

Volume LVII, Issue IV

PAStimes

Monthly newsletter of the
Phoenix Astronomical Society
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UPCOMING EVENTS CHANGES

Please, check the current schedule of upcoming events prior to going to any meeting or event. Lately I have had to change a few dates due to accommodating a speaker or school. For example: Our December meeting will be on a Friday, and yes, you need to know this. And the November Meeting of the Minds has been moved twice, once because of Turkey Day, and the other because a school asked us to do a star party for them. So, check the upcoming list every time you plan to attend something. The current one is usually in the newsletter and you can always email me or call me to confirm the dates. Thanks so much for reading the newsletter.***

WHY USE AN INTERFEROMETER?

from <http://ftp.nofs.navy.mil/projects/npoi/whynpoi.htm>

Since the invention of the telescope, astronomers have been striving for clearer definition of the objects they observe; this has led to the development of larger and larger telescopes. As we increase the size of a telescope, faint objects become easier to see and the detail seen in the object improves as well. The physical effect that limits the resolution of a telescope is called diffraction with the amount of diffraction decreasing with increasing telescope size and vice versa. To illustrate this behavior let's consider a pair of stars lying close together on the sky. One such pair could be the binary star system Mizar, visible to the naked eye and found in the handle of the Big Dipper. In the figures to the right, we have shown the hierarchy of stars in the Big Dipper to aid the reader in understanding the Mizar system. Mizar lies very close to Alcor, another naked eye star, and both may be seen as distinct stars by the unaided eye. This visual pair of stars is not physically connected by gravity. Mizar itself is a pair of stars, Mizar A and Mizar B, that are separated by about 14 seconds of arc, too close to be seen by the naked eye as a distinct pair. The eye, which has a resolution of about 2 minutes of arc, discerns the Mizar star system as a single star. However, with modest optical aids (binoculars, for example) it is resolved into a close pair. An important by-product of increased

resolution is the ability to point the interferometer very accurately to the position of a star. If we can accurately point from one star to another, we can determine the relative positions of the stars. This is the principal of astrometry, the measurement of star positions. Surveying the interferometer position relative to bedrock is a key function of the laser metrology system at the NPOI. This metrology system allows us to determine the accurate angular differences between the stars, thereby measuring their positions on the sky. Measuring accurate star positions is one of the historical mandates of the Navy and was a strong motivation to finance the development of the NPOI. Accurate star positions are useful in traditional forms of navigation (before GPS). When the interferometer is fully functioning as a precision astrometric instrument we expect to be able to measure star positions from the ground with an accuracy of about 1/1000 of a second of arc. These measurements will provide an important demonstration for space-based interferometers that may increase that accuracy manyfold. These high precision measures will also yield interesting scientific results. Following the work of the Hipparcos satellite, we should be



This is an aerial picture looking toward the center of the array. The four astrometric huts are visible to the left of center in the photo. The inner parts of all three arms and the perimeter road may be seen. The beam-combining laboratory is the large building visible above and to the right of center. Long-delay-line vacuum pipes are seen to the right of the laboratory.

able to correct measures of the motions of stars in the galaxy that will help to establish distance scales and to understand the structure of our galaxy. Another interesting scientific problem for today's astronomer is the direct observation of surface features on stars. Now, we only have high resolution photographs of the Sun in which we may see spots, prominences, flares and other structure that reveal activity on and below the surface. We do not yet have comparable photographs of any other stars than our Sun. If we tried to observe alpha Centauri, our nearest solar-like star at a distance of 1.3 parsecs, its disk would have a size of 7 milliseconds of arc, almost 270,000 times smaller than the apparent size of the Sun!

As our astronomer friend to the left notes a very big telescope is necessary to resolve the star's disk, let alone observe star spots on its surface. In fact, to see the surface of alpha Centauri in visible light we would need a telescope with a mirror diameter of 14 meters, larger than the Keck telescopes in Hawaii. To resolve spots would require a

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telescope at least 100 times larger than that. Such a large telescope is well beyond our present day technology, if we try to construct one using a single mirror. However, it is within our present capability if we use interferometric techniques. Invented by Albert Michelson in the 19th century, the interferometer makes use of separate telescopes that are widely spaced rather than on a single large mirror. While the interferometer does not capture as much light as a single mirror of the same diameter it can achieve the resolution. Interferometers first became practical in the mid-1970s and are now under development in several parts of the world. Most visitors to an optical interferometer will not recognize the array of optical elements. One example of an interferometer is the NPOI on Anderson Mesa outside Flagstaff, Arizona.***

ON THURSDAY, NOVEMBER 4, DENNIS YOUNG

of SiriusLookers will present viewing thru his 3/4meter Scope (with new toys!) & first hand experience on the SpaceShipOne launch and a short video clip at the PAS meeting.***

THE RETURN OF SATURN STAR PARTY AT HIGH DESERT PARK

by Barbara Hartman

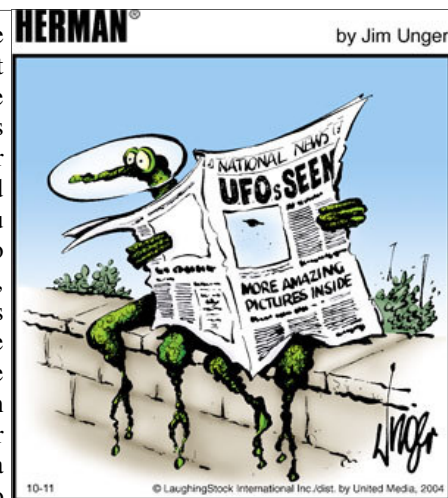
Yes, the Lord of the rings, that golden orb that awes and amazes stargazers of all levels is back in the evening sky - Late evening that is. Saturn rises at about 10:00 pm on November 13th. The most beautiful planet of the solar system is almost at what astronomers call quadrature and that is that it is just about at a 90 degree angle to the sun from our perspective here on Earth. What's so amazing about that? At this time in the Saturnian systems orbit, the shadows cast on the planet by the rings and vise versa make the planet really look 3-D through a telescope. It's amazing; you've got to see it! The sun sets about 5:00 pm and twilight ends almost two hours later at 6:52 pm. The waxing crescent moon sets about 6:00 pm (give or take for the mountains) making for a very lovely sight during sunset. This is a pot-luck so bring a main dish to cook for yourself or group, hamburgers, hot dogs, chicken, steak, whatever you like and a dish to share with everyone. Enough for 10 servings should be plenty and it can be anything from Mac-n-cheese, to chips and dip, to Aunt Hattie's green bean casserole. Bring something to drink and snacks for the evening, a red lensed flashlight, wear sensible clothes, and bring a light jacket or sweater as the air will cool considerably and may get quite chilly. Pillows and blankets for the kids would be a good idea if you plan to stay late. As usual we will be setting up on the ball field and we will be sharing the park with a group of RVers who will be set up - up in the parking lot. Plan to arrive between 3:30-4:00, get set up; we'll have the barbecue going. We'll eat, pick up before the sun goes completely down and then stargaze the night away.***

