OBSERVER

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"Earthrise"

Earth dazzles above the lunar horizon. *(Credit: Apollo 8 Crew/NASA)*

On Christmas Eve 1968, the crew of Apollo 8 televised images of their home planet from lunar orbit. The iconic image of the blue planet captured above was dubbed "Earthrise." Whereas they did see the Earth rise and set over the lunar horizon from their vantage point, the trio might have seen no such thing from the lunar surface. With the Moon tidally locked in its orbit around the Earth (with a Lunar "year" equaling a Lunar "day" of about a month), Earth would not loop around too far in the sky above, say, Tranquility Base. But for the fact that the Moon goes around Earth in an eccentric orbit of 5.4° inclination to Earth's equatorial plane, the Earth would be appear as stationary as a Christmas tree ornament in the dark lunar sky. It would be presenting phases, of course.

On May 5, 1969, a 6¢ First Class Mail postage stamp was issued to commemorate the first manned mission to achieve lunar orbit; the domestic Air Mail postage cost 10¢ and was phased out by 1975.

Blaisdell Memorial Library, Nottingham NH, December 1

The event was an introduction to and a demonstration of their new Library Telescope. The librarian (Amy Cowell) suggested to me on arrival that an astronomy presentation would also be appropriate, and so I started with that for benefit of the people in the room. When the lights went back on, focus shifted to their Library Telescope. I basically outlined the content of our six-pack of YouTube videos and answered a few questions. At the end I had a discussion with the library staff about collimation and lens cleaning, and also on how to contact NHAS about more serious problems.

- ***Steve Rand***

Epping Middle School, Epping NH, December 3

Given that the event had been post-poned twice already and Lindsey, our host teacher, wanted some closure on her astronomy unit, we went ahead even though skies were not forecast to be good until later in the evening. As the doors opened, about 45 students and a few parents filed into the 8th grade Earth Sciences classroom that had an impressive array of astronomy posters and projects. After my long version of the presentation, **Paul Winalski** decided that with only a few small openings in the cloud cover, the observing part of activity would have to wait for another time.

- ***Steve Rand***

Cub Scout Pack 405, Derry NH, December 4

The location wasn't ideal but the Cub Scouts were enthusiastic and well-behaved. I estimate there were about 25 of them and five adults. **Herb Bubert** and **Paul Winalski** were the other NHAS members present. There was a bit of haze and local lights, which mean that only mag. 2 and brighter stars were visible (e.g., Albireo was barely visibility). I tried to see the clusters M36 and M37 in Auriga and the nebula M57 in Lyra but they didn't show through the haze. I brought my OA-6.5 and set it up on my tracking platform. I showed the nearly-full Moon until everyone had seen it and then went to Albireo, the Double-Double and Polaris. For the last two I used high magnification so that the close pairs could be split.

- ***John Bishop***

We had a much bigger crowd than anticipated, but between the haze and the gibbous Moon lighting up the sky, conditions were poor for deep-sky objects. I spent my time showing NGC 457 in the 14" TScope to what seemed an endless line of kids. After that I switched to 61 Cygni. I tried to find M31 but couldn't see the guide stars in Andromeda well enough.

- ***Paul Winalski***

Parkside Middle School, Manchester NH, December 15

The event took place under partially hazy skies, compounded by urban light pollution inevitable in downtown Manchester. There was an extremely bright white floodlight focused on the school parking lot that interfered with my ability to find deep sky objects. We had excellent attendance with 60+ showing up and we also had excellent attendance by NHAS members. Lines were 10+ at each scope for most of the evening, and I only got to show three objects: NGC 457 (the Lobster cluster), 61 Cygni, and the Double Cluster in Perseus (magnificent in the 35mm TeleVue Panoptic eyepiece).

A mother and her very enthusiastic teenage son showed up with a long focal-length Celestron refractor, whose pointing device they'd left behind. By sighting along the telescope tube I managed to find the Pleiades for them. Their lowest magnification eyepiece was a 20mm Huygens, which couldn't show the whole cluster. I lent them my 32mm TeleVue Plössl, which gave an excellent view of the whole Pleiades in their scope. **Ted Blank** spent a lot of time with them helping them sort out their scope, as well as help them find Albireo.

- ***Paul Winalski***

Broken Ground School, Concord NH, December 17

Ed Ting was unable to give the indoor presentation; I substituted. But the evening of observing unfortunately was clouded out.

- ***Paul Winalski***

Nesmith Library, Windham NH, December 29

This event took place on its first backup date. We had an excellent turnout, with well over fifty people for the indoor presentation and the observing afterwards of a couple of hours. NHAS members attending were **John Bishop, Herb Bubert, Joe Derek, Gardner Gerry, Steve Rand** and **Paul Winalski.**

The sky was nearly overcast at 6 PM, but it cleared for the latter half of the observing. Others were covering the first quarter Moon, so I concentrated mainly on deep sky objects in the 14" TScope Newtonian reflector. I spent the majority of my time on M35, which was showing very well. I also showed M36 and M37. One of the children present wanted to see a double star, so I found 61 Cygni for him. Another request was for

the Andromeda galaxy. Once Orion had cleared the trees, I was showing M42, both with and without an O-III filter. I also found W Orionis (it's not a real observing session, after all, unless you find a carbon star).

Others present were showing other objects such as M15, the Pleiades, and the double cluster in Perseus. I think the library's patrons got a good sampling of the major wonders of the night sky this time of year.

- ***Paul Winalski***

There was a great turnout, with over 50 at my indoor presentation. A special treat for me was bringing along my eleven-year old nephew **Alex Bonenfant,** who had got an Orion XT6 Classic for Christmas. This was his first opportunity to set it up and use it on his own. With some advice from **Gardner Gerry** as to the set up location, and a little support from my wife **Christine,** Alex had the waxing gibbous moon in the FOV by the time the presentation was done and soon had a line at his scope. It was fun watching him do his thing, occasionally making sure the moon was centered in the eyepiece. After the crowd thinned, he successfully went after the Pleiades and then M42 to complete his first femto-Messier Marathon.

One of his neatest accomplishments on this day was his very first astro-photograph, taken afocally with an iPhone5 held over the eyepiece.

- ***Steve Rand***

The XT6 Dob sees action in Windham. (Photo: Steve Rand)

Society Activities

LTP – The Year in Review

2014 was a quiet year for the **Library Telescope Program,** compared to the 2013 explosion that is.

