

STELLAR SENTINEL



Grand Traverse Astronomical Society August 2014

The Invisible Shield of our Sun

By Dr. Ethan Siegel

Whether you look at the planets within our solar system, the stars within our galaxy or the galaxies spread throughout the universe, it's striking how empty outer space truly is. Even though the largest concentrations of mass are separated by huge distances, interstellar space isn't empty: it's filled with dilute amounts of gas, dust, radiation and ionized plasma. Although we've long been able to detect these components remotely, it's only since 2012 that a man-made spacecraft -- Voyager 1 -- successfully entered and gave our first direct measurements of the interstellar medium (ISM).

What we found was an amazing confirmation of the idea that our Sun creates a humongous "shield" around our solar system, the heliosphere, where the outward flux of the solar wind crashes against the ISM. Over 100 AU in radius, the heliosphere prevents the ionized plasma from the ISM from nearing the planets, asteroids and Kuiper belt objects contained within it. How? In addition to various wavelengths of light, the Sun is also a tremendous source of fast-moving, charged particles (mostly protons) that move between 300 and 800 km/s, or nearly 0.3% the speed of light. To achieve these speeds, these particles originate from the Sun's superheated corona, with temperatures in excess of 1,000,000 Kelvin!

When Voyager 1 finally left the heliosphere, it found a 40-fold increase in the density of ionized plasma particles. In addition, traveling beyond the heliopause showed a tremendous rise in the flux of intermediate-to-high energy cosmic ray protons, proving that our Sun shields our solar system quite effectively. Finally, it

showed that the outer edges of the heliosheath consist of two zones, where the solar wind slows and then stagnates, and disappears altogether when you pass beyond the heliopause.

Unprotected passage through interstellar space would be life-threatening, as young stars, nebulae, and other intense energy sources pass perilously close to our solar system on ten-to-hundred-million-year timescales. Yet those objects pose no major danger to terrestrial life, as our Sun's invisible shield protects us from all but the rarer, highest energy cosmic particles. Even if we pass through a region like the Orion Nebula, our heliosphere keeps the vast majority of those dangerous ionized particles from impacting us, shielding even the solar system's outer worlds quite effectively. NASA spacecraft like the Voyagers, IBEX and SOHO continue to teach us more about our great cosmic shield and the ISM's irregularities. We're not helpless as we hurtle through it; the heliosphere gives us all the protection we need!

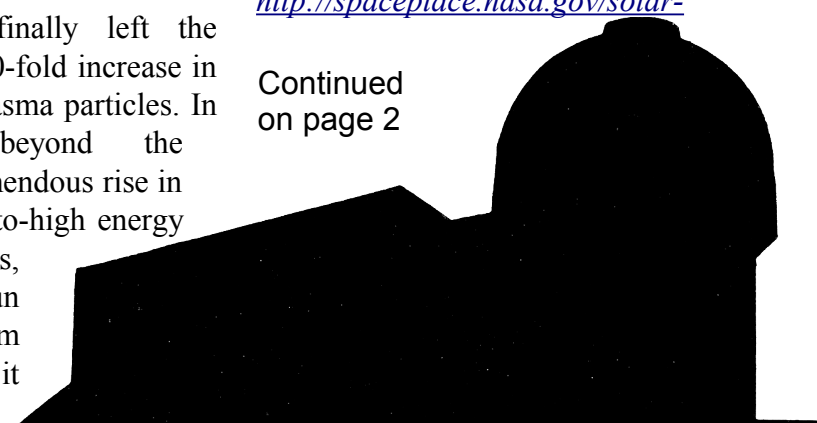
Want to learn more about Voyager 1's trip into interstellar space? Check this out:

<http://www.jpl.nasa.gov/news/news.php?release=2013-278>.

Kids can test their knowledge about the Sun at NASA's Space place:

<http://spaceplace.nasa.gov/solar->

Continued
on page 2



The Invisible Shield of our Sun

(From page 1)

[tricktionary/](#).



