

Morning Star

Spring 2016



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New Members

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

Dave Bristol
Patrice MaComber

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.

April 4

Mars 2016 Apparition By Gary T. Nowak

The Planet Mars is going to come close to Earth in May 2016. This will be the Red Planet's best showing in more than a decade. Advanced visual amateur astronomer and long time Mars observer, Gary Nowak, will be covering the short observing opportunity for Mars (17 April - 21 July 2016). This presentation will look at the types of telescopes that are best for observing Mars. He will discuss optical filters and observing techniques.

Did you know that Mars is the only Solar System Planet that we have a reasonable view of the surface features? A survey of visual features will be covered, from the Martian volcanoes to its dust storms, clouds and polar ice caps. The

presentation will let you in on a technical trick which will help the observer see features on Mars. There will also be a sprinkling of interesting historical information that will reveal why the Planet Mars has always been fascinating to humans.

Gary was born in 1955 in Springfield, VT. He has BA degree in History from the University of Vermont, an AS degree in Electrical and Electronics Engineering from the Vermont Technical College and served a term in the VT Army National Guard as a 1st Lieutenant of a Tank Platoon. He's been interested in astronomy since his early teens. Since 1970 he has been a member of the Association of Lunar and Planetary Observers (ALPO). In 1979 he joined the American Association of Variable Star Observers (AAVSO). While carrying out his nova search program he independently discovered Nova Aquilae 1999 No. 2 while sweeping the Milky Way with binoculars. For this discovery he received the AAVSO Nova Award. Gary routinely searches for comets, novae and supernovae. He joined the Vermont Astronomical Society (VAS) in 1978, has served the club for many of the years since as a board member, vice president and president (twice).



Image by Paul Walker



Jupiter By Paul Walker

Taken 2016-03-11, Stack of 900 frames from a 1 minute video.

May 2

Annual Banquet / Business Meeting

No Presentation. Members and invited guests only. **Contact any member to get an invite.**

If you are having the meal, choices are Turkey with all the fixings or Veggie Lasagna. Paul will send out RSVP's in April.

The meal is \$20 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.

Silent Auction

There will be a silent auction to raise money for the club.

Elections this year are for President, Vice President and the 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 6

ALMA, the Largest Telescope Array in the World By Al Boudreau

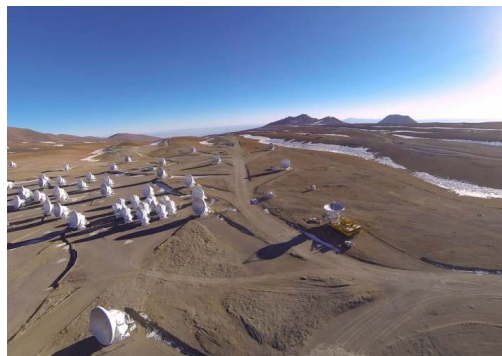


One of the telescopes in transit.
Photo credit: ESO-Pascal Martinez

An international consortium is now finishing construction of the "Atacama Large Millimeter/submillimeter Array" (ALMA) high in the Andes Mountains of Chile. At an elevation of 16,500 feet, the Atacama is the driest place on Earth. ALMA's 66 precise antennas can create a submillimeter telescope 46,000 feet across with resolution that rivals the Hubble Space Telescope. Even more important, ALMA can now penetrate thick dust clouds obscuring many important objects in the Universe. This \$1.5 billion telescope will revolutionize astronomy.



A small part of the array.
Photo credit: NRAO/AUI/NSF



Credit: Ariel Marinkovic / X-Cam

Mr. Boudreau is a retired Aerospace Engineer, an Associate Fellow of the American Institute of Aeronautics and Astronautics. He is a serious amateur astronomer with his own observatory in Bridport, VT where he has started dabbling in astrophotography. He joined the Vermont Astronomical Society in 2006. He is well known for his excellent presentations.

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 (www.vtastro.org) Events page for any last minute cancellations, members will be sent email updates.

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

Member and Invited Guest Star Parties at the GMO

(Green Mountain Observatory)

100 Observatory Road, Hinesburg, VT

There are no planned member star gazing parties at GMO this Spring. Instead we are planning 2 sessions that will be easier for more members (and non-members) to attend. At these events we will have experienced members providing help to the less experienced members. This assistance will include help setting up and operating scopes and finding objects to view.

(The 2 events listed below)

Member and Invited Guest Star Gazing at Angele's (Shelburne)

April 15, 16 or 17

Start time about 8:00 PM

We will observe on only 1 of the 3 nights, which ever one looks best weather-wise with the priority in the order of Friday, Saturday, Sunday.

Member and Invited Guest Star Gazing at Dennis's (New Haven)

April 29, 30 and May 1

Start time about 8:20 PM

We will observe on only 1 of the 3 nights, which ever one looks best weather-wise with the priority in the order of Friday, Saturday, Sunday.

Keep on eye on your email for updates.

For Star Gazing at the GMO

Contact: Paul Walker

802-388-4220 (H)

802-861-8640 (W)

paulwaav@together.net (H),

walkerp@biotek.com (W)

For Star Gazing at Angele's

Contact: Paul above or

Angele Mott Nickerson

a.mott.nickerson@gmail.com

For Star Gazing at Dennis's

**Contact: Paul above or
Dennis 802-453-2360
dpwoos@GMAVT.NET**

If you are 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.

Check the web site for last minute updates and cancellations.

Public Star Gazing

Check our website www.vtastro.org for any updates. Members can watch for emails.

School, Library and other group requested star gazing parties. - None currently scheduled.

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
Ron Anstey (802-524-3653)
Joe Comeau (802-238-1664)
Jack St. Louis (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**

**Public Star Gazing at
Libraries**

Stay tuned.

Members watch for emails.

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

Except for the May 9 transit of Mercury, 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

<http://historicsites.vermont.gov/directory/>, "Directory of Sites", "Hubbardton Battlefield", "Things to Do", "Events and Happenings"

May 9, Monday,**Transit of Mercury Across the Sun**

Note: This event will be held during daylight (not at night)

On Monday, 2016 May 9, Mercury will transit the Sun for the first time since 2006. The transit or passage of a planet across the face of the Sun is a relatively rare occurrence. As seen from Earth, only transits of Mercury and Venus are possible. There are approximately 13 transits of Mercury each century. In comparison, transits of Venus occur in pairs with more than a century separating each pair.

The Green Mountain Alliance of Amateur Astronomers will have over 25 pairs of certified Eclipse Shades safe for direct solar viewing, plus several tele-

scopes and pairs of large binoculars with the finest protective film made today, in order to view this fairly rare solar system occurrence.

Transit lasts from 7:13 AM to 2:41 PM Total transit is 7-1/2 hours in length Mid-transit is at 10:57 AM.

**June 3, Friday,
Saturn at Opposition**

Saturn, the 6th planet outward from the Sun, is the most distant world that's easily visible to the unaided eye. Telescopes revealed its rings in the 17th century. Spacecraft in the 20th century revealed that what we thought of as three rings around Saturn to be thousands of thin, finely detailed rings – made of tiny chunks of ice. Saturn also has 62 moons with confirmed orbits. Only 53 of Saturn's moons have names, and only 13 have diameters larger than 30 miles.

Saturn is in a direct line between the Earth and the Sun on June 3, meaning that it rises in the east just as the Sun sets in the west. If you had a bird's-eye view of the solar system that day, you'd see our planet Earth passing in between the Sun and Saturn. You'd see the Sun, Earth, and Saturn lining up in space. But not for long. Earth moves in orbit at 18 miles per second in contrast to only 6 miles per second for Saturn. Soon, we'll be pulling ahead of Saturn in the race of the planets around the Sun.

Saturn is truly a wondrous world of rings and moons. It's everyone's favorite thing to gaze at through a small telescope, so take the opportunity to see it this night!

