

SDAA

San Diego Astronomy Association

Promising the Sun, the Moon, and the Stars...and Delivering!



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A Non-Profit Educational Association
P.O. Box 23215, San Diego, CA 92193-3215

SDAA Business Meeting

Will be held at:

SKF Condition Monitoring
4141 Ruffin Road
San Diego, CA 92123-1841
November 12th at 7:00 pm

Don't Be Locked Out!

The combination to the lock on the gate at Tierra del Sol has been changed. See your mailing label.

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News and Notes

November 2002

Cataclysmic Variables — Eclipse Photometry By Dennis Ritz

Cataclysmic variable (CV) stars consist of evolved binary stars, a red dwarf (RD) and a white dwarf (WD) in very close orbits with orbital times of 1-10 hours. I have measured the light from eclipses of CV's. Some images and materials are not able to be included in the Newsletter, but can be found on the SDAA web site at: <http://sdaa.org/SDAAEvents/cataclys.htm>

White dwarf stars consist principally of the remaining core of carbon with some helium, nitrogen, and oxygen. The red dwarf star has evolved to fill its Roche lobe and the red dwarf's atmosphere, principally of hydrogen, is overflowing into an accretion disk surrounding the white dwarf. Where the hydrogen flows into the accretion disk, an impact hot spot rotates with the disk as material spirals onto the surface of the white dwarf. After sufficient hydrogen accumulates on the surface, the WD hydrogen explosively ignites in what is known as a nova. Accretion disk instabilities also cause outbursts known as dwarf nova. Where the binary star orbits are planer to our line of sight, the larger red dwarf may eclipse the white dwarf and hot spot providing a glimpse at the dynamics of these stars and the accretion disk.

Using a Meade 16" LX200 equatorially mounted telescope, I attached a Santa Barbara Instruments Group (SBIG) 9E CCD camera. The CCD is a Kodak 1602 chip 512x512 pixel array of 20x20 micron detectors. It is cooled by a two stage Peltier cooler augmented by circulating water to a working temperature of -20 C. Cooling the chip reduces thermal

emission of electrons which would cause a background current. Readout of the chip is via a parallel cable interface to a Pentium II computer. The LX200 is controlled by The Sky software (Software Bisque). The use of this software greatly simplifies acquisition of the target star by accurately slewing to a nearby bright star, syncing to known Right Ascension and Declination and slewing to the target CV coordinates. Computer time was set by listening to WWV time reference short wave broadcast.

The CCD camera was controlled by MaxIm DL software, (Cyanogen Productions). The image was focused using the focus mode of rapid acquisition and downloading for computer display of a star of relatively low magnitude, and finally focused using the target CV star field to produce as sharp an image as possible. Star charts of target CV fields were downloaded from the AAVSO (American Association of Variable Star Observers <http://www.aavso.org/>), The Catalog and Atlas of Cataclysmic Variables (Space Telescope Institute http://archive.stsci.edu/cgi-bin/dss_form), and The Center for Backyard Astrophysics (CBA <http://cba.phys.columbia.edu/charts/>) Comparison of the target field with the CCD field allowed verification that the target field was in the telescope field of view. Target CV's were selected by comparison with a list of Right Ascension sorted CV's from CBA and the book "Cataclysmic Variable Stars, How and Why they Vary" by Coel Hellier (see references).

Exposures using 1x1 binning were taken using automatic dark field subtraction

(continued on page 2)

(continued from page 1)

performed by the MaxIm DL software. Dark field exposures were taken with the CCD shutter closed for an exposure time identical to the light field exposure time and dark (thermal) current noise and bias subtracted from the light image. Exposures varied, generally from 10-60 seconds depending on the target star magnitude and focal reducer on the telescope Guiding during exposures was performed by the guider CCD chip in the SBIG 9E camera, a separate chip that acquires a guiding star, images the star and periodically sends corrections to the telescope mounting stepper motors. Guiding is necessary to reduce drift due to imperfectly aligned equatorial axes, flexure in the telescope/camera, imperfect driving gears, etc. Once the focused image of the target CV was found and guiding initiated, a sequence of up to 500 exposures was made. Each image was saved to hard disk and transferred to a Zip drive for later photometric data reduction. The web site has images and data reduction, when the process worked.

DY Peg (Pegasi)

I acquired target DY Peg and took a long

series of images, only to find the f3.3 focal reducer produced some stars with nice images, while others had a weird coma. I placed an f6.6 focal reducer on the telescope and obtained images of WZ Sge.

WZ Sge (Sagittae)

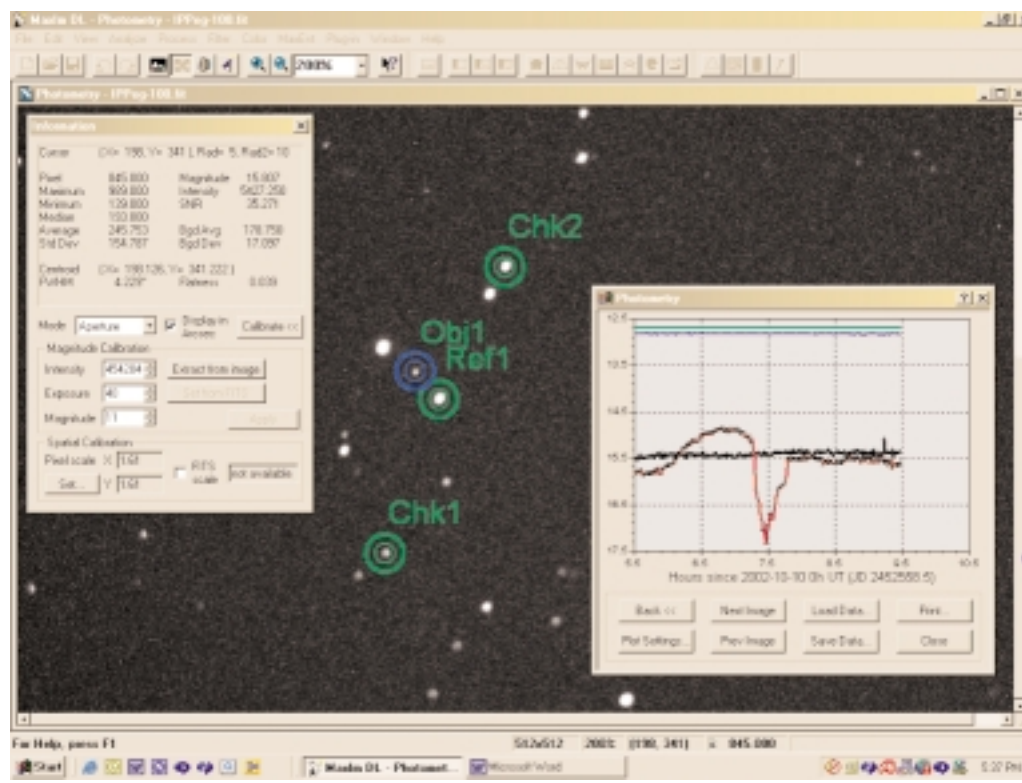
WZ Sge is representative of a class of short period (1.36 hours) cataclysmic variables that undergo accretion disk instabilities resulting in 'superhumps'. From magnitude 14 it undergoes disk outbursts over times much longer than its' orbital cycle as accretion material slowly fills the elliptical accretion disk.

