



ABSTRACTS

Friday, June 5, 2015

9:00am – 10:15am Paper Session I

Welcome

15 min

Horace A. Smith, Mary Anderson, Wayne Osborn, Andrew Layden, Grzegorz Kopacki, Barton Pritzl, Andrew Kelley, Keith McBride, Michael Alexander, Charles Kuehn, Aron Kilian, Eric King, David Carbajal, R. Lustig, Nathan De Lee

20 min

“Lightcurves and Period Changes for Type II Cepheids in the Globular Cluster M13”

B, V, and Cousins I band lightcurves have been observed for the type II Cepheids V1, V2, and V6 in the globular cluster M13. These are relatively short period, BL Her-type Cepheids, with periods of 1.5, 5.1, and 2.1 days, respectively. Additional observations of V2 have been obtained from early photographic plates in the Yerkes Observatory archive. Long term period changes of these Cepheids have been determined by combining recent photometry with earlier observations that now extend back for more than a century. The observed period changes for V1, V2, and V6 are compared with the predictions of stellar evolution theory, under the assumption that the progenitors of the Cepheids were stars that at one time were on the blue horizontal branch.

Dave Cowall

20 min

“Multiband CCD Photometry of CY Aquarii using the AAVSONet”

δ Scuti stars are a class of short-period pulsating variable stars that include CY Aquarii. Multiband CCD photometry was performed on that star using AAVSONet instruments: BSM-HQ, BSM-NM, and BSM-S. Rapid cadence, multi-hour time series yielded high precision light curves and new maxima. Data analyses revealed a pulsation pattern consistent with the existing model that describes the formation of SXPHE stars.

POSTER INTRODUCTIONS:

Robert Berrington, Thomas Joirdan, Erin Tuhey

poster

“The BSU Short Period Variable Stars Program”

Recent large area sky surveys like the Northern Variability Sky Survey (NSVS), and the All Sky Automated Survey (ASAS) have discovered numerous variable stars in the magnitude range $8 < V < 15$. While these surveys will extend our knowledge of luminosity variability to much fainter systems ($V < 15$) their large area coverage prevents the systematic temporal coverage or accurate photometric coverage needed to accurately study these systems. We have begun a program to obtain accurate photometric measurements of select variable stars detected with both the NSVS and ASAS for further study. All photometric measurements are obtained by the Cooper Science Rooftop observatory, the SARA-KP 1-meter or the SARA-CT 0.6-meter telescopes, and the soon to be available SARA-JK 1-meter telescope. The naturally modular nature of the study makes this program ideal for students. I will summarize the work that has been done to date with both students and faculty at BSU.

Marco Ciocca

poster

“Adventures in transformations: TG, TA, oh my!”

AAVSO made available, through the great volunteer work of Gordon Myers and George Silvis, two very useful tools, Transform Generator and Transform Applier (TG and TA) for transforming instrumental magnitudes to the standard system. I will juxtapose the steps necessary to obtain transformation parameters "the old fashion way" and how can the same result be achieved with these two tools. I will present transformation parameters for the Eastern Kentucky University (EKU) telescope and obtained with the standard field M67. These parameters were applied to photometric results for AE Uma, a short-period, high-amplitude delta Scuti star (Period ~ 0.086 d)

Kristine Larsen

poster

“Sunlight in the Spotlight in the International Year of Light”

One of the main focuses of the International Year of Light (IYL) is interdisciplinary education and outreach. While variable stars in general provide myriad opportunities to accomplish this, one variable star in particular - our sun - offers unique opportunities in this vein. From conducting ground-based safe solar observations with white light and hydrogen alpha filters, to highlighting satellite observations at other wavelengths and spectroscopy, observing our nearest star provides a solid basis from which to explore the electromagnetic spectrum (and the relevant technologies used to study it). The IYL highlights cultural astronomy, the history of science, and the important role women have played in our understanding of the natural world. Not only was the primary deity in many cultures the sun god or goddess, but the motions of the sun across the heavens were carefully studied using sundials, astrolabes, and monolithic structures (including Stonehenge). Sunspots were discovered long before the invention of the telescope, and their occurrences carefully recorded. Today, these records (along with records of another important way the sun interacts with our planet, namely the creation of aurora) extend our understanding of the solar cycle backwards in time across the centuries to before the time of Galileo. Women have played an important role in our observation and understanding of the sun, including Annie Maunder at the Royal Greenwich Observatory and Elizabeth Brown, Solar Section Director of the British Astronomical Association. The sun also played a central role in verifying Einstein's General Theory of Relativity (itself celebrating its centenary during the IYL). This poster will provide examples of sun-centered projects and activities that can be used during the IYL and beyond to educate and interest citizens young and old about our nearest star, with an eye to especially highlighting the importance of the ongoing work of the Solar Section of the AAVSO.

