



# THE PINE MOUNTAIN OBSERVER

Volume 22, No. 3 Celebrating 38 Years of Observing Winter 2005

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## Observatory Report 2005

## MEETING NOTICE

Winter Meeting  
 Saturday, December 3<sup>rd</sup>  
 2005  
**12:00 PM**  
**University of Oregon**  
**Willamette Hall**  
*details on page 12*  
 for more information:  
 Mary Hill  
 visions@pacifier.com

**2005** WAS AN EXCITING YEAR OF IMPROVEMENTS AT THE OBSERVATORY. In early May Bob McGown and several volunteers completed work on the new observing pad adjacent to the 32" dome. The 10 yards of concrete for the pad had to be pumped almost 200 feet from the 24" viewing area. The reason for this was we were afraid the concrete trucks driving over the walkway to the 32" would bust the existing pathway. This new area will be used as a radio telescope site for the next couple of years. The site will eventually be available as a robotic telescope site that can be rented out for short-term (1-3 years) astronomical projects from other universities. (See photo)

During the time the pad installation was happening, Allan Chambers and I were removing trees from the hill above the 24". We took out all of the trees from the pathway up to the cairn to just above the northeast side of the 32".

In June Karl Osterich and new volunteer Mark Hermansen came up to help remove trees. Because of the sensitive plants growing in this area the cut trees had

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*Pine Mountain Observatory taken August 12, 2005. Tree removal plus new gravel areas around the grounds are evident. Photo by Mark Dunaway, by way of gracious pilot Norm Winningstad.*

## Observatory Report

continued from pg. 1

to be removed by hand down to the 24" viewing area and then transported to existing burning sites down by the parking area. The limbs will be burned this winter. The wood from the trees will be available for camper's fires. We contemplated other uses for the wood but the trees we were cutting had very little trunk material and were mostly limbs.

In addition to the many school, Scout and church groups visiting PMO this summer, we held two major star parties. The first event was the 3<sup>rd</sup> annual Geocaching Star Party during the weekend of June 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup>. This event brought folks from all over the state and as far away as southern California. There were over seventy that came and camped for a weekend of geocaching, visiting and stargazing. For those of you who are not familiar with geocaching here is a web site link:

<http://www.geocaching.com/faq/>

This next link is to the posted invitation to the event and it also contains notes from folks who attended:

[http://www.geocaching.com/seek/cache\\_details.aspx?guid=3c5d7a77-a9c7-484a-bc00-115ebdb13837](http://www.geocaching.com/seek/cache_details.aspx?guid=3c5d7a77-a9c7-484a-bc00-115ebdb13837)

Even though the weather was a bit on the cold side the event was a great success and folks are already talking about the 4<sup>th</sup> annual Geocaching/Star Party for next year!

The other big Star Party in 2005 was the PMO

Perseid Meteor/Fundraising event on August 11<sup>th</sup>. This event brought over sixty folks to PMO. Ken and Noreen Robbins and also University of Oregon's College of Arts and Sciences Development underwrote this event. Dr. Greg Bothun from Physics at U of O and Lee Johnson, amateur astronomer and professor of English at University of British Columbia were this year's guest speakers. Due to the size of the event it was held in the new viewing area adjacent to the 32". Catering was provided by Robby J's Bistro. Norm Winningstad flew in by helicopter from Newport and gave me a lift to PMO from the Bend airport. This gave me the chance to get photos of the observatory from the air.

In September Karl, Mark and I finished the tree removal off the hill above the 32". Tim King, Greg Haider, and Collin Partridge from U of O facilities services came up and helped us in the removal. Thanks to the hard work from all the folks mentioned above the 24" and 32" in scopes now have 90% of the views they had when they were installed. Next year we will finish the job of restoring telescope views from the 15" scope and also remove the rest of the trees blocking the views from the 32" to the south west. Yeah!

Fundraising for the new educational facility is kicking into high gear this winter. We need help with fundraising efforts along with donations! If you are

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## View The Sky Without A Telescope, Tycho Brahe!

by Norma Leistiko

**L**OOKING UP: SO MUCH GOES ON AT PINE MOUNTAIN Observatory! So many people assist and promote the Observatory behind the scenes! So many knowledgeable visitors share their information with us as we gaze at the night sky together. I have been at the Observatory every weekend during visitor-season for three (3) years and have learned so much from everyone. I listen a lot and look up. Looking up is what we do best up here.

Best, I like to lie on my back after most visitors have gone home and just watch the Milky Way turn. I feel I am at the center of a huge clock, even though I know there is no center to the universe and the clock is a human convenience. I try to find the globular clusters and galaxies I've just shown visitors with our 24 inch telescope; but this time without dialing in the north-south and east-west co-ordinates. I like to see how ancient astronomers saw. How did they measure the sky? Can I see the fuzzy big Andromeda galaxy up by the big "W"; is that square Hercules or is it Pegasus? Looking up is easier if you lie down. A plastic bed you float on in a swimming pool is good.

**Going where Tycho Brahe went:** I am going to Denmark for the December holidays this year and there I hope to visit the island where Tycho Brahe (1546–1601), the Danish astronomer, spent many years viewing the sky. Tycho (pronounced "Teeko")<sup>1</sup> Brahe didn't have a telescope. Telescopes were not used until 1609 when Galileo thought it would be a cool way to see celestial objects. Tycho was dead by then. Lenses for reading were available in Italy in the thirteenth century, but not until the seventeenth century did spectacle makers in the Netherlands put together a device "by means of which all things at a very great distance can be seen as if they were nearby."<sup>2</sup> I don't know if Tycho lay down on his back, but I do know he looked up a lot.

