The Focal Point

The Atlanta Astronomy Club
Established 1947
February 2018

Vol. 30 No. 6

Editor: Tom Faber

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The February AAC Meeting

At the Fernbank Science Center

Beginning in January the general meetings of the Atlanta Astronomy Club were moved to the **3rd Friday of each month** and will be held at the Fernbank Science Center, near Decatur, in one of the classrooms. Following the meeting the Fernbank Observatory will be open for observing and new member orientation / training, when weather permits. The February meeting will be held on **February 16th beginning at 7:30PM**. The 7:30PM meting start time will be in effect for the January and February meetings. Beginning with the March meeting on the 16th, after the change to Daylight Saving Time on March 11, we anticipate moving the meeting start time back to 8:00PM. The meeting presentation is TBA at this time.

Credit: Google Maps

Hubble Probes the Archeology of Our Milky Way's Ancient Hub

NASA/STScI/AAS News Release - Jan 11, 2018

For many years, astronomers had a simple view of our Milky Way's central hub, or bulge, as a quiescent place composed of old stars, the earliest homesteaders of our galaxy.

However, because the inner Milky Way is such a crowded environment, it has always been a challenge to disentangle stellar motions to probe the bulge in detail.

Now, a new analysis of about 10,000 normal Sun-like stars in the bulge reveals that our galaxy's hub is a dynamic environment of stars of various ages zipping around at different speeds, like travelers bustling about a busy airport. This conclusion is based on nine years' worth of archival data from NASA's Hubble Space Telescope.

The Hubble study of this complicated, chaotic heart of our Milky Way may provide new clues to the evolution of our galaxy, said researchers.

The research team, led by Will Clarkson of the University of Michigan-Dearborn, found that the motions of bulge stars are different, depending on a star's chemical composition. Stars richer in elements heavier than hydrogen and helium have less disordered motions, but are orbiting around the galactic center faster than older stars that are deficient in heavier elements.

"There are many theories describing the formation of our galaxy and central bulge," said Annalisa Calamida of the Space Telescope Science Institute, Baltimore, Maryland, a member of the Hubble research team. "Some say the bulge formed when the galaxy first formed about 13 billion years ago. In this

Continued on pg 7

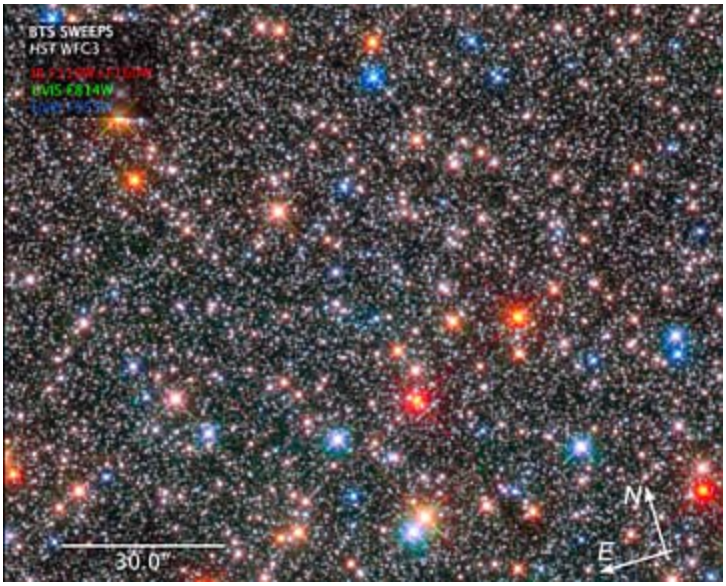
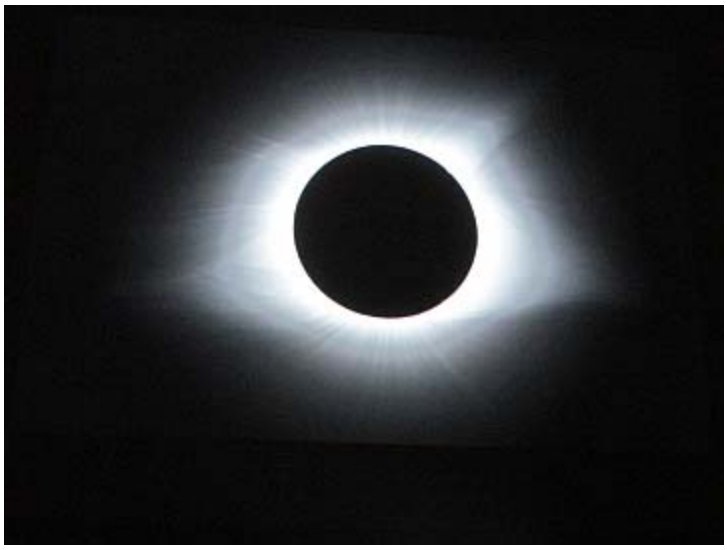


