News from the Society for Astronomical Sciences

Vol. 11 No.4 (October, 2013)

Planning for the SAS-2014 Symposium

New dates, a new location and a triple-conjunction joint meeting

The SAS-2014 Symposium will be a joint meeting with the American Association of Variable Star Observers (AAVSO) and the Center for Backyard Astrophysics (CBA). Gathering these three organizations together will be a wonderful chance for the small-telescope research community to share results and network with each other.

We hope to increase the participation by professional astronomers and educators, by moving the Symposium to mid-June. **The 2014 Symposium will be held on June 12-13-14** (that is Thursday-Friday-Saturday). Mark your calendars! The AAVSO Board meeting will be on June 11.

In preparation for the 2014 Symposium, the SAS Board investigated several alternative locations for the meeting. We hoped to provide improved conference facilities, more attractive lodging, reduced overall cost for the attendees, and more convenient travel for those from outside southern California. In the end we narrowed the choices down to three: Big Bear, Ontario and Las Vegas. Many of you participated in our survey during the summer. The compilation of your opinions was presented in a "special edition" SAS Newsletter, last month.

By a narrow margin Ontario Airport hotel was chosen to host the 2014 SAS Symposium.

So, begin planning now for the SAS-2014 Symposium: new dates, a new meeting place *and* a joint meeting with AAVSO and CBA

SAS-2014 Location: Ontario Airport Hotel

700 North Haven Avenue, Ontario, CA 91764

Based on the opinions expressed by respondents to the recent SAS survey, the 2014 Symposium will be held at the Ontario (CA) Airport Hotel.

The Ontario Airport Hotel.

This property is well suited to small and medium sized conferences. It provides conference facilities, guest rooms, and dining that are more attractive than what has been available at our traditional Big Bear location. And *much* faster and more reliable Wi-Fi internet connections!

It will also be more convenient for most of our attendees to get to. Ontario CA is a shorter drive from most southern California cities than Big Bear is. For SAS attendees who travel from outside southern California, the hotel is about 5 miles from the Ontario CA airport, and a free hotel shuttle is available if you don't want to rent a car. The Ontario airport is served by most major US airlines, with flights to most major US cities.

This is an independent hotel (not currently part of a chain), but they are in the process of branding with a hotel chain whose name they cannot reveal, but you will easily recognize it when the process is completed (probably by the end of 2013).

Publication of Student Projects and Research Papers

Recent SAS Symposia have included a handful of student groups, describing their (very well-done) projects on asteroid lightcurves, stellar spectroscopy, double-star astrometry, and sky-glow evaluations. In keeping with the SAS mission of encouraging small-telescope astronomical research, we applaud these efforts. The SAS will now offer a forum for ensuring that this work is included in the astronomical literature, and that these students can include a publication citation in their resumes.

Beginning with the January, 2014 Newsletter, we will be pleased to receive student-research paper submissions for the SAS Newsletter. The Newsletter papers will be considered as "pre-prints", so that they are made available promptly. These will then be formally published as "papers without presentation" in the next SAS Proceedings volume.

Please encourage your students to submit appropriate papers by e-mail to one of the Newsletter Editors.

Reminders ...

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. You can renew your membership on the SAS website (SocAstroSci.org), by going to the MEMBERSHIP/REGISTRATION tab.

Symposium Proceedings: The published proceedings from the 2013 Symposium are freely available in PDF format at the PUBLICATIONS tab of the SAS website (www.SocAstroSci.org).

Symposium videos: If you weren't able to attend the annual Symposium, you can still watch the presentations. Videos of most of the technical presentations have been posted on the SAS website at the PUBLICATIONS tab. These are "WMV" files that should be compatible with most modern computers. The videos are freely available to all interested viewers.

Contact info: If you haven't been receiving e-mail messages about the Newsletter or the SAS Symposium, then perhaps it's because you've changed your e-mail address but haven't told us. You can update your contact info on the MEMBERSHIP/REGISTRATION tab of the SAS website. The SAS never sells or shares your name or contact information without your explicit permission.

Workshop Videos

Those of you who requested DVD's of the workshops during the SAS-2013 meeting should have received them by now. If your DVD hasn't arrived, or if it was defective, send a note to Bob Buchheim at Bob@RKBuchheim.org and he'll send you a replacement.

If you couldn't attend but would like DVDs of our recent Workshops, send a note to Bob. The following workshop videos are available:

"Digital Imaging Photometry" (2013)

"Lightning Safety and Hazard Management" (2013)

"Small-Telescope Spectroscopy" (2012)

"Robotic and Remote Observatories" (2011)

"Eclipsing Binary Stars" (2011)

If you were registered for the workshop when it was held, the DVD costs $5. If you were not registered for the workshop, the cost is $55.

