Space News Update

— July 28, 2017 —

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1. Eclipse Balloons to Study Effect of Mars-Like Environment on Life

Steps forward in the search for life beyond Earth can be as simple as sending a balloon into the sky. In one of the most unique and extensive eclipse observation campaigns ever attempted, NASA is collaborating with student teams across the U.S. to do just that.

A larger initiative, **NASA's Eclipse Balloon Project**, led by Angela Des Jardins of Montana State University, is sending more than 50 high-altitude balloons launched by student teams across the U.S. to livestream aerial footage of the Aug. 21 total solar eclipse from the edge of space to NASA's website.

"Total solar eclipses are rare and awe-inspiring events. Nobody has ever live-streamed aerial video footage of a total solar eclipse before," said Angela Des Jardins. "By live-streaming it on the Internet, we are providing people across the world an opportunity to experience the eclipse in a unique way, even if they are not able to see the eclipse directly."

A research group at NASA's Ames Research Center, in California's Silicon Valley, is seizing the opportunity to conduct a low-cost experiment on 34 of the balloons. This experiment, called MicroStrat, will simulate life's ability to survive beyond Earth -- and maybe even on Mars.

"The August solar eclipse gives us a rare opportunity to study the stratosphere when it's even more Mars-like than usual," said Jim Green, director of planetary science at NASA Headquarters in Washington. "With student teams flying balloon payloads from dozens of points along the path of totality, we'll study effects on microorganisms that are coming along for the ride."

NASA will provide each team with two small metal cards, each the size of a dog tag. The cards have harmless, yet environmentally resilient bacteria dried onto their surface. One card will fly up with the balloon while the

other remains on the ground. A comparison of the two will show the consequences of the exposure to Mars-like conditions, such as bacterial survival and any genetic changes.

The results of the experiment will improve NASA's understanding of environmental limits for terrestrial life, in order to inform our search for life on other worlds.

Mars' atmosphere at the surface is about 100 times thinner than Earth's, with cooler temperatures and more radiation. Under normal conditions, the upper portion of our stratosphere is similar to these Martian conditions, with its cold, thin atmosphere and exposure to radiation, due to its location above most of Earth's protective ozone layer. Temperatures where the balloons fly can reach minus 35 degrees Fahrenheit (about minus 37 Celsius) or colder, with pressures about a hundredth of that at sea level.

During the eclipse, the similarities to Mars only increase. The Moon will buffer the full blast of radiation and heat from the Sun, blocking certain ultraviolet rays that are less abundant in the Martian atmosphere and bringing the temperature down even further.

"Performing a coordinated balloon microbiology experiment across the entire continental United States seems impossible under normal circumstances," said David J. Smith of Ames, principal investigator for the experiment and mentor for the **Space Life Science Training Program, the intern group developing flight hardware and logistics for this study**. "The solar eclipse on August 21st is enabling unprecedented exploration through citizen scientists and students. After this experiment flies, we will have about 10 times more samples to analyze than all previously flown stratosphere microbiology missions combined."

Student Teams Observing the Eclipse

Beyond the opportunity for NASA to conduct science, this joint project provides the opportunity for students as young as 10 years old to be exposed to the scientific method and astrobiology -- research about life beyond Earth. Since ballooning is such an accessible and low-cost technique, the project has attracted student teams from Puerto Rico to Alaska.

The data collected by the teams will be analyzed by NASA scientists at Ames and NASA's Jet Propulsion Laboratory, Pasadena, California; collaborators at Cornell University, Ithaca, New York; scientists funded by the National Science Foundation and National Oceanographic and Atmospheric Administration; faculty members and students at the teams' institutions, as well as the public.

"This project will not only provide insight into how bacterial life responds to Mars-like conditions, we are engaging and inspiring the next generation of scientists," said Green. "Through this exciting 'piggyback' mission, NASA is collaborating with scientists of the future to take a small step in the search for life beyond our planet."

Source: Universe Today Return to Contents

2. Has Cassini Found a Universal Driver for Prebiotic Chemistry at Titan?

The international Cassini-Huygens mission has made a surprising detection of a molecule that is instrumental in the production of complex organics within the hazy atmosphere of Saturn's moon Titan.