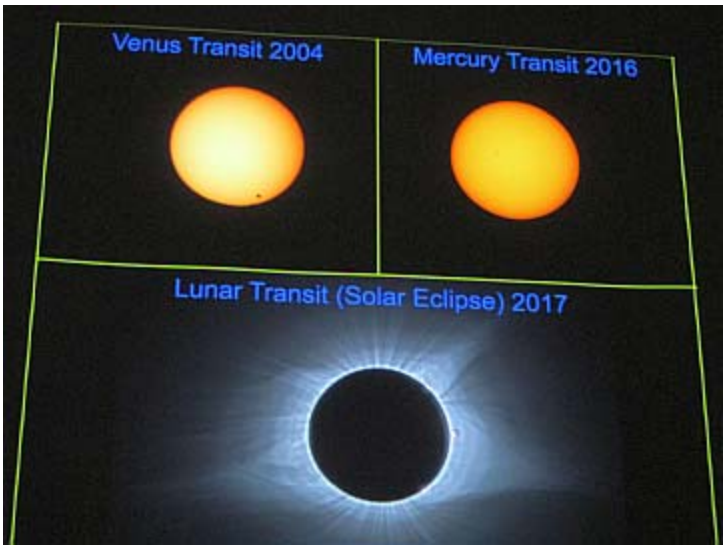
Image: NASA, ESA, and T. Brown (STScI). Science: NASA, ESA, W. Clarkson (University of Michigan-Dearborn), and A. Calamida and K. Sahu (STScI)

