Spot the Stars of the Summer Triangle

By DAVID PROSPER of the NASA Night Sky Network
Edited by BILL DAVIDSON

September skies are a showcase for the **Summer Triangle**, its three stars gleaming at directly overhead after sunset. The **equinox** ushers in the official change of seasons on September 23. The moon will be 8.9 days old, 64% illuminated in Sagittarius. Jupiter will rise in Aries, while Uranus follows closely behind. Neptune preserves its watch over its aquatic domain in the constellation of Pisces, and Saturn remains vigilant in Aquila.

The bright three points of the **Summer Triangle** are among the first stars you can see after sunset: Deneb, Vega, and Altair. The Summer Triangle is called an **asterism**, as it's not an official constellation, but still a striking group of stars. However, the Triangle is the key to spotting multiple constellations! Its three stars are themselves the brightest in their respective constellations: Deneb, in Cygnus the Swan; Vega, in Lyra the Harp; and Altair, in Aquila the Eagle. That alone would be impressive, but the Summer Triangle also contains two small constellations inside its lines, Vulpecula the Fox and Sagitta the Arrow. There is even another small constellation just outside its borders: diminutive Delphinus the Dolphin. The Summer Triangle is huge!

The **equinox** occurs on September 23, officially ushering in autumn for folks in the Northern Hemisphere and bringing with it longer nights and shorter days, a change many stargazers appreciate. Right before sunrise on the 23, look for Deneb - the Summer Triangle's last visible point - flickering right above the western horizon, almost as if saying goodbye to summer.

continued

RAC Events

For more information go to *Rochesterskies.org*

Sep 8 *Fri* Public Sky Observing at Dodge Center Public Library 7:00-10:00 pm

Sep 9 *Sat* Public Sky Observing at Root River Park at 8:00-10:00 pm

Sep 12 *Tue* Sep Monthly Club Meeting at RCTC 7:00-9:00 pm

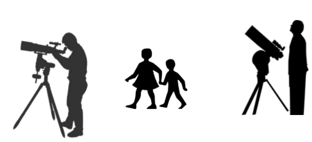
Sep 19 *Tue* Public Sky Observing in Elgin at Plainview Elgin Millville Middle School 8:00-10:00 pm

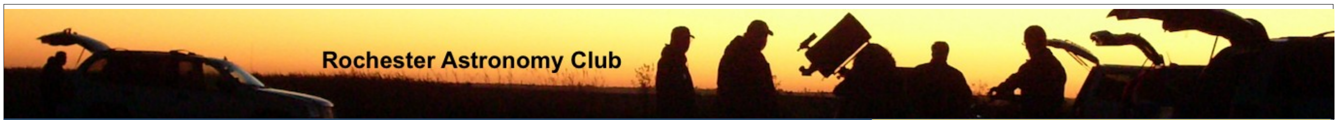
Sep 22 *Fri* Public Sky Observing at Watson Soccer Field 7:30-9:00 pm

Sep 23 *Sat* Public Sky Observing at Frontenac State Part 8:00-10:00 pm

Oct 7 *Sat* Public Sky Observing Root River Park at 7:30-9:30 pm

Oct 10 *Tue* Oct Monthly Club Meeting at RCTC 7:00-9:00 pm





Spot the Stars of the Summer Triangle

The Summer Triangle region is home to many important astronomical discoveries. Cygnus X-1, the first confirmed black hole, was initially detected here by x-ray equipment on board a sounding rocket launched in 1964. NASA's Kepler Mission, which revolutionized our understanding of exoplanets, discovered thousands of planet candidates within its initial field of view in Cygnus. The Dumbbell Nebula (M27), the first planetary nebula discovered, was spotted by Charles Messier in the diminutive constellation Vulpecula way back in 1764!

Stargazers can easily spot Saturn, shining low in the southeast after sunset, while Jupiter gradually rises in the east. During the onset of September, the moon will rise in the east shortly before 9:00 pm local time, followed by Jupiter at 10:30 pm, and Mars will have already set in the west. On the evening of October 1, the gas giant and the Moon pair will rise together shortly after 8:00 pm, providing an awe-inspiring spectacle.

