# THE OBSERVER

The Astronomy Club of Tulsa's Newsletter Published Since 1937

RON WOOD NETA APPLE JOHN LAND JACK EASTMAN BRAD YOUNG ANN BRUNN


www.astrotulsa.com

# EDITORS NOTES

## THE COVER


**ASTRONOMER OF THE MONTH**

This month we go about 2,700 years forward and honor Carl Sagan. This should have been a easy one for many of you who have read his books and seen the acclaimed Cosmos TV Mini-Series. Carl is arguably one of the top 5 most famous. I am sure he has been seen by billions and billions. Ok, that was bad.

Carl Sagan (1934-1996, American) could be called 'the astronomer of the people'. He popularized the science of astronomy with the general public, and revolutionized science fiction by believing that we are not alone in the universe. He championed the search for extraterrestrial intelligence, which continues today with a number of missions to Mars to search for signs of life on that planet.

## About This Issue:

**Few things will no longer appear every month. One will be Actomart as this is a great section we just are not selling enough to keep it up every month. It will show back up as we have items our members would like to sell. The other will be The Toy Box and this does not appear every month because a certin degree of research goes into this so we don't just list items because they are new. Speaking of new we have added one new section this month , Beginners Challenge and we just have wait and see what response it has. I will continue to try new things and always welcome and credit suggestions.**

**Starting next month we will be adding NASA's Spaceplace as a feature, but more about that next month.**

## To Submit to the Observer:

**Email your article or content with pictures to jerrym@pantherenergy.us please put newsletter in the subject or it might not show up.**

**NEW MEMBER CORNER**

**Here we go, September and October. Welcome All!**

**Lee Bickle, Darrell Henk, Mandy Nothnagel, Robbin Jones, Jon Ruyle, Andrew Foreman, Mark Foreman, Ed Hinckley, Patty Jeter and Jody Ray**



THE OBSERVER IS EDITED & PUBLISHED BY: JERRY MULLENNIX

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# Guest Speaker

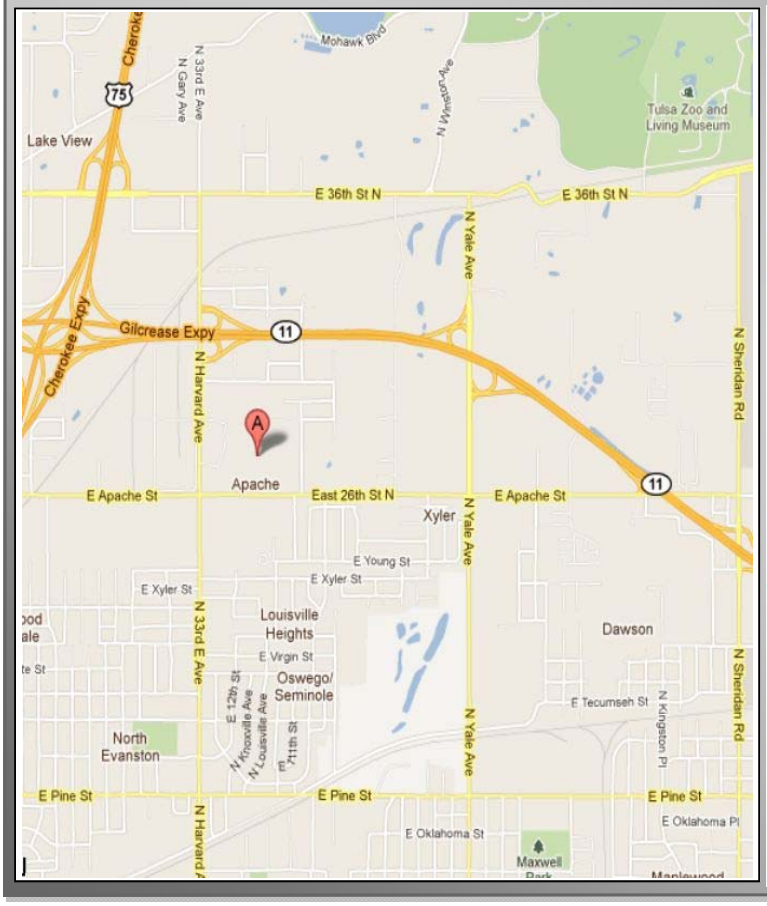
Due to our club dinner we will not have a guest speaker this month but mark your calendars for December 9th when Meteorologist George Flickeinger will be our next scheduled guest speaker.

**Friday December 9, 2011 at 7:00 PM**

**Note: All building locations in map below are prior to earthquakes and subject to change.**

## 3727 East Apache, Tulsa, OK 74115

## Room 1603 Building #2 Student Union




# Astro Prez

MESSAGE FROM THE PRESIDENT ANN BRUUN

Greetings fellow A.C.T. members! I would first like to introduce the volunteers who have agreed to serve on the board and other appointed positions this year. Vice President – Tony White, Secretary – Tamara Green, Treasurer – John Land, Board – Tim Davis, Teresa Davis, Stan Davis, Bill Goswick, Catherine Kahbi, Tom McDonough, Newsletter Editor – Jerry Mullennix, Facilities Manager – Chris Proctor, Sidewalk Astronomy – Owen Green. At our first Board meeting I gave an informal description of what I would like to see the club accomplish this year. I don't know if we will be able to do everything but we can definitely accomplish whatever the membership is willing to support. First, I would like to see us have a big public event similar to the Mars Watch at Mohawk Park. Also, I think a members dark sky weekend would be fantastic, and a fundraiser such as a garage sale will definitely help with club expenses. Finally I would love to have another cookout/potluck for the membership. It is really up to you to decide the priorities for the club. Let the officers/board know what you are interested in or any ideas you have. I will also do my best to get the time and location of future board meetings published so that any members who are interested can attend. Remember, the officers and board are your representatives.

Many of you have heard and may have participated in the discussion about an alternate dark site for the club. It is true the sky at Mounds is not as good as it was a few years ago. A committee is being formed to explore potential alternate dark sky sites. This is in the very early stage and is by no means being considered a potential replacement for the Mounds Observatory. The Observatory site we have is still viable for exploring many deep sky objects and a perfect location for public outreach since it is not too far from Tulsa. The alternate site would be more for member events focused on deep sky observing. Brad Young has agreed to head the committee that will be tasked with coming up with three potential sites. They will also be asked to explore how other clubs that have procured an additional site manage. Any member would be welcome to help in the assessment of potential sites. If you are interested in serving on the committee let Brad know. Also if you have any suggestions for sites to be assessed let the committee know. Right now I would like you to be thinking about the distance you would be willing to go to visit such a site. In other words how long would you be willing to drive to get to get there, one and a half hours, two hours? This is a key factor that will be used to identify locations. As I said this is very preliminary. We have an observatory that needs to be supported by the club. The acquisition of an additional site will have to be carefully and thoroughly examined.

I look forward to serving as the A.C.T. President and hope we can accomplish our goals and have fun at the same time.

Ann Bruun

ACT President


By: Jerry Mullennix

Some of you may have noticed the new logo on the front cover marking our clubs 75th year in existence. It is a lot to think about and though I am not positive but I believe we are the oldest club in the State of Oklahoma.

Our sister club over in OKC is proudly celebrating their 50th and we congratulate them. However, we were drinking age when they got started. I guess you could say "we were astronomy before astronomy was cool."

Here are some facts when we started: Sky and Telescope was two different magazines, Sky being one and Telescope the other. They would not be Sky and Tel for 5 more years.

All of the little smudges you know as galaxy's including Andromeda were known as nebula because nothing existed beyond the Milky Way. That's right, almost everyone thought the Milky Way was the entire Universe.

Why I say almost, there was one young man, Edwin Hubble who made observations with the Hooker Telescope in 1923 where he identified Cepheid Variables in several of these nebulae, including Andromeda and Triangulum. Cepheid's are what is now known in astronomy as a Standard Candle (used for measurements). He presented his findings in 1925 to the American Astronomical Society where he was quickly rebuked.

Our club would exist before anyone believed there could actually be something 2 million light years from the Earth.

The Milky Way and stellar universe was believed to be roughly lens-shaped and about 3,000 to 30,000 or more light years in extent. (Current wisdom shows about 100,000 though x-ray scopes are finding it may be much bigger, maybe X2.) In this space occur nearly all the stars, nearly all the diffuse nebulosity's, nearly all the planetary nebulae, nearly all new stars, nearly all clusters, nearly all the variable stars, etc., but not spiral nebulae. There were approx. 100,000 spiral nebulae who's distance could not known. This is because they did not believe the measurements they calculated for theses and assumed the standard candle was only accurate to a fixed distance from Earth.

We now know them as galaxy's and 100,000 doesn't begin to count them. Their distances go back to the beginning of Space/Time approx. 14 billion light years and we now suspect this may be one of countless universe's, some of which the physics we understand here will not apply there.

Now, all of the information I have provided about the way we perceived space was from a treasured book I have titled Wonder Book, it was published in 1935 by Funk & Wagnalls Company.

Our club has a lot to be proud of and all of us are fortunate to share in the history of this club. Lets make this a great year in astronomy and discovery . Happy Birthday!

THE GREAT NEBULA IN ANDROMEDA

# Find a Bit of Heaven in Oklahoma

**By Ron Wood**

A few years ago there was a story about an amateur astronomer who received a picture postcard from a friend who was vacationing in Europe. The picture was an aerial view of the countryside, and the recipient, studying the card, became convinced that it contained the very faint image of an unknown astrobleme---an impact structure---which, as it turned out, it did. Consequently, I cannot look at any such image without compulsively examining it for signs of an astrobleme. The word comes from the Greek for "star scar." It is synonymous with impact structure and is usually used when referring to a highly eroded crater.

For example, whenever I go to the National Weather Service website to check the radar, my eye gravitates to a large, faint, circular feature on the map just to the northeast of Ardmore. Check it out. If you don't see it right away try using your averted imagination. It is about 15 miles in diameter and is bisected by the Pontotoc/Johnston county line. So, fishing for a topic for this article, I decided to do a survey of astroevents of the Oklahoma region.

Over the years I heard my dad tell of accidently seeing a total solar eclipse near Okemah in 1918 when he was six years old. A brief search confirmed that such an eclipse did in fact occur on June 8th, with the path of totality sweeping diagonally across the US from Washington state to Florida, passing across Okemah at about 4:30. Tulsa appears to have been just within the northern edge of the path.

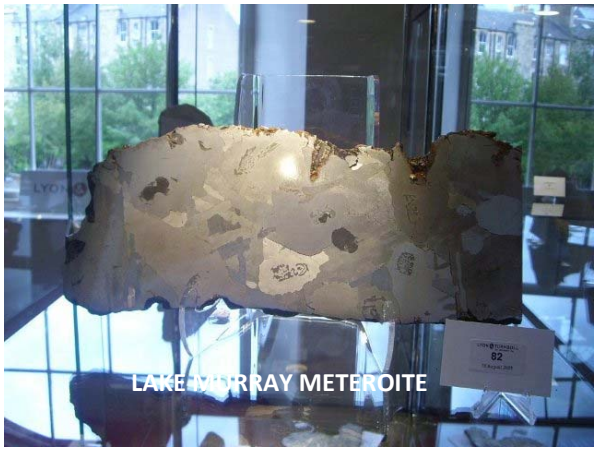
Besides this eclipse, I was aware of only two other leads to investigate: the Lake Murray and Lost City meteorites.

