SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

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Member Steve Borgens captured this stunning image of the Horsehead Nebula from Morgan Hills, CA using an Astro Tech 65 mounted on an Ioptron CEM60. The Horsehead Nebula, also known as Barnard 33, is a dark nebula in the constellation Orion approximately 1500 light years from Earth.

OCA CLUB MEETING

The free and open club meeting will be held on December 8 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange.

This month, Daniel Stern from JPL will speak about Spinning Black Holes, Exploding Stars, and Hyperluminous Pulsars: Recent Results from the NuSTAR Satellite.

NEXT MEETINGS: January 12, February 9 (speakers TBA)

STAR PARTIES

Both the Orange County and Anza sites will be open on December 16. Members are encouraged to check the website calendar for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

You are also reminded to check the web site frequently for updates to the calendar of events and other club news.

COMING UP

The next sessions of the Beginners Class will be held at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana on December 1 and January 5.

Youth SIG: contact Doug Millar

Astro-Imagers SIG: Dec 6, Jan 3

Astrophysics SIG: Dec 15, Jan 19

Dark Sky Group: contact Barbara Toy

President's Message

By Barbara Toy

Happy December and Happy Holidays, everyone! In afddition to the holidays, this is our annual election season, and you should find a copy of this year's ballot in your December issue of the Sirius Astronomer; you can also download it from the club website. The instructions are on the ballot – please do vote and either mail your ballot to the club P.O. Box or put it in the ballot box at the January meeting (January 12, 2018). The election ends at the end of the January general meeting (and includes ballots postmarked through midnight of that day).

As you can see from the ballot, we have one candidate for each position, but there are also spaces to write in candidates – so that is an option. If you write someone in, though, please be sure that person would be willing to serve on the board if elected, and that they meet the requirements (i.e. they have to be currently active members and to have been a member for at least a year; for President or Vice President, they also have to have served at least one year as a Trustee at some point).

Since we have only one formal candidate for each position, you may wonder why you should vote or whether your vote means anything. It does matter, since, if nobody votes, we won't have a Board next year. Your votes also serve as a reminder that the Board is answerable to the membership and that it draws its authority from the membership. We need to know that the board is supported by our members, so please do vote!

Our Candidates

We have been very fortunate over the time I've been involved with the Board to have talented and dedicated officers and trustees, and the candidates you see on the ballot all fit that mold. I don't have room here to do all of them full justice, but here are some points of interest about them for those of you who may not know them:

Trustees:

Andy Lowry (aka Andy David) is our current Outreach Coordinator as well as a Trustee, and has some great plans for where the program could go in the future to make it even more effective in introducing members of the public, particularly young people, to the wonders of the night sky and astronomy in general, which she is tackling with tremendous energy and enthusiasm as well as imagination. Jim Benet built an incredibly successful Outreach program during the years that he was the Coordinator, and continues to work with Andy - we are very lucky to have the two of them!

John Hoot has an extensive background designing software to run telescopes, among other devices, and was a consultant to Meade Instruments for many years. Besides his practical knowledge of equipment, he has years of experience as a researcher and is active in SAS as well as in educational activities at Mt. Wilson. He's been very generous in making his expertise available to the club – which included coming up with a control system for the Kuhn on an emergency basis back in the early 2000s when the system we were using before that suddenly became unavailable. His system was much easier to use than its predecessor, and worked very well until we had the major equipment failure that resulted in completely renovating the Kuhn around 2004.

Doug Millar was a long-standing member of the club when I joined in 2000, and was on the Board for a number of years in the 1990s (his wife, Helen Mahoney, also a past Board member, was President of the club in the late 1990s). He has a passionate interest in radio astronomy, and organizes regular trips to visit the radio astronomy array in the Owens Valley, and is also passionate about finding ways to involve young people in club activities. He took on the club announcements for the general meetings when Bob Buchheim retired from the Board, and has found ways to include younger members who attend the meetings in the presentations, giving them more reason to be interested in the club and its activities and also helping them develop presentation skills that they can use in whatever they do in life.

Sam Saeed is active in the AstroImage group, where he has given a number of helpful presentations as the featured speaker, and he has been putting the slide presentations together for the club announcements since Bob Buchheim retired from the Board. He also helps out when needed at the general meetings, including filling in for Alan Smallbone and me when we weren't able to attend the November meeting. He has an observatory at Anza and is out there frequently, often for several days at a time, so he can keep us advised of potential problems that may not be apparent on shorter visits. He and his wife, Marilyn, regularly help out with our annual Starbecues as well (along with Gary Schones), for which I am very grateful.

Greg Schedcik is a past President and Vice President of the club, and has generously provided us with a place for the Board to meet for several years at his office in Fullerton. In his years on the Board, we've benefitted from his business insights and common sense advice – unfortunately for us (though not for him), his employer has recognized

his capabilities as well, leading to promotions and lots of travel, and leaving him less time for astronomy and club activities than in the past, but he makes it to the general meetings and local star parties when he can.

Gary Schones was a long-standing member of the Board when I joined it in 2001, and I quickly learned that our Anza site would be a totally different place without him. He arranged for us to get the trailers that now form Anza House – without that, we wouldn't have been able to get permits for a lot of the observatories that are currently on the site. He's a contractor, skilled with tractors and bulldozers, and has cleared and repaired a lot of areas on the property, including areas for new structures and our roads each year when they get eroded, and he also built several of the observatories on the site (including his own). He arranged for us to get the container that now provides storage for the club observatory, and built shelving inside to make it more usable. There's so much he's done to improve the site in the time I've known him it's impossible to remember it all – I'm just really grateful that he's been willing to devote so much time, energy and resources to making our Anza more usable as well as safer.

