103rd Annual Meeting
November 6-8, 2014
Hilton Hotel, Woburn, MA

ABSTRACTS

Friday, November 7, 2014

9:00am – 10:15am General Paper Session Part I

Frank Dempsey *10 min*

"Betelgeuse period analysis using Vstar"

Betelgeuse was studied using the Vstar software package and analysis of the observations in the AAVSO database. Period analysis derived a period of 376 days, in comparison with literature periods of 420 days using satellite UV data (Goldberg 1984) but significantly different from the VSX period of 2335 days. The unique set of PEP observations of this star is also shown and advantage of PEP Johnson V observations is shown in comparison with the visual observations.

Gary Walker *15 min*

"EE Cep Winks in full Color"

We observe the long period (5.6 years) Eclipsing Binary Variable Star EE Cep during its 2014 eclipse. It was observed on every clear night from the Maria Mitchell Observatory as well as remote sites for a total of 25 nights. Each night consisted of a detailed time series in BVRI looking for short term variations for a total of >10,000 observations. The data was transformed to the Standard System. In addition, a time series was captured during the night of the eclipse. This data provides an alternate method to determine Time of Minimum than traditionally performed. The TOM varied with color. Several strong correlations are seen between colors substantiating the detection of variations on a time scale of hours. The long term light curve shows 5 interesting and different Phases with different characteristics.

Kangujam Yugindro Singh, Irom Ablu Meitei *10 min*

"Transient pulsation of Sirius"

A photometric study of Sirius during the last week of January, 2014 has revealed that the star shows transient pulsation. Observations of Sirius were taken with integration period of ten seconds in B and V bands using SSP3 photometer attached to a Celestron CGE1400 telescope. During the observations taken in the night of 30 January, 2014 the B-band magnitude remained almost unchanged; the difference in the maximum and minimum magnitude in B-band 0.13. However, it was found that the V-band magnitude changed appreciably, decreasing to values up to more than 4. The pulsation in the V-band was so rapid that the V-band magnitude changed sometimes by more than 4 magnitudes in a short period of ten seconds. Such a transient change in the properties of Sirius cannot be accounted for by the eclipsing binary phenomenon. Disruptive binary interactions such as mass transfer between Sirius A and B might account for such a powerful transient phenomenon.

John C. Martin *10 min*

"Eta Carinae Continues to Evolve"

Eta Carinae affords us a unique opportunity to study the pre-supernova evolution of the most massive stars. For at least the last half century, it has maintained a 5.5-year spectroscopic cycle that culminates with abrupt decreases in the strong stellar wind emission features. Over the last 15 years, the star has brightened at an accelerated rate and altered its spectrum, in addition to the spectroscopic cycle, indicating an ongoing change in state. We present Hubble Space Telescope spectroscopy and synthetic photometry from the most recent spectroscopic event (2014.5) that shows notable differences with past events and provides clues to the on-going evolution of the star.

POSTER INTRODUCTIONS:

Robert Dudley *poster*

"The Trend in the Observation of Legacy Long Period Variable Stars"

A decrease in the number of observers of the Legacy Long Period Variable Stars has been noted by the AAVSO. Amongst the observing community there is the perception that observers collecting digital data is making up for this gap. Data from the annual President's report (2002-2013) and the AAVSO International Data Base for the years 1993, 2003, and 2013 were analyzed. For the period of 2002 to 2013 the total number of observers remained fairly constant (816 +/- 97) with a large bump in 2011. The number of observations has slowly declined since 2007 though there has recently been an increase in the number of observations. From the AID data the number of observations reached a maximum in 2003 and has slowly declined afterwards. These trends as well as other information gleamed from the data will be present and discussed.

Shelby Jarrett, Cybil Foster *poster*

"Analysis of Hα lines in Epsilon Aurigae post-eclipse"

Epsilon Aurigae is an eclipsing binary star system located in the constellation Auriga. The primary is an F type star that is eclipsed every 27 years by a large disk of material. Campaigns in the past have focused on the photometry and spectroscopy during the eclipse without much attention to the primary outside of the eclipse. Spectra taken throughout the year following the end of the last eclipse showed continued changes in the spectrum of the primary star outside of the eclipse. We seek to develop a model and comprehension of how the primary spectrum changes independent of the eclipse in order to establish a better understanding of the secondary and its influence on the spectrum during the eclipse. We will analyze medium resolution spectra covering most of the visual range from the end of the 2011 eclipse to the present for significant patterns, focusing primarily on spectral regions and features that have been previously discovered in the interpretation of the eclipses.

