Volume 26 Issue 5

May 2012

The Observer

East Valley Astronomy Club

From the Desk of the President

by David Douglass

You can tell summer is here. The sun is going down (setting) later and later each night. Beginning observing times are slipping into mid to late evening, reducing our available observing time, unless we are willing to stay up until the wee hours of the morning.

And then, there is the temperature.

A few weeks ago, I was imaging out in the back yard, and the temperature was in the low 60s. Last night, I was doing some imaging, and the temperature was in the 90s. And that was at 10:00 PM. Must be time to head for the high country, and some of those nice dark places.

Wow, so much going on these days. Annular eclipse, the Venus Transit, The Messier Marathon, Astronomy Day, the Chandler Centennial Star Party, and lots of people building observatories. Some of those observatories are backyard types (mine and Tom Polakis), and some are remote site observatories (Bernard Miller and Howard Anderson). And if you talk to those that are building, or have already built (Steven Aggas up in Heber, or Frank Pino in Queen Creek), they are all busy, with full agendas doing "upgrades" and agendas for observing, both visual and imaging. Astronomy is truly a fantastic activity.

Even GRCO is getting in on the act. GRCO's new Lunt Solar Telescope was on display at the last EVAC meeting, arriving just in time for the upcoming solar events. And it was announced that the purchase order has been issued for the parts and pieces to automate the dome, syncing it with the telescope. Parijat Singh is doing an excellent job getting the Citizen Scientist program going. The corp of volunteer operators continues to rise, with twenty-seven

Continued on page 5

The Backyard Astronomer

Kitt Peak 36" Observing Night *by Bill Dellinges*

On the night of April 15th of this year, I participated in a Kitt Peak Observatory night observing session on the 0.9 meter WIYN telescope (36" Wisconsin, Indianapolis, Yale, National Optical Astronomy Observatory).

Unlike the nightly public sessions on their 20" and two 16" telescopes, this program is only offered a few nights a year. Its cost is $129 per person. As it turned out, I chose the right night because the two previous evening sessions were cancelled due to weather and the May dates are during the full moon.

The program began with dinner in the astronomer's dining hall and our leader, Dean Ketelsen joked we might just see a real astronomer there.

We didn't.

Dean works at the mirror lab at the University of Arizona in Tucson. Many amateurs may have met Dean at star parties and is credited, as he says, as "restarting" the Grand Canyon Star Party (John Dobson originally started the GCSP).

Our group of 16 was then taken for a tour of the 4 meter Mayall Telescope, the largest of the 26 telescopes on the mountain. I abstained from the two hour tour as I had seen it before and wanted time to put on five layers of clothes in anticipation of the evening's cold temperatures.

Continued on page 2

Upcoming Events:

Public Star Party - May 11

Local Star Party - May 12

General Meeting - May 18

Deep Sky Observing - May 19

Check out all of the upcoming club events in the Calendars on page 8

Inside this Issue:

The Backyard Astronomer

Continued from page 1 The 0.9 meter telescope is a monster. Between its slow ponderous movement and growling rising and lowering adjustable height floor, I thought for sure someone that night would be crushed to death in the dark! But no, we all left in one piece.

The 0.9 meter WIYN telescope has a focal ratio of F 7.5 and focal length of 7239mm. Most of the time we used a 31mm Nagler eyepiece giving us the lowest power (234x) and largest field (0.35 degrees) during the session.

During our three hour tour of the night sky, we viewed, in order, Venus, M42, NGC 2261 (Hubble's Variable Nebula), NGC 2392 (the Eskimo Nebula), M95 and accompanied supernova), Mars, M3, M51, and Saturn. While everything looked pretty good – as you'd imagine in a 36" telescope at 6,800' – I was especially impressed with M51 which displayed a very bright spiral arm structure with direct vision.

The comet-like fan of dust in NGC 2261 was bigger and brighter than I've ever seen it.

The globular M3 was outstanding.

The planetary nebula NGC 2392 showed structure I'd never seen before.

Saturn? Let's just say it was pretty darn impressive. As the evening progressed, we got colder and colder. Dean mercifully took us downstairs to the warm room twice during the night where, thank God, coffee was available.

I recommend this experience with one caveat. This program is not as reliable as the 20" and 16" programs offered every night except during the monsoon period in July and August. The 0.9 meter scope is only scheduled a few nights in the fall and spring and seems more susceptible to weather cancellations and other problems – my reservation last year was cancelled because of "plumbing problems."

By the way, the WIYN 0.9 meter telescope is not to be confused with the adjacent WIYN 3.5 meter telescope. We were using an older telescope, a 1966 Boller and Chivens instrument.

To review my EVAC articles on my 20" and 16" sessions, check the EVAC newsletter archive for January 2004 and November 2007 respectively.

For a description of the 0.9 meter night program, see: http://www.noao.edu/outreach/kpvc/wiyn-public.php