DECEMBER PAS MEETING SWAP MEET

At the December PAS meeting, we have our annual swap meet. Bring items you wish to sell or trade, and we will help you do that. Items for sale will be placed on the

tables at the back of the room, as not to interrupt the speaker. We will have our normal order of events and then after the speaker is done, the swapping and selling will begin. If you complete a sale prior to the meeting beginning, that is awesome! This is your chance to get those items sold. Please come with an idea of how much you'd like to sell your item for and either make a price page for it prior to the meeting, or use my extra scrap paper that I'll

bring, and create one when you arrive. Please make your tags neat and easy to read and place them on the table in front of the item you wish to sell. Mark the tag with a brief description of what the item is and how much you want for it. We will have two tables set up at the back of the room for the Swap meet items. Let's see everyone there!***



"According to this, we gave a 45 year-old woman a skin rash."



received from Dan Heim

THE BENEFITS OF JOINING THE INTERNATIONAL DARK-SKY ASSOCIATION

by Bob Gent

received from Barbara Hartman

Sometimes it's tough to "quantify" what one gets for joining a non-profit, educational organization like IDA. As the only organization dedicated to preserving the beauty of our night skies through improved outdoor lighting practices, we provide simple, win-win, solutions to the problems of energy waste, glare, light trespass, and destruction of the night skies. How have we been doing at this task? We have published nearly 200 information sheets, and these are distributed to thousands concerned citizens around the globe. In addition, we distribute helpful videos, numerous IDA slides sets, and posters. We also now publish and distribute nearly 40,000 copies our quarterly newsletters each year. As a member, you would receive IDA's newsletter as a benefit. Thanks to the help of many volunteers, we now run an excellent website at www.darksky.org. News media, IDA members, city planners, and others use the information found here to promote quality outdoor lighting and to preserve the beauty of our night skies. One day during a major IDA news story in November 1998, 38,000 people visited our web site. But all of these numbers don't begin to tell the real story. IDA is making a huge difference. A lot has been accomplished, and the word is getting out. Better lighting is appearing in many locations. Better lighting fixtures are being developed, and all of these things will improve as time goes on. We have been getting excellent media coverage. Working with the media, we have had dozens of hard hitting stories about the problems of poor outdoor lighting. Allies are being established. IDA members around the globe are

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establishing regional sections and affiliates to promote our cause. Virginia, Pennsylvania, Texas, Arizona, California, Japan, Canada,



Here is an awesome photo of Ross Tucker doing his presentation with his IBook on the lectern. The white MacIntosh laptop fits well and is held firmly by the ledge at the bottom of the lectern's slanted top. Ross did an awesome job with this presentation.

and Australia are just a few of the locations with very active IDA sections. We have forged new alliances with the Illuminating Engineering Society of North America (IESNA). This group sets defacto lighting standards with their recommended practices (RP). This year, a new IESNA RP has been published which promotes quality outdoor lighting to reduce glare and promote energy conservation. Several of the IDA board members are IESNA members. We are also developing new alliances with the National Parks. They now recognize that poorly design outdoor lighting is a serious threat to their night skies. They understand that the beauty of a magnificent, star-filled sky is a precious treasure that they don't want to lose. The Environmental

Protection Agency is now helping us promote quality lighting to conserve energy, thereby reducing fossil fuel consumption and lowering atmospheric pollutants. "So what? This still doesn't convince me," you say. Then, here is another example of our forward progress. After a long struggle, the state of New Mexico passed a "Night Sky Protection Act" which was signed by the governor on April 6, 1999. Hundreds of other municipalities around the globe are taking similar actions to conserve energy through responsible outdoor lighting. IDA is on the front lines providing support to all these communities asking for help. Don't you want to promote public awareness and improve our quality of life? None of this is cheap. Running an office, paying employees, covering utilities, supplies, insurance, rent, printing, postage, and many other expenses is very costly. This is why your membership is critical to us. You are helping us help everyone in the battle to save our night skies. In addition, there is strength in numbers, and we leverage your support around the globe. Ask again. What do I get for my membership? How much is it worth to preserve the beauty of our night skies? To conserve energy? To promote quality outdoor lighting to reduce glare and light trespass? Never before has there been such a win-win solution to a difficult problem. Please



We had two members of the class to whose room we are borrowing, Mark & Logan, attend the October meeting. Mark (left) was here for the September meeting too. It is nice to see the young folk joining us at the meetings. We hope to see more of these two and others in the near future.

help IDA by joining or making a contribution now. You would be doing a great service to all.***

OCTOBER PAS MEETING REVIEW

Did you miss this one? You should not have. We had Ross Tucker, a JPL Solar System Ambassador at this meeting. Wow, his energy levels kept us alert. Ross usually presents to a younger crowd, school age kids, and he didn't change his talk for us, much. He did give us more info than the school kids would have gotten, more details and such, but he had an awesome amount of energy, and he was entertaining as well. It was an awesome talk. We opened the meeting with Dan doing the opening. Mark got in an accident on the way to the meeting, so he wasn't there. Jerry is still out of town, so he wasn't there. Matt Kohl and Leah Sapir were missing as well. And we have a few new folks show up. I wish to thank Tommy Tucker for attending, as well as Amber Rihl, Logan (can't read last name on sign in sheet), Scott Loucks, and Mark D'Asta. Logan and Mark are currently enrolled students of Foothills Academy and Mark came last month. I guess we did a good job; he came back again. Thank you all for attending. So, we opened the meeting with Dan just briefly introducing Ross in case he had to leave early. Ross took the floor for quite some time and use a bunch of energy and comedy. He told us of many interesting things, such as the fact that it is only 1 of 300 Solar System Ambassadors around the country. We heard about all the planetary missions and particularly

about Cassini, which is what I asked him to cover the most. His major at ASU is Particle Physics. In the background we had an entertaining music selection provided by Ross of Bach. It was very nice to listen to. At the end of his presentation, we all went outside for a little project of creating an engine out of people. He showed us how



And here we have an interesting set of folks. The gentleman on the left has the same last name as Ross, so I presume it is his Dad. Dad came to photograph Ross doing his presentation. It was nice to see a new face. And then look who we have beside him! John Pulis made it to this meeting and we are so glad he did. Not pictured is one other dude who joined us that evening, Scott Loucks. The photo I took of him came out too blurry to put in the newsletter. However, I do want to welcome all our new visitors and the returning ones from last month and to Thank John Pulis for making through his quadruple heart surgery and returning to us. We hope to see a lot more of him and everyone else who was there.

the proton and electron worked, and then shot the electron with a beam, which then sent the electron off to the side, and the proton was drawn toward the back of the space ship and ejected, causing the propulsion needed to maneuver the space craft. We had several people be the space ship walls, standing in a circle, and Mike was the proton, and Mark was the beam, and Logan was the electron. It

was an interesting demonstration. Then we went indoors and he concluded his talk and shared Milky Way candy bars with everyone as a conclusion. His talk was wonderful and Kevin Harcey invited him back to update us anytime. The

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meeting actually ended earlier than usual, so Dan, myself, Don, Barbara and a few others looked at the photos on the nearby computer of the ones we are voting on for the PAsTimes Star Tours postcard. We looked but didn't decide anything yet. We ran out of time. So, we all worked our way outdoors, Dan locked up behind us and then several of us stood around in the parking lot talking till about 10:15pm. It was an awesome night to be outdoors. And the presentation was awesome as well. Thank you Ross! And welcome to the new people who showed up. See you at the next meeting when we will have a 28" telescope to view through, possibly in the parking lot till 10pm. See you there!***

