nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

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Yuri's Night and Mount Wilson

Every April 12th there is a world-wide celebration known as "Yuri's Night" to commemorate the first time man went into space. Yuri Gagarin made one revolution of the planet in 108 minutes on April 12th, 1961, and became the first human in space. I went to the 2013 celebration hosted by the Planetary Society at the Samuel Oschin Pavilion, California Science Center, Los Angeles, underneath the Shuttle Endeavour. This event was sold out. I got to meet and talk to with moon walker Buzz Aldrin, Astronaut Garrett Reisman, X-Prize founder and CEO Dr. Peter Diamandis, and President & CEO of Virgin Galactic George Whitesides and his wife Loretta the Co-Creator of "Yuri's Night". I also met Benjamin and Cariann Higginbotham, the husband and wife team of Spacevidcast.com. Also in attendance was the Mohawk Guy (Bobak Ferdowsi) of JPL Mars Curiosity landing fame. While Bill Nye "The Science Guy" couldn't make it due to weather flight delays, several heavyweights from the Planetary Society gave a presentation. All of this around and under the Space Shuttle Endeavour. Needless to say I had a great time.

After Buzz Aldrin left, I packed up my mementos and headed up the mountain to the 60" inch telescope. I arrived at the gate just before midnight. The first item I saw was the owl nebula, but my eyes were not dark adapted yet, so the image was very faint and elusive. My camera was made to take general pictures & pictures underwater, so I only took some of Saturn and a double star. We did have some high clouds every now and then, and there was no low-cloud cover for LA, so LA's lights lit up the western sky. At the end of the night we looked at several double stars that could shine through the clouds and haze. I loved the view of Saturn. The view was better than any picture I took. I can tell you that I will remember this night forever.

Gary Thompson

General Meeting 3/22/13

Lee Collins started the meeting going over some double stars and nebulae. The Flaming Star nebula was very striking. Lee also went over the "Clownface" or "Eskimo" nebula discovered by astronomer William Herschel in 1787. He moved on to M37, a globular cluster. M37 is a nice object for binoculars.

Our speaker for the evening was Dr. Loredana Vetere. Her topic was "The Violent Universe." Currently she is helping out at Pomona College. Her specialty is Gamma Ray Bursts (GRBs) and X-ray emissions. She has worked extensively with the Swift spacecraft which is actually 3 separate telescopes. It observes in the gamma-ray, X-ray, Ultraviolet and optical wavebands. First there is the Burst Alert Telescope, or BAT. BAT detects GRBs and computes the coordinates within 1 to 4 arc-minutes within 15 seconds, which is immediately relayed to the ground. The X-ray Telescope (XRT) takes images and performs a spectral analysis of the GRB afterglow. This gives a more precise location to within 2 arc-seconds. The Ultraviolet/Optical Telescope (UVOT) is then used to detect the optical afterglow. All of this is automatic. It is called Swift after the swift bird. Since its launch on November 20th, 2004, it has detected more than 750 GRBs, captured the X-ray afterglows for more than 90% of them and the optical afterglows for more than 50% of them. You can see its work in real-time by going to http://grb.sonoma.edu/ NASA also has a Swift website:

http://heasarc.gsfc.nasa.gov/docs/swift/

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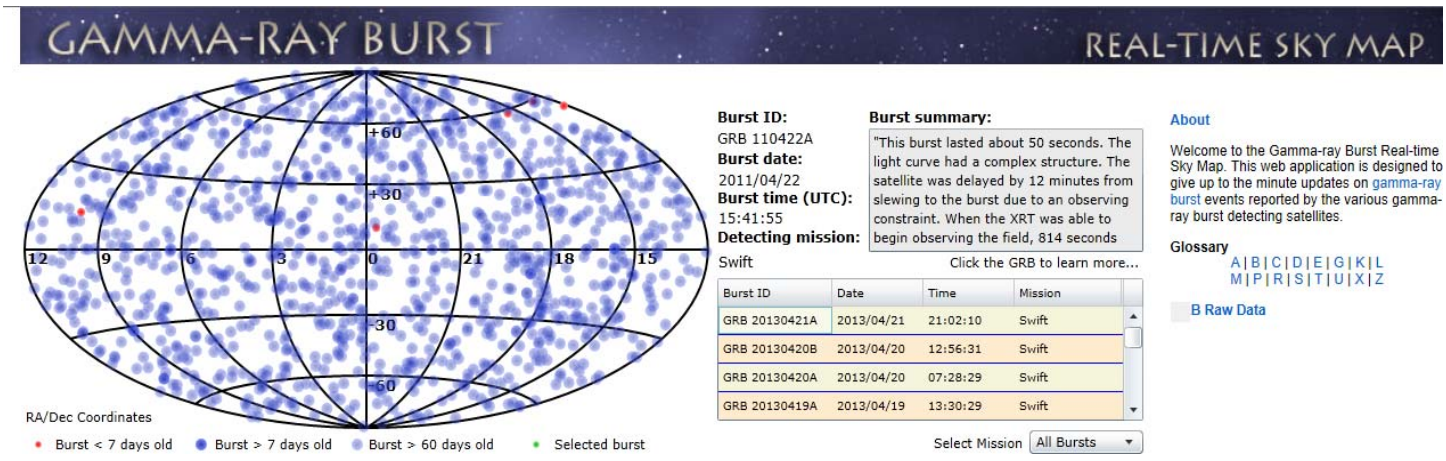
Gary Thompson