Titan boasts a thick nitrogen and methane atmosphere with some of the most complex chemistry seen in the Solar System. It is even thought to mimic the atmosphere of early Earth, before the build-up of oxygen. As such, Titan can be seen as a planet-scale laboratory that can be studied to understand the chemical reactions that may have led to life on Earth, and that could be occurring on planets around other stars.

In Titan's upper atmosphere, nitrogen and methane are exposed to energy from sunlight and energetic particles in Saturn's magnetosphere. These energy sources drive reactions involving nitrogen, hydrogen and carbon, which lead to more complicated prebiotic compounds.

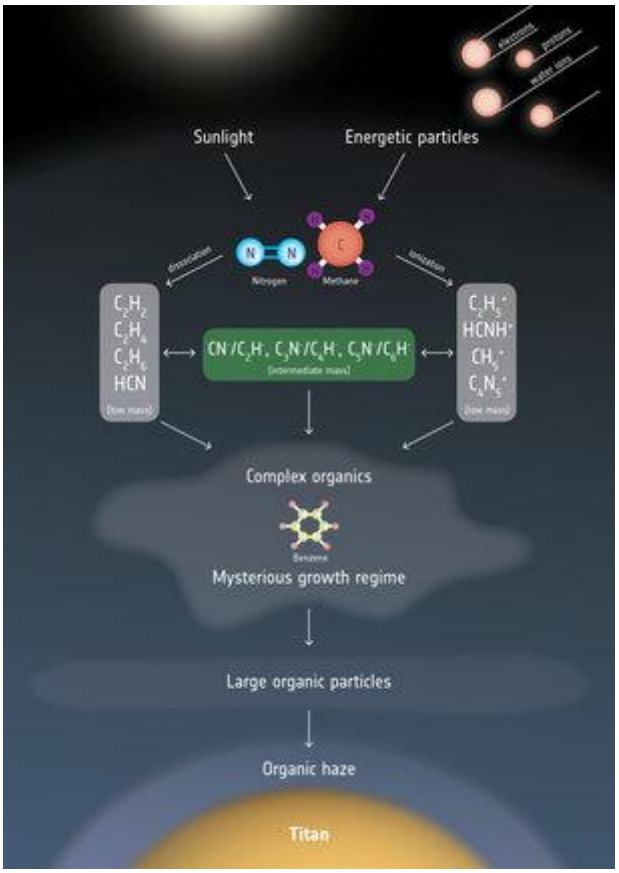
These large molecules drift down towards the lower atmosphere, forming a thick haze of organic aerosols, and are thought to eventually reach the surface. But the process by which simple molecules in the upper atmosphere are transformed into the complex organic haze at lower altitudes is complicated and difficult to determine.

One surprising outcome of the Cassini mission was the discovery of a particular type of negatively charged molecule at Titan. Negatively charged species – or 'anions' – were not something scientists expected to find,

because they are highly reactive and should not last long in Titan's atmosphere before combining with other materials. Their detection is completely reshaping current understanding of the hazy moon's atmosphere.

In a new study published in *Astrophysical Journal Letters*, scientists identified some of the negatively charged species as what are known as 'carbon chain anions'. These linear molecules are understood to be building blocks towards more complex molecules, and may have acted as the basis for the earliest forms of life on Earth.

The detections were made using Cassini's plasma spectrometer, called CAPS, as Cassini flew through Titan's upper atmosphere, 950–1300 km above the surface. Interestingly, the data showed that the carbon chains became depleted closer to the moon, while precursors to larger aerosol molecules underwent rapid growth, suggesting a close relationship between the two, with the chains 'seeding' the larger molecules.



"We have made the first unambiguous identification of carbon chain anions in a planet-like atmosphere, which we believe are a vital stepping-stone in the production line of growing bigger, and more complex organic molecules, such as the moon's large haze particles," says Ravi Desai of University College London and lead author of the study.

"This is a known process in the interstellar medium, but now we've seen it in a completely different environment, meaning it could represent a universal process for producing complex organic molecules.