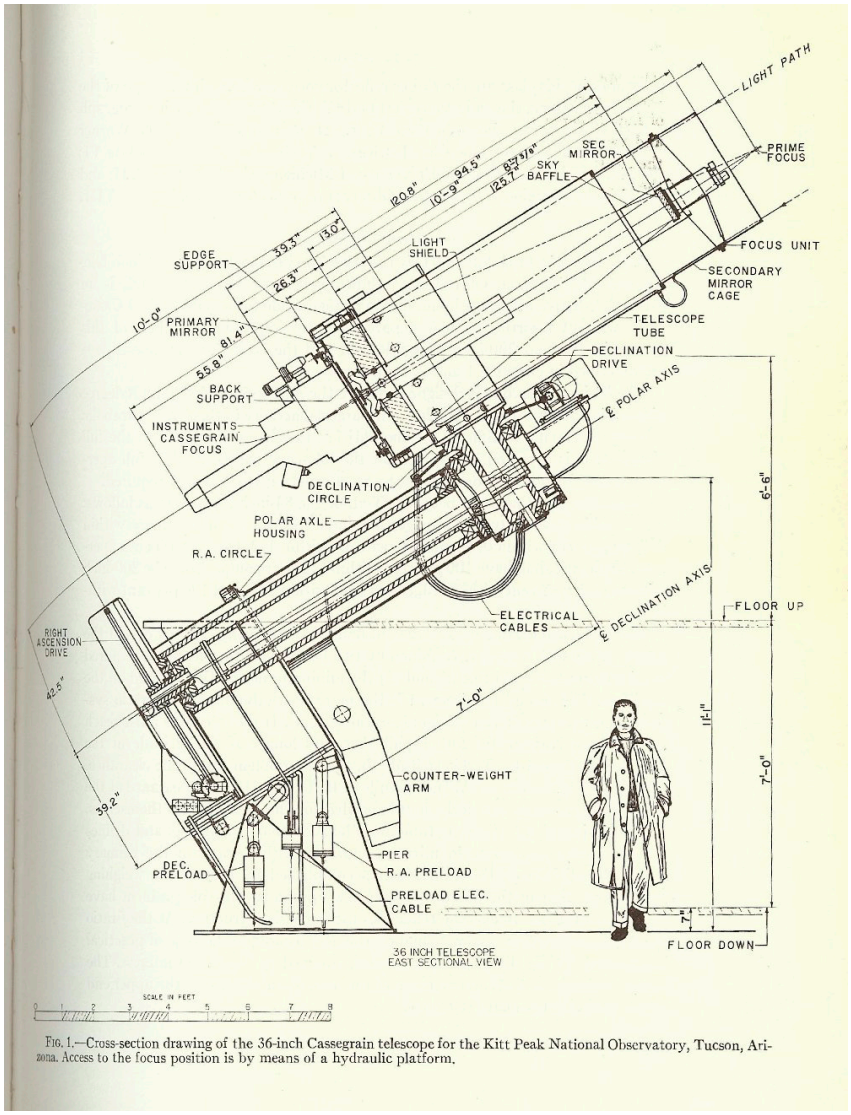


FIG. 1.—Cross-section drawing of the 36-inch Cassegrain telescope for the Kitt Peak National Observatory, Tucson, Arizona. Access to the focus position is by means of a hydraulic platform.

A detailed drawing of the 0.9m telescope, including all measurements, and a trace of the light path.

The Cosmic Web

by Henry De Jonge IV

Introduction

The stars and galaxies we can see from Earth seem to be organized into streams or filaments of light and dark, (black voids) interspaced along a wispy or spider like web structure that is appropriately called the cosmic web, (the official term originated in 1996). This structure can be understood today as matter clumping together on a cosmic or universal scale. This universal framework of the visible universe also seems to trace the dark matter, (DM) of our universe as well. The origins and mysteries of this structure are still being understood and there remain many questions still to be answered. We will examine the cosmic web in this article.

One of the biggest mysteries is how this structure may glue our cosmos together. We are also not completely certain that it represents the true structure of the universe. Its exact nature still eludes us. However we do know that the cosmic web is at least as large as the visible universe, about 14 billion light years across. It is often compared structurally to a large sponge or spiders web. Searching for and determining more details about the cosmic web and understanding its origin is one of the most interesting and challenging issues in modern day cosmology (see figure 1).

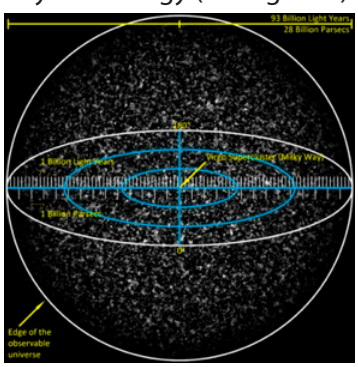


Figure 1. Simulation of the 3 dimensional observable universe-the fine grains of light represent super clusters

Origins

We believe that the origin of this cosmic web were the initial quantum fluctuations generated shortly after the Big Bang. Within the smaller, denser areas of this web like structure, condensed the galaxies and clusters we see today. It is thought that these smaller areas and patterns of condensed visible matter were formed by the connective bridges of dark matter, (DM). Thus the cosmic web is a complex connected structure which is both visible and invisible in form. The relatively recent discovery of dark energy, (DE) also adds another element to the structure puzzle. The exact roles of both DM and DE in the formation, structure, and evolution of the cosmic web are far from being completely understood. However it is generally assumed that DM is the glue that binds the filaments together.

The Cosmological Principle

This central principle of relativity theory and cosmology states that at any given time and on a large enough scale the Universe is homogeneous, (the same everywhere) and isotropic, (the same in all directions). We can plainly see that on a relatively small scale, (like the Earth, solar system, galaxy, local group, and clusters) the Universe is far from homogeneous and isotropic. At scales of hundreds of millions of light years we can see superclusters and the giant voids that separate them. This sponge like form is the cosmic web and constitutes the true large scale structure of our known Universe. It is about 90% voids with about 10% superclusters. If we think of one part of a sponge or piece of cheese as just like any other then we begin to see the cosmological principle in action with respect to the cosmic web.

Observations

So far the cosmic web has largely been mapped in visible light, in the future more wavelength regions like X-ray and IR will be used for mapping the cosmic web. This visible data has produced detailed maps of the cosmic web which show the locations of dense visible matter in our universe. One method of detecting the invisible DM structure is by using gravitational lensing as a direct probe. One scientist used the visible images of over 500,000 galaxies from the HST to map in a crude manner a small bit of the cosmic web in 3D, (see figure 4).

Support for the cosmic web structure comes from various sources. One is the large scale galaxy redshift surveys that have taken place over the years. Recent examples are the Two Degree Field Survey, (2dF-in 2001) and the Sloan Digital Sky Survey, (SDSS-which has already gone through at least 6 releases-see figure 9). The 2dF gave us a cosmic view of 2 pizza slice shaped regions each about 60 degrees across and a few degrees thick that stretch out about 2 billion light years, (see figure 2). One additional feature of this survey is that it showed that quasars were distributed isotropically around our galaxy which implies that they are distributed isotropically about all points and at any given time. Their apparent evolution, (more common in the past than the present) is also thought to be homogeneous in space-time, (see figure 3). Even the Hubble flow, (the average large scale motion) is seen to be isotropic since at any single time the rate of expansion was unique in the universe.

The cosmic web is generally visualized to be one dimensional filaments, two dimensional sheets, and 3 dimensional volumes or clusters. Other galaxy redshift surveys like the Center for Astrophysics (CfA) Survey in 1989, and the Las Campanas Redshift Survey (LCRS) in 1996, also provide us with a picture of the large scale structures in the present day universe. All these major galaxy redshift surveys clearly demonstrate that galaxies are distributed in a complex interconnected network of filaments, sheets and clusters encircling nearly empty voids.

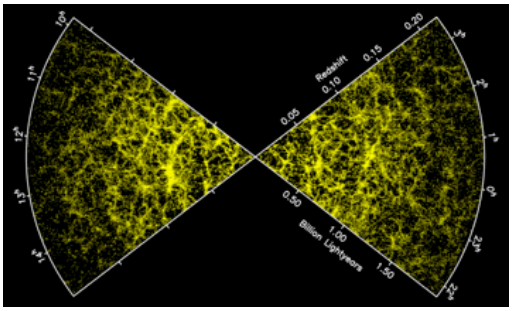


Figure 2. 2dF image of galaxy distribution, (our galaxy is in the center of the image)

Recently it was reported that primordial, pristine clouds of H were discovered as well as small stars in our own galaxy that were composed up of gas with a similar

Continued on page 4

The Cosmic Web

Continued from page 3

composition, (metal abundances as low as 1/10,000 that of the sun). This suggests that these small pockets of pristine gas in the cosmic web have lingered about for billions of years and may still be forming new, small stars. Thus the cosmic web is still evolving and slowly letting go of her secrets.

