News from the Society for Astronomical Sciences

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Planning for SAS-2020

Mark your calendars: the SAS-2020 Symposium will be June 11-12-13, 2020 in Ontario, California, at the Ontario Gateway Hotel (same venue as the 2019 Symposium).

We are excited to announce that the 2020 Symposium will be a joint meeting with the **American Association of Variable Star Observers** (AAVSO). AAVSO members will receive the same discounted registration fee as SAS members.

The hotel remodel is progressing. By next year, we will be in the new guest rooms and the lobby and restaurant remodel should be finished.

Start thinking now about the project and results that you'll present at SAS-2020: the Call for Abstracts is below.

Symposium Registration will open in February, 2020, through the SAS website (SocAstroSci.org).

Call for Abstracts

Papers for presentation at the SAS-2020 Symposium are solicited on all aspects of astronomical science that are (or can be) pursued by observations with small telescopes (less than 1-meter aperture). We encourage presentation of work which follows the Scientific Method, including clear hypotheses, reproducible experiments, and results. Examples of work presented in the past are:

- Observations, data, and analysis of variable stars, eclipsing binary stars, double stars and stellar systems
- Observations, data, and analysis of asteroids and other solar system objects; and exoplanets
- Progress, status, and planning for upcoming observing campaigns such as the TESS follow-up initiative.
- Instrumentation/hardware and techniques (including software) for photometry, astrometry, spectroscopy, polarimetry, and fast-cadence observations (e.g. occultations)
- Investigations of atmospheric effects, light-propagation and scattering, light pollution monitoring as they affect astronomical observations.

We welcome three types of papers: "Paper with Presentation" includes both a written paper for the Proceedings and a 20-minute presentation; "Paper without Presentation" is a written paper for the Proceedings; and "Posters". We will include time in the agenda for 5-minute "sparkler talks" for most Posters.

All abstract submissions will be reviewed by a panel of experienced amateurs and professionals who will provide helpful feedback to authors and decide which submissions to schedule as part of the symposium as either presentations or posters.

Submit your abstracts via e-mail to: Program@SocAstroSci.org.

Abstracts are due by March 15, 2020. You will be informed of acceptance by March 22.

Final papers for the Proceedings will be due by April 16, 2020.

InStAR Workshop Sunday morning after SAS

Those of you who are interested in education and student projects in astronomy will want to extend your stay at SAS for one additional day. On Sunday, June 14, the InStAR (Institute for Student Astronomical Research) will hold a workshop in the Ontario Gateway Hotel.

Rachel Freed, InSTAR President, writes: The workshop will be similar to last year. I hope we can have a larger turnout from the amateur astronomy community. The workshop will explain how the research seminar works, the tools we use, the paper writing, etc, with some short student presentations to give a sense of the final results. We may be able to include a hands-on workshop to get students working with amateur astronomers doing data collection and / or reduction.

To register for this free workshop, go to

https://forms.gle/SNYtk2QWwCUGEzHi6.

There will be more information on this in the next SAS Newsletter.

Reminders for SAS Members ...

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 can request a bound copy of the Proceedings (free), even if you cannot register or attend 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 watch many of the presentation videos on the SAS website at the PUBLICATIONS tab.

Kudos, Criticisms, or fresh Ideas? If you have any questions or ideas for the Symposium, ideas for Workshops or Technical topics that you would like to see, or comments on any other subjects related to the Symposium, please share them with the Program Committee at program@SocAstroSci.org.

Workshop Slides: The slides from Dr. David Boyd's SAS-2019 workshop on "Scientific Analysis of Amateur Spectra" are now available (free) on the BAA website. Point your browser to: https://britastro.org/node/19379 to download the slides in PDF format.

Sad News: Earl Wilson was a long-time member of SAS, and a great enthusiast for small-telescope research contributions. He was also active in the RTMC and the China Lake Astronomical Society. Earl died on Nov 23, in Reno NV.

Farewell, Earl!

SAS was represented at the annual Pie Town festival

Small Telescope Science in the News

Here are some interesting notes that have appeared in the literature over the past few months, showing the science that is facilitated by small-telescope photometry and spectroscopy.

Third Components With Elliptical Orbits in the Eclipsing Binaries by D.E. Tvardovskyi, et al. (*see arXiv:1912.02087v1*).

The photometric lightcurve of an eclipsing binary system contains quite a bit of interesting information: its periodic aspect tells the orbital period of the pair, the shape of the lightcurve provides information about the relative sizes and separations of the stars, multi-color lightcurves tell about the temperature difference of the components, etc. A long-term record of the times of minimum light (a few eclipses carefully measured every few years) can provide improved accuracy in the period determination, and can also show evidence of changes in the period. Often, the nature of the changing period can be reliably attributed to a particular phenomenon, such as mass-loss o rmass-transfer between the two stars, magnetic interactions, or (as in the case of this study), the presence of a third body in orbit around the eclipsing pair.

This is a nice report on the use of the "O-C" ("Observed minus Calculated") method to characterize the (invisible) companions in 9 eclipsing binary systems. The observational

data came mostly from small amateur telescopes, much of it from the AAVSO database. The authors find compelling confirmation of the third-components (previously reported) in all of the systems they studied, with the third bodies generally in elliptical orbits; and accompanied by other phenomena that create a continuous change in the period of the eclipsing pair (most likely mass-loss, in their assessment).

A nice feature of the report is that they not only provide the essential equations for this O-C analysis, but also conduct a careful error analysis and a comparison of their results with prior reports.

Disk Instabilities Caused the 2018 Outburst of AG Draconis by Helena M. Richie, et al (*see arXiv:1912.01681v1*).