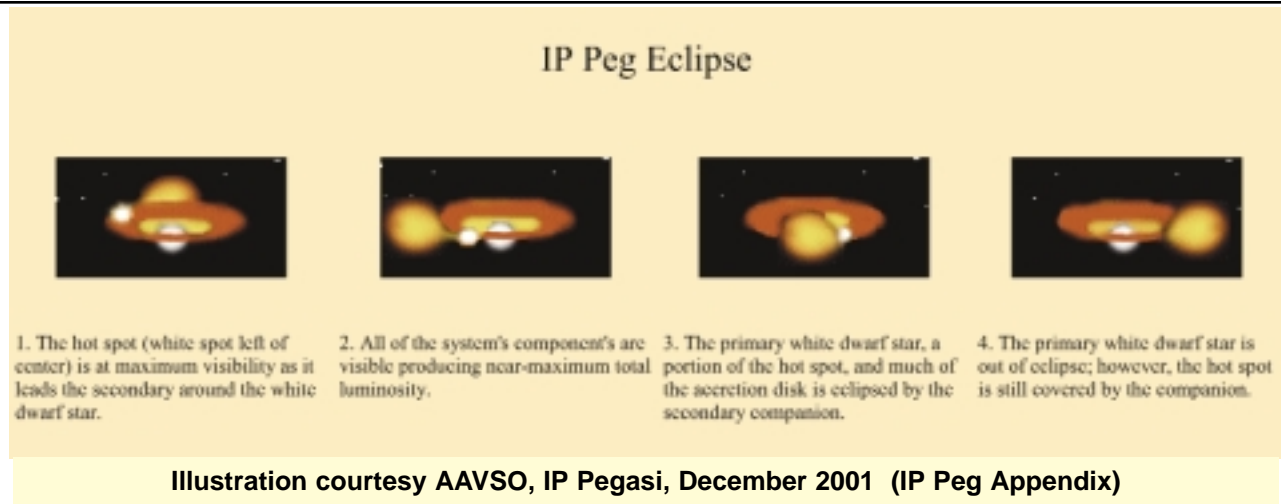
On the SDAA web site (<http://sdaa.org/SDAAEvents/cataclysm.htm>) are pages illustrating the data for each target CV. Only the light curve for IP Peg is reproduced in the Newsletter, below. First note on the web site the 20-second exposure with labeled calibration and target stars (page WZ1). The image is a mirror image and reversed from the AAVSO identification chart. This is due to the optical characteristics of Schmidt-Cassegrain telescopes, but MaxIm DL easily allows the re-orientation of the field for

identification. Once identified, the 'raw' FITS fields obtained from the CCD are used for photometry data reduction. Thus the screen shot (WZ2) illustrating the calibration reference (Ref 1), check star (Chk 1) and target object (Obj 1) WZ Sge is a reversed mirror image of the Field image. Once the stars are identified, it is not difficult to view the raw images and identify the correct stars. AAVSO charts are provided in regular and reversed view. Based on the AAVSO charts, the reference and calibration stars are identified before data photometry. The WZ Sge series consists of 318 images that are presented as a graph on WZ2 and WZ3. The upper black trace plots the magnitude of the Chk 1 star as a reference point as calculated from the Ref1 star. The Chk star provides an 'error' estimate of the readings obtained from image to image. The lower red line shows the image magnitudes of WZ Sge. There is a short scale point-to-point fluctuation probably representing measurement error or CV 'flickering', as well as a longer period of about 1 hour probably generated by the orbital eclipse. However the data is very noisy, due to the short exposure. The left box on WX2 shows a Maximum count of only 190 electrons/photons. This is a very low value and the short 20-second exposure was insufficient to obtain sufficient counts for decent light curves. So I needed to increase the exposures and next observed TT Ari.

TT Ari (Arietis)

TT Ari field was located (page TT3), focused and tracking initiated, taking 61 CCD images. Regretfully the TT Ari CV image was saturated, i.e. the CCD pixels maximized their ability to record photons at 64,000 counts. The CV image was basically overexposed with an exposure of 40 seconds. This was the exact opposite of the problem with WZ Sge. It is shown on page TT1. While the 'noise' in the Check star is very low, a flat line, the lower TT Ari plot is not useful.





IP Peg (Pegasi)

IP Peg was discovered to be an eclipsing binary in 1985 and is a premier cataclysmic binary of the U Gem dwarf nova type seen nearly edge on from Earth (80 deg inclination), allowing the red dwarf to deeply eclipse the white dwarf, the hot spot, and the accretion disk. It has a 1.02 solar mass white dwarf and a 0.5 solar mass red dwarf feeding the accretion disk. It undergoes disk instabilities causing dwarf nova disk outbursts approximately every 3 months. It is one of the brighter deeply eclipsing CV's with an orbital period of about 3.8 hours. Thus in one night a complete orbital cycle can be recorded.

