Eyepiece Views: September, 2007

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E Y E P I E C E V I E W S #322

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1. INTRODUCTION

Fall again? Time flies with undeniable speed. AAVSO is once again gearing up for a very busy time of the year with the annual meeting preparations.

To find more information about our annual meeting click here.

While northern hemisphere-based observers are moving into the beautiful clear skies of the fall, the southern hemisphere is starting to warm up for more comfortable summer observing experiences.

Whatever season you are heading towards, enjoy the beauties that come with it!

We hope you will enjoy our fall issue. Your suggestions, comments, questions are welcomed, as always. Just send an e-mail to gamze@aavso.org

Thanks and good observing!
Gamze Menali, AAVSO Technical Assistant

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2. MIRA IS STILL WONDERFUL! - David B. Williams

Until the recent rise in popularity of cataclysmic variables, Mira stars were the "bread and butter" of the AAVSO. Their large light variations (up to ten magnitudes!) make them ideal targets for visual observers, and there are so many of them - more than 6,000 Miras were discovered before the era of robotic surveys.

Mira itself was the first periodic variable to be recognized. In August 1596, Dutch pastor and sky watcher David Fabricius noticed a "new star" in Cetus, which dimmed and disappeared in the following weeks. But this was not another nova. (He saw it again in 1609 but missed the significance). German lawyer and sky mapper Johann Bayer plotted Mira in 1603 while compiling his star atlas and gave it the designation omicron Ceti. It was seen again in 1638 by another Dutch observer, Johann Holwarda, who had the attention span to finally notice that Mira reappeared regularly every eleven months. The Danzig brewer and astronomer Johannes Hevelius proposed the name Mira.

The AAVSO has visual observations of Mira dating back to Argelander and Schmidt in the mid-19th century. Maxima of Mira are fairly reliable at third magnitude but can vary from second to fourth. Last year, AAVSO observers were excited to watch as Mira brightened to a peak at magnitude 2.1. Historical records suggest that Mira reached first magnitude in 1779.

Mira is the brightest Mira variable because it is the closest at just 417 light years. This proximity permitted another important discovery in 1923, when R. G. Aitken used the 36-inch Lick refractor to detect a close, faint companion star. Mira B was long thought to be blue, prossibly a white dwarf, but recent observations indicate that it is a normal K-type star of about 0.7 solar mass. Because Mira variables produce a strong stellar wind, some of this matter is captured in an accretion disk around the companion star, which, not surprisingly, is also variable (VZ Cet).

And after more than 400 years, Mira is still in the news. Mira is a red giant, and the Hubble Space Telescope succeeded in measuring its angular diameter of 0.06 arcsecond, making it about 700 times larger than the Sun - a giant indeed.

In August, astronomers operating a far-ultraviolet satellite announced another wonderful discovery. As Mira plunges through the interstellar medium at 130 kilometers per second, its stellar wind has produced a dramatic (in UV light) bow shock and luminous tail stretching back some 13 light years - two degrees on the sky. You can read all about it in Sky & Telescope's report.

Mira's amazing tail is a dramatic demonstration of why Mira variables are important. With their strong stellar winds, they are a prime means of enriching the interstellar medium. Miras are also of special interest because they represent a future evolutionary stage of our own star, after it swells to engulf the Earth and before it becomes a planetary nebula.

I didn't always observe Mira variables with much enthusiasm - they seemed to be ho-hum variables compared to other, more intriguing types. But several talks by Mira-star expert and past AAVSO president Lee Anne Willson convinced me that Mira variables really are important and worthy of our observing time.

The AAVSO International Database contains more than 60,673 observations of Mira. Are you one of the 1,600 observers who have contributed estimates? Mira is currently at minimum, around magnitude 9.0. But in a couple of months it will begin its rise to the next maximum in January. I'll be watching and contributing my observations of this wonderful variable star.

3. DO YOU SEE WHAT I SEE? - Gerald P. Dyck

While learning to find and recognize the fields of variable stars each observer will find mnemonic devices to aid in the process. I have a large repertory of these visual tricks to guide me on the way. As I move from naked eye to finder to eyepiece I often wonder how many other observers might be noticing the same little signposts which guide me to my targets. For me these visual markers come in several categories:

1. Miniature versions of standard constellations
2. Stick figures of various creatures and objects
3. Letters of the alphabet.

I will cite five examples in each category and wait to hear if any others observers have noticed any of the same things.