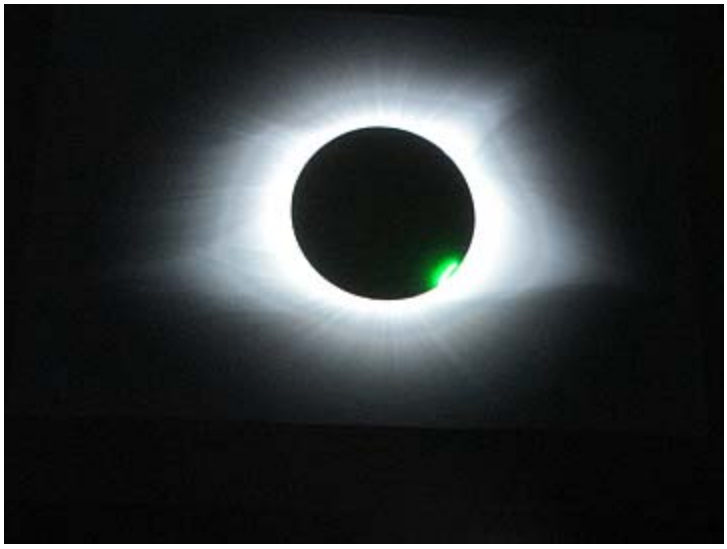
January AAC Meeting Report

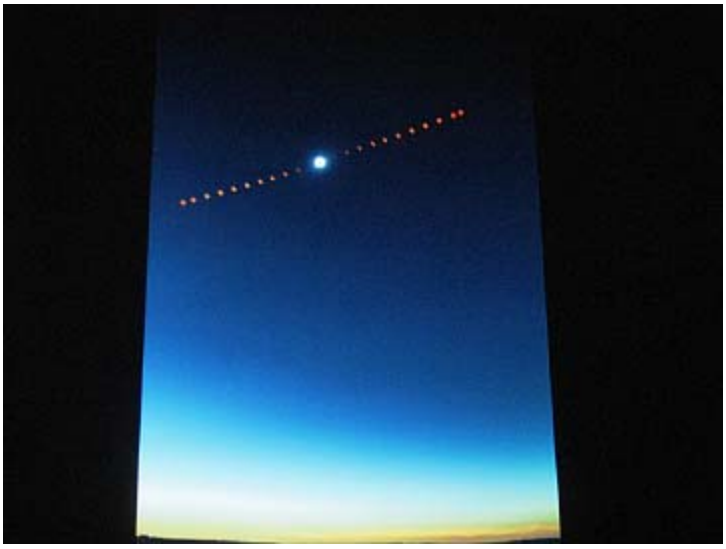
Photos by Tom Faber

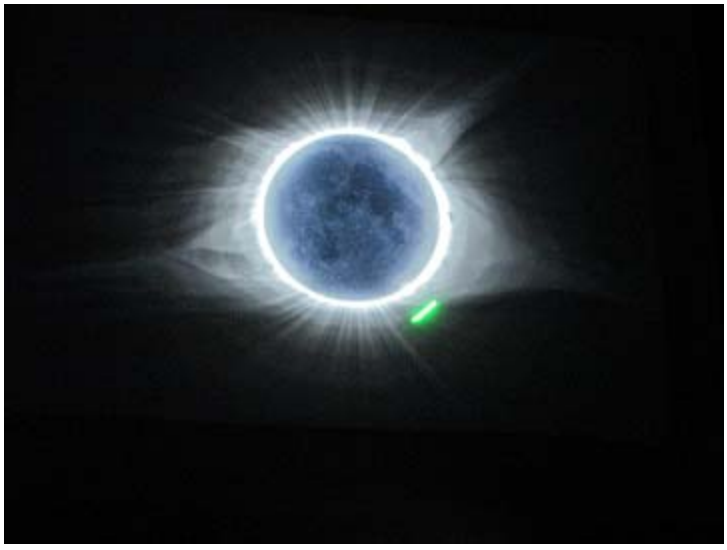
The January AAC general meeting was held on Friday, January 19th at the Fernbank Science Center. About 30 members and guests were present. Our featured speaker was long time AAC member Daniel Herron (photo right, on right). Daniel presented a talk about his trip to view and photograph the total solar eclipse on August 21. Daniel took a 1.5 week road trip to view and photograph the solar eclipse from a location in eastern Wyoming. He talked about how he prepared for the trip and how he was set up to do imaging of the eclipse using computer controlled DSLRs, the trip to Wyoming, and his experiences during the eclipse. After Daniel's talk he answered a number of questions. After the Q&A there were announcements by AAC officers about upcoming events and activities. The meeting then adjourned and some of the attendees went to a nearby restaurant for dinner and more astronomy discussions.




Venus Transit 2004
Mercury Transit 2016
Lunar Transit (Solar Eclipse) 2017







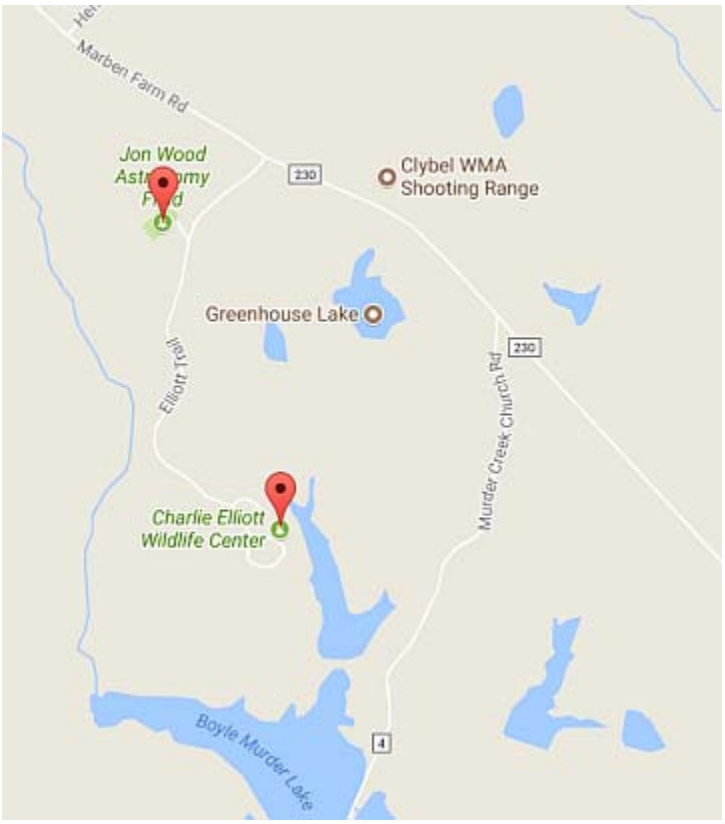
The Next Charlie Elliott Meeting

Join us for our next meeting on Saturday February 17th, 2018 at 4:00 p.m. at the Charlie Elliott Conference Center, Conference Room B.

Meeting Details

Physics in Space is Awesome!

