SAS-2013 Symposium Will be Held at Big Bear, CA

The annual “Symposium on Telescope Science” of the Society for Astronomical Sciences will be held at the Northwoods Inn at Big Bear, CA, on May 21, 22, 23, 2013 (Tues-Wed-Thursday). The Symposium is the premier forum for presentation and discussion of small-telescope astronomical science. Amateur and professional astronomers, instructors and students are all invited to attend. The technical papers will span a wide range of research topics, including solar system studies, variable stars, pro-am collaborations, instrumentation, and educational activities.

The current schedule of papers to be presented is given on page 4 of this Newsletter. (The Program Committee is still finalizing the schedule, so there may be some adjustments before the meeting).

In addition to the formal presentations, a large roster of Poster Papers has been accepted.

The Symposium also features product displays and sales by our valued Sponsors and Vendors of astronomical equipment.

On Tuesday May 21 the SAS hosts two half-day educational Workshops (about which, see the next article). The Technical session begins Wednesday May 22 with an opening talk by Ms. Emily Lackdawalla, and wraps up with the banquet and after-dinner presentation by Mr. Mike Simonsen.

Registration information is on the “Symposium” page of the SAS website: www.SocAstroSci.org. We look forward to seeing you at Big Bear!

Workshops at 2013 SAS Symposium

The SAS-2013 Symposium will include two educational workshops on Tuesday, May 21. Sign up for the workshops when you register for the Symposium. Workshop cost is $50 (each).

Summaries of the contents are:

Lightning protection for Critical Assets in Small and Large Observatories will be presented by Richard Kithil, President of the National Lightning Safety Institute.

One of the first recorded lightning insults to an observatory was in January 1890 at the Ben Nevis Observatory in Scotland. In more recent times lightning has caused equipment losses and data destruction at the US Air Force Maui Space Surveillance Complex, the Cerro Tololo observatory and the nearby La Serena scientific and technical office, the VLLA, and the Apache Point Observatory. In August 1997 NOAA’s Climate Monitoring and Diagnostic Laboratory at Mauna Loa Observatory was out of commission for a month due to lightning outages to data acquisition computers and connected cabling. The University of Arizona has reported “lightning strikes have taken a heavy toll at all Steward Observatory sites.” At Kitt Peak, extensive power down protocols are in place where lightning protection for personnel, electrical systems, associated electronics and data are critical. Design-stage lightning protection defenses are to be incorporated at NSO’s ATST Hawaii facility.

For observatories lightning protection no longer is as simple as Franklin’s 1752 invention of a rod in the air, one in the ground and a connecting conductor. This presentation discusses selection of engineered lightning protection sub-systems in a carefully planned methodology which is specific to each site. Topics include Grounding, Bonding, Surge Protection Devices including AC Power, solar power, UPSs, and signal and data line protection.
Dr. Kithil is an internationally-recognized lightning protection expert with nine NASA assignments completed as well as 20 years field experience in mining, refineries, data centers, the military, etc. He says he is always learning...always learning.

Astronomical Photometry with Consumer Digital Imagers, presented by John Hoot and Bob Buchheim.

With an inexpensive digital camera and free software, any student or amateur astronomer can now conduct astronomical photometry projects, with surprisingly small investments of money and time. This workshop will show you how it is done.

The workshop shall teach attendees the complete process of making accurate photometric measurements using commercial digital cameras. Both DSLR and “point and shoot” cameras shall be covered. Each step of the process will be presented.

Topics include: camera selection, mounting, target selection, exposure, calibration, data reduction, result presentation and submission. Examples of both unfiltered and multicolor differential photometry shall be presented. The workshop shall use open source and freely available software.

Mr. Hoot is president and founder of Software Systems Consulting, an engineering design firm specializing in robotics, instrumentation and signal processing. He is an electrical and computer engineer and has been an avid astronomer for over 50 years. He has designed and developed telescope control systems, CMOS and CCD imagers, radio telescopes, automated observatories, image processing and data capture and analysis systems.