Image credit: Hubble Heritage Team (AURA / STScI), C. R. O'Dell (Vanderbilt), and NASA, of the star LL Orionis and its heliosphere interacting with interstellar gas and plasma near the edge of the Orion Nebula (M42). Unlike our star, LL Orionis displays a bow shock, something our Sun will regain when the ISM next collides with us at a sufficiently large relative velocity.

GTAS Annual Picnic and Star Party

This year's picnic and star party will be in lieu of our normal August meeting. It's Saturday night August 2nd at the farm of Gerald and Evelyn Brandt. They have a beautiful high spot which overlooks the Grand Traverse Bay. We've had picnics there many times.

The Time:

7 p.m., or as soon as you can make it. Don't be in a hurry to leave. The wonders of the night beckon as the skies darken.

The Location and Route:

Head out M22 from Traverse City north to Revold Road about 13 miles north of Tom's West Bay (M72 & M22 intersection) and turn left (west). There's a sign for Revold before you get there. Revold ends at Center Road (County Road 633). Turn right (North). Travel about 2.3 miles to Herman Road where the reduced speed zone and the 25 MPH speed limit sign is. Turn left on Herman Road and travel about 1.4 miles. There is a farmer's windmill on the left before the unmarked asphalt paved drive also on the left. Turn left on the drive marked 304 (Farview Orchards). This is opposite the Crestwood road sign is (on the right). Note for GPS units, it is **304 S Herman Rd, Suttons Bay, MI**. Remember the "S". (Long: 85.67503 W, Lat: 44.97759 N)

Follow the asphalt drive turning to the left at the two forks on it. The road will end in a gravel road by the front of a brown house (The Brandt's). The drive will take you through a cherry orchard to the picnic and viewing spot. Drive slowly, it's a bumpy ride through the orchard. It's nearly a mile from Herman Road to the picnic spot. www.gtastro.org/members has a map from S. Herman Road to the picnic site, including an aerial photograph from MapQuest.

What To Bring:

Provide a dish (Entree, salad, vegetable, or desert) to pass. You will also have to provide your own table service, beverage and drinks, chairs and trays or tables.

Bring your telescope. This should be a grand opportunity to view the skies from a super location. If you don't have a telescope, bring binoculars. No binoculars? Hey, it's a star party —There's always someone else's telescope to look through. We'll also have the 25" telescope there, and the Lunt Solar telescope.

Grand Traverse Astronomical Society - Est. June 1982 – 32 years of service

-----Officers-----		Directors	S.S Staff	-----Patrons-----
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Editor	Bob Moler			Nancy Hammond
				Charles Bell

Society Events

Check <http://www.gtastro.org> for late breaking events.

August

- 1 Friday **Star Party:** 9 p.m. - 11 p.m. - NMC Rogers Observatory.
- 2 Saturday **GTAS Annual Picnic** – 7 p.m. - Brandt Farm – See page 2 for details
- 9 Saturday **Sun & Star Party:** 4-6 p.m. & 9-11 p.m. - Sleeping Bear Dunes – Thoreson Farm
- 10 Sunday **Annual Meteors & Smores** – 10:30 p.m. - 11:30 p.m. - Leelanau State Park
- 15 Friday **Friday Night Live** – 5 p.m. to ? 200 block of Front St in front of Orvis Streamside
- 15 Saturday **Star Party:** 9 p.m. - 11 p.m. - NMC Rogers Observatory.
- 22 Friday **Friday Night Live** – 5 p.m. to ? 200 block of Front St in front of Orvis Streamside

September

- 5 Friday **Board of Directors** – 7 p.m. - NMC Rogers Observatory
General Meeting – 8 p.m. - NMC Rogers Observatory.
Star Party: 9 p.m. - 11 p.m. - NMC Rogers Observatory.
- 6 Saturday **International Observe the Moon Night** 200 block of Front St near Orvis Streamside
- 13 Saturday **Sun & Star Party:** 4-6 p.m. & 9-11 p.m. - Sleeping Bear Dunes, Dune Climb Parking Lot
- 20 Saturday **Star Party** – 9 p.m. - 11 p.m. - NMC Rogers Observatory.

----- Star Parties -----

Rogers Observatory star parties for the rest of 2014: 8/1, 8/16, 9/5, 9/20, 10/4, 10/18, 11/7, 11/15, 12/5.

