



Roanoke Valley Astronomical Society

Amateur Astronomy News and Views
In Southwestern Virginia



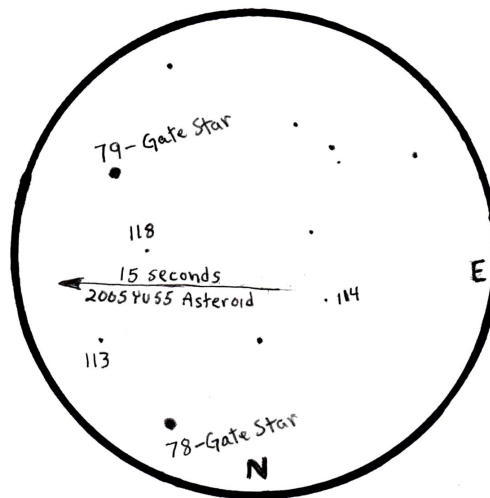
Volume 28—Number 12

December 2011

It was neither a dark nor stormy night

By John Goss

All the brouhaha about the little asteroid 2005YU55 — headlined as "Giant asteroid to pass near Earth" — prompted me to try to have a look at it as it passed between the earth and the moon on election night, November 8. Using fourth magnitude 9 Pegasi as the initial



reference star, I quickly located the field where the aircraft carrier sized rock (or rock pile) was predicted to pass at 8:45 p.m. Sky and Telescope had a useful finder chart on their website which gave both positions and times.

[\(Asteroid\)](#) Continued on page 2)

December 19 RVAS Meeting:

Solstice Social Gazes into the New Year

Indulge in an evening of camaraderie while hearing about the Top Ten Amateur Astronomy Events in 2012. Members are asked to bring snacks for all to enjoy and the RVAS will supply beverages to thirsty astronomers. We will also discuss RVAS activities in the next year. Please join us for this night of joviality!

Reminder: If you haven't paid your club dues please do so soon.

The glow from the nearby waxing gibbous moon brightened the field significantly. Stars fainter than twelfth magnitude could not be seen. The sky was clear and there was no wind, so waiting for the little space rock was not an unpleasant experience.

I waited. Nothing came flying by. When 9:00 p.m. arrived, I pointed the telescope to where the asteroid should be moving at 9:05. Again, nothing. Becoming a little frustrated, at 9:15 I slewed the scope to a location far ahead on its predicted flight path and waited and waited some more. There were two seventh magnitude stars separated by about 13 arc minutes that the asteroid was supposed to pass exactly between at 9:31, according to Sky and Telescope. They formed an easy-to-see "gate" through which the asteroid just had to pass. I waited.

Nothing at 9:31. But...

One minute later, I noticed a very faint point where there hadn't been one a minute earlier. It was 15 arc minutes to the west of the two "gate" stars and was situated next to a 11.4 magnitude star. The distance between the two, maybe 2 arc minutes, was closing. One of those two objects must be it, I thought. When their separation began opening, I realized which one was the sought after asteroid.

Genevieve hurried outside to have a look. She, too, saw the very dim object move between the gate stars. She found that by moving her head slightly while using averted vision she was able to spot it more easily. We followed it for another minute when it approached and nearly occulted an 11.7 magnitude star. The moving asteroid was of similar brightness.

It isn't often you get to see something noticeably move in "outer space" in real time. Quite exciting!

