The Focal Point

The Atlanta Astronomy Club
Established 1947
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Editor: Tom Faber

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April AAC Meeting Cancelled

There will be no April meeting of the Atlanta Astronomy Club due to the ongoing COVID-19 pandemic and the requirements to limit group gatherings to prevent further spread of the disease. While we are not able to hold our monthly meetings right now, please continue to follow AAC on its web page and Facebook page for updates until we are able to have our regular meetings again.

In the mean time, you are encouraged to attend the Charlie Elliott Astronomy observing events and online programs when they are held. See the article to the right for details for their next one.

Fernbank Science Center's Planetarium At Home Programs

While we have been unable to have in-person AAC meetings at the Fernbank Science Center for a while now, our host, Fernbank Science Center's planetary geologist Scott Harris, has been having a series of virtual programs about astronomy and planetary sciences on Fernbank's Facebook page. Recent programs have been about the 50th anniversary of the Apollo 14 mission, and the upcoming launch of the James Webb Space Telescope. For more information about Scott's upcoming programs check out Fernbank's Facebook page here: https://www.facebook.com/fernbankcenter

Charlie Elliott Chapter Meetings

With the Covid pandemic still with us in a major way, we will have — weather permitting – another informal observing event the following evening, May 8, at the Jon Wood Astronomy Field (which is on the right, shortly after turning onto Elliott Trail from Marben Farm Rd). As always, this event is free.

Note that the Elliott Trail automatic road gate closes for incoming traffic at 5 p.m. Afterwards, a four-digit combination must be entered on a keypad near the gate for it to open. That combination is available only to dues-paying Club members. Therefore, non-Club members planning to join us on the observing field should enter the park before 5 p.m. Club members who may arrive after 5 p.m. and do not have the gate combination should contact a club officer at least 24 hours prior to their visit to obtain the gate combination.

The gate opens automatically for exiting traffic as you approach it to leave no matter what time it is.

According to the Sky Safari astronomy app, sunset at our location near Mansfield, Georgia, will be at 8:20 p.m.

Please check out our Facebook Page at https://www.facebook.com/groups/ceastronomy . There you'll find a welcoming group of people sharing ideas and tips as well as organizing ad-hoc observing and imaging sessions on the Jon Wood Astronomy Field.

For those not familiar with the Charlie Elliott Wildlife Center, go to https://georgiawildlife.com/charlie-elliott-wildlife-center

The CEWC phone is 770-784-3059, Monday - Saturday 9 a.m.– 4:30 p.m.