Cecilia Caballero is a new candidate for the Board, and is enthusiastic about participating in more club activities now that she lives closer. She teaches middle school astronomy, and should provide us with valuable insights from that perspective as well as the perspective of a mother of young children (several of her children have assisted Doug Millar with the announcements at the general meetings).

Officers:

Charlie Oostdyke (Treasurer): Besides keeping track of income, including sending out notices for when dues and other payments are due, paying our bills and dealing with our tax returns, Charlie keeps track of memberships, generates updated membership lists that he sends to those who need them, keeps track of the licensees for the observing pads and observatories at Anza, uploads the information necessary for new members to access the "Members" section of the website to the website (and sometimes deals with other website issues as well), processes, addresses and mails the Sirius Astronomer each month, figures out how to deal with changes in postal regulations, works with our broker on insurance issues, and innumerable other activities that are needed for the club's ongoing activities that most of us would find headache-inducing at best. Fortunately for us, he seems to get some level of enjoyment from meeting these challenges. When he decides at some point that it's time to retire from this position, I expect it will take several people to handle all that he has been doing. Quite selfishly, I'm hoping this will be long after I've retired from the Board myself…

Alan Smallbone (Secretary): Alan has been a Trustee for several years, and took on the Secretary's responsibilities when Bob Buchheim retired from the Board at the end of 2016. Besides producing Minutes summarizing events and decisions made at Board meetings and maintaining the club's records (which Bob turned over to him), he's been the person providing the computer with the pre-meeting and announcement slide shows and dealing with equipment issues at the general meetings. He also chairs the AstroImage SIG, and sometimes has time to do some of his own imaging, though not as much as he'd like. In the interest of full disclosure I should mention that he's my husband, so it wouldn't be appropriate to go into a full litany of all of his fine qualities and activities – I'll just say that I'm very grateful that he was willing to take on this position and also for his help during the meetings.

Reza AmirArjomand (Vice President): In our club, the Vice President has an extremely important function – finding speakers for the general meetings (and sometimes banquets). During the years that Reza has been our Vice President, he has consistently found us truly excellent speakers – I don't know how he does it, and I'm exceedingly grateful that he's willing to continue to find us more speakers as Vice President in 2018. He's also our Webmaster, and, among other things, has been working on changes in the hosting of the website that should get around some of the issues we've had when our past service made changes without warning.

Barbara Toy (President): I joined the club in early 2000, and Jim Benet convinced me to run for the Board for 2001. Liam Kennedy, who was President then, persuaded me to become Vice President the following year, and just as I felt I was getting the hang of that job, he decided that he didn't want a third term as President, so I wound up in that position due to a profound lack of other candidates. I've been on the Board ever since, except for taking one year off (which was when I became Observatory Custodian and also got to know Alan, an unexpected bonus), and was President for six of them by 2009. Since then, I'm happy to say that we've had a number of different Presidents, including Reza and Greg – I think it's generally good to have a variety of people in that position.

Those are our candidates for the 2018 Board, and I hope you find us all worthy of your trust and your votes.

We had some unexpected challenges on the Board in 2017, with Steve Short deciding to resign and Amir Soheili being transferred out of state, but it has been really great having Doug Millar and John Hoot join the board to fill the vacancies. As a result, we've had an excellent Board to work with this last year, and, although we'll miss Kyle Coker, who decided not to run this time, I think we'll have an equally strong Board for 2018. I'm looking forward to working with them!

© Barbara Toy, November 2017

AstroSpace Update

December 2017
Gathered by Don Lynn from NASA and other sources

Merging neutron stars observed – On August 17 gravitational waves were detected by all 3 gravitational wave instruments, determined to be from 2 merging neutron stars. 2 seconds later 2 space telescopes detected a short gamma-ray burst in the same general direction. About 70 ground-based and space telescopes followed up observing the roughly defined source area in the sky, and a new object was found in galaxy NGC 4993, located about 130 million light-years away in Hydra. The object was the predicted brightness and spectrum for a kilonova, a theoretical explosion 1000 times as bright as a nova, but dimmer than a supernova. This object was detected in every type of light: radio, infrared, visible, ultraviolet, X-rays, gamma rays. It generally faded over the next days (but faded in seconds in gamma-rays). Lots of spectra were taken. What was accomplished with these observations: First detection in light of a gravitational wave event; confirmation that gravitational waves travel at the speed of light; first detection of gravitational waves from merging neutron stars; the firmest detection of a kilonova; confirmation that a kilonova can be caused by merging neutron stars; confirmation that a kilonova is a major source of heavy elements such as gold, lead, and uranium being generated and spread through the Universe; confirmation that a short gamma-ray burst can be caused by merging neutron stars; closest gravitational wave event observed; one of the closest gamma-ray bursts observed. A new mystery emerged: the gamma-ray burst was unexpectedly weak considering its close distance.

