



# Roanoke Valley Astronomical Society

Amateur Astronomy News and Views  
In Southwestern Virginia



Volume 28—Number 9

September 2011

## Will the Higgs Boson be a No-Show?

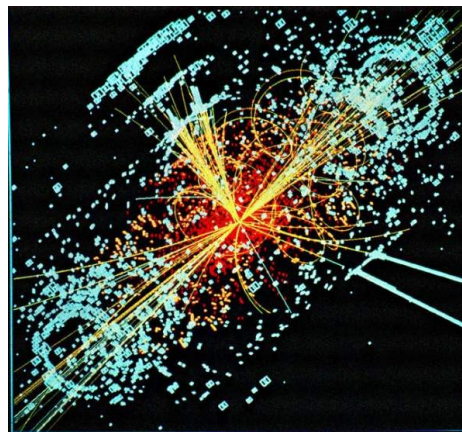
By Clark M. Thomas

Ten billion dollars have literally been sunk into the Franco-Swiss border to detect incredibly ephemeral particles. The Large Hadron Collider was built near Geneva by the European Organization for Nuclear Research, or CERN, to create particles physicists believe existed just after our local big bang. For more than a year it has shot beams of protons toward each other around a seventeen-mile track at close to the speed of light.

The grand prize would be detecting with a high degree of certainty the elusive Higgs boson, which could be the final piece of evidence needed to prove that the Standard Model of particle physics explains the behavior of subatomic particles.

Remember the snipe hunts of our childhood? Our childhood snipe hunts involved sticks and other thoroughly worthless instruments to help us find and capture the ever-elusive

snipe. Snipe birds actually exist, but never at snipe hunts. Today's adult snipe hunt involves an army of scientists constructing and commanding the largest particle accelerator ever, all in hopes of spotting a mass-giving "God particle" that theoretically lasts just long enough to travel the distance of a proton. That's one brief lifespan, even if you have the most awesome piece of machinery helping you. So far no luck, but some hints, maybe.



*Simulated Appearance of Higgs Boson*

Let's look at ten reasons why this hunt may never bag its quarry:

1.) More time may be needed. That's a fair objection with any frontier piece of equipment. How much more time?

2.) The Higgs boson would be detected by statistical data and reverse physics from secondary particles, since it decays too quickly to be

*(Boson Continued on page 2)*

observed. True, but the level of certainty must be much higher than it has been to date.

3.) The Standard Model says the Higgs boson emerges from the Higgs field that precedes the other particles. Yes, but a model is not always a fact. The field itself has not been detected. Either the model is false (unlikely in totality), or the theory needs modification within a larger theory.

4.) If the Higgs boson is the particle that provides mass to other particles which exist in electromagnetism, and in the strong and weak nuclear forces, it is proper to ask how, when, and where the Higgs boson itself emerges. Is there another, even more ephemeral, particle that gives birth to the Higgs?

5.) If the Higgs boson does what the Standard Model says, then how does it propagate its function long after the local universe's big bang? Doesn't that imply that creative elements in the local big bang are also present within today's nuclear components?

6.) A fundamental hypothesis of physics is the equivalency of energy and matter. We see, for example, this equivalency in Einstein's  $E=mc^2$ . His formula does not require the intermediation of a Higgs boson.

7.) The very reason for the Large Hadron machine and its seventeen mile tunnel is the very reason that from one inertial frame of reference a particle in a vacuum cannot exceed the speed of light. What I call the elastic pop of the electron as it leaves its atomic source is a quantum of energy that does not vary, and which is sufficient to propel a particle almost

to the vacuum light speed nearly instantaneously, but not faster, and not instantly.

8.) The LHC cannot infinitely accelerate photons. At any given point in time, and within the same inertial frame of reference, all objects are still, even if they are relatively at light speed (or faster) within other frames of reference. This all means that any pulse of energy from within the LHC cannot propel the protons to a speed faster than light.

9.) Everything makes sense when we understand that energy and matter are both expressions of the same existence. We don't need a particle from nowhere to send us somewhere. Following the formula for gravity to its mathematical conclusions within a sub-nano world reveals this unity. Even though everything resolves into expressions of gravity, we often express forces as being of four types, when in fact they are all expressions of one force/energy, which I call the Universal Yin/Yang.

