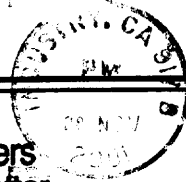




Newsletter of the Pomona Valley Amateur Astronomers

Amateur
astronomers
just get better
looking ...



Claire Stover

Volume 21 Number 12

nightwatch

December 2001

President's Message

December gets its name from word "decem" meaning ten in Latin. December was the tenth month in the Roman calendar. In the modified Gregorian calendar it's the 12th month but since none of us speaks Latin we don't really worry about this. Similarly we call the group of people with musical instruments an orchestra, without knowing word orchestra means power of the stars. True meaning of so many things, names, places or people seem to be lost somewhere. Most of the people are just taking what is presented to them and devoting so little effort to understand true meanings or origins of the words, names or events.

This is the reason why I like to be a member of the PVAA. The members of this club devote their time in reading, observing and sharing with other people. In our star parties behind every telescope I find knowledgeable people who can talk on anything from history to evolution. After each meeting (sometimes shivering in Harvey Mudd parking lot) we spend a long time discussing various things. In brief, being with PVAA members is not a boring thing.

If so, why don't we have a fresh flow of new members? For the last 4 years that I have been a member our solid core did not expand a bit. Probably this is due to our insufficient public relations. I personally believe that expanding number of our members is the most important task lies

ahead.

2001 is almost over. We had an unforgettable year. I think the Leonid shower on the 18th of November was the peak activity of the year. We had a big group of observers as well as many potential members who came by and looked through our telescopes. Such events are very effective triggering mechanisms for many people. So I expect more people in our following activities.

I wish all our members a happy and prosperous New Year. Being a member of PVAA is a great thing and I hope many people will discover this fact soon.

Alper Ates

PVAA Events Calendar

Month	Star Party	General Meeting	Board Meeting
December	15	7	11/30
January	12	25	4
February	9	22	1
March	16	22	1

Leonids are Headliners at November Star Party

This year's Leonid meteor shower was in no way a disappointment to the numerous attendees of PVAA's November star party. In addition to members, non-member invitees brought the number up to 50 people in attendance. Also present were members of the general public who either came out for the shower or just happened to be at Cottonwood Springs in Joshua Tree national Park on November 17th-18th. This made the grand total something in excess of 50. All those attending were treated to a truly spectacular celestial display.

My brother Chris and I decided to share the drive to the observing site this time. On the ride out it was overcast. This condition slowly improved as we traveled farther east and closer to Cottonwood. By the time we arrived some patches of blue had appeared, but most of the sky was still obscured by clouds. While perfect (all sky) transparency was never reached that night; as darkness approached the visibility continued to show improvement. During the hours of darkness thin clouds somewhat hampered the seeing off and on, but the Cottonwood luck (which has never failed me) held and the atmosphere stayed clear enough to observe all out the very faintest of meteors.

The orbital debris of Comet 55P/Tempel-Tuttle, which completes an orbit of the sun every 33 years, causes the Leonid meteor shower. There is the possibility of an excellent meteor shower or even a meteor storm whenever the part of Tempel-Tuttle's orbit, which is occupied by the comet, is closest to Earth. There have been predictions of much better than average Leonid activity since 1998 and those predictions have not been completely wrong, but have not lived up to our fondest hopes either. This was again forecast to be a good year for the Leonids and this time the prognosticators were unequivocally right. The moon cooperated too, by being absent for the peak this year. Observations were made of Jupiter and Saturn and all the usual suspects, but the Leonids definitely stole the show.

