SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

December 2020 Free to members, subscriptions $12 for 12 issues **Volume 47, Number 12**

This is the Milky Way seen from Joshua Tree National Park as imaged by David Pham using a Canon EOS 6D Mark II through wide angle lens. The image was taken 20 September 2020.

Because of the COVID-19 crisis and ongoing efforts to reduce exposure to the virus:

. **All in-person club events are cancelled**

. **Use of the Anza site is discouraged**

Please read more about how OC Astronomers has modified its activities on page 2.

Upcoming Events - free and open to the public

Beginner's class	Friday, 4 December at 7:30 to 9:30 PM The topic this month will be the basics of astrophotography	ONLINE
Club Meeting	Friday, 11 December at 7:30 to 9:30 PM "What's Up?": John Garrett from OCA Main speaker will be Dr. Joel R. Primack from UC Santa Cruz whose talk we be "State of the Universe Report"	ONLINE
Open Spiral Bar	Saturday, 12 December at 10:00 to 11:30 PM Want to socialize? Grab your images, experiences, questions, or none and see your fellow Orange County Astronomers face-to-face.	ONLINE

Please consult the calendar on the OCA website to RSVP (required)

Response to COVID-19 Crisis

COVID-19 continues to affect all of our activities. All in-person club events remain cancelled through at least the end of this year. Cancellation periods for specific events are detailed below. Please see the President's Message for additional information.

Any use of the club's Anza site by members is at their own risk as we have no way of cleaning or sanitizing the site to CDC standards. If you must go to the site, be sure to clean and sanitize surfaces you have contact with and make sure it is cleaner when you leave than it was when you arrived. You must bring cleaning supplies and sanitizer with you as it is not provided at the site. Be sure to take any trash that you generate or find on the site out with you, and please maintain social distancing if anyone else is out there.

If you have any questions, feel free to contact board members or post them to the email groups or through social media. We will do our best to respond, but please bear with us if there is a delay as we all have other responsibilities as well.

We hope you and your families and friends all remain safe and healthy, and best wishes to all of you!

Summary of Cancellations of OCA In-Person Events

Due to the ongoing COVID-19 crisis, all in-person club events are cancelled through at least the following periods:

General Meetings	Cancelled until further notice; please try our virtual meetings instead
Anza Star Parties	Cancelled indefinitely
Orange County Star Party	Cancelled indefinitely, until allowed by Orange County Parks
Outreaches	Cancelled indefinitely
Beginners Astronomy Class	Cancelled indefinitely, please contact Dave Pearson to attend Zoom classes
SIG Meetings	Cancelled indefinitely, depending in part on availability of facilities and when meetings could go forward safely. Some may schedule Zoom events.

Please check the website, email groups and social media for updates.

From the Editor

Sirius wants photograph submissions from club members

We need submissions for this year. I will also pull some from the OCA members images section on our website but those will be at my discretion. If you would like your picture on the cover, please send it to me along with a brief description of the subject, where the image was taken, and the equipment used.

Ideas for Future articles

The newsletter includes articles from members or about subjects suggested by our members. We seek ideas and writers to cover them. To contribute an article or work with the editor to produce one, please contact me at newsletter@ocastronomers.org .

Due dates for submission of articles, pictures and advertisements

Issue	Due date
January 2021	19 December
February	23 January
March	21 February

President's Message

By Barbara Toy

At this time of year, we commonly look back and take stock of the year that is coming to its end. Every year has its challenges and its victories – with 2020's challenges, survival itself is a pretty good victory. Fortunately, as a club, we've had victories that go beyond that. One of our biggest is the success of our on-line general meetings, which not only have been going very well but are a tangible sign that our fundamental activities continue. Looking back, I realized that our March meeting was the only one we actually lost this year, as the Covid-19 shut-down happened too close to that meeting for us to do anything but cancel it. Reza (our webmaster and vice president) managed to work things out with our main speaker and "What's Up" presenter so our April meeting could go forward on its regular date and time via Zoom, and that has continued.

