



THE OBSERVER



The Astronomy Club of Tulsa's Newsletter Published Since 1937

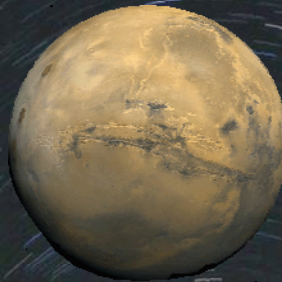
RON WOOD

ANN BRUUN

JOHN LAND

BRAD YOUNG

MIKE HOTKA

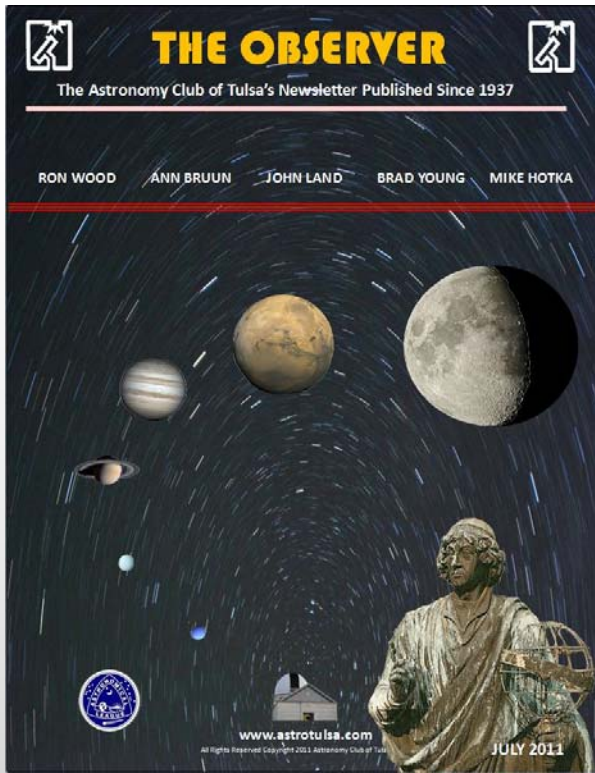


www.astrotulsa.com

All Rights Reserved Copyright 2011 Astronomy Club of Tulsa

JULY 2011

THE COVER



Many of you have heard Steve Chapman and I have been venturing to Hula lake for astronomy. I would like to invite anyone wanting to go try a much darker site with us next weekend as we head back up. The drive is about 20 minutes further than the observatory from downtown Tulsa. I will have more info and some pictures next month. The cover is a 15 minute exposure of Polaris I took from Hula Lake a couple of weeks ago.

FORECAST:

HOT HOT AND MORE

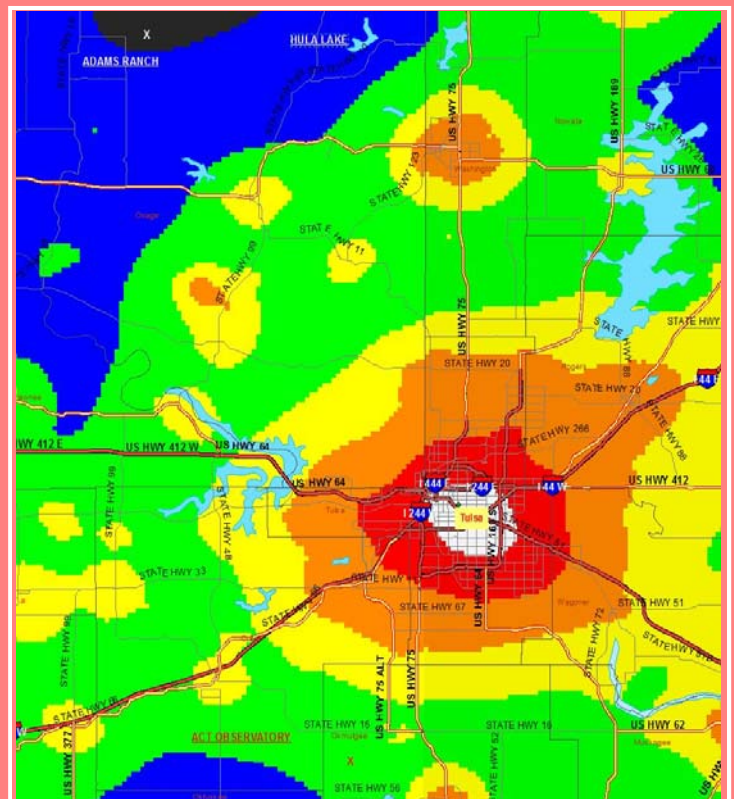
HOT. There does not

seem to be any relief this

year but if you have not gone out for astronomy I strongly encourage you to give it a try.

As long as there is a breeze and there usually is on top of the hill then it is not that bad.

Look forward to seeing you.



Dark Sky Meter Map. If you do not know how to read these or want to understand the colors please visit the clear sky clock website.

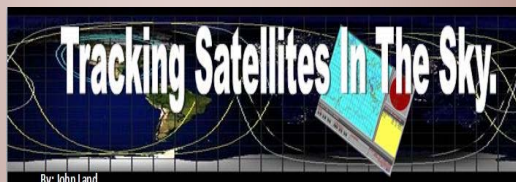
JULY FEATURES



What Am I Going To Observe Tonight?

By: Brad Young and Mike Hotka

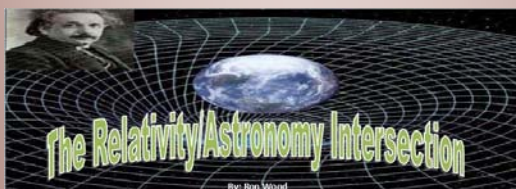
Page 4



Tracking Satellites in the Sky.

By: John Land

Page 8



The Relativity/Astronomy Intersection

By: Ron Wood

Page 10



Finding Scutum

By: Ann Brunn

Page 13

CONTENTS

3	<i>Events</i>	
4	<i>What Am I Going To Observe Tonight?</i>	<i>Brad Young and Mike Hotka</i>
7	<i>Vesta Fiesta</i>	
8	<i>Tracking Satellites In the Sky</i>	<i>John Land</i>
10	<i>The Relativity/Astronomy Intersection.</i>	<i>Ron Wood</i>
13	<i>Finding Scutum</i>	<i>Ann Brunn</i>
14	<i>TASM Re-Cap</i>	<i>Images By Tamara Green</i>
17	<i>Actomart</i>	
20	<i>NASA News</i>	<i>Space Science</i>
21	<i>Hula Lake Pictures</i>	<i>Jerry Mullennix</i>
22	<i>The Toy Box</i>	



Garrett Optical® stocks over 50 astronomy binoculars from six different manufacturers, and we're based right here in south Tulsa.

Visit our websites
www.GarrettOptical.com
www.AstronomyBinoculars.com
for more information!

