THE OBSERVER

The Astronomy Club of Tulsa's Newsletter Published Since 1937

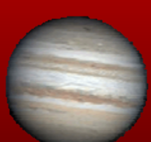
RON WOOD NETA APPLE JOHN LAND JACK EASTMAN CLYDE GLANDON

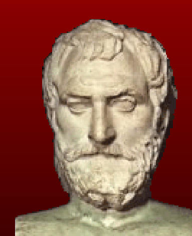
UNDERSTANDING FILTERS AND WHAT FILTER WHEN

NASA'S LRO FINDS PROFF OF LIFE ON

OKIE-TEX ROUNDUP!

CLUES TO THE MILKY WAYS PAST





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OCTOBER 2011

EDITORS NOTES

THE COVER

Starting this month the Observer will honor great astronomers throughout history. This will be in the bottom right hand corner of the cover and your challenge is to guess who it is before you open to this page and find the answer.

This month we begin with Thales (624-547 B.C., Ionian) he was a Greek philosopher who traveled widely in Mesopotamia and Egypt, and brought astronomical records from these cultures back to Greece. He believed that the Earth is a disk floating on an endless ocean. Legend has it that he correctly predicted a solar eclipse in the year 585 B.C.

With a little work on your favorite charting program you can figure out where he was, what day and time it was when he made the prediction based on the clues above.

As a total eclipse actually cuts a very narrow path across the earth you only need to figure out its path that year and assume he was in a populated area. This is because the legend probably would not have survived had he been walking the desert with one or two others.

As always I am pleased to present another issue of the Observer. This month I would like to welcome back a writer many of you already know, Neta Apple.

For those of you who were not with the club when Neta was a member you are not aware of what we lost when Neta moved away. She was always deeply involved with all of our out reach and a great teacher. Neta is a good friend of mine as well as many others in the club and getting her to write for the Observer again did not take much coaxing to my surprise. Neta has that personality that just wants to help when astronomy is involved.

She also asked that I let all of you who did not get to go to Okie-Tex know how much she misses our club and wishes she could come back. We miss her as well.

Thanks for the article Neta and we hope this is just the beginning.

NEW MEMBER CORNER

Slight problem with timing on our new members as the list did not arrive in time all will be published next month. Sorry for the delay. Jerry

CONTENTS

Guest Speaker

Our guest speaker this month is a webcast interview with Tom Field on Decoding the Mysteries of Starlight. Tom will tell us about the information hidden in the spectrum of starlight and how amateur astronomers can now be involved in Spectroscopy.   See Tom's Interview with Sky and Telescope editor Dennis di Cicco at

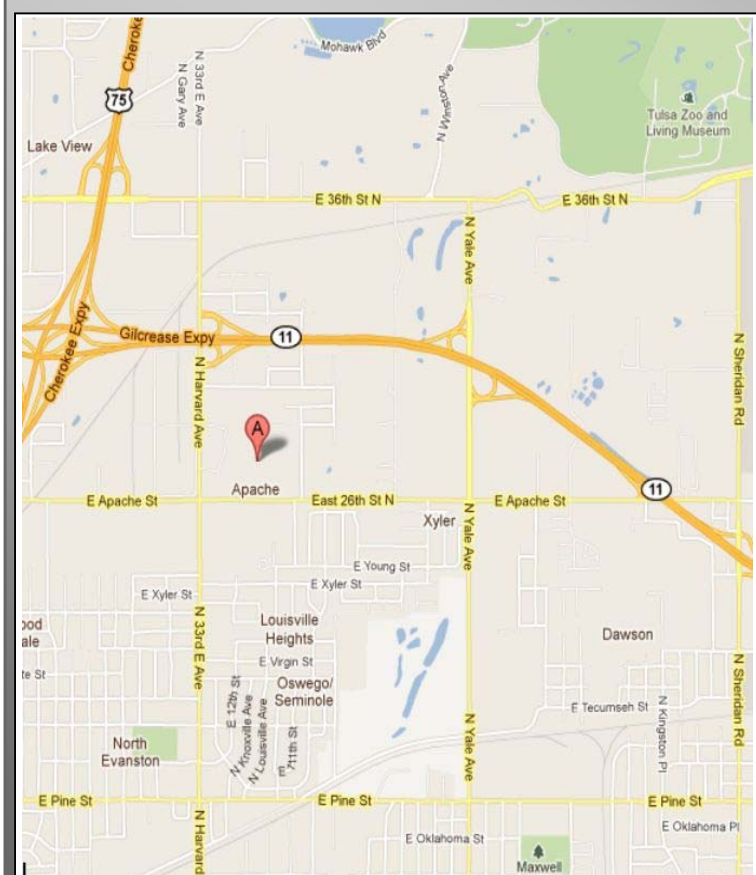
http://www.skyandtelescope.com/skytel/beyondthepage/121557614.html

This Friday October 14, 2011 at 7:00 PM

ELECTIONS ARE HELD AT THE MEETING ON FIRIDAY 10-14-2011. COME OUT AND LETS PICK OUR OFFICERS AND BOARD MEMBERS. HOPE TO SEE YOU ALL THERE!

3727 East Apache, Tulsa, OK 74115

Room 1603 Building #2 Student Union



LETTER FROM THE EDITOR

By: Jerry Mullennix

Well another Okie-Tex has come and gone. For the Astronomy ccub of Tulsa that means election time. This is the time in our club that you should be thinking about the direction you would like to see our club go and if you have time thinking about giving of yourself by serving on our board.

As the editor it is probably not appropriate for me to say who I do or do not support until election time. However, I can say my biggest hope is that we elect a board with the goal of finding our club a dark sky site as the number one priority behind growing our membership.

For long time members, we can all testify that we have seen a slow deg-

radation in sky quality at Mounds. This is not to say we should give up on Mounds. Our current observatory would still be every bit as useful as it is now, we would just be adding a dark sky site to compliment what we have. It will allow a more detailed study of the sky.

A dark sky site is not a new idea, although I believe this is the first time it has been mentioned in our newsletter. It has been a topic at board meetings and observing sessions for many years.

Realizing the need and discussing it are the easy parts. The hard part is all of the work that follows and it could take several years to do this right.

Sometimes as a member its easy to say why don't they paint the dome or why don't they have more pads at the observatory. The thing is, we are all "They" and its not just the board that makes our club what it is, it is all of us as a group. Let's keep in mind the board is made up of all volunteers and nobody at the Astronomy Club of Tulsa receives a check. NOBODY.

When you see Teresa, John or James on the field with twenty kids teaching them about the wonders of the Universe it is a personal commitment on their part to make our club better. There are many others who play a part in making our group what it is and we all know who they are.

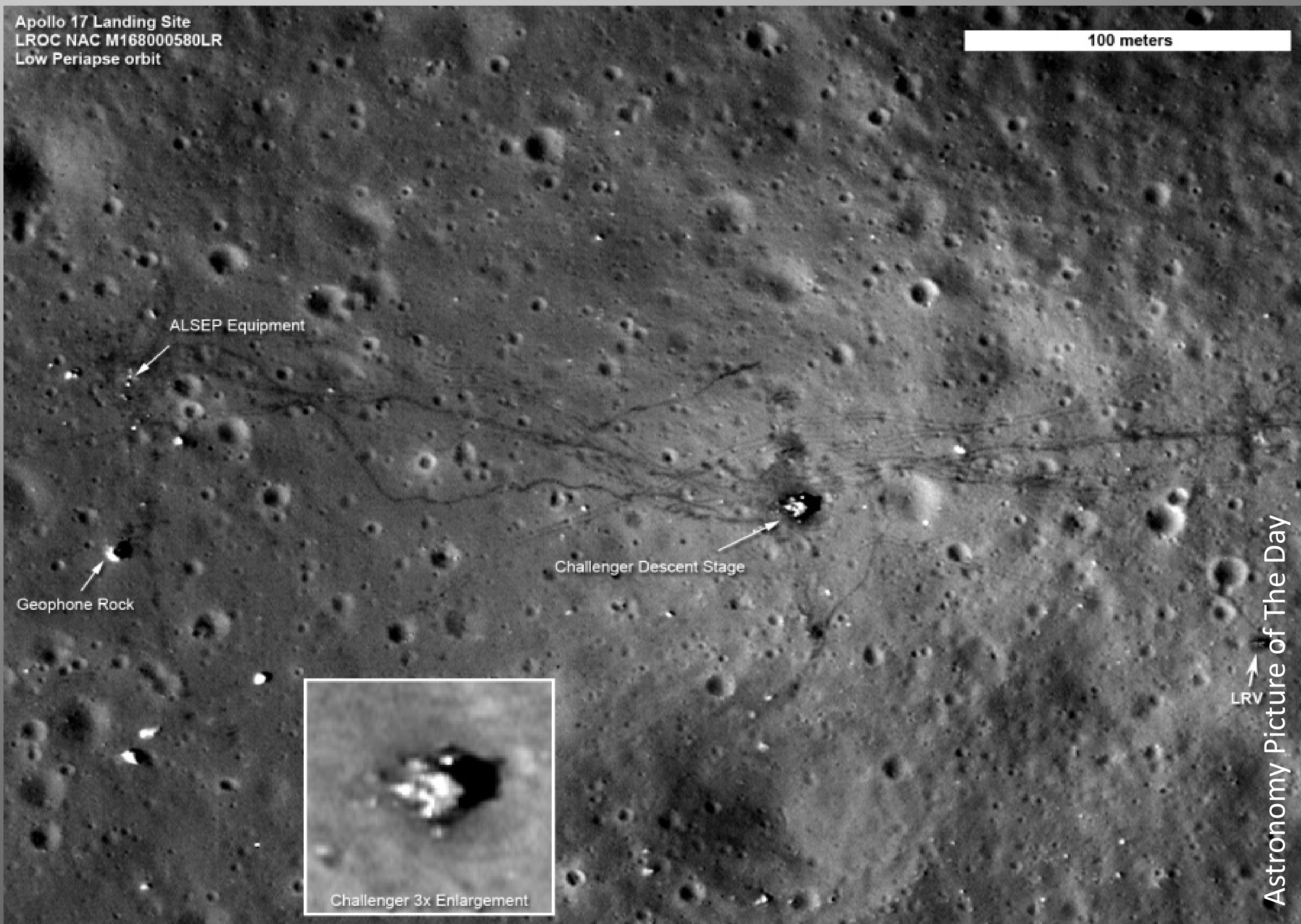
Sometime during the 80's this club mustered up everything necessary to secure the land and build an Observatory and ever since we have enjoyed the benefits of their efforts. Some are still here and the others are still talked about on cold winter nights gazing up at the stars on the very field they help secure.

