Roanoke Valley Astronomical Society

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The RVAS LiTel Project

Putting telescopes in the hands of the interested public

By John Jardine *Goss*

The Executive Committee and members who attended the December RVAS meeting voted to begin a new Society project, one that directly affects the public. Its aim is to put telescopes in the hands of people who are thinking about entering our hobby. This is an exciting opportunity for amateur astronomy!

The Roanoke – Botetourt library system offers more than just books for its patrons to check out. So, why can't it offer telescopes, as well?

A program first developed by the New Hampshire Astronomical Society, then picked up by other astronomy clubs, donates modified inexpensive, but quality telescopes to local library systems. These clubs have found that their donated scopes have been checked out continuously, or nearly so. The RVAS envisions a similar program.

The LiTel Project

The library telescope needs to meet certain qualifications. For neophytes to have a meaningful observing experience, it must:

1. be "user friendly,"

2. be as durable as telescopes go,

3. be portable,

4. give sharp, steady images so the observing experience isn't marred,

5. have a large enough aperture to pick up some of the sky's deep space showpieces.

6. have a range of magnification to be useful for discerning detail on the moon and bright planets, and for enjoying expansive star clusters.

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The Orion AstroBlast, regularly $199, fits the bill nicely. This 4.5 inch telescope is light weight, small, sturdy and inexpensive. With a few relatively easy modifications, it can be made library ready:

Since eyepieces are readily lost, the telescope will be fitted with a zoom lens. The Celestron 8 – 24 mm ($57) gives a range of magnifications allowing good views of small planets and large star clusters. The zoom eyepiece will be inserted in the focuser tube so that it can not be easily removed.

Because of the eyepiece's 2° field of view when it is at the 24 mm setting, the telescope does not need a small finder scope.

The mirror cell needs to be modified so that the mirror can't be disturbed by inquisitive but unauthorized fingers.

The bearings on its Dobsonian base need to allow buttery smooth operation.

An easy to follow guide needs to be created.

A carrying and storage bag is needed.

The Botetourt library system has enthusiastically agreed to partner with the RVAS on this exciting project. This means that libraries between Eagle Rock in northern Botetourt County and Bent Mountain in Roanoke County can offer this scope to their patrons for check out. The checkout period will be seven days and only people eighteen years of age or older will be allowed to check them out. The telescope will be inspected periodically, perhaps once per month.

The telescope, a moon filter, and the zoom eyepiece have been ordered. The plan is in motion!

2012: A great year for amateur astronomy!

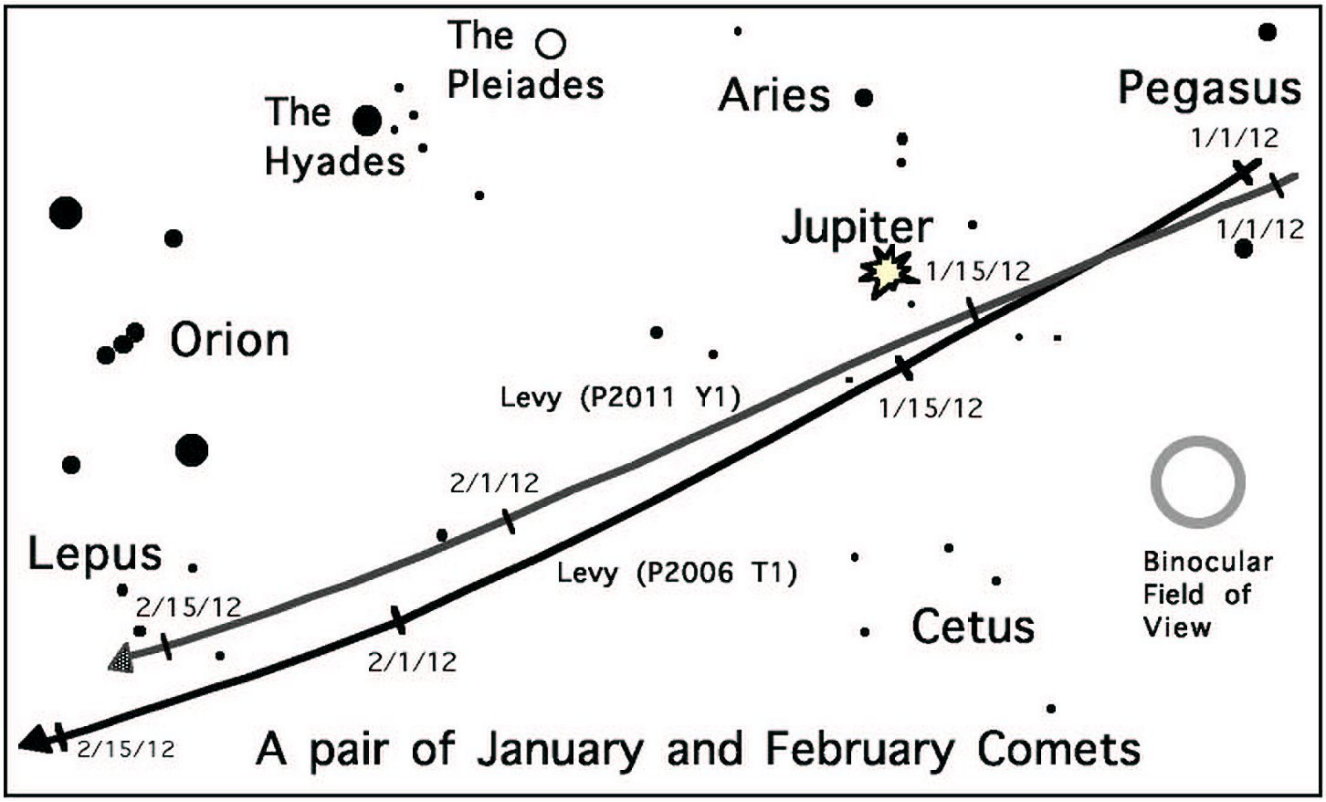
By John Jardine Goss, Vice President Astronomical League

All joking aside about the end of the world in December, 2012 promises to be a great year for amateur astronomy. It features numerous celestial scenes worthy of viewing: lunar occultations, planetary encounters, comets, asteroids, planetary satellites, planetary visits to deep sky objects, and the last Venus transit of the twenty-first century. Get your clean, crisp new calendars ready for marking!