As other victories, Dave Fischer has kept the Sirius Astronomer going without missing a beat, and Dave Pearson migrated our Beginners Class to an on-line format very quickly and successfully. Our Outreach program had a lengthy period of inactivity, but Ceci Caballero, our new Outreach Coordinator, is now getting it back on track with on-line events with local schools. While we don't know when our Orange County star parties can start again, or when we will be able to safely schedule regular star parties at Anza, various members have been able to get in some viewing and imaging, following appropriate guidelines to keep themselves and those around them safe, so the year hasn't been a complete astronomical bust – plus we did get a pretty nice comet!

So, as a club, we're doing pretty well in spite of all that this year has thrown at us. I hope that all of you are doing at least as well as the club, and that you all make it through the rest of 2020 and into 2021 safely and in good health, along with all your loved ones. Let's also hope that we're able to get this virus under control quickly in 2021; sadly, there doesn't seem any way that can happen in 2020.

As another sign of the continued life and health of our club, we are currently in the middle of our annual . . .

OCA Election

For some reason, there was no surge of folks clamoring to be put on the ballot for our very own annual election for the OCA Board of Trustees. In fact, our club secretary, who was collecting the nominations, didn't receive any beyond those submitted by the members of the current Board.

On the bright side, the members of the current Board are apparently enjoying the experience enough that they all agreed to run again. This is great because not only does this mean that we have a candidate for every position on the Board, but all of the people who are running have an established record of working well together. That has made Board meetings and other interactions on Board matters over the last year congenial as well as productive, which has really helped in dealing with the fallout from the pandemic.

So now we're at the point where we need you to vote. Membership on our Board is by election, and the annual election is an important reminder to you and to us that we hold our positions to serve the interests of our members and our club as a whole, not our own individual interests. It also demonstrates that our members take an interest in the activities of the Board and gives us moral support when we must make difficult decisions to protect the club's interests.

In past years, we provided paper ballots through the Sirius Astronomer, the OCA website, and the January general meeting that marks the last day of the election. This gave you two options for voting, sending in your completed ballot by mail or voting in person at the January meeting by putting your ballot into the ballot box. We are still providing the paper ballot on the website and in the December Sirius Astronomer, but obtaining it at the January meeting and delivering it to the ballot box in person, unfortunately, isn't an option for this election as we fully expect that our general meetings will continue to be by Zoom well into 2021. If you vote by paper ballot, please follow the directions on the ballot itself. In particular, please be sure to print your name legibly on the outside of the envelope containing your ballot and mail it to the address on the ballot.

However, this year we are making a second option available, voting electronically. The details for this should be in a separate article in this issue of the Sirius Astronomer and will be posted on the website as well. We are hoping that members will find this a more convenient way to vote than by mail-in paper ballot; the electronic ballot may look a bit different but it should give you all the options that you have in voting by paper ballot. John Hoot worked on determining the best service to use for this, and the chosen service does protect the confidentiality of the vote and gives us a way to verify that only one ballot is submitted per eligible member.

To make this electronic option possible, the Board had to amend the Bylaws to give an earlier date for determining eligible voters than the original Bylaws. Per this amendment, you have to be a member in good standing on December 1, 2020, to vote in this election (originally you had to be a member in good standing three days before the January meeting). That means that your membership dues must not be delinquent as of December 1 for you to be able to vote.

We hope that a lot of you will try this option, so we can see if it works in practice the way we expect. We would appreciate any comments you have about your experience with this, both good and bad, as that will help us improve this option in the future.

So, there's an additional reason for voting than those given above – to help us improve the voting process itself. And did I mention that we do have a really good set of people on the Board who deserve your support? For some reason, none of the others wanted to run for president, which is why I'm in that slot again, but working with people like them makes the president's job pretty easy. So, please, get your ballots in and show them you care!

Some Final Thoughts…
By the time you see this, Thanksgiving will be behind us and Christmas and all of the other December and year-end holidays will be coming up fast. I hope you and your families all find ways to celebrate the holidays safely and enjoyably in spite of the coronavirus and all of the other stresses of this eventful year.

I know some of you may be dealing with the disease itself, or coping with the loss of a loved one. If that is your situation, I'm really sorry, and I hope that the spirit of the season brings you some comfort and not additional grief.
Best wishes to all of you, and may 2021 be a much better year for us all than 2020!