"The question is, could it also be happening within other nitrogen-methane atmospheres like at Pluto or Triton, or at exoplanets with similar properties?"

"The prospect of a universal pathway towards the ingredients for life has implications for what we should look for in the search for life in the Universe," says co-author Andrew Coates, also from UCL, and co-investigator of CAPS.

"Titan presents a local example of exciting and exotic chemistry, from which we have much to learn."

Cassini's 13-year odyssey in the Saturnian system will soon draw to a close, but future missions, such as the international James Webb Space Telescope and ESA's Plato exoplanet mission are being equipped to look for this process not only in our own Solar System but elsewhere. Advanced ground-based facilities such as ALMA could also enable follow-up observations of this process at work in Titan's atmosphere, from Earth.

"These inspiring results from Cassini show the importance of tracing the journey from small to large chemical species in order to understand how complex organic molecules are produced in an early Earth-like atmosphere," adds Nicolas Altobelli, ESA's Cassini–Huygens project scientist.

"While we haven't detected life itself, finding complex organics not just at Titan, but also in comets and throughout the interstellar medium, we are certainly coming close to finding its precursors."

Source: ESA

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3. New Comet: C/2017 01 ASAS-SN Takes Earth by Surprise

A new comet discovery crept up on us this past weekend, one that should be visible for northern hemisphere observers soon.

We're talking about Comet C/2017 O1 ASAS-SN, a long period comet currently visiting the inner solar system. When it was discovered on July 19th, 2017 by the All Sky Automated Survey for Supernovae (ASAS-SN) system, Comet O1 ASAS-SN was at a faint magnitude +15.3 in the constellation Cetus. In just a few short days, however, the comet jumped up a hundred-fold in brightness to magnitude +10, and should be in range of binoculars now. Hopes are up that the comet will top out around magnitude +8 or so in October, as it transitions from the southern to northern hemisphere.

Never heard of ASAS-SN? It's an automated sky survey hunting for supernovae in both hemispheres, with instruments based at Haleakala in Hawaii and Cerro Tololo in Chile. Though the survey targets supernovae, it does on occasion pick up other interesting astronomical phenomena as well. This is the first comet discovery for the ASAS-SN team, as they join the ranks of PanSTARRS, LINEAR and other prolific robotic comet hunters.

Evoking the very name "ASAS-SN" seems to have sparked a minor controversy as well, as the International Astronomical Union (IAU) declined to name the comet after the survey, listing it simply as "C/2017 O1". Word is, "ASAS-SN" was to close to the word "Assassin" (this is actually controversial?) For our money, we'll simply keep referring to the comet as "O1 ASAS-SN" as a recognition of the team's hard work and their terrific discovery.

But what's in a name, and does an interplanetary iceball really care? On a long term parabolic orbit probably measured in the millions of years, O1 ASAS-SN has an orbit inclined 40 degrees to the ecliptic, and reaches perihelion 1.5 AU from the Sun just outside the orbit of Mars on October 14th. This is most likely Comet C/2017 O1 ASAS-SN's first passage through the inner solar system.

Currently located in the constellation Eridanus, hopefully comet O1 ASAS-SN's current outburst holds. Expect it to climb northward through Taurus and Perseus over the next few months as it begins the long climb towards the north celestial pole.

As seen from latitude 30 degrees north, the comet will move almost parallel to the eastern horizon, and clears about 20 degrees altitude around local midnight, very well placed for northern hemisphere observers.

At its closest in mid-October, Comet O1 ASAS-SN will be moving a degree a day through the constellation Camelopardalis

Here's a month-by-month blow by blow for Comet O1 ASAS-SN:

August

14- Crosses into Cetus.

16- Crosses the celestial equator northward.

20- Crosses into Taurus.

September

11-The waning gibbous Moon passes two degrees to the south.

17- Crosses the ecliptic northward.

20- Photo op: passes 4 degrees from the Pleiades open star cluster (M45).

28-Crosses into Perseus.

October

1-Reaches max brightness?

12-Crosses the galactic equator northward.

14-Reaches perihelion 1.5 AU from the Sun.