10.) It may be that so-called Higgs boson particles of various flavors will be revealed by the LHC. If so, that discovery will not be the end of Big Bucks Physics, just another way to embellish the diversity within unity. Anything that comes from somewhere at some time is not a god, just an earlier expression of the Universal Yin/Yang.

If all of this seems too weird for words, not to worry. I have another essay that covers most of this territory from different perspectives: <http://astronomy-links.net/cosmofallacies.htm>

# Asteroid 2010 TK7

## Near-Earth Objects

By Neal Sumerlin

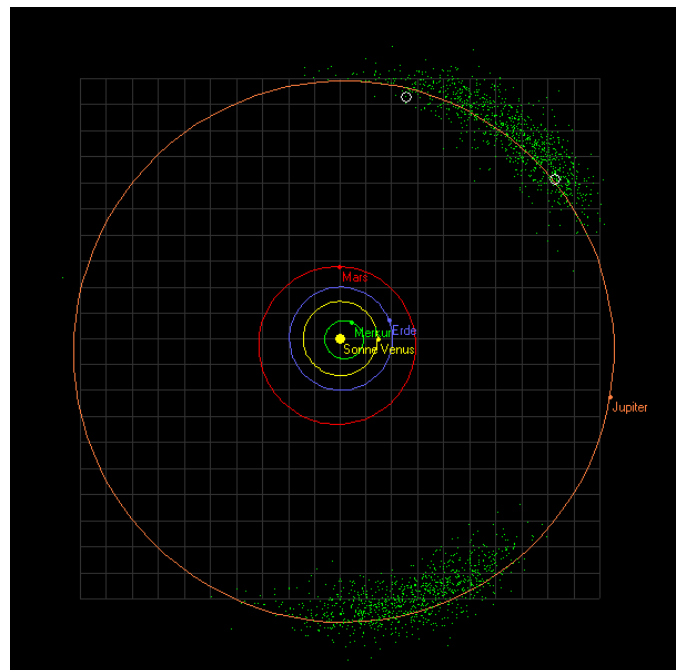
Near-Earth objects (NEOs) are of interest to us for several reasons. One is a matter of safety: if an asteroid or comet were to impact the Earth, the consequences could range from local damage to global catastrophe, depending upon the size of the object and the velocity of impact. Another reason for our interest in these has to do with future human exploration: a human mission to a nearby asteroid could be a dress rehearsal for a later trip to Mars. Many of these objects have already been found. NASA is actually under a congressional mandate to catalogue all NEOs larger than a kilometer (0.6 miles) in diameter, because of their potential as impact hazards. As of August 2011, a total of 828 Near-Earth asteroids (rocky bodies) had been found. You may see larger numbers cited in some places, but these are based on earlier estimates of the average reflectivity of these objects. Stay with me on this:

- Improved estimates for the average reflectivity of these asteroids have shown them to be more reflective than first thought.
- If we measure the brightness of these objects, and we know their reflectivity, we can then determine their size.
- If they reflect more light than we thought, then they don't have to be as large as we first thought to appear as bright as they do.
- A higher reflectivity results in smaller sizes.

### Asteroid 2010 TK7

All of this is preface to the announcement of an object well below this one-kilometer size

threshold: asteroid 2010 TK7, whose discovery was announced in the last few days and whose diameter is estimated at 300 meters. Why so much interest in this particular asteroid? This is the first Trojan asteroid discovered for the Earth. These asteroids occupy gravitational "sweet spots" near the Earth, specifically ones that precede and follow the Earth in its orbit by  $60^\circ$ . Jupiter, our largest planet, has over 4000 of these.



Jupiter Trojans [http://www.minorplanets.org/ExpeditionLaSagra/img/Jupiter\\_Trojans.png](http://www.minorplanets.org/ExpeditionLaSagra/img/Jupiter_Trojans.png)  
You can see that these objects are spread out so they are not *exactly*  $60^\circ$  ahead of and behind the planet. If one were to "freeze" Jupiter in place and show only the motions of these asteroids, you would see some of them move

(TK7 Continued on page 4)

