



Roanoke Valley Astronomical Society



News About Amateur Astronomy
In Southwestern Virginia
<http://www.roavas.org>

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January 2005

Astronomical Exploits and Good Cheer!

By John Goss

On the night before the winter solstice, the RVAS held its last meeting of the year.

Twenty-two members braved temperatures in the teens to share astronomical exploits and good cheer with fellow amateurs. There was plenty to report!

The latest from MPO

There is a distant galaxy behind the southeast edge of M31, the Andromeda Galaxy. This Zwicky Galaxy Cluster recently was imaged by **Mike Good** at MPO (Mike's Place Observatory). His image of these 16th, 17th, and 18th magnitude smudges were of "island universes" on the order of a billion light years away. Incredible! Mike also showed his images of other celestial objects including the newly arrived Comet Maccholz. Taken in the middle of December, its tail components could be distinguished. Over the next few weeks, its tail should brighten and lengthen.

Speaking of Comet Maccholz, it will be situated for easy early evening viewing in

January, especially on the 7th, when it will moving northward past the Pleiades. **John Goss** offered locator maps for this quick moving visitor.

Yes, you can see a black hole, sort of.

What does it take to observe this time of year in the cooler climes of the Cahas Mountain Overlook? For starters, try many layers of clothes from head to toes. **Clark Thomas** ventured up to the Parkway on December 18 for that evening's transparent, 6th magnitude skies. His efforts rewarded him with super views of the Rosette Nebula, Hubble's Variable Nebula, and what is perhaps the most distant object that can be seen visually through a telescope of 16 inches in aperture: quasar Q0405-0012 (MSH 04-12).

The light that Clark directly saw left its source some FIVE BILLION YEARS AGO. That's a few hundred million years before our Sun and Earth were formed from a dust cloud! Clark was witnessing emissions from matter accreting into a supergiant black hole – the quasar itself.

If you would like information about challenging objects visit: <http://www.skyhound.com/sh/skyhound.html>

December's RVAS public outreach

On Saturday night, December 4, the RVAS was part of the festivities at Explore Park. About fifty people stopped by the array of telescopes at our favorite Explore Park overlook for views of the Double Cluster, M57, M103, M31, the Sculptor galaxy, and other late fall favorites. The RVAS wants to thank those members who participated: **Carl Barnhart, Rand Bowden, Bill Green, Gary Hatfield, Katherine Hix, Mark Hodges, Carol Mesimer, Dave Thaler, Clark Thomas, and Richard Zue**. Without their efforts, this event could not have happened.

As 2004 winds down, RVAS President **Katherine Hix** briefly reviewed some of the more memorable Society events over the past twelve months. Among them were a couple of well attended public

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2005 Resolutions

By Clark M. Thomas

While we are planning all our New Year's resolutions, let's include some fun items with an RVAS astronomical theme, such as...

Mystery Object

On these cold winter nights, are you California Dreamin' with the Mamas and Pappas? If so, then you should be ready to name this month's big Mystery Object!

Send your best guess to Dave Thomas, our Mystery Object Columnist, at

thomasde-ka8inl
@worldnet.att.net



- 1) No more storage dust on the formerly must-have scope.
 - 2) Show children what is beautiful on any given night.
 - 3) Complete one or two of the Astronomical League's many challenge programs.
 - 4) Attend at least six monthly meetings of our club.
 - 5) Attend some star parties.
 - 6) Recruit one new member
 - 7) Volunteer for this year's VAAS to be hosted by RVAS.
 - 8) Write an article for the NL.
 - 9) Read an astronomy book.
 - 10) Take time to view comets, asteroids, meteor showers, aurorae, planets, satellites, and anything else that moves against the starry backdrop.
- Resolve *and* do just half of all these activities to make your 2005 be truly stellar! ★

Astro-Quiz

Over the centuries, many constellations have been concocted, and then fallen out of use. One such was *Custos Messium*, the harvest keeper. Where was this constellation, and what did it designate?

