

# THE BLUE MOON OBSERVER

## JANUARY, 2018

The January general meeting is replaced every year by the **Annual Banquet**. Although our meetings are the first Tuesday of the month, this year the first Tuesday in January falls so close to the New Year holiday that the Annual Banquet will be held on **Tuesday, January 9** with social hour at **5:30 PM** at the **Lodge at Leathem Smith**. We will order from the menu and pay individually. Dinner at 6:30 PM.



### Door Peninsula Astronomical Society

Mailing Address:

**P.O. Box 331**

Sturgeon Bay, WI 54235

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### *Notes from Our Meeting* *5 December, 2017*

*President Gary Henkelmann welcomed 20 members plus a few guests on a cold blustery night. Announcements: Our newest members are Todd and Cheryl Rockway, bringing our total membership to 61 families. Gary gave us an overview of last month's activities: Nov. 13<sup>th</sup> was the Fall landscaping clean-up and thanked organizer, Barb Henkelmann, and DPAS members Dr. John Beck, Susan Basten, Coggin Heeringa, Dan and Margi Andrae, Kathy Tryner and Jim Williamson for helping out. The Nov. 18<sup>th</sup> Viewing was clouded out but several groups showed up and took an Observatory tour. At the Nov. 27<sup>th</sup> board meeting, they approved the 2018 program schedule and budgeted equipment for the Observatory and mound area repairs. Steve Ransom-Jones commented on the upgrades to*

*the Observatory computer, which they hope will make it easier for the members to use and to procure a larger sensor for viewing nebulae.*

*Coming up on Saturday, Dec. 16<sup>th</sup> is the monthly Viewing Night.*

*The DPAS Annual Banquet will be held at The Lodge at Leathem Smith, Sturgeon Bay. Social hour is scheduled for 5:30 pm and dinner at 6:30 pm. The Viewing Night is Jan. 13<sup>th</sup> and viewing objects are the Beehive Cluster, Eskimo Nebula and M46 Open Cluster.*

*Tom Minahan announced that Dr. John Beck won 3<sup>rd</sup> place at a recent Rib Fest held at The Lodge at Leathem Smith, which brought a round of applause.*

*Jacque Axland reported on next year's NCRAL Conference coming up on May 4-5, 2018. They hope to have the website up and running soon. The shirts and banners are ordered.*

*Steve Ransom-Jones gave an overview*  
**continued on page 3**

## The Beauty, Mystery and History of the Crab Nebula



### Who We Are

DPAS is a local club and chapter of the Astronomical League. We are also a club member of the International Dark-Sky Association and the Night Sky Network, teaching arm of the Astronomical Society of the Pacific. We meet on the first Tuesday of every month, with rare exception. Meetings are held at the Ray & Ruthie Stonecipher Astronomy Center unless otherwise announced. We operate and maintain the Leif Everson Observatory which houses a 14" Celestron Schmidt-Cassegrain telescope on a sophisticated tracking mount controlled by computer, a weather station housed in the observatory with current readings shown on our web site:

[www.doorastronomy.org](http://www.doorastronomy.org)

The StarGarden near the observatory is used for viewing the sky with unaided vision, binoculars and members' telescopes. There are also binocular mounts set in concrete which allow viewers of different heights to view an object through the same binocular.

The Ray & Ruthie Stonecipher Astronomy Center, shown on the right at the top of this page, provides for storage, projects, meetings, warm-up and toilet facilities. It also houses a StarLab, an inflatable planetarium with a sophisticated projection system. The planetarium is available for group presentations.

An Analemmatic Sundial was dedicated on October 20, 2012.

The "astronomy campus" as described here is reached by taking Utah Street east to the stop sign and turning left through the gate onto Stargazer Way. Set your GPS to 2200 Utah.

The Crab Nebula is (or was) one of the most beautiful objects in the sky to view with a telescope. Behind this beauty is an astronomical mystery that spans almost a thousand years, which we will travel back in time to unravel.