It's time for a new group to reach down and find a way to get us a dark sky site. We need a board that is willing to put together an exploratory committee to begin narrowing down and outlining the possibilities and where we go next and we need them to report to the membership as a whole every few months so all can be involved.

Then on a cold winter night 35 years from now a group will be out at the Tulsa Dark Sky Site and say these words "How did they ever manage to make this happen?"

NASA'S LRO FINDS EVIDINCE OF LIFE ON THE MOON.

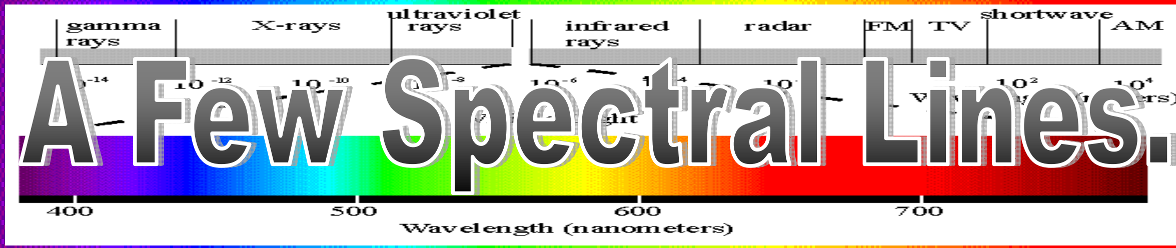
SUBMITED BY: JERRY MULLENNIX



Explanation: This view of the Apollo 17 landing site in the Taurus-Littrow valley was captured last month by the Lunar Reconnaissance Orbiter (LRO), the sharpest ever recorded from space. The high resolution image data was taken during a period when LRO's orbit was modified to create a close approach of about 22 kilometers as it passed over some of the Apollo landing sites. That altitude corresponds to only about twice the height of a commercial airline flight over planet Earth. Labeled in this image are Apollo 17 lunar lander Challenger's descent stage (inset), the lunar rover (LRV) at its final parking spot, and the Apollo Lunar Surface Experiments Package (ALSEP) left to monitor the Moon's environment and interior. Clear, dual lunar rover tracks and the foot trails left by astronauts Eugene Cernan and Harrison Schmitt, the last to walk on the lunar surface, are also easily visible at the Apollo 17 site. (Credit NASA and Astronomy Picture of the Day.)

Since other publications failed to recognize the significance of this photo I felt the Observer should bring it to light. Sorry I could not resist. Jerry

A Few Spectral Lines.



By: Ron Wood

The subject of filters causes a lot of confusion among amateur astronomers. There are many types of filters available, but they all work by blocking out part of the incoming light in order to gain some viewing advantage such as improved contrast. There are polarizing filters, neutral density filters, color filters, broadband filters, narrowband filters, O-III filters, H-alpha filters, H-beta filters and others.

In order to understand these filters it is helpful to keep in mind some basic information about light. Photons of electromagnetic energy are created whenever an electric charge, such as an electron, is accelerated. Small accelerations produce long wavelength low energy photons, and large accelerations produce short wavelength high energy photons. Stars consist of a plasma of charged particles which are accelerated by violent random thermal motions resulting in the production of a "continuous" spectrum of electromagnetic radiation at all wavelengths.

Electromagnetic radiation may also be produced by excited neutral atoms, when an orbital electron jumps from one allowed orbit to another at lower energy. The energy difference between the two orbits appears as a photon of a definite wavelength so that a gas made of these excited atoms will produce a bright "emission line" spectrum rather than a continuous spectrum as in the case above.

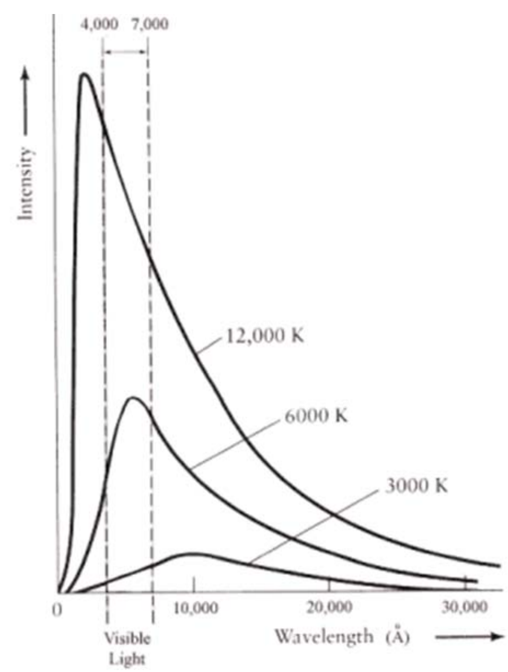
Wavelengths are commonly given in units called Angstroms, equal to one 10 billionth of a meter, and symbolized here by A*. Another commonly used unit is the nanometer, abbreviated (nm) which is one billionth of a meter. The visible part of the spectrum lies between 4000 A* on the blue end and 7000 A* on the red end.

Stars radiate at all wavelengths with a temperature-dependent theoretical energy distribution spectrum given by Planck's Law for Blackbody Radiation. (See graph.) For an average star very little energy is radiated at very long or very short wavelengths. The peak of the energy distribution lies between these two extremes.

According to Wien's Law the wavelength of the peak radiant energy varies inversely with temperature. This means that cool stars will radiate most intensely at long red wavelengths while hot stars will radiate most intensely at short blue wavelengths. Thus, Rigel with a temperature of 11,000 degrees appears blue, while Antares at 3,100 degrees appears red. The Sun at 5,800 degrees radiates most strongly at an intermediate yellow wavelength.

So objects such as stars and galaxies radiate a mixture of all wavelengths producing a continuous spectrum. Other objects containing rarified excited gases, such as planetary and diffuse nebulae, radiate strongly at discreet wavelengths producing an emission line spectrum.

Some of the important emission lines have proper names which indicate which chemical element produces them. From hydrogen we get the wavelength called H-alpha at 8563 A*. This wavelength is red and gives the beautiful red color seen in the photographs of many nebulae such as the Rosette. Another hydrogen line called H-beta is seen in the blue at a wavelengthl of 4861 A*. There is strong H-beta emission around the Horsehead nebula. Doubly ionized oxygen, (O-III), produces a green emission line at 5000 A*. This line is seen in many



nebulae such as the Dumbbell and Veil.

