Skylights

Newsletter of the Astronomical Society of Northern New England

JAN 2015

Member of NASA's

Astronomical League

ASNNE MISSION

ASNNE is an incorporated, non-profit, scientific and educational organization with three primary goals:

1) To have fun sharing our knowledge and interest with others.

2) To provide basic education in astronomy and related sciences to all who are interested.

3) To promote the science of Astronomy.

What's Up In January

By Bernie Reim

The month of January is named after the Roman god, Janus. He is the god of transitions, gates, doors, endings and beginnings, and time itself. He is depicted with two faces, always facing forwards and backwards at the same time. That is a good way to enter any new year, remembering what we learned in the past and always looking forward to the future to learn more about where we really are.

The days are already getting longer now that we are past the winter solstice. Long nights are great for people interested in what is always going on in the skies above them. There are several good conjunctions and other unique events this first month of the New Year that will be worth making an effort to see, even if it gets icy cold.

Jupiter will be rising a little earlier each evening, approaching its opposition early next month. Venus and Mercury will be quite close to each other low in the evening sky half an hour after sunset with Mars just above this celestial duo of our first two inner planets. Saturn has switched to the morning sky and it will pass just two degrees or about two fingers at arm's length, below the waning crescent moon one hour before sunrise on Friday the 16th. Earth will be closest to the sun on the fourth day of this month. As a bonus there will also be a comet named Lovejoy visible with a small telescope, an asteroid named Juno, and a meteor shower named the Quadrantids.

Jupiter begins the month rising around 8 pm in the constellation of Cancer, just to the west of Leo, and will end the month rising by 6 pm. The king of the planets is getting slightly closer and brighter each night as it approaches its opposition on the 6th of February next month, when the earth will be directly between Jupiter and the sun. Our largest planet will only be 400 million miles away, or about 36 minutes at the speed of light. That will be its best opposition until 2019. Its average distance is 484 million miles, or 43 minutes at the speed of light. Jupiter reaches opposition every 13 months. The moon does this every month when it reaches full moon.

Venus and Mercury will be nicely visible within just 5 degrees of each other for the first three weeks this year. Look low in the southwestern sky about half an hour after sunset each clear evening this month to watch this celestial dance unfold. Notice that orange Mars is only about 15 degrees to the upper left of this dynamic duo.

These two planets are called inferior planets because they are located closer to the sun than the earth. They are the only planets in our solar system with no moons and the only ones that go through phases like our moon, but on a different rhythm. They also have very long days and very short years since they spin very slowly. A day on Mercury lasts 59 days and a year lasts only 88 days. A year on Venus lasts 225 days and its days lasts 243 days.

There are also many things about these first two planets which are very different and even opposite from one another. Venus has the highest surface air pressure of any place

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TRIVIA: Mark Twain was born during an appearance of Halley's Comet in 1835 and died on the day of its next appearance in 1910.

Inside This Issue

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What's Up "*Continued from page 1*"

in our whole solar system. It is about 100 times that of Earth's surface, or the same pressure as if you were 3,000 feet under our ocean. Mercury has no air at all.

Venus is the most reflective planet and Mercury is the darkest, only as reflective as an asphalt parking lot. Venus has the most circular orbit and Mercury the most eccentric, or oval orbit. It slows down and speeds up all the time and you could even see the huge sun rise, and then drop below the horizon, and then rise again the same day from the surface of Mercury. Venus is tilted 177 degrees on its axis, almost upside down. Mercury has almost no tilt at all, only 1/30 of a degree. That means the plane of its equator is its path around the sun. Mercury has a perfect 3 to 2 resonance, making 3 spins on its axis for every two times it orbits the sun.

Venus is always the same temperature of 870 degrees F, hot enough to melt some metals and hot enough to cook a pot roast in two seconds. Mercury has the largest range of temperatures of any place in our solar system. It plunges 1,000 degrees after sunset each day. It is hot enough to melt lead in the daytime and cold enough to liquefy oxygen at night. The strangest thing is that Venus is brightest when it is closest to Earth, which you would expect, but Mercury is brightest when it is farthest away from earth. So Mercury can change its brightness by a factor of more than 1,000.