Mr. Buchheim has been an electro-optical systems engineer, production manager, and amateur astronomer with a special love of photometry and educational applications. He is the author of The Sky Is Your Laboratory, a “laboratory manual” for backyard scientists.

Emily Lakdawalla to present Opening Talk

We are honored that Ms. Emily Lakdawalla has accepted our invitation to present the Opening Talk, to kick off the technical session on Wednesday morning.

Ms. Lakdawalla is Senior Editor at the Planetary Society, a contributing editor at Sky & Telescope magazine, and a passionate advocate for the exploration of all of the worlds of our solar system.

Many of you may be familiar with her blogs, photos, videos, podcasts, print articles, and social-media postings through which she shares the adventure of space exploration with the world. This promises to be a sparkling start to the SAS Symposium.

“ASTRONOMY: Hobby or Obsession?”

We are pleased to announce that science writer Mike Simonsen, recipient of the Astronomical League’s Leslie Peltier Award, and the British Astronomical Association’s Charles Butterworth Award is scheduled to present the keynote lecture after Thursday’s banquet.

Many of you know Mike from his work at AAVSO and his research on variable stars, but it turns out that he is also an insightful observer of the human condition ... specializing in the peculiar customs and dreams of the genus Homo Sapiens Astronomicus.

Mike will share with us a humorous look at amateur astronomers and the lengths, extent and expenses they are willing to go, to realize their celestial dreams.

Treat yourself and a guest to “dinner and a show”: Thursday evening’s banquet and Mike’s presentation. We promise an entertaining evening for all!

Reminders ...

Membership Renewal: Your SAS membership runs from May through April. Even if you can’t attend the annual Symposium, we value your participation in the Society for Astronomical Sciences, and your interest in small-telescope science. You can renew your membership on the website (SoCAstroSci.org), by going to the “Membership/Registration” tab.

Symposium videos: If you aren’t able to attend the annual Symposium, you can still watch the presentations. We plan to record the technical presentations again this year, and will post the
videos on the SAS website a couple of weeks after the Symposium.

The Workshop videos will not be available on-line, but you can order DVDs of the workshops. If you registered for the workshop, the DVD is $5. If you were not registered, it is $55 (per workshop).

Contact info: If you haven’t been receiving e-mail messages about the Newsletter and 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. The SAS never sells or shares your name or contact information without your explicit permission.

AAS Education Prize

The American Astronomical Society has awarded its 2013 Education Prize to Dr. John Percy, for his “… more than 40 years of tireless advocacy for K-12 astronomy education in Canada and worldwide … and promoting effective partnerships with amateur astronomers…” You may remember that Dr. Percy was the keynote speaker at the 2009 SAS Symposium.

Passing of Douglas Hall, noted astronomer and former director of Dyer Observatory

by Nancy Wise (courtesy of Vanderbilt University)

It is with sadness that we report the death of Dr. Douglas S. Hall, professor of physics and astronomy, emeritus, and former director of Vanderbilt Dyer Observatory, whom many of you knew and worked with. He died March 16 after a brief illness. He was 72.

Dr. Hall was a distinguished astronomer and scientist credited with several significant discoveries. He and his student researcher became the first to measure the mass and diameter of a very young double star, and then to demonstrate observationally that such very young stars assume a flat, toroidal shape during their early stages. “My analysis has revealed, quite unexpectedly, that one of the two stars is shaped like a doughnut, presumably as a result of extremely rapid spin-

ning,” Hall told the Tennessean in 1971. The discovery made national news headlines.

Dr. Hall was the co-discoverer of star spots (similar to sunspots) on stars, proposing that such spots were responsible for variations in the stars’ brightness. His work was key to establishing the origin of variability on close binary stars known as RS Canum Venaticorum variable stars. His working definition for them is still used today.