17-Crosses into Camelopardalis.

18- Passes closest to Earth at 0.722 AU distant.

29-Passes 10′ from the +4 mag star Alpha Camelopardalis.

November

17-Crosses into Cepheus

December

6-Passes 3 degrees from the north celestial pole.

12-Reaches opposition.

31-Drops back down below +10th magnitude

At the eyepiece, a small comet generally looks like a small fuzzy globular cluster that refuses to snap into focus. Seek out dark skies in your cometary quest, as the least bit of light pollution will dim it below visibility. And speaking of which, the Moon is also moving towards Full next week so the time to hunt for the comet is now.

We've still got a few weeks left before the August 21st total solar eclipse for a bright "eclipse comet" to show up… unlikely, but it has happened once in 1948.

Keep in mind, current magnitude estimates for Comet O1 ASAS-SN are still highly speculative, as we seem to have caught this one in outburst… hey, remember Comet Holmes back about a decade ago in 2007? One can only dream!

-Also check out this recent NEOWISE study suggesting that large long period comets may be more common that generally thought.

Source: Universe Today Return to Contents

The Night Sky

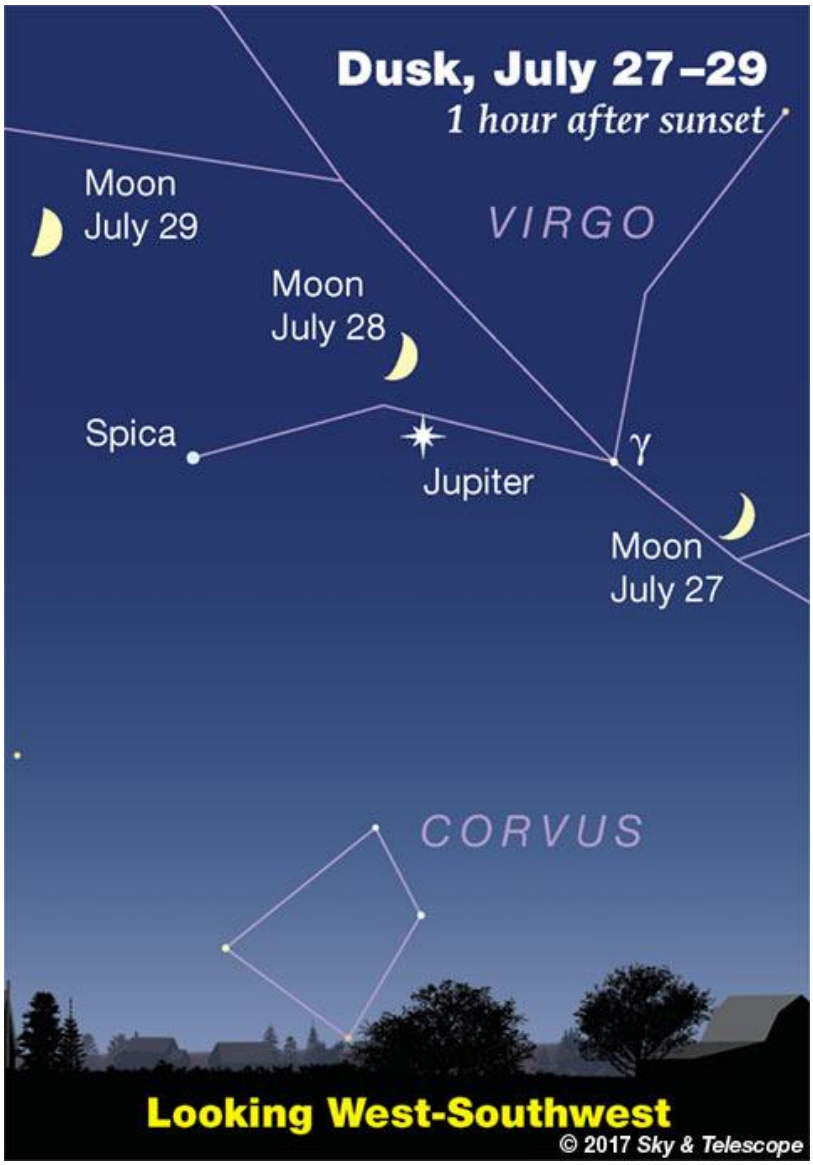
Friday, July 28
• Jupiter shines under the Moon this evening, more or less as drawn here (their exact placement will depend on your location).