Interstellar visitor – An object was discovered using the Pan-STARRS telescope in Hawaii, with a velocity substantially above a parabolic orbit about the Sun, so definitely arrived from outside the Solar System. In the past, some objects have been found barely above parabolic, but this is the first unequivocally above. Its spectrum does not match typical Kuiper Belt objects, another reason to believe it is interstellar. It was at first classified as a comet, based on its orbit, but further observations failed to find any hint of tail or coma, so it was reclassified as an asteroid. Then the IAU invented a new class for it: Interstellar object. The discoverers named it ʻOumuamua, which is constructed of Hawaiian words meaning to reach out first. It is now known as 1I/2017 U1 (ʻOumuamua) or various contractions of that. It appears to be highly elongated and rotate every 3-5 hours. Its direction of approach and velocity do not match any nearby star systems, so we don't know where it came from.

Juno (Jupiter orbiter) – has found from its gravity measurements that material is flowing as far as 1900 miles (3000 km) below the visible cloud surface, and is doing so asymmetrically. Also, Jupiter's magnetic field differs between the northern and southern parts. A computer simulation of the recently discovered small storms near the poles shows that they should fall apart unless they contain crystals that are only known to form in certain types of vortices.

Cassini (Saturn orbiter) – Though the mission is over, new discoveries are still being made: Molecules from the rings are drifting down into the planet's upper atmosphere, mostly ice; methane was found in the upper atmosphere, though it is not expected to come from the rings nor be created in the high atmosphere; it takes the combined gravitational influence from 7 of Saturn's inner moons (out through Mimas) to keep the rings from spreading and eventually dissipating; a toxic mixture of hydrogen cyanide ice and benzene ice has formed a cloud in the upper atmosphere of the moon Titan, high above its methane clouds, near the south pole.

Enceladus' core – Computer simulation of Saturn's moon Enceladus shows that sufficient heat can be generated to keep its below-surface ocean melted and to power its geysers by means of tidal flexure of the moon every orbit; but only if the moon's core is a loose conglomeration of rocks such that the core pieces rub against each other with this flexure. Thus we now know what the core of Enceladus must be. Though this simulation best explains the observations of Enceladus, it still does not explain why all the geyser activity is near the south pole. More work is needed.

Exocomets – An amateur astronomer searching through Kepler (planet finding space telescope) data found 3 dips in light level that did not fit the shape expected for planets transiting (passing in front of) stars, but did fit objects with tails, meaning comets. These were brought to the attention of professional astronomers, and eventually 6 of these were found. These are the first comets ever discovered outside the Solar System. It is believed that all of the comets passed quite close to their stars and vaporized. This explains why no repeat transits were found for any of them.

Exoplanet too large – A gas giant planet, dubbed NGTS-1b, has been found orbiting a very small star (half the diameter of our Sun), making it the largest known planet compared to the size of its star. Theorists told us that when such a small star forms, it does not have enough material orbiting it to form a gas giant planet. That will send the theorists back to the drawing board. It was found by the transit method (slightly dimmed its star as it passed in front), and confirmed by the radial velocity method (causes its star to wobble as it orbits).

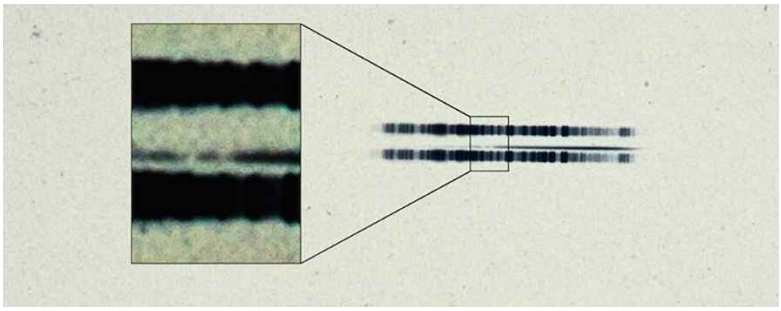
Close exoplanet – An Earth-sized exoplanet that is in or near the habitable zone (where temperatures should allow liquid water to exist) has been discovered orbiting Ross 128, a very nearby (11 light-years away) red dwarf star. Only Proxima Centauri has a habitable-zone planet nearer to us. Young red dwarfs flare a great deal, splattering their planets with high levels of ultraviolet and X-rays. But Ross 128 has aged beyond this and is relatively calm. This makes it a good place to search for life. The planet was found using the radial velocity method. It orbits its star every 9.9 Earth days. Motions of the stars will bring Ross 128 and its planet closer to the Solar System, so that in 79,000 years it will be closer than Proxima.

Star too small – It takes a long time to make a white dwarf star. A star, initially roughly Sun-like, has to use up its hydrogen fuel, then collapses to a white dwarf (though it can become a red giant in between). The smaller the initial mass, the longer it takes to use up the fuel, because such stars consume hydrogen at a far slower rate. In fact, any star with an initial mass substantially smaller than the Sun has not had enough time since the Big Bang to become a white dwarf. Yet there are a few dozen known low-mass white dwarfs. Another has just been discovered in Perseus, and it is the lowest mass known for a white dwarf (in the range of 20-30% the Sun's mass). As with all other low-mass white dwarfs, this star has a closely orbiting companion that must have stolen mass from the star. This happens when the star reaches the end of its hydrogen fuel and swells up into a red giant. During the swollen phase, the companion can gravitationally pull material off the star or even blow away the outer portions of the star. An unusual feature of the new discovery is that the companion is a brown dwarf, not an ordinary star. So even though the brown dwarf must have stolen substantial material, it didn't retain enough to graduate from a brown dwarf to a normal star.

