Huachuca Astronomy Club of Southeastern Arizona

NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

OCTOBER 2017

PRESIDENT'S NOTES

SATURN SHINES AND A COMET TRIES

Ah, October. Now is a perfect time to turn normal sleep-seeking people into keen-eyed zombies (astronomers). Why, you ask? Saturn. How, you ask? Saturn, the planet that enthralled so many of us with the unimaginable rings, is in opposition; this year the rings are at their most open. Once every 29 years the rings appear angled 27 degrees (from our Earthly view) showing their brightness and complexity like no other time. Even naked eye, the planet seems brighter due to the added reflections from the rings. This October, Saturn is close to setting at dusk. However, given calm clear skies, we still have about two hours to gaze ourselves and mesmerize others; think neighborhood star parties. I know I've said it before but there really isn't a prettier sight through a smallish backyard telescope than planet Saturn.

Jupiter stays close to the sun this month, but the outer gas giants Uranus and Neptune are well placed for viewing. Uranus wanders along the ecliptic a little brighter than magnitude 6 in Pisces, while not far off, Neptune spends 2017 in the constellation of Aquarius shining a bit dimmer at magnitude 7.8.

COMET C/2017 O1 (ASASSN1)

IMAGED SEPTEMBER 17,2017, AT THEN MAGNITUDE 11.5, DAVID ROEMER.

Lastly, a new, brightening comet, C/2017 O1 (ASASSN1), discovered by the All-Sky Automated Survey for Supernovae (ASASSN), is expected to brighten up to magnitude 7.5 this month. I got a look at the comet while it was still below the equator in Taurus. It was small and dim at about magnitude 11.5 but already sprouting a short tail in my images. This comet won't be a show stealer, but it stays well placed for us Northern Hemisphere observers. October 1st, it should reach maximum brightness. By October 12th, it crosses the galactic equator, moving northward. On the 14th, it reaches perihelion 1.5 AU from the sun. October 17th, C/2017 O1 crosses into Camelopardalis. Then on October 18th, the comet passes closest to Earth at 0.722 AU distance. After that, it is on its way poleward and outward. So, C/2017 O1, is yet another comet taking a quick trip through to the inner solar system before heading out to darker pastures.

Clear Skies Everybody; no, I mean it.

AT THE OCTOBER MEETING

The October meeting will be held at 7 pm in the Library Commons at Cochise College on Friday, October 13. This is not our usual location. The Student Union is not available this month.

Our originally scheduled speaker had to reschedule, so this month's program will be a presentation by our resident Solar System Ambassador, Ted Forte, on the Psyche Mission to a metal world. The launch of the newly approved orbiter mission to the asteroid 16 Psyche has been moved up a year and a redesign of the spacecraft power system and an updated trajectory will shorten the trip to the asteroid belt.

Next month, we'll be back in the Student Union for a talk by Nogales amateur astronomer, Michael Schwartz who will update us on his Tenagra Observatory which has been searching for NEO's under a NASA contract.

HAC Elections: Call for Candidates

Elections for the HAC board of directors will be held at the November meeting. Nominations, including self-nomination, can be made in person at the October meeting or by contacting any current member of the board. If there are no contested positions, elections will be by affirmation at the October meeting. If any seat has more than one candidate, an election by written ballot at the November meeting will decide the seat. The successful candidate is the person obtaining a majority of voting members (members present at the November meeting). Only members in good standing may vote. Currently, the candidates for the board are as follows:

For President: David Roemer
For Vice President: Bill Howard
For Secretary: Bert Kelher
For Treasurer: Ted Forte

Member at Large (four seats):
Gary Grue
Ken Duncan
Ken Kirchner
Howard Day

The office of Past President is an un-elected post filled by the most recent former president (or the most recent former president available and willing to serve). If David remains President, Bob Gent will continue as Past President.

RASC Handbooks and Astro Calendars

The October meeting will be your final opportunity to order the 2018 RASC Observer's Handbooks through the club and receive the advantage of a volume discount and get the club discount on the 2018 Astronomy magazine Deep Space Mysteries calendar. The books and calendars will be ordered shortly after the October meeting.

The handbooks are $21 each and the calendars are 6.50 each. Please pay when ordering.