Permission granted by Night Sky Network

Fall Issue Content

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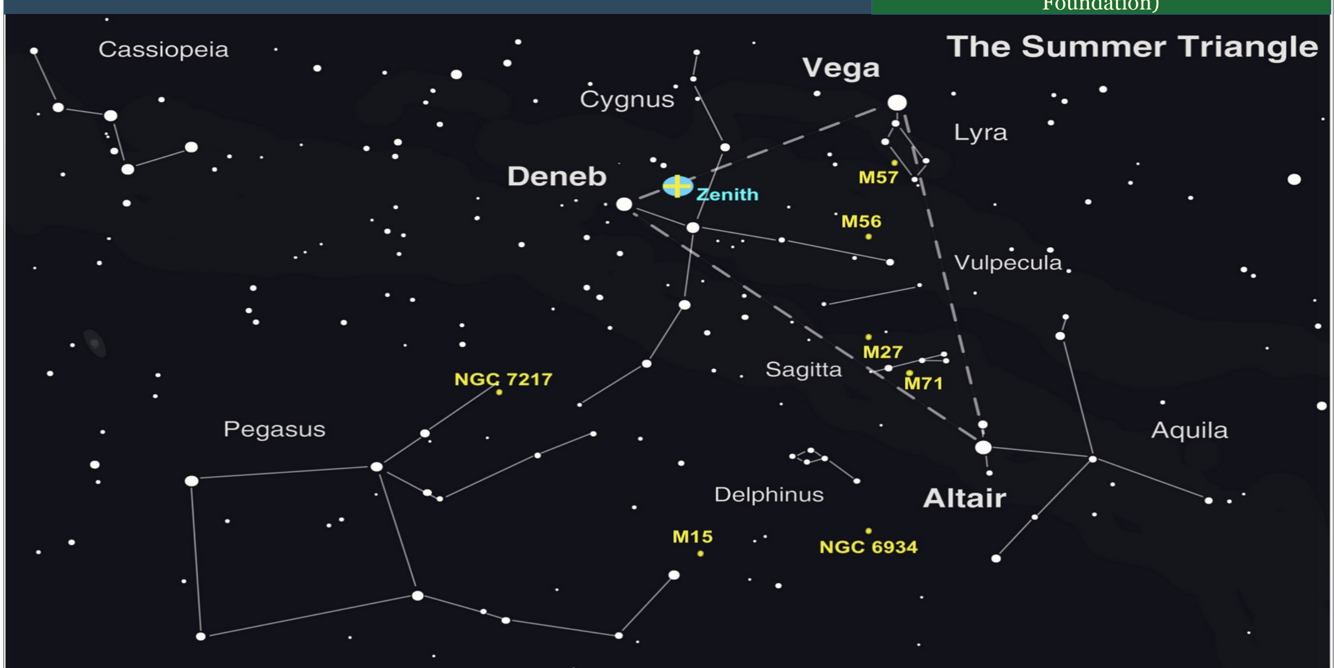

Astro Photo Editing by *RAC* member Mike Benson

I recently had the opportunity to interview Mike Benson, an active member of the Rochester Astronomy Club. During our conversation, Mike shared his passion for astrophotography editing and how he first became interested in the field. Learning about his journey and what he hopes to achieve with this endeavor was fascinating. Here's a summary of Mike's responses to my questions.

What got you started in editing astro photos?

About 4 years ago, I bought a Nikon camera and started taking pictures as a hobby in retirement. I thoroughly enjoyed pictures of wildlife and landscapes. As I got "into" photography, I remember writing down a quote from Ansel Adams. "The raw file is the equivalent to the composer's score, while developing the image is the performance." The more I looked at my raw files, the more I became aware of the importance of "developing the image". This was where artistic expression begins. I make no claims about being an artist; I just love trying to make a good compelling image from raw files that meets my eyes perception of art.

I quickly discovered Lightroom and Photoshop and realized these software packages offered me avenues to "developing the image". After several Udemy courses, Sean Bagshaw courses, etc, etc, I became somewhat proficient at Photoshop and Lightroom. Last year I joined the Minnesota Astronomical Society, and shortly after joining, I won a drawing

continued

North Central Region of the Astronomical League Newsletter

Northern Lights[link] Summer Issue Table of Content

NCRAL ***Northern Lights***[link]

I invite you to check out our regional newsletter, ***Northern Lights***, which features exciting observational programs, the latest astronomical news from the north-central states, essential updates from the Astronomical League, and so much more that you won't find anywhere else.

When you come across a word followed by **link**, simply click on it, and you'll be taken to its corresponding webpage.

Astro Photo Editing

held at a club meeting. The drawing was for a one year membership to Masters of “developing the image”. This was where artistic expression begins. I make no claims about being an artist; I just love trying to make a good compelling image from raw files that meets my eyes perception of art.