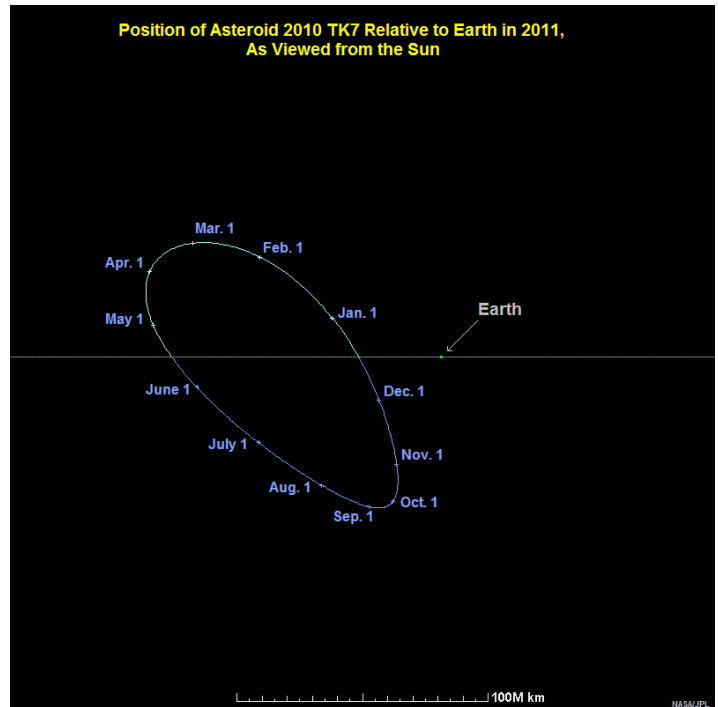
(TK7 Continued from page 3)

around one point 60° in front of Jupiter and others around another point 60° behind it. What is at these points? Nothing—they are just gravitationally stable locations in the Sun -Jupiter-asteroid system.

Until now, no Earth Trojans had ever been discovered.

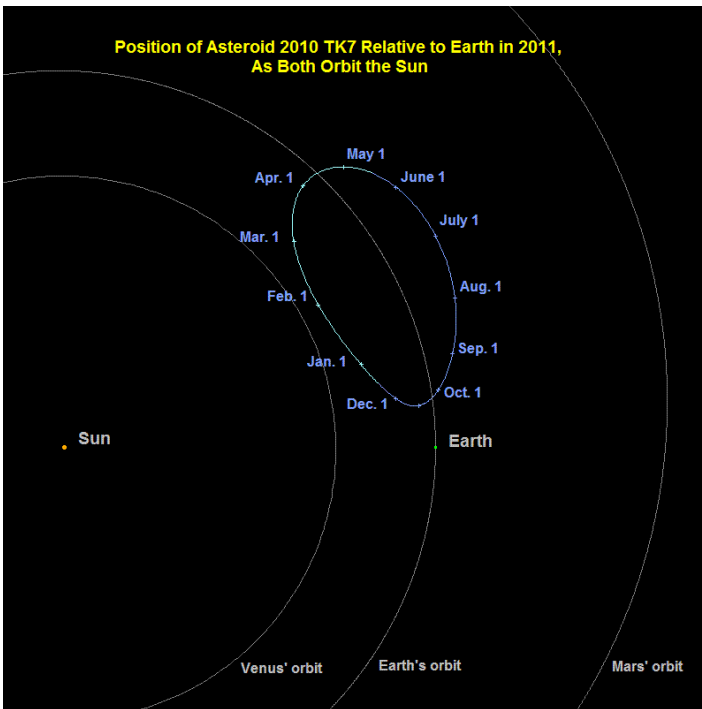
2010 TK7's orbit is complex. Let's look at it from several perspectives. First, let's "freeze" the Earth in its orbit and show only the motion of the asteroid. This first image looks down on the Earth's orbit from above the north pole.

as they both orbit the sun.



