



News from the Society for Astronomical Sciences

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Some Highlights from the 2017 SAS Symposium and AAVSO Spring meeting

Every year I come home from the SAS Symposium with my brain full and my enthusiasm recharged with opportunities for small-telescope science. It happened again this year.

The educational workshops gave something for the fans of solar systems, near and far. Brian Warner and Bob Stephens described a variety of projects for asteroid photometry. There are quite a few asteroids whose rotation periods are uncertain (or maybe wrong), but even if you see that an asteroid already has a well-determined rotation period, don't pass it by. A few more well-done lightcurves can provide the data needed to determine a good shape model. Continued monitoring can also discover or verify the presence of asteroid satellites. Few asteroids have well-done phase curves; and there are quite a few asteroids whose absolute magnitude is uncertain, or that needs confirmation.

This workshop resonated nicely with the "evening with the pro's" talk by Dr. David Jewitt, on the subject of active asteroids (or main-belt comets). When you're searching for an asteroid satellite, you look for transient dips in brightness, typically a few hours long. A collision or a fragmentation, or some other disturbance to the asteroid can create a transient *brightening*, typically a couple of days long. Relatively few of these have been reported and well-studied, but that may be a selection effect.

For fans of distant solar systems, Dr. Jessie Christiansen's workshop described several areas in which the Kepler and the upcoming TESS projects will benefit from sustained obser-



vations by small-telescope photometry and (in the case of TESS) spectroscopy. See more about this below.

Dr. Joe Patterson's talk at "evening with the pro's" reminded us of the value of long-term and near-continuous monitoring of cataclysmic variables, to unravel the phenomena of these complex systems. One of my notes from that evening was his point that thanks to a world-straddling group of observers, "the sun never rises on the Center for Backyard Astrophysics".

Quite a few technical talks sparked my interest and highlighted the creativity and skill of modern backyard scientists.

John Hoot described the design of a \$500 radio telescope, and showed his wonderful initial results.

David Boyd opened our eyes to the capability of a modern commercial spectrograph on a modest telescope, with his exciting report on spectrophotometry of the Symbiotic stars. He

displayed pretty dramatic changes to the spectrum, as the star's brightness fluctuated. I look forward to more such results next year, from more of our spectroscopists.

Kristine Larsen set a high standard for educators who are striving to use astronomy as a classroom tool. When her students asked for more work, you know that she's on to something good!

Arne Henden's paper "How faint can you go" struck a chord during the photometry lunch discussion, when the topic of long-period variables came up. I don't recall the exact sequence of events, but four things that stuck in my mind were:

- It's worth the effort to go faint (long exposures, stacking, etc.) and follow these stars all the way to minimum brightness, because an actual brightness measurement -- even with large error bars -- is much more valuable than a "fainter than" report;

- In the case of long-period variables, the existing data is pretty sparse when they're faint. But:
- There is some evidence that these stars do things when they are faint, and they may display relatively rapid fluctuations.
- We were encouraged to strive for fairly rapid cadence (e.g. a data point every couple of nights) when they near minimum brightness.

All of the papers presented at the Symposium are freely available in the Proceedings, and videos of most of the talks are freely available also. Go to the PUBLICATIONS tab on the SAS website (www.SocAstroSci.org) to see them.

Plans for SAS-2018

The 2018 SAS Symposium will be held June 14-15-16 in Ontario, California. Mark your calendars.

If you have ideas for Workshops or Technical topics that you would like to see, or comments on any other subjects, please contact us at program@SocAstroSci.org. The Program Committee is always striving to make the SAS Symposium the best meeting that you can attend.

“Kepler and TESS Opportunities” workshop video is freely available:

TESS is scheduled to launch in March 2018, providing a fabulous tool for detecting exoplanet transits. One thing about TESS is that it has fairly large pixels (21 arc-sec), so that usually there will more than one star per pixel. Dr. Jessie Christiansen really opened our eyes to the contributions that small-telescope observers can make to the TESS project when data starts flowing:

- Seeing-limited photometry of each candidate will be needed, to identify which star within the TESS Pixel is the host of the transit;
- Spectral type must be determined for each candidate host star; and
- Two- or three-color photometry of each host star's transit will be useful to discriminate against false positives (eclipsing binaries, etc.)

Because the TESS target stars are fairly bright, these project are well within the capability of small-telescope photometry and spectroscopy. I imagine that quite a few people are already planning and preparing for this mission.