Proxima Centauri dust – ALMA (radiotelescope array in Chile) has detected a ring of dust orbiting Proxima Centauri, the nearest star outside our Solar System. The ring extends from 1 to 4 AU from its star (an AU is the distance between the Sun and Earth). There is also a hint of another ring outside this one. One planet is known to orbit that star, inside the inner dust ring. However the presence of 1 or 2 dust rings makes it likely there are more planets there not yet discovered.

Kronos – A search for pairs of stars moving together (and therefore likely orbiting each other), but with different chemical abundances turned up the stars HD 240430 & HD 240429, located about 350 light-years away. One is enriched in high-melting-temperature elements while low in volatile elements. The other has normal elemental abundances. The best explanation is that the former star has absorbed quite a bit of the material from which rocky planets are made. This would be planets that collided with the star. Calculations show it would take about 15 times the mass of the Earth to achieve the abundances seen. The astronomers involved nicknamed this star Kronos, after the mythological Titan who ate his children. Of course the other star became Krios, the brother of Kronos.

Old exoplanet evidence – 100 years ago, the Mount Wilson 60-inch telescope photographed a spectrum of Van Maanen's Star, a very nearby white dwarf. It showed some heavier elements that shouldn't be in the surface of a white dwarf; they should sink far below the surface. The best theory at the time was that interstellar dust was raining down on the star. That same spectrum was recently studied again in light of all the astronomical discoveries made in the last century. The best theory now is that planet or asteroid material was swallowed by the star relatively recently (in terms of astronomical times). So a century ago astronomers were faced with evidence that exoplanets exist, but they did not know the significance of that evidence. This new interpretation means that Van Maanen's Star likely has an asteroid belt and planets, though none has yet been discovered.



100-year-old spectrum of Van Maanen's Star. Credit: Carnegie Institution for Science.

Black hole jets – When material falls from a disk about a black hole into the black hole itself, some other material gets accelerated away, forming the jets for which black holes are famous. But the details of how the material is accelerated remain a mystery. New observations of 2 stellar-mass black holes made simultaneously in visible light and X-rays show that the flares of visible light show up 1/10 second later. It is believed that the visible light shows up only after particles are accelerated, while the X-rays are produced before. This constrains the time and distance over which jet particles are accelerated, narrowing the theories that could explain it. The fact that the 2 different black holes had the same delay also constrains theories. However, previous work showed a much larger delay between X-rays and visible light in the case of supermassive black hole jets. So the speed of particle acceleration apparently depends on mass. Similar observations will be made on other black holes to try to solve the mystery.

Mapping the Milky Way – Astronomers using the Very Long Baseline Array (a radiotelescope array spread across the Earth) have measured the distance to a star-forming cloud on the opposite side of the Milky Way, using parallax. At 66,000 light-years, this is the farthest accurate parallax measurement ever made. Such distance measurements will be made to many more such clouds in order to make a map of the Milky Way. It should take about 10 years.

Curiosity drill work-around – The sample drill on Mars rover Curiosity has not been used for about a year, since it developed a mechanical problem. The drill has a post on each side of it that contacts the ground to be drilled and has sensors in the posts that are used to keep the drill running with stability. The problem has been isolated to these posts. A work-around that uses the sensors in the arm holding the drill instead of the sensors in the posts has been tested on Earth, and will soon be tested on Mars. Curiosity may soon be able to resume drilling and analyzing the drill samples. During the past year, Curiosity has been using its laser zapper and infrared spectrometer to analyze rocks, instead of the drill method.

Instant AstroSpace Updates

An object dubbed **2016 HO3**, which was found orbiting the Sun near the Earth's orbit, such that it circles about the Earth-Moon system for periods before escaping, was determined to be a small asteroid, though some astronomers had thought it might be a rocket body.

Observing **Jupiter's auroras** with X-ray space telescopes has found that the southern aurora pulses regularly every 11 minutes, but the northern ones are erratic. Interestingly, Saturn's auroras do not produce X-rays, while Jupiter's do.

2 **hot Saturns** (low-density gas giants orbiting close to their stars) and a **super Neptune** (a gas or ice giant larger than Neptune but smaller than Saturn) are among the more unusual exoplanets found recently. All 3 were found by the SuperWASP search for exoplanets using small wide-angle robotic cameras in South Africa and the Canary Islands.

The **farthest spiral galaxy**, therefore seen as it was the furthest back in time (over 11 billion years ago), has been discovered with the help of a gravitational lens that magnified and brightened the image. Spiral galaxies were rare in the early Universe, so all known galaxies farther than this one are elliptical or irregular.

The **2020 Mars rover** is being equipped with 23 cameras, including zoom, video, stereo, and color ones, and a sky-cam for weather. Past rovers, in chronological order had 5, 10, 10 and 17 cameras.

The **Dawn** spacecraft, which has orbited asteroid Ceres since March 2015, has been granted an extension to its mission to continue studying that body essentially until it runs out of gas in perhaps a year. It will lower its orbit to get higher resolution observations, but will not be allowed to crash into Ceres and possibly pollute it with microbes.

Estate Sale:

12-inch Meade LX200 classic telescope and Meade Pictor imaging package.
Includes field tripod, wedge, keypad, power supplies and cables, 8x50 and red-dot finder scopes, eyepieces, printed documentation, and various visual and photographic accessories. All items have been stored in a dry and secure location since last used by original owner. Offered as a complete set for $2000.
Technical questions should be directed to Bruce Waddington, bw_msg01@earthlink.net, (949) 939-0063.
For other questions or to make purchase arrangements, please contact Ms. Mary Ann Wood, (562) 417-5242.