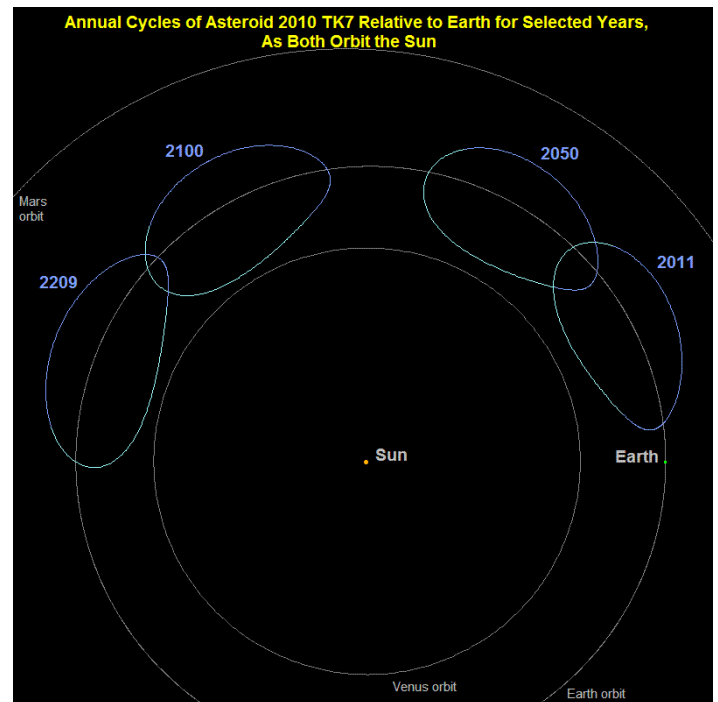
View from the sun [http://neo.jpl.nasa.gov/images/2010tk7\\_rf2.gif](http://neo.jpl.nasa.gov/images/2010tk7_rf2.gif)

And it's even more complicated than that! The asteroid's position drifts to a point all the way on the other side of the sun from Earth, then



View from above Earth's orbit [http://neo.jpl.nasa.gov/images/2010tk7\\_rf3.gif](http://neo.jpl.nasa.gov/images/2010tk7_rf3.gif)

A second image comes from a different perspective. Here we see the Earth and the path of 2010 TK7 above and below the path of the Earth as seen from the sun. Think of the path that the asteroid traces out as covering the surface of an eggshell moving with the Earth



(TK7 Continued on page 5)

(TK7 Continued from page 4)

drifts back to its current location near us.

Orbit Drift Over Time [http://neo.jpl.nasa.gov/images/2010tk7\\_rf4.gif](http://neo.jpl.nasa.gov/images/2010tk7_rf4.gif)

What does it look like when you “unfreeze” the motion of the Earth? If you have Java installed on your computer (if you don't, it's a free download here: <http://java.com/en/download/manual.jsp>), you can set both the asteroid and the planets in motion: <http://ssd.jpl.nasa.gov/sbdb.cgi?sstr=3548081;orb=1;cov=0;log=0;cad=0#orb>

This is a very cool tool! Play with it—here are some suggestions.

1. Slide the right hand scroll bar all the way to the bottom to look down on the orbits from above the north pole.
2. Slide the zoom scroll bar to zoom in just enough so that the asteroid's orbit nearly fills the screen.
3. Set the interval to 1 day, and click the >> symbol above it to start the animation.
4. While the animation is running, slide the right hand scroll bar halfway up to see the orbits from a different angle, and to see how the asteroid's orbit is tilted relative to the Earth's.
5. Play on your own!

### Can we go there?

Despite its proximity, 2010 TK7 is not a good candidate for a near-term visit from astronauts because of its high orbital inclination. This means its velocity relative to the Earth is fairly high. The difficulty of getting to some place from the Earth is determined by the  $\Delta V$  (delta V; change in velocity) required. From low

Earth orbit, the requirements to reach each of these solar systems bodies are:

Moon: 6 km/s (kilometers per second)

Mars: 9 km/s

2010 TK7: 9-10 km/s

More typical Near-Earth asteroid: 4 km/s

Of course, energy requirements are not the only factor in human exploration! Mars is not just 50% harder to get to than the moon—the moon is three days away and Mars is at least six months away. A NASA proposal to visit the Near-Earth asteroid 1999 AO10 in 2025 would require a total mission time of five months.

### Is it a danger to us?

In a word: no. It's not on a collision path with us. Even when it comes closest to us, it is generally far above or below the Earth's orbit. If it did collide with us, a 300-meter diameter rocky body could do serious damage. Just how much damage would depend on its impact velocity, but suffice it to say that an impact over Richmond would devastate Lynchburg. The Near-Earth asteroid with the highest current probability of impact is 1950 DA, which may strike the Earth in 2880. The difficulty of predicting orbits that far into the future, however, could easily lower the probability well before then. In any case, if we haven't developed the capability to divert such objects by then, we deserve to be hit!

