News from the Society for Astronomical Sciences

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Recap of SAS-2021 Symposium

We held our online Symposium SAS-2021 last month. The creative format and active interchange among participants seem to have gone over well with the attendees.

The Proceedings will be posted onto the SAS website in the near future. Until that happens, the final version of the Proceedings book is freely available at its temporary home on DropBox at https://www.dropbox.com/s/nakvu23no08di8j/2021%20Proceedings%202021-06-23.pdf?dl=0

Videos of the presentations are available on the SAS YouTube channel at

https://www.youtube.com/playlist?list=PLPes_hgrvEV-KzTJa0i9eJfQKnELTQPqMe

Because the focus of the on-line sessions was discussion among the presenters and the participants, we didn't make any recordings of the on-line sessions. (We didn't want anyone to have to worry that some poorly phrased comment would come back to haunt them in the future).

We have hopes that this will be our last fully online Symposium, and we're looking forward to seeing everyone "live, in person" in summer of 2022! Details on the plan for 2022 are being formulated now. If you have ideas, let us know at program@ScoAstroSci.org.

Newsletter 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 popular and useful for the participants. The key feature is that a modest number of people who are interested in a particular subject meet regularly (via Zoom), get to know each other, and share problems, report progress, and celebrate successes in fully interactive online meetings.

These aren't formal classes: for that, go to the AAVSO (who offer a broad array of well-done classes that we aren't going to compete with). Rather, the concept here is that people with a shared interest get together regularly as a small community-of-practice, forming their own agenda and helping each other grow in skill and understanding of a particular topic. Think in terms of the coffee break at your local astronomy club, except this is done online).

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.

"Eclipsing Binaries" workshop Videos

Videos of this 2018 workshop by Dr. Bob Nelson are now freely available online:

Part 1= https://youtu.be/KeGqlwWpBfM
Part 2= https://youtu.be/Fyxv38B8RrM
Part 3= https://youtu.be/qR6JWbN3juM

Guild Knowledge:

There are some things that are so well-known to practitioners of some arts that they are never spelled out; but as a result, they are completely opaque to the uninitiated. We ran across two of them this month.

The URCA process: Most journals require that acronyms should be defined on first use, but sometimes a term is so well-known that it goes undefined (think "DARPA"). Consider this, from a recent pre-print (https://arxiv.org/pdf/2107.04059.pdf) :

"*In the strong-field regime (B << 3 × 10^{14} G), significant B-field decay occurs while the star is undergoing neutrino cooling (which we assume to be due to modified URCA reactions)*"

Huh? Wayne Green points us to Wikipedia for the definition:

In astroparticle physics, an Urca process is a reaction which emits a neutrino and which is assumed to take part in cooling processes in neutron stars and white dwarfs. The process was first discussed by George Gamow and Mário Schenberg while they were visiting a casino named Cassino da Urca in Rio de Janeiro. As Gamow recounts in his autobiography, the name was chosen in part to commemorate the gambling establishment where the two physicists had first met, and "partially because the Urca Process results in a rapid disappearance of thermal energy from the interior of a star, similar to the rapid disappearance of money from the pockets of the gamblers on the Casino de Urca." In Gamow's South Russian dialect, urca can also mean a robber or gangster.

Guild speak in action....

Gravitational deflection of light, and asteroid occultation predictions:

A somewhat less obtuse, but nevertheless surprising item came up at the recent on-line meeting of the International Occultation Timing Association (IOTA), Dave Herald gave a fascinating talk about how asteroid occultation paths are affected by the gravitational deflection of starlight. Turns out that modern astrometric catalogs, and modern asteroid orbits, are both sufficiently accurate that gravitational deflection of light can have a noticeable impact on the predicted (and actual) occultation path on the surface of the Earth.

We normally think of an occultation happening when the asteroid passes “in front” of the star. However, the starlight is “bent” as it passes through the Sun’s gravitational field, so the asteroid is actually in front of the star’s apparent position. If you could turn gravity off, you’d see that the geometric position of the asteroid is slightly to one side of the geometric position of the star.

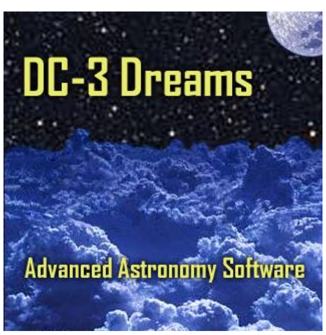
For asteroids smaller than about 10 km diameter, ignoring the gravitational light deflection will result in a predicted occultation path that is in error by more than the diameter of the asteroid(!)

SAS occultationists may want to find and listen to the recording of his talk.

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
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http://www.dc3.com/

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Enriching your astronomy experience since 1983.
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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.

