



THE OBSERVER

East Valley Astronomy Club



Total Solar Eclipse August 11, 1999

UPCOMING EVENTS:

- Public Party - August 11*
 - Local Star Party - August 12*
 - No EVAC Monthly Meeting This Month*
 - Deep Sky Party - August 19*
 - Solar Eclipse - August 21*
- Check out all of the upcoming club events in the Calendars on page 14.*

EVAC This Month

by Don Wrigley

For the benefit of those who have not attended regular meetings lately and may have missed the previous announcements, I wish to reiterate that the EVAC meeting scheduled for August 18th has been cancelled. The reason for the cancellation is quite simple: most of the officers and, I suspect, a fairly good percentage of the membership will have left town by the 18th, in order to get to a good spot to view the upcoming total eclipse on the 21st. The September meeting will be held on its regular scheduled date (September 15th).

I fully expect to be flooded with

requests to show eclipse photos, and I welcome all entries. Since we have no speaker, as yet for the September meeting, we have the option of devoting ample time for those who wish to share their photos.

We have many excellent photographers in this club and I look forward to seeing the view from many different parts of the country.

Good Luck to all of you who will be traveling to see the eclipse and let's all pray for clear skies!

Don Wrigley

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If It's Clear...

by *Fulton Wright, Jr. Prescott Astronomy Club*

August 2017

Celestial events (from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find information) customized for Prescott, Arizona. All times are Mountain Standard Time.

On Tuesday, August 1, it is a good time to look at the lunar crater, Clavius, as libration has tipped that part of the Moon toward us. It is a big crater, located in the southern part of the Moon, near the terminator and has an arc for decreasing sized craters in it.

On Monday, August 7, at 7:33 PM the full Moon rises spoiling any chance of hunting for faint fuzzies for the night.

On Tuesday, August 15, the Moon is at third quarter phase and rises at 12:41 AM (Wednesday).

On Sunday, August 20, before midnight, three of Saturn's brightest moons are all on the celestial west of the planet. They are (starting with the furthest) Titan (magnitude 9.2), Rhea (magnitude 10.4), and Dione (magnitude 11.2).

On Monday, August 21, it is new Moon and you have all night to hunt for faint fuzzies. At 9:12 AM a partial eclipse of the Sun begins in Prescott. It is maximum about 10:30 AM (about magnitude .75). The show is over at 11:59 AM. For a total eclipse, you need to travel. The path of totality starts in Oregon and exits in South Carolina. I expect many Americans (and some foreigners) to crowd into the path. I plan to be in Rexburg, ID hoping for clear skies. Sky and Telescope, and Astronomy have articles about the eclipse this month. Your favorite search engine will produce more sites than you need. Many companies will sell you eye protection which you will need for the partial phases. It is already too late to get reservations in the eclipse path, but you might get some in driving distance of the path. Remember: you will need eye protection when any part of the photosphere (the bright part of the Sun) is showing unless you use a pin hole camera to project an image of the Sun. I use a #14 welder's filter. You must not use a filter during totality if you want to see anything (and you will want to see something).

On Monday, August 28, at 11:31 PM, the first quarter Moon sets.

FULL MOON ON AUGUST 7 AT 14:30

LAST QUARTER MOON ON AUGUST 14 AT 21:15

NEW MOON ON AUGUST 21 AT 14:30

FIRST QUARTER MOON ON AUGUST 29 AT 04:13

Ophiuchus – The Doctor Will See You Now

In Greek mythology Ophiuchus (oh-fee-you-kus), the Serpent Holder, was the physician Aesculapius, who was so accomplished in his trade that he could revive the dead. Hades, God of the Underworld, found that most disconcerting. Concerned he would lose customers, Hades complained to his master Zeus, King of the Gods, who was sympathetic to Hades' plight and killed Aesculapius with a thunderbolt. In old star charts Ophiuchus is depicted holding a serpent. In ancient times, a snake's venom was thought to have healing powers. And the snake's annual shedding of its skin symbolized rebirth. Thus, our physician coddles a serpent across his lap representing two other constellations: Serpens Caput (the head) on the west side of Ophiuchus and Serpens Cauda (the tail) on the east side. This is the only case of a constellation being interrupted. Today we still see the relationship of the snake and medicine in the symbol of the caduceus.