EVENTS

EVENT	PROGRAM	WHERE	DATE	TIME
Monthly Star Party	July Star Party	ACT Observatory	7-29-2011	8:30 PM
Vesta Fiesta	Vesta Watch	Tulsa Air and Space Museum	8-6-2011	5 to 10 PM
Side Walk Astronomy	Public Observing	River Walk Crossing	8-13-2011	8:00 PM
August Star Party	Monthly Star Party	ACT Observatory	8-19-2011	8:00 PM
August Star Party	Members Night	ACT Observatory	8-26-2011	8:00 PM

Next month we will announce our first speaker for the September 6, group meeting. We are changing the location of the meetings and will have all of the info and maps in the August Issue.

AUGUST 2011

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6 <i>Vesta Fiesta 1/4 Moon</i>
7	8	9 <i>Ask John Land a Question Day</i>	10	11	12	13 <i>River Walk-Full Moon</i>
14	15	16	17	18	19 <i>Public Star Party</i>	20
21 <i>Last Quarter Moon</i>	22	23	24 <i>Jim O'toole Miller Sings to Moon</i>	25	26 <i>Members Star Party</i>	27
28 <i>NEWMOON</i>	29	30	31			

What Am I Going To Observe Tonight?

By: Brad Young and Mike Hotka

Introduction

The article below will appear in the next issue of Reflector – the quarterly publication of the Astronomical League. All members of the Astronomy Club of Tulsa (except students at discount rate) are in the AL and are eligible for the Observing Clubs mentioned. Non-members of ACT can still receive the magazine and qualify for the Observing Awards if they are a Member-at-Large of the AL. Check out <http://astroleague.org/observing>

Our Observing Chairperson is Ann Bruun. Ann and several other members of ACT have AL observing awards, and if you have any questions about the observing programs, ask one of us and I'll bet we can help.

A few other notes – Mike did all the work. I just helped with the editing and questionnaires. Mike is a member of the Longmont (Colorado) Astronomical Society and a very active observer.

The AL is always looking for new ideas for observing clubs. My wife, Harriet, has suggested a "Club Hopper's Club" where observers visit other clubs and share ideas and observing

time. We can easily start on that by attending the Messier Marathon at TUVA, going to the Bartlesville club, Okie-Tex Star Party, or visiting a local club while travelling on vacation.

Have you ever asked yourself the question, what am I going to observe tonight? Even worse, did you ask yourself this question after you have your scope setup and evening twilight is ending?

If you are working towards an Astronomical League observing club certificate, you will have the answer to this question. There are currently 111 Astronomical League members, active and past, who have completed 10 or more Observing Clubs to receive the Master Observer Observing Club certificate. Ten current Astronomical League members have received 20 or more Observing Club certificates, three of those with 30 or more certificates. The top Observing Club certificate holder has 36 Observing Club certificates to his name.

Why should you complete more Observing Clubs? Here is how the top 10 certificate holders answered a questionnaire sent to each.

When asked: What motivates you to start and complete so many Observ-

ing Clubs?, Brad Young (Astronomy Club of Tulsa) said "the structure of the clubs allows me to plan, set goals, and feel accomplishment when I am finished." Robert Pitt, (Birmingham Astronomical Society) likes "the challenge of the club requirements which gives direction to my limited viewing opportunities." Mike Ramirez (Northeast Florida Astronomical Society) said "by starting with an Observing Club plan and setting goals to achieve that plan, I was able to keep going and complete the Observing Club". Doug Brown (Minnesota Astronomical Society) indicates that "it's a good structured way to observe. For me, if I don't have a plan for observing, I tend to gab too much instead of observing". "There's never an evening sunset when I don't know what I'll be hunting down that coming night" said Scott Krantz (Astronomical Society of Kansas City).

For Mike Hotka (Longmont Astronomical Society), the motivation for completing so many Observing Clubs is "I like the hunt. Finding objects and actually seeing them." For Aaron Clevenson (North Houston Astronomy Club), "I want to see it all! The problem is there are

thousands and thousands of things to see. Where do I begin? The Observing Club lists obviously.” John Goar (Olympic Astronomical Society) said “There is something exciting about hunting down a list of related objects”. “Without the Observing Clubs I would be stuck in the mode of observing the same things over and over again”, said Young. For Krantz, “The Observing Clubs keeps me looking at new and off-the-beaten-track objects.”

When the top 10 certificate holders were asked: What Observing Club did you like the best?, Brown likes the Messier Observing Club the best. For Young, he liked the Earth Orbiting Satellite Observing Club, while Hotka liked the Lunar II Club. “I had no idea you could see all kinds of subtle features on the lunar surface if the Sun angle was low enough. Shadows reveal a ton of lunar detail.”. Clevenson’s favorite Observing Club was the Planetary Observer’s club. Ted Forte (Back Bay Amateur Astronomers) liked “the Herschel 400 the best. The main reason is this club was best suited to my usual observing style. I liked the varied types of objects represented and the broad range of difficulty embodied in the objects”. Pitt likes all the Observing Clubs he has completed, while Ramirez liked “two, one personal and one for the teacher in me. First the personal club was Lunar I Club

because I love to gaze back into time as to how Earth and other planets were formed. The second, which encompasses the first, is the Outreach Club, for I love sharing the lunar features with people and to see in their faces the awe that I see every time I look into the eyepiece”. Krantz liked the Globular Cluster club the best. For Goar, “the Comet Observers Club was my favorite”. Jim Ketchum’s (Astronomical Society of Kansas City) “favorite was the Globular Cluster Club. It was relaxing, enjoyable and I’m partial to Globular Clusters”.

Most of these ten observers all started out by receiving their Messier Certificate first. Since then, they have kept on going. And by completing more and more Observing Clubs, these people have become seasoned observers. Each Observing Club has something to teach you, whether you are more enlightened about the subject/objects or you learn new observing techniques to aid in your observing efforts.

When asked: What Club taught you the most? Hotka said “the Open Cluster Observing Club. It taught me to make sure I have what I need in the field to find and observe faint objects. If I know I will be looking for faint objects, I will make sure I have a picture of the star field or other references to help me find the faint fuzzy I am looking for”.