As soon as darkness arrived I began aligning and focusing the CCD. I adjusted the Peltier cooler to -20 C, and acquired the target field, shown as IP1 on the web. A 40 second exposure produced only about 1000 photon/electron counts. Wind gusts streaked some images that were discarded from photometry. Exposures began about 8:55 pm at a rate of about 1 every 50 seconds until 4:04 am, totaling nearly 500 exposures. The early morning exposures lost focus and some were discarded. However using MaxIm DL photometry plotting software, a light curve (below) was obtained comparing very favorably with that shown on page 2 of the AAVSO 'Variable Star of the Month' (web) taken with the 2.1 meter telescope at McDonald Observatory.

Analysis of IP Peg Results

First consider this illustration of IP Peg and compare to the following image of labeled photometry:

IP Peg Eclipse

1. The hot spot (white spot left of center) is at maximum visibility as it leads the secondary around the white dwarf star.
2. All of the system's component's are visible producing near-maximum total luminosity.
3. The primary white dwarf star, a portion of the hot spot, and much of the accretion disk is eclipsed by the secondary companion.
4. The primary white dwarf star is out of eclipse; however, the hot spot is still covered by the companion.

Illustration courtesy AAVSO, IP Pegasi, December 2001 (IP Peg Appendix)

Illustration 1 shows the red dwarf emerging from behind the accretion disk. Note the hot spot is not directly between the WD and RD, but forms ahead of the RD as the accreting material enters the gravitational orbit of the WD. White dwarfs commonly have masses from 0.3-1.4 solar masses, with a diameter about that of Earth. Above 1.4 solar masses the WD will collapse into a neutron star about 10 km in diameter. Neutron star binaries are X-ray emitters, while ordinary WD have surface temperatures as high as 60,000 K and emit white-hot light of spectral class O. White dwarf stars are general-

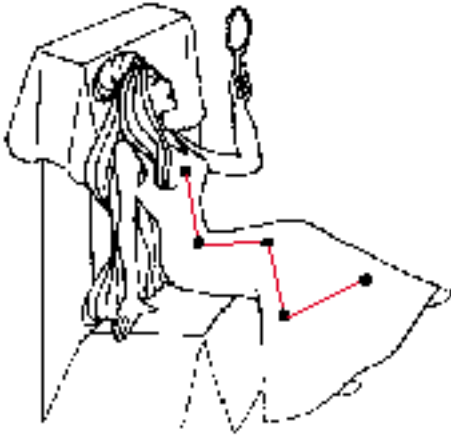
ly the carbon core of sun sized stars which have exhausted their hydrogen and helium fuels and released their outer atmospheres as planetary nebula. The carbon cores emerge from the planetary nebula as white-hot remnants unable to support further nuclear fusion and slowly cool over billions of years. The red dwarf companion is lighter than the WD. In the case of IP Peg the WD is about 1.02 solar masses and the RD about 0.5 solar masses. The more massive the star, the faster it evolves through the hydrogen burning main sequence, into a red giant with a core containing carbon, helium, and hydrogen concentric shells, and through the planetary nebula ejection of the outer atmosphere to the white dwarf carbon core. In the common envelope phase of a binary system when the first heavier star reaches the planetary nebula stage, both are enveloped in a common envelope ejecting/transferring mass and reducing the angular momentum/orbits until the WD is heavier than the RD. The only stable binary systems that have Roche lobe contact, that region of equal gravitational potential where the inner Lagrangian point (L1) allows mass transfer, are where the WD is heavier than the RD. As binaries evolve, they may become 'detached' binaries where the Roche lobe is not filled by the red giant and mass transfer does not occur. IP Peg is that rare case where the RD Roche lobe is filled and mass transfer occurs stably in a 'semi-detached' binary,

(continued on page 8)

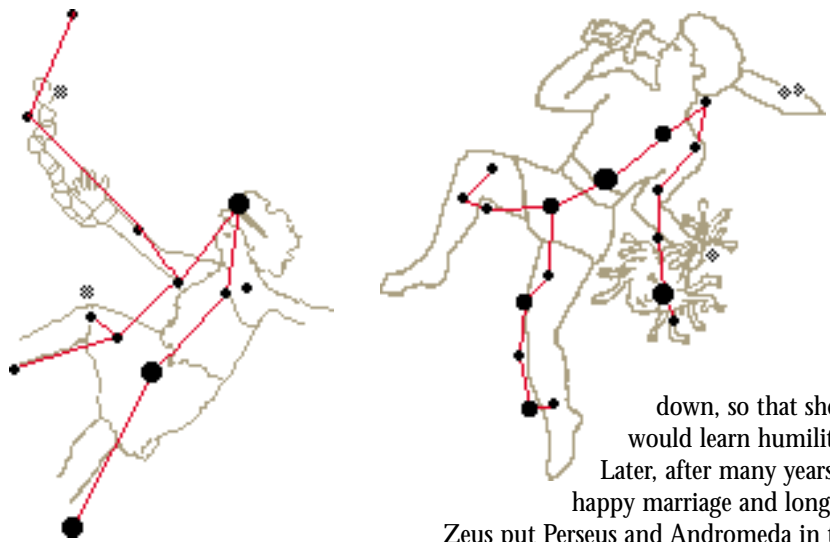
Astronomy 101

The Mother, Daughter and the Son-in-Law by Scott Baker

Last month I showed you how to find the farthest thing you can see with your naked eye, the Great Andromeda Galaxy, or M31 in Andromeda. This month we'll talk about three constellations, Cassiopeia, Andromeda and Perseus, all close together in the sky, and their relationship in Greek Mythology.