Dark Enengy

About ninety years ago Einstein postulated that the laws of physics should be the same regardless of the source of acceleration. Math is the language of physics and it doesn't care whether one uses "a" for acceleration or "g" for gravity. The equations solve the same way. Einstein was satisfied with Special Relativity which deals with inertial frames, no acceleration. In that theory time became a fourth dimension when expressed as "ct" where c is the velocity of light and t is time.

Acceleration in math is the second derivative of distance with respect to time. So it wasn't too surprising that Einstein expressed General Relativity as four second order differential equations. His first attempt to test his equations was with the orbit of Mercury. Until then the motion of Mercury as it got closest to the sun (perihelion) varied from Kepler and Newtonian laws. When Einstein applied his General Relativity equations the result was exactly what had been observed. Later Einstein said that was one of the best moments of his life. Eureka, it worked!

The solution to any differential equation includes a constant which may be zero or non-zero. So Einstein included one in his solution. But later he was convinced it had a zero value.

The universe is observed to be expanding. If the constant in General Relativity is zero, then the expansion should be slowing down due to gravity. If it is positive, there is some energy force acting opposite to gravity.

Cepheids have the nice property of a known curve for the light observed over a period of a few days. Within the Milky Way we can measure the distance to a Cepheid using parallax. The baseline is simply our earth orbit diameter of about 186 million miles. After many observations it was concluded that this technique could be used to estimate distances to other galaxies. Supernova, type 1a, were also used. About 20 years ago the supernova was starting to be the preferred method for very distant galaxies. As data was developed, it appeared the universe was expanding at a slightly accelerated rate. That meant Einstein's constant was not zero.

Two prominent theories have tried to explain this apparent Dark Energy. Each is based on its own assumptions and predicts certain results yet to be confirmed or falsified. They are both too complicated to discuss in this article. Suffice it to say that whereas everyone thought the universe was expanding but should be slowing down due to gravity, it is now generally accepted that the expansion rate is accelerating.

A third concept is being developed by a fairly new group interested in causal set theory and quantum gravity. One member is Fay Dowker who received her Ph.D. from Cambridge working under Stephen Hawking in 1990. She is now a professor at Imperial College London. In their approach space/time is considered quantized. That means the "here/now" is a point in space/time and space/time is not a continuum but quantized.

They start by assuming two adjacent points in space/time can be separated by no more than the Planck scale. As the universe expands any two points eventually exceed this value and a new point appears in between. That new point provides a negative pressure against gravity. Everyone agrees on how much pressure is required to explain the observations and this new approach gives the right answer.

It is believed by some that this approach, using quantized space/time, may also eliminate the need for string theory to explain what happens at the sub-atomic scale. This is an exciting new approach.

Some of you may wish to watch a 45 minute lecture by Fay Dowker on YouTube at

http://www.youtube.com/watch?v=VhHE86d-Th8

Ken Crowder

Club Events Calendar

April 26 - General Meeting

May 9 - Board Meeting, 6:15
May 14 – Ontario Library Main Branch 7 – 9 PM
May 16 – Los Osos High School, 7:30pm
May 17 – General Meeting
May 22-27 - RTMC

June 8 - Star Party – White Mountain
June 13 - Board Meeting, 6:15
June 21 - General Meeting

July 6 - Star Party – Mt Baldy, Cow Canyon Saddle
July 11 - Board Meeting, 6:15
July 19 - General Meeting

August 3 - Star Party -GMARS, Landers

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What's Up? - Hubble's Tuning Fork

Hubble's "tuning fork" is a pronged shape for his classification of galaxy forms. First published in his 1936 book "The Realm Of The Nebulae" but then redefined as a Realm Of The Galaxies. This is now a name for an area centering on the Coma-Virgo Galactic Super Cluster. Here are over 25 Messier galaxies, with many examples of galactic types.

