News from the Society for Astronomical Sciences

Vol. 18 No.3 (December 2020)

Planning for SAS-2021

The SAS-2020 Symposium – held as a joint meeting with AAVSO – was a good success. We had a larger-than-normal participation, heard excellent research reports, interesting new ideas, and had useful interchange with the authors.

As much as we'd love to have an in-person Symposium in 2021, The SAS Board sees too many unknowns on the horizon: uncertainty over restrictions mandated by local authorities, uncertainty over people's willingness to travel and participate in large gatherings; and uncertainty about hotels' ability to take and honor event contracts. So, we will be doing SAS-2021 as a virtual, online Symposium in summer 2021.

We will build off of this year's success, with plans for SAS-2021 that will offer increased time for interactions and discussion – not just with the presenters, but also among the attendees. It still won't be the same as hobnobbing in the bar at an in-person Symposium, but it will provide for more extended and free-wheeling discussion than is done in a typical webinar format.

We'll describe the details of the enhanced online format, and the event dates, in the next Newsletter.

Right now, it is time for you to start thinking about what you will present at SAS-2021.

Photo courtesy of Bob Stephens, who was taking advantage of a lunar eclipse to shoot something fainter.

SAS-2021: Call for Abstracts

Papers for presentation at the SAS-2021 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 topics presented in recent years include:

- 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.
- Instruments and techniques (hardware and 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 amateur and professional astronomers 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, 2021. You will be informed of acceptance by March 22.

Final papers for the Proceedings will be due by May 16, 2021.

Call for Contributions: This issue of the SAS Newsletter is a bit thin. Your editor suspects that some of you have interesting stories that your colleagues would like to read about: Small projects that you're doing; Interesting (or curious) observations you have made; Projects for which you could use a few collaborators; Reviews and lessons-learned from new equipment you've put into service; or other astronomical tidbits.

If you have something to share, contact Bob Buchheim:

Bob@RKBuchheim.org.

Interest in "mid-term" online events?

Our ongoing experiments with online special-interest meetings (on Spectroscopy, 3-D printed instruments, and Observatory automation) have been useful for the participants. The key feature is that a modest number of people who are interested in a particular subject can meet regularly, get to know each other, and share problems, progress, and successes in fully-interactive online meetings.

If there is a topic that you'd like to see addressed in this way, let us know: Send a note to Bob Buchheim Bob@RKBuchheim.org.

SAS-2020 is now freely available online.

Videos: if you weren't able to join the live sessions, I encourage you to check out the recordings of the presentations. The videos are freely available from the SAS Website, so you can still see the technical papers. The links are:

Day 1= https://youtu.be/JhU44tDmkSI

Day 2= https://youtu.be/IcHIdgONoQI
Day 3= https://youtu.be/0Ew2iIq_r2k
Day 4=https://youtu.be/eNCuBDlnVGA
Day 5= https://youtu.be/qlfKLNNbDLA

Feel free to share these links with your students and colleagues who might be interested.

Proceedings: The PDF of the Proceedings is freely available on the SAS website at

http://www.socastrosci.org/images/2020_Proceedings_final.pdf

Journal of Double Star Observations

Congratulations to Rachel Freed, who has taken over from Kent Clark as the Editor of the Journal of Double Star Observations. Many of you know Rachel as the President of InSTAR and a regular participant in SAS Symposia.

Book Reviews

A small gang of spectroscopists were comparing notes on their favorite spectroscopy reference books. Here are a couple of reviews ...

Successfully Starting in Astronomical Spectroscopy – A Practical Guide by François Cochard

Spectroscopy presents a steep learning curve to the newcomer, both in mastering the equipment and its use and in learning how to process the data it produces. This book aims to assist the new user up that learning curve. Does it succeed? Read on.

The book's subtitle "A Practical Guide" accurately describes the author's approach to introducing spectroscopy to the newcomer. As someone who has been climbing the spectroscopic learning curve myself over the past few years, I found the book addresses many of the issues I faced and gives the sort of practical advice I would have found very useful. It does this in a methodical way by progressively addressing the capabilities, both in equipment and skills, which the new user needs to acquire.