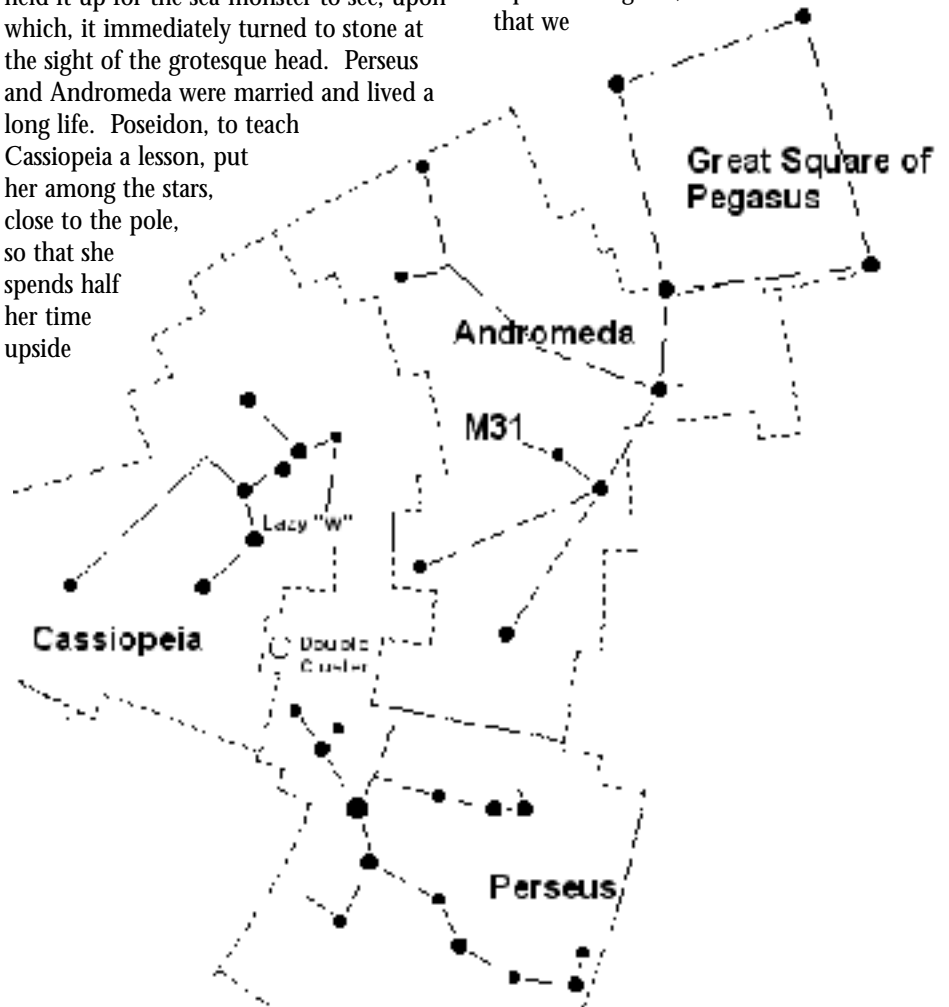
First, the story: Cassiopeia, the wife of Cepheus, the King of Æthiopia (not the current Ethiopia), was a beautiful, yet vain and boastful woman. She thought her beauty to be so great, that it even surpassed that of Nereids, the goddess of the sea. Nereids, hearing of Cassiopeia's boasts, asked Poseidon, the God of the Sea, to punish Cassiopeia. Poseidon agreed and sent a great monster, Cetus, to ravage the land of Cepheus and Cassiopeia. Cassiopeia, after consulting an oracle, was told that in order to appease the gods, she should chain her beautiful daughter, Andromeda, to the rocks by the sea as an offering for Cetus. Perseus, the son of Zeus and the mortal Danaë, having recently slain Medusa, the Gorgon, heard of Andromeda's peril and rushed to her aid on the wings of Pegasus. Perseus said to Cepheus, the King, "I can save your daughter, but only if you promise me her hand in



down, so that she would learn humility. Later, after many years of happy marriage and long life, Zeus put Perseus and Andromeda in the stars, to honor them.

marriage and a kingdom of my own". Cepheus agreed, and Perseus, removing the head of Medusa from a sack he carried, held it up for the sea-monster to see, upon which, it immediately turned to stone at the sight of the grotesque head. Perseus and Andromeda were married and lived a long life. Poseidon, to teach Cassiopeia a lesson, put her among the stars, close to the pole, so that she spends half her time upside

To find these constellations in the sky, look for two prominent features, the Great Square of Pegasus, that we





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located last month, and the large lazy "W" of Cassiopeia. Once you've located the Great Square, high in the Eastern sky, just after darkness falls, turn your head to the North and down a bit, to locate the large lazy "W" of Cassiopeia (it will be in a sideways position in the sky, see the attached chart). Andromeda lies between Cassiopeia and Pegasus, with Perseus below the two beautiful ladies.

Cassiopeia and Perseus lie in the thin, outer spiral arms of our galaxy, and from a dark sky site, you can see the winter Milky Way running through them. Using binoculars, scan this portion of the sky and locate the Double Cluster in Perseus, about halfway between Perseus and Cassiopeia. The Double Cluster is made up of two "open clusters" also called "galactic" clusters, that are very close together. The two clusters lie approximately 7000 light years away and span an area in the sky equivalent to a full moon in diameter. Each cluster contains over one hundred stars of varying age, brightness and color, and is a beautiful object to behold in binoculars.

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SkyWatch for November, 2002

John Mood



[Times PDT] [* = Easy] [** = Moderate] [*** = Difficult]

Sat., 2 Nov. ---- STAR PARTY @ Tierra del Sol.

Mon., 4 Nov. ---- NEW MOON, 12:34 p.m.

Sat. 9 Nov. ---- STAR PARTY @ Tierra del Sol.

Tues., 19 Nov. ---- LEONID METEOR SHOWER this a.m. (see below).

---- FULL MOON, 5:34 p.m.

Sat., 30 Nov. ---- STAR PARTY @ Tierra del Sol.

Tues., 2 Dec. ---- NEW MOON, 11:34 p.m.

