Scientific Paper Session

Saturday, October 18, 2008

11:30 am – 5:30 pm

11:30 am – 12:00 pm

Variable Star Astronomy Education Outreach Initiative   Donna L. Young   *20 minutes*

Abstract: The American Association of Variable Star Observers (AAVSO) published a comprehensive variable star curriculum, "Hands-On Astrophysics, Variable Stars in Science, Math, and Computer Education" in 1997. The curriculum, funded by the National Science Foundation, was developed for a comprehensive audience – amateur astronomers, classroom educators, science fair projects, astronomy clubs, family learning, and anyone interested in learning about variable stars. Some of the activities from the Hands-On Astrophysics curriculum have been incorporated into the educational materials for the Chandra X-Ray Observatory's Educational and Public Outreach (EPO) Office. On two occasions, in 2000 and 2001, triggered by alerts from amateur astronomers, Chandra observed the outburst of the dwarf nova SS Cygni. The cooperation of amateur variable star astronomers and Chandra X-Ray scientists provided proof that the collaboration of amateur and professional astronomers is a powerful tool to study cosmic phenomena. Once again, the Chandra and AAVSO have teamed up – this time to promote variable star education. The Hands-On Astrophysics curriculum is being re-designed and updated from the original materials to a web-based format and is nearing completion. The new version, re-named Variable Star Astronomy, will provide formal and informal educators, and especially amateur astronomers, educational materials to help promote interest in and knowledge of variable stars.

The International Year of Astronomy and Citizen Science   Aaron Price   *10 minutes*

Abstract: 2009 has been endorsed as the International Year of Astronomy by both the United Nations and the United States Congress. This talk will briefly outline the IYA cornerstone projects and then will go into more detail regarding the AAVSO's role as leading a citizen science project regarding the variable star Epsilon Aurigae.

12:00 pm – 1:30 pm   ***Lunch Break***

1:30 pm – 3:25 pm

Automated calibration and an open-source sky survey   David Hogg   *30 minutes*

Abstract: I describe a system that can take any astronomical image (professional, historical, or amateur) and, based on the content of the pixels alone, determine the pointing, rotation, and scale of that image, plus other calibration information (such as date, bandpass, point-spread function, and sensitivity). We are using this system to start an "open-source sky survey" in which we build up time-resolved imaging of the sky, and a physical model of the sources therein, from heterogeneous data from all available sources. This is a great opportunity to start a rich communication channel between professional and amateur astronomers, with data and ideas flowing both ways.

The Chandra Variable Guide Star Catalog   Joy Nichols   *30 minutes*

Coauthors: D. Huenemoerder, E. Martin, J. Lauer, D, Morgan, A. Henden & the AAVSO
Abstract: The Chandra X-ray Observatory has observed about 37,000 stars in the wavelength range 4000-9000 A as guide stars for maintaining pointing control of the satellite. While these guide stars were intended to be non-variable in order to maximize the pointing accuracy, we have found that 673 are variable, generally at the 0.05 mag level. The catalog of these variable guide stars includes many types of variable stars, including pulsating stars, detached eclipsing binaries, contact binaries, etc., with spectral types generally in the range A through K. Light curves of these variables are the same length as the X-ray observation performed by Chandra, varying from 1 ksec to 170 ksec. The Chandra Guide Star Catalog includes about 300 stars that appear to be newly discovered variables. A description of the instrumentation is included and interesting examples from the catalog are shown and discussed. We introduce a new collaboration between the Chandra Variable Guide Star Team and members of the AAVSO, who will enhance this catalog with expertise in variable star characteristics. For future investigation, we intend to reprocess all available photometry in order to look for long-term variability and lower amplitude fluctuations that may not be apparent in the visual inspection of the existing time series. This work was supported by NASA contract NAS8-37073.

The Evolution of R Coronae Borealis Stars   Geoffrey Clayton   *20 minutes*

Abstract: Among the hydrogen-deficient post-asymptotic giant branch (post-AGB) stars are the R Coronae Borealis (RCB) stars, a small group of carbon-rich supergiants. About 50 RCB stars are known in the Galaxy and the Magellanic Clouds. Their defining characteristics are hydrogen deficiency and unusual variability -- RCB stars undergo massive declines of up to 8 mag due to the formation of carbon dust at irregular intervals. Apparently related to the RCB stars are the hydrogen-deficient carbon (HdC) stars. The five known HdC stars are similar to the RCB stars spectroscopically but do not show declines or IR excesses. The evidence for and against the two scenarios that have been proposed for the origin of RCB stars is discussed in the light of recent observational data. These scenarios are, the double degenerate and the final helium-shell flash models. The former involves the merger of a CO- and a He-white dwarf. In the latter, a star evolving into a planetary nebula central star is blown up to supergiant size by a final helium shell flash.

Reclaiming the Astronomical and Historical Legacy of Antonia Maury   Kristine Larsen   *20 minutes*

Abstract: Antonia Maury is perhaps best known in astronomical history circles as a student of Maria Mitchell's at Vassar and a pioneer in spectral classification at the Harvard College Observatory. Among her other astronomical interests were eclipsing and spectroscopic binaries, especially Beta Aurigae (which she discovered) and Beta Lyrae, whose peculiar behavior occupied her interest in the later years of her career. This paper will highlight Maury's often overlooked contributions to variable star and binary star astronomy, and strive to put a human face on this brilliant yet enigmatic woman astronomer through personal stories told to the author by Dorrit Hoffleit.

