Roanoke Valley Astronomical Society

Amateur Astronomy News and Views
In Southwestern Virginia

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RVAS Picnic at Apple Ridge

By Michael Good

It was a small group (8), but we had fun, because it was like a family picnic. It did NOT rain. We played tennis, we ate, we visited, and we enjoyed the observatory.

I saw a wild turkey walking past the observatory when I first drove up, plus the usual deer. We also did some weeding of the Dobsonian pad that we made for RVAS members to use, and had some fun with Mark making faces.

Food Aplenty

Next year we can talk about a rain/cloud date, assuming that is why more folks did not come.

Gathering in the Observatory

Dob Pad Police Call

"Clear Sky clock says, What!!?"

Supernova!

By Neal Sumerlin

There is a reason why most of the major observatories in the U.S. are west of the Mississippi River. The clouds and rain we have had in Virginia for the last several weeks have reduced our view of the heavens to about 10,000 feet above us. I know my friends and loved ones in Texas would love to swap climates with us for just a little while, but it has been frustrating for those of us who would like to see a little farther than the clouds.

The major phenomenon we are missing is one of the nearest and brightest supernovae in decades. But before we get going on this particular supernova, let's provide a little background on the subject.

What is a supernova?

A supernova is a stellar explosion that results in a burst of energy being released, appearing to be a "new star" in the heavens before it fades over weeks or months. Before it does so, it can outshine an entire galaxy of hundreds of billions of stars.

What are the different types of supernovae?

There are basically two. Type II (type two) supernovae result from the deaths of massive stars, ones that are ten, twenty, or fifty times as massive as our sun. They do not go quietly at the end of their lives. There comes a point in their cores when they can no longer sustain themselves against the crushing gravitational force of their huge masses. A complex series of events ensues, not all of which are fully understood, the end result of which is a massive explosion visible across billions of light years of intervening space.

Type Ia (type one a) supernovae are different. These can only occur in binary star systems, ones where two stars orbit each other in close proximity. This allows one star to "steal" material from the other, as its gravity pulls matter from its companion.

The star that eventually becomes a Type Ia supernova is a white dwarf. This is the eventual fate of our sun and of all low-mass stars. Our sun will not become a supernova because it lacks a stellar companion. But a star in a close binary system, instead of quietly fading away, can acquire matter from its partner, steadily increasing its mass. A white dwarf sustains itself against further collapse by something called electron degeneracy. Not a comment on the morals of subatomic particles, this term refers to the ultimate crowding together of atomic matter, pushing atoms so close to each other that the electrons making up their outer regions start pushing back.

But if there is enough matter, and the consequent gravitational force is strong enough, even this is not enough to prevent further collapse. One solar mass is not enough—our sun will simply cool and fade over hundreds of millions of years. But the progenitor of a Type Ia

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supernova? It is gradually adding more and more mass until it reaches a critical limit at 1.4 solar masses: the Chandrasekhar limit. At this point the star undergoes further collapse, and a runaway nuclear reaction essentially consumes the entire white dwarf star. These events are among the most energetic in the universe.

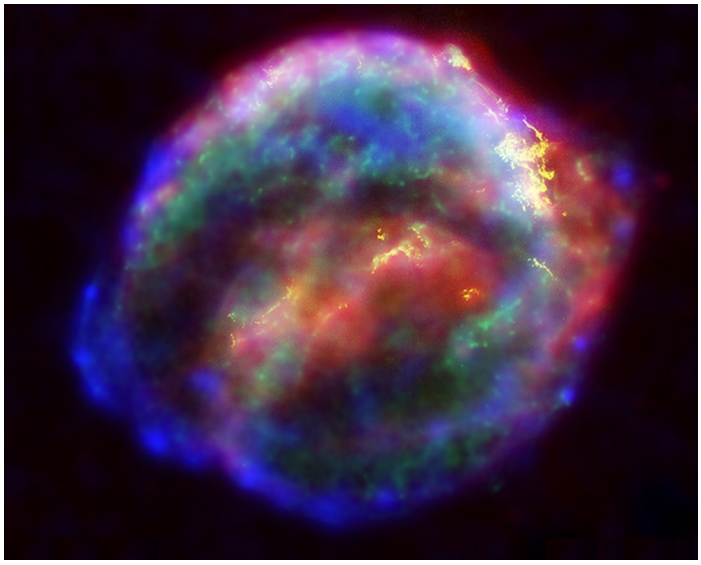
What's so special about Type Ia supernovae?

