News from the Society for Astronomical Sciences

Vol. 21 No.3 (November 2023)

Who Ya Gonna Call? If you use PlaneWave, DC3 Dreams ACP, or Optec products, or you are curious about small-telescope spectroscopy and photometry, you'll find like-minded enthusiasts at SAS-2024.

Get Ready for SAS-2024!

The SAS Program Committee invites you to participate in the Society for Astronomical Sciences' 43rd Annual Symposium, in Ontario, California on **June 20-21-22**, 2024. The Symposium is the premier annual conference devoted to small-telescope astronomical research. SAS-2024 offers both in-person and interactive online participation.

The Symposium brings together amateur astronomers, students (with or without their mentors), and professional astronomers for in-depth discussions of topics related to small-telescope science and research. It is an excellent venue for presenting development of instruments, new observing techniques, discussing targets of observational campaigns, describing instrumentation and data reduction or analysis methods, developing collaborations, and sharing results, expertise and experience. Almost any topic related to astronomical research using modest telescopes is of interest to SAS. In the past these have included – but are not limited to – asteroids, planetary observations, variable stars, solar observing, extra galactic transients, and extrasolar planets.

You do not need to be an expert to benefit from participating in the Symposium: our goal is to help you learn about small-telescope research opportunities and become a productive observer and researcher, by providing a collaborative environment where you will learn how to perform quality observations, generate useful data, and contribute to astronomical science.

Proceedings and recorded videos from recent SAS Symposia are available on our website: SocAstroSci.org.

Registration for the Symposium will open on January 1st, 2024. The registration links are:

In Person participation:
https://socastrosci.app.neon-crm.com/event.jsp?event=79&

Interactive On-Line participation:
https://socastrosci.app.neon-crm.com/event.jsp?event=84&

The Registration fee is $100 (for SAS members) or $125 for non-members. An "early-bird" 13% discount will be

applied to in-person registrations made before March 31st.

We hope that you will join us, either in person or online!

Cerro Tololo (by Bob Stephens)

Call for Abstracts for SAS-2024

Papers for presentation at the SAS-2024 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 at previous Symposia 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 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.

We will accept both in-person and remote presentations (in-person are preferred).

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 30, 2024. You will be informed of acceptance by April 7.

Final papers for the Proceedings will be due by April 27, 2020.

Mini-talks ("show & tell") at SAS-2024

In order to facilitate discussion of topics that might not fit into our regular program of presentations and papers, we also welcome "show & tell" Mini-talks. Here's the idea: Quite a few of you have done or seen something that is useful, and of interest to our community; but which isn't ripe for a full Paper or Poster. This year, we will schedule time for short presentations (~ 10 minutes) of projects, results, and observations that you have been involved in; or projects that you are soliciting help with.

No paper is required, and the "show & tell" Mini-talk presentations can be made by both in-person and on-line participants.

The only rules are:

- Please let us know by June 1st what your topic will be, so that we can schedule accordingly (e-mail to program@SocAstroSci.org) .
- Topics should be related to small-telescope astronomical research (broadly defined, to include equipment, analysis methods, intriguing observations, etc.)
- On-line participants please provide your slides to Bob Gill by June 10, so that we'll have a backup in case of connectivity problems (e-mail to RMGill@Roadrunner.com).
- In person participants please bring your slides on a USB stick.

We look forward to seeing what you have been up to!

Upcoming meetings:

Here are a couple of meetings that you might be interested in – one in the past, the other in the future:

"Observing techniques, instrumentation and science for metre-class telescopes III" was held in Slovakia in September 2023. (Friends of SAS Woody Sims and Francois Tessyier attended in person). The PDFs of some of the presentations are available at the conference website: https://www.astro.sk/conferences/80AI2023/index.php?part=program

There are some interesting things going on in Europe, many of them pursued with telescopes smaller than 1-meter.

Symbiotic stars, weird novae, and related embarrassing binaries will be held June 3 to June 7, 2024, hosted at the Faculty of Mathematics and Physics of Charles University (nestled in the heart of Prague, the capital of the Czech Republic). Details are available at:

http://symbiotics2024.cuni.cz/home.html. The call for Abstracts will open on November 15th.