The Lake Murray meteorite was discovered by J.C. Dodson in 1933 projecting from the side of a gully on his farm near Lake Murray, but it was not excavated until 1952 when Dodson guided a Mr. Graffham, director of the Tucker Tower museum, to the site. Graffham, recognizing the importance of the find, immediately called the Institute of Meteoritics at the Univ. of New Mexico which dispatched a recovery team at once. It proved to be the largest meteorite ever found in Oklahoma, weighing over 600 pounds, and the largest granular hexahedrite in the world.

It was embedded in sandstone dating from the Cretaceous period, suggesting that it landed in a nearshore, shallow sea as these beds were being deposited about 110 million years ago. This makes it the oldest intact meteorite on earth, though older "fossil meteorites" have been found in which the original material has been replaced by minerals. A thumbnail-sized slice sold on Ebay this spring for $16; or you can get a thin, square, 6X6 inch slab for about $2000.

An equally important 17 kg meteorite fell near Lost City in northeastern Oklahoma at 8:14 pm, Jan. 3, 1970. The importance of this meteorite lies in the fact that its flight path was captured on film by several cameras of the Smithsonian Prairie Network, which had gone into operation in 1960 for just this purpose. These photographs made it possible to calculate the orbit around the sun, the trajectory through the atmosphere, and the likely point of impact. This had only been done once before, in the case of the Pribram meteorite fall in Czechoslovakia in 1959.

Gunther Schwarz, manager of the network stationed in Nebraska, heard of the fall on the 10 o'clock news and called network headquarters in Cambridge, MA, setting in motion a prearranged plan. Eight-



LAKE MURRAY METEROITE

een hours after the fall an Air Force plane flew at 60,000 ft. from Oklahoma City to Atlanta, Georgia, and back, taking air samples.

Driving from Nebraska, Schwarz was not able to reach Lost City until Jan. 9th due to icy roads and 8 inches of new snow. He drove from Lost City toward the impact area intending to tell the local residents what to look for, but just outside town he found the meteorite lying in the road 800 meters from the predicted point of impact.

LOST CITY METEORITE

A very great deal of important information was derived from the Lost City meteorite, making it possible to more accurately determine such things as the cosmic ray flux in the inner solar system and the density and composition of subsequent meteors. You can buy a one-inch, 1.5 gm slice of Lost City from Mile High Meteorites for $500. Meteors and eclipses are all well and good, but my fever ran high for making an original discovery of an "Ardmore Astrobleme." I did find a very impressive astrobleme, but someone else found it first, and it is almost two hundred miles from Ardmore. It is in northwestern Oklahoma near the small town of Ames in Major County.

Since it is buried under 9000 ft. of sediment it was not even recognized as an astrobleme until 1991. It is 8 miles in diameter and is dated to 470 million years ago. The subterranean crater is beautifully depicted on the Ames Museum website by graphics developed from seismic data. Ames is one of the most intensively studied craters in the world and one of six petroleum- producing craters in the US.

I did discover another very interesting site in the Oklahoma panhandle on Bull Creek in Beaver County. In 2007 a 26-member team from 16 institutions theorized that a cosmic impact over North America, possibly similar to the 1908 cometary airburst over Tunguska, set off a 1,300-year-long cold spell known as the Younger Dryas, fragmenting the prehistoric Clovis culture and leading to the extinction of 35 species of mammals, including mammoths.

Team member Douglas Kennett reported finding nanometer-sized diamonds concentrated in the relevant sedimentary layer at all six widespread sites in the study including Bull Creek. The theory and Kennett's findings are both the subjects of a heated but very interesting debate.

I couldn't find any mention of other impact sites in Oklahoma though there are a surprising number nearby in surrounding states. In Kansas, Haviland Crater is an oval-shaped crater 50 feet in diameter, making it one of the smallest in the world. Its age is estimated to be less than 1000 years. Over 15,000 pounds of pallasite meteorites have been recovered from the site.

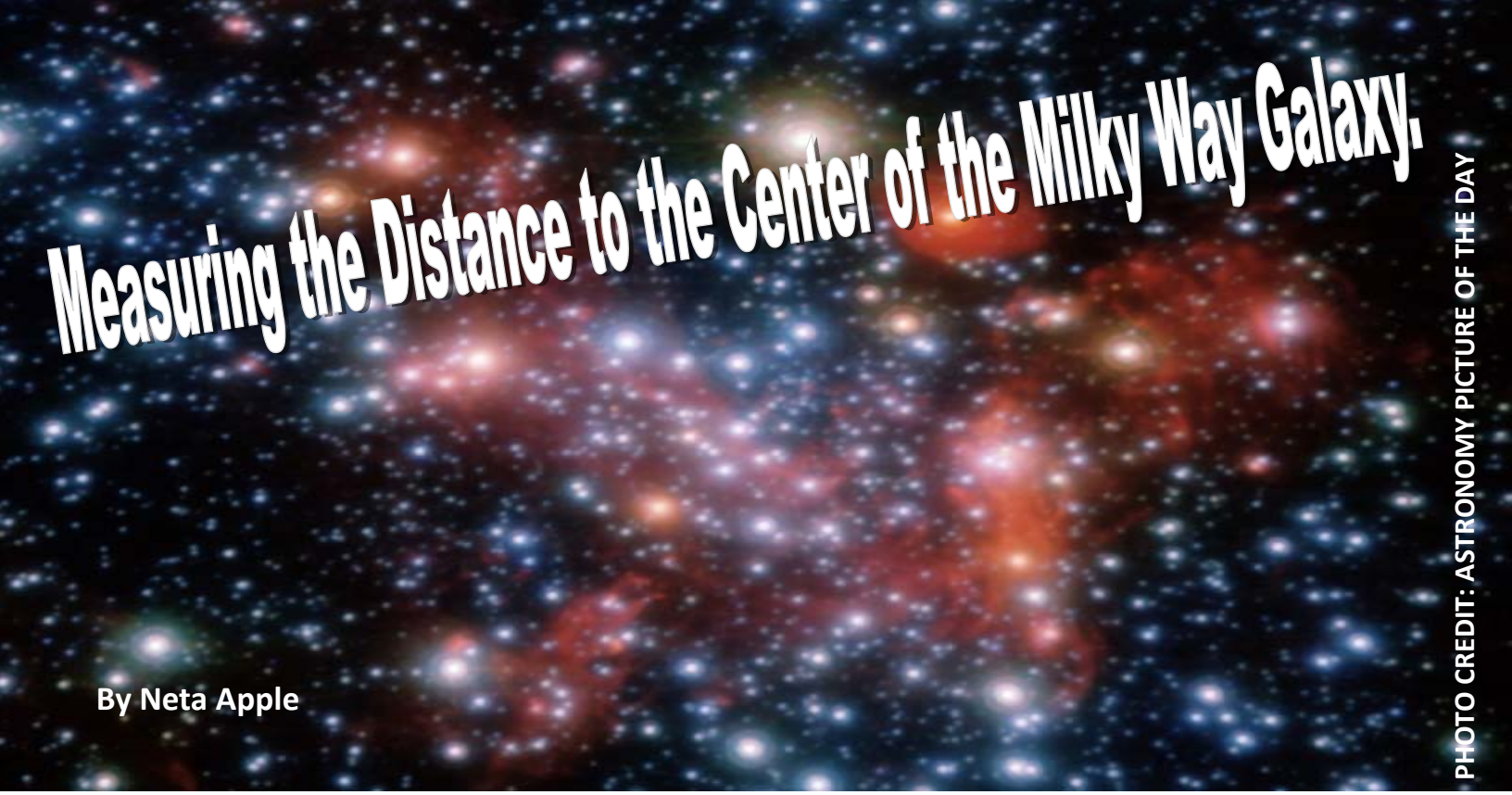
In Missouri, Weaubleau-Osceola is the fourth largest crater in the United States. It is believed to have been caused by a 1200 ft. meteoroid between 310 and 340 million years ago. Associated conglomerate rocks found in the area are nearly perfectly round and are referred to locally as "Missouri rock balls."

Also in Missouri, Crooked Creek Crater is 7 km in diameter with an age estimated at 80 million years. Decaturville Crater in Missouri is 6 km in diameter and is less than 300 million years old.

In Texas, Sierra Madera Crater is 13 km in diameter and is estimated to be less than 100 million years old. A central peak rises 793 feet above the surrounding desert.

Also in Texas Odessa Meteor Crater is the largest of several craters in the area formed by the impact of thousands of octahedrites. Over 1500 meteorites have been recovered from the area, the largest of which weighed approximately 300 pounds. The crater is 550 feet in diameter and is estimated to be less than 50,000 years old. Due to erosion the crater is currently 15 feet deep at its lowest point.

Given the density of astroblemes in the region I have high hopes that some future search may uncover the Ardmore--or make that, the Ron Wood Astrobleme.




**Introduction**

For centuries mankind believed the Earth was the center of the Universe. After it was proven that the Earth orbits the Sun, it was thought that the Sun was the center of the Universe. It was only in 1920, less than 100 years ago, that the young astronomer Harlow Shapley first used the distribution and distances to globular clusters to show that the Sun lies at a distance from the center of the Milky Way Galaxy, not at its center. Using this information, he calculated the diameter of the Galaxy to be about 300,000 light years, with the Sun being about 13 kpc (kiloparsecs; 1 kpc = 3261.6 light years) from its center, farther than the current accepted figure.

In 1985 the International Astronomical Union (IAU) recommended the use of 8.5 kpc, (about 28,000 light years), rather than the previous value of 10 kpc (Pottasch 1990) for the distance from the Sun to the center of the Galaxy. Results from continuing investigations to determine this distance, $R_0$, seem to indicate that the IAU may soon need to revise its recommendation again.

Why is the value of $R_0$ important? Simply put $R_0$ can be used as a meter stick for other distance measurements. Before exploring this more fully, it is necessary to review some history and examine some of the various methods that have so far been used to determine $R_0$ and the accuracy of the results.

**History**

While working at the Mt. Wilson Observatory just after the turn of the 20th century, Harlow Shapley noted that the 69 globular clusters known at the time were arranged in a huge sphere which was centered on a point located several kiloparsecs away from Earth. He reasoned that due to the action of gravitational forces this point should be the center of the Milky Way.

Shapley set out to determine the size of the Galaxy by using variable stars, known as Cepheids. Cepheids had recently been discovered to have a precise relationship between their period of variability and their brightness, or luminosity. He logically assumed that Cepheids in the distant globular clusters would follow this same relationship and that he could use these Cepheids as "standard candles" by use of which he could determine the distances to the globulars, then use this information to determine the distance to the point about which they were distributed.

Assuming that the Cepheids he observed in the globular clusters had the same period-luminosity relationship as those located nearer, he measured the apparent brightness and length of period of the globular cluster Cepheids and compared them to those located nearer the Sun. He could then calculate by how much each of the globular variable stars was dimmed, and using the in-

verse square law, which states that the distance to a bright object diminishes with distance by the square of the object's distance from the observer, determine how far away it was. By measuring the distance to the central point of the sphere of globulars he in effect measured the distance to the center of the Galaxy.

Shapley's value of about 13 kpc, (Reid 1993) is nearly twice modern values. At that time Shapley had no way of knowing that his sampling contained two types of Cepheids. Now known as Population I and Population II based on their metallicity, each group has a different period-luminosity relationship. He had no way to know that the variable stars he used in the globular clusters were older, less metallic and thus dimmer than expected. This combined with extinction, dimming of distant stars due to intervening dust, produced this erroneous result (Reid, 1993). Still, this was a wonderful achievement since it forced astronomers to consider that the Sun is not at the center, and that the Galaxy might be very large.

