National Aeronautics and
Space Administration

2020

EXPLORE SCIENCE

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EXPLORE SCIENCE

There's never been a better year to explore, never a better time to step into the unknown, and never a better opportunity to help protect and improve life on Earth as a result of this work. In fact, during the last few years, NASA Science has set the foundation for defining moments in many areas. Our groundbreaking science, innovative approaches, and inspiring missions are opening the door and leading the way for NASA to go forward to the Moon and ultimately Mars. Our partners in the science community have risen to the challenge with us, and we are actively experimenting with new partnership approaches that help get more science per dollar. Because of the foundation we have built, we are on the verge of new discoveries to further expand human knowledge. Our journey is helping us understand our home planet, our place in the universe, and to search for life elsewhere.

The future's potential is rich. And it's global. Nature continues to amaze us with its art and beauty. This calendar highlights just a few of the many ways that NASA Science is making discoveries that affect us all and showcases some pioneers and leaders in the field who make us all aspire to constantly reach even higher.

The discoveries we make today are inspiring a new generation to follow in our footsteps. Science is for everyone, and I invite all to join us on this journey to explore together and learn through the power of discovery.

Thomas H. Zurbuchen

Associate Administrator
NASA Science Mission Directorate

JANUARY 2020

Westerhout 40 is Home to Hundreds of Baby Stars. Westerhout 40 (W40) is a *nebula*—a giant cloud of gas and dust in space where new stars may form. It is a nursery for hundreds of baby stars, as revealed in this infrared image from NASA's Spitzer Space Telescope. The two lobes are giant bubbles of hot, interstellar gas blowing from the hottest, most massive stars in this region. Besides being beautiful, W40 exemplifies how the formation of stars results in the destruction of the very clouds that helped create them. Inside giant clouds of gas and dust in space, the force of gravity pulls material together into dense clumps. Sometimes these clumps reach a critical density that allows stars to form at their cores. Radiation and winds coming from the most massive stars in those clouds—combined with the material spewed into space when those stars eventually explode—sometimes form bubbles like those in W40. But these processes also disperse the gas and dust, breaking up dense clumps and reducing or halting new star formation. The material that forms W40's lobes was ejected from a dense cluster of stars that lies between the lobes in the image. W40 is about 1,400 light-years from the Sun. **Image and text credit:** NASA/JPL-Caltech

http://www.spitzer.caltech.edu/images/6583-ssc2019-04a-Space-Butterfly

Born in 1957, **Wendy L. Freedman** is a Canadian-American astronomer best known for her measurement of the Hubble constant and determining the age of the universe. She served as the director of the Carnegie Observatories in Pasadena, California, and Las Campanas, Chile, from 2003 to 2014. In 2014 she became the John and Marion Sullivan University Professor of Astronomy and Astrophysics at The University of Chicago. Her principal research interests are in observational cosmology, focusing on measuring both the current and past expansion rates of the universe and on characterizing the nature of dark energy. She has received numerous professional awards, including the Gruber Prize in Cosmology and Heineman Prize for Physics. Photo credit: James Duncan Davidson/TED

December 2019

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February 2020

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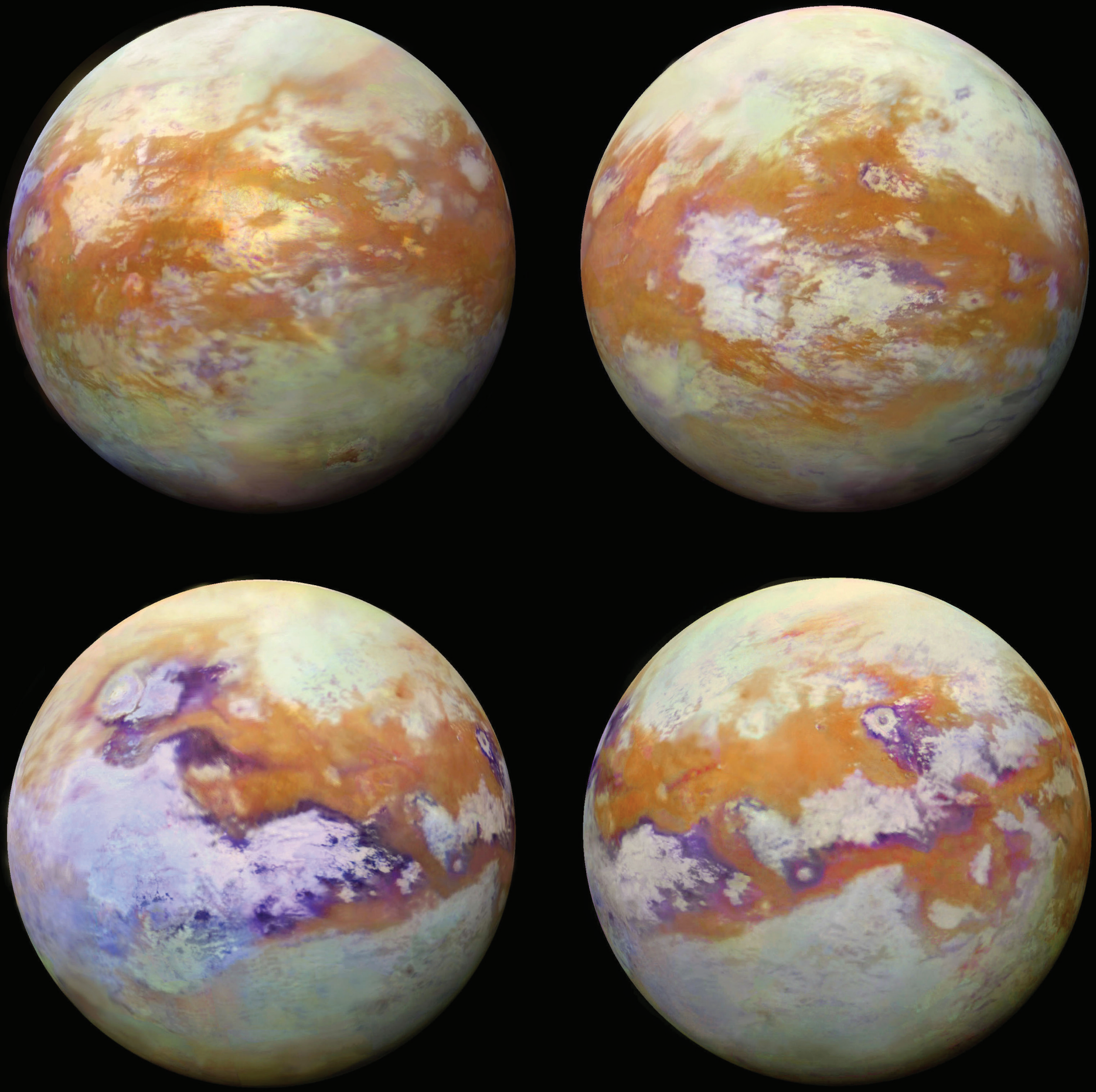
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 New Year's Day	2	3 First Quarter	4
5	6	7	8	9	10 Full Moon	11
12	13	14	15	16	17 Last Quarter	18
19	20 Birthday of Martin Luther King, Jr. (observed date)	21	22	23	24 New Moon	25
26	27	28	29	30	31	