Losmandy Tripod
Losmandy tripod (no mount) with steel legs and Losmandy dampening paws, $100.
Contact Val, (949) 380-1244.

Orange County Astronomers has a new online shop! The icon link to the shop can be found on the homepage of the OCA website.
Support OCA and BUY A TEE! The direct link is:

http://www.neatoshop.com/artist/Orange-County-Astronomers

Greetings from Palmia Observatory

By George Robinson

We have discussed taking long exposure images of dim extended objects during previous blog posts using non-tracking mounts. This time we want to describe the addition of a piggyback adapter to mount a wide-angle camera on the tracking telescope. This post will also describe some email feedback from our Julian visit and review some new books covering physics, gravitation and philosophy of science.

We should first look at upcoming astronomy events like the American Astronomical Society 231st annual meeting held in Washington, DC on January 7-12, 2018. This year I notice that they offer a special discount for amateur astronomers so the conference fee is only $50, instead of the price I used to pay like over $600. I also signed up for the tutorial on Bayesian modeling of cosmic population. Umm good! The meeting is now really affordable but, of course, you still have to get to DC and get a hotel room. I so appreciated the discount that I had to pay it forward and chose to donate $100 to the AAS student travel fund so that other grad students and post docs could travel and attend the conference. Anyway, hope to see you there! Oh, and by the way, my donation was for real grad students, so none of our local gravity study group need apply, even though some of you technically could be listed as "senior" grad students or post docs!

In previous attempts at imaging dim extended objects, we could see the need for a tracking mount to reduce star trails and at the same time the need for wider angle views than are normally available with a telescope due to the large size of the extended objects. This is where the benefits of the piggyback mounted camera stand out. Check out the final assembly of the camera and piggyback mount below.

Added piggyback adapter for tracking wide-angle, long exposure images. (Source: Palmia Observatory)

The photo shows the 80mm refractor telescope with red dot finder mounted on the left side and the wide angle camera mounted on the piggyback adapter. The adapter consists of the additional clam shell ring installed around the telescope tube and the TeleVue camera adapter mounted on the ring. A second mounting position on the clam shell is also available for another accessory, such as a guide camera. The whole setup was easy to install, once the correct tools and lengths of bolts and washers were found. First of all the clam shell rings use metric cap screws and a 4mm hex head wrench is necessary to install the ring. Then the TeleVue adapter mounts on the ring with two 1/4-20 thread cap screws, which required 3/16 inch hex (Allen) wrench. I had some spare 1/2 inch cap screws and as these were just a bit too long, I had to find a couple of 1/4 inch washers to take up the slack.

My only worry now is if something vibrates loose during transit and if I have to assemble the system in the field in the dark and remember to bring all of the required tools.

This side view shows more clearly the washer kludge setup needed to allow clearance between the v-rail and the 2nd clam shell. The cap screws used here are 1/4-20 and 3/4 inch long. This kludge worries me a bit in that it is a source of additional misalignment between the scope optical axis and the right ascension motor drive axis.

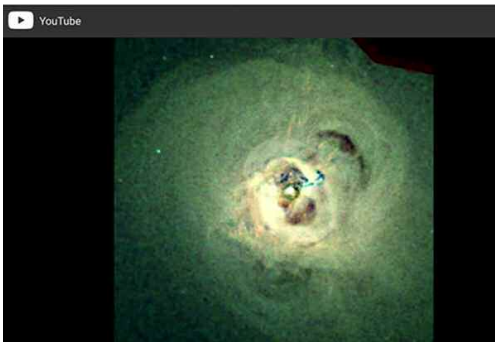
Now, where are all the stars that are supposed to be visible during the total eclipse? Some visual observers reported seeing Venus and some other stars, but I did not see any such thing. I guess being busy and making sure that I captured at least a couple of images during totality and remembering to put the solar filter back on kept me pretty occupied and yet I did have a spare moment to look around and see what the darkened landscape looked like.

To see if any stars were visible in any of our captured images, the 1/8 second exposure of the totally eclipsed sun was imported into AIP4WIN for further analysis. See the screenshot on opposite page. Yes, there is a little bright dot in the lower left of the camera image that might just be Regulus, a magnitude 1.4 star that should be quite close to the sun.

Side view of piggyback adapter washer kludge to allow 2nd clam shell and v-rail clearance (Source: Palmia Observatory)

We received an interesting email from the two gentlemen, now identified as Julianites, Dale and Dennis, we met in the Julian Café during our recent observing trip there as described in the blog posting of November 2, 2017. Check out that visit on the main page of the blog and how I was intrigued by their copy of the book, "The Day we found the Universe," by Marcia Bartusiak. I now have that book which describes the early interaction between Hubble and Einstein and the Mount Wilson observations and final recognition that the universe is expanding.