We began the year with a backlog of seven libraries wanting scopes. At the March 2014 Mod party, we built and delivered eight scopes to NH libraries and two in Massachusetts. Then for the first time in several years, we had no backlog of libraries wanting telescopes.

A single scope represented the June 2014 delivery, made to the **Gordon Nash Library** in New Hampton (north of Concord).

A few more requests came in, and by September we had six more scopes to build at our last Mod party of the year. One of these six was the 100th telescope delivered in NH, and **Concord Public Library** was the recipient. **Marc Stowbridge, Rich Schueller, Ramaswamy, Rob Mack** and I were present for the handover to **Deb Baker** of the Library staff.

***Above:** Deb Baker and the CPL telescope, flanked by Rob, Pete, Marc and Rich.*
***Right:** Pete Smith handing over the scope to Cathy Vincevic of the Gordon Nash Library. (Photos: Ramaswamy and Gerry Smith)*

The event was covered by two reporters and written up very nicely in the *Concord Insider* and the *Concord Patch*.

We closed the year with a grand total of 104 scopes delivered in New Hampshire and 3 in Massachusetts.

In their October 2014 issue, ***Sky and Telescope*** featured a 4 page article on the NHAS Library telescope program, written by **John Goss,** President of the **Astronomical League.** Thanks to articles like this and word of mouth, this humble program that Mark Stowbridge started in 2008 is taking hold in clubs across the US. This year I answered inquiries from Washington, New York, Vermont, Nevada, Arkansas and Connecticut. In addition we helped **Mercer Public Library** in Mercer, Wisconsin build their own scope and the **Mahoning Valley Astronomical Society** of Ohio built 6 LTP scopes for their area. In Illinois, we helped **Lake County Astronomical Society** build 3 scopes and we also worked with **St. Louis Astronomical Society (SLAS).** Special kudos go out to the members of SLAS – they contacted us with questions about the LTP in August, and by October they had held their first Mod party to build 18 telescopes for their local libraries. You can read more about their program at the **SLAS** web-site.

In Massachusetts, **Jim Zebrowski** of the **Aldrich Astronomical Society (AAS)** has done a great job of promoting the LTP. Jim attended a couple of our Mod parties last year to learn about the program, and this year AAS has delivered 10 scopes in Massachusetts and currently has an 11 library backlog! You can read more about the **AAS** program at their web-site as well.

Lastly, I would like to give special honors to the **Cornerstones of Science** in Maine. They have been a great supporter of the LTP (with 30+ scopes in Maine) and are assisting many regional clubs with program resources.

Back on the home front, **Steve Rand** was very busy this year producing a set of 6 training videos for the LTP. We now have his videos on the **LTP page** of our own web-site (scroll down to the ***Videos*** section box) and are in the process of creating a DVD with Steve's videos to be included with LTP Starblast packages delivered in 2015.

In summary, 2014 was a fairly quiet year in terms of delivered telescopes, but we were very busy spreading the word and maturing the program for the years ahead. Thanks to all the NHAS members that have made this program a success for NH and for libraries across the US.

- ***Pete Smith***

*[The history of **LTP in New Hampshire** was also covered in the September 2014 issue of the* **Observer.** *The article (on page 13) was complemented by an illustrated story (on page 5) about our last Mod party of the year, featuring 18 NHAS members as unindicted co-conspirators. Identifying the Usual Suspects is the year-end quiz. Here's a clue: in a twist right out of a Hollywood script, one who skipped this lineup is the newly elected President of NHAS. –Ed.]*

Pot Luck 2014 at MSDC, Concord NH, December 12

If **Paul Winalski,** who gazed around the hall last year in amazement at the turnout (there were 43 milling around the room a year ago), was even more amazed this year, he did not comment on it. **John Rose** counted 49 this year, while **Ed Ting** came up with "about 50." Numbers aside, it was an impressive gathering in spite of some of the regular business meeting attendees being absent on this day. And the food was as good as the company.

"Rags" and Ted Blank traded ideas about the membership committee with Curt Rude, Larry LaForge and Pat Adams.

Mike Townsend inspected some of the swap table wares under John Rose's watchful eye. (All Photos: Ed Ting)

The Swap Table had far fewer items on display this year than last – while John Rose and a few others had interesting accessories to sell or give away, **Dan Smith** and **Matt Marulla** had cornered the books market. Matt in particular was looking very pleased that he had to make only one change at the web-site (for President), but he had obviously forgotten the change at the membership committee and that could more than double his workload! **Marc Stowbridge** entertained himself and others with a Geiger counter, which failed to detect any radioactive content in the iron meteorite being passed around. All this was soon forgotten, once the real goodies were set out and ready for the taking. Did I mention there was food?

He of the very many hats, from PVSG to NHAS – Dwight Lanpher caught hatless for a change.

Outgoing President Ted Blank and Pat Adams exchanged pleasantries, as Stu May looked on.

Food is always top priority on this evening, but Mike Townsend found time to converse with new member Sergio Alvarez of Sudbury, Mass. (at right).

A token telescope looked on as everyone concentrated on the task at hand, except Director Steve Rand, who always has an eye for the camera, however distant.

First Night in Portsmouth NH, December 31

This was the first time **Rags** and **I** had attended the First Night festivities at Market Square in Portsmouth, so we were not quite sure what to expect. We were happy to see **Tom Cocchiaro, Gardner Gerry, Andy Jaffe** and **Curt Rude.** It was a lot of fun and also very well attended. People showed up as soon as the telescopes were visible – even before they were ready to use!

The first viewing was the moon, and some scopes were trained on it for most of the night. People were wowed to see the details of the craters and Mare Imbrium. Later on people were just as excited to view Jupiter and the Greater Orion Nebula. The light pollution coupled with the bright moon made simple viewing difficult, but there were practically no clouds until after midnight when we had begun to pack up. Rags looked for Comet Lovejoy, but saw only a very dim object with no tail.

***Above:** The First Night ice sculpture featured penguins.*
***Below left:** All set up and waiting for the First customers.*
Below right:** It was a very short wait, as the First revelers found the scopes right away.* ***(All photos: Nori Odoi)

The crowd ebbed and flowed, and we often had long lines. I took on the role of educator – I would work my way back through the line describing what people would be viewing and why it was exciting – fielding questions as best I could and sprinkling in a few fun facts. When people reached the telescope, they had a better idea of what they were looking at, and Rags could focus on describing exactly what they were seeing.

