NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

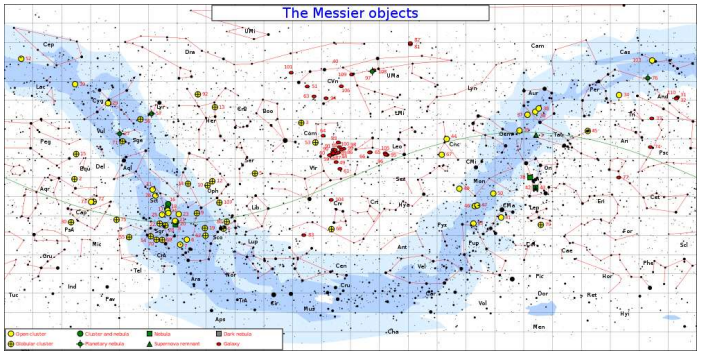
MARCH 2020

PRESIDENT'S NOTES

March Madness? Yes, a Messier Marathon!

Ah March, kite flighting, Tall people throwing things at hoops, stirrings of green in the garden and getting ready for a Messier Marathon. I won't thrill you with the story of Charles Messier or the origins of the early spring marathon. Instead let's just say if you want to see all 110 Messier objects in one (or more) nights it will take you all night and it will be a marathon. From before dusk to just about dawn. I've done the marathon at least a half dozen times but have never bagged all 110. Weather, horizons, drowsiness, the dreaded Virgo galaxies can all conspire to reduce your total object haul. The objects can all be caught with a small telescope (three-inch diameter objective or larger) or even large binoculars if the magnification is sufficient (25 x 100s will work) M1 is very small. The club has a date of March 21 this year, it's a Saturday and if weather gets bad, we'll reschedule till the next Saturday the 27th. Object tables, planetarium programs and moon phase information give you a window for the marathon from 17 March to 3 April for 2020.

A Messier Marathon Chart



Source: https://en.wikipedia.org/wiki/Messier_marathon

For some old school observers, the marathon is a test of star hopping. For others it is a great excuse to spend the night out with other M marathoners, kind of a focused star party. To others it is a celebration of a pioneer in modern astronomy that logged all these fuzzy objects so no one else would ever need to look at them. Still others take it as a contest to image all the objects in one night. Then there are those who never thought to do a Messier marathon or think they would never be able to find the objects. We don't know how many of each kind of observer/marathoner we have in the club, at least a few of each I expect. So, we wondered what we could do to best serve up the marathon in a format that most, maybe not all of you would enjoy. Our idea a Messier Marathon using the Patterson's 20" telescope. But Dave isn't using computers and program and telescope with an objective that size overkill?, sure. But what is our point here, well almost anyone can try to see the M-objects like Messier, small fuzzy cometish looking things. But we now know what the objects Charley wanted to avoid are wonderous, so let's look at them as they can and should be: big, bright and in focus.

I know it won't be as dark at the Patterson as it might be in your own backyard, but we'll be in a nice dome, using a 20" telescope that is computer controlled and have a nice warm classroom with a kitchen and bathrooms. Perfect for an over nighter. There is also the 6" refractor piggybacked on the 20" that can be used to image. As well, you can bring a scope and set it up on the patio, I might do that myself if only to make sure the Ted isn't putting Hubble slides in the 20"s eyepiece.

So, until then get some sleep, get some practice, and get out there and stare.

THE SHAPING OF PLANETARY NEBULAE PART 1

TED FORTE

The planetary nebula is a stage in the late evolution of stars of about 8 solar masses or less. When low to intermediate mass stars exhaust the hydrogen in their cores, they begin the process of evolving off the main sequence.