Answer to Last Month's Astro-Quiz: With "dark matter" such a timely topic, you might think that the term is of recent coinage. Actually, its earliest use appears to date back to **Jacobus Kapteyn (1851-1922)**. This Dutch astronomer developed a theory that the Milky Way galaxy was 55,000 light-years wide and one-fifth as thick. He noted that the system had to rotating to be stable and that observations of what was then called "star streaming" was evidence for this. Kapteyn noted that "when the theory is perfected it may be possible to determine the amount of dark matter [Kapteyn's italics] from its gravitational effect."

The Roanoke Valley Astronomical Society is a membership organization of amateur astronomers dedicated to pursuit of observational and photographic activities. Meetings are held at 7:30 p.m. the third Monday of each month at Center in the Square Roanoke. 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. Family membership is \$25.00; student membership is \$10.00. For information, call the RVAS Message Line at 540-774-5651. Articles, quotes, etc. published in the newsletter do not necessarily reflect the views of the RVAS, its editor, officers, or individual members.

RVAS web page: <http://www.roavas.org>

Officers/Executive Committee: **Katherine Hix**, President (334-2443); **Mike Overacker**, Vice President (776-3092); **Mark Hodges**, Secretary (774-5039); **Lynn Slonaker**, Treasurer (774-5695); **Bruce Jones**, Executive Committee Member-At-Large (774-3844); **Paul Caffrey**, Immediate Past President (345-2847); **Dave Godman**, Past President / New Member Coordinator (774-3337); **John Goss** and **Genevieve Goss**, Outreach Coordinators (966-4606); **Frank Baratta**, Membership and Public Viewing Coordinator (774-5651); **Mahesh Tailor**, Web Master (776-5472); **Clark M. Thomas**, Newsletter Editor (427-1873, clarkt7@cox.net).

The Local Group

By Genevieve Goss

2005 is here, offering a blank slate on which to write your hopes and plans for the new year.

For the amateur astronomer, if your previous resolutions to "get outside and observe" have fizzled, let this be the year you venture forth! Here are some general suggestions for getting started:

1) **Make the effort!** It's tempting to let observing

Last Month's Mystery Object

The December Mystery Object was an emission nebula in Perseus. Designated NGC 1624, it is a young star cluster that still has some of the original gas and dust cloud surrounding about a dozen stars.

The nebula is located on the sky at RA 4h 40m 24s, Dec. 50 deg, 27' and glows at magnitude 10. The object is faint in a 10" scope but is visible in a 6" scope with difficulty. Use a nebula filter.



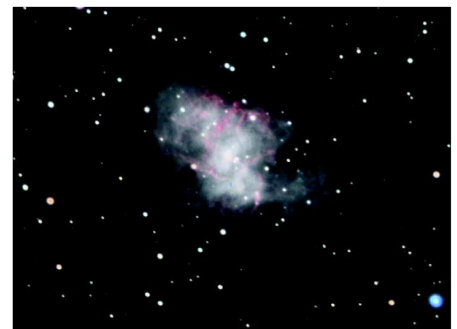
slide when life offers so many other time-consuming activities and responsibilities. This new year, make a commitment to attend at least one public and one club observing session. You'll enjoy sharing your knowledge of the heavens with many who may never even have seen the Milky Way or the Moon through binoculars. Club observing sessions give you the chance to learn from your colleagues' experience.

2) **Don't be intimidated!** Club members encompass all levels of knowledge and expertise. Their astronomy paraphernalia ranges all the way from unaided eyes to computer enhanced imaging equipment. *You do not need to own a telescope to attend observing sessions.* Feel free to ask questions or ask to look through someone's eyepiece. Astronomy is a hobby with ever-expanding horizons; no one knows everything!

3) **Prepare!** The experience of observing under dark, clear skies is a reward in itself. However, if you prepare by looking at the newsletter sky chart, sky maps, or web sites such as *Sky and Telescope's* Interactive Sky Chart, you'll have specific observing tasks, and will be on your way to earning your Astronomical League Messier certificate! Choose first a few easy objects to observe, based on your personal level of knowledge. As you gain experience, go for more difficult objects.

