News from The Society for Astronomical Sciences

Vol. 8, Number 2

Report from the 2010 Joint SAS/CBA Symposium

The 2010 Symposium on Telescope Science saw over one hundred amateur and professional astronomers gather in Big Bear, CA to share recent research results, methods, and instrumentation related to small-telescope astronomical science. This year's Symposium was a joint gathering of the Society for Astronomical Sciences (SAS) and the Center for Backyard Astrophysics (CBA). During two full days of technical presentations, the topics ranged from variable stars (of several different types) to asteroids to Jovian satellites, and included CCD photometry, video photometry, spectroscopy, polarimetry, and radar methods of observation. In addition, about fifty people attended the "day before" tutorial workshops on "Small-telescope Spectroscopy" presented by Olivier Thizy and "Calibrating CCD Imagers" presented by Richard Berry. Attendees were treated to new-product highlights from several of the sponsor companies, and quite a few impromptu networking discussions could be found surrounding the conference location. The event was rounded out by the traditional banquet and a wonderfully entertaining presentation by Chris Butler on "Our Little Corner of the Galaxy".

Darrell Moon calibrates his CCD camera
photo by R. Stephens

ε Aurigae

The ongoing first-half of the eclipse of epsilon Aurigae naturally generated several presentations. Considering its 27-year interval between eclipses, this may not be a "once in a lifetime" event, but it is certainly an "only two or three chances in a lifetime" opportunity to gather data about this stellar eclipse. Dr. Bob Stencel described his photometric and spectroscopic results: modulation of the potassium line hints that there may be rings in the occulting object, and the reason for the excess H-α absorption is still a mystery. Jeff Hopkins showed the photometric evolution of the entry into eclipse, providing detail that isn't available for previous eclipses. He pointed out that continued consistent monitoring of this object is still important. The next effect to watch for is the

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mid-eclipse brightening, which might begin any time now and continue through late 2010 (and which was not captured at all during the last eclipse).

Gary Billings described his rapid-cadence observations, which gave the important "null result" that there are no coherent variations in brightness at periods between a few minutes to a few hours (to within about ±0.01 mag).

If the occulting object contains a mass of dust, we'd expect to see a change in polarization as the eclipse progresses. Gary Cole described the polarimeter he developed to search for this effect. So far the polarization of the star seems to be constant at 2.3% ±0.1%, but monitoring must continue throughout the eclipse.

Variable stars

The small-telescope research community has long needed an all-sky network of photometric "secondary standard" stars. Such a network will be a boon to both variable-star and asteroid studies. Tom Smith described the equipment, procedures, and progress of the APASS (AAVSO Photometric All-Sky Survey). This project will yield an all-sky net of photometry in B, V, g', r', i' bands, from magnitudes 10 to 16.5 – meaning that we can be pretty sure that several well-characterized stars will be in any CCD field of view.

Creating accurate lightcurves of variable stars is an ongoing need, to augment the data coming from surveys and enable complete and accurate characterization of these stars. Jerry Horne made detailed follow-up observations of several stars that had been tentatively identified as RRc-Lyra stars by the ROTSE satellite data. He was able to see multiple periods, and in a few cases show that the RRc-Lyra classification was questionable.

Since this was a joint meeting with the Center for Backyard Astrophysics, there were naturally several presentations on cataclysmic variable stars, including an excellent introduction and overview of the physics and observational aspects of these stars, by Dr. Joe Patterson. Small-telescope photometry by amateur observers – who can collaborate to provide 24-hour coverage of a target star – is critical to characterizing the behavior of these stars.

Robert Koff presented the photometric study of cataclysmic variable TT Arietis, coordinated by CBA during its fade in late 2009, and supported by a large number of CBA and AAVSO observers. The lightcurves showed 1-2 magnitude "spikes" every few days, along with lower-amplitude, very rapid fluctuations. These CCD data can be evaluated in conjunction with contemporaneous UV (Galex satellite) and x-ray (Swift satellite) observations.

Mike Simonsen described the "Z CamPaign" to observe a particular type of dwarf nova whose prototype is Z Camelopardalis, which is being coordinated by the cataclysmic variable section of the AAVSO. These stars are in need of careful photometry and, because they are relatively poorly studied, there is good potential for finding something new and interesting.

Spectroscopy

John Menke presented his spectroscopic observations of the outburst of U Scorpii, a recurrent nova that burst almost right "on schedule" in January, 2010. With his 18-inch telescope and commercial (SBIG) DSS-7 spectrometer, Menke was able to detect the Doppler shift in the H-α line and the gradual changes in spectral line shape and depth as the eruption progressed. These data are likely to appear in upcoming publications about the eruption.

