Abstracts of Papers and Posters Presented at the 94th Annual Meeting of the AAVSO, Held in Newton, Massachusetts, October 14–15, 2005

Long-Term Light Curves of Cepheid Variables (paper)

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Abstract We have analyzed the light curves of sixty-five Cepheid variables, using visual data from the American Association of Variable Star Observers (AAVSO). We find that Cepheid pulsations are not nearly so constant as is often believed; half of our well-observed sample show episodes of period change, in addition to long-term period evolution. We derive the Fourier decomposition coefficients for the sample, and present mean light curves for the best-observed stars. We also find that the light curve shape is usually well approximated by a "bent sawtooth" wave, which can account for the coefficients of the Fourier series.

Photometry of η Aquilae (paper)

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Abstract η Aql is a classical Cepheid variable of the δ Cephei type. Visually it varies visual magnitude 3.5 to 4.6. In the *J* infrared band, the star varies from magnitude 2.2 to 2.7 and in the *H* infrared band it varies from magnitude 1.9 to 2.2. This paper reports on *J* (1.25 micron) and *H* (1.65 micron) photometry gathered by the AAVSO Infrared Photometry Group using the SSP-4 photometer. This collection of observations represents the most extensive consistent set of *J* and *H* band observations reported in the literature for this star. Reduction of the observations reveals a period of variation of 7.1760 ± 0.0037 days. The *J* and *H* band observations lag the visual observations by approximately 0.2 cycle.

V725 Sagittarii: Real-Time Evolution of a Pulsating Star (paper)

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Abstract V725 Sgr is a unique pulsating variable star, first recognized by Henrietta Swope, which has increased its period by a factor of at least 5 in the past century. It has also changed its amplitude and its mean magnitude. It appears that, for the first few decades of the 20th century, its spectrum and variability were those of a Population II Cepheid. Now, they are those of a red semiregular (SRa or SRb) variable. We will review V725 Sgr's past history. Unfortunately, it was largely neglected through the middle of the 20th century, though there was a key paper in 1973 by Serge Demers (*J.Roy. Astron. Soc. Canada*, **67**, 19). We have now used visual (mostly Overbeek and Williams) and photoelectric CCD (Lund) photometry of V725 Sgr, from 1985 to 2004, to study V725 Sgr's recent variability—period, amplitude, mean magnitude—using a variety of time-series analysis techniques (Fourier, least-squares, self-correlation), which we shall describe. We shall then discuss possible explanations; V725 Sgr's behavior is consistent with the final stages of a thermal "flash" in its nuclear burning shells, from the asymptotic-giant branch and back.

*deceased July 19, 2001

Time Series Observations of UX Ursae Majoris (poster)

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Abstract CCD photometry of the variable star UX Uma (1332+52) was obtained using a 0.2 meter Schmidt-Cassegrain telescope. UX Uma is a binary star system consisting of a white dwarf primary star and a solar-type secondary star. Designated as a "nova-like" system, material is systematically being transferred from the secondary star to the primary. According to models, this material forms an accretion disc around the primary. As the dimmer secondary star moves in front of the brighter primary, eclipses can be observed. A sequence of two eclipses were systematically observed and analyzed for the first time in approximately ten years, according to AAVSO data. The orbital period was determined to be 0.196578 ± 0.000168 day. Preliminary results show that one of the eclipses observed can be classified as "peculiar" and suggests that the hot spot on the accretion disc dimmed during one of the recorded eclipse events. This could be due to the variation of the rate of material falling onto the accretion disc from the secondary star. These observations were conducted with the assistance of undergraduate astronomy students.

CY Aquarii Revisited (paper)

Ronald E. Zissell
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Abstract The author has been observing CY Aqr for forty years. This dwarf cepheid has undergone over 200,000 cycles in this interval. Gross and subtle period changes are apparent in the O–C diagram. To paraphrase Alice, "things just get curiouser and curiouser."

Some Recently-Discovered Red and Brown Dwarfs (poster)

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Abstract In a paper on recently-discovered red and brown dwarfs, Costa *et al.* (2005, *Astron. J.*, **130**, 337) published parallaxes obtained with the 1.5-meter telescope at Cerro Tololo Inter-American Observatory. They reported absolute parallaxes for thirty-one stars, twenty-nine of which are red dwarfs. Four of these red dwarfs are known flare stars; more of these red dwarfs may also be variable stars. A large-aperture telescope will be required to monitor these stars, since all of them are between thirteenth and nineteenth visual magnitude. The red dwarf DENIS 1048-3956 (spectral type M8.0V) is found to be only 4.00 ± 0.03 parsecs (13.06 light years) from the Sun. Teegarden's Star (SO $0253+165258$, spectral type M7.0V) is also discussed. Since most of the sixty-three stars now known to be closer than five parsecs (16.3 light years) are red dwarfs (45), the completeness of the present count of red dwarfs and brown dwarfs further from the Sun is discussed on the

basis of these recent papers and *The Catalog of nearby Stars* by Gliese and Jahreiss (1991, ADC CD-ROM: *Selected Astronomical Catalogs, Vol. I*, Eds. Brotzmann and Gesser, NASA/ADC, GSFC, Greenbelt, MD).

