

The Focal Point

The Atlanta Astronomy Club
Established 1947
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Editor: Tom Faber

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The April AAC Meeting

By Ken Poshedly, AAC Program Chair

Friday, April 19 at 8 PM - Fernbank Science Center

"Putting the 'Amateur' in 'Amateur Astrophotography'"

"You're only as good as your gear" is not always true when it comes to taking photos of the night sky, but there is no substitute for experience. You could read every article and forum post on Cloudy Nights and buy all the most expensive gear, but ultimately there is nothing more helpful than getting outside and trying, failing, learning, and trying again.

Truly the learned opinion of one who has been there. So join us at 8 p.m., on April 19, at the Fernbank Science Center Resource Center (formerly the library room) when Jon Doran shares his insight with us on the travails of his own learning curve.

In his own words: "The talk will cover my experiences in astrophotography over the past 6 years during high school and college. I will show some of my early attempts at capturing the night sky with unconventional tactics to overcome the budget limitations of a high school student. Getting a DSLR camera and the cheapest tripod on Amazon opened the door to Milky Way photography, and I learned that it IS possible to put a 7-pound Orion ED80 telescope on that same plastic tripod and capture sharp pictures of the Moon."

"I will demonstrate my current portable DSLR astrophotography rig that relies on free and open source software running on low-cost and low-power computer hardware. The setup can accomplish everything from go-to control, polar alignment, image sequencing, camera focusing, auto-guiding, observatory dome control, and more — all running on a \$35 computer."



Believe it or not, Jon is a 4th year Computer Engineering undergrad at Georgia Tech.

As always, the AAC program is FREE and open to the public. Finally, and weather-permitting, all will be invited upstairs to Ralph Buice Observatory to view through the 0.9 meter (36-inch) Cassegrain reflecting telescope inside the 10 meter (30 ft.) dome.

The Fernbank Science Center is located at 156 Heaton Park Dr. NE, Atlanta, GA 30303. (Phone: 678-874-7102).



An image of M42 and the surrounding area by Jon Doran

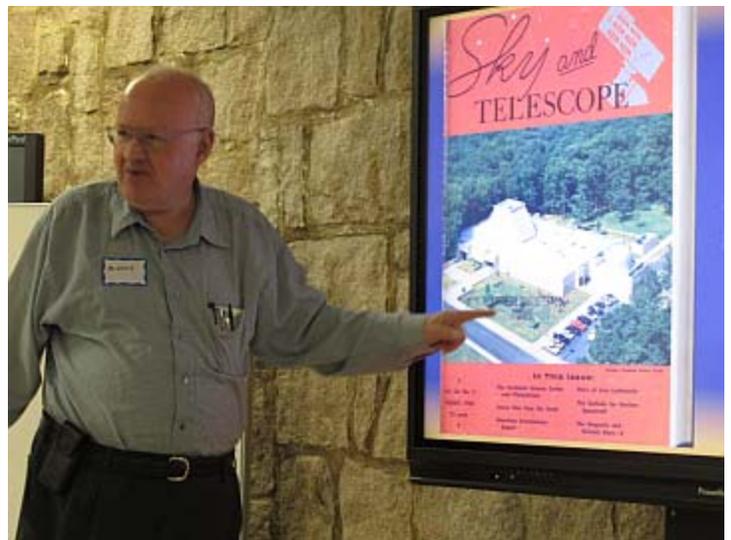
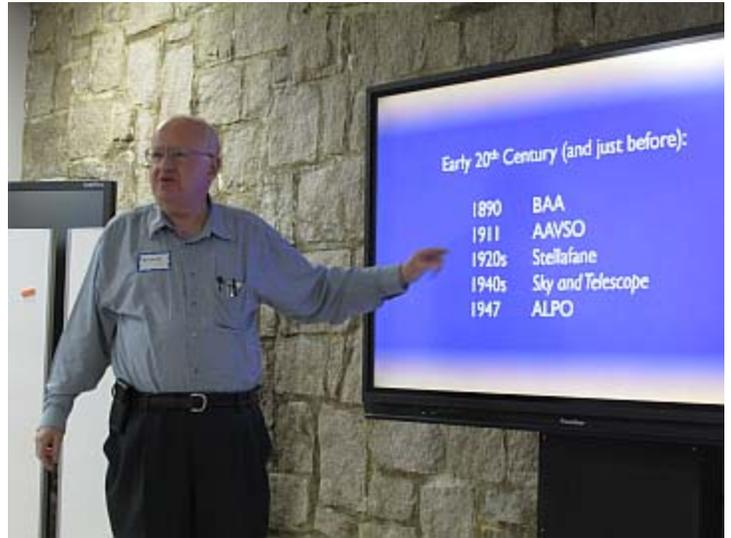
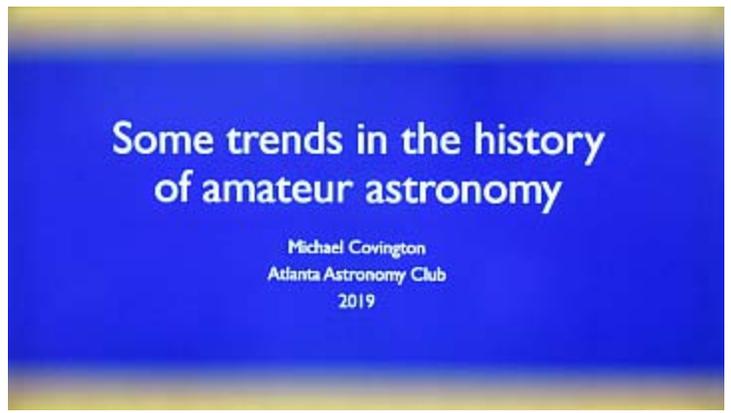