A generally unknown fact about Ophiuchus is that the ecliptic passes through the southern portion of its borders making it an unofficial thirteenth zodiacal constellation. Since constellation borders were officially created in 1930 by Belgian astronomer Eugene Delporte on behalf of the International Astronomical Union (IAU), the eastward traveling Sun spends 18 days in Ophiuchus compared to 7 days in Scorpius. Other factoids: The last supernova seen in northern skies was in Ophiuchus in 1604. Kepler recorded it reaching magnitude -3.0. Sky Atlas 2000 shows Ophiuchus beats Sagittarius in the total number of globular star clusters, 21 to 19. Occupying 948.34 square degrees of sky, Ophiuchus is huge, ranking 11th in size of the 88 constellations. The overall appearance of the constellation is not particularly striking other than the large chunk of sky it covers. Its brightest star Rasalhague is only magnitude 2.1. It's located at the very top northern tip of what might be called a large bullet or artillery shell shaped object standing on end. Or maybe you see it as a large version of the torso of the Tin Man from the Wizard of Oz?

The Doctor offers many splendors for the stargazer. M-10 and M-12 are the brightest of its many globular star clus-

ters. M-10 is the more rewarding and is quite impressive in an 11 inch telescope at 165x. IC 4665, a wonderful open star cluster more than half a degree in diameter, is located one degree northeast of Beta Ophiuchi and best seen in 15x70 binoculars. Ten degrees due east of IC 4665 is NGC 6633, another fine, slightly smaller cluster. Midway between these two clusters is the planetary nebula NGC 6572. This specimen is rather small at 11" but unusually bright at magnitude 9.1. Five degrees east south-east of IC 4665 is a V-shaped pattern of third magnitude stars reminiscent of the Hyades in Taurus. This is the obsolete constellation Taurus Poniatovii (Poniatowski's Bull) created in 1777 to honor the King of Poland. It, like many other questionable constellations, did not make the cut when the IAU reorganized the night sky's constellations at its first meeting in 1922. A nice view of this large splash of stars can be had in a 7x50 binocular.

Rho Ophiuchi (SAO 184381) is a remarkable quadruple star so far south in Ophiuchus that you might think it's in Scorpius. To find it, note to the upper right of Antares a quadrilateral of four stars - Rho is its northern most star. A 9x50 finder will split it into three stars, making a tight triangle. Rho, at magnitude 5.0, is the brightest star of the group. The other two seventh magnitude stars are about 150" away. An 11 inch telescope at 90x will reveal Rho's magnitude 5.74 companion 3.1" away. Another lovely double star worthy of your attention is 70 Ophiuchi (SAO 123107). This is the eastern most bright star in the aforementioned "Poniatowski's Bull." The double's components are 4.2 and 6.0 magnitude with a separation of 6.3". An 11 inch telescope splits it easily at 90x, but the pair's beautiful yellow and orange colors are best appreciated at higher power. 70 Ophiuchi is 16.5 light years away and its two stars revolve around each other in only 88 years.

It's hard to ignore the huge Serpent Holder hogging more summer sky than he should. But the respectable Doctor offers many fine remedies for those who seek night sky treasures for medicinal purposes.

Total Eclipse of the Sun July 11, 1991. Baja, Mexico

by Bill Dellinges

Excerpts from a Stargazer's Logbook

With the solar eclipse coming up August 21, 2017, I thought it might be fun to share my experience of the July 1991 solar eclipse which lasted 6 minutes and 25 seconds. I can see how this may bring a smile to the face of those who have seen an eclipse and interest to those who haven't. I quote from my logbook in raw format. I must have written this after the fact – I can't imagine I wrote it under "combat conditions."

"Before first contact I made some quick checks on the scope, camera, position of sun in the camera, beach chairs in the right position, binos, Questar case to throw the filter in, exposure notes taped to the tripod leg, camera strap out of the way, cable release in position, towels in position to accommodate our equipment which very likely would end up being thrown every which way as I changed modes from scope photography to just enjoying the rest of the eclipse visually.

The experts told us 2 things that were not true and 1 thing that was. 1) that it wouldn't get dark till the sun was covered about 99%. Not true! At 50% everyone noticed that it was getting a little dark, that famous eerie light effect you get near totality. About this time I noticed a drop in temperature – it got cool, whereas before we were frying out there. 2) At totality we were led to believe it would get very dark. Not so here. The sky was dark blue. Someone yelled out "There's Venus." Sure enough, soon after 50%, it popped out. (At totality I could see Venus, Jupiter, Mercury, and Sirius).

