Eyepiece Views: July, 2006

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1. INTRODUCTION

Yet another season! While we are enjoying summer here in the northern hemisphere, we hope that our observers from the southern hemisphere are enjoying another beautiful season, winter.

This is Eyepiece Views' first anniversary since our return to regular publication. And here's another event that makes you think about the speed with which the Earth makes one complete revolution around the Sun: It is also Eyepiece Views' fifth anniversary! We had to take an extended break during publication because we needed to reorganize the staff time for a large project. It has been great to be back! We hope that you enjoyed the articles published and information given in our publication so far.

Our July issue has light, fun readings in it. If you like it, consider going back to read our previous issues in greater detail.

With our best wishes for our readers and observers around the world!

Thanks and good observing!
Gamze Menali, AAVSO Technical Assistant (MGQ)

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2. STARS IN NEED OF OBSERVERS - Dr. Matthew Templeton

Those of you who've been reading Eyepiece Views for a long time may remember that Janet Mattei contributed occasional articles on Miras in need of more study, and lists of these stars are also released annually as part of the AAVSO Bulletin. In the June 2005 edition of Eyepiece Views, Erwin van Ballegoij gave a good review of how to observe Mira stars and other LPVs, along with recommendations for interesting stars. In this issue of Eyepiece Views, I thought I would do a little cheerleading of my own, and make some suggestions for worthy and interesting targets.

First, if you are not already familiar with it, the annual Bulletin of the AAVSO contains predicted dates of maxima and minima for 562 long-period variables. Many of these stars are long-time favorites of AAVSO observers, but many more of these go underobserved for one reason or another. Some of these variables are in desperate need of observations, and anything you can do for them would be appreciated. Included in the Bulletin are lists of stars that we've marked as "in need of observations" -- we've even broken them down into "urgent need" and "very urgent need" for your convenience! Many of these are southern stars, and Southern Hemisphere observers are encouraged to try some of these if they're able. But a few are observable by just about everyone. One example I picked off the list is U Cap, for which we have D- and E-scale charts. At -15 degrees, nearly everyone has a shot at it, and at 20 hours RA, it's in view right now. Give U Cap or any other star on our "In need of observations" list a try if you're looking for a new challenge this season.

In addition to the stars on that list, even "well-observed" stars can use some well-timed help now and then. All stars that lie at low to moderate declinations have annual gaps of varying lengths due to interference from the Sun. Stars become less well-observed as they rise later and later in the evening, until observations stop entirely for a few months before they become visible in the evening sky again. However, some stars are interesting all the time, and some of their short-term activity may go undetected without observational coverage. Some Mira variables, including Mira itself, have varying maxima and minima. Others, like the SR+symbiotic star CH Cyg, the Mira+symbiotic star R Aqr, and the carbon miras R Lep and R For, may exhibit other interesting behavior. Observations of such stars when they are morning objects can be a huge help to those who make use of AAVSO data later on. As someone trying to disentangle omi Cet's intrinsic behavior from the annual observing gap, I put myself at the head of that list! If you observe in the morning hours, consider adding some Miras and other long-period variables at low declinations into your observing routine.

One group of Miras that demand continuous coverage are those that we know to have changing behavior. I've written several times about Miras exhibiting period changes, and those stars need to be continuously monitored well into the future. The best-known candidates are currently: Mira stars T UMi, LX Cyg, BH Cru, R Aql, R Hya, R Cen, Z Tau, and W Dra, and the semiregular star RU Vul. Other stars with interesting period changes include the Miras RU Tau, and S Ori, and the semiregular (SRd) variable Z Aur. But period changes aren't the only things going on. For example, some Miras appear to undergo changes in chemical composition. Albert Zijlstra noted in a 2004 paper that TT Cen seems to be on the border between the "C" and "S" type Miras, and that its spectrum alternates between the two. While chemical changes can't be tracked visually, the optical light curve can be compared to spectroscopy to help understand what's going on. TT Cen has become better-observed in recent years, but more observations are needed.

Finally, in addition to the long-period giants, there are some other stars nearing the ends of their lives that bear watching. A fine variable star for southern binocular and small-telescope observers is eta Carinae. This bright luminous blue variable is made up of one or more blue supergiant stars, and is a supernova waiting to happen. While the supernova will be a fine show (whether it happens tomorrow or a thousand years from now), it's an interesting variable star right now, with variability coming from the star itself, binary eclipses, and the interaction of the stars with the stellar wind. Continued monitoring of this object provides useful data for astronomers trying to understand what's happening in this complex system. In the northern hemisphere, the star P Cyg belongs to the same class of variables as eta Car, and makes a fine target for binocular and small-telescope observers.