Andrew Pearce, Stan Walker

poster

“Variable Star Projects - A Southern Perspective”

Variable Stars South is based on the concept of projects in different fields of variable star astronomy which are expected to provide useful information about a star or stars on a time scale of a year to a decade - there are a few exceptions. This poster covers projects and results for binary stars, Cepheids, Mira stars and some others - also the techniques in use - visual observing, CCD and DSLR photometry and some spectroscopy. We also look at some of the problems associated with a lack of adequate longitude coverage in a very watery hemisphere!

George Silvis

poster

“The SIDdatagrabber”

The Stanford/SARA SuperSid project offers an opportunity for adding data to the AAVSO SID Monitoring project. You can now build a SID antenna and monitoring setup for about \$150. And with the SIDdatagrabber application you can easily re-purpose the data collected for the AAVSO.

George Silvis

poster

“Transforms Explained”

A review of why and how transforms are applied to your data and a visualization of what happens to your data when it is transformed.

10:15am – 10:45am *Coffee Break and Poster Viewing*

10:45am – 12:00pm

Paper Session II

Mike Simonsen

30 min

“Double Trouble”

Variable stars with close companions can be difficult to accurately measure and characterize. The companions can create misidentifications, which in turn can affect the perceived magnitudes, amplitudes, periods and colors of the variable stars. We will show examples of these Double Trouble stars and the impact their close companions have had on our understanding of some of these variable stars.

Michael Joner, Eric Hintz

15 min

“Standard Stars for the BYU H-alpha Photometric System”

We present primary standard stars for the BYU H-alpha photometric system. This system is similar to the H-beta photometric system that is often used with the intermediate band uvby system. Both systems use the difference between magnitudes measured in a wide (15-20-nm) and narrow (3-nm) bandpass centered on one of the strong Balmer lines of hydrogen to establish a color index. Line indices formed in this manner are independent of atmospheric extinction and interstellar reddening. These indices provide intrinsic measures of effective temperature for stars with spectral types between B and G.

The present primary standard stars for the BYU system as established using spectroscopic observations that cover the region between the H-alpha and H-beta lines. The indices were formed using synthetic photometry reductions to convolve ideal filter profiles with the observed spectra. The number of observations per star is generally in excess of 25. Some stars have been observed more than 100 times over a period of 7 years. The typical error per observation for these stars is on the order of 1-3 mmag. In addition to the standard field stars, we present H-alpha and H-beta observations of individual stars that are members of selected open clusters. These include the Hyades, Pleiades, Coma, and NGC 752 clusters. Additional stars that exhibit varying degrees of hydrogen emission are easily distinguished in a plot of the alpha-beta plane. We have found that candidates for emission line objects, high mass x-ray binaries, and young stellar objects are readily identified in our alpha-beta plots.

We acknowledge continued support from the BYU College of Physical and Mathematical Sciences as well as support from NSF Grant AST #0618209. We also thank the Dominion Astrophysical Observatory for continued allocation of robotic observing time for spectroscopy on the 1.2-m telescope.

Joe Ulowetz

30 min

“Rolloff Roof Observatory Construction”

Lessons learned about building an observatory by someone with limited construction experience, and the advantages of having one for imaging and variable star studies. Sample results shown of composite light curves for cataclysmic variables UX Uma and V1101 Aql with data from my observatory combined with data from others around the world.

12:00pm – 2:00pm *Lunch Break*

2:00pm – 3:30pm Paper Session III

Rodney Howe, Frederic Clette (presented by Roger Kolman & Kristine Larsen)

20 min

“Thomas Cragg proves to be a good observer”

Thomas Cragg proves to be a good observer, enough to be included in the restricted club of 21 long-duration stations without major stability problems over the interval 1945-2015. Although, his counts seem to make a slight downward jump in 1983, and there is a sharp decline in the last two years of his observing career (aging?). Cragg's observations will be used for the equivalent comparison with the new reconstructed sunspot number that is produced from the 21 stations showing the same features in the past six solar cycles. This reconstructed number is fully independent from the original Z^A_{rich} sunspot number. It actually confirms the corrections being applied to the original sunspot number series (a more simple approach simply multiplying the original series by the correction factor established for the Locarno observatory's drift), as published in the 2014 paper, by Frederic Clette, SILSO, Royal Observatory of Belgium.