Searching for Open Cluster Variable Stars Using Short Duration Unfiltered Images (paper)

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Abstract As part of an ongoing project to search for statistical evidence of isolated apparent flux transients in stars, such as might arise from occultation by Kuiper Belt Objects, we have acquired numerous unfiltered images from the fields containing several open star clusters. A typical data set for a single cluster consists of hundreds or thousands of images of a few seconds' duration from each clear night in a two- to three-month observing window. We have begun assessing the viability of utilizing these data sets to search for variable stars in these fields. Variable stars in clusters are useful for understanding both stellar evolution and the dynamical evolution of regions of relatively high stellar density. Cluster populations can also prove useful in calibrating various distance estimation techniques. With so many images from a single night, our data are particularly sensitive to variable stars with periods less than a day (e.g., W UMa and δ Scuti stars). Because our data sets cover many nights over several months we can also reliably detect longer period eclipsing binary stars. We report our technique for identifying stellar variability given the residuals inherent in light curves constructed from unfiltered images. We have tested our technique on the fields containing M67 and NGC 129 and we report the results of those tests as well.

A New Look at Johnson/Cousins Photometric Filters (paper)

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Abstract Some of the Schott glasses originally prescribed by Bessell in creating Johnson/Cousins *UBVRcIc* photometric filters for use in CCD cameras are no

longer available. We have selected new glasses, and added interference coatings, to create a new set of filters that accurately match the original Johnson/Cousins bandpasses. This paper will describe the new prescriptions and give preliminary results from on-telescope tests.

Remote Observing with SLOOH (paper)

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Abstract SLOOH.com is a web-portal for an autonomous observatory in the Canary Islands founded in 2003. The equipment includes two 14-inch SCT's and SBIG ST-10 CCD cameras. SLOOH has over 4,000 subscribers and actively observes for over 2,500 hours annually. Subscribers reserve time on the observatory and specify target coordinates. One application of SLOOH has been to search for and confirm supernovae. SLOOH uses novel automatic image processing and a sophisticated software architecture. In 2006 SLOOH plans to add photometric filters and to deploy a WWW system that allows detailed control of the observatory, culminating with retrieval of FITS image files.

SS-AT—A Remote Telescope for Pretty Pictures, Science Projects, and Real Research (paper)

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Abstract ISS-AT, the International Space Station—Amateur Telescope, is being planned to provide amateur astronomers and students a space-borne platform for imaging for whatever purpose. The ISS-AT Alpha Scope has been established in Arizona and is remotely operated from Dyer Observatory in Nashville to prove the concept of operation for the proposed space telescope. A significant block of time on the Alpha Scope is being offered to AAVSO to help prove to NASA that amateur astronomers are capable of doing real astronomical research from space.

Deep Impact Tempel 1 Student Projects (paper)

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Abstract Students have been working on comet research projects using images from the 2.0 meter Faulkes Telescope North (FTN) located on Haleakala, Maui

in Hawaii. In June, students attended sessions to do remote observing with FTN and to learn to use image processing software in preparations for the July 4 Deep Impact comet/impactor encounter. They operated FTN in real time during the encounter at a teacher/ student workshop held on Maui. Images of the comet as well as preliminary results will be shared. The mentoring provided by an AAVSO member has been instrumental in assisting us with developing a pilot mentor program that will utilize amateur astronomers.

Update on the Harvard College Observatory Plate Digitization Project (paper)

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Abstract We are building the fastest astronomical plate scanner in the world, capable of scanning an 8"×10" plate to 2300 dpi in under 30 seconds. This paper presents a description of the scanner and related efforts to put the entire Harvard College Observatory plate collection online.

Preliminary Findings on the Impact of Observing Variable Stars on Middle School Students' Beliefs and Attitudes Toward the Nature of Science (paper)

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Timothy Slater
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Abstract In Spring 2005, middle school students in the desert Southwest used the curriculum packet "In the Hunt for Variable Stars." Preliminary results are contributing to a larger study of how authentic research impacts students' beliefs and attitudes toward the nature of science. The paper provides initial and post-program data from surveys, class observations, and interviews. Students concentrated their studies on the Right Ascension $19^h\ 45^m$ using StarDial data available online.

Some Notes from Annie Jump Cannon's Notebooks (paper)

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Abstract In the mid-1890s, Annie Jump Cannon decided to return to her alma mater, Wellesley College, to pursue graduate studies in physics and astronomy and to assist her mentor, Professor Sarah Frances Whiting, in teaching the undergraduate courses there. In the fall of 1896, when Whiting sailed to Europe for a sabbatical leave, Cannon journeyed into Cambridge to continue her graduate work at Radcliffe College and to assist in the astronomical research at Harvard College Observatory. There, Professor Pickering, the director of the observatory, gave her some assignments in the fields of variable stars and stellar spectra. Along with her scientific observations, Cannon also made some personal notations. This paper will take a look at some of her notes and observations, especially those of her early, impressionable years at the observatory.

Ormsby MacKnight Mitchel, Astronomer and Civil War General (paper)

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Abstract A few colorful episodes from the life of O. M. Mitchel will be presented: his ambitious efforts to found the Cincinnati Observatory; his popular lectures in astronomy; his daring schemes and untimely demise during the American Civil War.

Station at the Center of the Universe (paper)

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Abstract Grand Central Terminal in New York City is acclaimed by astronomers for its fabled "Sky Ceiling", the largest star map in human history. However, there are over a dozen astronomy features of this rail hub dating from its opening in 1913 through its newest section in the 1990s. These were demonstrated for the first time by NYSkies at the 2003 Earth Day show in the terminal. NYSkies had about the most humble of booths but the very grandest of all exhibits! Slides and handouts highlight the astronomy of Grand Central Station, station at the center of the universe.