

# THE BLUE MOON OBSERVER

## AUGUST, 2017

The August general meeting of DPAS will be held on August 1 at 7 PM at the Ray & Ruthie Stonecipher Astronomy Center. The main features will be Mike Egan's photos of the 1994 Solar Eclipse over Chicago and Zach Merideth's report on Exoplanets. Steve Ransom-Jones will present Astronomy Basics. Refreshments will be served.



### Door Peninsula Astronomical Society

Mailing Address:  
P.O. Box 331  
Sturgeon Bay, WI 54235

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

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#### Notes from our Meeting: July 11, 2017

First time, **Gary** opened our meeting as President (*applause!*) and promptly offered welcomes to six new members Dave and Patty Buck, Dennis and Patricia Meyer, and Mary and Clement Grote. He then thanked Elsie and John Lindgren, who came without extended family this time, but with gifts (later). He spoke of the International Dark Sky presentation at Newport State Park (the 48<sup>th</sup> such designation in the world, he said), gave the Birch Creek view-sharing event on July 26 a plug, introduced Zack Meredith (with a neat-o haircut) to all, and said that I would give a brief at our next meeting (showing the slides of the 1994 partial eclipse over Chicago) and that Dave Lenius will give the main talk, on the HR Diagram. That said, he gave the program over to Tom Minahan.

**Tom** (clad in a T-shirt that read **Avoid Negativity:  $f(x) = |x|$** ) spoke of how to view the Sun during the coming eclipse. "Don't fry your eyes!" he cautioned, using a chart as the first of his exhibits, well-acted each one. First, he modeled the

glasses with Mylar lenses, showed a couple of methods of projection: a hole in the end of a 4x4x30" cardboard box with a section cut out for viewing, the hole, again, in a card with a back-up screen of paper, suggesting the use of tin foil instead of paper (more accurate hole), and filters that fit over his binoculars. Jim Maki added #14 welding glasses to the list. Tom also suggested *Astronomy* magazine, with "25 Hot Eclipse" viewing places. Gary handed out envelopes with a USPO stamp on each of the eclipse and the darkened stamp became the image of the Moon when you put your thumb on it for a moment. Inside the envelope was a pair of glasses for each person there. A timely and good gift!

Then a break to enjoy the traditional gifts of the Lindgren family: homemade chocolate chip cookies, a caramel-based chocolate treat, sweet Bing cherries, coffee, apple and cranberry juices! (The grandkids will be there next year!) Lots of conversation before the main event ...which was **Gary** who opened with a question of how many orbits the Moon has made around the Earth. The answer, to be explained, was "four". More on this *continued on page 3*



#### 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 Earth's Moon-Full of Surprises

Next month, on August 21st, the Moon will pass between the Sun and the Earth, partially obscuring the Sun over the entire North American Continent for several hours, and totally covering the solar disk for a couple of minutes along a narrow, 90 mile-wide path from Oregon to South Carolina. The event will be headline news here in the United States, but it's not likely to even raise eyebrows elsewhere, as eclipses of the Sun occur several times each year, and unless you're in the direct path of the event it won't affect you at all. And even here in Door County, on August 21st, most of us may not notice the darkening of the sky during the middle of the day unless we're paying attention and recognize what the cause is. And of course, that cause is the Moon.

We learned in last Month's "Eye on the Night Sky" column that the Moon was first determined (2200 years ago) to be about 38% the size of the Earth, later refined to 27%, which makes it the largest moon/planet ratio in the Solar System. There are larger moons, consisting of, in order, Ganymede (Jupiter), Titan (Saturn), Callisto, and Io

(both Jupiter), but they're only 2.6-4.4% as large as the planet they orbit. The highest ratio next to our Moon goes to Neptune's Triton at 5.4%, so by a factor of 5 our Moon eclipses all others for its ability to cast a shadow on its host.

A second and subtle feature of our Moon is that its orbit around the Earth does not coincide with the earth's orbit around the Sun. The plane of the Moon's orbit is tilted 5.1 degrees to the "Ecliptic" upon which the Earth circulates. This does not seem like much, but in order to explain the frequency of Solar (and Lunar) eclipses, we need to appreciate how the size of the Moon, the distance of its orbit from the Earth, and this angle of tilt all combine to produce a low likelihood of the Moon's shadow contacting the Earth each month. The Moon's 2100 mile diameter has to pass inside of the Earth's 8,000 mile height as it passes in front of the Sun to cast a shadow, and given that it could be 21,000 miles above or below the Ecliptic in its' orbit at the time, the odds of doing so are about 1 in 5.

Another feature of the Moon is that it orbits the Earth in an elliptical path, one which is not too pronounced, but it *continued on page 5*



### 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

later. Meantime, he set out to answer  
 the following questions regarding  
 this and other eclipses:

- Can they be viewed safely?
- Causes?
- How often do they appear?
- How long do they last?
- Best place to see them?

