Society for Astronomical Sciences

News from the Society for Astronomical Sciences

Vol. 20 No.2 (September 2022)

SAS-2022 Symposium Recap

Our "in person" SAS-2022 Symposium brought the gang of small-telescope researchers back together to share results, envision new project ideas, make new friends and cement old friendships and collaborations.

It was a bit of a struggle to sort the audio quality of the on-line connection, but we thank the on-line participants for sticking with us. We hope that you had a satisfactory experience in the end.

Here are the numbers:

60 people registered for the in-person event

34 people registered for on-line participation.

We are grateful to all of the presenters – at the Workshops and the Technical Papers – our Sponsors, and all of you who attended, whether in person or online. Your participation makes thisthe premier annual event for small-telescope astronomical research. The SAS Board sends special thanks to Rachel Freed, for serving as our Master of Ceremonies:

The Proceedings PDF is freely available on the SAS website, at: https://socastrosci.org/wp-content/uploads/2022/05/2022_Proceedings.pdf

Videos of all of the presentations are freely available at: https://youtube.com/playlist?list=PLmQ5Bvz4ACYISWNChWPwzPHMPkK5cVcZd

Feel free to pass those links on to people in your network who might be interested.

The SAS Board collected quite a few comments and suggestions from participants at this year's Symposium, as we make plans for the 2023 event.

If you have concerns that we should consider, or suggestions that you think would improve the Symposium, please let us know, by e-mail to Program@SocAstroSci.org.

Science in action at SAS-2022

Welcome to new SAS Board Member Tony Rodda

2022 was Election Year for SAS. The election for Board members and Officers was held "by acclamation" during the 2022 Symposium. In a stunning political development, the slate of incumbent Board members and Officers was returned to office for another three-year term.

The Board invited Tony Rodda to fill a vacant seat, which he has agreed to do. Welcome aboard, Tony!

The vacancy came about because long-time Board member (and Symposium Master of Ceremonies) Jerry Foote had decided to retire from his positions. Jerry does plan to continue participating in SAS activities (call it "Emeritus" status).

Tony is a British amateur astronomer with nearly fifty years' observing experience. His interests are primarily photometry and spectroscopy for "all things that vary, particularly cataclysmic variables" with a recent short detour into solar spectroscopy. He is a member of the British Astronomical Association and the AAVSO. Tony is a time-served electrical engineer with a degree in Astronomy and Astrophysics.

He lives in the village of Ponteland in the northeast of England, at 55 degrees North, with his wife Deborah. He has five children, "thankfully all launched" and is a lifelong motorcycle and Newcastle United fan.

Science in action at SAS-2022

Dr. Brian Kloppenborg joins AAVSO as Executive Director

AAVSO has announced the selection of Dr. Brian Kloppenborg to be Executive Director. "Brian brings to AAVSO the needed skills in advancing our scientific impact combined with experience in management and project budgeting," notes AAVSO President David Cowall.

Before joining the AAVSO, Brian worked as a Research Scientist at Georgia Tech Research Institute. He served as a subject matter expert, lead engineer, product owner, and project director on a variety of government programs. Kloppenborg takes the post on September 16.

Founded in 1911 by William Tyler Olcott, AAVSO is an international citizen-science organization that organizes amateur astronomers in the collection of observations of stars that vary in brightness. At the outset, the organization trained a few dozen amateur astronomers to estimate stellar brightness using an observing method devised by Harvard astronomer Edward Pickering. In its first year, AAVSO members contributed over 13,000 magnitude estimates. Today, AAVSO has 1300 members and 5000 observers worldwide, reporting some 13,000 observations every night in support of long-term monitoring projects, a rich collection of program stars, and short-term campaigns called "alerts" that support professional astronomers using the Hubble Space Telescope and now the JWST. Dr. Kloppenborg will be AAVSO's sixth Director, following Leon Campbell, Margaret Mayall, Janet Mattei, Arne Henden, and Stella Kafka.

Brian Kloppenborg holds a Ph.D. in Physics, specializing in Astrophysics, from the University of Denver and a B.A. in Physics from Hastings College. Before his work at Georgia Tech Research Institute, Brian ran a small business that provided data science, machine learning, and GPU accelerated computing services. His research interests have included photometry, spectroscopy, astrometry, and long-baseline optical interferometry of eclipsing binaries, novae, and young stellar objects. His work has been published in Nature, Astrophysical Journal, Journal of the AAVSO, and similar scholarly journals.