November 8, 2011; 9:33 p.m. EST

Equipment

Telescope: 10 inch SCT,

Eyepiece: 24 mm Panoptic

Magnification: 104x

Asteroid 2005YU55

*Apparent angular speed: about 15 arc minutes
per minute of time*

Magnitude: 11.3 - 11.8

Polar Ring Galaxy NGC 660

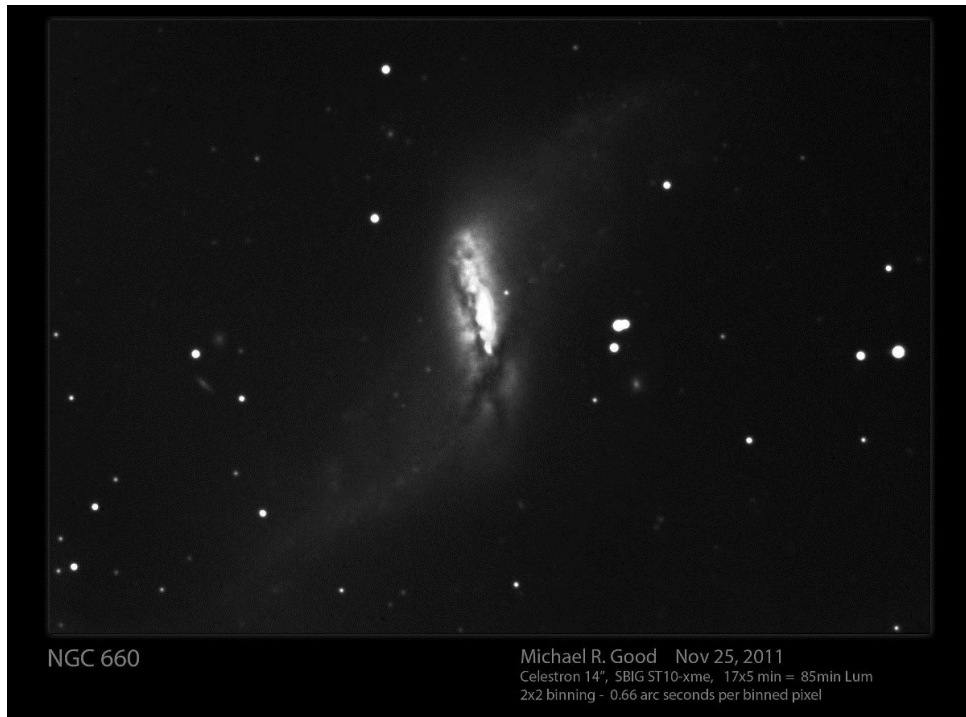
By Michael Good

On the clear night of Friday, November 25, 2011, Mike's Place Observatory (MPO) turned the Celestron 14" towards NGC 660. The air was delightfully transparent, but the atmospheric seeing was atrocious. Despite tweaking collimation (never a good idea during poor seeing, but still needed doing), I did a quick probe of edge-on galaxies that I might image (of particular interest to UVa's Dr. Steve Majewski, who looks at tidal streamers for interacting galaxies). I have imaged NGC 891 many times, and know it has no readily evident tidal streamers.

NGC 660 was chosen. This is listed as a Polar Ring Galaxy. These are rare structures that have rings of stars & gas orbiting at a large angle to the plane of their galaxies main disk. It is felt these galaxies may be the effect of seeing a galactic merger. Because of the poor seeing and small pixels of my CCD, I decided to image at 2x2 binning, so that instead of using 6.8 micron pixels, I combined four pixels to make one larger 13.6 x 13.6 micron pixel. This takes an obscene plate scale of about 0.33 arc seconds per pixel, and

instead uses 0.66 arc seconds (still not appropriate for bad seeing). In the not-too-distant future, I will be receiving a different adaptive optics unit from SBIG, where I can resume imaging with a focal reducer using the C14, which will solve my east-coast-skies imaging dilemma (the AO-8 has 1.9 inch back-focus requirement, compared to 3.5 inches for the AO

-7 unit that I currently use. My Celestron f6.3 focal reducer is out of spec when used with the AO-7 + color wheel + camera, producing vignetting and coma at the corners).



I took 17 five minute exposures and captured enough of NGC 660 to image the polar ring structure, and capture a number of background galaxies. This looks like a fun target for future work, when skies are a bit sharper, a focal reducer is again added to the imaging train, and color data is added.

Mars Science Laboratory Launches!

by Clark M. Thomas

On November 26th, 2011, the Mars Science Laboratory (MSL) flawlessly soared away from Earth toward its new home on Mars next August.

Attached to this short article is a NASA detail sheet of two pages that explains how the MSL is a big step beyond Odyssey and Spirit, on the way to possible human explorers henceforth. The purpose of this SUV-sized lab on wheels is to look for preconditions for microbial life within the layers of history revealed at its landing site.

This lab is fueled by plutonium, so the NASA public relations folks have made light of this source, along with praising the expanded capabilities, especially during the Martian winter. You can see videos about the power source, as well as videos about the launch, landing, and ground science here:

<http://marsprogram.jpl.nasa.gov/msl/ultimedia/videoarchive/>

At this time there are three satellites orbiting Mars, and one working robot rover, the venerable Odyssey. Curiosity, the new guy on

the block, will send its findings to orbit, for relay to Earth. Down on Mars it will be positioned in a crater to look back in time through layers of rock, much like an archeologist can do inside the Grand Canyon.



