchester, Vt. The observatory is now surrounded by trees but is still used by current astronomy students.

The first VAS observatory was built by the newly formed Junior VAS, high school students from Burlington HS and Rice HS. The club was granted the use of a hill on the Barr Farm, located on Pond Road, in Shelburne. Ed Salvias cemented a pipe in a crack in a rocky outcrop near the top of a hill, where a 6" RFT scope was mounted with a 45 degree angle for observational tracking. In 1968 the JVAS built the first VAS observatory on that spot with the pipe mount centered in the building, the dimensions being 8 foot 'square', walls 4 feet high, with a peaked roof. The roof was lifted off for observing, then lifted back on and secured when not in use, the door secured with latch and lock.



The next construction project was the warming hut, 8 feet wide by 12 feet deep and 7 feet high at the front, with the roof sloping down towards the back. The warming hut was constructed in the spring/summer of 1969.

A replacement observatory was planned and constructed at the Barr Farm, this building would be of sturdi-

er construction with a roll-off roof, using roller-skate wheels. A new pipe was put in the ground, centered in the observing area, with a Cave Astrola equatorial mount and Keith Lawrence's 6" F/10 Newtonian reflector. Also used on this mount was the JVAS's 10" F/5.6 solar Newtonian. This observatory had an attached storage space at the entry way, where the roof rolled off. Plans were begun to



build a dual-observatory, but the landowner did not want more buildings on his land.

In 1970 the JVAS members met with Robert Patterson of Poker Hill Road, Underhill, to discuss the construction of an observatory site on his land. Bob liked the idea, and agreed to lease about 2 acres for a 10 year period. At this time, since the core of the JVAS graduated from high school, the JVAS ceased to be a separate entity, and the current JVAS membership evolved into the VAS. Younger members later join the club, but the JVAS was not reinstated.

In 1971 the VAS site at the Barr Farm was closed down after vandals destroyed the warming hut and attempted to break into the observatory. The remains of the hut were taken down, the observatory removed later.

During that year, while Keith was attending UVM, news of a large aperture-telescope lens was conveyed by Dr. David DePatie, professor of Physics. Keith and I went with Dr. DePatie to the cellar of the Dental Hygiene building, then located on the north side of upper Main St. That building was moved to the south side a few years ago. There was discovered a 9" Alvan

Clark refractor, which had been "in storage" for about 30 years. The telescope and mount was disassembled, cleaned and painted by VAS members, then reassembled for installation in Underhill.

In November of that year (1971), VAS traveled to Middlebury College to investigate their 12" Newtonian, which was to be removed from their observatory and replaced with a new SCT. VAS agrees to pay \$500.00 for the telescope, but over a five year period. The telescope had a plate glass mirror, but was deemed adequate for use in the new dual observatory.

For the next two years, VAS constructs first a two story clubhouse and then the dual-observatory, joined by a storage area, at the Poker Hill site. High walls on one end of the building housed the 9" Clark refractor, lower walls on the other end housed the 12" Middlebury reflector.



On July 20th, 1974, the objective lens was installed in the Clark refractor, members observed sunspots through holes in the clouds; I am not certain when the 12" reflector was installed. This site was in use until 1980 when the lease with the new owners ran out, Bob Patterson had previously moved to Nova Scotia. The buildings were left 'as is' to the new owners, the Clark was returned to the UVM Cook Science Building for refurbishing, a new site search began.

In 1981 observing sessions were begun at a site on Old Creamery Road in Williston, on land owned by then VAS President Larry LaForge. In 1982 the site was approved, the foundation for the 4th VAS observatory poured in May, the corner stone was set in place in September. The Clark refractor was

installed in July 1983, open house on 10-11 September, the site officially named Green Mountain Observatory.



1989 brought the closing of the GMO and the return of the Clark to UVM, which has not been installed in an observatory since that time. Later efforts by Don Manley, Professor of Astronomy at UVM, to build an observatory on UVM land were thwarted, the Clark telescope was set up in a museum room in the Cook Science building, where it remains today.

From June 1989 to March 1990, VAS members used Catamount Cross Country Ski Area in Williston, for a temporary observing site, no observatory was constructed.

In 1990, the VAS obtained permission for a temporary observatory at Lester Brown's Farm, South Road, Williston. In September a 12'x12' modular observatory was built in Georgia, Vt. at then VAS President Russ Chmela's house, disassembled, then re-assembled on Brown's Farm. This



observatory housed 3 different scopes – In October was a Celestron 5" F/10 SCT, November an 8" F/9.2 Newtonian on a German Equatorial Mount, then in April 1991 the club's 10" F.20 Buchroeder Tri-Schiefspiegler tilted component reflector on an alt-azimuth mount.

At the June 1993 VAS monthly meeting, it was announced that a new observatory site has been located, in Hinesburg, North Road. This site could turn out to be permanent, or at least longer term per an agreement with the Town of Hinesburg. First test observations were in July, the observatory at Brown's Farm was disassembled and moved to the current Hinesburg site with the Schief installed by September.



A Grand Opening was held, then President Brad Vietje spoke of the history of the VAS, special guest John Martin of the Springfield ATMs congratulated the VAS on their new site.

The current Green Mountain Observatory contains an 18" F/4.5 'Obsession' Newtonian reflector telescope on an alt-azimuth mount, and is enjoyed by the VAS members and invited guests.



To sum up, the VAS has constructed 5 observatories, at 5 different sites, two different observatories at the first site in Shelburne, and the same building used at the second site in Williston and the current site in Hinesburg. The membership has waxed and waned, but through the tough times the club endured and accomplished much.

Such accomplishments by an energetic group of amateur astronomers with such passion for their hobby and abundant talents is to be highly commended! The Vermont Astronomical Society has survived, grown and become an important resource for Vermont communities due to its amazing membership, past and present. I am sure the VAS will continue with this momentum well in to the future.

It is no wonder I speak of the VAS with great pride, at every opportunity. I applaud all VAS members for their efforts.

Special thanks to Paul Walker for editing this article, and to Gary Nowak for additions to this historical timeline.



We are partnering with NASA's Space Place ([spaceplace.nasa.gov/](http://spaceplace.nasa.gov/)).