Meantime, he had some stories about  
 famous eclipses and their outcomes.  
 For instance: In 1504, Columbus  
 used his knowledge of a coming  
 episode by threatening Jamaicans  
 who wouldn't give him the  
 provisions he needed to move on,  
 and scared them into giving the  
 needed food and water with the "bad  
 moon rising" ... in 1889 Mark Twain  
 used an eclipse to save Hank Morgan  
 of A Connecticut Yankee in King  
 Arthur's Court from being burned at  
 the stake ... how Columbus and  
 Mark knew about them was amazing  
 in itself! Also amazing were the  
 number of eclipses: about 2-1/4 a  
 year. And that the Sun has nothing to  
 do with the eclipse, because it's all  
 about the Moon's orbit, tilted at 5.1  
 degrees from the Earth's orbit. The  
 Earth and Moon also share a  
 common center – their center of  
 mass – around which they rotate.  
 This is called barycentric. It is the  
 same as happens with the Sun: it,  
 too, shifts its center to match the  
 pull of its planets. This brought the  
 conversation back to the number of  
 orbits the Moon has – four. There is  
 the *sidereal* orbit, measured from the  
 stars, that takes 27.32116 days  
 beginning to end; *synodic* orbit, Gary  
 had a fine chart demonstrating this  
 one, taking 29.53 days and measured  
 from new moon to new moon (it  
 takes an additional 2.1 days for the  
 Moon to "catch up" to the Earth  
 moving in its orbit); then there is the  
*anomalistic* orbit, measured from  
 perigee to perigee and taking 27.55

days to make the trip (the perigee  
 being the closest it comes to Earth at  
 363,400 kms vs. the apogee at  
 405,500 kms); finally, also  
 illustrated, the *draconic* orbit, 27.21  
 days, measured ascending node to  
 ascending node.

This particular eclipse is rare for  
 another reason: it will take over the  
 contiguous continental States, being  
 named "the American eclipse" for  
 that reason. In Sturgeon Bay, 83% of  
 the Sun will be obscured, but those  
 trekking south to St Peters, Missouri,  
 and then south a bit from there, will  
 witness totality, when the Sun will be  
 100% obscured and, for those couple  
 of minutes, the protective glasses can  
 come off and the dark sky will reveal  
 what the Sun is hiding: two planets  
 to the left and the right and stars,  
 before the shadow moves further  
 toward the east.

We, in Sturgeon Bay, will see the  
 partial eclipse starting at 11:57am,  
 when the Moon first "nibbles" at the  
 Sun, peaking at 1:16 and exiting the  
 scene at 2:37pm. Dave Lenius will  
 be manning the big telescope and  
 sending the images over to the  
 comfort of the Astronomy Center.  
 For first-hand viewing, there'll be a  
 telescope or two set up in the field to  
 view. Though we are clearly not  
 among the 25 best spots to watch, we  
 will be one of the two best to see it  
 from!

Mike Egan

### New Members Since Last Issue:

David & Patricia Buck  
 Hartland, Wisconsin  
 Welcome to DPAS!