A few seconds before totality I started getting really pumped up, as if I wasn't already! What the hell was I going to do? Stay at the camera, look for the Diamond Ring, watch for the approaching shadow, or what? Stay with the plan I guess – though later I would question not enjoying the beginning of totality. OK, here it comes! Look out! Looking at the last sliver of sunlight in the Questar, I glanced up at the sun to assess the situation. There's a brilliant light at 11 o'clock – the Diamond Ring I guess. I quickly unscrew the filter from the scope, placing it in the scope case. Hop back to scope. Begin firing off shots without looking up. Much shouting and noise from humans around me. Switch from shooting partial shots to totality shots. Slower speeds to catch the corona. Done. Now look up. Did I look up before I shot these shots or after –

I don't remember – it's real crazy now. But whenever it was I looked up, I saw it for the first time. The one thing experts had said that WAS true – 3) NO PHOTOGRAPH, VIDEO, CAN EVER CONVEY OR RENDER WHAT AN ACTUAL TOTAL SOLAR ECLIPSE REALLY LOOKS LIKE. The most awesome spectacle I've ever seen was at the zenith (83 degrees). There is was. What I had heard about and seen in countless pictures. But I was not expecting this:

The black moon, like a bullet hole in the sky, looking much bigger than normal, high in the sky, surrounded by a corona that was breathtaking. Two long delicate, intricate wisps of light extended out from either side of the moon at least as wide as the moon (East-west. North-south direction not so much, which is normal). People were yelling "prominences, prominences!" I couldn't see them. Maybe a minute went by. Turn the camera away from the sun. Jump into my lounge chair next to my wife – damn – the chairs facing the wrong way! Hell with it, no time to rearrange chairs (like on the Titanic), I lay down on it with my feet up on the backrest – no good, straddle the damn thing. Look up. My God! It's more beautiful than I ever imagined! (Note this was my first total eclipse). Something like a religious feeling sweeps through me. I can't believe it. I'm totally unready for this (no pun intended), no eclipse photo ever looked like this.

It's difficult to describe the nature of the wispy corona. The luminous emanations, especially along the east west axis were so fine and delicate. I think this aspect of the corona was perhaps the most impressive thing of the whole event. How much time left I wonder? How much time did I waste on the camera shots? I grab the 7x50 bino from my wife (did I even ask her for them?). Yes, I think I did. I put then on the big black hole in the sky. Now I could see all kinds of prominences around the moon's limb. I see a huge prominence at 11 o'clock. It's so big I could see that its looped over, going back down to the sun. There's also some very bright, white, fire-like stuff along the rest of the limb. So the limb is very "busy" with 'stuff." The bino also revealed the beautiful gossamer, diaphanous nature of the corona.

I yell out, "How much time?" "One minute" someone answers. The binos are up, down, over to Lora, did they come back to me before it's over? I want it to go on forever.

Total Eclipse of the Sun July 11, 1991. Baja, Mexico

by *Bill Dellinges*

I don't want it to stop. Burn this image into your memory bank. Third contact! A flash of light, a huge, long period of Diamond Ring. Too bright to look at any longer. It's over. Oh no. Too short. I think I blew it by spending too much time taking pictures. Next time – no photography. Or do it in the middle of totality. Don't miss the start of totality. Almost everyone begins to relax. Not too many follow the

last part of the eclipse (something I notice at later eclipses and I think pretty typical). Throngs head to the bar, only a few steps away and begin to unwind from the stress, and the beauty of the experience they just witnessed. Man, that was a fast 6 ½ minutes."

Cosmic Alignments

by *Henry De Jonge IV*

Introduction

Last year it was reported that the spin of at least 64 SMBHs, (super massive black holes) aka AGN, (or active galactic nuclei), in distant galaxies seemed to be aligned. That is the SMBHs seen in a locally small part of a filament, within the cosmic web, appeared to be acting in unison or share a symmetry of sorts. This defies statistical explanation and also our cosmic sense of relationships, extending across the super vast scales between such massive and powerful objects. This result was discovered serendipitously as the researchers were only trying to study the faintest radio sources known at the time. We will look a bit more into this fascinating and amazing discovery.

The Cosmic Web and Galaxies

It is currently thought that the cosmic web of our Universe is the largest structure we know of. Basically our Universe on the largest scale looks like a huge spider web, where the individual points on the filaments are not stars or galaxies but galaxy clusters. This structure is believed to originate from and be held together by the invisible strands of dark matter, (DM). Amazingly it appears to be over 80% "empty"-that is full of voids. It is also thought that all the gas, dust, galaxies, clusters, dark matter halos, and all else inside these filaments is flowing along like a fluid in a hose. This reminds me of a sort of network of veins and capillaries for the body of our Universe. As things move along, the galaxies and clusters continue to merge and evolve within the filaments.