Eclipses: 10/8 lunar a.m., 10/23 solar p.m.

Sleeping Bear Dunes star parties for the rest of 2014: 8/9, 9/13, 10/21. Eclipses: 10/8 lunar a.m., 10/23 solar p.m.

----- Some of the best objects for public viewing in August -----

Planetary Object(s): Mars, Saturn

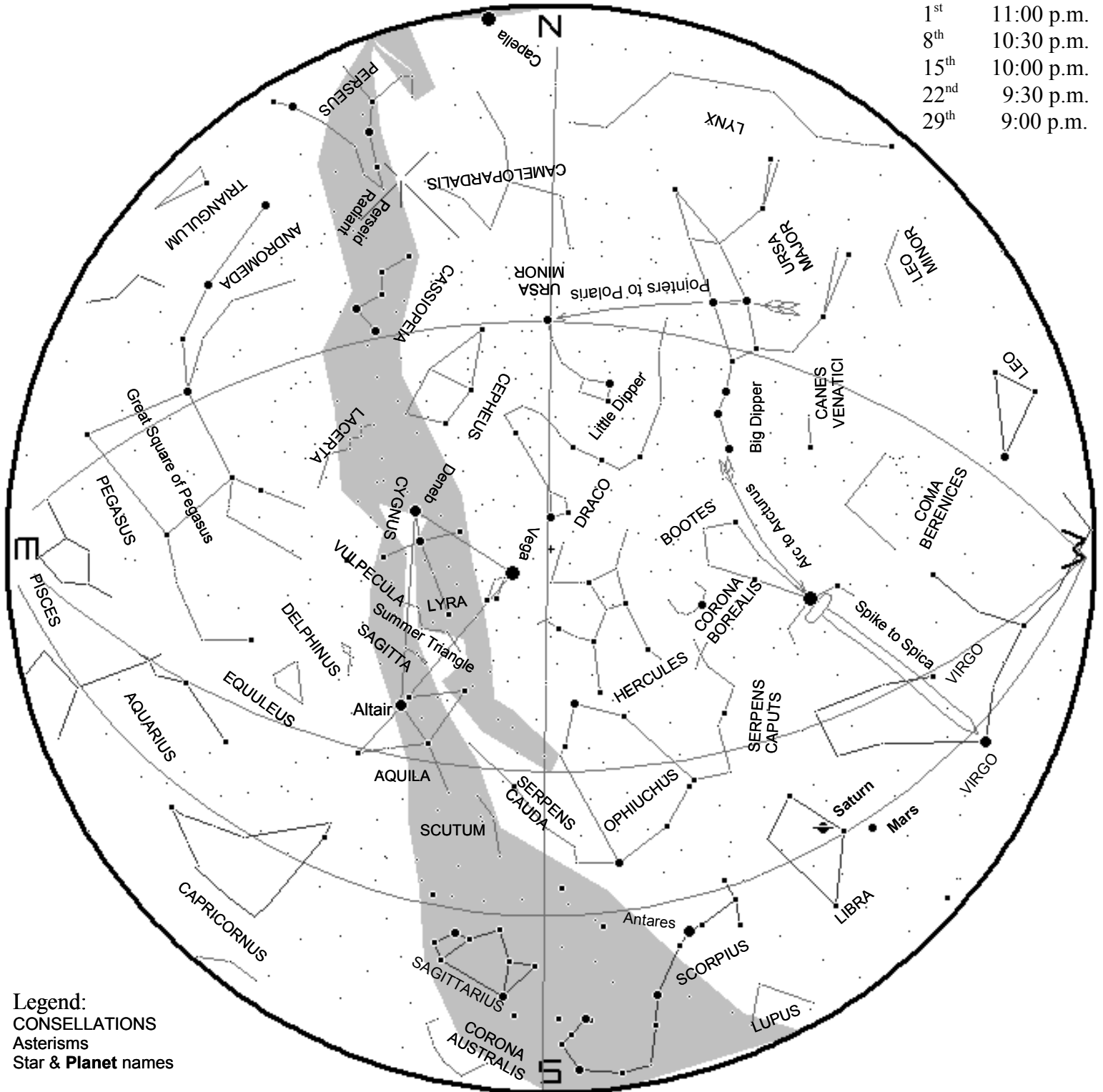
Deep Sky Object, description, constellation, distance	Rt. Asc.	Declin.
	hr. min.	° ' "
M 13: Great Hercules globular cluster, Her, 25k l.y.	16 41.7	+36 28
M 57: Ring Nebula (planetary), Lyr, 1500 l.y.	18 53.6	+33 02
Alberio (β Cygni): Gold and blue double star, Cyg, 160 l.y., actual separation = 400b miles	19 30.3	+27 43
M 11: A great open (galactic) star cluster, Sct, 5.5k l.y.	18 50.0	-06 16
M 27: Dumbbell nebula (planetary), Vul, 900 l.y.	19 58.8	+22 43
M 8: Lagoon Nebula (Emission Nebula) with cluster NGC 6530, Sgr, about 5K l.y.	18 03.8	-24 23
M 16: Cluster and Eagle Nebula, Ser, 8k l.y.	18 18.8	-13 47
M 17: Swan Nebula (a.k.a. Horseshoe and Omega), Sgr, 5.7k l.y.	18 20.8	-16 11
M 22: Bright, large globular cluster, Sgr, 10.6k l.y.	18 36.4	-23 54
M 31: Great Andromeda Galaxy, And, 2.3m l.y.	00 42.7	+41 16
M52: Rich open cluster, Cas, 5.5k l.y.	23 24.2	+61 35
Almach (γ Andromedae): Yellow and greenish-blue double star, And, 260 l.y.	02 03.2	+42 17
γ & h Persei: Double Cluster, Per, 7k l.y.; γ Per, 8.1k l.y.	02 20.0	+57 08