In addition to his many research interests, he served as director of Dyer Observatory for more than 15 years. His role at Dyer not only allowed him to do hands-on research, but it also made him the public face of all things celestial in the Nashville area.

Dr. Hall loved to share his knowledge with people, recalled Rocky Alvey, who was hired by Hall in 2000 and today is director of Dyer Observatory. “He was a very gentle, wonderful man—we’re about public outreach here—and he was great with the public,” Alvey said. “Some of my best memories are of public nights, or when we’d get calls about a meteor or something someone saw in the sky. Some of the questions were very out there, about UFOs or such, and he always dealt with them with a lot of tact or a little humor. He never made the person feel like they’d asked a stupid question.”

That joy of sharing astronomy with the public also was evident in his work with amateur astronomers. Hall encouraged backyard astronomers to contribute to his research and other scientific knowledge. He is credited for forging bonds between professional and amateur astronomers and was the founder and longtime leader of the International Amateur–Professional Photoclectric Photometry Group.

“He was the first astronomer to actively recruit and train amateur astronomers to make the kind of measurements needed to gather data,” said Gregory Henry, one of Hall’s graduate students who is now astronomer at the Center of Excellence in Information Systems at Tennessee State University. “This is now common, these citizen scientists, amateurs who are commonly assisting with scholarly research. He mentored amateur astronomers and harnessed the capabilities of what was there.

“He was also the first professional astronomer to take advantage of robotic telescopes. He would meet with amateurs across the country, and it was in such a meeting that the idea about creating an automated telescope first came about. In astronomy, researchers and amateurs would have to stay up all night, take measurements, write them down—it was tedious,” Henry said. “Lou Boyd in Phoenix succeeded in building the first telescope (in 1983) that could take the measurements that Doug and I needed.” Hall put Boyd and his telescope to work capturing data on 75 stars over four years. The consistent, accurate and efficient results proved to be a technological breakthrough for the time, prompting Hall to apply for and be awarded a National Science Foundation grant for an automatic photoelectric telescope for Vanderbilt in 1987.

“He was a giver of his time and expertise, not just with me but with the other graduate students and a bevy of amateur astronomers,” Henry said. “Doug was a teacher as well as a researcher. He loved to explain things in his area of expertise.”

“So many people look at the world and look at it through filters. He wanted to look at the truth,” Alvey said. “He was a great scientist. He looked at the stars and didn’t bring his preconceptions. He wanted to know what they were—the objective truth.”

He is survived by his wife; two sons, Bruce Douglas Hall and Brandon Scott Hall; one sister; and a brother.
SOCIETY FOR ASTRONOMICAL SCIENCES: 2013 SYMPOSIUM

Tuesday, May 21 Workshops

09:00 Photometry with DSLR’s and other digital cameras
     Hoot & Buchheim
14:00 Lightning protection for Critical Assets in Small and Large Observatories
     Richard Kithil

Wednesday, May 22

08:00 Coffee/Registration
08:40 Welcome
     Lee Snyder
08:50 Kickoff presentation
     Emily Lakdawalla
09:20 Call for Observations of the 2013 LADEE Mission to the Moon
     Brian Cudnik
09:40 JEE2012 Observing Campaign Results
     Scott Degenhardt
10:00 Using JPL Horizons Database to Predicts Jupiter Extinction Events
     Wayne Green
10:20 Coffee Break (20 minutes)

-Solar System Research-

10:40 4-Point Backyard Diurnal Parallax Method
     Eduardo Alvarez
11:00 Binary Asteroid Discovery and Analysis at the Palmer Divide Observatory
     Brian Warner
11:20 Radar Observations of Asteroids
     Lance Benner
12:00 Lunch (2 hours)

-Variable Stars-

14:00 Follow-up Observations from the MOTESS-GNAT MG1 Variable Star Catalogs
     Roy Tucker
14:20 Contact Binary Star Candidates in the MOTESS-GNAT Catalogs
     Eric Craine
14:40 Eclipsing Binaries with Possible Tertiary Components
     Lee Snyder
15:00 Multi-Effect Variables in the Kepler Database
     Jerry Horne
15:20 Coffee Break (20 minutes)