Covid Requirements

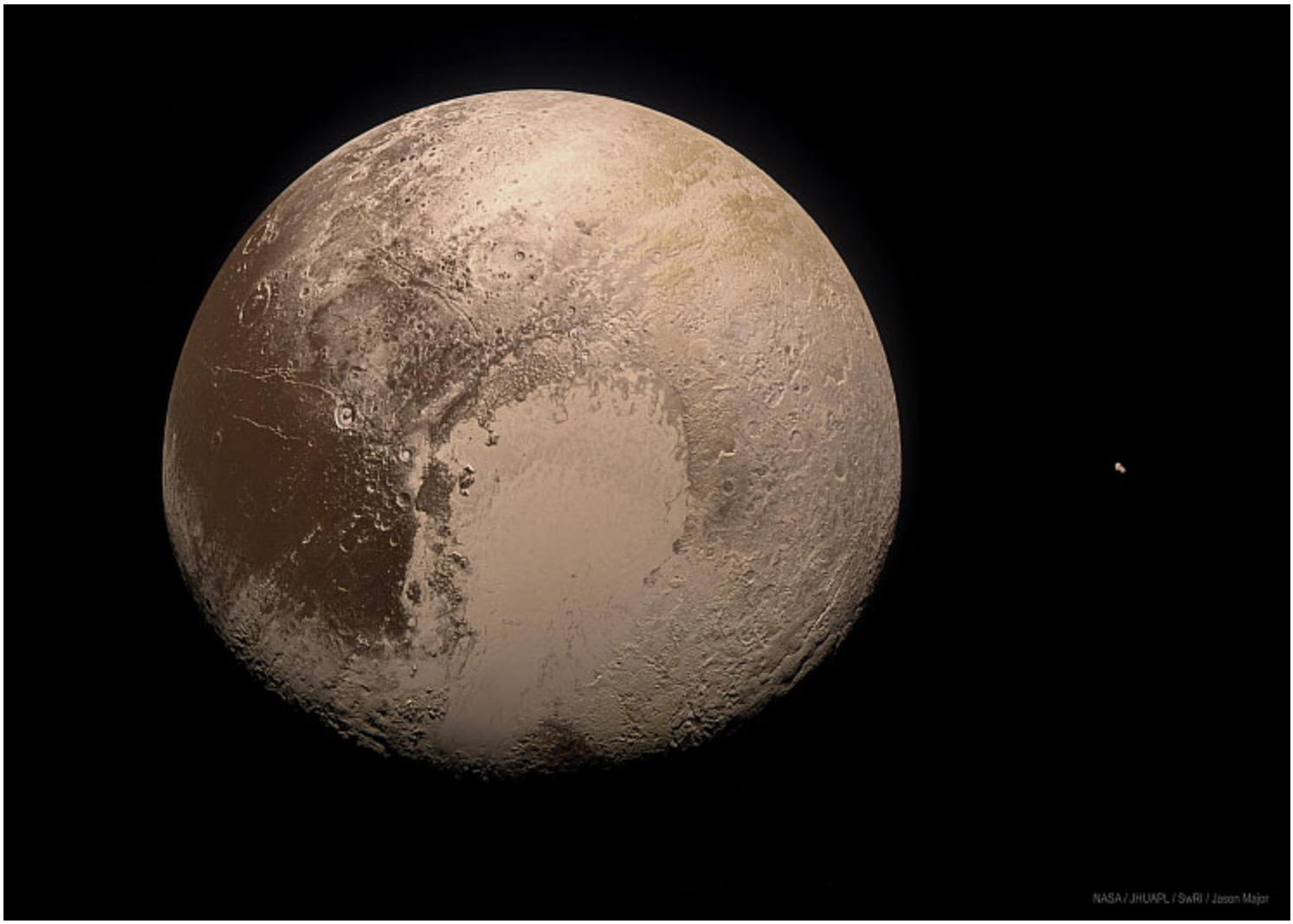
IMPORTANT! Face masks are required and we remind all attendees that the CDC's 6-foot social distancing requirement remains in effect. Note also that NO refreshments will be served, so bring your own.

Workshops

If you have an idea for a 15 to 20-minute pre-meeting presentation about something you've learned or a project you're working on, contact Steve Siedentop or Ken Poshedly.

Our Monthly Meetings and Public Observing Nights

The status of in-person meetings will be announced monthly as the COVID situation changes. Visit the "Our Calendar" tab at the top of the page for our 2020-2021 meeting, observing, and outreach schedule. Start times vary throughout the year so please check back for details.



Our main exploration targets: Pluto (2015) and the much smaller Arrokoth (2019), to scale. Other exploration targets included Pluto's five moons. (Credit: NASA/Johns Hopkins APL/Southwest Research Institute)

New Horizons - NASA's Mission to Pluto and the Kuiper Belt

The PI's Perspective: Far From Home

By Alan Stern, March 23, 2021

New Horizons remains healthy and continues to send valuable data from the Kuiper Belt, even as it speeds farther and farther from Earth and the Sun.

I'm going to focus this PI's Perspective on a major upcoming mission mile marker — namely, New Horizons being 50 astronomical units (AU) from the Sun next month. But first, some mission news.

Our biggest news is that most of our latest flight software upgrades, which will provide new scientific capabilities on the spacecraft, are in final test and on track to be uplinked in July. In fact, one of those updates, for our solar wind instrument called SWAP, is already aboard the spacecraft — and being used to produce new science! That software, transmitted to New Horizons in mid-February and tested for a week at the end of February, allows us to see much finer structures in the solar wind as we plow toward the heliopause, the outer edge of the heliosphere that surrounds the solar system.