FEBRUARY 2020

Seeing Titan with Infrared Eyes. This selection of images of Saturn's moon Titan represents some of the clearest, most seamless-looking global views of the icy moon's surface produced so far. The large yellowish-brown center region seen in the top right image shows the equatorial "Shangri-La" dune fields where NASA's Dragonfly mission will first land, exploring this region in short flights, building up to a series of longer "leapfrog" flights of up to 5 miles (8 kilometers). The bright circular feature in the upper center is Selk Crater, Dragonfly's ultimate destination. It will stop along the way to Selk Crater to take samples from compelling areas with diverse geography. It is quite clear from this unique set of images that Titan has a complex surface, sporting myriad geologic features and compositional units. Titan boasts many features of seas, such as the exchange of heat between the sea and the air, and the generation of ocean waves that are only known empirically on Earth. By considering these same processes in a different physical setting, with different gravity, different liquid properties and so on, we can gain a more fundamental understanding of how these processes work. The views were created using 13 years of data acquired by the Visual and Infrared Mapping Spectrometer (VIMS) instrument onboard NASA's Cassini spacecraft, and show the landing site for NASA's Dragonfly mission. **Image and text credit:** NASA/JPL-Caltech/University of Nantes/ University of Arizona

https://photojournal.jpl.nasa.gov/catalog/PIA21923

Born in 1961, **Ellen R. Stofan** is the director of the Smithsonian's National Air and Space Museum and former NASA Chief Scientist (2013–2016) in Washington, D.C. She was an associate member of the Cassini Mission to Saturn Radar Team and principal investigator on the Titan Mare Explorer, a proposed mission to send a floating lander to a sea on Titan. Stofan's integral work in the discovery of Titan's lakes and seas pioneered deeper understanding of that world and expanded the field of physical oceanography to beyond Earth science. Stofan is a co-investigator on NASA's Dragonfly mission to Titan. Photo credit: Jim Preston, Smithsonian National Air and Space Museum (NASM2018-01471)

January 2020

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26	27	28	29	30	31	

March 2020

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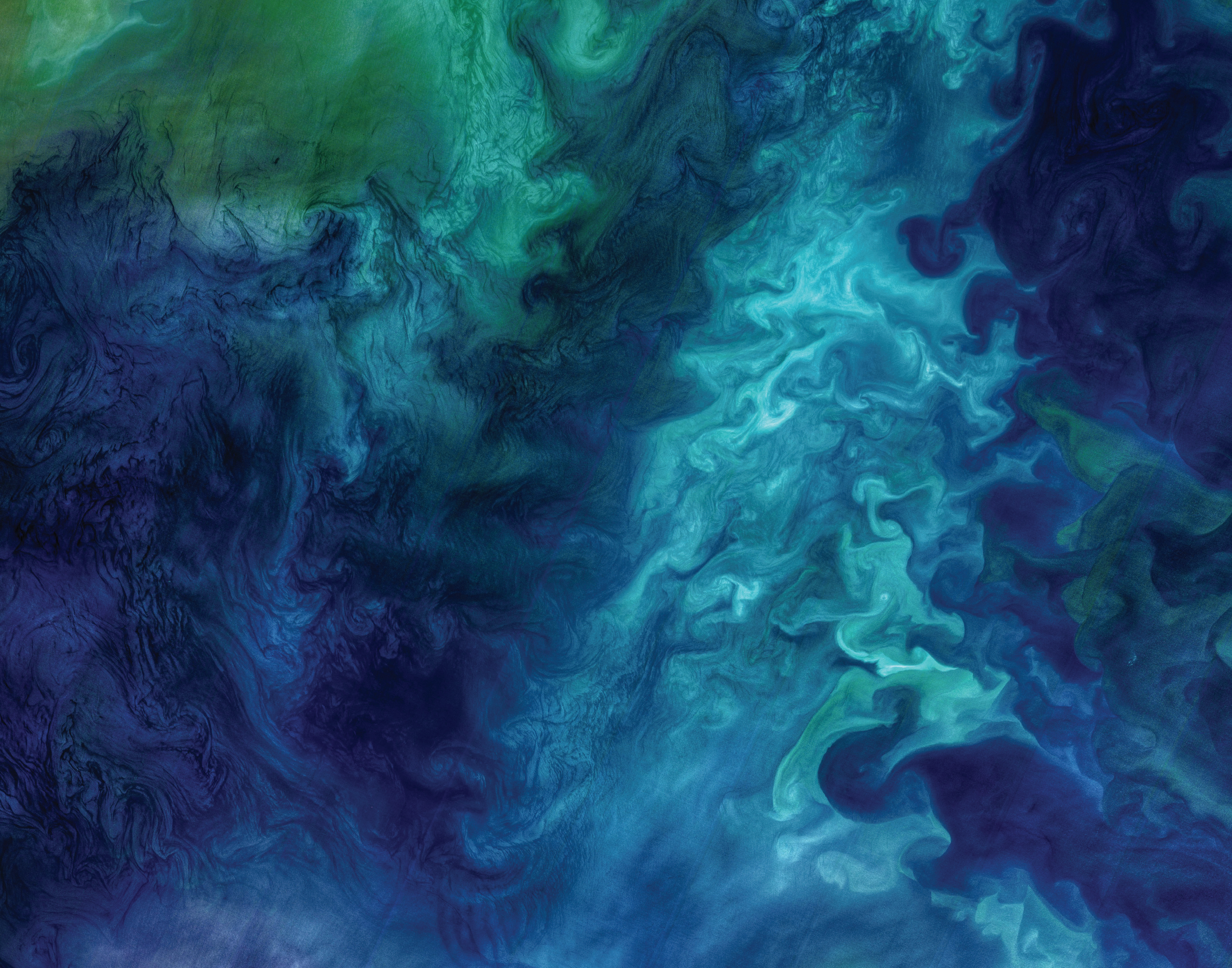
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2 First Quarter	3	4	5	6	7	8
9 Full Moon	10	11	12	13	14	15 Last Quarter
16	17 Washington's Birthday (observed date)	18	19	20	21	22
23 New Moon	24	25	26	27	28	29