The early chapters introduce spectra and spectroscopy, provide a basic introduction to the physics of light and starlight, and discuss choosing the type of spectroscope most appropriate for different observing programmes including the trade-off between resolution and wavelength coverage. The emphasis here is on a realistic understanding of what is achievable. It is worth noting that the book only describes the use of spectroscopes employing a slit to isolate light from the target. The optical design of different types of slit spectroscope is illustrated with the Alpy and Lhires instruments produced by the author's company Shelyak Instruments.

Chapters eight and nine are perhaps the most valuable for newcomers to spectroscopy as they describe how to set up a spectroscope for the first time on the bench during the day before ever connecting it to a telescope. This stage, which includes focusing and aligning the two cameras attached to the spectroscope, is crucial if the user is to achieve optimum performance. Attempting these adjustments outside at night for the first time will almost certainly lead to frustration and failure. The information provided here has been distilled from many years of helping new users and seeing the problems they encounter.

The book then moves on to describe how to make and reduce spectroscopic observations starting with the Sun since this does not require the user to attach the spectroscope to a telescope. The author illustrates the data reduction process using Christian Buil's ISIS software, arguably the most advanced software freely available to the amateur community but software which has a steep learning curve for the new user. In the view of this reviewer it is a challenge worth overcoming as ISIS contains so much useful functionality that it repays the effort of learning it many times over.

After providing good practical advice on mastering control of a GOTO mount for the first time and learning the process of autoguiding, the author describes attaching the spectroscope to the telescope, balancing the equipment on the mount, and managing the plethora of cables involved. These are all tasks best performed in daylight. Finally the telescope must be focused at night so that a sharp stellar image is seen within the slit in the guiding image and the autoguider activated to keep the star centered in the slit for the duration of the exposure which may last many minutes.

The book finishes with a short reprise of the information in the preceding chapters by describing a typical observing session and provides pointers to ways in which the user can continue to improve their observational technique. The author underlines the importance of archiving spectra in one of the managed spectroscopic databases now available to ensure the data will be available to others.

Reading this book is like having an expert at your elbow who talks you thought the complex process of choosing a spectroscope, setting it up and using it to record high quality stellar spectra. At all stages the author provides sound advice based on years of experience helping new users. For a beginner starting out in spectroscopy, I strongly recommend this book as there are few sources which cover the whole process in such well-grounded detail.

review by David Boyd

(This review was originally published in the Journal of the BAA in October 2018.)

Atlas of Representative Cometary Spectra by P. Swings and L. Haser (University of Liege Astrophysical Institute Belgium 1956). 37 pages + 23 plates.

To my knowledge this was the first atlas of its kind to be published. I have known of its existence for many years. It was not available until recently, when I contacted the University library, and asked them to make it available as a free open source publication. To my delight, they did.

Few comets that appeared before 1956 were ever bright enough to obtain a spectrum. At that time the need for such an atlas was felt not only by astronomers working in that field, but also people working in other disciplines such as different branches of spectroscopy, meteor astronomy, solar physics, upper atmosphere physics, combustion phenomena and flame spectroscopy.

Every comet is different, displaying its own behaviour, but showing features common to all comets.

This compilation covers with painstaking efforts many different comets from 1899-1952, consisting of some 350 spectrograms, 23 plates, 12 in x 16 in, all chosen to illustrate the many different aspects of cometary spectra with related laboratory spectra. The spectra were taken through different telescopes and spectrographs at different dispersions and heliocentric distances. The reproductions are the best selection of cometary spectrograms obtainable at that time, on black and white photographic plates.

The 28 page introduction to cometary physics is an excellent guide to the knowledge of the subject, at that time. The authors discuss the various parts of a comet, comparing them with spectra of aurorae, airglow and various combustion phenomena. There is a list of relevant laboratory data about laboratory spectra connected to comets.

While the spectra are reproduced well, this publication suffers from its share of typos. Nonetheless, it is a great publication for its time and occupies 'pride of place' on my bookshelf.

review by Jack Martin
Huggins Spectroscopic Observatory UK

E-mail Jack at jackmartin781@gmail.com for a PDF copy of the **Atlas of Representative Cometary Spectra**.