**Modern Determinations of $R_0$**

Currently astronomers use several methods to measure $R_0$, all of which fall into three basic categories: primary methods which are measured directly without use of a "standard candle;" secondary methods use "standard candles" such as the variable stars used by Shapley; and indirect methods which combine theoretical modeling of the Galaxy with several observations (Reid, 1989 and 1993).

Primary methods of measurement of $R_0$ should be more accurate since the measurement is made in one single step rather than relying on secondary calibrations and multiple steps. Direct measurements using stellar parallax are impossible due to the very small angles of parallax involved at such distances so other methods must be employed. Two examples of primary methods are distance measurements to water masers and to stars very near the galactic center.

Reid, et al (1988) used water masers to measure the distance to the center of the Galaxy. Interstellar masers occur in molecular clouds proximal to massive newly formed stars. Traces of water vapor are associated with these stars. Water molecules can become "excited" in these locations and produce masing "spots" (Reid, 1993). The motion of these spots can be measured using Very Long Baseline Interferometry (VLBI) to measure Doppler shifts and angular motions indicating various velocity components to within a few km/sec in a technique which has been called "expanding cluster parallax." Using such data from a water source in the area designated Sgr B2, which lies very close to the center of the galaxy, Reid, et al (1988) determined the distance to Sgr B2 to be 7.1 ± 1.5 kpc by comparison of angular and line-of-sight velocities.

Eisenhauer, et al, (2003) claim to have made the most accurate primary measurement of $R_0$. They also claim their value of 7.94 ± 0.42 kpc has few uncertainties of astrophysical origin, and is the first primary distance determination with an uncertainty of less than 5%. This value was obtained from astrometric and near infrared observations of the star S2 which orbits very near Sgr A*, the central black hole of the Galaxy, using the ESO Very Large Telescope (VLT) located in Chile. This method involves determination of the proper motions and line-of-sight velocity of the star, the same method used for orbiting binaries, and the use of Kepler's third law to obtain $R_0$. One cannot argue with the directness of the method- it does not require allowances for extinction and has been proven reliable by use in other locations. It seems that this method should be one of the most accurate and precise.

As previously noted, Shapley's determination of the distance to the galactic center used "standard candles," thus it fits into the class of secondary methods. These methods rely on the idea that certain types of distant objects are the same and have the same luminosity, or brightness, as similar objects located nearby. This has become more accurate as more is now known about the objects chosen for use as standard candles and with the ability to observe the objects in wavelengths other than visible light , (e.g. radio, IR, and X-rays), that are not highly affected by intervening dust. Selection of standard candles about which a great deal is understood is vital to accuracy. A demonstration of this concept is evident in repetition of Shapley's work by Racine and Harris (1989) who obtained a value of $R_0$= 7.5± 0.9 kpc.

Other modern studies involving the use of the Cepheids as standard candles have resulted in results of $R_0$= 7.8± 0.7 kpc (Caldwell & Coulson 1987). Use of RR Lyrae stars by Carney et al (1995) yielded a value of 7.8± 0.4 kpc.

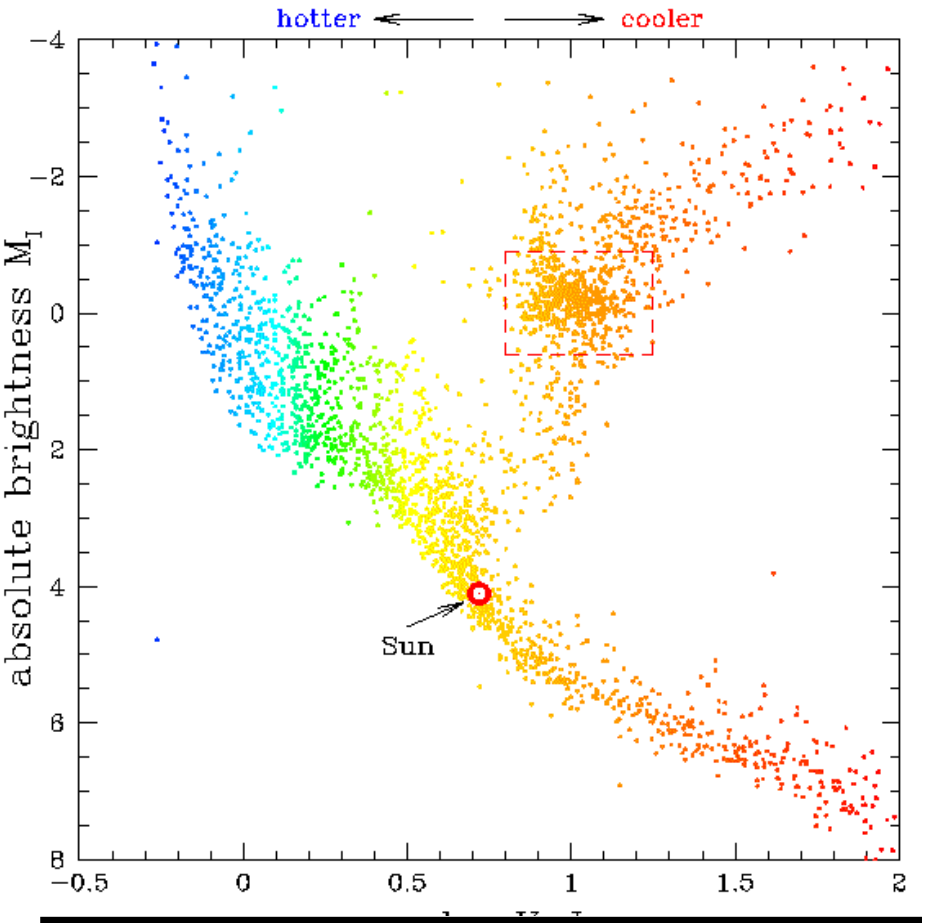



**Figure 1 Location of red clump stars on the Hipparchos color-magnitude diagram which plots color of stars compared to absolute brightness. From http://cfa-www.harvard.edu/~kstanek/RedClump/.**

Another standard candle method uses red clump stars. Red clump stars are giant, bright, metal rich stars located just above the turn off point on the color-magnitude diagram (see Figure 1) that have finished fusing the hydrogen in their cores and progressed off the main sequence. According to Paczsynski and Stanek (1998) red clump stars are very common, and very well understood making them good candidates for use as standard candles. Trigonometric parallaxes of ~ 600 nearby red clump stars from Hipparchos and their absolute magnitudes were compared with apparent magnitudes of red clump stars in Baade's Window measured by OGLE. (Baade's Window is a "hole" in the dust that shrouds the center of the Galaxy through which stars near the Galactic center may be examined (Nemiroff & Bonnell 2002),) This method gives the distance to the galactic center in one step which yielded $R_0 = 8.4 \pm 0.4$kpc.

There are a great variety of indirect objects and method combinations that can lead to a value of $R_0$. Some examples include the use of rotation models of the Galaxy (Caldwell & Coulson 1987) in conjunction with various types of stars including planetary nebulae, Cepheid variables, bright type O and B stars, IR stars and Sgr A* itself. Values obtained for these methods range from 7.6 kpc to 10.4 kpc with a variety of estimated errors (Reid 1989, 1993) which seem largely dependent upon the reliability and directness of the method. Each of these methods has a great deal of uncertainty and thus results do not seem as accurate or precise as those obtained by more direct methods.

**Significance of $R_0$**

Since the distances to far-away objects in the Universe are determined by the use of Galactic standards, the value of $R_0$ has an aspect even more important than determination of the size of the Galaxy. The Hubble constant and $R_0$ are somewhat interrelated and thus it may be possible to use the Galaxy as a sort of intergalactic meter stick to measure distances to other spiral galaxies in the future (Reid 1993).

A change in the value of $R_0$ leads to changes in many areas of astrophysics, e.g. kinematic distances, mass determinations of the Galaxy and the Galactic center (Carney et al 1995), which are fundamental to many of the theories and models of the Galaxy and the Universe. Particularly intriguing is the idea that an improved determination of $R_0$ would enable accurate recalibration of standard candles such as globular clusters, O and B type stars, red clump stars, planetary nebulae, and Cepheid, RR Lyrae and Mira type variable stars with greater precision for use in determining distances to nearby galaxies observed to contain these same types of objects. Thus the distances to nearby galaxies would change.

Determination of the absolute magnitude of RR Lyrae stars would bear

heavily on the determination of their metallicity and ages. This information is in turn used to constrain the age of the Universe and the Hubble constant.

**Conclusions**

Accurate determinations of $R_0$ can be used to calibrate standard candles for use in measuring distances to other galaxies, in development of models of the Galaxy and in determining the size and age of the Universe.

Astronomers use a variety of methods to determine the Galactocentric distance, some of which are more direct and thus more accurate than others which require the use of standard candles, multiple steps or models in making the determination.

Values for $R_0$ range from 7.1 kpc to 10.4 kpc, with varying amounts of error inherent to each determination. The IAU currently recommends use of $R_0$ = 8.5 kpc which is greater than most of the values reported here. Thus it would seem that in the near future the IAU may need to re-examine this value and recommend a revision. Some researchers are already beginning to use 8.0 kpc.

Comparing values of $R_0$ since that first measurement made by Shapley nearly a century ago, one might think we lived in a shrinking Galaxy! At this time the value of $R_0$ is just over half of Shapley's value. The Galaxy has not shrunk, rather the knowledge of how to accurately measure the Galaxy, and thus the Universe, has instead grown. It would appear that astronomers are now zeroing in on a highly accurate and precise determination of $R_0$ which will enable more accurate determination of distances inside and outside the Galaxy.

**References**

Caldwell, J. A. R. & Coulson, I. M., 1987, AJ, 93, 1090.

Carney, B., Terndrup, D., Suntzeff, N. & Walker, A., 1995, AJ, 110, 1674.

Eisenhauer, F., Schodel, R., Genzel, R., Ott, T., Tecza, M., Abuter, R., Eckart, A. & Alexander, T., 2003, ApJ 597, L121.

Nemeroff, R. & Bonnell, J., 2002, Astronomy Picture of the Day http://apod.nasa.gov/apod/ap021223.html

Paczynski, B., & Stanek, K., 1998, ApJ, 49, L219.

Pottasch, S.R., 1990, A&A, 236, 231.

Racine, R. & Harris, W., 1989, ApJ, 98, 1609.

Reid, M. J., Schneps, M. H., Moran, J. M. & Gwinn, C.R., 1988, ApJ, 330, 809.

Reid, M. J., 1993, ARA&A, 31, 345.

Reid, M.J., 1989, AUS, 136, 37.

# How Dark is Your Site?

By: Brad Young & Jerry Mullennix

Please Note, This was written prior to Ann's President Message and some of my portion of this message does not apply now.

As it is said in the Godfather ; "I am going to make them an offer they cannot refuse." Last month I mentioned that our club needed to accelerate the topic of procuring a dark sky site for the Astronomy Club of Tulsa and that our Board should move it higher on the priority list. A few days after the newsletter hit the stands Brad Young , a long time club member ,posted a detailed proposal for the Boards consideration on this topic. I have reprinted the post following my note.

I had a long talk with Brad, when we meet at Hulah Lake last Friday night, about his post. I quickly realized that Brad well understood all of the obstacles' that faced us such as money, availability, drive time, and the biggest, getting the club to agree. After our Discussion both Brad and I along with Steve Chapman decided we would be willing to volunteer our time as part of the original screening committee to get this started, (see below) should our board decide that this is something we should pursue.