The Sunspotter Program taught Krantz “the most about the observing subject. I learned to categorize sunspots and sunspot groups. I learned that there was a lot more to see on the Sun than just random dark spots.” As was the case for Clevenson. He indicated “although I know many things about many objects, I really found that I knew rather little about the Sun and its surface”. Forte too liked “the Sunspotter Club, without a doubt. I found myself rather well versed in the particulars of the other clubs that I have done. Still, I was no stranger to the Sun either, for I had been casually observing the Sun for years. Doing the Sunspotter Club, however, opened up new questions for me and I became more interested in the mechanics of sunspots and the solar cycle. It made me a much bigger fan of our star.” “The Earth Orbiting Satellite Observing Club, although the Dark Nebula Club was a very close second” said Young as he “had ignored both before the clubs were announced.” Ketchum liked “both the Lunar and the Lunar II for they taught me so much about our closest neighbor. There is such a rich array of craters, mountains and plains that you can readily see and appreciate”. Goar was able to “honed my star-hopping skills the most by completing the Herschel 400 Club. But just about every club taught me a unique skill, which I think is the

most valuable thing about completing these programs.” “The Messier Club primarily because it was my first attempt to learn how to use charts and star hopping techniques. It taught [Ramirez] to become proficient in navigating the night sky.” According to Pitt “both the Planetary Observer’s and Open Cluster Observing Clubs taught me the most about those objects. I liked the observing guides for these clubs and the descriptions of the characteristics to be documented. I appreciated the variety of these objects much more after gaining a better understanding of the classical descriptors applied to these objects and learning what features to look for when comparing different examples.”

Next, the top 10 were asked: What new techniques were learned while completing so many Clubs? “Doing these clubs has made [Forte] a much more disciplined note taker and has encouraged me to sketch objects much more than I ever had before.” Goar has “learned the sky well. I am able to star-hop with ease wherever I want to go.” As is the case for Ramirez who “learned how to use charts and star hopping techniques. I have become proficient in navigating the night sky”. Ketchum “learned how to read star maps, whether hard copies or on a computer screen, to be able to pinpoint the exact location of some of the really hard objects to see. I

learned how to coax an object out of the dark sky by using Averted Vision techniques. Both take lots of practice, but pay huge dividends”. For Hotka, “just being prepared for my observing session and making sure I have all the tools and references I need in the field to help me find faint objects.” Clevenson has “perfected the techniques of finding faint fuzzies. And although I am no artist, I sketch everything. If you are not sketching, then you are missing much detail.” “I have become more proficient at star hopping, averted vision, sketching, eyepiece / filter selection, planning, and the tracking and predictions required for satellites” said Young, but “most of all, I just have more confidence that I can see things that I might otherwise think too difficult.” For Brown, it was “learning how to use equipment to its best advantage”. Pitt learned that “patience and planning are the most important techniques that I have learned, along with dealing with frustrations. Most objects will come around again next year if you miss them this year. Many of my observing skills, including patience, were dramatically improved with the experience gained from the different clubs.” Krantz learned some valuable techniques he summarized as follows: “While hunting down faint and elusive objects, I learned scope tapping to get some movement in the field of view.

Move your eye around the desired object to find your averted vision *sweet spot*. Use an eye patch on your non-observing eye and keep that eye open. Keep breathing! Without thinking about it, many times you’ll hold your breath trying to find something. Use a detailed image or digitized sky survey image in conjunction with a chart. Never give up! If you can’t see it tonight, try again tomorrow night.”

The Astronomical League has many great Observing Clubs for you to complete. All the information about these Clubs is on the League’s website. By looking at all the choices and picking those Clubs that you are interested in, you too will be on your way to becoming a Master Observer, and beyond.

Tulsa Air and Space
Museum & Planetarium
presents

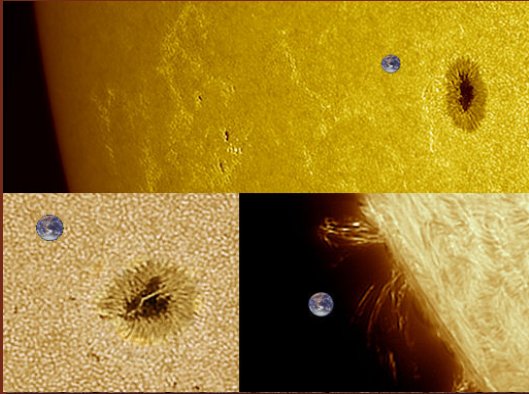
Vesta Fiesta

Enjoy an evening of fun and entertainment on
August 6, 2011, from 5:00 PM to 10:00 PM

After four years cruising at stunning speeds, the robotic spacecraft, Dawn, has entered the atmosphere of the asteroid, Vesta. Celebrate Dawn's year-long orbit of the asteroid with exciting planetarium shows, scientists, and telescope viewing!

- Bill Nye the Science Guy!
- Doc Gizmo from the Science Theatre with OUT OF THIS WORLD science experiments at the planetarium!
- Local asteroid expert, Bryan Sidlinger, with a REAL piece of the asteroid Vesta!
- LIVE feed from NASA on the planetarium dome as Dawn orbits Vesta and LIVE presentations by Dawn team members from NASA's Jet Propulsion Laboratory discussing the mission!
- Interactive dome-show with COOL Colleen on asteroids and the asteroid belt!
- Travel through our Solar System toward deep space during full-dome show "Infinity Express"!
- Venture outside after dusk for a rare view of space through advanced telescopes on the lawn!

EVENT ADMISSION TICKETS



SUNSPOT EARTH

Here is a nice shot of the Sun (By John Land) with the Earth superimposed near a sunspot giving us a relative size comparison. NICE WORK JOHN.

