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THE OBSERVER

BATTLE POINT ASTRONOMICAL ASSOCIATION

WWW.BPASTRO.ORG BAINBRIDGE ISLAND, WA

Photo credit: Mario Alejandro Torres

Webb Telescope First Images

BPAA is one of two Bainbridge Island organizations to be selected by NASA as Webb First Images Community Event Hosts, along with the Kids Discovery Museum (KiDiMu). Join us at the Ritchie Observatory for a series of events highlighting Webb's first images, which promise to be spectacular. Visit BPAstro.org for details

- Tuesday, July 12, 7:30am: First Images Release. In person at the Observatory, or view at home.
- Tuesday, July 12, 3:00pm: NASA Expert Panel Discussion explaining what the images show. Exclusive in-person only at the Ritchie Observatory; no public stream available.
- Sábado, 16 de julio, 11:00am: Panel de discusión de expertos de la NASA, exclusivo solo en el Observatorio Ritchie, en español.
- Saturday, July 16, 12:30pm: NASA Expert Panel Discussion, exclusive only at the Ritchie Observatory, in English.
- Saturday, August 6, 12-4pm: KiDiMu Celebrates Webb First Images. BPAA will be on hand with telescopes. More at KiDiMu.org.

Mayan Stragazers

The historic Maya oriented their lives by the heavens. Today, their descendants and Western scholars team up to understand their sophisticated astronomy.

As regular readers of the Observer know, most of our articles include a "Reader's Digest"-like synopsis of the main story with a link to the source for the full article. But when Peter Moseley (thanks, Peter!) recently submitted an article about Mayan astronomy from Science, we couldn't find a good way to do justice to the content in a condensed version.

So instead, we strongly encourage all to use the link below to read the entire fascinating article. Enjoy!

(Source: science.org)

Restore the John Rudolph Planetarium

Our efforts to raise $60,000 to replace the John Rudolph Planetarium projector and upgrade the projection dome are off to a great start! Thanks to Bainbridge Community Foundation's Community Grant Cycle and BPAA members like you, we raised $15,000. Thank you!

The new projector and dome will allow us to teach astronomy to learners of all ages regardless of weather, even in the daytime!

Additionally, we received a generous pledge from a BPAA member to match additional donations up to $15,000! Your gift of $100 will have twice the impact and allow us to provide free field trips for local schools and enhance our outreach capabilities.

Climate Smart Bainbridge

Climate Smart Bainbridge is currently offering a program that helps individuals and families choose goals to work towards a more sustainable household. The program asks a few questions about your household's energy and natural gas habits and consumption, and evaluates your carbon emissions and environmental impact. It presents your household with challenges you can choose to create goals that minimize your carbon footprint depending on your ability to complete them. Challenges are easily customizable and are fit for any level of commitment. This is a simple and easy opportunity for households to take small steps to minimize your environmental impact. Thank you for your consideration.

Together we can make a real difference in the fight against climate change. Learn more at https://www.climatesmartbainbridge.org – Grace Bonow, BPAA student member

Mirrors Aligned: Webb Telescope's First Full-Color Images Due in July

After completing two additional mirror alignment steps in March 2022, the team confirmed the James Webb Space Telescope's optical performance will be able to meet or exceed the science goals the observatory was built to achieve.

This "selfie" was created using a specialized pupil imaging lens inside of Webb's Near Infrared Camera, or NIRCam, instrument, which was designed to take images of the primary mirror segments instead of images of the sky. This configuration is not used during scientific operations and is used strictly for engineering and alignment purposes. In this image, all of Webb's 18 primary mirror segments are shown collecting light from the same star in unison.

Now, we're counting down to the release of the Webb Telescope's first full-color images and spectroscopic data during a broadcast beginning at 10:30 a.m. EDT on Tuesday, July 12.

