The Blue Moon Observer

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Door Peninsula Astronomical Society

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54235

www.doorastronomy.org

In place of a general meeting, this year the annual banquet will be on Tuesday, January 8, 2019 at the Nightengale, 1541 Egg Harbor Road. Social hour begins at 5:30 PM, seating for dinner is at 6:30. Dinners and beverages are "Dutch Treat".

Meeting Notes from the December 4 general meeting

Attendance: 22

Refreshment provided by Todd & Cheryl Rockway. Thanks!

Introductory remarks by our president Gary Henkelmann: Welcome new members Betty Lou Schoemacker and Dzintars Petersons. The Blue Moon Observer came out yesterday. Another terrific job by Dr. Beck and thank you. The Mars Insight lander successfully landed on Mars on November 26 on a high plain near Mars' equator called Elysium Planitia, chosen for its flatness. Our annual DPAS dinner is scheduled for Tuesday, January 8, 2019 at the Nightingale Supper Club in Sturgeon Bay. Social hour @ 5:30 pm and dinner @ 6:30.

Looking back on 2018: the DPAS awarded 4 scholarships in the spring to deserving local high school students planning university studies in math, science or engineering. DPAS hosted NCRAL 2018 in April. Lots of contributions by members - Thank You! DPAS had a presence at the local STEAM event at Sunrise School. We plan to attend every year now - very important to get them early! At least 10 planetarium shows done by Susan Basten in our StarLab dome. The dome is currently loaned out. The theme for Astronomy Day in October was Waves and included a demonstration of a sophisticated half-dome planetarium by Aram Friedman, who designed the $17 million Digital Dome for the Hayden Planetarium in New York City. Thanks to Dave Lenius and Steve Ransom-Jones and Tom Gwilym for acquiring and nstalling our new 16" Ritchey-Chretien telescope - calibrations in progress. Also thanks for the new giant flatscreen TV for the Astronomy Center. Our outreach committee held viewings at local state parks, some coinciding with state park events such as the candlelight walk at Whitefish Dunes, and 5 Nights Under Dark Skies at Newport State Park in August. Two lending telescopes were purchased and given to the Egg Harbor library. High-school student and aspiring engineer Cody Schwartz gave a presentation to our November general meeting on his involvement with designing molds for the Big Falcon Rocket.

Coming up in 2019: Because this is the 50th anniversary of the Apollo 11 Moon Landing, our short programs this year will look back on manned space flight leading up to the momentous feat in July, with reports of other manned missions subsequent to the moon landing. ALCON 2019 is July 25 - 29 at Cape Kennedy and includes an (optional) 3-day cruise to the Bahamas! Mercury will transit the Sun on November 11 - event to be scheduled. The Peninsula Players will present "Silent Sky"

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 16" Ritchey-Cretien telescope on a sophisticated tracking mount controlled by computer, and a new Maksutov-Cassegrain telescope for planetary viewing. A weather station is housed in the observatory. Current weather readings are shown on our web site:

www.dooastronomy.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 the same object through the same binocular.

The Ray & Ruthie Stonecipher Astronomy Center provides for storage, projects, meetings, warm-up and toilet facilities. It also housed a StarLab, an inflatable planetarium with a sophisticated projection system. The planetarium was used for group presentations. See announcements page 6.

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. Or you can set your GPS to 2200 Utah.

The Stuff Stars are Made Of
Tom Minahan

How do we know the stars and galaxies are made of the same stuff we are here on Earth? "Because science", specifically spectrography, chemistry and quantum physics. It sounds like it might be complicated, but conceptually it's a few simple steps. The conclusion is the whole of the known universe in composed of the same elementary particles, chemical elements and types of radiation throughout. There is still a list of astronomical unknowns such as dark energy and the source of high-energy cosmic rays (actually ultra-high energy charged particles), just to name two. But the deduction that the entire universe is homogeneous in its constituent parts is one of the greatest intellectual achievements ever.