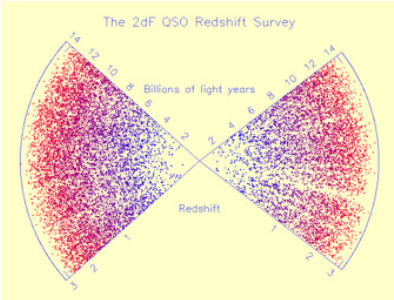


Figure 3. 2dF image of quasar distribution

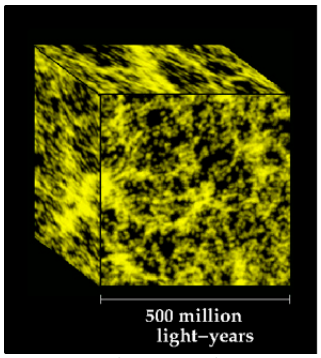


Figure 4. 2dF image of a cosmic cube showing the cosmic web sponge like structure

In another recent, (2009) study by the ESO a beautiful visible glimpse of the cosmic web was seen. It is about 6.7 billion light years distant and stretches beyond the visible area of a prominent galaxy cluster. It shows filaments millions of light years in length that form part of the cosmic web, (see figure 5 and 6).

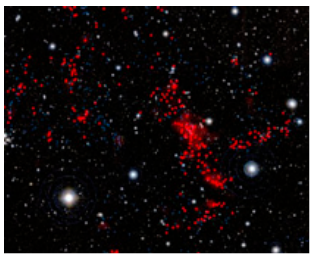


Figure 5. An ESO image of the cosmic web

A non visual piece of support evidence comes from the observations of the CMBR which was discovered in the mid 1960's. The CMBR is believed to have originated in the early Universe after atoms had formed and radiation was allowed to be released. It is commonly called the echo of the big bang and accounts for the greater part of all the radiant energy in the universe. It is seen to be highly isotropic and differs in mean density in different direction to less than one part in ten thousand. We do assume that the observed isotropy around our location is evidence of isotropy around all locations and is therefore indirect evidence of homogeneity at the present time and the past, (see figure 7).

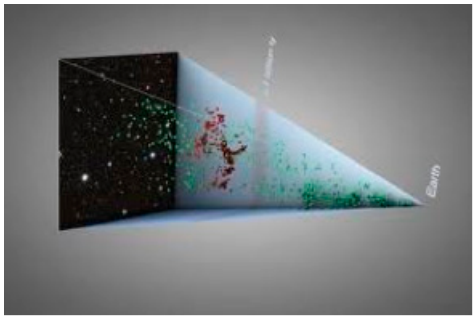


Figure 6. Here is another perspective of the immense structure around this distant galaxy cluster.

In another non visible wavelength the Chandra X-ray telescope observations have also revealed an intergalactic web of hot gas and implied DM. This hot gas is like a fog with channels or filaments carved out by gravity, (see figure 8).

Galaxies and clusters

That the cosmic web represents our vast universe of linked galaxy clusters is generally accepted. One of the most prominent galactic examples of this is the Virgo cluster with about 1500-2000 member galaxies. The Virgo cluster forms the heart of a larger local super cluster of which our Local group is an outlying member. We can see faint streams of stars connecting the galaxies in the Virgo cluster and recently there has been discovered a filament of material that connects our Milky Way galaxy to a nearby cluster of galaxies.

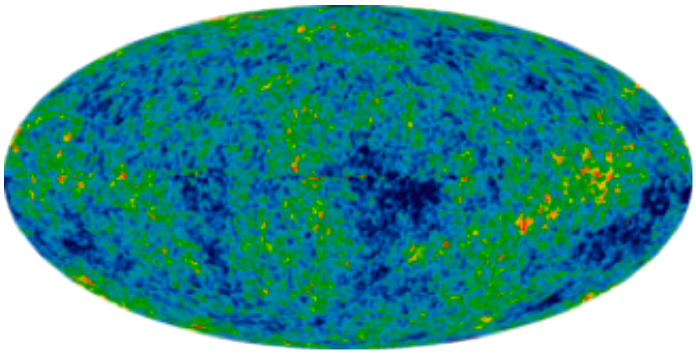


Figure 7. 2010 WMAP image of the CMBR

It is like this filament of small galaxies and globular clusters around our galaxy which lie in a common plane are a sort of an umbilical cord that helped feed our galaxy in its' formative years. Gravity slowly draws matter along these interconnecting galactic filaments towards other galaxies where their larger gravity takes over once the matter is close enough. Thus galaxies are thought to be grown by consumption of matter over time and building up from the smaller to the larger. We see that more intergalactic and cluster connections are being discovered as we get better at detecting them.

The cosmic web is thought to be the conduit or pathway that feeds directly into galaxies and clusters by moving DM into them with the regular matter following and building them up. The environment and properties of these pathways or filaments could be extremely important factors in galaxy birth, growth, and evolution. It appears to me to be like the circulation system in the human body. It has always amazed me how the cosmic web looks like intracellular structure as well.

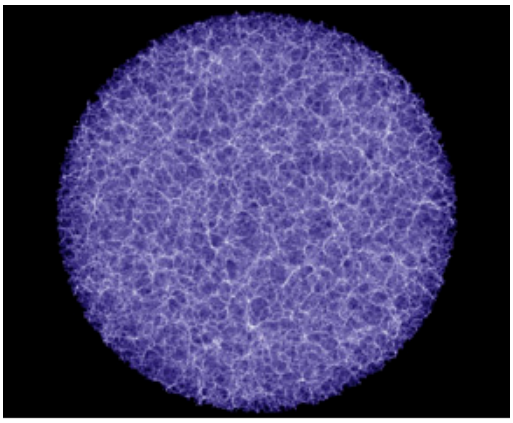


Figure 8. Here is an image of the matter distribution in the universe produced by a supercomputer

DM

One dilemma regarding the cosmic web is that many of the predictions about the makeup of ordinary matter in the web seem to be in error. The cold dark matter model, (CDM) when combined with the cosmic inflation model indicate that large structures grow

Continued on page 15

May Guest Speaker: Rogier Windhorst

Rogier Windhorst is a Regents' Professor in the School of Earth & Space Exploration at ASU. He holds a B.Sc. in Astronomy, Physics and Mathematics; a M.Sc. in Astronomy and Physics; and a Ph.D. in Astronomy; all from the University of Leiden in the Netherlands.