Olivier Thizy presented a practical – and ongoing – example of pro-am collaboration in spectroscopy focused on the Be stars. These are hot "B" stars whose spectral lines change from emission to absorption as the star cycles. Amateur records of Hα variability are being collected into the BeSS (Be star spectra) library where they are available to professional astronomers who are studying these systems. A measure of the success of this project is that there are now 10,000 spectra in the database, the vast majority of them contributed by amateur astronomers with modest-size telescopes and modest-cost commercial spectrometers.

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The workshop on "calibrating CCD Imagers" included the opportunity for participants to characterize their own imagers, using a special lightsource and software developed by Jerry Foote. Photo by R Stephens

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Solar System

The mutual events of Jovian moons have been exploited for a variety of purposes over the centuries. Scott Degenhardt appears to have broken new ground by combining video observation of mutual events (occultations) with photometry of the video stream. He presented compelling evidence of the light-curve signature of the atmospheres of Io and Europa. This is a remarkable achievement from a small ground-based system.

Asteroids continue to provide a diverse array of opportunities for amateur scientists. Dr. Lance Benner showed some recent very detailed radar observations of near-Earth asteroids, and noted that this is one of the subjects where pro-am cooperation has recognized value. Amateur asteroid astrometry improves the ephemeris so that the narrow-beam radar can be accurately aimed in three dimensions (RA, Dec, and Doppler range-rate). Dr. Benner suggested two important upcoming targets for which both pre-encounter astrometry and photometric lightcurves will assist in the radar data analysis: 2002 CY46 will be about mag 16.3 in August, and (3838) Epona will reach mag 15.5 in November.

Dr. Alan Harris discussed "the Divine Dypsomania" of asteroid studies – once you begin it is difficult to quit! – and he offered several topics (and challenges) for small-telescope research, such as characterization of recently-separated heliocentric asteroid pairs.

Asteroid phase curves present a challenging photometric project that can yield good rewards by providing relatively rare data (fewer than 150 phase curves have been published) and unique information about the surface properties of asteroids. Robert Buchheim described his observation and data reduction methods, and presented two phase curves created from his observations of 1130 Skuld and 535 Montague.

The very-nearest astronomical targets discussed this year were meteors. Wayne Green presented imaging system parameters and a data analysis approach to determine meteor trajectories from multi-station wide-field camera systems. Robert Stephens and Ralph Megna then reported on observations and trajectory analysis of a bolide observed at the Riverside Astronomical Society's Goat Mountain Research Station. They realized that the same bolide had been featured in an "astronomy Picture of the Day" imaged by Wally Pacholka. By combining the two observations, they were able to estimate the trajectory of the object as it flew over

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Membership Information

Membership in your new Society for Astronomical Sciences (SAS).

As was pointed out with the last issue, it was felt that a modest membership fee would greatly help SAS to produce a better product for its members. This fee will be $25.00 per year. What will this membership fee provide? Well for one thing it WILL NOT go to any committee members as part of their efforts within SAS. We volunteer our time for The Society.

Members will receive a discount for the registration fee each year for the Symposium at Big Bear. It will assure you that you will get a copy of the published proceedings each year, even if you do not attend the Symposium. It will help defray costs in bringing in outside speakers (professionals) to the symposium.

Membership is annual and runs from July to June of the following year. To become a member, send $25 to: Society for Astronomical Sciences, 8300 Utica Avenue, Suite 105, Rancho Cucamonga, CA 91730. You may also join online at the registration page of the web site. Membership dues are tax deductible.

The SAS is a 501(c)(3) charitable organization.

Your Participation Wanted!

As I have mentioned in previous Newsletters, we need your participation in the Newsletter. We don't want this to become a one person or just a couple person show. If you have an article which can cover a variety of topics, please put it together for a future Newsletter. Work in progress is always welcome. In addition, we have started a "letters to the Editor" section where we would like to add 2-3 letters from the members/participants. We had no letters to incorporate into this Newsletter edition. Constructive comments are always welcome as we are always looking for ways to improve not only the quality of the Newsletter but also the quality of the Symposium. We want the SAS to become a year around organization not just a once a year group.

Contact Us:
8300 Utica Avenue, Suite 105
Rancho Cucamonga, CA 91730

Email:
Lee Snyder: lsnyder@socastrosci.com
Robert Stephens:
rstephens@socastrosci.com
Dale Mais: dmais@socastrosci.com.
Newsletter Editor

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southern California.

Telescopes

There are some projects where light-gathering aperture is the enabling parameter, and optical quality is relatively unimportant. Dr. Russell Genet described some of the science programs that can be conducted with a "light bucket" telescope – such as lunar and asteroid occultations, fast-cadence photometry, polarimetry, and (maybe) stellar intensity interferometry – and which should be within the reach of energetic amateur astronomers and small college observatories.

Education

One of the neat things about small-telescope research is that it is readily accessible to undergraduate students, and that astronomical projects provide the students with practical application of a variety of mathematical, statistical, and critical-thinking skills. Doug Walker described his experience injecting astronomical projects into a non-astronomy class.