People seemed to really enjoy this, and I learned a lot about the audience in the bargain. Some were knowledgeable astronomers; most were just excited to see something they had never seen before in their lives. Some were quite old, yet still remembered their excitement at seeing Saturn in their high school years. Some were jaded teens that seemed quite bored until they gasped at the "way cool" close-up looks at lunar craters. Others were youngsters who had to be lifted to look through the eyepiece and then chattered on and on about what they saw. Almost everyone knew the constellation of Orion and all were happy to see the location of the Greater Orion Nebula on Sky Safari on my phone, before they actually viewed it through the telescope. A number spoke with foreign accents and talked about astronomy in their countries. Several people were also interested in NHAS membership.

It was a privilege and a pleasure participating in First Night. Despite temperatures in the mid-teens, we didn't really get cold until we started packing up. Our thanks to Tom for his excellent work in organizing it.

- ***Nori Odoi***

Gardner looks up to get going.

"Rags" providing lunar looks, but soon has to look for more options (right).

Gardner with his long line of enthusiasts (left), as Curt has his Yogi Berra moment (right): where have all the people gone?

Andy got ready early, but not early enough it would seem!

First Night lights and festivities. *(All Photos: Nori Odoi)*

Struve 817 [STF 817, Σ817] – Double Star in Orion

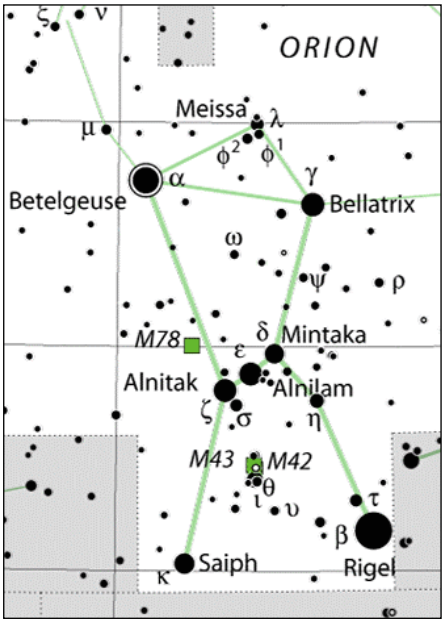
by Glenn Chaple

I'm a big fan of "off-the-beaten-path" sky objects. One of my favorites is the little-known double star **Struve 817** - the 817th double star catalogued by the German-born Russian astronomer F. G. W. Struve during a survey conducted between 1824 and 1827. I wrote about this little gem in my first "Object of the Month" column 5 years ago. It's time for a return visit!

According to a measurement made in 2010 and posted in the ***Washington Double Star Catalog*** (available online at the US Naval Observatory website), Struve 817 consists of near-twin magnitude 8.68 and 8.93 stars separated by 18.7 arc-seconds in a position angle of 73°. The separation and P.A. differ little from what Struve himself measured around the time of discovery. Astronomers describe stellar partnerships that show little orbital motion as being "relatively fixed." If the component stars of Struve 817 form a true binary pair, their orbital period must encompass many centuries.

What gives this relatively obscure double star a special allure is its location just 20 arc-minutes south of the red supergiant Betelgeuse. To find Struve 817, simply aim your telescope at Betelgeuse. A medium power eyepiece (75 to 100X works well) should capture this delicate pair shining just outside the dazzling rays of ruddy Betelgeuse. It's a startling sight. The Washington Catalog lists the spectra of Struve 817's components as A5 and K. Can you make out a color contrast between the two?

Some years ago, I wrote a four-part seasonal series for *Deep Sky* Magazine in which I introduced my favorite 100 double stars. Included with such celebrated pairs as Mizar, Albireo, and the "Double-Double" epsilon Lyrae was Struve 817. On the next crisp winter night when Orion beckons you to visit his magnificent Nebula, take a minute to travel a road less taken and try for this delightful double star.



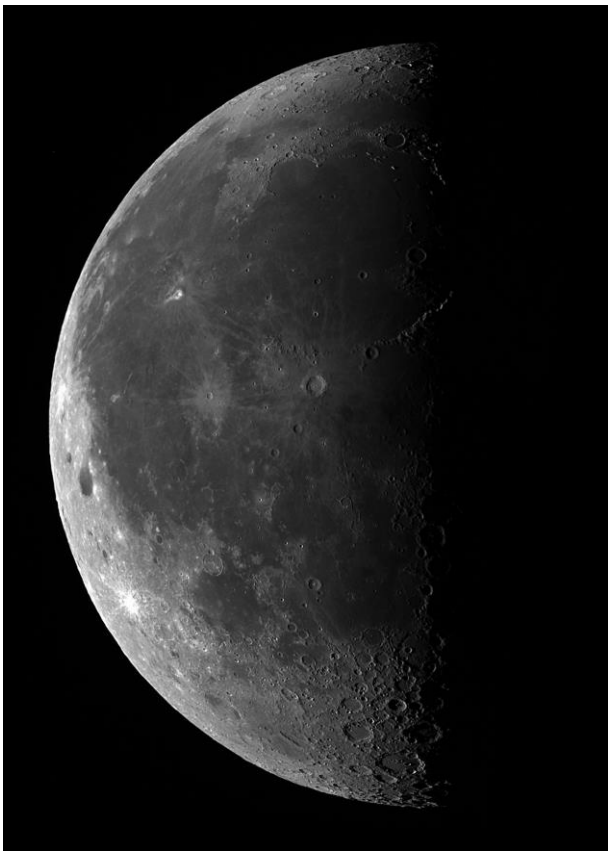
Generated by constellation-guide.com (Courtesy: IAU and Sky & Telescope)

Betelgeuse and Struve 817. Sketched by the author. (3-inch f/10 reflector at 60X; ½ degree field)

Do Two Halves make One?

Two halves do not always make a whole one, especially when dealing with lives of radio-isotopes, but the Last Quarter Moon coupled with a First Quarter one stands a better chance. What we have here may not be "stitchable" (even if the exposures could somehow be matched), but still the potential is there.

On December 14, just past LQ, **Ed Ting** imaged his favorite object, and two weeks later on December 29, **Alex Bonenfant** took his very first astro-photograph, a day after FQ. The images offer a study in contrast.



LQ, imaged by Ed Ting.

Takahashi FS102 @ prime focus, ASI120MM camera, FireCapture 2.4, Registax 6. Composite stitch of 3 images. December 14, 2014.

FQ + a day, imaged by Alex Bonenfant.

Orion XT6 Classic, 25mm Plössl, iPhone5 used afocally, Image flipped and rotated by 25º to get North on top. December 29, 2014.