EVENING PLANETS:

NEPTUNE (mag. 7.9) [**] & URANUS (mag. 5.8) [*½] are in Capricornus, the Goat, but won't be visible much longer so catch 'em while you can. SATURN [*] rises after sunset stuck as it were on one of the horns of Taurus, the Bull; the planet is high enuf above the haze before midnight to examine closely its rings, open almost to their maximum!

MORNING PLANETS:

JUPITER [*] moves from Cancer, the Crab, to Leo, the Lion, & high in the sky before dawn. Both falling MARS [*½] & rising VENUS [*] are in Virgo, the Virgin, preparing for their close pass next month.

Both BEGINNING OBSERVERS & EXPERIENCED OBSERVERS ----

I'm concentrating exclusively on this year's LEONID METEOR SHOWER 'cause you won't have this chance again for 30 years. The chance, that is, to see a METEOR STORM, in which 100s, or even 1000s of meteors fall every hour. Scientists have zeroed in on the concentrations of streams of particles left behind by Comet 55P/Temple-Tuttle. This year, the 1st occurs too early for us. But at about 2:30 a.m. on the morning of the 19th, the 2nd concentration should hit. The MOON is a problem, but it will be in the west, only a couple of hours from setting, & if you go out to the desert, the Laguna Mtns. Will provide additional blockage of moonlight. The scientists can't predict exactly what will happen, 1000s of tiny quick meteors, or 100s of fat thick ones. One thing is certain -- you won't see a thing if you're not there!

TIERRA DEL SOL

LAT = 32° 36' 46" N (± 0.1"), LONG = 116° 19' 55" W (± 0.1"), ELEV = 3710' (± 5'), at the bathroom, as determined from USGS 7.5 min 1/24000 map.

Send comments & questions to me by phone (619/225-9639), USPS (4538 Long Branch Av., San Diego, CA 92107) or my e-mail address 1happyalien@cox.net.

¡HAPPY VIEWING!



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Tele Vue Seminar at OPT by John Restivo

Tele Vue USA rep, Steve White will be at Oceanside Photo and Telescope on Friday, November 15th, from 4:00 to 6:30 p.m. Mr. White will be teaching two free seminars for all who are interested in optics as used in Astronomy.

His first class will last about one half hour and will include refractor and reflector basics, magnification, what focal length means, and apparent field of view versus real field of view and how to calculate them.

His final lecture will be in advanced optics, lasting about one and one half hours. This will include chromatic aberration, basic glass types, approximate dispersion numbers of various general classes of glasses (from regular Crown vs ED vs fluorite, field flatness, off axis astigmatism in eyepieces, Barlow and Powermates, summary of all TCO scopes, TVO eyepieces and summary of other TVO products such as mounts, photography, etc.

After the seminars, there will be use of telescopes outside.

For further information, call OPT at (800) 483-6287.

Star Party Report by Michael Dietz

Stars In The Park will be held on Wednesday, November 6th and December 4th. Star party nights at the site in Tierra Del Sol will be on November 2nd, 9th, 30th, and December 7th and 28th. We will be at Vallecito Stage Station on November 9th for our last Camp With The Stars program for the year.

On Thursday, November 7th we will be in La Mesa for a 6:45 p.m. star party at Christ Lutheran School located at 7929 La Mesa Blvd. To reach the school, take I-8 to the Fletcher Parkway exit. Head East on Fletcher Parkway to Baltimore Drive and turn right. Head South on Baltimore Drive to El Cajon Blvd. and turn right. Head West on El Cajon Blvd. a couple of blocks

to La Mesa Blvd and turn left. Head South to the church. Turn right at the first driveway past the church. They will provide dinner for the volunteers at 6 p.m.

On Tuesday the 12th we have a 6 p.m. star party at the Chula Vista Library.

We are back in Chula Vista on the 13th for a star party at Casillas School located at 1130 J Street. To reach the school take I-805 South to H Street and head East. Turn right on Paseo Del Rey and head South 1 block to East J Street. Turn left on East J Street and head East a couple of miles to the school.

On Monday, December 2nd we will be in Lakeside for a 6:30 p.m. star party at Lakeview Elementary located at 9205 Lakeview Road. To reach the school take I-8 East to the Los Coches Road exit. Turn left at the stop sign and head under the freeway and cross Old Hwy. 80. Turn right on Lakeview Road and head to the school which will be on the right.

On Tuesday, December 10th we have a star party in San Diego just South of Hwy 94 at Johnson Elementary.

As always, please contact one of the star party coordinators (Rich Bentley, Mike Dietz, Joe McGerald, or Bob Nanz) to let them know that you will be attending. That way they can let you know of any changes or cancellations.

Camp With The Stars by Michael Dietz

This month's Camp With The Stars program will be our last one of the year. We will be out in the dessert on November 9th at Vallecito Stage Station Campground. If you have a telescope that you can share with the campers you are welcome to join us and camp for free. If you like, you can come up on Friday and enjoy the campground an extra day/night. Don't forget to bring a towel and swimsuit so you can take a dip in the pool at Agua Caliente Hot Springs for free.

To reach Vallecito Stage Station take I-8 East to Ocotillo, and then take Hwy. S-2

North about 30 miles to the campground, which is about 4 1/2 miles north of Agua Caliente Hot Springs. Those of you that are coming from the North County area can take Hwy. 78 through Julian to Scissors crossing. Turn right and head South on Hwy S-2 to the campground. If you plan on attending please let me know at (619)334-9930 so I can make arrangements to accommodate everyone.

Acknowledgments by Michael Dietz

The club would like to thank Bill Armstrong, Dean Belcher, Rich Bentley, Tim Boller, Jim Brown, Carolyn Corless, Peter DeBaan, Erik DeVine, Mike Dietz, Jim Eely, S2 Hall, Diana and Shawn Kelly, Jose Magsaysay, Nick Marilao, Doug McFarland, Joe McGerald, Ken Olson, Jennifer Pesqueira, Rich Strobel, Ed Uribe, George Varga, Bob Wetzel, Bill Whalen, Marjorie White, Dave Will, and Roger Zellmer for helping with the school star parties, Camp With The Stars, and Stars In The Park programs. Your efforts are greatly appreciated by the students, parents and teachers.