If you look at the winter sky at the Orion asterism and then allow your eyes to drift upwards, you will see the 'V' shape of the head of Taurus. The Crab Nebula may be found near the tip of the horn of Taurus closest to Orion. Unfortunately, this celestial beauty is not visible to the unaided eye and will only appear as a ghostly smudge in binoculars. With a medium size telescope, you can start to make out the details and tendrils.

It was discovered in 1721 by John Bevis and then rediscovered by Charles Messier, who mistook it for a comet. Upon discovering his error, Messier decided to publish an almanac of stationary objects so that no future astronomer would make the same mistake, giving the Crab Nebula pride of place as object M1 in the Messier Catalogue. Lord Rosse, proud owner of a huge telescope in Ireland produced a series of sketches that showed a resemblance to a horseshoe crab, thus giving the heavenly object its popular name.

The Crab Nebula is around 6,500 light years away, spans 11 light years and is expanding rapidly at almost 1,000 miles per second. Photography shows that the expansion is not slowing, giving

rise to the first mystery: physics predicts that the expansion should be slowing unless something is providing energy to the nebula to power the expansion. What is this energy source?

As astronomy developed, spectroscopy was used to study the properties of distant objects. This new technique revealed further mysteries: the nebula was richer in helium than was expected and there was an unusual intensity of blue light. The blue light observed is normally associated with high energy electrons spiraling at near light speed through an intense magnetic field, an effect known as synchrotron radiation. What is that energy source accelerating the electrons to such a fantastic speed?

Finally, at the dawn of radio astronomy, astronomers noticed a number of regions that produced very regular pulses that were deemed far too regular to be natural. The Crab Nebula was one of these, emitting radio pulses 30 times a second. Later studies showed that this was also taking place in the X-ray and Gamma parts of the electromagnetic spectrum. When faced with unknown, complex phenomena, humankind can instantly 'resolve' the issue by applying a three letter acronym and thus these objects were designated LGMs (Little Green Men). But what is the energy source for these unusual transmissions.

Scientists reversed the expansion of the Nebula to attempt to determine the time of its origin, ***Continued on page 6***



### DPAS BOARD

Gary Henkelmann, President  
[president@doorastronomy.org](mailto:president@doorastronomy.org)

Thomas Minahan, Vice President,  
 Outreach Coordinator, and Board  
 Secretary

Susan Basten, Secretary, Treasurer,  
 ALCOR, and Membership  
 Chairperson  
[treasurer@doorastronomy.org](mailto:treasurer@doorastronomy.org)

John J. Beck, Past President and  
 Editor  
[editor@doorastronomy.org](mailto:editor@doorastronomy.org)

Jim Maki, Academic Coordinator

John W. Beck, Webmaster

Mike Egan, David Lenius, Jacque  
 Axland, and Steve Ransom-Jones,  
 Members at Large

Ray Stonecipher, in spirit

In addition, Barbara Henkelmann  
 serves as the DPAS Archivist.

The business of the DPAS is largely  
 conducted at the Board meetings to  
 leave the general meetings open for  
 programs. The Board meetings are  
 scheduled for 7 PM on Monday, 8  
 days prior to the following general  
 meeting, at the Astronomy Center.  
 Members of DPAS are invited to  
 attend Board meetings.

### *meeting notes from page 1*

*of next year's program schedule  
 which will include the video  
 course, "Nature of the Universe,"  
 and short monthly programs on  
 the Constellations.*

*The main program of the evening,  
 "Popular Misconceptions in  
 Astronomy" was presented by Dr.  
 John Beck. Reporting on about 30  
 common misconceptions, the  
 program was very informative and  
 entertaining. I'm sure there were  
 at least a few that may have led  
 some of us astray. His first  
 comment was that the "Big  
 Dipper" is not a constellation, but  
 an asterism and the sky is divided  
 up into constellations, Ursa Major  
 being one of them. There were  
 quite a few misconceptions about  
 our Moon, from its phases being  
 caused by the Earth's shadow to  
 the "half moon" has half the  
 effect on the tides as a "full  
 moon". Planets travel in circular  
 orbit around the sun (elliptical),  
 and the perennial favorite: Mars  
 appears larger than the moon on  
 August 23<sup>rd</sup> (Not!). A very  
 common misconception is that the  
 seasons are caused by the Earth's  
 distance to the Sun, instead of the  
 tilt of the Earth on its axis. A  
 video of the crowded asteroid belt  
 showed a very hazardous journey  
 but in reality, the asteroids are  
 very far apart. There is no sound  
 in space; Polaris is not the  
 brightest star in the sky (87<sup>th</sup>);  
 and during the vernal equinox you  
 can stand an egg on its end. (You  
 can try that trick at any time of*