We don't usually make Workshop videos freely available, but this topic seems to have sparked quite a bit of interest. Dr. Christiansen has agreed to make the videos freely available on the SAS website – go to the PUBLICATIONS tab, then to the “2017 videos” link to view this workshop.

Astronomy Rewind

Here's a citizen-science initiative that might interest some of the SAS community. Recall that last year we heard Dr. Brooke Simmons describe the “Zooniverse” platform that takes advantage of human abilities to interpret images, and mates it with computers' ability to merge diverse data sets.

Now, that pairing is being applied to the challenge of adding value to astronomical images that were published in “paper” journals over the past 150 years. The idea is that humans are very good at recognizing an astronomical image (distinguishing it from all of the other photos and graphics that might appear in a journal paper), and finding descriptive data about the image in the same paper (e.g. image scale, spectral band). Then the Zooniverse platform applies this “meta-data” to the digitized image and adds it to the archive.

The notion is that these “paper” images can be transformed into long-time record of changes in the sky (e.g. proper motions, nova outbursts). So far, it seems to be working nicely.

For a description of the goals and progress, see go.nature.com/2o9f1eb.

The project website is

<https://www.zooniverse.org/projects/zooniverse/astronomy-rewind>.

Reminders to the SAS Membership ...

Membership Renewal: Even if you can't attend the annual Symposium, we value your support of the Society for Astronomical Sciences, and your interest in small-telescope science.

As an SAS member, you will receive a bound copy of the Proceedings even if you cannot come to the Symposium.

Symposium Proceedings: Published proceedings from all recent Symposia are freely available in PDF format at the PUBLICATIONS tab of the SAS website (www.SocAstroSci.org).

Symposium Videos: If you missed a recent Symposium, you can still watch many of the presentation videos on the SAS website at the PUBLICATIONS tab.

Workshop Videos: Video recordings of most of the Workshops from recent years are available from SAS. If you were registered for the Workshop, then the recording is free. If you were not a registered attendee, then the price is \$25 per workshop. Contact Bob Buchheim (Bob@RKBuchheim.org) for the details.

Keeping in Touch: The SAS Yahoo group (“SocAstroSci”) is a good way to keep in touch with the members and participants.

Kudos or Criticisms? We are looking forward to seeing you at SAS-2018! If you have any questions or ideas for the Symposium, or comments related to the Symposium, please share them with the Program Committee at program@SocAstroSci.org.

We will appreciate your input about the technical sessions, the workshops, the hotel, the banquet, the lunchtime discussions, and anything else that might help us improve the future SAS Symposia.

A New Small-Telescope Spectroscopy Initiative

The German Workshop for Variable Stars (BAV) has initiated a web-magazine “BAV Magazine Spectroscopy”, available at the BAV website. The plan is to publish twice per year. The main focus of the magazine is pure spectroscopic observations and the link to photometric observations. The publication will consider articles about apparatus/technical considera-

tions, evaluation methods for spectra, and the physics of the stars and their atmospheres, the latter especially for variable stars. The articles are written in either German or English.

The July-2017 issue has three interesting articles in English. Dr. Steve Shore discusses some aspects of outflows (or mass exchange) in binary star systems.

Dr. Ernst Pollman reports on a long-term project to search for periodicity of the emission-line flux in P Cyg. The project combines photometry (to understand continuum brightness variations) and spectroscopy (to calculate the line's Equivalent Width). By combining these, the project finds a 310 day period in the line flux.

Finally, Dr. H. Kawakita describes a project to search for diatomic molecules in novae, to which amateur-spectroscopy data is welcomed. Part of the idea is to see if the isotope ratios (e.g. $^{14}\text{N}/^{15}\text{N}$) match those in "pre-Solar grains" found in meteorites; this would add strength to the hypothesis that these grains represent input to the solar nebula from earlier novae.

You can get the magazine (free) from the website of the BAV:

<http://www.bav-astro.eu/index.php/veroeffentlichungen/bav-magazine-spectroscopy/issues-of-magazine>

The direct link to the June 2017 issue is:

<http://www.bav-astro.eu/images/BAV-Magazin.pdf>

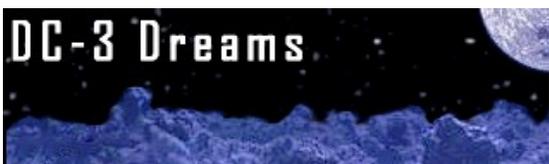
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Small-Telescope Science in the News

Here are notes on several publications that show the surprising results that can be gotten with modest-size telescopes and modern photometric and spectrographic equipment.