4) **Practice observing courtesy!** Dim your headlights as you approach the observing area. Before you arrive, turn off dome lights, or obscure them with red cellophane/plastic. (Your auto parts store can sell you red interior light bulbs.) Ask before you touch or look through someone's equipment. Although soliciting opinions on equipment is encouraged, refrain from making editorial comments about the size or quality of another's telescope! Whether you're a beginner or a seasoned observer, try not to monopolize anyone's time.

5) **Enjoy!** Feel good about the progress that you are making. Pride yourself in participating in such an exciting hobby. Be happy that you're not shopping in a crowded mall! And don't underestimate the stress-relieving benefits of being in fresh (albeit cold!) air, in relative quiet, with the sparkling dome of the night sky above you. ★



Michael Good's nifty image of the Crab Nebula (M1) reminds us of the many beautiful things to see this winter and spring. Just step outside!

Mark your calendars now!...

Top Ten Amateur Highlights for 2005

By John Goss

What will the new year bring? Will there be any cool stuff in the sky?

To answer these questions I concocted a list for 2005, in chronological order:

1. January 7

Comet Macholz C/2004 Q2 is next to the Pleiades.

2. January 13

Mercury and Venus are separated by 19 minutes around 7:00 am. They will have an altitude of 6°. Sunrise is at 7:33 a.m.

3. January 25

Saturn passes in front of open cluster NGC 2420 at about 10:00 p.m. NGC 2420 has a diameter and integrated magnitude of 10' and 8.3, respectively. Imagine bright Saturn floating among a sparkling field sprinkled with 10th magnitude stars!

4. March 3

Third quarter Moon occults Antares at 6:34 a.m. They will be 26° above the western horizon. Sunrise is at 6:47 a.m.

5. April 8

Partial solar eclipse. Only 4% of the Sun is covered. Be sure to use the proper whole aperture solar filter! The eclipse begins at 5:50 p.m.; eclipse ends at 6:50 p.m.

6. April 11

Moon - Pleiades are separated by 1° at 8:30 p.m. The moon is at 11% phase and at 28° altitude in the northwestern sky.

7. April 14

At 10 p.m. Jupiter 7' south of NGC 4691, an 11.8 magnitude galaxy. This will demonstrate the small apparent size even large planets actually have!

8. May 24

Full Moon occults Antares at 4:45 am. They are 14° above the western horizon.

9. June 25-26

Saturn, Venus and Mercury form a close (1°) grouping just after sunset in the northwest.

10. August 12-13

Perseid Meteor shower in the early mornings of August 12 and 13.
Moonset 8/11: 11:25 p.m.
Moonset 8/12: 11:56 p.m.

11. Oct. 30

Mars is nearest to the earth 0.464 AU (43 million miles). Although its diameter will be only 20", some 5" less than in 2003, it will be much higher in the sky than in the 2003 apparition.

There you have the Top 10, errr, Top 11!

Certainly, there is something for everyone: comets, planetary arrangements, occultations, meteors, and an eclipse.

When viewing these, think "RVAS Astrophotography Contest!" ★



And Let's Not Forget 2004!

Last year was full of rare beauty, highlighted by the Venus transit, which many of us were fortunate to see rising above the misty valley below.

Last year was also a time to see the Sun and Moon dance in shadows. It was a time to watch beautiful auroras, a supernova, and the ISS. It was a time to view the majestic planetary progressions. It was a time to visit VAAS in Charlottesville, and a time to start preparing for our VAAS guests in 2005!

Very Large Array Telescope

By Dave Thomas

Fifty miles west of Socorro, New Mexico, on U.S. highway 60, and two miles south on state highway 52 is the location of the Very Large Array radio telescope.

This modern marvel of radio astronomy, comprising twenty-seven radio telescope antennae, can stretch out to encompass an area the size of Washington, D.C.

The telescope uses a "Y" configuration, and each leg can be as long as thirteen miles, and as short as two thirds of a mile. It can resolve objects ten seconds of arc, or the width of our galaxy.



Photo: Dave Thomas

Each individual antenna is mounted on rails, and is movable from one location to another as needed for each configuration. The antennas are



RVASers go far and wide to get the story!