1. Comet Levy P(2006 T1) and Garrad P (2009 P1)

We haven't had a grand comet in a number of years and it doesn't look like 2012 will be different. However, binoculars users may be able to catch two seventh — perhaps sixth — magnitude cometary visitors in the first part of 2012.

Early evenings in January bring us Comet Levy, a seventh magnitude fuzzy ball scooting from Aries into Eridanus. On the 15th, it lies 6° west of Jupiter. The best times to view it will be from January 15 through 25 when there is



A new comet discovered by David Levy, P(2011 T1), just might brighten to binocular visibility. Strangely, it follows nearly the same path as P(2006 T1).

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(Great year Continued from page 3)

no moonlight washing out the sky. Does your telescope view reveal a wispy tail?

From late February through March, Comet Garrad graces our skies. The big question is how bright it will become. Some accounts indicate 7th magnitude, other claim almost naked eye visibility. Garrad will be located in Hercules in January, then swing near the Little Dipper in mid February, and pass west of the Big Dipper in March and April.

2. Venus and Uranus.

On February 9 at 7 p.m., Uranus lies 19 minutes east of brilliant Venus. Can you spot the 5.9 magnitude planet amid the glare of Venus? Use moderate magnification (around 100x) or greater to see the round disk of Uranus and the gibbous disk of Venus.

3. Can you spot Phobos and Deimos?

From February 12 through March 25, when Mars is at its closest and brightest, its two small, dim moons, Phobos and Deimos, are also at their brightest. To increase your chance of seeing them, Mars should be at least 25° above the horizon and there should be no moonlight interfering. In February, this corresponds to observing at 10 p.m. EST from the 12th to the 25th. In March this corresponds to observing at 11 p.m. EDT from the 10th through the 25th. Mars will span about 14 arc seconds and the magnitudes of Deimos and Phobos are 13.2 and 12.2, respectively. Phobos is situated to either side of the planet by less than the planet's diameter. Deimos, although a magnitude dimmer, is situated from the planet by 2.5 times Mars' diameter, possibly putting it far enough outside the planet's glare to spot the little satellite.

Place Mars near the edge of the field and focus on it. Then, move the planet just outside of the field. If luck is with you, you'll be able to spot the moons just inside the field of view and just outside of the planet's glare.

Deimos:

Date Separation from Mars Side away from Mars

2/13 30 seconds west

2/15 32 east

2/16 30 east

2/18 38 west

2/20 37 east

2/23 38 west

2/25 40 east

...

3/13 40 west

3/15 33 east

3/18 39 west

3/20 36 east

(Great year Continued on page 5)

(Great year Continued from page 4)

3/23 36 west

3/25 38 east

Phobos

2/13 11 west

2/14 11 west

2/17 11 west

2/20 11 west

2/21 11 west

2/24 11 east

…

3/10 11 east

3/14 11 west

3/17 11 east

3/21 11 west

3/25 10 east

The dates when both moons should be most easily visible are February 20 and March 25.

4. Lunar occultation of Zeta Tauri

For very early morning observers on March 2, the 2.96 magnitude star Zeta Tauri can be seen being occulted by the waxing gibbous moon. Begin watching at 1:40 a.m. before the star suddenly disappears behind the moon's dark southern edge about 1:49. It reappears next to the brightly lit lunar surface around 1:55 a.m. making it more difficult to see than the disappearance.

5. The bright and the dim

Mars slides into the same field of view as the galaxies M95 and M96 on March 16 and 17. How difficult will it be to spot both the bright planet and the two very dim galaxies at the same time? M95 and M96 will be giants compared to tiny Mars, but their low surface brightness may make their identification difficult.

6. Venus Transit

The transit begins on June 5 just after 6 p.m. and continues well after sunset. Let's hope for clear skies with no late afternoon or early evening storms!

7. Vesta passes Aldebaran

Asteroids are interesting to observe because they creep across the sky, showing discernible movement in just two or three hours time. Vesta passes Aldebaran on the morning of August 6. Look at Aldebaran at 4:00 a.m. when it rises above the atmospheric goop, for the 7.5 magnitude Vesta sitting thirteen arc minutes to the left of the star. The next morning, the asteroid will have moved eastward by a few minutes.

8. The moon points to Venus in the daytime.

(Great year Continued on page 6)

(Great year Continued from page 5)

At 4 p.m. on August 13, the pale crescent moon lies next to Venus low in the west. Binoculars should help in finding this pair. Venus is about two-thirds of the moon's apparent diameter to its upper left. The planet shouldn't appear nearly as washed out as the moon because its surface brightness is much greater. The moon occults Venus at 4:43 when they are less than 7° above the horizon.

9. Ceres grazes southern lunar rim.

The largest asteroid, Ceres, can be easily found on September 9 around 3:30 a.m. For observer's north of a line extending from just north of Winston-Salem, NC to just north of Richmond, VA, and continuing to the northeast, the moon's southern edge barely occults it. Begin observing at 3:40. Sometime in the next ten minutes, the moon blocks the 7.7 magnitude Ceres. Does Ceres wink out suddenly as the dark lunar rim covers it, or does it disappear gradually, taking many seconds to do so?