Members of the Green Mountain Alliance of Amateur Astronomers will be setting up their telescopes for public viewing of Saturn, plus many other deep sky objects.

**August 12-13,
Friday night-Saturday morning,
Perseid Meteor Shower**

The Perseid meteor shower is one of the main celestial events of the summer. This year, skies will be dark after the Moon sets around midnight, leaving the sky ready for peak meteor viewing. This shower's timing is perfect for a summer trip to your favorite dark sky site: the Hubbardton Battlefield! Here's to eating

s'mores by the campfire and seeing s'more meteors overhead!

You need no special equipment to enjoy this nighttime spectacle. You don't even have to know the constellations. But you'll definitely want to find a dark, open sky to fully enjoy the show. It also helps to be a night owl. Give yourself at least an hour of observing time, for meteors in meteor showers often come in spurts and are interspersed with lulls; with up to 60 meteors per hours the Perseids is a reliably good meteor shower as the Earth ploughs through the debris of the comet Swift-Tuttle. If our planet happens to pass through an unusually dense clump of meteoroids – comet rubble – we'll see an elevated number of meteors. We can always hope!

An open sky is essential because these meteors appear to fly across the sky in many different directions and in front of numerous constellations. However, if you trace the paths of the Perseid meteors backward, you'd find they come from a point in front of the constellation Perseus. But once again, you don't need to know Perseus or any other constellation to watch this or any meteor shower.

Enjoy the comfort of a reclining lawn chair and look upward in a dark sky, far away from pesky artificial lights. Remember, your eyes can take as long as twenty minutes to truly adapt to the darkness of night. So don't rush the process. All good things come to those who wait.

Members of the Green Mountain Alliance of Amateur Astronomers will be setting up their telescopes for public viewing of deep sky objects.

September 3. Saturday, Discovery Night - The Hidden Deep Sky Mysteries of Our Universe

A tour of the galaxy! A three-day old crescent Moon sets not long after dark and the night kicks off with Saturn and Mars in the southwest above Antares. The Whirlpool Galaxy is still pretty high in the northwest, and M13 in Hercules is still a showpiece high in the west. Countless sights in the summer Milky Way are there to wow any crowd, and by 10 PM Pegasus and Andromeda are high in the East. Stephan's Quintet awaits the 18"

Obsession, along with jaw-dropping views of M31 and its companions.

It's Labor Day weekend, and a huge turnout is a definite possibility when those from farther away have had the chance to travel. We've all been greatly impressed by the number of stargazers at past events who had traveled more than an hour's drive to attend our events.

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."

The Closest New Stars To Earth By Ethan Siegel

When you think about the new stars forming in the Milky Way, you probably think of the giant star-forming regions like the Orion Nebula, containing thousands of new stars with light so bright it's visible to the naked eye. At over 400 parsecs (1,300 light years) distant, it's one of the most spectacular sights in the night sky, and the vast majority of the light from galaxies originates from nebulae like this one. But its great luminosity and relative proximity makes it easy to overlook the fact that there are a slew of much closer star-forming regions than the Orion Nebula; they're just much, much fainter.

If you get a collapsing molecular cloud many hundreds of thousands (or more) times the mass of our sun, you'll get a nebula like Orion. But if your cloud is only a few thousand times the sun's mass, it's going to be much fainter. In most instances, the clumps of matter within will grow slowly, the neutral matter will block more light than it reflects or emits, and only a tiny fraction of the stars that form—the most massive, brightest ones—will be visible at all. Between just 400 and 500 light years away are the closest such regions to Earth: the molecular clouds in the constellations of Chamaeleon and Corona Australis. Along with the Lupus molecular clouds (about 600 light years distant), these dark, light-blocking patches are virtually unknown to most sky watchers in the northern hemisphere, as they're all southern hemisphere objects.

In visible light, these clouds appear predominantly as dark patches, obscuring and reddening the light of background stars. In the infrared, though, the gas glows brilliantly as it forms new stars inside. Combined near-infrared and visible light observations, such as those taken by the Hubble Space Telescope, can reveal the structure of the clouds as well as the young stars inside. In the Chamaeleon cloud, for example, there are between 200 and 300 new stars, including over 100 X-ray sources (between the Chamaeleon I and II clouds), approximately 50 T-Tauri stars and just a couple of massive, B-class stars. There's a third

dark, molecular cloud (Chamaeleon III) that has not yet formed any stars at all.

While the majority of new stars form in large molecular clouds, the closest new stars form in much smaller, more abundant ones. As we reach out to the most distant quasars and galaxies in the universe, remember that there are still star-forming mysteries to be solved right here in our own backyard.

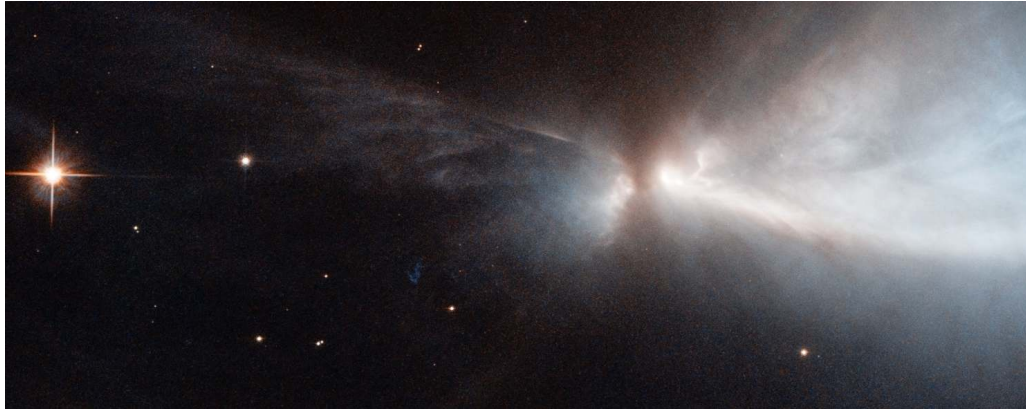


Image credit: NASA and ESA Hubble Space Telescope. Acknowledgements: Kevin Luhman (Pennsylvania State University), and Judy Schmidt, of the Chamaeleon cloud and a newly-forming star within it—HH 909A—emitting narrow streams of gas from its poles.

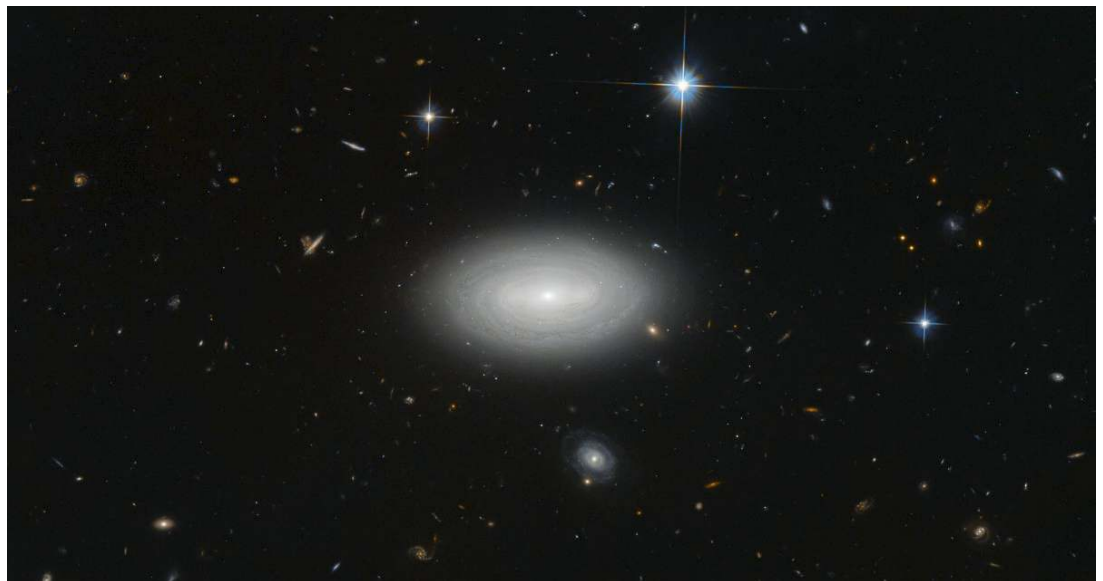
The Loneliest Galaxy In The Universe By Ethan Siegel

Our greatest, largest-scale surveys of the universe have given us an unprecedented view of cosmic structure extending for tens of billions of light years. With the combined effects of normal matter, dark matter, dark energy, neutrinos and radiation all affecting how matter clumps, collapses and separates over time, the great cosmic web we see is in tremendous agreement with our best theories: the Big Bang and General Relativity. Yet this understanding was only possible because of the pioneering work of Edwin Hubble, who identified a large number of galaxies outside of our own, correctly measured their distance (following the work of Vesto Slipher's work measuring their redshifts), and discovered the expanding universe.