*the year.) Another interesting  
 video demonstrated the Coriolis'  
 Effect in a tub of water at the  
 equator in Ecuador and then in  
 the northern hemisphere and the  
 southern hemisphere all in  
 different places on the same plaza.  
 This required a scientific mind to  
 see that the tests were rigged.*

*At the start of the experiment  
 "still" water at the "equator"  
 drained straight through, while at  
 the other two locations, pouring  
 the water from different directions  
 caused the water to circulate in  
 the tub before draining.*

*The planetary alignments cause  
 lots of consternation in a certain  
 group of believers and during a  
 full moon it has actually been  
 proven that it doesn't have the  
 effect of more babies being born,  
 nor are criminals more active nor  
 are there more visits to the ER.*

*A video showed what happens  
 during an aurora borealis that  
 starts with the sun hurling plasma  
 out into space during a solar  
 storm and gets deflected by the  
 Earth's magnetic field but  
 concentrated at the poles where  
 we see the stunning effects in the  
 night sky.*

*Another sun related topic is that  
 the sun rises in the east and sets  
 in the west in the same place  
 every day. Those of us who get up  
 early know that the sun moves  
 southward in the winter and back  
 north in the summer. The plot of  
 the sun from a specific location  
 forms a figure 8 pattern.*

**Continued on page 4**



## Astronomy Quiz

- I. A Black Widow is
  - A. An eclipsing binary
  - B. A millisecond pulsar
  - C. A neutron star
  - D. All of the above
  - E. None of the above
- II. Which of the following accepted a heliocentric model of the solar system?
  - A. Aristarchus of Samos
  - B. Ptolemy
  - C. Nicholas Copernicus
  - D. Galileo Galilei
- III. The habitable zone is determined by the mass of a star and \_\_\_\_\_.

### Meeting notes from page 3

The meteor show that took place in August was not particularly the brightest but when a meteorite enters the atmosphere it is not friction that causes it to vaporize, but the shock wave and compression that heats it up and vaporizes it. The last misconception Dr. Beck gave us had to do with the amount of time it would take to send and receive a signal from another civilization... not in an hour but many years would elapse. Dr. Beck took questions from the audience and talked a bit more about other effects on tides besides the moon. The sun, irregular coastlines, warm vs. cold water, etc., all have some influence on the oceans. The entire group was sure to learn something new from this well thought out and educational program.

The members adjourned to the refreshment table to find a clever display of constellations of small iced lemon sugar cookies, chocolate cupcakes with colorful nebulae frosting with tiny stars, a plate of both dwarf and giant star sugar cookies and mini Milky Way bars. Pat and Dennis Meyer also thought of those not seeking sweets and provided a plate of purple grapes and small tangerines. All were wonderfully tasty! Thank you Pat and Dennis! After the refreshments and a short social interlude, a panel of four DPAS members convened at the front of the room to begin the

short program "Ask the Amateur Astronomer." The amateur astronomers were Tom Minahan, Steve Ransom-Jones, Dr. John Beck and Dave Lenius, with Gary Henkelmann moderating. Tom started the program by cautioning everyone not to purchase a department store Christmas telescope for that budding astronomer in the family. They will be very disappointed. Instead, purchase a small telescope from Meade, Orion or Celestron and showed the group a \$59 telescope from Meade that was a much better buy. Also an old telescope from someone's basement is too frustrating to try to fix.