K2 – Second Light, Second Sight

On December 18, 2014, NASA announced the discovery of an exo-planet some 180 light-years away, believed to be more than double the size of our own Earth. Similar announcements about Jupiter- and Neptune-sized bodies have been occurring with regularity over the many months since data collection by the *Kepler* spacecraft ceased in May 2013. NASA had announced the 'termination' of that mission in August 2013, but the almost 3-year supply of *Kepler* data in the pipeline continued to be analyzed, leading to new discoveries. But the December 18 discovery differed in one crucial aspect – it was based on new data.

How did that happen?

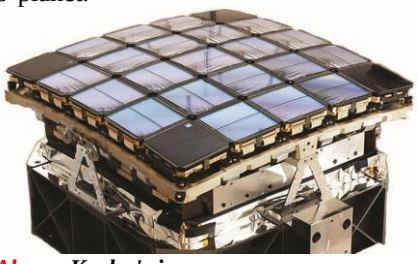
Artist's impression of the Kepler telescope in orbit. (Credit: WikiMedia Commons)

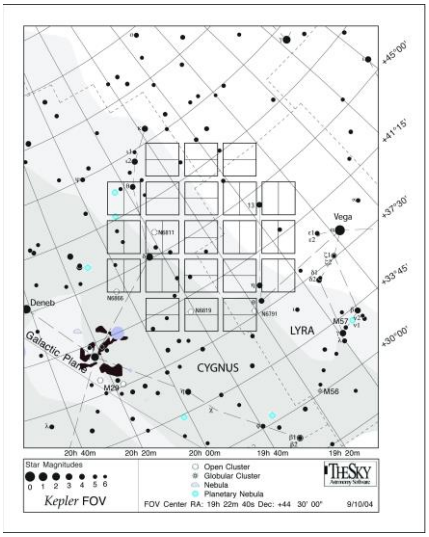
The Kepler Mission

Launched on March 7, 2009 the *Kepler* mission set out to determine the fraction of stars in the Milky Way galaxy that are orbited by Earth-like planets in the so-called "Goldilocks zone" of habitability, with the possibility of liquid water (and life) being present on such worlds. *Kepler* is equipped with an optical telescope of 950mm effective aperture (with a primary mirror of 1400mm) made of light-weight ultra-low expansion glass and a 9-layer high reflectance coating. With a camera made up of 42 CCDs of 2200x1024 pixels sitting in its focal plane, *Kepler* is just a sophisticated photometer tasked with continually monitoring the brightness of over 150,000 stars in a fixed field of view, looking for minute dips in the received light. The photometer has a soft focus to facilitate better photometry rather than generate sharp images. In effect, it tries to detect the periodic dimming caused by the transit by a planet of its star – a method of detecting extra-solar planets championed for years by **Dr. William Borucki** of NASA's Ames Research Center, who spent 20 years getting *Kepler* designed, approved and into space.

With a minimum of 3 measured transits required for an Earth-like candidate exo-planet to be confirmed, the original *Kepler* mission was set to operate for 4 years. Later it was extended to 7 years since the combined differential photometric precision of the original design (20 ppm on a magnitude 12 star for a 6.5 hour integration of measurements) was not being met. Accuracy of measurements indicated a median value of 29 ppm, so more transits had to be measured to confirm a candidate exo-planet.

Kepler is in a heliocentric orbit of 372.2 days and therefore falling "behind" the Earth ever so slightly – NASA calls it an "Earth-trailing" orbit. The field of stars the photometer was designed to point at was chosen well off the ecliptic so that sunlight would not interfere as the space-craft went around the Sun. An additional consideration in choosing this fixed field in the constellations of Cygnus, Draco and Lyra was that the solar system is heading in that direction as its orbits the galactic center. It is also an area with a large concentration of Sun-like stars. *Kepler* deals with a 115 degree^2 field of view, of which 105 degree^2 is considered of scientific quality (with low vignetting).