Most variable star observers have their favorites and "old friends" that they keep track of year after year, and it shows in

the extraordinary length and quality of many light curves in the AAVSO International Database. But many stars also go unobserved or underobserved, and visual observers have a great opportunity to maintain and expand the lightcurves of lots of variable stars. If you're looking for a new challenge this summer, want to make a unique contribution to the AAVSO, or just want to mix up your routine, take a look at list of underobserved stars in the AAVSO Bulletin, or at any of the stars I've talked about here. Astronomers -- current and future -- may thank you for it!

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3. RAMBLINGS FROM THE UK - Gary Poyner

Recently the BAA Variable Star Section held its annual meeting at the world famous Rutherford Appleton Laboratory in Oxfordshire, England. A time for old friends and acquaintances to get together and talk about observing (and in my case the archaeology of Leptis Magna in Libya, but that's another story), Variables and of course the weather (what else do we Brits talk about!) Our honoured guest was Dr. Arne Henden, who spoke about the enigmatic V838 Mon. Although an excellent presentation, I'm sure we would all agree that having the opportunity to chat with Arne face to face was the highlight of the day. The talks by amateurs at the meeting were heavily biased towards CCD photometry (pretty common nowadays), with just one being given on visual observing alone. I gave a short presentation on the current OJ+287 campaign, but that of course is a mixture of both visual & CCD. But quite apart from this leaning towards CCD's, the thing that struck me most of all was, where were all the young people? Without being too unkind to a mixed sex audience, the average age must have been 35-40, with probably the youngest person attending being one of the speakers, Dr. Darren Baskill from Leicester University. This has indeed been the case for many meetings of the BAA over the years, and not just those concentrating on Variables.

Over the past few years I have travelled to many Astronomical Societies from Scotland to the south coast of England, spreading the word on the Visual observation of Variable Stars to the best of my ability. But I can count the number of young people attending all of those meetings on one hand. Speaking with the various secretaries of those clubs, I find that there just aren't any young people attending local society meetings these days. Why is this? What has happened to youth in amateur astronomy? I remember back some 36 years ago when I first joined a local Astro club (Birmingham AS), how thriving the junior section was. As an enthusiastic 12 year old, I was one of around 10 youngsters all eager to learn from the adults, try different types of telescope, and just be generally involved in an evening of pure practical astronomy. This no longer seems to happen in the UK. Does it where you live?

Modern technology, the use of computer controlled telescopes and laptops and superb Astro software should all be factors in luring the young person to our hobby. But it doesn't appear to be the case. Why, you don't even have to get cold and damp now to carry out your observing. It can be done from indoors! Is it cost, light pollution or indifference which keeps the young from observing their own personal night sky? And who will take over the observation of Variable Stars when we present group reach our own quiescence? It's a worrying prospect that come fifty years from now, there just might not be any amateur Variable Star observers at all, at least in the UK!

In the November 2002 issue of Eyepiece News, you will find a piece written by me on the relative advantages of a Dobsonian Telescope over a GOTO. In this piece, I describe how using such a telescope left me feeling cold and didn't give me the same feeling that I get from finding the objects myself. Well it may surprise some of you who remember that article that just 12 months later, I would be the owner of a 14-inch LX200 GPS. The reasons for this apparent "U-turn" were many. I wasn't happy with the quality of the 18 inch scope I was using, the light pollution was getting too bad to use a fast reflector etc. I tried in vain to seek out a good quality 18 or 20 inch f5 Dobsonian scope in the UK. Then Meade introduced the 14 inch GPS. I thought about it for some time before going ahead and buying one. Now some 25,000+ observations later I can speak with some authority on this subject. The optics are superb, the observing position is very comfortable (I have to sit down these days to make the majority of my observations), and the limiting magnitude is about the same as the 18 inch on a good night (around 16.5). BUT the actual enjoyment level of observing has, for me

personally, dropped considerably. No longer can I open up the observatory when there are a few gaps in the cloud (and a good chance of rain) and hope to "chase" them around the sky making observations through them.

Of course I get great pleasure from just looking at the night sky through any instrument (or with the Naked Eye for that matter), but now the scope does all the finding for me. Even with a high power eyepiece, the GOTO drops me on the field 95% of the time (the other 5% is probably due to inaccurate co-ordinates!). I now no longer need to know even the location in the sky for any new variable which I observe. At the beginning of this year I added a new CV to my programme. I printed a chart, took it to my scope and keyed in the position. The scope slewed to the field, and I made the observation. I then thought about what I had done, and realised that I had absolutely no idea as to where this object was in the sky. I was shocked! Over the years I had imprinted in my mind the positions of over 300 Variables, along with their comparison stars and magnitudes, yet here I was observing a new object and being in complete ignorance as to where it was in the sky! being one of those long winded 1RXS designations, I was even unsure as to which constellation it was in! So now, whenever I add a new star to my programme, I always make certain I locate the field with my small 8.75 inch dobby first, just to make certain I know where I am! The luddite in me just won't go away!