We Made It Ourselves

Amateur astronomers have always needed to be resourceful and creative to pursue this interest. In the old days there were few commercial makers of astronomy gear and even fewer of software relevant to this hobby so we made what we needed or shared our skills with others who had complementary abilities. Even now the hobby doesn't create a large marketplace for manufacturers so there may not be the right parts to put together the exact setup that we want, leaving us the choice of changing what we want or making something ourselves to complete it.

These projects aren't limited to things we make from scratch and they may be small projects or big ones. We include creatively used commercially bought products that we modified for our purposes but exclude things that we had done for us professionally.

To stimulate our memories, let's set up some categories:

- Structural: Observatories (those built by ourselves or with friends), piers, observing patios, etc
- Mechanical: Telescope mounts, tracking systems, adapters to put optical train onto mounts, observing chairs, efficient ways of transporting our astro-gear, etc
- Optical: Lenses, mirrors, entire telescopes, radio antennas and radio receivers for those who do some radio astronomy
- Electrical: Rigs for supplying power to our astro-gear when AC is not available, other ideas ?
- Software: Spreadsheets, system control software, contributing code or testing effort to Open Source projects such as PHD2, image processing software, image analysis software, etc
- Other stuff that doesn't really fit in these categories

My request of the readers is to send me (newsletter@ocastronomers.org) a brief description of astronomy related things that they made themselves or with the help of friends. These will summarized in a future article and subsequently this column will feature short write-ups of some of these DIY projects which may inspire more of us to make useful things.

To serve as examples, here are a few things I made in the past: Barn door tracker (this was my first mount), Bahtinov masks sized for my telescopes, pier adapter (made with help from my neighbor), mounting adapters for red dot finders and guide scopes for setups that didn't already have a means of attaching them, wind screen for my pad at Anza.

OCA Scope Loan Program Becoming "Adopt A Scope"

By John E. Hoot, Scope Program Director

With Covid-19 and a surge in telescope donations to the Club, we have decided to experiment with a new method of getting scopes to our members safely and effectively. I call it the Adopt A Scope program. It is modeled on the way animal rescue shelters operate. Instead of adopting a cute puppy, OCA wants you to give a lonely telescope a new home. Under the new program model, many of our scopes will be up for adoption. Simply purchase the scope at a ridiculously low price and take it home. If it wets the carpet or cannot be house broken within 6 months, you can bring it back in working order and we will refund your money less a $15 dollars handling fee. Otherwise, it is your scope forever!

Select a scope from the list below and contact me at scopes@ssccorp.com to schedule a time to pick up your scope at the club's storage facility, contact free, at South Coast Self Storage, 3480 W Warner Ave, Santa Ana, CA 92704.

If you currently are hosting a rental scope and wish to adopt it, please email me to negotiate a price.