Credit: Google Maps

March AAC Meeting Report

Photos by Tom Faber

The March meeting of the AAC was held at the Fernbank Science Center Resource Center, beginning at 8PM, on Friday, March 15. There were about 30 members and guests present. After various announcements, AAC Program Chair Ken Poshedly (photo bottom) introduced our guest speaker, Michael Covington, who presented a talk titled "Some trends in the history of amateur astronomy". Michael talked about how amateur astronomy has changed over the decades since the 1800s in the US and England, through the 20th century, and up to the present day. He talked about how advancing technology has changed amateur astronomy particularly with the advancement in computers and imaging in the last couple of decades.



March was Membership Renewal Month

The AAC has moved to a "one-date-for-all" membership renewal. ALL CLUB MEMBERS, with certain exceptions, should submit their \$30 dues for 2019 by the end of March. Please send your renewals to AAC Treasurer Sharon Carruthers, renew online using PayPal, or you can bring your renewal to the March Meeting. For more information see: http://atlantaastronomy.org/?page_id=22

Thank You for your support of the AAC!

April Charlie Elliott Meeting

Join us April 6th when Theo Ramakers presents his research on the current solar cycle and the transition to cycle 25. To form a baseline for this research, Mr. Ramakers had to create a database of solar observations and leveraged the archives of the Association of Lunar and Planetary Observers, NASA, and NOAA's Space Weather Prediction Center. Yes, space weather is a thing! For his research, Mr. Ramakers used the average size of sun spots rather than the quantity and will cover the progression of solar cycle 24 as well as the transitions of cycles dating back to 1874!

Mr. Ramakers is a retired software professional and found his interest in astronomy while in the Boy Scouts growing up in the Netherlands. Orion has always been his favorite. As it usually goes with most of us, Mr. Ramakers returned to amateur astronomy later in life when his children gave him a telescope for Christmas. His initial interest was in planetary observation and imaging. Mr. Ramakers has been involved with Charlie Elliott Astronomy and served as Director from 2008 to 2011 and Outreach Coordinator from 2011 to 2016, becoming a NASA/JPL Solar System Ambassador. Mr. Ramakers also serves as the an Assistant Coordinator for the Solar, Computer, and Online sections with the Association of Lunar and Planetary Observers. Later in life, Mr. Ramakers turned his interest to solar observing and led him where he is today.