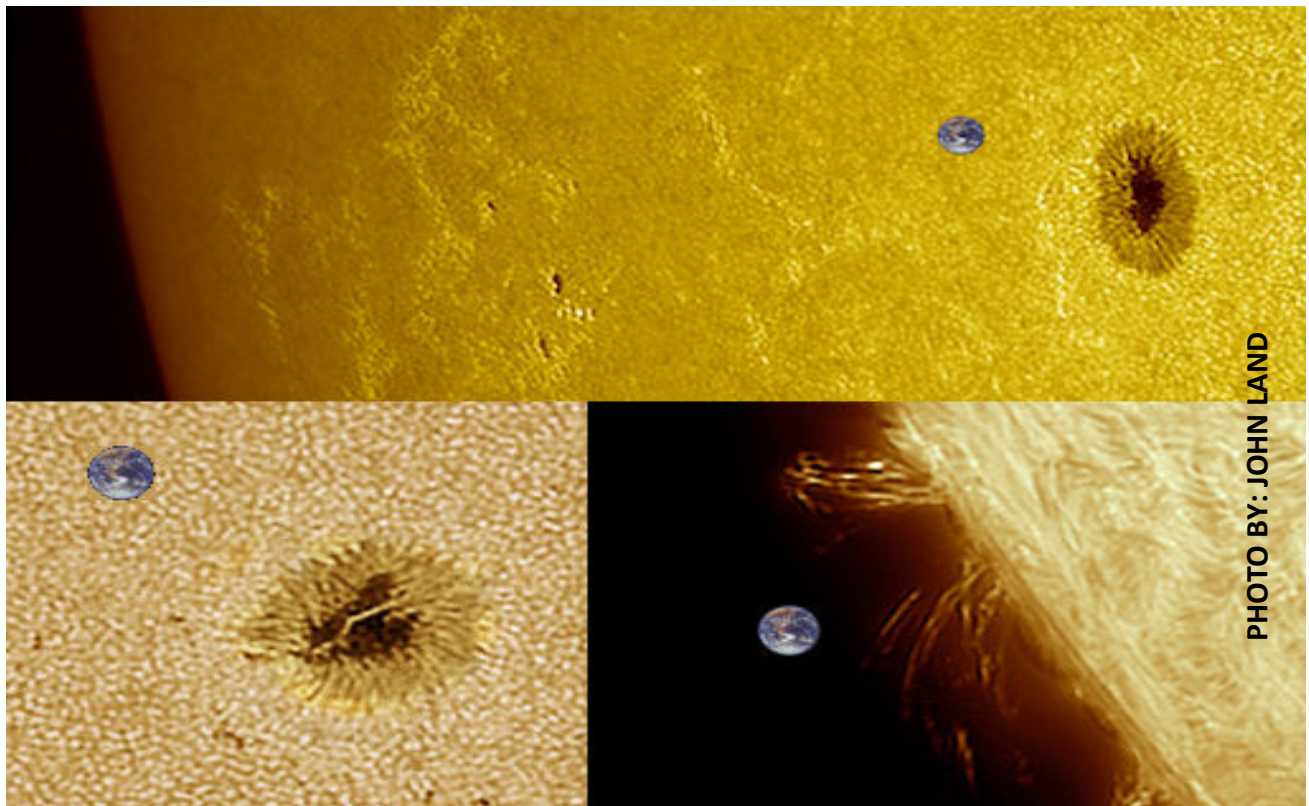


PHOTO BY: JOHN LAND

Tracking Satellites In The Sky.

By: John Land

Summer time is a great time to look for satellites passing overhead. One of my earliest adventures in astronomy was watching a communications satellite called Echo 1. President Eisenhower used this a giant 10 story tall Mylar balloon to bounce signals across the Atlantic from France to Washington DC. http://en.wikipedia.org/wiki/Project_Echo More recently I went out before dawn to watch the last flight of the Space Shuttle Endeavour and the International Space station fly in tandem across the sky.

Satellites appear as star like objects silently moving through the background of stars. They are best seen a few hours after Dusk or before Dawn. We see them because they orbit high above the earth and are still illuminated by sunlight. In the summer the sun is up longer at northern latitudes allowing you to see satellites almost until midnight. The majority of the satellites are in polar orbit moving either N to S or S to N. Some of the brighter and more interesting satellites - such as the International Space Station ISS or Hubble Space telescope HST - travel from West to East. As you watch they will fade out about halfway across the sky when they pass into Earth's shadow. Satellites in low orbit move more quickly across the sky than those in higher orbits.

There are several websites that give predictions of satellites visible in your area. There are also Apps avail-

able for Iphone, Ipad and Android phones. In fact these apps have become so popular that the host sites have had to add extra servers to handle the data flow.

It's important to specify your observing location as closely as possible to get the best predictions. Some sites allow you to enter your zip code or to select your town from a list. In urban areas zip code will be more specific than just your town. The Globe At Night project has a tool to specifically locate your Latitude and Longitude coordinates. Type in your address and it will locate you on a Google map. <http://www.globeatnight.org/webapp/>

Then use the Satellite view option to see an aerial view of your location. Zoom in on your location. To move the red tag to a specific location in your yard, Right click on the red tag - Move your cursor to the desired location and Left click. This will give your coordinates within a few feet. Of course a GPS or smart phone will give you similar information.

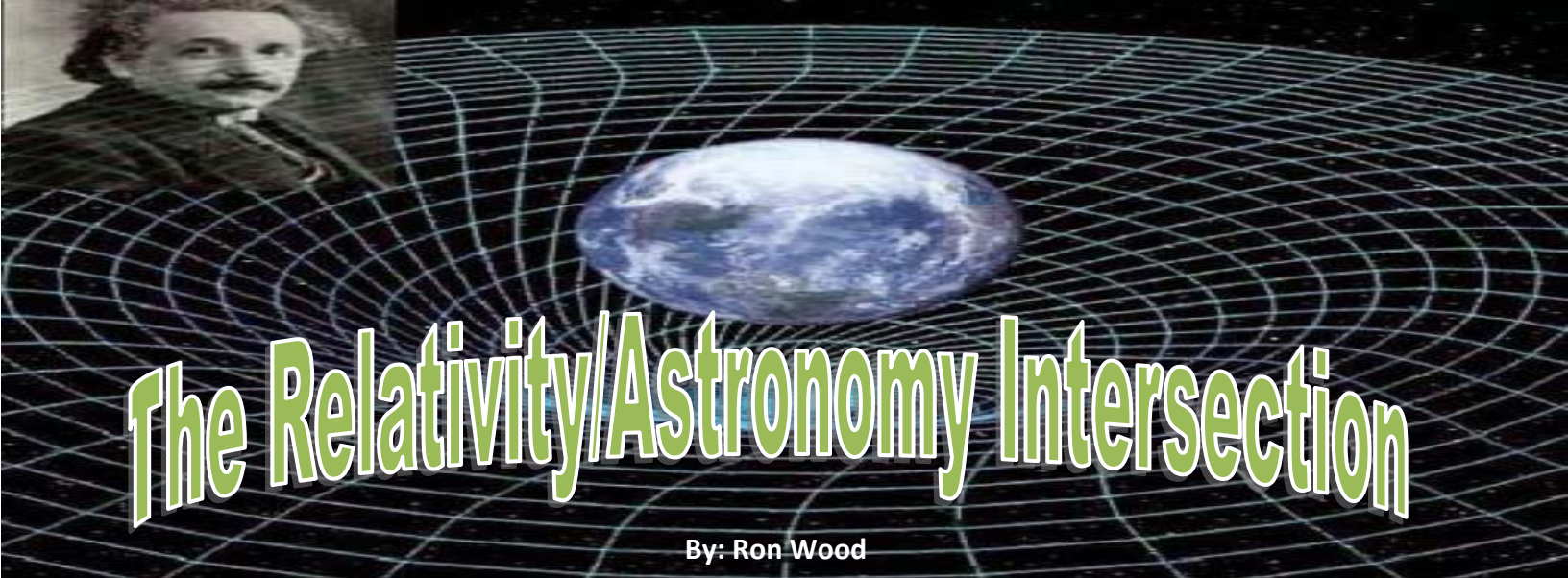
The website SpaceWeather.com runs a simple Satellite Flybys site which gives info on a few bright satellites. Check the [Simple Satellite Tracker](#) or on [your cell phone](#)

The site www.Heavens-Above.com (Note the - Hyphen in its name) gives much more through information for many satellites as well as other astronomical objects. It also allows you to set up an

optional login account so you don't have to put in location data every time. You can set up multiple observing locations such as home or the observing site. To better understand the rest of this article, you may want to open the site as you read further to see how it works.