Adopt A Scope Inventory

INV#	Type	Size	Mfg	Model	Accessories/Notes	Price
1	Mac	3.5"	Meade	ETX90	90mm f15 Maksotov Alt/Az Goto table top fork mounted telecope. Runs off batteries or 12VDC	$75
2	Newtonian	4.5"	Meade	DS2114ATS	4.5" mewtonian reflector or a single fork mount Goto telescope with tripod. It operated of 8 D cells, or 12VDC	$60
8	Cassegrain	8"	Hand made		A hand made 8" cassigrain telescope with an alt AZ telescope. A nice visual instrument.	$25
10	SCT	8"	Celestron	Orange Tube	8" f10 Schmidt Cassigrain fork mounted telescope with equatorial wedge, tripod, tracking drive and slow motion controls	$200
16	SCT	10"	Meade	LX200 Classic	8" LX200 Classic Alt/Az GOTO telescope. 2024mm Flocal length, with tripod. Suitible for astrophotography with the addition of an equatorial wedge (not included)	$250
19	Mac	2.25"	Meade	ETX60	A 60mm f5 achromoatic GOTO telescope in a table top fork mount. Comes with tripod and accessories.	$35
20	Reflector	8"	Orion	SkyView	An 8" f6 newtonian reflector on an Orion German Equatorial Mount with tripod, counter weights and Sidereal Tracking & SloMo on both axis	$125
24	Reflector	4.5"	Meade	4504	A 4.5 inch Newtonian reflector mont on Goto German Mount with tripod. An OK visual instrument. Not suitable for astrophotography	$50
26	Dobsonian	8"	Celestron	Starhopper	Celestron 8" Newtonian Reflector in a Dobsoian mount	$100
31	MAK-Cas	5"	Meade	ETX-125	125mm f15 Maksotov Alt/Az Goto table top fork mounted telecope. Runs off batteries or 12VDC	$100
32	Newtonian	4.5"	Meade	DS-114AT	4.5" mewtonian reflector or a single fork mount Goto telescope with tripod. It operated of 8 D cells, or 12VDC	$60
35	Newtonian	4.5"	Meade	DS-2114	4.5" mewtonian reflector or a single fork mount Goto telescope with tripod. It operated of 8 D cells, or 12VDC	$60
36	Schmidt-Cas	8"	Celestron	Ultima 8	8" f10 Schmidt Cassigrain fork mounted telescope with equatorial wedge, tripod, adjustable quartz tracking drive and slow motion controls. Suitable for astrophotography	$150
37	SCT	8"	Meade	LX200GPS	8" f10 Schmidt Cassigrain OTA on GOT AZ/EL fork mount, with tripod. Suitable for astrophotogray with the addition of an equatorial wedge (not included)	$250
39	Black C8 OTA	8"	Celestron		8" F10 Celestron Schmidt Cassigrain OTA Only	$60
40	Newtonian	8"	Viixen f5	LXD55 Mount	Vixen 8" f5 Newtonian OTA on a Meade LXD55 GOTO German equatorial mount.	$250
41	SCT	14"	Celestron	C14 Classic	w/Wedge, and Tripod	Free
48	SCT	12"	Meade	LX200 Classic	12" f10 Schmidt Cassigrain fork mounted GOTO Az/EL telescope with tripod, tracking drive and slow motion controls. Suitable for astrophotography with the addition of an equatorial wedge (not included)	$250
49	Dobsonian	4"	Orion	Dobonian	Table Top Dob - Easy to use	$35
51	Split Fork	16"	Meade/Home	DS16	Equatorially Mounted 16" Newtonian	$100
52	SCT	8"	Meade	2080LX	8" F10 Schmidt Cassigrain OTA on fork mount with a quartz adjustable rate drive. RA & Dec PUSH TO encoders, equatorial wedge and tripod. Suitable for astro photography	$150
53	SCT	4.5"	Celestron	NexStar 114GT	4.5" mewtonian reflector or a single fork mount Goto telescope with tripod. It operated of 8 D cells, or 12VDC	$60
54	Newtonian	8"	Orion	Atlas 8" Goto	8" f6 Newtonian OTA on Orion GOTO German equatorial mount with tripod	$200

Notice on changes in eligibility to vote in the OCA election:

So we can provide our members with the option of voting electronically as a convenient alternative to voting by mail-in paper ballot, the OCA Board of Trustees has amended the OCA Bylaws regarding voter eligibility. Per the amended requirement:

You must be a member in good standing as of December 1, 2020 in order to vote in the election for the 2021 Board. This is a change from the previous requirement in the Bylaws that you had to be a member in good standing three days before the January general meeting in order to vote. This change means that, if you are delinquent in paying your membership dues as of December 1, 2020, you will NOT be eligible to vote in this election.

Please contact OCA Treasurer Charlie Oostdyk if you have any questions concerning your eligibility to vote, or if you have sent a payment that you think he may not receive by December 1, 2020.

Please check the OCA website (ocastronomers.org) or the December issue of the Sirius Astronomer for information regarding the option to vote electronically.

Please note that we do NOT expect that we will be able to meet in person for the January 8, 2021 general meeting, so you will NOT be able to submit paper ballots in person this year. The only way you can submit paper ballots in this election is by mail.

Our thanks to all of you for your continuing cooperation and support through this very challenging period.
OCA Board of Trustees

Electronic Voting Available This Year

By John E Hoot, Trustee

This year, because we are not going to be able to hold our annual election in person at our January meeting, we are offering two different voting option for the club's board of directors and officers. You will find a mail in ballot in this month's newsletter. Additionally, members with an email address in their club profile will receive emails with personalized voting ID's and confidential credentials and instructions that will allow you to vote electronically and anonymously on a cell phone, tablet or PC at a web site hosted by "Election Runner", a company we have hired to administer our 2021 elections.

https://electionrunner.com/

I want to encourage you to vote. It is easy and free to vote electronically. Additionally, the e-ballot will include some free form questions to help the new board to serve you better. This is our club, help us make better serve your needs.