Sir isaac Newton was the first to demonstrate that white light is composed of the varied colors of the rainbow. Refract light through a prism to separate it into it's constituent hues. By placing a second prism in the path of the refracted light in different ways, he showed that 1) the colors can be reconstituted into white light and 2) a monochromatic component from the first prism's spectrum cannot generate other colors. Thus white light is not changed into colors by refraction, white light is composed of different colors of light. We understand now that each color represents a different frequency of electromagnetic radiation that is visible to us. The electromagnetic spectrum is actually much wider than the band of frequencies we see as light. The entire spectrum is composed of, in order of increasing frequency (with approximate size of the wavelength of radiation for each): radio waves (buildings), microwaves (grains of sugar), infrared light (protozoans), visible light (bacteria), ultraviolet light (molecules), X-rays (atoms) and gamma rays (atomic nuclei). Even though all this radiation has a wavelike nature, light is carried through the universe (and here on Earth) in really small packets of energy called photons. As the frequency f of radiation increases, the energy E of each constituent photon, or quantum of light, increases proportionately,

$$E = h \cdot f,$$

where h is Plank's constant. Energy is measured in Joules or Ergs, frequency is measured in Hertz. Because each photon carries a minute amount of energy, Plank's constant is minuscule.

When the light emitted by hot matter is refracted, one obtains a continuous spectrum of colors with varying intensities [see figure]. Low-pressure gas (of one element) excited by heat or collisions with electrons produces a spectrum with emission lines: most of it is dark but for a finite number of bright emissions of specific colors at their corresponding frequencies of radiation. In the mid-1800's physicist Gustav Kirchhoff and chemist Robert Bunsen first observed emission lines in the spectra of heated elements. They demonstrated that each element has it's own unique set of emission colors, or frequencies. It's a signature. The stimulated atoms of the element emit photons only at certain frequencies and none elsewhere. Observations by chemist William Hyde Wollston earlier in 1802 showed that the bright spectrum of the Sun contains dark narrow gaps called absorption lines. Many of the observed colors of absorption line up exactly with elemental emission lines observed in the laboratory. These absorption spectra from the Sun are theorized to be signatures of specific elements present in the atmosphere of the Sun. They result when cooler gas in the photosphere of the Sun absorbs the light emitted by the hotter surface, but only at specific frequencies. Some of the elements observed in the Sun include hydrogen, helium, oxygen, carbon and iron. By matching the absorption signatures from the Sun with emission signatures from the laboratory, we know that the Sun's atmosphere at least is made from

continued on page 5

DPAS BOARD

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editor@doorastronomy.org

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Dennis Sundin, Member at Large

Ray Stonecipher, in spirit

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 held at the Astronomy Center at 7 PM on Monday, 8 days prior to the following general meeting. Members of DPAS are invited to attend Board meetings.

Meeting notes from page 1

August 21 - September 1, "The touching human interest story behind an important scientific discovery." … is about astronomer Henrietta Swan Leavitt. We shall attend as a a group.

We watched and listened to #5 in the video lecture series Dark Matter, Dark Energy: The Dark Side of the Universe by CalTech professor Sean Carroll. Here's what we have covered so far:

#1 Fundamental Building Blocks

#2 The Smooth, Expanding Universe

#3 Space, Time and Gravity

#4 Cosmology in Einstein's Universe

[Keep in mind that even the scientific "scholars" in our group do not understand everything in these lectures - always new things to learn.]

Tonight's episode is titled Galaxies and Clusters: 100 Billion Galaxies each containing 100 Billion stars! The universe is smooth on a large scale but ever-expanding, as described by a set of equations derived by Alexander Friedmann in 1922. But it has clumps: the density of the universe is not uniform. The slight variations seen in Cosmic Microwave Background (CMB) radiation show that the universe was irregular even at 400K years old. Why is the universe on a large scale lumpier now than early on? Because gravity turned-up the "constant knob," concentrating matter together. Another way scientists know this is because looking farther deep into space and further back in time, we see galaxies and galaxy clusters in different stages of development and make conclusions about their evolution. Question to ponder: Why do humans find galaxies beautiful?