Susan N. Oatney

20 min

“Searching for motion within the solar atmosphere”

The mystery of heat transfer within the solar atmosphere has long been a subject of study and debate. Not unlike large solar observatories that are funded by public monies, amateur solar observers also have a keen interest in this subject and are able to creatively employ tools at hand such as a two slit interferometer used to create interference lines in an attempt to measure motion. (Interference patterns: http://en.wikipedia.org/wiki/Double-slit_experiment) With a 6" equatorially pier mounted refractor focused just above the visible disk of the sun, images taken with a Meade Lunar Planetary Imager video LPI CMOS camera at ~30 Hz sample rates and stored as FITS files. A variety of photometry, unrated color, and full aperture solar filters are combined with and without a two slit interferometer placed at the focus of the telescope. These images, explored through the NASA <http://heasarc.gsfc.nasa.gov/docs/software/fv/> FITS viewer were applied to show logarithmic color contours. Selected fv images were placed consecutively in a movie format that shows some cyclical motion around and between the contours, mostly of the solar corona.

Matthew Knot

15 min

“Study of Eclipsing Binary Systems NSVS 732240 and NSVS 5726288”

In this paper, I present photometric data collected on two β Lyrae type eclipsing binary systems: NSVS 7322420 and NSVS 5726288. I also present the results of the analysis of the data. This was done by modeling the systems using the Wilson-Devinney code to determine the characteristics of the stellar components. The analysis indicates that NSVS 7322420 is a semi-detached system while NSVS 5726288 is a detached system.

Ronald Kaitchuck, Garrison Turner, Joseph Childers

30 min

“A Search for Exoplanets in Short-Period Eclipsing Binary Star Systems”

In recent years over 1900 exoplanets have been discovered. Far fewer have been found in binary star systems. Exoplanets can either orbit both stars at a very great distance (p-type) or they can orbit one star of a widely separated stellar pair (s-type). For the s-type situation, how close can the stars be before planetary formation and stability are no longer possible? Can exoplanets be found in short period (<20 days) binaries? The existence or non-existence of exoplanets can place constraints on both the theory of planetary and binary star formation. An on-going program to detect planetary transits in close binary star systems will be discussed. The stellar selection criteria, and the unique problems and advantages of searching for exoplanets in eclipsing binary stars will be presented.

3:30pm – 4:00pm *Coffee Break and Poster Viewing*

Saturday, June 6, 2015

10:45am – 11:15am

Donna Young “**Stellar Presentations**”

30 min

The AAVSO is in the process of expanding its education, outreach and speakers bureau program. PowerPoint presentations prepared for specific target audiences such as AAVSO members, educators, students, the general public and Science Olympiad teams, coaches, event supervisors and state directors will be available online for members to use. The presentations range from specific and general content relating to stellar evolution and variable stars to specific activities for a workshop environment. A presentation - even with a general topic - that works for high school students will not work for educators, Science Olympiad teams, or the general public. Each audience is unique and requires a different approach.

The current environment necessitates presentations that are captivating for a younger generation that is embedded in a highly visual and sound-bite world of social media, twitter and U-Tube and mobile devices. For educators, presentations and workshops for themselves and their students must support the Next Generation Science Standards (NGSS), the Common Core Content Standards, and the Science Technology, Engineering and Mathematics (STEM) initiative.

Current best practices for developing relevant and engaging PowerPoints presentations to deliver information to a variety of targeted audiences will be presented along with several examples.

11:15am – 12:00pm *Group Photo followed by Campus Observatory Tour (not handicap accessible)*

12:00pm – 2:00pm *Lunch Break*

2:00pm – 3:00pm **Paper Session IV**

Mike Simonsen

30 min

“**The Nature of Z Cam Standstills**”

Because the standstills in Z Cam light curves are the defining characteristic of Z Cam dwarf novae, it would be helpful to better define what constitutes a standstill. The author will attempt to clarify the definition of standstills to aid in the classification of Z Cams. We will also examine some of the interesting features of standstills and Z Cam behavior before and after standstills.

Mike Joner, Eric Hintz

15 min

“**The Lyncis Two for One Special**”

The pulsating delta Scuti star AN Lyn and the near contact binary UU Lyn are conveniently located at high declination in the northern constellation of Lynx. These variable stars are about 15 arc minutes apart in the sky and differ in average brightness by roughly one magnitude. This combination makes it fairly straightforward to secure photometric data on both stars at the same time using a common set of comparison stars. We present observations made at the BYU West Mountain Observatory during the spring of 2015 and outline some preliminary conclusions that can be drawn about these distinctly different variable stars.