Miniature Constellations

DO Draconis - I cannot see the field of DO DRA with noticing the prominent Cygnus-like shape of the main asterism, except that the swan's neck is a bit too long to make a perfect replica. When DO is in outburst it is seen riding along on one of the wings.

WW Ceti - When WW is in outburst it sits in the position of Vega to complete a miniature picture of the constellation Lyra.

AR Andromedae - I locate this star by finding the miniature Sagitta which lies nearby.

CN Orionis - Have you noticed that this star is embedded in a miniature version of Cepheus? However, the roof of the "house" is a bit steeper than that of the larger brother. Another miniature, but much fainter "Cepheus" lies near DX Andromedae.

EY Cygni - Observers of this CV must surely have seen what I have seen: an almost perfect replica of the Big Dipper (though one cup star is out of place) pouring down onto the "shuttle" where EY CYG lies.

Stick Figures and Objects

FO Persei - I would have a good deal more trouble finding the rather difficult field of FO PER were it not for the "inchworm" of stars about half a field away.

SW Ursae Majoris - I have nicknamed the asterism in the field of SW UMA "The Candlestick" (the old-fashioned kind with the curved handle). Can you see it?

SS Cygni - Whenever I point out SS CYG to friends at my eyepiece I say, See the face of the steer? SS is right between his eyes." Does anybody else have the same vision?

RU Pegasi - I cannot look at the field of RU PEG without seeing a snail crawling from left to right (inverted

field). RU and its very near neighbor form the antennae.

IP Pegasi - When IP PEG is in outburst it shines inside a "kite" of the shape I used to manufacture when I was a boy. My stellar kite has a fine tail as well.

Letters of the Alphabet

Z Camelopardalis - This was one of my first CVs. Early in my observing adventures I noticed that its field was surrounded by an upper case "R" in the 8-power finder. I was doubly pleased to see a second "R" shape surrounding the target at high power.

UZ Serpentis - When this CV is in outburst it completes the fifth letter of the alphabet. Along with the asterism to its left (inverted field) it spells "YE."

UW Persei - Very near the position of UW Persei (which I have never seen in outburst) in a perfectly-formed "J."

UU Aquilae - In the field of UU AQL there is a lazy "K" lying on its face and guiding me to the position of this variable.

CY Lyrae - I can see a loose cluster of stars in my finder which, when magnified, spell the work "JO" above the position of CY LYR.

Conclusion - If any of you Eyepiece View readers have noticed any of my little astronomical sign posts or others in a similar vein, I would enjoy hearing from you.

Please contact me at geraldpdyck@yahoo.com

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4. THE EYE - Kate Hutton

This note to Eyepiece Views will be a combination of book review & account of an EXTREMELY special tour, for which I actually studied, hence the book review part.

When I was at RTMC (Riverside Telescope Makers Conference Astronomy Expo) over Memorial Day this year, I met a lady who is a night assistant (telescope operator) on the 200-inch telescope at Palomar Observatory. Jean Mueller is her name & she was introduced to me by members of the Ford Observatory crew Pam Gonzales & PJ Goldfinger. I believe they know each other because PJ is an operator on Mount Wilson (on the CHARA array, my next tour to try to line up - can I pass myself off as a journalist for Eyepiece Views, I wonder?).

Jean used to work at Mount Wilson. Jean very generously offered, with no arm-twisting or other coercion on our part, one of her days off to give us a tour of the Mountain. "Us" being that subset of the Ford crew known as the Fine Girls (FG's, not to be confused with yellow stars). Due to scheduling problems, believe it or not, yours truly (your journalist) was the only FG to actually show up!

But I'm getting ahead of myself. To prepare myself to ask intelligent questions, I read The Perfect Machine: Building the Palmar Telescope by Ronald Florence. This book is packed with the history of Pasadena, Caltech, Mt. Wilson & Palomar itself, plus much technical info, but is also quite a "page turner". After I was finished, I lent it to my mother, who had expressed interest, with the comment that "If you read this, you will learn more about Pyrex than you ever wanted to know!"

Where should I start? Maybe at the beginning.

I got there a little early, so I wandered into the viewing gallery. First, I should say that the dome is enormous (more or less the size of the Roman Coliseum), imposing & spotless white to help keep the temperature stable during the day. The main entrance is the one used by tourists, who follow a marble stairway up to a visitor area separated from the observatory floor by a glass wall. If you pay for a tour, or if you know someone, you can go beyond the glass wall. The docents are part of an organization called Friends of Palomar Observatory, which runs the public tours. There is also a small public museum & a gift shop. Be prearrangement, Jean met me there.