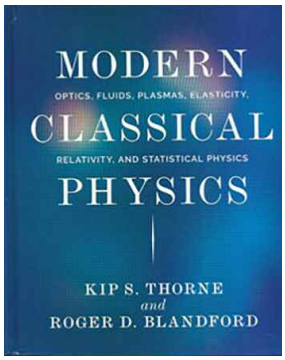
Anyway, Julianite, Dale asked questions about an article by Caleb Scharf dealing with the 63 orders of magnitude of size between the largest structures in the universe and the smallest structures in physics based on the Planck length. Well, I had not heard of Caleb before, but, wow, am I really appreciated the recommendation. He is a well respected astrobiologist at Columbia University and has several published books (which I will probably pick up very shortly) and various YouTube lectures. Two that I saw and enjoyed are referenced below. The first one deals with the feedback effects from galactic black holes and how that feedback limits and constrains the star formation rate in the galaxy and thereby the size of the galaxy itself. Pretty neat stuff! Thank you for that recommendation, Dale and Dennis!



Feedback from black holes constrain size of galaxies (Source: https://www.youtube.com/watch?v=yueT-FyH0pLw#action=share)

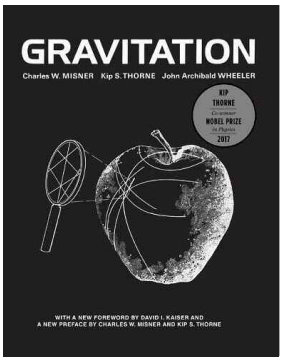
The other video lecture that I found quite interesting is the following where Caleb discusses, "The Copernicus Complex – Are we special in the universe?" Recall that Copernicus convinced us that the Sun is the center of our solar system, not the Earth. Caleb goes on to discuss how our position is special, but not exceptional – unique but not significant. Who knows! Check out the rest of the argument and discussion at: https://www.youtube.com/watch?v=ERp0AHYRm_Q#action=share

Finally for all of our physicist wannabe readers we should report on some new 2017 editions of classic textbooks. As you might know from your own studies of general relativity, a good background, often more than many of us got in our undergraduate years, in classical field theory and Lagrangian mechanics, etc., in order to make sense of the more advanced topics. This 2017 edition, although I think the earlier edition was maybe only available on the internet, has all of these important topics covered in much more detail than in the first of our introductory university physics texts. Of special interest to me, other than a handy reference containing other topics, were the last chapters, 24-28, which covered the transition from special relativity to general relativity and gravitational waves and cosmology. It is hard to find a better text or for that matter a less expensive text, on a per page basis, than this text, which goes for 7.65 cents per page on Amazon.



At 1552 pages and 7.3 lbs., this 2017 excellent text has multiple chapters on gravitational waves.

It seems that Kip Thorne has not been busy enough, what with writing a book for the Interstellar movie and also winning the Nobel prize, and still has time to update his classic gravity textbook. That classic textbook on gravity, *Gravitation*, by Misner, Thorne and Wheeler, has been released as a 2017 edition. I guess now that Kip Thorne has won the Nobel prize it is time for a new edition. I remember buying the first 1972 edition back in about 1975 from B. Dalton Booksellers at the Montclair Mall. The booksellers are gone for sure and I don't know if the mall is there any longer.

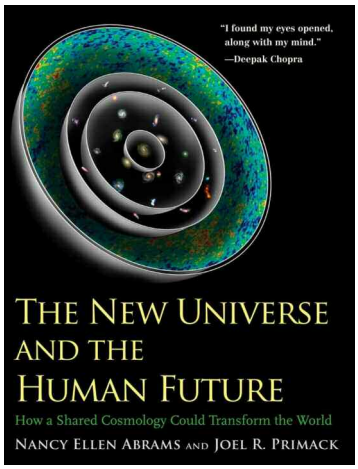


This classic Gravity textbook, first out in 1972, is now available in this 2017 edition.

I still have my original copy, now over 40 years old, and I'm still trying to understand the subject. I found the text very difficult and much of the discussion assumed that I could work out some of the details myself. Wrong! I needed a little more handholding and examples than the Caltech students who first used this textbook. I don't think I'll get the new released version which, just like the first edition, weighs in at 6.2 lbs. and 1336 pages, because I'm still working on the original edition. I find that after all of my study, I finally can go back and read and understand some of the chapters in this classic text. My other general relativity texts in include those by Weinberg and Carroll, and easier texts by Collier and Moore, but I suppose my favorites, mostly because I find them a little bit easier to understand, are those by Schutz and the great gravity book by Hartle.

Well, since we have been discussion great physics books, and while we wait to try our new piggyback adapter on the 80 mm telescope for some tracked long exposure imaging, we should make a few comments regarding some cosmology books that go way beyond cosmology, as a

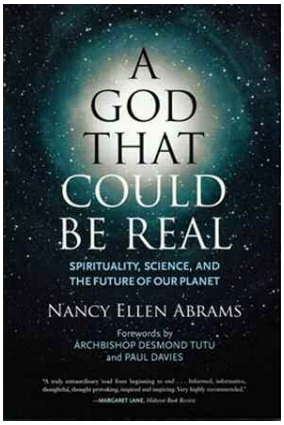
science, and consider how what we are learning about cosmology comes right back and leads to changes in how we think of ourselves as humans in this universe.



In the November 2, 2017 blog post, I mentioned how after hearing Professor Joel Primack, UCSC – who is a world class particle physicist and cosmologist – speak on the topic of "The Galaxy-Halo Connection" at the UCI physics colloquia, that I was impressed enough to buy his book, *The View from the Center of the Universe.* Well, it turns out he has another interesting cosmology book out, again coauthored with his wife, Nancy Ellen Abrams.