### Space Place

"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."

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.

Following are Space Place Partners' articles for January and February 2014

### Surprising Young Stars in the Oldest Places in the Universe By Dr. Ethan Siegel

Littered among the stars in our night sky are the famed deep-sky objects. These range from extended spiral and elliptical galaxies millions or even billions of light years away to the star clusters, nebulae, and stellar remnants strewn throughout our own galaxy. But there's an intermediate class of objects, too: the globular star clusters, self-contained clusters of stars found in spherically-distributed halos around each galaxy.

Back before there were any stars or galaxies in the universe, it was an expanding, cooling sea of matter and radiation containing regions where the matter was slightly more dense in some places than others. While gravity worked to pull more and more matter into these places, the pressure from radiation pushed back, preventing the gravitational collapse of gas clouds below a certain mass. In the young universe, this meant no clouds smaller than around a few hundred thousand times the mass of our Sun could collapse. This coincides with a globular cluster's typical mass, and their stars are some of the oldest in the universe!

These compact, spherical collections of stars are all less than 100 light-years in radius, but typically have around 100,000 stars inside them, making them nearly 100 times denser than our neighborhood of the Milky Way! The vast majority of globular clusters have extremely few heavy elements (heavier than helium), as little as 1% of what we find in our Sun. There's a good reason for this: our Sun is only 4.5 billion years old and has seen many generations of stars live-and-die, while globular clusters (and the stars inside of them) are often over 13 billion years old, or more than 90% the age of the

universe! When you look inside one of these cosmic collections, you're looking at some of the oldest stellar swarms in the known universe.

Yet when you look at a high-resolution image of these relics from the early universe, you'll find a sprinkling of hot, massive, apparently young blue stars! Is there a stellar fountain of youth inside? Kind of! These massive stellar swarms are so dense -- especially towards the center -- that mergers, mass siphoning and collisions between stars are quite common. When two long-lived, low-mass stars interact in these ways, they produce a hotter, bluer star that will be much shorter lived, known as a blue straggler star. First discovered by Allan Sandage in 1953, these young-looking stars arise thanks to stellar cannibalism. So enjoy the brightest and bluest stars in these globular clusters, found right alongside the oldest known stars in the universe! Learn about a recent globular cluster discovery here:

<http://www.nasa.gov/press/2013/september/hubble-uncovers-largest-known-group-of-star-clusters-clues-to-dark-matter>.

Kids can learn more about how stars work by listening to The Space Place's own Dr. Marc:  
<http://spaceplace.nasa.gov/podcasts/en/#stars>.



Globular Cluster NGC 6397. Credit: ESA & Francesco Ferraro (Bologna Astronomical

Observatory) / NASA, Hubble Space Telescope, WFPC2.

## A Two-Toned Wonder from the Saturnian Outskirts By Dr. Ethan Siegel

Although Saturn has been known as long as humans have been watching the night sky, it's only since the invention of the telescope that we've learned about the rings and moons of this giant, gaseous world. You might know that the largest of Saturn's moons is Titan, the second largest moon in the entire Solar System, discovered by Christiaan Huygens in 1655. It was just 16 years later, in 1671, that Giovanni Cassini (for whom the famed division in Saturn's rings—and the NASA mission now in orbit there—is named) discovered the second of Saturn's moons: Iapetus. Unlike Titan, Iapetus could only be seen when it was on the west side of Saturn, leading Cassini to correctly conclude that not only was Iapetus tidally locked to Saturn, but that its trailing hemisphere was intrinsically brighter than its darker, leading hemisphere. This has very much been confirmed in modern times!

In fact, the darkness of the leading side is comparable to coal, while the rest of Iapetus is as white as thick sea ice. Iapetus is the most distant of all of Saturn's large moons, with an average orbital distance of 3.5 million km, but the culprit of the mysterious dark side is four times as distant: Saturn's remote, captured moon, the dark, heavily cratered Phoebe!

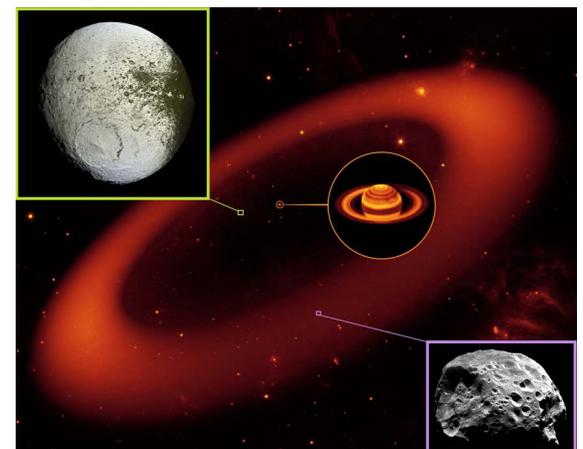
Orbiting Saturn in retrograde, or the opposite direction to Saturn's rotation and most of its other Moons, Phoebe most probably originated in the Kuiper Belt, migrating inwards and eventually succumbing to gravitational capture. Due to its orbit, Phoebe is constantly bombarded by micrometeoroid-sized (and larger) objects, responsible for not only its dented and cavity-riddled surface, but also for a huge, diffuse ring of dust grains spanning quadrillions of cubic kilometers! The presence of the "Phoebe Ring" was only discovered in 2009, by NASA's infrared-sensitive Spitzer Space Telescope. As the Phoebe Ring's dust grains absorb and re-emit solar radia-

tion, they spiral inwards towards Saturn, where they smash into Iapetus—orbiting in the opposite direction—like bugs on a highway windshield. Was the dark, leading edge of Iapetus due to it being plastered with material from Phoebe? Did those impacts erode the bright surface layer away, revealing a darker substrate?

In reality, the dark particles picked up by Iapetus aren't enough to explain the incredible brightness differences alone, but they absorb and retain just enough extra heat from the Sun during Iapetus' day to sublimate the ice around it, which resolidifies preferentially on the trailing side, lightening it even further. So it's not just a thin, dark layer from an alien moon that turns Iapetus dark; it's the fact that surface ice sublimates and can no longer reform atop the leading side that darkens it so severely over time. And that story—only confirmed by observations in the last few years—is the reason for the one-of-a-kind appearance of Saturn's incredible two-toned moon, Iapetus!