Remember that the explosion occurs when a particular mass limit is reached, so the runaway nuclear reactions consumes the same amount of matter for each Type Ia explosion. The explosions have consistent characteristics, and can be used as "standard candles" useful in determining cosmic distances. If a bright object's actual luminosity (energy output) is known, then a comparison of its brightness (its appearance) with its luminosity (its actual energy output) can yield its distance. A candle held next to your eye appears much brighter than any star. We recognize that the difference in appearances is the result of a vast difference in distance.

How often do supernovae occur?

In our own Milky Way galaxy, the estimated rate is once every 50 years, although the last one actually observed was in 1604, five years before the invention of the telescope. The cloud of hot expanding gas that is its remnant is shown below.

As our telescopes became able to see farther and farther into space, we found more and more supernovae in distant galaxies. This is illustrated nicely by the naming system for supernovae. The first supernova of any given



SN 1604A

year is designated as (for example) SN (for supernova) 2011A, the next is SN 2011B, and so on. Once the alphabet is run through, the next discovery is SN 2011aa, then SN 2011ab, etc. In 1987, a naked-eye supernova was discovered in the Large Magellanic Cloud, a small companion galaxy to our Milky Way. Discovered on February 23, it was the first of the year: SN 1987A. By contrast, the recent supernova, discovered on August 24 from images taken on the nights of August 22 and 23, is designated SN 2011fe—the 161st of the year. A supernova discovered on February 21 of this year is SN 2011ap. The last supernova of 2010 was SN 2010ma. For a list of recent supernovae, go here: http://cbat.eps.harvard.edu/lists/RecentSupernovae.html

What are the particulars of this supernova?

It is in a relatively nearby galaxy (21 million light years away is a close neighbor on the galactic scale) known variously as M101 and the

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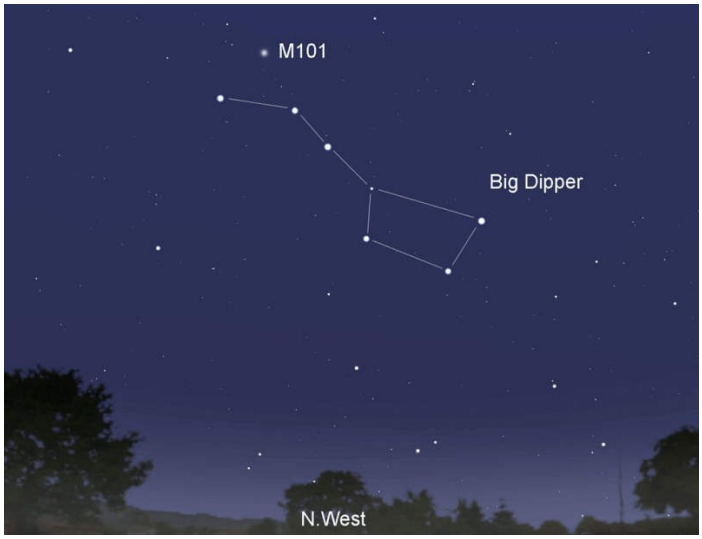
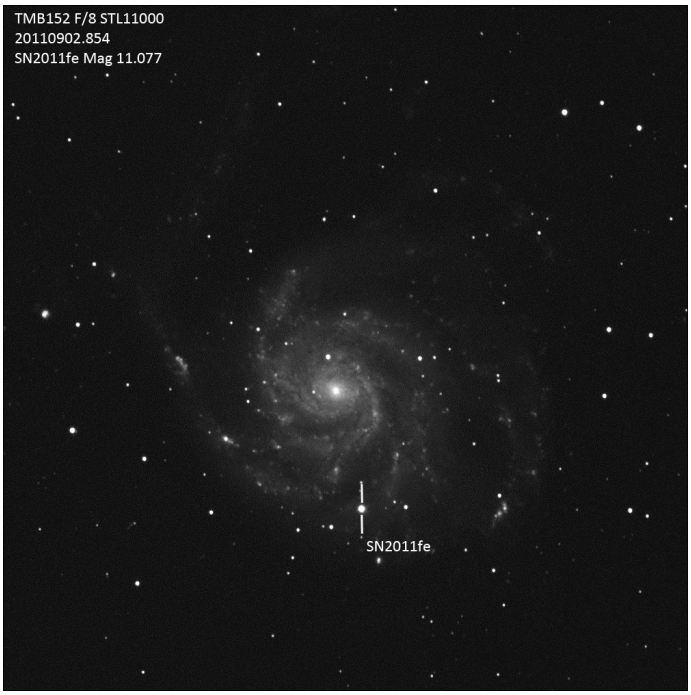
Pinwheel Galaxy. It is easily visible even in modest telescopes, above the "handle" of the Big Dipper, as shown below. It reached its maximum brightness on September 13, and even then it was not visible to the naked eye. It will fade slowly, and should be visible in telescopes for several weeks to come.