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 investigation of poorly studied open cluster NGC 4337 using multi-color photometric and Gaia DR2 astrometric data
by D. Bisht, et al
AJ 160:119 (2020 September
pre-print available at https://arxiv.org/abs/2006.13618

At SAS-2020, John Hoot gave an interesting paper describing some of the ways that Gaia data can be used for investigations such as open cluster HR diagrams (by using Gaia parallax and proper motion to distinguish cluster members from foreground and background clutter). Here is a paper that extends that concept, to conduct a "no telescope" research project.

The authors investigate NGC 4337. They begin by using Gaia positions, parallax, and proper motions to distinguish probably cluster members. Then they use a variety of catalogs to create brightness and color indices for the cluster stars, including 2MASS, WISE, and APASS photometry. One of their key results is a very clean HR (color-magnitude) diagram of the cluster.

From that, along with star-density counting, they determine the extent of the cluster, and compare it to the (calculated) tidal radius – the radius where gravitational pull from the rest of the Galaxy equals the gravitational pull from the total mass of the cluster. Comfortingly, these turn out to be nearly equal.

Combining the Gaia data with a model of Galactic gravitational potential enables them to estimate the orbit of the cluster around the Galaxy.

All in all, a neat piece of work, and an instructive example of the sort of investigations are facilitated by readily-available databases. This might come in handy when a run of bad weather confines you indoors.

The roster of author affiliations gives an intriguing view of geopolitical collegiality in astronomy. The lead author and one other are with the Chinese Academy of Sciences (PRC); two authors are from Taiwan; three are from India; and one is from the Middle East (affiliated with both Egypt and Saudi Arabia). Astronomy is making strange bedfellows: PRC and Taiwan are of course in a long-standing disagreement about sovereignty, and PRC and India recently had a dust-up on their disputed border. It is a nice sign that, while they all disagree about some things, their astronomers can work productively together on others.

A Mystery in Chamaeleon: Serendipitous Discovery of a Galactic Symbiotic Nova
by L Lancaster, et al
AJ 160:125 (September 2020)
pre-print available at https://arxiv.org/abs/2002.07852

Here is the investigation of a mystery that involved searching through dusty – and on-line – archives.

Once upon a time, CN Cha was a run-of-the-mill mag 14 Mira variable (period about 250 days, and amplitude about 3 magnitudes). Then, in late 2012, it suddenly shot up in brightness (reaching about mag 8), although it seems that nobody remarked on it at the time.

In 2019, the authors had other business with the star when they aimed one of the Las Campanas telescopes at it, but they were surprised by both its spectrum and its brightness.

That led them through a search of online databases and image archives, to piece together the evolution of the brightness outburst and make a tentative explanation of its cause.

The story of the search is educational and entertaining; and like any good mystery it ends with the identification of a pretty likely suspect. You'll probably enjoy it, and you may get ideas for other data-mining projects of your own.

Time sequence spectroscopy of Epsilon CrA. The 518 nm Mg I triplet region analyzed with Broadening Functions
by Slavek M. Rucinski
AJ 160:104
pre-print at https://arxiv.org/abs/2004.06086

Our usual cut-off for "small telescope science" is 1-meter or less. This paper violates that, but only a bit (data came from a 1.5 m 'scope) because the subject – W UMa stars (also known as "contact binaries") – is of interest to many of you who have made photometric lightcurves, used them to model W UMa systems, and searched for orbit changes in the O-C diagram.

Like any eclipsing binary system, if you have a good lightcurve (preferably in more than one color) and a good radial velocity curve, you can construct a 3-D model of the system, including its orbit inclination, the sizes, and the shapes of the two stars. Most (all?) of the lightcurve modelling codes for W UMa systems use the Roche-lobe model, and implicitly contain the seemingly-reasonable assumption that the two stars are in synchronous rotation (i.e. rotation periods = orbital period, so they keep one side facing the other). The picture of the system is often thought of as a peanut or dumbbell in solid-body rotation.

This paper reports on very high-resolution (R≈ 80,000) time-series spectroscopy of eps CrA. The idea was to investigate the "solid body rotation" assumption. Not surprisingly, it is complicated to interpret the changing spectral features as the system goes through its orbit; but it definitely isn't a simple solid-body rotation.

