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E Y E P I E C E V I E W S #324

March, 2008

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1. INTRODUCTION

Greetings All,

Although there is still unthawed snow on the ground, it is almost spring for our Northern Hemisphere observers while folks down under are looking forward to welcoming another magical season, fall.

Speaking of spring, don't forget to check the AAVSO spring meeting announcement.

Our March issue is a fun one! One of our avid contributors, Mike Simonsen, created the Needs More Observations (NMO) tool a while back in 2003. In this issue of Eyepiece Views, we are reintroducing the NMO tool. Mike also submitted a great article about the latest total lunar eclipse. Chris Stephan also kindly shares with us his eclipse experience. Chris' efforts to encourage young people to engage in astronomy should be commended. Speaking of avid contributors, Kate Hutton sent us two book reviews both of which make excellent reads. We are happy to announce that we have yet another article from Mike Simonsen which many of you may have been looking forward to -- Mike's highly regarded LPV notes. We thank all of our contributors for making this issue a wonderful one and we hope that you all will just sit back, relax and enjoy a great read.

Thanks and good observing!

Gamze Menali, AAVSO Technical Assistant

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2. NEEDS MORE OBSERVATIONS (NMO) PLANNING TOOL - By Mike Simonsen

As most of you know, each year AAVSO releases the Bulletin with predicted dates of maxima and minima for long period variables (LPVs). This is a valuable tool for planning observing sessions. With it you can determine what stars will be visible in your telescope based on location in the sky for that particular month and the predicted magnitude range of the variables. However, for many stars there is not enough data to create mean light curves or make reliable predictions of the behavior of these stars. These stars are listed in a supplement to the Bulletin, "Stars in Need of More Observations".

In 2003, I created what came to be known as the NMO Planning Tool. It was a spreadsheet in both Excel and Word format containing all the stars from the Needs More Observations lists from the Bulletin. The tables could be sorted by constellation, RA, Dec and a number of other properties. The goal was to assist in planning observing sessions to obtain coverage of these under-observed stars, making the best use of the combined resources of CCD and visual observers. After two years or so of inactivity, we are reintroducing this tool for observers.

Each month we will examine the light curves and Quick Look data for these stars, noting their most recent recorded magnitudes and discernable trends such as rising to maximum or fading towards minimum.

The stars are then sorted by their current observed magnitudes from AAVSO data. Stars brighter than 13.5V are designated B for brighter. Stars fainter than 13.5V are designated F for fainter. Stars with no data available in the Quick Look files are designated NA. Stars with observations more than 30 days old are designated O. Each of these categories is then listed by constellation in order of increasing RA.

In the 'notes' column, stars are designated "conjunction" if they are in or approaching conjunction with the sun. Observations of stars setting shortly after sunset are important to help fill in seasonal gaps in the data. Conversely, stars that are coming out of conjunction and are visible before dawn are designated "morning". Observations of these stars are important to fill in seasonal gaps in the data also.

We encourage visual observers to obtain positive estimates of the stars brighter than 13.5V first, and then move on to other targets. CCD observers and visual observers with large aperture telescopes are encouraged to go after the objects fainter than 13.5V. Any observations of stars with old or no data are useful.

The lists will be revised and posted to the AAVSO website before the first of each month.

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3. BOOK REVIEWS By Kate Hutton

Book Review: GALAXIES IN TURMOIL; the Active & Starburst Galaxies & the Black Holes that Drive Them, by Chris Kitchin, Springer 2007

When I was studying astronomy in the 1970's, there existed a bewilderment of unusual galaxies & unusual radio sources: double-lobed radio galaxies, quasars, Seyferts of various types, QSO's, BL Lac objects. The consensus was that black holes (if they existed) must be responsible for the enormous energy output in some mysterious way, but it was not clear how these various objects were related to each other, if they were. Much has happened in 30 years. GALAXIES IN TURMOIL does an excellent job of tying the field together in a language appropriate for the serious amateur astronomer or astronomy "buff". There is a unifying model, such that each AGN (active galactic nucleus) possesses some or

all of certain usual features, depending on the mass & feeding rate of its central, supermassive black hole. A great deal of the variety, which of the features are seen from Earth, it turns out, is explained largely by the viewing angle. For example, if we see the host galaxy more or less flat on, we see most of the features, while some features may be hidden by a torus of obscuring material if the host galaxy is seen edge on. If we happen to be looking directly into one of the high-energy "jets", we see something different entirely. There is a good explanation of "relativistic boosting", which makes the jets appear brighter & more rapidly varying than they would be if they were not traveling toward us at very close to the speed of light.

The last chapter covers some details specifically for the amateur astronomer: how to observe AGN's. A large table is provided, listing 150 or so of the brightest objects, ranging from V=9-ish to V=16-ish. Unfortunately, no information is given about coordinating organizations such as the AAVSO, how to make magnitude estimates, or where to get comparison star information.