-On the Campaign-

15:40 Speckle Interferometry of Close Double Stars
     Russell Genet
16:00 Searching for White Dwarf Exoplanets
     Bruce Gary
16:20 Sponsor Infomercials

Thursday, May 23

08:30 Coffee

-Outreach Programs-

08:40 Research, Education, and Outreach at the Oakley Observatories
     Richard Ditteon
09:00 Telescope Education Outreach
     Gilbert Clark
09:20 The Joy of Finding Things Out: Children's Astronomy Outreach
     Tom Munnecke
09:40 Bohdan Paczynski: A Big Science Polymath Promoter of Small Telescope Science
     Rob LaPointe
10:00 Coffee Break (20 minutes)

-Special Projects-

10:20 Sedona Roadway Lighting Project: Implications on Observational Astronomy
     Eric Craine
     Erin Craine
11:00 Putting the New Spectrometer to Work (Part II)
     John Menke
11:20 Spectroscopic Study of the Blue Component of Alberio
     Kenneth Whight
11:40 Group Photo / Lunch (2 hours)

-Remote Observatories-

14:00 21st Century Lightning Protection for High Altitude Observatories
     Richard Kithil
14:20 Configuring a Large Dobsonian for Remote Imaging
     Richard Stanton
14:40 Oasis Under a Canopy of Stars
     Robert Stephens
15:00 Good Night, and Good Luck
17:30 Dinner
19:00 Banquet Speaker
     Mike Simonsen
Small-Telescope Astronomical Science in the News: January – March 2013

compiled by Bob Buchheim

Certainly we all wish we had access to a larger telescope, at a higher and darker site ... but the most productive telescope is the one that gets used regularly. There are a wide range of research projects that are within the capabilities of a backyard-scale telescope, and that can provide valuable information about the universe, when undertaken by a student, amateur astronomer, or small college observatory. Here are examples of such research that were published in the past few months.

Ole Roemer’s method still on the stage: The study of two bound eclipsing binaries in quintuple system V994 Her
by P. Zasche and R. Uhlar

Here is a tricky study of an eclipsing binary system. V994 Her consists of two pairs of stars. Each pair is an eclipsing binary, and the two pairs are gravitationally bound to each other (in a 6.33-y orbit), making for a very complicated lightcurve. This paper presents an O-C (Observed minus Calculated) study of the times of eclipses (from both pairs). The O-C curve displays the apsidal motion of each pair, and the effect of their mutual orbit. Plus, it appears that a nearby star (about 1 arc-sec away from the two EB’s) is also gravitationally related to this system, making it a quintuple system.

As the authors note, it is quite remarkable that all of their data was gathered with an 8-inch (20-cm) telescope by an amateur astronomer (Mr. Uhlar) in his private observatory.

The Extended Optical Disk of M101
by Christopher Mihos, et al

This paper reports deep CCD images of the spiral galaxy M-101, taken with the 61-cm (24-in) Burrell Schmidt telescope at Kitt Peak. Capturing the faint glow of the outer galaxy’s halo is a challenge. The authors made long exposures — e.g. 20-minute exposures in B-band — and then summed about 60 such images and re-binned them (32x32 pixel median binning) to get a decent signal. (The flux density of the galaxy halo is significantly smaller than the flux density of the “black” night sky.) Finally, their B and V-band photometric zero-points were calibrated to SDSS photometry.

The deep images show a few interesting effects. First, any pretty astro-image of M101’s spiral arms shows that its nucleus appears to be off-center, with the arms stretching significantly farther toward the southwest. Curiously, the faint outer halo glow extends farther to the northeast; so the nucleus is still “off center” relative to the halo, but in the opposite direction. There is also an extension of the halo toward the east (the authors call it the “East spur”), which might or might not be related to the dwarf companion galaxy NGC 5477.