AstroSpace Update

December 2020
Astronomy and space news summarized by Don Lynn from NASA and other sources

OSIRIS-REx is the spacecraft that on October 20 picked up a sample of surface material from the small near-Earth asteroid Bennu. When spacecraft controllers took images of the sample mechanism, they found that the sampling had been overly successful. There was so much soil and rocks in the mechanism that the Mylar flap that was to contain the sample had lodged on rocks and failed to close. So the precious sample was slowly escaping and floating away into space. Controllers immediately commanded the spacecraft to stow the sample in the sealed container designed to protect the sample on its way back to Earth. The original plan had been to make further tests, such as a spin test that would weigh the sample, before stowing it. Arrival back at Earth is still scheduled for September 24, 2023.

Asteroid Density – Analysis of tracking data of OSIRIS-REx combined with observations of trajectories of particles thrown off by asteroid Bennu has allowed scientists to create a map of the asteroid's gravity field. Bennu was known to be a rubble pile, that is, filled with void spaces between the constituent rocks. The gravity map surprisingly showed the core to be less densely packed than nearer the surface. Bennu's spin may be pushing material outward to cause this. If so, then eventually the asteroid may spin itself to pieces.

Different Kilonova – On May 22, a short gamma-ray burst was observed. Immediate follow-up observations were made in visible light, X-rays, infrared and radio. All the evidence points to a merger of 2 neutron stars, making a kilonova burst of light (a kilonova is about 1000 times as bright as an ordinary nova), as expected from the similar events in 2013 and 2017. However, the new event appears to have left behind a magnetar (a neutron star with extremely strong magnetic field) rather than the black holes that the previous events left. It was also about 10 times as bright in infrared as the previous ones. So apparently there are 2 ways to make a kilonova. Previously magnetars were believed to be created by the explosion of massive stars at the ends of their lives. Apparently there are 2 ways to make a magnetar. Astronomers believe that if this narrative is correct, then within a few years ejected material will begin giving off radio waves, so they will continue to monitor the object in radio.

Gravitational Waves – The scientists of the LIGO and Virgo gravitational wave detectors have released a new catalog of all of their detected wave events. It contains 50 events, including 39 that have been analyzed so far from the current observational run. Most of the events were mergers of black holes. The large increase in events detected since the first 2 observing runs reflects the increased sensitivity obtained from equipment upgrades performed between runs. Upgrades include increasing laser power, improving mirrors, and use of quantum squeezing. The last of these is a technique for reducing the Heisenberg uncertainty in measuring the length of the wave detector arms by increasing the uncertainty in a related quantity. More upgrades will be made before the next observing run, scheduled to begin in mid-2022. The Japanese KAGRA gravitational wave detector will go into operation for that next observing run.

Active Red Dwarf – About ¾ of the stars in our galaxy are tiny dim red dwarf stars. Naturally many of the exoplanets being discovered orbit this common type of star. In the search for habitable planets, astronomers have been disappointed that young red dwarf stars usually emit too much X-ray radiation and flares to allow any of their planets to be habitable. But older red dwarfs tend toward less dangerous emissions. However, recent studies of the very nearby (6 light-years away) red dwarf Barnard's Star found that it is quite active though old, showing ultraviolet and X-ray emissions and stellar flares about 25% of the time. So not all old red dwarfs calm down.

Extreme Weather – An exoplanet dubbed K2-141b has been discovered where the extreme temperature causes rock to melt into lava oceans, even evaporate into rock vapor. Winds in excess of 3100 mph then blow the vapor to the cold part of the planet, where it rains lava and drops rock snowflakes. The planet orbits extremely close to its star and keeps one side always toward that star, resulting in temperatures over 5400 °F on the star-facing side and as low as minus 328 °F on the unheated dark side. This surely is a candidate for the worst weather in the Universe.