We know that gravity, (general relativity) is the key player in this structure and flow of matter, as both baryonic and DM move towards the denser matter concentrations or

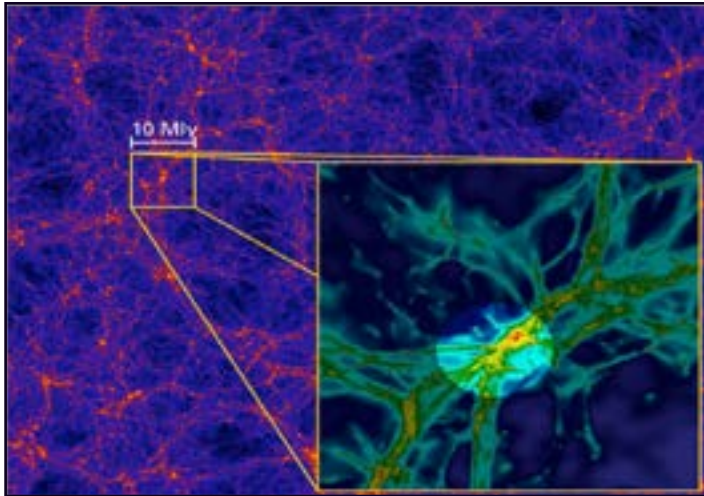
nodes within the filaments. Gravity may also cause influences between filaments, (therefore the internal constituents also) as different densities of flow pass one another. We see from observing galaxy clusters on relatively small scales, (within a few Mpc) that the local density environment plays a role in shaping galactic properties however the nature of large scale evolution is still very much unknown. The observed cosmic web has been well described by simulations of dark matter and gas in the universe; and it appears the cosmic web influences us on both a Universal scale and on a local scale.

Galaxies grow in basically two ways. One way is that they can merge via local gravitational interactions just like our galaxy is doing today with many small satellite galaxies that surround it. This is also what is in store for our Milky Way and the Andromeda Galaxy in about 4 billion years. We see evidence of these mergers throughout the Universe.

In another method, more isolated galaxies can grow in a somewhat gentle fashion, feeding on inflowing gas from the cosmic web. The inflowing gas is difficult to observe directly as it is cold and has not yet formed stars. This material in the filaments flows both in and out. This pristine gas reservoir is studied indirectly by using distant quasars as lighthouses to probe the gas in front of them. Additional supporting evidence for this has been observed in distant, (young) galaxies as their starburst, (new star growth) regions have a much lower metal abundance than the main portions of the galaxy, indicating that these galaxies are somehow acquiring some primordial gas that most likely is coming from the pristine cosmic web filaments.

Cosmic Alignments

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A computer simulation of dark matter showing a lattice of filaments separated by voids: the cosmic web. The inset shows a 10 million light year region around gas filaments. Galaxies may grow by pulling in gas from such filaments.

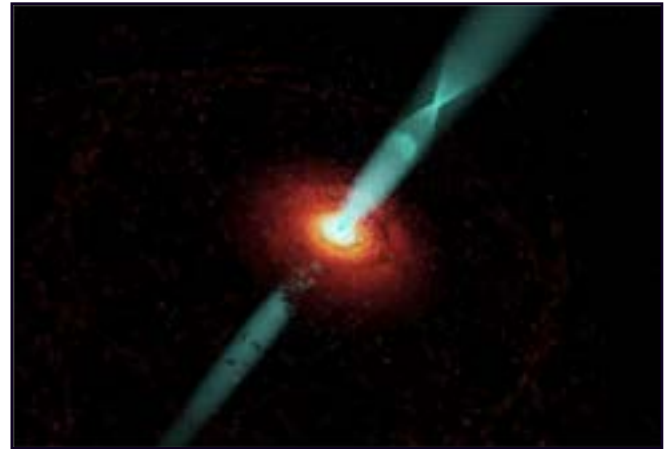
AGN and SMBHs and spin alignment

It is now well believed that most all large galaxies have in their centers a SMBH which weighs in at millions to billions of solar masses. This has been observed for many years and we also know that there are a few correlations, (connections or relationships?) between the SMBH and parts of the galaxy. There seems to be a link between the two that is by far not yet fully understood.

AGN, (active galactic nuclei) are very large and powerful centers of galaxies which emit prodigious amounts of energy and matter that can be seen across the universe. They are also known by such names as quasars and blazars, (and other types). The unified AGN model states that these different types of super powerful AGN are all variations of a single engine. That engine is a SMBH that is actively feeding off of stars, gas, and whatnot, and emitting radiation which can be detected across the visible universe. Currently a SMBH is the best theory that can produce such energies and observations.