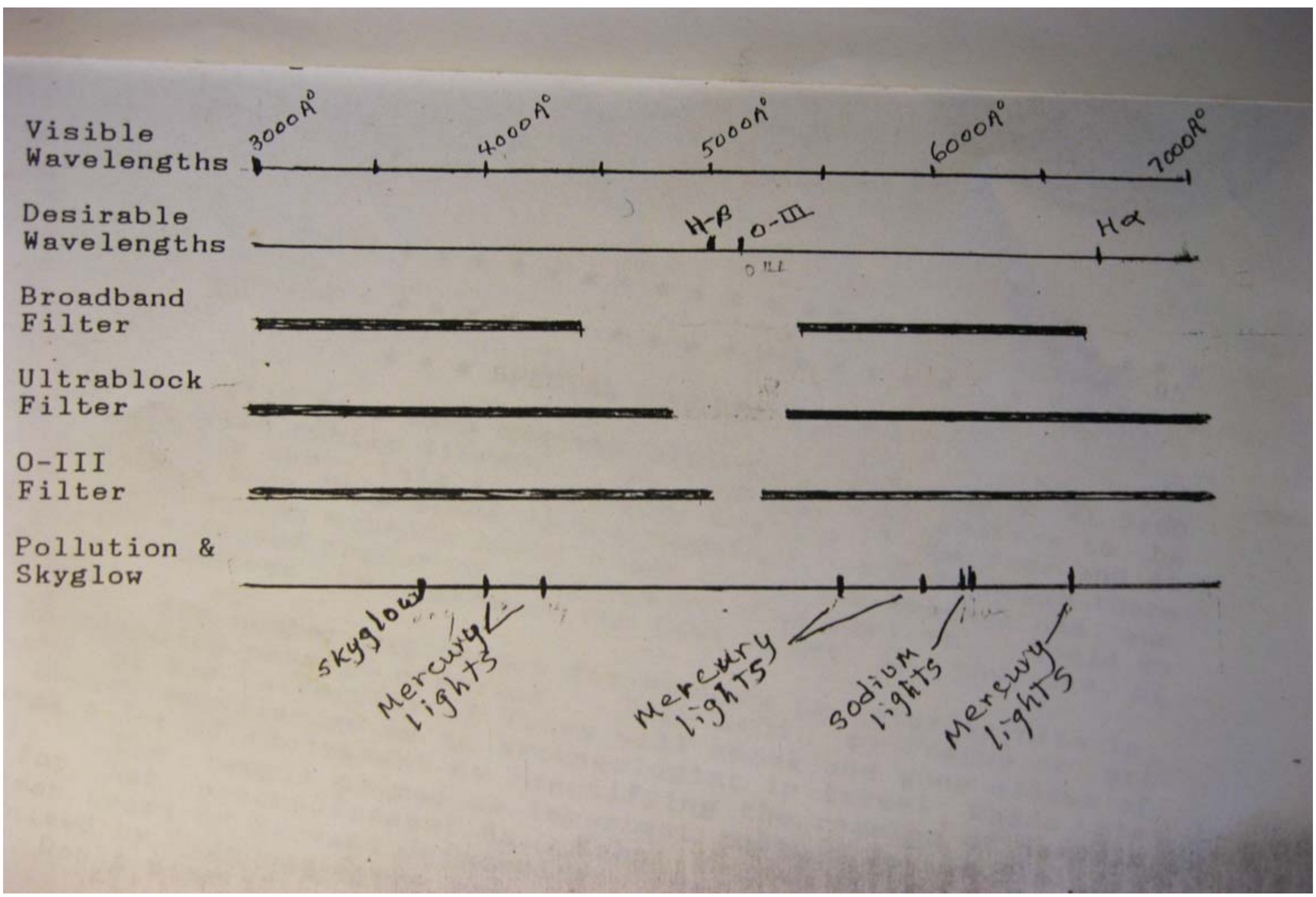
We might call these wavelengths "good" because they are coming to us from things we want to see. There are other wavelengths we might call "bad" because they are coming from things we don't want to see, like street lights. Sodium vapor lights have a close pair of bright emission lines in the yellow at about 6000 A*. Mercury vapor lights give us several bluish lines from 4000 to 4500 A*.

Filters work by blocking the bad wavelengths and allowing the good ones to pass. This creates a very dark background sky and increases contrast with the nebula which is bright at the transmitted wavelengths. A subtle point often overlooked is that a filter always dims anything you look at slightly. However, the image contrast can be enhanced and the view improved because the filter dims the background sky more than it dims the object of interest, which is radiating strongly at the transmitted wavelengths.

The Orion Skyglow, Broadband, and Ultrablock filters work by blocking the parts of the spectrum containing the bad wavelengths. The H-alpha filter used for viewing the sun transmits a very narrow band of the spectrum at about 8563 A* allowing us to see the spectacular prominences shooting out from the limb. The O-III filter transmits the 5000 A* green light from doubly ionized oxygen very well, but blocks other wavelengths.

The diagram below may help bring the big picture into focus. The first line represents all the wavelengths of the visible spectrum from 4000 A* to 7000 A*. The second line shows the desirable wavelengths of light such as H-alpha and O-III. The next three lines show which wavelengths are transmitted by different filters. A solid line indicates that those wavelengths are blocked and a gap indicates transmission. The last line shows the undesirable wavelengths of light pollution.

Good luck and good viewing and be sure to get a good look at the Veil through an O-III filter as soon as possible.



Open and Globular Star Clusters:

Clues to the History of the Milky Way?

By: Neta Apple

Go outside in a dark location on most any night and you can see fuzzy patches in the sky or collections of stars in close proximity to each other. Using binoculars or a telescope these fuzzy patches are revealed to be groups of stars, known as open clusters, resembling bright diamonds on black velvet. Individual stars are easily resolved since the stars in the clusters can be widely spread, as in the Pleiades, also known as the Seven Sisters.

Other groups of stars not visible to the naked eye are even more breathtaking. Globular clusters, so named because they look like a glob of stars, have the appearance of a cotton ball in the telescope; only large telescopes may resolve individual stars in their tightly packed cores, though smaller instruments reveal individual stars around the edges.

Both groups have been favorites of astronomers for centuries, with most of the objects on the famous Messier list being of one class or the other. Modern astronomers are finding that globular and open star clusters are much more than just visually beautiful objects. They differ greatly in distribution and in the types, chemical composition, and number of stars they contain. These differences may lead astronomers to an exciting new understanding of our galaxy's chemical history and structure as surely as DNA can reveal one's biological heritage.

Globular Clusters

Astronomers looking to study globular clusters can't look just anywhere [13]. These highly compact, spherical objects, (see Figure 1 image), containing 100,000 to one million stars, are only distributed in two main areas of our galaxy; in the surrounding halo and the galactic bulge. There are 150 known globular clusters [6][15]. They appear dim and reddish due to the great age of the majority of the stars contained in them [3] [11][12]. Some have been found to harbor black holes in their cores [18]. If we lived near the core of a globular cluster we would see thousands of stars all about one parsec away, each brighter than the full Moon. We could not stand to look at them as they would be such bright pinpoints. Visual astronomy would be virtually impossible [21]!

There are no areas of active star birth or clouds of dust or gas in these ancient clusters of stars which are so tightly packed by the gravitational forces of the combined mass of the stars inside [3][7]. Over the billions of years of their existence, they have exhausted all the material left nearby for making new stars. Cores of these clusters are so tightly packed that close encounters between stars are comparatively frequent and binary pairs containing one white dwarf are common as a result. Most of the stars are small, reddish population II stars. Population II stars are old, coming from the generation prior to that of our own more metallic, Population I Sun. At the time of the formation of the stars in globular clusters metals were much rarer than now so these stars have low metallicities [3][11][12][14]. (Remember that in astronomy metals are any element other than hydrogen and helium.) Head on collisions, or near head on collisions, in the dense cores, can produce bluish colored stars known as blue stragglers, but these are not like the familiar young blue O and B type stars, e.g. Vega or Rigel, found in other locations [19].

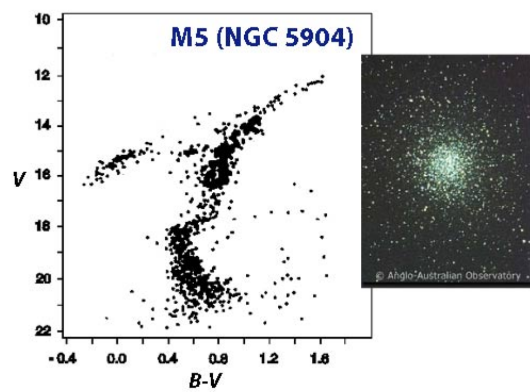


Figure 1 Hertzsprung-Russel diagram and image of M5 a globular cluster located in Serpens. http://outreach.atnf.csiro.au/education/senior/astrophysics/stellarevolution_pleiadesact.html

A Hertzsprung-Russell (H-R) diagram which plots the luminosity of stars on the vertical axis and the temperature of stars on the horizontal axis can be used to demonstrate the ages of stars in a particular group. Contrary to common convention, highest values on the horizontal axis are located nearest the diagram's origin, thus stars of highest temperature are located on the left of the diagram. Figure 1, from the Australia Telescope Outreach and Education website, shows an H-R diagram of M5 in addition to the already referenced image. Note how most of the stars are located low in the center of the diagram and going upward toward the right with a characteristic bend low and toward the center. This is typical of the H-R diagram of a globular cluster. This indicates there are no young, high-mass stars left. The stars in this group are old and departing from the typical diagonal that runs from upper left toward lower right known as the main sequence of stellar evolution. Diagrams such as this one indicate that globular clusters are billions of years old, perhaps older than the disk of the galaxy, and maybe as old as the Universe [3][7].

It is unknown how globular clusters form, but observations would indicate most form in conjunction with galaxies [6]. It is now thought that some in our galaxy may represent cores of other smaller galaxies consumed by the Milky Way [3]. Stars in each cluster appear to have been formed at the same time, possibly by disturbances in the giant molecular cloud (GMC) that eventually condensed to form the galaxy. No new globular clusters are seen to be forming currently in our galaxy; they appear to be 'fossils' from the time of the formation of the galaxy. As such they may contain clues to the chemical make-up of the GMC from which the galaxy formed [15].

Ages for globular clusters are estimated between 11.5 and 18 Gyr (billion years), however, new data on the age of the Universe rules out the upper end of this span. With refinement it is possible that globular clusters could give astronomers limits for the age of the Universe [3][12].

Open Clusters

In many ways open clusters are opposites of globular clusters. These loosely held groups of stars are found in locations containing large amounts of dust and gas. They are often embedded in giant molecular clouds or on the spiral arms of the galaxies where star birth is occurring, and we can observe locations where more open clusters are forming, such as the Orion Nebula [3] [12].