Saturn is now visible in the morning sky in the constellation of Scorpius, near Antares where Mars was in October of last year. A slender waning crescent moon will be two degrees to the left of the ringed planet on the morning of the 16th.
Comet Lovejoy will be visible in a small telescope at around 8th magnitude, cutting a nice path just to the right of the famous winter hexagon all this month. It will begin the month just to the right of Rigel, the blue giant star in Orion, continue through Taurus just to the right of the Pleiades, and travel all the way to Andromeda this month. It is moving quite fast now, covering 3 degrees of the sky each day. It will be at its closest approach to earth at 44 million miles in early January. Discovered by Terry Lovejoy on August 17 of 2014 from Brisbane, Australia, this is already the fifth comet that this amateur astronomer has named in his honor for being the first person on Earth to spot these celestial visitors.

The asteroid named Juno will reach opposition on the 29th in the constellation of Hydra below the Winter Hexagon. It will be around 8th magnitude, similar to Comet Lovejoy and not too far from it in the sky to begin the month. This was the third asteroid discovered, back in 1804 just 3 years after the first and largest asteroid, Ceres, was discovered. Ceres, at 600 miles in diameter, is about the size of Texas. Then there is Vesta at 330 miles, Pallas at 320 miles, and Juno at 170 miles in diameter. These four largest asteroids make up about half the mass of all the millions of asteroids in the belt between Mars and Jupiter.

The Quadrantid meteor shower peaks on Saturday night the 3rd into Sunday morning the 4th. This shower could produce over 100 meteors per hour, but this year the moon will be nearly full, so you would be lucky to see about a dozen or so per hour towards morning when the moon is sinking low into the west. Named after a defunct constellation Quadrans Muralis, these meteors will originate from a point in the sky near the Big Dipper and Draco the dragon.

Jan 1. On this day in 1801 Giuseppe Piazzi discovered the largest of all asteroids, Ceres.

Jan 3. The Quadrantid meteor shower peaks.

Jan 4. Earth is at perihelion, or closest to the sun today at 91.4 million miles or about 3% closer to the sun than it is at aphelion in July. Full moon is at 11:53 a.m. EST. This is also called the Wolf Moon or the Moon after Yule.

Jan 7. On this day in 1610 Galileo discovered 3 of the 4 largest moons of Jupiter. They are Callisto, Europa, and Io. He would discover the largest moon in the whole solar system, Ganymede at 3200 miles in diameter, just 6 days later.

Jan 8. The moon passes 5 degrees south of Jupiter this morning.

Jan 13. Last quarter moon is at 4:46 a.m.

Jan 14. Mercury is at greatest eastern elongation from the sun at 19 degrees today. On this day in 2005 the Huygens probe landed on Titan, the largest moon of Saturn and the only moon with an atmosphere. On this day in 2008, the MESSENGER spacecraft made its first Mercury flyby.

Jan 19. The New Horizons mission to Pluto was launched on this day in 2006. It will not get to Pluto until July of this year, but it will already begin to be able to take better pictures of this icy dwarf than the Hubble Space Telescope ever could within a few months. The spacecraft was reawakened last month from its long hibernation and is healthy and ready to discover new truths about Pluto that could go well beyond our imagination of what is possible.

Jan 20. New moon is at 8:14 a.m.

Jan 21. The slender waxing crescent moon passes close to Venus and Mercury this evening.

Jan 23. The first 3 moons of Jupiter that Galileo discovered will have their shadows transit Jupiter over an 8 hour period tonight.

Jan 26. First quarter moon is at 11:48 p.m.