At 9:25 P.M. we found out what kind of fireworks were in store when a bright fireball raced nearly from horizon to horizon, shedding shimmering shards of itself and leaving a glowing column of ionized gas in its wake. So far the shower had been good, but as expected after midnight the meteor activity really started to pickup. From 12:20 A.M. until 12:30 A.M. Chris and I counted 12 and 10 meteors respectively, making an hourly rate of 72 and 60. At 1:00 A.M. the hourly rate increased to 84 and 96 by our counts. At 1:31 A.M. the rate climbed to 186 per hour. At 2:05 A.M. the rate was remaining steady with Chris getting 186 per hour and 162 per hour for me. At 3:00 A.M. our count had reached an incredible 750 meteors per hour. At 4:06

A.M. it was still at 210 per hour by my count and 186 per hour according to Chris. These kinds of numbers persisted until dawn. Of the people I talked to that night only Bob Branch had seen a better meteor shower than the 2001 Leonids. Bob observed the Draconid meteor storm of 1946 from Los Angeles.

The November star party also saw the return of an old friend. Mira, the 24-inch telescope which at one time partially belonged to PVAA and is now entirely owned by Webb School made the trip out to Cottonwood accompanied by Steve Sittig and family. It was good to see this fine instrument back out at one of our observing sessions.

Our December star party will be at the darkest site PVAA regularly visits, Mesquite Springs at the north end of Death Valley near Scotty's Castle. I hope many of you can be there to enjoy it.

Ron Hoekwater

..PVAA 24 HR. Hotline.

Get the latest news on the star party, club meetings, special events and astronomy happenings.call 909/985-1684

Visit or website at:

<http://www.cyberg8t.com/patrick/PVAA.htm>

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Looking Up in December

With all of the excitement from the remarkable return of November's Leonids still fresh in our minds, it is perhaps not amiss to think ahead to astronomical events of December 2001.

On December 14, from around noon to 2 p.m. PST, southern Californians will be able to view the partial phases of the annular solar eclipse occurring much further south. We won't notice much unless we are looking: only a small bite will be taken out of the southern limb of the Sun. Don't look directly at the Sun (reminds me of the warning: "Never look directly into the laser collimator with remaining eye"). Use glasses specifically designed for the purpose (not sunglasses or welding glasses), an H-alpha filter such as the new one Bob Branch purchased from Coronado, or use a pinhole in a sheet of paper or piece of cardboard and examine the shadow on the ground.

Saturn is just north of Aldebaran and rises conveniently early in the evening to be a fabulous view. The rings are steeply inclined to our line of sight; so much so that the authorities say that Cassini's Division is "easy in almost any telescope now". So much for my pride in viewing the division in the wonderfully still air at Joshua Tree at the November Star Party. Jupiter rises about two hours after Saturn and by mid-evening is high enough to be nicely visible. Look for them on misty, hazy December evenings when the inversions have set in and the air is quiet and the seeing is sharp. These bright planets do not suffer from our L.A. Basin skyglow, and make it worthwhile to bring your telescope outdoors on any clear evening. Show your neighbors! If they have not seen Saturn with her rings or Jupiter with his moons and bands, they will remember the night all their lives.

Speaking of Saturn, it will be occulted by the nearly-full Moon on the night of December 28. Check *Sky and Telescope* or *Astronomy* for the precise timing in our area, but it will be after midnight. An occultation of Saturn is one of the most sublime sights in the sky. Whether it is watching Saturn disappear into the thin shadow at the edge of the Moon's limb, or seeing it reappear over the mountains and mare of the opposite edge, this occultation is a sight to see. Use your telescope and get as much magnification as the telescope will support. Be ready to be surprised when the ringed planet finally reappears. You will have to scan the limb unless you know just where and when to look. With an excellent knowledge of your position and a good time-piece, the precise time of first, second, or fourth contact is of some scientific interest. (Third contact is pretty

hard to observe precisely) These time measurements can be used to refine our knowledge of the Moon's motion and the figure of the Earth.