The Stars and Planets for August 2014

By Bob Moler

Planets are plotted for mid month. The star positions are correct for:

1 st	11:00 p.m.
8 th	10:30 p.m.
15 th	10:00 p.m.
22 nd	9:30 p.m.
29 th	9:00 p.m.

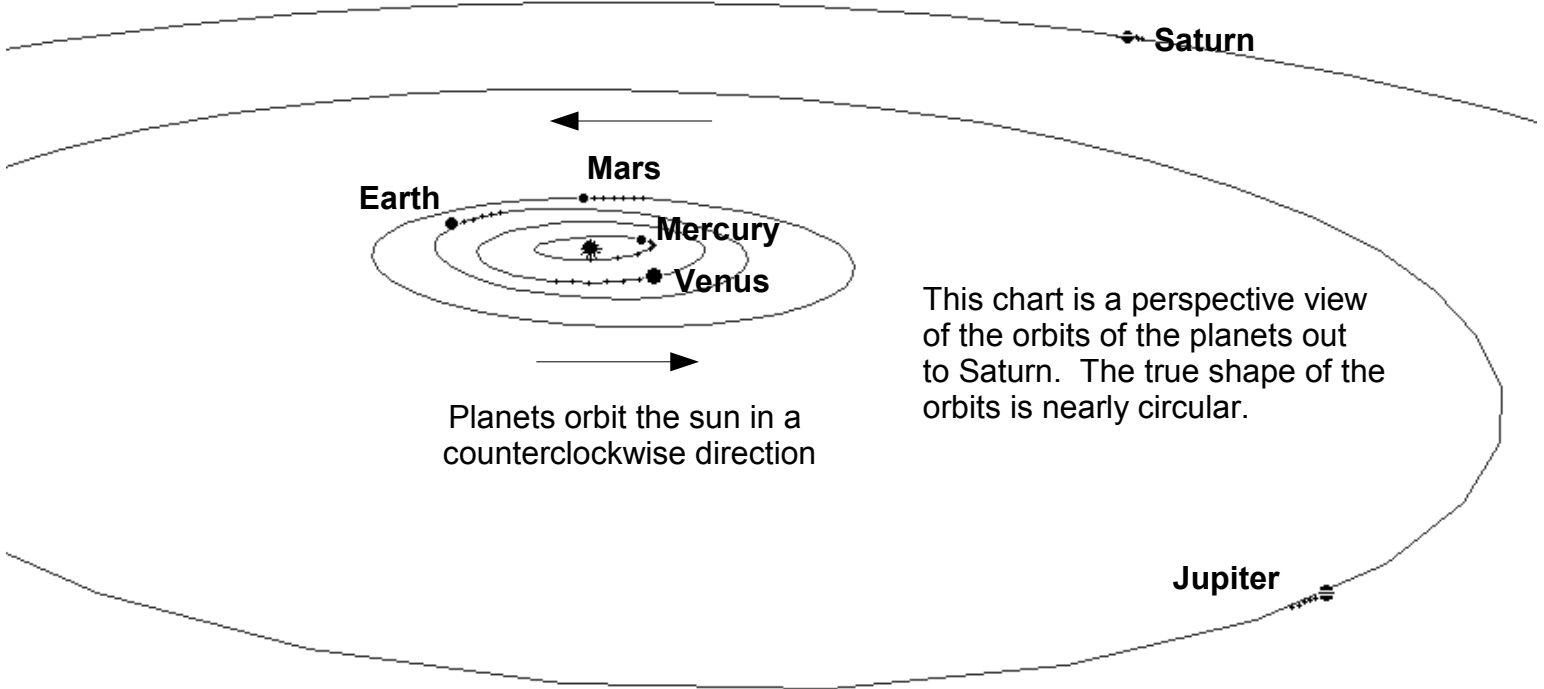


Legend:
 CONSELLATIONS
 Asterisms
 Star & Planet names

August is the greatest month to view the stars, in my humble opinion. That's because summer Milky Way extends to the southern horizon showing us the great star fields in Sagittarius and Scutum along with Scorpius. Binoculars are all that is necessary to scan the milky band for deep sky wonders such as star clusters and nebulae, both bright and dark. Chart time at mid month is 10 p.m. in tune with the sunset and twilight end times which are decreasing. This will soon give us colder weather, but for now it gives us darker skies at a reasonable hour. Saturn and Mars are visible low in the southwest. Check out also the location of the Perseid radiant low in the northeast. The peak of the shower occurs with a full moon so only the brighter meteors will be visible.