MARCH 2020

Churning in the Chukchi Sea. As Arctic sea ice breaks up each spring, vibrant phytoplankton blooms thrive. These blooms can form striking patterns of blue and green seawater, such as those visible in this image of the Chukchi Sea acquired on June 18, 2018, by the Operational Land Imager (OLI) on Landsat 8—a satellite operated by NASA and the U.S. Geological Survey. The green hues are likely from diatoms, which are microscopic algae (with silica shells and plenty of chlorophyll) that grow in the nutrient-rich, cool, salty water that flows into the Chukchi Sea from the Bering Strait, called "Bering Sea Water." Sediments could also be contributing to the bright green areas. The milky turquoise hues are likely from a different type of phytoplankton, called coccolithophores, that can do well in the warmer, less-salty, and nutrient-poor water that flows into the Chukchi Sea, called "Alaskan Coastal Water." The waters from these two sources are well mixed as they travel through the relatively narrow Bering Strait and into the Chukchi Sea, bringing nutrients to the surface where plenty of sunlight helps phytoplankton grow. This mixing, followed by the slowing of the currents once the waters exit the Bering Strait, promotes phytoplankton growth well into July. **Image and text credit:** NASA's Earth Observatory/Ocean Color Web/Norman Kuring

https://earthobservatory.nasa.gov/images/92412/churning-in-the-chukchi-sea

Born in 1942, **Eugenia Kalnay**, currently distinguished university professor at the University of Maryland, was previously branch head of Global Modeling and Simulation at NASA's Goddard Space Flight Center, where she developed the NASA 4th Order Global Model, which tested the impact of satellite data for improved weather prediction. She was then director of the National Centers for Environmental Prediction (NCEP) Environmental Modeling Center at the National Weather Service (NWS), during which time NWS made major advances in weather prediction. Kalnay earned a master's degree in meteorology from the University of Buenos Aires and was the first woman to obtain a Ph.D.—and then first female professor—in the Massachusetts Institute of Technology's Department of Meteorology. She has more than 190 peer-reviewed publications, including the most cited paper in geosciences, and has received numerous awards, including the World Meteorological Organization's top award (IMO Prize) and the American Geophysical Union Roger Revelle Medal. She has served on Scientific Advisory Boards for the United Nations Secretary General, National Oceanic and Atmospheric Administration, NASA, and other organizations. Photo credit: University of Maryland

February 2020

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23	24	25	26	27	28	29

April 2020

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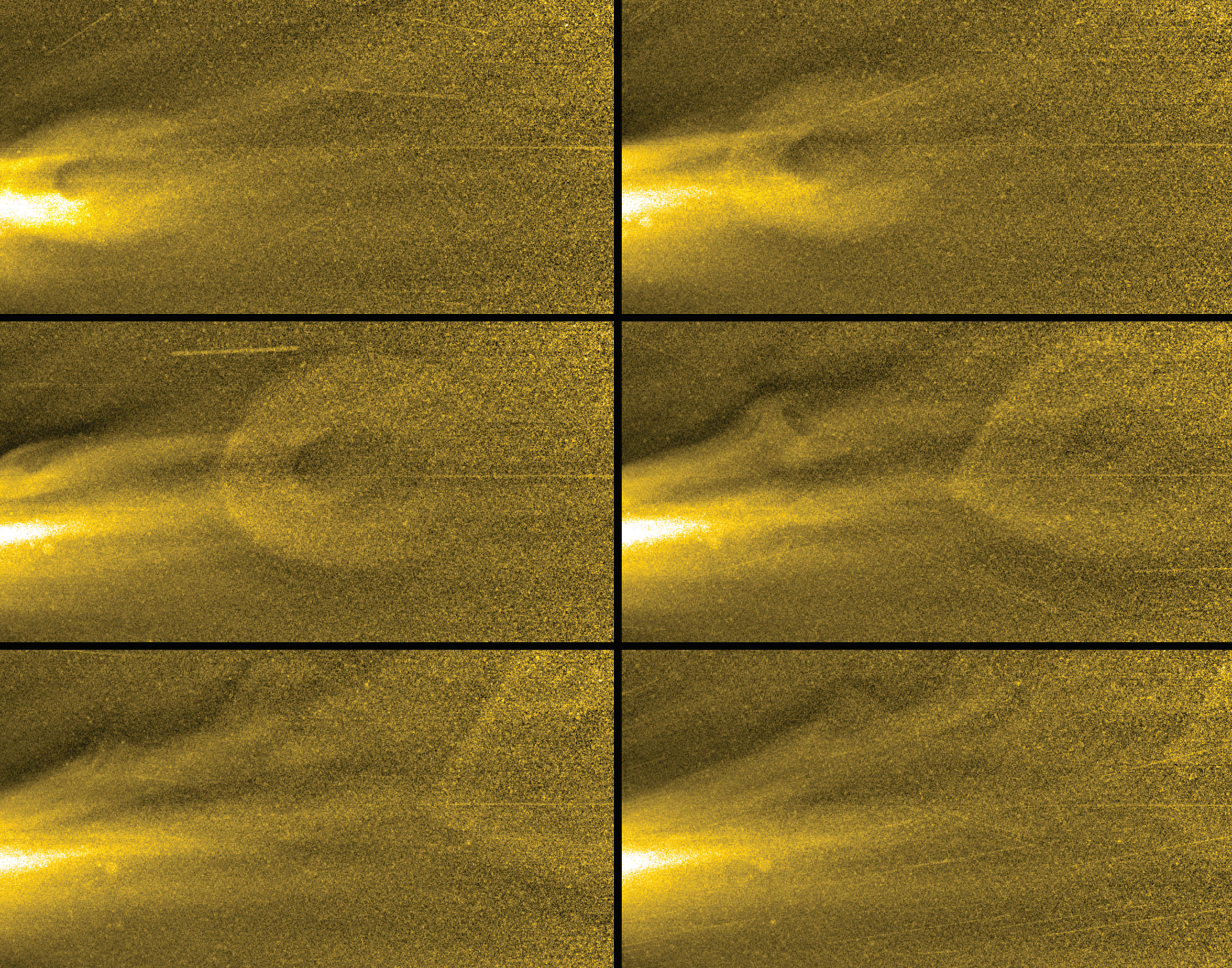
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

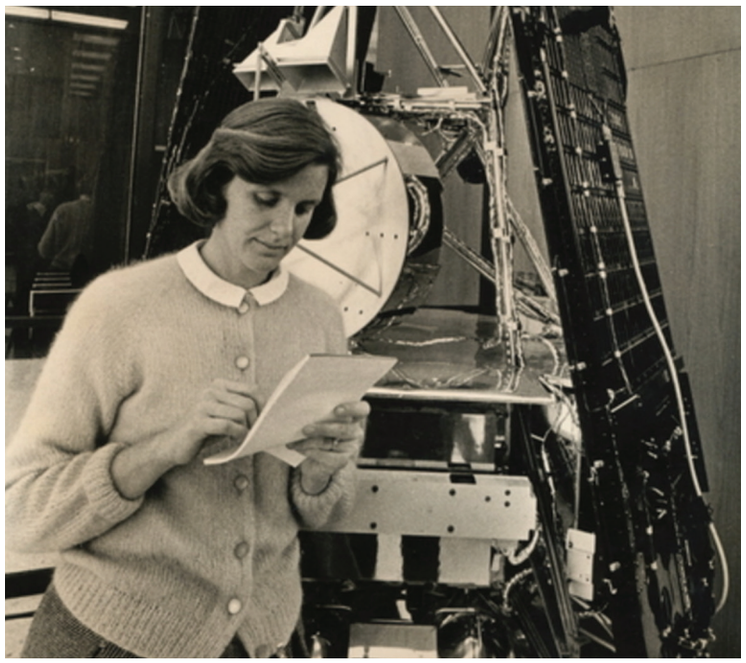
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 First Quarter	3	4	5	6	7
8 Daylight Saving Time Begins	9 Full Moon	10	11	12	13	14
15	16 Last Quarter	17	18	19	20	21
22	23	24 New Moon	25	26	27	28
29	30	31				