Once the core becomes clogged with helium, hydrogen fusion shuts down and the crush of gravity is able to overcome the outward pressure that has previously held the star in equilibrium. The star begins to collapse from the inside out and gravitational energy is converted to heat. The rising internal temperature and density will eventually ignite hydrogen fusion in a shell around the collapsing core. This not only halts the collapse of the outer layers, but actually reverses it, causing the outer layers to expand. The increased surface area of the expanded star cools and reddens. This is the Red Giant phase of stellar evolution or the Red Giant Branch (of the Hertzsprung-Russel diagram).

The fusing hydrogen shell continues to dump helium ash onto the still collapsing core which eventually will become dense enough, and hot enough, to initiate helium fusion (into carbon and oxygen). This new, more furious reaction radiates energy outward that disrupts the hydrogen burning shell and

causes the star to enter a new era of relative equilibrium – the inward crush of gravity balanced by the outward force of the radiative pressures. These forces will compete, alternately ebbing and flowing for a time and will manifest as the pulsations of a variable star. The details and variations of this process is unimportant to our story.

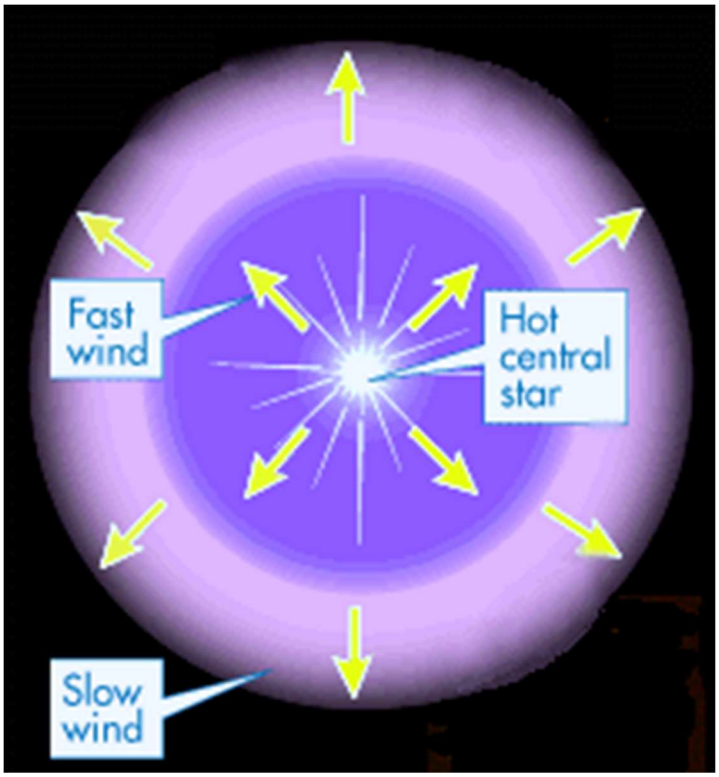
Eventually, the helium core becomes clogged with carbon and oxygen and in a process similar to the RGB, the star will expand a second time, this time to even greater dimensions. As helium fusion shuts down in the core, the collapse begins again, the gravitational energy of the infalling layers eventually resulting in helium igniting in a shell around the inert carbon core (often explosively) and then a hydrogen shell igniting around the helium shell. This pushes the outer layers of the star outward. This second ascent red giant phase is termed the Asymptotic Giant Branch or AGB, named after the nearly parallel line it creates on the HR diagram. It is these AGB stars that are thought to be the precursors of planetary nebulae.

As the star expands to enormous dimensions, the outer layers are necessarily less tightly bound and the outward pressures can more easily accelerate particles to escape velocity initiating extreme mass loss. As the layers peel away, the radiation pressure experienced at the star's ever-shrinking outer surface increases, and the surface material is driven away at higher and higher speeds.