In a rotating frame of reference that freezes the orbital motion of the two stars, there appears to be a steady, continuous flow of material. This flow leaves the primary star at high latitude (i.e. above and below the "equator" of the system), flows toward the equator of the secondary star, goes around the secondary, and then returns to the equator of the primary star.

Eps CrA is the second star that the author has studied in this way, and the results here replicate the conclusions of his previous study (on AW UMa) – there are complicated flows between the two stars, not compatible with the Roche-equipotential formulation. It is not yet clear what that implies about the accuracy of models that have been made using the Roche-equipotential model, but it is clear that the subject will need more investigation (both in theory and in observations).

Evolution of the disk of π Aqr: from near-disappearance to a strong maximum
by Ya¨el Naz´, et al
preprint at: https://arxiv.org/pdf/1906.09030v1.pdf

It has been said in several places that the great virtue of small-telescope spectroscopy is in long-term, frequent measurement of a target object. The resulting time-series spectroscopy is a uniquely valuable resource to investigate the object's character.

Many SAS spectroscopists (and others whose names will be familiar to many of you) are in the list of authors for this paper, which provides an excellent example of the power of such time-series spectroscopy using modest telescopes and commercial spectrographs (primarily the Shelyak LHIres).

The paper describes the evolution of the H-alpha emission profile of the Be star π Aqr over the past seven years, and uses the observed features of the H-alpha line to display important properties of the system. Like most (all?) Be stars, π Aqr is a binary system. The central wavelength of the H-alpha feature displays a cyclic velocity shift, which presumably indicates the orbital period. The strength of the line (characterized by equivalent width, EW) tells us about the decretion disk. The line profile usually displays a blue-side peak ("V" or "violet"), a central absorption feature, and a red-side peak ("R"). The wavelength (or velocity) difference between the "V" and "R" peaks is (probably) and indication of the size of the decretion disk (treating the disk material as being in Keplerian orbit around the primary star). The changing intensity of the two peaks (the "V/R ratio") can be interpreted as changes in the structure of the disk. In the case of π Aqr, the large database of spectra enabled the authors to use a "tomographic" analysis to visualize the changing aspect of the decretion disk.

Check out the paper – it will probably motivate you to keep up the effort of regular observation of this star, and similar stars.

A Single-Chord Stellar Occultation by the Extreme TNO (541132) Leleakuhonua
by Marc W. Buie, et al
preprint at: https://arXiv.org/pdf/2011.03889v1

Here's another success for occultation observing, and for the RECON project: a direct measurement of the size of a distant TNO.

Observing an occultation is always a bit of an adventure, and this project was subjected to an array of the usual pitfalls. First, predictions are never perfect: the orbit of this TNO was based on only a few months of astrometry, and (considering its small size) the accuracy of star catalogs is a non-trivial error source. Equipment is unreliable: of the fourteen sites that attempted the event, 10 were able to collect data. One had telescope alignment problems, two couldn't point to the right location, and one started observing too late (sound familiar?) More sites would have participated, except that they were under bad weather (also familiar?). Of the 10 "good" observing runs, exactly one observed the brightness-drop of the occultation ... but a nearby station (no event observed) provides good constraint on the object size. So, as is often the case with occultations, a "valid miss" can be as important as a "detected event".

Knowing the object's size and its apparent magnitude, gives a good estimate of its albedo: $p_V \approx 0.2$.

Call for Observations of the Active Centaur 29:/Schwassmann-Wachmann
by Maria Womack, et al
Minor planet Bulletin Vol 47 (2020)

This object orbits outside of Jupiter, and is well-known for its frequent comet-like outbursts. This paper announces a long-term campaign to observe it with photometry (in all available filters), spectroscopy, and astrometry. There are quite a surprising number of things that we don't know about it, including: the spin period of the solid body (hard to measure because the lightcurve is usually overwhelmed by the comet-like coma), the periodicity (or not) of the outbursts, the size of the nucleus, and the cause of the outbursts.

The international observing campaign details can be found at http://wirtanen.astro.umd.edu/29P/29P_obs.shtml .

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Membership Information

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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