APRIL 2020

The Not-So-Quiet Sun. A sequence of six images from the Wide-field Imager for Solar Probe, or WISPR, an instrument aboard NASA's Parker Solar Probe. The Parker spacecraft has traveled closer to the Sun than any human-made object before it, and will ultimately come to within 3.83 million miles of the Sun's surface. WISPR captures images not of the Sun per se, but of the solar wind streaming away from the Sun. This continual wind of particles changes the very nature of space as it travels through the solar system, its radiation able to affect planetary atmospheres, technology, and human explorers in space. This image series shows the expelling of the solar wind particles and magnetic fields—as exemplified by the doughnut-shaped "O's" seen in the middle row of images, which are presumably magnetic flux ropes flowing out and expanding into the ambient wind. These are the first ever near-solar images of such small releases and are the first clear evidence of the previously predicted theory that they occur regularly. **Image and text credit:** NASA/Naval Research Laboratory/Parker Solar Probe

https://nasa.gov/parker



Born in 1932, **Marcia Neugebauer** was an investigator of the Mariner 2 plasma analyzer that made the first extensive measurements of the solar wind and discovery of its properties. Neugebauer's research was among the first that yielded direct measurements of the solar wind and shed light on its physics and interaction with comets. She received a B.A. in physics from Cornell University in 1954, followed by an M.S. in physics from the University of Illinois in Urbana in 1956. She was awarded an honorary doctorate of physics in 1998 by the University of New Hampshire. Photo credit: NASA

March 2020

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May 2020

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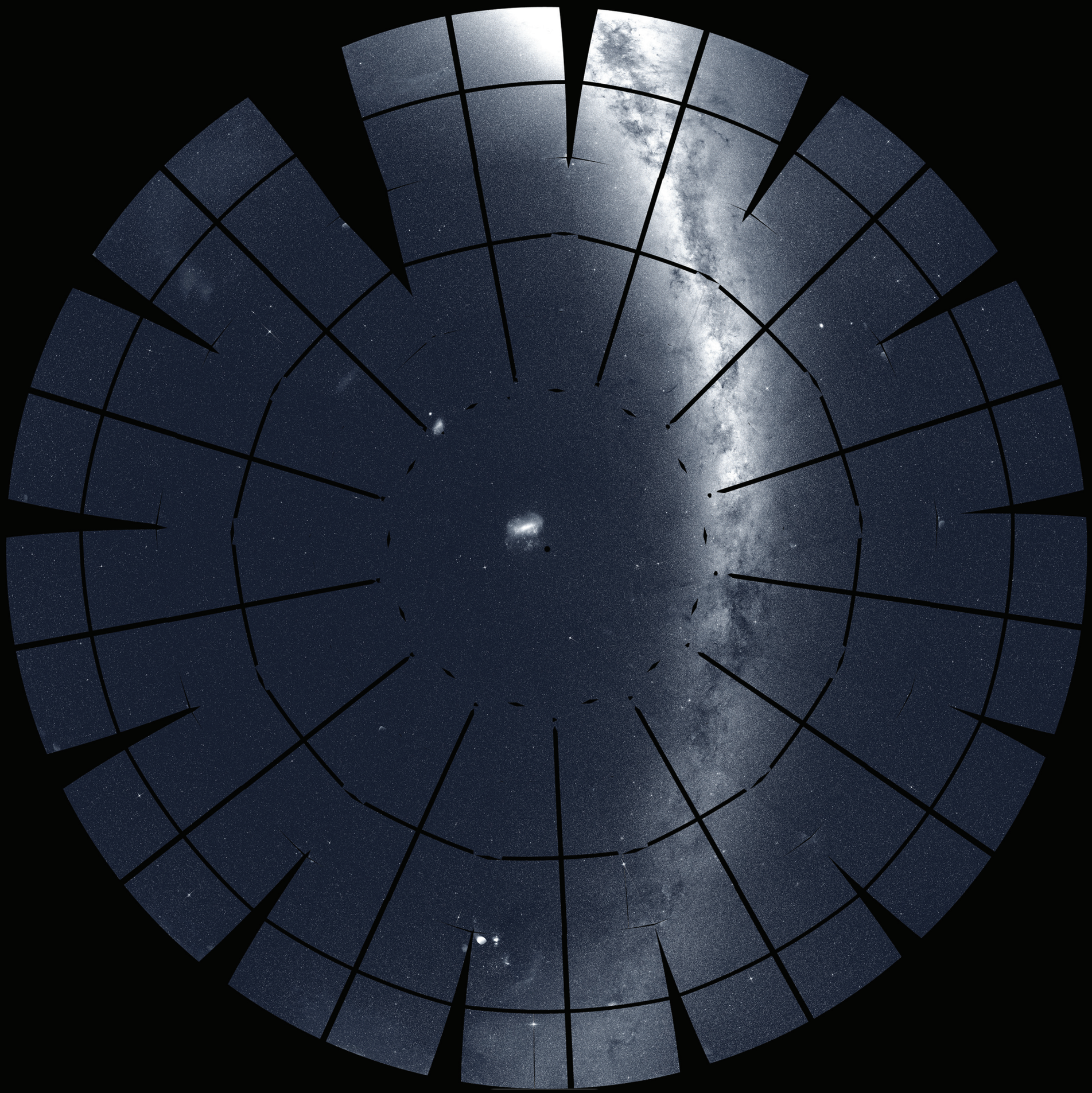
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 First Quarter	2	3	4
5	6	7	8 Full Moon	9	10	11
12	13	14 Last Quarter	15	16	17	18
19	20	21	22	23 New Moon	24	25
26	27	28	29	30 First Quarter		



MAY 2020

TESS Takes a Panoramic View of the Southern Sky. This mosaic of the southern sky was assembled from 13 images taken by NASA's Transiting Exoplanet Survey Satellite (TESS) during its first year of science operations, which were completed in July 2019. The mission divided the southern sky into 13 sectors, each of which the spacecraft's four cameras imaged for approximately 27 days. Many notable celestial objects can be seen, including the glowing band of the Milky Way, our home galaxy, seen edgewise, and the Large Magellanic Cloud, a nearby galaxy located about 160,000 light-years away. The center of the image marks the sky's south ecliptic pole and the center of the mission's southern continuous viewing zone, where sectors overlap for improved sensitivity to planets with smaller transits and longer orbital periods. TESS discoveries here are considered ideal for follow-up observations by NASA's James Webb Space Telescope, scheduled to launch in 2021. Targets in the central portion of this zone will be continuously available for observation and monitoring by Webb. Scientists are working to confirm more than 1,000 TESS candidate planets in this mosaic, even as TESS has shifted its gaze to the northern sky, a survey that will be completed in July 2020. **Image and text credit:** NASA/MIT/TESS

https://svs.gsfc.nasa.gov/13285

Born in 1958, **John M. Grunsfeld** is an American physicist and a former NASA astronaut. A veteran of five Space Shuttle flights, Grunsfeld's academic background includes research in high-energy astrophysics, cosmic ray physics, and the emerging field of exoplanet studies, with specific interest in future astronomical instrumentation. He served as NASA Chief Scientist from 2003 to 2004. Grunsfeld was appointed Deputy Director of the Space Telescope Science Institute in January 2010. He returned to NASA in 2012 to serve as Associate Administrator of NASA's Science Mission Directorate, a role he held until 2016. Photo credit: NASA