Symbiotic binary systems exhibit a wide array of activity, driven by the interaction between their two stars (mass loss from the large, cool component; activity in an accretion disk that feeds material onto the small, hot component; ionization of the stellar wind), and occasional spectacular outbursts, that can be driven by several phenomena. Here is a nice report on a recent outburst of the symbiotic AG Dra. The author's observational data is augmented by an extensive record of photometry from AAVSO.

Diagnosing the cause of an outburst depends on a consistent record of photometry, preferably in several color bands (e.g. B-V-R). The May 2018 outburst turned out be be somewhat abnormal, in terms of its amplitude and color evolution. The authors conclude that it was most likely a "dwarf nova" outburst.

One important piece of evidence was left out of this report: spectroscopy. It turns out that AG Dra is a fine target for small-telescope spectroscopy, and spectro-photometry (as described by David Boyd in his Workshop at SAS-2019). Indeed, there is a sizable collection of spectra of this star in the ARAS database, including recent spectra collected by friends of the SAS David Boyd and Woody Sims.

Hunting ghosts: the iconic stellar stream(s) around NGC5907 under scrutiny by Oliver Mueller, et al (see *arXiv 1911.12577v1*).

This is a story of "who are you going to believe: me, or your own eyes?" Theory posits that when a dwarf galaxy is gobbled by a large galaxy, there should remain a tidal tail of debris from the disrupted dwarf galaxy. Many of you have seen astro-images that show evidence for these tidal tails: you might recall the paper given by astroimager Jay Gabany at SAS several years ag where he showed stunningly clear images of some tidal tails, and photometry of these streams. So far, so good.

It turns out that isn't the end of the story, though. The authors of this report attempted to replicate observations of the stellar streams, using larger instruments and "professional" (vs "amateur") routines for image processing. They don't see the complete "double loop" stream around NGC5907 – only part of it – even though it should have been easily within their reach, judging by amateur images that show it, using less sophisticated instruments.

They conclude that something odd is going on. Perhaps something about the imaging setup or data reduction can make the double-loop fade, or "pop", depending on your equipment. Subtle differences between spectral response between systems might be involved. Most troubling is the possibility that various image-processing routines might be either "hiding" these very-low-surface-brightness features, or (gasp!) creating false-positives. The authors can only conclude by emphasizing "the need for an independent confirmation of the reliability of the detected low-surface brightness features..." with more and different instruments.

Observation of Eclipse Shadow Bands Using High Altitude Balloon and Ground-Based Photodiode Arrays by Janvi P. Madhania, et al (see *arXiv 1911.05841v1*).

One of the highlights of most total solar eclipses is seeing the subtle dance of "shadow bands" playing across the ground (or, better, on a white sheet layed out on the ground). The standard explanation of this phenomenon is that the the thin arc of illumination created by the mostly-eclipsed solar disk is modulated by atmospheric turbulence, resulting in a visible scintillation of the sunlight.

If that explanation is correct, then a sensor on a high-altitude balloon shouldn't "see" the shadow band phenomena ... but it did!

If you're involved with high-altitude ballooning, it might be worthwhile to repeat this experiment at an upcoming solar eclipse.

Misidentification of TYC3055-988-1 as a Variable Star in the KELT Survey by Jarrod Hansen, et al (freely available at *https://iopscience.iop.org/article/10.3847/2515-5172/ab52fb*)

One of the purposes of the TESS Follow-up Observing Program (TFOP) is to provide ground-based confirmation of both the identity and the characteristics of candidate exoplanet transits that are discovered by the TESS satellite. Some SAS and AAVSO participants are contributing to this effort.

The need to confirm the identity of the varying star (be it a true exoplanet transit or a more run-of-the-mill eclipsing binary) is partly driven the the very large pixels of the TESS imaging system: TESS pixels are 21 arc-sec on a side, which leaves quite a bit of room for multiple stars within a single pixel, and hence the potential for confusion about which star is changing in brightness. Higher-resolution ground-based photometry, with pixel scale of 1-2 arc-sec, can unravel the identity of the variable star.

This report provides a useful illustration of the problem and the solution, related to a KELT observation; KELT, the Kilodegree Extremely Little Telescope has similarly large pixels (23 arc-sec on a side).

KELT had identified TYC3055-988-1 as a variable star with period = 2.775 hr and amplitude ≈ 0.5 mag P-P. The author's follow-up observations using a 0.25 m telescope and CCD photometry showed that (1) the varying star had been mis-identified and (2) the reported period was incorrect. The

misidentification arose because the true variable star is a relatively fainter star located just 1.5 pixels away from TYC3055-988-1 – exactly the sort of situation that TESS Follow-Up is intended to resolve.

The period-error arose from a decision-tree within the KELT processing pipeline. As the automated pipeline examines KELT images, it determines potential periods for each non-steady source, and then runs a series of tests to determine the "best estimate" period. It isn't unusual for a factor-of-two uncertainty to arise when the primary and secondary minima of an eclipsing binary have nearly the same amplitude. That happened in this case – KELT reported a period that was half of the "correct" period. In this case, it turns out that the "correct" (longer) period was also detected within the KELT pipeline, but it was excluded because it fell near one of the known observational aliases of the KELT observing cadence. So the author's detective work did a good service by correctly identifying the variable star, and characterizing its variation.

Perhaps this example will encourage some of you to add both TESS and KELT follow-up to your observing schedules.

2019 Symposium Sponsors

The Society for Astronomical Sciences thanks our Sponsors for their participation and financial support. Without them, our Symposium would not be possible. We encourage you to consider their fine products for your astronomical needs.

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The Society for Astronomical Sciences welcomes everyone interested in small telescope astronomical research. Our mission is to 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 on request each year, even if you do not attend the Symposium.

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

The SAS is a 501(c)(3) non-profit educational organization.

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