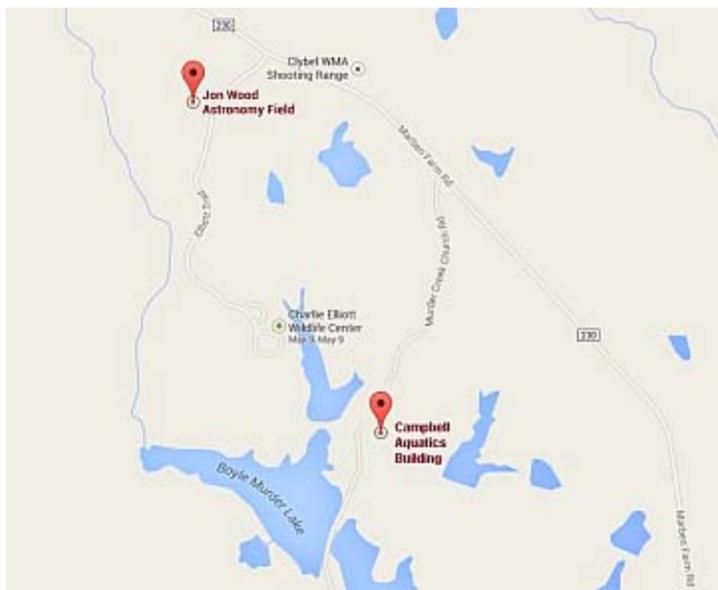
If you haven't found it already, check out our Facebook Page. You'll find a welcoming group of people sharing ideas and tips as well as organizing ad-hoc observing and imaging sessions on Jon Wood Astronomy Field.

Perspective

Observing Coordinator Steve Sidentop will be on hand to discuss what you can see and image in the night sky. His short presentation will cover observing from both a visual and a contemplative perspective. Steve started out as an observer, moved into astrophotography and enjoys doing both, finding observing particularly therapeutic. That's a good thing, because he needs all the therapy he can get! Steve will be joined by Astrophotography Coordinator Mark Woolridge who will cover the imaging challenges of the month and tips on how to image them as well as tips for beginners so you don't have to do everything the hard way!

Observing After the Meeting

All are invited to Jon Wood Astronomy Field immediately after the meeting (weather-permitting). As always, the event is free and open to the public.



Credit: Google Maps

Upcoming Charlie Elliott Meetings

Upcoming Charlie Elliott meetings will be held on: April 6, May 4, June 1, July 6, August 3, August 31, October 5, November 2, and December 7, 2019. 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>

Public stargazing on Jon Wood Astronomy Field follows the meeting, weather permitting.

Valorie Whalen completes AL Binocular Variable Star program

By David Whalen, from the Charlie Elliott Astronomy Facebook page

Congratulations to CE Astronomy member, Valorie Whalen! The Astronomical League awarded her a certificate and pin for completing the Binocular Variable Star Observing Program. In order to complete this program she had to observe fifteen variable stars at least four times each, estimate their visual magnitude, and report those estimates to the American Association of Variable Star Observers (AAVSO).



2019 Zombie Star Party

by Daniel Herron, AAC Observing Chair

This year's Zombie Party is scheduled for Thursday, April 4 thru Sunday, April 7 (3 nights) at the Deerlick Astronomy Village. The Zombie party is a no-frills, open to the public, 3 night star party hosted by the Atlanta Astronomy Club. No speakers, workshops, or sessions – just observing. This event is open to all, beginners and experts alike, AAC members, and non-members (how else are we going to get you hooked!). The event is \$15 per person per night due upon arrival, no refunds for bad weather once paid. See you there!

Weather:

General rule if the weather looks to be rainy during the night we will just cancel for that night and start the party the next day. We will make the go/no go decision for Thursday by Wednesday night.

Note:

The Zombie party got its name from the way we all look the next morning after staying awake all night observing and has nothing to do with the undead that are occasionally rumored to walk the area! Check <http://atlantaastronomy.org/> for updates.