April 2020

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June 2020

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21	22	23	24	25	26	27
28	29	30				

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7 Full Moon	8	9
10 Mother's Day	11	12	13	14 Last Quarter	15	16
17	18	19	20	21	22 New Moon	23
24 31	25 Memorial Day	26	27	28	29	30 First Quarter

JUNE 2020

Asteroid Bennu. This mosaic image of asteroid Bennu is composed of 12 PolyCam images collected on December 2, 2018 by NASA's Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft from a range of 15 miles (24 kilometers). Analyzed data from OSIRIS-REx has revealed water locked inside the clays that make up its scientific target, the asteroid Bennu. During the mission's approach phase the spacecraft traveled 1.4 million miles (2.2 million kilometers) on its journey from Earth to arrive at a location 12 miles (19 kilometers) from Bennu on December 3, 2018. During this time, the science team on Earth aimed three of the spacecraft's instruments towards Bennu and began making the mission's first scientific observations of the asteroid. OSIRIS-REx is NASA's first asteroid sample return mission. Data obtained from the spacecraft's two spectrometers, the OSIRIS-REx Visible and Infrared Spectrometer (OVIRS) and the OSIRIS-REx Thermal Emission Spectrometer (OTES), reveal the presence of molecules that contain oxygen and hydrogen atoms bonded together, known as *hydroxyls*. The team suspects that these hydroxyl groups exist globally across the asteroid in water-bearing clay minerals, meaning that at some point, Bennu's rocky material interacted with water. While Bennu itself is too small to have ever hosted liquid water, the finding does indicate that liquid water was present at some time on Bennu's parent body, a much larger asteroid. **Image and text credit:** NASA/GSFC/University of Arizona

https://www.nasa.gov/press-release/nasa-s-newly-arrived-osiris-rex-spacecraft-already-discovers-water-on-asteroid

Melba R. Mouton (1929–1990) was an African-American mathematician who began her NASA career in 1959. Recognized as a "computer," she became the head mathematician for NASA's Echo 1 and 2 satellites, and by 1961, the head programmer for a team responsible for predicting spacecraft trajectories and locations. By 1972, Mouton had become the assistant chief of research programs for the Trajectory and Geodynamics Division at NASA's Goddard Space Flight Center. Her computations were instrumental in producing orbital element timetables, allowing the tracking of satellite orbits—including calculating when satellites would be visible from Earth, allowing millions to view the satellite as it passed overhead. Photo credit: NASA

May 2020

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July 2020

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26	27	28	29	30	31	

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5 Full Moon	6
7	8	9	10	11	12	13 Last Quarter
14 Flag Day	15	16	17	18	19	20
21 New Moon Father's Day	22	23	24	25	26	27
28 First Quarter	29	30				

2020 YEAR AT A GLANCE

January

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February

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March

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April

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May

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June

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28	29	30				

EXPLORE SCIENCE

OPERATING & FUTURE MISSIONS

HUBBLE
WEBB
XMM-NEWTON*
XRISM*
SPHEREX
IXPE
CHANDRA
NEW HORIZONS
FERMI
ISS-NICER
VOYAGER 1
VOYAGER 2
GEHRELS SWIFT
EUCLID*
TESS
NUSTAR
SOLAR ORBITER*
SPITZER
WFIRST
WIND
THEMIS
PARKER SOLAR PROBE
SOFIA
HINODE*
MMS
ICON
ACE
TIMED
ISS-AWE
PUNCH
GEOTAIL*
AIM
SET-1
DRAGONFLY
BEPICOLOMBO*
STEREO
GOLD
SDO
SOHO*
IMAP
IRIS
IBEX
JUICE*
TRACERS
PSYCHE
JUNO
DART
EUROPA CLIPPER
LUCY

NEOWISE

OSIRIS-REX

MARS ODYSSEY

MMX*

MARS EXPRESS*

CURIOSITY

EXOMARS 2016*

MAVEN

EXOMARS 2020*

INSIGHT

MRO

MARS 2020

ISS (2)

TEMPO

MAIA

TROPICS

PACE

ISS (6)

ICESAT-2

CALIPSO

TSIS-2

OCO-2

NISAR

CYGNSS

CLOUDSAT

LANDSAT 9

AQUA

LANDSAT 7, 8

GLIMR

SUOMI NPP

GRACE-FO

SENTINEL-6A/B*

LRO

SMAP

THEMIS-ARTEMIS

GPM

VIPER

PREFIRE

PEREGRINE MISSION ONE+

TERRA

NOVA-C+

JPSS-2*

DSCOVR*

SWOT

SORCE

GEOCARB

AURA

ASTROPHYSICS

PLANETARY SCIENCE

HELIOPHYSICS

EARTH SCIENCE

FUTURE MISSIONS IN BOLD

* PARTNER-LED

+ COMMERCIAL PARTNERSHIP

OCTOBER 2019

science.nasa.gov/missions

July

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26	27	28	29	30	31	

August

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23	24	25	26	27	28	29
30	31					

September

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27	28	29	30			

October

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November

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29	30					

December

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20	21	22	23	24	25	26
27	28	29	30	31		

JULY 2020

Chasing Sea Ice While Playing Tag with a Satellite. NASA's Operation IceBridge Mid-Weddell mission, which flew over Antarctica's Weddell Sea in October 2018, may have been one of the campaign's most difficult, but it provided some of the most stunning images. Operation IceBridge was a decade-long airborne campaign that bridged the gap in Arctic and Antarctic land and sea-ice observations between the end of NASA's Ice, Cloud, and land Elevation Satellite, ICESat (2003–2010), and the launch of ICESat–2 (2018–present). The Mid-Weddell Sea mission "chased the sea ice" using sea-ice drift calculations for IceBridge route planning, and thus charted the same area of sea ice as ICESat–2 when it flew over—an area constantly in motion due to wind and currents. Because the 11-hour low-light flight took place overnight, the team saw multiple sunsets and sunrises, as seen in this photo of new sea ice taken through the window of the DC-8 by the IceBridge deputy project scientist, Linette Boisvert. "Because of the low lighting, the sky changed from oranges to pinks to blues, making for quite the show from the DC-8's windows," she wrote. The perfect coordination with ICESat–2, the first since the satellite launched, allowed the team to directly compare data from IceBridge and ICESat–2, a critical step for the development of an ICESat-IceBridge-ICESat–2 time series. **Image and text credit:** NASA/Linette Boisvert

https://blogs.nasa.gov/earthexpeditions/tag/ice-bridge

Born in 1954, **Diane L. Evans** retired in 2019 as director of the Earth Science and Technology Directorate at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California. Evans joined JPL in 1981 to develop remote sensing techniques for Earth surface geology using combined datasets from visible, infrared, and radar satellites, and initiated some of the first multisensor field campaigns. Earlier, she was a principal investigator on a number of NASA-sponsored research activities in China, Australia, Spain, Hawaii, Wyoming and California's Mojave Desert. After a short detail to NASA Headquarters in Washington, D.C., Evans held numerous positions at JPL before her most recent as director in 2001. Evans led a number of planning committees at NASA and academic institutions, and she served on several advisory panels, including the Defense Science Board Task Force on Trends and Implications of Climate Change for National and International Security. The recipient of NASA's Outstanding Leadership Medal, Evans is the author of more than 100 research publications, book chapters, and conference presentations about geologic and radar remote sensing. She received her A.B. in geology from Occidental College in Los Angeles and a master's and doctorate in geological science from the University of Washington, Seattle. Photo credit: Max S. Gerber