ASTRONOMICAL LEAGUE BINOCULAR MESSIER CERTIFICATE #633

by Barbara Hartman

If you remember back in a previous newsletter, I told you about the Astronomical League's observing certification programs, well since then I have received my first award, the cool pin I am wearing in this picture. As many of you know I was proud to show off my Certificate and Pin at the last meeting, what a feeling of accomplishment. When I first began the Binocular Messier program, I was unsure how it would go, but I had previously viewed most of the Messier objects through my telescope; I thought how hard could it be? Well to my incredible enjoyment it was fantastic, an awesome experience. All I did to participate, was download and print the program materials from the League web site at www.AstroLeague.org. They have a "universal" observing form (in PDF and Word format) you can print it right from their web site, but I made my own just for this program; which I'd be willing to share. I purchased a Sky and Telescope Messier Card for a few bucks, but you could use the list they give and



This is Barbara Hartman. Barbara is being posted in the newsletter for a couple different reasons. First, please notice the awesome little pin (looks like binoculars) that she was awarded for completing her Messier observing catalog. She says it was well worth the effort. Also, I'd like to thank her for all the extra stuff she is doing for PAS. She is very involved with the International Dark Sky Association and has helped Richard Guthrie and a few others get the lighting in their house's area toned down to be more Astronomer pleasant. She has also helped me with many ideas and come up with quite a few for improving the club. She is one busy gal and a great PAS member.

whatever star charts you like. The lists of objects are geared toward different sized binoculars, but you can view any 50 of the objects you want to for your award. You can even view them all if you wish, but 50 is all you need. I viewed a couple that weren't on my list and one twice, which was interesting to see the two slightly different takes on the same object. Once I had all my materials and forms in order, I began to observe the objects. It only took me about three weeks from beginning to end. Two Saturday nights and the final week I observed three nights during the week from my backyard, so five nights all together. I limited myself to ending each weeknight at 10:00 pm, so

it was only two hours a night that I worked on this- Did I say worked? Well it was more like play to me! I was also surprised and awed at how amazing most of the objects looked in the binoculars wide field of view. Not only was I seeing the object, but also the area around it and that made it seem as though I were viewing them for the very first time. It was incredible and incredibly easy. I wrote down my impression of each item as I viewed it and when I was done

I sent a photo copy of my log sheets to the club chairperson. Little more than a week later I had my pin and certificate. Your name and club gets posted on their web site too. There is no time limit for any of these programs, take as long or as short a time as you need. It's an immensely rewarding and fun thing to do. See you at the next star party; I'll be starting the Caldwell program.***

FLAGSTAFF FESTIVAL OF SCIENCE REVIEW Weekend 1 – September 25 & 26

Our weekend (which is the weekend of my birthday and this is how I celebrate it) started with Friday evening not working out as planned. We had planned to make it up to Flagstaff by 7pm to see the talk about Lucy at NAU. However, that plan didn't work out and we actually didn't get up to Flagstaff till about 9:30pm. By



Here I am making a Saturn. They had the gentleman in green with his back to this photo running the event. He showed us how to do it. The other gentleman in green to his right and on my side of the table, would help each of us do it. There was a line going from left to right in this photo, where the girl in blue was first, then me and then the kid with dark hair. I was helping the kid with dark hair as he was in a hurry to finish his Saturn.

then, everything was done with for the Festival activities, including the star gazing at Heritage Square (Yes, for those who might see a similarity, there is a Heritage Square up in Flagstaff as well as one at the Arizona Science Center). So, Friday evening we relaxed at the cabin and rested up for a long day in Flagstaff. Saturday came and we began the day in Wheeler Park. As you can see from the many photos here, we were quite busy and we had a great time. Let me give you a review of the highlights of the park activities. We wandered around for about 2 hours, from roughly 10am to 12pm. We visited the Gore display. This year they had a great display, a 2 sided tent and an extra tent set up that was supposed to be rain falling. The kids were having fun in that one. One person/kid at a time could go in there wearing the special Gore –Tex fabric raincoat, hat, boots, gloves, etc... and experience NOT getting wet. It



Flagstaff Festival of Science, Wheeler Park, Here we have the USGS all set up with a Mars Rover on the table, a 3-D image with glasses for viewing, some really cool posters and images in the background and some nice globes off to the side. It was an awesome day to have the festival.

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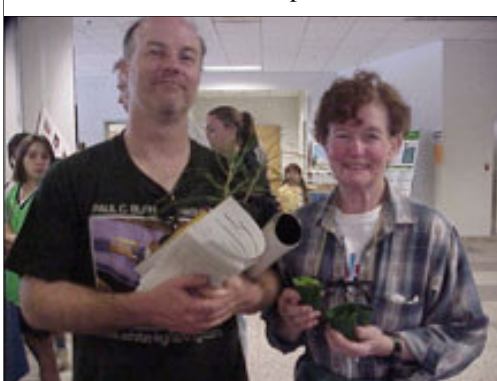
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was fun just to watch the littlest kids standing in the "rain" looking out of the big yellow tent like "What am I doing in here?" Gore had quite a display set up. There were about 10 little tent rooms all connected in 2 rows, and each room showed something different. One room was very interesting and showed a model of a hydrogen car with gore-



Bruce and William are seen here where they had some telescopes set up for viewing at NAU. The telescope on the left was set up for Sun spots, thus the solar filter on the end of it. And the Orange telescope where William is was on solar flares.



Bruce & Bette picked up some plants at the NAU Mountain Campus Science Day event. Behind them is where the bug display was set up, and to the left of Bruce is where the plant making table was, and to Bette's right is where they were giving away the pine trees Bruce is holding. We had just finished making the little plants she is holding when I decided to take this photo.

tex being used to transport the hydrogen. That was very interesting. The next table down was Lowell Observatory and they had some handouts and things to give away and some solar telescopes set up. I saw Kevin Schindler there and we chatted briefly. I looked at the sunspots. There was only one visible that I could see, but it was a big one. I stopped at the U.S.G.S. table and collected a few flyers and things to read. They had a nice display and around the back the kids were making Saturns. So, while I made my own Saturn my brother Bruce took some photos. This was rather cool. We made a Saturn out of glue, 2 CD's, a Styrofoam ball cut in half and painted with something (pre painted), glitter, a paperclip, and string. I made a Saturn to remember this day by. This would be a cool project for a school group or just something we could do at a later time, possibly, maybe for Astronomy Day with the kids who stop by our table. They also had some really cool 3D posters and



tarantulas, etc, were there. That part doesn't interest me other than to see the huge bugs on someone else. Not on me. Mom and I made our own plants. One group was showing us how these really cool plants germinate with their seeds



This is just one angle of the whole Wheeler Park Festival of Science event. We are looking East from the Library. On the far left is the table with the globes, the USGS table. In the hole between the two sets of trees is where the telescopes were set up by Lowell Observatory for solar viewing. To their left was Gore.

up on their leaves. So, they had little planting cups and soil and we got to plant our own little plants and take them with us. We stopped at one display that was showing you how to eat mesquite trees. You take the mesquite bean, bake it, make it into a powder and then they had it in cookies so you can taste it. I couldn't have the cookies but the rest of my group (Mom, Dad, William and Bruce) said it was really good. The cookies had chocolate so I have to avoid that. Another display was giving away baby pine trees, so mom and I each got one. They had a display that always keeps William's interest having to do with a Tesla coil and other electrical things.