His research is in astronomy, cosmology, galaxy formation and evolution, the cosmic dark ages and the epoch of First Light, and astronomical instrumentation.

Since the early 1990's, his group at ASU has contributed significantly to unraveling the formation and evolution of distant galaxies with the Hubble Space Telescope, and the role that supermassive black holes and Active Galactic Nuclei have played in the process of galaxy assembly.

He is one of the world's six Interdisciplinary Scientists for NASA's 6.5 meter James Webb Space Telescope (JWST) to be launched in 2018. His group at ASU plans to use JWST to map the epoch of First Light in detail.

Rogier's talk is entitled *NASA's James Webb Space Telescope (JWST): The new Frontier in the Cosmos after Hubble.*

From the Desk of the President

Continued from page 1

members. If you would like to join them, contact the Observatory Manager, Dave Coshow for more information.

Lots of good articles to read in the Observer this month. Things are really "looking up". Hmmmm, where have I heard that before? Hopefully everyone has some observing planned. If you need some ideas, check out the "observing programs" page on the evaconline.org website. Personally, I am trying to finish up on my EVAC 200 (9 targets to go), and the Planetary Nebulae (5 targets to go). These items are really "low" and in the deep south. Also, only 32 targets to go to complete the Herschel 400.

See you all next month, if not before. Remember, we all need to "Keep Looking Up" !!

Howard Israel Solar System Walk Memorial Project

As most members and friends of EVAC know, our long time member, Howard Israel, is battling with lung cancer, and is currently under hospice care at his home.

His family wanted to work together to come up with a lasting memorial to Howard's long time passion, astronomy, and more directly, to his long time commitment to astronomy outreach programs. Howard has worked for many years as a volunteer at the Lowell Observatory in Flagstaff, and also worked extensively with the Chandler Parks and Recs department, giving many astronomy outreach talks at the Chandler Environmental Education Center.

The family has reached an agreement with the city of Chandler, and the project calls for the construction of a large scale solar system model walk at the Veterans Oasis Park, which is also the home of the Environmental Education Center.

The family is currently seeking donations to the project, which is currently projecting a cost of $15,000 to $20,000. They are well on their way, with current donations totaling over half that figure. EVAC is participating in this project, and working with the family, handling the donation receipts, and project payments, thus the project is covered by EVAC's 501(c)(3) status, and donations are tax deductible.

If you would like to contribute to this most worthwhile project, donations can be made to EVAC. Contact Ray Heinle, Treasurer, or David Douglass, President to make donations, or seek further information.

● Full Moon on May 5 at 20:36

◑ Last Quarter Moon on May 12 at 14:47

○ New Moon on May 20 at 16:48

◐ First Quarter Moon on May 28 at 13:16

Upcoming Meetings

May 18
June 15
July 20
August 17
September 20
October 19

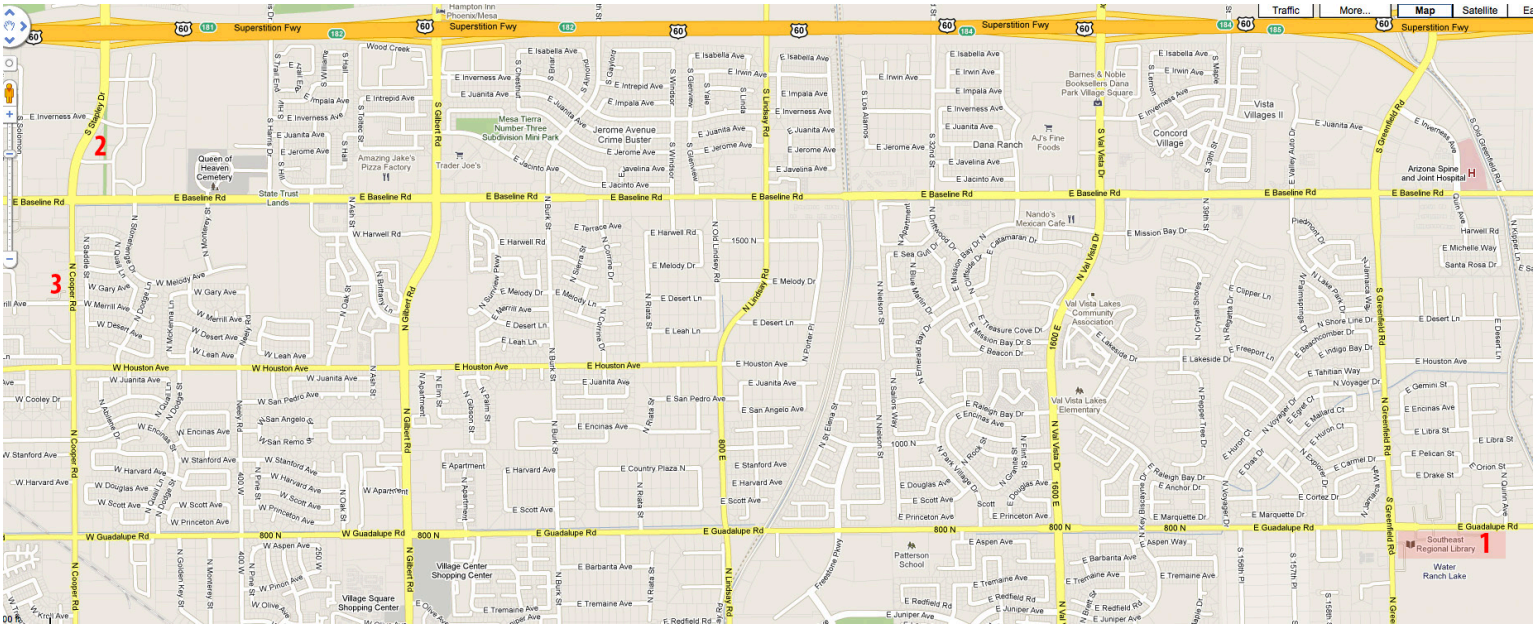
The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads. Meetings begin at 7:30 pm.

All are welcome to attend the pre-meeting dinner at 5:30 pm. We meet at Old Country Buffet, located at 1855 S. Stapley Drive in Mesa. The restaurant is in the plaza on the northeast corner of Stapley and Baseline Roads, just south of US60.

Likewise, all are invited to meet for coffee and more astro talk after the meeting at Denny's on Cooper (Stapley), between Baseline and Guadalupe Roads.

Visitors are always welcome!