Oddly, I find no biographical information in or on the cover of this book. Kitchin writes like a professional astronomer, although not at all obscurely. A quick "google" shows that he is an astronomy educator & a professor at the University of Hertfordshire. He has written a number of books for the amateur crowd, particularly in the Patrick Moore series. By this sample of one, I would say he is good at it.

Book Review: FLASH! The Hunt for the Biggest Explosions in the Universe, by Govert Schilling (translated by Naomi Greenberg-Slovin), Cambridge University Press 2002

There are probably more up-to-date popular books on gamma ray bursts (GRB) available. This one came out in 2000 in Dutch, 2002 in English & the field is a rapidly developing one. FLASH!, however might be one of the most entertaining. Schilling is a science writer specializing in astronomy & a contributing editor to Sky & Telescope, so there are no bloopers. I'll be looking for more of his books.

"Armageddon is a Valhalla compared to what happens here. In a fraction of a second the star collapses in on itself. Trillions of tons of hot gas disappear forever through the one-way door of a black hole. Space becomes distorted, time ceases to have meaning, and matter is thrown into a frenzy. The star devours itself from the inside out. In a last agonizing scream the disappearing nucleus of the star spews out two jets of boiling, roiling matter ... They bore burning tunnels through the outer layers of the star, which has no idea of the drama that has come to pass in its dark depths. But the star cannot continue to exist in the face of this cosmic violence. Like a Christmas bauble with a hand grenade inside, it explodes, spitting out an incredible quantity of energy that comes free from its inside."

Thus, perhaps, the prologue draws the video game set deeper into an informative book. The entire book is not written in this "explosive" style, but the style is colorful nonetheless, with a slight, intriguing European accent. Concerning the competition between gravity & nuclear energy production that rules stellar evolution, the author says: "Ultimately, however, it is indeed gravity that wins. Gravity needs no fuel. While a star stokes itself up to prevent a catastrophic collapse, gravity just has to sit by patiently & wait. When the hydrogen supply finally gets used up, the internal pressure drops & gravity makes its move. How fast this occurs depends upon the original mass of the star."

There is also much about the human side of scientific research: international & personal rivalries, getting instrument packages into space by various means, wrangling director's discretionary telescope time, with whom one can share privileged information, even speculation by the girlfriends of graduate students

about why gamma ray bursts prefer to happen on weekends & holidays! Tycho Brahe's gold nose, or even Tycho Brahe himself, would not have existed without supernovae like the Stella Nova that he observed in 1572.

It is hard to get anything else done while FLASH! lies around the house, only partially read.

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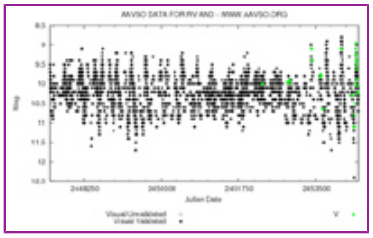
4. LPV Notes March, 2008 Mike Simonsen

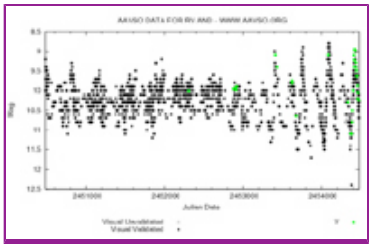
As spring draws near, many interesting Long Period Variables (LPVs) become lost to the sun. March is the best chance to get those last few important observations before these stars go into conjunction.

RV And is one such interesting star. It is listed in VSX as a SRA, ranging from 9-11.5V with a period of 171.65 days.

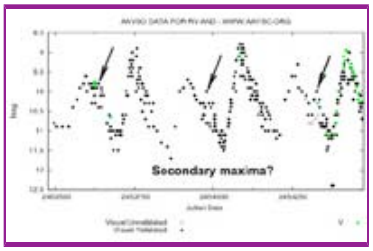
Here is a known case of the light variations changing characteristics abruptly and dramatically. Examining the 7000 day AAVSO Light curve shows this clearly. In the early part of the light curve RV And is varying consistently between 9.1 and 11.5, for the most part. Then the changes become apparent. The range of variation decreases and the period decreases. Just as suddenly, the variations return to something resembling its previous behavior, perhaps with slightly brighter maxima than before, every other cycle.



The 4000 day light curve shows this most recent transition clearly. Obviously, this star deserves continued long term coverage.



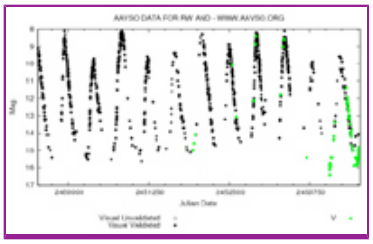
What I find particularly interesting is what appear to be humps or secondary maxima in alternating cycles in the recent data. The 1000 day light curve shows this well.



