

The Focal Point

The Atlanta Astronomy Club
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Editor: Tom Faber

Table of Contents

- Page 1...** AAC & CE Mtgs, Fernbank Virtual Programs
- Page 2...** Remembering AAC Member Don Hall, NGC 6137
- Page 3...** Lunar Halo with a Lion, a Small Dog, and the Water Snake
- Page 4...** IC 443, and NGC 2841 by Richard Jakiel
- Page 5...** M46 and NGC2438 by Richard Jakiel, How dark is space?
- Page 6...** NGC 7331 and Stephan's Quintet by Dan Llewellyn
- Page 7...** AAC Online, Memberships, Contact Info
- Page 8...** Calendar, AAC List Serv Info, Focal Point Deadline

February AAC Meeting Cancelled

There will be no February 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 two great and successful online programs behind us now (nearly 3,000 Facebook viewers for the February event alone!) we now invite all to join us on Saturday, March 13, when we will feature Wil Tirion, whose beautiful sky maps have graced the pages of numerous publications for many years.

Just like our previous programs, the program begins at 1 p.m. Eastern Time, with a short presentation by Fernbank's planetary geologist Scott Harris. Following that will be a few remarks by Mike Shaw, director of the Charlie Elliott Astronomy Club about our club and its parent organization, the Atlanta Astronomy Club. Afterwards, Wil Tirion will have control of the screen to present his personal account of the history of star charts through the years.

Wil Tirion appeared in person at the Atlanta Astronomy Club's 2002 Peach State Star Gaze after missing the 2001 event due to the Sept. 11 terrorist attacks which occurred one day before his scheduled arrival. (All subsequent air travel was halted for some time.) World-known for his "Sky Atlas 2000.0" and other publications, Wil had no special education in astronomy. Instead, it was his hobby – like ours. From the time he was a little boy, he was interested in the subject. He received his first astronomy book (with "a nice fold-out map") when he was age 12. "That is when my interest in stellar cartography (uranography) started." After working on various sky maps for various publishers as a hobby, he decided to quit his job in 1983 and started working as a full time Uranographer.

Since then, Wil has branched out from doing just star charts and illustrations. Since 2010, he's been doing the layout and typesetting for books, starting with the 4th Edition of "The Cambridge Star Atlas", followed soon by a new edition of Milton Heifetz' book "A Walk Through The Heavens". In 2013, HarperCollins asked Storm Dunlop to write an astronomical yearbook and again, he was asked to do the charts and illustrations, as well as the layout/typesetting. That yearbook, "2014 Guide to the Night Sky", was well-received, leading to a North American edition being added in 2016 and in 2019 a southern edition followed. Wil is now hard at work on the 2022 editions.

Observing at the Jon Wood Astronomy Field

With Wil Tirion's presentation wrapping up by 2:30 p.m., we will have — weather permitting — another informal observing event that same evening, March 13, 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.

According to the Sky Safari astronomy app, sunset at our location near Mansfield, Georgia, will be at 6:41 p.m., so those with scopes and related equipment to set up should plan on an earlier arrival. In consideration of any astro-imagers, astronomical dusk ends at 8:04 p.m. Note that Daylight Saving Time will be in effect, thus the much later sunset and dusk times.

Remembering AAC Member Don Hall

By Alex Langoussis

Don Hall 1942-2021

AAC member Don Hall passed away on January 31, 2021, after being hospitalized for two weeks with COVID-19. In recent years he was unable to participate very much, tending to his ailing wife Ginger, but he was an active member in the club for several decades.

Rick Clark recalls Don as a great telescope engineer. It was Don who led the team that built the Villa Rica Observatory and 20-inch reflector. "He did most of the machine work and managing of the process." The designing, building, and installation of the very heavy telescope and mirror took up many weekends of Don and his team of club members. The result was a dark site and observatory that the Atlanta Astronomy Club would call home for three decades.

He loved telescopes of all kinds, and was a master of refurbishing telescopes. In his last few years, he drove out to Texas to buy an ailing Cave reflector, and brought it back to life, to new original condition, even tracking down the same motors and hardware originally supplied by the manufacturer. He also built a little 4-inch dob using a Nova mirror he had, that turned out to be an excellent comet scope. Don was a builder, and many of us will likely recall his lamenting that "we just don't build stuff anymore."

Don also loved viewing through the scopes, and with his son-in-law Scott would be a familiar face at the Peach State Star Gaze for many years. He enjoyed doing astrophotography as well, and in his younger years could be found imaging at Villa Rica on many freezing nights.