Photo: Dave Thomas

eighty-two feet in diameter and ninety-three feet tall when pointed straight up.

The signal from each antenna, ranging from 400 to 0.7 centimeters, is fed into the control building by a wave guide. This wave guide also allows control signals to be passed to the antennas from the control building.

The VLA was proposed in 1967 by the National Science Foundation, and completed in 1981 at a cost of just one dollar for each taxpayer.

The Small Radio Telescope, used for solar observations and visitor education, is located next to the visitor Center. The Small Radio Telescope is a single parabolic dish about eight feet in diameter.

The VLA is impressive to say the least. No photograph can give one the sense of the size and complexity of this man-made wonder. I can only recommend that, if given the opportunity, you should visit the site. ★

Hate Light Pollution?

Both Roanoke County and Roanoke City are in process of re-writing comprehensive zoning ordinances... jurisdictional documents that can (if so written) put specific limits on the type, quantity, and quality of exterior lighting in new construction, and especially in new development requiring re-zoning.

Both the city and county are requesting public in-put on their new ordinances. Now is a prime time to have a voice in getting lighting restrictions into these documents, as these ordinances could become the rule for the next 25 years.

Contact Jeff Wood
jeff@rifewood.com
344-6015

Stars: A Thousand Points of Light?

By Michael Good

In a telescope all stars look like points of light, and on some photos they are small, but on other photos they appear like big round balls of light. What's up? (Please... no Horkheimer humor here!) We must compare our eye to both film and CCD cameras.

If the retina of our eye were unfolded, it would be a collector about 40mm in diameter. Our lens, the pupil, can range from 7mm down to 1.5mm, with a focal length of about 16mm (to the back of your eyeball, dude). That means our eye has a focal ratio of $f/2.3$ to $f/11$.

The light receptors in our eye, the rods and cones, total about 100,000 cells (just like the pixels in digital cameras). The cones are the cells in the middle. There are about 1000 cone cells every millimeter, so they are about 2 microns in size each, but the eye collects light with short "integration times": 1/10 to 1/5 of a second per exposure. This allows us to detect motion. It also prevents us from seeing faint objects. When we look at stars in a telescope, we are taking 1/5 of a second exposures. The cells of our eye are almost 100% efficient detecting photons, but the light must pass thru "neural nets" in front of these light detector cells, so it ends up that only about 15% of the photons striking our eyes (at 505 nanometers) is detected.



NGC 7331 and the Deer Lick Galaxy Group

Photo: Michael Good

Film is only about 3% to 4% quantum efficient (throws away 96% of the light that strikes it!), but you can allow the film to count the photons for much longer than the 1/5 of a second limit of our eye. Film uses grains of silver halide crystals that are about 1 micron across, so higher resolution than our eye, but require 5 to 20 microns to create a decent image (proper S/N ratio).

Photons cause a defect in the crystals. These defects heal themselves unless more photons strike the same area. Only 3 or 4 photons can create a grain on the film, with 10 billion silver atoms. These grains become the negative

on the film. However, since this reaction to photons is chemical (and non-linear - more time does not mean a deeper image), as more light strikes the same area on film, the chemical reaction spreads to adjacent grains on the film. This means, a brighter star results in a larger clumping of grains than a fainter star. We can calibrate the size of these clumps to perform photometry with the grains on film. The size of the stars on film is dependent on how sensitive the grains are (the ASA or ISO rating of the film), and the exposure time.

But notice that you cannot "stretch" the resulting image.

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December RVAS Meeting

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events. Who can forget the 400 people at the Parkway Comet NEAT event last May, and the great coverage by *The Roanoke Times* of June's Venus transit? Again, events like those aren't possible without the efforts of club members. Thanks to everyone for making it a superb year!

Amateur Astronomy's Most Serious Threat

What to do about light pollution? Roanoke City is currently modifying its

ordinances, including those that affect outdoor lighting. RVAS member **Jeff Wood** presented information about this process, and encouraged everyone to join him in expressing the need for an effective lighting code.

Door Prizes and Food!...

