Abstracts of Papers Presented at the 102nd Spring Meeting of the American Association of Variable Star Observers, Held in Boone, North Carolina, May 16–18, 2013

Working Together to Understand Novae

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Abstract In ancient times, people occasionally looked up to find a "nova," or new star, in the sky. With about thirty-five per year in our galaxy, novae are the most common major stellar explosions. Although researchers now understand what causes a white dwarf to suddenly brighten into a nova, many puzzles remain, such as why novae appear to eject orders of magnitude more material than predicted by theory, and how a uniform eruption on a spherical white dwarf can expel matter in the form of jets, clumps, and rings. Coordinated observations at radio, optical, and X-ray wavelengths can answer these questions. I will describe a new opportunity for amateur astronomers to work with professional astronomers who are using X-ray and newly upgraded radio telescopes to observe novae. Participants will have the opportunity to learn about novae, share their own expertise, and participate in the process of scientific discovery.

AAVSO High Energy Network: Past and Present

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Abstract The AAVSO High Energy Network grew out of several initiatives in Pro-Am cooperation on gamma-ray burst localizations at the end of the 20th Century, and continues today as an informal "Section" within the AAVSO. A number of observers and groups continue to receive GRB alerts from the AAVSO's automatic service, and the amateur community remains involved in GRB followups. I'll highlight a few recent bursts with amateur followups, both within AAVSO HEN, and on their own, and make suggestions for how the amateur community could expand its pursuit of this field.

Late-time Observations of Novae

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Abstract The 61-cm telescopes of the AAVSO's robotic telescope network have been used to obtain multi-wavelength photometry of many recent novae. Few novae have been previously followed more than 100 days after outburst. We are systematically imaging all novae from the past decade. This paper is an interim report, giving results for the most recent novae, and highlighting where amateurs can contribute to the project.

Deriving Definitive Parameters for the Long Period Cepheid S Vulpeculae

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Abstract The long-period variable S Vul is now recognized to be a classical Cepheid, following a period a century ago when its status was less well established. Its pulsation period of 68.5 days makes S Vul the longest period Cepheid recognized in the Galaxy. Possible membership in an OB association was considered briefly thirty years ago, until it was discovered to be surrounded by a sparse cluster of faint stars designated as Turner 1. Membership of S Vul in the cluster was considered unlikely in the original photometric study of Turner 1 because of contradictory implications regarding the reddening and distance of S Vul with that of cluster stars, but a recent revisiting of the data supplemented by APASS observations indicates that the cluster and Cepheid are indeed related. The implications for the implied parameters of S Vul, its reddening, distance, age, and evolutionary mass, are discussed in light of our refined knowledge of the cluster in which the Cepheid resides.

The Z CamPaign Year Four

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Abstract Z Cam stars are a small subset of dwarf novae that exhibit standstills in their light curves. Most modern literature and catalogs of cataclysmic variables quote the number of known Z Cams to be on the order of thirty or so systems. After a three-year observing campaign and an exhaustive examination of the data in the AAVSO International Database we have trimmed that number by a third. One of the reasons for the misclassification of some systems is the fact that the definition of a Z Cam has evolved over the last eighty-five years to what it is today. We present the results of our investigation into sixty-four CVs listed at one time or another in the literature as Z Cams or possible Z Cams.

Periodic Brightness Fluctuations in the 2012 Ouburst of SN 2009ip

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Abstract In September 2012, the supernova impostor SN 2009ip in NGC 7259 had what some have theorized was its final outburst and terminal explosion as a type II-n supernova. Our Pro-Am collaboration observed this event with high temporal cadence in V, R, and I bands. Analysis of our data reveals a periodic fluctuation on the order of weeks (with several harmonics) in the de-trended light curve after peak brightness. We have verified that this is not an instrumental effect in that it also appears in data from other unrelated instruments. In this talk will present our data and findings.

Observations of an Eclipse of Bright Star b Persei by the Third Star in February 2013

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Abstract b Persei (SAO 24531 = HD 26961, V ~4.52) is a multiple star system consisting of a close ellipsoidal binary with a 1.5-day period and a third star with a 702-day orbit. b Per is a non-thermal radio source, and the evolutionary stage of the close binary is unclear. It may be a non-eclipsing Algol or a precursor to the Algol stage. Observations with the Navy Precision Optical Interferometer showed that the third star has a nearly edge-on orbit about the close binary. Based on this orbit an eclipse of the close binary by the third star was predicted for late January 2013. A call for observations—especially those with equipment to observe bright stars instrumentally—was made via the AAVSO. With the "back yard" convenience of a DSLR camera on a fixed tripod, DFC obtained an observation of the V magnitude of b Persei nearly every clear night in January–February 2013. The DSLR clearly detected the expected eclipse with a drop in of 0.12 V on JD 2456329 and JD 2456330 (Feb 5–6, 2013 and Feb 6–7, 2013). The eclipse was also detected by other AAVSO observers extending to JD 2456331 inclusive. The estimated duration of the eclipse (FWHM) is 2.0 ± 0.3 d. The DSLR also detects the 1.53-day orbital period of the A and B components of b Persei—a variation of 0.05 V magnitude due to the non-eclipsing ellipsoidal star shapes. A concerted campaign should recruit many AAVSO observers to detect the next predicted eclipses in mid-January 2014 (secondary) and early January 2015 (primary) assuming a 702-day cycle. Future photometric

observations may aid the understanding of the evolutionary stage of the close binary.

The Astronomer Who Came in from the Cold: the Evolution of Observing Variable Stars Over Three Decades at Appalachian State's Dark Sky Observatory

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Abstract Variable star research has been my main work from my Ph.D. dissertation work through three decades of research at our Appalachian State University Dark Sky Observatory. I will present a review of that work and the evolution of technology that took me from in situ observing with a photometer in a cold dome to remote and automatic CCD observing today. The research targets included RS CVn stars, apsidal motion eclipsing binaries, Trojan planets, and exoplanets in binaries.

Color of the Night Sky

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Abstract The author presents the results of all-night monitoring of the sky brightness in BVRI filters. The measuring equipment used was Unihendron SQM's and KNIGHTWARE software. Results from four observatories are presented, along with implications of twilight flats.

Kalman Filtering and Variable Stars

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Abstract The Kalman Filter (also known as linear quadratic estimation (LGE)) is used extensively in Navigation Systems to estimate the state in the presence of noise. The author explores the use of Kalman Filtering to estimate the magnitude of Variable Stars in the presence of Noise.

Astronomy: Hobby or Obsession?

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Abstract A humorous look at amateur astronomers and the lengths, extent, and expenses they are willing to go to realize their celestial dreams.