When you open the website the data shown is for Zero Latitude and Longitude. To find your location chose one of the options. Select from Database is the easiest - Just click on U for United States - Type in the name of your town (without State) and it will give you several choices. The *neighbors* option gives several smaller towns nearby. But the best option is to enter your specific coordinates or set up a login account.

Once you have selected your location you have several selections to choose from. I usually look at the satellites (brightest) [3.5](#) option which shows all the brighter satellites visible from town. This number refers to the satellites MAGNITUDE [Mag](#) which is a numerical measurement of an object's brightness. The brightest stars are 0 or 1st magnitude. The stars in the Big Dipper are 2nd magnitude The larger the number the dimmer the object. A negative sign in front the object says it is brighter than the stars. For example magnitude - 4.4 is as bright as Venus.



The Relativity/Astronomy Intersection

By: Ron Wood

Introduction

The fascination people have with the Theory of Relativity seems out of proportion to the very limited role it plays in our daily lives. Relativistic considerations play a vital role in the design and operation of particle accelerators and the global positioning system, but in our daily slow motion world Newton's second law ($F=MA$) is the tool of choice, not Einstein's more precise relativistic equations of motion, which are mathematically tedious. But in the field of astronomy there are numerous points of intersection with the theory of relativity. Einstein himself, when he published the General Theory in 1915, proposed three tests for it, all in the field of astronomy. With the powerful technologies of today, many relativistic effects are routinely observed. So I will sketch the relativistic concepts which come into play in astronomy and then discuss several of the more interesting examples.

The Concepts of Relativity

In 1905 Einstein published the Special Theory of Relativity. In it he postulated that the speed of light is

constant regardless of the relative motion of the source and the observer. This means that if an observer stands between two sources moving at, say, half the speed of light, one source approaching and the other receding, the observer will measure exactly the same speed for the light from both sources. This was most unexpected. It challenged the foundation of physics and has implications that confound common sense.

Three logical consequences of the invariance of the speed of light are that measurements by an external observer on a moving system will show that: (1) lengths contract along the direction of motion. (2) time slows down. (3) mass increases. This applies only to a system in uniform un-accelerated motion with respect to the external observer.

It is important to note that a second observer stationed within the moving system will not see any of these changes. Measurements of mass length and time made by him are called "proper" or "rest" mass, "proper" length and "proper" time. Ten years later, in 1915, Einstein published The General Theory which discarded the concept of

gravity as a force and extended the theory to include systems undergoing acceleration.

Just as the invariance of the speed of light held the key to special relativity, another brilliant insight called the Principle of Equivalence held the key to General Relativity. Einstein postulated that there is no distinction between gravity and acceleration. In other words there is no experiment which can be performed by a scientist in a windowless laboratory which will reveal whether he is sitting at rest in a gravitational field or accelerating upward in deep space. In either case dropped objects appear to accelerate towards the floor. Projectiles trace parabolic arcs.

And, finally, in General Relativity, clocks run more slowly in a gravitational field which gives rise to the phenomenon called gravitational redshifting. This means that a light source in a gravitational field will be redshifted when viewed by a distant observer outside the field. The more intense the field the greater the effect.

Conversely an observer in a strong gravitational field will see a distant source outside the field to be

blueshifted. This effect is distinct from doppler shifting, which involves relative motion between source and observer. Gravitational red-shifting may be viewed as a loss of energy by the photons as they rise out of a gravitational potential well.

With General Relativity space and time have become intertwined in a four dimensional fabric which is stretched and bent by the masses contained within it. Gravity is identified with the curvature of the four-dimensional spacetime fabric. In the words of John Archibald Wheeler: "Matter tells space how to curve. Space tells matter how to move."

The following are five examples of observations which illustrate the relativistic phenomena discussed above:

The Perihelion Precession of Mercury

The first test of Relativity proposed by Einstein addressed this longstanding problem in astronomy. In 1859 Urbain Le Verrier analyzed data from many past transits of Mercury and determined that the value predicted from Newton's laws for the rate of precession was incorrect by 43 arcseconds per century. Let's stop for a second to appreciate this calculation. Forty-three arcseconds is the angular diameter of Jupiter!

Many attempts were made to account for this discrepancy, thus the long search for the planet Vulcan thought to be perturbing Mercury's orbit. Nothing worked until 1915 when Einstein showed that General Relativity gave the correct value. This was the first success for

General Relativity and a major factor in its adoption.

This precession is explained by the intense solar gravitation mediated by the curvature of spacetime. The other planets experience such perihelion shifts as well, but they are smaller and harder to observe. For example, the perihelion shift of Earth's orbit due to spacetime curvature is about 5 arcseconds per century.

In situations involving intense gravitational fields and large accelerations the effect is much greater. A "double pulsar" discovered in 2003, PSR J0737-3039, has a periastron precession of 16.90 degrees per year. This system has afforded four independent, very precise, and successful tests of relativity.

The Eddington Experiment

The second test of General Relativity was proposed by George Ellery Hale at Einstein's request. The result was the Eddington eclipse expedition of 1919 to the island of Principe off the west African coast. The idea was simple: to photograph the star field surrounding the eclipse and compare the star positions with those in previous photos without the sun present. The sun happened to be in the Hyades at the time which afforded several targets near the solar limb.

Einstein's prediction was that starlight passing near the sun would be deflected, and the new positions would appear slightly displaced away from the sun. Newtonian physics predicted a deflection, but only half as much as predicted by relativity. The measured deflection was extremely small, amounting to

an angular displacement of only 1.75 arcseconds.

Though Eddington's data had no better than 20% accuracy and may have been somewhat oversold, it created a media sensation and the story was carried by major papers around the world. And even though the Hipparchos satellite has now confirmed Eddington's result to an accuracy of .7%, the internet is rife with crackpots railing at Eddington's "fraud."

When asked by his assistant what If Relativity had not been confirmed by Eddington, Einstein famously made the remark: "Then I would feel sorry for the dear Lord. The theory is correct anyway." In recent years this same phenomenon of light bent by gravity has been exploited in observations of gravitational lensing used to study very distant galaxies.

Gravitational Redshift

Einstein's third prediction was that a light source in a gravitational field will appear reddened to a distant observer outside the field. This is a relativistic effect induced by the gravitational field; there is no relative motion involved. If the observer and the source trade places the observer will see the light blueshifted to shorter wavelengths.

Photons lose energy and are redshifted as they climb out of a potential well, and blueshifted as they fall into a more intense gravitational field. The effect is very small but it increases with the strength of the field. Gravitational redshifting was first observed in a Harvard laboratory by Rebka and Pound in 1962. In a remarkably sensitive experiment, a microwave re-

ceiver was placed only 72 feet above a transmitter; the redshift due to the weaker gravitational field at the receiver was detected!