Project: If simultaneous observations are coordinated by two observers who are located near the same longitude and who are separated by a north-south distance of a couple of hundred miles, then the distance to the moon can be calculated using simple trigonometry.

10. Ceres passes Eta Gemini

Ceres can be found again, this time when it moves past the 3.3 magnitude star Eta Geminorum. On November 4 at 10 p.m., aim your scope at Eta. Ceres twinkles a minimum of three arc minutes to the star's east. As the hours pass, the little worldlet creeps to the northwest. If a medium magnification eyepiece is used, after two or three hours a slight change in position with respect to the star should be noticed.

Events and Gatherings

TriStar

March 3, hosted by the Greensboro Astronomical Society and the Cline Observatory

Astronomy Day

April 28

NEAF

April 28 and 29, sponsored by the Rockland Astronomy Club in Sufferin, NY

Green Bank Star Quest

June 20 — 23, hosted by the Central Appalachian Astronomy Club

ALCon: Celebrating Starlight

July 4 — 7, hosted by the Chicago Astronomical Society

VAAS

September 15, hosted by the Richmond Astronomical Society

Wine Moon and Stars

October 8 at Virginia Mountain Vineyards

Astronomy in 2011

By Neal Sumerlin

As the end of calendar year 2011 approaches, I thought my readers might enjoy a look back at some of the key events of the year in astronomy. The usual caveats apply: this is by no means an exhaustive list, nor is it meant to be. These are the items that drew my interest, and that I consider significant. I suspect another astronomy enthusiast's list would overlap mine in some respects, but surely not in all. Feel free to send me the item you thought most significant that I left out!

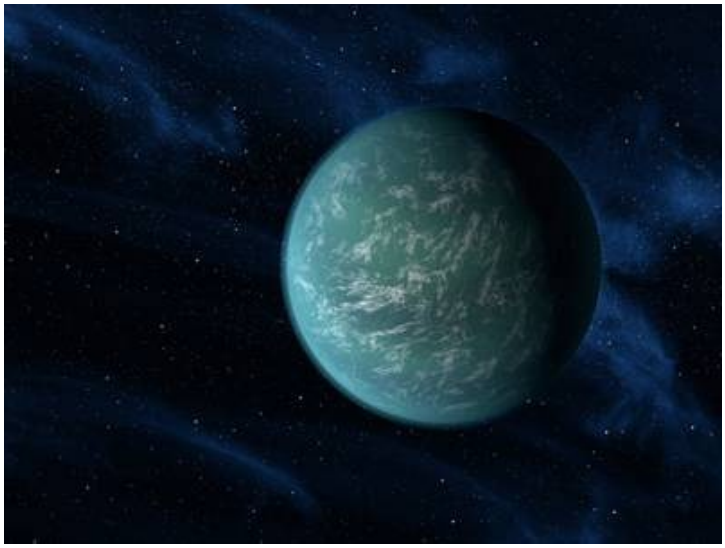
EXOPLANETS

This was the year that the number of suspected and confirmed planets orbiting other stars doubled, and doubled, then doubled again, due almost exclusively to the Kepler mission. This space-borne telescope has zeroed in on more than 100,000 stars in a patch of sky near the constellation of Cygnus, the Northern Cross. A very sensitive light meter looks for periodic dips in a star's brightness caused by a planet moving in front of the star and blocking a portion of its light-emitting surface from us. From the characteristics of the resulting light curve, the orbital and physical characteristics of the planet can be deduced.

Along with learning more about just how common planets are (very) and how similar other planetary systems are to our own (not very), there is understandably intense interest in finding Earth-like planets: small rocky planets at a distance from their stars that allows liquid water to exist on their surfaces. Such planets might—just might—be abodes of life.

Earlier this month, the first planet detected by Kepler that is small enough and at the right distance from its star to qualify as "Earth-like" was announced. Kepler 22-b is larger than Earth (but not so large that it must be a gaseous rather than a rocky planet), its star is quite Sun-like (a little smaller and cooler than the Sun, but not by much), and its orbit puts it well within the "habitable zone" (neither so close to the star that water boils, nor so far away that it freezes). The thing we don't know is its mass, which is determined by other means that are difficult to apply in this case.

So the illustration below is speculative, but definitely not outside the realm of possibility!



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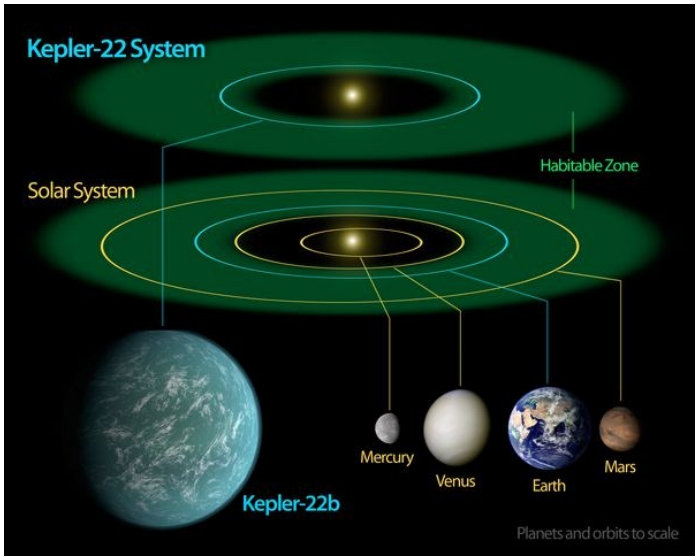
This illustration shows the habitable zones of Kepler 22 and of our own solar system as the same scale:



SOLAR SYSTEM

There are so many robotic spacecraft active in the solar system that it is difficult to keep track of them all. I think the best way to do so is through my favorite astronomy blogger of all, Emily Lakdawalla of the Planetary Society. She posts a monthly "What's Up In the Solar System" update of planetary missions; the December 2011 post is here.