Call for Volunteers -- Spring Election

By Ken & Karla Poshedly

The Atlanta Astronomy Club, founded in 1947 by the late Dr. William Calder, who came to Agnes Scott College in Decatur, Georgia from the Harvard College Observatory, to promote the collaboration of professional and amateur astronomers and to provide a venue for non-professionals to share their interests, is seeking candidates to run for office in the club's May election.

The AAC has a rich and varied history and is comprised of individuals from all walks of life, from students to professionals of all kinds; from youngsters to senior citizens; from those mildly interested in the night sky to those who "live and breathe this stuff". No matter who you are or what your occupation or stage in life, you're sure to fit in with the AAC.

The only requirement for candidates is to be a dues-paying member of the AAC and at least somewhat familiar with potential officer duties.

The following positions will be open: President, Program Chair, Observing Chair, Corresponding Secretary, Treasurer and Recording Secretary.

Duties are as described below:

- * President -- Serves as the chief executive officer who calls the program meetings to order and keeps things running smoothly.
- * Program Chair -- Books speakers for the club meetings.
- * Observing Chair -- Oversees matters involving the club's observing site and equipment at the Deerlick Astronomy Village.
- * Corresponding Secretary -- Oversees publication of the club newsletter.
- * Treasurer -- Handles the club's financial transactions and prepares an annual budget.
- * Recording Secretary -- Takes notes of the meetings for publication in the club newsletter.

All individuals except for the president may assemble a committee of helpers to assist with the functions of their respective office.

Interested individuals should contact the current AAC president, David Lumpkin at davidlumpkin@comcast.net

The Astronomical League

As a member of the **Atlanta Astronomy Club** you are automatically also a member of the **Astronomical League**, a nation wide affiliation of astronomy clubs. Membership in the AL provides a number of benefits for you. They include:

- * You will receive *The Reflector*, the AL's quarterly newsletter.
- * You can use the Book Service, through which you can buy astronomy-related books at a 10% discount.
- * You can participate in the Astronomical League's Observing Clubs. The Observing Clubs offer encouragement and certificates of accomplishment for demonstrating observing skills with a variety of instruments and objects. These include the Messier Club, Binocular Messier Club, the Herschel 400 Club, the Deep Sky Binocular Club, and many others.

To learn more about the Astronomical League and its benefits for you, visit <http://www.astroleague.org>

Hubble's Advanced Camera for Surveys Resumes Operations

NASA/STScI News Release - March 6, 2019

NASA has recovered the Hubble Space Telescope's Advanced Camera for Surveys instrument, which suspended operations on Thursday, Feb. 28, 2019. The final tests were conducted and the instrument was brought back to its operational mode on March 6.

At 8:31 p.m. EST on Feb. 28, the Advanced Camera for Surveys (ACS) aboard NASA's Hubble Space Telescope suspended operations after an error was detected as the instrument was performing a routine boot procedure. The error indicated that software inside the camera had not loaded correctly in a small section of computer memory. The Hubble operations team ran repeated tests to reload the memory and check the entire process. No errors have been detected since the initial incident, and it appears that all circuits, computer memory and processors that are part of that boot process are now operating normally. The instrument has now been brought back to its standard operating mode for normal operations.

The ACS was installed in 2002 and repaired during the last servicing mission to Hubble back in 2009 after a power supply failure. More than 5,500 peer-reviewed scientific papers have been published from its data, and it is credited with some of Hubble's most iconic images, including the Hubble Ultra Deep Field, the furthest look into the universe at that time.

Hubble itself is in its 29th year of operations, well surpassing its original 15-year lifetime. With its primary and backup systems, it is expected that Hubble will operate simultaneously with the upcoming James Webb Space Telescope to obtain multiwavelength observations of astronomical objects. Scheduled to launch in 2021, the James Webb Space Telescope is designed to see near- and mid-infrared light while Hubble is optimized for ultraviolet and visible light.