Here is a diagram indicating where to find the galaxy and the supernova:



Where to find the supernova

And here is an image of the supernova taken on September 2:



SN 2011fe

The main significance of this event is how quickly after the initial explosion images were captured. This should give us sharper insight into the mechanics of these titanic outbursts, and make them even more reliable as yardsticks for a very big universe.

Astronomy in 2030

By Clark M. Thomas

Plato said "awe is the beginning of philosophy." It is also the beginning of science, and a door to becoming our very best selves.

When I was ten years young in the mid-1950s there was another very active astronomy club in Roanoke to which I belonged. We met monthly in the Roanoke Library on the second floor.

Frequently a dozen or so of us assembled at Cahas to view the heavens through telescopes. We all had a great time gazing at faint fuzzies with our homemade six-inch reflectors. Nobody knew what a CCD was.

Two of my fun memories were being at Cahas when it really was a dark skies site – and when about ten adult club members were arranged in a line of chairs, peering into strange finder scopes that pointed downward toward the ground. Oh yes, there was a mirror attached to each tiny scope that reflected a precise area of the sky. In this way our adult viewers, along with other cooperating clubs, could listen to Naval Observatory time on the short wave radio – and thereby track...are you ready for this?...the first American satellites. Soon our military developed the capability to track their own launches, to see if they went into orbit. We were happy to play our part at the beginning, and nobody complained when our contribution was replaced by technology.

Flash forward to today to find a much different amateur astronomy scene. There remain a few antediluvians who actually look at the firmament through visual telescopes. More and more, however, amateur astronomy is separated from professional astronomy only by the cost of the electronic toys. Today's well equipped CCD amateurs in dark skies locations can secure and process images more compelling than images from even the largest observatory telescopes of my childhood.

It is tempting to project a straight line to the near future, such as 2030. This date is far enough into the future to realistically conceive; but not so far as to be mostly science fiction. Let's see what's in store both for amateurs and professionals:

The inspiration for this essay is Ray Villard's essay in Discovery News, entitled "The 'Virtual Universe' Will be Full of Discoveries." http://news.discovery.com/space/online-virtual-universe-will-be-full-of-discoveries-110816.html

Mr. Villard details all the fantastic equipment that will be at the command of professional astronomers. The frontiers of our science will be pushed closer to the local big bang. Some

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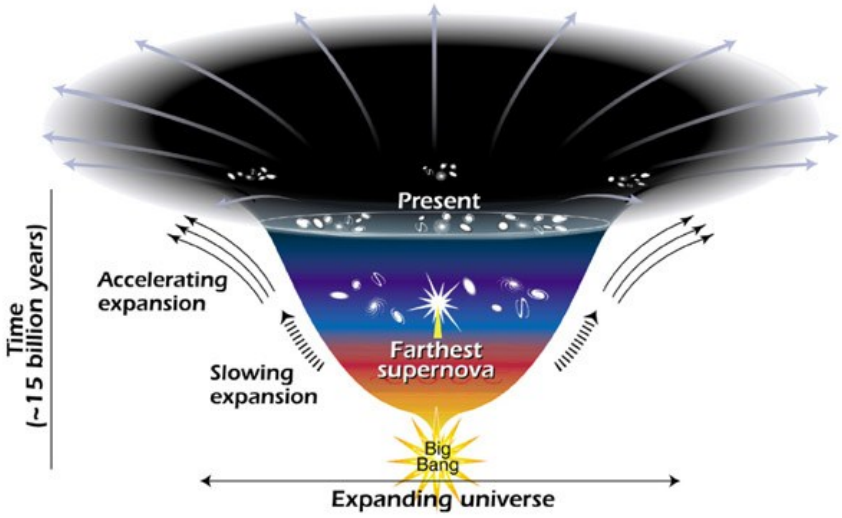
There Is No Dark Energy

by Clark M. Thomas

When an idea gets popular fewer people are willing to challenge the new "truth." The idea of inflation in the known universe was established by Hubble, and has continually been supported by red-shift observations. What supposedly explains this phenomenon is Einstein's "fudge factor," Dark Energy.