Highlights from 2011:

- In March, the MESSENGER probe settled into orbit around Mercury, the first spacecraft ever to do so. An earlier post is here, and the mission home page is here.
- The Dawn mission arrived at Vesta, the second largest asteroid in July. More about this mission here and here.
- The Curiosity Mars rover was successfully launched on its way at the end of November. Scheduled to land on Mars next August, this rover is the largest and most capable ever to explore the surface of the red planet.
- Another ambitious mission to Mars that hoped to return a sample from its tiny moon Phobos did not fare so well. The Phobos-Grunt (Russian for "ground" or "soil") launched into low Earth orbit from the famous Baikonur Cosmodrome in early November. When firing commands were sent to launch to Mars, however, they failed. The craft is presumed dead, and will reenter the atmosphere sometime in January.

ASTROPHYSICS

In this loosely defined category, we have the following:

- A supernova observed in M101 (the Pinwheel Galaxy) in August is one of the nearest observed in quite some time. M101 is 21 million light years from Earth. What is most notable about this particular stellar explosion is how soon after the event it was detected on Earth, a consequence of increasingly automated nightly telescopic surveys of the sky. In the old days (20 years ago!), amateurs scanning the heavens with their 10-inch scopes discovered the great majority of supernova explosions. They have been outpaced by large-

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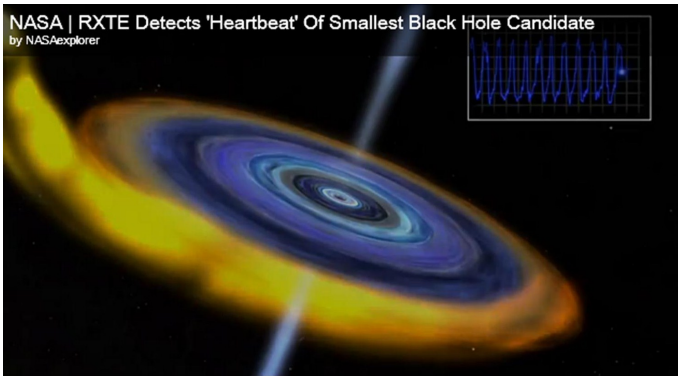
aperture automatic surveys such as the one that found this supernova. This was a Type Ia event, the complete thermonuclear destruction of white dwarf star. These are crucial to astronomers as so-called "standard candles", objects of known luminosity. If we know how luminous (inherently bright) an object is, and can measure how bright it appears to be, we can determine its distance. While Type Ia supernovae are believed to have very similar luminosities, there can be small variations depending on the compositions of their precursor stars. Seeing this supernova so early allowed astronomers to refine their models of these explosions, and thereby more finely calibrate their cosmic distance measurements. More from an earlier Star Struck post.

- Newly discovered black holes set records for size at both extremes of size—the largest and the smallest. These cosmic oddities result from the ultimate victory of gravity over the other forces of nature. All stars involve a balancing act between gravity (which seeks to collapse them) and other forces which prevent that collapse. In our own Sun, nuclear reactions in its core produce energy that maintains the Sun at a constant size. Five billion years from now, when it runs out of fuel, the Sun will go through a series of stages that will culminate in its becoming a white dwarf, an Earth-sized sphere of incredibly dense matter. Its further collapse is halted by "electron degeneracy". You just can't pack atoms any closer (their outer electrons are pushing back) without piling on more mass than the Sun possesses.

Black holes result when there is so much mass that nothing can resist the ultimate collapse. The density zooms to infinity if we are to believe Einstein's Theory of General Relativity (and there is as yet no good reason not to), and within the black hole's event horizon, nothing—not even light—can escape gravity's grip.

If you carefully review the preceding description, you may infer that a certain minimum amount of mass is necessary to create a black hole, but that there is no necessary upper limit to their size. You would be correct.

An X-ray satellite has detected periodic variations in X-rays probably being emitted from a flat disk of hot gas spiraling into the black hole. The rapidity of these variations indicates that the black hole responsible for them is less than three times the mass of our Sun. Any smaller and there wouldn't be enough mass to generate the black hole. The animation below depicts the pulsations arising from instabilities in the black hole's accretion disk:



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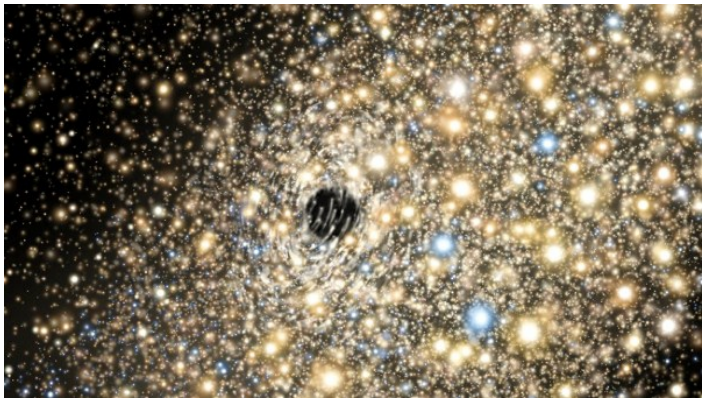
At the other end of the spectrum, a 21 billion solar mass monster lurks at the center of the galaxy NGC 4889. Supermassive black holes seem to reside at the center of most galaxies, including our own. The larger the galaxy, the larger is the central black hole. A massive galaxy with a correspondingly massive black hole is imagined below:



- Lastly, let us mention a curiosity: four very red galaxies discovered with the Spitzer Space Telescope. These are invisible to the Hubble Space Telescope, which doesn't see as deeply into the infrared wavelengths as the Spitzer, so they are "bright" only at these longer wavelengths, not in visible light. Galaxies are red for any number of reasons, and astronomers concluded that three of these reasons apply to all of these galaxies.
  oThey are very distant and their light is substantially red-shifted as a result. This means they represent galaxies at a very early epoch of the universe, only about a billion years after the Big Bang.
  o They have significant ongoing star formation, which heats up surrounding dust and makes a galaxy luminous in the infrared.
  o They have old stars that have evolved to become red, like Betelgeuse in Orion. This implies that these stars must have formed very early in the universe's history.
  If the stars in these galaxies are old enough for some of them to have evolved this far, that implies that star formation (and indeed galaxy formation) began earlier than we had thought. All of this together means that we have a lot to learn about the early universe. The more powerful instrumentation planned for the future will see farther out into the cosmos, and therefore farther back into time. Looking out (into space) is looking back (into time)! The science fiction dream of time travel is something astronomers do–and must account for –routinely.

HUMAN SPACE TRAVEL

- The last flight of the Space Shuttle took place in July as Atlantis returned from the International Space Station. While the shuttle is an impressive vehicle in many respects, it is also impressively flawed, as two disastrous losses of crew killing a total of fourteen persons demonstrate. Hanging on the side—rather than on the top—of a booster rocket is flaw number one. Witness the Columbia disaster, where falling debris fatally damaged the leading edge of a wing. Providing no means for the crew to escape a failing booster is flaw number two.

  Witness the Challenger disaster, where a 60s-style rocket escape tower could have

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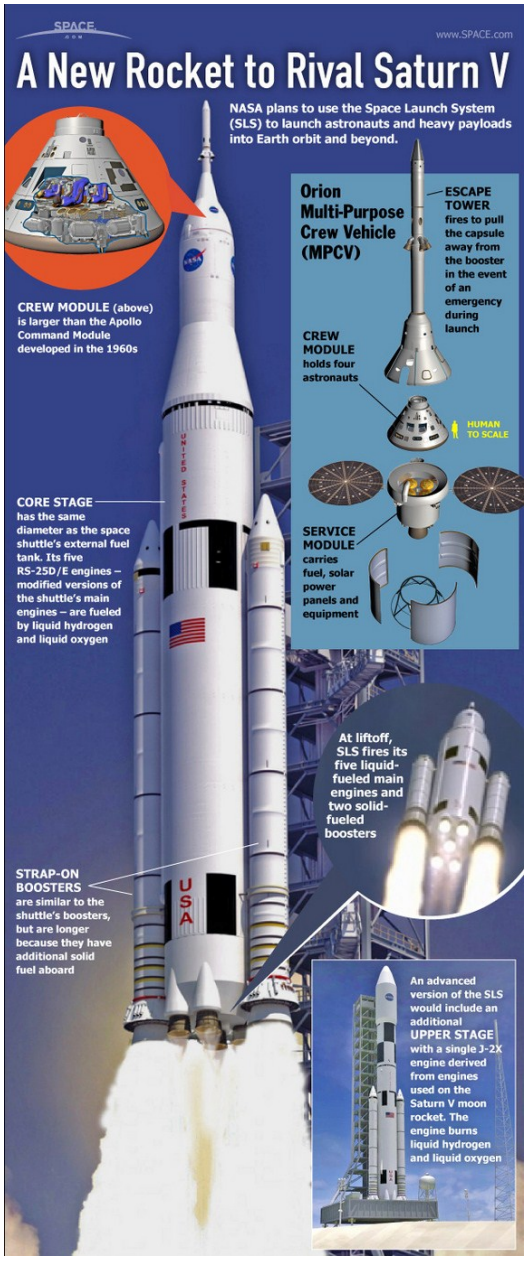