I quickly discovered Lightroom and Photoshop and realized these software packages offered me avenues to “developing the image”. After several Udemy courses, Sean Bagshaw courses, etc, etc, I became somewhat proficient at Photoshop and Lightroom. Last year I joined the Minnesota Astronomical Society, and shortly after joining, I won a drawing held at a club meeting. The drawing was for a one year membership to Masters of Pixinsight (MOP). MOP was a great start to develop my skills with a key astrophotography editing tool, PIXINSIGHT. This has become the principal astro editing tool in my arsenal. While Pixinsight is technical, this software allows you to do almost everything one would want to do in developing astro images.

Where do these “raw” files come from?

All of the pictures I’ve developed have come from someones’ raw files. In some cases, there are over 200 images of single deep sky object (the comet is an example). A few of these raw files are my own, some are from Telescope Live’s CCD or CMOS camera in Chile, Spain, or Australia, some are from a training course on Astrophotography development, and some are from websites such as MAST[LINK] and MistiSoftware[LINK].

There are many generous astro buffs donating their raw images.

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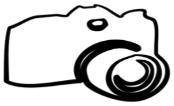
My first deep-sky object, M31. About 20, 5 minute subs through my Sky Watcher Esprit 100 and a OSC camera. Edits in Pixinsight.

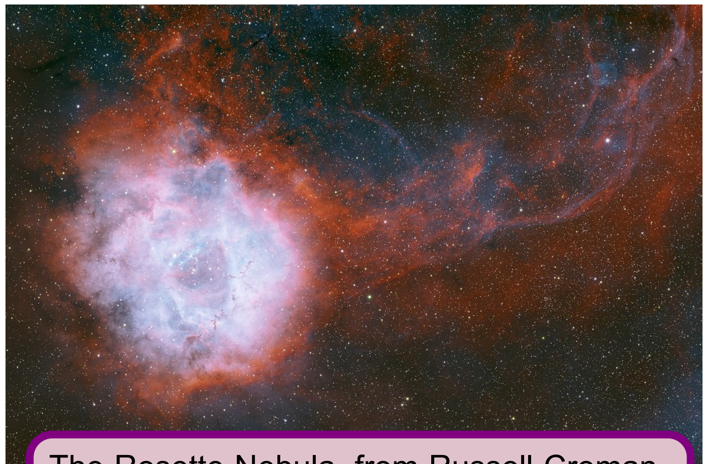


Astro Photo Editing

What is it that creates your enthusiasm for astrophotography?

When you look at what the camera has captured in a single raw file of an astro image, you will see stars, ... an occasional smudge, a slight blur, or very faint nebula formation. What happens when you do your first histogram stretch is the beginning of pure magic. The stacking of images to greatly improve the signal to noise, the star alignment, correction of cosmic rays and satellites, the integration of these images, the color adjustment, deconvolution, etc., . . . it is an unveiling, a sensuous trip into something that is buried in the raw files. Don't get me wrong, the initial composition is key, but what you do with the composition is what adds so much to the image. Every time I examine a finished image, I am enthralled with the beauty of what our cosmos has to offer. As I look at the Rosette Nebula, I am awed by how his structure was made, how it changed and how it will change in the future. When you see something that is 10's of light years across and realize that in a few 100 million years it will be completely gone, you have to marvel at the wonder our universe.

continued



The Rosette Nebula, from Russell Croman. This was a narrowband image. Telescope, a Takahasi 106. Edits in Pixinsight.

NGC3132, a James Webb Telescope image taken with NIRCAM. The narrowband editing was done in Pixinsight with some color tweaking in Photoshop. The NIRCAM data was mapped to an RGB color space according to wavelength.

Astro Photo Editing

What are some of your favorite images?

My favorites include Andromeda, Rosette Nebula, Orion Nebula, Veil, NGC3132, the comet, Eta Carina, . . . ah, I could go on for awhile. I think I've done close to 30 edits so far.

My initial astro image was the Milky Way. While it showed me that my camera could capture the Milky Way in Rochester, it was nothing compared to the wow I felt when I first stretched Andromeda. One stretch and I was hooked. The raw image of Andromeda is something that remains very compelling to me. This image showed me what is buried in the raw file.

The process of editing an astro image is somewhat technical. I try to preserve the structure details in an image. As a color blind individual, I make no claims that the colors are absolutely correct. What I edit is my own vision through my eyes. The edit must be new, fun, and my own. I've compared some of my edits to what others have done, and what I have found is that I must go where my vision takes me. In some cases it will be close to what others see and some it will be just my own vision. I've learned to be satisfied with what I see.