Book Signing—Timothy Ferris by John Restivo

On Saturday, October 5th, at the Reuben H. Fleet Science Center, Timothy Ferris made an appearance, lecturing and signing his latest book, Seeing in the Dark. SDAA members were on hand with telescopes for the public to view sunspots, prominences, and planets Venus and Jupiter. I wish to thank Rich Bentley, Peter DeBaan, Shawn and Diana Kelly, Jose Magsaysay and Ken Olson for giving the guests and public in general a chance to view a clear daytime sky. At the end of the lecture, Mr. Ferris was gracious enough to come out and personally thank the members and sign his book before departing for his home in northern California. Francis French, Education Program Coordinator for the Fleet, was kind enough to provide the group photo with Mr. Ferris.



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November Program Meeting by John Restivo

November's Program Meeting will be held at the Mission Trails Regional Park on November 20th, from 6:30 to 9:30 p.m. Our guest speaker will be long time member Earl Towson. Mr. Towson is a retired Aerospace Engineer who has had a lifelong interest in astronomy and space exploration and who enjoys working with children. He teaches astronomy and space exploration during summers at our local boy scout camp and at the BSA's Western Region's National Camp School. During the school year, he provides local schools with planetarium shows and presentations.

Mr. Towson was a past SDAA Director and Vice-President and is currently a NASA/JPL Solar System Ambassador (a volunteer public outreach program). He is also a volunteer classroom astronomer with the San Diego Science Alliance and the ASP's Project ASTRO. He is also an occasional guest lecturer at SDSU, the Reuben H. Fleet, the Sierra Club's Nature Workshop and for the SDAA.

Finally, he is a Board Member of the Mount Laguna Observatory Associates. Since retiring in 1993, Mr. Towson has enjoyed the opportunity over the past nine years to expand his knowledge by attending astronomy classes at SDSU and by volunteering at the Mount Laguna Observatory.

Many of us know Mr. Towson via the weekly e-mail astronomy newsletter he freely distributes, entitled "FYI ASTRO" (to subscribe, go to his e-mail address: etowson@tmisnet.com). Mr. Towson's topic for the Program Meeting is on one of his favorite areas of interests, "The Search for Habitable and Inhabited Planets." He will discuss past, current and planned NASA, ESA and private programs focused on the search for extrasolar planets, extraterrestrial life and extraterrestrial intelligence.

SPECIAL NOTE:

November's Program Meeting will also include nominations for upcoming Officer and Board of Director positions. The nomination committee will be presenting their list of candidates for the open positions at the November Board Meeting (held on November 12th at SKF Engineering). I will take nominations from the floor and if there are more than one candidate for a specific

position, a voting ballot will be included with the December newsletter, giving an opportunity for all members to exercise their voting right. So if you are interested in a position or have someone in mind to nominate, then it is imperative that you attend to have your voice heard. This Program Meeting will be an informative and fun evening and I expect to see a lot of you there.

Remember, this is the last program meeting for the year. The month of December will not include a program meeting in consideration for the religious holidays. The next program meeting will be the night of the annual banquet on January 18, 2003.

Palomar Observatory Tours by Kent Richardson

There are currently 51 people signed up for the two tours of the Palomar Observatory on November 16. We have room for 9 more. There is a database on the Yahoo group if you would like to add your name to the list. If you aren't a member of the Yahoo group, send an e-mail to kentr@san.rr.com. If you don't have e-mail, give me a call at 858-268-9943. I will e-mail those who have signed up directly with information on the tours.

Treasurer's Report by Jennifer Pesqueira

With the addition of the following members we now have a total of 532 SDAA members. Please welcome: Zoe Blaylock, Kent Buchholz, Eric Madrid, James Roth, Gene Schiller and George Vajgrt. Welcome to SDAA and may you enjoy clear dark skies.





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and the stars orbit one another in a plane from our view where the RD eclipses the WD and hot spot. The rate of material transferred through the L1 point is dependent on the evolution of the RD and closeness of the orbits. As the stars closely and rapidly orbit, magnetic braking and gravitational radiation (relativistic) reduce angular momentum and orbits. Magnetic braking dominates from orbital periods of 10-3 hours. Orbital times above (>10hrs) have no Roche lobe contact, and below 2 hours gravitational radiation dominates. Between 2-3 hours is the 'orbital gap', an instability in mass transfer between magnetic braking and gravitational braking. These mechanisms reduce the orbits and providing a 'steady' flow of approximately 10¹³ Kg/sec to the accretion disk.

Examining the labeled IP Peg photometry curve, the top green line is the magnitude plot of the Reference star (selected from the AAVSO chart as a non-variable labeled C1, the blue line is the Check star 2 (AAVSO 4) and Black line Check star 1 (AAVSO 7). As expected brighter Check star 2 shows lower variation, due to more photon/electron counts, while Check star 1 shows somewhat more noise, but is very similar in magnitude to the baseline of IP Peg and fairly represents the variation in measurement at the magnitude of IP Peg. (One Standard Deviation of Check star 2 is 0.029, 95% confidence level is 15.53-15.65 magnitude variations-See web 'Manual Photometry data'). The label shows 'V' above the light curve corresponding to the eclipse event. First, before the deep eclipse is the 'orbital hump', corresponding to figure 2 above, where all the components are visible and the hot spot rotates into our view along with the RD. As the RD covers the hot spot and WD, the photometry shows a rapid decline to minimum, occurring in only about 6 minutes! Careful photometry allows the diameters of the WD and RD to be determined, the orbital period and velocity, RD and WD masses, and other parameters calculated.