Brown Dwarf Discovered By Radio – Brown dwarf stars are just massive enough to begin nuclear fusion of heavy hydrogen, but not massive enough to fuse ordinary hydrogen, like main sequence stars do. Although some brown dwarfs have been seen in radio light, none has been discovered by radio, until now. Observations using LOFAR (low frequency radiotelescope array scattered across Europe) found the radio signal emitted by a previously unknown brown dwarf. The radio waves are given off by aurora on the brown dwarfs. Most brown dwarfs have been found by infrared telescopes because their temperatures produce infrared. However, the coolest brown dwarfs are difficult to discover, as they give off very little infrared.

Jovian Sprites – Juno (Jupiter orbiter) has imaged in ultraviolet the Jupiter equivalent of sprites or elves, forms of lightning that occur very high in the atmosphere above ordinary lightning storms. On Earth these are produced by excited nitrogen molecules and are seen in visible wavelengths of light. But on Jupiter, hydrogen molecules produce them in ultraviolet. Further observation will be attempted with Juno's radio and plasma wave instruments. Unfortunately the layout of Juno prevents simultaneous visible and ultraviolet observations, so it can't be determined if visible lightning accompanies the ultraviolet phenomena.

Early Mars Water – A meteorite that came from Mars has been shown to include minerals that likely form in water. The object was splashed off the red planet by an impact 4.4 billion years ago, indicating that bodies of water existed on Mars at that time, earlier than other evidence of bodies of water on Mars. The meteorite is named NWA 7533 since it was found in North West Africa, a few years ago.

Phosphine Second Opinion– I reported here in October that the chemical phosphine had been found in Venus's atmosphere. How the phosphine formed there is a mystery, because that chemical found on Earth is made by living beings. Another group of astronomers has now analyzed the data on which the phosphine discovery was based, using different methods, and concluded that it is quite possibly noise in the data rather than the presence of phosphine. More observations are needed to settle this, possibly from future spacecraft at Venus.

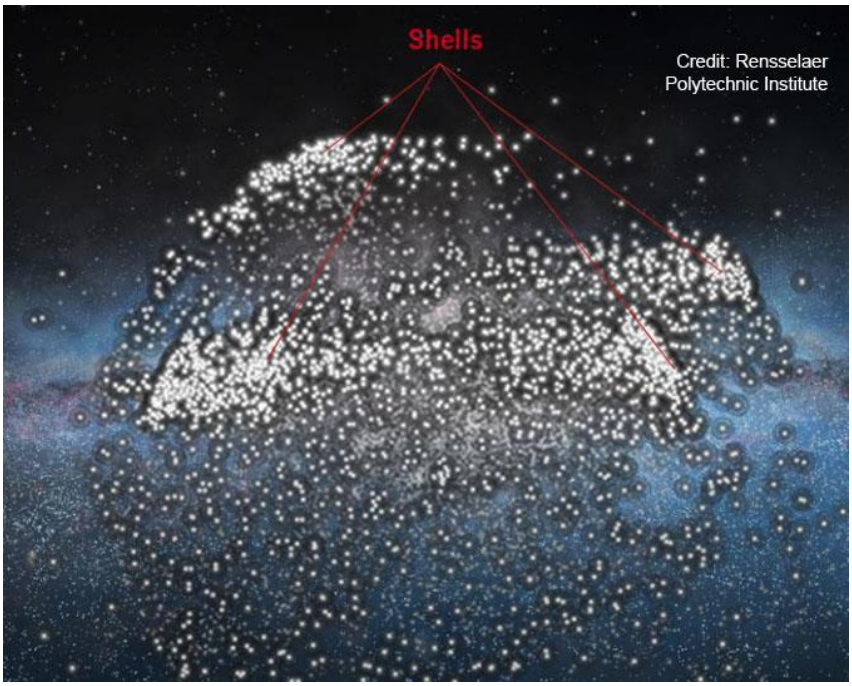
Comet Surface – 6 years ago the Rosetta spacecraft dropped its lander named Philae onto the surface of Comet 67P/Churyumov-Gerasimenko. Its anchor failed to hold and so the lander bounced twice then wedged, taking hours in the extremely low gravity of the comet. Scientists have now located the bounce marks and have studied them. The thin surface coating was scraped off to reveal clean water ice that is fluffier than new-fallen Earth snow. It is nearly 80% empty space between ice particles.