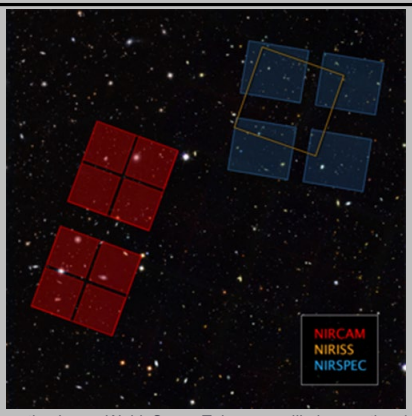
Learn more

NASA's Webb Reaches Alignment Milestone, Optics Working Successfully

NASA Invites Media, Public to View Webb Telescope's First Images

(Source: nasa.gov)

Webb to Uncover Riches of the Early Universe



This image shows where the James Webb Space Telescope will observe the sky within the Hubble Ultra Deep Field, which consists of two fields. The Next Generation Deep Extragalactic Exploratory Public (NGDEEP) Survey, led by Steven L. Finkelstein, will point Webb's Near-Infrared Imager and Slitless Spectrograph (NIRISS) on the primary Hubble Ultra Deep Field (shown in orange), and Webb's Near-Infrared Camera (NIRCam) on the parallel field (shown in red). The program led by Michael Maseda will observe the primary field (shown in blue) using Webb's Near-Infrared Spectrograph (NIRSpec). Credits: SCIENCE: NASA, ESA, Anton M. Koekemoer (STScI) ILLUSTRATION: Alyssa Pagan (STScI)

For decades, telescopes have helped us capture light from galaxies that formed as far back as 400 million years after the big bang – incredibly early in the context of the universe's 13.8-billion-year history. But what were galaxies like that existed even earlier, when the universe was semi-transparent at the beginning of a period known as the Era of Reionization? NASA's next flagship observatory, the James Webb Space Telescope, is poised to add new riches to our wealth of knowledge not only by capturing images from galaxies that existed as early as the first few hundred million years after the big bang, but also by giving us detailed data known as spectra. With Webb's observations, researchers will be able to tell us about the makeup and composition of individual galaxies in the early universe for the first time.

We know these galaxies exist because of extensive observations this team has made – along with an international research team – with the ground-based Very Large Telescope's Multi Unit Spectroscopic Explorer (MUSE) instrument. Although MUSE is the "scout," identifying smaller, fainter galaxies in this deep field, Webb will be the first telescope to fully characterize their chemical compositions.

These extremely distant galaxies have important implications for our understanding of how galaxies formed in the early universe. "Webb will open a new space for discovery," explained Anna Feltre, a research fellow at the National Institute for Astrophysics in Italy and a co-investigator. "Its data will help us learn precisely what happens as a galaxy forms, including which metals they contain, how quickly they grow, and if they already have black holes."

This research will be conducted as part of Webb's General Observer (GO) programs, which are competitively selected using a dual-anonymous review, the same system that is used to allocate time on the Hubble Space Telescope.

(Source: nasa.gov)

Hubble Delves Into Cosmic Treasure Trove

Credit: ESA/Hubble & NASA, R. Cohen

This image from the NASA/ESA Hubble Space Telescope captures the sparkling globular cluster NGC 6569 in the constellation Sagittarius. Hubble explored the heart of this cluster with both its Wide Field Camera 3 and Advanced Camera for Surveys, revealing a glittering hoard of stars in this astronomical treasure trove.

Globular clusters are stable, tightly bound clusters containing tens of thousands to millions of stars and are associated with all types of galaxies. The intense gravitational attraction of these closely packed clusters of stars means that globular clusters have a regular spherical shape with a densely populated center, as seen at the heart of this star-studded image.

This observation comes from an investigation of globular clusters which lie close to the center of the Milky Way. Previous surveys avoided these objects, as the dusty center of our galaxy blocks their light and alters the colors of the stars residing in them. A star's color is particularly important for astronomers studying stellar evolution, and can give astronomers insights into their ages, compositions, and temperatures.

The astronomers who proposed these observations combined data from Hubble with data from astronomical archives, allowing them to measure the ages of globular clusters including NGC 6569. Their research also provided insights into the structure and density of globular clusters towards the center of the Milky Way.

(Source:phys.org)

New Fossil Galaxy Discovery

A new fossil galaxy, which was uncovered via a systematic visual search of legacy survey images using the Mayall 4-meter telescope, led by Dr. David Martinez Delgado, could teach scientists about how galaxies form and confirm their understanding of cosmology and dark matter.

Dr. Michelle Collins, an astronomer at the University of Surrey, UK and lead author of the paper announcing this discovery says that they "have found a new, extremely faint galaxy whose stars formed very early in the history of the Universe. This discovery marks the first time a galaxy this faint has been found around Andromeda using an astronomical survey that wasn't specifically designed for the task."