Spectroscopic study of the mass transfer in the β Per binary system by Bernd Bitnar and Ulrich Waldschager, Spektrum Nr. 52, 1/2017, online at http://spektroskopie.fg-vds.de/index_e.htm

An LHires-III on an 8-inch telescope can detect the emission line that rides on top of the H α absorption feature in the Algol system. It can also measure the changing velocity of this emission feature, and its changing equivalent width. The results show that this emission feature goes around the primary synchronously with the secondary (K-type) star, and that the emission region is offset toward the primary (B-type) star. These observations are consistent with the model of mass transfer from the secondary star (which fills its Roche lobe) into an accretion disk surrounding the primary star; and a hotspot that emits in H α where the stream of matter from the secondary star hits the accretion disk.

This study highlights some of the features of small-telescope spectroscopy: the freedom to engage in long-duration studies (18 months in this case) that can augment or follow up on "snapshots" provided by larger instruments; the ability to get good SNR at medium-to-high resolution on bright stars; and validating the veracity of small-telescope non-professional researchers by replicating previous (larger-telescope) studies.

It is worth your while to take a look at this report, and the spectra that the authors show.

Shape Models and Physical Properties of Asteroids by Santana-Ros, T., Dudzinski, G., and Bartczak, P. online at <https://arxiv.org/abs/1705.05710v1>

Here is an excellent reference for small-telescope photometry of asteroids. It provides the observational requirements for several important projects in asteroid photometry – especially shape modelling. If you were intrigued by the "Advanced asteroid lightcurve projects" workshop (by Brian Warner and Bob Stephens), then you'll want to read this. (This is a chapter in the Proceedings book *Assessment and Mitigation of Asteroid Impact Hazards*).

Minor Planet Bulletin, R. P. Binzel, editor. Available online at http://www.minorplanet.info/MPB/MPB_44-3.pdf

If the Workshop on Advanced Asteroid Lightcurve Projects (Warner & Stephens) sparked your enthusiasm for asteroid photometry, download the recent issue of the Minor Planet Bulletin. You'll find reports related to most of the projects that were discussed in the Workshop at SAS-2017 (including a statistical study by Eduardo Manuel Alvarez that argues strongly for continuing to collect high-cadence asteroid lightcurves, and a report of two asteroids with very long periods by Fredrick Pilcher et al). Plus, each issue of MPB contains several lists of observing targets that need your attention over the next few months.

Continuing spectroscopic monitoring of Nova Sct 2017 = ASASSN-17hx

ATel #10558; by Paolo Berardi, Woody Sims, and Umberto Sollecchia (ARAS Group) on 6 Jul 2017; 02:40 UT
Credential Certification: S. N. Shore (shore@df.unipi.it)

Subjects: Nova

We report the results of low resolution spectroscopy of the classical nova Sct 2017 = ASASSN-17hx (Atel# **10523**, **#10524**, **#10527**) as part of the continuing nova monitoring program by members of the ARAS group. Spectra were obtained on 2017 Jun 29.8, Jun 30.3, Jul 1.9, Jul 2.3, Jul 4.3, and Jul. 4.8 with resolutions ranging from about 580 to 2650, depending on the spectrograph (Alpy600, LISA, LHIREs) and covering ~3800-7200Å and S/N of about 20-100) with exposure times ranging from 3500 to 10400 sec. The He I spectrum ATel #**10527** has persisted but weakened steadily since Jun 24, while after Jun 29 the Fe II 4921, 5018, 5169, among others, spectrum appeared with P Cyg profiles having maximum velocities around -800 km/s. The absorption troughs have increased in relative strength, from about 10% on Jun 30 to around 25% on Jul 4. H α showed absorption through Jul 2, at -1000 km/s, with the emission FWZI remained about 3200 km/s. On Jun 29-30, the He I lines showed P Cyg troughs extending to about -800 km/s, as reported previously; the absorption has persisted but both it and the emission have weakened, the profile narrowed, and the maximum velocity reduced to about -500 km/s or less. Na I D absorption, likely interstellar, was detected in those spectra with sufficient resolution. No Na I emission was detected but that may increase as the metallic lines develop. N II emission, reported in Atel #**10527**, was not detected on any of the spectra. The spectra are now those typical of the optically thick, post-fireball stage of the expansion. Observations are continuing, all spectra are publicly available though http://www.astrosurf.com/aras/Aras_DataBase/Novae/2017_NovaSct2017.htm

ARAS Nova Database

Editor's note: One of the authors is SAS member Woody Sims. His spectra of the nova are shown below. They were made with a C11EdgeHD with .7x focal reducer on a AP1100GTO mount, using the Shelyak LISA spectrograph and an Atik414ex monochrome camera. The nova was between 11 and 11.5 magnitude. Note that even at this modest resolution, you can see the "P Cyg" profile of some lines (e.g. Fe II).