The Future

Where is small-telescope research going? How and where are amateurs contributing to astronomical science? What are the "next big things" for pro-am collaboration? The professional astronomical community has its Decadal Surveys to focus funding requests and strategic goals. Aaron Price described a recently-organized initiative of AAVSO to conduct the first Decadal Survey of Amateur Astronomy and Astrophysics to assess these topics and make specific recommendations. White papers contributing to this goal are currently being solicited. To participate, go to www.decadal.aavso.org.

Dr. Arne Henden provided some "extreme photometry" challenges for the assembled multitude. Every nova is different and each one needs continued observations through at least one year after the outburst. Will more amateurs step up to this need and fill in the too-sparse data sets for many novae? One of the Cepheids in M-31 is "only" mag 19.4. Can any backyard scientists reproduce Hubble's groundbreaking observation of its lightcurve? HM Cnc is the fastest-known eclipsing binary, with a period of only 5.4 minutes. At mag 21, can any amateur reproduce its eclipse lightcurve and determine reliable times of minimum?

Conclusion

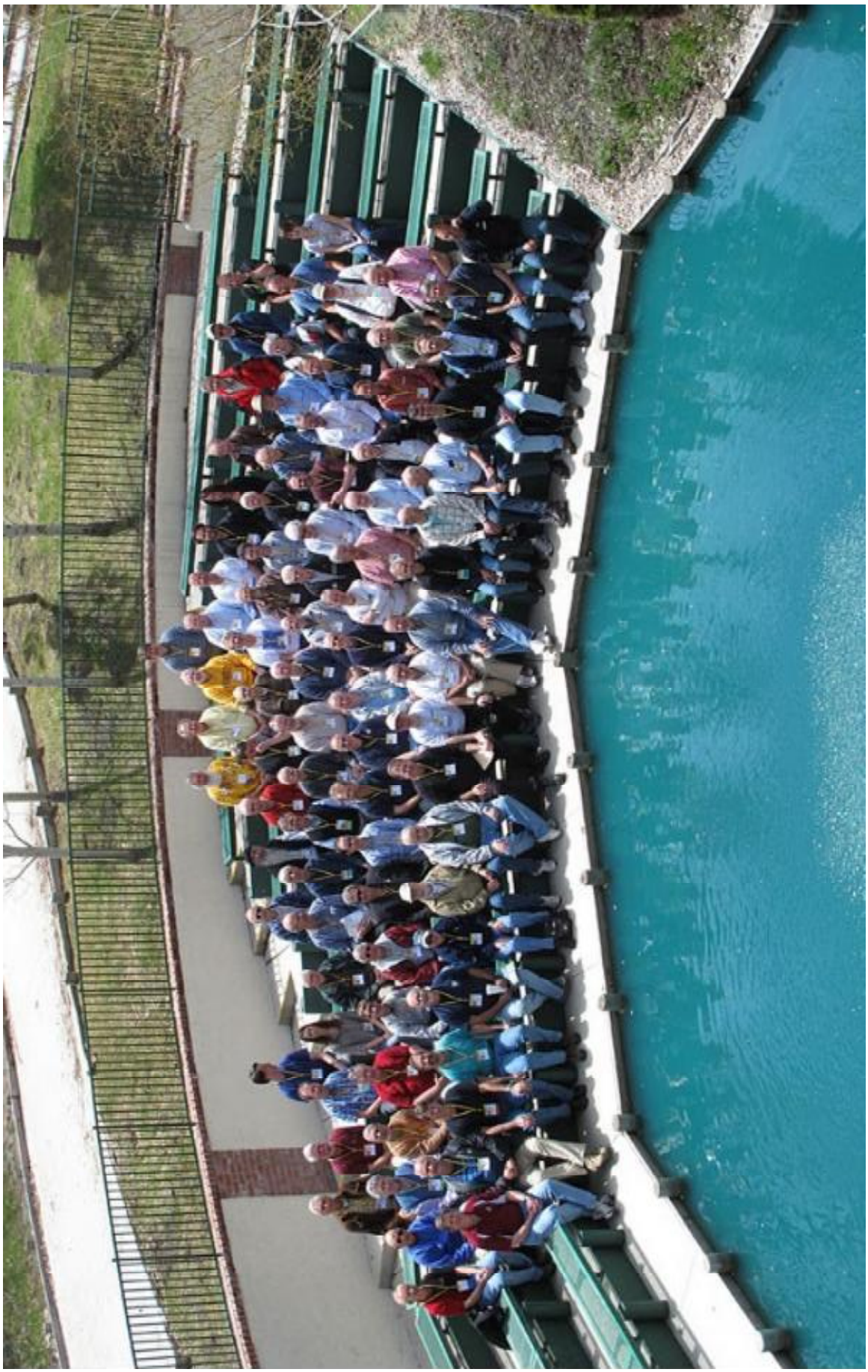
The 2010 Symposium provided a window into small-telescope science, and some of the opportunities for collaboration between amateur and professional astronomers. This was the 29th SAS Symposium, and the progress on display bodes well for the future of small-telescope astronomical science!