2 Old Country Buffet
1855 S. Stapley Drive
Mesa, Az. 85204

1 Southeast Regional Library
775 N. Greenfield Road
Gilbert, Az. 85234

3 Denny's
1368 N. Cooper
Gilbert, Az. 85233

May 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	**10**	**11**	**12**
13	14	15	16	**17**	**18**	**19**
20	21	22	23	24	25	26
27	28	29	30	31		

May 10 - Prescott Pines Science Camp Star Party

May 11 - Public Star Party & SkyWatch at Riparian Preserve

May 12 - Local Star Party at Boyce Thompson

May 17 - Charlotte Patterson Elementary School Star Party

May 18 - General Meeting at SE Library

May 19 - Chandler Centennial Star Party

May 19 - Deep Sky Observing Night

May 20 - Annular Solar Eclipse

June 2012

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	**5**	6	7	**8**	**9**
10	11	12	13	14	**15**	16
17	18	19	20	21	22	**23**
24	25	26	27	28	29	30

June 5 - Venus Transits the Sun

June 8 - Public Star Party & SkyWatch

June 9 - Local Star Party at Boyce Thompson

June 15 - General Meeting at SE Library

June 23 - Deep Sky Observing Night

East Valley Astronomy Club -- 2012 Membership Form

Please complete this form and return it to the club Treasurer at the next meeting or mail it to EVAC, PO Box 2202, Mesa, Az, 85214-2202. Please include a check or money order made payable to EVAC for the appropriate amount.

IMPORTANT: All memberships expire on December 31 of each year.

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

New Member Dues (dues are prorated, select according to the month you are joining the club):

☐ **$30.00 Individual** January through March

☐ **$35.00 Family** January through March

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$37.50 Individual** October through December

☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

☐ **$30.00 Individual** ☐ **$35.00 Family**

Name Badges:

☐ **$10.00** Each (including postage) Quantity: _____

Name to imprint: _____

Total amount enclosed: ☐

Please make check or money order payable to EVAC

☐ Payment was remitted separately using PayPal ☐ Payment was remitted separately using my financial institution's online bill payment feature

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Name: ☐ Phone: ☐

Address: ☐ Email: ☐

☐ Publish email address on website

City, State, Zip: ☐ URL: ☐

How would you like to receive your monthly newsletter? (choose one option):

☐ Electronic delivery (PDF) *Included with membership* ☐ US Mail **Please add $10 to the total payment**

Areas of Interest (check all that apply):

☐ General Observing ☐ Cosmology

☐ Lunar Observing ☐ Telescope Making

☐ Planetary Observing ☐ Astrophotography

☐ Deep Sky Observing ☐ Other

Please describe your astronomy equipment:

Would you be interested in attending a beginner's workshop? ☐ Yes ☐ No

How did you discover East Valley Astronomy Club? ☐

PO Box 2202
Mesa, AZ 85214-2202
www.evaconline.org

All members are required to have a liability release form (waiver) on file. Please complete one and forward to the Treasurer with your membership application or renewal.

Liability Release Form

In consideration of attending any publicized Star Party hosted by the East Valley Astronomy Club (hereinafter referred to as "EVAC") I hereby affirm that I and my family agree to hold EVAC harmless from any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), which may directly or indirectly be connected to EVAC and/or my presence on the premises of any EVAC Star Party and related areas.

I further agree to indemnify any party indicated above should such party suffer any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), caused directly or indirectly by my negligent or intentional acts, or failure to act, or if such acts or failures to act are directly or indirectly caused by any person in my family or associates while participating in an EVAC Star Party.

My signature upon this form also indicates agreement and acceptance on behalf of all minor children (under 18 years of age) under my care in attendance.

EVAC only recognizes those who are members or invitees and who also have a signed Liability Release Form on file as participants at an EVAC Star Party.

Please print name here ***Date***

Please sign name here

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

NASA's Space Place

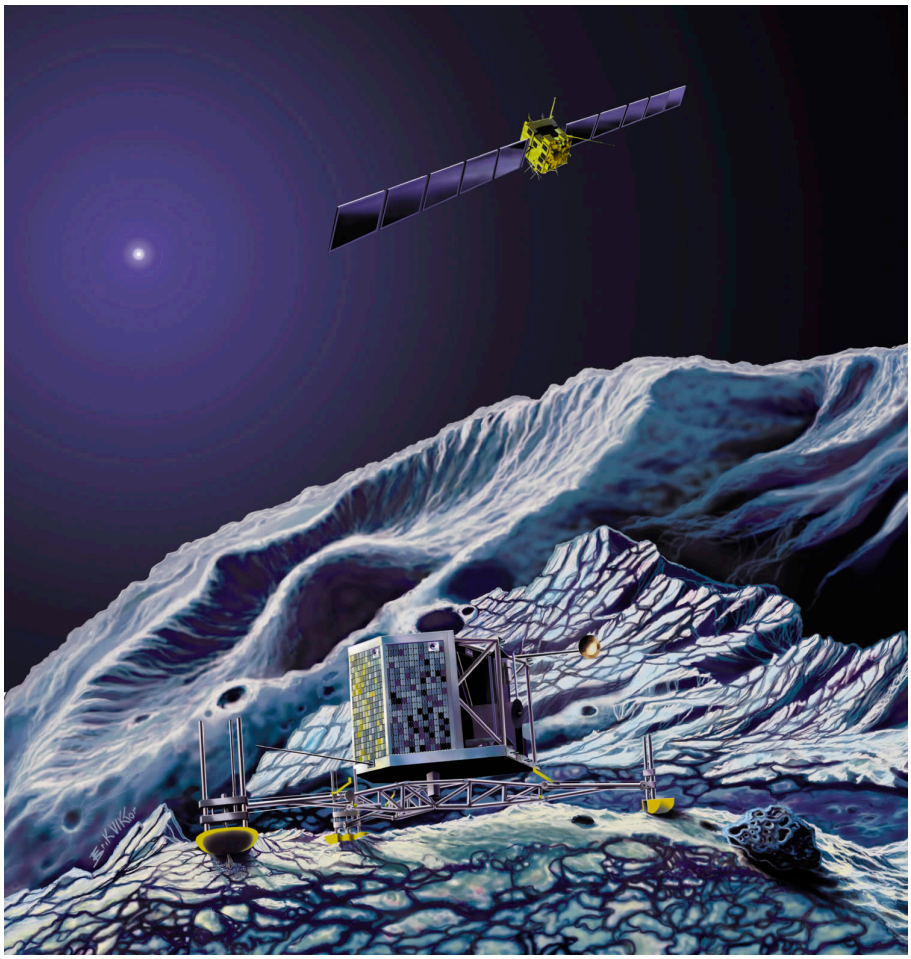
NASA Helps Europe Study a Comet

by Dr. Tony Phillips

Europe's Rosetta spacecraft is on its way to intercept comet 67P/Churyumov-Gerasimenko. Comets have been intercepted before, but this mission is different. Rosetta aims to make history by landing a probe on the comet's surface while the mother ship orbits overhead.