Learn more about Iapetus here:  
<http://saturn.jpl.nasa.gov/science/moons/iapetus>.

Kids can learn more about Saturn's rings at NASA's Space Place:  
<http://spaceplace.nasa.gov/saturn-rings>.



Images credit: Saturn & the Phoebe Ring (middle) - NASA / JPL Caltech / Keck; Iapetus

(top left) - NASA / JPL / Space Science Institute / Cassini Imaging Team; Phoebe (bottom

right) - NASA / ESA / JPL / Space Science Institute / Cassini Imaging Team.

## Board Talk

Board meetings are currently held at BioTek Instruments (Paul's employer) the week after the Monthly Meeting on Tuesday, 7:30 to 9:00 PM. They are open to all members, contact any Board Member for info.

Board meeting summaries:

### January

Jack has ordered a solar powered battery charger for the observatory for recharging the small 12V batteries we use there.

We have 2 requests for star parties. One from Hasten Library and one from Hinesburg Community School. Shelburne School is interested in a presentation. We could really use help for these and other requests as we seldom have as many scopes as we would like at these events and it's usual the same few people who participate. Please contact Jack St. Louis at [658-0184](tel:658-0184), [jack.st.louis@comcast.net](mailto:jack.st.louis@comcast.net), if you can help out.

We will have our Annual Banquet and Business Meeting at St. Johns Club again. Dennis will be in charge of getting door prizes, Paul for reserving the space.

### February

Joe will be at Earth Hour for public star gazing. He will also host Spontaneous Night Under the Stars at his place again this summer.

Ron will host solar observing at Haston Library. Ron also represented VAS at the state wide Librarian's Meeting to offer our services to Vermont's libraries.

### March

Jack has received permission to have public star gazing at Dorset Park, Dorset St., South Burlington every Friday night in May. He and Bob Horton will be hosting. Members are encouraged to come, with or without scopes.

Ron received a thank you letter from the librarian's at the Librarians Meeting (see February notes).

Doug Williamson will renew our membership with IDA (International Darksky Association).

We have extra Observers Handbooks, most of which we will give to area libraries.

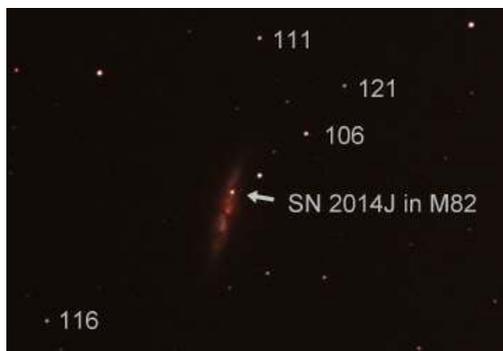
As part of the Burlington Summer Activity Program, Steve Scaravelle, Bill Wick, Don Manly, Donna Lescoe, Dennis Woos, Jack St. Louis and Al Boudreau will be running a Summer Astronomy Program (June 30 through July 3). Each will take a different day.

Vermont State Parks is interesting in our doing astronomy programs at the state parks this summer.

## Observers Page

### Supernova 2014J in M82

By Paul Walker



2014-01-30 Middlebury, VT  
Single unprocessed 2 min. exp.  
10 inch f/4.0 (1000mm fl) reflector  
Camera - Modified Canon Rebel XT  
ISO 200 (also see processed image on page 14)

M82 is a "starburst" galaxy about 12 million light years away in Ursa Major (Big Dipper). The numbers are magnitudes of comparison stars without the decimal point. The supernova was in the mid 11th magnitude range. The galaxy is magnitude 8.4.

I tried for the supernova on 2 nights. The first on 1/29/14. I hadn't used the scope for a few months (too cloudy or too cold). I was getting used to the cold weather by now so even though it was only about +10 deg. F I found it tolerable.

Even though the setup is semi-permanent, I had to polar align the scope

due to the frozen ground having shifted since last Fall. I might have been used to the cold but the "GoTo" equatorial mount wasn't. I tried to do the star alignment, but it didn't get to far. As the motors were ramping up to full slew speed the mount suddenly stopped with an awful grinding noise like the teeth on the gears were stripping out! Even though I knew it was only the stepper motors stalling, I still winched a little.

I grabbed an old hair dryer I use sometimes for drying dewed up optics and aimed it at the mount where the gears and motors reside. It took a while but eventually things warmed enough for the motors to stop complaining. I did a one star alignment using the northern pointer star in the Big Dipper (Dubhe) figuring that would be good enough for getting me to M82. I punched M82 into the hand controller and took a short exposure image. I saw a galaxy so I thought I was in the right place. I moved the scope around a little until I could see 2 galaxies in the test images. They weren't as bright as I expected, but it had been a few years since I had imaged them. So I went ahead with several frames. Turns out they were the wrong galaxies and I still haven't figured out which ones I got.

The next night was clear so I tried again. The air temperature again was about +10 deg. F. So again I used a hair dryer to warm the grease on the gears. I decided this was taking too long, so I switched to a propane torch. You want to be careful to keep the flame moving so you don't scorch any paint and to keep it away from any wires and plastic parts.

I did a 1 star alignment toward the East then pulled up Dubhe in the controller's data base. The star was not centered so I manually brought it closer to center. I then entered M82. This time it was in the field. It still took some time to get both M82 and M81 in the field because for some reason I incorrectly thought North was to the right in my camera's view, it was really to the

left (I have a mark on my focuser indicating landscape rotation for the camera and have North incorrectly marked, I still need to fix that). Ultimately I was successful with framing both M81 and M82.

Based on current theory supernovae occur 2 ways, either as a white dwarf star in a binary system that accumulates mass from its companion star until it reaches critical mass and explodes or as a massive star that collapses when it runs out of "fuel" then rebounds in an explosion. This supernova is of the white dwarf type.