The Naked Eye Planets

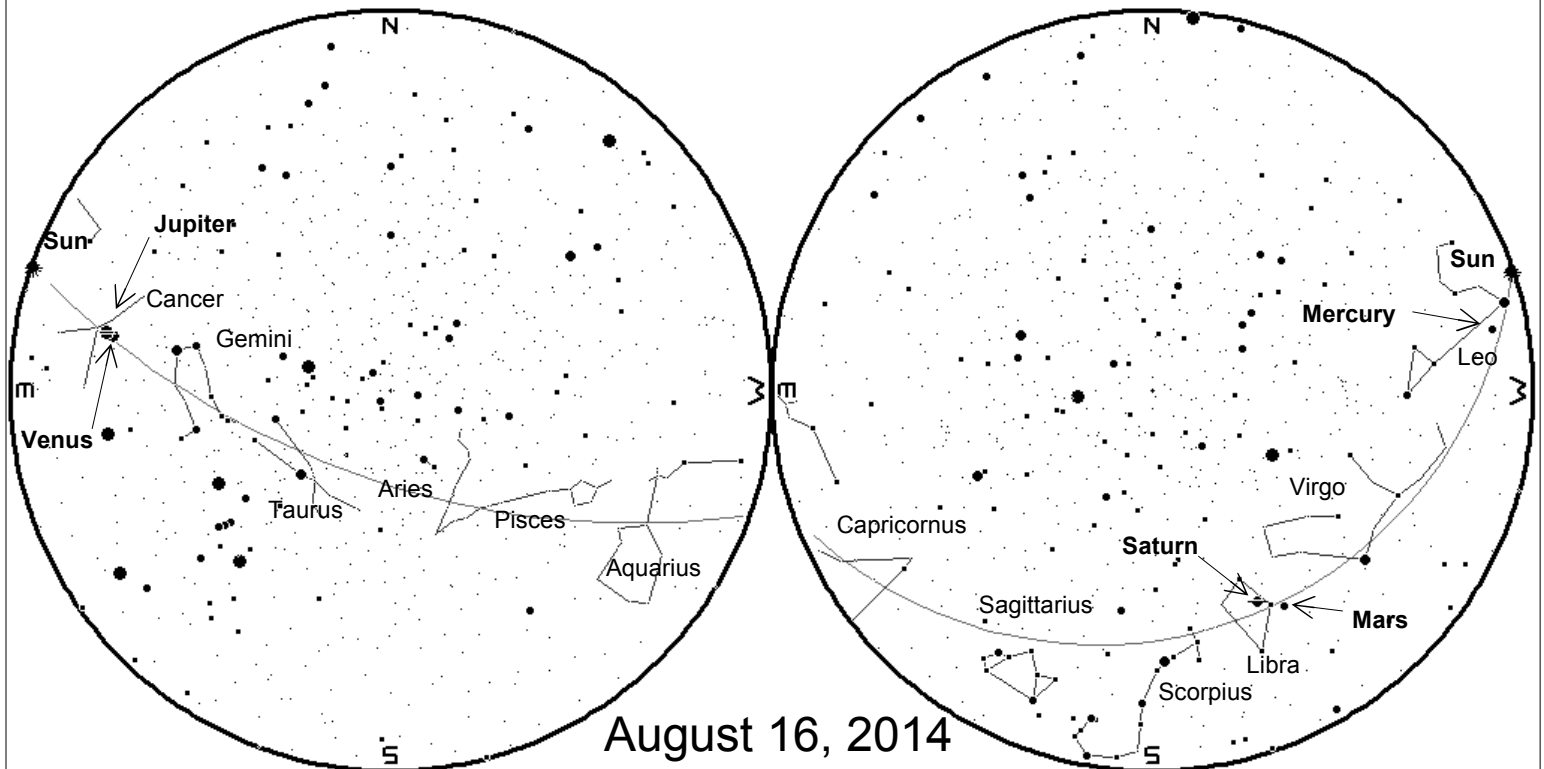
August 1st, 6th, 11th, 16th, 21st, 26th, & 31st



The Planets as Seen From Northern Michigan

Sunrise

Sunset

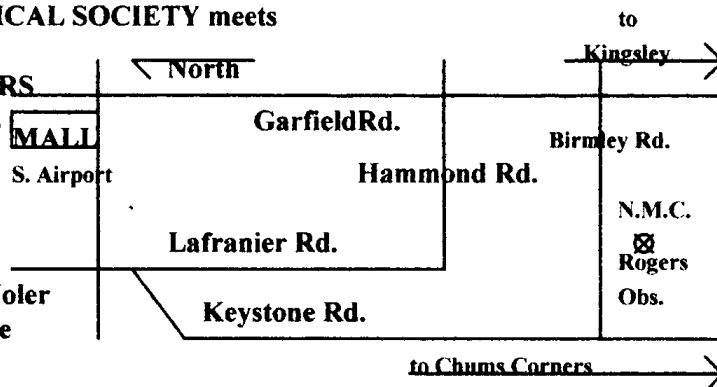


CELESTIAL CALENDAR

Aug 02	7:26 a.m.	Moon at Ascending Node
02	9:27 a.m.	Spica 2.3°S of Moon
03	6:02 a.m.	Mars 2.2°S of Moon
03	8:50 p.m.	FIRST QUARTER MOON
04	6:54 a.m.	Saturn 0.0°N of Moon: Occn.
06	6:29 p.m.	Venus 6.5°S of Pollux
08	12 p.m.	Mercury at Superior Conjunction
10	1:43 p.m.	Moon at Perigee: 356897 km
10	2:09 p.m.	FULL MOON
12	8 p.m.	Perseid Meteor Shower peak
14	8:18 p.m.	Moon at Descending Node
17	8:26 a.m.	LAST QUARTER MOON
18	1:05 a.m.	Venus 0.9°S of Beehive
18	2:48 a.m.	Jupiter 1.1°S of Beehive
18	1:46 p.m.	Aldebaran 1.6°S of Moon
24	2:09 a.m.	Moon at Apogee: 406523 km
25	10:13 a.m.	NEW MOON
27	1:33 a.m.	Mercury 3.4°N of Moon
29	9 a.m.	Neptune at Opposition
29	9:14 a.m.	Moon at Ascending Node
29	3:08 p.m.	Spica 2.5°S of Moon
31	3:21 p.m.	Saturn 0.4°S of Moon: Occn.
31	7:43 p.m.	Mars 4.1°S of Moon