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/

DC3 Dreams Software
Developers of ACP Observatory Control Software
http://www.dc3.com/

Software Bisque
Enriching your astronomy experience since 1983.
http://www.bisque.com/

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

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

Notes from Members

GNAT Program for Discovery and Characterization of Spotted Short Period Variable Stars Seeks Collaborating Observers

Eric R. Craine[1,2], Brian L. Craine[1,2], and Roger B. Culver[1,3]

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2. Western Research Company, Inc., Tucson, AZ 85741
3. Professor Emeritus, Dept. of Physics, Colorado State University, Fort Collins, CO 80523

Contact: Dr. Eric R. Craine, ercraine@wrc-inc.com

The Moving Object and Transient Event Search System (MOTESS) and the Global Network of Astronomical Telescopes (GNAT) have for over 20 years conducted the MG Sky Surveys (c.f. Tucker 2007, Kraus et al. 2007, Craine 2021) which have proven to be a rich source of discovery of new variable stars (c.f. Kraus et al. 2011, Tucker et al. 2021, and Craine et al. 2022),

The MG survey databases are well-suited as coarse sieves for the discovery and initial characterization of many broad classes of variable stars, many of which are sufficiently interesting to justify more comprehensive and intensive follow-up observation. These observations include additional time-series photometry, but also spectroscopy, polarimetry, and data mining of published serendipitous observations at a wide range of wavelengths.

Because the MG surveys are based on multiple drift scan observations the underlying cadence of the source data is typically one observation set every 1 – 3 days. This cadence will result in period ambiguities in the form of aliases for those short period variables (SPV) discovered in the surveys.

The result is that for SPVs it is necessary to obtain supplementary observations to break the alias and determine the correct period. This pursuit can be a source of useful projects for both students and amateur small telescope operators since it can produce useful results with a relatively small investment of time, and it introduces participants to many useful fundamental methodologies.

Although the determination of correct periods is important for the SPVs, follow-up observations can have additional utility for some of these stars, specifically in discovering and studying interesting characteristics of their behavior. Examples of such characteristics of short period eclipsing binaries may include the presence of prominent flare and outburst events, evidence for starspot distributions, and dynamic signatures of chromospheric activity.

The authors of this note have at various stages of the GNAT projects undertaken visual assessments of all of the MG1-VSC variable star candidates (> 26,000) in an effort to perform a very rough morphological classification of the light curves.

One of the motivations for this effort was to make “short” lists of stars that might be especially interesting for further observation. When the first of these lists was prepared it was further refined by analysis of the MG1 statistics parameters for each of the stars.

Among other classes of stars, this led to a short list of SPV stars that was discussed with Roy Tucker as the source list for a program of follow-up observations of interesting MG1-VSC stars.

We have recently reviewed this list and started selecting specific stars for which we would like to assemble the data we have collected to date, to update those observations for 2023 – 2024 observing seasons, to complete a preliminary analysis of the data, and to start publishing our results.

MG1-1995959 is one such star for which a draft manuscript is now in its early stages. We note that the collaborating observers currently include Grady Boyce, Chris Corbally, Brian Craine, Eric Craine, Roger Culver, Tim Hunter, Andy Kulessa, Warren Marwood, and Mike Miller, several of whom are SAS members.

In the meantime, we are selecting the next targets for this effort. In keeping with the current theme of looking at candidate spotted stars (of which MG1-1995959 is a striking new example) we are proposing an additional five such stars for an observing campaign this fall through spring.

The new candidate stars (for the moment presented as alias names for Spotted-Short Period Variable Candidates #n, where n = 1 - 5) are shown as representative follow-up GNAT phased light curves in Figures 1 – 5.

Again, we need to set up formal Research Teams for each of these stars and to prepare for observing programs. The S-SPV Candidate #1 is ready for observation NOW!

If you would like to participate in one or more of these programs, please contact Eric Craine right away and we can discuss the project in more detail. Also, if you are uncertain of whether this is of interest to you, please contact Eric and he will be happy to send you an invitation to the relevant Zoom meetings where you can learn more before committing to the effort!

Literature Cited

Craine, B.L., Craine, E.R., Tucker, R.A., Culver, R.B., and Anderson, R., (2021) "MG Sky Surveys: Data Pipeline and Project Status", Proc. 40th Ann. Symp. for the Soc.Astro.Sci., 31-38.

Craine, B.L., Kulessa, A.S., Craine, E.R., Culver, R.B., Kraus, A.L., Tucker, R.A., and Walker, D.K., (2022), "MOTESS-GNAT Sky Survey: MG1 Long Period Variable Stars Re-Visited After 10 Years", JAAVSO, **50**, 233-251.

Kraus, A.L., Craine, E.R., Giampapa, M.S., Scharlach, W.W.G., and Tucker, R.A. (2007), AJ,134, 1488-1502.