You can also purchase the books on-line:

1. Email Ted Forte tedforte511 at gmail dot com and let him know you will be ordering handbooks or calendars
2. Go to www.hacastronomy.org and along the right margin click on the Pay Pal donate button. You can use your credit card or your Pay Pal account.
3. Please add 3.5% to the cost of the handbook or calendar to cover Pay Pal's fee. ($21.74 for the handbook, $6.73 for the calendar)

HAC Dues

Most HAC memberships are set to expire each December. It's not too early to pay your 2018 dues. Regular memberships are $25, family memberships are $35, Students with valid ID pay $10. Military members get a $5 discount ($20 regular, $25 family).

If you have any question about when your dues are due, please see (or contact) the treasurer, Ted Forte.

HAC Holiday Party

This year's HAC holiday party will be a pot luck dinner in the Patterson Observatory classroom. As usual, the party will take the place of our December meeting.
We have reserved the Patterson classroom for Friday December 8 and Saturday December 9. Please let HAC President David Roemer know if you have a preference for the date.

The Kartchner Star Party

The Kartchner Star Party will be held on Saturday, October 14 in the bus parking area at Kartchner Caverns State Park. Weather permitting, we will set up solar telescopes for afternoon viewing starting around noon.

Dr. Kaitlin Kratter of Steward Observatory will be giving a talk in the Discovery Center at 5:30 pm.

Weather permitting, there will be stargazing after dark. Astronomers setting up telescopes get free admission to the park (just tell the guard at the gate who you are and why you're there and they'll let you in free). Guests pay the usual admission but the star party is at no extra charge.

Kartchner has only recently earned the International Dark Sky Association's *Dark Sky Park* status. Please come out and celebrate this remarkable achievement.

Thank you!

On behalf of the University South Foundation, and on his own behalf, Ted Forte would like to thank all the HAC members that purchased Dine Under the Stars tickets and helped with the event by manning the observatory. This year's DUTS was the best attended ever and while the numbers are still being crunched, it appears like it raised a considerable amount of money for scholarships. Thank you!

Chilli's Fundraiser

Stop by Chilli's for lunch or dinner on Thursday, November 2 and declare that you are there to support the University South Foundation and Chilli's will donate a portion of what you spend.

The Sun will form a planetary nebula? Maybe not!

Ted Forte

The *Binary Hypothesis* is the supposition that binary stars are required in the formation of (some, most, or all) planetary nebulae. Planetary nebulae are a late stage of stellar evolution of low and intermediate mass stars, i.e. stars less than about 8 solar masses that are too small to go supernova.

An idea started taking shape in the 1980's that the accepted model describing the formation of planetary nebulae could not account for the many complex shapes of these objects being revealed in HST images. That basic model is known as the Interacting Stellar Winds (ISW) theory.

Once a sun-sized star has converted most of the hydrogen in its core to helium, it begins a transformation from the main sequence ("normal" stars) that will take it through several stages of development in its conversion into a white dwarf. A white dwarf is a planet-sized stellar remnant composed of electron-degenerate matter (matter of extremely high density). The white dwarf is the core of the progenitor star: what is left after all of the outer layers of the star's atmosphere is ejected into the interstellar medium.

The intermediate phases between the main sequence and the white dwarf consist of the Red Giant Branch(RGB) phase, a period of Mira instability known as the Horizontal Branch (HB), a second ascent red giant period known as the Asymptotic Giant Branch (AGB) and finally the Planetary Nebula (PN) phase. The planetary nebula is an exposed stellar core surrounded by an ionized (glowing) circumstellar cloud.

The ISW theory describes the formation of this visible circumstellar cloud. All of the late stages of stellar evolution involve mass loss – the star expelling its atmosphere in a stellar wind. Mass driven away in earlier phases expands into space at low speed. By the time the star reaches the late AGB, the stellar wind is more energetic than the earlier wind and the ejected material is moving 10x (or more) faster. The faster moving material catches up to the slower material ejected earlier and compresses it in a snow-plow effect. The increased density sets the stage for photo-ionization.

As deeper layers of the evaporating star become exposed, the star's newly revealed outer surface gets hotter and hotter. By the end of the AGB, what remains of the star is just its incredibly hot core. It radiates in much shorter wavelengths than a main sequence star. Its principle radiation is in the ultraviolet. This UV radiation is energetic enough to ionize the gas (which is just at the required density for the process) in the circumstellar cloud, kicking electrons out of its atoms. When these free electrons recombine with nuclear ions they give off light in visible wavelengths. This process of absorbing high energy radiation and re-emitting lower energy radiation is called fluorescence. One very important atom involved in this process is oxygen. When two electrons are kicked out of an oxygen atom we say it is doubly ionized. When the doubly ionized oxygen (OIII) recombines with free electrons it gives off energy, a majority at 5007 angstroms, which is in the middle of the visible spectrum. This OIII line is the predominate emission from a PN and is why we employ OIII filters to observe them.