The next question was on the status of the ISS (International Space Station). On-going experiments have to do with longevity, plant growth and going to Mars. Scott Kelley, U.S. astronaut, has appeared on television recently, talking about experimenting with zero gravity and the debris encountered out in space. Budweiser sent some barley seeds to see if beer can be made on Mars. A question came up about the astronauts not having to wear space suits but it seems that they are too bulky to fit in the modules.

The next question for each of the participants was: What is your favorite viewing target?

Dave – Orion nebula because it's easy to find and interesting color variations.

**continued on page 5**



### Poetry Corner

Not from the stars do I my  
judgement pluck  
And yet methinks I have  
Astronomy,  
But not to tell of good or evil luck,  
Of plagues, of dearths, or seasons' quality  
Nor can I fortune to brief minutes tell  
Pointing to each his thinder, rain  
and wind,  
Or say with princes if it shall go  
well  
By oft predict that I in headen  
find:  
But from thine eyes my knowledge  
I derive,  
And, constant stars, in them I read  
such art  
As truth and beauty shall together  
thrive, If from thyself, to store  
thou wouldst convert;  
Or else of thee this I  
prognosticate:  
Thy end is truth's and beauty's  
doom and date.

William Shakespeare  
Sonnet 14

### Meeting notes from page 4

*Dr. John - M13, the Great Globular Cluster in Hercules.*

*Steve - Orion, Jupiter and the Andromeda Galaxy.*

*Tom – The Moon, not at full, but other times at the termination of light and dark bringing out the relief of mountains and valleys.*

*A question stumped the panel about the status of the radio astronomy project started by Kent Seeley, former DPAS member. The receiver is still on the premises but the location of other parts is unknown.*

*Do we have any data yet from the project involving turning all radio telescopes toward Sagittarius, the center of our galaxy? This was unknown but they surmised that it will take time to analyze the data.*

*The next question from the audience had to do with finding your way around the night sky. Dr. Beck suggested starting with the Big or Little Dipper since these are circumpolar and always in the night sky. Steve suggested using a planisphere to look for objects that would be visible. Star-hopping was illustrated by starting at the “W” of Cassiopeia, moving to Cepheus and ending up at the Garnet star. Monthly star charts are also very handy, available on the Internet. For the last comment of the evening, Tom mentioned calculating the trajectory of an object in the sky and the first object from outside our solar system turns out to be an elongated metallic object.*

*There being no other questions, the very educational and insightful meeting was brought to an end.*

**Notes by Barb Henkelmann in Mike Egan's absence**

**Editor's note: Thank you, Barb, for capturing and reporting the meeting!**

### Tentative Program Schedule 2018

**January:** Annual Banquet

**February:** Video: Fundamental Cosmological Building Blocks

**March:** Time and Relative Dimensions in Space - The Future of Space Travel

**April:** Video: The Smooth Expanding Universe

**May:** Measuring Gravity (Newton to LIGO).

**June:** Space, Time and Gravity

**July:** Atmospheric Physics of the Terrestrial Planets

**August:** Video: Cosmology in Einstein's Universe

**September:** Black Holes

**October:** Video: Galaxies and Clusters

**November:** Reserved

**December:** Video: Gravitational Lensing

Each month the supplementary program will be a series of lessons on “Learning the Night Sky”.



## Crab Nebula from page 2

arriving at a conclusion of 900 years earlier. In 1928 Edwin Hubble proposed that the origin of the Crab Nebula coincided with the Supernova of 1054.

Multiple observers in the Far East and Middle East had reported a 'guest star' in 1054 that was bright enough to be seen during the day and more intense than anything except the sun and moon. This star was visible with the unaided eye for more than two years. The lack of European records confirming this event is probably due to the continent suffering the ravages of the plague at the time. In 1942 Rudolf Minkowsky found a star with a very unusual spectrum at the location of the Supernove, although it now requires a 20 inch telescope to be observed.