The 2011 Symposium will be held at Big Bear, CA on May 24-25-26.

By Bob Buchheim

The Northwoods Inn provides a comfortable venue for the SAS Symposium. Photo by R. Stephens

The "calibrating CCD Imagers" workshop brought a busy group of CCD users together. Photo by R. Stephens



The traditional "group photo" brought everyone to the lagoon.

Photo by R Stephens

Information regarding the Photometry workshop sponsored by the SAS at the upcoming PATS. For more information please see the SAS web site: http://www.socastrosci.org/

Photometry Workshop Early Registration

Early registration is strongly encouraged. This allows us to prepare the software distribution packages in advance.

Payment can be made via PayPal to the Society for Astronomical Sciences (http://www.SocAstroSci.org) or you can send a check with the information below to:

Society for Astronomical Sciences
PATS Workshop
8300 Utica Ave., Suite 105
Rancho Cucamonga, CA 91730-3880
Email: rstephens@foxandstephens.com

Registration Fee:
$40 (Received on/before Sept. 5, 2010)
$50 (Received on/after Sept. 6, 2010, or at the door)

Registration Information

Name: _____

Address: _____

_____

City: _____

State: _____ ZIP: _____

Phone: _____

Email: _____

Your information will not be given to any other parties. We need the phone and email information in case there is a problem processing your registration. Please make sure the email address allows messages from "unknown" addresses, e.g., you block messages from anyone not on a "white list."

Backyard Astronomical Research

Providing scientifically-useful data from your backyard observatory is not impossible. In fact, hundreds of amateurs around the world are doing it even now with little more than a modest telescope and CCD or DSLR camera. Even visual observations are worthwhile in many cases.

To help you get started with the basics of CCD photometry, the Society for Astronomical Sciences is sponsoring a half-day workshop during the Pacific Astronomy and Telescope Show (PATS) in downtown Pasadena, CA, in September 2010. Copies of MPO Canopus and a printed Users Guide will be given out at no additional charge. The workshop will be "hands-on" for those who want to follow along during the demonstrations but you can also just watch and listen so that you can work with the software at your leisure with a better understanding of how to get started.

Workshop Information

Computer Requirements:
The MPO Canopus software is a Windows® program. It has been tested on Win98 through 64-bit Windows 7. *Windows XP and Windows 7 users must turn off UAC before and after installation.* Canopus has been run on Macs using Parallels but all files must be on a local Windows drive. ***We cannot troubleshoot Mac installations.***

Your laptop must have a DVD-R compatible drive and sufficient battery power to get through the program if you plan to follow along. AC outlets may be available but we cannot guarantee that there will be enough outlets for all.

Date:
Saturday, September 18, 2010

Schedule:

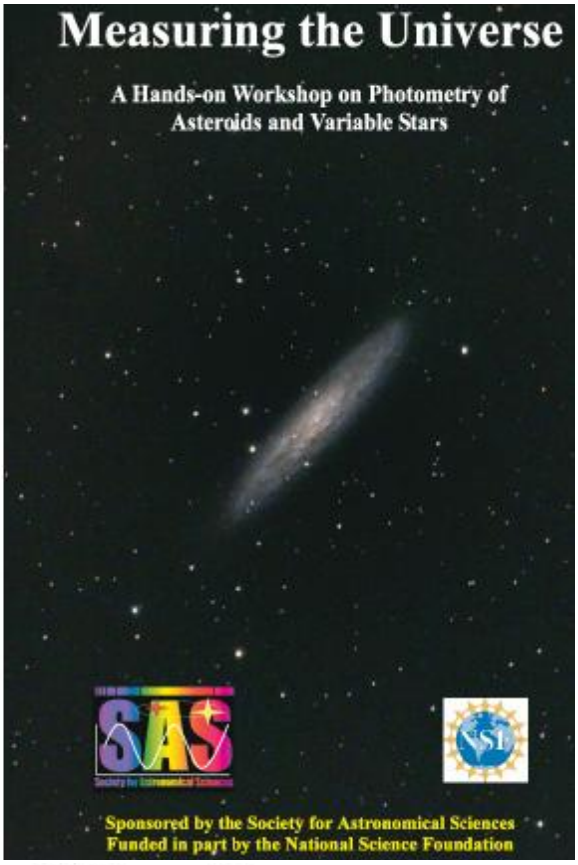
07:45-08:30	Software installation and coffee
08:30-09:45	Asteroid photometry
09:45-11:15	Break (Alex Filippenko talk from 10:00-11:00)
11:15-13:30	Variable star photometry

Fee: $40 (Received on/before Sept. 5)
$50 (Received on/after Sept. 6)