Advanced Camera for Surveys Information

Credit: NASA/STScI

The Advanced Camera for Surveys (ACS) replaced Hubble's Faint Object Camera during Servicing Mission 3B. Its wavelength range extends from the ultraviolet, through the visible and out to the near-infrared. ACS is a so-called third generation Hubble instrument. Its wide field of view is nearly twice that of Hubble's former workhorse camera, WFPC2, and with its superb image quality and high sensitivity, ACS has increased Hubble's potential for new discoveries by a factor of ten. The name, Advanced Camera for Surveys, comes from its particular ability to map large areas of the sky in great detail. ACS can also perform spectroscopy with a special optical tool called a 'grism'.

Three sub-instruments make up ACS

The Wide Field Channel is a high efficiency, wide field, optical and near-infrared camera. This space eye is optimised to hunt for galaxies and galaxy clusters in the remote and ancient Universe, at a time when our Cosmos was very young. The distribution in space of these distant objects will enable scientists to investigate just how the Universe evolved.

Another sub-instrument is the High Resolution Channel, though this is not currently operational. This camera was designed to take extremely detailed pictures (high resolution) of the light from the centres of galaxies with massive black holes, as well as of ordinary galaxies, star clusters and gaseous nebulae, where extraterrestrial planetary systems may be hidden. The instrument includes a coronagraph, capable of improving Hubble's contrast near bright objects by about a factor of 10.

Finally, the Solar Blind Channel blocks visible light to allow faint ultraviolet radiation to be discerned. Among other things, it can be used to study weather patterns on other planets and aurorae on Jupiter.

For more information about ACS turn to pg 7.

Hubble Watches Spun-Up Asteroid Coming Apart

NASA/STScI News Release - March 28, 2019

A small asteroid has been caught in the process of spinning so fast it's throwing off material, according to new data from NASA's Hubble Space Telescope and other observatories.

Images from Hubble show two narrow, comet-like tails of dusty debris streaming from the asteroid (6478) Gault. Each tail represents an episode in which the asteroid gently shed its material — key evidence that Gault is beginning to come apart.

Discovered in 1988, the 2.5-mile-wide (4-kilometer-wide) asteroid has been observed repeatedly, but the debris tails are the first evidence of disintegration. Gault is located 214 million miles (344 million kilometers) from the Sun. Of the roughly 800,000 known asteroids between Mars and Jupiter, astronomers estimate that this type of event in the asteroid belt is rare, occurring roughly once a year.

Watching an asteroid become unglued gives astronomers the opportunity to study the makeup of these space rocks without sending a spacecraft to sample them.



This Hubble Space Telescope image reveals the gradual self-destruction of an asteroid, whose ejected dusty material has formed two long, thin, comet-like tails. The longer tail stretches more than 500,000 miles (800,000 kilometers) and is roughly 3,000 miles (4,800 kilometers) wide. The shorter tail is about a quarter as long. The streamers will eventually disperse into space. Credits: NASA, ESA, K. Meech and J. Kleyna (University of Hawaii), and O. Hainaut (European Southern Observatory)

“We didn’t have to go to Gault,” explained Olivier Hainaut of the European Southern Observatory in Germany, a member of the Gault observing team. “We just had to look at the image of the streamers, and we can see all of the dust grains well-sorted by size. All the large grains (about the size of sand particles) are close to the object and the smallest grains (about the size of flour grains) are the farthest away because they are being pushed fastest by pressure from sunlight.”

Gault is only the second asteroid whose disintegration has been strongly linked to a process known as a YORP effect. (YORP stands for “Yarkovsky–O’Keefe–Radzievskii–Paddack,” the names of four scientists who contributed to the concept.) When sunlight heats an asteroid, infrared radiation escaping from its warmed surface carries off angular momentum as well as heat. This process creates a tiny torque that can cause the asteroid to continually spin faster. When the resulting centrifugal force starts to overcome gravity, the asteroid’s surface becomes unstable, and landslides may send dust and rubble drifting into space at a couple miles per hour, or the speed of a strolling human. The researchers estimate that Gault could have been slowly spinning up for more than 100 million years.