For a lot of reasons Hulah lake might not make a good site for us but we would like to invite the entire board to join us in viewing from this site where we could have an extended discussion , for that matter we would like to invite anyone interested in a dark sky site to load their telescope and come along. We could call it "ACT's Dark Sky Search Star Party." As our board has just started and Ann has not even had a chance to hold a meeting yet so this is just an idea—besides winter is taking a foothold and viewing opportunities are going to be narrowed for a few months. One thing we all must understand if this is to succeed is this will not be a quick process, we must take our time and do it right.

Jerry Mullennix

Post: By Brad Young

Towards a New Observing Site

For Consideration by the ACT Board.
October 25,2011

The time has come to identify, design, and procure a new observing site for the Astronomy Club of Tulsa. This site may replace or supplement the current site at Mounds.

**SCREENING COMMITTEE FORMATION**

A committee of 3-5 persons would be formed to screen possible sites, select a primary and one alternate, and report to the Board their findings by March 31, 2012. This committee would be headed by a Committee Chairman, who would be responsible for submitting the selection, working with the other members. All members of this committee shall be Astronomy Club of Tulsa members in good standing. Volunteers would be called for in the next Club Newsletter, general email, observing night, and/or indoor meeting. The selected volunteers shall elect the Committee Chairman. The Committee would establish a Work Plan including meeting schedule and location immediately after the election of the Chairman.

**COMMITTEE DELIVERABLES**

A formal proposal would be developed by the Screening Committee. The proposal would address the following issues:

Sky Darkness (Bortle Scale or Light Meter Measurements) and Light Domes (if any)

Estimate of Useful Life based on re-

cent construction in area

Weather and Environmental Concerns:

Wind, Dew, Noise, Safety, Public Use / Traffic

Seasonal Issues

Incidental Light Sources (light poles, etc.)

Suitability for:

Casual Observer

Visitors / Public Events

Overnight Observers

Future Multiday use (e.g. Star Party)

Accommodations: Onsite or Nearby

Utilities Available or Availability

Distance / Route Drivability from Downtown Tulsa

Procurement Plan including:

Lease or Purchase Expense

Recurring Costs (Taxes / Insurance / Utilities / etc.)

Improvements (Conceptual Plan and Budget)

Schedule

Funding Source

Transitional or Supplemental Plan with Mounds Site.

**BOARD REVIEW AND ACTION**

After receipt of the Proposal, the Board would have 30 days to accept or comment on the Proposal. Committee would have 30 days to address the comments, at which time the Proposal would be set to a vote by the General Membership of the Club. This vote would be a special election held during a regular Club Meeting or announced at least 30 days before the vote is cast.

If the Board or Committee finds there is not a tenable site during the review period, the party responsible for determining the Proposal is untenable shall make a written report available to all General Members within 30 days of the decision, describing in detail the reasons why the Proposal why the General Membership will not be presented with the Proposal. This report shall be presented at a regular Club Meeting and a vote held to accept the conclusion or restart the screening process.

**SCREENING COMMITTEE DETAILS**

After receipt of the Proposal, the Board would have 30 days to accept or comment on the Proposal. Committee would have 30 days to address the comments, at which time the Proposal would be set to a vote by the General Membership of the Club. This vote would be a special election held during a regular Club Meeting or announced at least 30 days before the vote is cast.

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Observers Name___Brad Young_____

Date of Observation_____10/28/2011_____

Site__Hulah Lake (Boat Landing)_____

Location of Observer

Latitude__ 36.8797. _____

Longitude___-95.9892 _____

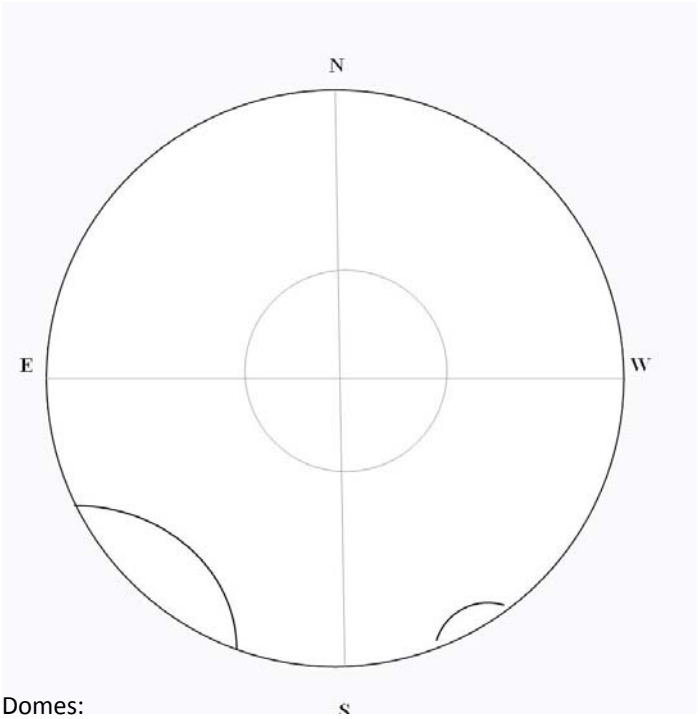
(west is negative)

Elevation____797 ft _____

Instrument Used (check one)

_____Unaided Eye

Draw or sketch light domes at the site.




Sky Darkness (Bortle Scale or Light Meter Measurements) and Light Domes:

*See drawing above and map on next page.*

Estimate of Useful Life based on recent construction in area: *Not addressed*

Weather and Environmental Concerns:

Wind – *could be a problem with no trees and lakeside site*

Dew – *dew reported by others; lake side site*

Noise – *boats, cars (occasional)*

Safety – *rangers; state park; no shelter*

Public Use / Traffic – *busy in summer, light traffic*

Seasonal Issues – *cold wind from lake in winter*

Incidental Light Sources (light poles, etc.) *occasional boats, small cluster of lights on opposite shore*

Suitability for:

Casual Observer – *1-2 hour drive back to Tulsa*

Visitors / Public Events – *probably not useful*

Overnight Observers – *need to establish shelter or use RVs*

Future Multiday use (e.g. Star Party) – *public land; not useful for private event*

Accommodations Onsite or Nearby – *RV hookups, campsites within a mile (fee)*

Utilities Available or Availability – *not at this site, at campground*

Distance / Route Drivability from Downtown Tulsa *1.5 hours, all four lane or primary two lane highways and paved access*

Procurement Plan including:

Lease or Purchase Expense – *not an option at this site (see note below)*

Recurring Costs (Taxes / Insurance / Utilities / etc.) *N/A*

Improvements (Conceptual Plan and Budget) *N/A*

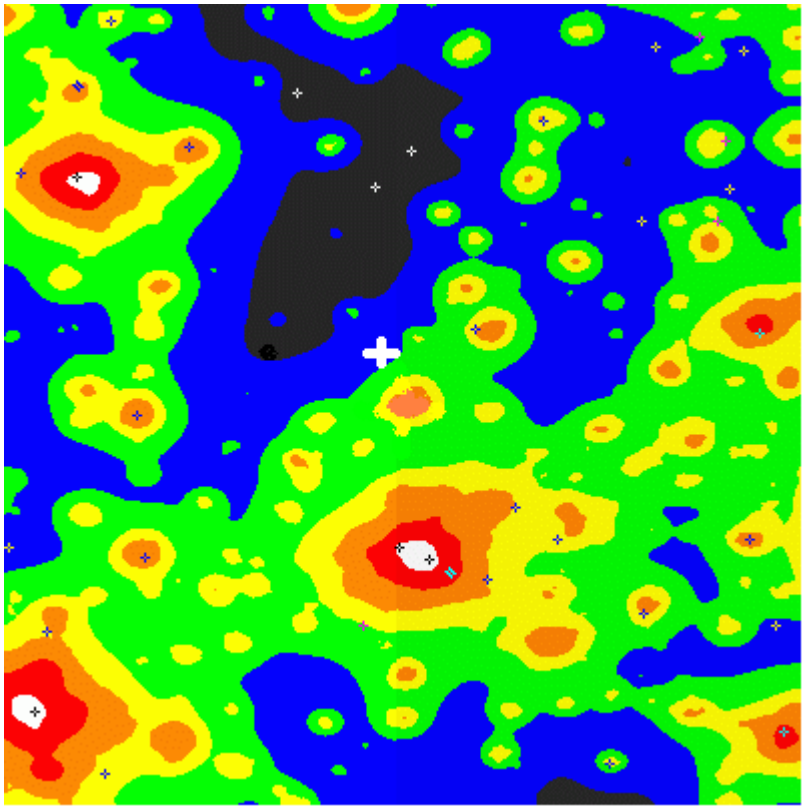
Schedule *N/A*

Funding Source *N/A*

Transitional or Supplemental Plan with Mounds Site: *See note below.*

*General consensus among attendees was that this particular site is useful only for short term, casual use. However, areas to north and west should be further scouted for land available for lease or purchase. The white cross below shows the location of the Hulah Lake Boat Ramp, in an area classified as*:

| Artificial / Natural Sky Brightness | Sky Brightness mags / sq arcsec V Band | Bortle Scale approx | Description (Descriptions are approximate. Your sky may vary.) |
|---|---|---|---|
| 0.11 to 0.33 | 21.89 to 21.69 | 3 | Low light domes (10 to 15 degrees) on horizon. M33 easy with averted vision. M15 is naked eye. Milky way shows bulge into Ophiuchus. Limiting magnitude 6.6 to 7.0. |