*Editors Note: Neal Sumerlin is Professor of Chemistry and Director of the Belk Observatory at Lynchburg College. He also hosts the "[Star Struck](#)" Blog which features astronomy related themes.*

# Odds and Ends: August RVAS meeting

By John Goss

The RVAS tried something new for its August meeting: Thanks to the efforts of Michael Good, the meeting was broadcast through Skype to Lynchburg member Dave Thomas. He was able to view the meeting on his computer while relaxing at home!

Sometimes you just can't win when it comes to the weather. After seeing that skies were going to be clear for a few hours, Mark Hodges started on the trip up Bent Mountain to observe at the Cahas Overlook. There was going to be a particularly interesting sight of the International Space Station entering the Earth's shadow in Hercules seconds before the Nano-sail D satellite was exiting the shadow in Cygnus. Mark intended on capturing this with his camera, making a most unusual image.

As he started his ascent on US 221, the moon could be seen rising among scattered clouds. When Mark reached the half way point up the mountain, it started to cloud over. It began sprinkling rain when he reached the top and by the time he was driving on the top of the mountain it was raining. The closer he approached the Cahas Overlook, the harder it rained. The result: No observing for Mark. Yes indeed, we astronomers have special power over the weather!

## **Observing Project: Creating a light curve for Beta Lyrae.**

From now until November, it is a great time to discover the variability of the star Beta Lyrae. This eclipsing binary has a period of nearly 13

days and it varies between magnitudes 3.4 and 4.3. If many observations of Beta's brightness are made, then a light curve can be established. Members are asked to capture images of the constellation Lyra using a standard digital point and shoot camera mounted on a tripod. Simply point the camera so that the constellation Lyra is near the center of the field. Use the same f stop and shutter speed, such as f2.8 at 15 seconds, for each picture.

Beta's brightness will be compared with two other stars in Lyra, nearby Gamma and Zeta. Gamma is the southeastern star in Lyra's parallelogram and Zeta is its northwestern star.

Gamma Lyrae maintains a constant light of 3.3 magnitude while Zeta shines at 4.3. If Beta is at a similar brightness as Gamma, it can be assigned a value of 1. If it is as dim as Zeta, then it can be given a 5. When it is between those two magnitudes, a proportional value is given. Then, if the time and day of the images are noted, a brightness graph can be generated.

Why not try this magnitude comparison using your unaided eyes or a pair of binoculars?

## **Astronomy is a big field: RVAS needs your help**

RVAS President Michael Good, always on the look out for people to contribute presentations, presents a suggested set of possible topics for RVAS members to investigate. If you find one of these topics interests you,

*(Meeting Continued on page 7)*

please email Michael. We are looking for a 5 or 10 minute mini-presentation. A newsletter article would naturally come out of your talk.

### 1) Astronomy Without A Telescope - Impact Mitigation

by Steve Nerlich on August 13, 2011. The save-the-Earth rehearsal mission Don Quijote, commissioned by the European Space Agency, is planned to test the potential of a real life-or-death mission to deflect a mass-extinction-inducing asteroid from a collision course with Earth. Currently at 'concept' stage, the Don Quijote Near Earth Asteroid Impact Mitigation Mission - has been modelled on a proposed flight to either 2002 AT4 or 1989 ML, both being near-Earth asteroids, though neither represent an obvious collision risk. However, subsequent studies have proposed that Amor 2003 SM84 or even 99942 Apophis may be more suitable targets. After all, 99942 Apophis does carry a marginal (1 in 250,000) risk of an Earth impact in 2036.

### 2) Pardon Me, But Your Black Hole Is Leaking...

by Tammy Plotner on August 12, 2011. Yes, we thought we knew everything there was to know about black holes. We know they are massive and compact. We know they possess a gravity so intense that it even bends "space time". We know they won't even allow light to escape. But what we weren't really prepared for is that our human line of reasoning might be wrong. Black holes might consume everything... But they leak information.

### 3) GRAIL Twins ready for NASA Science Expedition to the Moon: Photo Gallery

### by Ken Kremer on August 12, 2011. NASA's

GRAIL twins - dubbed GRAIL-A & GRAIL-B - are ready to embark on America's next science expedition to the moon in less than 1 month's time from Cape Canaveral Air Force Station, Fla.

The twin Gravity Recovery and Interior Laboratory (GRAIL) spacecraft have been exhaustively tested, fueled for flight and mounted side-by-side on a specially designed payload adapter inside the controlled environment of a clean room at the Astrotech Space Operations facility in nearby Titusville, FL.