Kraus, A.L. , Tucker, R.A., Thompson, M.I., **Craine, E.R.** and Hillenbrand, L.A. (2011) "The Mass-Radius (-Rotation?) Relation for Low-Mass Stars" ApJ, 728, 48-66.

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Tucker, R.A., Craine, E.R., Craine, B.L., Kulessa, A.S., Corbally, C.J., and Kraus, A.L. "MG1-688432: A Peculiar Variable System" (2021), Ap.J. Supp. Ser., 256, 1.

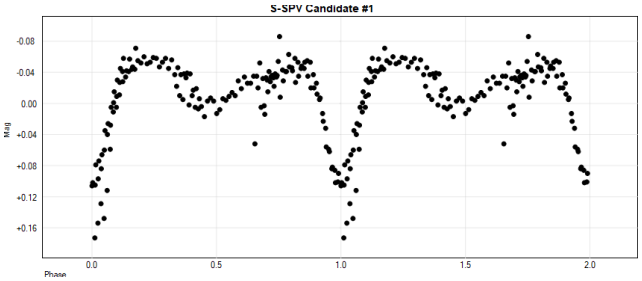

Figure 1. MG1_S-SPV_Cand#1
P ~ 14.2 h pos'n: 2030+03 m ~ 14.2

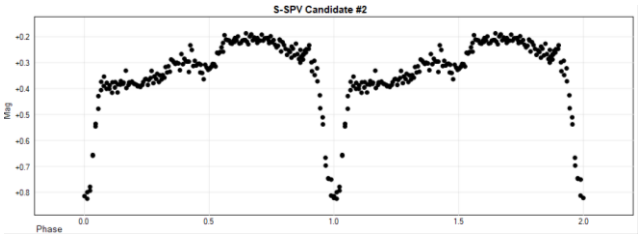

Figure 2. MG1_S-SPV_Cand#2
P ~ 15.9 h pos'n: 0604+03 m ~ 15.5

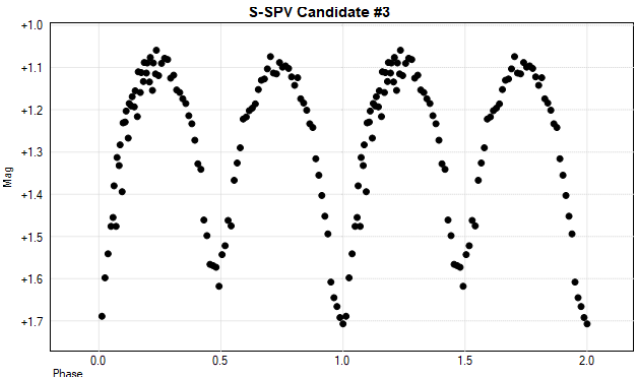

Figure 3. MG1_S-SPV_Cand#3
P ~ 7.5 h pos'n: 0700+03 m ~ 15.0

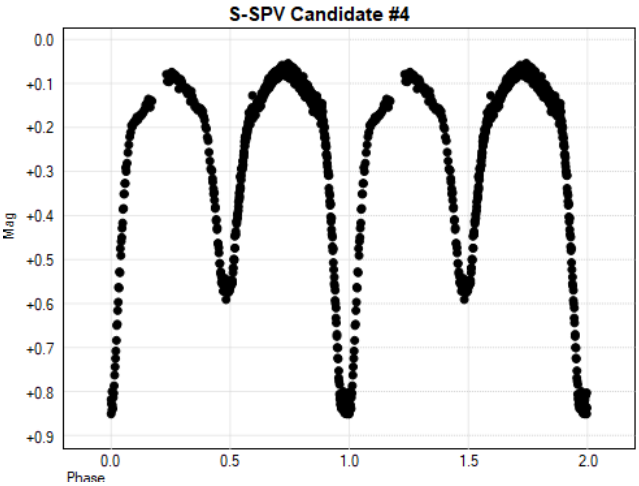

Figure 4. MG1_S-SPV_Cand#4
P ~ 25.4 h pos'n: 0914+03 m ~ 12.7

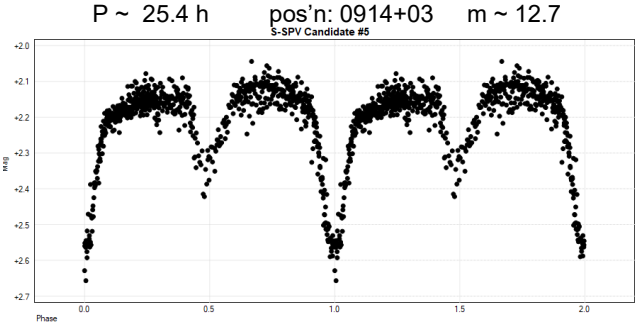

Figure 5. MG1_S-SPV_Cand#5
P ~ 18.6 h pos'n: 09 45+03 m ~ 15

Accessing NASA's Astrophysics archives using Python

The recent AAS meeting in Albuquerque included a Workshop on "Accessing NASA's Astrophysics Archives using Python". The information might interest some of you (particularly those of you who attended the "accessing professional databases" at SAS-2023). The organizers have OK'd sharing the slides with SAS participants.

The slides are at:
https://drive.google.com/file/d/1MeRFFLqornxHLw7kF9AhdunJvjxwfKh5/view?usp=sharing

The recording of a webinar on the same topic at AAS-237 is at

https://www.youtube.com/watch?v=wiCCIyXk6-o. The video and other materials are linked from https://heasarc.gsfc.nasa.gov/navo/summary/python.html.

Enjoy!

Small Telescope Science in the News

With JWST now operational, and Vera Rubin Observatory coming along, we may be heading into another season of worrying about the value of small-telescope and amateur observations. The best evidence in favor of small-telescope observations is their contribution to research. Here are some interesting reports that have appeared in the literature over the past few months, illustrating the science that is facilitated by small-telescope photometry and spectroscopy.

A bright triple transient that vanished within 50 minutes
By Enrique Solano, et al, MNRAS (pre-print available at arXiv:2310.09035v1)

This is a weird one: On 1952 July 19, the Palomar optical sky survey was conducting its routine of red- and blue-sensitive plates of the sky. One particular red-sensitive plate hosts three star-like points, snuggled together within about 10 arc-sec, each one about 15th magnitude. The blue plate exposed immediately after showed nothing at the location of the "triple" – implying that whatever those three objects were, they all disappeared in the intervening 50 minutes between the red- and blue-plate exposures (or they all dimmed by at least 10 magnitudes, which would be equally odd). The authors searched through all available survey archives, and found no image showing any of the three objects. They conducted a deep