A white dwarf is a "dead" star with about the mass of the Sun, i.e. it has gone through the red giant phase and has converted most of its hydrogen "fuel" into Helium, Helium into Oxygen and Carbon via fusion reactions and has collapsed down to about the size of the Earth. Sometime later, the companion star starts running out of hydrogen as well and enters the red giant phase swelling to tens to hundreds of times larger. If the 2 stars are orbiting close enough together, the white dwarf "steals" material from its bloated companion. This material builds up in a layer on the surface of the white dwarf until the internal pressure and temperature is high enough to fuse carbon at which point the star blows itself apart.

Jack St. Louis - After arriving home after last night's meeting, I looked up and saw the sky clear in the area of Ursa Major (The Big Hairy Animal), so I took out my Orion Shorty refractor and a 26mm eyepiece. A little searching and I found M 81 & M82, and could see the supernova in M82. It was faint and tiny, but I could tell it was there. I then used a 12.5mm eyepiece, that was a little better, then added my 2x barlow, that helped. Still tiny and faint, but because I knew where and what to look for, I can say I bagged it! First real night time observation in months for me. I froze my fingers but it was worth it.



Here's a picture Al Boudreau got with his Mallincam astro video camera on a 6-in SCT, 56 seconds exposure.

### Imaging planets in Puerto Rico 2014 By Joe Comeau

This year, Molly and I made our annual pilgrimage South to the little island of Culebra, 17 miles off the eastern tip of Puerto Rico. The five by seven-mile island is small but has a variety of mini-climates. The southern region is arid and the skies are mostly clear each night. Evening temperatures in February and March are in the mid- to upper 70s and the stable weather commonly results in very good to excellent seeing. The twelve-hour days of the Tropics allow for a reasonable balance between snorkeling, turtle watching and astro-imaging time.

This year I focused on lunar and planetary imaging. Jupiter was ideally positioned overhead in the evening sky and Mars and Saturn were well positioned in the early morning. Before dawn Venus appeared low in the sky but at 18° North latitude, it was better positioned than at 45° N. in Vermont. Since we stayed for a month, the possibilities for the moon were endless.

Along with a Celestron advanced VX mount, I sent an Astro-Tech 6" f/9 AT6RC Ritchey-Chrétien astrograph to Culebra by parcel post about a month before my visit. The inexpensive 12.9-pound scope was named a Sky & Telescope Hot Product for 2009. The AT6RC is designed for coma-free imaging using webcams, Deep Sky Imager-type cameras, and DSLRs.

For imaging, I used an ultra compact Sentech STC-MC33USB - 640x480 Color Camera. This camera is a progressive scan, VGA, USB 2 camera and can capture 60 frames per second (fps) at full resolution. It is well suited for planetary, lunar, and solar imaging. The sensor size is 4.74 x 3.55 mm and the pixel size is 7.40 x 7.40 μm.

The scope was set up on the shore at a cottage named "Casa Yaboa" on Mosquito Bay on the southeastern part of the island. There is an unobstructed view to the South and West. During the day, three large black plastic trash bags protected the scope, causing the tube to warm up from the sun. I found it very important to remove the trash bags and lens caps about an hour before imaging to allow the tube to cool to ambient. Thermal currents in the tube cause serious image degradation.

Imaging planets requires consideration of both image scale and exposure. To take advantage of the good seeing, a 3x Televue Barlow was used with the scope and camera to get an image scale of 0.4 arc seconds per pixel. AVI video files were collected at 25 frames per second or greater with minimal camera gain to give an individual frame histogram in the middle to upper third of the camera's eight bit dynamic range. Digital gain was not used because the noise artifacts were too high. Typically I captured 1200 frames per video which kept the video length to 48 seconds or below. This was important for imaging Jupiter. The planet's rapid rotation causes blurring with longer videos.

A larger scope would have given a wider choice of frame rates and lower camera gain combinations but portability considerations made this scope camera combination a very reasonable compromise.

For image processing, I used Registax 5.0.2.8 from [http://www.astronomie.be/registax/html/download\\_v4.html](http://www.astronomie.be/registax/html/download_v4.html) and the following procedure:

Steps used for these planetary images:

1. Select the AVI
2. Choose an alignbox size big enough to enclose the entire planet or a high contrast moon feature.
3. For planetary images only, select align center of gravity and increase the Lum Threshold until the box locks on the planetary image
4. Set the quality setting to gradient 2 and tracking settings at track object and predict track.
5. Set the lowest quality to 100
6. Click on the align button
7. After align is complete, reduce the quality setting to select a number of frames to process. I usually use at least the top 80% at this stage

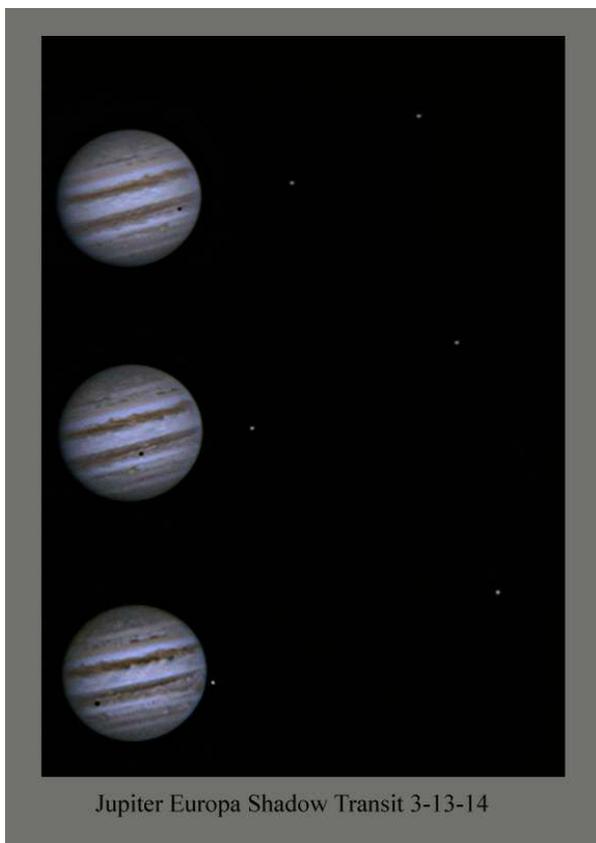
8. Click on limit to go to the optimize page. I use the fast optimizer V5 with the optimizer difference set on "squared", the optimizer limits set at 1-% improvement and the search area set at 8 pixels.
9. To create a reference frame, set the frames per alignpoint to 50 and hit "create".
10. On the wavelets page hit do all and continue
11. Back on the "optimize" page, optimize and a box will come up asking if you want to use the new reference - answer yes.
12. When finished go to the "Stack" tab and select normalization for frame intensity, show stackgraph and stretch histogram after stacking.