Attaching wheels to the Mars Science Laboratory

Although we might prefer humans on this ride, the total cost for Curiosity is only \$2.5 billion. The total cost, decades hence, for humans on Mars, with self-sustaining colonies, could exceed

\$2.5 trillion (my guess). Better generations of working robots will accomplish at a steep discount more science than could a few excited astronauts from America or China bouncing along the surface.

Even though we romantically prefer humans in space, economic realities likely would postpone or kill that option. Increasingly intelligent robots can satisfy our curiosities at a price tag the public would endorse. Even farther into the future, computer philosophers ([comphumans](#)) will inhabit and control deep space journeys to "nearby" stellar systems.



Mars Science Laboratory



NASA's Mars Science Laboratory mission is preparing to set down a large, mobile laboratory — the rover Curiosity — using precision landing technology that makes many of Mars' most intriguing regions viable destinations for the first time. During the 23 months after landing, Curiosity will analyze dozens of samples drilled from rocks or scooped from the ground as it explores with greater range than any previous Mars rover.

Curiosity will carry the most advanced payload of scientific gear ever used on Mars' surface, a payload more than 10 times as massive as those of earlier Mars rovers. Its assignment: Investigate whether conditions have been favorable for microbial life and for preserving clues in the rocks about possible past life.

Mission Overview

Plans for the Mars Science Laboratory call for launch from Cape Canaveral Air Force Station, Florida, between Nov. 25 and Dec. 18, 2011, and arrival at Mars in August 2012.

The spacecraft has been designed to steer itself during descent through Mars' atmosphere with a series of S-curve maneuvers similar to those used by astronauts piloting NASA space shuttles. During the three minutes before touchdown, the spacecraft slows its descent with a parachute, then uses retro rockets mounted around the rim of an upper stage. In the final seconds, the upper stage acts as a sky crane, lowering the upright rover on a tether to the surface.

Curiosity is about twice as long (about 3 meters or 10 feet) and five times as heavy as NASA's twin Mars Exploration Rovers, Spirit and Opportunity, launched in 2003. It inherited many design elements from them, including six-wheel drive, a rocker-bogie suspension system and cameras mounted on a mast to help the mission's team on Earth select exploration targets and driving routes. Unlike earlier rovers, Curiosity carries equipment to gather samples of rocks and soil, process them and distribute them to onboard test chambers inside analytical instruments.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., builder of the Mars Science Laboratory, has engineered Curiosity to roll over obstacles up to 65 centimeters (25 inches) high and to travel up to about 200 meters (660 feet) per day on Martian terrain.

The rover's electrical power will be supplied by a U.S. Department of Energy radioisotope power generator. The multi-mission radioisotope thermoelectric generator produces electricity from the heat of plutonium-238's radioactive decay. This long-lived power supply gives the mission an operating lifespan on Mars' surface of a full Mars year (687 Earth days) or more. At launch, the generator will provide about 110 watts of electrical power to operate the rover's instruments, robotic arm, wheels, computers and radio. Warm fluids heated by the generator's excess heat are plumbed throughout the rover to keep electronics and other systems at acceptable operating temperatures.

The mission has been designed to use radio relays via Mars orbiters as the principal means of communication between Curiosity and the Deep Space Network of antennas on Earth.

The overarching science goal of the mission is to assess whether the landing area has ever had or still has environmental conditions favorable to microbial life, both its habitability and its preservation.

Curiosity will land near the foot of a layered mountain inside Gale crater. Layers of this mountain contain minerals that form in water. The portion of the crater floor where Curiosity will land has an alluvial fan likely formed by water-carried sediments. Selection of Gale followed consideration of more than 30 Martian locations by more than 100 scientists participating in a series of open workshops.

Selection of a landing site of prime scientific interest has benefited from examining candidate sites with NASA's Mars Reconnaissance Orbiter since 2006, from earlier orbiters' observations, and from a capability of landing within a target area only about 20 kilometers (12 miles) long. That precision, about a five-fold improvement on earlier Mars landings, makes feasible sites that would otherwise be excluded for encompassing nearby unsuitable terrain. The Gale landing site is so close to the crater wall, it would not have been considered safe if the mission were not using this improved precision.

Advancing the technologies for precision landing of a heavy payload will yield research benefits beyond the returns from Mars Science Laboratory itself. Those same capabilities would be important for later missions both to pick up rocks on Mars and bring them back to Earth, and conduct extensive surface exploration for Martian life.

NASAfacts

Science Payload

In April 2004, NASA solicited proposals for specific instruments and investigations to be carried by Mars Science Laboratory. The agency selected eight of the proposals later that year and also reached agreements with Russia and Spain for carrying instruments those nations will provide.