Please see back cover for early registration information

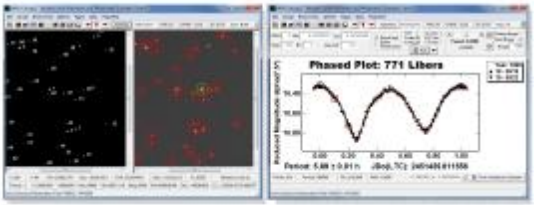
PACIFIC ASTRONOMY AND TELESCOPE SHOW PATS
http://www.mscastronomyexpo.org/PATS.htm

SAS
http://www.SocAstroSci.org



MPO Canopus Software

Complete working copies of MPO Canopus software and a printed version of the MPO Users Guide are providec as part of the workshop fee. The Users Guide is a set of step-by-step tutorials covering the essentials of astrometry and phctometry in MPO Canopus.



Canopus is used world-wide for astrometry and photometry of asteroids and variable stars. The majority of lightcurves submitted to the *Minor Planet Bulletin* were generated by Canopus. Thousands of CCD observations measured with Canopus have been submitted to the AAVSO and the *Journal of Double Star Observations*.

What will be Covered

Asteroids

- The special requirements for working asteroids
- Using multiple comparison stars (ensemble photometry)
- Putting observations onto a common system
- Measuring CCD images for photometry using Canopus
- Determining the rotation period of an asteroid

Variable Stars

- Importing comparison star photometry data from the AAVSO web site
- Batch processing of images tc obtain a variable star lightcurve
- Generating and submitting reports to the AAVSO

NSF

The software and printed Users Guide are made available at cost through NSF grant AST-1032896. The workshop fee goes entirely to the Society for Astronomical Sciences to cover facility costs. The workshop presenter receives no honorarium. NSF funding does not constitute an endorsement of SAS and/or MPO Canopus.

Dispatches from the Members

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Bits and Pieces

Bob Buchheim

Small-Telescope Science in the News – April - May 2010

I thought it might be fun to do a quarterly review of the "small telescope science" that has shown up in the literature or on the news. By "small telescope" I mean "within the range of telescopes and instruments that we backyard scientists might own or have easy access to"; and by "literature or news" I mean "published in peer-reviewed journals, or posted on the arXiv pre-print server." I'll generally skip over the contents of the Minor Planet Bulletin because you 'asteroid guys and gals' already read MPB every quarter. I make no promise of completeness. This will be a random grab of articles that caught my eye, either because they involved friends of SAS, or because they cover topics that are likely to be of interest to SAS members.

If this column is useful to you, let me know: that may improve its longevity. If it's pointless or annoying, let me know that too: it may hasten its demise. Either way, I appreciate your comments.

If you start doing some project as a result of any of these notes, send a Letter to the Editor, to let us all know what you're up to and how it's working out.

If you are the author or contributor to a paper that I miss, please send me a note (rbuchheim@earthlink.net) and I'll share the news in this column.

Low Amplitude Variables: Distinguishing RR Lyrae Stars From Eclipsing Binaries

by T. D. Kinman and Warren R. Brown

The Astronomical Journal v139, p2014-2025, 2010 May

The authors note that while "... low amplitude variables are difficult to identify and classify, yet determining their true nature is astrophysically important". They conducted follow-up observations, using a 42 inch telescope and aperture photometer in B and V bands, and the Tenagra 0.8-m telescope and CCD, on a sample of stars which had been observed by ROTSE and preliminarily categorized as RR Lyra variables. (Note that this is similar in concept to the study that Jerry Horne described at SAS-2010). Their findings (which are also similar to Horne's) are that a sizable portion of the preliminary RR Lyra stars are probably incorrectly classified – some are probably eclipsing binaries (based on their constant B-V color).

The TAOS Project: Upper Bounds on the Population of Small Kuiper Belt Objects and Tests of Models of Formation and Evolution of the Outer Solar System

by F. B. Bianco, et al

The Astronomical Journal, v139, p1499-1514, 2010 April

and

The Taiwanese-American Occultation Survey Project Stellar Variability. II Detection of 15 Variable Stars

by S. Mondal, et al

The Astronomical Journal, v139 p2026-2033, 2010 May

It seemed like a good idea to set up an array of small (50 cm) telescopes with CCD imagers and wide fields of view, and let them stare, searching for occultations by kuiper-belt objects. So far (3.75 years of data), a grand total of zero candidate kuiper belt occultations have been found. This is telling us something important about the population and size-distribution of KBOs. It is also probably telling us backyard scientists, "don't try this at home". At least not for that purpose. They did, however (not surprisingly) find some new variable stars. In a single 3-degree-square FOV containing 2900 stars (down to about mag 16), monitoring at variable cadence for 3.75 years resulted in the identification of 67 new variable stars.