Comet C2022E3(ZTF), from Adam Blocks data. This editing was done in Pixinsight. Picture taken on January 25, 2023.

Well I must say, Mike had a different story to tell. After thinking about what he said, it kinda sounds like an old man enjoying himself in his retirement years. If you have more questions for Mike or would like another interview, just drop me a line. As always, keep looking up.

Scattered History Notes from 2008

During February, a presentation was given by the ***RAC*** Secretary, **Nicole Edgar**, titled "Seven Sisters".

Randy Hemann, President
Kirk Severson, Vice President
Rebecca Bomgaars, Treasurer

Rochester's Sky

September

4th Moon near Jupiter with Uranus trailing behind.

11th Morning crescent Moon near Beehive Cluster, M44. Venus rising.

14th Good opportunity to spot the thin crescent Moon just before sunrise.

23rd September Equinox 1:50 am CDT

29th Harvest full Moon

Mercury ☿

Greatest western elongation on Sept 22nd with the bright planet rising 100 minutes before sunrise.

Venus ♀

Impressively bright morning planet, visible against dark skies at the end of the month, rising four hours before sunrise.

Mars ♂

Not visible this month.

Jupiter ♃

Bright morning planet reaching its highest position under darkness from mid-month. The Moon is close on Sept 4/5.

Saturn ♄

Evening planet, currently well presented. Reaches 24° altitude under dark sky conditions.

Uranus ⛢

Morning planet near Jupiter. Peak altitude, due south, in a dark sky mid-month onwards.

Neptune ♆

Binocular planet, reaching opposition on Sept 20th.

Rochester's 2023 Moon Phases

Aug	1:○,	8:◑,	16:●,	24:◐,	30:○
Sep	6:◑,	14:●,	22:◐,	29:○	
Oct	6:◑,	14:●,	21:◐,	28:○	
Nov	5:◑,	13:●,	20:◐,	27:○	
Dec	4:◑,	12:●,	19:◐,	26:○	

October

1st Morning Moon close to Jupiter.

14th **Partial Solar Eclipse**LINK from 10:30 am to 1:13 pm with maximum eclipse at 0.576 magnitude 11:49 am.

20th The current period is marked by the season of Jupiter, during which an exceptional double shadow transit involving Ganymede and Io will take place on this date from 12:58 am to 2:41 am CDT.

21st/22nd Orionid meteor shower peak (favorable)

Mercury ☿

Best during first week of October, bright in the morning. Lost after.

Venus ♀

Brilliant morning planet at greatest western elongation on Oct 24, 46.4° from the Sun.

Mars ♂

Not visible this month.

Jupiter ♃

Jupiter is very bright (mag. -2.8) and really well placed this month in southern Aries.

Saturn ♄

Well placed evening planet in Aquarius. A gibbous Moon is nearby on the evenings of October 23rd and 24th.

Uranus ⛢

Well-placed near Botein (Delta Arietis). Jupiter nearby; both joined by a gibbous Moon on October 1st/2nd.

Neptune ♆

Well-placed evening planet. Reaches highest point, due south in darkness all month. Requires binoculars to see.

continue

Rochester's Sky

For planets visible in **tonight's sky** in Rochester, Minnesota, click **TONIGHT**.

For further information on the partial eclipse on **October 14th** click **ECLIPSE**.

Global Event:	Annular Solar Eclipse
Local Type:	Partial Solar Eclipse in Rochester, Minnesota
Begins:	Sat, Oct 14, 2023 at 10:30 am
Maximum:	Sat, Oct 14, 2023 at 11:49 am 0.576 Magnitude
Ends:	Sat, Oct 14, 2023 at 1:13 pm
Duration:	2 hours, 44 minutes

FALL 2023: JUPITER

September '23 ALL TIMES ARE CDT **October '23 ALL TIMES ARE CDT**

GRS: Great Red Spot **IS:** Io shadow **ES:** Europe shadow **GS:** Ganymede shadow