13. The slider on the left side of the stackgraph should be lowered to cut off the peak spikes from slightly misaligned frames.
14. The slider on the bottom of the stackgraph should be moved to the left to limit any unusually low quality frames.
15. Hit the stack button to finish stacking
16. Open the wavelets tab
17. Click on RGB align - estimate to correct for atmospheric refraction
18. Adjust the wavelet sliders to bring out planetary features to taste. I usually use the 1:1 slider for sharpening and the 6:1 slider for contrast.
19. After adjustment click on the do all and save image buttons.

### Jupiter from Culebra

Jupiter has moved from its apparent opposition diameter of ~46.8 arcseconds on January 5, 2014 to ~38 arcseconds in March but it is still well placed in the sky. Cloud bands, the Great Red spot and numerous moon shadow transits were recorded.

(North is up all images)



The Great Red Spot



Io and Ganymede Shadow Transit

**Mars from Culebra**

Mars is approaching opposition on April 8, 2014 and will reach an apparent diameter of 15.1 arcseconds. In March, Mars went from 11.6 to 14.7 arcseconds. Features recorded include the North polar cap, dust storms and albedo features like the orographic clouds over the shield volcanoes in the Tharsis region.



Clouds over the Tharsis Region 3-7-14



Sinus Meridiana area 3-18-14



Mare Erythraeum Mare Acidalium area 3-16-14



Syrtis Major Sinus Sabaeus area 3-17-14

**Venus from Culebra**

Venus is at greatest elongation from the Sun on March 14th. The apparent size shrinks from 33 to 22 arcseconds. It is low in the eastern sky but in the tropics, the image is not badly distorted from atmospheric turbulence and refraction.

**Saturn from Culebra**

Saturn is highest before sunrise. The disk is 18 arcseconds and the rings are tilted at 22 degrees. It is low in the sky but rises to 55 degrees at maximum altitude. Saturn was difficult to image with the setup that I used because the surface brightness was not sufficient to give an image with a mid- to upper-range histogram at a frame rate of 25 and with no digital gain. 4000 frames were stacked to make this image. This is where a larger scope aperture would have helped. Taken 3-16-14.

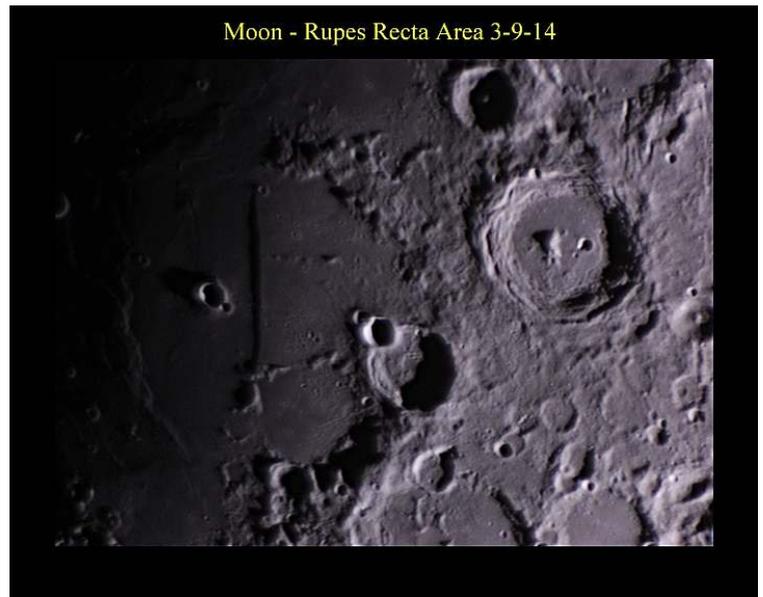


### The Moon from Culebra

The Moon moved from new to full in the first two weeks of March. On March 2nd the thin crescent was 1.6 days old and bright with earthshine.



Setting crescent Moon, 3-2-14, 1.6 days old



Moon - Rupes Recta Area 3-9-14



Mare Orientale Mare Humorum and Grimaldi area 3-17-14



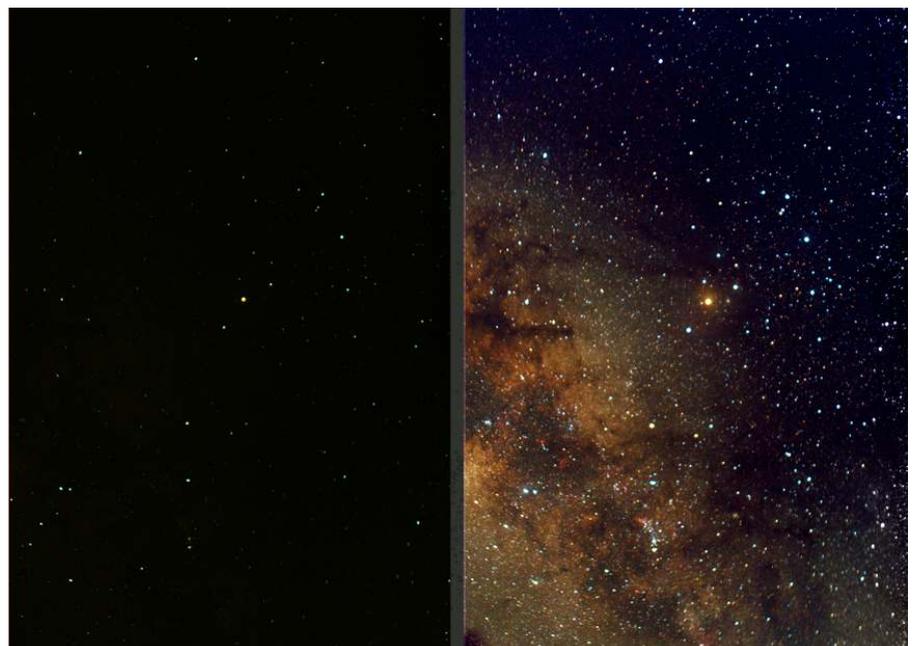
Montes Appeninus Area 3-9-14

Eratosthenes

While imaging the planets in the early March mornings, it was hard not to notice the start of the summer sky. Using a Canon DSLR piggybacked to my scope I was able to capture wide-field images of Scorpio, the Milky Way and the Southern Cross. All in all, it was a good vacation.