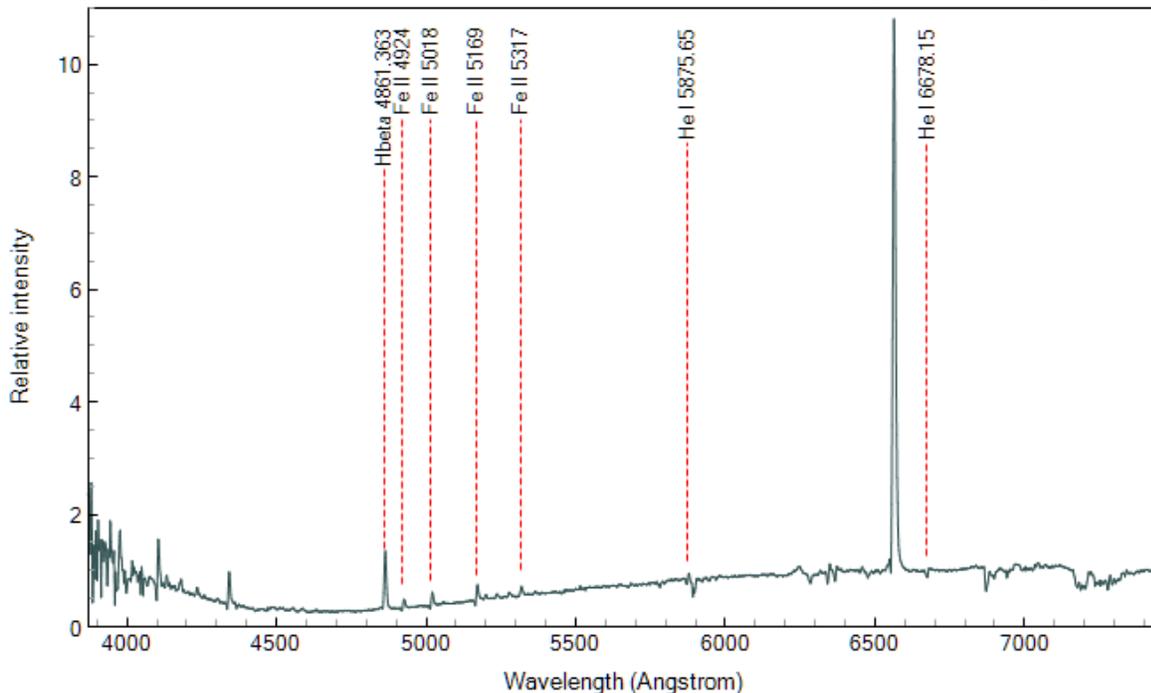
Multi-Epoch BVRI Photometry of Luinous Stars in M31 and M33, by John C. Martin and Roberta M Humphreys. Available online at <https://arxiv.org/pdf/1707.01552.pdf>

Author John Martin is a good friend of SAS. Here he reports something that seems to be right near the ragged edge of small-telescope capability: photometric monitoring of individual stars in nearby galaxies. The project uses a 0.5 meter telescope and CCD to follow the couple hundred brightest stars in M31 and M33, to search for variability. Two key features of the project are its long-duration (4 years and still running) and its ability to reliably detect 0.1-magnitude varia-