search with the 10-meter Gran Telescopio Canarias, and found nothing (to a limiting magnitude of about 25). So, what, then? Asteroids? No evidence of motion during the red exposure. Satellites? Sputnik wouldn't be launched until 5 years later. Stellar flares? Not likely that three stars would do that simultaneously. Cataclysmic variables? The huge delta-magnitude over a short time, and the simultaneity of multiple independent objects doing the same thing at the same time, make this unlikely in the extreme. The authors suggest (but don't really endorse) the idea of a hitherto unknown family of lensing objects, probably within the Milky Way.

The missing objects are at (J2000) RA= 21:18:10.4, Dec= +50:22:43.4.

If you enjoy long-shot bets, spend a rainy weekend going through your image archive to find anything you have of the target location, and see if the three objects (or any one of them) appear. Positive detection would start to constrain their nature; and negative results might be of interest, too.

The thing that struck me as doubly-weird about this event is that it isn't alone: there are other "disappearing object" events reported in the literature, that remain unexplained. See the paper for references.

The Advantages of Global Photometric Models in Fitting Transit Variations

by Yudkovsky, Y. et al, pre-print at arXiv:2311.06948v1

Quite a few of you are observing exoplanet transits, with an interest in recognizing transit-timing variations (TTVs). If you are in this group, and you fondly remember your classes in statistics, you might enjoy this paper. (If you're not fond of statistical analysis, you might pass by this paper).

The point of the research is to investigate two methods for analyzing transit timing variations. Method #1 – probably the most commonly used – is to determine the mid-transit time for each transit individually, and combine the results in an "O-C" type plot (Observed minus Calculated transit time). Method #2 is to take all transit photometry over all time as a single data set, and fit a model that includes transit shape and various forms of TTV (e.g. sinusoidal to model the effect of multiple planets in the system) across all of the observed transits, simultaneously. It turns out that if the transit signal-to-noise ratio is low, then Method #2 is much better. If the transit SNR is larger than about 12-15, the two seem to be nearly equivalent. The reason that Method #2 works better for low-SNR situations has to do with the fact that taking each transit as an independent event (as in Method #1) results in a non-Gaussian distribution of time-errors (even if the underlying photometry is gaussian-distributed).

The authors don't mention O-C curves for eclipsing binary stars or pulsating stars. I suspect that the conclusions would be similar; but the signal (and hence the SNR) for these stellar events are usually quite a bit larger than the tiny brightness dip of an exoplanet transit.