These AGN are often seen with bipolar, (out of the spin axis poles) mass/energy ejections that can reach thousands of light years. These bipolar mass/energy ejections are best understood as the result of rapidly spinning SMBHs with a large accretion disk, which funnels the mass/energy jets from the accretion disk using both spinning magnetic fields and the spinning of spacetime itself. Thus

the angular momentum of the SMBH is directly related to this mechanism and the direction of the jets is directly related to the spin axis. It had already been determined that there are direct relationships between the optical polarization of quasar jets and the structural axis of AGN.



An artistic representation of a spinning SMBH with an accretion disk and bipolar mass/energy ejections.

How is spin alignment measured?

This new result comes from the first time that spin alignment was measured by detecting the direction of radio waves directly from the SMBH jets. This paper was published in 2016 and came from a three-year, (2011-2013) deep radio imaging survey conducted by scientists in South Africa using the Giant Metrewave Radio Telescope (GMRT) in India. After examining the radio waves, (at 612 MHz) coming from a one square degree region of space called ELAIS-N1 (which spans a region of space at least 20Mpc), the South African research team found that 64 the jets being produced by these galaxies were in alignment within about 1 degree, over scales spanning greater than about 0.5 degree. The jet alignment was definitely not random. They calculated that the probability of this being a chance alignment was less than 0.1%. Interestingly they also calculated that there were about 100 radio jets within a one degree span of the sky but many are below the sensitivity of the measuring instruments, are in relatively quiet star forming galaxies, or in radio quiet AGN. Unfortunately due to lack of associated data they were not able to calculate the exact redshift and thus the distance to ELAIS-N1. It is thought to be approximately about redshift $z=1$.

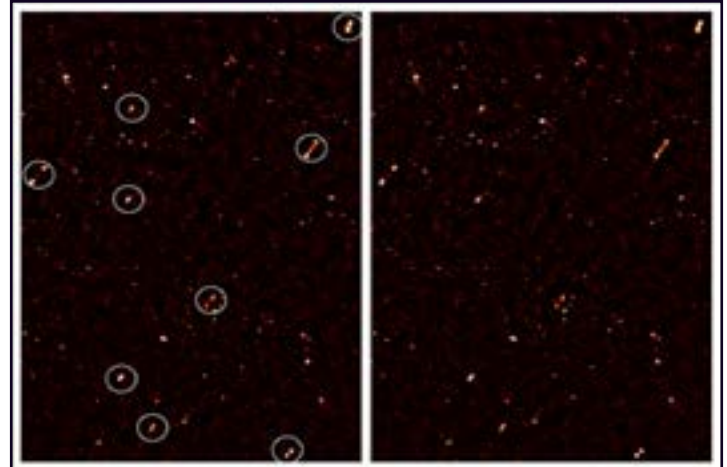
Cosmic Alignments

by Henry DeJonge IV

Although it has been thought that such alignments may possibly exist and other previous studies showed similar correlations between AGN jet polarization and galactic, (and filament) alignments, they were usually considered to have too many weak points, (like quasar feedback mechanisms) to show true and solid correlations. These new measurements were made possible due to the sensitivity of the radio images used, which also benefitted from the fact that measurements of the intensity of radio emissions are not effected by possible errors like scattering, extinction and Faraday rotation (which may have affected other studies).

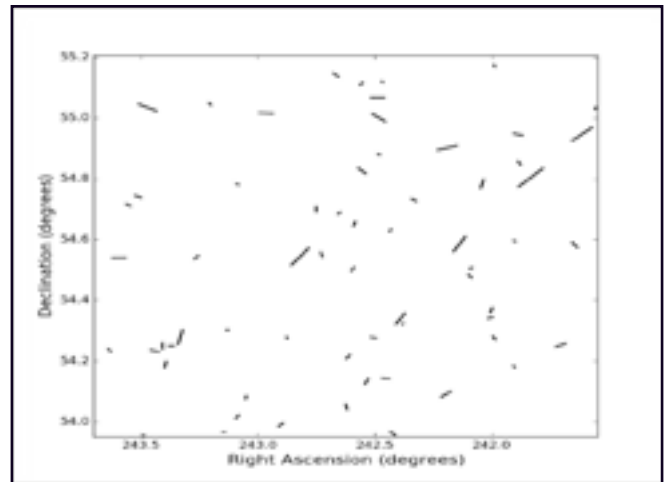
For example in 1998 astronomers found some evidence for very large scale coherent orientations of quasar optical polarization vectors. Astronomers found large-scale coherence in the polarization position angles of galaxies around the Northern and Southern galactic poles from a sample of 170 quasars. In 2001 it was determined that such alignments were most likely a result of the larger scale structure the quasars were imbedded within. It was concluded that these alignments were not random. This type of study has now been expanded to over 300 AGN over the years, still showing strong correlations. However due to the fact that the measurements were made using a "local" coordinate system and not a global system of coordinates, (thus making it not coordinate invariant) the studies have lost some credibility. There have also been questions raised on the statistical analysis used in the studies.