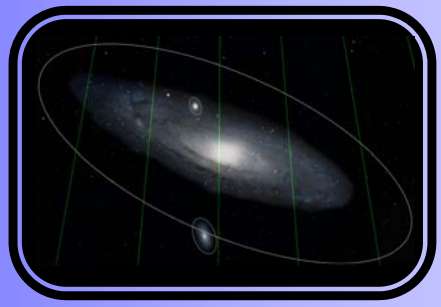


# Beginners Challenge

## DECEMBER, 2011

### *Constellation of the Month*

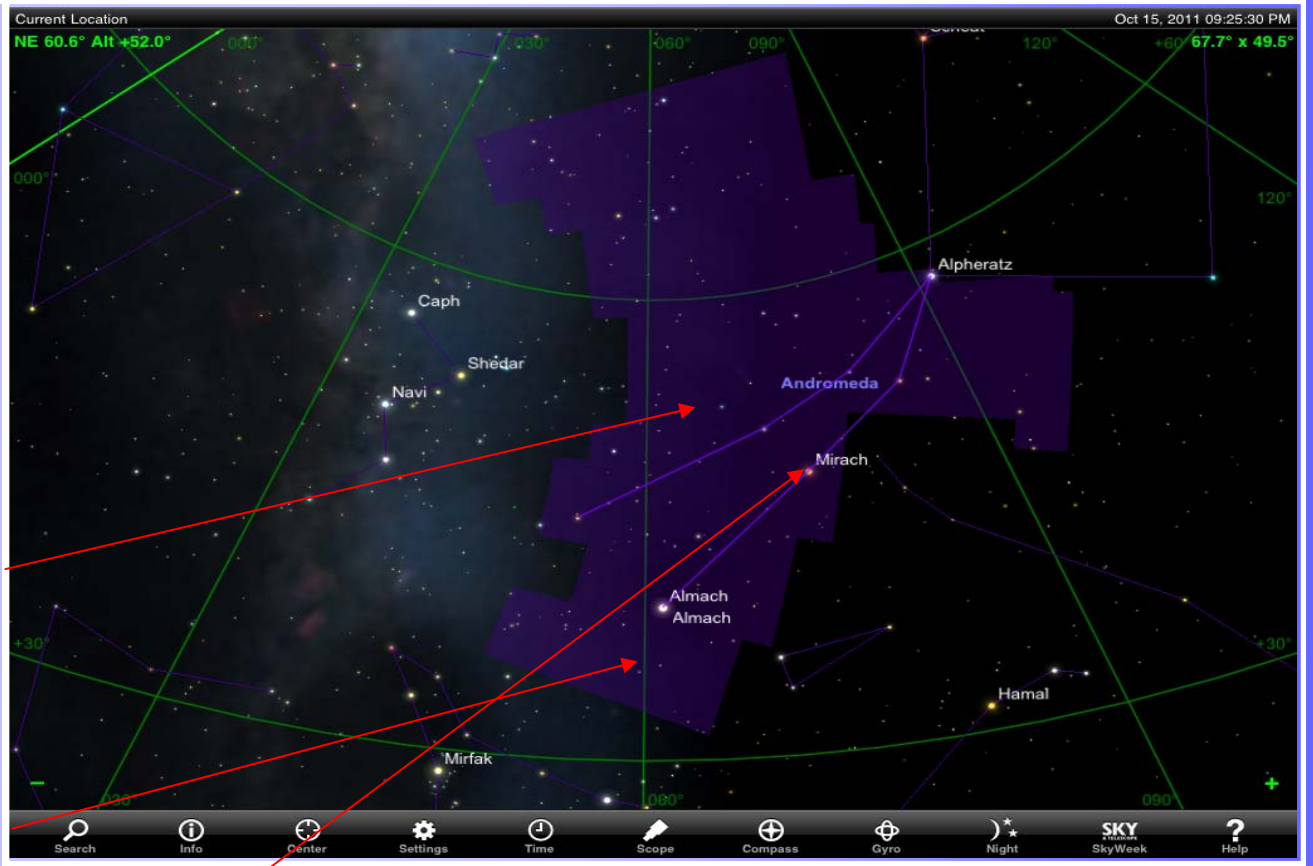
### *Andromeda*



M-31, M-32 and M-110 or The Great Andromeda Galaxy Group. All three can be seen in photo to the Right with M-110 being the bright spot at the bottom and M-32 being the bright spot at the top.

NGC 891 is a fine edge-on spiral galaxy, missed by Messier. It was discovered by William Herchel on October 6, 1784. At Mag 9.96 It is a relatively easy object for telescopes.

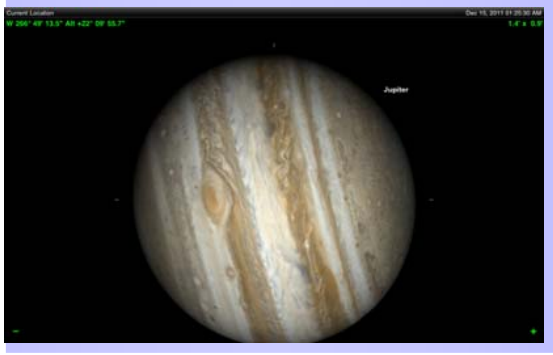
Mirach's Ghost NGC-404 a nice Elliptical Galaxy that appears to hide behind the bright star Mirach. Mag 10.25




Andromeda The Chained Maiden: Andromeda is visible from August to January in the northern hemisphere. She lies between Pisces and Cassiopeia, with her head at the upper left corner of the Great Square of Pegassus, and her feet near Perseus. The Star Sirah marks her head, Mirach marks her hips, and Almach represents her chained

### *Planet of the Month*

### *Jupiter*



Jupiter is the largest planet in our solar system, and by far the most massive. It contains over twice as much matter as all of the other planets combined. Jupiter is a very different planet from the Earth, or any of the other inner planets. It is composed mostly of liquid and gaseous hydrogen, and has not solid surface. For this reason, Jupiter is the first of the "gas giant" planets.

Jupiter has 63 known moons these range in size of 1/2 mile across to Ganymede the largest moon in our solar system so large in fact it is bigger than Mercury or Pluto. Jupiter's 4 main moons are Io, Europa, Callisto and Ganymede all four can be seen with binoculars.

Astronomy Club of Tulsa

astrotulsa.com

NASA News
JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY

PASADENA, Calif. -- NASA's Deep Space Network antenna in Goldstone, Calif. has captured new radar images of Asteroid 2005 YU55 passing close to Earth.

The asteroid safely will safely fly past our planet slightly closer than the moon's orbit on Nov. 8. The last time a space rock this large came as close to Earth was in 1976, although astronomers did not know about the flyby at the time. The next known approach of an asteroid this size will be in 2028.

The image was taken on Nov. 7 at 11:45 a.m. PST (2:45 p.m. EST/1945 UTC), when the asteroid was approximately 860,000 miles (1.38 million kilometers) away from Earth. Tracking of the aircraft carrier-sized asteroid began at Goldstone at 9:30 a.m. PDT on Nov. 4 with the 230-foot-wide (70-meter) antenna and lasted about two hours, with an additional four hours of tracking planned each day from Nov. 6 - 10.

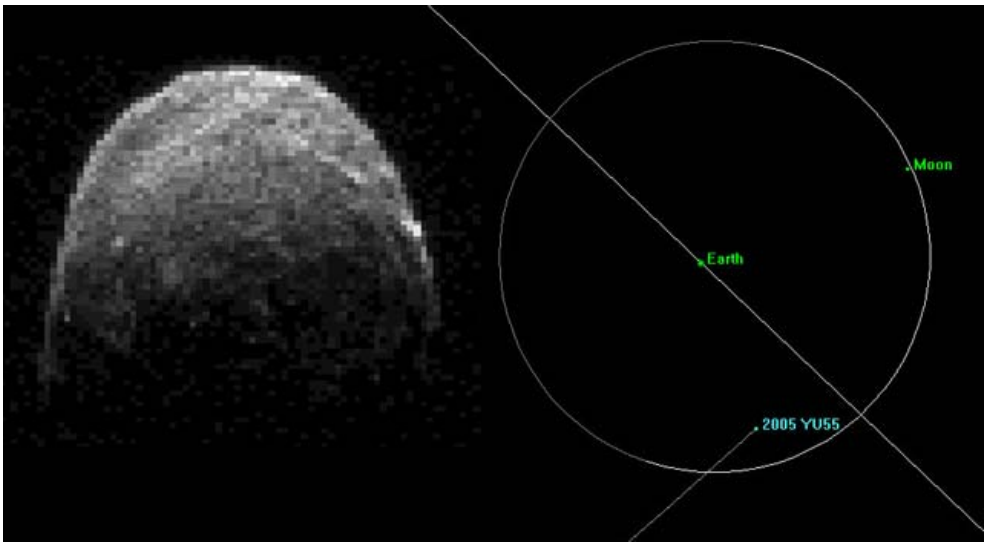
Radar observations from the Arecibo Planetary Radar Facility in Puerto Rico will begin Nov. 8, the same day the asteroid will make its closest approach to Earth at 3:28 p.m. PST (6:28 p.m. EST/1128 UTC).

The trajectory of asteroid 2005 YU55 is well understood. At the point of closest approach, it will be no closer than 201,700 miles (324,600 kilometers) as measured from the center of Earth, or about 0.85 times the distance from the moon to Earth. The gravitational influence of the asteroid will have no detectable effect on Earth, including tides and tectonic plates. Although the asteroid is in an orbit that regularly brings it to the vicinity of Earth, Venus and Mars, the 2011 encounter with Earth is the closest it has come for at least the last 200 years.

NASA detects, tracks and characterizes asteroids and comets passing close to Earth using both ground- and space-based telescopes. The Near-Earth Object Observations Program at NASA's Jet Propulsion Laboratory in Pasadena, Calif., commonly called "Spaceguard," discovers these objects, characterizes some of them, and plots their orbits to determine if any could be potentially hazardous to our planet. JPL manages the Near-Earth Object Program Office for NASA's Science Mission Directorate in Washington.

The new radar images are online at: http://www.nasa.gov/mission_pages/asteroids/multimedia/yu55-20111107.html .

For more information about asteroids and near-Earth objects, visit: http://www.jpl.nasa.gov/asteroidwatch .



NASA News
JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY

News release: 2011-337 Nov. 2, 2011

**NASA Study of Clays Suggests Watery Mars Underground**

PASADENA, Calif. -- A new NASA study suggests if life ever existed on Mars, the longest lasting habitats were most likely below the Red Planet's surface.

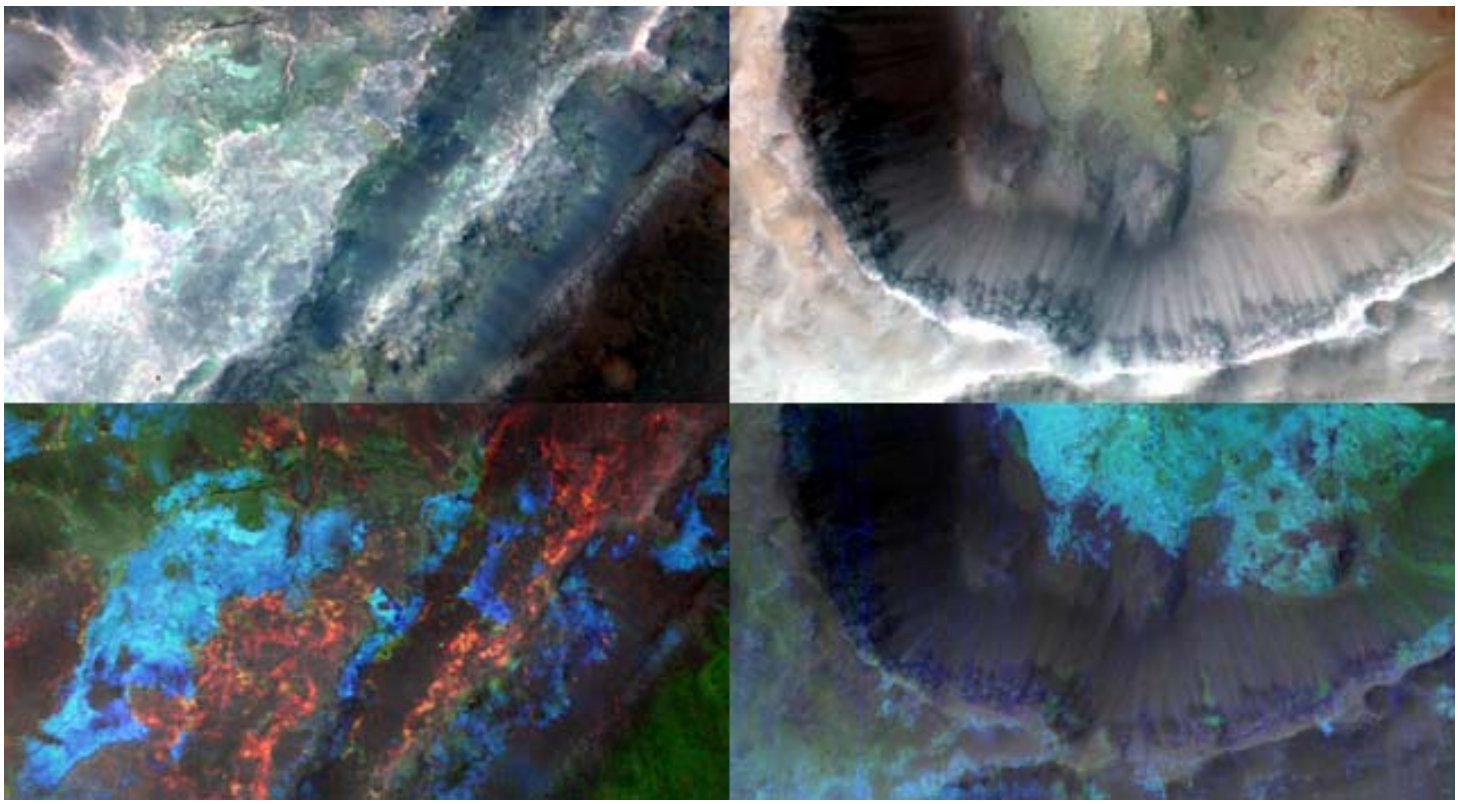
A new interpretation of years of mineral-mapping data, from more than 350 sites on Mars examined by European and NASA orbiters, suggests Martian environments with abundant liquid water on the surface existed only during short episodes. These episodes occurred toward the end of a period of hundreds of millions of years during which warm water interacted with subsurface rocks. This has implications about whether life existed on Mars and how the Martian atmosphere has changed.