Join us on February 17, 2018 at 4:00 p.m. when Crystal Gnilka discusses her research on a region just outside of a black hole, which isn't really a hole by the way, called the Narrow Line Region (NLR) which contains outflowing radiation and gas from the black hole's accretion disk. This region and the extended NLR (ENLR) are where really smart people like Crystal expect to see the various forms of feeding and feedback, i.e. the stuff that keeps the active galactic nuclei running and the material that is ejected. Understanding this loop and how the AGN interacts with the host galaxy is the goal of her research.



Credit: Google Maps

Crystal earned her B.S. in physics from Elmhurst College in the Great White North of Elmhurst, Illinois. Crystal always had an interest in space and astronomy and decided that astrophysics would be the most exciting application of her physics degree. Because, after all, astrophysics is physics in space and stuff in space is awesome!

All of the Above!

David Whalen, Charlie Elliott Astronomy Observing Supervisor will give a short but incredibly entertaining talk about what you can expect to see in the sky this month with binoculars and small telescopes, as well as the monthly observing challenge. If you've been to one of our meetings, you know that David is a dynamic and engaging speaker and always delivers a lot of great information with plenty of laughs! Be sure to ask for the monthly target list and a SkyMap! David will be joined by Astrophotography Coordinator Mark Woolridge who will cover the imaging challenges of the month and tips on how to image them.

Observing After the Meeting

All are invited to Jon Wood Astronomy Field immediately after the meeting for observing (weather-permitting).

Tech Talks

Details are still forming on the Tech Talk for February. Check back soon! If you have an idea for a 15-30 minute discussion or presentation that you would like to see or would like to give, contact the Charlie Elliott Program Coordinator, Steve Siedentop - program@ceastronomy.org.

Our Monthly Meetings and Public Observing Nights for 2018

Future Charlie Elliott meetings will be held on: March 17, April 14, May 12, June 16, July 14, August 11, September 8, October 6, November 10, December 8, 2018. Meetings start approximately 2 hours before sunset. Meeting rooms and start times vary, so please check back for updates or changes at: http://ceastronomy.org/blog/home

The January Charlie Elliott Meeting

Stephanie Dickson, Secretary, Charlie Elliott Chapter

Meeting Minutes: 1/20/18

Pre-meeting workshop at 3:00 p.m., Featured speaker: Barry Fitzgerald, Topic: Building an Arduino based automatic dew heater controller (15 attendees)

Attendees: Meeting 27, Field 24

Regular meeting date and time: Saturday, January 20 at 3:30 p.m.

Guest speaker: Dicy Saylor, PhD student at Georgia State University

Topic: Rotational rate of low mass stars (part 2). The Kepler mission was originally designed to look for earth like planets orbiting other stars (exoplanets), but has now been re-tasked to assist in data collection for other projects. Along with the Kepler data, she is using the "Superblink" catalog of 2.5 million stars watching for their proper motion (movement through the Milky Way), and looking for the faster rotating stars. Those stars with fast rotational rates are young, as the rotation of the star will slow throughout its lifespan. She has located 8 fast rotators in the halo of the Milky Way, rather than the disk (dust lane), where they should be. Halo stars are generally very old, so why are there fast rotators in the halo? She is looking for rotational periods of 4 days or less, which equates to an age of about 150 million years for the star. She hopes to be able to continue her research on these on a post-doctoral level.

Outreach by Dan Thoman: Jan 2018 Berkley Lake Elem, Jan 2018 Starling Elem, 2/13/18 Morgan County Elem, 3/2/18 Astronomy Night.

AL Awards: Michael Shaw received the Lunar 1 Award.

Other business: The equipment shed on the observing field needs cleaning and volunteers would be appreciated. There will likely be a day in the spring (warmer weather) to clean the shed out. Announcement for that will follow.

Outreach dates discussed: Morgan County Elementary School on February 13th from 5:00 p.m. to 7:00 p.m. If you can volunteer, please sign up on the NSN website.

Other news/events: ALPO is now offering Podcasts called "The Observer's Notebook", produced by Steve Siedentop. Links to these can be found on the ALPO website.

"All of the Above" Challenge visual object: The Owl Nebula in Ursa Major (Messier 97)

Mark Woolridge's Astrophotography targets:

Beginner: Moon (1/31 Lunar Eclipse), Moon & Jupiter (2/6), Moon & Mars (2/9). Intermediate: Orion Nebula (Messier 42). Advanced: Witch Head Nebula near Rigel, but in the constellation Eridanus

Hubble Finds Substellar Objects in the Orion Nebula

NASA/STScI/AAS News Release - Jan 11, 2018

In an unprecedented deep survey for small, faint objects in the Orion Nebula, astronomers using NASA's Hubble Space Telescope have uncovered the largest known population of brown dwarfs sprinkled among newborn stars. Looking in the vicinity of the survey stars, researchers not only found several very-low-mass brown dwarf companions, but also three giant planets. They even found an example of binary planets where two planets orbit each other in the absence of a parent star.