Collisions With the Milky Way – Astronomers have analyzed the spectra of the approximately 150 globular clusters that orbit our galaxy, as well as the shape and orientation of their orbits, and determined that 5 subgroups of globulars were captured from satellite dwarf galaxies when they collided with the Milky Way. The dates of collisions and numbers of captured globulars are:

11	billion years ago	13	globulars
10	billion years ago	5	globulars
9+	billion years ago	3	globulars
9	billion years ago	20	globulars
7	billion years ago	7	globulars

It is possible that many other collisions took place but did not contribute captured globulars. Computer simulations of collisions with a model of the Milky Way were used to derive the dates. The 5 collisions resulted in our galaxy capturing about a billion stars, a tiny fraction of those now in the Milky Way.

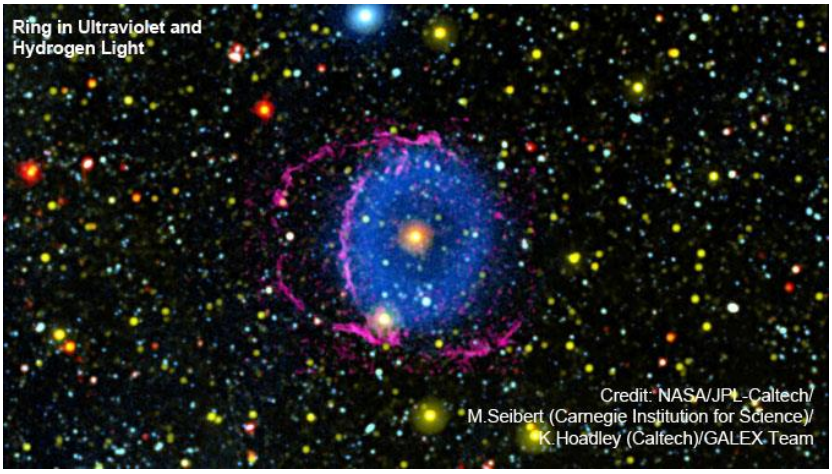
Milky Way Shells – A stack of shell-like structures of stars has been found in our Milky Way galaxy. Similar structures have occasionally been found in other galaxies, but these are the first seen in the Milky Way. They were found using data from the Sloan Digital Sky Survey and Gaia spacecraft. It is believed that these structures were formed from stars gravitationally ripped out of a dwarf galaxy that collided with the Milky Way nearly 3 billion years ago. A collision and subsequent oscillation that aimed nearly straight through the center of our galaxy would produce structures of this shape.



Milky Way Filaments – A team of astronomers has found a network of hydrogen filaments throughout the Milky Way. The work was the most detailed view of hydrogen yet made of the inner galaxy. The observations were made with the Jansky Very Large Array of radiotelescopes in New Mexico. Most of the filaments are parallel to the disk of the galaxy. One filament is 3000 light-years long. However perpendicular filaments were also found, which are believed to have been created where high rates of star formation blew material out of the galactic plane.

Bulge Star Ages – Previous studies of the stars in the central bulge of the Milky Way galaxy showed that they fell in at least 2 general age groups, implying that the center of the galaxy underwent 2 or more bursts of star formation in its history. A new study of millions of stars in the central bulge concluded that it had only one burst of star formation that occurred more than 10 billion years ago. The ages of the bulge stars have traditionally been determined by measuring spectroscopically the concentrations of elements heavier than helium. The new study concluded that the heavy elements built up much more quickly in the bulge than other galactic areas, so the bulge stars with varying heavy element content were all quite old. More studies are planned of bulge stars, studies that include distance measurements and orbital motion measurements of the stars.

Ring Finally Explained – A mysterious ring about a star, seen in ultraviolet light by the GALEX space telescope, has finally been explained after 16 years of study. A much smaller star collided with the star, named TYC 2597-735-1, about 2000 years ago. The stars merged and threw out a cloud of debris. A disk of gas cut the debris into 2 cones moving in opposite directions. The cones glow in ultraviolet. The initial GALEX images had been interpreted as the result of a supernova. However follow-up observations in infrared and visible light kept turning up features that didn't fit the supernova theory.



Earth's Magnetic Reversal – The Earth's magnetic field has reversed (north and south magnetic poles exchanged) every few hundred thousand years, at somewhat irregular intervals. This is known by measuring the magnetic fields in rocks that formed at different times in Earth's history. A new study of a rock record in Japan has revealed details of the last time a reversal occurred, about 773,000 years ago. The Earth's field was found to have gone through an unstable period for at least 10,000 years before the reversal and the reversal process took at least 20,000 years. This contradicts some previous studies that concluded that reversal process spanned much less time.