In 2014 it was observed that 19 out of 93 quasars had quasar polarization vectors, (at about redshift $z=1.3$) that were significantly polarized and that the axis of polarization was either perpendicular to or parallel to the accretion disks of the host galaxies. However this polarization vector state was considered to be a function of our viewing and therefore had a weaker correlation.



An image of the deep radio map at 612 MHz covering the ELAIS-N1 region, with some aligned galaxy jets. The image on the left has white circles around the aligned galaxies; the image on the right is without the circles.

Can we begin to use weak lensing as a tool to explore these cosmic alignments for even further galaxies, (and filaments)? Could gravitational lensing be used to examine any relationships between galaxy shape and known spin alignments, (especially with respect to redshift)?



This stick diagram shows the direction and lengths of radio jets at the positions of radio galaxies in the ELAIS-N1 612 MHz radio image. To enhance visibility, the lengths of the jets have been expanded by a factor of two.

Cosmic Alignments

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What are some possible origins?

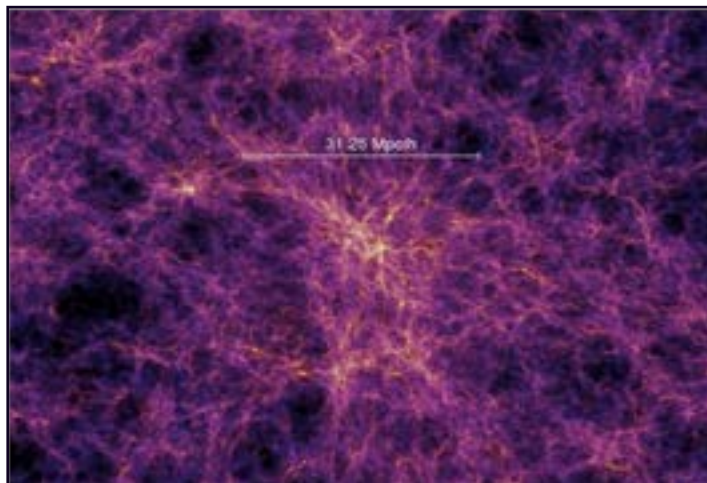
The main idea about the origin of this mysterious spin alignment is that during the Big Bang, (BB) when the Universe was much closer together and tightly bound these SMBHs and/or the galaxies were able to share certain properties like a common spin before expanding too far apart. This was the result of primordial mass fluctuations that were common over a local volume of spacetime. It seems unlikely to most theories that the common spin alignment was the result of later activity or communication over such large spacetime separations.

One other possible explanation that could create an alignment in galaxies on scales larger than galaxy clusters includes cosmic magnetic fields. Magnetic fields are just beginning to be studied and modeled in stars, galaxies, and even on larger scales. Their influence on galactic cluster scales and larger scales may have been due to their formation from primordial magnetic seeds during inflation or their effects during later galactic scale evolution. These magnetic fields have been shown to be present in galaxies, galactic clusters, and on larger scales. Their full influence is just being investigated

Other ideas such as fields associated with exotic particles like axions, and cosmic strings, may also offer potential influences on galactic and larger scales. It is thought by some that the alignments of these AGN could be related to quantum entanglement, and there are some ideas about entanglement in BHs, and the multiverse-perhaps these ideas are related? I was also wondering if there are any insights to be gained from chaos theory and system analysis to our cosmic system.

Many current cosmological computer models seem to indicate that while galaxies and clusters are flowing thru the cosmic filaments; more massive galaxies may tend to congregate near the centers of filaments while the less massive galaxies (younger?) tend to congregate near the outer edges of the filaments. It may be that the smaller, younger, more active galaxies are gathering the inflowing gas from the edges of the filament stream and becoming aligned with the overall filamentary flow, thus aligning their outflows, (and axis). The larger galaxies would continue to evolve thru mergers in the centers of the filaments, maintaining their original alignments. Perhaps this is also related to the influx of primordial cold gas for star forma-

tion? However these conclusions are still under debate as the models, (and their assumptions, etc.) are continually scrutinized and rerun. More data and analysis will determine if these ideas are correct, (however nice they sound).