Piecing together Gault’s recent activity is an astronomical forensics investigation involving telescopes and astronomers around the world. All-sky surveys, ground-based telescopes, and space-based facilities like the Hubble Space Telescope pooled their efforts to make this discovery possible.

The initial clue was the fortuitous detection of the first debris tail, observed on Jan. 5, 2019, by the NASA-funded Asteroid Terrestrial-Impact Last Alert System (ATLAS) telescope in Hawaii. The tail also turned up in archival data from December 2018 from ATLAS and the Panoramic Survey Telescope and Rapid Response System (Pan-STARRS) telescopes in Hawaii. In mid-January, a second shorter tail was spied by the Canada–France–Hawaii Telescope in Hawaii and the Isaac Newton Telescope in Spain, as well as by other observers. An analysis of both tails suggests the two dust events occurred around Oct. 28 and Dec. 30, 2018.

Follow-up observations with the William Herschel Telescope and ESA’s (European Space Agency) Optical Ground Station in La Palma and Tenerife, Spain, and the Himalayan Chandra Telescope in India measured a two-hour rotation period for the object, close to the critical speed at which a loose “rubble-pile” asteroid begins to break up.

“Gault is the best ‘smoking gun’ example of a fast rotator right at the two-hour limit,” said team member Jan Kleyna of the University of Hawaii in Honolulu.

An analysis of the asteroid’s surrounding environment by Hubble revealed no signs of more widely distributed debris, which rules out the possibility of a collision with another asteroid causing the outbursts.

The asteroid’s narrow streamers suggest that the dust was released in short bursts, lasting anywhere from a few hours to a few days. These sudden events puffed away enough debris to make a “dirt ball” approximately 500 feet (150 meters) across if compacted together. The tails will begin fading away in a few months as the dust disperses into interplanetary space.

Based on observations by the Canada–France–Hawaii Telescope, the astronomers estimate that the longer tail stretches over half a million miles (800,000 kilometers) and is roughly 3,000 miles (4,800 kilometers) wide. The shorter tail is about a quarter as long.

Only a couple of dozen active asteroids have been found so far. Astronomers may now have the capability to detect many more of them because of the enhanced survey capabilities of observatories such as Pan-STARRS and ATLAS, which scan the entire sky. “Asteroids such as Gault cannot escape detection anymore,” Hainaut said. “That means that all these asteroids that start misbehaving get caught.”

The researchers hope to monitor Gault for more dust events.

The team’s results have been accepted for publication by *The Astrophysical Journal Letters*.

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.

For more information about 6478 Gault and Hubble, visit:

http://hubblesite.org/news_release/news/2019-22

<http://www.nasa.gov/hubble>

What Does the Milky Way Weigh? Hubble and Gaia Investigate

NASA/STScI News Release - March 7, 2019

We can't put the whole Milky Way on a scale, but astronomers have been able to come up with one of the most accurate measurements yet of our galaxy's mass, using NASA's Hubble Space Telescope and the European Space Agency's Gaia satellite.

The Milky Way weighs in at about 1.5 trillion solar masses (one solar mass is the mass of our Sun), according to the latest measurements. Only a few percent of this is contributed by the approximately 200 billion stars in the Milky Way and includes a 4-million-solar-mass supermassive black hole at the center. Most of the rest of the mass is locked up in dark matter, an invisible and mysterious substance that acts like scaffolding throughout the universe and keeps the stars in their galaxies.

Earlier research dating back several decades used a variety of observational techniques that provided estimates for our galaxy's mass ranging between 500 billion to 3 trillion solar masses. The improved measurement is near the middle of this range.

"We want to know the mass of the Milky Way more accurately so that we can put it into a cosmological context and compare it to simulations of galaxies in the evolving universe," said Roeland van der Marel of the Space Telescope Science Institute (STScI) in Baltimore, Maryland. "Not knowing the precise mass of the Milky Way presents a problem for a lot of cosmological questions."