Moon Phases

Jan 4
Full

Jan 13
Last Quarter

Jan 20
New

Jan 26
First Quarter

Moon Data

Jan 8
Jupiter 5° north of Moon

Jan 9
Moon at apogee

Jan 16
Saturn 1.9° south of Moon

Jan 21
Venus 6° south of Moon

Mercury 3° south of Moon

Moon at perigee

Jan 22
Neptune 4° south of Moon

Mars 4° south of Moon

Jan 25
Uranus 0.6° south of Moon

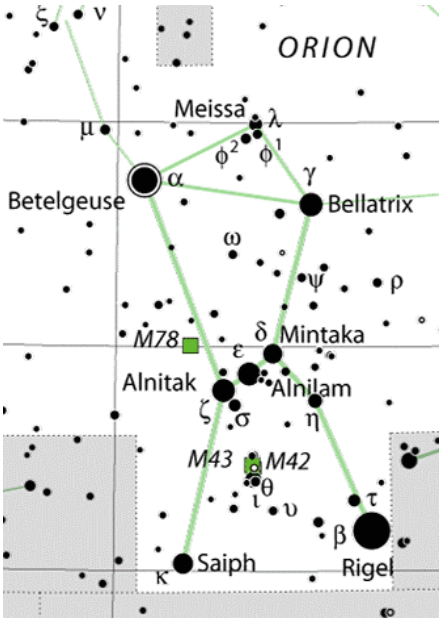
Sky Object of the Month – January 2015
Struve 817 (STF 817, S817) – Double Star in Orion
by Glenn Chaple

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 measure made in 2010 and posted in the Washington Double Star Catalog (available online at ad.usno.navy.mil/proj/WDS), 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.



constellation-guide.com (courtesy IAU and *Sky and Telescope*)

Betelgeuse and Struve 817. 3-inch f/10 reflector at 60X; ½ degree field.

Principal Meteor Showers in 2015

January 4
Quadrantids

April 22
Lyrids

May 6
Eta Aquarids

July 30
Delta Aquarids

August 12
Perseids

October 9
Draconid

October 21
Orionids

November 9
Taurids

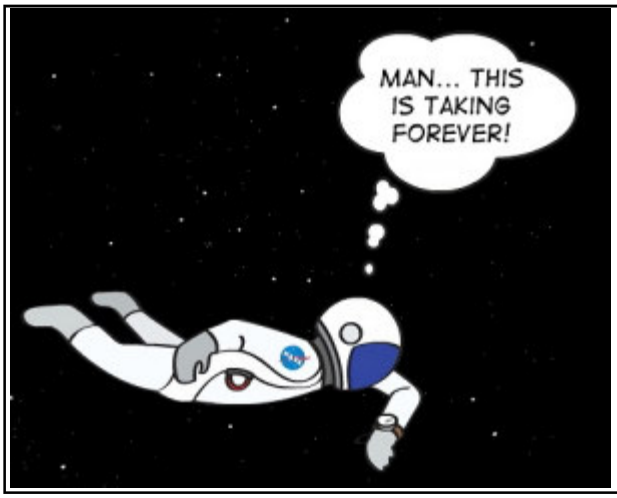
November 18
Leonids

November 26
Andromedids

December 14
Geminids

December 22
Ursids

Note: Dates are for maximum



Cliff-Jumping

Have you ever wondered where the tallest cliff in the solar system can be found? What about what it would be like to take a jump off of such a cliff. Take a guess? Here's a hint: it would take you over eight minutes to reach the bottom, and when you got there, you wouldn't be going that much faster than a car on the highway. Find answers to both of these absurdly cool question in the latest Space Place article. http://spaceplace.nasa.gov/cliff-jumping

The latest issue of the Space Place Newsletter: News and Notes for Formal and Informal Educators can be found at: http://spaceplace.nasa.gov/en/educators .

Check out our great sites for kids:

The Space Place website (http://spaceplace.nasa.gov)

The *SciJinks Weather Laboratory* at http://**scijinks.gov**

NASA Climate Kids at http://**climate.nasa.gov/kids**

Our club has merchandise for sale at:

www.cafepress.com/asnne



All money raised goes to our operating fund.
Any design can be put on any item.

Keeping an Eye on Storms and More

By Kieran Mulvaney

In late July 2013, Tropical Storm Flossie barreled furiously toward Hawaii. The question was not if it would strike, but when and where it might do so.

During the afternoon hours of July 29, forecasts predicted landfall later that week on the state's Big Island; however, by the time residents of the 50th state awoke the following morning things had changed. NOAA's Central Pacific Hurricane Center warned that the islands of Oahu, Molokai and Maui were now at a greater risk.