He could stand there for hours watching that. Then someone mentioned there were more activities in another building so we gathered our plants and wandered over and found a solar telescope display set up between the buildings. One telescope was showing the sunspots. The second



William is speaking with one of the telescope operators while we wait for the big scope in the foreground of the photo to chase the clouds away so we can see Venus. It has a GPS so they caught Venus several times during the day. We eventually got to see it before leaving.

was showing solar flares and the third was showing Venus in the daytime. He found it using a GPS system. We hung out there for a bit, Venus was hiding, and then wandered into the Chemistry building to watch a Magic/ Science show. We caught the tail end but it was nice to sit down for a bit and rest. When the Science ended we went back to bug the telescope display again and we chatted with them for quite a while. Then we decided we best get going as they were thinking of closing up. So, we hopped in the car and headed over to Bookmans. We didn't get to stay there long, as then we had to find dinner, and move on to the appointment I had set up to see Braeside Observatory. Braeside wasn't part of the Festival of Science this year. I created myself an invitation and so we headed over to see how that observatory was doing. We got there at 7:30pm and didn't

leave till 11pm. Our tour guide was Dennis. Dennis was hired to do research and run Braeside after the death of the Owner and Founder Robert Fried. Here is a paragraph from their website explaining what they do "Braeside Observatory is

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a small, but modern privately operated astronomical research facility located five miles West of downtown Flagstaff, Arizona at 7461 feet above sea level. Its business is to supply research data to the astronomical community. While it does not have a "public" program, we always welcome visitors for a tour and a talk of what we do here." I borrowed, also from the website, some history of Braeside, and included that in this newsletter. PAS and Braeside might soon have a working relationship. Dennis took us on a fantastic tour. We got to go places we only dreamed of. He showed us the Control Room, called the Bridge. He showed us some of what Braeside can do and how it is set up and told us all sorts of interesting things about it. He then showed us how it images M13 and then we went out to a set of binoculars he had put outdoors and he showed us M13 through the



Interferometer Tour. This is one of the light collecting units at the Interferometer up on Anderson Mesa. The unit on the right sheds its lid and collecting the photons, which then sends them down the white tube and into one of the three silver horizontal tubes via mirrors.

binoculars. Then we went on a tour of the dome, top and bottom. We chatted about all sorts of topics, not just astronomy or even about Braeside. We talked about computers, electronics, culminating telescopes, Star Trek, there were a bunch of topics we chatted about through the night. He then took us on a tour of the main house where the Control Room is located. We were very pleased with the tour and the information. Dennis said he used to belong to PAS a long time ago. Thank you so much,

Dennis, for the fantastic tour. This was definitely an awesome, exhausting day. Sunday, my birthday, we started the day with a brief tour around the Elden Pueblo ruins, then did some shopping, headed back to the cabin, and relaxed the rest of the day. We had ice cream and William and I headed home around 8pm. We have another exhausting weekend planned for Oct. 1, and it includes running into Dennis again at one of the events. I am looking forward to that! ***



Here we have Dennis sitting at the control panel for the Braeside Observatory telescope. The control panel is called the Bridge (named for Star Trek and positioned similar to it as well). Dennis was an excellent tour guide and we enjoyed our tour!

FLAGSTAFF FESTIVAL OF SCIENCE

Second Weekend
Review, Oct 1-3, 2004

Wow, what a wonderful weekend this was. You know, if you haven't attended any of the events for this Festival, you might want to consider getting in on them next year. I was lucky enough



Then we have the U.S. Naval Observatory. Some of you may remember Fred Harris. He came and did a talk a long time ago, and was the main speaker right after Pierre Schwaar was our Show and Tell for the night. I looked it up and Pierre passed away in March of 2000, so Fred must have done a presentation prior to that date. Here we have Fred playing the accordion and talking with my Dad, Ed Wurst, who repairs and plays accordions. Fred was running the Solar Viewing display, which wasn't as productive as one would think due to the thick clouds. He had two telescopes set up outside for people to look through, but the clouds took the views away. But we had an awesome visit with him.

this year to get 2 weekends of the Festival. This is the first year I got to do that. Let me tell you, we totally enjoyed ourselves and the amount of info we got from the tours was fantastic. Our first stop on Oct. 1 Friday didn't work out. We had plans to attend an event, a talk, up at NAU at 7pm. Well, it was also Adult Night Out at the Science Center here in Phoenix, so I opted to do that instead. So, we started out on Friday planning to attend the talk about Archeo-astronomy at the Science Center. Well, that didn't last long. I got a call from Mark, the Prez, and he said that some wonderful lady with a party, needed some telescopes. I called her and we set that up. So, never did make it to the Science Center for that talk and to do the telescopes outside that night. So, I called Don and Richard, my 2 partners and told them what was going on. Richard said he'd take the position at the Science Center so that I could do the observing session in Scottsdale. It turned out that he couldn't do the Science Center. They had too many kiosks in the way in Heritage square for him to get through to the Science Center to set up his telescope, so both Don and Richard ended up with me at the Party. We had a great observing session once the lights were turned down. We had Don on the E.T. Cluster most of the night. Richard chose to cover double stars and I was on the Perseids Double Cluster. The moon rose around 9pm which was after most of the party people left, and so the head people came over and joined us in viewing the Moon. We impressed them. We got done there around 9:30 or so and Kevin and Mike called to find out where we were, since we were scheduled to be at the Science Center and that is where they were, and we were not. We decided to go out for munchies, and met them over at a café. We stayed there for a couple hours and then departed

for the night. William and I headed home, unloaded the scope and accessories and reloaded the car with the stuff we needed for the weekend in Flagstaff. We took showers and left Phoenix at 1:30am. Yea, that was kind of late. We got to Flag and in bed around 4:15am, only to get up at 6 the next morning. I was really lacking sleep the whole day. I'm so glad we have XS Energy drinks for days like this. Our first tour was a reservation so we had to be there at 9am at the Anderson Mesa Interferometer. Chris who slightly hassled us saying we were in the wrong place and it was government and a restricted area greeted us. I didn't know how to take him so I just told him we were here for a tour. Then he told us he was joking and we all got a little laugh from it. Our tour guide, Nat White did an awesome presentation.

We must have been on that tour for about 2.5 hours but it was well worth it. If you haven't been on a tour of the Interferometer, I suggest you do it. In fact, I was asking Nat if we could do a Field Trip up so that many of PAS could

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Nat is telling us about a really funny story and then explaining how these tubes transport the data back to the main building.

ADS IN PAsTimes

This is the PAS advertising column & is a FREE service to all PAS members, guests, & VIP. Any Astronomy related items (books, scopes, binoculars, services, etc.) may be listed here that are being SOUGHT or SOLD. The item will only be advertised for ONE MONTH, but may be renewed each month (as needed) by contacting the Editor, by the newsletter deadline (the 1st of the month). It is requested that Non-PAS Members please make a small donation for placing your ad in both the PAsTimes newsletter and to my list of 170+ astronomy-loving email contacts. Please make check payable to Phoenix Astronomical Society and send to the return address on this newsletter. We do your advertising in hopes of great returns.