But what if the Milky Way weren't located in one of the "strands" of the great cosmic web, where galaxies are plentiful and ubiquitous in many different directions? What if, instead, we were

located in one of the great "voids" separating the vast majority of galaxies? It would've taken telescopes and imaging technology far more advanced than Hubble had at his disposal to even detect a single galaxy beyond our own, much less dozens, hundreds or millions, like we have today. While the nearest galaxies to us are only a few million light years distant, there are voids so large that a gal-

axy located at the center of one might not see another for a hundred times that distance.



While we've readily learned about our place in the universe from observing what's around us, not everyone is as fortunate. In particular, the galaxy MCG+01-02-015 has not a single known galaxy around it for a hundred million light years in all directions. Were you to draw a sphere around the Milky Way with a radius of 100 million light years, we'd find hundreds of thousands of galaxies. But not MCG+01-02-015; it's the loneliest galaxy ever discovered. Our Milky Way, like most galaxies, has been built up by mergers and accretions of many other galaxies over billions of years, having acquired stars and gas

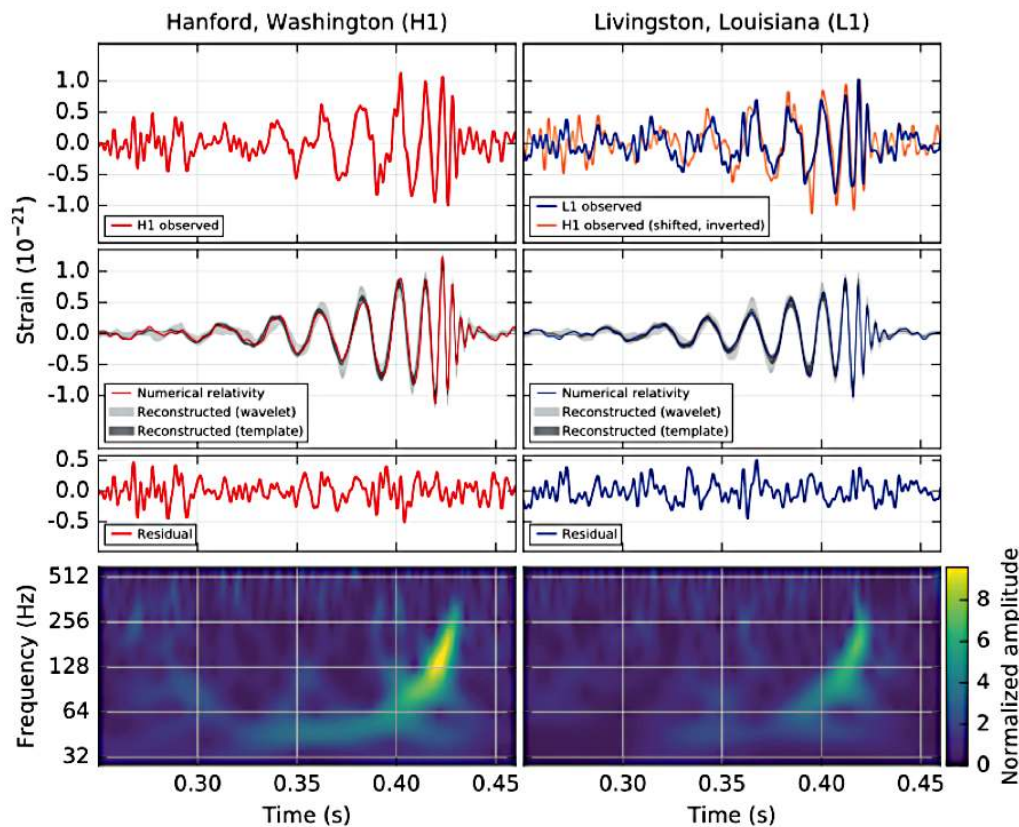
from a slew of our former neighbors. But an isolated galaxy like this one has only the matter it was born with to call its own.

Edwin Hubble made his universe-changing discovery using telescope technology from 1917, yet he would have found absolutely zero other galaxies at all were we situated at MCG+01-02-015's location. The first visible galaxy wouldn't have shown up until we had 1960s-level technology, and who knows if we'd have continued looking? If we were such a lonely galaxy, would we have given up the search, and concluded that our galaxy encompassed all of existence? Or would we have continued peering deeper into the void, NASA Space Place Astronomy Club Article January 2015 eventually discovering our unusual location in a vast, expanding universe? For the inhabitants of the loneliest galaxy, we can only hope that they didn't give up the search, and discovered the entire universe.

Image credit: ESA/Hubble & NASA and N. Gorin (STScI); Acknowledgement: Judy Schmidt, of the loneliest void galaxy in the known: MCG+01-02-015.

Gravitational Wave Astronomy Will Be The Next Great Scientific Frontier By Ethan Siegel

Imagine a world very different from our own: permanently shrouded in clouds, where the sky was never seen. Never had anyone see the Sun, the Moon, the stars or planets, until one



scopes to the delay caused by gravitational waves on pulsar radiation) and the space mission LISA will detect gravitational waves from supermassive black holes and many other sources. We've just seen our first event using a new type of astronomy, and can now test black holes and gravity like never before.

Image credit: Observation of Gravitational Waves from a Binary Black Hole Merger B. P. Abbott et al., (LIGO Scientific Collaboration and Virgo Collaboration), Physical Review Letters 116, 061102 (2016). This figure shows the data (top panels) at the Washington and Louisiana LIGO stations, the predicted signal from Einstein's theory (middle panels), and the inferred signals (bottom panels). The signals matched perfectly in both detectors.

Earth Hour 2016 By Joe Comeau



night, a single bright object shone through. Imagine that you saw not only a bright point of light against a dark backdrop of sky, but that you could see a banded structure, a ringed system around it and perhaps even a bright satellite: a moon. That's the magnitude of what LIGO (the Laser Interferometer Gravitational-wave Observatory) saw, when it directly detected gravitational waves for the first time.

An unavoidable prediction of Einstein's General Relativity, gravitational waves emerge whenever a mass gets accelerated. For most systems -- like Earth orbiting the Sun -- the waves are so weak that it would take many times the age of the Universe to notice. But when very massive objects orbit at very short distances, the orbits decay noticeably and rapidly, producing potentially observable gravitational waves. Systems such as the binary pulsar PSR B1913+16 [the subtlety here is that binary pulsars may contain a single neutron star, so it's best to be specific], where two neutron stars orbit one another at very short distances, had previously shown this phenomenon of orbital decay, but gravitational waves had never been directly detected until now.