Jessica Johnson, Kristine Larsen *poster*

"Discovery of Five Previously Misidentified BY Draconis Stars in ASAS Data"

This work is a continuation of an ongoing project first presented at the Fall 2013 Meeting of the AAVSO. The original poster introduced a spreadsheet of 3,548 computer-classified candidate Cepheid variable stars in the ASAS (All Sky Automated Survey) photometry data, a data set that was known to contain many false positive identifications. Previous work by Patrick Wils suggested that BY Draconis stars (spotted K and M dwarfs) were an important source of misidentifications in this sample. The authors have undertaken a project to systematically identify previously unknown BY Draconis stars in this data set. This is initially done through the investigation of the stars' known physical properties (for example, from infrared photometry [2MASS] and proper motion [PPMXL] data). An analysis of light curves and phase plots is the final step in identifying BY Draconis stars, for example searching for characteristic changes in mean magnitude and amplitude. Thus far five previously unknown BY Draconis stars have been identified through this process.

Kristine Larsen *poster*

"AAVSO and the International Year of Light"

The United Nations General Assembly has officially designated 2015 to be the International Year of Light (IYL). Modeled in part on the earlier International Year of Astronomy (IYA), this cross-disciplinary, international educational and outreach project will celebrate the importance of light in science, technology, cultural heritage, and the arts. It ties in with several important anniversaries, such as the 1000th anniversary of the publication of Ibn Al Haythem's "Book of Optics," the 150th anniversary of Maxwell's equations of electromagnetism, the centenary of Einstein's General Theory of Relativity, and the 50th anniversary of the discovery of the Cosmic Microwave Background Radiation. Because variable stars are defined as such due to the variability of the light we observe from them, all of the AAVSO programs, regardless of type of variable or instrumentation (eye, DSLR, PEP, or CCD) have natural tie-ins to the study of light. This poster will highlight a number of specific ways that AAVSO members and the organization as a whole can become intimately involved with this unique outreach opportunity.

Dale Mais *poster*

"Precision Photometry of Long Period Variable Stars: Flares and Bumps in the Night"

Mira variable stars are a broad class of stars, which encompass spectroscopic classes of type M, S and C. These stars are closely related in terms of their long term variability, position on the Hertzsprung-Russell diagram their intermediate mass (from ~0.8 to ~8 solar mass) and the fact that class M evolves into the S and C type stars as certain stages of shell burning around the core proceeds. Recently, evidence has accumulated to suggest that Mira variables may go through flare up stages which result in brightening on the order of several tenths of a magnitude or more and may last hours to days in length (Schaefer, B., 1991, Maffei, P., and Tosti, G., 1995 and de Laverny, P., et. al., 1998). Very little is known about these events, indeed it is not clear that these events are real. In order to address the reality of these events, we established an automated acquisition/analysis of a group of 108 Mira variables in order to obtain the densest coverage of the periods to better constrain the potential flare-ups. Telescope control scripts were put in place along with real time analysis. This allowed for unattended acquisition of data on every clear night, all night long, in the V, R and I photometric bands. In addition, during the course of the night multiple determinations are often obtained for a given star.

The light curves of many of the program stars show a Cepheid like bump phenomenon, however these appear on the ascending part of the light curve. In general, these bumps appear in longer period Mira's (>350 days) as pointed out by Melikian, 1999. Bumps are not obvious or easily seen in VISUAL data records, although slope changes during rising phase are seen in some cases. So far, greater than 100,000 magnitude determinations have been obtained, many closely spaced in time. This should help to further constrain the potential occurrences of flare-up events.

George Silvis *poster*

"Transformation: adjusting your data to the standard photometric framework"

This year the AAVSO made an effort to present tools to the membership to help them get their CCD data transformed. My poster offers a description of what transforming does, including a visualization of how it adjusts your data. And it shows the new TransformApplier application in action.