Their stars are often young, bluish-colored Population I stars with high metallicities of classes O and B, the hottest and youngest on the main sequence of stellar evolution. In some older open clusters the more massive young stars have already aged and have left the main sequence. Based on their high metallicity, some of the young stars are calculated to be only millions of years old [3] [12]. (Younger stars are more metallic because they contain materials previously processed by older stars.) Below, (Figure 2), is the H-R diagram for the Hyades, a young open cluster located in the constellation Taurus. Note how the stars in this cluster lie near a line that runs diagonally from the upper left to the lower right, known as the main sequence, with only a few stars not in this general area. This indicates that the stars are relatively young. Comparison of Figure 2 with the H-R diagram in Figure 1 shows definite and easily seen differences in mass and temperature and, thus, ages of the stars in these clusters. Such differences are highly typical when one compares the two types of clusters [3] [12].

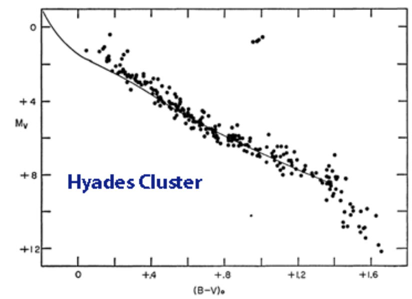


Figure 2 Hertzsprung-Russel diagram for the open cluster known as the Hyades. Credit: ***Johnson, H. L.; Mitchell, R. I.; Iriarte, B., Astrophysical Journal, vol. 136, p.75*** **http://outreach.atnf.csiro.au/education/senior/astrophysics/stellarevolution_pleiadesact.html**

Since stars in individual globular and open clusters appear to all be the same age, they can also give astronomers another method to test theories of stellar evolution. If these stars are formed from molecular clouds in groups at the same time and have the same chemical compositions, the only factors to change the way in which the stars evolve will be due to the different masses of individual stars. This gives astronomers a way to test theories about how mass of a star affects its evolution over time. If current theories are true, stars in these clusters with higher masses should evolve off the main sequence before their more modest sized siblings. So far observations support theory in this case [8][9][10].

The stars in a given globular or open cluster are also located at nearly the same distance from the Earth. This gives astronomers a way to compare the luminosities of a group of stars of different masses or different evolutionary stages located at similar distances. Using this information they may test methods for determining the distance to stars based on their luminosities [3][12].

An even more exciting use of open clusters is now taking shape. Astronomers have theorized that stars in open clusters might have nearly identical chemical compositions since they come from molecular clouds considered to be homogeneous. Results from recent measurements of chemical composition of stars in the Hyades, moving group HR 1614, and Collinder 261 indicate the stars in these clusters are chemically very similar [8][9][10].

Over time open clusters tend to be shredded due to gravitational effects from the galactic core and the component stars drift away to other locations [20]. More loosely held stars on the edges of globular clusters also drift away due to these same influences. This effect, known as evaporation, is thought to produce collections of stars called moving groups, which are remnants of the original clusters. The stars of moving groups, an example of which is the HR1614 moving group, can be spread over vast distances. De Silva et al (2006) have found that the HR1614 moving group have similar enough chemical abundances to have originally formed as a cluster from the same molecular cloud [9].

It is thought that eventually the stars in moving groups drift apart to become part of the general star field. Astronomers wishing to know more about the birth and development of our galaxy have until now had no way to track where these stars may have originated in the galaxy [8] [9][10]. With the findings that the stars in clusters such as the Hyades, Collinder 261, and the HR1614 moving group have high correlation in their chemical abundances astronomers may now be able to 'chemically tag' stars and compare them to other stars to see if they might have a common origin [8][9][10]. This is very similar to comparing DNA from living organisms to look for common ancestry. Using this method, astronomers may for the first time be able to find stars that were formed from the same molecular clouds, then trace them back by their proper motions to their common points of origin to find how the galaxy has changed over time and perhaps gain clues about how the galaxy formed [8][9][10].

While gorgeous to observe visually, the true value of globular and open clusters lies in information obtained from them that may contribute to our understanding of stellar evolution, origins of the galaxy and perhaps the Universe. The common origin of stars in both types of clusters provides a method to test theories of stellar evolution. Globular clusters with their great age and low metallicity may provide a window to the chemical abundances in the galaxy at the time of its formation. Tracking the movement of stars that have been torn from globular clusters and stars from evaporated open clusters by chemical tagging could provide an image of the infant galaxy and insight into how it was formed. Truly the beauty of these objects is more than 'skin deep'!

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Okie-Tex Roundup!

Ok, Okie-Tex 2011 has come and gone and I hope everyone who made the trip got all they were hoping for. This year was uneventful as far as the weather goes and there were plenty of great nights for star gazing.

We here in the Tulsa Club would like to pass a special thank you to the Oklahoma City Astronomy Club who sponsors the event and makes sure every year that it goes off without a hitch.

Top: Steve Chapman, Mike Blaylock and Jack Eastman look through Jacks 6" Alvin Clark Refractor manufactured in 1883. Of special note Jack was one of the first opticians hired by Celestron back in the 60's. Jack has a degree in Astrophysics and is a brilliant optical engineer. He designed the Optical System for the Cassini Huygens Probe! After a long talk with Jack he graciously consented to us publishing articles he has written over the years right here in The Observer. You can find the first later in this edition.

Top Left: Moon and Sunset over the ridge.
Bottom Left: Tony White prepares for the night. *Tony and Rod definitely use the Big Boy Mounts.*

ANOTHER DAY AT CAMP

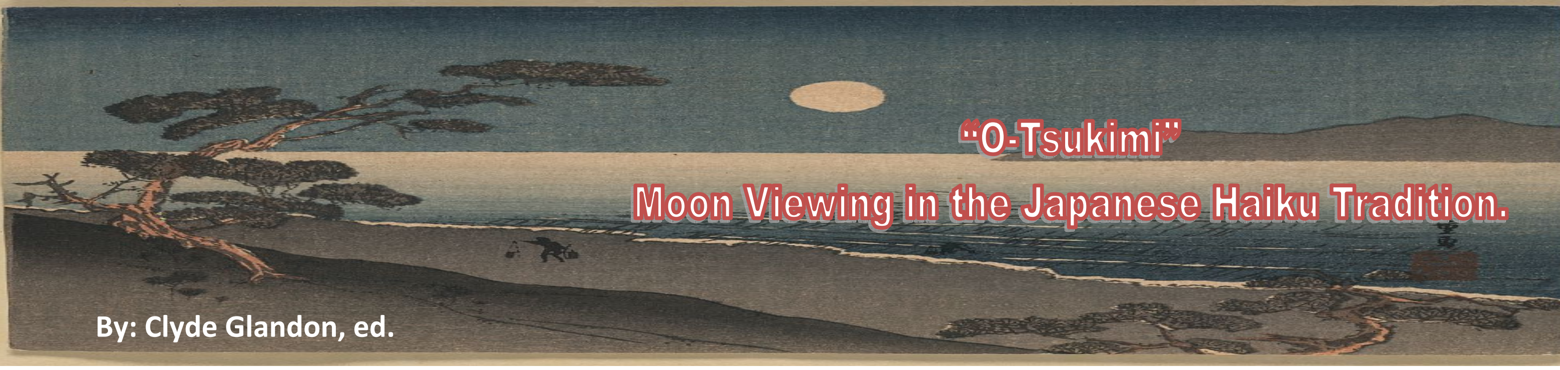
To the right is the famous Flamingo Ridge and below that is a view of the camp sites in the Tulsa area when its sleeping time.

The three pictures below are interesting shots I took during the day. The abandon house is located about 10 miles from Okie-Tex and though its not related I found it of interest and since I am the Editor you have to look at it as well.

All in all everyone had a great time and with some luck we will see some articles next month from some of our participants. Hint Hint.

GROWING UP WITH ASTRONOMY

Below: Here is a picture of Ein Apple walking in front of the Tulsa Headquarters at Okie-Tex the picture to the right was taken in 2005 when Neta and her sons Alex and Ein joined us on a trip to Chaco Canyon to see the Deep Impact Mission. Ethan is the one sitting. Their excitement for astronomy will continue for a lifetime. I am sure!



"O-Tsukimi"
Moon Viewing in the Japanese Haiku Tradition.

By: Clyde Glandon, ed.

Here are excerpts from a short pamphlet I prepared as a handout for the recent *Moon Viewing* event at the Tulsa Space Museum and Planetarium on Friday October 7, 2011.

The following are words from the introduction and from the selection of various traditional and contemporary haiku poems related to the experience of looking at the moon.

… Those familiar with the Japanese traditions associated with the writing of haiku poetry know of a widely practiced set of customs known as "moon viewing" or "moon festival" gatherings of various kinds.

I write this in the context of the development of contemporary "star parties" among astronomy enthusiasts. In this case: as such gatherings may be focused on the moon.

There is a rich quality of shared nonverbal experience when viewing the night skies and their wonders at the same time and location. The common or communal quality of the experience is happily noticeable while a group of people are "doing astronomy."

D.T. Suzuki, in his book *Zen and Japanese Culture*, explores a number of meanings which "moon viewing" has had. He writes:

The Japanese are lovers of softness, gentleness, semi-darkness, subtle suggestiveness. They like to sit quietly in the moonlight, enveloped in its pale, bluish, soul-consoling rays.

Enjoy these haiku as you engage in your own moon viewing, with your naked eyes or with instruments, alone or with others.