By studying the large-scale spin distribution of SMBHs could tell us much about the matter fluctuations that gave rise to the large-scale structure of the Universe. Credit: Volker Springel/ Virgo Consortium.

What are the cosmic implications?

Such large scale spin distribution alignments were unexpected and not predicted by current theories, thus opening the window for further analysis and possible cosmic theory revisions. Despite our advances in cosmology we are just beginning to understand the formation and evolution of large scale structure in our Universe.

Such large scale spin distribution alignments were unexpected and not predicted by current theories, thus opening the window for further analysis and possible cosmic theory revisions. Despite our advances in cosmology we are just beginning to understand the formation and evolution of large scale structure in our Universe.

Many questions arise; what are the effects of this alignment on galaxies and their evolution? What other “connections” may we find in the Universe on such scales or larger scales? Does this cosmic alignment violate the cosmological principle? Is the Universe homogenous and isotropic over the largest regions? Is there a relation between redshift and these cosmic alignments? Is there a relationship with the mass or type of galaxy and the spin alignments, (say a hot young star forming galaxy and an older

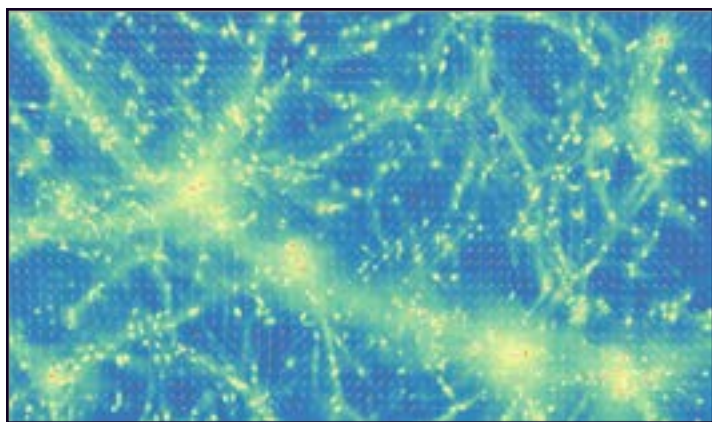
Cosmic Alignments

by Henry DeJonge IV

red galaxy)? Could this be related to the possible influx of primordial cold star forming gas within the filaments? Can these spin orientations flip as the galaxy evolves? What is the relationship between DM, (dark matter) and these galactic alignments? What role does DM take?

Some simulations, (2014-see the picture below) have indicated that relationships may exist with respect to the spins and the orientation of the filaments. About $z = 1.2$, model galaxies in a high-resolution simulation using cosmological hydro dynamical models, found that in low-mass galaxies this spin is locally aligned with the tidal field filamentary direction, while for the high-mass galaxies it is perpendicular to both filaments and walls.

Some simulations have already shown that by using DM and gravitational lensing we can peer further back into time and look deeper for such patterns. Even with more data, it is still however very difficult to incorporate many "local" processes, (star formation, super nova, etc.) into such models. More and better models with more and better observations will be needed.



The eigenvector (white arrows along the filament directions) of the tidal field within a slice of 25 Mpc in depth and 12.5 Mpc horizontally together with the gas density (from blue to red) within the Horizon-AGN simulation at $z = 1.2$.

Summary

It does seem to appear from initial observations and super computer simulations that large scale cosmic flows and alignments may exist and can also affect local galaxies and galactic structure in ways that are not fully understood or even known. Interestingly this also seems to apply to the SMBHs in the centers of these objects. These

effects may also be influencing even smaller local activities like SN, star, and planet formation.

In the future additional information will need to be collected and analyzed by such projects as South Africa's MeerKAT telescope and the Square Kilometer Array (SKA). These and other studies may provide additional evidence for such alignments once they go online. Future studies will also need to cover many more and larger spans of the sky than 1 square degree to better understand if this initial observation has deeper meaning.

This unexpected alignment will also be further evaluated by simulations that have been produced to model the large-scale structure of the Universe and how it evolved.

These include such studies as the FastSound project which has been surveying galaxies in the Universe with the Subaru Telescope's Fiber Multi-Object Spectrograph (FMOS), and the DESI Project which relies on the Mayall Telescope at the Kitt Peak, to chart the history of the Universe going back 11 billion years and creating an extremely precise 3D map.