This overnight recalculation was thanks to the Day/Night Band viewing capabilities of the Visible Infrared Imaging Radiometer Suite, or VIIRS, on board the Suomi National Polar-Orbiting Partnership (Suomi NPP) satellite. VIIRS is able to collect visible imagery at night, according to Mitch Goldberg, program scientist for NOAA's Joint Polar Satellite System (JPSS), of which Suomi NPP is a part. That means it was able to spot some high-level circulation further north than expected during the nighttime hours. This was an important observation which impacted the whole forecast. Without this forecast, said the Hurricane Center's Tom Evans, "we would have basically been guessing on Tropical Storm Flossie's center."

Polar-orbiting satellites, like Suomi NPP and the future JPSS-1 and JPSS-2 (scheduled for launch in 2017 and 2021, respectively), sweep in a longitudinal path over Earth as the planet rotates beneath them—scanning the globe twice a day. VIIRS, the imager that will be aboard all the JPSS satellites, images 3,000 km-wide swaths on each orbit, with each swath overlapping the next by 200 km to ensure uninterrupted global coverage. This high-resolution, rapidly updating coverage allows researchers to see weather patterns change in near real-time.

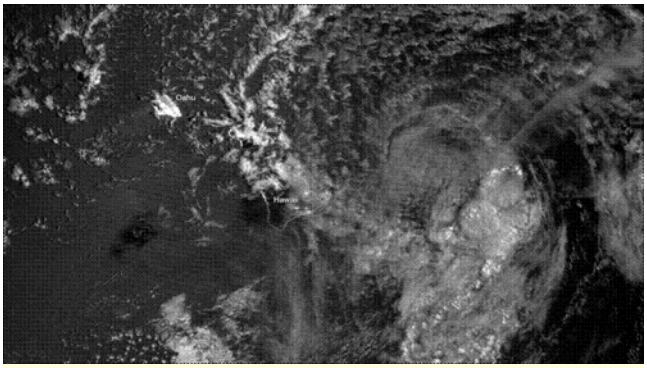
Instruments on Suomi NPP allow scientists to study such long-term changes too—things like, "the patterns of sea surface temperature, or coral bleaching," says Goldberg. They are even used by the World Bank to determine how much energy is burned off and wasted from natural gas flares on oil drilling platforms.

While scientists are excited by the JPSS series' wide range of capabilities, the ability to address pressing immediate concerns is, for many, the most tangible value. That was certainly the case in July 2013, when thanks to Suomi NPP, authorities had ample time to close ports and facilities, open shelters, activate emergency procedures, and issue flash flood warnings. Despite heavy rains, high surf, and widespread power outages, accidents and injuries were few. By the time the storm passed, Hawaii was soaked.

But it was largely unharmed.

Learn more about JPSS here: http://www.jpss.noaa.gov.

Kids can learn all about how hurricanes form at NASA's Space Place: http://spaceplace.nasa.gov/hurricanes



Caption:

S-NPP captured this image of Tropical Storm Flossie heading toward Hawaii using its VIIRS Combined Day-Night Band sensor. Credit: NOAA.

The University of California High-Performance AstroComputing Center

Wild Weather on WASP-43b

You thought finding planets around stars hundreds of light-years away was spectacular, exceeded only by determining their sizes and orbits.

Well, in the ongoing exoplanet version of the game "can you top this?" comes another phenomenal feat: discerning the weather on a distant exoplanet—including sensing water vapor in its atmosphere.

The planet is WASP-43b, orbiting a deep orange dwarf (at spectral class K7, as orange as a star can be without being a red dwarf) a tenth the size of the Sun, and with a cooler surface temperature (maybe 7,500°F compared to 10,000°F for the Sun, a G2 star). A whopping 260 light-years away in the constellation Sextans, you'd need an 8-inch telescope under dark skies even to pick out the host star (magnitude 12.4).

Like just about every other exoplanet discovered so far, WASP-43b is no vacation spot. The planet is the size of Jupiter but twice as massive. Indeed, the planet is slightly more than a tenth the diameter of the star itself.

Worse, it is in a nearly circular orbit less than a million miles from its star's surface—closer than four times the distance of the Moon from Earth: so close that it orbits the star in a year of just 19.5 *hours*. Its day is also 19.5 hours long because the planet's rotation is tidally locked: one side always faces the star and suffers permanent day while the other side has permanent night.