A Radar Survey of M- And X-Class Asteroids II. Summary and Synthesis

by Michael K. Shepard, et al

Icarus v208 (2010), p 221–237, June 2010

This is only peripherally related to "small telescope science", but it seems important to note that the "*et al*" in the author list includes several friends and members of SAS: Dr. Alan Harris, Dr. Lance A.M. Benner, Brian Warner, and Robert Stephens.

DI Herculis as a Test of Internal Stellar Structure and ary Models

by A. Claret, G. Torres, and M. Wolf

Astronomy & Astrophysics v515, A4 (June 2010)

DI Her is an eclipsing binary with an eccentric orbit. The resulting apsidal motion can be used to anchor theories of stellar structure and orbit circularization, but it might contain a troubling discrepancy compared to the predictions of general relativity. This article reports on new times of minima and their implications. The times of minima are based on small-telescope science: CCD photometry using 8- to 12-inch telescopes can provide exquisite timing accuracy. The photometric accuracy is about 0.01 mag (certainly achievable by "backyard scientists" for this ~ 9th magnitude star), and the estimated timing error of their new data is less than one minute. The apsidal motion that they are studying amounts to an "O-C" change of only 18 minutes over roughly 52 years.

This star presents a couple of opportunities for further study. First, the most recent T_{min} reported in this paper is from

mid-2008. Additional timings are needed, and getting them requires a bit of planning and dedication, since the orbital period is 10.55 days. Second, the interpretation of the apsidal motion is critically dependent on the Rossiter-McLaughlin effect in the spectroscopy, as reported by Albrecht et al (2009, Nature v. 461 p 373). Albrecht, et al used a 2-meter telescope and echelle with resolution of about 40,000; do you suppose any backyard spectroscopist can replicate that study?

The triple system AO Monocerotis

by M. Wolf, *et al*

Astronomy & Astrophysics v514, A75 (May 2010)

AO Mon is another eclipsing binary with an eccentric orbit (see the note about DI Her, above) but its apsidal advance is largely free of general relativity effects. The O-C curve does, however, show evidence of a third body in the system. This paper reports new times of minima, gathered with CCD's on 8-inch to 26-inch telescopes. As with DI Her, there are a couple of opportunities for further study. First, the apparent 3.6-year orbit of the 3rd body makes additional times of minimum (of both primary and secondary minima) valuable. Second, the authors note that "this massive system ... could be attractive for spectroscopists. The radial velocity curve should have a semi-amplitude of more than 200 km/s." So, do any of you suppose that this is within reach, for a 10th magnitude star? (If you feel lucky, it might be because this star is at RA= 07h 07m 07s)

HAT-P-16b: A 4 Mj Planet Transiting a Bright Star on an Eccentric Orbit

by L. A. Buchhave, et al

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.2009v1.pdf

GSC 2792-01700 (V = 10.8 mag) is found to have a transiting planet with a period P = 2.775960±0.000003 d. The photometric depth of the transit is about 1% (10 mmag), so it should be detectable by experienced amateur exo-planet observers. The star is at declination +48 degrees, which makes it nicely placed for northern-hemisphere observers. An unusual feature of this planet is that the radial velocity data indicates that it has a small but quite certain eccentricity of $\varepsilon \approx 0.036 \pm 0.004$.

The impact of a large object with Jupiter in July 2009

by A. Sánchez-Lavega, *et al*

http://arxiv.org/ftp/arxiv/papers/1005/1005.2312.pdf

This major impact scar on Jupiter was discovered by an amateur observer (Anthony Wesley, of Murrumbateman NSW Australia) using his 14.5-inch home-made Newtonian, and a video camera. It was subsequently monitored by several amateur observers, who contributed observations to the International Outer Planet Watch database.

This article describes calculations of estimated impactor trajectory, size/mass, and the implications for the probable rate at which Jupiter is hit by such objects – roughly once every 10 to 15 years. The interesting thing (to me) is that all of these calculations are based on amateur-reported observations, and the authors point out several times that the amateur's contribution was critical to the detection and characterization of this impact.

The authors also recommend that when monitoring for future impacts, the signal of the impact scar (which appears dark against the Jovian clouds) will be most apparent in the near-infrared methane absorption bands at 890 nm – which is nicely encompassed by Johnson-Cousins I-band filter.

Approximating RR Lyrae light curves using cubic polynomials

by S. Reyner, *et al*

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.2345v1.pdf

This article caught my eye because Jerry Horne gave a paper at SAS-2010 describing some incorrect type-assignments for purported RRc Lyra variables, which had been based on polynomial fits to the lightcurves. It also resonates with the article by Kinman & Brown (above).