Astronomers measure the mass of galaxies and the universe as a whole by observing Newtonian gravity effects. For example, we can measure the mass of our Sun or other stars from the velocities of orbitals. Likewise, the mass of a galaxy can be estimated from the speed of stars moving in and around it. The conclusion is that there is a bigger structure of something around observed galaxies. Cosmologists call this Dark Matter: Is it a whole new kind of stuff or is it matter we know about but can't "see"? By measuring the dynamics of galaxy movements clusters, astronomers now think that Dark Matter is gas in between galaxies spread out in clumps and filaments. Apparently 2/3 of ordinary matter in the universe is invisible intergalactic gas. Contrasting, The evolution of the universe appears to be largely governed by a Dark Energy that is expanding space itself, at an accelerating rate! The energy density of the universe has changed with its evolution and continues to change. The universe is comprised of 5% observed matter (stars and stuff), 25% Dark Matter and 70% Dark Energy.

After refreshments Dr. Beck described several galaxies and star clusters that are up in early winter during evening hours.

Open cluster M45, the Pleiades have nebulosity. A true compact cluster, meaning the stars are in proximity to each other and hence formed from the same star-forming cloud but an open cluster nonetheless.

Hyades, famous open cluster in Taurus. These stars do not have nebulosity. Stars not of same group but just lined up.

The double cluster NGC 2158 & M35 in the foot of Gemini. Use binoculars or telescope under low power to view.

3 popular open clusters in Auriga: M36, M37 and M38.

Globular clusters M13 and M15 west of Pegasus.

M2 is a tightly-bound globular. All globular clusters reside in the halo of our galaxy.

Two ways to find the Andromeda galaxy M31. 1) Follow the bisect of the "top" triangle in Casseopeia south or 2) Start at "lower left" star in the Great Square of Pegasus, jump 2 stars "left" and 2 stars "up".

M81 and M82 can be observed in the same binocular field and are found on a diagonal through the Big Dipper's cup towards the northeast.

Continued on page 4

Astronomy Quiz

1. What planet obits the sun between Jupiter and Uranus?

2. What is the point in the moon's orbit around the earth at which it is closest to the earth is called?

3. What is the point in a body's orbit around the sun in which that body is farthest from the sun is called?

4. True or false: Mercury, Venus, and Mars have no satellites.

5. 47 Tucanae (or 47 Tuc) is what kind of object?

6. The asteroid belt lies between the orbits of what two planets?

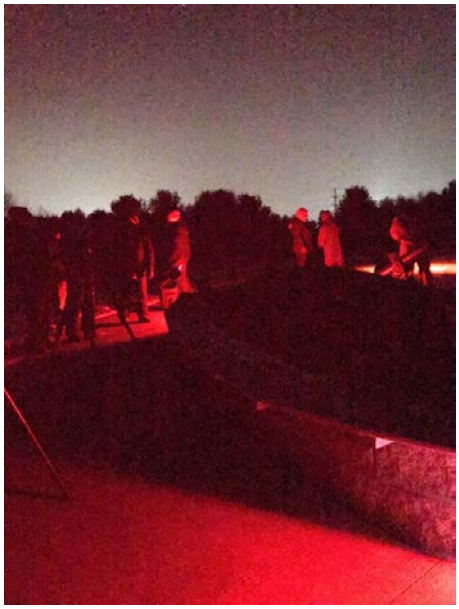
7. Earth's diameter is about how many miles?

Meeting notes from page 3

M51 the Whirlpool galaxy is near the handle of the Big Dipper. A 6" + aperture is needed to see clearly.

No General Meeting in January. Next General Meeting is Tuesday, February 5, 2019.

The above minutes were submitted by Tom Minahan. Thanks, Tom!



The above images were taken and submitted by Tom Minahan. This was our most recent viewing night,

Dec. 8 Viewing Night Draws a Crowd

Mostly clear skies and the promise of a comet brought out 20 members and visitors to the last scheduled viewing night of 2018 at the Lief Everson Observatory and Star Garden at the Astronomy Center. Warmed by the good company and Tom Minahan's propane orchard heater members set up their scopes and binoculars to seek out the elusive comet 46P which was nearing its closest approach to Earth.