We're also preparing another search for Kuiper Belt objects (KBOs) to study as we pass by them; those same summertime searches will also look for a new flyby target KBO, just as we did in our 2020 searches. Keep in mind, the search for Arrokoth (2014 MU69) took four years—and this search will go on for years, too, because it's a needle in a haystack challenge to find flyby KBOs! But this time, we're applying a new tool—artificial intelligence. Using machine-learning software, mission co-investigator JJ Kavelaars and collaborating scientist Wes Patrick have sped up and made those searches far more productive. In fact, when they reran the 2020 search data through their new software tools, it not only worked 100 times faster, but it turned up dozens of new KBOs that human searchers had not found in the search images! We'll be taking advantage of this important new tool again later this year, and next year and after that as well.

And one last news item: We're wrapping up development on a flight plan and command load to study three KBOs in May, determining their surface properties, shapes, and more. These kinds of studies we're doing from within the Kuiper Belt can't be done from Earth or even orbiting telescopes, and New Horizons has now studied almost 30 KBOs this way. For some of those KBOs, we we're close enough to search for and find satellites around them at resolutions even the Hubble Space Telescope

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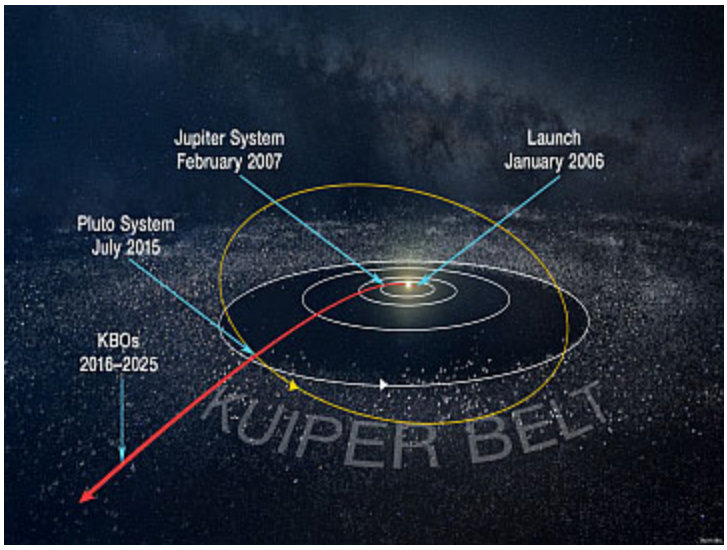

The flight of NASA's New Horizons mission. (Credit: NASA/Johns Hopkins APL/Southwest Research Institute)

cannot match, providing an important new window into how KBOs formed. Additional KBO observations are planned in September and December.

Reaching Rare Space

I mentioned earlier our big upcoming milestone: New Horizons will cross the amazing 50 AU distance marker on April 17 or 18, depending on your time zone here on Earth.). At 50 AU, we'll be 50 times as far from the Sun as Earth is! That's a milestone that only four operating spacecraft — Pioneers 10 and 11, and Voyagers 1 and 2 — have reached before us. That's so far away, in fact — almost 5 billion miles (7.5 billion kilometers) — that the Sun itself is smaller in the sky there than Jupiter is from Earth!

Of course, the Pioneers (now out of power and derelict) and the Voyagers (both still operating) are much farther out than New Horizons. In fact, they are so much farther out that none of them are the nearest spacecraft to us. That spacecraft is Juno, orbiting Jupiter 10 times closer to the Sun than New Horizons is now! And note that in mid-April, we'll have a news release, with some very special images we've taken from our perch so far away in the Kuiper Belt, so keep an eye out for that!

Looking back at the flight of New Horizons from Earth to 50 AU almost seems like a dream. Most of us on the flight team have been a part of it all the way, and during that time our kids have grown up, our parents (and we ourselves!) have grown older, and the first exploration of Pluto and the first KBO has been accomplished!