Coming out of the eclipse there are two evident 'steps', corresponding to the emergence of the WD and then hot spot. The accretion disk is larger than either the WD

or hot spot and also emerges. IP Peg is known as a dwarf nova, where over a somewhat irregular schedule on the order of every few months, the accretion disk outbursts, rapidly heating and dumping material onto the WD. This thermal instability of the disk is known as the Balbus-Hawley instability, and requires a strong coupling between the magnetic field of the WD and disk material. Cool disk hydrogen is neutral, not highly ionized nor coupled to the WD magnetic field. But as disk material accumulates and the disk heats up, at critical temperature (7,000K) the disk ionizes, couples with the magnetic field, and rapidly absorbs energy, resulting in more ionization and hotter temperatures. It is this disk instability that creates the 'dwarf nova'. This is not evident in my photometry, occurring on irregular several month schedule depending on the rate of accretion. The study of the eclipse of the accretion disk allows determination of the dynamics of the disk. In IP Peg the disk instability begins on the disk inside and travels outward; an 'inside out burst'. Disk tomography, utilizing Doppler shift of the accretion disk, has demonstrated that spiral waves are present in the accretion disk. These waves are caused by the RD pulling the disk material into elliptical orbits while the WD strongly circularizes the orbits, creating spiral shock waves. This is likely the same mechanism as causes spiral arms in galaxies where galactic orbits are disturbed by neighboring galaxies. (References 2)

In relatively short learning curve, excellent light curves were obtained for IP Peg, providing a fascinating glimpse at stellar evolution. However as an old astronomer asked; "Very good, but have you considered the effect of magnetic fields?" Ah well, back to the telescope! Tune in for next months' article on Magnetic Cataclysmic Variables -The Polars

References

Books

1. E. Chaisson and S. McMillan, Astronomy Today 4th Ed, Ch 19, 20, 21, Prentice Hall 2002, ISBN 0-13-091542-4
2. C. Hellier, Cataclysmic Variable Stars,

How and Why They Vary, Springer Praxis, 2001, ISBN 1-85233-211-5

3. D. Prialnik, An Introduction to the Theory of Stellar Structure and Evolution, Cambridge University Press 2000, ISBN 0-521-65065-8

Articles

1. Variable Star of the Month, IP Pegasi, December 2001, AAVSO URL: <http://www.aavso.org/vstar/vsotm/1201.stm>

Web Sites:

1. San Diego Astronomy Association: <http://sdaa.org/SDAAEvents/cataclysm.htm>
2. American Association of Variable Star Observers (AAVSO): <http://www.aavso.org/>
3. Center for Backyard Astrophysics, Columbia University: <http://cba.phys.columbia.edu/charts/>
4. A Catalog and Atlas of CVs at STScI: <http://icar.us.stsci.edu/~downes/cvcat/>
5. General Catalog of Variable Stars, Sternberg Astronomical Institute, Moscow, Russia: <http://www.sai.msu.su/groups/cluster/gcvs/gcvs/>

Tierra Del Sol Opening/Closing Instructions

These instructions are also posted at <http://www.sdaa.org/Docs/TDSiteInstructions.txt>

1. Open the two gates at the front using the numeric combination that appears on the address label of your newsletter (shown as XXXX). Dial the combination into the lock, from left to right, then push in towards the hasp, then pull back, and the locks will open. Drive in and close, at least, the chain link gate behind you. It is recommended that you lock the gate, and spin the numbers on the combination, behind you on non-star party nights, to keep out un-invited guests and stray dogs.
2. The power and water must be turned on next. The main power box and pump are located at the extreme South-West corner of the site, take the road to the



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right just after you enter the site and go to the end where you'll see the pump house. The combination to the pump and power switch is the same as the front gates. Unlock the locks, turn on the power and pump, and relock and spin the combinations.

- The combination to the locks to the bathrooms is also on your address label (five numbers XXXXX). Press the five numbers individually, in order shown, then turn the knob to unlock the doors. There are hooks and eyes to hold the doors open while you are on the site.
- The gate to the observatory area and the warming room is the same combination as the front gates. Again, open the gate, and lock and spin the combination on the lock.
- The warming room is available for your use while at the site. The combination for this lock is, again, on your address label (shown as X-X,X). This lock requires that you press in the first two numbers together, release, and press the third number, then open the door. The warming room has a heater, microwave and coffeepot for your use. Take out all trash when you leave the site.
- To close the facility - If you used the warming room, clean the room so that it's cleaner than you found it, vacuum, wipe down, sweep, take out trash, etc., there's a vacuum there if you need it. Turn off all appliances and lights in the warming room and close and lock the door.
- Make sure that you are the last person leaving, this may require you to walk up to all the observatory buildings and through all the private pads. If you are the last person there, then turn off the power and the pump and lock them in the off position. Lock all doors and gates and spin the combinations. Take out all trash.
- Close and lock the front gates. Focusing for Astrophotography

References and Resources from the Focusing for Astrophotography Series

If you liked the Focusing for Astrophotography series of articles, here are Jerry Lodriguss' references and resources where you can get more information.

World Wide Web Sites

Michael Hart - Different focusing methods. (<http://www.mailbag.com/users/ragreiner/H A02.html#Top>)

Doc G - High magnification through the focusing screen. (<http://www.mailbag.com/users/ragreiner/fo cusdevice.html#Top>)

Chuck Vaughn - Knife-edge focusing. (http://www.aa6g.org/Astronomy/Articles/k nife_edge.html)

Rockett Crawford - Knife-edge focusing.

Chris Vedeler - Focusing tips. (<http://www.isomedia.com/homes/cvedel- er/scope/focus.htm>)

William McLaughlin - CCD focusing article. (<http://willmclaughlin.astrodigitals.com/foc us1.htm>)

Warren Offutt - Diffraction focusing for CCD cameras - Winter 1995 issue of CCD Astronomy.

Books and Magazines

Brad Wallis and Robert Provin - *A Manual of Advanced Celestial Photography*.

Michael Covington's - *Astrophotography for the Amateur*.

Robert Reeve's - *Wide-Field Astrophotography*.

Chris Schur - **Getting Focused on Sharper Photos** - article in the July 1993 issue of Astronomy Magazine.