Traditional Haiku Translated from the Japanese

moon gazing
looking at it, it clouds over
not looking, it becomes clear
Chora

the autumn moon
on the other side of the river
who is it?   *Chora*

the sandy shore
why are they making a fire
under the summer moon
Shiki

sitting in the shadows
and letting the moonlight
have the room   *Seibi*

the summer rains
one evening the moon appeared
behind the pine tree, secretly
Ryota

Contemporary English Language Haiku

the moon at dawn
lily pads blow white
in a sudden breeze   *Nick Avis*

full advent moon
the pine tree starts singing
without any wind   *Clyde Glandon*

down wind
in the spruces
the late moon   *Jack Kerouac*

autumn night
a thin moon
the only smile I see   *Michele Harvey*

To close, from the Japanese heritage, perhaps one of the most powerful of haiku in terms of philosophy, healing, and a "spirituality" if you will, of astronomy:

the moon in the water
broken and broken again
still it is there   *Choshu*

Treasurers' Report

ACT Treasurers Report for Oct 6, 2011
John Land - Treasurer

Membership

85 Long Term members	plus 109 guests
24 New Members	signed up for email
109 Total Membership	

Annual Report of Accounts	October 6, 2011
Bank Checking	$ 1,627.78
Bank Savings	$ 5,996.49
Bank Liquid Assets	$ 7,624.27
Minus Reserve Escrow	$ (3,732.00)
Available Funds	$ 3,892.27
Club investment Accounts Sept 30, 2011	$ 14,183.85

(Note: Investment values continue to fluctuate due to weak economy)

Reserve Escrow for Future Expenses

$ 250.00	Emergency Reserve Fund
$ 270.00	3 months Utilities
$ 270.00	Obs Supplies & Repairs
$ 2,942.00	Escrow for Insurance & League - Dues 2012
$ 3,732.00	Total Operational Expenses

Projected Annual Main expenses		
$ 610.00	AL membership	$ 51 /mo/ 12 mo
$ 2,332.00	July Insurance	$194 /mo/ 12 mo
$ 600.00	Speakers & publicity	$ 50/mo/ 12 mo
$ 96.00	PO Box rental	Annually
$ 41.25	Website	Annually
$ 45.00	Safety Deposit	Annually
$ 1,080.00	Utilities	$ 90 /mo/12 mo
$ 600.00	Observatory Maintenance	$ 50/mo/12 mo
$ 5,404.25	Total	$ 467 / mo / 12 mo

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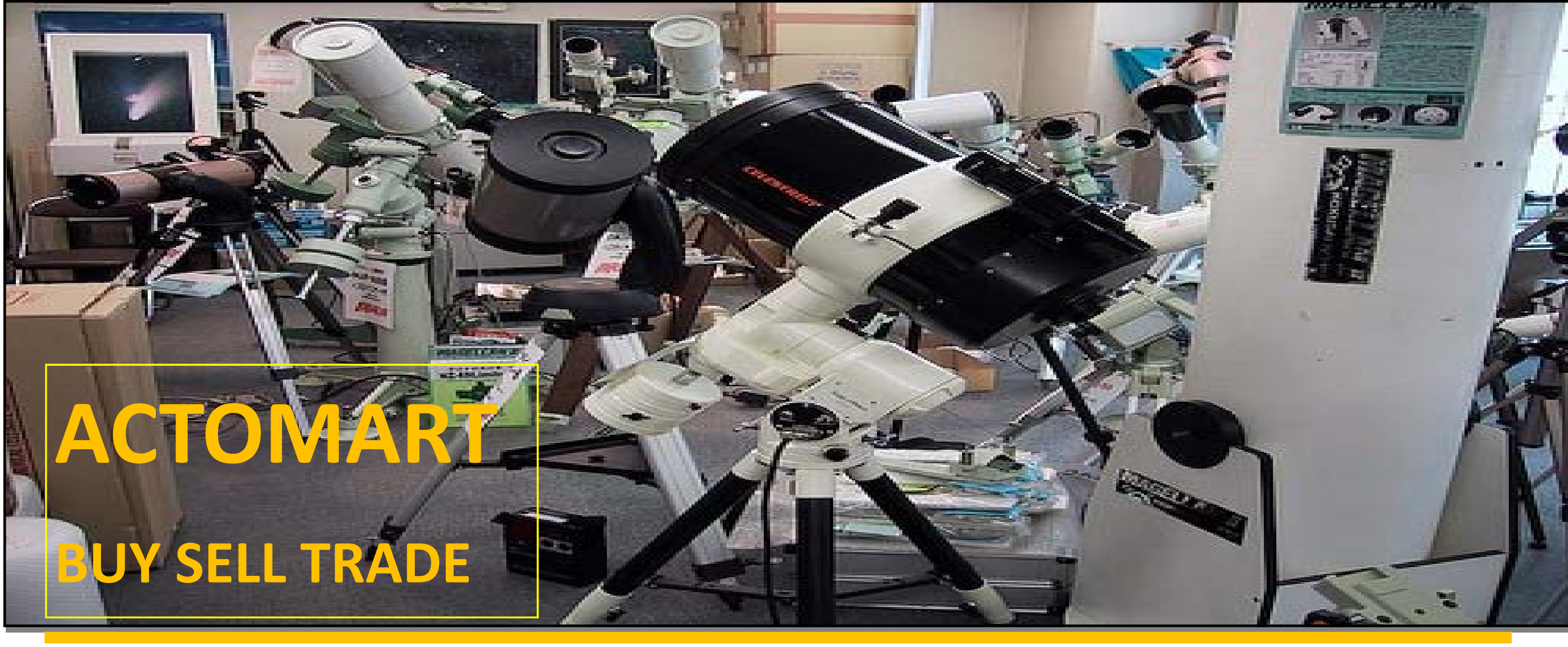
http://www.ursamajorstencils.com/cgi-bin/ursamajorstencils/nightsky.html

THE PROFIT FROM THE SALE OF THESE ARE GIVEN TO A VARIETY OF SERVICES



ACTOMART is a available to any member of the Astronomy Club of Tulsa free of charge. If you would like to sell your items on ACTOMART please contact John Land or Jerry Mullennix and we will be happy to post your products.

Long time Tulsa club member Denny Mishler is downsizing and moving to the dark clear skies of Arizona. He has decided to sell his 13" Dobsonian reflector, a Coulter Odyssey 1 for the unbelievably low price of $250.00. It comes with a Tuthill 80mm finder, a Telrad finder, and 2" focuser mounted at a 45 degree angle for optimum viewing comfort. The original 1.25" focuser is still attached at 90 degrees. The mirror has been carefully stored and has a good original coating. The Odyssey I comes in two parts, a barrel with an estimated weight of 60 pounds and a base weighing about 50 pounds. The mirror has one minor blemish on the circumference that doesn't effect seeing. The telescope will require adjustment and realignment, as it has been in storage (fully covered) for 6 or 7 years.

DENNY,

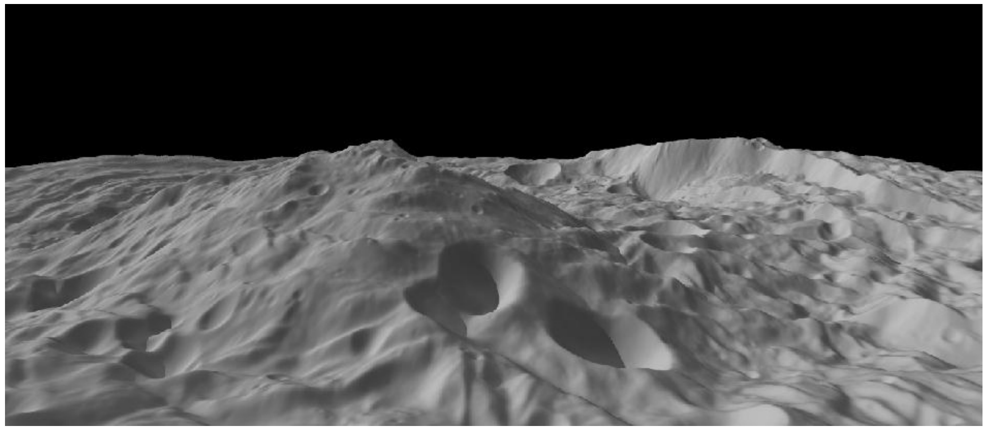
WE ARE TRULY SORRY TO SEE YOU GO BUT GLAD TO HEAR YOU ARE GOING TO HAVE GREAT SKY'S AT YOUR NEW PLACE. THANKS FOR THE MEMORIES!

ACTOMART

BUY SELL TRADE

Here is a vintage Tasco 76.2mm f/15.7 from late 60s, no electronics. It could be a #10TE offered by Lee Bickle. I know from the one I have these are nice scopes and not the Tasco company you might experience today. Lee is not sure about the value but there are several past scopes like this sold on Astromart. Lee is negotiable and would like to sell this one. Turns out he purchased the scope on the previous page from Denny. You can contact Lee at blotobeast@gmail.com

This was just way too cool not to print this month. Jerry



A new image from NASA's Dawn spacecraft shows a mountain three times as high as Mt. Everest, amidst the topography in the south polar region of the giant asteroid Vesta.

The peak of Vesta's south pole mountain, seen in the center of the image, rises about 13 miles (22 kilometers) above the average height of the surrounding terrain. Another impressive structure is a large scarp, a cliff with a steep slope, on the right side of this image. The scarp bounds part of the south polar depression, and the Dawn team's scientists believe features around its base are probably the result of landslides.

The image is online at: http://www.nasa.gov/mission_pages/dawn/multimedia/pia14869.html . It was created from a shape model of Vesta, and shows an oblique perspective view of the topography of the south polar region. The image resolution is about 300 meters per pixel, and the vertical scale is 1.5 times that of the horizontal scale.