George Silvis *poster*

"The Eggen Card Project"

At the 2013 meeting we kicked off the Eggen Card project. This project was to make the huge collection of photometric observations made by Olin Eggen accessible to researchers. My poster this year is to report progress and encourage more members to participate.

Lucian Undreiu, Andrew Chapman *poster*

"Visual Spectroscopy of R Scuti"

We are currently conducting a visual spectral analysis of the brightest known RV Tauri variable star, R Scuti. The goal of our undergraduate research project is to investigate this variable star's erratic nature by collecting spectra at different times in its cycle. Starting in late June of 2014 and proceeding into the following four months, we have monitored the alterations in the spectral characteristics that accompany the progression of R Sct's irregular cycle. During this time, we were given the opportunity to document the star's most recent descent from maximum brightness V~5 to a relatively deep minimum of V~7.5.

Analysis of the data taken during the star's period of declining magnitude has provided us with several interesting findings that concur with the observations of more technically sophisticated studies. Following their collection, we compared our observations and findings with archived material in the hopes of facilitating a better understanding of the physical state of RV Tauri stars and the perplexing nature of their evolution. Although identification of the elements in the star's bright phase proved to be challenging, documenting clear absorption features in its fainter stage was far less difficult.

As previously reported in similar studies, we identified prominent TiO molecular absorption bands near R Sct's faintest state, typical of mid-M spectral type stars. In addition to these TiO absorption lines, we report the presence of many more metallic lines in the spectral profiles obtained near star's minimum. Supportive of

previously published hypotheses regarding the causation of its variability, we observed significant variation in the star's spectral characteristics throughout different phases of its cycle. We are hopeful that our observations will make a meaningful contribution to existing databases and help advance our collective understanding of RV Tauri stars and their evolutionary significance.

10:15am – 10:45am *Coffee Break*

10:45am – 12:05pm **General Paper Session Part II**

Rodney Howe, Jan Alvestad *20 min*

"Parallel group and sunspot counts from SDO/HMI and AAVSO visual observers"

Creating group and sunspot counts from the SDO/HMI detector on the Solar Dynamics Observatory (SDO) satellite requires software that calculates sunspots from a 'white light' intensity-gram (CCD image) and group counts from a filtered CCD magneto-gram. Images from the satellite come from here http://jsoc.stanford.edu/data/hmi/images/latest/ Together these two sets of images can be used to estimate the Wolf number as W = (10g + s), which is used to calculate the American Relative index.

AAVSO now has approximately two years of group and sunspot counts in the SunEntry database as SDOH observer Jan Alvestad. It is important that we compare these satellite CCD image data with our visual observer daily submissions to determine if the SDO/HMI data should be included in calculating the American Relative index. These satellite data are continuous observations with excellent seeing. This contrasts with 'snapshot' earth based observations with mixed seeing. The SDO/HIM group and sunspot counts could be considered unbiased, except that they show a not normal statistical distribution when compared to the overall visual observations, which show a Poisson distribution.

One challenge that should be addressed by AAVSO using these SDO/HMI data is the splitting of groups and deriving group properties from the magneto-grams. The filtered CCD detector that creates the magento-grams is not something our visual observers can relate too, unless they were to take CCD images in H-alpha and/or the Calcium spectrum line. So, questions remain as to how these satellite CCD image counts can be integrated into the overall American Relative index.

David Cowall *20 min*

"Going Over to the Dark Side"

This is the tale of my continuing journey transforming from a visual to a CCD photometrist. It is my hope that sharing my experiences will help and encourage others to consider taking the same path. It has been hard, but fun; a wonderful opportunity as a newly retired physician to expand my horizons. However, my brain did have to make the switch from Biology to Physics. The major barrier that concerned me was cost, but change itself was also a challenge. Other issues included dealing with the complexity of technical systems and a myriad of details. My solution was to be patient and think small to insure success and then build upon all those little victories. The pedagogical component of this project was critical as well. It began with a good mentor and continued via networking with other members at meetings, taking CHOICE courses, and most importantly: practice, practice, practice. Each plateau suggested many new possibilities. I think "The Force" is now with me! The adventure continues.