Calendar of Astronomical Events Courtesy of Fred Espenak, www.AstroPixels.com

The GRAND TRAVERSE ASTRONOMICAL SOCIETY meets on the first Friday of each month at the NORTHWESTERN MICHIGAN ROGERS OBSERVATORY at 8 p.m. The public is invited to attend all Society functions as our guests. We are a non-profit group dedicated to the study of astronomy and the sky above us. If you would like more information on GTAS, please call Bob Moler at 946-8649, or write to the address on the last page of this publication.



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The Stellar Sentinel

Bob Moler, Editor

6003 Secor Rd.

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Stellar Sentinel Extras for August 2014

Musings by your editor, Bob Moler

Here is a full size version of the image that accompanied the *Invisible Shield of our Sun* article.

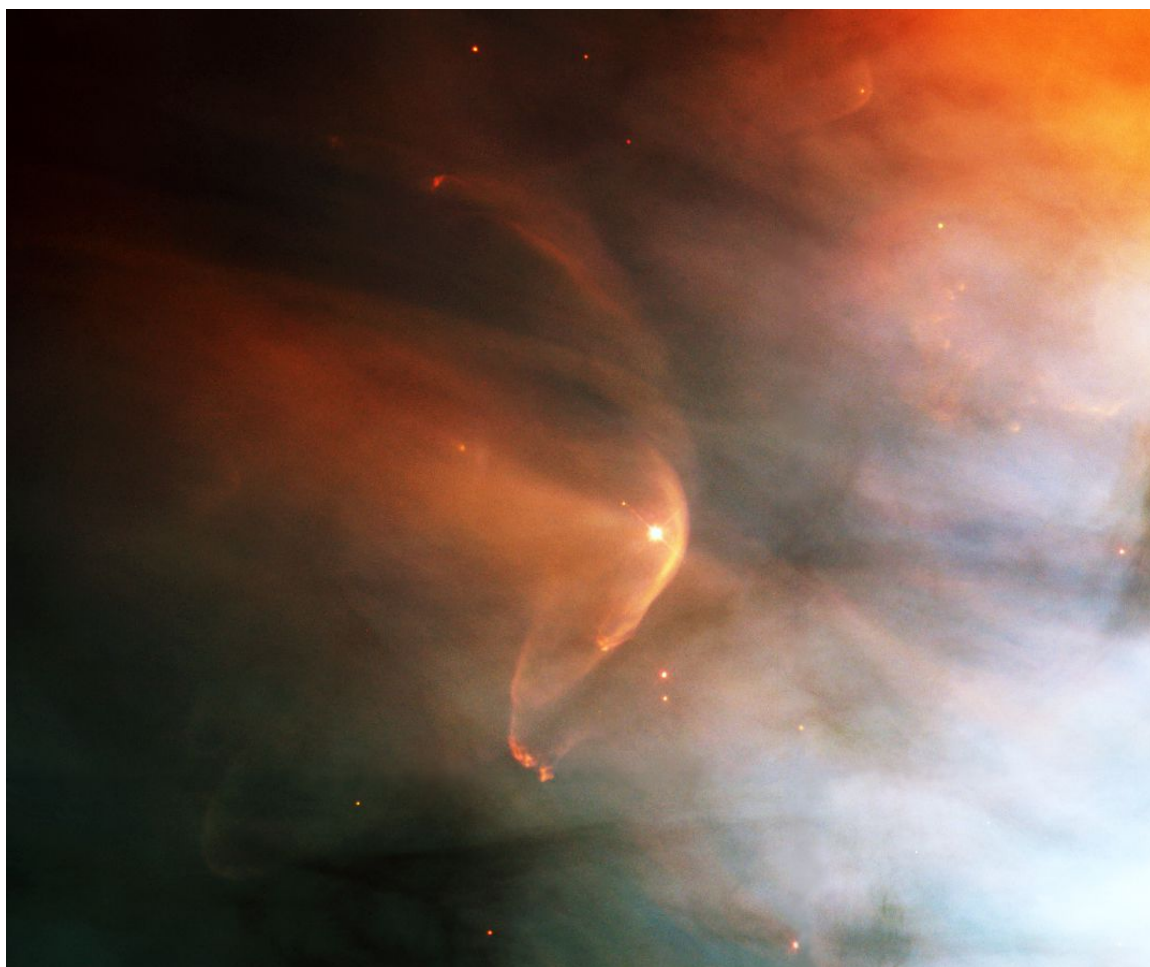


Image credit: Hubble Heritage Team (AURA / STScI), C. R. O'Dell (Vanderbilt), and NASA, of the star LL Orionis and its heliosphere interacting with interstellar gas and plasma near the edge of the Orion Nebula (M42). Unlike our star, LL Orionis displays a bow shock, something our Sun will regain when the ISM next collides with us at a sufficiently large relative velocity.

Where are the Perseid meteors this year?

On the night of the peak, August 12-13, the moon will be just past full making all but the brightest meteors invisible. But in the week or two before peak the Perseids will be increasing their numbers. Start looking for them after moonset. They will seem to come from the northeast but the radiant will be rising throughout the night.

Supermoon, Smoopermooon

Pardon me if I don't get excited by the fact that we are going to have a "Supermoon" August 10th. On the night of the full moon it will be at perigee, its closest point to the Earth in its orbit. The distance according to our Celestial Calendar page is 356,897 kilometers. That's 221,766 miles. At apogee this month, on the 24th, the moon will be 406,523 kilometers, or 252,602 miles away. That's somewhat larger than 11 percent difference in distance, due to the Moon's elliptical orbit. The name for the smallest moon is micromoon. Either is an exaggeration of terms.

I don't remember the supermoon term growing up. Wikipedia says it was coined by astrologer Richard Knolle in 1979 according to his web post from 2011. Oooo, an astrologer.