**Instruments at Hand:** When I look at the sky I use my finger widths and hand to mark distances between the lights I see. I say to myself that that distance looks bigger than this distance and stretch out my arm to measure by the width of my fingers. I also try to keep in mind that I am turning as I watch, like I am on a big globe of the earth in the library of my childhood and my brother is slowly turning the globe, like turning me on the little school yard merry-go-round. I measure the stars by my body. The experience is very personal and kinesthetic for me.

**The Tool Maker:** Although Tycho had no telescope he did have instruments, and he kept improving them. Tycho Brahe achieved a jump in accuracy in star positions by contributing to the most accurate catalog in use at the time (the catalog of Hipparchus, created in 150 BC). With Tycho's contributions and updates

to the star catalog the improvement went from 1000 arcsecond errors to 100 arc second errors. Tycho's goal was to make a measurement with less than 1 minute of error. This quite large jump in accuracy of the catalog of stars used was due in no small part to more accurate instrumentation invented by Tycho.<sup>3</sup>

Among Tycho Brahe's tools of measurement were the armillary sphere, the sextant and the quadrant, all of which he improved, redesigned and recalibrated. He made them out of metal if they had been made of wood and calibrated the tick marks on the instruments to improve accuracy. Here is an "armillary sphere," a device,



dating back to antiquity, composed of a set of graduated rings representing circles on the celestial sphere such as the ecliptic, where planets move, celestial equator and two great circles passing through the celestial poles and intersecting the ecliptic at either the Equinoxes or the Solstices. The whole globe often revolved about an

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**Observatory Report** ————— continued from pg. 3  
interested in helping by donating or assisting in fundraising for Pine Mountain Observatory's future please contact:

College of Arts & Sciences,  
Alumni & Development  
1245 University of Oregon  
Eugene, OR 97403-1245  
541.346.3950 (f) 541-346-1150  
[alumnidev@cas.uoregon.edu](mailto:alumnidev@cas.uoregon.edu)

Or contact me, Mark Dunaway:  
Pine Mountain Observatory  
Bend/Burns Star Rt.  
Bend, OR 97701  
541-382-8331  
[markpmo@uoregon.edu](mailto:markpmo@uoregon.edu)

Thanks for all your support. We hope to see you at the observatory next year! ❖

## Astronomy, Irish Style! Meeting the Leviathan

by Bob McGown and Dareth Murray

**W**HEN OBSERVING THE WHIRLPOOL GALAXY, we usually start thinking about the Third Earl of Rosse and his first observations of that beautiful spiral nebula. After a really good session on Chuck & Judy Dethloff's scope at OSP two years ago, we decided to make the Whirlpool Star Party and the Leviathan in Ireland a traveling priority and a reality.

Photos courtesy B. McGown, D. Murray 2005.



*The famous Poul nabrone Dolmen, ancient burial site in the Burren.*

Upon our arrival at the Shannon airport in Ireland we promptly rented a car and headed south to see the "Burren" area in Clare County. It has some of the most interesting megalithic tombs in Ireland. We found a stone fort dating back to the 15<sup>th</sup> century but there are relics of human habitation dating back almost 6,000 years!

Down in the Aillwee Cave, only discovered in the 1940's, we explored winding tunnels past two beautiful cave waterfalls.

Inside the cave there was still the skeleton of a bear preserved - the species has been extinct in Ireland for thousands of years! There were more passages to explore with ropes and scuba gear; however we opted to take dynamite blasted tunnel back to the visitor center quarried into the limestone mountain. On our way out of the Burren, Bob even got to do some rock climbing on castle walls and outcrops.

We then headed to the small village of Birr, site of the Whirlpool Star Party. By the way, driving on the left on Ireland's narrow roads after staying awake for 54 hours was an out-of-body experience for both passenger and driver! We drove into Birr and barely missed a sign for "The Ring," the Bed & Breakfast we had reserved months ago. It turned out that several other Whirlpool Star Party attendees were staying there too. The Ring is a working farm surrounded by

fields of black & white cows. It is noted for the huge ancient circular ditch surrounding it which can be seen from the air.

We dropped our luggage off there and returned to Birr to search for the star party. We went to the Rosse Castle Demesne but the gate was closed. Wandering around the village, we finally discovered that the star party itself was being held at Dooley's, a nearby pub. In the back of the pub is a large meeting room where we found members of the Shannonside Astronomy Club getting the room ready for the next day's events.

We started talking to David Bell, Whirlpool Star Party founder, and after finding out about Bob's "Observing Mars" presentation at OSP, he insisted on giving us free registration and banquet tickets if Bob would do a key-note presentation after the Saturday banquet! Bob was also encouraged to put up his Cosmic Expansion and Cosmic Blueprint light cone diagrams on some panels holding other interesting posters and astronomy exhibits. Everyone was extremely friendly and interested in what kind of star parties and skies we have in Oregon. We did brag about OSP.

The Whirlpool Star Party is held in Birr because of its proximity to Rosse Demesne and the marvelous Leviathan telescope the Third Earl of Rosse built on the grounds in 1840. Amateur astronomers from all around the world have gathered here for twenty years for a weekend of presentations, exhibits and observing. This year luminaries of the astronomical world such as celestial cartographer Wil Tirion and Vatican astronomer Brother Guy Consolmagno mingled with local amateurs and telescope makers such as Peter Wise and Eammon Asbro.

On Saturday we heard some great presentations from ESA's Mike McKay on the Mars Express and other ESA probes. There were many photo displays and telescope makers set up, showing off their latest creations. Peter Wise unveiled his 8" and 16" catadioptric Newtonian scopes. They have good views with a negative doublet and a positive doublet to create a very flat field image for astrophotography. Peter had first light with the 16" later that night at the star party.