Named "Pegasus V," the dwarf galaxy is located on the outskirts of Andromeda and appears as just a few sparse stars hidden in the sky.

The discovery was made in collaboration with NSF NOIRLab and the International Gemini Observatory.

Emily Charles, a Ph.D. student at the University of Surrey who was also involved in the study says that "the trouble with these extremely faint galaxies is that they have very few of the bright stars which we typically use to identify them and measure their distances. Gemini's large 8.1-meter mirror allowed us to find faint, old stars which enabled and allowed us to both to measure the distance to Pegasus V and to determine that its stellar population is extremely old."

More astronomical facilities are looking into researching faint galaxies in the near future.

(Source: phys.org)

Galaxy Rotation In the Early Universe

Conceptual image of MACS1149-JD1 forming and spinning up to speed in the early Universe. Credit: ALMA (ESO/NAOJ/NRAO)

As telescopes have become more advanced and powerful, astronomers have been able to detect more and more distant galaxies. These are some of the earliest galaxies to form in our universe that began to recede away from us as the universe expanded. In fact, the greater the distance, the faster a galaxy appears to move away from us. Interestingly, we can estimate how fast a galaxy is moving, and in turn, when it was formed based on how "redshifted" its emission appears.

The Atacama Large Millimeter/submillimeter Array (ALMA) telescope, located in the midst of the Atacama Desert in Chile, is particularly well-suited for observing such redshifts in galaxy emissions. Recently, a team of international researchers has observed redshifted emissions of a distant galaxy, MACS1149-JD1 (hereafter JD1), which has led them to some interesting conclusions.

Galaxy formation begins with the accumulation of gas and proceeds with the formation of stars from that gas. With time, star formation progresses from the center outward, a galactic disk develops, and the galaxy acquires a particular shape. As star formation continues, newer stars form in the rotating disk while older stars remain in the central part. By studying the age of the stellar objects and the motion of the stars and gas in the galaxy, it is possible to determine the stage of evolution the galaxy has reached.

Conducting a series of observations over a period of two months, the astronomers successfully measured small differences in the "redshift" from position to position inside the galaxy and found that JD1 satisfied the criterion for a galaxy dominated by rotation. Next, they modeled the galaxy as a rotating disk and found that it reproduced the observations very well.

The significance of their result is that JD1 is by far the most distant, and therefore, the earliest source yet found that has a rotating disk of gas and stars. Furthermore, the mass estimated from the rotational speed of the galaxy was in line with the stellar mass previously estimated from the galaxy's spectral signature, and came predominantly from that of "mature" stars that formed about 300 million years ago.

With the recently launched James Webb Space Telescope, the astronomers now plan to identify the locations of young and older stars in the galaxy to verify and update their scenario of galaxy formation.

(Source: phys.org)

Solar System Stable for Next 100,000 Years

It's nice to have a feel-good story every once in a while, so here's one to hold off the existential dread: the Earth isn't likely to get flung off into deep space for at least 100,000 years. In fact, all of the solar system's planets are safe for that time frame, so there is good news all around, for you and your favorite planetary body.

One of the most broadly accepted models of solar system formation, the Nice model, describes how the outer planets migrated early in the solar system's history, and would have wreaked havoc on the inner rocky worlds, possibly displacing or even swallowing smaller proto-planets in the process.

But now, researchers have done the math to show that such a migration is unlikely in the next 100,000 years. Angel Zhivkov and Ivaylo Tounchev from the Department of Mathematics and Informatics at Sofia University in Bulgaria used computer calculations to determine that the planets are likely to remain stable.

Even downgraded dwarf planet Pluto was included in this study, and diehard Pluto fans will be happy to know that it too is likely to do little more than oscillate a bit over the next 100,000 years.

So Earthlings, Martians, and Jovians alike: take a breath and enjoy the ride. The next 100,000 years around the Sun are going to be smooth sailing.

(Source: phys.org)

Triplet of Stars Was Once a Quartet

Stellar mergers in quadruple systems might be common, a new study shows. Take a recently discovered triple system, dubbed TIC 470710327, in which a close pair of stars is orbited by a third star. The outer star has more mass than the two inner stars combined, which poses a problem for theoreticians. Such a massive star ought to have started shining before the other two, and its intense radiation would have blown apart the gas around it — preventing the less massive pair from forming.