Anyone who has met Don remembers him as gracious and kind, a true Southern gentleman. He was very knowledgeable, and freely shared his knowledge with us, a mentor to many. Of the many people who have helped the club over the years, Don would have to be right there near the top.

Though no arrangements have yet been made, the latest information can be found at www.dignitymemorial.com, where you can also leave comments for the family.



Globular Cluster NGC 6397

NASA/STScI News Release: February 11, 2021

Hubble Uncovers Concentration of Small Black Holes

Astronomers found something they weren't expecting at the heart of the globular cluster NGC 6397: a concentration of smaller black holes lurking there instead of one massive black hole.

Globular clusters are extremely dense stellar systems, which host stars that are closely packed together. These systems are also typically very old — the globular cluster at the focus of this study, NGC 6397, is almost as old as the universe itself. This cluster resides 7,800 light-years away, making it one of the closest globular clusters to Earth. Due to its very dense nucleus, it is known as a core-collapsed cluster.

At first, astronomers thought the globular cluster hosted an intermediate-mass black hole (IMBH). These IMBHs are the long-sought "missing link" between supermassive black holes (many millions of times our Sun's mass) that lie at the cores of galaxies, and stellar-mass black holes (a few times our Sun's mass) that form following the collapse of a single massive star. Their mere existence is hotly debated. Only a few candidates have been identified to date.

"We found very strong evidence for an invisible mass in the dense core of the globular cluster, but we were surprised to find that this extra mass is not 'point-like' (that would be expected for a solitary massive black hole) but extended to a few percent of the size of the cluster," said Eduardo Vitral of the Paris Institute of Astrophysics, (IAP) in Paris, France.

To detect the elusive hidden mass, Vitral and Gary Mamon, also of IAP, used the velocities of stars in the cluster to determine the distribution of its total mass, that is the mass in the visible stars, as well as in faint stars and black holes. The more mass at some location, the faster the stars travel around it.

The researchers used previous estimates of the stars' tiny proper motions (their apparent motions on the sky), which allow for determining their true velocities within the cluster. These precise measurements for stars in the cluster's core could only be made with Hubble over several years of observation. The Hubble data were added to well-calibrated proper motion measurements provided by the European Space Agency's Gaia space observatory, but which are less precise than Hubble's observations in the core.

"Our analysis indicated that the orbits of the stars are close to random throughout the globular cluster, rather than systematically circular or very

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Lunar Halo with a Lion, a Small Dog, and the Water Snake by Tom Faber

A nice lunar 22° halo was visible at around 1AM on January 29. Also visible in the image are the stars of the Leo to the left of the moon, Castor & Pollux in Gemini toward the upper right, Procyon in Canis Minor between the trees toward the right, and the stars of the head of Hydra just inside the halo at the 5 o'clock position. Lunar (and solar) halos are formed by the refraction of moonlight (or sunlight) by hexagonal prism ice crystals. They are called 22° halos because the radius of the halo spans about 22° from the moon on the sky. This is a 10 second exposure with a Canon EOS T5i with a 18-135mm lens.

elongated,” explained Mamon. These moderate-elongation orbital shapes constrain what the inner mass must be.

The researchers conclude that the invisible component can only be made of the remnants of massive stars (white dwarfs, neutron stars, and black holes) given its mass, extent and location. These stellar corpses progressively sank to the cluster's center after gravitational interactions with nearby less massive stars. This game of stellar pinball is called "dynamical friction," where, through an exchange of momentum, heavier stars are segregated in the cluster's core and lower-mass stars migrate to the cluster's periphery.

“We used the theory of stellar evolution to conclude that most of the extra mass we found was in the form of black holes,” said Mamon. Two other recent studies had also proposed that stellar remnants, in particular, stellar-mass black holes, could populate the inner regions of globular clusters. “Ours is the first study to provide both the mass and the extent of what appears to be a collection of mostly black holes in the center of a core-collapsed globular cluster,” added Vitral.

The astronomers also note that this discovery raises the possibility that mergers of these tightly packed black holes in globular clusters may be an

important source of gravitational waves, ripples through spacetime. Such phenomena could be detected by the LIGO (Laser Interferometer Gravitational-Wave Observatory) experiment. LIGO is funded by the National Science Foundation and operated by Caltech and MIT.