This book, *The New Universe and the Human Future*, combines physics and cosmology with an examination of how this new understanding of the universe can and will affect how we as humans understand our connection to and place in the universe.

They describe how there has been a hole in our current thinking that has not enabled our understanding of our true place in the cosmos until now. That hole was due to a lack of knowledge regarding the true nature and structure of the universe. We are finally at a stage in our scientific evolution to begin to understand the nature of the cosmos and how we can begin to think about and ask questions that can be tested. This book begins the process of answering those questions, and has many great pictures too. They see the worldwide collaboration of scientists as an example of how the whole world can agree to work together for the benefit of the world. I found the book easy to read and the journey from our understanding of cosmology to a better understanding of our place in it to be very thought provoking. Check it out if you like the intersection between physics and the human condition and how we can find meaning and significance and how now, for the first time, we can ask questions that can be answered in a more testable way.



Abrams in this other book, *A God That Could Be Real*, presents an interesting, even if philosophical argument regarding the nature of God, where there is little agreement, even among the various sets of believers, about what characteristics apply and which do not. This is normally not the type of book that I read or comment on, although I do like the philosophy of science and how we come to know anything at all. But, given the book's author and philosophical nature, I actually enjoyed the first couple of chapters that I had time to read.

Abrams' central argument begins with the middle ages where little was known of the cosmos and any contradictions with science did not come up. There was much discussion at that time about the characteristics of God, and these discussions consolidated around what we know are now false claims about the universe. The Gods of Greece and Rome and other civilizations were often directly connected to nature, but during the middle ages this connection was severed. She argues, for instance, that the fight between Galileo and the church authorities resulted in further division between the scientific study of nature and belief. But she goes on to explain that this division was not necessary, and that God, nature and scientific study don't have to disagree, and the characteristics that we give up to get agreement with physics, are characteristics that don't matter much when it comes to fostering the relationship with God that most people say they seek.

Abrams says that to our modern minds, physics comes first, and since that is all we can know that is tested and relies on evidence, then God must be consistent with those laws and our beliefs can be understood to be made compatible with what we now know and understand. After all, the study of physics and other sciences where evidence is used in support of ideas is the most accurate approach to understanding our nature, and many of the ideas that are being rejected about God are just those old, erroneous unneeded assumptions and arguments which arose in the middle ages before the advent of the scientific method.

Yes, it seems to make sense that we should replace cosmological ideas formed in the middle ages with scientific concepts of the cosmos that are based on evidence which pass the observational tests now part of the scientific method. It is our choice, she says, that our understanding of God evolves and expands just as we know the universe expands and changes. Ok, ok, those are a lot of philosophical words, but something like that is the argument in the book. If your astronomical interest also flows into philosophy, be sure to check out this book. Abrams sees getting rid of some of the erroneous "middle ages" thinking as a way of getting more concurrence with our current knowledge of the cosmos without really impacting what folks seek in their search for something greater than themselves.

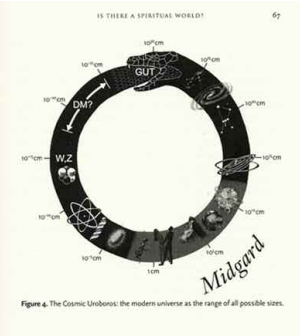


Figure 4. The Cosmic Uroboros: the modern universe as the range of all possible sizes.

Humans are located about half way between the very small and the very large.
(Source: Nancy Ellen Abrams)

One of the illustrations taken from Abrams' book is this one of the Uroboros, the snake swallowing its own tail. It sums up the unique position that we as humans occupy, almost halfway, in the size dimension between the very large and the very small. Modern physics talks about 63 orders of magnitude between the very large and the very small, associated with the Plank length. I still think this symbol, which shows how we are located about half way between the very small and the very large of what is currently available, is pretty interesting in that we are fairly well situated to investigate the large and the small. At the same time, there is still plenty of mystery in the universe in that over 95% of the energy density of the currently known universe is made of some unknown stuff. Pretty neat, we will have to keep an open mind and keep studying!

Until next time,

Resident Astronomer George

If you are interested in things astronomical or in astrophysics and cosmology, check out my blog at ***www.palmiaobservatory.com***

VOLUNTEER OPPORTUNITY

OCA Representative to WAA

Our club has been a member of Western Amateur Astronomers (WAA) for many years, and our representative for most of that time has been Tim Hogle, one of our Charter Members. He would like to retire from that position, and we are seeking a replacement.

WAA is an association of clubs in the western United States (different organizations serve other areas of the country), and its best known current activity is selecting the annual recipient of the G. Bruce Blair Award, which recognizes excellence in astronomy outreach activities. In the past, WAA organized conferences and provided resources for its members during times when there weren't many options available, and it is still available to provide support for its members, particularly smaller or newer clubs, though local needs have changed over the years.

The basic responsibilities of the WAA representative are to attend two Board meetings per year (one at RTMC and one elsewhere), report back to OCA on those meetings, solicit suggestions for OCA candidates for the G. Bruce Blair Award and formally deliver the nomination to WAA before the Winter Board meeting. Beyond that, our representative would potentially be able to influence the future course of WAA as it adapts to current conditions and determines how it can best serve the needs of its member clubs.

Tim is hoping to be able to overlap with whoever will be taking that over from him as WAA representative, to ease the transition to the new representative, and he is available to answer questions about WAA and what is involved in representing OCA's interests with the WAA. If you are interested in this position, please contact Tim Hogle (TimHogle@aol.com) or Barbara Toy (btoy@cox.net).