June 2020

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21	22	23	24	25	26	27
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August 2020

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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3 Independence Day (observed date)	4
5 Full Moon	6	7	8	9	10	11
12 Last Quarter	13	14	15	16	17	18
19	20 New Moon	21	22	23	24	25
26	27 First Quarter	28	29	30	31	

AUGUST 2020

Sunburn on the Moon. Research using data from NASA's THEMIS-ARTEMIS mission suggests that lunar swirls, like the Reiner Gamma lunar swirl imaged here by NASA's Lunar Reconnaissance Orbiter, could be the result of solar wind interactions with the Moon's isolated pockets of magnetic field. Unlike Earth, the Moon has no global magnetic field, but its small bubbles of magnetic "sunscreen" can deflect solar wind particles on a much smaller scale than Earth's magnetic field. While they aren't enough to protect astronauts by themselves, they do have a fundamental effect on the Moon's appearance. Under these miniature magnetic umbrellas, the material that makes up the Moon's surface, called regolith, is shielded from the Sun's particles. As those particles flow toward the Moon, they are deflected to the areas just around the magnetic bubbles, where chemical reactions with the regolith darken the surface. This creates the distinctive swirls of darker and lighter materials that are so prominent they can be seen from Earth. Through a backyard telescope the Reiner Gamma lunar swirl looks like a small figure eight on its side. NASA's Lunar Reconnaissance Orbiter's view from orbit reveals tendrils and daughter swirls that extend for several hundred kilometers—one more piece of the puzzle to help us understand the neighbor NASA plans to revisit within the next decade. **Image and text credit:** NASA LRO WAC science team

https://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=13150

Born in 1939, **George R. Carruthers** [*right*] developed the Far Ultraviolet Camera/Spectrograph, the first Moon-based telescope. Carruthers and **William Conway**, a project manager at the Naval Research Institute, examine the gold-plated telescope, used during the Apollo 16 mission to make the first observations of Earth from a distance in ultraviolet (UV) light, showing the full extent of the hydrogen atmosphere, the polar auroras, and the tropical airglow belt. In 1970, Carruthers made the first detection of molecular hydrogen in space using a sounding rocket. He has also worked on UV imaging of Earth's polar auroras and of the faint photochemical luminescence found in the upper atmosphere. Photo credit: U.S. Naval Research Laboratory

July 2020

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12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

September 2020

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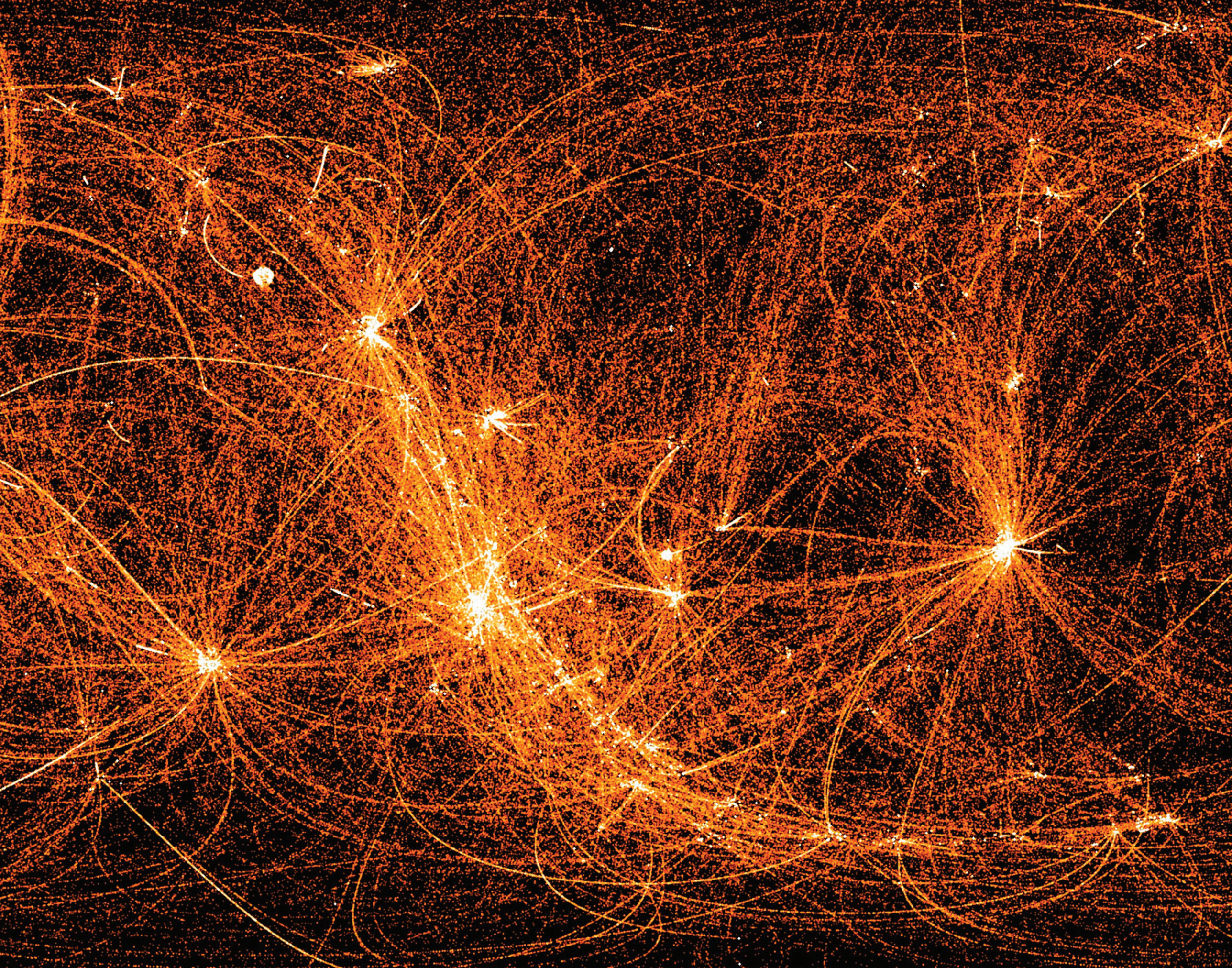
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3 Full Moon	4	5	6	7	8
9	10	11 Last Quarter	12	13	14	15
16	17	18	19 New Moon	20	21	22
23 30	24 31	25 First Quarter	26	27	28	29



SEPTEMBER 2020

NICER's Night Moves Trace the X-ray Sky. This image shows 22 months of nighttime X-ray data collected across the entire sky by NASA's Neutron star Interior Composition Explorer (NICER) mission, a payload on the International Space Station (ISS). Both day and night, NICER carries out its primary mission, maneuvering two to six times per ISS orbit to focus on specific X-ray sources, or "targets." Most of the targets are *neutron stars*—the smallest and densest stars in the universe—and NICER can measure their size with unprecedented precision. At night, when other sources of scattered light are removed, NICER's detectors remain active as it slews between targets, revealing a swirling web of X-ray energy that covers the whole sky and converges at certain points as depicted above.