"The types of clay minerals that formed in the shallow subsurface are all over Mars," said John Mustard, professor at Brown University in Providence, R.I. Mustard is a co-author of the study in the journal Nature. "The types that formed on the surface are found at very limited locations and are quite rare."

Discovery of clay minerals on Mars in 2005 indicated the planet once hosted warm, wet conditions. If those conditions existed on the surface for a long era, the planet would have needed a much thicker atmosphere than it has now to keep the water from evaporating or freezing. Researchers have sought evidence of processes that could cause a thick atmosphere to be lost over time.

This new study supports an alternative hypothesis that persistent warm water was confined to the subsurface and many erosional features were carved during brief periods when liquid water was stable at the surface.

"If surface habitats were short-term, that doesn't mean we should be



Impact cratering and erosion combine to reveal the composition of the Martian underground by exposing materials from the subsurface. Image credit: NASA/JPL-Caltech/JHUAPL

glum about prospects for life on Mars, but it says something about what type of environment we might want to look in," said the report's lead author, Bethany Ehlmann, assistant professor at the California Institute of Technology, Pasadena, and scientist at NASA's Jet Propulsion Laboratory, also in Pasadena. "The most stable Mars habitats over long durations appear to have been in the subsurface. On Earth, underground geothermal environments have active ecosystems."

The discovery of clay minerals by the OMEGA spectrometer on the European Space Agency's Mars Express orbiter added to earlier evidence of liquid Martian water. Clays form from the interaction of water with rock. Different types of clay minerals result from different types of wet conditions.

During the past five years, researchers used OMEGA and NASA's Compact Reconnaissance Imaging Spectrometer, or CRISM, instrument on the Mars Reconnaissance Orbiter to identify clay minerals at thousands of locations on Mars. Clay minerals that form where the ratio of water interacting with rock is small generally retain the same chemical elements as those found in the original volcanic rocks later altered by the water.

The study interprets this to be the case for most terrains on Mars with iron and magnesium clays. In contrast, surface environments with higher ratios of water to rock can alter rocks further. Soluble elements are carried off by water, and different aluminum-rich clays form.

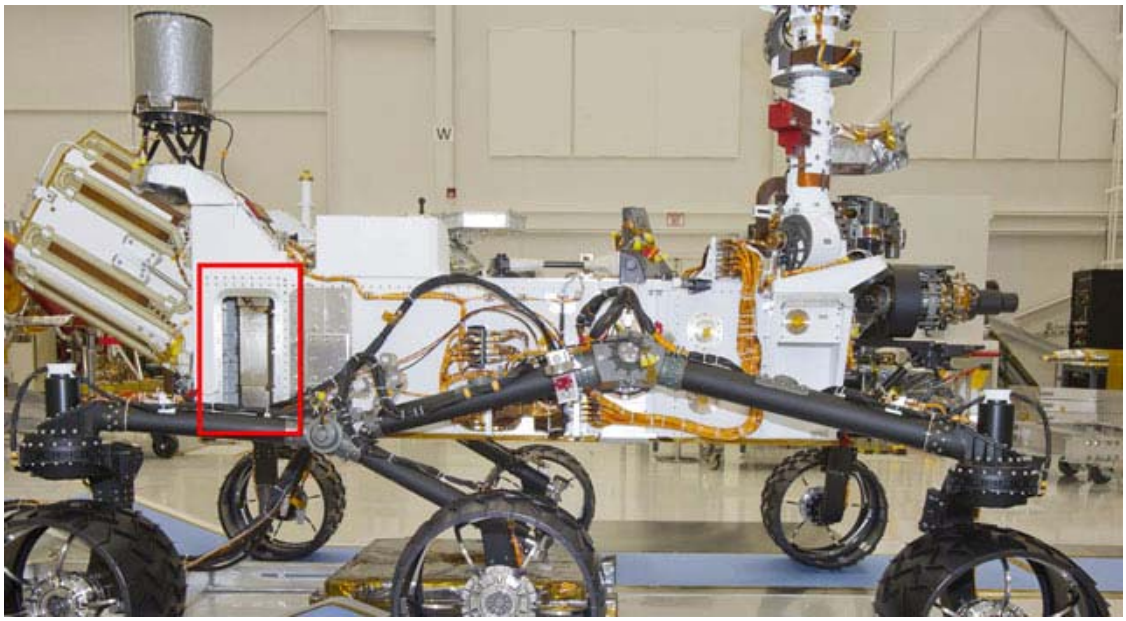
Another clue is detection of a mineral called prehnite. It forms at temperatures above about 400 degrees Fahrenheit (about 200 degrees Celsius). These temperatures are typical of underground hydrothermal environments rather than surface waters.

"Our interpretation is a shift from thinking that the warm, wet environment was mostly at the surface to thinking it was mostly in the subsurface, with limited exceptions," said Scott Murchie of Johns Hopkins University Applied Physics Laboratory in Laurel, Md., a co-author of the report and principal investigator for CRISM.

One of the exceptions may be Gale Crater, the site targeted by NASA's Mars Science Laboratory mission. Launching this year, the mission's Curiosity rover will land and investigate layers that contain clay and sulfate minerals.

NASA's Mars Atmosphere and Volatile Evolution Mission, or MAVEN, in development for a 2013 launch, may provide evidence for or against this new interpretation of the Red Planet's environmental history. The report predicts MAVEN findings consistent with the atmosphere not having been thick enough to provide warm, wet surface conditions for a prolonged period.

JPL, a division of Caltech, manages the Mars Reconnaissance Orbiter for NASA's Science Mission Directorate in Washington. APL provided and operates CRISM. For more information about the Mars Reconnaissance Orbiter, visit: http://www.nasa.gov/mro and http://mars.jpl.nasa.gov/mro .



**A Russian-built, neutron-shooting instrument on the Curiosity rover of NASA's Mars Science Laboratory mission will check for water-bearing minerals in the ground beneath the rover. Image Credit: NASA/JPL-Caltech**

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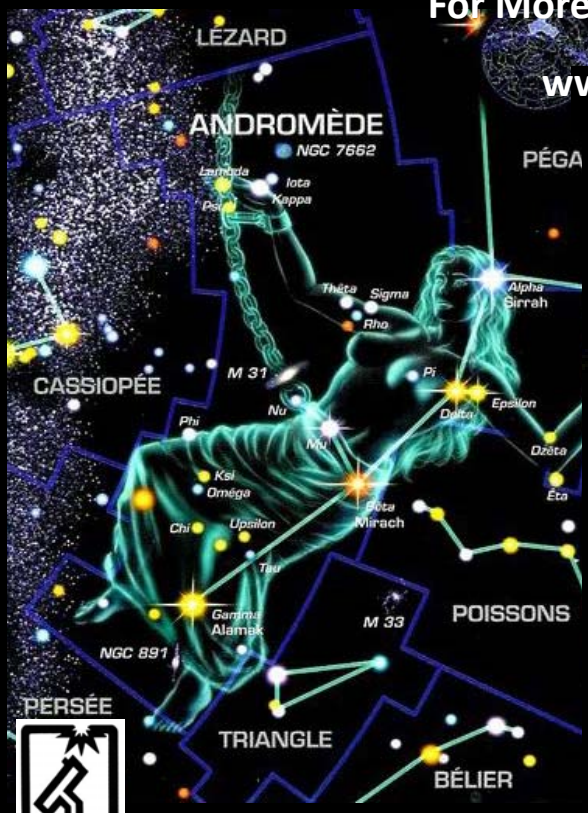


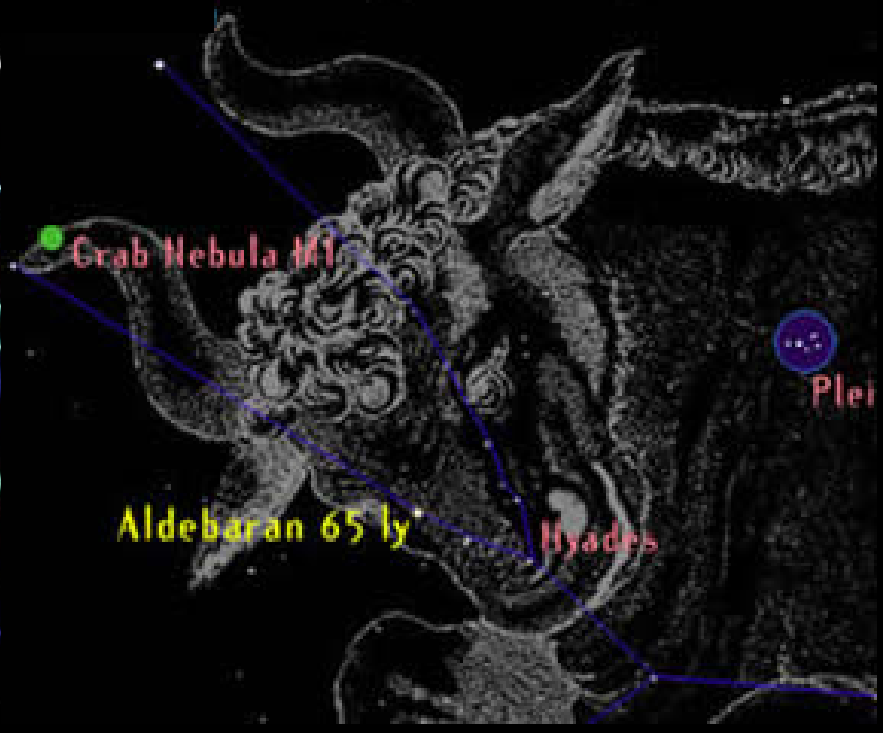

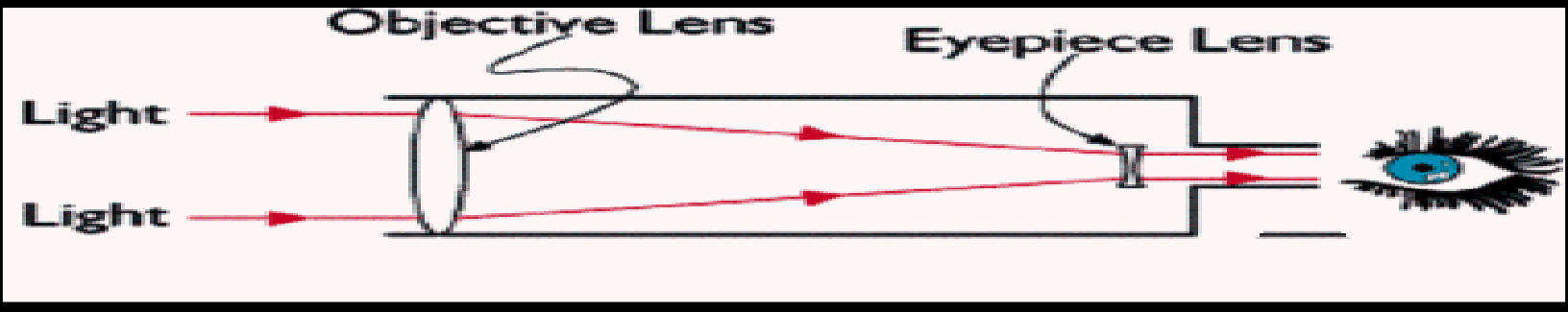


# Adventures with the Refractor

## Part II

By: Jack Eastman

**In the continuing saga of one person's attempts at the perfect telescope, I offer the following. Having gone on at length about the Newtonian in part 1, I now go to the Refractor. This story is a bit circuitous, as this telescope evolved over several incarnations, starting with a small lens, then to a Schmidt Cass, from which the mount was born, finally to the acquisition of a really fine 5-inch lens, and the fabrication of the 5-inch tube assembly. This whole process was spread over about 10 years, as opposed to the 6 or 7 months for the 12.5-inch.**