Looking ahead, just like other NASA planetary missions in extended (post-prime mission) operations, every three years we have to propose a new mission and science plan to NASA. If we are approved, we are funded for the next three years; if not, the mission will be terminated. Our next proposal will be due in early 2022. If New Horizons continues to be funded, it'll fly on, exploring the outer Kuiper Belt and the Sun's outer heliosphere. That's something no other spacecraft can do: we're the only one in this region!

We hope to continue proposing and performing science for many years. By the late 2030s, though, New Horizons may be too low on power to operate. That's because of the half-life of our plutonium power supply, which produces 3.3 watts less every year, and 33 watts less every decade. By the time it can't produce enough power to run the main spacecraft systems, New Horizons will be at or near 100 AU from the Sun—twice as far out as we are now. But even once the spacecraft is derelict—either because it runs out of power or fuel, or for any other reason—it will continue to coast outward, into the galaxy at a speed of nearly 3 AU (about 300 million miles) per year. In fact, even when the day comes in a few billion years that the Sun goes red giant and engulfs Earth, New Horizons, like the Pioneers and Voyagers, will still be out there, outliving even its home planet!

While you ponder that sobering thought, I'll conclude this report. In the meantime, I hope you'll keep on exploring — just as we do!

Hubble Spots Double Quasars in Merging Galaxies

NASA/STScI News Release - April 6, 2021

NASA's Hubble Space Telescope is "seeing double." Peering back 10 billion years into the universe's past, Hubble astronomers found a pair of quasars that are so close to each other they look like a single object in ground-based telescopic photos, but not in Hubble's crisp view.

The researchers believe the quasars are very close to each other because they reside in the cores of two merging galaxies. The team went on to win the "daily double" by finding yet another quasar pair in another colliding galaxy duo.

A quasar is a brilliant beacon of intense light from the center of a distant galaxy that can outshine the entire galaxy. It is powered by a supermassive black hole voraciously feeding on inflating matter, unleashing a torrent of radiation.

"We estimate that in the distant universe, for every 1,000 quasars, there is one double quasar. So finding these double quasars is like finding a needle in a haystack," said lead researcher Yue Shen of the University of Illinois at Urbana-Champaign.

The discovery of these four quasars offers a new way to probe collisions among galaxies and the merging of supermassive black holes in the early universe, researchers say.

Quasars are scattered all across the sky and were most abundant 10 billion years ago. There were a lot of galaxy mergers back then feeding the black holes. Therefore, astronomers theorize there should have been many dual quasars during that time.

"This truly is the first sample of dual quasars at the peak epoch of galaxy formation with which we can use to probe ideas about how supermassive black holes come together to eventually form a binary," said research team member Nadia Zakamska of Johns Hopkins University in Baltimore, Maryland.

The team's results appeared in the April 1 online issue of the journal Nature Astronomy.

Shen and Zakamska are members of a team that is using Hubble, the European Space Agency's Gaia space observatory, and the Sloan Digital Sky Survey, as well as several ground-based telescopes, to compile a robust census of quasar pairs in the early universe.

The observations are important because a quasar's role in galactic encounters plays a critical part in galaxy formation, the researchers say. As two close galaxies begin to distort each other gravitationally, their interaction funnels material into their respective black holes, igniting their quasars.

Over time, radiation from these high-intensity "light bulbs" launch powerful galactic winds, which sweep out most of the gas from the merging galaxies. Deprived of gas, star formation ceases, and the galaxies evolve into elliptical galaxies.

"Quasars make a profound impact on galaxy formation in the universe," Zakamska said. "Finding dual quasars at this early epoch is important because we can now test our long-standing ideas of how black holes and their host galaxies evolve together."

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Rosette Nebula by Dan Llewellyn

I recently purchased an Askar 200mm f/4 to try some super wide field. Really impressed with this lens. Here is the Rosette nebula and surrounding areas, showing the cone nebula to the right amongst many other objects. The Rosette nebula is a large star forming region (think stellar nursery where stars are born) located about 5,000 light years from Earth near one end of a giant molecular cloud in the constellation Monoceros. Sony A7s3 modified using the OPT Quad filter. Stack of 13 - 2 minute exposures taken on March 4, 2021.