The glowing cloud is what we see as a planetary nebula. It will remain visible for as long as the necessary density is maintained (about 10,000 to 50,000 years). The model successfully explains the observed emission.

What the ISW model cannot explain is how a presumably spherical AGB progenitor can produce the varied complex shapes exhibited by a large fraction (about 80%) of planetary nebulae. Several explanations invoke spinning magnetic fields, asymmetric outbursts and interactions with variably dense environments to explain the bipolar, multipolar, and other aspherical morphologies exhibited by a majority of PNe. None of those explanations hold up under scrutiny, however.

What can very successfully reproduce the observed shapes is the inclusion of stellar companions. Given the proportion of intermediate and low mass stars that exist in binary or multiple star systems it seems likely that a significant fraction of stars that produce PNe are binary. The physics certainly works. Models of interacting binaries are quite successful in producing the jets, equatorial disks and

aspherical outflows that result in shapes that reproduce what we observe.

The problem is this. We don't see enough PN with binary central stars. Early PN surveys produced a binary proportion of less than 15%. More recent work has upped that finding to over 30% and extrapolating those results to systems, that for various reasons, complicate detection has enabled some theorists to conclude that the real binary proportion is close to 85%. Some insist that it will eventually be found to be 100%.

The hottest topic in PN research today involves the contribution of "common envelope (CE)" binaries. In a CE system, one star has previously evolved to a white dwarf state when its companion evolves off the main sequence. The expanding AGB star grows large enough to overflow onto its neighbor. The smaller, denser companion becomes engulfed in the expanding atmosphere and as the two stars spiral into each other they expel their common envelope, and that becomes the planetary nebula. The two cores can even merge, explaining at least a portion of the missing binary central stars. Some portion of these systems are double degenerate (two white dwarfs). The CE interaction is incredibly important to stellar evolution models and yet very poorly understood.

It seems likely that the discrepancy between the expected and observed numbers of binary central stars is the result of several contributing factors. The separation and period of the binaries may be too small to detect in some cases. Observational biases also come into effect – many systems may have too large a separation and too long a period to have been detected by surveys that spend too little time observing a single object. There is also the aforementioned portion of objects whose binary central stars have merged. Line of sight projection effects may obscure companions and we can't rule out the possibility that in some cases, the companion is a large planet or small star that has been ripped apart.

Our evolving understanding of planetary nebulae and the role of binary central stars has blurred the lines between these objects and various other categories such as symbiotic variable stars, type 1a supernova progenitors, and other types of cataclysmic variables.

More and more astronomers are becoming convinced of the important role that binaries play in PN formation and some are even suggesting that binaries are essential to their development. This calls into doubt the oft-repeated declaration that our own star will end its life as a visible planetary nebula. Certainly, the sun will undergo prodigious mass loss in its later stages. Those expelled gasses will expand into the interstellar medium and there is little doubt that material ejected at different stages will move away at different speeds. The exposed core will eventually collapse into a white dwarf. All of that is a pretty fair bet. However, there is some delicate timing involved in the creation of a visible planetary nebula. The circumstellar cloud must reach and maintain the proper density at the same time that the central star becomes hot enough to ionize it. Is the interaction of a binary companion necessary to achieve that? Right now, the odds are about even. But, the research seems to be moving in the direction that will predict a less spectacular end to our star.

Examination of the binary hypothesis is ongoing and fascinating to follow. Several scientific papers materialize each month, and most bring us a bit closer to the conclusion that PNe are exclusively the result of multiple star systems. There is still a chance, though, that the small number of purely spherical PNe are the result of single star evolution. Who knows? Maybe there will still one day be a Sol Nebula to delight some far away astronomer in the far distant future.

Want Ads

For sale: Meade 10" LX200 classic telescope

In very good condition, with tripod, 120v AC and 12v DC power converters with 25' power cords, dew shield, 8x50 finder scope, electric focuser, piggy back bracket, and soft sided carrying case.Also includes a set of Meade

CCD color filters, Meade CCD 3.3 focal reducer and CCD variable T-adapter. Plus some other equipment.

Asking $ 1,800.