The Global Positioning System must compensate for this effect. To achieve 10 meter accuracy in the GPS system, signal travel times must be measured to an accuracy of 30 nanoseconds which requires gravitational redshift corrections of 30,000 nanoseconds per day. The value of the redshift for the sun is 1.23×10^{-6} . That is to say the wavelength of a spectral line is lengthened by a little more than a millionth of its value. Very massive objects such as neutron stars show large redshifts. In the case of a black hole the redshifted wavelength approaches infinity as the light source approaches the event horizon.

Time Dilation

A classic experiment by B. Rossi and D. Hall performed in 1941 involved mu mesons and the relativistic time dilation phenomenon. Large numbers of mu mesons are produced by the collision of cosmic rays with atoms in the atmosphere at a height of about 10 km. The mesons are very high energy, moving at .998% the speed of light. At rest they have a proper lifetime of only 2.22×10^{-6} seconds. So, moving at this speed and with this lifetime, they can travel only 658 meters before they decay, yet large numbers of them are detected at sea level 10 km below. This apparent paradox is explained on the basis of relativity. It must be kept in mind that the proper lifetime is the lifetime measured by an observer at rest relative to the meson, but in this situation the meson is moving at a

speed of .998c relative to the observer at sea level. Due to relativistic time dilation the observer at sea level will see the meson living 16 times it's proper lifetime which is long enough for it to cover the 10 km and be detected at sea level.

Seen now from the meson's point of view the 10 km distance to sea level is length contracted so that it is shorter than the 658 meters which is the meson's range in it's own reference frame so that, again, detection at sea level is possible. This experiment clearly shows that time dilation can be a very significant effect for clocks that are in high speed relative motion. Notice that the reality of detection at sea level is supported in the case of the observer by time dilation and in the case of the meson by length contraction.

Gravitational waves

General Relativity predicts that an accelerated mass will produce gravity waves which radiate outward through spacetime at the speed of light. These waves are so weak that Einstein had doubts that they would ever be detected. With the rapid development of technology there is now little doubt that it will happen sooner rather than later. The best place to look for them is near a strongly accelerated massive object such as a neutron star or a supermassive black hole. In 2003 Marta Burgay at Australia's Parkes Observatory discovered the only known binary millisecond pulsar PSB J0737-3039. The orbital period of 2.4 hours for this system is the shortest known for such an object which enables the most precise tests yet of General Relativity. Theory predicts a certain rate of

energy loss for the system due to gravitational waves. Very precise observations reveal that the actual rate of energy loss is in excellent agreement with that predicted. This is indirect evidence of gravitational waves. The two components will coalesce in about 85 million years. The upgraded LIGO gravitational wave detector is scheduled to go online in 2014. It consists of two large facilities, one in Louisiana and one in Washington state, which will work in tandem attempting to detect these waves for the first time. And, speaking of precise observations, it will be necessary to make certain distance measurements equal to one-thousandth the diameter of a proton! The population may be asked to hold it's collective breath.

Such as the precession of Mercury's perihelion, Eddington's observation of the 1919 solar eclipse confirming the General Theory of Relativity and the observation of time dilation associated with cosmic rays by Rossi and Hall in 1941 Eddington experiment conducted in 1919 which is now regarded as the first confirmation of the general theory of relativity.

Finding Scutum

By: Ann Brunn

The summer triangle is a familiar sight to most amateur astronomers. Vega is first on the scene followed shortly by Deneb at the back of the swan. Finally Altair rises to complete the triangle of bright stars. Lyra, Vega's home constellation has a very recognizable shape, it looks like a hockey stick to me and I can pick it out fairly easily. Cygnus, the swan, is also no trouble to pick out and always looks lovely flying along the Milky Way. Altair's constellation, Aquila, is always a bit more elusive for me and since I use Aquila to find Scutum I have had to become more familiar with this star pattern. Aquila is an eagle with Altair at the head or beak. If you follow a line down to Delta the wings spread out on either side. Continuing on down you come to three stars that form a distinct curve at the tail of the Eagle. These stars are Lambda and Iota Aquilae, and Eta Scuti. Follow the direction of the curve a little further and you run into M11, the Wild Duck cluster, one of the

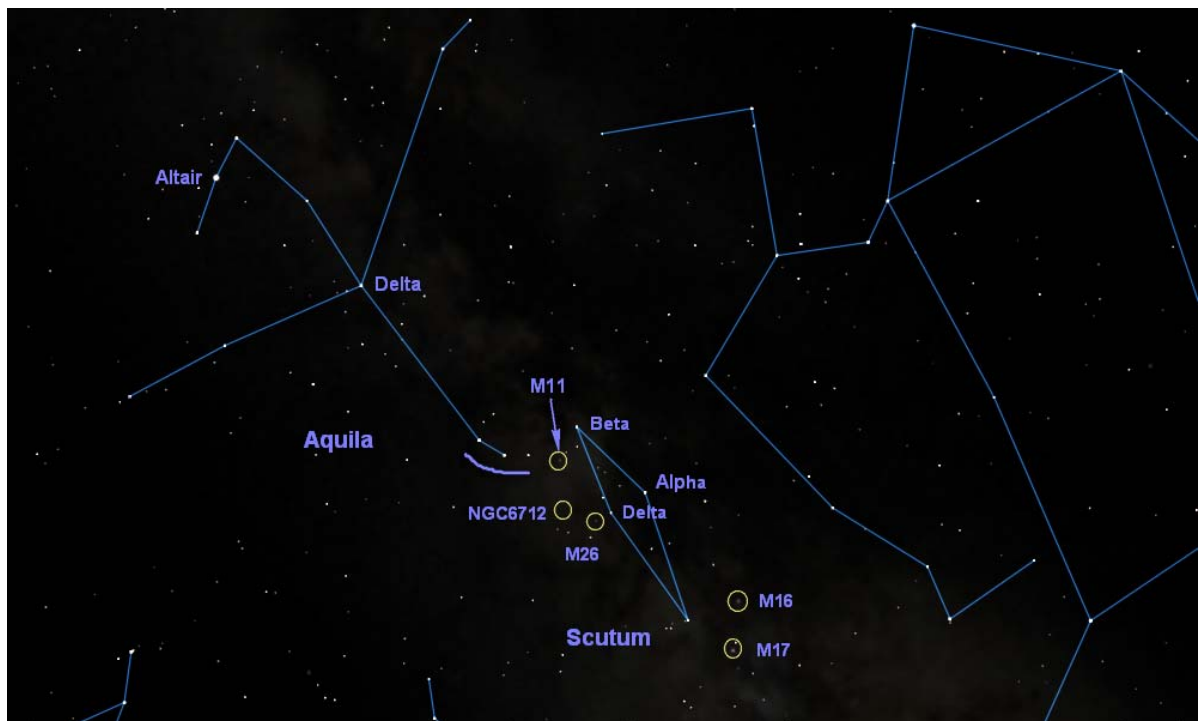
nicest open clusters in the sky and our first reason for seeking Scutum.