When a gravitational wave passes through an objects, it simultaneously stretches and compresses space along

mutually perpendicular directions: first horizontally, then vertically, in an oscillating fashion. The LIGO detectors work by splitting a laser beam into perpendicular "arms," letting the beams reflect back and forth in each arm hundreds of times (for an effective path lengths of hundreds of km), and then recombining them at a photodetector. The interference pattern seen there will shift, predictably, if gravitational waves pass through and change the effective path lengths of the arms. Over a span of 20 milliseconds on September 14, 2015, both LIGO detectors (in Louisiana and Washington) saw identical stretching and compressing patterns. From that tiny amount of data, scientists were able to conclude that two black holes, of 36 and 29 solar masses apiece, merged together, emitting 5% of their total mass into gravitational wave energy, via Einstein's $E = mc^2$.

During that event, more energy was emitted in gravitational waves than by all the stars in the observable Universe combined. The entire Earth was compressed by less than the width of a proton during this event, yet thanks to LIGO's incredible precision, we were able to detect it. At least a handful of these events are expected every year. In the future, different observatories, such as NANOGrav (which uses radiotele-

Earth Hour is a worldwide grassroots movement uniting people to protect the planet, and is organized by World Wildlife Fund (WWF) massive mainstream community on a broad range of environmental issues, Earth Hour was famously started as a lights-off event in Sydney, Australia in 2007. Since then it has grown to engage more than 7000 cities and towns worldwide, and the one-hour event continues to remain the key driver of the now larger movement.

The city of Burlington celebrated Earth Hour 2016 on Saturday, 19 March between 8:30 PM and 9:30 PM, setting an example to individuals, communities households and businesses to turn off their non-essential lights for one hour as a symbol for their commitment to the planet in creating a sustainable world.

Burlington was named one of three finalists in the Earth Hour City Chal-

lenge by the World Wildlife Fund (WWF), based on Burlington Electric Department's 100 percent renewably-sourced generation accomplishment, and will compete for the title of US Earth Hour City Capital this spring. Evanston, IL and Boulder, CO also were named as finalists. The Challenge, which spans one year and encourages cities to promote renewable energy and prepare for climate change, grew out of Earth Hour.

Before Earth hour, the city sent out a message from the Mayor:

"The City of Burlington is honored to receive such significant recognition from the World Wildlife Fund's global environmental movement, Earth Hour, and we'll be doing all we can to earn the title of 'US Earth Hour City Capital'" said Mayor Miro Weinberger. "I encourage our community to send a message about the importance of being good stewards of our environment by turning off their lights next Saturday evening."

"Our team at Burlington Electric is proud of our 100 percent renewable generation accomplishment and will continue to lead through energy innovation," said Neale Lunderville, General Manager at Burlington Electric Department. "We'll keep working aggressively to reduce demand, realize efficiency gains, and expand renewable generation."

While around the world on March 19, the lights of iconic sites like The Empire State Building and the Space Needle will be turned off, in Burlington, homeowners, renters, and business are encouraged to join City Hall, the Church Street Marketplace, and the Unitarian Universalist Church (UU) in turning off non-essential lights between 8:30 and 9:30 PM. Unique to Burlington's celebration will be star and planet gazing on the UU lawn, sponsored by the Vermont Astronomical Society.

The Vermont Astronomical Society's role in this year's event resulted in hundreds of people looking through scopes on a perfectly clear night. Brian Johnson, Angele Mott Nickerson, Jack St. Louis, Dennis Woos, Joe Comeau, Bob Horton and Donna Lescoe helped to make the evening a success.

Beginning the week of April 25 and continuing through mid-June, the WWF will launch a social media campaign de-

signed to engage citizens to vote and express support for their favorite city among the Earth Hour City Challenge finalists.

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:

January - No meeting

February

Hinesburg Agreement: will not be addressed by the town of Hinesburg until after their town meeting on 29 February, no time frame proposed.

We can work on the addition to the existing building.

Need to wait until the new Agreement is set to apply for a building permit for the new observatory.

Hedges (for light blocking at the Hinesburg Observing Site): Keith Lawrence brought in a catalog of possibilities, Doug will check with a landscaper about installation & costs.

VAS asset list: updated and new depreciations set.

Events Committee meeting held on Friday, 12 February.

Earth Hour: VAS will again go to the Unitarian Church at the head of Church St in Burlington, 8:30 - 9:30 PM.

Keith handed out a proposed work schedule for the Russ Chmela Observatory, all depends on how soon the Hinesburg Agreement is finalized.

Keith talked with Donna Lescoe about setting up a loaner telescope for the Starksboro Library.

The Board should begin each meeting by reviewing the last meeting minutes.

March

Meeting opened by Joe Comeau.

Activities Committee update:

The committee has scheduled 2 observing sessions to help members with setting up and using their telescopes and with finding objects in the sky. April 15,

16 or 17 at Angele's in Shelburne and April 29, 30 or May 1 at Dennis' in New Haven.

Membership Committee update:

The committee agreed to have Keith chair the committee. They have the final version of the survey for members. Angele is looking into how to set up Internet access to the member survey.

Suggestion for more member activities:

Have an open house at our observatory in Hinesburg.

Site Committee update:

The committee has discussed concerns about the impact development of land adjacent to the observing site in Hinesburg will have. Talked about the possibility of planting light blocking plantings. We have learned the development has been giving the OK to move ahead. However, we need to wait for more details before we can access the affects on the site.

The construction plans for the Russell Chmela Memorial Observatory are on hold as we wait for the town of Hinesburg to review the our proposed updates to the agreement of our use of the site.

We need to plan a work day before May 7 so we can move several old tires on the site to where the town can pick them up on Green-up Day.

Keith recommends that the club write some rules for conducting public star parties and that this would best be done by the board.

Mercury Transit (May 9) - We currently have no plans for a public event for viewing the transit. (The GMAAA does, see their events on page 3)

The Annual Business Meeting / Banquet is all set for May 2 at St Johns Club. Paul will send out RSVP's. We will have a silent auction of some club owned items and some donated items to raise money for the general fund.

Observers Page

Peter's New Camera

The following pictures won't win any awards, however, when you consider they were taken with a \$450 point and

shoot camera without pointing through a telescope they become - Wow!!!

Peter Gillette has a Canon SX50HS with a 50x optical zoom lens. 4.3 mm (at f/3.4) to 215 mm (at f/6.5) focal lengths. This is equivalent to a 24 mm to 1200 mm zoom on an "old" 35mm film camera. At full zoom (1200 mm) the area of sky covered (field of view) and the brightness of the image is very similar to a 35mm camera on my "big" 10" Newtonian (1400 mm focal length at f/5.6).

The camera weights about 1 ¼ lbs. The lens has a diameter of only 1.3 inches. It has a small imaging sensor typical of point and shoot cameras only 6mm across. This is how it gets away with using such a small lens.

From Peter-

I've just come in from my observatory. Its 9 degrees, but I've been too excited to get cold. First decent night in quite a while, and I decided to break out "the camera", and just see what I could do. Well, WOW!

I started off just getting the camera lined up on the back of my LX-200, shooting 2 1/2 minutes at ISO 800. What I was doing was centering Aldebaran in the scope, then centering it in the camera, then zooming in and refining the centering, ultimately to have the camera be "go-to", and try for a shot of M 1... [a supernova remnant]



Keep in mind that I've not done any processing on any of these shots! I did boost up the ISO to 2000, or something like that. It was the next stop up after 1600, and still just a 2 1/2 minute exposure. I was so pleased with that, that I decided, foolishly, to try for B33, the Horsehead [a dark molecular cloud]. Now, I have never been able to get a photo of it before, and had little hope. Silly me, especially after I saw the first



exposure, thru the little viewer. I started blathering!

This is just thru the camera, no extra optics, no processing. I did bump up the exp. time to 4 1/2 minutes, but that's it! And I think the lens was set around 50X.