The bright spots on the map represent the locations of several prominent X-ray sources, many of them *pulsars*—highly-magnetized, rotating stars that emit a beam of electromagnetic radiation, similar to how a lighthouse emits a rotating beam of light here on Earth. These have been identified by the mission's science team as targets for examination.

NICER also includes the experimental Station Explorer for X-ray Timing and Navigation Technology (SEXTANT) that utilizes the precise timing of pulsar X-ray pulses to autonomously determine NICER's position and speed in space. It's essentially a galactic global positioning system (GPS) that could someday enable spacecraft to navigate themselves throughout the solar system—and beyond. **Image and text credit:** NASA/NICER

https://svs.gsfc.nasa.gov/13214

Born in 1944, **Sandra M. Faber** is an American astronomer known for her groundbreaking research on the evolution of galaxies. She has made important discoveries linking the brightness of galaxies to the speed of stars within them and was the co-discoverer of the Faber–Jackson relation. In 1985, Faber got involved with the construction of the Keck Telescope and the building of the first Wide-Field Planetary Camera for the Hubble Space Telescope. In 1990, Faber played a major role in the diagnosis of Hubble's spherical aberration. Faber became a faculty member at the University of California, Santa Cruz (UCSC), in 1972 and in 1995, was made university professor, the highest honor for faculty in the University of California system. Faber is now professor emerita of astronomy and astrophysics at UCSC. She has received numerous professional awards, including the National Science Medal bestowed by President Barack Obama in 2013 and the Gruber Prize in Cosmology (2017). Photo credit: R. R. Jones/Hubble Deep Field Team/NASA

August 2020

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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

October 2020

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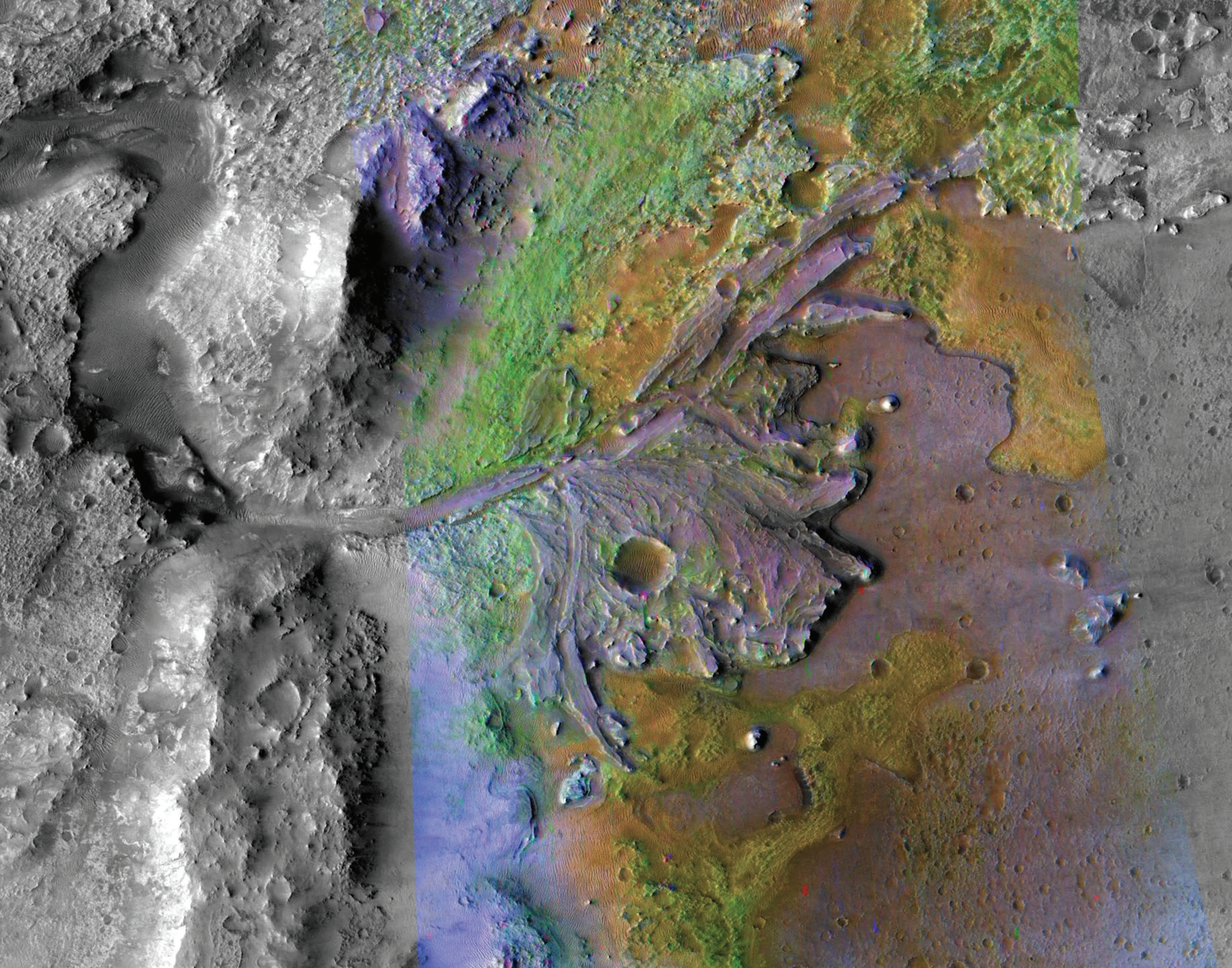
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 Full Moon	3	4	5
6	7 Labor Day	8	9	10 Last Quarter	11	12
13	14	15	16	17 New Moon Constitution Day	18	19
20	21	22	23	24 First Quarter	25	26
27	28	29	30			



OCTOBER 2020

Jezero Crater, Mars 2020's Landing Site. This image is of Jezero Crater on Mars, the landing site for NASA's Mars 2020 mission. It was taken by instruments on NASA's Mars Reconnaissance Orbiter (MRO), which regularly takes images of potential landing sites for future missions.

On ancient Mars, water carved channels and transported sediments to form fans and deltas within lake basins. Examination of spectral data acquired from orbit show that some of these sediments have minerals that indicate chemical alteration by water. Here in Jezero Crater delta, sediments contain clays and carbonates.