A suite of instruments named Sample Analysis at Mars will analyze samples of material collected and delivered by the rover's arm, plus atmospheric samples. It includes a gas chromatograph, a mass spectrometer, and a tunable laser spectrometer with combined capabilities to identify a wide range of organic (carbon-containing) compounds and determine the ratios of different isotopes of key elements. Isotope ratios are clues to understanding the history of Mars' atmosphere and water. The principal investigator is Paul Mahaffy of NASA's Goddard Space Flight Center, Greenbelt, Md.

An X-ray diffraction and fluorescence instrument called CheMin will also examine samples gathered by the robotic arm. It is designed to identify and quantify the minerals in rocks and soils, and to measure bulk composition. The principal investigator is David Blake of NASA's Ames Research Center, Moffett Field, Calif.

Mounted on the arm, the Mars Hand Lens Imager will take extreme close-up pictures of rocks, soil and, if present, ice, revealing details smaller than the width of a human hair. It will also be able to focus on hard-to-reach objects more than an arm's length away. The principal investigator is Kenneth Edgett of Malin Space Science Systems, San Diego.

Also on the arm, the Alpha Particle X-ray Spectrometer for Mars Science Laboratory will determine the relative abundances of different elements in rocks and soils. Dr. Ralf Gellert of the University of Guelph, Ontario, Canada, is principal investigator for this instrument, which will be provided by the Canadian Space Agency.

The Mars Science Laboratory Mast Camera, mounted at about human-eye height, will image the rover's surroundings in high-resolution stereo and color, with the capability to take and store high-definition video sequences. It will also be used for viewing materials collected or treated by the arm. The principal investigator is Michael Malin of Malin Space Science Systems.

An instrument named ChemCam will use laser pulses to vaporize thin layers of material from Martian rocks or soil targets up to 7 meters (23 feet) away. It will include both a spectrometer to identify the types of atoms excited by the beam, and a telescope to capture detailed images of the area illuminated by the beam. The laser and telescope sit on the rover's mast and share with the Mast Camera the role of informing researchers' choices about which objects in the area make the best targets for approaching to examine with other instruments. Roger Wiens of Los Alamos National Laboratory, Los Alamos, N.M., is the principal investigator.

The rover's Radiation Assessment Detector will characterize the radiation environment at the surface of Mars. This information is necessary for planning human exploration of Mars and is relevant to assessing the planet's ability to harbor life. The principal investigator is Donald Hassler of Southwest Research Institute, Boulder, Colo.

National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

www.nasa.gov

JPL 400-1416 10/11



In the two minutes before landing, the Mars Descent Imager will capture color, high-definition video of the landing region to provide geological context for the investigations on the ground and to aid precise determination of the landing site. Michael Malin is principal investigator.

Spain's Ministry of Education and Science is providing the Rover Environmental Monitoring Station to measure atmospheric pressure, temperature, humidity, winds, plus ultraviolet radiation levels. The principal investigator is Javier Gómez-Elvira of the Center for Astrobiology, Madrid, an international partner of the NASA Astrobiology Institute.

Russia's Federal Space Agency is providing the Dynamic Albedo of Neutrons instrument to measure subsurface hydrogen up to one meter (three feet) below the surface. Detections of hydrogen may indicate the presence of water in the form of ice or bound in minerals. Igor Mitrofanov of the Space Research Institute, Moscow, is the principal investigator.

In addition to the science payload, equipment of the rover's engineering infrastructure will contribute to scientific observations. Like the Mars Exploration Rovers, Curiosity will have a stereo navigation camera on its mast and low-slung, stereo hazard-avoidance cameras. Equipment called the Sample Acquisition/Sample Preparation and Handling System includes tools to remove dust from rock surfaces, scoop up soil, drill into rocks and collect powdered samples from rocks' interiors, sort samples by particle size with sieves, and deliver samples to laboratory instruments.

The Mars Science Laboratory Entry, Descent and Landing Instrument Suite is a set of engineering sensors designed to measure atmospheric conditions and performance of the spacecraft during the arrival-day plunge through the atmosphere, to aid in design of future missions.

Program/Project Management

The Mars Science Laboratory is managed for NASA's Science Mission Directorate, Washington, D.C., by JPL, a division of the California Institute of Technology in Pasadena. At NASA Headquarters, David Lavery is the Mars Science Laboratory program executive and Michael Meyer is program scientist. In Pasadena, Peter Theisinger of JPL is project manager and John Grotzinger of Caltech is project scientist.