The authors of this paper report on the use of polynomial (cubic) fits to the lightcurves of variable stars, and report a preference for the cubic fit because: (1) the cubic eliminates the spurious "ringing" that is a chronic feature of fourier fits, (2) the cubic gives an excellent fit to the phased lightcurve, with far fewer coefficients than is required for a fourier fit, and (3) the coefficients in the cubic fit seem to have significance in terms of stellar physics. The authors also note the distinction between a cubic-spline fit (which they do not prefer) and a fit to the lightcurve based on stitching together cubic polynomials (which they advocate). They describe in good detail their method for "stitching" the polynomials.

They then use their fitting procedure to identify RR Lyra variables in external galaxies and to distinguish between RRc and RRab types, based on the coefficients of the cubic-fit to their lightcurves.

Characterization and Photometric Membership of the Open Cluster NGC1981

by F. F. S. Maia, *et al*

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.3047v1.pdf

The authors used a 0.6m telescope and CCD imager

(BVRIc filters) – not wildly out of reach of the capabilities of SAS members – to study the HR diagram of an open cluster. This report seems to be a good role model for similar studies that backyard scientists might try. Of particular interest (to me) is their method for deciding on the membership-probability of individual stars, based on a statistical study of the cluster field versus a nearby non-cluster field. I also note that they analyzed their data as a "3-dimensional" H-R diagram, with two color axes and one brightness axis. This sounds familiar: I think I saw SAS's John Hoot do this a few years ago (but I can't find the reference).

The Orbital and Superhump Periods of the Deeply Eclipsing Dwarf Nova SDSS J150240.98+333423.9

by Jeremy Shears, Tut Campbell, Jerry Foote, Russ Garrett, Tim Hager, William Mack Julian, Jonathan Kemp, Gianluca Masi, Ian Miller, Joseph Patterson, Michael Richmond, Frederick Ringwald, George Roberts, Javier Ruiz, Richard Sabo, William Stein

http://arxiv.org/ftp/arxiv/papers/1005/1005.3219.pdf

Here is a grand paper about an eclipsing dwarf nova. Several of our SAS friends are co-authors. The lightcurves give good examples of the quality of work that can be done by amateur photometrists. They also highlight just how dramatic the variation can be in this sort of star (SU UMa) – a brightness change of 0.35 magnitudes less than 1.5 hours!

Discovery and Outburst Characteristics of the Dwarf Nova ASAS J224349+0809.5

by Jeremy Shears, Patrick Wils, Greg Bolt, Franz-Josef Hambsch, Tom Krajci, Ian Miller, Richard Sabo and Bart Staels

http://arxiv.org/ftp/arxiv/papers/1005/1005.3222.pdf

and

The 2003 And 2005 Superhumps in V1113 Cygni.

by K. Bakowska, et al

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.3278v1.pdf

These papers report on photometry of two different cataclysmic variable stars. The first includes several of our SAS friends as co-authors. Both papers include "O-C" ("observed minus calculated") curves showing the gradual change in superhump period. Their O-C curves are an interesting contrast, with the "amateur" curve having substantially greater quantity and density of data points, while the "professional" curve has relatively sparse data, with fairly large scatter. This higher density of data in the "amateur" curve makes the reported period changes much more believable.

The 1998 November 14 Occultation of GSC 0622-00345 by Saturn. I. Techniques for Ground-Based Stellar Occultations

by Joseph Harrington and Richard G. French

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.3569v1.pdf

and

The 1998 November 14 Occultation of GSC 0622-00345 by Saturn. II. Stratospheric Thermal Profile, Power Spectrum, and Gravity Waves

by Joseph Harrington, Richard G. French and Katia Matcheva

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.3570v1.pdf

OK, probably most of us don't have set-ups as nice as the IRTF on Mauna Kea, but there may be useful ideas here for our own occultation studies – such as their method of using a "scattered-light template" to remove the effect of Saturn's bright glare from their photometry, and their method of determining image times to great precision. (However, see the article below by Eastman, *et al* about time accuracy).

Orbital Period Variations in Eclipsing Post Common Envelope Binaries

by S. G. Parsons, T. R. Marsh, C. M. Copperwheat, V. S. Dhillon, S. P. Littlefair, R. D. G. Hickman, P. F. L. Maxted, B. T. G¨ansicke, E. Unda-Sanzana, J. P. Colque, N. Barraza, N. S´anchez, and L. A. G. Monard.

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.3958v1.pdf

I noticed this article for two reasons: first, I always enjoy a good story about "times of minimum and O-C curves", and second because the last-listed author is "Berto" Monard, CBA Pretoria. Some of you may remember Berto's presentation at SAS-2006, where he showed his picturesque observatory (roll-off roof and stone walls), and described the night sounds in the rural area of South Africa. (Personally, I'm used to coyotes, but I don't like the idea of hearing lions in the darkness). His observations of QS Vir, made with his 12.5 inch Meade telescope, stand nicely alongside the other data taken at the 4.2-m William Herschel Telescope and the 8.2-m Very Large Telescope.