The authors find none of the long extended tidal tails that are expected from recent galaxy interactions.

The B-V color of the halo is neither constant, nor azimuthally symmetric. The “bright” spiral structure of the galaxy displays the expected radial trend in color (redder at the nucleus, bluer in the spiral arms). The “East spur” of the halo is relatively red, whereas the extended halo toward the northeast is very blue.

Deep imaging of galaxy halos requires wide field of view (about 2.5 deg square, in this example) and long integration times, but (as R. Jay Gabany demonstrated at SAS a couple of years ago) are within the capabilities of the diligent amateur astronomer. The photometric characterization of these faint structures is far from simple, however. This paper gives a nice discussion of some of the methods that the authors used to deal with low signal levels, extremely wide dynamic range, and sky-glow; so if you are up to the challenge, this is a reference worth reading in detail.

The 2012 Rise of the Remarkable Type IIn SN 2009ip
by Jose L. Prieto, J. Brimacombe, et al

The star under consideration is (was?) a luminous blue variable, which had been observed to undergo eruptive mass-loss events three times in the past 5 years. The most recent outburst began as an eruptive mass-loss event, and then apparently morphed into a genuine Type II In supernova.

Author J. Brimacombe monitored the photometry of the event from his private observatory, using two telescopes: a 33-cm (13-in) RCOS (in R-band) and a 41-cm (16-in) RCOS in I-band. The “observatory” is a platform on the roof of a condo building near Cairns, Australia — so this paper proves that you can do valuable science with a modest-sized telescope in really challenging observing conditions! His observations captured the initial brightness rise of the supernova, which brightened at a peak rate of 0.5 mag in 6 hours. This data set will undoubtedly be evaluated in the context of spectroscopic studies (at slower cadence) of this unusual event.

BVRcIc Observations and Analyses of the Dwarf Detached Binary V1043 Cassiopeia and a Comment on Precontact W UMa’s
by R. G. Samec, et al

One approach to organizing the diversity of W UMa binaries is to envision a process of aging. Starting with two close stars; angular momentum loss (from stellar winds) causes them to grow closer, until they eventually merge, to be “reborn” as a single star. In this scenario, there should be some binary systems that are just heading into this process. They would be detached — but short-period — systems, both stars solar-type. The authors of this paper call them “Pre-contact W UMa binaries (PCWBs).

This paper presents a photometric study of one such system: V1043 Cas, based on multi-band CCD photometry from an 80-cm (31-in) telescope. The lightcurves are unsurprising Algol-type curves, showing a deep primary and shallow secondary eclipse. Modeling of the system indicates the two stars are similar in mass (mass ratio q= 0.9) and that fairly large star-spots must be invoked to match the details of the lightcurves.

The authors note that if — as they believe — this system is indeed a pre-contact system, then its orbit period should gradually get shorter. They request periodic eclipse timings so that an O-C curve can be constructed to test this expecta-
tion. At this point, there is insufficient history of timings to draw any conclusion. Such timings are well within reach of CCDs on backyard-scale telescopes.

The Return of the Andromedids Meteor Shower by Paul A. Wiegert, et al

This isn’t a “small telescope” research report, but it may interest those of you who enjoy meteor showers. The Canadian Meteor Orbit Radar observed enhanced flux of meteors in 2011 December, whose radiant and orbits corresponded to the defunct Andromedids meteor shower (remnants of comet 3D/Biela). Those of you who heard Dr. Jennisken’s lecture at SAS a couple of years ago will be pleased to know that his “Cameras for All-Sky Surveillance” (CAMs) project—which he described—also saw this outburst of activity.

The authors predict that the next intense Andromedid shower isn’t expected until 2018; but they also note that their model of the several meteor streams shed by the comet isn’t definitive for the next several year’s showers. So, you may want to monitor this shower, in late November – early December. The authors note that “...careful observations of these showers over the coming years could allow some measure of post-facto dust measurement or even orbit improvement for this intriguing comet.”