For more information about MSL, go to:

<http://www.nasa.gov/msl>

NASA Facts

The Veil Nebula

By Michael Good

I just processed this image of the Veil, taken back on Oct 21, 2011. It is 60minutes of luminosity and 30 minutes of color (10min/channel, or a 90 minute effort).

This is attaching the heavy ST10xme + color wheel + ao7 guider to the tiny 2" Burgess

processing. I made use of a nice posting on photoshop star repair (<http://bf-astro.com/starRepair.htm>), more impressively by selecting a conical portion of the top of the frame to apply this technique.

I only exposed dark frames (10 for lum, 3 for



90mm APO Doublet I got back in March, using just a camera piggy-back mount on my C14 for guiding with the Losmandy Titan.

The image was not completely in focus due to flexure (bottom in focus, top NOT in focus), producing some interesting challenges for pro-

cessing), and did not bother with flat frames. I left the three little stars with blooming spikes, for some "interest".

This target is worthy of a return, with more careful focusing and scope setup. I actually applied a 0.5 pixel ***BLUR*** to the final image, to reduce noise.

The 2012 Astronomical Calendar: Specially priced for RVAS members

The RVAS and the Astronomical League are pleased to announce a special offer for RVAS members from the Universal Workshop, the producers of Guy Ottewell's popular *Astronomical Calendar*. They are making the 2012 edition of the *Astronomical Calendar* available at a discounted price. There are plenty of good reasons why it has been published for nearly thirty-five years. The 2012 edition will not disappoint!

Packed throughout its 84 pages are monthly sky charts; daily celestial highlights; charts, tables, and explanations of planetary movements; eclipse times and paths; and lunar occultation specifics. There are extensive descriptions of the year's meteor showers and periodic comets, as well. This calendar tells, in clear language, what events occur and when they happen.

Club members can order this incredible compilation of the year's celestial events for \$19.95, shipping included (standard ground shipping to US addresses, only). But, to take advantage of the free shipping offer, you must order by Friday December 31, 2011, and either use the special website, www.Universalworkshop.com/clubs, or call 800-533-5083. The newly edited *Astronomical Companion* is also available at \$19.95, shipping included — if it is ordered at the same time as the *Astronomical Calendar*. Universalworkshop.com accepts Master card, Visa, Discover, American Express and PayPal.

Astro-Quiz

The return of a periodic comet to the inner solar system is often called a "visit." But for Comet 2P/Encke, with a period of just 3.3 years, calling it a "visit" is a bit of a misnomer. How come?

Answer to Last Month's Astro-Quiz: Last month we asked what phase the Earth would be as seen from the Moon, if the Moon was in its full phase as seen from Earth. Phases of the Earth as seen from the Moon are complementary to the Moon phases seen from the Earth. This is most obvious in this case. We know that at Full Moon, the Moon is at the other end of a line drawn from the Sun through the Earth, though slightly above or below (except at eclipses). So the Earth displays its dark side to the Moon; in other words, the Earth is "New" as seen from the Moon.

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)

John Goss, Vice President (vicepresident@rvasclub.org)

Rick Rader, Secretary (secretary@rvasclub.org)

Jeff Suhr, Treasurer (treasurer@rvasclub.org)

Carol Mesimer, Member at Large (memberatlarge@rvasclub.org)

Paul Caffrey, Immediate Past President (immediatepastpresident@rvasclub.org)

Randy Sowden, Past President (pastpresident@rvasclub.org)

David E. Thomas, RVAS Newsletter Editor (editor@rvasclub.org)

CALENDAR OF EVENTS

By Frank Baratta

MONTHLY MEETING: Monday, December 19th, 7:30 p.m., Virginia Western Community College, Roanoke. The evening program will be the Solstice Social . (Details on Page one of the December newsletter.)

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, December 16th and 17th. Sunset is at 5:04 p.m. Astronomical twilight ends at 6:38 p.m. The Moon rises at 12:34 and 1:42 a.m., respectively.

◇ Friday, December 23rd. Sunset is at 5:07 p.m. Astronomical twilight ends at 6:41 p.m. The Moon sets at 4:14 p.m. (The 24th is also good for anyone interested in Christmas-Eve observing.)

◇ Future Sessions: January 13th and 14th; 20th and 21st.

ROANOKE CITY PARKS and RECREATION PUBLIC STARGAZE: Saturday, December 17th, 5:45 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: January 14th, 6:15 p.m., Cahas Overlook.)