Water On the Moon – Several discoveries of water ice on our Moon in shadowed areas within craters have been announced in recent years. New observations made with SOFIA (airborne 100-inch infrared telescope) have found water ice in some sunny areas of the Moon. The ice is mixed in the surface soil in concentrations of about 100-400 parts per million. Previous observations of sunny areas of the Moon have found evidence that could be of either water or hydroxyl, but the new observations are definitely water. These observations are the first time SOFIA has looked at the Moon, because it was designed to track on stars, not the Moon. Because conditions in sunny areas of the Moon should eventually drive water off into space, there must be a means of replenishing the water. Several theories have been proposed. Further observations of other areas of the Moon at different sunlight angles will be made.

Moonlike Asteroid – There are thousands of asteroids orbiting the Sun in Jupiter's orbit, but at a roughly 60° angle ahead or behind the giant planet. These locations are 2 of the gravitationally stable Lagrange zones, formed by the combined gravity of the Sun and Jupiter. The objects are known as Trojan asteroids because the first ones discovered happened to have been named after various heroes of the ancient war between Troy and Greece. In recent years Trojans have been found in smaller numbers in the orbits of many of the other planets, including Mars. A new study of a Martian Trojan, asteroid 101429, found spectroscopically that its surface material is quite similar to that of our Moon. An obvious theory would be that the impact of a large object with Earth that formed our Moon more than 4 billion years ago also threw material out to Mars's orbit. Other explanations of the asteroid's surface composition have been proposed, so more work is needed before being certain that this Martian Trojan is a wayward piece of Earth.

Space Station – Humans have been living on the International Space Station continuously for 20 years, as of November 2. More than 240 people from 19 countries have stayed there. The second ever SpaceX Falcon rocket with people aboard arrived with 4 more astronauts on November 16. Before the Falcon, the crews arrived on 63 Russian Soyuz rockets and 37 Space Shuttle flights. The plan is to keep 7 people aboard the station for the foreseeable future, an expansion from the 6 that comprised a typical crew for several years past.

Voyager 2 Is Fine – NASA's Deep Space Network (DSN) is designed so that it can communicate by radio with any distant spacecraft from at least one of its 3 radio dish locations at any time, as the Earth turns. An exception to this is that spacecraft located very far south can only use the Australian location. Voyager 2 is very far south, and additionally is so distant that only the largest DSN radio dish (230 ft across), and therefore most sensitive, can be used. Since February the largest Australian dish has been undergoing repairs and upgrades, so Voyager 2 was instructed to ignore the fact that Earth wasn't going to talk to her for months. In late October, as dish repairs neared completion, the Australian large dish checked in with Voyager 2 and found that everything aboard the spacecraft was fine.

More Bad Arecibo News – A second cable (of 18) that supports the receiving equipment suspended above the radio dish antenna at Arecibo, Puerto Rico, has snapped and further damaged the dish surface. The observatory operators had started a plan to repair from the first cable break 3 months previously. But after the second break, the National Science Foundation (NSF), which funds Arecibo, hired experts to assess how to repair the telescope, and their answer was that it could not be done without life-threatening risks to repair personnel. So NSF decided the only option left is to perform a controlled demolition of at least the suspended parts, abandoning hope of the telescope's future use. Arecibo is the second largest radiotelescope dish in the world (about 1000 ft across) with a long history of important astronomical discoveries. Archived observations will remain available, and the visitor center and some auxiliary facilities will reopen after the demolition.

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The Televue 5x Powermate is different from a traditional Barlow lens because it has a 4 element lens design (Four Glass Elements) that delivers full field sharpness with virtually no aberration. The Televue 5x Powermate will outperform any Barlow lens because the additional lens elements within the Powermate body.

I purchased this Powermate new ($218), did an on-telescope test, and found that the magnification was too much for my my f/10 Celestron SCT. I am now using the 2.5 Powermate, which is more ideal for my telescope. This 5X powermate would probably be ideal for small telescopes or short focal length Newtonian telescopes.

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