Brian participated in AAVSO's largest observing campaign, to characterize the eclipsing binary star epsilon Aurigae. From 2009 to 2012, hundreds of observers worldwide followed this star with naked-eye, photoelectric, CCD, and DSLR observations, resulting in tens of thousands of photometric observations. The project, an intensive three-year effort (summarized in JAAVSO Vol. 40, No. 2) was, for Kloppenborg, "the most fun job I ever had."

AAVSO Annual Meeting

The Annual Meeting of the American Association of Variable Star Observers (AAVSO) will be held in Tucson on Nov 4-7, 2022. There is also an option for on-line participation. Go to AAVSO.org for details on the agenda and Registration.

The deadline for submitting Abstracts is September 4th.

This will be an opportunity for you to meet AAVSO's new Executive Director, Dr. Brian Kloppenborg.

Mount Wilson Summer Observational Astrophysics Retreat (SOAR):

The Mount Wilson Observatory "summer school" returned this year, after a two-year hiatus due to Covid-19. The session is led by Dr. Paula Turner (Kenyon College). The target audience is college students majoring in a physical science, usually in their sophomore or junior years. The criteria are flexible: we have seen incoming freshman, and also participants who completed their BS degrees a long time ago. SAS members John Hoot and Bob Buchheim participated as instructors and telescope operators, as did Tom Meneghini (Observatory Director), Patricia Hill (Observatory Docent) and Dr. John Varsik (from Big Bear Solar Observatory).

The students spend the first week receiving an overview of observational astrophysics and learning to use the telescopes and instruments that are available to them. At the conclusion of week #1, each student identifies a research-project they are interested in and works with the instructors to craft a project proposal that is feasible within the constraints of time and instrumentation. The second week is then devoted to data gathering and analysis, leading up to a project presentation on the final day of the session.

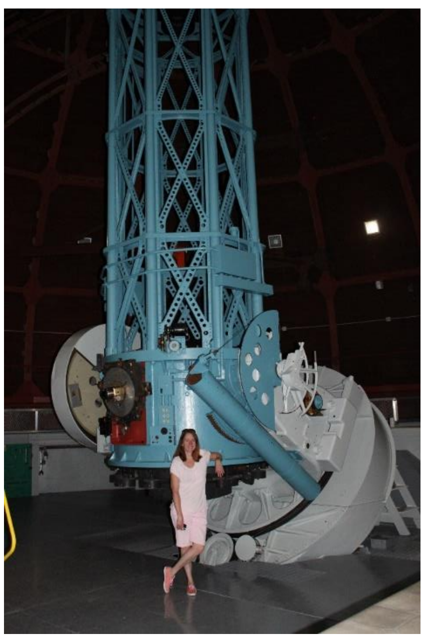
This year's projects covered the universe. Two students used the Snow solar spectrograph: one project measured the differential rotation of the Sun, and the other project attempted to observe Zeeman splitting in spectral lines within a sunspot.

Night-time projects used both a Meade-16" scope and John Hoot's remotely-accessible telescope. Projects included timing an exoplanet transit, a lightcurve of an eclipsing binary star, spectroscopy of the Omega Nebula, spectroscopy of a set of late-K through mid-M giant stars, spectroscopy of a sample of Be-stars, and a creative (and successful!) project to map ISM reddening at different galactic latitudes..

If you know a college student who would enjoy a hands-on astrophysics research experience, while living in the "Monastery" at Mt Wilson, point them to:

https://www.mtwilson.edu/summer-observational-astrophysics-retreat-soar/

The schedule for SOAR-2023 has not yet been set; it will probably be available in a couple of months. Check the website.



UV Imaging CubeSat Survey

from Doug Walker

Prime Solutions Group, Inc. (PSG) in partnerships with Southwest Research Institute (SwRI), the University of Colorado at Boulder, the University of Illinois, and the Astronomy Association of Arizona (AAA) are proposing the development, launch and operation of a CubeSat mission for stellar astronomy research.