• The Sagittarius Teapot is in the south after darkness is complete. It's about a fist at arm's length wide, and it's now tilting to pour from its spout on the right. The Teapot will tilt farther and farther, pouring out for the rest of the summer — or for much of the night if you stay out late.

Saturday, July 29
• Lower right of the Moon at dusk, look for Spica. Right of Spica shines brighter Jupiter.

Sunday, July 30
• First-quarter Moon (exact at 11:23 a.m. EDT). The Moon is in Libra, far upper left of Jupiter at dusk and far right of the head of Scorpius and Saturn.

• Starry Scorpius is sometimes called "the Orion of Summer" for its brightness and its prominent red supergiant (Antares in the case of Scorpius, Betelgeuse for Orion). But Scorpius passes a lot lower in the south than Orion for those of us at mid-northern latitudes. That means Scorpius has only one really good evening month: July, which is almost over.



Catch Scorpius in the south-southwest now right after darkness is complete, before it tilts lower toward the southwest. It's full of deep-sky objects for binoculars or a telescope — if you have a detailed star atlas to find them with. (See the *Pocket Sky Atlas* below.)

The *tail* of Scorpius curves low to the lower left of the Scorpion's bright head and main body. How low depends on how far north or south you live: the farther south, the higher Scorpius appears. Look for the two stars especially close together in the tail. These are Lambda and fainter Upsilon Scorpii, known as the Cat's Eyes. They're canted at an angle; the cat is tilting his head and winking.

The Cat's Eyes point west (right) by nearly a fist-width toward Mu Scorpii, a much tighter pair known as the Little Cat's Eyes. Can you resolve Mu without using binoculars? It takes very sharp vision!

Monday, July 31
• The Big Dipper, still high in the northwest after dark, is turning around to "scoop up water" through the evenings of summer and early fall.

Tuesday, August 1
• The waxing gibbous Moon this evening forms a triangle with Antares below it and brighter Saturn top its lower right, as shown here.

Source: Sky & Telescope Return to Contents

ISS Sighting Opportunities

For Denver:

Date	Visible	Max Height	Appears	Disappears
Fri Jul 28, 10:01 PM	1 min	13°	13° above N	10° above NNE
Fri Jul 28, 11:37 PM	1 min	10°	10° above N	10° above NNE
Sat Jul 29, 9:08 PM	2 min	16°	16° above NNW	10° above NNE
Sat Jul 29, 10:45 PM	< 1 min	10°	10° above N	10° above N
Sun Jul 30, 9:52 PM	< 1 min	10°	10° above N	10° above N
Sun Jul 30, 11:29 PM	< 1 min	13°	12° above N	13° above N
Mon Jul 31, 9:00 PM	1 min	12°	12° above NNW	10° above N
Mon Jul 31, 10:37 PM	2 min	11°	10° above N	10° above NNE
Tue Aug 1, 00:12 AM	< 1 min	10°	10° above NW	10° above NW
Tue Aug 1, 9:44 PM	< 1 min	10°	10° above N	10° above N
Tue Aug 1, 11:21 PM	< 1 min	16°	16° above N	16° above N

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights

(all times Eastern Daylight Time)