Small-Telescope Astronomical Science in the News: July - September 2013

compiled by Bob Buchheim

Variable stars, meteors, asteroids, star clusters – there is a whole universe out there offering research projects that can be done with small telescopes! Astrometry, photometry, and spectroscopy are all valuable tools in these endeavors, and this quarter's collection of published papers touches on all of them.

Period Changes in SX Phoenicix Stars: IV. BL Camelopardali
by George Conidis & Paul Delaney
Pub. Astro. Soc. Pacific v. 125 p 639 (2013 June)

This paper presents a set of new measurements of time-of-maximum-light of this pulsating variable star, gathered using CCD photometry on a60-cm (24-in) telescope. The new data extends the record of pulsation timings to roughly 34 years.

A quadratic fit to the O-C ("Observed minus Calculated") residuals indicates that the period is increasing by about 1 ppm per year. However, the authors point out that the quadratic fit isn't necessarily the best match to the data. A cubic equation or a step-wise model with an instantaneous period change are both better fits to the data. But the physical meaning of a cubic O-C trend is unclear, and it is an open mystery what could cause a step-change in pulsation period (assuming that it is real).

This star is a multiple-period oscillator, so timings and their interpretation may be complicated by small changes in the shape of the lightcurve from period to period. As usual, more data is doubtless useful.

Faint UBVRI Standard Star Fields
by James L. Clem and Arlo U. Landolt
The Astronomical Journal, 146:88 (19pp), 2013 October

This isn't a "small telescope" project, but it does report results that may be useful to small-telescope photometrists – the "Landolt" standards" are being extended along several dimensions. First, by using CCD sensors (instead of Dr. Landolt's previous photomultiplier tubes), the number of standard stars in the well-known Selected Areas is being dramatically increased. Second, the range of standards stars is being extended to fainter magnitudes. And third, several standard fields re being established at relatively high northern and southern declinations (in addition to the equatorial fields).

This new array of standards in UBVRI bands should make a nice complement to the all-sky UBVgri photometric network given by APASS.

Measuring the Rotational Periods of Isolated Magnetic White Dwarfs
by Carolyn S. Brinkworth, et al
The Astrophysical Journal, 773:47 (16pp), 2013 August 10

This report barely fits my definition of "small telescope" research, since it was done with a 1-meter telescope. The authors note that rotation periods of white dwarf stars are difficult to measure, because their surfaces are normally too hot for convection (hence, too hot for star spots), and their spectral lines are significantly widened by the strong gravitational field (making it difficult to convincingly measure rotational broadening). However, the subset known as magnetic white dwarfs provide phenomena that can generate a photometric signal that displays the rotation period.

The authors report time-series photometry of 30 magnetic white dwarf stars, 20 of which display photometric variation that is interpreted as showing their rotation period. These periods range from a few hours to nearly 100 hours. Several of the longer-period stars are in need of continued long-term

follow-up (the measured lightcurves are incomplete and noisy). This may be a challenging project for SAS photometrists, since the stars tend to be about 15th mag, and the lightcurve amplitude is only 5-10%. Still, there is certainly much to learn about the stars.

Photometric behaviour of the FU Orionis type star, V1057 Cygni, during the last 25 years
by E. N. Kopatskaya, et al
MNRAS 434, 38–45 (2013)

The target star here is a pre-main-sequence object that displayed a dramatic outburst in 1969-70, brightening by >6 magnitudes, followed by a long fade. This paper presents four decades of photometric monitoring of this object since its outburst, made almost entirely with telescopes ranging from 40 cm (16 in) to 70 cm (28 in). During the 1990's, the brightness plateaued, and then dropped to a second (lower-brightness) plateau in which it has spent the past ~ 14 years.

The photometric evolution continues, with interesting and confusing features. The lightcurve displays two periods: a "long" period (P≈4.5 yr) that is most apparent in B and V bands, and a "short" period (P≈ 1.4 yr) that is most apparent in I-band and in the infrared data (J-H-K bands). The Lithium Li λ6707 Å emission line shows a radial velocity cycle that seems to match the "short" period.

Is this a single star or a binary system (plus accretion disk, in either case)? The data are not definitive, although the authors lean toward the binary model, since variations on a binary model can explain both the outburst, and the gradual development of periodic fluctuations. They end with the advice that continued photometric and spectroscopic observation of this star, and all other FU Ori stars, is needed in order to compile long-time-history data that will help to unravel the nature and development of these systems. High-angular-resolution observations will also be useful, to search for evidence of binarity.