The Southern Cross (lower left corner)



Scorpio - two views



**M45, The Great Nebula in Orion**

**By Steve Yerby**

Conditions were perfect last night and it was a weekend [February 28] with no moon, so rare. I got 42x2mins on M42. I would have positioned the camera for the running man too but I was SO cold by the time I was set up and realized it wasn't in the frame, I settled for just M42. Camera - SBIG ST-8300, Scope - ED80, Mount - CGE Guided with Meade DSI III Camera Control/processing - Nebulosity 3, Processing - CS PS4



Jupiter (North down) with Io (barely visible, far left edge, on N. edge of S. Eq. Belt), Io Shadow (center) & Great Red Spot. 200 frames of high definition video taken 2014/03/07 at 9:56 PM.

In case you didn't know, now is a great time to be viewing Jupiter. Because Jupiter is tilted only slightly, transits of it's moons and moon shadows across the face of Jupiter are common. See Sky and Telescope for timing of events.  
(North down in all images)



Ganymede (top right) and Europa (bottom left) 250frames of HD video taken 2014/03/08/ at 7:30 PM.



Europa (left) and Callisto's Shadow. Callisto is out of the view to the left. 2014/03/11 at 7:19 PM

**Images by Paul Walker**



**Comet Lovejoy C/2013 R1**

**By Allon Wildgust**

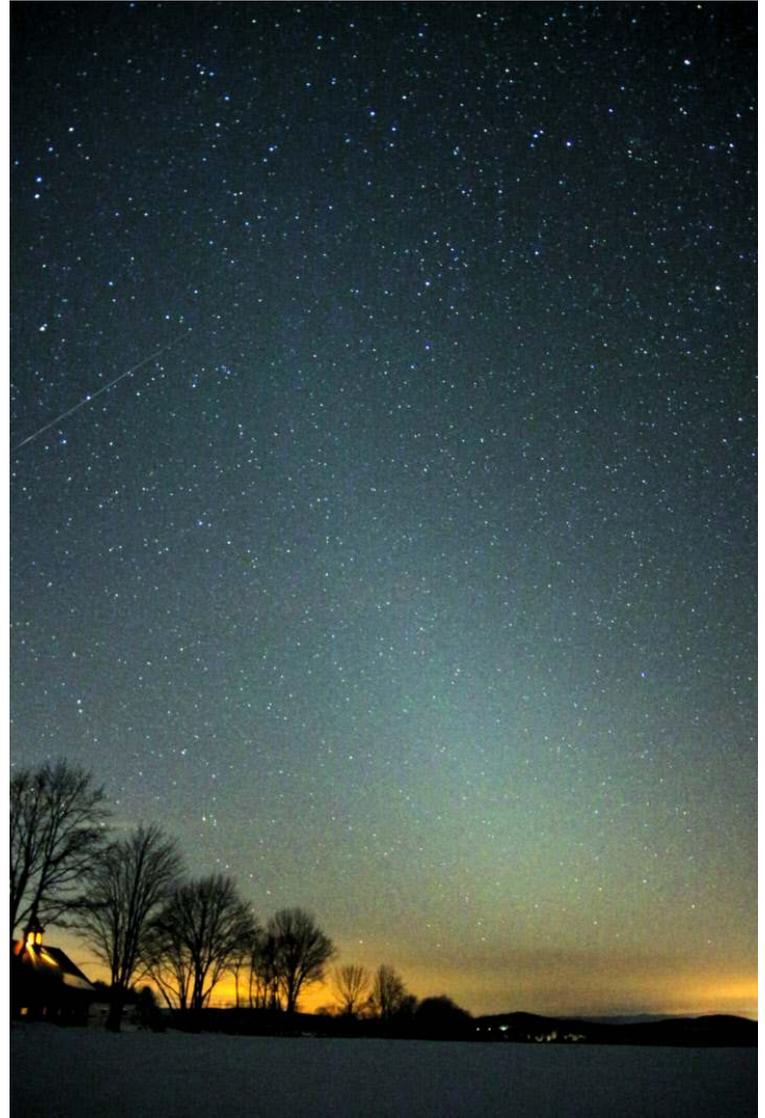
Comet Lovejoy arguably put on a better show for amateurs than Comet ISON. Allon took this tracked shot on December 25, 2013 using a Pentax K-3 camera piggybacked on his home-made scope. 300mm f.l., F/4.0, ISO 800, 42 second exposure. He had to contend with the trees that surround his house.

**Zodiacal Light and Meteor**

**By Allon Wildgust**

This faint dust cloud from comets is centered on the ecliptic and is best seen in the Spring and Fall under very clear skies. Occasionally one of these dust specks lights up when Earth plows into it.

Pentax K-3, @ 18mm f-3.5, 15 sec. ISO 3200 on 2/17/14 at 7:20 PM.



**M81, M82 and Supernova 2014J**

**By Paul Walker**

Here's a slightly cropped version of the processed image that includes the supernova . 30 x 2 minute exposures through Paul's 10" f/4.0 reflecting telescope.