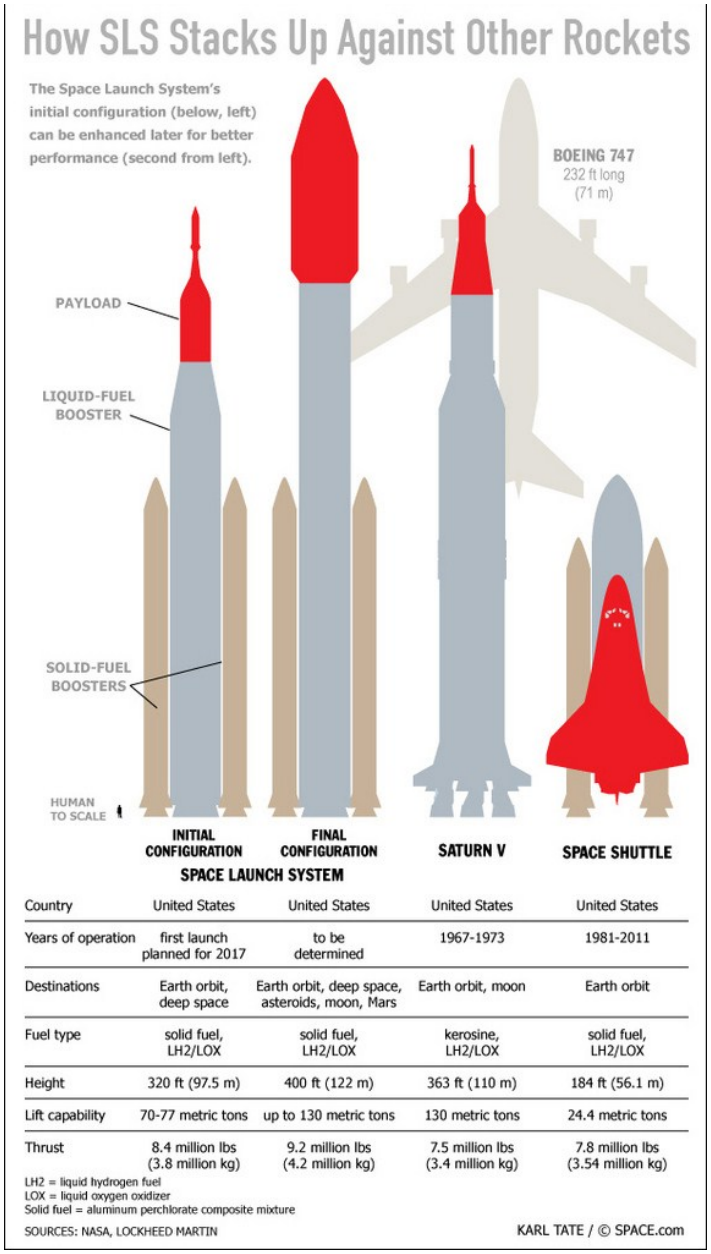

saved the crew. Those engineers in the 60s got it right the first time.

- Space tourism crept ever closer in 2011. Immediately after the 1969 moon landing, I sent away for my reservation on Pan American Airways' first flight to the moon. I don't remember the exact number—it was in the 5000s, I believe—and of course neither the reservation card nor Pan Am any longer exist. But some adventurers will soon take a short hop into space on Virgin Galactic's SpaceShip Two at $200,000 a pop, probably in 2013. The unofficial and arbitrary definition of the boundary of space is at 50 miles (80 kilometers) or 62 miles (100 kilometers) altitude, depending on whom you ask. SpaceShip Two will peak at 68 miles (110 kilometers) so there should be no question—you will be a space man or woman!

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The Virgin Galactic site has more on Space-Ship Two.

- Finally, where is NASA going with human spaceflight systems? After much confusion and controversy, the latest plans involve crewed vehicles that look like (and are) larger updated versions of the old Apollo-era capsules, and booster systems that look like an old Saturn V with Space Shuttle solid rocket boosters strapped to the side. The crew compartment rests at the top of the booster, and includes an escape system to pull the crew away from a failing booster.

  Where will the astronauts go? The proposed destination—a near-Earth asteroid—actually makes sense in several ways. It would be a long-duration (several months) mission that would rehearse the techniques needed for a later mission to Mars. It would not require a dangerous and fuel-hungry landing on and launch from the surface of a planet, since the asteroid's gravity is so low that we simply need to rendezvous with it–not land on it–in deep space. Perhaps most importantly, it would let us test out techniques for nudging such bodies into different paths. While there are no large asteroids on a collision course with Earth for the next century, such will not always be the case. Right now, if a mile-wide body were aimed at the Earth, there is not a single thing we could to prevent it. I for one would like to develop the capability to do more than hope that the impact point was on the other side of the world.If you have read this far, you deserve either my congratulations or my condolences, and perhaps both! My next post will look forward to what we might anticipate in 2012. Happy Holidays to everyone!

The December RVAS Solstice Social

December's Solstice Social was packed with friends – some who we haven't seen in a while, and food – which included an array of yummy desserts. After everyone loaded their plates and filled their glasses, members focused on a discussion of an exciting new Society project and a presentation of fascinating celestial events in 2012.

Food aplenty !

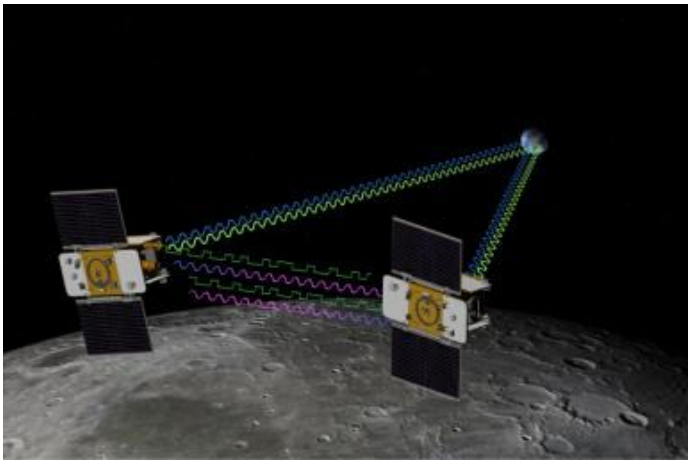
More food!

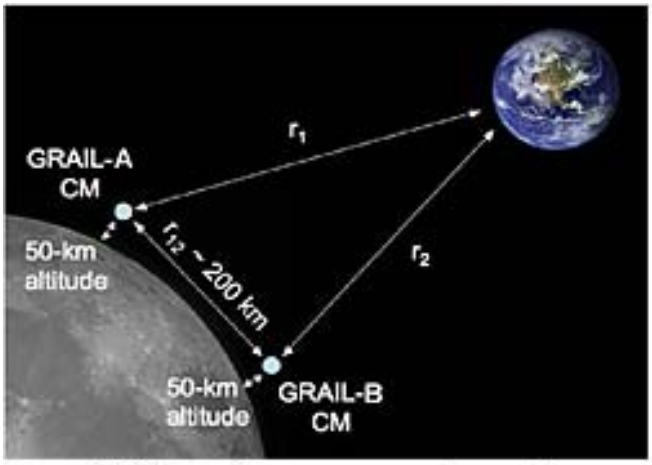
Welcome home, Issac!