Orion is now rising early enough to be easily visible in mid-evening. While you have your telescope out observing Saturn and Jupiter, show your neighbors M42 in Orion's sword. With a little aperture you ought to be able to see knots and striations in the nebula. Challenge the kids to find more stars than four in the Trapezium. The Horsehead Nebula will be nearly impossible from the L.A. Basin unless you are Ray Magdziarz with his fabulous Collins eyepiece. In fact, we should ask him to bring his telescope and eyepiece to a Winter meeting of PVAA to see if the Horsehead can be viewed as readily as it could be at Joshua Tree.

Star Party night is December 15, the night after the Geminids and the solar eclipse. Even though it crowds the Christmas holidays a little, we ought to all try to get out. Great views!

Ludd Trozpek

Persistent Leonid Meteor Trains

Following the initial exhilaration of the first wave of Leonid meteors in the early morning hours of November 18, some of us at Joshua Tree observed some interesting phenomena. After one particularly bright meteor crossed the zenith from east to west, someone grabbed Joe Hillberg's 25x100 binoculars which were at the ready on his parallelogram mount and aimed them at the still-visible train.

The 2.6-degree field gave a wonderful view of this spectral shape some 60 miles up. It was probably twenty to thirty seconds following the meteor before we got the binoculars pointed on it. By then it was glowing an eerie luminescent green reminiscent of the Orion Nebula. The most striking feature of it (and all the others we saw later) was the double aspect of it: two more or less bright parallel clouds separated by a dark area. Within the glowing clouds were billows and swirls and puffs familiar to anyone who has observed airplane contrails.

In fact, the double aspect of Leonid meteor trains has been observed before, and some attempt has been made at an explanation of them. The image accompanying this article shows the development of a Leonid train from 28 seconds after the meteor to one minute fourteen seconds afterward. Though it was taken during the 1998 Leonids, it is very similar to what we observed at Joshua Tree.

It should be noted that we were readily able to estimate the widths of the meteor trains we observed. In Joe's binoculars they took up approximately 1/8 of the 2.6 degree field of view—perhaps a third of a degree or so. Since a third of a degree is approximately 0.006 radians (6 milliradians), then at an assumed 100 miles height, the width would have been 0.6 miles. At a more modest height of 60 miles, the width would work out to be just under 0.4 miles.

It should also be noted that we were able to estimate the rather gale-like north winds blowing at the altitude of the meteor trains. The trains moved rather noticeably against the background of stars—probably crossing the whole 2.6 degree field in 20 seconds or so. At an assumed altitude of 60 miles, this would work out to a horizontal speed of about 3 miles in 20 seconds or 540 miles per hour: about the speed of a fast jetliner. We also observed that the wind was more or less laminar—not turbulent—because the basic structure of the train was preserved for many minutes. There was wind shear (most likely with altitude) because the train quickly developed hooks and twists as if some portions of it were being stretched one way and some the other. In this respect the trains we saw were similar to the one in the photograph.

The trains we observed frequently consisted of two parallel somewhat diffuse luminous trails, with some amount of puffy billowing which implies local turbulence. The morphology of the train is either a tube or a ribbon. My guess was that we were seeing a tube with more luminous material in the thick walls than in the hollow and dark center. There were two reasons for thinking this: first, I could think of no mechanism that would produce a ribbon-like structure from a single meteor. I could conceive of a tubular structure being formed as the hot gasses moved away from the path of the meteor in all directions first kinetically and then through diffusion in the thin atmosphere at sixty miles. Second, even as the train was twisted and turned by the winds aloft, it never showed itself "edge-on" as you would have expected with a ribbon. It always showed the double-path form.

The precise science of the meteor train is not known. There are some models which account for some of the feature but which do not account for all of the observations. The persistent train luminosity is thought to be caused by a recombination of ozone and oxygen catalyzed by metal atoms provided by the meteor. There are several reactions involving sodium or iron and various molecules of oxygen that produce excited metal species with lines in the 5700-6300 Angstrom region. Also, there is a strong green line produced by a 1S transition in atomic oxygen that may contribute.