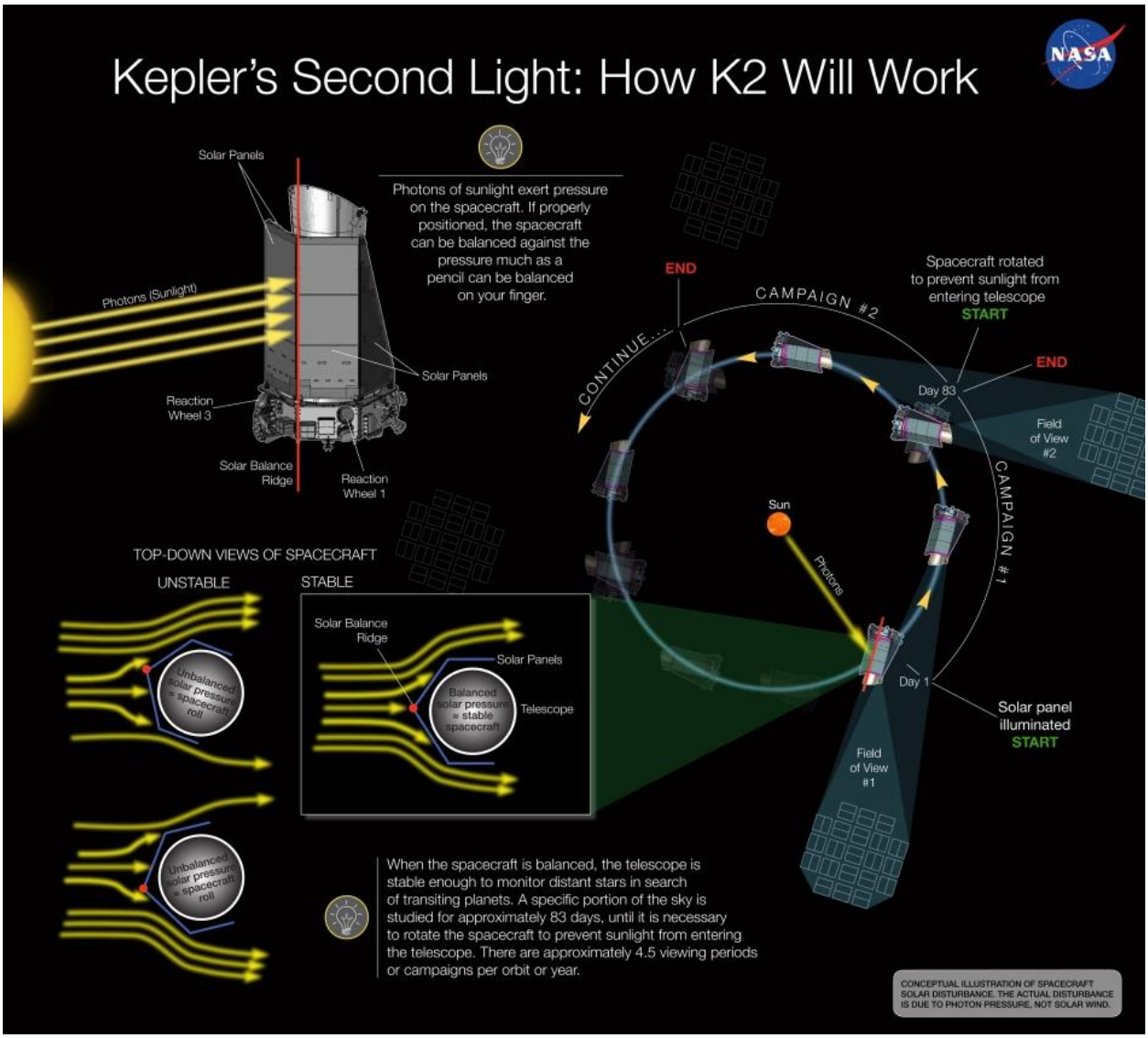


***Above:** Kepler's image sensor array, which is curved to account for Petzval field curvature. **Right:** Sky diagram of Kepler's investigated area. (Credit: WikiMedia Commons)*

The precise orientation of the spacecraft during data collection was the task of a set of 4 "reaction wheels" (gyroscopes), at least 3 of whom had to function properly for successful operation. In July 2012 one of these gyroscopes was deemed to be failed after showing erratic levels of friction; its shutdown left the mission with no redundancy in its fine-pointing mechanism. In May 2013, a second reaction wheel seized up completely and all data collection stopped. Attempts to revive the first gyroscope came to nothing – it could spin but not freely; the vibrations would have compromised the data. By August 2013 NASA had abandoned the original mission. It was thought that *Kepler's* planet-hunting days were at an end.

Kepler's Second Light

As scientists started considering other potential projects for *Kepler* that didn't require precise pointing, NASA went around looking for help. In an odd bit of coincidence that would have warmed the cockles of Douglas Adams's heart, a call for ideas about how best to make use of the arthritic *Kepler* led to astronomers submitting 42 white papers. One of them had a neat idea: Dispense with the fixed field of view. Let it float and let the Sun help out.



The yellow flow arrows represent disturbances due to photon pressure, not solar wind. ***(Credit: NASA/Ames, W. Stenzel)***

It all had to do with the solar panels that wrapped around *Kepler*. The loss of the crucial third gyroscope caused the spacecraft to roll about its telescopic line of sight when its solar panels were illuminated unevenly by sunlight. The job of pointing *Kepler* at the Cygnus region taxed the gyroscopes especially hard. The sunlight that powered the spacecraft was also compromising it.

The solution was to use sunlight to stabilize *Kepler* by keeping it pointed in a direction that kept its solar panels evenly illuminated. Tests showed that this method really kept the spacecraft very stable, with the two working reaction wheels controlling the other axes. In essence, the Sun became a virtual third reaction wheel, the third stabilizer. The compromise was that *Kepler's* planet-hunting would be limited to fields of stars that lie along the ecliptic, and any one field could be measured only for about 80 days, not across years. The hunted planets would have to be in fairly tight orbits around their host stars.

Initial tests concluded by October 2013 were with a full field of view in the constellation of Sagittarius, where light collected from a star in a 30-minute period generated an image within 5% of the quality of the original mission (with all four reaction wheels functioning). More testing showed that the level of pointing control could be maintained for a few weeks. But it was thought that the duration of measurement would not be sufficient to confirm exo-planetary transits using the original criteria. To achieve necessary stability, the orientation of the spacecraft had to be nearly parallel to its orbital path around the Sun, which is slightly offset from the ecliptic. The new mission, dubbed *K2*, would study a specific portion of the sky called a Field for up to 83 days (with 75 days of data collection) until it was necessary to rotate the spacecraft to prevent sunlight entering the telescope. Each orbit or "year" would yield 4.5 such unique viewing periods. Expanding its role, *Kepler* would also be looking at star clusters, supernovae, active galactic nuclei and other objects beyond the Milky Way.

K2 – Second Sight

After the March to May 2014 look at what was dubbed Field 0, an engineering run with stars of the open clusters M35 and NGC 2158 being targeted, *K2* was considered fully operational by June 2014. It was obtaining photometric precision approaching that of the *Kepler* photometry hardware it inherited in perfect working condition. With an estimated photometric performance of 44 ppm (6.5-hr S/N for a 12th mag G star), the *K2* mission is not quite capable of delivering what *Kepler* could have, but it still offers simultaneous observations of many objects with a precision an order of magnitude better than is achievable from the ground.

Field 1 of the *K2* mission was set towards the Leo-Virgo region of the sky and measured in the June to August 2014 timeframe, while Field 2 pointed near the galactic center and the "head" area of Scorpius, including the globular clusters M4 and M80.

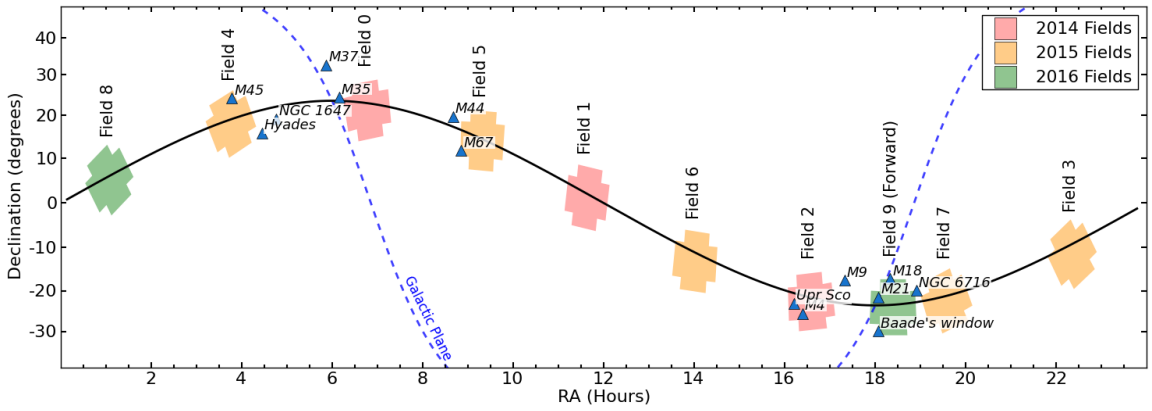
On October 20, the Mars-grazing ***Comet Siding Spring (C/2013 A1)*** passed right through Field 2 and *K2* was ready for it; it will be adding data to the comet's study!