We had time to stroll around the castle grounds and meet the Leviathan up close and personal. A German astronomer, Marcus with his Belfast college students who was acting as tour guide, said the first 10 IRA kids to jump the fence could climb the stairs to the very top of the structure! Needless to say, Bob was the first one over.

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Astronomy, Irish Style! ————— continued from pg. 4



*Dareth in front of the Leviathan.*

Going back to Dooley's for more presentations we then enjoyed a delicious banquet sitting with our new Irish friends. After dinner, we gave the "Observing Mars" presentation, complete with Marvin the Martian for humor. It was enthusiastically received.

About 9 p.m. we were given a ride over to the Rosse Demesne through a usually locked gate, coming in on a special road right in back of the Leviathan. It started out somewhat cloudy but everyone was hoping for the best. Brother Guy was an avid observer that evening as the clouds parted horizon to horizon and we got in about 3 hours of good observing. The Milky Way was brilliant with a visible light wedge of zodiacal light. It helps that the lights in the town of Birr are low-pressure sodium to reduce light pollution. The star party was counted as highly successful with about 50 participants and 25 telescopes.

Sunday morning we got locked in Rosse Castle as we sorted through historical manuscripts of John Herschel and the genesis of the NGC catalogue. Here we were with Charles Babbage and the Fourth

*continued on pg. 6*



*The Shannonside Club banner - see the smiling Oregonian underneath!*

Photo courtesy B. McGovern, D. Murray 2005.



*Bob in the Rosse castle archives researching the NGC catalog. Note the gloves.*

## Astronomy, Irish Style! ————— continued from pg. 5

Earl of Rosse (Laurence Parsons) in the archives room! Lady Rosse had invited us in to do more research in the archives and then realized she would be late to church. She quickly left us there alone in the castle. We didn't know she had locked the **big** front door behind her until I tried to get out!

It was a unique time to be sure and we didn't really mind that we were locked in! Bob was especially interested in early infrared astronomy and the historical observations and sketches of the fourth Earl. Along with us in the castle archives was Bob Bower, an astronomer/mathematician from Cambridge. He

and Bob had been doing research in the archives on Saturday as well. It is a treasure trove of priceless manuscripts and sketches.

A few hours later, we regretfully made our escape through the servant's door on the back side of the castle, leaving Bob Bower to his continuing research. We explored the visitor center and historic museum inside the main castle walls before finally leaving Birr and the Leviathan behind. It was a grand experience and one we want to repeat someday. ❖

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contact V.P. Bob Ewing

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if you wish to cancel your hardcopy edition



## Some Of My Favorite Things

ONE OF MY STUDENTS AT CLATSOP COMMUNITY College asked me what some of my favorite astronomical objects were. It really got me to thinking. Many of my favorites we take for granted. Many take special equipment to view. All are special to me. I will limit myself to my top ten.

**#10 Rainbows.** They are not necessarily astronomical, but they are pretty, and it means the sun is shining if only briefly.

**#9 Galaxy Clusters.** Virgo is my favorite cluster.

**#8 The Northern Lights.** Once in a while we are able to spot them here in Astoria. Very exciting and rare.

**#7 Astronomy Picture of the Day.** Everyone should know about this fabulous site on the internet. Each day a new picture is available to enjoy, download, and read about.

**#6 Planetary Nebulae.** The Cat's Eye is one of the most spectacular and interesting.

**#5 The Rings of Saturn.** Using any scope on Saturn can still elicit a "Wow!" from me.

**#4 The Moon.** I don't care what time of day or night or what phase the moon is in. I still love to just enjoy the view.

**#3 Any Clear Dark Night** anywhere. I do prefer warm nights, but I will always take advantage of cold ones too. I just need to wear more layers. Lots more.

**#2 Comets.** Remember Hale-Bopp? All you needed were your eyes. No scopes. No binoculars. Nothing. Two tails and wide sky coverage. Can't be beat.

**#1 M-51.** Everyone who knows me knows my favorite object is the Whirlpool Galaxy. I have it as wall paper on my computers at home and work. There is a large picture hanging in my dining room. It is the very first "space picture" I ever painted. I have had a love affair for a very long time with this grand spiral and its companion. What's 31,000,000 million light years when it comes to true love?

Find your favorites and fall in love with astronomy.

Mary Hill  
Prez FOPMO ❖

## Climbing The Distance Ladder

by Rick Kang

*From presentations done at NCTTS workshop in Tillamook and OSTA conference in Newport, supplemented with ideas from Professor Bothun's Tillamook presentation.*

AS YOU LOOK OUT INTO THE CLEAR NIGHT SKY, you view a bevy of objects, including planets, stars, and galaxies. How do we know what these objects are? We don't, unless we first know their distances! After several thousand years of wrestling with methods and technologies to attempt to measure what turn out to be incredibly large distances, (having tools only in the past few decades to make some fairly accurate measurements) we now feel reasonably confident to classify objects in space as belonging to one of a series of "ballparks" or zones: Our Solar System, our Galaxy, or out in the rest of our Universe.

The steps that got us to this point were many and complex. I'll try to walk you through some of the basics here:

After finding that climbing to the tops of mountains to touch the stars didn't work very well, ancients sought out a variety of methods to geometrically measure distances to objects in the heavens: early methods involved triangulation, the same way a woodsman

might try to estimate the height of a tree or the distance across a stream by measuring one other angle of a right triangle, plus length of baseline. This was modified then to parallax shift, where change in location against a distant background would reveal relative distance (a closer object appears to shift more, you've all seen this as you drive along a row of close or far away fenceposts). This was trickier to measure (for stars) than imagined, and took quite a few centuries before success

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### Volunteers Needed

Volunteer astronomy lecturers needed... give a lecture and enjoy the rest of the night viewing.  
We need your expertise.