We started the tour through the other entrance, the one used by the astronomers, technicians, etc., on the ground floor, below the telescope. From the viewing gallery, it looks as if the mount rests on solid marble, or at least concrete, but it actually sits on a giant steel truss, which in turn sits on four concrete piers imbedded 22 feet into the granite of Palomar Mountain. A narrow (surprisingly so, considering California's penchant for seismic activity) cork spacer separates that concrete from the concrete the dome sits on. This isolates the telescope from vibration caused by movement of the dome.

Back one step... across the road from the above-mentioned back entrance, there is a historic but unsung hunk of concrete, 200 inches wide. It turns out that the Palomar telescope itself was, in spite of many technical & fabrication difficulties, finished years before the grinding of the mirror was complete. All the testing, balancing & whatnot of the telescope structure were performed with this particular concrete slug standing in for the weight of the glass. When the mirror arrived, the slug was unceremoniously dumped out the back door, where is lies today.

Back to the ground floor of the dome. One of the interesting problems described in The Perfect Machine is how to drive & slew the telescope with no vibration & very little power. At Mount Wilson in the early 1900's, this task was accomplished by the very environmentally unsound, but none the less workable, method of floating the weight of the 100-inch telescope on mercury! At Palomar, the same thing is accomplished with a very thin film of oil, secreted under pressure through many small pores into the right ascension & declination bearings. Florence relates in the book that the weight of a workman's milk bottle, properly placed on the mount, would move the telescope.

While reading The Perfect Machine, I continually got the feeling that the 200-inch telescope pushed pre-computer technology just about as far as it would go. One of many examples is the shape of the mirror itself, the back side of which is cast in a waffle pattern, which was supposed to provide adequate rigidity with less weight. The rigidity turned out to be insufficient to maintain the figure as the telescope would move to different parts of the sky, however. A clever Caltech engineer devised mechanical units that fit into each waffle recess. When tilted at different angles, each device puts just enough pressure on the back of the mirror to maintain the figure. It is said that no-one today understands exactly how they work, but they do.

The Big Eye, as the 200-inch is sometimes called, today has a lot of help from computers. A plethora of computer equipment controls the telescope, the instruments & their associated workstations. Erstwhile darkrooms are now instrument labs, offices & storage rooms. The prime focus, where the likes of Edwin

Hubble once rode the telescope on its nightly rounds, is now packed with detectors & other electronics. The laser for the "laser guide star" & all its accessory equipment fill the Coude room.

Also at the Coude focus is an old, unused control room. Under the console is a unique bit of Palomar history: the phantom telescope. In the old days, there was no easy way to automatically move the dome to match the telescope, except through this small model which is slaved to the motion of the big scope. The phantom doesn't actually look much like The Big Eye, of course, but the essentials of the mount are there, with relays in the proper places to get the dome to keep up with the telescope. The phantom is not used today, but perhaps was too much trouble to remove. The same task is now accomplished with the worldÕs longest bar code, which stretches all the way around the inside of the dome. One of the ubiquitous computers reads the bar code & moves the dome as necessary.

The operator's console & the observer's station, barely distinguishable from upscale workstations, are today not on the observing floor or at the Coude focus, but housed in a small "dataroom" adjacent to the observing floor.

What is on the observatory floor, normally pushed all the way to the side, is the immense aluminizing tank for the big mirror. Click here to see the aluminizing process in action and watch a time lapse movie showing every step.

Another change from the old days is a cage the size of a small room that rides at the Cassegrain focus, full of the equipment that the astronomer of the night will be using.

Of course, there are some other telescopes besides the Big Eye on Palomar Mountain. One that I particularly wanted to see was the 48-inch Schmidt, now the Samuel Oschin Telescope. In my mind, at least, it is famous for the Palomar Observatory Sky Survey (POSS I & POSS II), many of the plates for which were taken by my tour guide. (POSS-II, I believe, is the ultimate source of the DSS option in your VSP chart plotter, not to mention Google Sky.) Outside the dome there is a large microwave dish & a liquid nitrogen tank, hinting that the 48-inch is a now completely electronic & automated telescope. In fact it does not even look like the shiny machine in the old photos; it's completely insulated with a blanket like a household water heater.