The new mass estimate puts our galaxy on the beefier side, compared to other galaxies in the universe. The lightest galaxies are around a billion solar masses, while the heaviest are 30 trillion, or 30,000 times more massive. The Milky Way's mass of 1.5 trillion solar masses is fairly normal for a galaxy of its brightness.

Astronomers used Hubble and Gaia to measure the three-dimensional movement of globular star clusters — isolated spherical islands each containing hundreds of thousands of stars each that orbit the center of our galaxy.

Although we cannot see it, dark matter is the dominant form of matter in the universe, and it can be weighed through its influence on visible objects like the globular clusters. The more massive a galaxy, the faster its globular clusters move under the pull of gravity. Most previous measurements have been along the line of sight to globular clusters, so astronomers know the speed at which a globular cluster is approaching or receding from Earth. However, Hubble and Gaia record the sideways motion of the globular clusters, from which a more reliable speed (and therefore gravitational acceleration) can be calculated.

The Hubble and Gaia observations are complementary. Gaia was exclusively designed to create a precise three-dimensional map of astronomical objects throughout the Milky Way and track their motions. It made exacting all-sky measurements that include many globular clusters. Hubble has a smaller field of view, but it can measure fainter stars and therefore reach more distant clusters. The new study augmented Gaia measurements for 34 globular clusters out to 65,000 light-years, with Hubble measurements of 12 clusters out to 130,000 light-years that were obtained from images taken over a 10-year period.

When the Gaia and Hubble measurements are combined as anchor points, like pins on a map, astronomers can estimate the distribution of the Milky Way's mass out to nearly 1 million light-years from Earth.

"We know from cosmological simulations what the distribution of mass in the galaxies should look like, so we can calculate how accurate this extrapolation is for the Milky Way," said Laura Watkins of the European Southern Observatory in Garching, Germany, lead author of the combined

Hubble and Gaia study, to be published in *The Astrophysical Journal*. These calculations based on the precise measurements of globular cluster motion from Gaia and Hubble enabled the researchers to pin down the mass of the entire Milky Way.

The earliest homesteaders of the Milky Way, globular clusters contain the oldest known stars, dating back to a few hundred million years after the big bang, the event that created the universe. They formed prior to the construction of the Milky Way's spiral disk, where our Sun and solar system reside.

"Because of their great distances, globular star clusters are some of the best tracers astronomers have to measure the mass of the vast envelope of dark matter surrounding our galaxy far beyond the spiral disk of stars," said Tony Sohn of STScI, who led the Hubble measurements.

The international team of astronomers in this study are Laura Watkins (European Southern Observatory, Garching, Germany), Roeland van der Marel (Space Telescope Science Institute, and Johns Hopkins University Center for Astrophysical Sciences, Baltimore, Maryland), Sangmo Tony Sohn (Space Telescope Science Institute, Baltimore, Maryland), and N. Wyn Evans (University of Cambridge, Cambridge, United Kingdom).

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.



This illustration shows the fundamental architecture of our island city of stars, the Milky Way galaxy: a spiral disk, central bulge, and diffuse halo of stars and globular star clusters. Not shown is the vast halo of dark matter surrounding our galaxy. A comprehensive survey that combines the observing prowess of both the Hubble Space Telescope and the European Space Agency's Gaia satellite measured the total mass of our galaxy at 1.5 trillion solar masses. Only a few percent of the estimated 200 billion stars in our galaxy contributes to this total. Most of the rest is locked up in invisible dark matter. The precision of Hubble and Gaia each allowed astronomers to measure the movement of the isolated spherical islands called globular star clusters. The more massive a galaxy, the faster its clusters move under the pull of gravity. And, this allows for the mass of our galaxy to be calculated. Credits: NASA, ESA, and A. Feild (STScI)

Hubble Space Telescope – Advanced Camera for Surveys

The Advanced Camera for Surveys (ACS) was installed on the Hubble Space Telescope during Servicing Mission 3B in 2002. An electronics failure in January 2007 rendered the two most-used science channels inoperable. Astronauts during Servicing Mission 4 repaired the Wide Field Channel (WFC), the workhorse responsible for 70 percent of the pre-2007 ACS science. The High Resolution Channel (HRC), however, could not be repaired.