It took some guidance by Susan Basten to get us looking in the right spot, and then, there it was, a fuzzy little blob in the eyepiece! Considering that the comet was still (and forever) outside of Earth's orbit, any tail would be streaming away from us and not visible. It was satisfying to at least be able to locate and identify the object of our search. The other targeted objects were also located before passing clouds brought the evening to a close and we retreated to the Astronomy Center for cookies and hot cider provided by Barb Henkelmann.

Gary Henkelmann

Following the viewing night, I set up my 4" refractor on the night of 12/15/18 in our back yard. Although the first quarter moon was not to set until around midnight, the appearance of wisps of fog suggested that condensation might become a problem if we waited much longer so between 10:30 PM and 11 PM we pointed the 1x finder between the Pleiades and the Hyades. Comet 46P/Wirtanen was easily spotted with a tiny bright center and prominent surrounding coma. We checked out a few more objects before shutting down. We didn't see any Geminid meteors but perhaps if we had stayed out later we might have.

Editor

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 thunder, rain and wind,
Or say with princes if it shall go well
By oft predict that I in heaven 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.

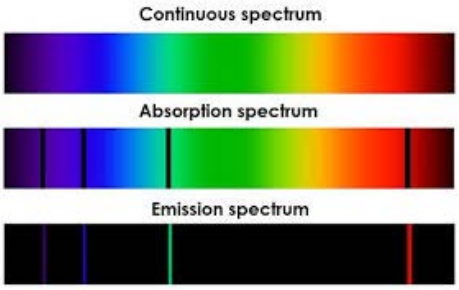
William Shakespeare
Sonnet 13

Pulse article from page 2
the same elements found on Earth. When the spectrum of the light from stars and far away galaxies is captured, we find the same absorption and emission signatures as those seen from the Sun, signatures of the same elements we are made of. It appears that the whole of the universe is comprised of the the same elements throughout.

It may not appear so from looking at the night sky, but everything in the universe is moving relative to each other. If you've heard of the Big Bang, then you know the universe is expanding, at an accelerating rate to boot. Galaxies far away are typically moving away from us (the observer) at great speeds. Light emitted by a luminous astronomical object moving quickly away at one wavelength will be observed as a longer wavelength, or lower frequency of light. It is red-shifted because the frequency is shifted toward the red end of the visible spectrum. All emission lines from all elements present are red-shifted a proportionate amount. The amount of red-shift in the emission/absorption lines indicates the objects receding speed. If the luminous object happens to be moving towards the observer, the frequencies are blue-shifted, indicating it's approach speed.

Why do atoms emit and absorb only specific frequencies of light? Quantum physics. A photon of light is created when an atom-bound electron at one energy level drops to a lower energy state, in an instant releasing one quantum of radiation. The amount of energy released is equal to the electron's energy drop in the atom, the difference between the starting and ending energy levels. An electron in a atom of a particular element can assume only a finite number of energy levels; therefore the atom can release photons only of certain energies. Referring to the equation, we deduce that the atom can release photons only at certain frequencies. Hence, emission lines in the spectrum. When an atom absorbs a photon, an electron jumps up but only to one of the predefined energy levels. Because the energy absorbed must equal the energy difference in the electron transition, an atom of a specific element can absorb only certain frequencies of light. Hence, absorption lines in the spectrum.

The discussion here would tell us that our color spectrum should be limited, but there seems to exist an infinite number of colors in our visual universe, This is because there are many different elements, each with a unique set of electron energy states and many different kinds of compounds which can affect the energy levels in the constituent atoms. Also, even though light at the quantum level must be of a specific frequency or color, they are mixed in a myriad of ways and our perception of color apparently can average out the individual frequencies into a multitude of hues. Hard to believe that underlying everything in the universe is the bedrock of physical reality, quanta of matter and energy, elementary particles and photons of radiation.