There was one last detail before the social could begin: the awarding of door prizes! We had four lucky winners: A much coveted RVAS mug filled with snack goodies was given to **Elizabeth Smith**. **Rand Bowden** came away with a 2005 Astronomy

wall calendar, and **Mike Overacker** added to his vast collection of alien memorabilia with a "Grow Your Own Alien." The final prize was awarded to **Dave Godman**. It was a framed picture of last June's Venus transit, taken by Mike Overacker. Come to a meeting; you may get a prize!

Finally, the members were let loose on all the snacks and drinks that everyone brought. What a good way to end the RVAS year! Well almost the end: the RVAS will bring in the new year with telescopes at Vinton's December 31st Enchanted Evening. ★

Thousand Points of Light?

...Continued from Pg. 6

If it is overexposed, you cannot reconstruct the lost data. Enter CCD chips.

The Charge Coupled Device can be made with picture elements of many different sizes, in many different array sizes. Common amateur CCDs on the market use 6.8, 7.4, or 9 micron sized pixels. Considering the 20 micron size of film grains to get a proper image, using smaller CCD pixels means you can over-sample your images.

As with our eye, the f-ratio determines the optical size of a star (let's not go into Airy Disc math here!), but it is actually electronic charge that bleeds across pixels to make a bright star appear larger on a CCD image. Fine. So why are my star sizes bloated? Well, if I were using a monster

telescope with a super huge CCD, I would be massively OVER-sampling the image. I would be placing MANY of my pixels on a star. Each pixel is like a rain bucket. If you put too much light in one bucket, it can spill to adjacent buckets (star gets bigger). But if you spread the light out over more buckets (over-sampling), you reduce spillage.

If you take an observatory class CCD (massive array sizes), and over-sample an image (add more rain buckets), you don't get a lot of light spilling into adjacent buckets. After you then resample this monster CCD picture array down to an image that will fit on one computer screen, the stars become TINY.

This is why images taken with large observatories using

large CCD chips result in small stars. What about the amateur?

To make a picture of a faint galaxy, you have to scale (gamma-log) the image to allow the eye to both see the bright star data AND the background faint details. When you do this, the stars grow in size. You must then work with a number of mathematical techniques to try and reduce the smearing of the atmosphere and telescope (called deconvolution) to try and reduce the sizes of the stars.

For pinpoint stars, just display the "high frequency" data, but then you don't see the faint spiral arms.

To display the faint data, you must bloat the stars and try to then shrink them with matrix operations (erosion, deconvolution, unsharp masking, etc). ★

Society Events and Activities for January 2005

JANUARY MEETING: Monday, January 17th, 7:30 p.m., fifth floor meeting room, Center In The Square, Roanoke. Member **Bruce Jones** is presenting the evening's main program, on the subject of celestial navigation.

"MEMBERS ONLY" WEEKEND OBSERVING SESSIONS: Unless otherwise noted, observing sessions are held at Cahas Mountain Overlook, milepost 139 on the Blue Ridge Parkway.

* **Friday and Saturday, December 31st and January 1st.** Sunset is at 5:13 p.m. Astronomical twilight ends at 6:47 p.m. The Moon rises at 9:57 and 10:57 p.m., respectively.

* **Friday and Saturday, January 7th and 8th.** Sunset is at 5:19 p.m. Astronomical twilight ends at 6:52 p.m. The Moon sets at 2:14 and 3:09 p.m., respectively.

* **Friday and Saturday, January 28th and 29th.** Sunset is at 5:41 p.m. Astronomical twilight ends at 7:11 p.m. The Moon rises at 8:51 and 9:52 p.m., respectively.

* **February Sessions: 4th and 5th.**

FRANKLIN CO. PARKS DEPT./RVAS PUBLIC STARGAZE: Next session March 12th, 7:00 p.m.

ROANOKE CITY PARKS DEPT./RVAS PUBLIC STARGAZE: Saturday, January 8th, 6:00 p.m., Cahas Overlook, milepost 139, Blue Ridge Parkway. For City, County and other area residents; RVAS members welcome to participate. Call the RVAS Message Line, 540-774-5651, for information. (Next session: February 5th, 6:30 p.m., Cahas Overlook.)

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