Interested? Mark Dunaway would like to hear from you. He can be contacted at  
[markpmo@uoregon.edu](mailto:markpmo@uoregon.edu)

## Summer 2005 Meeting Minutes

FRIENDS OF PINE MOUNTAIN OBSERVATORY

AUGUST 13, 2005

*Minutes taken by Sean McGonigal*

Meeting was called to order by President Mary Hill at 12:19 pm.

### Attending

- **Executive Committee Members:** President Mary Hill, Vice President Bob Ewing, Secretary Sean McGonigal, Treasurer Mark Dunaway, Greg Hogue, Bob McGown
- **Board Members:** Richard Berry, Fred Domineack, Dave Hill, Rick Kang, Norma Leistiko, Dareth Murray, Karl Oestreich
- **Guests:** Tom Conlin – U of O.

### Previous Meeting Minutes

- The spring 2005 meeting minutes were approved as written.

### Treasurer report - Mark Dunaway

- Report handed out.\*
- Several issues with the money that Mark is working out with the physics department accounting.
- If you want to buy something, e-mail Mark (assuming it's already in the approved budget) and he will get an electronic PO first. This will avoid credit card charges that we are incurring.
- June 1 balance discussed, but summer expenses and revenues are not yet included. Better reporting at the December meeting.
- Money from the annual fundraiser will be going into the educational center fund.
- Bob McGown and Dareth Murray donating sliced meteorites to FOPMO for sale in the gift shop and for educational use.

### Membership report - Bob Ewing

- Electronic copies of the newsletter available on the FOPMO website. Please email Bob Ewing at [bewing@pcc.edu](mailto:bewing@pcc.edu) to eliminate your snail-mailed paper copy. We are trying to save postage and printing costs, so let's get electronic and ditch the paper.

### Visitor Program report - Greg Hogue

- Good summer so far. Visitors are down over previous years. Lots of groups up this year, e.g. OMSI, UO Alumni, etc. Lots of clouds in June and July.
- 20 year plan update: Lots of details still need to be worked out for the educational center. Greg got people together for the planning, would like officially recognize the committee. Currently members: Greg Hogue, Richard Berry, Mark Dunaway,

Kent Fairfield, Norma Leistiko, & Karl Oestreich. Bob McGown added to Committee. Next meeting will be in early September. Motion to officially recognize the committee. Approved. Architecture students will present drawings in the December mtg. to the board.

- Kent Fairfield is helping this year. Moved from Lick Observatory. Should be attending meetings in the future.
- Bob M. possibly donating small solar telescope. He will get together with Greg to work out storage space.

### Gift Shop report - Norma Leistiko

- About \$1500 in inventory. Will perform a complete inventory after the season.
- Longer term would like the gift shop to be an information center until the educational facility is up and running, not just selling stuff.
- Greg: Thanks to Norma for being up here nearly every weekend.

### Observatory report - Mark Dunaway

- Radio telescope observing pad is ready.
- Ken Robbins donation made possible a new graveled viewing area behind the 32".
- More space behind the 10" telescope for people to move around.
- Some trees removed, more to go. Should be done by the end of next year at the latest.
- Forest Service District Ranger changed.
- Rick: update on the 15"? Alan is working on the motor.
- New C8 donated.
- New computer for the 24" is in place. Sean and Rick are setting it up.
- Tom Conlin: UO surplus web site for computer parts for UO departments. Contact Tom ( [tomc@cs.uoregon.edu](mailto:tomc@cs.uoregon.edu) ) for getting some more parts.
- Proposal in the county for a gravel pit right near Horse Ridge. PMO has issues with it as any dust will head our way. Mark submitted PMO information to an arbitrator. Arbitrator found in our favor, but there is another meeting with the County Commissioner this month that can override that decision. Alan will be speaking at that meeting.
- Possible road closures for OHV's over Pine Mountain and other nearby roads due to environmental damage and restoration.
- Special thanks to Mark for dealing with a lot of environmental issues.

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Summer Minutes ————— continued from pg. 8

### Education Report - Rick Kang

- Rick handed out report.\*
- Rick showed updated PowerPoint slide show for the weekly lecture - available for use by tour guide to use or just as a reference. Anybody can develop for programs for use by self and/or others.
- Rick is having issues getting reimbursed for expenses - only able to travel to local Eugene area unless the school district funds the travel.
- OSTA in Newport in October.
- Possible teachers workshop in Lane County on October 22.
- ASP Conference, September 14-16. Moved to cover Rick's and Greg H. expenses of \$1000. Approved.
- New FOPMO web site showed. All should view the website and give comments back to Rick. Address is: [http://pmo-sun.uoregon.edu/~pmo/new\\_fopmo](http://pmo-sun.uoregon.edu/~pmo/new_fopmo)
- Richard: facility needs - disabilities, both physical and visual; bored children. Looking into low-light level TV viewing of object that is being viewed. Systems run \$600 - \$1000. Richard may propose for next year's budget. Looking into borrowing one to test.
- Karl: 10" scope report. Lots of electronic issues last year, out of collimation earlier this year. Appears to be fixed now. Eric Carlson was a big help and he's done a lot of imaging.
- Limited storage on site was brought up several times. No room for scopes and other equipment. Shed around 10" will be torn down, and site committee will be looking to build larger storage shed.
- Article deadline for next newsletter is October 31, 2005. Send articles to Amy McGrew at [a.mcgrew@comcast.net](mailto:a.mcgrew@comcast.net).