Date	GRS Transit	Transit of Moon	Date	GRS Transit	Transit of Moon	Date	GRS Transit	Transit of Moon	Date	GRS Transit	Transit of Moon
1	02:32, 22:23		**16**			**1**			**16**	04:36	
2			**17**			**2**	03:05, 22:57	ES 20:35	**17**	00:23, 20:14	ES 01:46
3	04:10		**18**	01:34, 21:25	IS 04:04	**3**			**18**		
4	00:01	IS 00:16	**19**		IS 22:33	**4**	04:44	IS 02:21	**19**	02:01, 21:52	
5	05:48		**20**	03:12, 23:03		**5**	00:35, 20:26	IS 20:50	**20**		IS 00:39 GS 00:56
6	01:40, 21:31		**21**			**6**			**21**	03:39, 23:30	
7		GS 00:48 ES 23:29	**22**	04:50	ES 04:41	**7**	02:13, 22:04		**22**		
8	03:18, 23:09		**23**	00:41, 20:33		**8**			**23**	05:17	
9			**24**			**9**	03:51, 23:42	ES 23:10	**24**	01:13, 21:04	ES 04:22
10	04:56		**25**	02:20, 22:11		**10**			**25**		
11	00:48, 20:39	IS 02:10	**26**			**11**	05:29	IS 04:16	**26**	02:51, 22:43	
12		IS 20:39	**27**	03:58, 23:49	IS 00:27	**12**	01:20, 21:12	GS 20:55 IS 22:44	**27**		IS 02:34 GS 04:57
13	02:26, 22:17		**28**			**13**			**28**	04:29	IS 21:02
14		GS 04:49	**29**			**14**	02:58, 22:50		**29**	00:21, 20:12	
15	04:04, 23:56	ES 02:05	**30**	01:27, 21:19		**15**			**30**		
									31	01:59, 21:50	

Planetary Nebula – The Future of Our Sun

By John Attewell, Ph.D.

From the February 2023 Issue: The author, a member of the Rochester Astronomy Club, chose to observe the Ring Nebula (M57) during a public observing event. They and other docents disagreed about the nebula's width and decided to research its actual values. The author found that M57 is 2567±115 lightyears away, 16,000 years old, and has a diameter of 1.3 ± 0.8 lightyears. Planetary nebulae like M57 are formed from stars like our sun; only around 3,000 have been discovered. M57 was one of the first planetary nebulae discovered by Charles Messier in 1779 and was later classified as a "planetary nebula" by William Herschel. In 1864, William Huggins collected a light spectrum of the planetary nebula called the "Cat's Eye." He discovered that the emission lines corresponded with hydrogen and doubly ionized oxygen, not an unknown element he called "Nebulium." In 1910, Henry Norris Russell discovered a dim star that was not of spectral class M but of spectral class "A."

BIRTH All stars begin their life as clouds of hydrogen, but not all stars are created equal. Some clouds of hydrogen gas are small, and some are gigantic. Gravity begins to compress the cloud into a sphere of hydrogen gas. All stars, when they first begin to shine, burn hydrogen. The pressure at the core of this sphere is so great that a nuclear reaction occurs; hydrogen fuses into helium. The fusion also produces neutrinos and hot gamma rays. Even the most miniature fusion cores have a minimum temperature of 10 million Kelvins (18 million degrees Fahrenheit). This intense heat trying to escape from the core prevents gravity from further crushing the entire star. So, for a time, a stable nuclear reaction takes place. Our Sun is currently in that stable state.

All stars, no matter their size, have this same beginning. Besides size, the only difference among young stars is the surface temperature. Big stars have hotter surface temperatures, and smaller stars have cooler surface temperatures. A star's color is directly related to its surface temperature. Astronomers discovered that the star's color can be determined accurately by its light spectrum. Also, luminosity (the light intensity) is related to a star's size. Since the spectrum and light intensity can be directly measured from Earth, we can easily derive different stars' surface temperature and size. The relationship of all stars in this young state has a curvilinear relationship between size and surface temperature/ luminosity/ color. A graph of this linear relationship is called a Hertzsprung-Russel diagram, and the stars that fall on the curvilinear part are called "main sequence stars." Not all stars fall on the main sequence, but all young stars do. Main sequence red stars are smaller and cooler than yellow stars, which are medium-sized and warmer, but they, in turn, are cooler and smaller than blue stars, which are huge and hot. Main sequence blue-white stars are the hottest and the largest. Even with this variety, you might say that the main sequence is the nursery of all young stars, whether they are born large or small.

continued

Planetary Nebula – The Future of Our Sun

Teenage Stars

As previously mentioned,all young stars burn hydrogen in their cores. Large stars burn hydrogen more quickly than small stars. From its birth, our sun has enough hydrogen to burn for about 10 billion years. As the hydrogen burns, helium is created and, heavier than hydrogen, sinks to the center of the core. A new non-reactive core begins to develop with a fusing hydrogen shell forming around it. Very large stars will not be in this state for very long, but since our Sun is medium-sized and has already been a star for about 4.6 billion years, it will remain so for another 5.4 billion years.