In a much-simplified picture of what is known as the Generalized Interacting Stellar Winds (GISW) theory, a planetary nebula forms when the slow-moving material, driven away from the star in the late red giant to early AGB phases moving at about 100 KM/sec, is overcome and compressed by the faster-wind-driven material in the later stages moving at about 1,000 Km/sec. The faster wind-driven material overtakes the slower material and compresses it into a circumstellar shell. That shell achieves just the right density to be photo-ionized by the intense radiation from the central stellar body, now pretty much an exposed stellar core, which reaches the required temperature at the very same time. Ultraviolet radiation from the central star essentially fluoresces the cloud, which upon recombination of ions like OIII (doubly ionized oxygen), reradiate in the visible spectrum. The required conditions for a visible nebula continue for about 10-20,000 years as the cloud continues to expand, eventually becoming too thin to remain visible.

The GISW model explains spherical planetary nebulae quite well and remains the foundational backdrop for all PN formation models. But the rub is that less than 20% of Planetary Nebulae are spherical. Most planetary nebulae, and almost all known proto-planetary nebulae, are non-spherical. So, how do presumably spherical AGB stars produce the decidedly non-spherical nebulae that we observe?

In part two, I'll try to answer that question and touch on the latest advances in the study of the forces and circumstances that create the weird and wonderful shapes exhibited by most planetary nebulae.



Please Welcome Our New Members

Greg Deja of Sierra Vista joined the club at the February meeting. Welcome! We are glad you joined

At the Feb Meeting

The March meeting of the Huachuca Astronomy Club will be held in the library commons of the Cochise College library 901 N. Colombo Avenue in Sierra Vista at 7 pm. Our speaker will be Dr. Sergio Lettebe:

Betelgeuse: The Star and its "Fainting"

Betelgeuse is "fainting". What is "Betelgeuse"? What are its properties? How did it form? What is its fate? What does its "fainting" portend?

Sergio Lettebe received his doctoral degree in astrophysics from the University of Naples Federico II, Italy. A postdoctoral fellowship at the Vatican Observatory followed where he pursued photometric and spectral studies of irregularly variable stars. As part of this program he investigated the semi-regular variability of Betelgeuse, a project that he has continued to pursue over the years. His continuing interest in Betelgeuse serves him well for discussing the implications of the "fainting" of this red supergiant star. He has worked at Lowell Observatory in Flagstaff and recently retired to Patagonia, AZ, from a faculty position at Kent State University in Ohio.

Mark your Calendars for these special events

The HAC Messier Marathon: Saturday, March 21 at the Patterson Observatory. View the Messier objects through the 20-inch RC or bring your own scope. This event is scheduled for 6 pm till 6 am (if our observers hold out). March 28 is reserved as a rain date.

The Kartchner Star Party: Saturday April 18 at Kartchner Caverns State Park begging about noon with solar viewing. The LPL's Dolores Hill will deliver a talk on the OSIRIS REx mission in the Discovery Center at 5:30 PM. Stargazing from dark until 9PM (or later)

Math and Science Experience Friday April 24 from 9 am to 12:30 pm at the Patterson Observatory. This Cochise College outreach event is aimed at middle school students from all over the county. Patterson will be an "open exhibit" for the event.

The 3rd Not-in-any-way-Annual HAC Astro Swap Meet

Yep it is time for another HAC swap meet and we are having it on Saturday April 25. "There has been questions and hopes for another swap meet and we will continue to have them until we do it right," HAC President David Roemer was heard to say at a recent meeting. This time we are not going to have it during a major out of state star party, nor on a national holiday.

No, this time we are going to stage it on one of the dull weekends in April. Added to the already full field of items for a swap meet there are the amazing array of items from the estate of former HAC President Doug Snyder. Doug had a wide-ranging interest in astronomy, and it shows in the amazing collection of items that will be up for sale. As you know we have already circulated a spread sheet of some of his treasures. We'll be highlighting a few of these as well at the next meeting. If you want be involved with the swap meet please get in touch through the HAC group.

2020 Dues

Don't forget to pay your 2020 dues. There are several memberships in arrears (you know who you are). Actually, if you are not sure about your membership's status, please contact the treasurer (Ted Forte tedforte511@gmail.com). We hate to lose members, but it's a given that a few will leave us. If you are someone that has decided not to renew, please inform Ted so we can remove you from the roster.