Astronomers have discovered more than 100 double quasars in merging galaxies so far. However, none of them is as old as the two double quasars in this study.

The Hubble images show that quasars within each pair are only about 10,000 light-years apart. By comparison, our Sun is 26,000 light-years from the supermassive black hole in the center of our galaxy.

The pairs of host galaxies will eventually merge, and then the quasars also will coalesce, resulting in an even more massive, single solitary black hole.

Finding them wasn't easy. Hubble is the only telescope with vision sharp enough to peer back to the early universe and distinguish two close quasars that are so far away from Earth. However, Hubble's sharp resolution alone isn't good enough to find these dual light beacons.

Astronomers first needed to figure out where to point Hubble to study them. The challenge is that the sky is blanketed with a tapestry of ancient quasars that flared to life 10 billion years ago, only a tiny fraction of which are dual. It took an imaginative and innovative technique that required the help of the European Space Agency's Gaia satellite and the ground-based Sloan Digital Sky Survey to compile a group of potential candidates for Hubble to observe.

Located at Apache Point Observatory in New Mexico, the Sloan telescope produces three-dimensional maps of objects throughout the sky. The team poured through the Sloan survey to identify the quasars to study more closely.

The researchers then enlisted the Gaia observatory to help pinpoint potential double-quasar candidates. Gaia measures the positions, distances, and motions of nearby celestial objects very precisely. But the team devised a new, innovative application for Gaia that could be used for exploring the distant universe. They used the observatory's database to search for quasars that mimic the apparent motion of nearby stars. The quasars appear as single objects in the Gaia data. However, Gaia can pick up a subtle, unexpected "jiggle" in the apparent position of some of the quasars it observes.

The quasars aren’t moving through space in any measurable way, but instead their jiggle could be evidence of random fluctuations of light as each member of the quasar pair varies in brightness. Quasars flicker in brightness on timescales of days to months, depending on their black hole’s feeding schedule.

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Galaxy NGC253 by Dan Llewellyn

Known as the Sculptor galaxy, it resides in the Constellation Sculptor. It can be seen visually through even modest aperture telescopes, and presents itself looking like a silver coin, hence its more informal name, the silver coin galaxy. It's the largest galaxy in the nearest group (named Sculptor, what else?) to our own local group of galaxies and is a mere 10 million light years away. It was discovered by Caroline Herschel, sister of William Herschel, on September 23, 1783. This was taken October 13, 2020 through my 12.5 Planewave CDK using a cooled and modified Sony A7s. Stack of 7 - 5 minute subs guided.

This alternating brightness between the quasar pair is similar to seeing a railroad crossing signal from a distance. As the lights on both sides of the stationary signal alternately flash, the sign gives the illusion of "jiggling."

When the first four targets were observed with Hubble, its crisp vision revealed that two of the targets are two close pairs of quasars. The researchers said it was a "light bulb moment" that verified their plan of using Sloan, Gaia, and Hubble to hunt for the ancient, elusive double powerhouses.

Team member Xin Liu of the University of Illinois at Urbana-Champaign called the Hubble confirmation a "happy surprise." She has long hunted for double quasars closer to Earth using different techniques with ground-based telescopes. "The new technique can not only discover dual quasars much further away, but it is much more efficient than the methods we've used before," she said.

Their Nature Astronomy article is a "proof of concept that really demonstrates that our targeted search for dual quasars is very efficient," said team member Hsiang-Chih Hwang, a graduate student at Johns Hopkins University and the principal investigator of the Hubble program. "It opens a new direction where we can accumulate a lot more interesting systems to follow up, which astronomers weren't able to do with previous techniques or datasets."