Hubble's two pronged tuning fork begins with rounded elliptical galaxies at the handle's end then progresses up through elongated elliptical ovals, (E0 through E7). At the intersection of the two prongs are spindle-shaped galaxies (S0). The two forks then divide into spiral and barred spiral galaxies. One has simpler "pinwheel" spirals that open up their arms from Sa to Sc. The other prong has the more complex "barred" spirals from SB a to SB c. None of this represents a perceived evolution through time.

In the center of the Coma-Virgo Cluster is the gigantic M87. A big example of the elliptical roundness E1. M87 is also listed as Virgo A & Virgo X1 for powerful radiations that surge from a large black hole in its core. This black hole shoots out an long jet of energetic plasma light years into space. Near M87 is dimmer M86, a more oval elliptical classified E3.

Up north in Draco (dragon) is the Spindle Galaxy (NGC 5866) an S0 edge-on. This galaxy lies in the location of Messier's debated M102. Debated because it seems too faint for him to have seen.

Nearby in Ursa Major (big bear) are some brighter spiral galaxies of the Sa type. Here's the Pinwheel Galaxy, M101, and the Whirlpool Galaxy M51 (pictured) with its elliptical companion (NGC 5159). Both galaxies are classified as peculiar because of the interaction when NGC 5159 (S0 peculiar) passed in back of M51 (Sa peculiar). Galactic interaction always produces distorted forms that defy Hubble's tuning fork chart.

These two spirals (M101, M51) were also the first to be discovered as "spiral nebulae" by Lord Rosse in 1845. The overhead angle of these galaxies also allowed for the sighting of the first extragalactic supernovae.

Personally, I remember seeing M51 at an Oregon Star Party through two large 25 inch Dobsonian scopes that had been turned into 3-D binoculars. I seemed to be seeing M51 in 3-D even though it's 23 million light years away. When the scope was turned on M81 and M82, they were in 3-D too at 12 million light years. I had to climb a ladder to look down through the binocular eyepiece between the two scopes (don't drop anything out of your shirt pocket) but it was an impressive optical delusion

M81 (Bode's Galaxy) is a beautiful example of tight spiral arms classified Sa. Its troubled companion M82 (Cigar Galaxy) fits into Hubble's outcast group, irregular galaxies. M82 is tilted toward edge-on but brightly inflamed by starburst activity, probably caused by interaction with M81. It's the Cigar Galaxy for its shape and a dark "cigar band" that bisects its middle. In infared this band explodes into space with black hole radiations.

The barred spiral galaxies of the other tuning fork prong are harder to identify. Our own Milky Way Galaxy was originally thought to be an Sc spiral but is now considered to be a barred (but complex) SB c. Many "bars" are hidden by bright galactic cores or tilted viewpoints. The much viewed Leo Triplet is dominated by M66, a confusingly barred SB a, and its two companions, M65 and NGC 3628, are too tilted to classify. The other trio in Leo has an overhead M95, (SB b), along with a vaguely barred (Sa) M96 and a odd M105 (E1). All these galaxies show that Hubble's tuning fork types aren't that cut and dried

Many recently discovered extremely barred galaxies are a relief. Distant twisted NGC 1300 is a much photographed SB c, and the highly barred Meat Hook Galaxy is outrageous.

Many closer galaxies fit into fine spiral classifications, with modifications. M63 (Sunflower) in Canes Venatici (hunting dogs) is a good Sa with odd petals. Also in Canes, M94 is an Sa but with intense starburst activity. M64 (Blackeye) in Coma Berenices (Berenices' Hair) is a tight Sa with a ominous dust cloud.

Recently, many very peculiar galaxies that Hubble never dreamed of have been found. There are bizarrely ringed galaxies, like the weird Hoag's Object which looks like a big bull's eye. It seems that Hubble's tuning fork is too simple a system to deal with a never ending odd infinity of galactic forms.

Lee Collins