Kilometer-precise (UII) Umbriel physical properties from the multichord stellar occultation on 2020 September 21

by M. Assafin, et al MNRAS (2023)

preprint available at https://arxiv.org/abs/2310.11196v1

Here is a neat example of the power of a large network of tiny telescopes: the authors report occultation results of Uranus' satellite Umbriel. The "et al" in the author list includes several names that SAS'ers might recognize: Bruno Sicardy, David Dunham, Tony George, Richard Nolthenius, Paul Maley, Dennis di Cicco, Peter and Debra Ceravolo (yes – both of them!), and Roger Venable.

The path to Z And-type outbursts: The case of V426 Sagittae (HBHA 1704-05)

by A. Skopal, et al, A&A 636, A77 (2020)
https://www.aanda.org/articles/aa/pdf/2020/04/aa37199-19.pdf

The power of small-telescope time-series photometry and spectroscopy is evident in this paper, that discusses the evolution of V426 Sge over the past 60 years.

Current photometry from small telescopes was combined with historical data to prepare a 120-year lightcurve, showing two major outbursts and cyclic variations.

Time-series spectroscopy – much of it from amateur contributors to the ARAS database – are used alongside space-based data to determine the spectral energy distribution and its changes. These then contribute to a model of the physical changes of the system: luminosity, temperature, mass-loss rate, and others.

The occurrence of a symbiotic-nova outburst of V426 Sge in 1968, followed by a Z-And-type outburst in 2018; and the star's similarities to AG Peg, lead the authors to a sketch of possible connections between the different types of symbiotic star events.

Some of you will recognize the names of contributors to this work: Tim Lester, Forrest Sims, Christian Buil, Ulisse Munari, Franz-Josef Hambsch, and Olivier Garde. Well done, all!

The enigmatic multiple star VV Ori

By Edwin Budding, et al , pre-print at arXiv:2311.08247v1

VV Ori is a bright three-star system, in which the two closest stars form an eclipsing binary. Mark Blackford's excellent photometric lightcurve in B-V-R bands (made with an 80mm refractor, stopped down to 50mm) enabled determination of the B, V, R magnitudes of the primary, secondary, and third-light stars. The combination of TESS photometry and lightcurve modelling clearly displays the β-Cepheii-type pulsations of the primary(?) star. High-resolution spectroscopy shows that the primary has an unusually slow rotation.

The introductory comments about the target star contain a couple of subliminal messages for small-telescope observers of eclipsing binaries:

First, don't dismiss your lightcurve as being just a "gee whiz" experience. The eclipse lightcurve contains important information about the orbit (time-of-minimum-light measurement) and the nature of the stars (shape of the lightcurve). Even if you don't measure ToM yourself, do submit your photometry to AAVSO so that it will be available to future researchers. In the case of VV Ori, there is suggestion that the depth of the eclipses has changed over the decades, probably indicating precession of the eclipsing pair's orbital plane. The authors here test that hypothesis using TESS photometry from two sectors, and find that it is plausible.

Second, try – if you can – to measure both the primary and secondary eclipses. Among other things, that might indicate eccentricity in the orbit.

Third, we sometimes ask our astro-imager friends (with tongue firmly in cheek), "does the world really need another image of M42?". The answer is, "maybe, if there is something special about the image" – better resolution? Previously-unexplored spectral band? New type of instrument? – or something special about the purpose of making the image, such as time-series evaluation of changes. In any case, most eclipsing binaries probably need a well-done lightcurve (multi-band, both primary and secondary eclipses) at least every 5-10 years, to give a long-term photometric baseline of evolutionary changes ... just in case.

If you are already a fan of eclipsing binaries and analysis/modelling of the systems, this paper is worth a close read.

Study of the fastest classical nova, V1674 Her: Photoionization and Morpho-kinemetic model analysis

by Gesesew R. Habtie, et al.

pre-print at: http://arxiv.org/abs/2310.16619v1

V1674 underwent a very bright, very short-lived nova in June, 2021. In this paper, the authors use lightcurves from AAVSO (in B-V-R-I bands) and spectra from the ARAS database – hence almost entirely small-telescope data taken by amateur astronomers. From this data, they do a remarkable analysis of the evolution of the nova and make inferences about the constituents of the system, culminating in (among other things) a "picture" of the evolution of the nova material as it is blown away from the white dwarf.

The technical discussion is heavy-going, but the results are remarkable. It is worth your attention.

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