"Rosetta is the European equivalent of a NASA flagship mission," explains Claudia Alexander, project scientist for the U.S. Rosetta Project at NASA's Jet Propulsion Laboratory. "It will conduct the most comprehensive study of a comet ever performed."

Rosetta's payload contains 21 instruments (11 on the orbiter, 10 on the lander) designed to study almost every aspect of the comet's chemistry, structure, and dynamics. Three of the sensors were contributed by the U.S.: Alice (an ultraviolet spectrometer), IES (an ion and electron sensor), and MIRO (a microwave sounder).



Rosetta's lander Philae will eject from the spacecraft, touch down on the comet's nucleus, and immediately fire a harpoon into the surface to anchor itself so it won't drift off in the weak gravity.

The main event of the mission will likely be the landing. The 100-kg lander, which looks a bit like a cross between NASA's old Viking Mars landers and a modern microsatellite, will spend two weeks fastened to the comet's icy surface. The European-built probe will collect samples for analysis by onboard microscopes and take stunning panoramic images from ground level.

"First the lander will study the surface from close range to establish a baseline before the comet becomes active," explains Alexander. "Then the orbiter will investigate the flow of gas and dust around the comet's active, venting nucleus."

Rosetta's sensors will perform the experiments that reveal how the chemicals present interact with one another and with the solar wind. Alice and MIRO detect uncharged atoms and molecules, while IES detects the ions and electrons as the solar wind buffets the nucleus.

One problem that often vexes astronomers when they try to study comets is visibility. It's hard to see through the dusty veil of gas billowing away from the heated nucleus. The microwaves MIRO detects can penetrate the dust, so MIRO can see and measure its target molecules even when other instruments can't.

MIRO is one of several experiments focused on the comet's structural properties. It will determine the comet's dielectric constant, emissivity, and thermal conductivity to determine whether it is made of a powdery loose material, has a detectable layer of loose material, or is hard as rock.

"We want to find out whether comets have retained material from when the solar system formed," says Alexander. "If the ancient materials are still there, we can get an idea of what conditions were like at the dawn of the solar system."

Rosetta enters orbit in 2014. Stay tuned for updates!

Check out "Comet Quest," the new, free iPhone/iPad game that has you operating the Rosetta spacecraft yourself. Get the link at spaceplace.nasa.gov/comet-quest.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

If It's Clear...

by Fulton Wright, Jr.
Prescott Astronomy Club

May 2012

You can STILL see comet C/2009 P1 (Garradd), but you will want a medium (6 inch) telescope and dark skies. See Astronomy magazine, May 2012, p. 42 for a finder chart.

During May Venus goes from 26% illuminated, 38 arc seconds in size, and setting at 10:35 PM to 1% illuminated, 57 arc seconds in size, and setting at 8:16 PM. It is on its way to pass in front of the sun on the afternoon of June 5. (See note at the end of this article.)

On Saturday, May 5, at 7:14 PM (5 minutes before sunset) the full Moon rises, spoiling any chance of hunting for faint fuzzies for the night.

On the night of Saturday, May 12, at 1:19 AM (the 13th), the last quarter Moon rises.

On Sunday, May 20, not only is it new Moon, but, in the late afternoon, there will be an annular solar eclipse. The centerline of the path of annularity passes through Page, Arizona. If you go, you will not be the only person there. The partial phase starts at 5:24 PM. The annular phase starts at 6:32 PM and lasts for 4.5 minutes. The Sun (and Moon, of course) will be about 10 degrees above the west horizon. The Sun sets before the exiting partial phase is over. Flagstaff is just south of the annular path. Prescott is a little further south but will also see a deep partial eclipse. Even though the sun is very low, it is not safe to view directly any phase of this eclipse without a real solar filter. My favorite is a #14 welders plate. Sky & Telescope and Astronomy Magazine both have articles about the eclipse in their May issues.

On Tuesday, May 22, shortly after sunset at 7:32 PM, you can see a bunch of bright objects strung out along the western horizon. From south to north we have Sirius (magnitude -1.4), Betelgeuse (magnitude 0.6), The Moon (magnitude -2.4, thin crescent), Venus (magnitude -4.3, also thin but smaller crescent), Elnath (magnitude 1.7, near Venus), and Capella (magnitude 0.1, somewhat higher). At 7:29 PM the 3rd magnitude star, Zeta Tauri, will disappear behind the moon's north-planetary-west, dark limb. The sky will still be pretty light so you will want a telescope to find it. The star will reappear at 8:21 PM from the north-planetary-east, somewhat bright limb. Sky & Telescope, May 2012, p. 52 has an article about the occultation.

On the night of Monday, May 28, at 12:59 AM (the 29th), the first quarter Moon sets.

Heads up for a transit of Venus on June 5. In Prescott, the transit begins at 3:06 PM and still be in progress when the Sun sets at 7:40 PM. You don't have to travel anywhere to see it (although you might want to travel to avoid clouds), but you will want optical aid (binoculars or a telescope) and will need a real solar filter on the front of your binoculars or telescope (or in front of your eyes if you want to try to see the 1 arc minute black dot on the 30 arc minute Sun). This is not an especially spectacular event, but it is an especially rare one. You are unlikely to be able to view the next one on December 11, 2117.

Celestial events (from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find information) customized for Prescott, Arizona. Remember, the Moon is ½ degree or 30 arcminutes in diameter. All times are Mountain Standard Time.

I

Looking for that perfect weekend activity?

Why not resolve to getting involved?

Contact Dave Coshow to join the staff at GRCO

Email: grco@evaconline.org

Annular Solar Eclipse of 2012 May 20

Geocentric Conjunction = 23:59:09.1 UT J.D. = 2456068.499411
Greatest Eclipse = 23:52:46.6 UT J.D. = 2456068.494984