The team also obtained follow-up observations with the National Science Foundation NOIRLab's Gemini telescopes. "Gemini's spatially-resolved spectroscopy can unambiguously reject interlopers due to chance superpositions from unassociated star-quasar systems, where the foreground star is coincidentally aligned with the background quasar," said team member Yu-Ching Chen, a graduate student at the University of Illinois at Urbana-Champaign.

Although the team is convinced of their result, they say there is a slight chance that the Hubble snapshots captured double images of the same quasar, an illusion caused by gravitational lensing. This phenomenon occurs when the gravity of a massive foreground galaxy splits and amplifies the light from the background quasar into two mirror images. However, the researchers think this scenario is highly unlikely because Hubble did not detect any foreground galaxies near the two quasar pairs.

Galactic mergers were more plentiful billions of years ago, but a few are still happening today. One example is NGC 6240, a nearby system of merging galaxies that has two and possibly even three supermassive black holes. An even closer galactic merger will occur in a few billion years when our Milky Way galaxy collides with neighboring Andromeda galaxy. The galactic tussle would likely feed the supermassive black holes in the core of each galaxy, igniting them as quasars.

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Globular M3 by Richard Jakiel

The impressive spring globular cluster M3, taken with my 6-inch/9 Ritchey–Chrétien telescope. Camera was a Canon 1000 XS, and I took 6 x 5 minute subs at ISO 400.

Future telescopes may offer more insight into these merging systems. NASA's James Webb Space Telescope, an infrared observatory scheduled to launch later this year, will probe the quasars' host galaxies. Webb will show the signatures of galactic mergers, such as the distribution of starlight and the long streamers of gas pulled from the interacting galaxies.

The Hubble Space Telescope is a project of international cooperation between NASA and ESA (European Space Agency). NASA's Goddard Space Flight Center in Greenbelt, Maryland, manages the telescope. The Space Telescope Science Institute (STScI) in Baltimore, Maryland, conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy in Washington, D.C.

Credits: NASA, ESA, Y. Shen and X. Liu (University of Illinois, Urbana-Champaign), and H.-C. Hwang and N. Zakamska (Johns Hopkins University)

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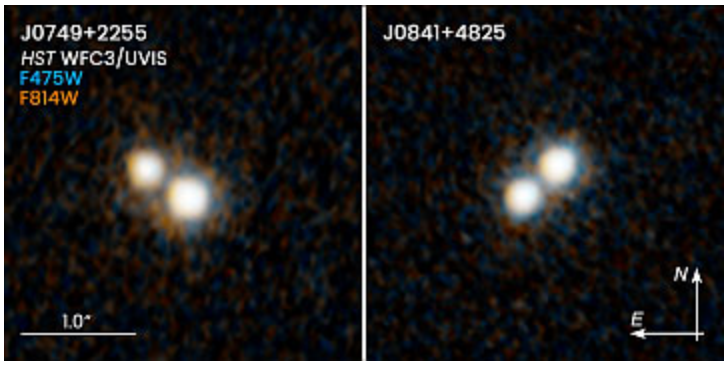

These two Hubble Space Telescope images reveal two pairs of quasars that existed 10 billion years ago and reside at the hearts of merging galaxies. Each of the four quasars resides in a host galaxy. These galaxies, however, cannot be seen because they are too faint, even for Hubble. The quasars within each pair are only about 10,000 light-years apart—the closest ever seen at this cosmic epoch.

Quasars are brilliant beacons of intense light from the centers of distant galaxies that can outshine their entire galaxies. They are powered by supermassive black holes voraciously feeding on infalling matter, unleashing a torrent of radiation.

The quasar pair in the left-hand image is catalogued as J0749+2255; the pair on the right, as J0841+4825. The two pairs of host galaxies inhabited by each double quasar will eventually merge. The quasars will then tightly orbit each other until they eventually spiral together and coalesce, resulting in an even more massive, but solitary black hole.

The image for J0749+2255 was taken Jan. 5, 2020. The J0841+4825 snapshot was taken Nov. 30, 2019. Both images were taken in visible light with Wide Field Camera 3.