### Publicity Report - Rick Kang

- Rick handed out report.\*
- PMO Saturday programs - have done this several times, moderate to low success from the public. Digital cameras today - shifted to an evening session. 4<sup>th</sup> program over Labor Day weekend on MARS.
- New less-expensive brochures handed out. We will be remaking with pictures in the near future. Rick looking for someone to do the graphics.
- Deep Impact event was a huge success
- ITS - no longer sponsoring as it is now self-sustaining. Good event.

### Next Meeting

- The winter 2005 Board of Directors meeting will be Saturday, December 3, 2005 {Note Date Change}, 12:00 noon at the University of Oregon, Willamette Hall. Please send agenda items to President Mary Hill at [visions@pacifier.com](mailto:visions@pacifier.com). All members and guests are welcome to attend.

### New Business

- Mary: Newsletter - need to make notification of electronic version. Mary will write article for next newsletter. Lots of discussion on what lists to use, too many lists, donators vs. members, etc. Bob and Mark will try to get a more common list. Discussion on membership renewal problems as well.
- ALCOR update from Bob and Dareth. RCA hosting 2007 ALCOR conference. Date TBD (likely in July).

Meeting was adjourned at 2:31pm ❖

\* All handouts on file with the secretary. Copies provided upon request.



*Galaxy NGC 891.*

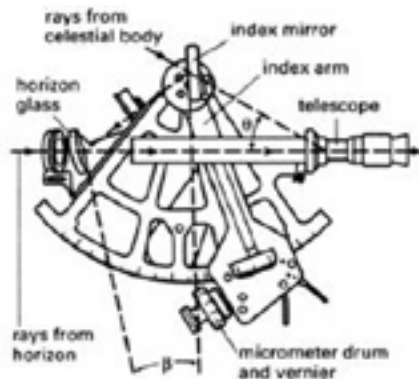
*Photo courtesy Richard Berry 2003.*

## View Without Telescope ————— continued from pg. 3

axis – the polar axis, within the horizon and meridian circles. The idea was that movable sighting adjustments would enable a star to be observed and its coordinates to be read off the relevant circle.

But, the armillary sphere was huge, over a meter in diameter. Tycho had so much trouble with wind using the sphere on the observing tower that he brought it inside and to the basement. There he simplified it so that it had but one circling plate instead of several metal rings encircling the sphere. In the end, Tycho used his armillary sphere as a recording device. He inscribed on the metal each object of importance in the sky.<sup>4</sup> I think of his improvement on the sphere as a kind of early planetarium device.

**SEXTANT** This instrument measured altitude, the distance from the horizon to a celestial object. Originally it had an arc of 60° (one sixth of a circle, hence its name). The sextant uses two mirrors: the horizon



glass, in which only the lower half is silvered, and the index mirror, which can be rotated about an axis perpendicular to the plane of the instrument (see illustration). An arm attached to the index glass sweeps round the calibrated arc, from which angles are read. The instrument is aimed at the horizon and the index mirror rotated until the celestial object can also be seen through the telescope. After careful adjustment to make the image of the celestial body just touch the horizon, the angle is read off the graduated scale. It was this graduated scale's accuracy that Tycho Brahe worked to improve.<sup>5</sup>

**QUADRANT** An obsolete navigational instrument used for measuring angles. It consisted of an engraved arc of a quarter of a circle (thus 'quadrant'), with a plumb line suspended from the centre of the circle. Stars were sighted along one arm and their elevation was read off the scale against the plumb line.<sup>6</sup>

**HVEN, TYCHO'S OBSERVING ISLAND** In 1574 King Frederick II offered Tycho the isolated island of Hven (Ven) in the straits off Copenhagen. In 1576 Frederick also offered funds to found and maintain an observatory there. Tycho named the castle/scientific institution Uraniborg. From alchemical furnaces in the basement to high observing decks with removable roofs, students, assistants, a printing press and paper mill it was the first of the modern observatory in that it was completely supported by the state and produced the first organized, extensive array of dependable data in astronomical history. Tycho observed here until 1597, over 20 years.

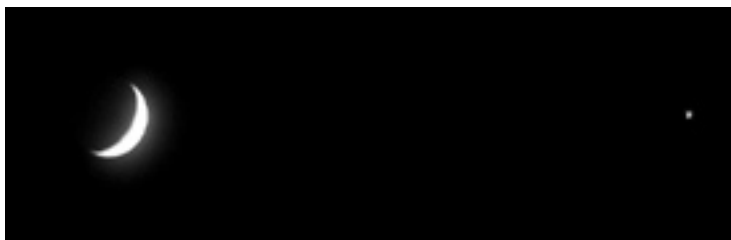
Today, there is a ferry from Sweden to Hven and an inn on the island. A museum of Tycho's observatory is there. The ferry runs year round. I will try to get there this December and tell you what I see - without a telescope. Perhaps the older pilot on my flight to Copenhagen keeps his eyes on the constellations as well as the GPS receiver.<sup>7</sup> ❖

**RECOMMENDED READING** and a great website for early astronomical instruments:

<http://www.humboldt.edu/~rap1/EarlySciInstSite/Instruments/ArmSphere/ArmilSph.htm>

**Evans, James. *The History & Practice of Ancient Astronomy*.** Oxford University Press, Oxford (1998). A wonderful new book which looks at ancient (particularly Greek, but spanning Babylonian to Medieval Europe) astronomy in context. Not only does the author provide many translations of how astronomy was actually done by the ancients, he also explains how to make observations of the celestial sphere using ancient tools

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*Naked-eye view of the crescent Moon, November 5, 2005 as seen from San Simeon, California. Photo courtesy Steve McGrew.*



Photo courtesy R. Berry 2003.