Field 3 towards the South Galactic Cap is being looked at at the time of this writing, while the scope of Field 8 in the first quarter of 2016 appears to be slotted but is as yet undefined.

FINAL K2 CAMPAIGN FIELDS

Field	Start	Stop	RA (J2000)	Dec (J2000)	Targets	Comments
0	2014 Mar 08	2014 May 30	06:33:11.1	+21:35:16	✔	Near Galactic Anti-center, M35, NGC 2158
1	2014 May 30	2014 Aug 21	11:35:45.5	+01:25:02	✔	North Galactic Cap
2	2014 Aug 23	2014 Nov 10	16:24:31.2	-22:27:00	✔	Near Galactic Center, M4, M80, M19, Upr Sco, rho Oph
3	2014 Nov 14	2015 Feb 03	22:26:40.8	-11:06:00	✔	South Galactic Cap, Neptune
4	2015 Feb 07	2015 Apr 24	03:56:18.2	+18:39:38		M45 (Pleiades), NGC1647, Hyades
5	2015 Apr 26	2015 Jul 11	08:40:37.8	+16:49:47		M44 (Beehive), M67
6	2015 Jul 13	2015 Oct 01	13:39:27.6	-11:17:43		North Galactic Cap
7	2015 Oct 03	2015 Dec 26	19:11:18.8	-23:21:36		Near Galactic Center, NGC 6717
9	2016 Apr 06	2016 Jun 29	18:01:25.1	-21:46:47		Galactic Center, Baades Window, M21, M18, M25, M8

(Credit: NASA/Ames)

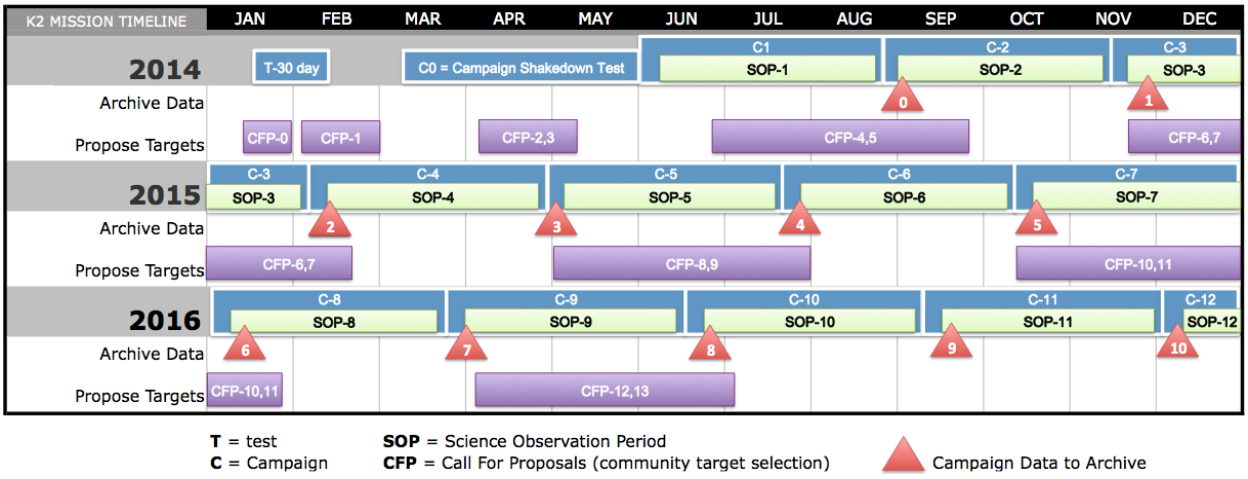


The selected fields along the ecliptic for the K2 mission ***(Credit: NASA/Ames, M. Still)***

On December 18, 2014, NASA announced that the *K2* mission had detected its first confirmed exoplanet, a super-Earth named HIP 116454 b, orbiting a magnitude 10.1 star of spectral type K0 about 183.5 light years away in the constellation Pisces (near the Circlet). Its signature was found in a set of engineering data meant to prepare the spacecraft for the full *K2* mission, taken back in February 2014. The discovery was confirmed with measurements by the HARPS-North spectrograph of the Telescopio Nazionale Galileo in the Canary Islands, which captured the wobble of the star caused by the planet's gravitational tug as it orbits. The newly confirmed planet is 2.5 times the diameter of Earth in a tight 9-day orbit around a star that is smaller and cooler than our Sun, making the planet too hot for life as we know it.

The *K2* mission will continue until another reaction wheel fails, or the fuel for the pointing mechanism thrusters is exhausted, whichever comes first. Until then the two-wheeler that is *K2* will keep looking. Meanwhile data from the original *Kepler* mission is still being analyzed and throwing up surprises.

- ***Ramaswamy***



The timeline of the selected fields for the K2 mission ***(Credit: NASA/Ames, M. Still)***

NHAS December 2014 Business Meeting Report

The monthly business meeting was held at MSDC, Concord NH on December 12th, with our President **Ted Blank** officiating for the last time. The Treasurer's report by **"Rags"** follows on the next page.

President's Report

There were no slides, no pie charts, no Astronomy Shorts, and not even Top 3 News items of the past month. The aroma of the pot-luck was too alluring.

Ted Blank began by thanking all the members and spouses present, as well as **Dr. Jim Young** and his family for the continued use of the YFOS facility. There was very welcome news that **Pat Adams, Larry LaForge, Jim Roberge** and **Curt Rude** have offered to work on the Membership Committee in 2015. Thank you guys! Certificates of recognition were then awarded to all members that participated in public out-reach events during the year and also to the following:

Scott McCartney and
Rich Schueller for EOC work
Pete Smith for running the LTP
Tom Cocchiaro for NEFAF work
Ramaswamy for editing the **Observer**
Larry Lopez for organizing Messier Marathons, managing the Mailing List, looking after YFOS and many other jobs
Gardner Gerry and
Paul Winalski for organizing our public observing events
Steve Rand for making presentations at many schools

Pete Smith gave a brief report on the LTP year that was. It ended with 15 scopes delivered and he thanked the 21 members that actively participated in the build and delivery of these scopes. He handed out certificates to those present, including his partner-in-crime **Gerry**, and finished with the trophy award to **Steve Rand** for producing a set of six instructional video clips on how to profitably use the LTP scopes.