Achieving Better Than One-Minute Accuracy in the Heliocentric and Barycentric Julian Dates

by Jason Eastman, Robert Siverd, B. Scott Gaudi

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.4415v3.pdf

Dispatches from the Members

Vol. 8, Number 2

Bits and Pieces

Bob Buchheim

"One minute accuracy" may not sound so difficult, but there's more to it than one might think. The topic of knowing, recording, and interpreting the exact time at which an event occurred is important to many small telescope science projects. Times of minimum of eclipsing binary stars (and the search for light-time effects such as additional stars in the system), and transit times of extrasolar planets (and possible changes in transit-time ephemeris) are examples of projects where timing is important.

Here's a simple example: Most of us record coordinated universal time into the FITS header of our images. Suppose that an event is observed at time= UTC1, and then another event is observed at time= UTC2. Is the interval between these two events ΔT = UTC2 – UTC1? Well, no, it isn't; or at least you can't be sure that it is, because of those pesky "leap seconds" that are inserted into UTC. If the first event UTC1 happened in, say, 1970, and the second event UTC2 happened in 2010, then you have to account for 26 leap-seconds that have been inserted during those 30 years, and which are invisible in the recorded UTC times.

Beyond that, if we're looking at extra-solar planets or binary stars, there is the problem that we observe from a moving Earth. The most common way of accounting for that is to convert observed times to Heliocentric times. This backs out the effect of the Earth's orbit around the Sun. But that correction is imperfect (and subject to misinterpretation) because the Sun isn't really the stationary center of the solar system – the Sun moves in a tricky little reflex orbit caused by the gravitational tugs of its planets. The "real" center of the solar system is the Barycenter, which can be as much as 8 light-seconds away from the center of the Sun. The authors point out that for this reason the IAU favors times referenced to the Barycenter (i.e. BJD rather than HJD).

As the demand for accuracy increases, there are an increasing number of effects that must be taken into account, and some of them amount to healthy fractions of a second in either uncertainty or potential confusion in the meaning the "time of the event".

The bottom lines are: a strong preference for Barycentric Julian dates referenced to the Terrestrial Dynamic Time base; and an even stronger recommendation that you report enough information about the timebase and any adjustments (e.g. how the conversion from UTC to HJD was done) so that subsequent researchers who use your data can properly and unambiguously interpret your reported times.

Physical Properties of ESA/NASA Rosetta Target Asteroid (21) Lutetia: Shape and Flyby Geometry

by Benoit Carry *et al*

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.5356v1.pdf

Here is a wonderful example of the wealth information that can be gleaned when professional "large telescope" data and amateur "small telescope" data are integrated with sophisticated mathematics – a high-fidelity assessment of the size, shape, density, and spin-axis of asteroid (21) Lutetia.

The "large telescope" data includes adaptive optics imagery from the Keck (10 meter) and ESO Very-Large (8.2 m) telescopes. The "small telescope" data includes lightcurves from a variety of amateur observers. The authors note that their mathematical method for integrating all of these data sets can also take advantage of multi-chord occultation data, but unfortunately none are available for (21) Lutetia. The net result of the shape inversion is that the asteroid is "...well described by a wedge of Camembert cheese..." (This is in contrast to the Moon, whose spectrum – I was once told – is a surprisingly good match to green Roquefort cheese). The spin-axis solution indicates that the obliquity is 95 degrees, meaning that Lutetia is "tipped over" in the same way that Uranus is.

It will be particularly interesting to see how these results stand up after "ground truth" is obtained during the flyby of (21) Lutetia by the Rosetta spacecraft this July.

Outburst Characteristics of the Dwarf Nova SDSS J073208.11+413008.7

by Jeremy Shears, Robert Koff, Richard Sabo, Bart Staels, William Stein and Patrick Wils

http://arxiv.org/ftp/arxiv/papers/1005/1005.5378.pdf

This outburst was discovered by noting variable objects in the SDSS data release, then monitoring them for activity. It is the first observed super-outburst of this cataclysmic variable. A dense set of photometric data taken with small telescopes (ranging from 10-inch to 17-inch aperture) and CCD imagers clearly displays the overall lightcurve of the outburst, the presence of superhumps, and the gradually changing period and amplitude of the superhumps.

SAS member Bob Koff is a co-author on this paper, as is CBA participant Bart Staels.

HAT-P-15b: A 10.9-Day Extrasolar Planet Transiting a Solar-Type Star

by G. Kovacs, *et al*

http://arxiv.org/PS_cache/arxiv/pdf/1005/1005.5300v1.pdf

It turns out that a small array of 11 cm (= 4.3 inch) telescopes giving high-accuracy photometry can be quite an effective tool for discovery and characterization of extra-solar planets. This paper reports the 15th transiting extra-solar planet discovered by the Hungarian-made Automated Telescope Network.

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Dr. Joe Patterson took the podium to explain cataclysmic variable stars and the Center for Backyard Astrophysics. Photo by R. Stephens