*A thrilling view awaits visitors inside PMO's dome.*

## Public Education, Outreach Report

by Rick Kang

FALL, 2005. OUTREACH EFFORTS RESUMED WITHIN Oregon's schools in September (actually we did several classes during the summertime, too). Visits this Fall have taken me to Newberg, Tillamook, Grants Pass, and before this is printed, probably to northern Nevada. The Sun-Earth-Moon basic program is still the most popular, although we continue to try to get students and teachers involved in digital data acquisition. The programs about the current exploration of Mars and Saturn actually are also popular.

In a collaboration with Professor Kevin Carr, of George Fox University, Professor Bothun and several Friends (Greg Hogue, Kent Fairfield, Allan Chambers, and myself) began the first Oregon Teachers Touching the Stars staff development program, a major statewide effort to produce Highly Qualified Teachers funded through the Federal Department of Education. Teachers from the North Coast were the first candidates: A dozen of them were delighted to receive 6-inch telescopes while in Bend, and to learn how to use them during

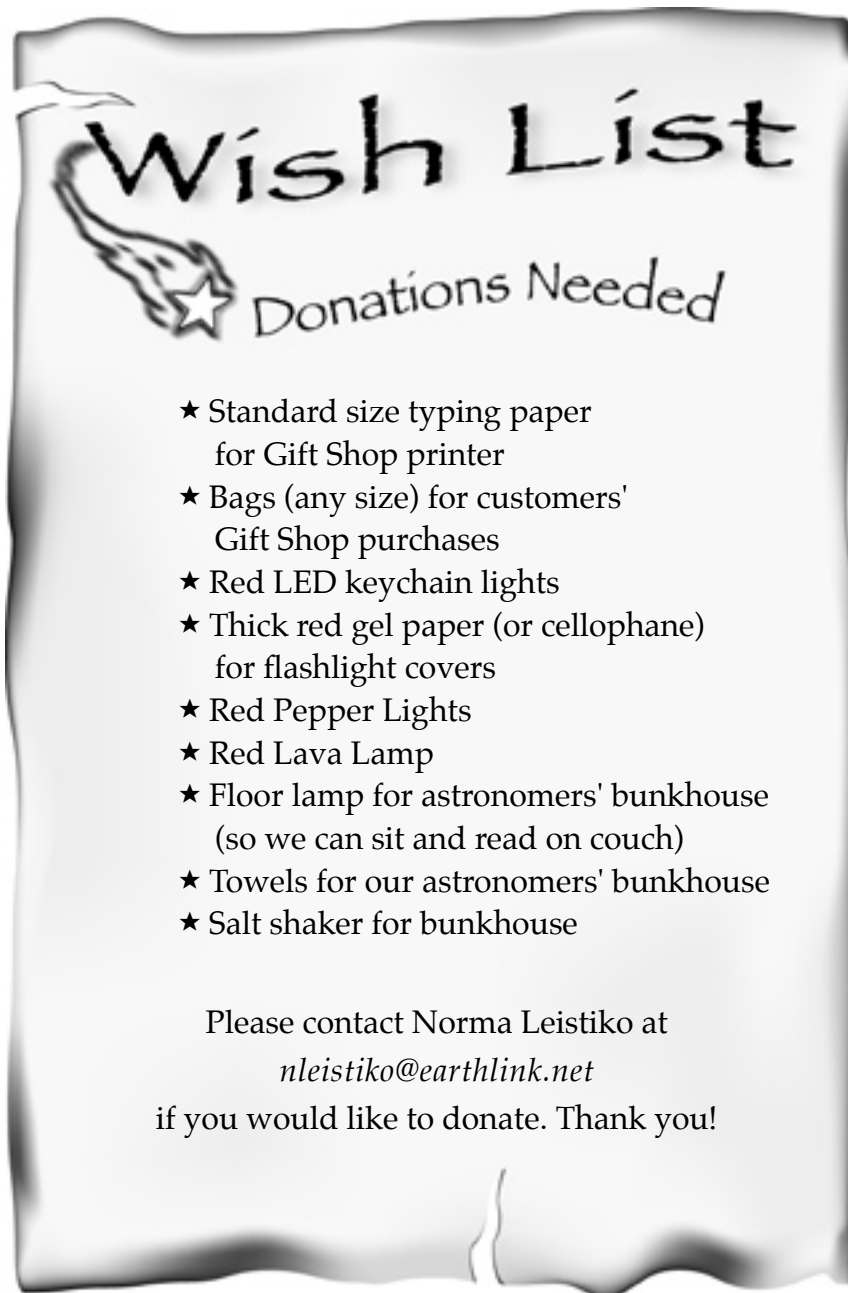
several nights at PMO. We reconvened in October in Tillamook to provide further training about astrophysics, and will be doing more followup with individual teachers. The group enthusiastically "sold" the program readily to a new group from Tillamook for next summer. We plan to open the program statewide by the third round. The current version of the program is administered through the Tillamook School District, by Ed Armstrong.