The observatory mission will consist of a space-based UV/optical telescope system designated as the Ultraviolet Follow-on Observatory (UFO). This proposed CubeSat will be a 12U system housing a 120 mm telescope and designed for a four-year plus mission timeline in high Earth orbit. UFO will follow in the footsteps of the successful launch and operation of the Colorado Ultraviolet Transit Experiment (CUTE) and the planned launch of the Star-Planet Activity Research CubeSat (SPARCS) which are paving the way for this new era in CubeSat UV space-based astronomy. The flight operation of UFO will demonstrate that small telescope observations in the ultraviolet frequency can provide valuable data to the astronomical science community and will help fill a critical need in the observational ultraviolet astronomy gap until NASA's Large UV/Optical/IR Surveyor (LUVOIR) mission launches in the early 2040s timeframe.

The purpose of UFO is to provide the amateur astronomer, the Pro-Am working team, high school, college and university teaching and research faculty and the general public the equal opportunity for use. The concept of operations is to enter a request for observing and related justification into an online system with the awarded observing time being based on the importance of the proposed observing project and the probability of results advancing astronomical science via peer reviewed publication.

This survey is to determine the importance and need of the UFO system. The results will be used to justify the need for a UV CubeSat mission in the NASA funding proposal system. The questions are:

- What is your position and interest in astronomy?
- Are you participating in Pro-Am astronomy research?
- If you are an independent researcher, indicate your area of research.
- Would you consider submitting a proposal for the utilization of this system?.
- Would UV time domain imaging support your research?
- Do you intent to publish your result results in peer-reviewed journals?

Please take UFO Utilization and Interest survey on line at:
[Ultraviolet Follow-On Telescope Utilization]

The survey results will be utilized in the NASA ROSES funding proposal process. Please respond by October 15, 2022 to allow us time to summarize and incorporate results. More information can be by emailing Doug Walker at dougwalker@psg-inc.net. Thank you for your time and help!

Symposium Sponsors

The Society for Astronomical Sciences is grateful to 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.

Sky & Telescope Magazine
The Essential Guide to Astronomy
http://www.skyandtelescope.com/

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Software Bisque
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http://www.bisque.com/

Starlight Xpress
Cooled CCD cameras for low noise imaging applications, and innovative accessories: Discovery starts here.
https://www.sxccd.com/

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Astronomical spectroscopy for research, industry, education and leisure: Stars won't look the same.
https://www.shelyak.com/?lang=en

PlaneWave Instruments
Makers of the CDK line of telescopes
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http://www.telescopes.net/

Reminiscences from a Member ...:

How I Became Interested in Astronomy
by Wayne Green

It was white and unfocused. The choice was down to the eve of the house or the Moon. What came into focus was the Moon and a lifelong interest in astronomy. I was 8 years old on a summer night.

My first real astronomy text was "Source Book in Astronomy", 1960 edition by Harlow Shapley. One I boldly borrowed from my elementary school's reserved book section. Not dated at the time, it was more than sufficient to focus deeper attention on the details of our physical universe. The book's crisp prose interspersed with mystical symbols (mathematics) established my lifelong-learner's expectations about the hard work necessary to learn science and mathematics. I was 10.

From the chaos of our middle school's mixing and moving us between classes, 8 people out of 1000 found and formed our own "penny university". A collaboration lasting from then until now though with the inevitable and regrettable passings. We soon joined the Astrogator Astronomy Club (AGAC) hosted by the Jacksonville Children's Museum.

Our assigned responsible adult, Mr. Richard Sweetsir got us into established meteor and occultation observing. We contributed our share of the 350,000 or so entries in the Watts Lunar Limb Atlas, and sent our meteor observations directly to NASA.

Dr. David Dunham, during a grazing occultation trip, suggested we not specialize in astronomy as careers. jobs were few and careers difficult to establish. I shifted into the math department, studying numerical methods and on into computer science. This provided me with a full career -- simulation, computer design, bit-slice computers and consulting on some very interesting projects.

Time and tide. In 2003, a friend that was an "outreach telescope operator" for the 20-inch Clarke/Segmuller telescope at the University of Denver kept prodding me to visit. I did. Upon seeing that telescope I had to learn to use it. That renewed my early interests in astronomy, led to my being the President of the Denver Astronomical Society for 3 years and the Chairperson for the MARS region of the astronomical league. SAS is where I deepened my actual skills.