Asteroid Photometry with PIRATE: Optimizations and Techniques for Small Aperture Telescopes

by Samuel L. Jackson et al, (accepted by PASP)

pre-print available at https://arxiv.org/pdf/2107.04390.pdf

Considering the large number of high-quality rotational lightcurves of asteroids that are determined by amateur-scale telescopes, it is a bit sad that so few asteroid observers are compiling phase curves. The reasons for this shortfall are understandable (particularly if you've ever done a phase-curve project): it dramatically increases the observing time required, and the photometric analysis is much more complicated. Analysis must unravel the effects of rotational modulation and longer-term brightness changes caused by changing Earth- and Sun-distance, in order to yield the effect of changing phase angle. It can also benefit from two-color photometry. The prize is worth aiming for, however. Phase curves provide information about the asteroid that isn't readily apparent from its V-band (or C-band) rotational lightcurve.

This paper is particularly focused on near-Earth asteroids, which present tricky – but important – targets. In addition to the normal asteroid light curve observing challenge, the NEA's add rapid apparent motion (a pointing-and-tracking challenge) and rapidly-changing phase angle. The NEA's offer the opportunity to characterize the object over a much broader range of phase angles than we can see from a main-belt asteroid.

This paper gives an educational overview of the phase-curve challenge, and approaches to meeting it using small telescope photometry. In particular, there is useful discussion of the challenge of photometry using images where both the stars and the target re trailed (on account of the rapid sky-motion of the target); an interesting section about the use of transforms for to put your asteroid photometry onto the standard system; and examples of NEA phase curves from the author's research.

Our asteroid observers will want to read this paper!

Discovery of Super-Slow Rotating Asteroids with ATLAS and ZTF photometry

by N. Erasmus, et al: (submitted to MNRAS)

pre-print available at https://arxiv.org/pdf/2106.16066.pdf

Very few asteroids are known with long (hundreds of hours) rotation periods. This is almost certainly influenced by an observational bias – after you've spent a few long nights gathering time-series photometry on an asteroid, and all you see is a flat line, you are likely to lose interest and move on to something more exciting. As a result, the long-period objects never get properly treated; and indeed, they are likely to go unreported at all.

The nightly surveys are better positioned to recognize long periods, since they are likely to observe the asteroid occasionally over weeks or months. However, (as Brian Warner and Alan Harris have noted), the lack of rapid-cadence observations leads to a serious risk of being misled by aliasing. A rotation period of a few dozen hours, sampled at a rate of one data point per few dozen hours, can lead to plausible-looking periods that are completely wrong.

The authors here report on asteroids with very long periods, based on combining years-worth of photometry from ZTF and ATLAS surveys. They find 39 asteroids with strong evidence of very long periods (rotation period > 1000 hours).

The insightful discussion of their procedures for rejecting erroneous long periods (due to aliasing) is worth studying. Partly they rely on a massive comparison of simulated lightcurves with the actual data; and partly they do some "checks" by conducting long observing runs on selected targets. The results lend confidence in the long periods that are inferred from the ZTF+ATLAS periodograms.

You will also see reference to some of our SAS friends in here: Tom Polakis and Bob Stephens figure prominently, as do Brian Warner and Alan Harris.

If you run across a "flat line" lightcurve that continues for a few nights, should you drop the target? Maybe not: There are probably plenty more slow-rotators awaiting discovery, and the modern star catalogs make it much easier to get high-quality photometry over long observing intervals. And since "replication" is an important feature in any science, it is probably worth the time and effort to confirm some of these purported long-periods, just to be sure.

The First Light Curve Solutions and Period Study of BQ Ari

by A. Poro, et al

pre-print available at https://arxiv.org/pdf/2006.00528.

Here a group of Turkish astronomers report a study of the W-UMa system BQ Ari, done with a half-meter telescope and B-V-R CCD photometry. It is a good example of what can be accomplished with a small telescope and a few nights of dedicated time-series photometry; plus a diligent consideration of previous observations of the star. It should also encourage ongoing programs of small-telescope observations of these systems, to add data points to the record of time-of-minimum measurements.

They show a very nice three-color photometry result, which they then used to model the system (using Wilson-DeVinney code). The system displays the O'Connell effect (the two orientations of maximum light have significantly different brightness), which they model as due to a star-spot on the brighter component of the eclipsing pair.

The variation of orbital period is examined by using the author's own times of minimum light, combined with previously-reported Tmin values from the literature. The resulting O-C curve shows a strong hint of a 6.28 year cycle, with amplitude of 3.37 minutes. That might be due to a third body ("light-time effect") or a magnetic interaction between the two stars.

Perhaps more importantly, their O-C curve serves as a reminder that as we continue to monitor this – and other similar systems – it is important to tailor our observation plans to achieve excellent timing accuracy of Tmin. Some of the published times of minimum light have error bars that are larger than the effect being reported here. Getting reliable and repeatable time-of-minimum measurement with uncertainty of one minute or better (1 minute = 7E-4 day) on a system like this requires observing runs lasting at least a two hours (to capture the steepest parts of the lightcurve), an imaging sequence that balances the desire for good photometric accuracy (higher SNR is better) with dense coverage of the lightcurve (more data points is better); and attention to details such as the stability of the time-sync of the observatory computer, and correctly distinguishing between primary vs. secondary minima.

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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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