### VTC CubeSat Update

On the right, is the first photo of the Earth taken by Vermont's first orbiting CubeSat. Downloaded and assembled by Bill McGrath of LED Dynamics (one of the Vermont CubeSat partners). It is of the North coast of Western Australia, looking towards Port Hedland



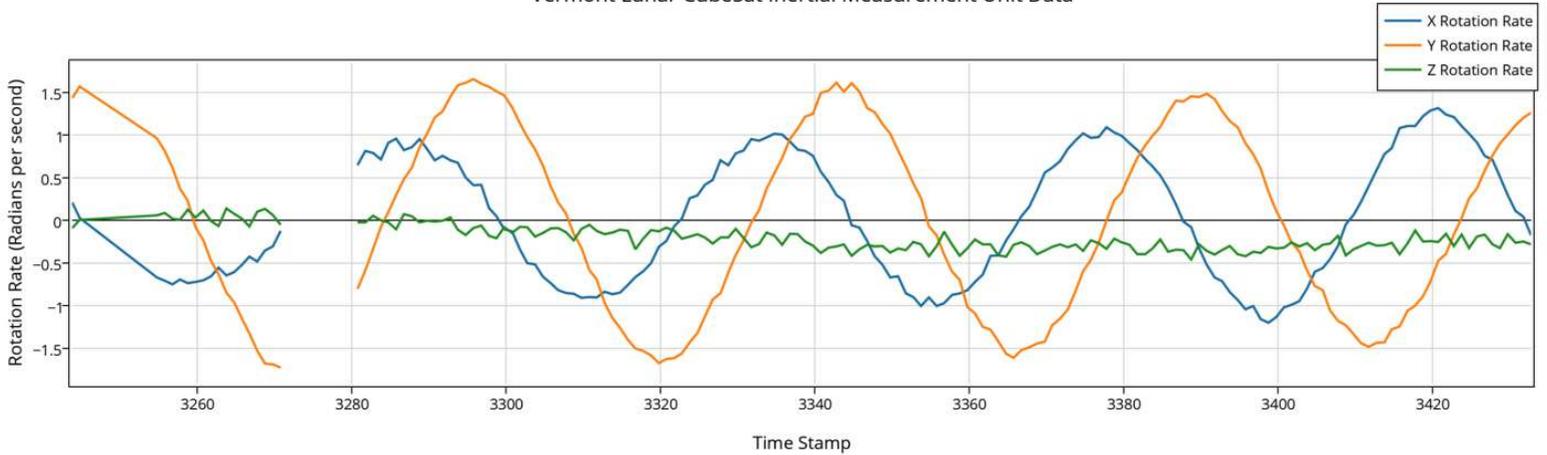
Below is some Inertial Measurement Unit data downloaded from the CubeSat on March 6, 2014 (plots by plot.ly)

This is part of the CubeSat Lunar Lander Project. The goal of the project is to explore the technologies required for building a viable CubeSat device that can orbit and/or land on the moon. This project's predecessor was the Alaskan Ice Buoy Project which assisted in learning about the CubeSat Kit hardware that is also being used in this project.

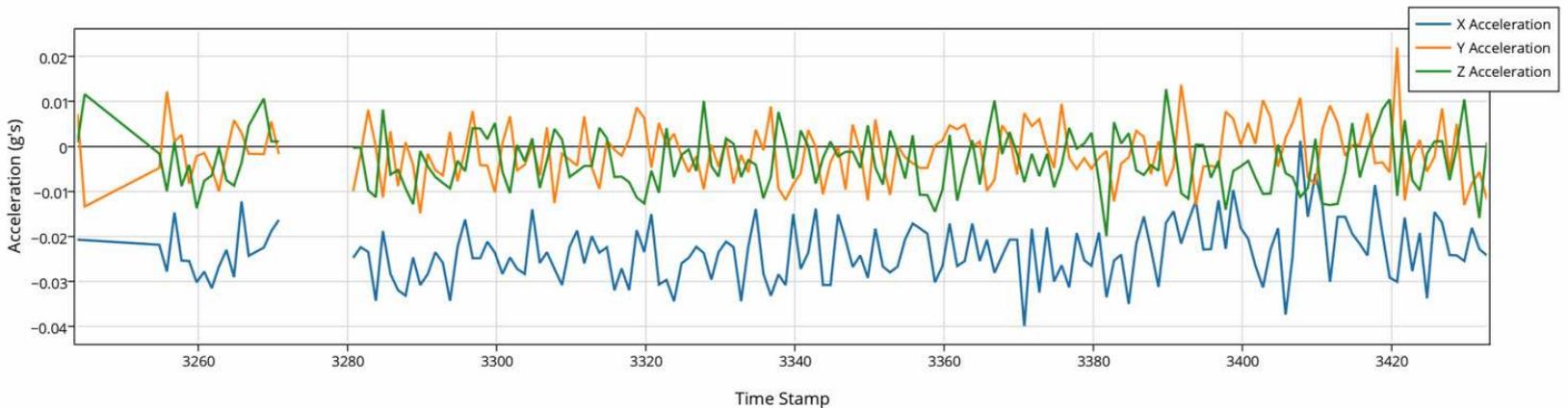
We have built a single CubeSat to test the navigation components we would use to go to the Moon. It was launched as part of NASA's ELaNa IV program on the Air Force ORS-3 mission, on an Orbital Sciences Minotaur 1 rocket from Wallops Island, VA, on November 19, 2013.

<http://www.cubesatlab.org/>

Vermont Lunar CubeSat Inertial Measurement Unit Data



Vermont Lunar CubeSat Inertial Measurement Unit Data



Here's a novel idea -

**INDOOR STAR PARTY**

By Larry Garrett

For amateur astronomers, winter can be an uncomfortable time. It's hard to concentrate on the stars above when you are freezing. Lawrence Garrett of Queen City Printers In Burlington, Vermont, has a solution to this problem: "Hold your star party indoors." Seriously. "For the past two months I have been holding indoor press room star parties," he says. "Using a solar filter, we have watched active region 1944 round the Sun. And we have been enjoying good views of Venus, which is currently a slender crescent. "

Here are two of his colleagues taking a look at the second planet through his Meade 90mm ETX:



"Even with window glass and slight haze, the sight of Venus was beyond my greatest expectations. Others with small telescopes might find these inside star parties just as good as those outside this time of year, and introduce Venus, and perhaps the Sun and Moon to co-workers, while staying warm in the process!"

How do you find Venus through the window in broad daylight? Garrett offers this advice:

"Venus is easy to see right before I start work in strong twilight. The real trick is to do polar alignment indoors so the telescope can track Venus. Its easy with the ETX if you know where the North Pole is. I start tracking on Venus for a few minutes, and then see how it has moved away from the center of the eyepiece view. I then move the whole telescope to place Venus back in the center and it tracks perfectly after that."