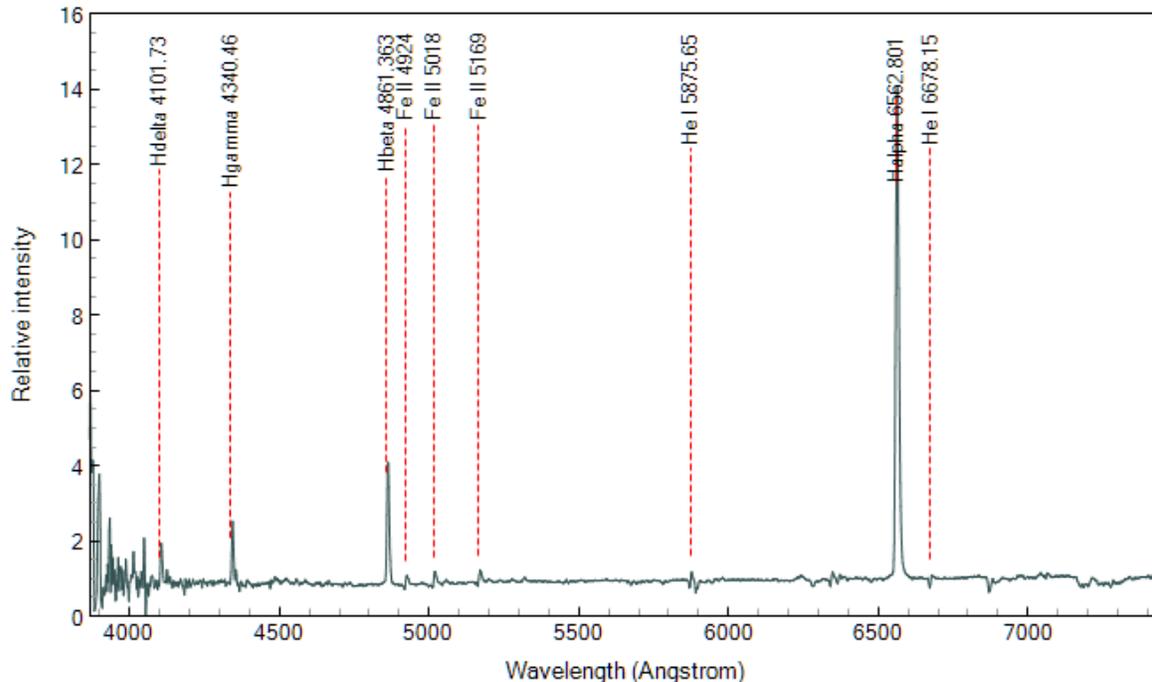
tions in brightness of the targets. So far, 13 targets are very likely to be variable, and 20 more are likely variables.

The results of this project are expected to improve the understanding of LBVs, and the S Doradus phenomenon.

Asassn-17hx C11HD LISA Atik414ex 2017-07-04.280 4215 s (7 x 600 s) R=966 Woody Sims



Asassn-17hx C11HD LISA Atik414ex 2017-07-02.333 5421 s (9 x 600 s) R=664 Woody Sims



The Apparently Decaying Orbit of WASP-12b by Patra, K.C. et al, *Astronomical Journal* 154:4, 2017 July

During SAS-2017, both Dennis Conti and Jessie Christiansen encouraged small-telescope observation of exoplanet transits, to monitor times of transit and provide data points for O-C curves of these events. Here's an example of the value of such observations.

Theory predicts that "hot Jupiter" planets (large gas giants in orbit very close to the parent star) should display both orbital decay, spiraling inward toward eventual digestion by the star, and – if the orbit is even slightly eccentric – rapid apsidal motion. Heretofore, neither of these predictions has been observed.

The authors used a 1.2 m telescope to observe transit lightcurves and make accurate timings. At 11.7 mag and with a transit Δmag of about 1%, this exoplanet transit should be within the capability of many SAS photometrists. A neat feature of their study is that they also used Spitzer to observe two occultations (planet passing behind the star).

With the record of transit and occultation timings so far, it is pretty clear that the planet's period is changing, but it isn't possible (yet) to decide between orbital decay or apsidal motion (or a combination of the two) as the cause. More data will obviously help clarify the situation. Projecting the O-C models forward, the "pure orbital decay" and "pure apsidal motion" model predictions will deviate from each other – by several minutes – by 2021. So put this guy on your observing-follow-up list.

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The Society for Astronomical Sciences welcomes everyone interested in small telescope astronomical research. Our mission is to provide education, foster amateurs' participation in research projects as an aspect of their astronomical hobby, facilitate professional-amateur collaborations, and disseminate new results and methods. The Membership fee is \$25.00 per year.

As a member, you receive:

- Discounted registration fee for the annual Symposium.
- A copy of the published proceedings each year, even if you do not attend the Symposium.

Membership application is available at the REGISTRATION page of the SAS web site: <http://www.SocAstroSci.org>.

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