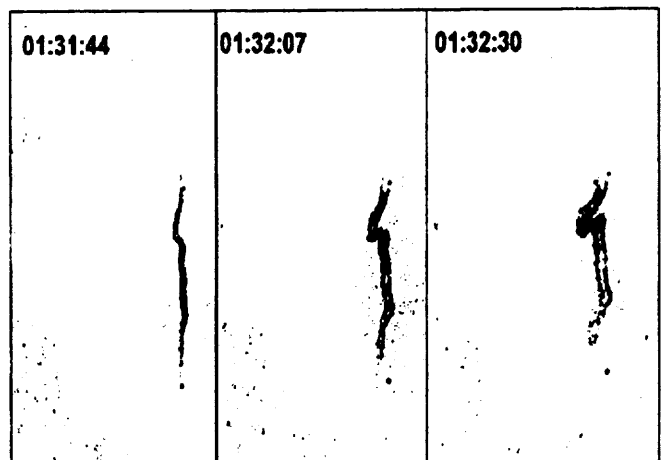
If we now assume that the twin tracks of the meteor are due to a luminous tube with a dark center (viewed from below), we can at least make the dark center plausible by noting that ozone in the center has been consumed by thermal dissociation and further by metal-catalyzed destruction. Since ozone "fuels" the chemiluminescent reactions with the metals in the meteor, the center of the tube is dark.

(It should be said that this theory provides a lower limit to the amount of meteor material ablated during the passage of the meteor since a certain amount of material and therefore a certain metal concentration is necessary to remove the ozone from the center of the tube through the catalyzed reactions. The probable mass necessary to provide the train we observed was 50-100 grams. (approximately 2 to 4 ounces))

At the low pressures of the upper atmosphere (approximately one-millionth the air pressure at the surface), the size and velocity of a Leonid (operating at a Reynold's number of more than 2000) would create a turbulent wake some 200 feet in diameter where the air temperature is raised more or less instantly to 1800 degrees Celsius. This instant heating creates a pressure increase of a factor of 10 or so which creates a radially-expanding shock wave that expands to some 500 feet in diameter until the pressures equilibrate. This happens in well less than a second since the speed of sound in this region is 900 feet per second or so.

Following this event is the longer, slower diffusion expansion that occurs at a speed of roughly 35 feet per second. Thus, after twenty seconds or so, a train some 2000 feet across (0.4 mile) is contemplated by the theory and is consistent with our crude observations.

Many of the facts and theories on Leonids presented here were taken from *The Dynamical Evolution of a Tubular Leonid Persistent Train* by Jennikens, Nugent, and Plane, May 2000.



Joe Hillberg had one of the wryest comments on the literal bombardment by the Leonids in the early morning of November 18. Commenting on those of us who finally turned in at 4:30 a.m. after watching hours of meteors streaming down over the whole sky at rates of up to 30 or 40 per minute he recalled that some people said, "Well, the rate is down to eight meteors per minute; I guess I'll go to bed."

Ludd Trozpek

Club Announcements

Our Treasurer, Ludd Trozpek, gave a summary of recent financial events including our Club joining the Astronomical League. While joining was necessitated by the need to acquire liability insurance so we can continue to hold meetings at Harvey Mudd College, Club members will receive the added benefit of a quarterly newsletter from the League. Ludd extended his thanks to the previous Treasurer, Jack Gardner, for his many years of service – keeping track of the records and distributing a monthly newsletter to us all is a challenging task. Three visitors attended our meeting and one joined the Club.

November Meeting

Alper presented a What's Up covering the planets Jupiter and Saturn along with sights to be found in their vicinity – the constellation Taurus and bright star Sirius along with comet Linear which is due to brighten from a current 8.5 magnitude to 5.3 by the end of November. Of course the big event in November is predicted to be the Leonid meteor shower. I'm sure many of us will have observation reports to share about this one at our next meeting!