*[Pete's **LTP – The Year in Review** report can be found on page 3. – Ed.]*

Almost a panoramic view of the Election, overseen by Parliamentarian Paul. (Photo: Dwight Lanpher)

The Gang of Five under the spotlight: Tom Cocchiaro, Steve Rand, David "Rags" Gilmore, Paul Winalski and John Bishop. (Photo: Ed Ting)

The LTP "Grammy" Award for 2014 went to Steve Rand.

The 2015 Elections

With no further nominations for the five offices, a motion was made to forego the secret ballot and elect the slate by voice acclamation. It was seconded and passed. The following slate of NHAS officers for the upcoming year was thus duly elected without opposition and by voice vote:

President: **John Bishop**
Vice President: **Tom Cocchiaro**
Secretary: **Paul Winalski**
Treasurer: **David Gilmore**
Director: **Steve Rand**

NHAS Treasurer's Report
(as of December 10, 2014)

Starting Checking Balance:		**$10,368.02**
Deposits:		
Membership	783.23	
Donations	3,235.00	
Interest	0.29	
Calendar sales	28.00	
Total:		**$4,046.52**
Expenses Paid:		
Rackspace Cloud (Web site)	22.65	
SouthPort (15"x6"vinyl laminate)	260.00	
Ted Blank (GLP for Smokey Joe)	122.00	
Total:		**$404.65**
Current Checking Balance:		**$14,009.89**
Petty Cash:		**$100.00**
Current Cash Balance:		**$14,109.89**
EOC Share:		**$6,527.02**

Membership: **56**

	Single + Family	
Cash Renewals:	12x30.00+1x10.00	370.00
Cash New Members	0x30.00+0x10.00	0.00
PayPal Renewals:	8x28.83+0x 9.61	230.64
PayPal New Members:	6x28.83+1x 9.61	182.59
Total:	**26**	**$783.23**
Current Members:	**82**	

(8 Family members, 31 members have paid by PayPal)

New Members:

Steve Bardus	Center Harbor NH
Mike Vaccaro	Amherst NH
Mohammad "Musa" Chugtai	Nashua NH
Sergio Alvarez	Sudbury MA
Robert "Russ" Russell	Hudson NH
Marc Sullivan	Raymond NH
Carl Stein	Greenland NH

Donations:

John Shonle	GEN	3175.00
Rich DeMidio	YFOS	60.00
Total:		**$3,235.00**

Contact Information

How to join NHAS

Write to us: NHAS
P. O. Box 5823
Manchester, NH 03108-5823

Send Email to: info@nhastro.com

Visit our web site: http://www.nhastro.com

How to contribute to the Observer

Email articles and snapshots to the Editor:

ramax.astro@yahoo.com

NHAS Officers:

President:	John Bishop
Vice-President:	Tom Cocchiaro
Secretary:	Paul Winalski
Treasurer:	David "Rags" Gilmore

Board of Directors:

Ken Charles
Pete Smith
Steve Rand

Orion Starblast 4.5 – LTP-style Scope

Custodian: ***Pete Smith***
Contact: psastro60@gmail.com

Equipped with:

Commercial red-dot finder with a special Joel Harris mount.
Celestron 8mm-24mm zoom EP, plus 17mm and 6mm EPs.
Instruction booklet and an Audubon constellations guide.
A red/white Headlamp and a Lens Cleaning Pen in the pouch.
A simple Collimation Cap to learn to collimate the old way.
A Planisphere and a Moon Map.
Richard Berry's "Discover the Stars"

How to Borrow a Loaner Scope in 3 Simple Steps

- Contact the custodian of scope you're interested in
- Arrange to meet for the transfer (usually at a monthly Business Meeting)
- Sign the requisite papers and leave with the scope

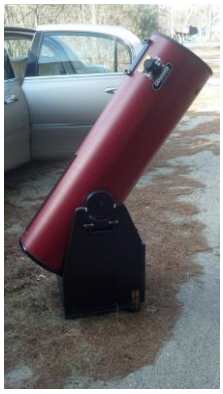
It is a benefit of your membership in NHAS. The loan will be for 2 months; an extension might be granted if no one else is waiting for the unit. The objective is to help new members get to know what will suit them personally, to experiment with options and to understand **what will work** in the time available to them to pursue their new hobby, and equally, **what may not.** A suitable (beginner's) telescope is invariably one that is easy to transport to the observing site and easy to setup, and not necessarily the one with the most aperture or sophistication.

Orion XT6 – 6" Newtonian on a Dobson mount

Custodian: ***Pete Smith***
Contact: psastro60@gmail.com

Equipped with:

Telrad finder with a dew shield
32mm, 25mm & 10mm Plössl EPs in a case
A Planisphere, a Moon map and a red light
Orion XT6 user manual
Richard Berry's "Discover the Stars"



Coulter Odyssey 10" Newtonian on a Dobson mount

Custodian: ***"Rags" Gilmore***
Contact: nhas@ragnorok.net

Equipped with:

Telrad finder with a dew shield
26mm TeleVue Plössl and 15mm Celestron Plössl in a case
A Planisphere and a Moon map
Richard Berry's "Discover the Stars"

Also available, independently of the telescope and in a separate slip-case:

Sky Atlas 2000.0 by Wil Tirion and Roger Sinnott
Sky Atlas 2000.0 Companion: Robert Strong & Roger Sinnott

Meade 8" Newtonian on a Dobson mount

Custodian: ***Ken Charles***
Contact: starnek2550@gmail.com

Equipped with:

Telrad finder with a dew shield
25mm and 10mm EPs
A custom-built base (made by Joe Derek and Chase McNiss)

Orion XT10 Newtonian on a Dobson mount

Custodian: ***Pete Smith***
Contact: psastro60@gmail.com

Equipped with:

Telrad finder
Assorted EPs: 35mm, 25mm wide-angle, 17mm and a mystery one (25mm?).
An EP case
Richard Berry's "Discover the Stars"

Regional Astronomy Clubs

New Hampshire Astronomical Society [NHAS] ***Skywatches around the State***
Sidewalk Astronomy in **Portsmouth**
www.nhastro.com