The Eclipsing Binary RU Eridani by Richard M. Williamson, et al
*Publ Astro Soc Pacific*, v125, 2013 January

Here is a report on photoelectric photometry (in U, B, V bands) of RU Eri, done on a 90 cm (35-in) telescope, augmented with previously-published radial velocity data. Unfortunately, the radial-velocity data did not detect the secondary star, so the authors had to use a “q-search” analysis to estimate the system’s mass ratio (they found q=0.53 ±0.1). The star turns out to be a near-contact system: the primary star fills its Roche lobe, and the secondary star is almost filling its Roche lobe. There is a hot spot on the secondary star. The stars aren’t “touching”, and aren’t in good thermal contact: the two stars have significantly different colors and temperatures.

An evaluation of eclipse timings over the past 65 years suggests that the orbital period is probably decreasing; but there is quite a bit of scatter in the data points (most of which are from visual timings). A period decrease is expected if mass is flowing from the primary to the secondary star.

The authors conclude by noting that “Continuous monitoring of eclipse timings is needed to confirm the decline in orbital period. Amateur astronomers have an important role to play...”

Mode Parameters of δ Scuti Stars V830 Her and HD 163032 with Four-Year Data from the Taiwan Automated Telescope Network by Javier Fernandez, et al
*Publ Astro Soc Pacific*, v125, 2013 January

Small telescopes have been pressed into service for a variety of photometric projects (exoplanets and variable stars). Here’s one of the smallest-aperture arrays that I’ve read about: The Taiwan Automated Telescope Network comprises four telescopes, each a 9-cm (3.45-in) Questar. The four telescopes are widely scattered in longitude: one each in Taiwan, mainland China, Uzbekistan, and Spain. (It’s nice to see that Taiwan and the PRC have reached a level of cordiality that permits them to collaborate on science projects).

The idea here was to make dense time-series (unfiltered) photometry that provided almost-continuous coverage of these two δ-Scuti stars (which are fortuitously located in the same field of view); with the objectives of (1) determining the dominant pulsation modes and (2) searching for changes in mode amplitude and/or phase over the four-year run of observations.

Their photometric accuracy is pretty impressive, giving very clean curves of the brightness variations that amount to just about Δmag≈ 0.1 mag (peak). Their stated photometric accuracy is better than 10 mmag.

Their data reduction and analysis was quite meticulous, designed to detect and correct for very slight night-to-night and site-to-site variations. The conclusion was that, over their observing interval, there was no detectable change in the amplitude of phase of any of the half-dozen pulsation modes that they detected in each star.

The Near Contact System EG Cephei by Ronald Angione and John Sievers
*Publ Astro Soc Pacific*, v125, 2013 January

Here’s a neat example of a “self-contained” complete study of an eclipsing binary system. The authors collected both photometric and spectroscopic (radial velocity and spectral type) data using modest telescopes—a 60-cm (24-in) telescope for CCD photometry in Stromgren “uvby” bands, and a 100-cm (40-in) ‘scope for spectroscopy.

They find that the system is detached but “near contact”. The primary star is a main-sequence star. However, the secondary star is larger in diameter than would be expected for an isolated main sequence star of its mass.

The Death Spiral of T Pyxidis by Joseph Patterson, et al
pre-print at ArXiV (1303.0736)

Lead author Dr. Patterson is the founder of the Center for Backyard Astrophysics, and all of the other authors are participants in that collaboration of small (backyard-scale) telescopes. You may recognize the names of many of them: Arto Oksanen, Berto Monard, Robert Rea, Franz-Josef Hambisch, Jennie McCormick, Peter Nelson, Jonathan Kemp, William Allen, Thomas Krajci, Simon Lowther, Shawn Dvorak, Thomas Richards, Gordon Myers, and Greg Bolt.