Congratulations, you have come to The bottom of the Frank Baratta Memorial Franklin County Park LightShield Bowl. Let there be dark!

NASA'S TWIN GRAIL SPACECRAFT REUNITE IN LUNAR ORBIT

PASADENA, Calif. Jan. 1, 2012-- The second of NASA's two Gravity Recovery And Interior Laboratory (GRAIL) spacecraft has successfully completed its planned main engine burn and is now in lunar orbit. Working together, GRAIL-A and GRAIL-B will study the moon as never before.





GRAIL gravity measurement model

"NASA greets the new year with a new mission of exploration," said NASA Administrator Charles Bolden. "The twin GRAIL spacecraft will vastly expand our knowledge of our moon and the evolution of our own planet. We begin this year reminding people around the world that NASA does big, bold things in order to reach for new heights and reveal the unknown."

GRAIL-B achieved lunar orbit at 2:43 p.m. PST (5:43 p.m. EST) today. GRAIL-A successfully completed its burn yesterday at 2 p.m. PST (5p.m. EST). The insertion maneuvers placed the spacecraft into a near-polar, elliptical orbit with an orbital period of approximately 11.5 hours. Over the coming weeks, the GRAIL team will execute a series of burns with each spacecraft to reduce their orbital period to just under two hours. At the start of the science phase in March 2012, the two GRAILs will be in a near-polar, near-circular orbit with an altitude of about 34 miles (55 kilometers).

During GRAIL's science mission, the two spacecraft will transmit radio signals precisely defining the distance between them. As they fly over areas of greater and lesser gravity caused by visible features such as mountains and craters, and masses hidden beneath the lunar surface, the distance between the two spacecraft will change slightly.

Scientists will translate this information into a high-resolution map of the moon's gravitation-

(Grail Continued on page 14)

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al field. The data will allow scientists to understand what goes on below the lunar surface. This information will increase knowledge

Notional view of the Moon's interior

of how Earth and its rocky neighbors in the inner solar system developed into the diverse worlds we see today.

Each spacecraft carries a small camera called GRAIL MoonKAM (Moon Knowledge Acquired by Middle school students) with the sole purpose of education and public outreach. The MoonKAM program is led by Sally Ride, America's first woman in space, and her team at Sally Ride Science in collaboration with undergraduate students at the University of California in San Diego.

GRAIL MoonKAM will engage middle schools across the country in the GRAIL mission and lunar exploration. Thousands of fifth- to eighth-grade students will select target areas on the lunar surface and send requests to the GRAIL MoonKAM Mission Operations Center in San Diego. Photos of the target areas will be sent back by the GRAIL satellites for students to study.

A student contest that began in October 2011 also will choose new names for the spacecraft. The new names are scheduled to be announced in January 2012. Ride and Maria Zuber, the mission's principal investigator at the Massachusetts Institute of Technology in Cambridge, chaired the final round of judging.

NASA's Jet Propulsion Laboratory in Pasadena, Calif., manages the GRAIL mission for NASA's Science Mission Directorate, Washington. The GRAIL mission is part of the Discovery Program managed at NASA's Marshall Space Flight Center in Huntsville, Ala. Lockheed Martin Space Systems in Denver built the spacecraft.

For more information about GRAIL, visit:

http://www.nasa.gov/grail

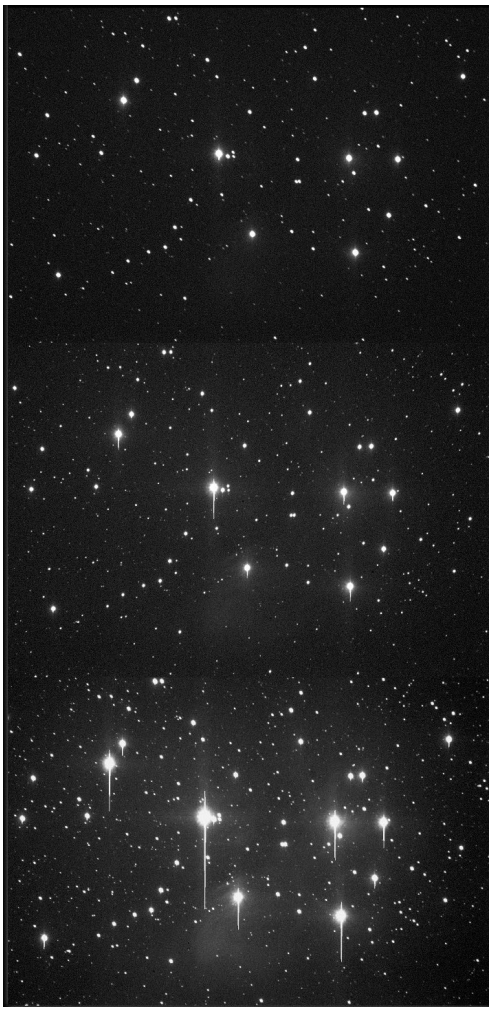
Information about MoonKAM is available online at:

http://solarsystem.nasa.gov/grail/education.cfm

Signal to Noise experiment with 91mm APO

By Michael Good

New Year's Day 2012. We all recovered from the night before, some of us went to church, and then after a quick rain in the afternoon, we were greeted to a ridiculously windy evening with scattered clouds. Obviously, I opened my observatory to take pictures!