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 - Image: NASA, ESA, T. Brown, S. Casertano, and J. Anderson (STScI). Science: NASA, ESA, and E. Vitral and G. Mamon (Institut d'Astrophysique de Paris (IAP))



Supernova Remnant IC 443 by Richard Jakiel

IC 443, the “Jellyfish” is a supernova remnant (SNR) in Gemini. Richard made this image at the 2016 Peach State Star Gaze using an 11-inch RASA telescope, with a Canon 60 DA camera. This images consists of 45 x one minute sub frames.



NGC 2841 by Richard Jakiel

A pretty spiral galaxy - NGC 2841. Imaged using the 24-inch telescope at Hard Labor Creek Observatory.



M46 and NGC2438 by Richard Jakiel

This image by Richard shows the open cluster M46 in Puppis. Also visible is the planetary nebula NGC 2438. Although NGC 2438 appears to be in the cluster it is unrelated and just happens to appear along the same line of sight as M46. NGC 2438 appears to be at only about 30% of the distance of M46. Richard used a 6-inch RC scope with a modified Canon 1000 XS camera with light pollution filter. The image consists of 10 5 minute subs, taken from light polluted suburbia.

New Horizons Spacecraft Answers Question: How Dark Is Space?

NASA/STScI News Release: January 12, 2021

How dark does space get? If you get away from city lights and look up, the sky between the stars appears very dark indeed. Above the Earth's atmosphere outer space dims even further, fading to an inky pitch-black. And yet even there, space isn't absolutely black. The universe has a suffused feeble glimmer from innumerable distant stars and galaxies.

New measurements of that weak background glow show that the unseen galaxies may be emitting more light than can be accounted for by existing surveys of the sky.

"It's an important number to know – how many galaxies are there?" said Marc Postman of the Space Telescope Science Institute in Baltimore, Maryland, a lead author on the study."

An estimate of the total number of galaxies has been extrapolated from very deep sky observations by NASA's Hubble Space Telescope and suggested there are about two trillion galaxies in the cosmos. It relied on mathematical models to estimate how many galaxies were too small and faint for Hubble to see. That team concluded that 90% of the galaxies in the universe were beyond Hubble's ability to detect in visible light. That study also estimated the combined light from those two trillion galaxies.

The new findings, which relied on measurements from NASA's distant New Horizons mission, finds only about half as much light as that earlier Hubble study but still twice as much light as existing catalogs of observed galaxies can account for.

"Take all the light from galaxies Hubble can see, double that number, and that's what we see – but nothing more," said Tod Lauer of NSF's NOIRLab, a lead author on the study.

These results will be presented on Wednesday, Jan. 13th at a meeting of the American Astronomical Society, which is open to registered participants.

The cosmic optical background that the team sought to measure is the visible-light equivalent of the more well-known cosmic microwave background – the weak afterglow of the big bang itself, before stars ever existed.

"While the cosmic microwave background tells us about the first 450,000 years after the big bang, the cosmic optical background tells us something about the sum total of all the stars that have ever formed since then," explained Postman. "It puts a constraint on the total starlight from galaxies that have been created, and where they might be in time."

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NGC 7331 and Stephan's Quintet by Dan Llewellyn

NGC 7331, the Deerlick Group and Stephan's Quintet. These galaxies reside in the constellation Pegasus, and are approximately 294 to 335 million light years away. Here is a stack of 12 - 4 minute subs taken on October 22, 2020 using a cooled and modified Sony A7s on an Esprit 150 APO refractor.

As powerful as Hubble is, the team couldn't use it to make these observations. Although located in space, Hubble orbits Earth and still suffers from light pollution. The inner solar system is filled with tiny dust particles from disintegrated asteroids and comets. Sunlight reflects off those particles, creating a glow called the zodiacal light that can be observed even by skywatchers on the ground.

To escape the zodiacal light, the team had to use an observatory that has escaped the inner solar system. Fortunately the New Horizons spacecraft, which has delivered the closest ever images of Pluto and the Kuiper Belt object Arrokoth, is far enough to make these measurements. At its distance (more than 4 billion miles away when these observations were taken), New Horizons experiences an ambient sky 10 times darker than the darkest sky accessible to Hubble.

"These kinds of measurements are exceedingly difficult. A lot of people have tried to do this for a long time," said Lauer. "New Horizons provided us with a vantage point to measure the cosmic optical background better than anyone has been able to do it."

The team analyzed existing images from the New Horizons archives. To tease out the feeble background glow, they had to correct for a number of other factors. For example, they subtracted the light from the galaxies expected to exist that are too faint to be identifiable. The most challenging correction was removing light from Milky Way stars that was reflected off interstellar dust and into the camera.