Gordon Myers, Ken Menzies, George Silvis, Barbara Harris *20 min*

"Photometry Transforms Generation with PTGP"

Historically the development of photometry transformation coefficients required extensive manual effort and the use of large spreadsheets. A new release - version 5.0 - of the Photometry Transformations Generation Program (PTGP) achieves the goal of generating transformation coefficients without the use of spreadsheets - saving considerable time and ensuring data accuracy.

PTGP version 5.0 works directly with VSP to retrieve the most recent standard star reference magnitudes (currently for M67 and NGC7790). It then processes instrument magnitude file(s) downloaded from VPHOT or exported from AIP4WIN or MaxIm. Either AUID or "Boulder" star ids can be used for AIP4WIN and MaxIm.

When using VPHOT data or "Boulder" star ids, PTGP determines the AUID names for each of the reference standard stars. All standard transforms are calculated. Plots of each transform's data can be reviewed, and individual star observations added/deleted. Transform sets can be saved for further use. Transform sets can be compared and selected sets averaged. The averaged sets can be exported in a file format compatible with the AAVSO TA tool.

The presentation will provide a brief overview and demonstration of the tool. It will also discuss the implications of using Python for the development - both benefits and potential problems. The program runs on both PC's and Mac's. A subsequent presentation will discuss the use of VPHOT and PTGP to generate transforms and the testing of the impacts of varying key VPHOT and PTGP parameters.

Ken Menzies, Gordon Myers *20 min*

"Using VPHOT and PTGP to generate Transformation Coefficients"

The AAVSO web site hosts two useful tools (i.e., VPHOT; PTGP) to help develop your transformation coefficients. They can be used together to simplify a tedious process involving standard comparison star selection, image reduction and spreadsheet analysis.

The process necessary to generate Transformation Coefficients involves: (1) measurement of instrumental magnitudes of Standard Comparison Stars, (2) measurement of instrumental magnitudes for a set of images and filters (UBVRI), and (3) downloading of comparison star magnitude files in a standard format. The subsequent process involves: (4) importing the set of standard comparison star magnitude files into PTGP, and (5) the automatic calculation of transformation coefficients and transformation plots. During testing in VPHOT and PTGP, simple steps and alternatives have been identified to generate accurate transform coefficients.

The first VPHOT step is the obvious need to upload multiple images in multiple standard filters to VPHOT. The second step is to open each image, overlay all standard comparison stars (currently M67 or NGC 7790), view the photometry table, and download the comparison star magnitude data files. Two alternatives involve either the use of individual image files (e.g., 4B, 4V, 4R; 4I) or the stacking of all images for each filter (i.e., 1B, 1V, 1R; 1I). The latter improves the SNR.

In PTGP after the selection of telescope, standard fields, and data reduction software, one selects all comp star magnitude files. The "Calculate Transform Set" button calculates the applicable filter magnitude and color index coefficients. Testing of this process included an evaluation of the impact of several alternatives including: (1) choice of individual filter images or stacked filter images, (2) choice of all standard comparison stars or a selected subset of standard comparison stars, and (3) choice of a minimum SNR. Each of these alternatives affects the transformation coefficients to a small extent.

12:05pm – 2:00pm *Lunch Break*

2:00pm – 3:15pm **General Paper Session Part III**

Kangujam Yugindro Singh, Irom Ablu Meitei, Salam Ajitkumar Singh, Rajkumar Basanta Singh *15 min*

"Observational activities at Manipur University, India"

We have innovatively designed and constructed three observatories each costing a few hundred USD for housing three small Schmidt-Cassegrain type telescopes namely, Celestron CGE925, Celestron CGE1400, Meade 12" LX200GPS. These observatories are completely different in design and are found to be perfectly usable for doing serious work on astronomical observation and measurements. The observatory with the Celestron CGE1400 telescope has been inducted, since January 2012, as one of the observatories of the international 'Orion Project' headquartered at Phoenix, Arizona, which is dedicated for photometric and spectroscopic observations of five bright variable stars of the Orion constellation namely, Betelgeuse (alpha Orionis), Rigel (beta Orionis), Mintaka (delta Orionis), Alnilam (epsilon Orionis) and Alnitak (zeta Orionis). Using this observatory, we have been producing BVRI photometric data for the five stars of the Orion project. The other observatory with the Meade 12" LX200GPS telescope is being inducted into service for CCD photometric study of SU UMa stars in connection with implementation of a project funded by Indian Space Research Organization (ISRO). In the present paper, we would like to describe our self-built observatories, our

observational facilities, the BVRI photometric data that we acquired for the Orion project, and our future plan for observation of variable stars of interest.