Double Stars in the USNO CCD Astrographic Catalog
by William I. Hartkopf, et al
The Astronomical Journal, 146:76 (8pp), 2013 October

I've seen a few "data mining" efforts to discover new double stars and common-proper-motion pairs in existing catalogs (e.g. Cabalero, 2010, *JDSO* did quite a job searching UCAC-3). If you're thinking of such a search of the UCAC-4 catalog, don't bother: Dr. Hartkopf and the team at the US Naval Observatory have done it, finding about 58,000 double stars and 4755 new common-proper-motion pairs.

This fits into our "small telescope" research category for a couple of reasons. The Astrograph used to make the images that are at the heart of UCAC is a pair of 8 inch (20 cm) refractors. The follow-up speckle interferometry that was done to confirm some of the UCAC-4 discoveries used a 26 inch (66 cm) refractor. And photometric data on the UCAC pairs was gathered from APASS, itself an impressive small-telescope project.

Properties of the Close-In Tertiary in the Quadruple System V401 Cyg
by L.-Y. Zhu, et al
The Astronomical Journal, 146:28 (5pp), 2013 August

The authors report on eclipse observations made with 60 cm (24 in) telescopes, and the O-C diagram of this eclipsing binary. Their analysis suggests an observing project that may appeal to some SAS photometrists.

V401 Cyg is an eclipsing contact-binary, with a deep primary eclipse (ΔR ≈0.5 mag). The O-C (observed-minus-calculated) analysis of eclipse times shows a pretty clear cyclic pattern, which the authors attribute to the light-time effect caused by a tertiary star in an approximately 3.5 year orbit around the eclipsing pair. The presence of the tertiary star has also been inferred by other photometric studies and by spectroscopic observations, so its presence is pretty certain. (There is also a visual-double companion about 18 arcsec away, that presumably is part of this system, but it is so far away that it doesn't play any role in the eclipses or the light-time effect.)

The authors used the O-C data to estimate the orbit of the tertiary star. The observing challenge comes about because the best-estimate orbit of the tertiary star suggests that it *might* eclipse the contact pair. The lightcurve of such an eclipse would offer some valuable data about this hierarchical triple system. The author's orbit solution can't pin down the tertiary eclipse timing exactly, but they expect it to happen sometime between mid-October and mid-November, 2014. Of course, Cygnus is pretty low in the west by then, so you'll only have a few hours each night to make time-series photometry, but this sounds like a worthwhile addition to your project calendar, if you're a fan of eclipsing binaries. V401 Cyg is Vmag≈11, and is located at (J2000) RA=19h 29m 19.5s Dec: +30°24'11".

NGC 1252: A High Altitude, Metal Poor Open Cluster Remnant
by R. de la Fuente Marcos, et al
MNRAS 434, 194–208 (2013)

There are quite a few "open clusters" in the NGC for which it isn't at all clear whether they are, truly, clusters, or just visually-appealing asterisms – striking to the visual observer, but not genuine stellar associations. The authors here report on their effort to unravel the situation of one of these, NGC 1252. They used a 100 cm (40 in) telescope and CCD photometry in U-, B-, V-, and I-bands to construct a color-magnitude diagram, and drew proper-motion data from the SPM4 catalog, and also used a large telescope to obtain high-resolution spectra of selected stars in the putative cluster.

The color-magnitude diagram of stars that appear (visually) to form the cluster is a formless cloud of data points -- definitely not a cluster-like sequence. The spectra of the brightest stars do not indicate any clustering in terms of distance, radial velocity or metallicity, so these bright stars do not form any sort of cluster remnant. However, when stars in the field are selected based on common proper motions, they find 7 stars that are most likely the core of an open-cluster remnant (probability of membership > 50%).

All things considered, the authors conclude that there is, indeed, an old (about 3 Gyr) open-cluster remnant centered at NGC 1252 at a distance of about 1 kpc. The authors note the need for deeper photometry, and additional spectroscopy, in order to understand the history of this cluster and thereby provide data that might be able to test models of open-cluster dissolution.

Visible Spectroscopic Observations of a Near-Earth Object, 2012 DA14
by Seitaro Urakawa, et al
Publ. Astron. Soc. Japan 65, L9, 2013 August 25

Here's a report that is impressive for its audacity: the authors report their visible-wavelength spectra and reflectivity determination of a NEO, using a 40 cm (16 in) telescope and low resolution slit spectrograph (R≈ 500). They aimed at the asteroid as it was speeding by at about 1500 arc-sec/min, and managed to keep it on the 5 arc-sec wide slit for a total of 36 sec. From this, they got a nice spectrum spanning about 4000 to 9000 Angstroms. Dividing the raw spectrum by the spectrum of a solar-analog star, they were able to achieve a relative spectral reflectance curve that verified other assessments that the target is an L-type asteroid.