The subject of this paper is the cataclysmic variable (CV) star T Pyx, and the unexpected discovery that the team found, based on a 15-year photometric effort that gathered thousands of hours of time-series photometry. T Pyx, like all CV’s is a system consisting of a white dwarf surrounded by an accretion disk that collects mass from a companion more-or-less normal star. As mass accumulates on the white dwarf, it reaches a threshold and undergoes an eruption, which (in the case of T Pyx) makes its brightness rise by about 9 magnitudes. This is a dwarf nova. It is often suspected that the net long-term average of mass accumulation (during “quiescence”) and occasional outbursts, is that the white dwarf gradually increases its mass until it reaches the point where it can go out in a blaze of glory as a type Ia supernova.

Unfortunately, it turns out that in the case of T Pyx, an analysis of the orbital period (from the “O-C” diagram of the minimum light in the photometry) shows that the white dwarf is, net, losing mass— not gaining it. So T Pyx is no longer a very good candidate for being a SN Ia progenitor. This
probably raises a host of questions about SNe Ia and CVs, that deserve more study of more stars, by more “backyard scientists”.

**Seven-Year Multi-Color Optical Monitoring of BL Lacertae Object S5 0716+714**
by Yan Dai, et al

Cosmology with a small telescope? Yes, it turns out that the old formula of compensating for small aperture with long observing runs, works with active galactic nuclei. The authors report a 6.5 year series of multi-color photometric observations of this bright BL Lac object, done with a 60-90 cm (24-35 in) telescope and CCD sensor. The target brightness varies from about 13th to 15th magnitude, on a variety of time scales ranging from intra-night variability to year-long cycles. They caught the object changing by 0.1 magnitude in just a couple of hours, and nearly 2 magnitudes over about 6 months.

The principal focus of their study was color-vs.-brightness characterization. In general, the object is “bluer when brighter”. One method used to interpret the activity is to plot color vs. brightness in a time-cycle. Eruptions may follow a “clockwise” or counter-clockwise path in such a diagram, which provides useful information about the competing forces exerted on electrons in the active region. They found one very clear counterclockwise loop, which probably illustrates the particles gradual acceleration during the flare.

**New Classification and Basic Stellar Parameter of SW Equulei**
by O. Behre and M. Hunsch

Occasionally, very surprising results come up when you set out to replicate someone else’s observations. This paper is an example. The target star (SW Equ) has been generally classified as a W-UMa type contact eclipsing binary. However, the authors illustrate – by re-printing the lightcurve that led to this conclusion – that the original lightcurve is pretty noisy and may not stand up to skepticism. They conducted a very long project of sporadic photometric monitoring over three years, using a 35-cm (14-in) telescope and CCD camera. What they found was that the lightcurve is roughly a triangle-wave, with the characteristic fast rise and slow decay that is characteristic of some types of pulsating stars. A very detailed Fourier analysis of their lightcurves offer strong support for their conclusion that it is an RR Lyra type “overtone” pulsator. The interaction between the fundamental and overtone periods results in a very complicated lightcurve, and requires long spans of observation to unravel. Score one for the philosophy of “small telescope plus long observing run”, for finding the true nature of this star.

**Asteroids’ Physical Models from Combined Dense and Sparse Photometry and Scaling of the YORP Effect by the Observed Oblliquity Distribution**
by J. Hanuš et al
pre-print at ArXiv 1301.6943v1

Asteroid lightcurves derived from small-telescope time-series photometry are the principal source of data for this work, which reports shape models (from lightcurve inversion) and assessment of the rotational state (including changing spin axis and spin rate, caused by the YORP effect) of 119 asteroids. The author list is long, and contains quite a few names that SAS members may recognize, including: B. Warner, R. Stephens, F. Pilcher, R. Behrend, W. Cooney, R. Durkee, D. Higgins, R. Koff, G. Masi, D. Polishook, and R. Roy. If you have ever wondered if it is really worthwhile to submit your asteroid lightcurve data to ALCDEF (in addition to publishing it in Minor Planet Bulletin), the answer is “yes, indeed!” Much of the raw data that made this research possible came from ALCDEF.