Brown dwarfs are a strange class of celestial object that have masses so low that their cores never become hot enough to sustain nuclear fusion, which powers stars. Instead, brown dwarfs cool and fade as they age. Despite their low mass, brown dwarfs provide important clues to understanding how stars and planets form, and may be among the most common objects in our Milky Way galaxy.

Located 1,350 light-years away, the Orion Nebula is a relatively nearby laboratory for studying the star formation process across a wide range, from opulent giant stars to diminutive red dwarf stars and elusive, faint brown dwarfs.

This survey could only be done with Hubble's exceptional resolution and infrared sensitivity.

Because brown dwarfs are colder than stars, astronomers used Hubble to identify them by the presence of water in their atmospheres. "These are so cold that water vapor forms," explained team lead Massimo Robberto of the Space Telescope Institute in Baltimore, Maryland. "Water is a signature of substellar objects. It's an amazing and very clear mark. As the masses get smaller, the stars become redder and fainter, and you need to view them in the infrared. And in infrared light, the most prominent feature is water."

But hot water vapor in the atmosphere of brown dwarfs cannot be easily seen from Earth's surface, due to the absorbing effects of water vapor in our own atmosphere. Fortunately, Hubble is up above the atmosphere and has near-infrared vision that can easily spot water on distant worlds.

The Hubble team identified 1,200 candidate reddish stars. They found that the stars split into two distinct populations: those with water, and those without. The bright ones with water were confirmed to be faint red dwarfs. The multitude of fainter water-rich, free-floating brown dwarfs and planets within the Orion nebula are all new discoveries. Many stars without water were also detected, and these are background stars in the Milky Way. Their light was reddened by passing through interstellar dust, and therefore not relevant to the team's study.

The team also looked for fainter, binary companions to these 1,200 reddish stars. Because they are so close to their primary stars, these companions are nearly impossible to discover using standard observing methods. But by using a unique, high-contrast imaging technique developed by Laurent Pueyo at the Space Telescope Science Institute, astronomers were able to resolve faint images of a large number of candidate companions.

This first analysis did not allow Hubble astronomers to determine whether these objects orbit the brighter star or if their proximity in the Hubble image is a result of chance alignment. As a consequence, they are classified as candidates for now. However, the presence of water in their atmospheres indicates that most of them cannot be misaligned stars in the galactic background, and thus must be brown dwarfs or exoplanet companions.

In all, the team found 17 candidate brown dwarf companions to red dwarf stars, one brown dwarf pair, and one brown dwarf with a planetary companion. The study also identified three potential planetary mass companions: one associated to a red dwarf, one to a brown dwarf, and one to another planet.

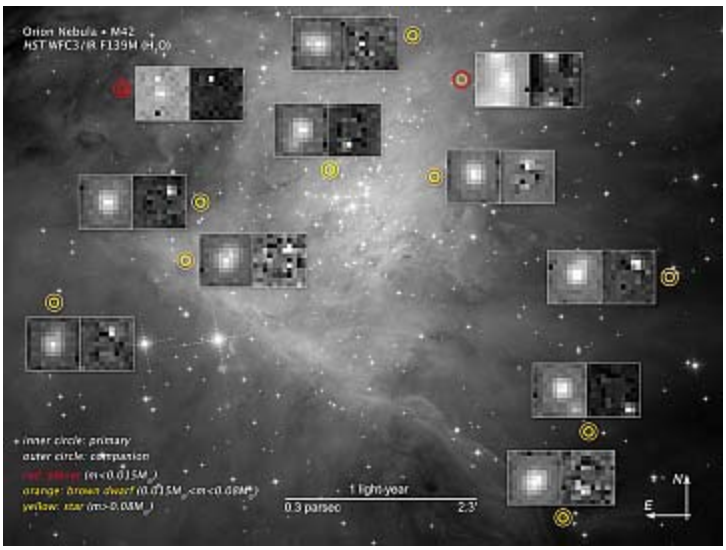
"We experimented with a method, high-contrast imaging post processing, that astronomers have been relying on for years. We usually use it to look for very faint planets in the close vicinity of nearby stars, by painstakingly observing them one by one," said Pueyo. "This time around, we decided to combine our algorithms with the ultra-stability of Hubble to inspect the vicinity of hundreds of very young stars in every single exposure obtained by the Orion survey. It turns out that even if we do not reach the deepest sensitivity for a single star, the sheer volume of our sample allowed us to obtain an unprecedented statistical snapshot of young exoplanets and brown dwarf companions in Orion."