The 2011 October Draconids Outburst – I. Orbital Elements, Meteoroid Fluxes and 21P/Giacobini–Zinner Delivered Mass to Earth
by Josep M. Trigo-Rodr´ıguez, et al
MNRAS 433, 560–570 (2013

Here is a really wonderful report describing observations and analyses of a meteor outburst, done with a healthy pro-am collaboration.

The observations were made primarily by the array of wide-field video and CCD camera comprising the Spanish Meteor Network (SPMN), plus some impressive visual meteor observations. The SPM is an array of meteor cameras scattered all over Spain. The wide-field cameras are similar to the meteor-cams that are readily available to amateurs, and are based on camera lenses with focal length ranging from 4mm to 25mm – so this report definitely get the "smallest aperture" award for this month. Three visual observers compiled an extraordinary effort, comprising both meteor-time and meteor-brightness estimates, which yielded a population index r=2.3.

Sixteen meteors were captured on video or CCD from multiple sites. These enabled the researchers to calculate the trajectory of the meteors, including their atmospheric deceleration and extrapolation to the pre-entry orbital elements. This information gave a very precise value for the radiant, showed the orbital path of the cometary-meteor stream, and was used to derive values for the aerodynamic strength of the meteor particles. All in all, a wonderful collaborative effort of professional and amateur meteor observers! If you have a meteor camera and are interested in how to extend you data reduction along these lines, this paper has a fine explanation of most of the principles involved.

An Anisotropic Distribution of Spin Vectors in Asteroid Families
by J. Hanuš, et al
Astronomy & Astrophysics, Sept. 18, 2013
pre-print at: http://arxiv.org/abs/1309.4296v1

One area of research that continues to benefit greatly from small-telescope and amateur research is the study of asteroids: ground-based time-series photometry can provide the "raw data" from which to determine the rotation period, shape, and spin-state of these objects. The "et al" in the author list of this paper includes several names that SAS'ers will probably recognize: Brian Warner, Jim Brinsfield, Ron Durkee, Dave Higgins, Bob Koff, J. Oey, Fred Pilcher, Bob Stephens, and Luca Strabla.

The collection of asteroid light curves has grown to the point where it is now possible to do statistical investigations of the spin-state-evolution of asteroid families. This is (to me) a remarkable accomplishment, since determining the spin-vector orientation of an asteroid requires a shape model; making a shape model requires a handful of light curves gathered at different asteroid-Earth orbital orientations; and each lightcurve entails at least several nights of accurate time-series photometry. So a great deal of data – and correspondingly a great deal of telescope time – is needed just for a single shape model. Then add to this the need for shape models of a sufficient number of asteroids to represent a statistically meaningful sample of an asteroid family, and you can see how important the small-telescope community is to this enterprise.

The authors find that (for the 8 collisional families studied) there is a trend in the spin-vector alignment that is consistent with the predictions of Yarkovsky/YORP theory. At the initial catastrophic collision that created a family, the spin vectors should by randomly, isotropically distributed. But over time, the smaller objects are subject to torques that tend to align the spin vector (normal to the orbital plane) and also tend to displace their orbits (prograde rotators being moved toward larger semi-major axis, and retrograde rotators being moved toward smaller semi-major axis). Plots of semi-major axis vs. spin-vector latitude show this trend pretty clearly for 7 of the 8 families studied here.

This report implies another (unstated) item for those of you who are doing asteroid lightcurves: the importance of entering your lightcurve data into ALCDEF, so that it can be retrieved by researchers for projects such as this.

Optical Trail Widths of Faint Meteors Observed with the Canadian Automated Meteor Observatory
by E. Stokan, et al
MNRAS 433, 962–975 (2013)

The particles that give rise to meteors are tiny. But how wide is the optically-emitting tube that creates the visible meteor? The problem is sort of like measuring the diameter of the filament of an electric bulb, except of course the meteor is also moving rapidly. The authors used a pair of automated meteor camera systems. Each system has two cameras. The wide-field camera detects and tracks the meteor. The narrow-field camera (and intensified CCD with FOV≈ 1 degree) is aimed to follow the meteor throughout its trajectory.

The optically-emitting region is surprisingly wide. Based on their collection of 30 resolved meteor trails, the width of the trail is nearly 100 meters when the meteor is in the tenuous upper atmosphere, dropping gradually to <20 meters wide near burnout. The width of the trail is established by the mean-free-path of the excited atoms in the upper atmosphere. These results will provide useful data for anchoring models of the optical-emission process.

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Membership Information

The Society for Astronomical Sciences welcomes everyone interested in small telescope astronomical research. Our mission is to provide education, 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 each year for the Symposium at Big Bear, CA.
• A copy of the published proceedings each year, even if you do not attend the Symposium.

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

The SAS is a 501(c)(3) non-profit educational organization. Your Membership dues and donations may be tax deductible.

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