As early as 200 B.C. the idea of a heliocentric model for the known cosmos was advanced by Greek philosophers. However, a much more believable model was the geocentric model. It was better at explaining many observations, such as why things fall down to Earth. It also had a good answer for the fairly constant brilliance of Venus. The Catholic Church loved it. It was only after Copernicus advanced his heliocentric vision that the Sun was placed at the center of what was known. Galileo, Kepler, and Newton supported Copernicus, and all was well – until those faint fuzzies turned out to be very distant nebulae and galaxies, and the Sun was found to be just another grain of sand in the celestial beach.



This diagram reveals changes in the rate of expansion since the universe's birth 15 billion years ago. The more shallow the curve, the faster the rate of expansion. The curve changes noticeably about 7.5 billion years ago, when objects in the universe began flying apart at a faster rate. Astronomers theorize that the faster expansion rate is due to a mysterious, dark force that is pushing galaxies apart.

Dark Energy is the kind of mystery scientists love. It is an elusive idea somehow associated with the "god" Einstein. It is potentially provable, but not easily without spending billions of dollars on toys for astronomers, and it is romantic. The only problem is, there is no dark energy. This emperor has no clothes.

Whereas Dark Matter has been verified through many experiments, and it does interact with baryonic matter (the stuff we can see and detect) through gravity, so-called Dark Energy is only demonstrated by red shifts which accelerate beyond several billion light years. Dark Energy is sometimes seen as a fifth fundamental force, joining gravity, electromagnetism, and the strong and weak nuclear forces.

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The problem with such acceleration measurements "proving" Dark Energy, is that they are dependent on either the idea of a unique Universe; or on a universe among a community of other universes, each gravitationally independent of each other, and all within one Universe.

In science the law of the minimum is highly respected. It is also known as Occam's Razor. Briefly, scientists look for hypotheses with the simplest explanations. A much simpler explanation for "dark energy" red shifts is the increasing flow of intergalactic gravitons as galaxies are pulled toward the edge of our known universe, which is also approaching the adjacent universe's mass. This phenomenon works in all directions that we look, because there are universes adjacent to ours in all directions, much as we see in a foam of bubbles.

There already is some evidence of matter beyond our big bang's expansion, as seen by variations in the CMB (Cosmic Microwave Background). Big science looking for nonexistent Dark Energy will by necessity discover more about the one universal force, the only unifying force in Nature, gravity.

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great questions will be layered over with finer hypotheses, but never really answered. It will be a time of vast raw data accumulations pouring into our virtual astronomical library. Hundreds or even thousands of armchair professional astronomers who never look through any great instruments will thereby be employed to look for patterns.

Villard's vision of full employment for armies of astronomical technicians is naively flawed. Trained human eyes will mostly be superseded by super-intelligent pattern recognizing programs. Humans will mostly be left to abstract theorizing, and to very high level analysis of data patterns.

Nevertheless, our visual cortices will continue to team up with analytical grey matter to sometimes challenge the AI, at least until 2030. One example is the recent armchair discovery of nova ring signatures in galactic clouds above the Milky Way. They are just sitting there on selected web images, as if waiting for discovery. That's the spirit of my recent talk to the club. Review the evidence in our January 2011 RVAS newsletter, pages 11-14.

NASA false color image of M82 showing X-ray, visible, and infrared

Some amateurs in 2030 will be out on cold nights with modest equipment, exploring the same skies I enjoyed with awe in the 1950s. No matter how many billions are spent on Big Astronomy, money cannot buy awe. Just one night under a clear dark sky gives it to us for free. I like to imagine that Plato became a philosopher one night under his celestial canopy.

Astro-Quiz

Over the centuries there have been many star maps and catalogs. But those of Flamsteed and Draper involve a bit of a misnomer. Why is that?

Answer to Last Month's Astro-Quiz: The star patterns we know today have been visualized differently among cultures. One of the brightest and best known is Orion, which has an ancient history. Many cultures have seen this pattern as a hunter. However, to the ancient Egyptians, this bright winter constellation was envisioned as Osiris, the God of Light.

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, October 17th, 7:30 p.m., Virginia Western Community College, Roanoke. The evening program to be announced .

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, October 21st and 22nd.** Sunset is at 6:35 p.m. Astronomical twilight ends at 8:02 p.m. The Moon sets at 3:12 and 3:46 p.m., respectively.

◊ **Friday and Saturday, October 28th and 29th.** Sunset is at 6:27 p.m. Astronomical twilight ends at 7:54 p.m. The Moon sets at 7:52 and 8:52 p.m., respectively.

◊ **Future Sessions: November 18th and 19th; 25th and 26th.**

ROANOKE CITY PARKS and RECREATION PUBLIC STARGAZE: Saturday, October 22nd, 7:15 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: November 26th, 5:45 p.m., Cahas Overlook.)