The constellation Scutum represents a shield and can be drawn many different ways depending on the star chart you are using. I prefer connecting the stars to form a very thin diamond using Beta, Alpha, Gamma, Delta and back to Beta. For me using this pattern makes it easier to find the marvelous sights located around Scutum. If you follow the line from Alpha across to Delta a bit further in the same direction you will find M26, another very nice open cluster. For a challenge you can try NGC6712, a very spread out globular cluster with a hazy patch at the center. It forms one point of an equilateral triangle with Beta and Alpha Scuti.

Our final two targets are not actually in the Scutum constellation but the Shield points the way. By following

the directions of the bottom point of the diamond another $2\ 1/2^\circ$ you will find M17 a wonderful, very noticeable nebula. This is the Swan nebula and is also called the Omega nebula. Whatever you call it, this nebula is a very unusual and interesting object. Moving up from M17 $2\ 1/2^\circ$ you run into M16, the Eagle nebula. It is not as noticeable as M17 and looks more like an open cluster with nebulosity when observed visually.

This whole section of the sky around and beneath Scutum is packed with sights; open clusters, nebulas and globular clusters. Using the Shield as your home base you are bound to discover many more gems as you explore this area. Good hunting!



ACT and TASM Join Forces to Bring the Moon to Tulsa.



TULSA MOON

No its not a new country song. Here are some pictures submitted by Tamara Green. Thanks Tamara

TASM
TULSA AIR AND SPACE MUSEUM & PLANETARIUM
lewis@tulsamuseum.org

Tulsa Air and Space Museum & Planetarium
3624 N. 74th East Ave.
Tulsa, OK 74115
Contact: Leshi Lewis, Planetarium Manager
(918) 834-9900 x 401

TULSA AIR AND SPACE MUSEUM & PLANETARIUM BRINGS THE MOON TO TULSA!

Tulsa Air and Space Museum & Planetarium proudly presents, "Moon Over Tulsa", on Saturday, July 9th at 7:00 p.m. in the James E. Bertelsmeyer Planetarium. Please join us for an evening full of fun with a live presentation in the planetarium, full-dome show "Two Small Pieces of Glass", and a rare look at the first-quarter moon through advanced telescopes. Come see our new upgraded planetarium projector system and new shows.

At "Moon Over Tulsa", planetarium staff will present a view of the moon in an up close and personal presentation. The live show will take you on a journey straight to the surface of the moon where you will learn about the life of the moon, its orbit around Earth, and NASA's history with the moon. This will be an interactive experience where questions and answers are welcome.

Following the live presentation, you will enjoy the full-dome feature "Two Small Pieces of Glass". Produced to engage and appeal to audiences of all ages, this show traces the history of the telescope from Galileo's modifications to a child's spyglass to the launch of NASA's Hubble Space Telescope and the future of Astronomy.

Finally, after the audience has learned more about the moon and the history of the telescope, they will venture outside for a rare look at the first quarter moon through telescopes provided by TASM volunteers and the local community. One telescope includes a 13" Dobsonian Reflector, which brings the moon so close to the human eye that viewers can actually see craters, mountains and valleys on the moon's surface!

Admission to the event is \$12. A \$2 coupon is available on local community calendars and when you check-in at TASM through Facebook.

For more information, contact the Tulsa Air and Space Museum & Planetarium at (918) 834-9900 or visit www.TulsaAirAndSpaceMuseum.org

Tulsa Air and Space Museum & Planetarium is located at 3624 N. 74th East Ave., across from the Tulsa Zoo/Mohawk Park entrance.



MOON OVER TULSA



Night Sky Star Stencil™

- **Night Sky Star Stencil™** transforms the ceiling of your darkened room into a dramatic replica of the real night sky while leaving the lighted room unchanged (no posters or noticeable markings).
- **Dazzling and romantic.** Guaranteed bedtime fun for everyone.
- **Soothing and relaxing.** Finally a simple cure for fear of the dark. The peaceful comfort of a starry night inspires a feeling of "connectedness" with the universe. Enhance your sense of peace with our new tape, Night Sounds™ (see below).
- **Accurate and educational!** Stars and constellations are in proper positions with accurate relative brightness. You also get a hand-held Star Map and Constellation Finder that shows the names and locations of hundred of stars--an entire hemisphere! In addition, the star map is an excellent take-along item anytime you're star gazing outdoors.
- **Easy!** You simply affix the stencil to the ceiling or wall--the adhesive won't stain or remove paint or wallpaper--and paint the stencil holes with the special glow-in-the-dark paint. Then you remove the stencil. Works on both smooth and textured ceilings!
- When you're ready for the stars to shine, expose them to normal room light. Turn out the lights, and the stars glow and keep glowing for up to 30 minutes. They can be recharged indefinitely and are unnoticeable in lighted rooms or on light-colored surfaces. The 8-foot stencil takes one hour to apply; the 12-foot takes two hours. **The stencil can be saved and reused.**
- **It's all here!** Your kit contains everything you need. The Night Sky Star Stencil (either 8- or 12-feet in diameter), adhesive, a special formula luminous paint, brush, and easy-to-follow instructions.



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

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

 **GARRETT OPTICAL**
PERFORMANCE SPORT OPTICS
 **AstronomyBinoculars.com**



Garrett Optical® stocks over 50 astronomy binoculars from six different manufacturers, and we're based right here in south Tulsa.

Visit our websites
www.GarrettOptical.com
www.AstronomyBinoculars.com
for more information!



ACTOMART

BUY SELL TRADE

ACTOMART is 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.



Hello! I attended one of your star nights at the observatory in the Fall and thought you all might be a good starting point. My husband and I have a Celestron NexStar 8 SE Telescope, along with many accessories and Eyepieces that we are wanting to sell. I just thought if anybody had any interest at all, it might be you all or your members. We have owned everything for about a year and we have used it about 3 times. Anyone can contact me if there is any interest. My contact information: Heather Thomas [918-269-6801](tel:918-269-6801) hdt12@mac.com Thank you, Heather Thomas

ACTOMART
BUY SELL TRADE



Garrett® Gemini 15x70 LW Binocular



10% off the Gemini 15x70 LW Binocular - Just use coupon code "ACT" during online checkout on AstronomyBinoculars.com. Orders must be placed online to qualify.

Garrett® Gemini 15x70 LW Binocular



› Gemini 15x70 LW Binocular



Garrett® Gemini 15x70 LW Binocular





STAR PARTIES WITH THE ASTRONOMY CLUB OF TULSA



SUMMER STAR PARTIES IN TULSA ARE ONE OF A KIND.

MAKE PLANS TO JOIN US THIS YEAR AND BRING THE WHOLE FAMILY.