Combining the two unique techniques, imaging in the water filters and high-contrast image processing, the survey provided an unbiased sample of newly formed low-mass sources, both dispersed in the field and companions of other low-mass objects. "We could reprocess the entire Hubble archive and try to find jewels there," Robberto said.

The team will present its results Thursday, Jan. 11, at the 231st meeting of the American Astronomical Society in Washington, D.C.

Finding the signatures of low-mass stars and their companions will become much more efficient with the launch of NASA's infrared-sensitive James Webb Space Telescope in 2019.

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, Inc., in Washington, D.C.



This image shows the central portion of the Orion Nebula, where the Hubble Space Telescope was used to conduct a survey for low-mass stars, brown dwarfs, and planets. Each symbol identifies a pair of objects, which can be seen as a single dot of light in the symbol's center. The thicker inner circle represents the primary body, and the thinner outer circle indicates the companion. The circles are color-coded: Red for a planet; orange for a brown dwarf; and yellow for a star. Adjacent to each symbol is a pair of Hubble images. The picture on the left is the original image of the primary and companion. The image on the left shows the companion only, with the primary object digitally subtracted through a special image processing technique that separates the images of the objects into binary pairs. The portion of the Orion Nebula measures roughly 4 by 3 light-years. Credits: NASA, ESA, and G. Strampelli (STScI)

Researchers Catch Supermassive Black Hole Burping — Twice

NASA/STScI/AAS News Release - Jan 11, 2018

Astronomers have caught a supermassive black hole in a distant galaxy snacking on gas and then "burping" — not once, but twice.

The galaxy under study, called SDSS J1354+1327 (J1354 for short), is about 800 million light-years from Earth. The team used observations from NASA's Hubble Space Telescope, the Chandra X-ray Observatory, as well as the W.M. Keck Observatory in Mauna Kea, Hawaii, and the Apache Point Observatory (APO) near Sunspot, New Mexico.

Chandra detected a bright, point-like source of X-ray emission from J1354, a telltale sign of the presence of a supermassive black hole millions or billions of times more massive than our Sun. The X-rays are produced by gas heated to millions of degrees by the enormous gravitational and magnetic forces near the black hole. Some of this gas will fall into the black hole, while a portion will be expelled in a powerful outflow of high-energy particles.

By comparing X-ray images from Chandra and visible-light (optical) images from Hubble, the team determined that the black hole is located in the center of the galaxy, the expected address for such an object. The X-ray data also provide evidence that the supermassive black hole is embedded in a heavy veil of dust and gas.

The results indicate that in the past, the supermassive black hole in J1354 appears to have consumed, or accreted, large amounts of gas while blasting off an outflow of high-energy particles. The outflow eventually switched off then turned back on about 100,000 years later. This is strong evidence that accreting black holes can switch their power output off and on again over timescales that are short compared to the 13.8-billion-year age of the universe.

"We are seeing this object feast, burp, and nap, and then feast and burp once again, which theory had predicted," said Julie Comerford of the University of Colorado (CU) at Boulder's Department of Astrophysical and Space Science, who led the study. "Fortunately, we happened to observe this galaxy at a time when we could clearly see evidence for both events."

So why did the black hole have two separate meals? The answer lies in a companion galaxy that is linked to J1354 by streams of stars and gas produced by a collision between the two galaxies. The team concluded that clumps of material from the companion galaxy swirled toward the center of J1354 and then were eaten by the supermassive black hole.

The team used optical data from Hubble, Keck, and APO to show that electrons had been stripped from atoms in a cone of gas extending some 30,000 light-years south from the galaxy's center. This stripping was likely caused by a burst of radiation from the vicinity of the black hole, indicating that a feasting event had occurred. To the north they found evidence for a shock wave, similar to a sonic boom, located about 3,000 light-years from the black hole. This suggests that a burp occurred after a different clump of gas had been consumed roughly 100,000 years later.

"This galaxy really caught us off guard," said CU Boulder doctoral student Rebecca Nevin, a study co-author who used data from APO to look at the velocities and intensities of light from the gas and stars in J1354. "We were able to show that the gas from the northern part of the galaxy was consistent with an advancing edge of a shock wave, and the gas from the south was consistent with an older outflow from the black hole."