What does all that mean for its weather?

To find out, a team of astrophysicists—including Jonathan Fortney at the University of California, Santa Cruz (UCSC)—combined two observational techniques for the first time and dove deeply into the data.

Emission and transmission

The team secured several precious days of observing time on the Hubble Space Telescope in November and December 2013 to obtain measurements of the planet over three nearly consecutive orbits with Wide Field Camera 3. They also acquired data from three primary transits (where the planet crossed directly in front of the star) and two secondary eclipses (where it passed behind the star), observing in the thermal (heat) near infrared at wavelengths of 1.1 to 1.7 micrometers (μm) using an instrument called the G141 grism. They supplemented the HST observations with high-precision observations from NASA's Spitzer infrared space telescope at slightly longer wavelengths (3.6 and 4.5 μm).

During transits, they measured how the host star's light filtered through the planet's atmosphere—a technique called transmission spectroscopy—to determine the abundance of any water vapor in the atmosphere where the day side transitions to the night hemisphere. Also at different points during transits, they used a technique called emission spectroscopy to monitor the heat emitted at night by the planet itself.

Using custom software run on the Hyades supercomputer cluster at UCSC, they used the extracted spectra to provide a comprehensive view into WASP-43b's atmosphere, including how temperatures change with height around the planet. They were also able to map temperatures and water abundances in the atmosphere at different longitudes across the planet's day and night sides—an entirely new technique.

"Continued on page 7"

'Wild Weather on Wasp-43b'
"Continued from page 6"

"The emission spectrum shows strong evidence for water absorption," the authors wrote in *The Astrophysical Journal Letters.* The Spitzer data also suggest that carbon monoxide and carbon dioxide exist in the atmosphere. The place seems to be too hot for clouds.

Easier than measuring Jupiter

Studying the exotic inferno WASP-43b 260 light-years away actually may shed light on our own solar system.

"Even though Jupiter is much closer to Earth, the composition of its atmosphere is actually harder to study than WASP-43b's." Fortney explains. "Our own solar system's giant planet is so cold that most of its important molecules are hidden in clouds far below the visible atmosphere. The high temperatures of 'hot Jupiters' such as WASP-43b make studying their atmospheres easier."

How hot? WASP-43b's day side is hot enough to melt iron (2,700°F); the night side is much "cooler"—at 900°F it would "only" melt lead. For perspective, that makes the night side as comfortable as Mercury's day side—maybe worse, because of WASP-43b's humid atmosphere. Because heat is so poorly distributed through its atmosphere, fierce hot winds roar from the day side to the night side.

The team hopes that their measurements can reveal more about the conditions under which planets form. "These observations with Hubble show us that we can understand the makeup and weather of giant planets around other stars with current telescopes," Fortney says. "Thus, they are an important step towards characterizing the atmospheres of more Earth-like worlds with future, specialized space telescopes." *–Trudy E. Bell, M.A.*

Further reading: The findings appeared in two articles: "A precise water abundance measurement for the hot Jupiter WASP 43-b" in the October 1, 2014 issue *ApJ Letters,* and "Thermal structure of an exoplanet atmosphere from phase-resolved emission spectroscopy," in *Science* on October 9.See also the NASA press release "Hubble reveals most detailed exoplanet weather map ever" at http://www.spacetelescope.org/news/heic1422/ . A time-lapse video of the data as WASP-43b rotates/revolves appears at http://astro.uchicago.edu/~kbs/wasp43b.html .

The University of California High-Performance AstroComputing Center (UC-HIPACC), based at the University of California, Santa Cruz, is a consortium of nine University of California campuses and three affiliated Department of Energy laboratories (Lawrence Berkeley Lab, Lawrence Livermore Lab, and Los Alamos National Lab). UC-HiPACC fosters collaborations among researchers at the various sites by offering travel and other grants, co-sponsoring conferences, and drawing attention to the world-class resources for computational astronomy within the University of California system. More information appears at http://hipacc.ucsc.edu