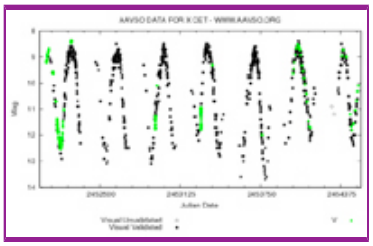
RV And is listed in the Bulletin as a star in need of more observations. I think it's not only deserving of more coverage, but I suggest a higher cadence of observations to see if this secondary maximum can be more clearly demonstrated to be real, fleeting or perhaps developing into some other new characteristic behavior. Always brighter than 12th magnitude, it is easily visible in small telescopes. It is currently heading for minimum and the next cycle should be one that exhibits this odd behavior. As luck would have it, it is also dropping like a stone into the sun. Observe it while you can in the west, and try to pick it up as a morning object as soon as possible on the other side of Sol.

For further reading on this star, specifically addressing this mode switching behavior, read 1991AJ....101.1043C Observation of Possible Mode Switching in Three Semiregular Variable Stars, Cadmus, R. R., Jr.; Willson, L. A.; Sneden, C.; Mattei, J. A.

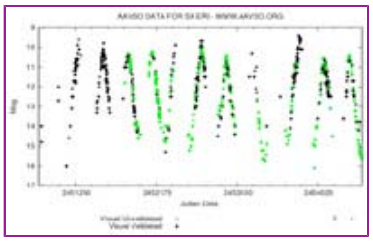
Another Mira in Andromeda, RW Andromedae, seems to have had two rather faint maxima the last two cycles. Mostly maxing out around 8.0 in previous cycles, the last two have barely scratched their way to 10th magnitude. Will this be the rise to max that makes it to the top, or not? Currently below 14th magnitude and on the rise, this will be an interesting cycle to see what happens as it rises towards maximum.



X Ceti suffers from poor coverage of its entire light curve. Due to the 177 day period, every other cycle it is lost to coverage as it goes into conjunction with the Sun. Looking at the 2500 day light curve only reveals half the story here. Is this one of those Miras with alternating bright and faint maxima? It will be hard to tell without more data. These are the kind of stars we need to follow as far into the west as possible and pick up in the morning sky as early as we can.

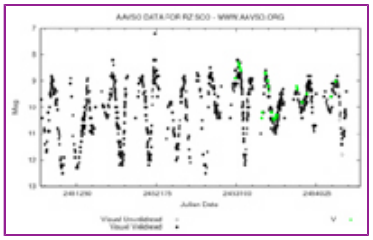


Also getting lower in the west each night is SX Eridanus. Currently at or near minimum, around 15th magnitude, it should be on the rise just as we lose it to the Sun. Maxima vary from 10.5 to 9.3. Like RW And, it has had two faint minima the last two cycles. How far will it rise before we lose it? How bright will it be when we see it in the morning, preceding Orion into the morning sky?



In the morning sky this month, many of our LPV friends from spring and summer are already well above the horizon before dawn. Stars in the Milky Way regions of Cygnus, Lyra, Ophiuchus, Serpens, Aquila and Scorpio lay waiting for the early risers and all-nighters amongst us.

RT Sco is a star that just doesn't get much attention. RU Sco has received almost no attention from visual observers in the last few years, though it has been well observed by CCD observers. RZ Sco has a very erratic and interesting light curve, and is definitely worth keeping tabs on!



In May we'll check back with the stars that are setting in the west now to see what has happened while they've been in hiding. Until then, clear skies and warmer nights to you all.

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5. RED STARS, RED MOON By Mike Simonsen

Contrary to conventional wisdom, I observe variable stars during full moon. No, it's not my favorite time of the lunar cycle to observe due to the sky brightness, but I think you should take advantage of a clear night regardless the phase of the moon. Once in a great while a syzygy occurs and even full moon isn't such a bad time. (A syzygy is the alignment of three or more celestial bodies in the same gravitational system along a straight line. The word is usually used in context with the Sun, Earth, and the Moon or a planet. Solar and lunar eclipses occur at times of syzygy.)

February 20th was the last total lunar eclipse for North America until 2010, and it happened to be the first clear night here in 2008 that wasn't -50C, so I headed out to the observatory as twilight ended. The moon was already well above the horizon in the east, parked slightly NW of Saturn in Leo. Between the snow-covered ground and the full moon it was impossible to tell twilight had ended. It was bright enough outside to read by. The snow underfoot crunched sharply as I walked out to the dome, a sign it was already pretty cold outside, but the forecast low was for -20C, seasonably cold for a Michigan night in February, and bearable as long as there is no wind to speak of.