July 26, 2011

at Kennedy Space Center

Ariz.

NASA Sets Launch Coverage Events for Mission to Jupiter

- Vernon Thorp, program manager, NASA Missions United Launch Alliance, Denver

A news conference will be held at the Kennedy News Center approximately 2.5 hours after launch, and a news release will be issued as soon as Juno's condition is determined. Spokespersons will be available for interviews.

The full version of this story with accompanying images is at:

- Jan Chodas, Juno project manager Jet Propulsion Laboratory, Pasadena, Calif.

http://www.jpl.nasa.gov/news/news.cfm?release=2011-227&cid=release_2011-227

- Tim Gasparini, Juno program manager Lockheed Martin Space Systems, Denver

NASA Television Coverage On Aug. 3, NASA Television's Media and Education Channels will carry the Juno prelaunch news conference live beginning at 1 p.m. EDT (10 a.m. PDT).

CAPE CANAVERAL, Fla. -- NASA's Juno spacecraft is set to launch toward Jupiter aboard a United Launch Alliance Atlas V rocket on Aug. 5. The launch window extends from 11:34 a.m. to 12:33 p.m. EDT (8:34 to 9:33 a.m. PDT), and the launch period extends through Aug. 26.

- Clay Flinn, Atlas V launch weather officer 45th Weather Squadron, Cape Canaveral Air Force Station, Fla.

On Aug. 5, NASA Television coverage of the launch will begin at 9 a.m. EDT (6 a.m. PDT) and conclude after spacecraft separation from the Atlas V occurs approximately 53 minutes and 49 seconds after launch.

The spacecraft is expected to arrive at Jupiter in 2016, on a mission to investigate the gas giant's origins, structure, atmosphere and magnetosphere. Juno's color camera will provide close-up images of Jupiter, including the first detailed views of the planets' poles.

A Juno mission science briefing will follow the prelaunch news conference. Participants are:

- Scott Bolton, Juno principal investigator Southwest Research Institute, San Antonio

For NASA Television downlink information, schedule information and streaming video, visit: <http://www.nasa.gov/ntv>.

- Toby Owen, Juno co-investigator University of Hawaii

Audio only of the prelaunch news conference and the launch coverage will be carried on 321-867-1220/1240/1260/7135. On launch day, mission audio of launch countdown activities, without NASA TV commentary, will be carried on [321-867-7135](http://www.nasa.gov/ntv) starting at 7 a.m. EDT (4 a.m. PDT). Launch audio also will be available on local amateur VHF radio frequency 146.940 MHz heard within Brevard County.

NASA will host a prelaunch news conference in the News Center at the agency's Kennedy Space Center in Florida on Wednesday, Aug. 3, at 1 p.m. EDT (10 a.m. PDT). Conference participants are:

- Jack Connerney, Juno instrument lead NASA's Goddard Space Flight Center, Greenbelt, Md.

- Andy Ingersol, Juno co-investigator California Institute of Technology, Pasadena

- Fran Bagenal, Juno co-investigator University of Colorado, Boulder

Candy Hansen, Juno co-investigator Planetary Science Institute, Tucson,

- Colleen Hartman, assistant associate administrator, Science Mission Directorate NASA Headquarters, Washington

- Omar Baez, NASA launch director

coverage online, visit: <http://www.nasa.gov>.

coverage will be streamed live, with a chat available, at <http://www.ustream.tv/nasaapl2>

the Kennedy Space Center in Florida. JPL is a division of the California Institute of Technology in Pasadena.

A prelaunch webcast will be streamed at noon EDT (9 a.m. PDT) on Aug. 4. Live countdown coverage through NASA's Launch Blog begins at 9 a.m. EDT (6 a.m. PDT) on Aug. 5. Coverage features live updates as countdown milestones occur, as well as streaming video clips highlighting launch preparations and lift-off. For questions about countdown coverage, contact Jeanne Ryba at [321-867-7824](tel:321-867-7824).

The NASA News Twitter feed will be updated throughout the launch countdown at <http://www.twitter.com/nasa>.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. The Juno mission is part of the New Frontiers 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

To view the webcast and the blog or to learn more about the Juno mission, visit: <http://www.nasa.gov/juno>

The news conferences and launch



Hula Lake Area

Photo By: Jerry Mullennix



4th Fireworks and Moon—Downtown Tulsa

Photo By: Jerry Mullennix



Hula Lake Area

Photo By: Jerry Mullennix

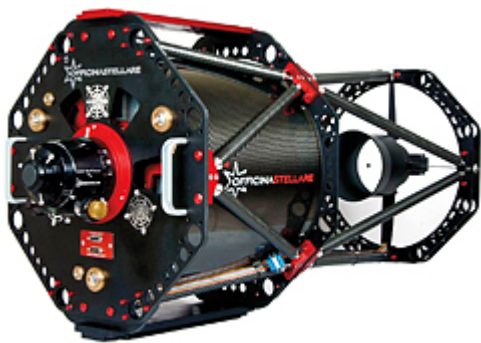


Hula Lake Area

Photo By: Jerry Mullennix

THE TOY BOX

Here are a few new items that look very interesting. I have not spoken with anyone who has tried any of these but would welcome any review on new astronomy gear. This is not an endorsement of any of these items and the information provided is from the respective companies website.



Officina Stellare
Via S. Sebastiano 27, 36016 Thiene VI, Italy
officinastellare.com

Officina Stellare's full line of Ritchey-Chrétien telescopes is now available to U.S. customers. Its new series of Pro RCs (Ritchey-Chrétien astrographs) offers three levels of options, allowing you to customize the telescope at the time of purchase. Each Pro RC features your choice of primary and secondary mirrors made with regular or low-expansion optical glass and protected aluminum coatings. A carbon-fiber truss-tube assembly with three fans behind the primary mirror aids in temperature regulation of the optics. A built-in two-element field flattener guarantees pinpoint stars across the field of today's largest CCD cameras. Base models include two Losmandy-style removable dovetail mounting plates. Additional accessories are available at the time of order; see the website for details and a list of dealers. I'm sure these babies are priced to move.

CLUB OFFICERS

President	Owen Green	918-851-8171
Vice-President	Teresa Davis	918-637-1477
Treasurer	John Land	918-357-1759
Secretary	Tamara Green	918-581-1213

BOARD MEMBERS AT LARGE

Bill Goswick	
Allen Martin	918-407-9706
Tim Davis	
Chris Proctor	918-810-6210

APPOINTED STAFF

Newsletter Editor	Jerry Mullennix	
Facility Manager	Chris Proctor	918-810-6210
Membership Chair	John Land	918-357-1759
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:

"Think like the Owl—Seeing at night is all that's important"

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

Night Sky Network

Astronomy Clubs bringing the wonders of the universe to the public



Astronomy Club of Tulsa