Dues are $35 family ($25 for active duty military family), $25 regular individual ($20 military) and $10 for students with a valid student ID.

HAC dues payment options

1. You can pay your dues in person by cash or check made out to Huachuca Astronomy Club. See the treasurer, Ted Forte, at a meeting or event.
2. You can mail your dues check to the Huachuca Astronomy Club PO Box 922, Sierra Vista AZ 85636
3. You can pay online by visiting www.hacastronomy .org and pulling down the membership menu. You'll be directed to Pay Pal where you can use your Pay Pal account OR your credit card.
4. If you have a Pay Pal account, you can use PayPal Direct to send your payment to paypal@hacastronomy.org
5. If you have a Zelle account with your bank, you can make a dues payment by transferring funds to twforte@powerc.net

NASA Night Sky Notes

March 2020

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

Dim Delights in Cancer

David Prosper

Cancer the Crab is a dim constellation, yet it contains one of the most beautiful and easy-to-spot star clusters in our sky: The **Beehive Cluster**. Cancer also possesses one of the most studied exoplanets: the superhot super-Earth, **55 Cancri e**.

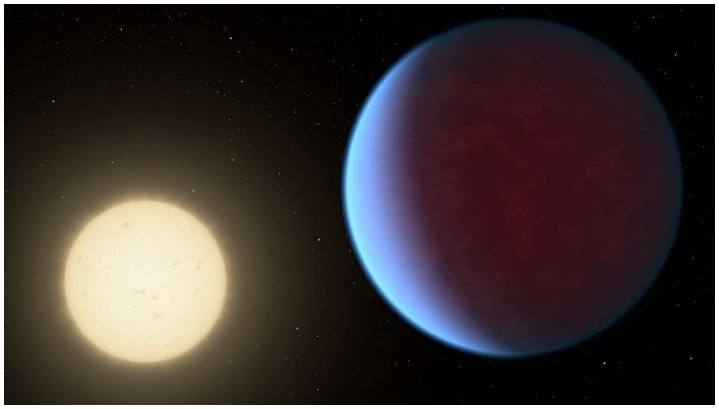
Find **Cancer's** dim stars by looking in between the brighter neighboring constellations of Gemini and Leo. Don't get frustrated if you can't find it at first, since Cancer isn't easily visible from moderately light polluted areas. Once you find Cancer, look for its most famous deep-sky object: the **Beehive Cluster**! It's a large open cluster of young stars, three times larger than our Moon in the sky. The Beehive is visible to unaided eyes under good sky conditions as a faint cloudy patch but is stunning when viewed through binoculars or a wide-field telescope. It was one of the earliest deep-sky objects noticed by ancient astronomers, and so the Beehive has many other names, including Praesepe, Nubilum, M44, the Ghost, and Jishi qi. Take a look at it on a clear night through binoculars. Do these stars look like a hive of buzzing bees? Or do you see something else? There's no wrong answer, since this large star cluster has intrigued imaginative observers for thousands of years.

55 Cancri is a nearby binary star system, about 41 light years from us and faintly visible under excellent dark sky conditions. The larger star is orbited by at least five planets including **55 Cancri e**, (a.k.a. Janssen, named after one of