SCIENCE, cont'd. from p. 6

attend a tour. He showed us every detail of the interferometer. The outsides of the buildings/telescopes are painted with a special Infrared Light Reflecting paint so that the heat of the sun does not interfere with the results that are gathered inside. We sure enjoyed that presentation and before I left, I asked Nat if he would mind doing a talk at our club. So, we may be able to bring the Interferometer to PAS in the near future. I also included in with this review, a portion of their website for future information on how the Interferometer works. This was so interesting and an excellent tour. Our next stop was the National Weather Service. This has always been a great tour, but this year they did a better one than last year. When we walked in, Jesse greeted us at the front desk. He directed us to a room where Brian was our first stop. Brian did a brief summary of what the weather service does for us, in a conference room with a slide show. This was very interesting. Mike was our guide for the weather maps section of the tour. He was telling us how there are 15 meteorologists working there, 3 hydro-meteorological technicians, 3 electronic technicians, 1 IT specialist (someone has to keep the computers running smoothly) and 1 administrative assistant. And what does the Weather service provide for us? They provide Public Forecasts, Aviation forecasts, fire weather forecast & support and the watches, warnings, statements and advisories you see on your TV or hear on the radio. Then we went outdoors and Clair, a wonderful dude, did a bunch of different things for his part of the tour. The table outside had many weather instruments on it. The item on the right in the photo of the table has a big bucket at the top of it. This bucket is used to measure rainfall. It houses anti freeze and mineral oil. We saw how then used the snow measuring stick and many other facets of weather measuring. It was an enjoyable tour. The following day we went up the Ski Lift for a talk having to do with the flora, fauna, & volcanoes of the area. This was highly interesting. We first got in line at 10am to get our tickets, and then we went up the lift to the top. It is about a ½ hour ride up. I took lots of photos, and as we got closer to the top, it became colder. It was about 62 Degrees at the base of the lift, but only 40 degrees at the top. However, with the wind chill, it had to be much



Inside the control room of the Naval Observatory's main telescope (the 61"), we have a tour guide telling us how and what they do with the data they receive from this station. It is becoming more automated, such that the astronomer doesn't need to sit in here all night. They can program the computer to tell the telescope to do the viewing, and then they can go to bed, come back the next morning, get the data and do the analysis in the comfort of their office.

colder. Once at the top, you could see for miles all around. Our tour guide was a forest ranger. He told us about the vegetation up there and the different levels of vegetation from sea level on up. Then after his brief introduction, we hiked up one level of a little hill. The altitude was 11,500 feet, and boy did we feel it when hiking up that little hill. We got to the landing where his assistant did a brief talk about an endangered species of plant. I didn't take notes at this talk, so the name of the plant isn't in my mind, but we enjoyed the talk. Then we went up another little hill and stopped to talk about the pine trees and why they are different than the ones down at the bottom of the ski lift. After that we



This is the smaller scope within the dome along side the main dome's location at the Naval Observatory. it is cooled with liquid nitrogen and has a massive unit on the bottom where the CCD camera is connected. Ron Stone showed us this wonderful scope. The dome was kept mostly closed due to threatening clouds.

went back down to the landing to look out and see the volcanoes that were talked about. This whole talk took about 1.25 hours and we enjoyed it. Just as we were leaving the upper end of the ski lift, a storm was setting in off to the left of the lift. We got on the lift, thinking "something is coming" and headed back down. It is weird, but the ride up seemed longer than the ride down. I would have liked to just stay on the lift and got back up and back down one more time. It was interesting. On the way up we saw and I tried to photograph a porcupine. On the way down, there wasn't anything to see of interest in the way of wildlife except a dog someone was taking for a walk. So, we get down, Bette and Ed get off the lift, 2 chairs later Bruce gets off the lift, and just as William and I get off the lift a light rain and hail start to fall. We go inside and visit the restroom (there are no restrooms up at the top and it is very cold up there), and the storm outside was brewing. Then we work our way to the car. We eat our lunch while driving down the hill, and get to the U.S. Naval Observatory. Our first stop at the Observatory was to see an old friend and previous speaker to PAS, Fred Harris. He was sitting outdoors with 2 solar telescopes set up (no sun at this point) and he had them covered in plastic, and he was sitting off to the side playing the accordion. That got Ed's attention. My Dad, being a music instructor, plays the accordion and repairs them, and Fred was saying how it is hard to find an accordion repairman. Well, the two of them had a great conversation. Then we left Fred outside and went inside to investigate what was to be seen. In the room/dome where the 61" telescope is housed, Fred Vrba and I chatted for a while. We talked about the scope and how they are thinking of revamping that scope. They are building a 4 meter scope to replace it and would be selling off the 61" scope to someone eventually. That scope weighs 50 tons. That was very interesting. Then we went into the control room, and Dave Monet, who was the guide in there the previous year, was talking about what the control room does and how astronomers who borrow time on the 61" telescope do not have to stay up all night any more to monitor what the scope is doing. Now they program it, and go to bed, come back in the morning and

See NAVAL, p. 8

NAVAL, cont'd. from p. 7

get the data. That is so interesting. Anyway he was telling us that during the time when the Moon is in the sky and gets in the way of taking dark sky pictures, they use the Infrared camera that is on that scope. The other two weeks of the month, they use the CCD camera. And one thing the Naval Observatory is known for is the cataloging of stars. They started in 1850 measuring and catalog stars. The star catalog is the USNOB catalog. It is available to the public. Dave was showing us the most recent find, the star they have been working on which is a T-type star that is Cool at only 800 deg. F. It is faint, nearby and just bigger than Jupiter. After visiting with Dave, we worked our way over to the smaller scope where Ron Stone was doing a presentation. This is the 1.3 meter scope. In the 1960's the Naval Observatory was built in Flagstaff. We then left Ron and went back to Fred Harris before leaving. Fred was packing up his telescopes just as we arrived and so we chatted for a few moments and then left. The tours were to end at 4:30 and I think we didn't get out of there till about 5pm. Yes, Terri is the last to leave any good event. It sure was an enjoyable and educational Festival this year. It would be nice if more of PAS could attend the events in future years.***

Look for more Festival of Science photos in future issues.

BRAESIDE OBSERVATORY

Borrowed directly from the website <http://www.labbey.com/Braeside>

Braeside Observatory is a small, but modern privately operated astronomical research facility located five miles West of downtown Flagstaff, Arizona at 7461 feet above sea level. Its business is to supply research data to the astronomical community. While it does not have a "public" program, we always welcome visitors for a tour and a talk of what we do here. A simple contact is all that is required. Braeside Observatory was founded in 1976 by Robert Fried, now a retired Delta Airline Captain. Fried entered into the world of astronomy as an amateur by joining a local astronomy club in 1960 in Atlanta, Georgia. The first telescope was a 3 inch refractor, a gift from his family. Interest in the heavens quickly increased as he began scouting out all the objects seen in books and magazines with his new telescope. Within a short time, he was taking pictures of the moon, planets and anything else that happened to be visible in the sky and learning the dark room magic that goes with making astronomical photographs, along the way. He experimented with what was then a new technique called "chilled emulsion" photography by building a special camera. He hoped to produce better pictures with this device which makes it possible to expose the film longer, thus imaging fainter objects. But, alas, he was to soon realize that the coffee table book pictures were simply out of his reach with the 3 inch aperture of his refractor. Looking



Braeside Observatory Dome



Braeside Observatory telescope



Braeside Observatory Control Room called THE BRIDGE

for an affordable larger aperture telescope proved to be equally elusive. This is where the dream stood till that fortuitous colloquium meeting in New York. A chance meeting with Sir Patrick Moore, that well known author and popularizer of astronomy, at a colloquium on Transient Lunar Phenomena in 1963, brought a glimmer of hope to his dreams. While sitting at the hotel bar one evening talking to Sir Patrick about the difficulties of justifying an expensive larger telescope so he might possibly consider trying to do some serious work, Moore said simply "...Why don't you just build it?" The seed was

planted and a challenge had been issued. Two years later on Thanksgiving night, first light filtered through what was to become the present backbone of the Braeside facility, all designed and constructed by Fried. Eleven years later, Braeside Observatory was