There was a method to my madness. I had just completed removing the AO7 adaptive optics unit from my astro-CCD camera. I wanted to see if I could reach focus with my Burgess 91mm APO (refractor) using my Celestron 0.63 focal reducer attached to my color wheel and SBIG ST10xme camera. Without the AO7, all I needed was to see a star to play with the setup.

The attached image shows my "first light" with this optical setup. I chose the Pleiades, nice and high in the sky. The focal reducer allows me to see all the sisters on the same frame of my camera. I used 2x2 binning for this test. The picture shows three images, each show in 2x2 binning, which produces a meager 1092x736 pixels.

The top image is only a 5 second exposure. Even so, you still see the effects of wind buffeting the telescope (elongated stars). All the stars visible in a nice pair of 7x50 binoculars stand out in this image, but only the slightest hint of nebulosity. The camera I use has micro-lenses, which produce the star-burst diffraction spikes on the brighter stars. It is also a NON-BLOOMING camera. This is referred to as NABG, and produces the fastest CCD response. It also allows you to see when you have saturated the CCD chip, in case you are using the camera for photometry (measuring the brightness of stellar objects). In this case, only the stars without blooming tails can be used for measurements. I digress.

The middle image is a 15 second exposure with the same setup, and less wind. Far more stars are visible, the blooming spikes are longer, and the nebulosity around Merope is particularly

(S-to-N Continued on page 16)

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visible. Finally, the bottom image is 60 seconds in length, again with wind buffeting evident, longer "blooming" tails on the brighter stars, and much more nebulosity. I tried for a 120 second integration, but the wind simply would not allow it!

These images have NOT been flat fielded. Flat fielding removes the effects of optical vignetting. Even so, it shows how quickly a properly matched CCD system can capture nebulosity that took me far longer to capture back when I shot color ISO 800 film. I look forward to using this optical setup of the 91mm Burgess APO Doublet coupled to the focal reducer and CCD setup on a night without howling winds and scattered clouds.

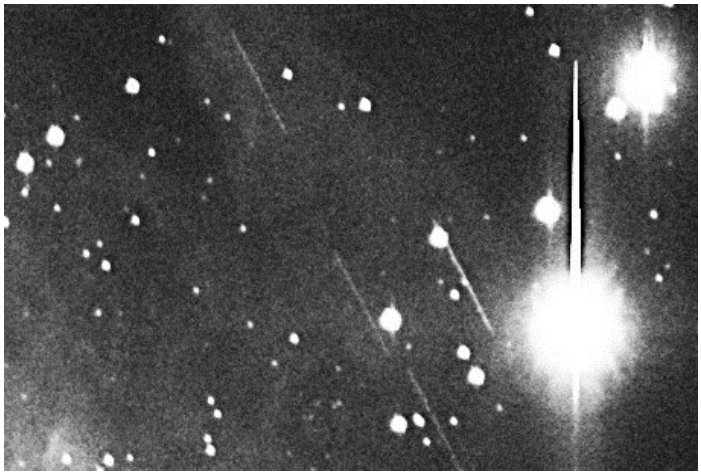
Satellite Invasion on New Year's Day

By Michael Good

On the same night as my M45/Pleiades experiments, I also grabbed some short exposures of the M42 and Running Man nebulas in Orion, using the 91mm APO Doublet with the SBIG ST10xme CCD.

The luminance makes a nice image of this field, especially considering this is only 10 fifteen second images summed together. But the POINT of this little article is to call attention to the satellites that are continuously streaking through our field of view in this neck of the woods. I remember that last year I took my camera and attached it to Paul Caffrey's William Optics Megrez 80mm at his home near Grandin and Patrick Henry High School. On that night like last night, the wide field views of my 91mm and Paul's 80mm, especially with a focal reducer used for both, resulted in catching a large patch of sky.

Notice the upper right corner of my image, highlighted in the inset image. Nine satellites captured in ten fifteen second images. Truly an invasion indeed!



Astro-Quiz

Renowned in mathematics, Leonhard Euler (1707-1783) was also famous in astronomy. But an annular solar eclipse on July 25, 1748, led to his wrong assertion about the Moon. What was Euler's assertion?

Answer to Last Month's Astro-Quiz: Last month we indicated that the return of a periodic comet to the inner solar system is often called a "visit." We asked why calling the return of Comet 2P/Encke a "visit" was a bit of a misnomer. Encke has a period of just 3.3 years, the shortest of any known periodic comet. At its greatest distance from the Sun—"aphelion"—it's still well inside Jupiter's orbit. But though Encke fades to as low as magnitude 20, it remains visible in professional observatory telescopes. So, it's not as if it's ever out of sight.

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*

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CALENDAR OF EVENTS

By Frank Baratta

MONTHLY MEETING: Monday, January 16, 7:30 p.m., Virginia Western Community College, Roanoke. This cold, harsh time of year is ideal for getting your scope ready for spring observing. Join everyone to learn about reflector and SCT collimation and about lens and mirror cleaning. Make your scope hum!

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

- **Friday and Saturday, January 13th and 14th. Sunset is at 5:25 p.m. Astronomical twilight ends at 6:57 p.m. The Moon rises at 10:27 and 11:34 p.m., respectively.**

- **Friday and Saturday, January 20th and 21st. Sunset is at 5:32 p.m. Astronomical twilight ends at 7:03 p.m. The Moon sets at 3:02 and 4:07 p.m., respectively.**

- **Future Sessions: February 10th and 11th; 17th and 18th**

ROANOKE CITY PARKS and RECREATION PUBLIC STARGAZE: Saturday, January 14th, 6:15 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: February 11th, 6:45 p.m., Cahas Overlook.))