I then decided that I'd just about had enough, but then saw that NGC 2903 [mag. 9.6] was very well placed, so I said, "What the heck!", and gave it a try,



at 3 1/2 min., and maybe 75X. Notice the other galaxy [mag. 12.7] I caught, without even knowing it, at the left edge of the frame. Amazing!

If this doesn't get you guys inspired to get yer gear out and try some of this CHDK stuff, I give up!

-P-

Just a little image processing was done on the versions of the images on that follow. As one can surmise by the fact Peter "piggy backed" the camera on his 8" Schmidt-Cassegrain, the camera does have to be riding on motor driven equatorial mount that is reasonably well polar aligned. By the way, the limiting magnitude on these images is ~15.5.



Just as with any imaging setup. Taking several images and combining them will improve the quality considerably.

Just think what will be available for cameras in 5 to 10 years!

Paul Walker has been active with his newest toy, ah, piece of high tech equipment. Even though the weather hasn't cooperated much, Paul managed to take advantage many of the available nights. Following are several objects he imaged with a 6 inch f/4 Newtonian.

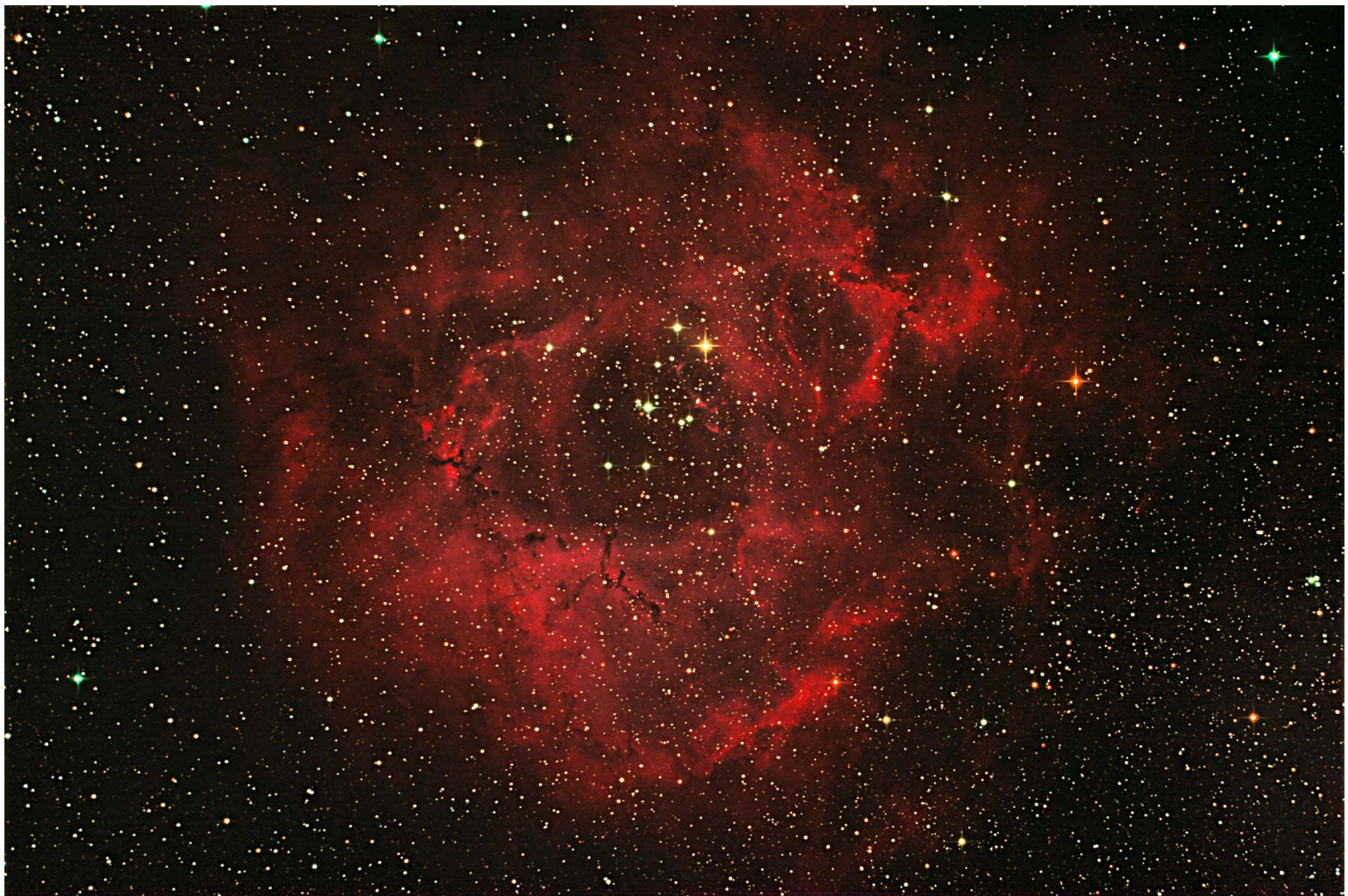
Along with the telescope, the following details are common to each image:
Field of view: 1.32 x 2.02 deg.
SkyWatcher EQ-6 German Equatorial Mount with Orion Atlas Goto Electronics & Motor Upgrade Kit.
Camera - Modified Canon Rebel XT.
Orion Broadband Light Pollution Filter.
Baader Multi-purpose Coma Corrector
Autoguider- Celestron NexGuide
Guide Scope - Maksutov-Cassegrain 90mm f/13.3 1200mm fl
Stacking and wavelet sharpening - Registax 5
Other - Picture Window Pro 6 and Adobe Photoshop Elements 9.