Dawn entered orbit around Vesta in July. Members of the mission team will discuss what the spacecraft has seen so far during a news conference at the Annual Meeting of the Geological Society of America in Minneapolis. Among other things, they'll share their hypotheses on the origins of Vesta's curious craters.

The meeting, at the Minneapolis Convention Center, runs from Oct. 9 to 12, with the Dawn news conference scheduled for Wednesday, Oct. 12, at 10 a.m. PDT (noon CDT).

The event will air live on the Geological Society of America webcast page at: http://hosted.mediasite.com/mediasite/Viewer/?peid=e8adbee5a37e455fbe199b29129e3b7c1d . Media representatives not able to attend the meeting may participate by registering at: http://rock.geosociety.org/forms/11_pressConf.asp . More information about the webcast is at: http://www.geosociety.org/news/pr/11-63.htm .

The event will also be carried live, with a moderated chat, at: http://www.ustream.tv/nasajpl2 .

The news conference panelists are:

Carol Raymond, Dawn deputy principal investigator, NASA's Jet Propulsion Laboratory, Pasadena, Calif.
Paul Schenk, Dawn participating scientist, Lunar and Planetary Institute, Houston
Debra Buczkowski, Dawn participating scientist, Applied Physics Laboratory, Johns Hopkins University, Laurel, Md.
Federico Tosi, Dawn Visible and Infrared Spectrometer team member, Italian Space Agency, Rome

Following a year at Vesta, the spacecraft will depart in July 2012 for Ceres, where it will arrive in 2015. Dawn's mission to Vesta and Ceres is managed by the Jet Propulsion Laboratory, Pasadena, Calif., for NASA's Science Mission Directorate in Washington. JPL is a division of the California Institute of Technology in Pasadena. Dawn is a project of the directorate's Discovery Program, managed by NASA's Marshall Space Flight Center in Huntsville, Ala. UCLA is responsible for overall Dawn mission science. Orbital Sciences Corp. in Dulles, Va., designed and built the spacecraft. The German Aerospace Center, the Max Planck Institute for Solar System Research, the Italian Space Agency and the Italian National Astrophysical Institute are international partners on the mission team.

More information about the Dawn mission is at: http://www.nasa.gov/dawn

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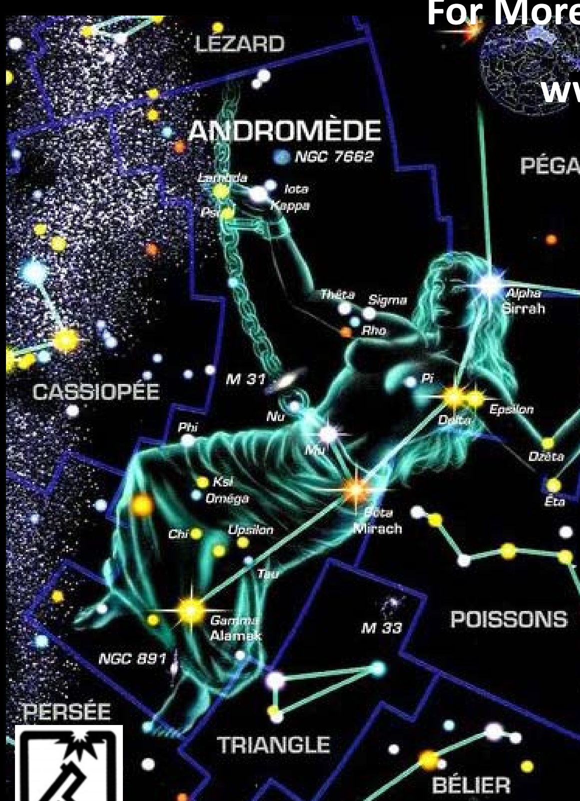

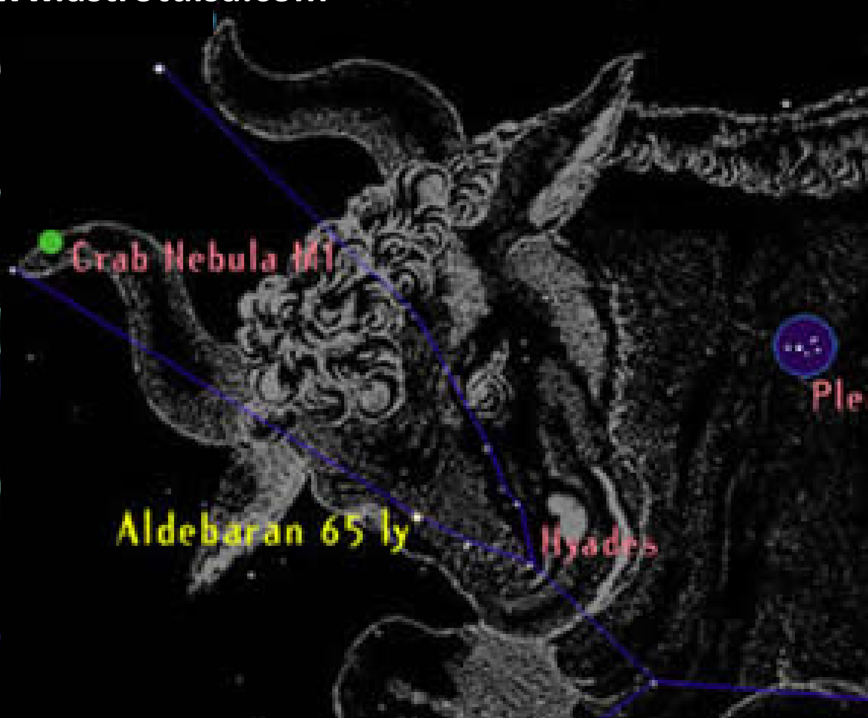

PASADENA, Calif. – NASA's Gravity Recovery And Interior Laboratory (GRAIL)-B spacecraft successfully executed its first flight path correction maneuver Wednesday, Oct. 5. The rocket burn helped refine the spacecraft's trajectory as it travels from Earth to the moon and provides separation between itself and its mirror twin, GRAIL-A. The first burn for GRAIL-A occurred on Sept. 30.

"Both spacecraft are alive and with these burns, prove that they're kicking too, as expected," said David Lehman, GRAIL project manager at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "There is a lot of time and space between now and lunar orbit insertion, but everything is looking good."

GRAIL-B's rocket burn took place on Oct. 5 at 11 a.m. PDT (2 p.m. EDT). The spacecraft's main engine burned for 234 seconds and imparted a velocity change of 56.1 mph (25.1 meters per second) while expending 8.2 pounds (3.7 kilograms) of propellant. GRAIL-A's burn on Sept. 30 also took place at 11 a.m. PDT. It lasted 127 seconds and imparted a 31.3 mph (14 meters per second) velocity change on the spacecraft while expending 4 pounds (1.87 kilograms) of propellant.

These burns are designed to begin distancing GRAIL-A and GRAIL-B's arrival times at the moon by approximately one day and to insert them onto the desired lunar approach paths.

The straight-line distance from Earth to the moon is about 250,000 miles (402,336 kilometers). It took NASA's Apollo moon crews about three days to cover that distance. Each of the GRAIL twins is taking about 30 times that long and covering more than 2.5 million miles (4 million kilometers) to get there. This low-energy, high-cruise time trajectory is beneficial for mission planners and controllers, as it allows more time for spacecraft checkout. The path also provides a vital component of the spacecraft's single science instrument, the Ultra Stable Oscillator, to be continuously powered for several months, allowing it to reach a stable operating temperature long before beginning the collection of science measurements in lunar orbit.

GRAIL-A will enter lunar orbit on New Year's Eve, and GRAIL-B will follow the next day. When science collection begins, the spacecraft will transmit radio signals precisely defining the distance between them as they orbit the moon. Regional gravitational differences on the moon are expected to expand and contract that distance. GRAIL scientists will use these accurate measurements to define the moon's gravity field. The data will allow mission scientists to understand what goes on below the surface of our natural satellite.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the GRAIL mission. The Massachusetts Institute of Technology, Cambridge, is home to the mission's principal investigator, Maria Zuber. The GRAIL mission is part of the Discovery Program managed at NASA's Marshall Space Flight Center in Huntsville, Ala. Lockheed Martin Space Systems, Denver, built the spacecraft. Launch management for the mission is the responsibility of NASA's Launch Services Program at the Kennedy Space Center in Florida. JPL is a division of the California Institute of Technology in Pasadena.

More information about GRAIL is online at: http://www.nasa.gov/grail and http://grail.nasa.gov .

PASADENA, Calif. -- Astronomers have found a new cosmic source for the same kind of water that appeared on Earth billions of years ago and created the oceans. The findings may help explain how Earth's surface ended up covered in water.

New measurements from the Herschel Space Observatory show that comet Hartley 2, which comes from the distant Kuiper Belt, contains water with the same chemical signature as Earth's oceans. This remote region of the solar system, some 30 to 50 times as far away as the distance between Earth and the sun, is home to icy, rocky bodies including Pluto, other dwarf planets and innumerable comets.

"Our results with Herschel suggest that comets could have played a major role in bringing vast amounts of water to an early Earth," said Dariusz Lis, senior research associate in physics at the California Institute of Technology in Pasadena and co-author of a new paper in the journal Nature, published online today, Oct. 5. "This finding substantially expands the reservoir of Earth ocean-like water in the solar system to now include icy bodies originating in the Kuiper Belt."