And it doesn't stop there. As I write these words, I receive a dozen or so e-mails telling me that a number of CCD observations have been made on my behalf by a robotic telescope a couple of thousand miles away on the island of Tenerife. All (now there's an understatement) I have to do is view the image and reduce the photometry. People over here (and abroad) have seen my name next to a CCD observation and thought I had "deserted over to the other side". It's somewhat re-assuring (and mildly amusing) that each one registered shock in their comments. For me, the times they are a changing, but not too quickly thank you very much!

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4. CONTRIBUTING TO SCIENCE BY VISUAL PHOTOMETRY: EASY, ACCURATE AND FUN! - Mike Linnolt

"What can I possibly contribute to science with my small telescope or binoculars in my light polluted backyard?"

This is an all-too-common question heard when amateur astronomers first consider the possibility of moving beyond purely recreational astronomy into scientific astronomical research with their telescope, binoculars or naked eye.

After the fun of just looking at and logging faint "fuzzies" begins to wane, the longing to find something "useful" to do with one's hobby inevitably springs forth. Unfortunately, the majority of astronomy "clubs" have little knowledge or resources to help the amateur who wants to begin serious astronomical observing.

But, thanks to the incredible growth of the internet over the last decade, now practically anyone can get online and find the information to help them do this, right at their fingertips (or mouse clicks)! The AAVSO has joined the internet revolution as well, so just about all the information necessary for variable star studies can be found online on their website www.aavso.org.

Starting out as a visual variable star observer (VSO) is the best way to begin contributing scientifically valuable observations, and couldn't be easier! Why start out as a visual observer, not CCD, one may ask? The answer is that it's much easier to learn how to make good brightness estimates visually than electronically. And, with a little practice one can soon approach the 0.05-0.1 magnitude accuracy levels of the best observers!

To begin, one only needs to email aavso@aavso.org and be assigned an observer code (typically 3 letters) and login. This enables you to submit your star observations online and to contribute to VSX, the international variable star database. The

light curve generators, Quicklook, star charts and a host of instructional materials are available free to all.

Some of the most common concerns of the new VSO are:
(1) How do I locate the variable star?
(2) How do I accurately estimate its brightness?
(3) Won't light pollution be a problem?
(4) How do I submit my observations?
(5) How do I know my observations are "correct"?

Locating variables is no more difficult than locating galaxies, nebulae or other deep sky objects, which many amateurs are already familiar with. The AAVSO website has an extensive catalog of charts for a large number of variable stars, which is available to anyone online at http://www.aavso.org/observing/charts/

This catalog can be searched for by variable name, or location in the sky, and will return a listing of charts covering the area around the variable at different scales. The wide area charts are "a" or "b" and the most detailed narrow field charts are "e" and "f". So, one can easily choose which chart best suits their telescope and magnification. Additionally, each chart lists the celestial coordinates (R.A. and declination J2000) for the star, allowing observers with "goto" telescopes to instantly locate the object. And very soon, an automated chart generator will be available, allowing observers to create their own custom charts!

Estimating the brightness of variables visually (visual photometry) is quite simple in principle, and any observer can learn how to do it quickly. The fundamental thing to know about visual photometry, as opposed to electronic photometry such as CCD or PEP, is that the human eye is a contrast detector, not a photon counter. The human visual system has evolved over the eons to be a very efficient detector of differences in contrast between the object and the background, because that property provided a selective advantage to our predecessors to better survive in nature. This method of detection has differences, advantages and disadvantages, over electronic photon counting. So, the key to doing accurate visual photometry is to understand the principles of how our visual system functions, and how to best apply its strengths to doing good photometry.