Rosette Nebula & NGC 2244

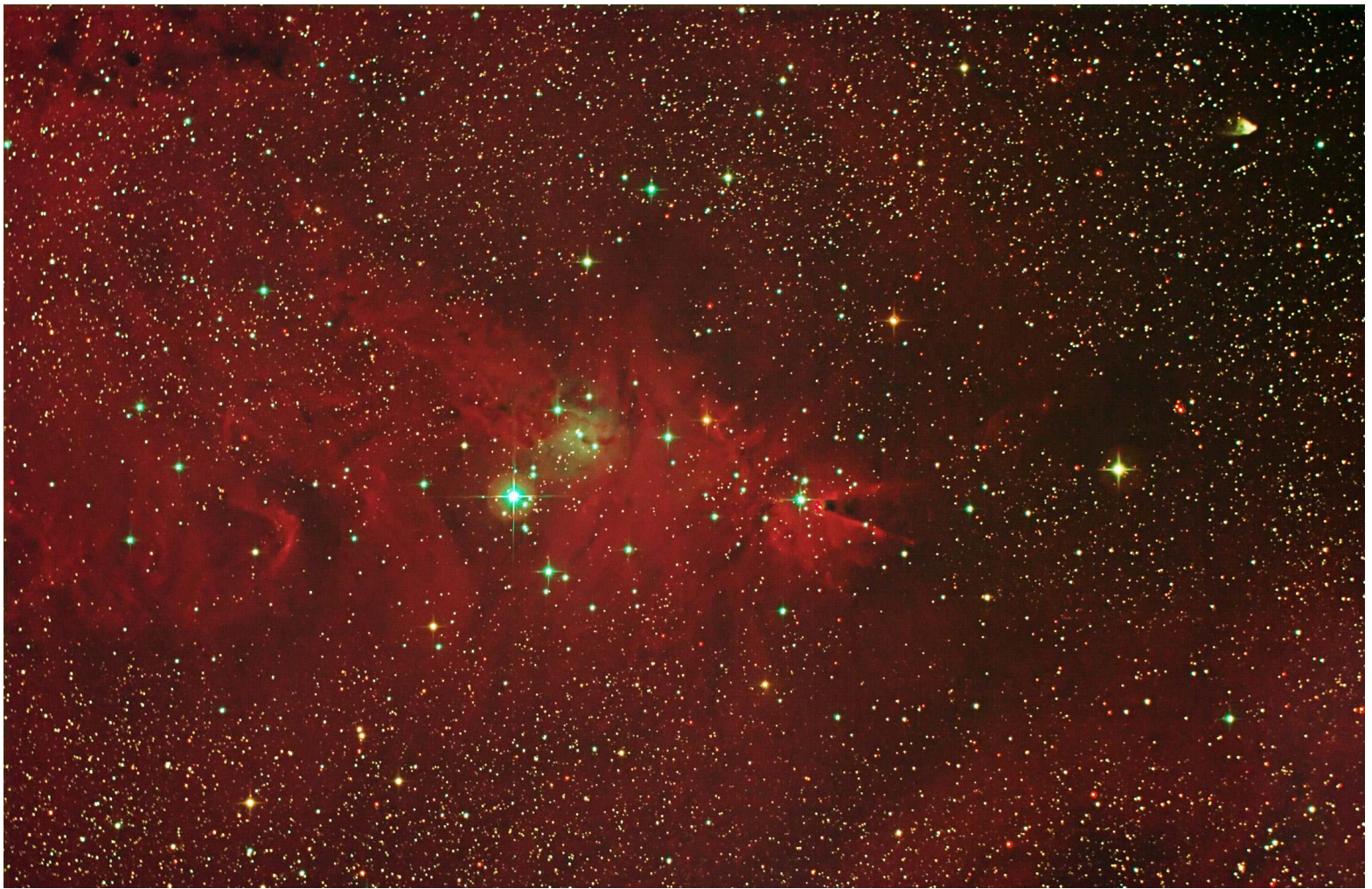
2016-02-05 Middlebury, VT

Constellation - Monoceros

The Rosette is a cloud of dust and gas which is still collapsing and forming stars. Several clumps of dense molecular clouds are visible silhouetted against the brighter glow of hydrogen gas. In it's







center is a young open star cluster (NGC 2244) with an estimated age of less than 5 million years.

Exp.- 5 min X 36 (3hr) at ISO 400
 Orientation - North right
 Camera Temperature- 11-17 deg. F
 Transparency (sky brightness) (using a Sky Quality Meter) at target 20.47 - 20.56 mag/arc sec
 Transparency at zenith 20.77 - 21.00.
 Transparency at Polaris 20.83 - 21.00.
 Seeing 4-5 (scale of 1-10)
 Limiting Visual Magnitude 5.6 - 5.8 (near Polaris)

M42 (The Orion Nebula), NGC 1976 and the Running Man Nebula

2016-02-26

Constellation - Orion

This is another, much better known, cloud of dust and gas collapsing and forming stars with an imbedded cluster.

I have been experimenting with using lower ISO settings (sensitivity or gain) on the camera. Knowing the center of M42 is so bright that it typically gets blown out (over exposed) I tried the lowest setting of ISO 100 for this image.

I was surprised that this actually allowed me to retain good detail in such a long exposure. Had I used ISO 200 I probably would have lost the Trapezium and other central detail. I did lose out on the faint outer detail but most of that is due to only an hour of total exposure time as opposed to 2 or 3 hours for the other images.

Exp.- 4 min x 16 (64 min) at ISO 100
 North right and rotated approx. 25 deg CCW.

Temperature and transparency ranges are based on the lowest and highest readings taken over the imaging session.

Camera Temperature- 10 to 11.5 deg. F
 Transparency at target 20.25 to 19.97
 Transparency at zenith 20.66 to 20.60
 Transparency at Polaris 20.72 to 20.59
 Seeing 6 (scale of 1-10)
 Limiting Visual Mag. 5.6 (near Polaris)
 Light covering of fresh snow (~ 0.5")

NGC 1893 & IC 410

2016-03-11

Constellation - Auriga

This is yet another cloud of dust and gas collapsing and forming stars with an

open cluster in its midst. Just to the upper left of center is a small feature that looks like a tadpole with eyes of stars. Exp.- 4 min x 46 (184 min total or 3 hr 4 min) at ISO 800.

North right.

Camera Temperature - 26 to 28 degree F
 Transparency at target 20.38 to 20.63
 Transparency at zenith 20.75 to 21.0
 Transparency at Polaris 20.83 to 20.99
 Seeing 4 (scale of 1-10)
 Limiting Visual Mag. 5.6 (near Polaris)

Flaming Star Neb (IC405)

2016-03-06

Constellation - Auriga

Right next door to IC 410 is this, yet another, cloud of dust and gas which is collapsing and forming stars. Actually they are both part of the same cloud.

Exp.- 5 min x 25 (2 hr 5 min total) at ISO 800

North right.

Camera Temperature - 20 - 26.7 deg. F
 Transparency at target 20.60 - 20.51
 Transparency at zenith 20.79 - 20.95

Transparency at Polaris 20.90 - 20.96
Seeing 4 (scale of 1-10)
Limiting Visual Magnitude 5.8 (near Polaris)

The Christmas Tree, Cone, Hubble's Variable Nebula & NGC 2264

2016-03-03

Constellation - Monoceros

I have run out of ways to describe clouds of dust and gas collapsing and forming stars, but not examples of them.

The "Christmas Tree" is laying on its side with the base of the trunk marked by the brightest star. The top of the tree is marked by another star to the right of center. Just right of that is the Cone Nebula. Hubble's Variable Nebula is the object to the upper right that looks like a little comet. NGC 2264 is the open cluster in the middle made up of several bright stars (and probably some dimmer ones as well).

Exp.- 5 min x 29 (2 hr 25 min total) at ISO 400
North up.



Camera Temperature - 2.5 to 6.7 deg. F
Transparency at target 20.7 to 20.37
Transparency at zenith 20.86 to 20.95
Transparency at Polaris 20.84 to 20.97
Seeing 4-5 (scale of 1-10)
Limiting Visual Mag. 5.6 (near Polaris)
Very little snow on the ground

If you think my images come out looking great on the first try, above is my first attempt at processing the Christmas Tree Neb. Getting the color looking good is often the hardest part. The other is not over processing and making it look gaudy or grainy.

Orion M42

By Steve Yerby



Scope: AstroTech RC 6" f/5.6
Camera: SBIG ST-8300C

Exposure: 48 X 2 min (1hr 36min total)
With flats and darks.
Processing: Nebulosity4 and Photoshop
- stretched to not overexpose trapezium.

Solar Prominences

By Steve Yerby

A beautiful false color image in the hydrogen alpha wavelength of 656.3 nm. The prominence on the left extends about 220 thousand miles, almost the distance between the Earth and Moon.

Scope: Coronado SolarmaxII 60mm
Camera: Skyris 274M (video)
Exposure: 1111 frames
Processing: Registax6 and Photoshop (false color)

Location: Rocky Road Observatory - check out Steve's web site at

www.stevesstarstuff.com for more of Steve's images.



Pictures from Culebra Puerto Rico and Monteverdi Costa Rica

By Joe Comeau

I once again traveled south for vacation and some celestial imaging. Following are four of those images.

Comet Catalina was photographed in Culebra Puerto Rico with an Astrotech 66 ED refractor on Feb. 5, 2016. It was close to 7th magnitude and moving away from us. The planets were up in the morning and I have a montage with Jupiter photographed on Feb. 8 and Saturn, Mars, Venus and Mercury on Feb. 11, 2016.

Thor's Helmet was captured in Culebra during the evenings of Feb. 11 and 12. I have been trying to get enough data on this object for several years and hope to combine earlier data with this to get a better signal to noise ratio.

The Moonbow (next page) was photographed on February 21, 2016 near the Monteverde cloud forest in

Costa Rica. This is one of the few places in the world where moonbows are often seen. They are visible when conditions are right between December and February near the full moon.