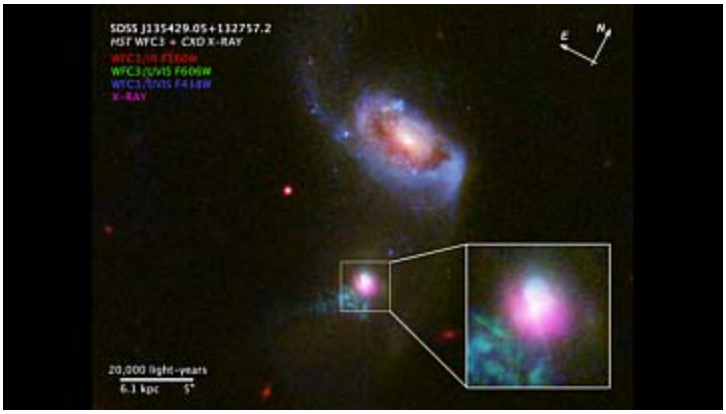
Our Milky Way galaxy's supermassive black hole has had at least one burp. In 2010, another research team discovered a Milky Way belch using observations from the orbiting Fermi Gamma-ray Observatory to look at the galaxy edge on. Astronomers saw gas outflows dubbed "Fermi bubbles" that shine in the gamma-ray, X-ray, and radio wave portion of the electromagnetic spectrum.

"These are the kinds of bubbles we see after a black hole feeding event," said CU postdoctoral fellow Scott Barrows. "Our galaxy's supermassive black hole is now napping after a big meal, just like J1354's black hole has in the past. So we also expect our massive black hole to feast again, just as J1354's has."

Other co-authors on the new study include postdoctoral fellow Francisco Muller-Sanchez of CU Boulder, Jenny Greene of Princeton University, David Pooley from Trinity University, Daniel Stern from NASA's Jet Propulsion Laboratory in Pasadena, California, and Fiona Harrison from the California Institute of Technology.

A paper on the subject was published in a recent issue of The Astrophysical Journal and is available online. Comerford presented the team's findings in a January 11th, 2018 press briefing at the 231st meeting of the American Astronomical Society held in Washington D.C.

NASA's Marshall Space Flight Center in Huntsville, Alabama, manages the Chandra program for NASA's Science Mission Directorate in Washington, D.C. The Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, controls Chandra's science and flight operations. 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, Inc., in Washington, D.C.



Supermassive black holes, weighing millions of times as much as our Sun, are gatherers not hunters. Embedded in the hearts of galaxies, they will lie dormant for a long time until the next meal happens to come along.

The team of astronomers using observations from the Hubble Space Telescope, the Chandra X-ray Observatory, and as well as the W.M. Keck Observatory in Mauna Kea, Hawaii, and the Apache Point Observatory (APO) near Sunspot, New Mexico, zeroed in on a flickering black hole.

A black hole in the center of galaxy SDSS J1354+1327, located about 800 million light-years away, appears to have consumed large amounts of gas while blasting off an outflow of high-energy particles. The fresh burst of fuel might have been supplied by a bypassing galaxy. The outflow eventually switched off then turned back on about 100,000 years later. This is strong evidence that accreting black holes can switch their power output off and on again over timescales that are short compared to the 13.8-billion-year age of the universe.

Credits: NASA, ESA, and J. Comerford (University of Colorado-Boulder)

case, all bulge stars should be old and share a similar motion. But others think the bulge formed later in the galaxy's lifetime, slowly evolving after the first generations of stars were born. In this scenario, some of the stars in the bulge might be younger, with their chemical composition enriched in heavier elements expelled from the death of previous generations of stars, and they should show a different motion compared to the older stars. The stars in our study are showing characteristics of both models. Therefore, this analysis can help us in understanding the bulge's origin."

The astronomers divided the stars by their chemical compositions and then compared the motions of each group. They determined the stars' chemical content by studying their colors and divided them in two main groups according to their heavy-element (iron) abundance. The chemically enriched stars are moving twice as fast as the other population.

"By analyzing nine years' worth of data in the archive and improving our analysis techniques, we have made a clear, robust detection of the differences in the motion for chemically deficient and chemically enriched Sun-like stars," Clarkson said. "We hope to continue our analysis, which will allow us to make a three-dimensional chart of the rich chemical and dynamical complexity of the populations in the bulge."