Jean showed me, however, an old 14-inch glass plate or two. She showed me the plate holder that the plates were in when exposed & how the plates were vacuum sealed to the back of the holder so they would be curved to match the curved Schmidt focal plane. To give a feeling of the large field of view, the plate that Jean loaded onto the viewer contained all of M31 with room to spare. We had a little bit of fun with star catalogs identifying a couple of very large stellar images on the plate, which turned out to be 4th magnitude stars. The entire archive of original plates for the 1st & 2nd Palomar Sky Surveys are housed in the coude room of another Palomar telescope, the 60-inch, as there is no longer any room on the Caltech campus for such "legacy data".

The 60-inch telescope (no kidding, housed in the Oscar Mayer building) is Palomar's example of a totally modern observatory, which operates unattended. When you walk onto the observing floor, you are greeted with a sign warning "robotic telescope may move at any time" (accompanied by a sound similar to a truck backing up). On that particular night, a potential donor had the use of the 60-inch with an actual eyepiece. We dropped by in the evening & were treated to views of a few scenic planetary nebulae & a globular cluster much too big to fit into the field of view.

The rest of the night we spent camped out in the parking lot, shooting the mountain breeze & watching the Perseids, which were few but some good. In spite of L.A., San Diego & the Indian casinos, luminous peacocks

competing with each other to display the brightest lights, the sky is still pretty darn good up on Palomar Mountain. My eyes aren't the eyes of a teenager any more, but I could (just barely) see the 5.5 comp star for P Cygni.

On our way out, we paused outside the 200-inch dome, its white surface bright with starlight. The slit was open. Cassiopeia & the Milky Way were behind. It was a sight to behold!

Jean, you are an honorary Fine Girl.

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5. TRANSIENT OBJECT UPDATE - Dr. Arne Henden, AAVSO

(From a discussion group message sent on 9/4/07).

Remember with nearly all of the novae described below, they lie in crowded fields. As they fade, you need to be *very* careful about nearby contaminating stars. Another thing to note is that every single one of these novae is different from the rest, and that there isn't a "normal" one in the bunch. We have a lot to learn from novae.

V458 Vul
This nova went into outburst around August 9, had three peaks to about 8th magnitude over the next two weeks, and for the last two weeks has been fading smoothly to its current V=11.5 level. Nicely placed for northern observers, this nova should be monitored nightly as it will either have more outburst episodes, or will start to fade dramatically.

V5558 Sgr
After a few outbursts to as bright as V=6.3, this nova has settled down to V=8.3 and holding. Like V458 Vul, Halpha is strong. We're now about 130 days into the outburst, with no indication of this star fading away. Keep at it until the season ends!

V1280 Sco
After peaking at 3rd magnitude, this nova faded quickly to about 15th, had an echo outburst, and is now continuing to fade. Probably too faint for most observers, but you might give it a try if you can reach that far south (or are a southern observer) and get a few datapoints as it fades.

V1281 Sco
This nova faded smoothly from its peak about V=5 to about 13th magnitude in about two months, but I don't see any new data over the past few months.

V2467 Cyg
After many dips, this star seems to have settled down to about V=13.2, with a large Halpha bump. Just about every nova with strong Halpha is in the nebular phase, where getting accurate photometry depends on where your particular filter bandpass drops to zero.

V2615 Oph
After peaking at 9th magnitude, this nova faded until JD245250, at which time it started to fade quickly. It is now about V=16. Will it have an echo outburst? Keep watching and see.

V390 Nor
Another one of the multi-peaked novae; the first peak was the brightest at about V=9.7, but now it has faded to 13th magnitude. Too far south for most northern-hemisphere observers, You folks down south are the ones doing the brunt of the work on this nova.

SN 2007gr
This supernova looks like it peaked a week or so ago at V=12.6 and is now starting to fade. Be careful of the nearby bright spots on the galaxy, as they will interfere with proper magnitude estimates very quickly. There was a nice study by Li et al. in CBET 1041, where they compared recent CFHT images of the SNe along with archival images from HST to try and locate the progenitor. The best they could come up with is a match to a prominent cluster of several highly luminous blue stars, so the progenitor is probably a high-mass supergiant. They expect to get some late-time HST images for a careful comparison with high precision astrometry.

Don't forget PQ And for the upcoming HST visitation (I see a number of "fainter thans" in the 17th magnitude range, so I know observers are starting to contribute). Also, as mentioned on CVNet, there are other fun objects like FN Sgr (a symbiotic variable that may be an eclipsing system) and VZ Sgr (an RCB star currently undergoing a fading episode); the eclipsing cepheid ASAS182612 is still a good object to follow; blazars and HMXBs for other observers; etc. I bet we can find something for everyone!

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Please send comments and suggestions to gamze@aavso.org.

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