My indoor star parties have made spaceweather.com today.

Yes, the Venus shot was taken right through the glass the same Day.

**Mars** - Taken by Stephen Scaravella's friend Ernie from Florida.



It shows the north polar cap, orographic clouds over the Elysium volcanoes just north of the Martian equator and a bright blue cloud over the Hellas impact basin in the southern hemisphere

**Something More Down to Earth**

Not all star-like and spiral nebulae-like objects are in the sky. Here are recent examples of what **Allon Wildgust** has been doing on cloudy winter days.



Snowflake.



Frost on window.

**For Sale / Wanted**

**For Sale:**

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

**NextStar 11-inch SCT, Alt-Az mount**

I have decided to sell my *older Next-Star 11-inch*. I put a lot of work into it through the years. I had it fully baffled and flocked with dark material. Also recently refurbished the altitude and azimuth motors. New hand pad and, I put in a feather-touch focuser (\$300). Its go-to and tracking are impeccable. It comes with 50mm finder and has a Telrad base mounted. Heavy duty tripod. If you know anyone that is interested let me know. I will keep it if there is no interest, but it's a shame to leave it unused.

**Asking price is \$700.** Paid \$3000.. [Stephen Scaravella, 802-434-3884 or englishnotation@gmail.com](mailto:Stephen.Scaravella@802-434-3884)

\*\*\*\*\*

**Celestron CPC-1100 Telescope plus accessories.**

**Asking price is \$2100, brand new condition.** It's four years old but literally has been used about three times -- two times on my deck and once on the lawn. Original tags are still on the scope. 11 inch Schmidt-Cassegrain Telescope, tripod, Celestron PowerTank Battery, and Celestron Accessory Kit (\$240 value), with additional eyepieces and filters, is included in price. The new sale price of this set on Amazon is \$3300. NexStar computer GPS controlled.

Available for pick up only in Stowe, Vermont, [please call 781 266 6606 \(mobile\)](tel:7812666606) or [978 692 2673 \(home\)](tel:9786922673).

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**8" Schmidt-Cassegrain Telescope**

Meade LXD 500 with many extra's. I'm from Jeffersonville and asking \$500.00.

extra #812 polar alignment finder #1702 Dual-Axis Drive System. 6 colored filters including a nebula filter in a case.

Meade super Plossl 26mm  
Meade series 3000 Plossls - 25mm, 16mm, 9.5mm, 6.7mm  
Meade 2x Telenegeative Lens (Barlow)  
Meade #918a Diagonal Prism, lenspen, 1 bottle brite sky lens cleaner, 1 Mylar Filter.

Contact David Cook,  
dbcook5610@hotmail.com

\*\*\*\*\*

**Starlight Xpress Lodestar Monochrome Imager & Autoguider**

Retail is \$595 asking \$395. Buyer pays for shipping of their choice and any PayPal fees.

I am the only owner/user and it has seen very little use, maybe 20-30hrs. I Plan to use my DMK21 as a video guide camera with PHd or Metaguide Quick Overview:

- Doubles as an electronic finder and planetary imaging camera with an image format of 752 x 580 pixels.
- Black anodized aluminum body measures only 32 x 72mm and weighs approximately 50 grams.
- Built-in USB 2.0 compatible and powered interface downloads images typically in 0.2 seconds at full resolution.

· The Starlight Xpress Lodestar utilizes a ICX429AL Sony Exview inter-line CCD with low dark current and vertical anti-blooming.

**Celestron 23mm Axiom**

Basically unused and very clean condition. Buyer to pay for shipping of their choice and PayPal fees. \$125

**Baader LaserColli**

Unused Item in very clean condition. Buyer pays for shipping of their choice and any PayPal fees. For sale at \$50.

Contact Douglas Duncan  
douglasd@3w3d.com  
PO Box 8, West Glover, VT 05875  
(802) 525-4904

**Lenses:**

2- 6" diameter air spaced doublets, 38" fl anti reflective coated, \$150.00 each

2- 5" diameter glued doublets, 28" fl A/R coated \$150.00 each (these are a matched pair)

**Mirrors:**

3- 13" diameter 2" thick, 120" fl silver coated, \$750.00 each

1- 20" diameter 3" thick, 1 1/2 chip on edge needs re-coating, (fl unknown) \$700.00

Mirrors are spherical, custom made for focusing high power lasers.

Contact Charles Lysogorski, Gor Optics, info@gor-optics.com  
802-238-3103

\*\*\*\*\*

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

**Dues  
Time to Renew Your  
Membership**

Associate Members \$15  
Full Members \$25

**Your can bring a check (preferred) or cash to the meeting or send a check to the address below.**

**If there is no change to your mailing address or email all we need is your name so we can update our records.**

Contact Paul Walker  
or  
Doug Williamson  
or

Send dues to VAS, PO Box 782, Williston, VT 05495.

**Announcements**

**ELECTIONS**

Elections this year are for President, Vice President and 4 Board Members at Large. Any full member interested in any of these positions please contact any of the board members listed at the end of this newsletter.

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

All membership dues are due as of January 1st. \$15 for Associate Members, \$25 for Full Members.

Send dues to VAS, PO Box 782, Williston, VT 05495.

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

**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 / Changing Email?**

Please send changes to Paul Walker, 53 Valley View, Middlebury, VT 05753, paulwaav@together.net

**Web Site**

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

Email: webmaster@vtastro.org

Paul Walker is acting webmaster.

**Board Members**

Jack St. Louis	Pres	658-0184
Open	VP	
Doug Williamson	Treas	388-3482
Paul Walker	Sec'y	388-4220
Ron Anstey		524-3653
Joe Comeau		238-1664
Bob Horton		879-7802
Gary Nowak		879-4032

Editor and Publisher - Paul Walker

**Contributors:**

Al Boudreau, Joe Comeau, Larry Garrett, Stephen Scaravella, Ron Lewis, Jack St. Louis, Gary Nowak, Paul Walker, Allon Wildgust, Steve Yerby, Dr. Ethan Siegel, NASA's Space Place (My apologies if I missed anyone)