Overview

ACS was primarily designed to survey large areas of the sky at visible and red wavelengths with 10 times greater efficiency than the earlier premier Hubble camera, the Wide Field Planetary Camera 2 (WFPC2). For five years ACS consistently lived up to that promise. Many of the most extraordinary images from Hubble were taken with the ACS/WFC, most famously perhaps the Hubble Ultra Deep Field, still the deepest look of visible light from the early universe after galaxies had begun to form. The High Resolution Channel provided ultra-sharp views over a smaller field-of-view. It included an option for imaging faint objects around bright stars through a coronagraphic capability that blocks out light from bright sources. The Solar-Blind Channel (SBC) was designed to provide small field-of-view imaging in the far ultraviolet region of the spectrum. Following its installation on Hubble, the ACS became the observatory's most heavily used instrument.

The Instrument

WFC and HRC have Charge Coupled Devices (CCDs) for detectors. WFC has a 4,000-by-4,000-pixel format created by two adjacent 2,000-by-4,000 devices. The CCDs were optimized for sensitivity in the red region of the spectrum, and spectral coverage extends from about 3,500 angstroms in the blue, up beyond the visible-red to 1.1 microns (11,000 angstroms). The field of view is 202-by-202 arcseconds (arcsec). In the far ultraviolet, SBC uses a Multi-Anode Microchannel Array (MAMA), also used by the Space Telescope Imaging Spectrograph (STIS) on Hubble. SBC has a 1,000-by-1,000-pixel format, a field of 31-by-35 arcsec, and sensitivity from 1,150 angstroms to 1,700 angstroms. All the detector channels employ selectable filters mounted on rotating filter wheels to transmit the desired color of light to the detector for any particular image. The ACS' performance in visible to red light is ideal for surveying redshifted galaxies and clusters of galaxies at moderate to large distances across the universe. ACS and Wide Field Camera 3 (WFC3) together enable the "best of all worlds" for astronomers, providing superb wide-field imaging over a broad range of wavelengths.

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/atlaastro>.

AAC Officers and Contacts

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

AAC Events are listed in BOLD

Apr 4th-7th, Thursday-Sunday: **Zombie Star Party at DAV. Contact Daniel Herron for details**

Apr 5th, Friday: New Moon.

Apr 6th, Saturday: **CEA Chapter Meeting.**

Apr 8th, Monday: Grouping of moon, Mars, Hyades, and Pleiades.

Apr 12th, Friday: Moon First Quarter.

Apr 16th, Tuesday: Mercury near Venus morning.

Apr 19th, Friday: **AAC Meeting 8PM at the Fernbank Science Center.** Full Moon.

Apr 21st, Sunday: Lyrids meteor shower.

Apr 22nd, Monday: Uranus conjunction with Sun.

Apr 23th, Tuesday: Moon near Jupiter.

Apr 25th, Thursday: Moon near Saturn.

Apr 26th, Friday: Moon Last Quarter.

May 4th, Saturday: New Moon. **CEA Chapter Meeting.**

May 6th, Monday: Moon near Hyades. Eta Aquariid Meteor Shower peak.

May 11th, Saturday: Moon First Quarter. Astronomy Day at Tellus Museum 1PM-11PM.

May 17th, Friday: **AAC Meeting 8PM at the Fernbank Science Center.**

May 18th, Saturday: Full Moon.

May 19th, Sunday: Mars near M35.

May 20th, Monday: Moon near Jupiter.

May 22nd, Wednesday: Moon near Saturn.

May 26th, Sunday: Moon Last Quarter.

June 1st, Saturday: **CEA Chapter Meeting.**

June 3rd, Monday: New Moon.

For more event listings and updates 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 May is Sunday, April 28. Submissions received after the deadline will go in the following issue.**



FIRST CLASS



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The Focal Point