The remaining signal, though extremely faint, was still measurable. Postman compared it to living in a remote area far from city lights, lying in your bedroom at night with the curtains open. If a neighbor a mile down the road opened their refrigerator looking for a midnight snack, and the light from their refrigerator reflected off the bedroom walls, it would be as bright as the background New Horizons detected.

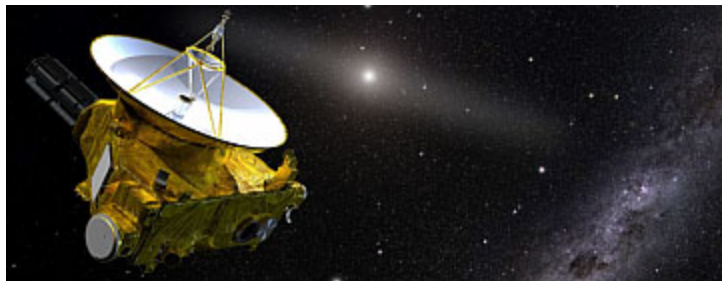
So, what could be the source of this leftover glow? It's possible that an abundance of dwarf galaxies in the relatively nearby universe lie just beyond detectability. Or the diffuse halos of stars that surround galaxies

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might be brighter than expected. There might be a population of rogue, intergalactic stars spread throughout the cosmos. Perhaps most intriguing, there may be many more faint, distant galaxies than theories suggest. This would mean that the smooth distribution of galaxy sizes measured to date rises steeply just beyond the faintest systems we can see – just as there are many more pebbles on a beach than rocks.

NASA's upcoming James Webb Space Telescope may be able to help solve the mystery. If faint, individual galaxies are the cause, then Webb ultra-deep field observations should be able to detect them.

This study is accepted for publication in the *Astrophysical Journal*.



This artist's illustration shows NASA's New Horizons spacecraft in the outer solar system. In the background lies the Sun and a glowing band representing zodiacal light, caused by sunlight reflecting off of dust. By traveling beyond the inner solar system and its accompanying light pollution, New Horizons was able to answer the question: How dark is space? At lower right are background stars of the Milky Way.

Credits: Joe Olmsted STScI



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/atlaastro>.

AAC Officers and Contacts

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

AAC Events are listed in BOLD

- Feb 8th, Monday: Mercury conjunction with Sun.
- Feb 11th, Thursday: New Moon.
- Feb 14th, Sunday: Grouping of Mercury, Jupiter, and Saturn morning.
- Feb 18th, Thursday: Moon near Mars.
- Feb 19th, Friday: Moon First Quarter.
- Feb 24th, Wednesday: Grouping of Mercury, Jupiter, and Saturn morning
- Feb 25th, Thursday: Grouping of Mercury, Jupiter, and Saturn morning.
- Feb 27th, Saturday: Full Moon.
- Mar 5th, Friday: Moon Last Quarter. Conjunction Mercury & Jupiter morning.
- Mar 10th, Wednesday: Grouping of the moon, Mercury, Jupiter, and Saturn morning.
- Mar 13th, Saturday: New Moon. **CE Observing night 6:30PM - tentative.**
- Mar 14th, Sunday: Daylight Saving Time begins at 2:00AM.
- Mar 20th, Saturday: Spring Equinox at 5:37AM.
- Mar 21st, Sunday: Moon First Quarter.
- Mar 25th, Thursday: Venus at Superior Conjunction.
- Mar 28th, Sunday: Full Moon.
- Apr 4th, Sunday: Moon Last Quarter.
- Apr 11th, Sunday: New Moon.
- Apr 20th, Tuesday: Moon First Quarter.
- Apr 26th, Monday: Full Moon.

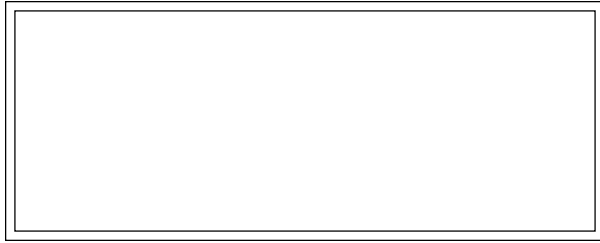
For more event listings and updates see the calendar at www.atlantaastronomy.org

Atlanta Astronomy Club Listserv

Because 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 March is Sunday, February 28. Submissions received after the deadline will go in the following issue.**



FIRST CLASS



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Newsletter of The Atlanta Astronomy Club, Inc.



The Focal Point

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

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