We are now we are beginning to see new cosmological models coming out using varied correlations between the cosmic web and galactic spin to examine the effects-the future is open to further predictions. During the last few years for example some researchers have produced different models that completely reverse or leave out some of the major observations regarding possible cosmic spin alignment, (like reversing the direction of spin!).

Since many of the conclusions presented herein are based on incredibly small sample sizes and distance scales, (Vs. the suspected trillions of galaxies in our Universe) we may be getting a bit ahead of ourselves. However the idea that the Universe, (and us) are somehow deeply connected in many ways is hard, (for me at least) to let go. We are just beginning to better understand how our Universe came about and how what happened in the early times still affects it today. There is no doubt that many more connections and a greater understanding are waiting to be discovered.

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December 15

January 19

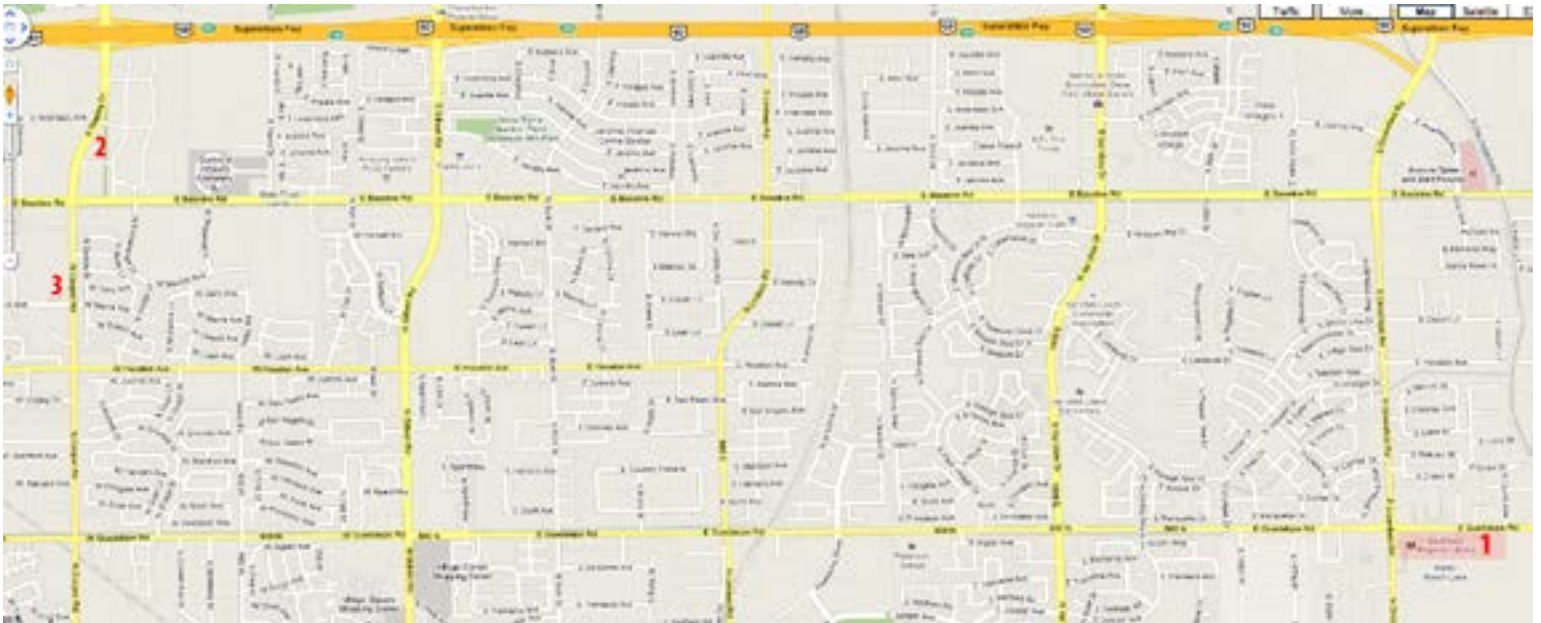
February 16

March 16

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.

Visitors are always welcome!



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



AUGUST 2017

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	26	30	31	

August 11 - Public Star Party

August 19 - Deep Sky Party

August 12 - Local Star Party

August 21 - Total Solar Eclipse

SEPTEMBER 2017

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

September 8 - Public Star Party

September 16 - Local Star Party

September 15 - EVAC Monthly Meeting

September 23 - Deep Sky Star Party

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www.evaonline.org

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