A team of astronomers came up with an original solution. What if the massive outer star used to be two smaller stars that merged shortly after they formed? The scenario, to be published in the Monthly Notices of the Royal Astronomical Society (preprint available here), not only explains this triplet's configuration, but also demonstrates the complex pathways to star formation.

In the new study, scientists supposed that the system began with two pairs of stars. Orbital behavior of isolated binary stars is usually predictable, but add another star or two to the mix and the orbits start showing complicated behavior. Periodic changes in the orbits' elongation and inclination could alter stellar evolution and, in the most extreme case, merge some family members. And that was the scenario the authors were after.

(Source: skyandtelescope.org)

Comet Chury's Unexpected Chemical Complexity

Data from comet "Chury", collected while the comet passed the point of its orbit closest to the Sun, show a plethora of surprising molecules sublimating from expelled dust particles. On average, this complex organic material resembles that present in meteorites and Saturn's ring rain, indicating a shared presolar origin. Credit: Universtiy of Bern

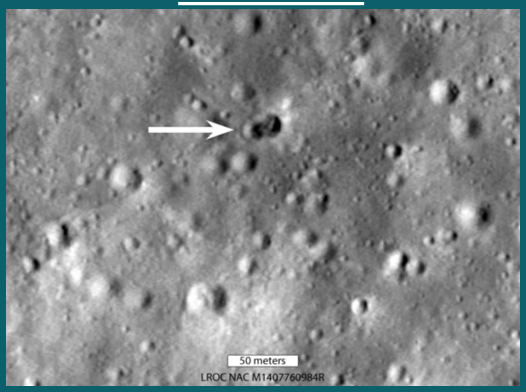
A team of researchers led by the University of Bern has for the first time identified an unexpected richness of complex organic molecules at a comet. This was achieved thanks to the analysis of data collected during ESA's Rosetta mission at comet 67P/Churyumov-Gerasimenko, also known as Chury. Delivered to the early Earth by impacting comets, these organics may have helped to kick-start carbon-based life as we know it.

Comets are fossils from the ancient times and from the depths of our solar system, and they are relics from the formation of the sun, planets, and moons. A team led by chemist Dr. Nora Hänni of the Physics Institute of the University of Bern, Department of Space Research and Planetary Sciences, has now succeeded for the first time in identifying a whole series of complex organic molecules at a comet as they report in a study published at the end of June in the journal Nature Communications.

When Chury reached its perihelion, the closest point to the sun, it became very active. Sublimating cometary ices created outflow that dragged along dust particles. Expelled particles were heated up by solar irradiation to temperatures beyond those typically experienced at the cometary surface. This allows larger and heavier molecules to desorb, making them available to the high-resolution mass spectrometer ROSINA-DFMS (Rosetta Orbiter Sensor for Ion and Neutral Analysis-Double Focusing Mass Spectrometer). "It turned out that, on average, Chury's complex organics budget is identical to the soluble part of meteoritic organic matter," explains Hänni. "Moreover, apart from the relative amount of hydrogen atoms, the molecular budget of Chury also strongly resembles the organic material raining down on Saturn from its innermost ring, as detected by the INMS mass spectrometer onboard NASA's Cassini spacecraft."

(Source: phys.org)

Booster Impact Crater On the Farside Of the Moon



A recent lunar science mystery has provided an interesting result. After a months-long search, the Lunar Reconnaissance Orbiter mission team recently found a pair of new craters on the lunar farside, formed when an object hit the Moon on March 4, 2022. Observers had spotted the object on its moonbound trajectory, though the impact itself was of course out of Earth's line of sight.

Exactly what the impactor was made for an intriguing tale. Initial calculations suggested it was the upper stage booster of a SpaceX Falcon 9 rocket, which launched the Deep Space Climate Observatory mission. But observers later refined the trajectory and identified the object as a Long March 3C upper stage from China's Chang'e 5 T1 mission. Chang'e 5 T1 flew past the Moon in late 2014 to demonstrate capsule reentry ahead of the full Chang'e 5 lunar-sample return. To date, however, China has not confirmed that the object was related to the Chang'e 5 T1 mission.

The impactor was projected to hit the lunar surface around 7:26 a.m. EST / 12:26 UT on March 4th, near the large crater Hertzsprung on the lunar farside. The Lunar Reconnaissance Orbiter (LRO) team found the impact site about 8 kilometers (5 miles) from the expected impact site. This slight shift wasn't unexpected, as solar-wind pressure can gently push on the empty rocket booster — basically a hollow cylinder — and alter its trajectory prior to impact.