### 4) Astronomers Discover a Dark Alien World

by Jason Major on August 11, 2011. An exoplanet has been discovered by astronomers that reflects less than one percent of the light it receives from its parent star. Less reflective than black acrylic paint, this planet is literally darker than coal!

TrES-2b is a Jupiter-sized gas giant orbiting the star GSC 03549-02811, about 750 light-years away in the direction of the constellation Draco. First discovered in 2006 by the Trans-Atlantic Exoplanet Survey (TrES), its unusual darkness has been identified by researchers led by David Kipping from the Harvard-Smithsonian Center for Astrophysics (CfA) and David Spiegel from Princeton University, using data from NASA's Kepler spacecraft.

### 5) JPL's 'Muscle Car' - MSL - Takes Center Stage

(Meeting Continued on page 8)

by Jason Rhian on August 14, 2011. CAPE CANAVERAL, Fla. - NASA is experiencing what could be dubbed a "summer of planetary exploration." With the Juno mission to Jupiter on its way as of Aug. 5, NASA is prepping not one but two more missions - this time to terrestrial bodies - specifically the Moon and Mars.

#### 6) Red-Burning Galaxies... Let's Get The Party Started!

by Tammy Plotner on August 11, 2011. Utilizing the Subaru Telescope, a research team of astronomers from the University of Tokyo and the National Astronomical Society of Japan (NAOJ) used a wide-field image to take a look four billion years back in time. The object of their interest was a galaxy cluster, but what really took their fancy wasn't the old matrons - it was the red star-forming galaxies hanging around the edges.

Just exactly what is a "red-burning galaxy"? Astronomers hypothesize they might be the transitional key between the young and old... and present at a party that shows dramatic evolution. It's not the fact that such galaxies exist within galactic clusters, but why they seem to appear along the outskirts.

#### 7) As a bonus topic: Earth's second moon

Members are encouraged to investigate these topics by entering them on Google. If any one topic is any member's cup of tea, why not present a short talk on the particular subject of interest?

#### **Library telescope**

The Astronomy Enthusiasts of Lancaster County (PA) began a lending program last year in conjunction with their local library system. They purchased a 4.5 inch Orion Astroblast reflector, did a few modifications to it to make it more durable, wrote a simple but clear user's manual, and donated it to the library. The library allows its patrons to check it out in the same manner as they do books. The program has been a great success — the telescope is continually on loan in their community.

If the Roanoke/Botetourt Library system allows it, would the RVAS like to sponsor a similar program for our area? If a suitable telescope can not be found locally, Orion sells this specific model for \$199. Modifications would put the final price closer to \$300. This would be a great way to bring astronomy to our community while promoting the RVAS at the same time.

#### **Lunar Sessions**

September's RVAS lunar observing sessions for completing the Astronomical League's Lunar

*(Meeting Continued on page 9)*

*(Meeting Continued from page 8)*

Club are scheduled for the dates and times listed below. Please bring your scope and a pair of binoculars and a lunar filter will allow for more comfortable viewing during the 11 day old and full moons.

4 days — Thursday September 1, 8:00 p.m.,

Explore Park Overlook

8 days — Monday September 5, 7:30 p.m., Discovery Center

11 days — Thursday September 8, 8:00 p.m., Discovery Center

14 days — Sunday, September 11, 8:30 p.m., Explore Park Overlook

---

# 2011 RVAS Picnic: September 17 at Apple Ridge Farm

*Fine food, fun, and fellowship*

*By John Goss*

In the waning days of summer, the RVAS is holding its annual picnic at Apple Ridge Farm. The event begins at about 3 p.m. on Saturday September 17 and, weather permitting, lasts well after dark. The Society will furnish hot dogs, hamburgers, condiments, and soft drinks. Members are encouraged to bring either a covered dish, salad, or dessert.

Directions to Apple Ridge Farm:

- Take US 221 South up Bent Mountain to Copper Hill. (Copper Hill is 16 miles from VA 419 and Cave Spring Corners.)
- Turn right onto VA 796 (Copper Hill Road)
- After about 1 mile turn right on VA 644 (Pine Forest Rd), cross the bridge.

- After about 1.5 miles turn right into the ARF driveway by the pond.

- Meander through the complex until you reach the Meador Science Building. The picnic area is next to the Meador Science Building, near the picnic tables (of course).