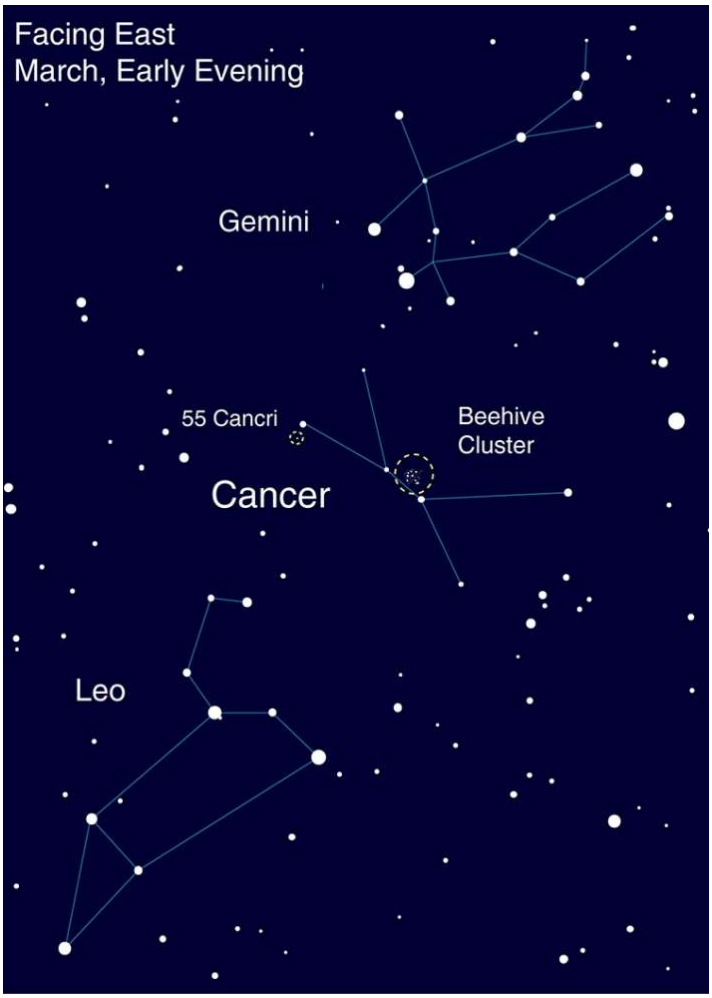
the first telescope makers). Janssen is a "super-earth," a large rocky world 8 times the mass of our Earth, and orbits its star every 18 hours, giving it one of the shortest years of all known planets! Janssen was the first exoplanet to have its atmosphere successfully analyzed. Both the Hubble and recently-retired Spitzer space telescopes confirmed that the hot world is enveloped by an atmosphere of helium and hydrogen with traces of hydrogen cyanide: not a likely place to find life, especially since the surface is probably scorching hot rock. The NASA Exoplanet Catalog has more details about this and many other exoplanets at bit.ly/nasa55cancrie.

How do astronomers find planets around other star systems? The Night Sky Network's "How We Find Planets" activity helps demonstrate both the transit and wobble methods of exoplanet detection: bit.ly/findplanets. Notably, 55 Cancri e was discovered via the wobble method in 2004, and then the transit method confirmed the planet's orbital period in 2011!

Want to learn more about exoplanets? Get the latest NASA news about worlds beyond our solar system at nasa.gov.



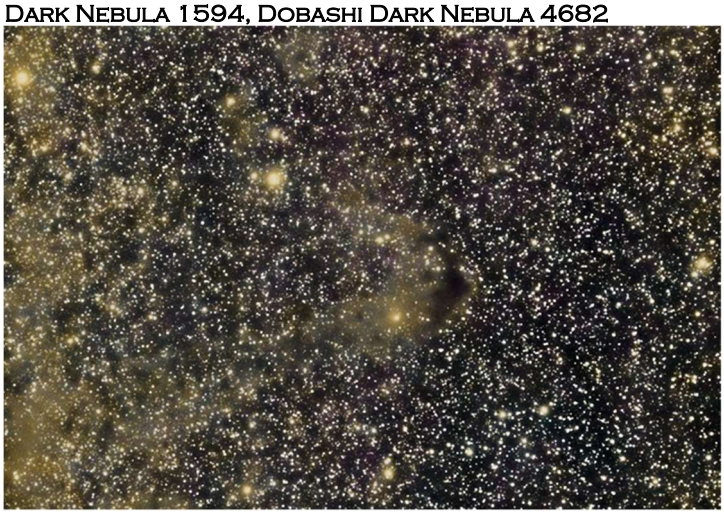
Artist concept of 55 Cancri e orbiting its nearby host star. Find details from the Spitzer Space Telescope's close study of its atmosphere at: bit.ly/spitzer55cancrie and the Hubble Space Telescope's observations at bit.ly/hubble55cancrie Credit: NASA/JPL-Calte