Our speaker for the evening was Bob Mortimer, Geologist by profession and amateur astronomer and telescope maker during his off-hours. He explained to us some of the structure and properties of the sun, along with definitions of prominences and filaments. These are two names for the same phenomenon depending on if they are observed in profile at the edge of the solar disc (prominence) or if we see them from above looking down on the solar surface (filament). Bob had some interesting ideas on the overwhelming effect of solar magnetic activity on Earth's temperatures. Perhaps the "global warming" we are currently observing presages a cooling trend on Earth that may even lead us into another Ice Age. History indicates previous Ice Ages have begun this way. It is probably a valuable lesson that we Earthlings may not have it all figured out when it comes to predicting the effects of the various and interconnected influences on our climate. We may do well to keep a warm parka on hand while we shelve the aerosol cans and Freon – just in case the sun turns out to be a

bigger player in all this than our spray deodorant.

Leonid Observations

My family and I joined the many Club members at Cottonwood Springs for the Leonid meteor shower. We can all attest to its dramatic show. While the longest trail and perhaps the largest single meteor occurred early at 9:25pm and streaked almost 180 degrees from horizon to horizon, sheer numbers were best experienced from 2am – 3:30am. My daughter, Lucy, counted 835 individual meteors during this time, with peak rates of 10-17 per minute. My husband preferred the relative warmth of the motor home but experienced the audible response of the large crowd at Cottonwood as "ooohs" and aaahs" at the big ones were heard through the night. It was a wonderful evening under the stars, definitely worth the long but easy drive and the chilly temperatures.

Claire Stover

Received

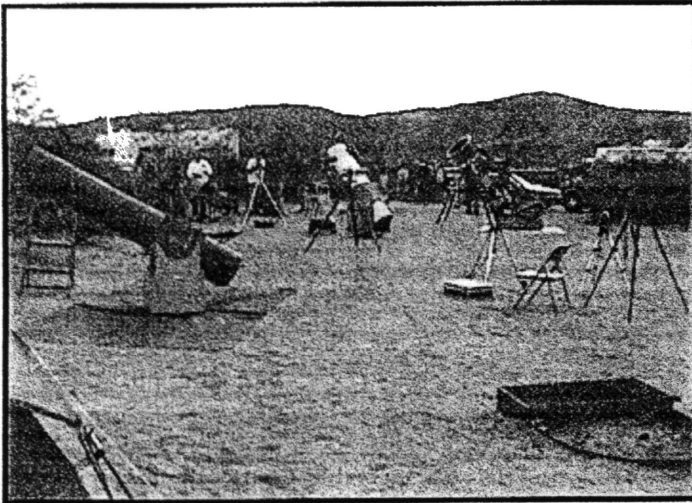
The Club has received a copy of a new NASA Technical Paper: *The Total Solar Eclipse of 2002 December 04*, by F. Espenak and J. Anderson. (NASA/TP-2001-209990) Goddard Space Flight Center, Greenbelt, Maryland. 77 pp.

This publication covers literally everything one would want to know about next year's southern-hemisphere solar eclipse. The authors include tables and charts of all of the circumstances and contacts as well as detailed sections on African and Australian weather prospects. There are many local maps and an entire section on observing the eclipse.

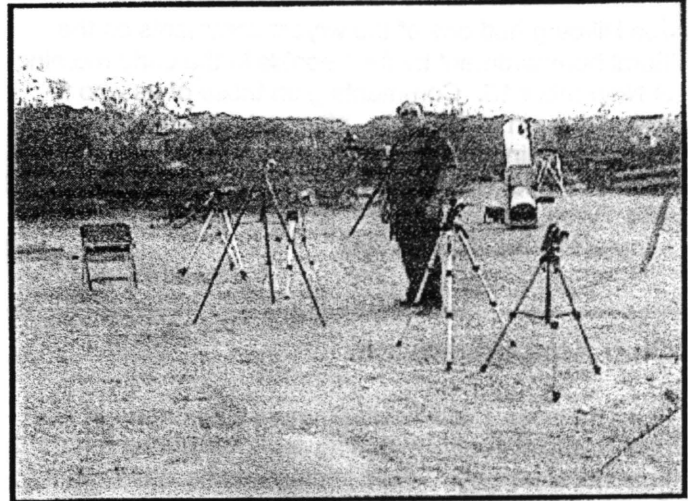
The flavor of the book may be had by considering a few sentences from p. 1. "The instant of greatest eclipse occurs at 07:31:11 UT when the axis of the Moon's shadow passes closest to the center of the Earth ($\gamma = -0.302$). The length of totality reaches its maximum duration of 2 minutes 4 seconds, the Sun's altitude is 72 degrees, the path width is 87 kilometers and the umbra's velocity is 0.670 km/s. Unfortunately, the umbra is far at sea approximately 2000 kilometers southeast of Madagascar..."