Amateur Astronomical Society of Rhode Island (North Scituate, RI)
www.theskyscrapers.org

Amateur Telescope Makers of Boston
(Westford, Mass.)
www.atmob.org

Astronomy Society of Northern New England (Kennebunk, Maine)
www.asnne.org

Gloucester Area Astronomy Club
(Gloucester, Mass.)
www.gaac.us

McAuliffe-Shepard Discovery Center [MSDC] (Concord, NH)
First Friday Observing Event
www.starhop.com

Northeast Kingdom Astronomy Foundation (Peacham, VT)
www.nkaf.org

North Shore Astronomy Club
(Groveland, Mass.)
www.nsaac.org

Penobscot Valley Star Gazers
(Bangor, Maine)
www.gazers.org

Online Live Observatories

Astronomy Live (broadcasts)
www.astronomylive.com

SLOOH (Tenerife, Canary Is.)
www.slooh.com/about.php

Worldwide Telescope
www.worldwidetelescope.org

Magazines

Astronomy
www.astronomy.com

Sky & Telescope
www.skyandtelescope.com

Astronomy Gear

Adorama
www.adorama.com

Agena AstroProducts
www.agenaastro.com

Astromart
(Used equipment and advice)
www.astromart.com

Astronomy-Shoppe
(in Plaistow, NH 03865)
www.astronomy-shoppe.com

Celestron
www.celestron.com

Cloudynights
(Used equipment, Articles, Forums and Reviews)
www.cloudynights.com

Explore Scientific
www.explorescientific.com

High Point Scientific
www.highpointscientific.com

Kendrick Astro Instruments
www.kendrickastro.com

Lunt Solar Systems
www.luntsolarsystems.com

Meade Instruments
www.meade.com

Oceanside Photo & Telescope
www.optcorp.com

Orion Telescopes
www.telescope.com

ScopeStuff
www.scopestuff.com

TeleVue
www.televue.com

Vixen Optics
www.vixenoptics.com

William Optics
www.williamoptics.com

Astronomy Web Sites

CalSky
(Sky Calendar to plan Observing)
www.calsky.com

Free Star Charts
(Star Charts for MM, Planets etc.)
www.freestarcharts.com

Heavens Above
(on Satellites, Spacecraft, Planets)
www.heavens-above.com

NASA
www.nasa.gov

Dark skies Observing Sites
(Horizons and Clear Sky information)
www.observingsites.com

ScopeReviews
***(Reviews by Ed Ting,* NHAS)**
www.scopereviews.com

Sloan Digital Sky Survey DR10
http://skyserver.sdss3.org/

SpaceWeather
(Solar activity, Asteroid passes)
www.spaceweather.com

Computer Software

Cartes du Ciel (*aka* **Skychart**) (Free)
www.ap-i.net/skychart/

Celestia
www.shatters.net/celestia

Computer Aided Astronomy (Free)
www.astrosurf.com/c2a/english/

Earth Sky Tonight
www.earthsky.org/tonight

SkyMap Online
www.skymaponline.net

Starry Night
(many versions, Novice to Expert)
www.starrynight.com

Stellarium (Free)
www.stellarium.org

WinStars (Free)
www.winstars.net/english/

Event	Date	Time	Location
First Friday Skywatch for MSDC	Friday, January 2	7:00pm	MSDC, Concord NH
NHAS Business Meeting	Friday, January 9	7:30pm	St. Anselm College, Manchester NH
EOC Meeting	Thursday, January 15	6:30pm	Manchester City Library, Manchester NH
Skywatch for Mary E. Bartlett Library	Thursday, January 15	7:00pm	22 Dalton Road, Brentwood NH
Skywatch for Gilmanton School	Friday, January 16	6:30pm	1386 NH Route 140, Gilmanton NH
Coffee House Night at YFOS	Saturday, January 17	5:00pm	YFOS
Hampton Academy Skywatch	Wednesday, January 21	7:00pm	931 Ocean Boulevard, Hampton NH
Hampton Academy Skywatch (first backup date)	Thursday, January 22	7:00pm	931 Ocean Boulevard, Hampton NH
Skywatch for Gilmanton School (backup date)	Friday, January 23	6:30pm	1386 NH Route 140, Gilmanton NH
Sidewalk Astronomy Skywatch	Saturday, January 24	6:00pm	Market Square, Portsmouth NH
Rey Center Skywatch	Saturday, January 24	6:30pm	Waterville Valley NH
Hampton Academy Skywatch (second backup date)	Monday, January 26	7:00pm	931 Ocean Boulevard, Hampton NH
Hampton Academy Skywatch (third backup date)	Tuesday, January 27	7:00pm	931 Ocean Boulevard, Hampton NH
Skywatch for Mary E. Bartlett Library (first backup date)	Thursday, January29	7:00pm	22 Dalton Road, Brentwood NH
Skywatch for Mary E. Bartlett Library (second backup date)	Friday, January 30	7:00pm	22 Dalton Road, Brentwood NH
First Friday Skywatch for MSDC	Friday, February 6	7:00pm	MSDC, Concord NH
Rey Center Skywatch	Saturday, February 7	6:30pm	Waterville Valley NH
NHAS Business Meeting	Friday, February 13	7:30pm	MSDC, Concord NH
Milton Free Public Library Skywatch	Saturday, February 14	6:30pm	13 Main Street, Milton Mills NH
EOC Meeting	Thursday, February 19	6:30pm	Manchester City Library, Manchester NH
Coffee House Night at YFOS	Saturday, February 21	5:00pm	YFOS
Sidewalk Astronomy Skywatch	Saturday, February 28	6:00pm	Market Square, Portsmouth NH

Note: ***Please check [Calendar] at www.nhastro.com for up-to-date information on upcoming events.***

Date	Lunar Phase
Monday, January 5	Full moon 4:53am
Tuesday, January 13	Last quarter 9:47am
Tuesday, January 20	New moon 1:14pm
Tuesday, January 27	First quarter 4:48am
Tuesday, February 3	Full moon 11:09pm
Thursday, February 12	Last quarter 3:50am
Wednesday, February 18	New moon 11:47pm
Wednesday, February 25	First quarter 5:14pm

Credits

Contributors to this month's **Observer:**

John Bishop, Ted Blank, *Alex Bonenfant, Glenn Chaple,* Gardner Gerry, "Rags" Gilmore, Dwight Lanpher, Nori Odoi, Steve Rand, John Rose, Gerry and Pete Smith, Ed Ting, Bob Veilleux and Paul Winalski.