There's a profession astronomers can respect.
</snark>*

Being a relatively old guy, 1979 was well past my formative years as an amateur astronomer and even four years after I started producing my Ephemeris programs for Interlochen Public Radio. Yet I only remember supermoon being a big deal for the last few years.

The actual size of the supermoon aside, folks mistake the normal optical illusion of an enlarged moon rising as the supermoon. The moon always looks larger when it's near the horizon than when it's high in the sky. The same thing happens to the sun, it looks larger rising and setting, the when higher in the sky. Caution: Use a solar filter to observe the sun. In photographs the Moon is the same size whether on the horizon or high in the sky. Actually the horizon moon will appear slightly smaller on the horizon. One, it will be squished vertically by the action of the refraction of the earth's atmosphere. Two, it is nearly 4,000 miles farther away at the horizon than at the zenith, where we're the radius of the Earth closer to the Moon.

I challenge anyone to be able to actually detect, by looking at the moon in the sky, whether they are looking at a supermoon or not. There's nothing of comparable size out there. The same thing will happen when one thinks the full moon is so white. OK, there's some gray too. However the Moon's total albedo of reflectance is 0.136 or 13.6%. Some say 0.07 or 7%, comparable to a charcoal briquette. If one could get Saturn's moon Enceladus, with nearly a 100% albedo, next to the Moon without it turning into a comet by sublimating away, the dinginess of our Moon would be immediately obvious.

* </snark> For the uninitiated: This is a takeoff on HTML (hypertext markup language) tags that direct how text or other items are displayed or linked. For example "This is printed in BOLD letters." will display as "This printed **in BOLD** letters.". The beginning tag is rarely used in emails, or posts. </snark> just means that the prior passage was a snarky remark.



Source: Wikipedia. The "Supermoon" of March 19, 2011 (right), compared to a rather "average" moon of December 20, 2010 (left): note the size difference. Images by Marco Langbroek, the Netherlands, using a Canon EOS 450D + Carl Zeiss Jena Sonnar MC 180mm lens.