Scientists theorize Earth started out hot and dry, so that water critical for life must have been delivered millions of years later by asteroid and comet impacts. Until now, none of the comets previously studied contained water like Earth's. However, Herschel's observations of Hartley 2, the first in-depth look at water in a comet from the Kuiper Belt, paint a different picture.

Herschel peered into the comet's coma, or thin, gaseous atmosphere. The coma develops as frozen materials inside a comet vaporize while on approach to the sun. This glowing envelope surrounds the comet's "icy dirtball"-like core and streams behind the object in a characteristic tail.

Herschel detected the signature of vaporized water in this coma and, to the surprise of the scientists, Hartley 2 possessed half as much "heavy water" as other comets analyzed to date. In heavy water, one of the two normal hydrogen atoms has been replaced by the heavy hydrogen isotope known as deuterium. The ratio between heavy water and light, or regular, water in Hartley 2 is the same as the water on Earth's surface. The amount of heavy water in a comet is related to the environment where the comet formed.

By tracking the path of Hartley 2 as it swoops into Earth's neighborhood in the inner solar system every six-and-a-`half years, astronomers know that it comes from the Kuiper Belt. The five comets besides Hartley 2 whose heavy-water-to-regular-water ratios have been obtained all come from an even more distant region in the solar system called the Oort Cloud. This swarm of bodies, 10,000 times farther afield than the Kuiper Belt, is the wellspring for most documented comets.

Given the higher ratios of heavy water seen in Oort Cloud comets compared to Earth's oceans, astronomers had concluded that the contribution by comets to Earth's total water volume stood at approximately 10 percent. Asteroids, which are found mostly in a band between Mars and Jupiter but occasionally stray into Earth's vicinity, looked like the major depositors. The new results, however, point to Kuiper Belt comets having performed a previously underappreciated service in bearing water to Earth.

How these objects ever came to possess the telltale oceanic water is puzzling. Astronomers had expected Kuiper Belt comets to have even more heavy water than Oort Cloud comets because the latter are thought to have formed closer to the sun than those in the Kuiper Belt. Therefore, Oort Cloud bodies should have had less frozen heavy water locked in them prior to their ejection to the fringes as the solar system evolved.

"Our study indicates that our understanding of the distribution of the lightest elements and their isotopes, as well as the dynamics of the early solar system, is incomplete," said co-author Geoffrey Blake, professor of planetary science and chemistry at Caltech. "In the early solar system, comets and asteroids must have been moving all over the place, and it appears that some of them crash-landed on our planet and made our oceans."

Herschel is a European Space Agency cornerstone mission, with science instruments provided by consortia of European institutes. NASA's Herschel Project Office is based at the agency's Jet Propulsion Laboratory in Pasadena, Calif., which contributed mission-enabling technology for two of Herschel's three science instruments. The NASA Herschel Science Center, part of the Infrared Processing and Analysis Center at Caltech in Pasadena, supports the U.S. astronomical community. Caltech manages JPL for NASA.

HULAH LAKE SUNSET

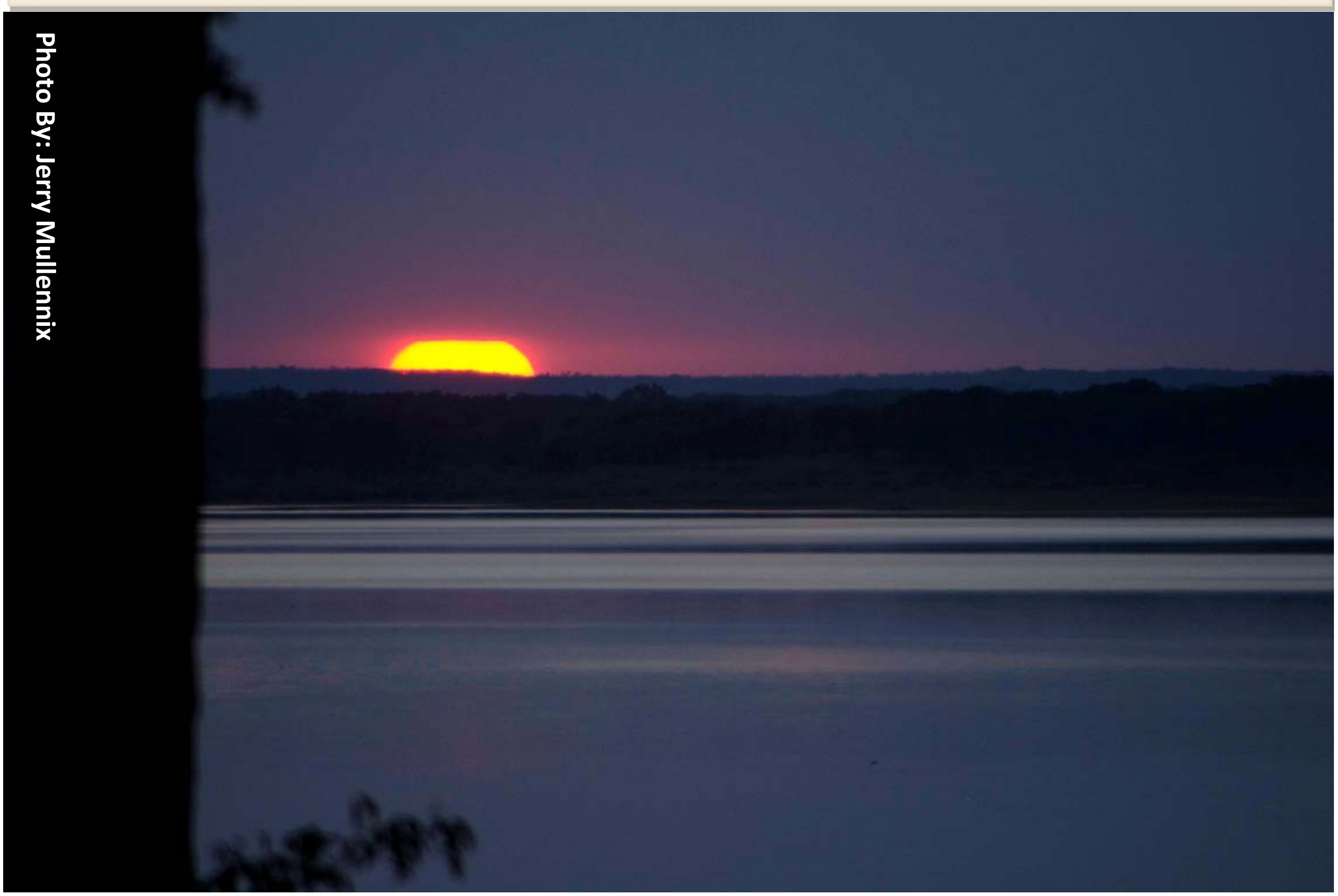

Photo By: Jerry Mullennix

Jack Eastman
Speaks on His Telescopes
Part 1

About Jack Eastham: I meet Jack at Okie-Tex this year and had a very long discussion about his career and his telescope. I was previously aware of who he was from a book by Bob Piekiel called Celestron the Early Years. Bob became a friend of mine when I purchased my old Blue and White Celestron 8” and Bob and I have had many discussions about scopes and astronomy since.

Jack has had a very interesting career and he offered to let us publish his work here in our newsletter. Jack Eastman was one of the first opticians hired by Tom Johnson to work on his newly created line of telescopes, back in the mid 1960s. Jack has a degree in Astrophysics and is a brilliant optical engineer. Today he works for Martin-Marietta

(Lockheed Martin) in Colorado. **(NOTE: JACK DESIGNED THE OPTICAL SYSTEM FOR THE CASSINI-HUYGENS PROBE!)**

In response to Pat Ryan's quest for

Jack Eastman shows off his homebuilt 12.5" Telescope.

material for the D files, I am writing the descriptions of several of my attempts at telescope making in a few installments. First, a bit of history. This whole business of astronomy (and subsequent telescope making) got started here in Denver when I was in the 2nd grade. My dad took me out in the yard and we observed the moon with his 8X30 binoculars. A year or so later we moved to Los Angeles, and by a fluke the hook of astronomy became more firmly set. We were at Knotts Berry Farm enjoying dinner, gold panning and their various mineral exhibits and as we were leaving we saw a sign, "observatory". We went over to this little building full of astronomical photos, books etc. and for a dime we could go out back and see Jupiter with a gasoline powered telescope. (The building was far enough from the rest of the place that they had a gas generator to run the telescope drive) The view was stunning and I was terminally hooked. The KBF telescope was a 9-inch Newtonian. My parents bought me a book (Bernhart, Bennett & Rice, New Handbook of the Heavens) and that was it. I was caught.