It is particularly valuable to have a large number of well-characterized lightcurves (from several apparitions, for each asteroid) because in addition to the study of individual objects, the availability of a large sample makes possible the statistical characterization of entire populations. This research took such advantage, and discovered that the magnitude of the YORP-torques seems, on average, to be significantly less than previously expected. The most likely reason for this reduced torque is that the “previously expected” torque was calculated on the assumption that asteroids were smooth bodies. When the model is updated to assume (more realistically) that the surface is rough on many scales (from small pits to pretty big boulders), the YORP torque is reduced.

**Binarity and Pulsation in Algol-Type Binary System SX Draconis**
by E. Soydugan and Y. Ka_car

Now here’s something that you don’t see every day: an eclipsing binary that contains a pulsating star. SX Dra is an Algol-type eclipsing system (Period = 5.17 d) that shows a deep flat-bottomed primary eclipse (ΔV≈1.8 mag) and shallow (ΔV≈0.2 mag) secondary eclipse. The authors used CCD photometry with a 40-cm (16-in) telescope, observing over 39 nights (nearly 200 total hours of “shutter open” time) to map a complete lightcurve in B- and V-bands. The results were used for system modeling (with the Wilson-Devinney code), O-C analysis of period changes, and Fourier analysis of the residual light variation.

Wilson-Devinney analysis shows this to be an Algol-type system, with the secondary component filling its Roche lobe. The history of eclipse timings presents an O-C curve that has a parabolic-plus-sinusoidal shape. The parabolic term indicates that the orbital period is increasing; presumably due to mass-transfer from the secondary to the primary star. The sinusoid term could be a light-time effect (from a third body) or a manifestation of magnetic activity. The authors consider both possibilities. A third body would have to be more massive than the sum of the primary and secondary stars (and therefore brighter, assuming that it is a star); since no evidence for third-light is seen in the W-D solution, they reject this possibility. Magnetic activity in the primary is plausible, given the mass, temperatures, and position in the H-R diagram that is implied by the W-D solution, so they prefer this explanation.

The photometric data points show a noticeable scatter around the W-D solution, larger than can be explained by the SNR. When the modeled EB lightcurve is subtracted from each data point (to give the residual light variation), and this residual is studied by Fourier analysis, two clear periods show up, each with an amplitude of about ΔV=0.02 mag P-P (a bit larger in B-band) and period of about 1 hour. These are interpreted as delta-Scti pulsations in the primary star.

The authors note that one thing is badly needed to finish the characterization of this system: a spectroscopic
study. There is some disagreement in the literature about the spectral types of the two stars, and (most importantly) a radial-velocity curve would pin down the mass ratio and absolute dimensions of the system. At 10\textsuperscript{th} magnitude this is a tough target for small-telescope high-resolution photometry, but the long period will permit the use of long exposures. Are any SAS spectroscopists up to this challenge?

You have heard several SAS Leaders remind you of the importance of publishing your data, either as a paper or by submitting it to a recognized data archive such as ALCDEF for asteroid lightcurves, or the AAVSO database for variable stars.

Don’t let your data lie unseen in a dusty file cabinet! Eventually, both it and you will perish.

Notwithstanding the wisdom of this repeated advice, there is something romantic about dusty old observing notebooks. These are in the Harvard College Observatory archives. The HCO collection includes Ms. Henrietta Leavitt’s original notebooks, one of which is shown in the inset. (photo by Bob Buchheim)
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SAS Contact Information

8300 Utica Avenue, Suite 105
Rancho Cucamonga, CA 91730

Lee Snyder: lsnyder@socastrosci.com
Robert Stephens: rstephens@socastrosci.com

Newsletter Editors:
Dale Mais: dmais@socastrosci.com
Bob Buchheim: Bob@RKBuchheim.org

On the web: www.SocAstroSci.org

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