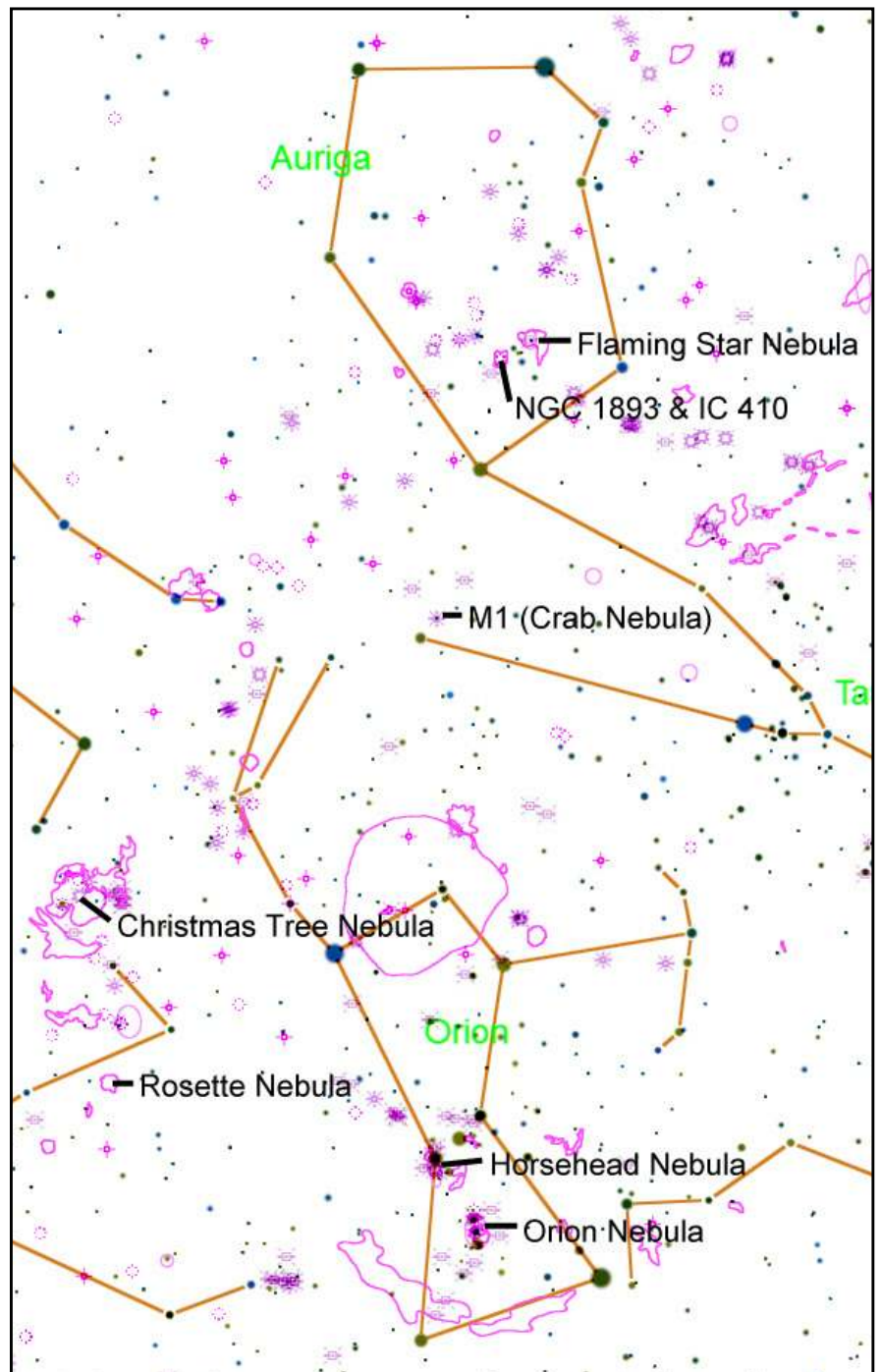
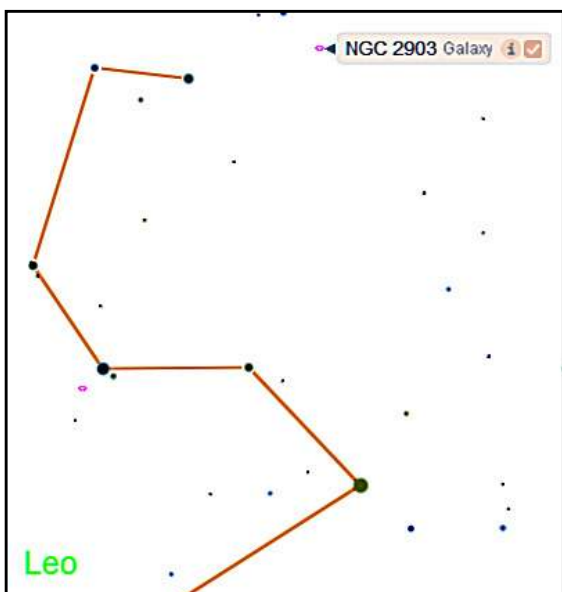
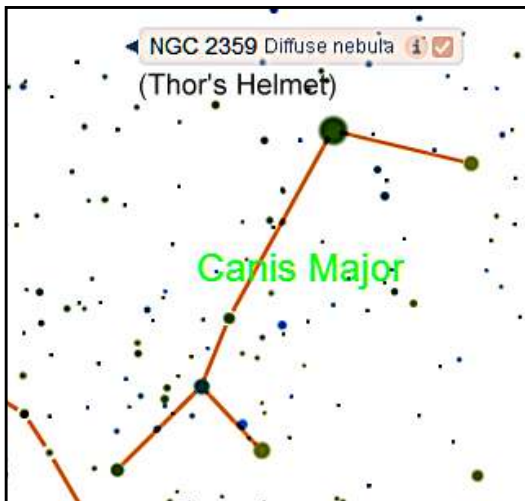
The planets (next page) were captured with a Sentech video camera. The

Moonbow was an 8 second exposure with a Fuji point and Shoot camera. The comet and Thor's Helmet were captured with a modified Canon XT DSLR. Thor's Helmet was captured with a 6" Astrotech RC.





These charts show the locations of the deep sky objects in the images (except for Comet Catalina).





Rima Ariadaeus By Paul Walker

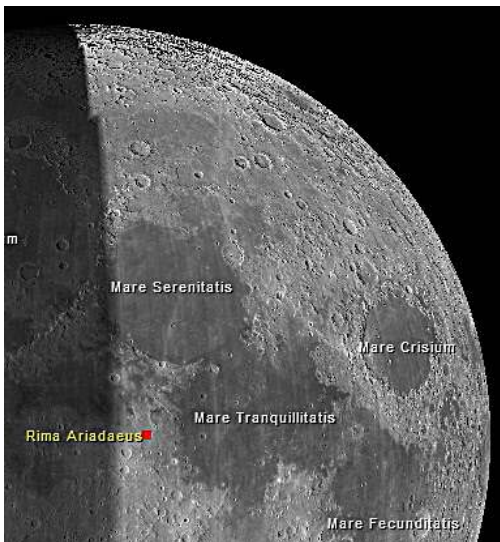
Taken on 2016-02-14 through my 10" f/5.6 Newtonian when the Moon was 6.4 days old. This rille is 220 x 7 Km or 133 x 4 Mi.

North is up. It was made by combining "called stacking" the best of 800 video frames from a 1 minute 17 second (about 2300 frames) video taken with Nikon AW110 camera. The camera was set to 5x optical zoom and attached to a 24mm eyepiece and a 3x Barlow for an effective magnification of about 600x.

The image was stacked using Registax 5. Registax was also used to bring out the details using wavelets. Those familiar with this program can probably figure out the wavelet settings from the following notation that I also included in the name of the image file.

(iL1Si2-wav30,3,4,2,2,1)

The location is shown below (north up).