Then came the Griffith Observatory, Planetarium shows and peeks through their 12-in. Zeiss refractor. I HAD to have a telescope!! The 8X30s simply didn't cut it. My first ever real telescope was a 40mm Polarex, identical to the Unitron 40mm Alt-Az. Wow! the moons of Jupiter, Rings of Saturn and all. I needed a bigger telescope! Got to have a bigger telescope!! Next came a 60mm Alt-Az., Also a Polarex, and this was a new one with lots of eyepieces and other goodies. I still have this one, you'll hear about it in another article. A year goes by, I had discovered Unitron, and they have even bigger 'scopes! I needed a bigger telescope! Got to have a bigger telescope!! This time my folks took me up to the Griffith Observatory where I joined the L. A. Astronomical Society, signed up for the mirror grinding school, bought a 6-inch kit and had at it. There'll be more about the 6" in a later writing. A couple of years go by, and I needed a bigger telescope! Got to have a bigger telescope!! My parents really got tired of this, and under the Christmas tree in 1956 was a real big and heavy box. I had wanted (besides a bigger 'scope) a 7mm eyepiece. That's what I thought was in the box. The last eyepiece I got for my birthday or whatever was in a huge box with a zillion other little things, pieces of wood, stones etc. I thought "here we go again". My folks did have a sense of humor. No, in this box was a 12.5-inch grinding kit, the biggest obtainable. I think my parents were so sick of me squealing "I needed a bigger telescope! Got to have a bigger telescope!!" that they thought this would shut me up and keep me busy for a while. They hoped for quite a while!

What follows is a description of this instrument, which I still have and is still in service. I call it the old workhorse, and is the one I do most of my serious observing with.

The design desirement for this 'scope was to be an f/6, in the belief that the optics were still "makeable" and it wouldn't be impossibly large mechanically. As I roughed out the mirror, the focal length got shorter, seemingly, at the rate of feet per minute until it got to about f/10 By the time it was at f/9 it was getting shorter, it seemed, by feet per month. Several pounds more of #80 grit and it was down close to f/8, getting shorter now by inches per decade. This is why it is f/7.6. Yes! 'tis a monster. Over all it took about 100 hours from start to finish on the mirror over the course of about 6 months. I had all but given up on the mirror, after my best effort at figuring, and took it to Cave optical Co. for possible refiguring. Tom Cave redid my first 6" and did a magnificent job on it. When I went to hear the verdict after Tom had tested the 12, he told me it was as good as any of his and to take it home and build a telescope! I did. I had the mirror tested again by Joe Miller, who then taught mirror making at the L.A. club (who later became the director of the Lick Obs) he said it looked very good, probably better than tenth wave. This thing saw first light August, 1957, (Jupiter) unfortunately a couple of months too late for the high school science fair, as I had already graduated in June of '57.

The whole mount design revolved around a box of aircraft engine main bearings from the old DC-3. My dad was able to get these from his work at Western Airlines. Figuring that bearings were expensive, and I now had enough for this thing we'd make everything else fit. The bearings were 7"OD X 4"ID. We made the pier from 6" diameter pipe, filled with cement and found 7" steel tubing, with about 1/8 wall for the bearing housings. 4" OD pipe, 1/4" wall, machined to fit inside of the bearings served as the shafts. these shafts were welded to the 7" housings and the polar axis was welded to a piece of the 6" pipe at the requisite 34 degree angle (the latitude of L.A.) and bolted to the pier via the big pipe flanges. This in turn is bolted into a half yard or so of cement in the ground. (The whole thing now leans at about a 6 degree angle to accommodate the latitude difference from LA to Denver)

The drive is a 12", 96 tooth worm gear, clutched to the polar axis, which carries a 10" driven R.A. circle. A 15:1 reduction to a 1 RPM motor completes the drive. A second motor doubles the speed and provides a 15 deg/hr slow motion to the West, the other button turns all the motors off for 15 deg/hr to the East. In addition a small reversible motor, via a differential, provides guiding at +/- ~ 3 deg/hour. The polar axis also carries a 7" Hour Angle circle. The Declination slow motion is a manually operated tangent screw with the equivalent of a ~3675 tooth gear. The slow motion and clamp for the declination are operable from the eyepiece through long shafts and a gear system. The dec. circle is 15" in diameter and can sort of be read from the eyepiece. A 18"X44" or so plate is welded to the dec. shaft and carries the saddle for the tube assembly.

The 14"DiaX106"long tube is of 18 gauge galvanized steel, reinforced with 14" piston rings from an old diesel powerhouse engine. The mirror cell is sort of the standard two triangle design made from 1" thick aluminum plates, separated by a push-pull screw system. No springs! My first one was 1.5" plywood with really hefty springs, but it wouldn't hold collimation! This one has a 9-

point flotation and three radial supports and seems to stay put just fine. The eye end consists of a 7" X 8" plate with four bolts on which the focusser, camera and whatever else can be attached over a four inch opening in the tube. I didn't want to be restricted by a small 1.25" or even 2" opening

The 1.25 focuser was the only purchased component (except the 2" diagonal, eyepieces and finder objectives) and was the first to give up. I made a new 2.4" focusser with adapters for 2", 1.25" and an assortment of other oddball sizes. Other accessories, built over time, include a special adapter for a 38mm Erfle, several planetary and direct focus cameras and camera adapters, a spectrograph and an adapter for the video camera. The 2" diagonal fully illuminates a 20mm diameter field, but works satisfactorialy with the erfle at a field diameter of 52mm. Although the illumination at the edge of this field is only 45% the views at 1.2 degrees are fine.

The finders are a 13X60 near the bottom of the tube and a 24X80 near the eyepiece as well as a couple of peep sights. The guide 'scope is a 4.25" f/22 Newtonian, whose focal length is very close to that of the 12. A real bear of a mirror! It was almost impossible to control the focal length, so I ground it flat through #220 grit, on the garage floor, and then used the #220 to generate the curve. Slowly and carefully.

All the parts, including bearing holders, and optics, were hand made as we had no machine capabilities. My dad borrowed a welding outfit and the two of us built this thing using the blacksmith arts! Weld it on, bend 'till it works and if it doesn't, cut it off and try something else. Those machine jobs on the shafts, and large welds, were farmed out to a local shop. I later learned one of my biggest goofs was not learning the machine shop arts. I took the cure for this, at the hands of a benevolent neighbor, and subsequent parts for this 'scope, including the new focuser and a new drive were from my ALM era. (After Learning Machineshop) I convinced my dad early on that we couldn't live without a lathe, mill, drill press and all. I still don't have a mill, but my dad and I split the cost for the rest of the stuff. An interesting note is that merely wanting to look at the stars can lead in all sorts of unimagined and expensive directions!

My major mistake on the first 6", aside from inexperience, was being in a rush. I had to have it done for the next close approach of Mars, and one lesson learned is that one doesn't rush a precision job like a telescope mirror. On the 12, I adopted a much more laid back approach. I had a fine 6" and I would be overjoyed at having a 12, but if it didn't work out, at least I'd still have the 6. I took it slow and easy, and it was a success. One of the major uses for this instrument was Lunar and Planetary photography. I had published several articles in the early '60s on that subject in The Strolling Astronomer (ALPO journal), Vol. 15 #9-10 Nov. 1961, Vol 16 #7-8, Aug. 1962, The Griffith Observer (Griffith Observatory) Feb. 1961 and Jul. 1965 and Sky and Telescope, July 1959.

Major mistakes were: 1) no rotating tube or upper section. This was sort of by design. If the tube rotates so does the field of view. Bad. (This is an excuse) We had no idea how to facilitate a rotating tube when building this thing. (This is a reason!) This makes getting to the eyepiece an interesting chore in some parts of the sky. Cure: If I were to do it again, Install some sort of rotating part at least for the eye end. 2) Ball bearings. Not enough friction which causes wiggle, and required friction pads inside the bearing housings. This was a lesson taught, learned but ignored, from the 6" mount. Cure: Lapped babbit bearings, if I were to do it again. 3) welding shafts directly to bearing housings. Doesn't allow for adjustment of orthogonality of axes and optical axis. Cure: Weld flanges on the shaft ends and housings. Machine to 90 deg. angles and bolt together, with shims if necessary. 4) Tube too small. The clear aperture of this thing is 12.6", the tube is slightly under 14" inside. With the reinforcing rings the clear path is 13.3" . Thermal currents are the kiss of death! Cure: a larger tube. The "Tombaugh criterion" is 1.5X the aperture 19" in my case. Easier things are vent holes (already done) and insulation (to be done in the near future)

When I built this thing it was one of the biggest. A 12.5" grinding kit was $48, the blank, $21. A 16" blank alone was $175, so "aperture fever", when tempered with the realities of the dollar, stopped at 12.5. 16s were rare and I knew of only one 18". One must realize these things are never finished. There are all sorts of fixes, modifications and the like that go on forever. This monster has given me over 40 years of service and pleasure, and hopefully many more to come.

THIS IS THE TYPICAL JOY EXPRESSED WHEN YOU ARE ABOUT TO SPEND AN EVENING VIEWING FROM HULAHA LAKE!!!!

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Observing Chair	Ann Bruun	918-834-0757
New Members	Owen Green	918-851-8171
Group Director	Tamara Green	918-581-1213
Webmaster	Jennifer Jones	
Night Sky Network	Teresa Davis	918-637-1477

MEMBERSHIP INFO

Astronomy Club of Tulsa membership ($45/year) includes membership in the Astronomical League and subscription to ACT's "Observer" and AL's "Reflector". "Astronomy" ($34/year) and "Sky and Telescope" ($33/year) are also available through the club. For more information contact John Land at 918-357-1759. Permission is hereby granted to reprint from this publication provided credit is given to the original author and the Astronomy Club of Tulsa "Observer" is identified as the source.

Jim "O'Toole" Millers—Astro Words of Wisdom:

"When you don't know the answer tap your chin and look up like you used to know it"

ACT welcomes your questions, suggestions, comments and submissions for publication. Please send all inquiries to jerrym@pantherenergy.us

Night Sky Network
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