The astronomers based their analysis on Advanced Camera for Surveys and Wide Field Camera 3 data from two Hubble surveys: the Wide Field Camera 3 Galactic Bulge Treasury Program and the Sagittarius Window Eclipsing Extrasolar Planet Search. Sets of spectra from the European Southern Observatory's Very Large Telescope in Chile were used to help estimate the chemical compositions of stars.

Currently, only Hubble has sharp enough resolution to simultaneously measure the motions of thousands of Sun-like stars at the the galaxy bulge's distance from Earth. The center of our galaxy is about 26,000 light-years away. "Before this analysis, the motions of these stars was not known," said team member Kailash Sahu of the Space Telescope Science Institute. "You need a long time baseline to accurately measure the positions and the motions of these faint stars."

The team studied Sun-like stars because they are so abundant and easily within Hubble's reach. Previous observations looked at brighter, aging red giant stars, which are not as plentiful because they represent a brief episode in a star's lifetime. "Hubble gave us a narrow, pencil-beam view of the galaxy's core, but we are seeing thousands more stars than those spotted in earlier studies," Calamida said. The Milky Way's bulge is roughly one-tenth the diameter of our pancake-shaped galaxy. "We next plan to extend our analysis to do additional observations along different sight-lines, which will allow us to make a three-dimensional probe of the rich complexity of the populations in the bulge," Clarkson added.

The researchers said that this work is also an important pathfinder for NASA's James Webb Space Telescope to probe the archaeology of the Milky Way. Scheduled for launch in 2019, Webb is expected to more deeply probe stellar populations in the Milky Way bulge.

The **Atlanta Astronomy Club, Inc**., one of the South's largest and oldest astronomical society, meets at **3:00 P.M.** on the 2nd 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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Board: Open

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Elliott Chapter ALCor: Jack Fitzmier

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Elliott Webmaster: Larry Owens webmaster@CEastronomy.org

Elliott Outreach Coordinator: Dan Thoman outreach@ceastronomy.org

Georgia Astronomy in State Parks: Sharon Carruthers Treasurer@AtlantaAstronomy.org

PSSG Chairman: Peter Macumber pmacumber@nightsky.org

PSSG Co-Chair: Open

Sidewalk Astronomy: Open sidewalkastronomy@AtlantaAstronomy.org

Light Tresspass: Ken Edwards, Contact info TBA

Woodruff Observ. Coordinator: Sharon Carruthers Treasurer@AtlantaAstronomy.org

AAC Webmaster: Daniel Herron

Observing@AtlantaAstronomy.org

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

AAC Events are listed in BOLD

Feb 7th, Wednesday: Moon Last Quarter.
Feb 11th, Sunday: Moon near Saturn.
Feb 15th, Thursday: New Moon.
Feb 16th, Friday: **AAC Meeting at Fernbank Science Center at 7:30PM.**
Feb 17th, Saturday: **CEA Chapter Meeting.**
Feb 23rd, Friday: Moon First Quarter.
Mar 1st, Thursday: Full Moon.
Mar 2nd, Friday: Mercury near Venus in evening.
Mar 4th, Sunday: Neptune in conjunction with Sun.
Mar 9th, Friday: Moon Last Quarter.
Mar 10th, Saturday: Moon between Mars and Saturn morning.
Mar 11th, Sunday: Daylight Saving Time Begins at 2:00AM.
Mar 16th, Friday: **AAC Meeting at Fernbank Science Center at 8:00PM.**
Mar 17th, Saturday: **CEA Chapter Meeting.** New Moon.
Mar 18th, Sunday: Moon near Mercury and Venus evening.
Mar 20th, Tuesday: Spring Equinox at 12:15PM.
Mar 22nd, Thursday: Moon near Aldebaran evening.
Mar 24th, Saturday: Moon First Quarter.
Mar 31st, Saturday: Full Moon.
Apr 8th, Sunday: Moon Last Quarter.
Apr 12th, Thursday: **AAC Zombie Party at DAV Begins.**
Apr 14th, Saturday: **CEA Chapter Meeting.**
Apr 15th, Sunday: **AAC Zombie Party at DAV Ends.** New Moon.
Apr 20th, Friday: **AAC Meeting at Fernbank Science Center at 8:00PM.**

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

Atlanta Astronomy Club Listserv

Subscribe to the Atlanta Astronomy Club Mailing List**:** The name of the list is: AstroAtlanta. The address for messages is: AstroAtlanta@yahoogroups.com . To add a subscription, send a message to: AstroAtlanta-subscribe@yahoogroups.com .

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 Saturday, February 24. Submissions received after the deadline will go in the following issue**.

ATLANTA ASTRONOMY CLUB EST. 1947

The Focal Point

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