Middle Age

Now things get crazy. Based on their size, maturing stars will begin to take separate paths on the Hertzsprung-Russel graph. Young stars may start on the main sequence, like the straight quill of a feather. But maturing stars branch off the quill-like barbs of a feather; very old stars diverge even further. The linear relationship between size, surface temperature, luminosity, and color nolonger applies. Neutron stars, supernovae, red giants, carbon stars, brown dwarfs, the Cepheids, and white dwarfs are just a few of the wild menagerie that spins off the main sequence.

From here, we will only follow stars, like our sun, that form a planetary nebula.

Our sun is classified as a yellow dwarf. All yellow dwarfs have masses of 0.9 to 1.1 solar mass. Based on its spectrum, the sun is also classed as a G-type main-sequence star. All planetary nebulae form from stars between 0.9 to 3 solar masses[1]. Main sequence stars of this size range are of the B, A, F, and G spectral classes and can all become planetary nebulae.

When the hydrogen begins to run out, the star cannot generate enough heat to counteract gravity. In a short time, the star starts to collapse again, creating more pressure on the remaining hydrogen shell, which speeds up hydrogen fusion, becoming hot enough to make the star brighter and, with enough new heat, expands the outer surface layers. The star becomes a red giant[2]. The red-giant phase typically lasts only around a billion years. Examples of red giants are Epsilon Ophiuchi (a G-type), Arcturus (a K-type), Gamma Comae Berenices (a K-type), and Aldebaran (a K-type). These stars have very large diameters.

continued

1 Some references declare stars of 1-8 solar masses will form planetary nebulae.
2 Not to be confused with a “red supergiant.” A red supergiant is a different animal that ends its life in a spectacular supernova.

Planetary Nebula – The Future of Our Sun

When our sun becomes a red giant, it will grow so large that its surface will engulf Mercury, Venus, possibly Earth, and maybe even Mars.

As the hydrogen shell continues to burn, more helium builds up in the core until, finally, the helium core ignites. Burning helium creates lots of energy; much more heat than hydrogen fusion. So much heat that the star boils, and parts of the surface begin to “puff off.” Thus, the red giant throws nebulous gas into space. This process of helium fusion is not continuous. It starts and stops in fits causing pulsations on the surface and in the atmosphere. This ejected gas races away at tremendous speed (15 to 50 km/second). Over time this creates a layered nebular look resembling the layers of an onion. Also, the star's rotation, magnetic fields, and the presence of planets and companions further create strange and beautiful patterns in the nebular gas.

Helium fusion also creates carbon and oxygen, which, being heavier than helium, begin to sink and form a new core. The heat of helium fusion is so intense that ultraviolet light is the primary radiation that leaves the star. The escaping ultraviolet light causes the nebular gases to ionize and, thus, glow in visible light. When the glowing nebula becomes large enough, we see it as a planetary nebula. The nebula phase, however, does not last long. The expanding luminescent material eventually disperses and cools, becoming invisible in about 20,000 years. This short period of glowing is why we see so few planetary nebulae in our corner of the galaxy.

Old Age

But the aging process of these stars is still ongoing. As more and more carbon and oxygen accumulate and less and less hydrogen and helium are available for fusion, the core becomes exposed as a dense white-hot star. We call those stars “white dwarfs.” Henry Norris Russell observed this type of star when he examined 40 Eridani B. They are dense stars compressed into small earth-like objects that are so hot that most of their radiation can only be seen in the ultraviolet range – beyond the spectrographic methods of Russell’s day.

John will conclude his series on the future of our sun next time in ***RochesterSkies***.

An infrared Spitzer Space Telescope image of the Dogg Nebula (NGC 246). Credit: NASA/JPL.

FRONTENAC SUMMER BY JOSEF CHLACHULA

RAC met on Saturday, July 29, in Frontenac State Park overlooking Lake Pippen and the Mississippi River. Camp visitors had the opportunity to observe the 11.7-day-old moon through telescopes, revealing numerous formations that stood out, particularly on the terminator and other objects. Although the International Space Station was visible to the naked eye, faint objects were not discernible due to the excessive brightness emanating from the moon.


Mike is getting ready his telescope on tripod equatorial mount.


Randy Hemann talks about stars.

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