Greg Hogue and I attended a very informative and productive conference in Tucson in September, organized by the Astronomical Society of the Pacific. The theme was Education and Public Outreach. We met many fellow educators and shared and learned a lot of information about methods, techniques, hardware, and software. There were so many great resources to get familiarized with. On the way to and fro, we visited Lowell Observatory at Flagstaff, Meteor Crater

*continued on pg. 14*

## Winter Meeting Notice

THE WINTER MEETING IS SATURDAY, December 3<sup>rd</sup>, noon, at the University of Oregon's Willamette Hall, in Eugene, Oregon. Please e-mail Mary Hill any agenda items at [visions@pacifier.com](mailto:visions@pacifier.com). All Friends of PMO members and guests are welcome to attend. ❖



## Distance Ladder \_\_\_\_\_ continued from pg. 7

was achieved (the result also boggled the citizens of the time as the stellar distances (light years) were unimaginable!) Within our Solar System, the measurements only yielded relative distances of planets from the Sun, the basic AU or Earth-Sun distance determination became yet another challenge, taking many years before a reasonably successful measurement was calculated actually from observations of a transit of Venus across the Sun's face (another observation filled with many challenges!) Solar System distances, in millions and billions of miles were boggling enough!

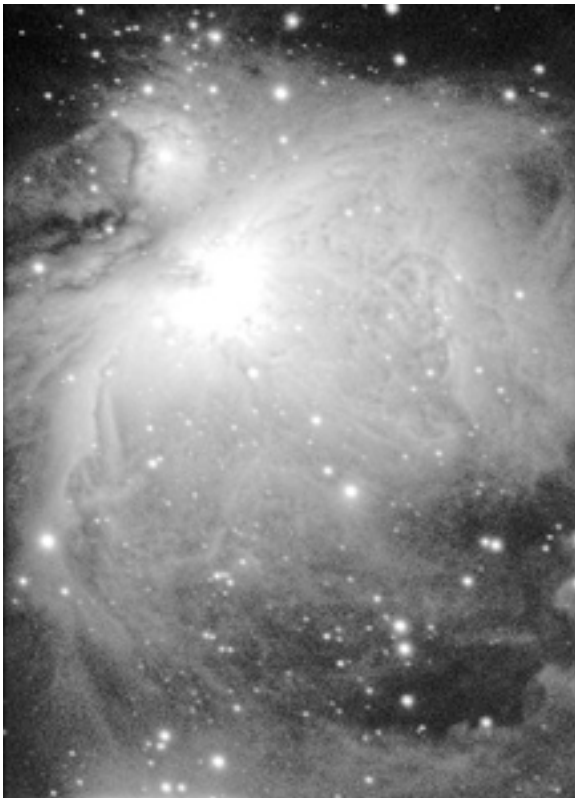
Further attempts at stellar parallax shift measurements proved futile, as the angle change became immeasurably small for most stars, even when using the Earth-Sun distance at 6-month intervals as the baseline, so a new system had to be devised. If you think about a row of streetlights, you realize that since the light spreads out from each bulb, light from a more distant bulb spreads out further, thus there is a relationship between brightness and distance. One major problem with this measurement system is the issue of "apples and oranges." We need a "standard candle" at a geometrically verifiable distance, to serve as our basis for photometric comparisons. The Cepheid variable stars served as initial standard candles, calibrated about 100 years ago by Annie Cannon and Henrietta Leavitt at Harvard University. Their research, supplemented by spectroscopic data to sort out the "apples", have served us well to yield distances of hundreds to thousands of

light years to stars within our Milky Way galaxy, as well as to nearby Galaxies, where Edwin Hubble and his contemporaries, able to locate Cepheids within these galaxies, using some of the modern large telescopes, greatly expanded the size of our known Universe to millions of light years. But alas, these stellar candles are not resolvable in most galaxies. We either need to find other types of candles, or entirely new techniques.

Not far into the 20th century, amateur astronomer Vesto Slipher came upon an interesting relationship about the "red shift" of starlight related to the size and brightness of various galaxies, the smaller (farther) the galaxy, the more the overall light was red-shifted (waves apparently stretched out). Hubble graphed this data and found a linear relationship of the shift to the distance. The result strongly implied that our Universe is expanding, thus also implying a compact creation event ("big bang" model).

This relationship can be extrapolated, so that if we measure the red shift of a galaxy's light, we can go to the Hubble relationship and determine an approximate distance (there are many assumptions and uncertainties when measuring over these gigantic megaparsec (millions to billions of light years) distances). Modern astrophysicists have come up with several variations on photometric and spectroscopic measurements to measure inter-galactic distances in a number of ways. There have been a series of disputes about the results, related to the age of the Universe, but slowly the numbers are converging, and the latest data from the WMAP project seems to appease most of the protagonists. Most recently, the use of supernovas as standard candles has uncovered an even more unnerving feature of our Universe, an apparently rapidly increasing size of our Universe as a yet unexplained force accelerates space-time's expansion, dragging galaxy clusters away from one another at an ever increasing rate.

Who knows what we'll discover next. How far can we see? Can we find the border if there is one, and what is beyond? Distance measurements are at the core of astrophysics and as we build the ladder, each new rung sustained by data and consistencies of the rung below, we continually find new uncertainties, challenges, and questions as we grapple with the huge dimensions of space. ❖



*The Great Nebula in Orion.*  
Photo courtesy Richard Berry 2003.



*Oregon's Highway 20 leads to PMO. Photo courtesy Richard Berry 2002.*

## Education Report — continued from pg. 11

east of there, and Kitt Peak Observatory, south of Tucson. There were many very good ideas learned from our visits to these facilities to draw upon for the proposed Education Center at PMO. The panel discussion at the conference about how to improve usage of remote imaging facilities was attended by eighteen active operators of such facilities, including a number of radio telescope observatories. We agreed that the common problems are overcoming the various forms of teacher inertia, how to make the process, particularly software/network connectivity, and target selection more efficient and accessible for the users, and how to increase funding for each facility to enable the first two tasks to be successful. We'll publish the key points online and open an e-mail discussion group.