Eclipse Magnitude = 0.9439 Gamma = 0.4827

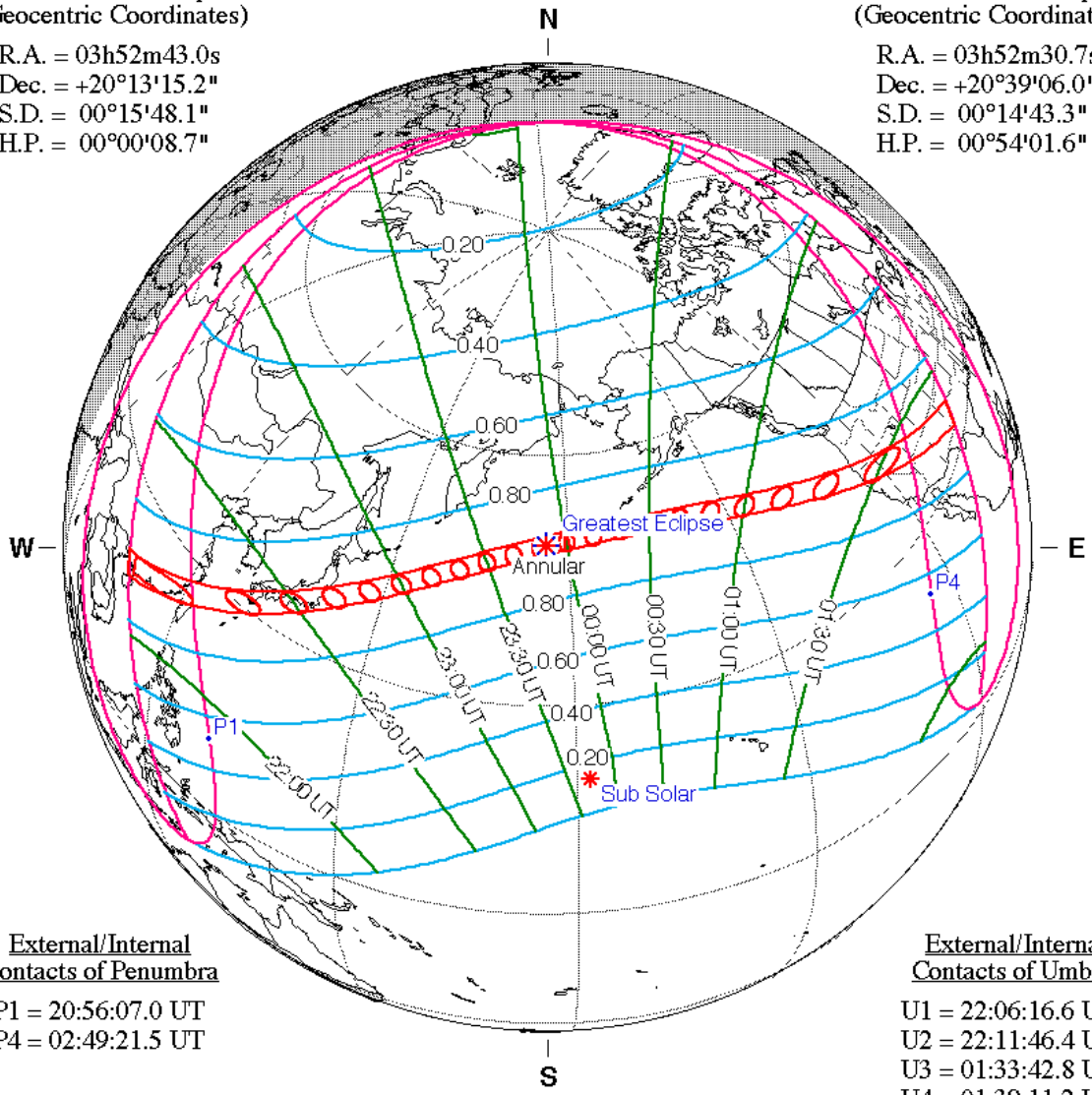
Saros Series = 128 Member = 58 of 73

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 03h52m43.0s
Dec. = +20°13'15.2"
S.D. = 00°15'48.1"
H.P. = 00°00'08.7"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 03h52m30.7s
Dec. = +20°39'06.0"
S.D. = 00°14'43.3"
H.P. = 00°54'01.6"



External/Internal Contacts of Penumbra

P1 = 20:56:07.0 UT
P4 = 02:49:21.5 UT

External/Internal Contacts of Umbra

U1 = 22:06:16.6 UT
U2 = 22:11:46.4 UT
U3 = 01:33:42.8 UT
U4 = 01:39:11.2 UT

Local Circumstances at Greatest Eclipse

Lat. = 49°05.3'N Sun Alt. = 60.9°
Long. = 176°16.8'E Sun Azm. = 171.0°
Path Width = 236.9 km Duration = 05m46.4s

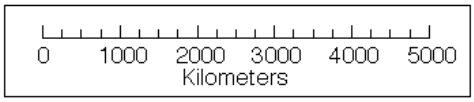
Ephemeris & Constants

Eph. = Newcomb/ILE
ΔT = 69.0 s
k1 = 0.2724880
k2 = 0.2722810
Δb = 0.0" Δl = 0.0"

Geocentric Libration
(Optical + Physical)