With the advent of modern physics, we now believe that we have an answer to the mysteries of the Crab Nebula. Stars like our Sun generate their energy from fusing hydrogen into helium. There is a delicate balance within a star: gravity attracts the matter of the star into a hot, dense mass that allows fusion to take place. The radiation pressure from the energy released by this reaction resists this gravitational collapse. Stars like our sun find a balance between the gravitational collapse and the radiation pressure, which will last for another 5 billion years or so.

Larger stars form a core of helium which, if the pressure becomes large enough, start to fuse helium into Carbon and Oxygen, releasing even more energy, causing the star to expand due to the greater

radiation pressure. The Helium burning phase can last for around a million years. If the mass of the star is sufficient then Carbon (for about 1,000 years) and Oxygen (for around 100 days) can fuse into heavier elements (Neon, Magnesium, Silicon, Sulphur and eventually Iron), releasing even more energy at each, ever shorter, stage (Silicon fusion typically lasts for about 5 days). Iron is the 'break even' element as fusing Iron absorbs more energy that it produces.

We now have a recipe for a cosmic Anti-Soufflé, starting with the ingredients of a star about 10 times the mass of our sun with a 5 day old iron core that reaches a mass of about 1.4 solar masses. At this point the iron will start to fuse, absorbing energy, rapidly cooling the core and almost eliminating the radiation pressure. This will cause a sudden and rapid collapse (over 50,000 miles per SECOND), resulting in intense pressures that start to degenerate the matter of the core, which detonates in a huge nuclear explosion, ejecting 80% of the star.

Aha ... now we can link the Nebula, rich in Helium, to the explosion seen in 1054.

Meanwhile, in the core, matter collapses and degenerates into mostly neutrons, turning an object larger than the sun into something the size of the Door Peninsular, where one teaspoon of this neutron soup would weigh over a billion tons. Like a spinning figure skater drawing their arms inwards, this collapse makes the object spin much faster - to around 30 times a

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## Astronomy Quiz Answers

- I. The answer is d. A black widow is an eclipsing variable millisecond pulsar, a neutron star in orbit with a brown dwarf.
- II. All but Ptolemy. Even Aristarchus of Samos pictured the sun at the center of the movement of the earth. Ptolemy insisted that the earth was the center of the universe and all the sun revolved around earth
- III. The radius of the orbit of the planet. It is defined as the presumed temperature at which water can exist in its liquid state.

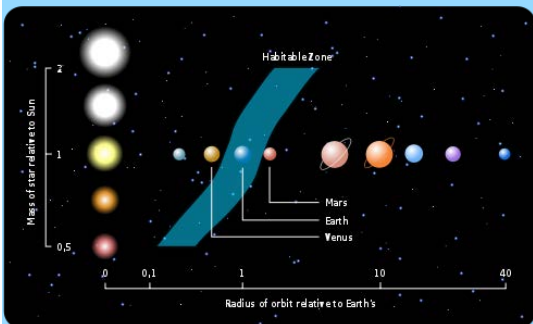


Image from Wikipedia

### **Crab Nebula from page 6**

second in the case of this neutron star. With a huge gravitational and magnetic fields accelerating any charged particles (including electrons), electromagnetic radiation will be generated and emitted along the spinning poles.