I had always wanted a refractor of some size. I still had, and have to this day, the 60mm Polarex, and a couple of other 60mm 'scopes, but they are 60mm. A real refractor is a 4" or more. As I said earlier, except for the Knotts telescope, a Newtonian, I was raised on refractors. There was the 12" Zeiss at the Griffith Observatory, and a beautiful 6" Brashear/Warner & Swasey at Mt. Wilson, which I was privileged to look through early on, and finally gained the use of on a nearly unlimited basis. There was an identical 6" at the student's observatory at UCLA. Remember, from Part 1, my driving my parents batty about a bigger telescope, I kept howling about Unitron: "Look a 4"! and on an equatorial to boot!!" Never mind the equivalent price, in today's dollars, of something like $8,000! This all passed, sort of, with the completion of the 12.5", but, still, a 4- or so inch refractor would have been nice.

I had the delusion of trying to make a lens. This seemed, at the time, out of reach. For one thing the math involved looked formidable. Maybe after I had algebra... That came and went, maybe Trig... No, how about Calculus... By the time I bit the bullet, I discovered all the high powered math wasn't needed. A little algebra maybe, and a whole lot of arithmetic. The gory details of the design process really is beyond the scope of this discussion, however, these design methods are described in Amateur Telescope Making (ATM) II, by J. R. Haviland (pp 212--) and in ATM III by Alan E. Gee, (pp 208--), Charles L. Woodside (pp 565--) and James H. Wyld, (pp 581--). Then there was the problem of glass. Mirror blanks were plentiful and cheap, optical glass wasn't. Today none of it is. Cheap, that is!

Somewhere along the line, I think I was just finishing up at UCLA, we were rooting around at the venerable old C&H Sales in Pasadena when I came across what appeared to be 4" lens blanks. Fat biconvex and deep plano-concave pressings, which if made into lenses, would have been very short, maybe f/3 or f/3.5. I don't recall if the index and dispersion numbers were on these or if we just assumed they'd be "ordinary" crown and flint. I bought a couple of sets of these things, for a quarter each, and thought seriously about making the long sought after 4" lens. Using the formulas for color correction and assuming the properties of these chunks of glass I set about to regrind the curves to make an f/15. It turned out these things weren't 4" but something less, leading to a 3.6" aperture. I thought if I make the crown equiconvex, and match the concave side of the flint, I could test the concave with the knife edge test, and match the convexes to that by interference fringes. If all looked good, I could then test the whole lens and, sup-

posedly any error remaining would be on the back of the flint, which could then be dealt with accordingly. After polishing I was somewhat gratified that the focal length seemed close to the design, and with an eyepiece the color correction was reasonably good. I tried to figure these glasses with limited success, finally noting the lens was terribly astigmatic. A test with crossed polarizers showed the dreaded colored "Maltese Cross" in the crown element, indicating a large amount of strain in the glass. Amazingly enough, this was the crown element. The flint was fine. I checked the other blanks I had, and they too were strained. That put this telescope on the back burner.

The scene now switched to my first job, right out of school, with Valor Electronics. Tom Johnson, the owner, was fooling around a new type of telescope. My first encounter with Tom was at a star party, where he showed up with an 18" Cassegrain. (See cover, Sky & Telescope, March 1963) Remember, this was the mid '60s, and aperture fever stopped at 12.5", maybe a 16 or two. This 'scope didn't perform all that well, and Tom tried some redesign and, skipping over the details, his fiddling led to serious breakthroughs in the manufacturability of the 4th order aspheric plates for the Schmidt telescope. This fooling around led to what we know today as the Celestron Schmidt Cassegrain. I helped Tom develop this system and he was able to keep me out of the army. Clearly a fair trade! One optical system we did while I was there was an 8" f/12, using a very fast f/1.6 primary. I made an extra set of optics as a backup, and when the order was delivered I was able to keep the spare set.

In the first part I talked about the machine shop education. By now my dad and I had the lathe, drill press with X-Y and rotary table and all. Also, the L.A. area is a paradise for tinkerers, as there is a major scrap metal yard seemingly on every street corner! Also, even though this was California, USA people, back then, weren't as damned "sue-happy" as they are today, so the managers of these places let us go tramping around and pick up what we needed, weigh it, pay up and go. What came of all this was the fabrication of an equatorial mount, for the 8" SC, patterned, functionally, after the Warner & Swasey at Mt. Wilson. This one was all machined from aluminum with 1.25 thick walled tubing for the shafts, threaded and set up at 90 deg to the saddle plate and bearing housings. Again, ball bearings (some lessons never get learned!) but this time there was adequate damping in the design of the clamps and the bearings could be preloaded to some extent. The drive is a 6.25" 100 tooth brass worm gear, a 16:1 reduction and a 1 RPM motor. But wait! That's 1600:1! Thanks to the slot car hobby I obtained the gears for a 20:18 gear train, and voila! 1440:1. The motor is mounted on the baseplate, the power is transmitted to the gearbox by a short shaft and universal joints. This system allows a little flexibility as the latitude is changed. The slow motions are both tangent arms, the declination being the equivalent of a 691:1 gear reduction, the RA being 534:1. the Declination is clamped to the bearing housing, the R.A to the hub of the drive gear. This way, using the RA slow motion doesn't affect the drive rate, and therefore the RA circle carried on the gear doesn't get out of time. Since the lead screws on the tangent arms straight and the motion is along the arc of a circle, the screw mounts and the nuts they engage must be able to swivel to avoid jamming. The worm on the main gear is spring loaded to eliminate backlash, and allow for any "out-of-round" of the main gear. I was complemented on this design at one of the star parties and it was strongly suggested I get this patented. I said I really can't. I stole this entire concept from an 1880's vintage Warner & Swasey mount! The ball bearings are retained by threaded rings in the axes, which can be tightened to provide preload to the bearings. The cover over the lower polar axis bearing is also a 3.5 -inch hour angle circle. Since the shafts and housings are both aluminum, there is no trouble with temperature changing this preload. This equatorial head is supported by a stout old transit tripod. The telescope this mount was built for was the 8" SC for which I subsequently completed the tube assembly. The details of this telescope will be told later.

While at Valor I remembered my failed 3.6" lens and asked our glass supplier if he had any suggestions. He said to bring the lens and maybe his place could reanneal it or something. When I got the lens back, it looked OK, but when I put it together the performance really stunk. Close examination showed a sort of "fire polished" appearance on one side. It needed to be reground. As I

refine-ground the bad surface it ground in an hour-glass pattern. After this I again reassembled it and took a look. The astigmatism was much worse. Rats! I needed to re-grind the other side as well. When the glass was reannealed it sprung into a potato-chip shape. After all this consternation I finally got the lens to a reasonable condition, but it never did work very well. A Clark or Zeiss this is not! This telescope is now serving as a guide telescope on a 4" astrograph made from one of the old f/6 Aero Tessars. This camera, with the 60mm Polarex as a guide 'scope, is pictured on the cover of the Griffith Observer for Feb. 1961.

It seems I have strayed, digressed and wandered from the purpose of this article, my 5" refractor, the one in the accompanying photo. Believe it or not all the previous baloney is leading up to this 5".

Some years go by, I switched jobs to Fairchild Space and Defense Systems in El Segundo, where I was being taught lens design. I was called in by them to fill an optician's position, but I wasn't that interested at the time. The person I went to see said to see "Dick" on the way out. "Dick" was Dick Heimer, the director of optical design. "Do you know anything about optical design?" "A little-- telescope objective.. (the 3.6)" "Do you know anything about computers?" "No-- Besides I'm not all that good at math" "Get your butt in here Monday-- You'll learn" So, for the next 2.5 years I learned optical design. After that (FS&DS was closed, all the managers went back to Long Island, the rest of 'em went to Hughes) I fulfilled my prime directive-- get out of LA. I found myself here in Colorado.

I still wanted a "big" refractor. Maybe I should try again with better glass. I was older, presumably wiser (?) and it would be interesting to go through the whole process, hopefully now knowing a little more about what I was doing. I had approached a very good friend in Tucson, asking if he knew where one could obtain blanks for a refractor objective. Given the choice, I decided to go for a 5", thinking that 4s are nice, but fairly common, while a 6 would be a monster, based on the experiences with the Mt. Wilson 'scope. Lynn said he'd sniff around and see what he could find. Tucson probably has more optical companies and telescope makers (really big telescopes) per acre than anywhere else on the planet. I had begun to calculate the curves for a 5" f/15 using Conrady's G-sum method described in Alan Gee's chapter in ATM III. Somewhat arduous but the curves supposedly lead to a lens corrected for secondary color, third order spherical and coma. This method is an algebraic technique, assumes thin lens approximations, and leads to a good starting point which should be "tweaked" by rigorous ray trace techniques. Here is where practicality steps in. One can tweak and tweak and tweak, but the moment of truth comes while producing those carefully calculated curves. As the lens progresses it will need to be tested and figured until all traces of aberration are gone. It is far less torturous to use the initial curves from Gee, and then polish until the lens looks good. Saves a whole lot of wear and tear on the calculator, (and the brain) besides the indices of the glass might not be exactly as given and the thicknesses and radii of the surfaces might be a little off, requiring even more "tweaking". Making a lens is quite different than a mirror. The mirror needs only one surface (good) but it must be paraboloidal, not spherical, and must be made roughly four times more accurately as the lens surface. (The error on the wavefront for reflection is twice the surface error, while for refraction it is roughly half the surface error.) The lens needs four surfaces, but these are spheres and usually with fairly steep radii on three of them so the figure is relatively easy to control. The back surface is generally of a long radius, nearly flat in some cases, and is a bit more of a problem. One usually figures this back surface last when finishing up the lens. Attention needs paid to wedge, the parallelism of the two sides of the lens element. This HAS to be carefully controlled. Element thicknesses are not all that critical. in fact these parameters are ignored in the G-sum calculation, as is the airspace. Once the lens is close to completion, one can vary the airspace slightly to try and improve the correction, or to "tweak" the color correction, then control the remaining spherical by a tad more polishing.