We have been approached by OMSI to hold a small scale summer astronomy camp at PMO next summer. This might be a great opportunity to begin a program that has been considered and discussed for several years, getting interested K-12 students together at PMO for several nights of concentrated astrophysics.

The FOPMO outreach staff is actively searching for sources of funding to cover our outreach operations, for travel and equipment expenses, and also to provide stipends for instructors so that we can maintain and expand our currently very successful and popular programs (traveling outreach and onsite opportunities). Additional Oregon Space Grant dollars have arrived and are appreciated, but the delay in the process and the amount available will not sustain our outreach efforts. With the addition of an on-site education facility at PMO, we'll need educational staff in order to make the facility come to life. Our outreach and tour programs have all been volunteer efforts so far, but the time has come for supporting the operation so that the staff, particularly the instructors, are compensated for the professional efforts they put forth. If you know of potential funding sources, please contact Ms. Jane Gary, Executive Director of College Advancement, UO College of Arts and Sciences, [jgary@cas.uoregon.edu](mailto:jgary@cas.uoregon.edu), (541) 346-3951. Your support is appreciated and makes a large impact on increasing scientific literacy throughout the State. ❖

## View Without Telescope — continued from pg. 10

and home-made modern counterparts. Tools explained range from the very simplest (the gnomon) to the complex (armillary spheres, astrolabes, planetary equatoria). An appendix even provides diagrams for photocopying to make an astrolabe and an equatorium for Mars.

### ENDNOTES

1 *Encyclopedia of Astronomy and Astrophysics. Volume 4.* Editor in Chief, Paul Murdin, British National Space Center. Nature Publishing Group, London 2001 page 3365-3368

2 "telescope" *The Oxford Companion to the History of Modern Science.* J. L. Heilbron, ed., Oxford University Press 2003. Oxford Reference Online. Oxford University Press.

3 *Encyclopedia of Astronomy and Astrophysics. Volume 4.* Editor in Chief, Paul Murdin, British National Space Center. Nature Publishing Group, London 2001 page 3365-3368

4 "Armillary sphere" *Encyclopaedia Britannica 2005* Encyclopaedia Britannica Premium Services 22 Oct. 2005 <http://www.britannica.com/eb/article-9009526>

5 "sextant" *A Dictionary of Physics.* Ed. Alan Isaacs. Oxford University Press, 2000. Oxford Reference Online. Oxford University Press. Central Oregon Community College. 23 October 2005 <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t83.e2758>

6 "quadrant" *A Dictionary of Astronomy.* Ed. Ian Ridpath. Oxford University Press, 2003. Oxford Reference Online. Oxford University Press. Central Oregon Community College. 23 October 2005 <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t80.e3039>

7 *Scientific American* October 2005 issue there is an article at the end of the magazine written by a flight instructor who originally learned how to navigate in an airplane by tracking the constellations and tries to get his students to look up sometimes instead of just being glued to the Global Positioning System dials. ❖

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## New Procedure, Address For Contributions Updated Membership Information

**T**O JOIN OR RENEW YOUR MEMBERSHIP IN FRIENDS AND TO DONATE TO OUR programs, please fill out and mail the form above and send along with your check to the address as printed (College of Arts & Sciences Development Office, 1245 University of Oregon, Eugene, OR 97403); not either of the P.O. boxes used in prior requests.

Please make your check out to the UO Foundation and note on your check's memo area, "For Friends of Pine Mtn." We are unable to include a return envelope at this time.

You can specify by writing a note that your donation is applied to specific Friends' programs: We have a new **Jim Girard Memorial Education Fund** specifically for outreach efforts, our **Education Center Fund** to support construction of our new building at PMO where we'll conduct summer programs and classes year-round, and our regular **Friends of PMO Fund** that is used to support all facets of our operation (this is the default account if none is specified).

We suggest \$20 as an initial annual membership donation. We welcome major amounts towards our Education Center project.

Thanks for your contribution! ❖

*The Pine Mountain Observer* is the newsletter of the Friends of Pine Mountain Observatory (FOPMO). The *Observer* is published three times per year and is made available at no cost to Friends, the members of FOPMO. Your participation is welcome.

If you have relevant material to contribute to this newsletter, **e-mail** your articles and images to the editor. **Please note**, when sending your images, use the best possible resolution with the least compression. Image files saved as TIF or JPG format along with some descriptive text is helpful.

Deadline for the Spring 2006 issue is  
**Saturday, March 11<sup>th</sup>!**

**Amy McGrew, Editor**  
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**About the Friends of Pine Mountain Observatory**

**Friends** are citizens across the globe who help PMO by contributing voluntary labor, materials, and/or funds. You are welcome to join the more than 200 current Friends by sending the attached form, with your check, to the address below.

**Benefits of Membership and Activities of Friends**

**Friends** may visit PMO free of charge. Members receive several copies of the newsletter each year. The newsletter describes current **Friends** projects, the status of the Observatory's operations, occasional technical articles about ongoing research, and informs

members about upcoming activities. Various **Friends** are directly involved with upgrading telescopes, improving educational programs, organizing publicity, and producing fact sheets, brochures and documents.

The **Friends Board of Directors** meets three times per year, usually in Portland, Eugene, and Bend. All members are welcome. There is also the tradition of a **Special Star Party for Friends**, at Pine Mountain, each summer. Check your newsletter. Contact any Friends officer about meetings. Get involved!

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