VOLUNTEER OPPORTUNITY

Website Designer for the OCA Website

The OCA website is a major resource for our members as well as where people most often get their first impression of us. Our current website has served us very well for over a decade, but it is based on old technology and urgently needs to be updated to meet our current needs, including an ability to work across multiple platforms (including smartphones and tablets). Amir Soheili, past OCA Trustee, was working on this project when he was transferred out of state earlier this year and had to give up his OCA activities.

If you are interested in getting involved in the redesign of the website, either as a solo project or as part of a group, please contact Alan Smallbone (asmallbone@earthlink.net) or Barbara Toy (btoy@cox.net).

Studying Storms from the Sky

By Teagan Wall

The United States had a rough hurricane season this year. Scientists collect information before and during hurricanes to understand the storms and help people stay safe. However, collecting information during a violent storm is very difficult.

Hurricanes are constantly changing. This means that we need a lot of really precise data about the storm. It's pretty hard to learn about hurricanes while inside the storm, and instruments on the ground can be broken by high winds and flooding. One solution is to study hurricanes from above. NASA and NOAA can use satellites to keep an eye on storms that are difficult to study on the ground.

In Puerto Rico, Hurricane Maria was so strong that it knocked out radar before it even hit land. Radar can be used to predict a storm's path and intensity—and without radar, it is difficult to tell how intense a storm will be. Luckily, scientists were able to use information from a weather satellite called GOES-16, short for Geostationary Operational Environmental Satellite – 16.

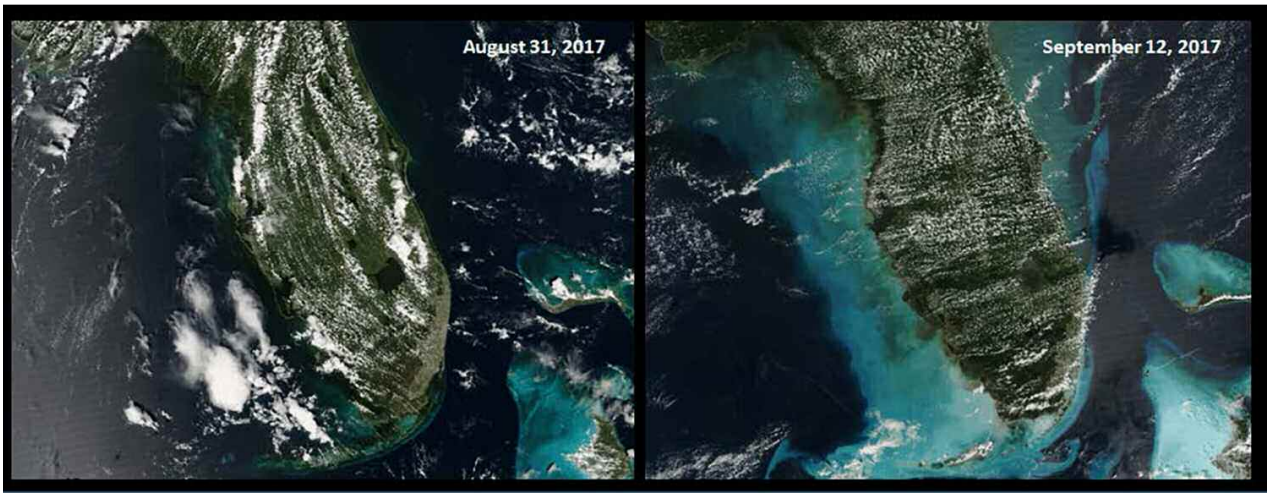
The "G" in GOES-16 stands for geostationary. This means that the satellite is always above the same place on the Earth, so during Hurricane Maria, it never lost sight of the storm. GOES-16's job as a weather satellite hasn't officially started yet, but it was collecting information and was able to help.

From 22,000 miles above Earth, GOES-16 watched Hurricane Maria, and kept scientists on the ground up to date. Knowing where a storm is—and what it's doing—can help keep people safe, and get help to the people that need it.

Hurricanes can also have a huge impact on the environment—even after they're gone. To learn about how Hurricane Irma affected the Florida coast, scientists used images from an environmental satellite called Suomi National Polar-orbiting Partnership, or Suomi-NPP. One of the instruments on this satellite, called VIIRS (Visible Infrared Imaging Radiometer Suite), took pictures of Florida before and after the Hurricane.

Hurricane Irma was so big and powerful, that it moved massive amounts of dirt, water and pollution. The information captured by VIIRS can tell scientists how and where these particles are moving in the water. This can help with recovery efforts, and help us design better ways to prepare for hurricanes in the future.

By using satellites like GOES-16 and Suomi-NPP to observe severe storms, researchers and experts stay up to date in a safe and fast way. The more we know about hurricanes, the more effectively we can protect people and the environment from them in the future.



These images of Florida and the Bahamas were captured by a satellite called Suomi-NPP. The image on the left was taken before Hurricane Irma and the image on the right was taken after the hurricane. The light color along the coast is dirt, sand and garbage brought up by the storm. Image credit: NASA/NOAA

To learn more about hurricanes, check out NASA Space Place: ***https://spaceplace.nasa.gov/hurricanes/***

This article is provided by NASA Space Place. *With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit* ***spaceplace.nasa.gov*** *to explore space and Earth science!*

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