Mike Joner *20 min*

"A Report on West Mountain Observatory Observations for the KELT Follow-up Observing Network"

The KELT project is a ground based observational system that is dedicated to searching for exoplanet planet candidates by photometrically detecting suspected transit events. Brigham Young University astronomers have participated as part of the KELT Follow-up Observing Network for the past year with observations from various small telescopes including the three small research telescopes located at the West Mountain Observatory. This presentation will report on the structure of the KELT project and examine some of the observations that have been made with telescopes at the West Mountain Observatory.

David Turner *15 min*

"Visual Observing: New Ideas for an Old Art?"

New detectors have had a positive effect on the precision of observations by amateur observers, but often overlooked is the fact that new methodologies can also improve the precision of simple eye estimates. Described are a variety of techniques used successfully to make visual observing easier and more reliable than is sometimes the case. There are many variable stars for which such techniques could greatly improve the scientific value of the observations for astronomical analysis. Some are often too bright for standard photometric techniques.

John Toone *20 min*

"America's First Variable Star"

An account of the mistakes, controversy and confusion associated with the first variable star to be discovered from the USA.

3:15pm – 3:45pm *Coffee Break*

3:45pm – 4:45 pm **General Paper Session Part IV**

Mike Simonsen *30 min*

"The Future of Visual Observations in Variable Star Research: 2015 and Beyond"

In this paper we examine the strengths and weaknesses of visual observations in variable star research and outline areas where visual observers can still make a contribution to science. We also examine reasons for continuing to support visual observers participation in the AAVSO for decades to come.

John Toone *20 min*

"The Life of Albert Jones"

A biographical account of the world's most prolific variable star observer.

Saturday, November 8, 2014

11:15am – 12:00pm **Special Paper Session Part I**

Kent Honeycutt *45 min*
"Why do some Cataclysmic Variables Turn Off?"

12:00pm – 2:00pm *Lunch Break*

2:00pm – 3:10pm **Special Paper Session Part II**

Ulisse Munari *30 min*
"Before the Giants: APASS support to ambitious ground-based Galaxy investigations and space missions serching for exo-Earths."

Stephen Levine *20 min*
"APASS and Galactic Structure"
While the AAVSO Photometric All-Sky Survey (APASS) catalog was designed to facilitate all-sky photometric calibration, especially for variable star work, it can be used for much more. This will be a short look at some of the aspects of local galactic neighborhood kinematics and structure that can be studied using APASS data.

Mike Joner *20 min*
"Astronomical Photometry and the Legacy of Arne Henden"
Arne Henden has helped provide a valuable resource to the photometric community with the publication of the 1982 book titled *Astronomical Photometry*. I will present a brief review of the topics covered in this handbook and recount some of the many times that it has been useful to myself and my students for answering a wide variety of questions dealing with the acquisition and reduction of photometric observations.

3:10pm – 3:45pm **Group Photo** *and Coffee Break*

3:45pm – 5:00 pm **Special Paper Session Part III**

Richard Berry ***(Brief remarks)*** *10 min*

Paula Szkody *20 min*
"Collaborations with Arne on Cataclysmic Variables"
The start of the Sloan Digital Sky Survey in 2002 marked the beginning of a 14 year long collaboration with Arne on the photometry of cataclysmic variables. Starting with the USNO Flagstaff station, and continuing with AAVSOnet, Arne and the AAVSO members contributed ground based followup of SDSS candidate CVs to determine their orbital periods and characteristics. In addition, many scientific studies using spacecraft observations with HST, XMM and GALEX were enabled and improved due to their contemporaneous ground-based photometry. Some of the primary results in the 39 publications resulting from this long term collaboration will be summarized.

Mike Simonsen *30 min*
"The History of AAVSO Charts, Part III: The Henden Era"
In this paper we pick up where "The History of AAVSO Charts, Part II: The 1960s Through 2006" left off and discuss the evolution of the automated chart plotter, the comp star database, the new tools available to the chart and sequences team and Director Arne Henden's influence and legacy.

Gary Walker *15 min*
"Arne's Decade"