Henrietta Swan Leavitt   Katy Sternberger   *10 minutes*

Abstract: Henrietta Swan Leavitt, born in 1868, was a great woman astronomer. Though she is not widely known for her work, she studied Cepheid variable stars and devised a law which states that a star's brightness is directly linked to the length of its period. This launched the quest to discover how to measure the universe.

POSTER: **Overview of the DASCH Photometry Pipeline**   Edward J. Los   *2-3 minutes*

Abstract: DASCH is "Digital Access to a Sky Century at Harvard", the effort to digitize approximately 520,000 astronomical plates in the Harvard College Observatory collection. This paper is an overview of the photometry pipeline which has generated over 400 million magnitude measurements from over 3400 scanned plates.

POSTER: **First steps towards a solar flare detector using**   James Faustman Breitmeyer   *2-3 minutes*
      the AAVSO design

3:25 pm – 3: 50 pm   ***Coffee Break***

3:50 pm – 5:30 pm

How do pulsating giant stars make dust?   Lee Anne Willson   *20 minutes*

Abstract: Mira variables of spectral types M (more oxygen than carbon), S (carbon ≈ oxygen) and C (more carbon than oxygen) all show signs of dusty winds. Radiative acceleration of the dust is thought to play a crucial role in driving the winds, once the atmosphere has been levitated by the pulsation. However, efforts to model the nucleation and growth of dust grains have encountered a host of difficulties. The process is complex, involving a very large number of reactions of particles (atoms, molecules, clusters and grains) with each other. The coupling of the grains to the radiation field is also difficult to model with confidence, as it depends on the composition, the size and the shape of the grains. Common approximations to make the problem tractable have lead to results that contradict observations; for example, they predict that S stars should produce no dust, but some S stars do. Some ideas for solving this problem come from laboratory studies. There may also be ways to get the right result without so much work by taking advantage of natural feedback evident in the models.

A Microprocessor-based Starfield Simulator   Doug Welch   *15 minutes*

Coauthors: Anthony Tektach, Unihedron and Steve Bickerton, Princeton
Abstract: We present a microprocessor-based system for reproducing the realtime behavior of stellar time-series, including the effects of selectable degrees scintillation noise. At present, the system has 64 white LEDs which are individually programmable. The simulator may be used to investigate measurement and analysis biases since all properties of star (constant and variable) are under the control of the programmer. A live demonstration of the unit will be provided.

120 Years of RZ Dor   James Bedient   *10 minutes*

Abstract: Archival data on RZ Dor is examined to update its type and period. Data ranging from pre-1900 Harvard plates through AAVSO visual estimates made during the 1980s and 1990s to 21st century CCD photometry is used to confirm its type as Mira and determine an accurate period. The value of multiple independent accessible datasets is confirmed yet again.

40 Years of Mystery: Unraveling BZ UMa   Aaron Price   *20 minutes*

Coauthor: Grant Foster
Abstract: The dwarf novae BZ UMa has perplexed astronomers for decades. Activity typical of both UGSU and intermediate polar (IP) dwarf novae have been detected while no expected UGSU type superoutbursts had been detected since the star was discovered in 1968. Finally, the diligence of variable star observers was once again rewarded with a superoutburst in April, 2007. We report on statistical analysis of the 2007 superoutburst and subsequent polarimetry measurements. We integrate all our findings into a proposed description and classification of the system.

Update on HST Campaign on Pulsating White Dwarfs   Paula Szkody   *15 minutes*
in Cataclysmic Variables

Abstract: For the past 6 years, we have conducted programs on the Hubble Space Telescope, coordinated with ground support from the AAVSO network of observers. These programs have determined temperatures for 9 of the dozen known pulsating white dwarfs that exist in cataclysmic variables. Unlike single, non-accreting, white dwarfs, which have a very narrow range of temperatures within their instability strip, the accreting pulsators range from 10,500K to 16,500K with most being near the hot end. In addition, the accreting pulsators are found to stop showing pulsations at times, a phenomenon not seen in the single white dwarfs. The superoutbursts of two of our systems in 2007 complicates the picture further but allows the chance to study the effect of temperature changes on a relatively short timescale.

Two-Color Photometry of the Double-Mode RR Lyrae Star,   David A. Hurdis   *20 minutes*
NSVS-5222076

Abstract: Few double-mode RR Lyrae field stars (i.e., not in a crowded globular cluster) are known, and observations of them are especially useful to modelers because their two independent pulsation periods allow a unique determination of the star's mass and radius. Only recently identified as an RRd field star, NSVS-5222076 is bright and well-placed for Northern Hemisphere observers. Photometry time-series were acquired in both the V and I bands. Period analyses of these data were performed with the Deeming DFT algorithm in Peranso. The results agree with the fundamental and first-overtone periods determined from V data alone by Oaster, Smith and Kinemuchi.