Credits: NASA, ESA, H. Hwang and N. Zakamska (Johns Hopkins University), and Y. Shen (University of Illinois, Urbana-Champaign)

The **Atlanta Astronomy Club, Inc**., one of the South's largest and oldest astronomical society, meets at **3:00 P.M.** on the 3rd Saturday of each month at the Fernbank Science Center in Decatur, or occasionally at other locations or times. Membership fees are **$30** for a family or single person membership. College Students membership fee is **$15**. These fees are for a one year membership.

Magazine subscriptions to ***Sky & Telescope*** or ***Astronomy*** can be purchased through the club for a reduced rate. The fees are **$33** for Sky & Telescope and **$34** for Astronomy. Renewal forms will be sent to you by the magazines. Send the renewal form along with your check to the Atlanta Astronomy Club treasurer.

The Club address: Atlanta Astronomy Club, Inc., P.O. Box 76155, Atlanta, GA 30358-1155. AAC Web Page: **http://www.AtlantaAstronomy.org.** Send suggestions, comments, or ideas about the website to webmaster@AtlantaAstronomy.org. Also send information on upcoming observing events, meetings, and other events to the webmaster.

Atlanta Astronomy Club Online

While this newsletter is the official information source for the Atlanta Astronomy Club, it is only up to date the day it is posted. So if you want more up to date information, go to our club's website. The website contains pictures, directions, membership applications, events, updates, and other information. http://www.atlantaastronomy.org You can also follow the AAC on Facebook by joining the AAC group, and on Twitter at http://twitter.com/atlastro.

AAC Officers and Contacts

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Light Tresspass: Ken Edwards, Contact info TBA

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AAC Webmaster: Daniel Herron

Observing@AtlantaAstronomy.org

Calendar by Tom Faber (Times EDT/EST unless noted)

AAC Events are listed in BOLD

Apr 4th, Sunday: Moon Last Quarter.
Apr 6th, Tuesday: Moon near Saturn morning.
Apr 7th, Wednesday: Moon near Jupiter morning.
Apr 11th, Sunday: New Moon.
Apr 18th, Sunday: Mercury at Superior Conjunction.
Apr 20th, Tuesday: Moon First Quarter.
Apr 25th, Sunday: Conjunction Mercury and Venus at dusk.
Apr 26th, Monday: Full Moon.
Apr 29th, Thursday: Moon near Antares morning.
May 3rd, Monday: Mercury near the Pleiades at dusk. Moon First Quarter.
May 8th, Saturday: **CE Observing at the Jon Wood Astronomy Field night 8:30PM.**
May 9th, Sunday: Venus near the Pleiades at dusk.
May 11th, Tuesday: New Moon.
May 12th, Wednesday: Moon near Venus.
May 13th, Thursday: Moon near Mercury.
May 15th, Saturday: Moon near Mars.
May 17th, Monday: Mercury Greatest Elongation East.
May 19th, Wednesday: Moon First Quarter.
May 26th, Wednesday: Full Moon.
May 28th, Friday: Conjunction Mercury with Venus evening.
May 31st, Monday: Grouping of the Moon, Jupiter, and Saturn morning.
June 3rd, Thursday: Venus near cluster M35 evening.

For more event listings and updates see the calendar at www.atlantaastronomy.org

Atlanta Astronomy Club Listserv

Becasue of the shutdown of Yahoo Groups, the Atlanta Astronomy Club Mailing List has been moved to IO Groups. You can visit the group, start reading messages and posting them here: https://groups.io/g/AtlantaAstronomyClub.

Focal Point Deadline and Submission Information

Please send articles, pictures, and drawings in electronic format on anything astronomy, space, or sky related to Tom Faber at focalpoint@atlantaastronomy.org. Please send images separate from articles, not embedded in them. Articles are preferred as plain text files with images separate but Word documents or PDFs are okay. **The deadline for May is Sunday, April 25. Submissions received after the deadline will go in the following issue**.

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The Focal Point

Newsletter of The Atlanta Astronomy Club, Inc.

We're here to help! Here's how how to reach us:

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