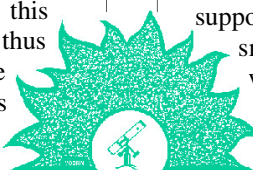
officially founded and accepted by the IRS as a Private Operating Foundation, a 501 (c), (3), non-profit organization. This opened the way to proposing for grants to support what Fried had begun. In 1978, contact was made with a professional astronomer who wanted research data that Fried was able to supply. A mentoring relationship was established and as collaboration with other astronomers from all over the world began to increase, Fried began learning what it was like in the real world of professional astronomy. Fried's first paper in collaboration with a this professional astronomer (D. S. Hall, Vanderbilt

University) was in the journal "Astrophysics and Space Science" (1982) and contained his photoelectric photometry measurements. Thus began what has become a list of more than 50 papers, co-authored with a score of astronomers from around the world, in the journals as listed in the international database, SIMBAD, at Strasbourg, France. Since 1995, when the Braeside CCD camera was first added to the telescope accessories, more than 39,000 images have been taken in support of the work at Braeside. Meanwhile, the observatory continues to upgrade its technical capability and productivity.

The Braeside mission is simple:

To make available through collaboration, research data requested by members of the astronomical community worldwide. Astronomers, especially those with teaching responsibilities, are finding it increasingly difficult to carry out "time-critical" research programs, not just because of these responsibilities, but because of the difficulty of being awarded observing time at the national observatories. The development of new detector technologies and larger telescopes have compelled these large national facilities to strengthen their support of this kind of instrumentation. The result has been a steady decline in budgetary support for the more traditional observing methods that use the smaller telescopes, often resulting in their closure. This is where facilities like Braeside come in. Our principle activity is called "photometry", an observing procedure

See BRAESIDE, p. 9



BRAESIDE, cont'd. from p. 8

that directly, or indirectly, affects just about every area of astronomical research today. It is done with an instrument attached to the back plate of a telescope onto which the stellar object's light from the telescope is focused. In this way, we can accurately measure the brightness of the object. This brightness is recorded in a computer and by using our special programs, we can accurately determine its magnitude, color, temperature, and other information of astrophysical interest. These data are used to model what is going on up there. The resulting information is then sent to collaborating astronomers via the NASA Science Internet and is made available to astronomers throughout the world. The facilities are on a 10 acre tract of land surrounded by State and Federal Forest Land. They include the telescope building and the control building.

General

There are three computers linked together as a peer-to-peer network system. The main, or command computer located in the control room, is called the "Bridge". This one is a Gateway P-5/166. In the telescope dome room are two additional computers, both clone 486/66. These computers are called the ICC and the TCC (Instrument Control Computer, and Telescope Control Computer, respectively). The Bridge communicates separately to the ICC and the TCC via fiber optic serial port links. The ICC and TCC also communicate with each other over a short 24 inch long serial port connection. Additionally, there is a 10Mb/sec Ethernet fiber optics link that transmits CCD frames rapidly down to the Bridge in the control room.

Telescope Building

The telescope is mounted on a 30 foot high pier sunk onto bedrock and rising some twenty four feet above the ground. This pier is 30 X 40 inches, made of concrete block, and is filed with rebar rods and concrete. The telescope is attached to this on top of the pier. The telescope building is constructed of 2 X 6 stud material, sheathed with vertical running ribbed metal covering, and is without insulation. The building dimensions are a cube of 24 feet. The actual observing floor is 20 feet above ground. The dome is an aluminum 14 foot diameter structure redesigned from a silo (farm, that is) dome. It has two motor-driven transverse shutters. The dome is rotated by means of a "drive" ring clamped between two 3 inch diameter grooved wheels, one steel (the idler wheel) and one hard rubber (the driver wheel). The drive motor is a computer controlled reversible AC gear motor. A hand railed catwalk surrounds the dome affording safety when removing snow, or just showing the night sky to visitors. A steel stairway leads both to the telescope room and this catwalk.

Control Building

The "Control Building" is pretty much the nerve center of the observatory. Besides the telescope control room itself, there is a library/office, a dark room, a snack bar area, blackout sleeping room with twin beds and full bath, machine shop and an electronics work area. A 35 year PASP library as well as other journals and catalogs are available in the library. The building is located some 100 feet north of the telescope building. All aspects of the observatory are operated from the control room. The Bridge computer is connected to each of the two dome room computers (TCC and ICC) by duplex fiber optic cables as mentioned above. Lightning storms are frequently a problem in the late summer time in Flagstaff. The fiber connections minimize the hazard to all computers that

could occur with copper cable connections. A television camera provides the Bridge console with a view of the telescope room, while a intercom transmits room sounds from the dome so the operator can always see and hear what's going on there. Additionally, an intensified TV field acquisition camera in the telescope topbox provides the operator with the telescope's field of view on an 8 X 10 arc minute field. Finally, the ICC and the TCC both have their separate display at the Bridge console. All together, there are five monitors in the console providing information on the system operation. The telescope is a fork mounted classical Cassegrain with an f3.9 primary of 62.5" fl. The hyperbolic secondary is of 4X magnification resulting in a Cassegrain focal ratio of f15.6. Both mirrors are made of annealed Pyrex. The primary mirror cell is an aluminum casting and incorporates a 9 point flotation system. The telescope main tube is an epoxy impregnated, epoxy finished (inside and out) "Sonotube" with 5/8 inch wall. The secondary spider is a 3-arm support setup cast directly into the telescope's aluminum end ring. The ring also incorporates three manually (...!) operated petals for closing the tube. This spider ring casting incorporates appropriate mounting fittings that hold the screwjack motor assembly for longitudinal (focus) motion of the secondary mirror. It is computer controlled through the operating program. The telescope base is a 400 pound 3/8" welded steel plate structure. The telescope fork is cast from an aluminum alloy called "Tensilloy". The polar axis is a solid 5 inch diameter cold rolled steel material, machined and heliarc welded to the fork attach plate. The cast fork is held to the fork attach plate by eight 3/4" diameter bolts treaded into the fork. The moving mass of the telescope is approximately 285 pounds. The declination saddle structure is also made of cast Tensilloy and securely attached to the telescope tube. The fork declination attach points are fitted with 2" wide X 2" ID precision roller bearings. These bearings receive the declination journals. The telescope tail plate is made from the same material, carefully machined to parallelism, and attached to the tail plate support end ring casting. The tail plate has threaded bolt hole patterns for mounting a variety of accessories. ***

MEETING OF THE MINDS REVIEW

With a new visitor! 10/28/04

Hey! I really want to thank Avery for attending the Meeting of the Minds this month. I don't think it is what she expected but I sure appreciate her being there. Here are the topics we covered that night: 1) Check Signing Proposal, 2) IDA Barbara wants position, 3) Move M.O.M. to a more North location, 4) F.H Star Party after Holidays like in Feb or Mar, 5) Astronomy Day event, 6) No M.O.M. in Nov., 7) December meeting on Friday Dec 3rd, 8) Phoenix Children's Hospital, 9) Speakers, and 10) Year in Space Calendar being ordered Nov 1. We had a good meeting. In attendance were Mark, Jerry, William, Avery, Mike, Matt, myself, Richard and Ed. With so few people we really got more done quicker and even finished by 8:30 that night. That was a very good time to stop the meeting when we completed everything. There was good discussion between everyone and here are some of the results of the meeting.... Those Officer's who attended the meeting were handed an Elections page. This page is set up so that if you are an Officer, and changing position, or retaining a position in the club, you will need to write a short paragraph to go along with my Proxy Vote idea. These items need to be gotten to me no later than Feb 1st. It will help me make a good