Orion was just about due south, and neither the telescope nor I wanted to move very far from our parked position, so I began observing in and around Orion first. The seeing was pretty steady and there was no haze or cirrus. On a good night like this I can easily see stars down to about 14.5 from the celestial equator to

about -20 declination with the 12 inch. Full moon's added charms had reduced that to around 13.8. I checked off three stars in Eridanus and then moved on. Fortunately, the southernmost stars in Canis Major on my list were both fairly bright, 10th magnitude, so making the estimates there was easy. The Moon was rising higher and the eclipse hadn't started yet, so the sky was getting brighter as I moved into Orion.

I find Orion to be a lot like Taurus for visual observing. There are beautiful areas with bright blue and white stars dotting the field of view, and then there are those troublesome dull areas that seem to be shrouded in a haze and devoid of anything but a few dim guideposts to find your way to the variables. Finding your way around during full moon is really difficult in these spots. I found myself getting impatient for the eclipse to begin to eliminate the moon-glow polluting these star-poor fields. About the time the moon was half covered by Earth's shadow, things started getting better. Fainter stars began popping out of the background and I was able to make 14th magnitude estimates.

RR Orionis is one of my favorite Miras in Orion. It spends a good deal of time fainter than 13th magnitude and has a couple 14th magnitude comparisons close by that can fool you into making a hasty misidentification on a cold moonlit night. Fortunately, its about as far north as you can go in Orion, so if the moon isn't too bright I can make out all the 13th and 14th magnitude comp stars in the field and sort it all out to make the call. RR Ori was in the mid 13's, so it was good that the earth's shadow was gobbling up the moon. I finished the remaining LPVs in Orion and went inside to have some coffee, warm up and wait for totality.

About twenty minutes before the last bit of bright white Moon disappeared I stepped back outside and looked at the moon with binoculars again. The back yard was noticeably darker and most naked eye stars visible on a moonless clear night were pretty easy to make out. I headed to the observatory hoping to get dark-adapted by the time totality began, so I could take advantage of this 'bonus' dark time in February.

I pointed the telescope up towards Auriga. It looked like the darkest part of the sky, was riding nice and high, and Auriga is chock full of interesting Miras. At this point the dogs in the area all seemed to notice the moon was disappearing and began barking. One would start barking here, another one would answer him off in the distance, and the racket grew louder and louder as all the dogs within earshot started sharing eclipse notes. As the moon turned completely dark orange-red the coyotes began howling. This got all the dogs going again. As if that weren't enough to scare away whatever sky dragon was eating the moon, the donkey on the horse farm north of me started braying as loudly as I've ever heard him.

The canine cacophony eventually subsided and I enjoyed the hour of totality observing Miras in Auriga. About the time the moon started to escape the grip of eclipse, both the telescope and I were pretty well frozen. My fingers were starting to hurt and the corrector plate was frosted on the inside about an inch all the way around the central obstruction. The dew heater can't keep up with pointing straight up on a -20C night for long. I packed it in, closed up the dome, took a last quick tour of the moon in binoculars and headed for the warmth of the house.

In the morning I noticed the blue jays at the bird feeders seemed a little grumpier than usual. They probably didn't sleep very well with all the racket from the dogs and the donkey the night before. Me, I slept like a frozen rock.

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6. LUNAR ECLIPSE GRACES SKIES OVER AVON PARK MIDDLE SCHOOL By Chris Stephan

Wednesday February 20 brought the last total lunar eclipse that will be visible until December 2010. I wanted to encourage the students to come out and see this great celestial event so I host a star party on the outdoor basketball court of Avon Park Middle School. Several students and parents showed up early and help move six telescopes and other equipment from my room to the outdoor court. The skies did not look very promising at first, yet there was close to 30 people there early, before the eclipse began.

The eclipse was predicted to begin at around 8:30 P.M. and last until midnight. I scheduled the star party from 8:30-11:00 P.M., since it was a school night. The clouds opened at the beginning of the eclipse. We could see the earth's shadow starting to creep onto the lower left portion of the moon. By 9:00 P.M. there were 100 or more people there! There were lines of people at each telescope. I also had 4 new binoculars, which were put to good use. Many people brought their own binoculars.

Throughout the eclipse, I walked around and gave explanations of the telescopes and also what was happening during the eclipse. As the eclipse drew near to totality, many people started to comment on the orange-rust color of the moon.

Another highlight of the evening was Saturn. Saturn just happened to be just to the lower left of the moon. The telescopes nicely showed the rings of Saturn. We also had opportunities to look at Mars, and a few other objects.

Clouds played hide and seek on and off through out the evening, but we had many good openings to view the eclipse. Many people were still around at 10:15 P.M. However, a large patch of clouds came over, covering the entire sky. It was totally cloudy at 10:30 P.M., so I thanked everyone for coming, and closed up the star party.

I was so pleased at the number of students and parents who attended. The excitement shown by the students made the evening worth it.

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Good observing!
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