Sunset arrives about 7:24 p.m. and the 20 day old moon doesn't rise until 10 p.m. This gives members plenty of darkness to study Jupiter, Uranus, Neptune, a plethora of globulars and galaxies, and the magnificent Milky Way with either their own scopes or with the 8 and 12 inch ARF Schmidt Cassegrains.

Hope to see you there!

# Astro-Quiz

By Frank Baratta

The star patterns we know today have been visualized differently among cultures. This bright winter constellation was envisioned by the ancient Egyptians as Osiris, the God of Light. What do we know this pattern to be today?

**Answer to Last Month's Astro-Quiz:** Last month we asked what would be a good site to place Barnard's Star, which lies about 6 light-years from Earth, if Earth was a 3-inch diameter ball one kilometer away from a model Sun. On that basis, placing Barnard's Star on the surface of the Moon would be very close to the correct scale. Barnard's Star is about 6 light years, or about 380,000 astronomical units, and the moon is at about 384,000 kilometers from Earth.

The Roanoke Valley Astronomical Society is a membership organization of amateur astronomers dedicated to the pursuit of astronomical observational and photographic activities. **Meetings are held at 7:30 p.m. on the third Monday of each month, at Western Va. Community College Natural Science Center, 3102 Colonial Ave. S.W. Roanoke, Virginia. Meetings are open to the public.** Observing sessions are held one or two weekends a month at a dark-sky site. Yearly individual dues are \$20.00, Seniors \$18.00. Family dues are \$25.00, Senior Family \$22.00 . Student dues are \$10.00. Articles, quotes, etc. published in the newsletter do not necessarily reflect the views of the RVAS or its editor.

RVAS web page: <http://rvasclub.org>

## *Officers/Executive Committee/Editor*

**Michael Good**, President ([president@rvasclub.org](mailto:president@rvasclub.org))

**John Goss**, Vice President ([vicepresident@rvasclub.org](mailto:vicepresident@rvasclub.org))

**Rick Rader**, Secretary ([secretary@rvasclub.org](mailto:secretary@rvasclub.org))

**Jeff Suhr**, Treasurer ([treasurer@rvasclub.org](mailto:treasurer@rvasclub.org))

**Carol Mesimer**, Member at Large ([memberatlarge@rvasclub.org](mailto:memberatlarge@rvasclub.org))

**Paul Caffrey**, Immediate Past President ([immediatepastpresident@rvasclub.org](mailto:immediatepastpresident@rvasclub.org))

**Randy Sowden**, Past President ([pastpresident@rvasclub.org](mailto:pastpresident@rvasclub.org))

**Clark M. Thomas**, RVAS Newsletter Editor ([cmtastronomy@hotmail.com](mailto:cmtastronomy@hotmail.com))

# CALENDAR OF EVENTS

By Frank Baratta

**MONTHLY MEETING: Annual RVAS Picnic and Star Party, Saturday, September 17<sup>th</sup>, 3:00 p.m., Apple Ridge Farm, Copper Hill, Virginia**

**RVAS WEEKEND OBSERVING SESSIONS:** Unless otherwise indicated, observing sessions are held at Cahas Mountain Overlook, milepost 139 on the Blue Ridge Parkway.

◇ **Saturday, September 17<sup>th</sup>. Annual RVAS Picnic and Star Party, 3:00 p.m., Apple Ridge Farm, Copper Hill, Virginia. Sunset is at 7:26 p.m. Astronomical twilight ends at 8:54 p.m. The Moon rises at 10:02 p.m.**

◇ **Friday and Saturday, September 23<sup>rd</sup> and 24<sup>th</sup>. Sunset is at 7:15 p.m. Astronomical twilight ends at 8:42 p.m. The Moon sets at 4:41 and 5:17 p.m., respectively.**

◇ **Future Sessions: October 21<sup>st</sup> and 22<sup>nd</sup>; 28<sup>th</sup> and 29<sup>th</sup>.**

**ROANOKE CITY PARKS and RECREATION PUBLIC STARGAZE: Saturday, September 24<sup>th</sup>, 7:45 p.m., Cahas Overlook, Milepost 139 Blue Ridge Parkway. Nonmembers must register with Parks & Rec. at 540-853-2236. Members can call 540-774-5651 for information. (Next session: October 22<sup>nd</sup>, 7:15 p.m., Cahas Overlook.)**