This is a fine technical treatise that makes interesting reading whether or not one is planning a trip to the opposite side of the world in December of next year. It is available for loan from the Club. See Bob Akers.

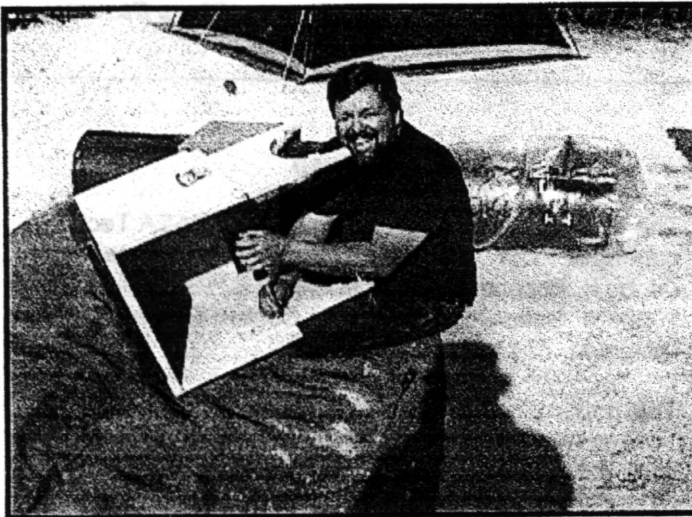
Ludd Trozpek



Cottonwood Springs early afternoon as the field filled up with telescopes and gear.



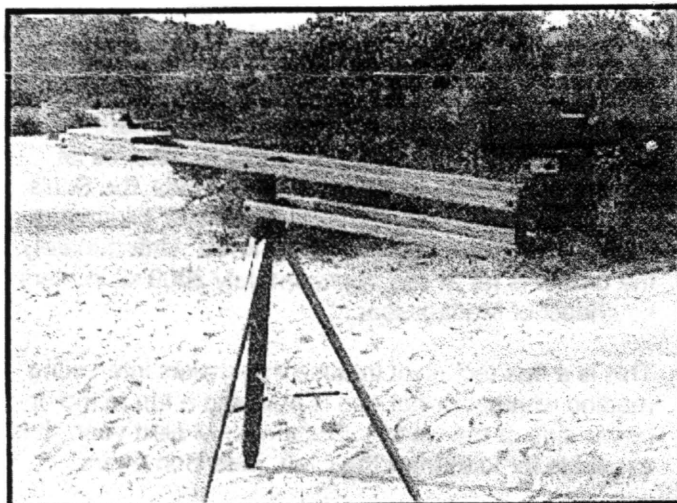
Joe Hillberg among his cameras getting set up for the Leonid meteor shower.



Dennis Lumbert doing some last minute adjustments to his telescope.



Ludd Trozpek was second to arrive and set up for the Leonid meteor shower.



Joe Hillberg's parallelgram binocular mount.

There were many PVAA members, at least twenty, but most of them showed up when it was too dark to photograph them.

"Mira", the 24 inch telescope was brought in by Webb School with some students.

Alper Ates was there with a lot of students from Pomona College