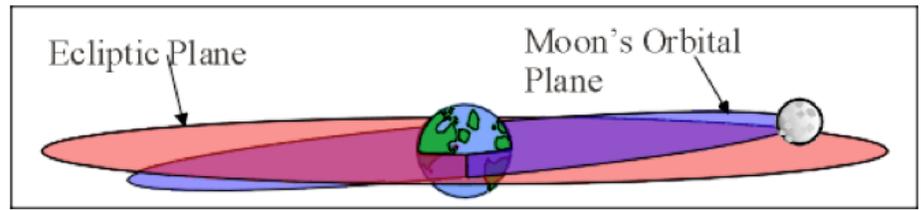


**Astronomy Quiz**

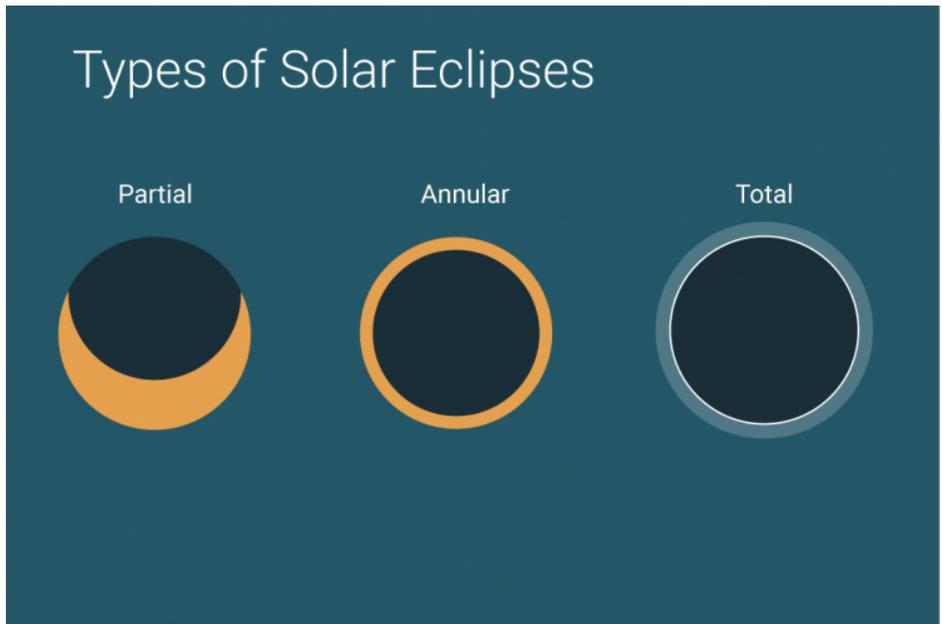
1. The Perseid meteor shower represents Earth’s atmosphere passing through the dust trail from what comet?
2. Of the statements about Capella:
  - A. Capella is much younger than our Sun
  - B. Capella is a double star
  - C. Capella is about 4.2 million light years away
  - D. Capella is much more massive than our Sun
  - E. Only A, B, and C are correct
  - F. Only B and D are correct
  - G. A, B, C, and D are all correct.
3. Messier 22 is a globular cluster in which constellation?
4. The exhaust gas given off by the Delta 4 Heavy rocket into the atmosphere consists of\_\_\_\_\_.



Relative size of Earth (left) and our Moon. Courtesy WorldbyStorm in Astronomy.



Courtesy [CliveBest.com](http://CliveBest.com)



Courtesy [TimeandDate.com](http://TimeandDate.com).

Above images are from Gary Henkelmann’s Peninsula Pulse article. See page 2.



## Poetry Corner

### A Good Night a fibonacci poem

Star  
Planet  
Nebula  
Spiral galaxy  
Zodiacal constellation  
Open star clusters as well as globular  
clusters  
All these and double stars are well within  
the grasp of my Newtonian telescope  
I wait until sun and moon have set and  
sky is dark  
And my pupils have adjusted  
My finder aligned  
All is well  
At last  
Vast  
Sky

John J. Beck

*Moon Surprises* from page 2 does make the Moon appear up to 17% larger or smaller, from Perigee (225,000 MI) to Apogee (250,000 MI). The timing of this in relation to an eclipse will determine whether or not the Moon can totally block sunlight at the ground. If it can, a Total eclipse may occur, and if it can't, an Annular eclipse may occur.

The sizes and distances of both the Sun and the Moon relative to the Earth are uniquely positioned so as to make it possible for the Moon to just totally block all the light from the Sun, or not quite block all the light, depending upon how close the Moon is to Earth. Someday, because the Moon is slowly moving farther from the Earth, total eclipses will no longer occur. In the meantime, we can enjoy the variety of eclipses, and complexity of movement that our unique satellite has to offer.

The Door Peninsula Astronomical Society meets Tuesday, August 1 at 7:00 PM at the Stonecipher Astronomy Center, 2200 Utah St., Sturgeon Bay, featuring: a photographic review of the 1994 Solar eclipse over Chicago; a presentation on how stars are grouped by type and size; and an update on Exo-planets and why we are not finding any around some

stars. The meeting is open to the public and refreshments will be served. Visit [www.doorastronomy.org](http://www.doorastronomy.org) for more information.

DPAS will also be leading special Solar Eclipse Telescope Viewing tutorial sessions at the Sturgeon Bay Library (August 16 at 5:30 PM) and Sister Bay Library (August 17 at 11:00 AM) to demonstrate the safe use of the Library Telescopes with their newly-acquired solar filters that patrons can check out for eclipse and sunspot viewing.

Public viewing of the August 21st Solar Eclipse will also be hosted at the Astronomy Center, beginning at 11:00 AM with live projection of the eclipse from the Leif Everson Observatory as well as other sites across the country where the Total eclipse will be seen. Solar eclipse glasses will be available for visitors' use.

*By Gary Henkelmann,  
President, Door Peninsula  
Astronomical Society*

*The preceding article by Gary Henkelmann was published in the Peninsula Pulse in July and used by permission of the Peninsula Pulse and doorcountypulse.com.*

See images on page 4.