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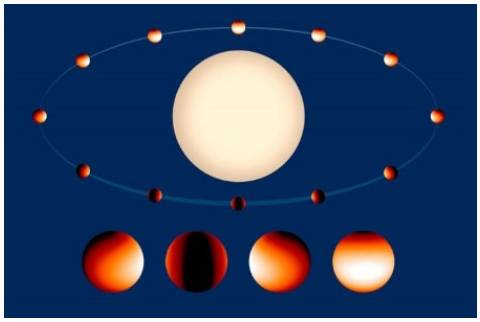

Artist's conception (not to scale) shows exoplanet WASP-43B orbiting its orange dwarf host star. The four images below show close-ups of the planet at points in its orbit 90 degrees apart. (Transits and eclipses are not shown.) Credit: NASA, ESA, and Z. Levay (STSci)

Club Meeting & Star Party Dates

Date	Subject	Location
Jan 9th (NOTE: We are meeting on the 2nd Friday this month).	**ASNNE Club Meeting:** **6:45-7:30PM:** Joan's Beginner Astronomy Class (Public walk-ins welcome). **7:30-9:30PM:** Club Meeting **Meeting Agenda** **Guest Speaker:** TBD Bernie Reim - What's UP Astro Shorts: (news, stories, jokes, reports, questions, observations etc.) Where's Pluto - Update on the New Horizons Mission and "Planet" status. Mission 5 phases 1, Pre-encounter (now through October 2014), Immediate approach (April-May 2015), Encounter (June-August 2015), Immediate post-encounter (September-October 2015) and later post-encounter (April-December 2016).	The New School, Kennebunk, Me.
Jan 16th	Club/Public Star Party (*Visit website for updates and or cancellations*)	Starfield Observatory, West Kennebunk, Me.

Directions to ASNNE event locations

Directions to The New School in Kennebunck [38 York Street (Rt1) Kennebunk, ME]

For directions to The New School you can use this link to the ASNNE NSN page and then click on "get directions" from the meeting location. Enter your starting location to generate a road map with complete directions. It works great. http://nightsky.jpl.nasa.gov/club-view.cfm?Club_ID=137

Directions to Starfield Observatory [Alewive Road, Kennebunk, ME]

From North:
Get off turnpike at exit 32, (Biddeford) turn right on Rt 111. Go 5 miles and turn left on Rt 35. Go 2 miles on Rt 35 over Kennebunk River to very sharp 90 degree left turn. The entrance to the Starfield Observatory site is at the telephone pole at the beginning of the large field on the left. Look for the ASNNE sign on the pole.

From South:
Get off the turnpike at exit 25 in Kennebunk. After toll both turn right on Rt 35. Go up over the turnpike and immediately turn right on Rt 35. About 4 miles along you will crest a hill and see a large field on your right. Continue until you reach the end of the field. Turn right into the Starfield Observatory site at the last telephone pole along the field. Look for the ASNNE sign on the pole. If you come to a very sharp 90 degree right turn you have just passed the field.

To join **ASNNE**, please fill out the below membership form. *Checks should be made payable to: Astronomical Society of Northern New England (A.S.N.N.E).* For more details, please visit our website: **http://www.asnne.org**

Astronomical Society of Northern New England
P.O. Box 1338
Kennebunk, ME 04043-1338

2015 Membership Registration Form

(Print, fill out and mail to address above)

Name(s for family): _____

Address: _____
City/State: _____ Zip code: _____

Telephone # _____

E-mail: _____

Membership (check one):
Individual $35 _____ Family $ 40 _____ Student under 21 years of age $10 _____ Donation_____

Total Enclosed_____

Tell us about yourself:
1. Experience level: Beginner____ Some Experience ____ Advanced_____

2. Do you own any equipment? (Y/N) And if so, what types?

_____
3. Do you have any special interests in Astronomy?

_____
4. What do you hope to gain by joining ASNNE?

_____
5. How could ASNNE best help you pursue your interest in Astronomy?

_____
6. ASNNE's principal mission is public education. We hold many star parties for schools and the general public for which we need volunteers for a variety of tasks, from operating telescopes to registering guests to parking cars. Would you be interested in helping?
Yes_____ No_____

7. ASNNE maintains a members-only section of its web site for names, addresses and interests of members as a way for members to contact each other. Your information will not be used for any other purpose. Can we add your information to that portion of our web site?

Yes_____ No_____