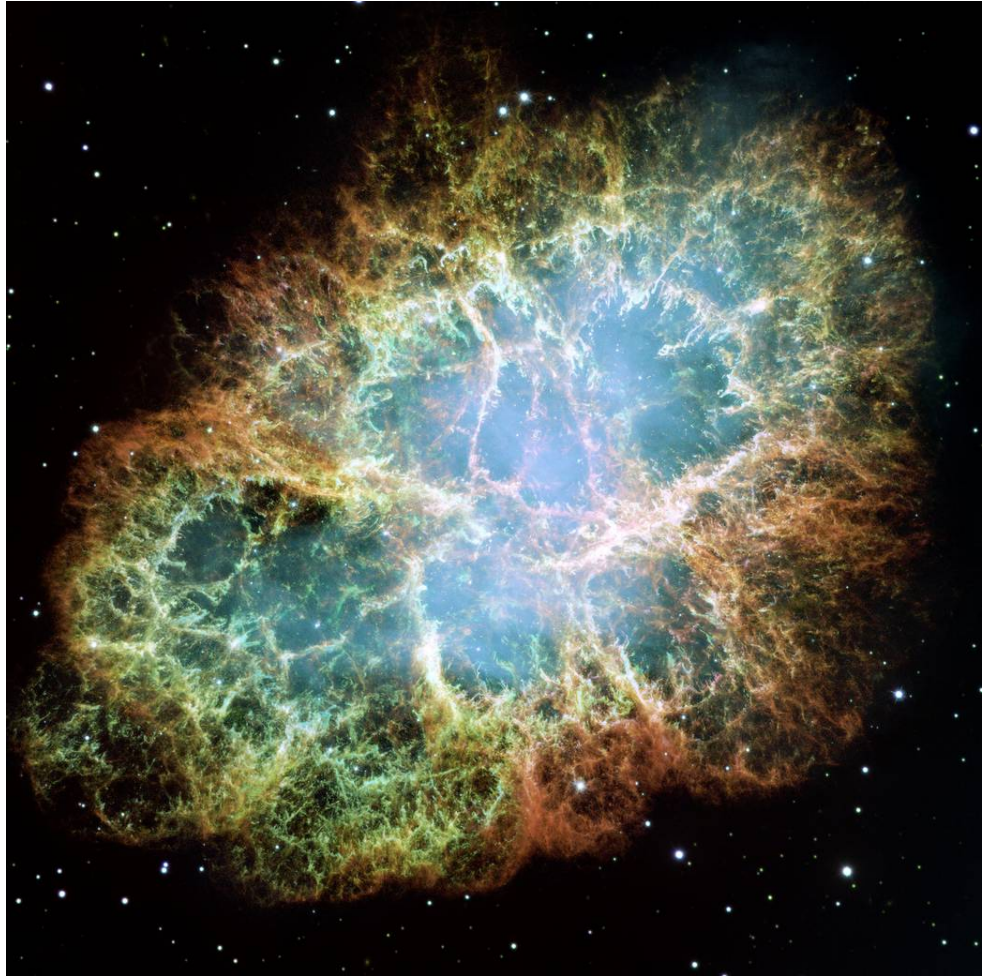
Bingo!!! We have an energy source, accelerated electrons (blue light) and a 'radio lighthouse' or pulsing star. This understanding was developed in 1968 with the discovery of the Pulsar star type.

Radiation from the Crab Nebula has proven to be really useful in studying our solar system, by providing us with a cosmic X-ray machine. As object pass in front of M1, the resultant X-ray images have allowed us to study the corona of the sun and learn about the atmosphere of Saturn's moon Titan.

After a deluge of science to solve the mystery, I would like to leave you with a beautiful composite image of the Crab Nebula that NASA developed earlier this year, combining visible, radio, infrared, ultraviolet, X-ray and gamma images.

Enjoy them while you can. As a footnote, based on the rate of expansion, it is expected that in another 1,500 years the Crab Nebula will be too faint to be seen from Earth. Given the distance then this point was reached around 5,000 years ago, the Nebula is no longer emitting sufficient light to be seen and

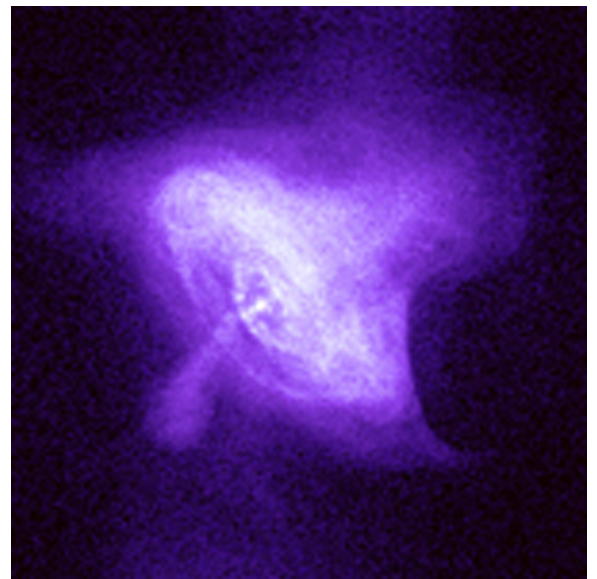
the only images are from light that has already started its journey to us.