## Astronomy Quiz Answers

1. Comet Swift–Tuttle.
2. The answer is G. Capella is a double star with each component star having a mass of about twice that of our Sun. They are young stars, only about 400 million years old, just 1/10 the age of our Sun. It is about 4.2 million lightyears away in the constellation Auriga, the Charioteer.
3. M22 is a globular cluster in Sagittarius.
4. The byproduct of combustion of hydrogen is water. (Delta rockets no longer use kerosene plus hydrogen.)

## DPAS Club Activities

Birch Creek viewing was scheduled for July 26 with an alternate date of July 27. Weather precluded viewing on the earlier date. Skies were clear all day on the 27th until early evening when cumulus and cirrus clouds moved in. Fortunately the clouds gradually receded to the southeast, uncovering Saturn and later Sagittarius. Mosquito's were fierce early but seemed to become less prominent as it got darker, and humidity was low enough that condensation was not a problem. Not as many students visited our telescopes as in some years, but those who did were enthusiastic about being able to see bands on Jupiter, 3 of Jupiter's Galilean moons, the rings of Saturn, and a few deep sky objects. Arranged annually by Tom Minahan, he was there along with Susan Basten and your editor.

On August 16 at 5:30 PM a program on using the loaner telescopes to safely view the sun will be presented at the Sturgeon Bay Library. A similar program will be given at the Sister Bay Library at 11 AM on August 17

The candlelight walk at Whiefish Dunes takes place August 19. Arrangements to have telescopes there are pending as there is no beach this year and some DPAS members may have left for

Solar Eclipse viewing. Hopefully arrangements can be made for viewing from one of the parking lots as has been done in the past.

Public viewing of the August 21st Solar Eclipse will also be hosted at the Astronomy Center, beginning at 11:00 AM with live projection of the eclipse from the Leif Everson Observatory as well as other sites across the country where the total eclipse will be seen. Solar eclipse glasses will be available for visitors' use.

Vandalism has plagued the Astronomy Campus recently. Several of the glass tiles in the Analemmatic sundial have been broken as have some of the planks in the walkway to the StarGarden. It is unclear whether the unlocked and open gate is or is not related. Repairs will be made.

Don't forget the Perseid meteor shower from now to August 24, peaking the night of August 11-12. Unfortunately the waning gibbous moon will be rising early, making faint meteors hard to see. But Perseids sometimes produce fireballs which should be visible despite the moonlight.

Members are invited to:

- Attend Board meetings
- Sign up for refreshments
- Suggest topics
- Present topics
- Draw logo suggestions for NCRAL 2018.

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## **Twenty Years Ago on Mars...**

By Linda Hermans-Killiam

On July 4, 1997, NASA's Mars Pathfinder landed on the surface of Mars. It landed in an ancient flood plain that is now dry and covered with rocks. Pathfinder's mission was to study the Martian climate, atmosphere and geology. At the same time, the mission was also testing lots of new technologies.

For example, the Pathfinder mission tried a brand-new way of landing on Mars. After speeding into the Martian atmosphere, Pathfinder used a parachute to slow down and drift toward the surface of the Red Planet. Before landing, Pathfinder inflated huge airbags around itself. The spacecraft released its parachute and dropped to the ground, bouncing on its airbags about 15 times. After Pathfinder came to a stop, the airbags deflated.

Before Pathfinder, spacecraft had to use lots of fuel to slow down for a safe landing on another planet. Pathfinder's airbags allowed engineers to use and store less fuel for the landing. This made the mission less expensive. After seeing the successful Pathfinder landing, future missions used this airbag technique, too!

Pathfinder had two parts: a lander that stayed in one place, and a wheeled rover that could move around. The Pathfinder lander had special instruments to study Martian weather. These instruments measured air temperature, pressure and winds. The measurements helped us better understand the climate of Mars.

The lander also had a camera for taking images of the Martian landscape. The lander sent back more than 16,000 pictures of Mars. Its last signal was sent to Earth on Sept. 27, 1997. The Pathfinder lander was renamed the Carl Sagan Memorial Station. Carl Sagan was a well-known astronomer and science educator.

Pathfinder also carried the very first rover to Mars. This remotely-controlled rover was about the size of a microwave oven and was called Sojourner. It was named to honor Sojourner Truth, who fought for African-American and women's rights. Two days after Pathfinder landed, Sojourner rolled onto the surface of Mars. Sojourner gathered data on Martian rocks and soil. The rover also carried cameras. In the three months that Sojourner operated on Mars, the rover took more than 550 photos!

Pathfinder helped us learn how to better design missions to Mars. It gave us valuable new information on the Martian climate and surface. Together, these things helped lay the groundwork for future missions to Mars.

Learn more about the Sojourner rover at the NASA Space Place: <https://spaceplace.nasa.gov/mars-sojourner>



*Caption: The Mars Pathfinder lander took this photo of its small rover, called Sojourner. Here, Sojourner is investigating a rock on Mars. Image credit: NASA/JPL-Caltech*