The most important thing to understand about accurate visual photometry, is to properly utilize the fine contrast detection ability of our eyes. This is best achieved when we have comparison (comp) stars a little fainter and a little brighter than the variable. Then, our vision can measure the variable star to an accuracy of about 0.05-0.1 magnitudes, with respect to those comp stars. Maximum accuracy is obtained if the two comp stars are less than 0.5 magnitude apart, and a difference of 0.3 magnitude is particularly advantageous, since it allows easy estimation to the 0.05 or 0.1 magnitude level. For example, let's say a variable's brightness appears to lie between that of 9.0 and 9.3 magnitude comp stars. In this case, it is easy to notice if the variable is closer in brightness to the 9.0 or the 9.3, or exactly half way between the two comp stars. So, in this particular case a rapid estimate can be made as 9.1, 9.2 or 9.15, respectively. On the other hand, using comp stars over one magnitude apart reduces accuracy, and particularly to be avoided is "extrapolating" beyond the brightest or faintest in the sequence of comp stars. Without limits set by a brighter and fainter comp star, our ability to estimate becomes degraded. Interestingly, CCD as a photon counter can retain accuracy beyond sequence limits, but the eye as contrast detector cannot. Yet, as was stated at the outset, as long as we recognize and take advantage of our vision's strong points and limitations, very effective estimation can be achieved.

A more detailed explanation of our visual system, how it works, its biophysical properties, and how best to utilize it for visual photometry can be found in my presentation made at the 2005 AAVSO annual meeting. This Powerpoint file may be found online at: www.aavso.org/aavso/meetings/fall05present/linnolt.ppt

To make accurate estimates one must also take care to avoid common mistakes!

(1) Watch for stars with close companions. Quite a few variables have nearby neighbors (less than an arcminute apart). It's a problem when such companions have a similar brightness to the variable, at some point during its variability. It is imperative that the observer use sufficient power, aperture or optical quality/focus to clearly isolate the variable alone, otherwise the estimate of brightness may be too high by several tenths of a magnitude due to measuring the combined light of both stars.

(2) Try to measure the comparison and variable on the same position on your retina. Retinal sensitivity varies, so it is quite important that both stars are estimated using the same photoreceptors.

(3) Avoid using too red comparison stars. (These are stars with a photometric B-V magnitude greater than +0.8) The human rod sensitivity drops off rapidly towards the red end of the visual spectrum, and individual variations become greater there. If the star is red, the peak of its light curve lies toward the edge of the rod response curve, and it will appear fainter than the published standard electronic Johnson V magnitude. This fact, coupled with larger individual variation to red response will result in a substantial loss of accuracy in visual estimates. Of course, many common variables which observers follow are red, such as Mira type stars. Some people have suggested the use of red comparison stars to better match the estimates. While there is some controversy in this regard, I believe that introducing two red stars into an estimate further reduces accuracy because both stars are likely to have different B-V and then more subject to the "red" issues which reduce accuracy! So, I would recommend always seeking out the normal stars with B-V < +0.8 as comps when estimating any variable. Typically, the detailed CCD charts will have the comp stars sequences listed along with the B-V values, and most of the charts webpages have a link to the sequence photometry file (*.seq listing the B-V for the comps on the charts). So proper selection of good "white" comp stars can be easily made.

(4) Avoid estimating through clouds. Most clouds have a very fine scale microstructure, their density can vary substantially over a small distance of just arcminutes. So, there can be a difference in the density of the cloud you are viewing through, at the comp star and the variable star, and the density difference can change quite rapidly and randomly. As a result, these variations can cause serious errors in estimating a variable!

(5) Record the time of your observation accurately and precisely, to the nearest minute at least. Some variables change brightness quickly.

Light Pollution or moonlight has little effect on variable star estimation! Many beginning observers fear that they cannot do effective observations from their light polluted locations. This is not true. Because stars are point sources, you can increase magnification to darken the background without affecting the stars, to help visualize them. Since both the comp star and variable are affected equally, background light has little effect on your estimates. If you are estimating very faint variables, near your limit of detection, higher background light may have some impact, since your visual response becomes non-linear down in that portion of the response curve. This is an area for advanced discussion, and beyond the scope of this article.

Submitting your observations couldn't be simpler! With your AAVSO observer code you login to WebObs and fill in the fields with the star, date, magnitude, comp stars. Your data will be stored in the database within 10 minutes!

Verify your observations by checking Quicklook afterwards. This takes a few seconds and you can check to see if your observations are in line with other observer's recent ones. This way, any obvious errors due to typos in the magnitude or the time of the observation can be caught immediately. If you make one, just email AAVSO and they will promptly correct your observation. Avoid any attempts to bias your observation to more closely match another "more experienced" observer! Making your own independent observation, as best as you can, is the most important thing. Many variables change brightness over a short time frame, and your independent observation at that moment can be crucial data for future research.

In summary, by following these basic guidelines, and taking care to avoid the common mistakes, anyone can make good, accurate scientifically useful observations by visual means alone! No expensive or complex electronic system is required to participate in the furthering of scientific knowledge. Clear skies and Have FUN!

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