APML Archives

Astro Photography Mailing List (APML) archives. (<http://astro.umsystem.edu/apml/>)

Products

STI Stiletto Focuser. (<http://www.stellar-international.com/sti.html>)

B&K Astro Focuser for Olympus cameras. Not manufactured anymore, but it may be possible to find it on the used market. (<http://web2.airmail.net/a0011306/images/Web-om2.jpg>)

Beattie Intenscreen focusing screens. (<http://www.intenscreen.com/>)

Camera Stores

B&H Cameras - A professional fully stocked camera store and mail order house in New York City. A very reputable business with an astonishing selection and great prices on supplies and new equipment. They also deal in used equipment. (<http://www.bhphotovideo.com/>)

KEH Camera Brokers - A professional photography store and mail order house in Atlanta specializing in used equipment. (<http://www.keh.com/>)

Abbey Camera - A professional photography store and mail order house in Philadelphia with a good selection and competitive prices on supplies and new equipment. (<http://abbeycamera.com/>)

Del's Cameras - in California. Specializes in used Nikon equipment.

Allen's Camera Shop, Levittown, PA (215) 547-2841



San Diego Astronomy Association

Focusing for Astrophotography—Part 8 by Jerry Lodriguss

Editor's Note: This is the last part in a series of articles written by Jerry Lodriguss that are being reprinted in the newsletter with his permission. You can see more of Jerry's work at www.astropix.com.

Frequently Asked Questions

Ok, so what's really the EASIEST way to focus?

Probably parfocalizing a short focal length eyepiece with the film plane.

Yea, but what's really the BEST way to focus?

In order of accuracy, probably:

1. By test on the film
2. Knife edge or Ronchi screen
3. High magnification loupe on the groundglass

Where can I get a Beattie Intenscreen?

See the Beattie Home Page.

I have an Olympus, will the Vari-magnifier help?

Not very much I'm afraid. The view is restricted and dim, and it does not really provide sufficient magnification for

accurate focusing.

A knife-edge or ronchi screen will work much better.

Where can I get a DW-4, D red dot screen, good used camera, etc?

You can try these camera stores:

B&H Cameras - A professional fully stocked camera store and mail order house in New York City. A very reputable business with an astonishing selection and great prices on supplies and new equipment. They also deal in used equipment.

KEH Camera Brokers - A professional photography store and mail order house in Atlanta specializing in used equipment.

Abbey Camera - A professional photography store and mail order house in Philadelphia with a good selection and competitive prices on supplies and new equipment.

Del's Cameras - in California. Specializes in used Nikon Equipment.

Le Camera - near Trenton, NJ. Phat Le specializes in used cameras. Phone: 1-800-786-3686

Can I change the screen on my (fill in the blank) camera?

Maybe. See the camera manual if you have one. Contact the camera stores listed above.

Check in the Astro Photography Mailing List archives at:
<http://www.system.missouri.edu/apml/>.

Ask on the APML mailing list, or sci.astro.amateur.

Do a search at <http://www.google.com> for something like "Focusing screens for Olympus Cameras".

What's the best kind of camera body to use for astrophotography?

Why, the one you have, of course!

If you are in the market for one, check out the info on my cameras for astrophotography page and Focusing / Camera Bodies.

How do I focus with a zoom lens? Are zoom lenses any good for astrophotography?

You focus them just like you focus any lens or telescope.

They may or may not be any good for astrophotography. Single focal length lenses are usually better, but you will just have to test the zoom on the stars and see if it's good enough for your personal standards.

Clip and Save

2002 Board of Directors and Chairpersons

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TDS Site Director, Terry Stewart
email: t-c-b@juno.com619-295-2449



SDAA Calendar of Events November 2002

S	M	T	W	T	F	S
					1	2 Star Party at Tierra Del Sol
3	4	5	6 Stars in the Park	7 Star Party at Christ Lutheran School 7929 La Mesa Blvd	8	9 Star Party at Tierra Del Sol Star Party at Vallecito Stage Station
10	11	12 SDAA Board Meeting Star Party at Chula Vista Library	13 Star Party at Casillas School 1130 J Street Chula Vista	14	15	16
17	18	19	20 SDAA Program Meeting	21	22	23
24	25	26	27	28	29	30 Star Party at Tierra Del Sol

The Back Page

FOR SALE

Meade 8" LX200

Complete system with all standard accessories plus extras. Like new. First offer over \$1,400. 619.263.1121

Thanks,

Jim Potter

e-mail: PotterJas@cs.com

5980 Tooley Street fax: 619.264.5257

San Diego, CA 92114-1331 USA

voice: 619.263.1121

Banquet Information provided by Shawn Kelly

The Banquet invitations will be send out with the December newsletter, but here's a preview of the information.

The banquet will be on January 18th from 6:30 p.m. to midnight at the Hanalei Hotel on Hotel Circle. Tickets will be \$35 and parking will be \$2 per car at the gate.

Any members with special dietary requirements should contact Shawn Kelly at sdkellysdaa@yahoo.com

The menu is scheduled to include fresh seasonal fruit upon arrival and a buffet dinner with:

- California Greens with Choice of Dressing
- Marinated Black Bean Salad
- Red Dill Potato Salad
- Pineapple Coconut Cole Slaw
- Marinated Baked Chicken
- Braised Beef Short Ribs
- Potatoes au Gratin
- Fresh Seasonal Vegetables
- Corn Bread with Honey Butter
- Chocolate Fudge Torte

A cash bar will be available

MEMBERSHIP INFORMATION

Send dues and renewals to P.O. Box 23215, San Diego, CA 92193. Include any renewal cards from Sky & Telescope, Astronomy, or Odyssey magazine in which you wish to continue your subscription. The expiration date shown on your newsletter mailing label is the only notice that your membership in SDAA will expire. Dues are \$35 for Contributing Memberships; \$25 for Senior (Basic) Membership; \$3 for each Family membership. In addition to the club dues the annual rates for magazines available at the club discount are: Sky & Telescope \$29.95, Astronomy \$29, and Odyssey \$25.46. Make checks payable to S.D. Astronomy Assn. PLEASE DO NOT send renewals directly to Sky Publishing. They return them to us for processing. Your membership type, expiration date, and site combinations are printed on the first line of the mailing label on this newsletter.

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