10:30 a.m., Friday, July 28 - ISS Expedition 52-53/Soyuz MS-05 Launch Coverage (Ryazanskiy, Bresnik, Nespoli; includes video B-roll of the crew's launch day pre-launch activities at 11 a.m. ET; launch scheduled at 11:41 a.m. ET) (starts at 10:45 a.m.) (all channels)
1:30 p.m., Friday, July 28 - Video File of ISS Expedition 52-53/Soyuz MS-05 (Ryazanskiy, Bresnik, Nespoli) Pre-Launch and Launch Video and Post-Launch Interviews (all channels)
5 p.m., Friday, July 28 - ISS Expedition 52-53/Soyuz MS-05 Docking to the ISS Coverage (Ryazanskiy, Bresnik, Nespoli; docking scheduled at 6 p.m. ET) (starts at 5:15 p.m.) (all channels)
7 p.m., Friday, July 28 - ISS Expedition 52-53/Soyuz MS-05 Hatch Opening and Welcoming Ceremony (Ryazanskiy, Bresnik, Nespoli; hatch opening scheduled at appx. 7:40 p.m. ET) (all channels)
10 p.m., Friday, July 28 - Video File of ISS Expedition 52-53/Soyuz MS-05 Docking, Hatch Opening and Other Activities (all channels)
1 a.m., 2 a.m., 3 a.m., 7 a.m., 11 a.m., 3 p.m., 11 p.m., Saturday, July 29 - Replay of the ISS Expedition 52 In-Flight Interview with the Guinness Book of World Records and NASA Flight Engineer Peggy Whitson (NTV-1 (Public))
8 a.m., 2 p.m., 4 p.m., 9 p.m. Saturday, July 29 - Replay of the Video File of ISS Expedition 52-53/Soyuz MS-05 Docking, Hatch Opening and Other Activities (all channels)
1 p.m., 8 p.m., Saturday, July 29 - Replay of Celebrating 100 Years: A Storied Legacy, A Soaring Future (NTV-1 (Public))
1 a.m., 2 a.m., 7 a.m., 11 a.m., 3 p.m., 7 p.m., 11 p.m., Sunday, July 30 - Replay of the ISS Expedition 52 In-Flight Interview with the Guinness Book of World Records and NASA Flight Engineer Peggy Whitson (all channels)

9 a.m., 5 p.m., Sunday, July 30 - Replay of Celebrating 100 Years: A Storied Legacy, A Soaring Future (NTV-1 (Public))
10 a.m., 1 p.m., 6 p.m., 9 p.m., Sunday, July 30 - Replay of the Video File of ISS Expedition 52-53/Soyuz MS-05 Docking, Hatch Opening and Other Activities (all channels)

Watch NASA TV on the Net by going to the NASA website. Return to Contents

Space Calendar

- Jul 28 -  [Jul 27] Soyuz MS-5 Soyuz-FG Launch (International Space Station 51S)
- Jul 28 - Comet 198P/ODAS At Opposition (2.803 AU)
- Jul 28 - Comet 333P/LINEAR At Opposition (3.573 AU)
- Jul 28 - Asteroid 10101 Fourier Closest Approach To Earth (1.332 AU)
- Jul 28 - Asteroid 6111 Davemckay Closest Approach To Earth (1.487 AU)
- Jul 28 - Asteroid 5036 Tuttle Closest Approach To Earth (2.569 AU)
- Jul 28 - Charles Perrine's 150th Birthday (1867)
- Jul 29 - South Delta-Aquarids Meteor Shower Peak
- Jul 29 - Centaur Object 83982 Crantor At Opposition (17.417)
- Jul 29 - Comet 164P/Christensen At Opposition (2.080 AU)
- Jul 29 - Apollo Asteroid 2017 FQ64 Near-Earth Flyby (0.073 AU)
- Jul 29 - 35th Anniversary (1982), Burnup of Salyut 6 Space Station (USSR)
- Jul 30 - Mercury At Its Greatest Western Elongation (27 Degrees)
- Jul 30 - Asteroid 1094 Siberia Closest Approach To Earth (1.836 AU)
- Jul 30 - Vladimir Dezhurov's 55th Birthday (1962)
- Jul 31 - Asteroid 19398 Creedence Closest Approach To Earth (0.959 AU)
- Jul 31 - Asteroid 12410 Donald Duck Closest Approach To Earth (1.814 AU)
- Jul 31 - 25th Anniversary (1992), STS-46 Launch (Space Shuttle Atlantis, EURECA)