See MINDS, p. 10

MINDS, cont'd. from p. 9

proxy voting page for everyone. We opened the meeting with introductions around so that Avery wouldn't feel left out. This helped so that she knew who she was talking to. Jerry supplied Terri with all the upcoming Lake Pleasant star party dates, the Deep Sky and the Shallow Sky star parties. Those will be posted shortly, to cover all upcoming star parties in the newsletter. Jerry brought up the PAS Swap Meet in December. You will want to bring your item, then have a page where you put your asking price, and then have a pen near by, so that anyone who wants to put their bid down on that page, can do so prior to the start of the meeting. The Swap Meet will continue during the meeting, but not during the speaker. Then at the end of the meeting, the owner can go back to the item and see who bid the most on that item and either sell it or decline the sale based on the amount offered. For example, you bring a \$20 eyepiece and put \$20 on the page in front of your eyepiece with its description. I can go to the table and offer \$10 for it by putting "Terri \$10" on the page. If not one outbids me and you want to part with it for \$10 from me, you can sell it to me. This is Jerry's idea and it sounds like a good one. Start searching for those items today. Find what ever you want to sell that is astronomy related and let's help you get it sold at the December PAS meeting. We then talked about the Social and how I need to write an article about it. So, that will show up in the newsletter, soon. We discussed the issue of how checks are being signed by the club officers. It has been, in the past, the Treasurer was the only signature, ever since I took over as editor. Well, we discovered that the PAS Constitution says that 2 signatures are required to make the check valid based on the Constitution. So, we are working out a solution to this because we have situations where the Prez or Vice aren't available for signing of checks and that creates a hassle when the recipient of the check has to wait for their monies due to a delay in getting a signature from the main Officers. So, I proposed we agree that as long as one of the Officer's is available and witnessing the transaction, they can sign to show they saw it (or initial it) as a witness in the absence of the Prez or Vice. This idea is still being tossed around. We then talked about Barbara's request to be the IDA Liaison. She is already a member of the Dark Sky Association but would like it known to the club members that she will fight for your cause if you need some lights reduced to help darken our skies. She is a good advocate for keeping the skies dark. So, we all agreed to post that in the newsletter on the contact page. That change should show in this issue. We also discussed that we need to make Jerry the High Power Rocket Launch contact. So, that will also be posted in the newsletter in the list of contacts. Then we talked about possibly getting a Variance from the City of Scottsdale for events that are held after 8pm at Foothills Academy. This we will leave up to Dan to contact and see if we can't get permission to be out there. The idea is that we are educating the public with our telescopes and so, once in a while, we might be allowed to hold a public event at F.H. Academy for the purpose of educating the public. We will contact Dan and see where that goes. By the way, Dan, Kevin, and Don were missed at this meeting. Dan felt too sick to come. Kevin and Don were just missing. And we did have Mark and Jerry this time, which was a nice change. Then we talked about Astronomy Day. Matt and I have been working on what we want to do, where we want to do it, how we want to do it, and if we want to be involved with the Science Center this year, or go it alone. We tossed around a few ideas and opened it up for discussion to be sure to get enough input.

We are thinking of doing a raffle, with a big name speaker, but haven't decided on the details yet. I'll keep you informed as to what we plan to do as I learn more. It was suggested we hold a major event up in Anthem instead, and draw more people in that way. Jerry then talked about our Phoenix Children's Hospital star party which happens on Nov 17. Sunset is at 5:15 and he would like the volunteers there by 4:30pm if possible. He also needs to know who is coming. So, those of you who have volunteered, I have you on the list. I have Richard, Ed, Don and Dan so far. Anyone else who wants to sign up so you get your name badge from the hospital, needs to contact me ASAP so we can let Jerry know. That sums up the meeting except for the last announcement by me which was that on Nov 1 I am putting in the order for the Year In Space Calendars and I was hoping for just a few more copies to cut the costs, but didn't get them. So, the cost will be \$9.95 each and I am collecting ASAP. Get those checks to me NOW. Thanks. Reminder: There will be **NO MEETING OF THE MINDS** in November, and the December PAS Meeting is on Friday December 3rd.***

WHAT THE DARKSKY ADVOCATE CAN DO FOR YOU

As the Darksky Advocate, Barbara says, "(Her) duties should be to educate our members as to their local lighting ordinances and to help them get things done - like street lights shielded or filing formal complaints about light trespass. Also to help them with resources, like pamphlets explaining lighting issues and what can be done to correct them, letter writing, contacts and help them get signed up as members of the IDA . . . (I) just want everyone to know that if they need help with lighting issues that there is hope, and to promote the IDA, because the IDA can do more to preserve the night sky than anyone of us can individually."***

STAR TALES

received from Bette Wurst

With few exceptions, stars that make up constellations usually lie at various distances from the Earth, only appearing to be grouped together because they lie in approximately the same direction. For example, the stars in the prominent autumn asterism the Great Square of Pegasus range from about 97 to 330 light years away.***

The Cat's Paw Nebula, located 5,500 light years away, is an emission nebula in the constellation Scorpius. The nebula contains stars that are many times more massive and hotter than the Sun. The UV light from these stars ionizes the hydrogen atoms in surrounding space, causing a red glow.***

Discovered by Giovanni Cassini in 1684, Dione, one of Saturn's larger moons, is unique in the solar system. The moon, which is made of rock and water ice, has another moon within its orbit called Helene.***

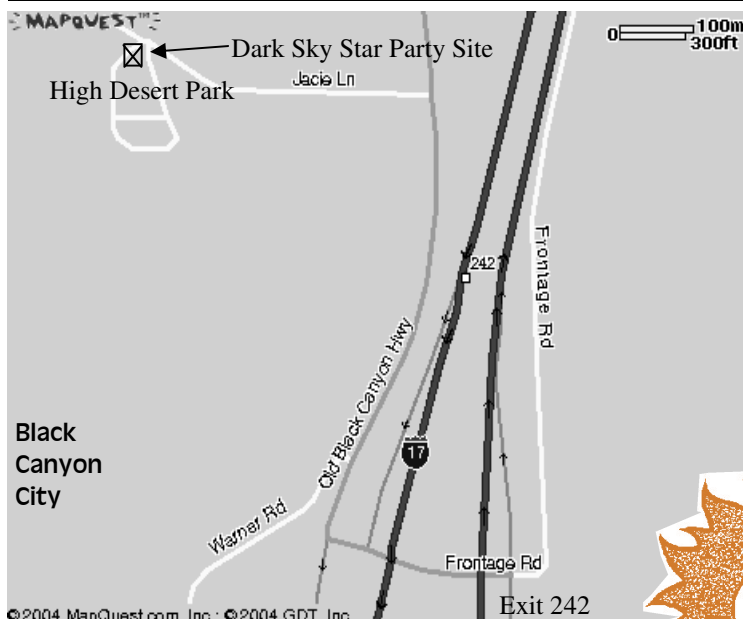
IS THIS THE END OF ROBIN?