Richard S. Post

15 min

“**Automated Supernova Discovery**”

We are developing a system of robotic telescopes for automatic recognition of Supernovas as well as other transient events in collaboration with the Puckett Supernova Search Team. At the SAS2014 meeting, the discovery program, SNARE, was first described. Since then, it has been continuously improved to handle searches under a wide variety of atmospheric conditions. Currently, two telescopes are used to build a reference library while searching for PSN with a partial library. Since data is taken every night without clouds, we must deal with varying atmospheric and high background illumination from the moon. Software is configured to identify a PSN, reshoot for verification with options to change the run plan to acquire photometric or spectrographic data. The telescopes are CDK24, with Alta U230 cameras, one in CA and one in NM. Images and run plans are sent between sites so the CA telescope can search while photometry is done in NM.

Our goal is to find bright PSNs with mag 17.5 or less which is the limit of our planned spectroscopy. We present results from our first automated PSN discoveries and plans for PSN data acquisition.

3:00pm – 3:30pm *Coffee Break and Poster Viewing*

3:30pm – 4:30pm **Paper Session V**

Joe Patterson, Berto Monard, Paul Warhurst, Gordon Myers

20 min

“IM Normae: A Second T Pyx?”

T Pyx is the Galaxy's most famous recurrent nova, erupting to magnitude 6 about every 20 years. For nova hunters and variable-star observers generally, it should be quite easy to discover stars with similar properties. There are probably half a million CVs out to the distance of T Pyx, and most have an underlying structure similar to that of T Pyx: low-mass secondary, fairly massive white dwarf, short orbital period. But of these half million stars, there is no second T Pyx. The star is unique in another way: its orbital period is increasing on a timescale of 300,000 years. Like the proverbial bat out of hell.

A 2002 nova eruption nominated a second star for this elite club: IM Nor, a short-orbital-period (2.5 hours) star which previously erupted in 1920. We began a program of time-series photometry to track the shallow eclipses - to test for orbital period change, the other signature of T Pyx resemblance. By 2015 we found this effect: *Porb* increases on a timescale of 2 million years.

Thus, the two stars appear to be blowing themselves apart on a timescale of roughly a million years. This could explain why the stars are so rare: because they are rapidly self-immolating. And that could happen because the classical-nova outburst overwhelms the low-mass secondaries that live in short-period CVs - leading to unstable mass transfer which quickly evaporates the secondary. This implies that all short-*Porb* classical novae should be "recurrent" (erupting on a timescale of decades). Greater attention to CP Pup (1942), RW UMi (1956), GQ Mus (1983), and V Per (1887) is definitely warranted.

Doug Welch, Arne Henden, Taylor Bell, Cissy Suen, Ian Fare, Alison Sills

20 min

“Globular Cluster Variable Stars - Atlas and Coordinate Improvement using AAVSOnet Telescopes”

The variable stars of globular clusters have played and continue to play a significant role in our understanding of certain classes of variable stars. Since all stars associated with a cluster have the same age, metallicity, distance and usually very similar (if not identical reddening), such variables can produce uniquely powerful constraints on where certain types of pulsation behaviors are excited.

Advanced amateur astronomers are increasingly well-positioned to provide long-term CCD monitoring of globular cluster variable star but are hampered by a long history of poor or inaccessible finder charts and coordinates. Many of variable-rich clusters have published photographic finder charts taken in relatively poor seeing with blue-sensitive photographic plates. While useful signal-to-noise ratios are relatively straightforward to achieve for RR Lyrae, Type 2 Cepheids, and red giant variables, correct identification remains a difficult issue - particularly when images are taken at V or longer wavelengths.

We describe the project and report its progress using the OC61, TMO61, and SRO telescopes of AAVSOnet after the first year of image acquisition and demonstrate several of the data products being developed for globular cluster variables.

Michael Cook

20 min

“A LARI Experience”

In 2012, Lowell Observatory launched The Lowell Amateur Research Initiative (LARI) to formally involve amateur astronomers in scientific research by bringing them to the attention of and helping professional astronomers with their astronomical research. One of the LARI projects is the BVRI photometric monitoring of Young Stellar Objects (YSOs), wherein amateurs obtain observations to search for new outburst events and characterize the colour evolution of previously identified outbursters. A summary of the scientific and organizational aspects of this LARI project, including its goals and science motivation, the process for getting involved with the project, a description of the team members, their equipment and methods of collaboration, and an overview of the programme stars, preliminary findings, and lessons learned is presented.