I worry that the term "amateur astronomer" has been coopted by commercial interests. The amateur of old is now more of a social observer. Through the AAVSO and SAS collaborations, a number of people have found a way back to being amateur astronomical scientists. As birds of a feather we flock together and share interests in telescope and instrument making, data acquisition and reduction, and the science sides of astronomy and astrophysics.

Looking back, I think skill sets I acquired from my career served me well for modern amateur astronomy work. Astronomy "is" mathematics. It drives experimental design and informs the reduction of raw data into publishable knowledge necessary to propel science.

I see the future going forward as one in which each of us needs to develop our replacements in the younger crowd coming up. Younger usually means around age 50, post career and family development with the means to purchase the equipment necessary to continue with small telescope astronomy.

The bright sky now belongs to us. It is up to us to make the best of this moment.

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.

An Exceptional Dimming Event for a Massive, Cool Supergiant in M51

by Jacob E. Jencson, et al

The Astrophysical Journal, 930:81 (15pp), 2022 May 1 (see https://iopscience.iop.org/article/10.3847/1538-4357/ac626c/pdf)

This doesn't qualify as "small telescope science", since the observations were made with Hubble and the Large Binocular Telescope. It caught my eye because it exemplifies a notion that I overheard John Hoot telling our students at Mt. Wilson SOAR: "The astrophysics that drives people to look at the faint, distant universe, is – in many cases – also occurring in the nearby, bright universe …" Jencson et al were searching for evidence of "failed supernova", a (theoretical) situation in which a massive star collapses directly into a black hole, without first flashing as a supernova. The evidence of such a thing would be a massive, evolved star that suddenly vanishes, so they searched through HST images of several galaxies for that signal. A plausible event occurred in M-51, in 2019. A bright (≈ mag 22), red star was clearly visible in 2005 and in 2016, but absent in 2019. However, follow-up observations in 2021 found that it was back again, somewhat fainter than it had been six years earlier, but definitely returned from the (putative) grave.

The author's analysis suggests that the event in M-51 could have been something very similar to the "great dimming" of Betelgeuse – with a larger delta-magnitude and a bit longer duration, but very similar signature. The Betelgeuse event was, of course, most definitely "small telescope" (or "no telescope") science, with much of the data coming from backyard observers and collated by AAVSO.

Recognition of the Betelgeuse-analog will complicate the search for failed supernova, and demand that suspected discoveries be confirmed by looking at archival observations (to assess the object's history of variations), and also monitoring it in the future (to be sure that it is really "gone").

Dynamical structure of the pulsating atmosphere of RR Lyrae. I. A typical pulsation cycle

By D. Gille1, B. Mauclaire, et al

A&A 623, A109 (2019)
(https://www.aanda.org/articles/aa/pdf/2019/03/aa33869-18.pdf)

This is a really wonderful example of the power of small-telescope time-series spectroscopy. The target is RR Lyra (V-mag ≈ 7.2 – 8.1). Almost all of the data came from eShel spectrographs (R≈ 10,500) on 14-in telescopes operated by amateur astronomers. The data set provides a very complete set of spectra showing the star's complete pulsation cycle (P≈ 13.6 hr) at a time-resolution of about 1 spectrum every 15 minutes.

The spectra show the short-lived H-alpha emission feature driven by shock waves in the star, the expansion of the interior layers where sodium and H-alpha features are generated (the layers are at different depths, hence there is a phase difference between them), the motion of material "falling" as the star shrinks, and the resulting compression of the photosphere. This data set will probably be very valuable for testing theoretical models of the pulsations, and of the interior structure of the star.

If you are interested in small-telescope spectroscopy, or in pulsating stars, you'll want to read this paper carefully. The significant expenditure of telescope time that is needed to compile a complete record of a star's activity, makes a project like this virtually impossible for a large professional observatory to do, but it falls into the "sweet spot" for backyard scientists.

I took away three important points: First, I had (naively) assumed that we had a pretty good understanding of the RR Lyra stars, aside from the mystery of the Blazhko effect. That turns out to not be true: advances are needed in both the observational records and the modelling codes, in order to fill out the gaps in our understanding.