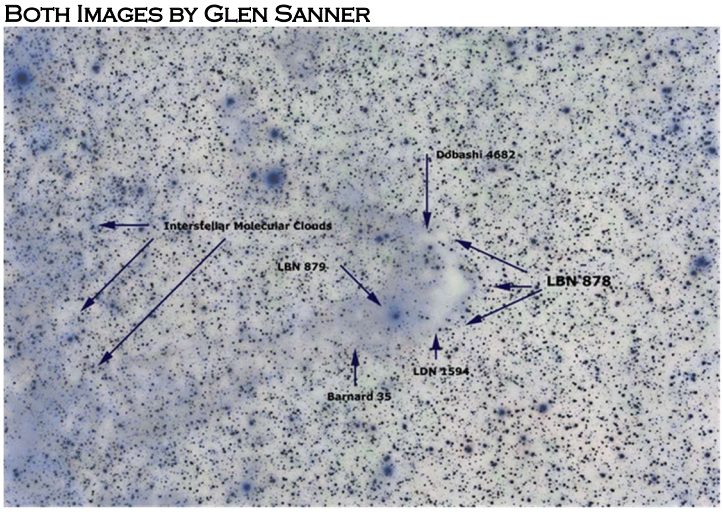
Look for Cancer in between the "Sickle" or "Question Mark" of Leo and the bright twin stars of Gemini. You can't see the planets around 55 Cancri, but if skies are dark enough you can see the star itself. Can you see the Beehive Cluster?

Pictures from HAC Members

Barnard 35, Lynds' Bright Nebulae-879/878, Lynds' Dark Nebula 1594, Dobashi Dark Nebula 4682



Both Images by Glen Sanner



Club Officers and Contacts

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HAC Mar/Apr Calendar of Events

SU	MO	TU	WE	TH	FR	SA
1 Mar	**2** 12:57PM	**3**	**4**	**5**	**6** HAC Meeting Library Commons Bisbee Sci Center 1-3PM	**7**
8 Daylight Savings Time begins	**9** 10:48AM	**10**	**11**	**12**	**13** Bisbee Science Center 1-3 PM	**14**
15	**16** 2:34AM	**17** 	**18**	**19** Faras Elementary Pirttleville 9-11AM Vernal Equinox	**20** Bisbee Science Center 1-3 PM	**21** Messier Marathon Patterson Observatory
22	**23**	**24** 4:28AM Venus greatest eastern elongation	**25**	**26**	**27**	**28**
29	**30**	**31**	**1 Apr** 3:21AM	**2** Patterson Public Night 7:30 PM	**3**	**4**
5	**6**	**7** 7:35PM	**8**	**9**	**10** HAC Meeting Library Commons	**11**
12 	**13**	**14** 3:56 PM	**15**	**16**	**17**	**18** Kartchner Star Party
19	**20**	**21** Lyrid Meteors	**22** 7:26PM Lyrid Meteors	**23** Earth Day Farmers Market in Vet Park 10a-2p Lyrid Meteors	**24** Math & Science Exp at Patterson 9AM to 12:30PM	**25** Telescope Sale and Swap Meet Patterson
26	**27** Venus Greatest Brillancy	**28** Astro Night at Faras Elem	**29**	**30** 1:38 PM Public Night at Patterson 7:30PM	**1 May**	

Join **HacAstro** to keep up to date with all of the Huachuca Astronomy Club events

Send an email to: HACAstro+subscribe@groups.io