A large box appears on my doorstep from Tucson. Lynn's return address on it and "Fragile, Glass" written all over it. What-?? Then I remembered asking him some months earlier about telescope glass. I opened the box, dug through a zillion wads of paper and all and got to the first piece of glass. I unwrapped it and

wow! a pristine, beautiful lens element! It was even AR coated, edged to 5" diameter and seemed to have a fairly long focal length, around 800mm or so. My initial figuring showed the crown element should have a focal length around 770mm or so. Mixed emotions!

I'd feel terrible grinding into this lens, but then again, hopefully, it'd be a nice lens after the surgery. Maybe I could leave this one alone and match the flint to it, using other glass tools to shape it. Further digging produced a weakly negative lens element (the flint) equally as pretty as the crown. Suddenly it hit me. There is some guy out there expecting the delivery of a lens and is highly disgruntled at receiving a couple of blanks! I called Lynn and told him I had what appeared to be a finished lens and that he'd goofed. When the customer for the lens called to give him hell, he can explain the mix-up, and in the mean time I'll get this in the return mail. Lynn said "no, no goof. You wanted a 5" crown and flint, that's what you got" "But this is a finished lens!" "So what, one crown, one flint..." 'but..." "Don't know if its any good or not. I found it in our scrap glass locker. I apologize as I don't know which flint it is, F2 or F4. The crown is BK7 for sure. Enjoy..." I took the elements outside and measured the combined focal length. 1800mm! Just what I was planning to make. Wow! No grinding, no G-sum process, but was this thing any good? Scrap glass? I taped them to the end of a long cardboard tube and looked at Jupiter and a few stars. It was good. Very good.

I obtained a 5" diameter 5 foot long aluminum tube and some other odds and ends from which to make the lens cell and rack and pinion focuser. The 5-inch tube was cut off at 90 degrees at both ends and a counter cell machined to fit on the end. I tested the lens by autocollimation, and determined the last couple of millimeters of its diameter showed some error, so the clear aperture was made to be 122mm. I had a 5-inch thin ring, threaded on the outside, so I threaded the back of the lens cell to match this ring. I cut a shallow groove in the countercell as clearance and when the lens is mounted on the tube, this groove prevents any possibility of the cell ring coming loose and the lens elements falling out. The lens cell is attached by three sets of push-pull screws to allow for collimation. The focuser has a brass tube 2.8" in diameter with a 7" travel and a 2.5 inch holder diameter. I hate refractor focusers with small travel! Once I got these components put together the balance point was only about a quarter of the way down the tube. It worked but looked sort of silly. This thing needed weight at the bottom end. I solved this by mounting my 60mm Polarex as a guide telescope, which served a useful purpose and placed the balance near the middle of the tube. Later I added a Unitron 10X40 finder, purchased from a friend, and a couple of sliding weights on the tube to rebalance for different eyepieces and accessories. The tube is fastened to a piece of 3" channel with stainless steel hose clamps. The channel is bolted to the saddle plate on the mount's Declination axis

Mount? You may have guessed. The 8" SC mount talked about earlier was used for the refractor by rotating the Dec. axis 180 degrees, to bring the slow motion knob closer to the eye end. The mount could then be used for either 'scope quite easily. With the design of this mount, with the refractor on it really looked like a telescope! A freak accident led to the loss of the 8" SC (a story in itself) after which the mount was dedicated to the 5" I added extension rods and a flex cable to the clamps and slow motions so they could be operated easily from the eyepiece.

Paul Thayer, a long time member of DAS handed me a big eyepiece one night at a Chamberlin star party. He said "this thing is a pig! If you think you can use it, it's yours" It was a 63mm Plossl, war surplus, probably the one described in MIL-STD 141, Optical Design. I tried it on my 12.5, and it didn't work well at all. Much too low a power, exit pupil too big and so on. But what about at f/15. More optical certified duct tape, and I tried it on the 5" Worked nicely! 28X, 1.8 degree field. Nice. I asked Paul if he really couldn't use it on his 4" f/10 refractor. He said "no. It's a pig" so I machined up an adapter for it. One night, New moon, I was in the middle of Nevada with this setup and was poking through the Southern Milky way. Dark nebulae, little star clusters, black sky and subtle contrasts, needle sharp images all the way across the 1.8 degrees! This made a believer out of me and popped the myth that an f/15 can't be a richest

field telescope! With other, more normal eyepieces this telescope is superb for double stars and the planets, especially when the seeing is marginal and the 12.5 would need to be stopped down. With a Herschel wedge and #10 welders filter the Sun can be spectacular with all the fine detail in sunspots and spot groups as well as the granular appearance of the photosphere. This telescope is primarily used on the Sun, Moon, planets and double stars, but is a capable richest field with the 63mm eyepiece. It has fulfilled the desire for a really nice refractor. It saw first light about 1973, and has been used continuously ever since. A medium sized refractor is a real pleasure to use, and a 5" seems just the right size, balancing performance and portability.

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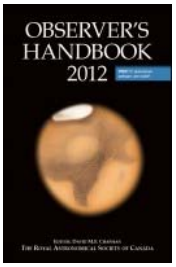
# 2012 Astronomy Publications

The Mayan's may have run out of time on their calendar in 2012, but Astronomers are eagerly awaiting many awesome events. Some 2012 highlights include a sunset Solar Eclipse May 20, June 4 partial Lunar eclipse at sunrise, June 5 – Long awaited Solar Transit of Venus


2012 Astronomy Wall Calendars for only $ 10 Twelve months of Deep Sky photos packed with information on astronomical happenings for the year. Our supply will go fast so bring exact change or a check to the meeting. Sneak Preview at http://lib.store.yahoo.net/lib/yhst-22106725251441/68165spread.pdf

2012 Canadian Observers Handbook - $ 24 prepaid orders only. Something new for 2012. Included will be a CD with all the catalogues from the observing handbook and an observing program. http://www.rasc.ca/handbook/ Send payment to John Land by Nov 18 address is on the website under Join.




**Digital Astronomy publications** – Both Astronomy and Sky & Telescope magazines have digital subscriptions available for computer, IPad or smart phones. If you already subscribe to their print versions through the club discount, go to their websites to see how to add a digital version to your subscription. Our you may chose an all digital subscription.

Club rates for print versions are $ 33 Sky & Telescope $ 34 Astronomy.

The club also received a promotion notice from by Sky & Telescope Magazine.

For renewing or starting a subscription by December 9 at the club member rate of $ 33.

You will receive a Mars DVD - - 2012 Sky Starter Pack with Almanac.

Messier and Caldwell cards - - Let's Go Star Gazing booklet - - Sky & Tel Decal.

# ASTRONOMY CLUB OF TULSA – MINUTES - BOARD MEETING SAT NOV 5,

The meeting was held at the Broken Arrow Library, 300 W. Broadway, Broken Arrow, OK.

President Ann Bruun called the meeting to order at 10:15 AM.

Tamara read the mintues from the last board meeting, which was on September 10, 2011.

**Action Item No. 1 – Alternate Dark Sky Site**

There was discussion about finding a dark sky site for the membership, with pros, cons, cost, maintenance, convenience for members, terrain, darkness of sky, etc. being brought into consideration and about forming a committee to investigate possibilities. Ann would like for a committee to bring forth 3 possible sites for consideration. Tony suggested 5. Tom suggested a deadline of June 1. Ann made a proposal to form the committee. ***Tony made motion to allow a committee to form to look into possible dark sky sites and offer chairmanship to Brad Young. Catherine seconded, all in favor, motion carried.***

**From the Treasurer:**

John had to leave at 11, so he went over the Club papework for the officers to sign. ***John made a motion to approve the changes to the signers on Wells fargo account to include Ann Bruun, , President, Lowell A. White, Vice President, and John Land , Treasurer. Bill seconded. All in favor, motion carried.***

There was also discussion about the Nov 11 dinner. Ann suggested just buying bagged salad and dressings to add to the meal. John said that 57 people signed up for the dinner, 64 seats have been reserved. There was also a suggestion about name tags.

***John made motion to invite Ron and Maura Wood to be lifetime members, Tony seconded. All in favor, motion carried.***

**Action Item No. 2 – Observatory Opening and Closing Procedures for All Star Parties**

After discussion about offering keys to our new members after walking them through the opening and closing procedures, Chris said that he will write up the procedures. He also has a new AT&T key and it works.

**Action Item No. 3 – Logistics During Public Star Parties**

Chris needs about 5 people to efficiently run a public star party. He has spoken to the lady who is in charge of student community service at Cascia Hall and Chris can get students to take money, walk the grounds, and do whatever else needs to be done. This gives the kids their community service hours as well as helping us. Catherine said her high-school aged daughter and her classmates could possibly help as well. Chris needs one member to relieve him on the telescope. Tamara volunteered. Chris' dome shows are typically 6 objects and take about 30 minutes. ***The board decided to allow Chris to have Cascia Hall students assist with logistics.*** Also, there will be a scope class for officers.

On the subject of our 75th Anniversary, Chris suggested for our public events that we trailer-mount the old 16 inch telescope, attach a CCD camera and laptop, and we can transport the telescope and use it at public events. ***Chris asked for board's approval to move forward with it. After more discussion, the board decided to allow him to do this.***

**Action Item No. 4 – Sidewalk Astronomy and TASM Events**

***After discussion about events at TASM and Bass Pro, the board decided to continue to do both, and to have sign up sheets for members to commit to public outreach events***. Chris also does not feel we should charge ACCREDITED schools to come to our public events, as that falls under the outreach and education part of what we do. Catherine will bring sign up sheets for our public events to the dinner on Nov. 11.

**Action Item No. 5 – ACT 2012 Events Calendar**

We went over the 2012 calendar. The Messier Marathon is on March 24. Ann had a list of suggestions from John about some of the dates, which she shared with the board. Easter is on April 8, so we could move the ACT TCC meeting to March 30. November 16 was suggested for the 2012 dinner meeting. Another item on that list was either moving the date for the December meeting, but after discussion among the board, it was decided that we just skip the meeting due to its close proximity to the holidays.

There was no other business, so Ann adjourned the meeting at 12:05 PM.

## CLUB OFFICERS

| | | |
|---|---|---|
| President | Ann Bruun | 918-231-0301 |
| Vice-President | Tony White | 918-258-1221 |
| Treasurer | John Land | 918-357-1759 |
| Secretary | Tamara Green | 918-581-1213 |

## APPOINTED STAFF

| | | |
|---|---|---|
| Newsletter Editor | Jerry Mullennix | |
| Facility Manager | Chris Proctor | 918-810-6210 |
| Membership Chair | John Land | 918-357-1759 |
| Observing Chair | Chris Proctor | 918-810-6210 |
| Group Director | Tamara Green | 918-581-1213 |
| Webmaster | Jennifer Jones | |
| Night Sky Network | Teresa Davis | 918-637-1477 |

## BOARD MEMBERS AT LARGE

| | |
|---|---|
| Stan Davis | 918-294-3196 |
| Teresa Davis | 918-637-1477 |
| Tim Davis | |
| Bill Goswick | 918-742-6146 |
| Catherine Kahbi | 918-230-8480 |
| Tom McDonough | 918-851-2653 |

## 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 re-print 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:**

**"Say what you want, but as I approach the speed of light it means I have to get up and go to work."**

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