As you may notice, this is another issue again left without a chapter to the Round-Robin Story Contest. Shall the fate of Captain Steven Marks and the P.A.S. be left unknown? What are those disgusting blobs? And why won't they go away? Would you like to know what happens next? If so, you may have to be the one who continues the tale. Submissions for Chapter 3 will be taken until November 27.***



UPCOMING EVENTS

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
NOV. 7	8 Saturn stationary	9 Jupiter 1.0° south of Moon, occultation. Venus 0.2° north of Moon, occultation.	10 Mars 0.5° north of Moon, occultation	11 Mercury 2° north of Antares; Uranus stationary	12	13 Black Canyon City Deep Sky Star Party & Potluck , see map; New Moon 9:27 A.M. EST
14 Moon at perigee	15 Deadline for submissions to January Newsletter	16 Venus 4° north of Spica; Leonid meteor shower	17 PAS Public Star party for Children's Hospital, Location: 20th Street and Thomas, 5pm; Neptune 5° north of Moon	18 PAS School Star Party at Phoenix College Football Field for 2nd Grade of Khalsa Montessori Elementary, 7-9pm	19 SAC meeting at ASC, sounds good; First Quarter Moon 12:50 A.M. EST	20 Mercury at greatest eastern elongation (22°)
21	22	23	24	25 Thanksgiving	26 Full Moon 3:07 P.M. EST	27
28	29	30 Moon at apogee; Mercury stationary; Saturn 5° south of Moon	DEC. 1	2	3 PAS Meeting , 7pm, Speaker: Nat White Topic: Details, Details, Details, Astronomical Optical Interferometry; Adult Night Out at Arizona Science Center	4 Lake Pleasant Shallow Sky Party - see map; Last Quarter Moon 7:53 P.M. EST



Lake Pleasant
Shallow Sky Star Party Site
Contact Jerry 623-328-9290
or Mark 623-435-5454 so
you don't go alone.

DECEMBER 2004

PAStimes

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PHOENIX ASTRONOMICAL SOCIETY

Terri & William Finch
PAStimes NL Editor & HP Editors
10828 N Biltmore Dr #141
Phoenix AZ 85029 USA

PAStimes
Dec. 2004 Issue

STAMP

BRING A FRIEND

DECEMBER SPEAKER: Nat White
TOPIC: Details, Details, Details,
Astronomical Optical Interferometry

TO:

MAILING LABEL

THIS ISSUE:

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WHY USE AN INTERFEROMETER? - p. 1
THE RETURN OF SATURN STAR PARTY AT HIGH DESERT PARK - p. 2
DECEMBER PAS MEETING SWAP MEET - p. 2
THE BENEFITS OF JOINING THE INTERNATIONAL DARK-SKY
ASSOCIATION - p. 2
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P.A.S. Meeting Location

Foothills Academy College Prep
7191 East Ashler Hills Dr, Rm. 204

PAS MEETINGS 2004/2005

Friday, Dec. 3, 2004, 7 pm

Feb. 3, 2005, 7 pm
Mar. 3, 2005, 7 pm
Apr. 7, 2005, 7 pm
May 5, 2005, 7 pm

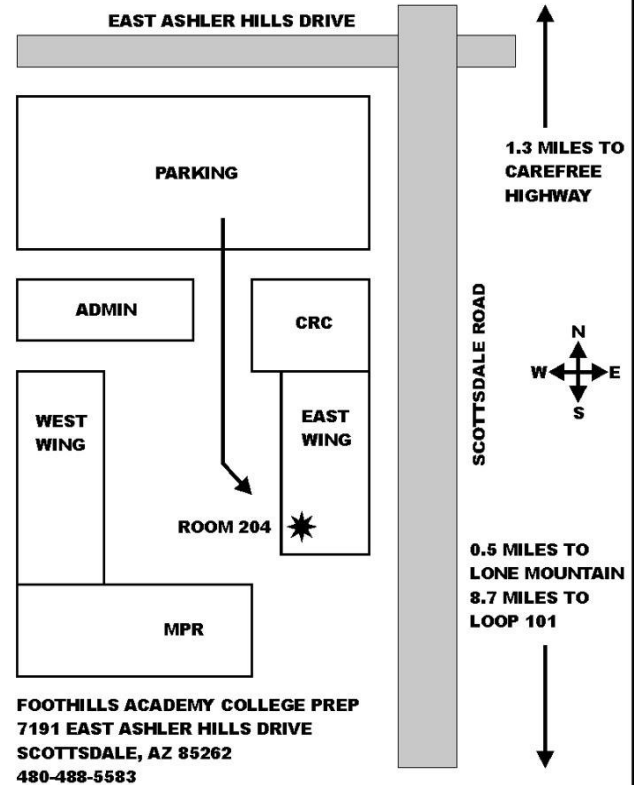
MEETING OF THE MINDS 2004/2005

Nov: Cancelled

Dec. 16, 2004, 7 pm
Jan. 27, 2005, 7 pm
Feb. 24, 2005, 7 pm
Mar. 31, 2005, 7 pm
Apr. 28, 2005, 7 pm

2004/2005 P.A.S. Contact List

POSITION	NAME	E-MAIL ADDRESS	PHONE #
President:	Mark Stephenson		623-435-5454
V.P., Star Party Dir. & H.P. Rocketry Liaison:	Jerry Belcher		623-328-9290
Treasurer:	Richard Guthrie	rg85029@mindspring.com	602-943-8278
Multimedia Dir.:	Dan Heim	dan@heimhenge.com	623-465-7307
Editor & Photographer:	Terri Finch	alienstarstuff@yahoo.com	602-547-2420
Co-Editor:	Matt Kohl	coeditormatt@yahoo.com	623-847-3371
HomePage Dir.:	William Finch	gilgamesh_az@iname.com	602-547-2420
Hosts:	John Pulis		623-582-9235
	Ed Garbero		602-942-2452
Public Relations Dirs.:	Mike Marron	primefactory@cs.com	480-488-3031
	Kevin Harcey	kevinofphx@yahoo.com	602-622-0258
Darksky Advocate:	Barbara Hartman	AlyaSerpens@yahoo.com	623-374-5364



FOOTHILLS ACADEMY COLLEGE PREP
7191 EAST ASHLER HILLS DRIVE
SCOTTSDALE, AZ 85262
480-488-5583

Submissions to **PAStimes** should be received no later than the 15th of the month for publication in the next issue. Email submissions received at: **PASEditor@yahoo.com** or **CoEditorMatt@yahoo.com**. Items arriving too late for an issue will be printed in a future issue (if applicable). **PAStimes** is produced monthly by Terri & William Finch and Matt Kohl. It is distributed to the members, friends & guests of the **Phoenix Astronomical Society**. It is also circulated to business, teachers, and organizations relating to astronomy. For needed changes to the **PAS Homepages** contact William or Terri Finch, or Matt Kohl. **KCH Cartoon** is by Kevin C. Harcey. Extra Editing & Newsletter Layout by Matt Kohl (MK). Meeting & Star Party **photos** taken & **Editorial** articles written by Terri Finch (Rip). Additional materials from sources as noted. For membership info contact Terri Finch or Richard Guthrie. For newsletter submissions or to get on the mailing list (2 months free) contact Terri Finch. PAS is a nonprofit organization with the purpose of educating the public, and sharing a great hobby! If you receive a duplicate copy of this Newsletter, please pass it on to a friend and inform the Editor. **CLEAR SKIES & HAPPY STARGAZING!!!**