l = -1.29°
b = -0.58°
c = -13.67°

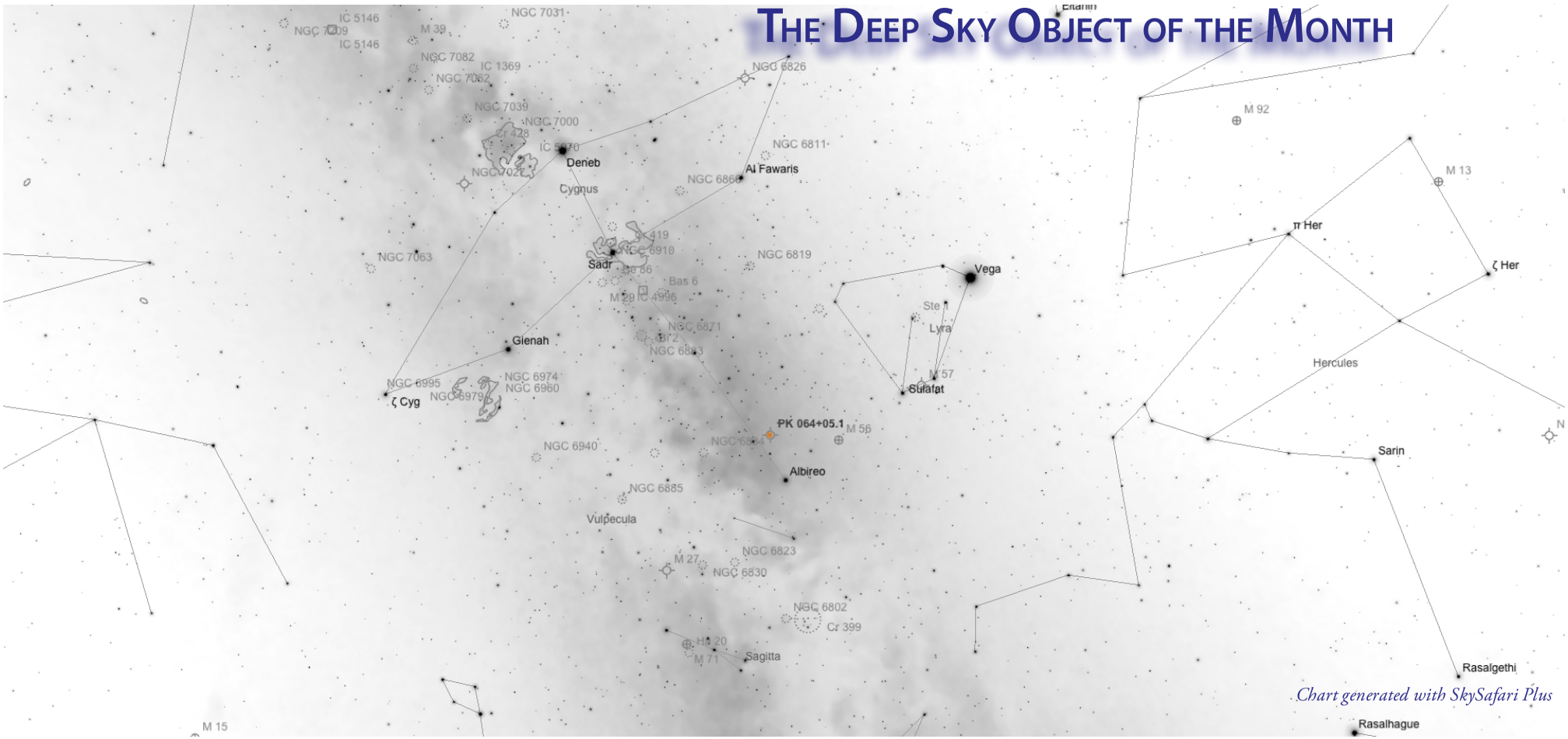
Brown Lun. No. = 1106



F. Espenak, NASA's GSFC - Fri, Jul 2,

sunearth.gsfc.nasa.gov/eclipse/eclipse.html

The Deep Sky Object of the Month



Unfortunately, not many planetary nebulae show a wealth of detail in amateur telescopes - most of them appear as minuscule disks, almost impossible to distinguish from the background stars. A fine example of this type of planetary nebula is PK 64+5.1, or Campbell's Hydrogen Star, a tiny but surprisingly bright object located about 2.5° north of Albireo.

Herschel never saw PK 64+5.1, nor does it belong to the NGC. Its position is not plotted on many sky atlases and most modern observing guides let it pass without notice. What is this planetary?

In 1893, the American astronomer William Campbell was observing through a visual spectroscope at Lick Observatory, when he happened upon this strange object in southern Cygnus. From its spectrum it was clearly not an ordinary star, but rather a tiny planetary nebula. Today we know it as Campbell's Star, although it is labeled on most maps as PK 64+5.1, a designation from the Catalogue of Galactic Planetary Nebulae.

Even though it is visible with small telescopes, Campbell's Star is only recognizable as a planetary when viewed with moderately high magnification. Because PK 64+5.1 is only 5" across, an 8-inch reflector at 200x reveals just a small, 9th-magnitude grayish disk. Larger telescopes equipped with an OIII filter will also show the nebula's 11.3-magnitude central star.

PK 64+5.1 (Campbell's Hydrogen Star) Planetary Nebula in Cygnus

RA: 19h 35m 14.72s Dec: +30° 32′ 42.4″ Size: 0.2′ x 0.2′ Magnitude: 11.39

The Cosmic Web

Continued from page 4

hierarchically thru gravitational instability.

As we have mentioned, the DM properties, structure, and evolution seem to control the cosmic web. However exactly what DM is and its connection to the cosmic web remains a mystery.

Future paths and conclusions

The biggest advantages for future researchers studying the cosmic web will be the use of advanced super computers, (perhaps even quantum computers) and powerful multi wavelength telescopes, (like the Keck Cosmic Web Imager using a 2 channel spectrograph to collect data of LSB sources in the IGM) which should allow extremely larger amounts of data to be utilized in the models and produce results in a shorter period of time. In fact today we have so much data that our current systems cannot handle it all and we will be busy for years into the future analyzing these current mountains of data.

We have seen some data in non visible wavelengths but are still basically analyzing mostly in optical wavelengths and there are may more doors left to open.

One aspect of observing ever further outwards in the future, (by seeing the past) is that this will help us gather more structural data, since the nature of the cosmic web appears to be length scale related. We need to look beyond the 50-80 Mpc range to begin seeing the true cosmic scale of the cluster structures.

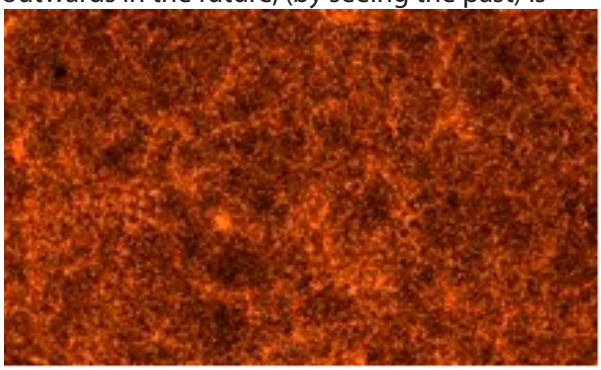


Figure 9. This image contains about 500 million galaxies imaged by the SDSS-III showing roughly 1/3 of the total survey. More detailed data from this survey needs to be gathered and analyzed.

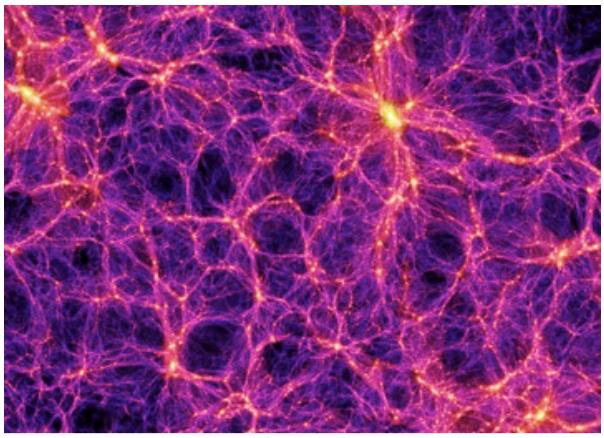


Figure 10. Here is a simulation of the growth of DM structure which the visible matter follows based upon the original quantum fluctuations in the early universe

Advances in cosmology and mathematical modeling, (especially in nonlinear mathematics) of structure formation will also play a big role in developing better and more informative models from which we can derive a better and more complete understanding of the cosmic web.

As one of the many benefits to becoming an East Valley Astronomy Club member, we have the following telescopes available for monthly check-out to current EVAC members:

8 inch Orion manual Dobsonian
8 inch Orion Intelliscope Dobsonian
60mm Tasco Alt-Azimuth Refractor

For more information, or to check out one of these scopes, please talk to:

David Hatch
EVAC Properties Director
480.433.4217

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