*Above: Image Credit: NASA, ESA, J. Hester, A. Loll (ASU)*

*Right: Credit: NASA/CXC/SAO*

*The preceding article by Steve Ransom-Jones was published in the Peninsula Pulse in December and is used by permission of the Peninsula Pulse and doorcountypulse.com.*

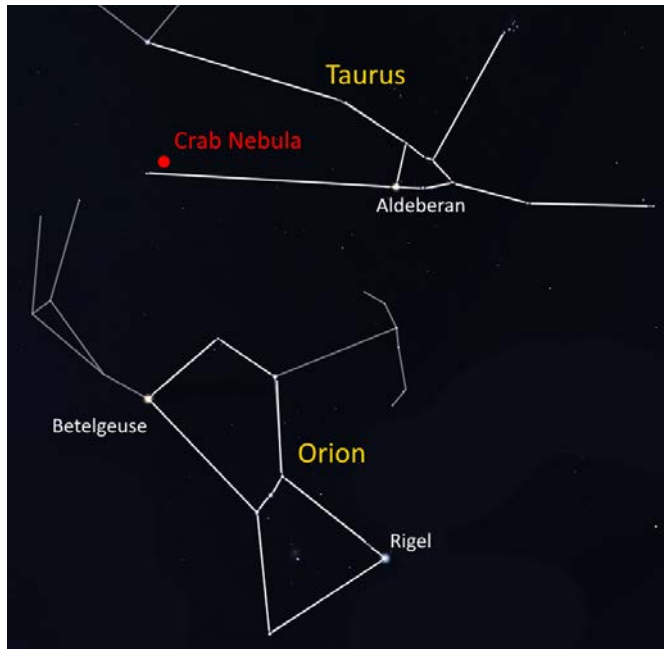




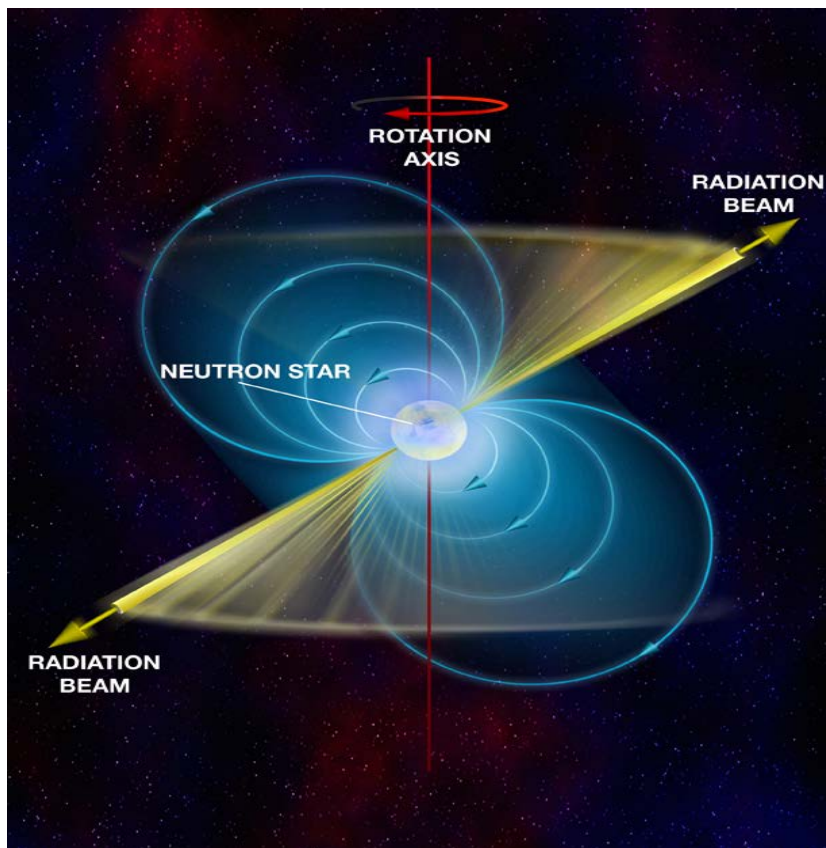
This composite image of the Crab Nebula, a supernova remnant, was assembled by combining data from five telescopes spanning nearly the entire breadth of the electromagnetic spectrum: the Very Large Array, the Spitzer Space Telescope, the Hubble Space Telescope, the XMM-Newton Observatory, and the Chandra X-ray Observatory.