- Aug 01 -  [Jul 27] 50th Anniversary (1967), Lunar Orbiter 5 Launch
- Aug 01 - Optsat 3000/ Venus/ Samson 1-3 Vega Launch
- Aug 01 - Cassini, Distant Flyby of Prometheus, Pandora & Pan
- Aug 01 - Alpha Capricornids Meteor Shower Peak
- Aug 01 - Comet 77P/Longmore Closest Approach To Earth (2.573 AU)
- Aug 01 - Comet P/2001 H5 (NEAT) At Opposition (4.188 AU)
- Aug 01 - Apollo Asteroid 2017 KV4 Near-Earth Flyby (0.081 AU)
- Aug 01 - Asteroid 2161 Grissom Closest Approach To Earth (1.533 AU)
- Aug 01 - Asteroid 3140 Stellafane Closest Approach To Earth (1.829 AU)
- Aug 01 - Asteroid 22739 Sikhote-Alin Closest Approach To Earth (2.033 AU)
- Aug 01 - Asteroid 29132 Bradpitt Closest Approach to Earth (2.168 AU)
- Aug 01 - Asteroid 1125 China Closest Approach To Earth (2.736 AU)
- Aug 01 - Kuiper Belt Object 2013 AT183 At Opposition (63.416 AU)

Source: JPL Space Calendar

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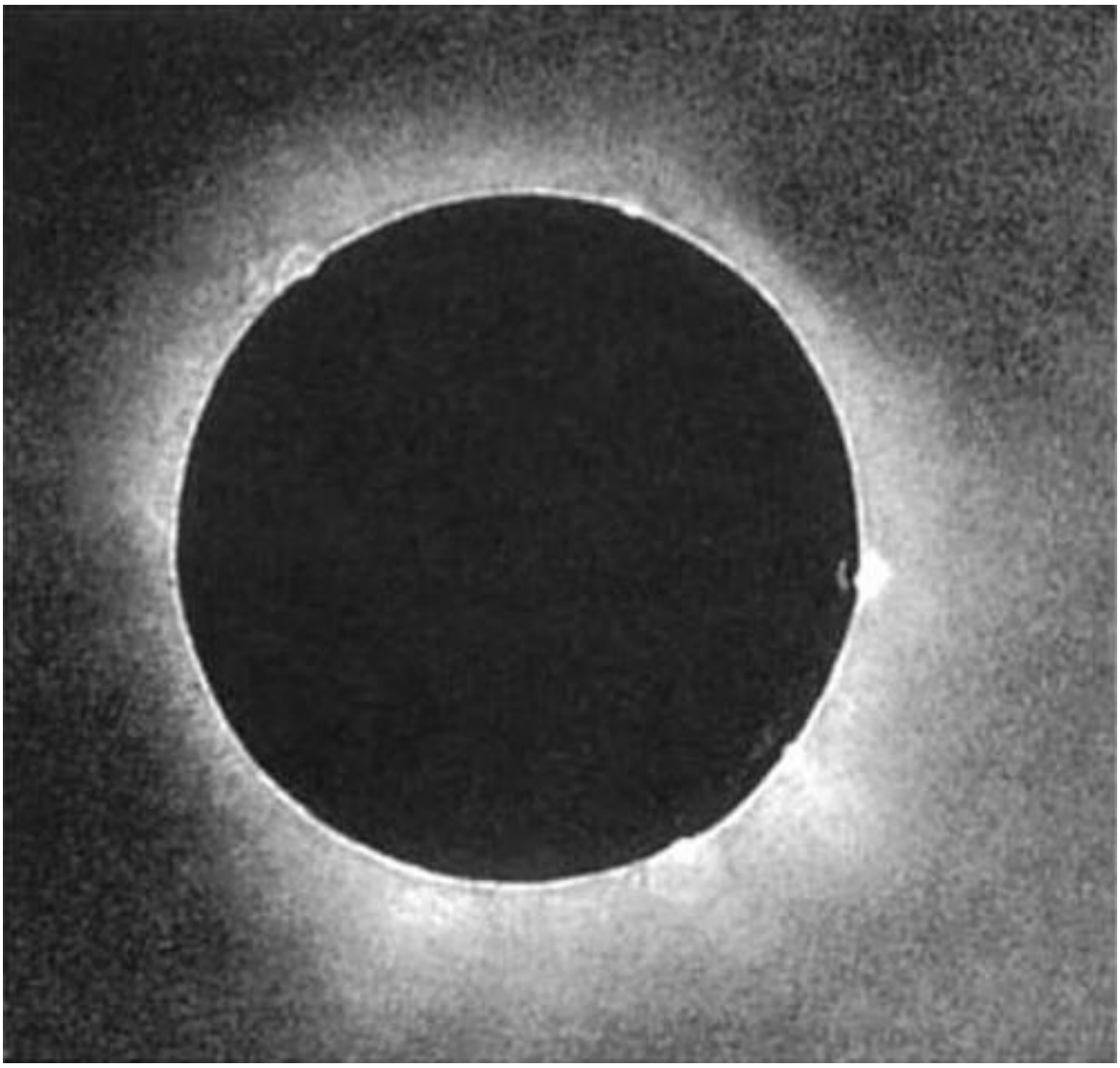
Food for Thought