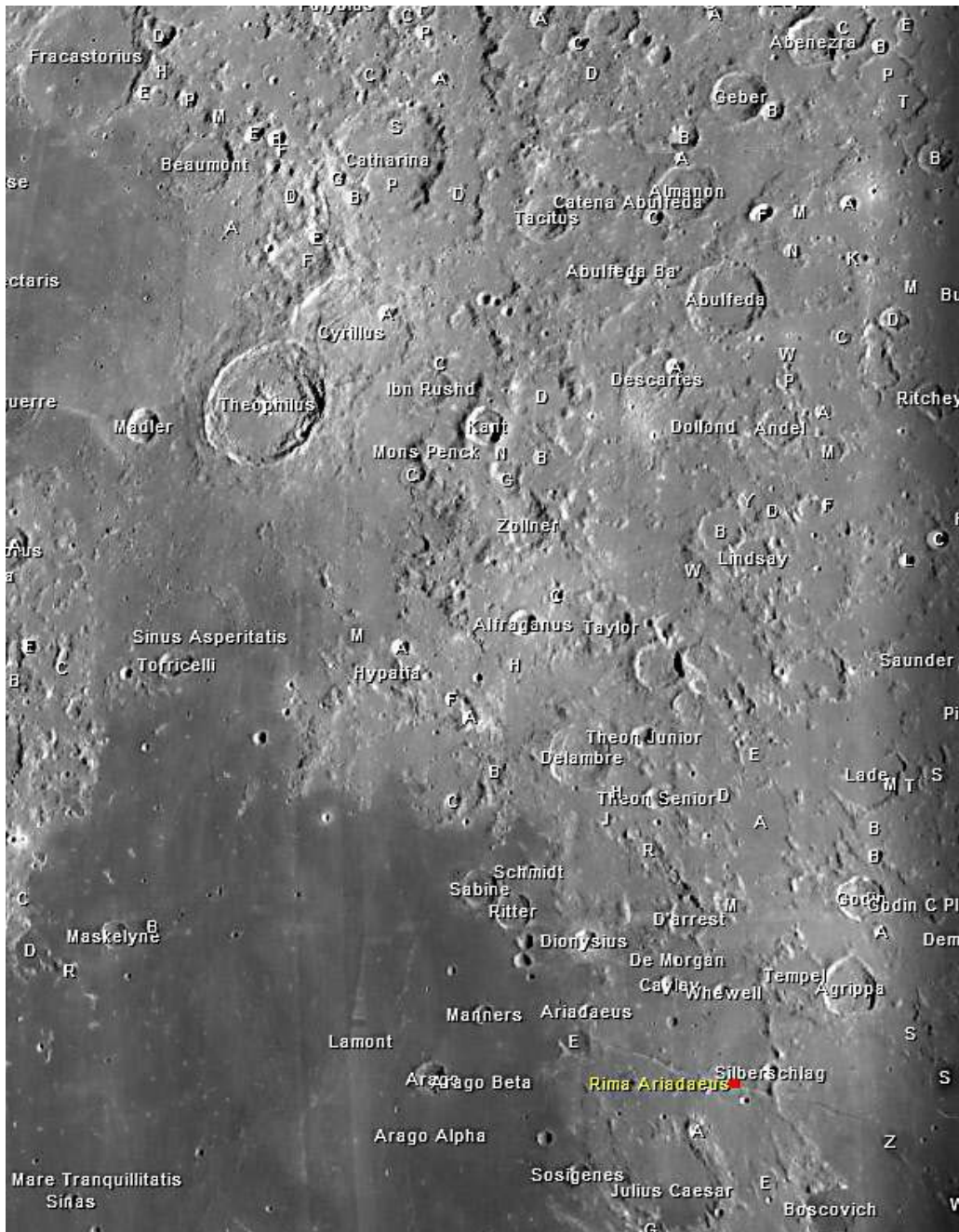
Created using Virtual Moon Atlas 6.0 and Picture Window Pro 7

Moon Mosaic By Paul Walker

Below is a 3 image mosaic that I put together using other videos taken on 2016-02-14. The individual images are stacks of 700 high definition video frames. I used the Nikon AW110 (point & shoot) camera at 5x optical zoom, a 24mm eyepiece on a 2x Barlow (instead of the 3x for the Ariadaeus image) for an effective magnification of about 300x.

Rima Ariadaeus is in this image as well near the bottom right. North is down. On the next page is a chart with many of the craters labeled. I think this is the first time this rille has been well placed when I happened to be viewing the Moon. Seems I typically get a better





view of Rima Hyginus just to the East (right) and hidden in shadow here.

A striking feature I noticed is a chain of craters centered about 1" from top of the the image called Catena Abulfeda. No doubt the lighting has to be right for this to stand out. Another interesting feature is the crater Torricelli centered on the left edge of the image. In my image it looks like a single crater formed by a very shallow impact. However, based on what I read it is actually 2 craters. The large 61 mile diameter crater Theophilus (left side about 2/3 the way up from the bottom) reminds me of the better known and slightly smaller (56 mile) crater Copernicus 1000 miles to the North-East.

What other interesting features do you see among the craters and mountains?

The Moon is well positioned high in the sky in the evening for Spring viewing.

I highly recommend the free software Virtual Moon Atlas 6.0 I used to create the reference charts.

Gary's Astronomical Events for the Month

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

For Sale / Wanted

For Sale:

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.

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 finderscope
4-speed Zero Image-Shift Microfocuser
16-channel GPS receiver
Net telescope weight: 62 pounds
Net tripod weight: 20 pounds
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:

Meade Series 5000 5-element Plossl eyepieces, which are 8 eyepieces ranging from 6.4mm to 40mm. Come with their own custom aluminum case and are all in plastic (bullet) cases. (\$250)
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)
Meade #895 Vibration Isolation Pads (\$53 value)

4-1/4" Newtonian Reflector

(Tasco 114mm) with 1-1/4" eyepiece (probably a 25mm).

Surprisingly well-made OTA.
Comes with a very poor mount (tripod), but if placed on a good AZ/EL mount,

you will be good to go! **Asking a mere \$85 OBO** for this. Don't let the name "Tasco" fool you on this nice reflector.

Contact Ron Lewis, 247-5913,
vtpoet@gmail.com

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

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 \$695 with the accessories listed

Contact Bruce Harmon, 802-876-7535
or bdhinv@yahoo.com.

Feather-touch focuser for a Schmidt-Cassigrain

Brand new, hardly used.

For specs go to
http://starlightinstruments.com/store/index.php?route=product/product&product_id=51. **Asking \$200** for it.

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

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

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

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 **\$3500** - **will negotiate.**

Contact Rick@vsbmetal.com
Or you can contact Ron Anstey
anstey@myfairpoint.net

Wanted:

Wanted: Your **older mono CCD imaging system** that you never use anymore. Get in touch and let me know what you have.

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

Send emails to bvtguy@yahoo.com.

Mike Stadtmauer (704-609-1432)

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

Dues

Time for Yearly Membership Renewal

Associate Members \$15

Full Members \$25

Contact Paul Walker or
Doug Williamson

or Send your address (and email)
and dues to

VAS, PO Box 782, Williston, VT 05495.

Announcements

Annual Banquet / Business Meeting

Elections

Elections this year are for **President, Vice President and the 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.

Silent Auction

There will be a silent auction to raise money for the club.

See Meeting / Presentations on page 1 for more information.

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 / 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.

Board Members

Jack St. Louis	Pres	658-0184
Joe Comeau	VP	238-1664
Doug Williamson	Treas	388-3482
Paul Walker	Sec'y	388-4220
Bob Horton		879-7802
Gary Nowak		879-4032
Bill Wick		485-7877
Keith Lawrence		453-5496

Editor and Publisher - Paul Walker

Contributors: Joe Comeau, Peter Gillette, Paul Walker, Steve Yerby, Dr. Ethan Siegel, (NASA's Space Place)
(My apologies if I missed anyone)