Contact Bob Stroxtile at strox@ssvecnet.com or call 520-249-0875.

For Sale: Pier Tech electric telescoping pier with Lati-wedge made for the latitude of Sierra Vista

All the hardware, bolts, nuts, washers and plates are with the pier. Pier Tech can make new legs for it to make it correct for anywhere in the world. The pier and wedge have never been used and the only time the pier was out

of the box was to take the photos. New today, the pier and wedge are $3,400. Asking $2,800.

Contact Bob Stroxtile at strox@ssvecnet.com or call 520-249-0875.

FOR SALE: MEADE STARFINDER 8" REFLECTOR TELESCOPE

Will Sell at a very reasonable price. Included are a Telrad Finder, Filters, and additional Lenses.

Contact Mr. Jim Moses at (520) 803-0913 or by email jjmoses2@gmail.com

FOR SALE: PLANEWAVE CDK14 CORRECTED DALL-KIRKHAM TELESCOPE.

Includes the OTA, new November 2014, optional truss rod, shroud and, optional upper dovetail and the accessories that were included with the telescope (primary to secondary spacing tool). There is NO FOCUSER (they do not come with one, you need to add one) but the adapter for an Optec TCFS3i (which is the focuser I used) is included. I also have the factory wooden shipping crate. The telescope has been in use every clear night in the observatory in Sonoita. This is an outstanding instrument and a great imaging scope.

FOR SALE: CELESTRON CELESTAR 8 INCH S/C DELUXE - $1200.

Will also sell pieces individually. Contact Rhonda and Terry Taylor at (520) 366-2378 or by email at twrl2@yahoo.com. Or See Craigslist at http://sierravista.craigslist.org/bar/4523742100.html

FOR SALE: OLDER OPTICAL GUIDANCE SYSTEMS 12.5" F/9 RITCHEY-CHRETIAN TELESCOPE.

Very good Paul Jones ceramic optics, Robofocus secondary focuser, will include Takahashi collimating telescope. Some of the images through the scope are at Mshadephotography.com.

Contact Mike J. Shade at mshade@q.com

FOR SALE: 8" CELESTRON NEX STAR

Good condition with all original accessories.
Contact Mae Childs at maechilds2014@aol.com

Club Officers and Contacts

President: David Roemer **Vice President:** Bill Howard
Secretary: Bert Kelher **Treasurer:** Ted Forte
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Farpoint Astronomy http://www.farpointastro.com/
Starizona http://starizona.com/

HAC Oct/Nov Calendar of Events

SU	MO	TU	WE	TH	FR	SA
1 OCT	**2**	**3**	**4**	**5** 2:40 pm Venus/Mars 0.2⁰	**6**	**7**
8 Draconid Meteors	9 Columbus Day Draconid meteors	**10**	**11**	**12** 8:25 am	**13** HAC Meeting Librray Commons	**14** Kartchner Caverns Star Party Noon to 11 pm
15	**16** Seventh grade students from NACO at Patterson 10am	**17** Venus/Moon 2º	**18**	**19** 3:12 pm Uranus at opposition	**20** Member Star party Blue Marvel Orionid Meteors	**21** Member Star party (backup) Orionid Meteors
22 Orionid Meteors	**23**	**24** Saturn/Moon 3º	**25** Gather Home School Grp at Patterson	**26** Patterson Public Night 6 pm	**27** 6:22 pm	**28** International Observe the moon night. Pallas at Opposition
29	**30**	**31**	**1 NOV**	**2** Chilli's USF Fundraiser	**3**	**4** 1:23 am
5 Daylight Savings Time ends	**6**	**7**	**8**	**9**	**10** 3:36 pm Hac Meeting Student Union	**11** Girl Scouts at Patterson 6 pm
12	**13**	**14**	**15**	**16** Patterson Public Night 6 pm Leonid meteors	**17** The Nov Member Star Party will be 17 or 18 watch HACLIST for details Leonid meteors	**18** 6:42 am Montezuma Pass Star Party Leonid meteors
19	**20** Saturn 3º S of moon	**21**	**22** Neptune Stationary	**23**	**24** Mercury greatest east elongation	**25**
26 12:03 pm	**27** Mercury/Saturn conjunction	**28**	**29**	**30**	**1 Dec**	Huachuca Astronomy Club of Southeastern Arizona

All event times MST. Join Haclist to keep up to date with all of the Huachuca Astronomy Club events
Send an email to: haclist-subscribe@yahoogroups.com