"The actual impact location was uncertain, largely because our last observations were made about four weeks before impact," says Bill Gray (Project Pluto), who had observed the object and compiled others' observations. "After that, the object was too close to the Sun in the sky to be able to point a telescope at it."

"We were fairly confident that the LRO crew would have to search a bit around our predicted impact sites," Gray adds. "It's a little farther off than either of us had expected, but not surprisingly so."

What was unexpected was the double crater that resulted from the impact, 28 meters (92 feet) along its longest axis. An eastern crater (18 meters across) is superimposed on a western crater (16 meters). Most of the mass from the 1.8-ton spent booster is expected to be located in the aft rocket motor end, but the double crater indicates that there was a large mass on both ends.

(Source: skyandtelescope.org)

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New Method For Predicting the 11-year Solar Cycle Strength

Scientists from Skoltech and their colleagues from the University of Graz & the Kanzelhöhe Observatory (Austria), Hvar Observatory (Croatia), and the Belgian Solar-Terrestrial Center of Excellence—SILSO, Royal Observatory of Belgium presented a new method to predict the strength of the 11-year solar cycle. The results are important for anticipating and mitigating space weather effects on astronauts, pilots and modern technological systems both in space and on Earth.

The sun is the source of powerful explosions that can affect astronauts and modern technologies in space and on Earth. In the 19th century, it became clear that sunspots appear and disappear with a certain periodicity, on average, every 11 years. Sunspots are now regularly monitored by more than 80 observatories across the world and researchers have compiled continuous sunspot records for over four centuries, which is the longest scientific experiment in the history of humanity.

Sunspots are visual manifestations of powerful magnetic fields that have risen from the solar interior through its surface. The magnetic tubes carrying solar matter emerge from one sunspot, forming a giant loop, entering the surface again through another sunspot. Therefore, most sunspots come in pairs, which, like a magnet, have opposite polarities—one being positive and the other negative. Free magnetic energy accumulates in these loops and can be suddenly released, for example, in the form of a flare, or plasma ejection.

The authors of the recent study in Astronomy & Astrophysics came up with a new method to predict the strength of the 11-year solar cycle. The team showed that the maximal growth rate of sunspot activity in the ascending phase of a solar cycle is an effective precursor of the amplitude of the solar cycle. Making use of the new catalog of Hemispheric Sunspot Numbers, recently presented by the team, they showed that the predictions of the solar cycle amplitudes are more accurate when the evolution of solar activity is considered separately for the two hemispheres of the sun.

"The solar magnetic field is the driver of the 11-year solar cycle and of energetic eruptions from our sun. We have learned from our study that we can obtain more accurate predictions of solar activity when using hemispheric sunspot data, which capture the asymmetric and out-of-phase behavior of the solar magnetic field evolution in the north and the south solar hemispheres," says study co-author Astrid Veronig, professor at the University of Graz, and head of the Kanzelhöhe Observatory for Solar and Environmental Research.

"And whatever storms may rage, we wish everyone good weather in space," concluded Tatiana Podladchikova.

(Source: phys.org)

WHAT'S UP(COMING)!

Jul 2 – IC4756 is well placed
Jul 13 – Full Moon
Jul 28 – New Moon
Jul 29 – Piscis Austrinid meteor shower 2022
Jul 30 – Southern δ-Aquariid meteor shower 2022
– α-Capricornid meteor shower 2022
Aug 4 – C/2017 K2 (PANSTARRS) reaches its brightest
Aug 11 – Full Moon
Aug 13 – Perseid meteor shower 2022
Aug 14 – Saturn at opposition
– M15 is well placed
Aug 15 – M2 is well placed
Aug 18 – κ-Cygnid meteor shower 2022
Aug 22 – Asteroid 4 Vesta at opposition
Aug 27 – New Moon
Sep 1 – Aurigid meteor shower 2022
Sep 7 – Asteroid 3 Juno at opposition
Sep 9 – September ε-Perseid meteor shower 2022
Sep 10 – Full Moon
Sep 16 – Neptune at opposition
Sep 22 – September equinox
Sep 25 – New Moon
Sep 26 – Jupiter at opposition