Credits: NASA, ESA, NRAO/AUI/NSF and G. Dubner (University of Buenos Aires)





Above and below drawn by Steve Ransom-Jones for the Peninsula Pulse Article. Below is "A Cosmic Lighthouse".



### Viewing Nights 2018

- January 13
- February 17
- March 17
- April 14
- May 19
- June 16
- July 14\*
- August 11\*
- September 8
- October 6
- November 10
- December 8

\*May be cancelled because it gets dark so late.

### New Members

Todd & Sheryll Rockway  
 Leslie Boden

### Nightowl

First, looking back at 2017. By the time of the annual banquet on January 3, planning was well underway for the much anticipated solar eclipse of August 21. April 21-23 was NCRAL 2017 hosted by Rochester Astronomy Club in Minnesota. Gary Henkelmann was able to attend for part. 2017 saw a major revision of the DPAS Website. Thanks, John W. Beck.

Another website which was updated in February last year was the Night Sky Network of the Astronomical Society of the Pacific and our *continued on page 10*

**Nightowl from page 9**

members were invited to watch the monthly webinars provided thereby.

One of the many activities of Board members in 2017 was contributing an astronomy-related article to the Peninsula Pulse for publication every month. By permission, those articles are also included in our monthly Blue Moon Observer.

Despite many cloudy nights we did manage to have some successful viewings. Dave Lenius demonstrated the Lief Everson Observatory to visitors. Less dependent upon the weather were Susan Basten's many planetarium presentations. Astronomy Day was held in the fall, and there were many visitors despite rainy weather.

Several of our programs were parts of the Steven Hawking series *Genius*. It was fun to watch a group of students learn and thus illustrate various astrophysics principles.

Spring and Autumn campus cleanups were again coordinated by Barb Henkelmann, who

also brings Master Gardeners to the tasks. Thus the Astronomy Campus is kept aesthetically pleasing and some of us have even learned about a few plants. We also get to see and hear some birds that frequent the campus during the day but are not apparent at meeting or star gazing times.

We became reluctantly accustomed to the gate from Utah to Stargazer Lane being open at all times after years of keeping it locked. That decision was made by the Crossroads at Big Creek Board over the objections of the DPAS Board.

Jacque Axland accepted the chairmanship of NCRAL 2018 and with her committee, she had all the basics covered by the end of the calendar year including having received online reservations for the event. Meanwhile David Udell, who had committed DPAS (with Board approval) to hosting NCRAL 2018, unexpectedly moved away. Thanks, Jacque!

Elections were held and Gary Henkelmann took the reins with clear expectations including committees and assigned

tasks. Bylaws were updated.

Dave Lenius and Steve Ransom-Jones have updated the Lief Everson Observatory including the dome and shutter, mount alignment, and computer replacement.

Many members travelled to Missouri to observe the Great Solar Eclipse of 2017 and enjoyed a most unique experience.

DPAS helped Newport State Park celebrate designation as an IDA Dark Sky Park.

Looking forward to 2018: NCRAL is paramount; we anticipate a large and enthusiastic turnout from several states. There is some interest in rebuilding a radio astronomy setup. Updating the planetarium is on our planning and wish lists. We will continue and perhaps expand our library telescope loaning program. We expect to work more closely with Newport State Park.

Editor

*Happy New Year!*