Second – usually in the context of time-series photometry – the question often arises "what should my observing cadence be – how many data points across the pulsation cycle?" The answer is often a vague "… it depends on the nature of the phenomena involved …". That is valid, but it is hard to translate into an observing plan. Here, the authors highlight several phenomena (e.g. the shock-generated H-alpha emission lines) whose entire life-cycle is only a few percent of the overall pulsation period. Which might suggest that we should use the most rapid cadence that the target and your SNR will support, especially in cases where rapid-cadence has never been systematically undertaken.

Finally, the authors note that this effort "… demonstrates further the increasing role of the amateur spectroscopy community in stellar surveys". Amen!

Accuracy and Precision in Amateur Photometry
by Edward Wiley and Kenneth Menzies
JAAVSO V 50 No 1 (2022)
Available at https://app.aavso.org/jaavso/article/3810/

I hope that this paper will encourage other photometrists to replicate what Wiley and Menzies have done: use your own observations of a few Landolt standard fields to assess your photometric accuracy and precision. Doing that for ourselves, to understand the quality of our own imaging and processing, is probably more important than the specific results in the paper.

The idea is straightforward: You are going to make images of a few Landolt fields in order to determine the color transforms of your system. Use those same images to perform differential photometry of the stars, and assess the quality of your results. Pick one standard star (or a small ensemble) as the "Comp", and use that one to determine the brightness of the other (standard) stars in the image, using the same procedures that you would normally use for photometry of a variable star. Then compare your "observed" brightness of each star ("O") to it's "known" brightness ("K", given by Landolt). Ideally, your results will match Landolt's, to within a very small standard deviation ("precision") and with a negligible offset ("accuracy").

As Wiley and Menzies show, it is quite practical for backyard photometry to achieve precision and accuracy of ≈ 0.02 magnitudes. Two key requirements are (1) good imaging and image processing, and (2) effective use of transforms to put your instrumental magnitudes onto the standard (B-V-R-I) system.

They find that for their own setups, the V-transforms are small (which means that there is only a small difference between the local instrumental spectral response and the standard V-band response). That is probably a testament to the excellent quality of modern photometric filters and the general consistency of spectral response across the wide selection of cameras that are available. However, the B-transforms are significant, and the I-transform is also important. They didn't investigate R-band, but I think that most of us have found that the R-transform (like B-) is important for best accuracy.

The other thing that they found was that there was no significant difference in achievable accuracy and precision between CCD vs. CMOS photometry, if the images are properly treated (dark, flat, exposure, avoidance of saturation, etc.)

Go forth and do likewise!

The Periodic Signals of Nova V1674 Herculis (2021)

By Joseph Patterson, et al

Pre-print available at
https://arxiv.org/ftp/arxiv/papers/2207/2207.00181.pdf

This is an excellent discussion of the status of Nova Her 2021, over the first year after the explosion; and a fine example of the remarkable information that can be gleaned by time-series photometry using backyard-scale telescopes.

Keying off of the results of Wiley and Menzies (above), the other important quality parameter for our photometry is "fitness for use". Sometimes that means intentionally accepting a relatively low SNR, with consequent relatively large imprecision (large standard deviation), in order to achieve fine time-resolution. That is a traditional trade-off made by the CBA observers: take long series of exposures that are short enough to capture quite high-frequency fluctuations in the star's brightness; and rely on the large mass of data to enable you to detect small, periodic, signals.

For V1674 Her, this strategy has reliably measured the ≈8.3-minute spin period of the white dwarf and the ≈3.7-hour orbit of the two stars in the system. Significantly, the data shows evidence of a sudden increase in the spin period at the time of the nova explosion (i.e. slowing down of the spin), followed by a longer-term trend of decreasing spin period (i.e. spin speeding up).

The orbital lightcurve was also well-captured, and it appears to show a gradual increase in the orbital period after the nova explosion.

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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.

SAS Contact Information

9302 Pittsburgh Avenue, Suite 200, Rancho Cucamonga, CA 91730

On the web:
www.SocAstroSci.org

Program Committee:
program@SocAstroSci.org

Membership:
Robert Stephens:
rstephens@socastrosci.com

Newsletter Submissions to:
Bob@RKBuchheim.org