1st Photo of a Total Solar Eclipse Was Taken 166 Years Ago Today



People have observed total solar eclipses since ancient times, but it wasn't until the 19th century that people figured out how to photograph them.

As you prepare for the total solar eclipse of Aug. 21, here's something to think about: The first photo of a total solar eclipse was taken on July 28, 1851, by Johann Julius Friedrich Berkowski, who was said to be the most skilled daguerreotypist in the Prussian city of Königsberg (now Kaliningrad, Russia).

Berkowski was commissioned by the Royal Prussian Observatory at Königsberg to create a still image of the total solar eclipse using the daguerreotype process, in which the image was directly exposed onto a polished copper plate.

Once it was polished to a shiny, mirror finish, the silver-plated copper was treated with halogen or iodine fumes that made it sensitive to light. Exposing the copper plate inside the camera would leave behind a latent image, or an invisible trace of the photograph.

To make a latent image visible, the daguerreotypist would treat the copper plate with mercury vapor in a dark room. Applying a liquid chemical treatment then removed the light sensitivity of the plate. Then, the daguerreotypist could rinse it off, dry it and seal it in a glass frame. The final product was a black-and-white image that was microscopically textured as a result of the silver's exposure to sunlight.

Before Berkowski created his famous first daguerreotype of a total solar eclipse, photographers had struggled to capture any decent images of eclipses. Photos were often overexposed or underexposed, and they failed to show the right amount of contrast between the sun's bright corona and the dark disk of the moon.

According to a paper in the journal Acta Historica Astronomiae, Berkowski's daguerreotype was the first correctly exposed image of the sun's corona. Berkowski used a small refracting telescope and captured an 84-second exposure that he initiated as soon as the moon had moved completely in front of the sun, the paper explains. Not only did his photo show the contrast between the corona and the moon, but it even revealed a few solar prominences extending from the sun's disk.

Since then, solar eclipse photography has become much easier with digital cameras and even smartphone cameras. To find out how you can capture your own cool photo of totality, check out our guide to photographing the solar eclipse.

To find out what to look for in solar eclipse photography equipment, check out The Best Gear for Taking Pictures of the Solar Eclipse from our sister site Tom's Guide.

Source: Space.com Return to Contents

Space Image of the Week

Hubble's Cosmic Atlas

This beautiful clump of glowing gas, dark dust and glittering stars is the spiral galaxy NGC 4248, located about 24 million light-years away in the constellation of Canes Venatici (The Hunting Dogs).

This image was produced by the NASA/ESA Hubble Space Telescope as it embarked upon compiling the first Hubble ultraviolet "atlas," for which the telescope targeted 50 nearby star-forming galaxies. The collection spans all kinds of different morphologies, masses, and structures. Studying this sample can help us to piece together the star-formation history of the Universe.

By exploring how massive stars form and evolve within such galaxies, astronomers can learn more about how, when, and where star formation occurs, how star clusters change over time, and how the process of forming new stars is related to the properties of both the host galaxy and the surrounding interstellar medium (the gas and dust that fills the space between individual stars).

This galaxy was imaged with observations from Hubble's Wide Field Camera 3.

Source: NASA

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