The preceding article by Thomas Minahan was published in the Peninsula Pulse in December 2018 and used by permission of the Peninsula Pulse and doorcountypulse.com.

Astronomy Quiz Answers

1. Saturn orbits beween Jupiter and Uranus.

2. The closest point is called the perigee.

3. The farthest point is called the aphelion.

4. False. Mars has two satellites, Deimos and Phobos.

5. 47 Tucanae is a bright globular cluster seen from the southern hemisphere.

6. The asteroid belt lies between the orbits of Mars and Jupiter.

7. Earth's diameter is about 8,000 miles or about 12,700 kilometers. The diameter at the equator is larger than the polar diameter.

Viewing Nights

The following is the tentative list of viewing nights for 2019. Changes will be posted her and at www.doorastronomy.org

January 5
February 2
March 9
April 6
May 4
June 1
July 6
August 3 (and/or 28)
September 28
October 26
November 23
December 28

Note: some summer viewing may be canceled because it gets dark so late.

What do we know about Comets?

Our knowledge of comets dates back to antiquity with records of observations recorded in stone thousands of years ago. Chinese astronomers kept records and illustraions of comets for centuries. Halley's comet was observed and recorded in China in 240 B.C. and possibly as early as 466 B.C.

"Comets are cosmic snowballs of frozen gases, rock and dust that orbit the Sun. When frozen, they are the size of a small town...There are likely billions of comets orbiting our Sun in the Kuiper Belt and even more distant Oort Cloud.The current number of known comets is: 3,535"
(solarsystem.nasa.gov)

The best known periodic comet is Halley's, reappearing about every 75 years. It last appeared in 1986 and is predicted to reappear in 2061. Edmond Halley examined reports of a comet approaching Earth in 1531, 1607 and 1682. He predicted its return in 1758 and his calculations revealed that at least some comets orbit the sun. Jump to 1910 when it passed by Earth at only about 13.9 million miles and It was first photographed. In 1986, large earth-based telescopes as well as several spacecraft obtained detailed images and data regarding this comet.

"Edmond Halley published "A Synopsis of the Astronomy of Comets" in 1705, cataloguing what he had found from searching historical records of 24 comets appearing near Earth between 1337 and 1698. Three of those observations appeared to be very similar in terms of orbit and other parameters, leading Halley to propose that one comet might be visiting Earth again and again." (space.com)

The nickname "dirty snowballs" or "icy dirtballs" summarized their composiiton. They are thought to be remnants of the early formation of our solar system and may have even brought water and minerals to Earth .

Kuiper belt comets are generally short period comets with somewhat

Halley's comet (spacecentre.co.uk)

predictable orbits up to about 100 years. Oort cloud comets or "long period" comets can take as long as 30 million years to complete one orbit around the sun. Sungrazing comets or Sungrazers all follow a narrow orbit, called the Kreutz path, as a result of a huge comet breaking apart thousands of years ago. They pass within 850,000 miles of the sun's surface and are often best imaged by coronographs which block out most of the light from the sun.

The coma about the nucleus of a comet is caused by melting of frozen liquids and gasses from the heat of the sun. The coma becomes a tail when the coma is blown in a direction away from the sun by the solar wind. Often two tails form, one of gasses and one of dust particle. When the comet's orbit is outside that of Earth, any tail would face away from the view from Earth as is the case with 46P/Wirtanen 2018.

NASA's Stardust mission collected dust from Comet Wilde 2 in 2004 and returned the samples to earth in 2006. The information from those samples is still being studied. Deep Impact showed some features of the structure of Comet Temple 1 by firing an impactor to excavate part of the comet.

One of the most exciting comet events in our lifetime was when Comet Schoemaker-Levy 9 broke up in July 1992 and impacted Jupiter in July 1994. The fragments orbited toward the giant gas planet and by calculating the orbit and checking earlier images, the breakup could be documented.

There's much to be learned from studyiny comets, and much to enjoy by just looking up! Editor