The image combines information from two instruments on MRO: the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) and the Context Camera (CTX). **Image and text credit:** NASA/JPL-Caltech/MSSS/JHU-APL

https://photojournal.jpl.nasa.gov/catalog/PIA23239

Born in 1928, **Margaret G. Kivelson** is an American space physicist, planetary scientist, and distinguished professor emerita of space physics at the University of California, Los Angeles. Her research focused on the magnetospheres of Earth, Jupiter, and Saturn, and more recently, on Jupiter's Galilean moons. She was the principal investigator for the magnetometer on the Galileo Orbiter that acquired data in Jupiter's magnetosphere for 8 years and a co-investigator on the fluxgate magnetometer (FGM) of the Earth-orbiting NASA-European Space Agency Cluster mission. She is actively involved as the Europa Clipper magnetometer science lead, as a co-investigator on NASA's Time History of Events and Macroscale Interactions during Substorms (THEMIS) mission, as a member of the Cassini magnetometer team and as a participant in the magnetometer team for the European JUICE mission to Jupiter. Photo credit: Wikipedia CC BY-SA 3.0

September 2020

S	M	T	W	T	F	S
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20	21	22	23	24	25	26
27	28	29	30			

November 2020

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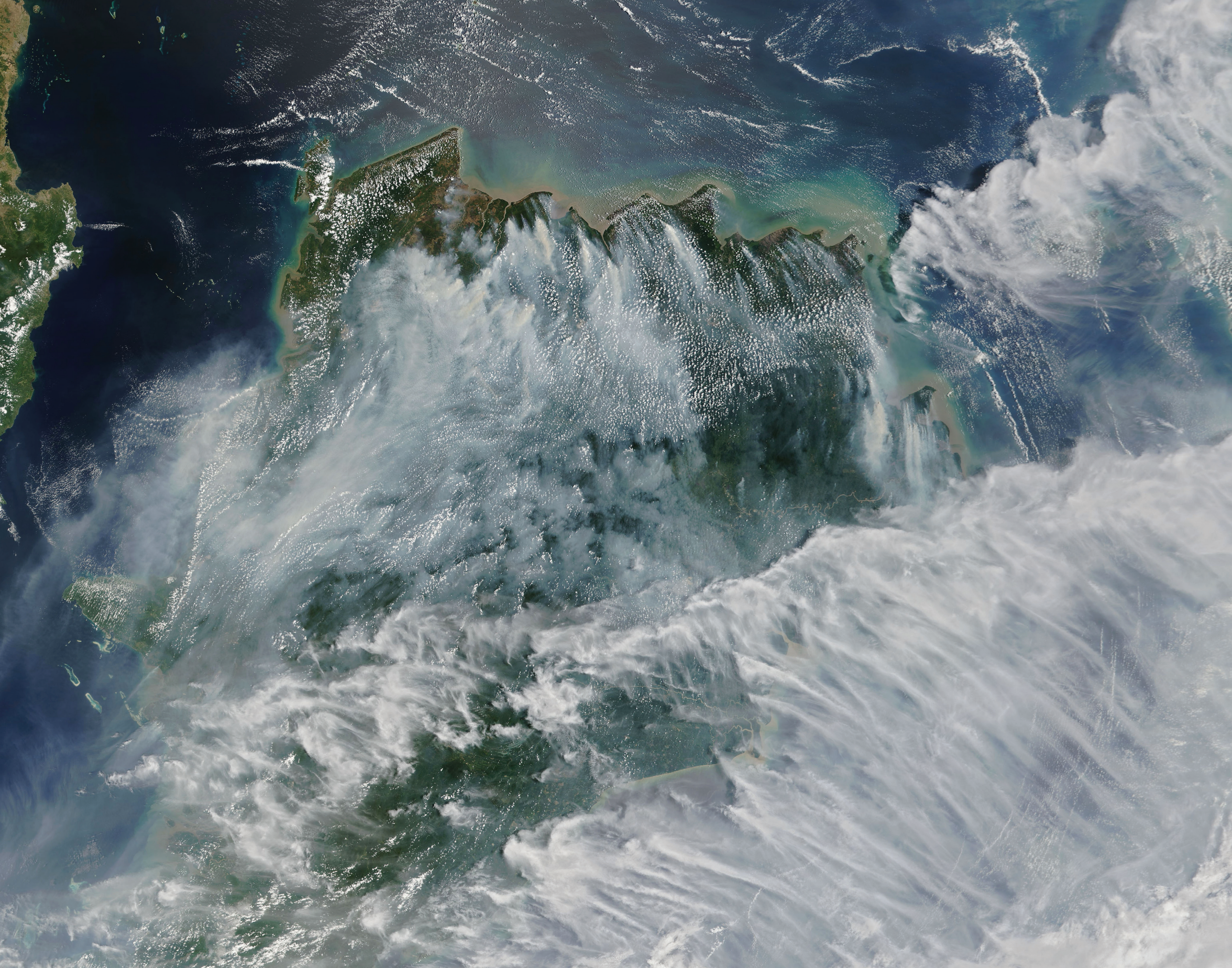
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Full Moon	2	3
4	5	6	7	8	9	10 Last Quarter
11	12 Columbus Day	13	14	15	16 New Moon	17
18	19	20	21	22	23 First Quarter	24
25	26	27	28	29	30	31 Full Moon Halloween



NOVEMBER 2020

Smoke Blankets Borneo. Blazing fires across Borneo covered the Asian island with thick, noxious smoke, seen here in this September 15, 2019, image from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite. The smoke triggered air-quality alerts ranging from "unhealthy" to "dangerous," prompting schools to close, airlines to cancel flights, and health centers to provide oxygen to people with breathing difficulties. While fires in this region are not unusual, as farmers regularly burn agricultural and logging debris, the number and intensity of these particular fires were exacerbated by an El Niño-induced dry spell. NASA provides space and airborne-based observations of fires and other natural hazards to help governments and relief agencies anticipate, respond, and provide relief to affected areas. In some cases, NASA's Disasters Program team works directly with response agencies to develop custom products. All NASA Earth data are free and open to the public. **Image and text credit:** NASA's Earth Observatory/Joshua Stevens

https://earthobservatory.nasa.gov/images/145614/smoke-blankets-borneo

Tiruvalum N. (T.N.) Krishnamurti (1932–2018) retired in 2008 as the Lawton Distinguished Professor of Meteorology in the Department of Earth, Ocean and Atmospheric Science at Florida State University (FSU). At FSU, Krishnamurti became known as the "Father of Modern Meteorology" as he led development of a revolutionary forecasting method called the "Superensemble," which helps accurately predict hurricanes, drought, and floods. Krishnamurti was a leader in numerical weather prediction, and his research interests included high-resolution forecasting of hurricane tracks, landfall, and intensities; short- and long-range monsoon prediction; and interseasonal and interannual variability of the tropical atmosphere. Krishnamurti contributed to NASA's Tropical Rainfall Measuring Mission (TRMM). The recipient of some of the most prestigious awards in his field, Krishnamurti received his bachelor's degree in physics from Delhi University and a master's degree in meteorology from Andhra University in Visakhapatnam, India. He earned his Ph.D. in meteorology from the University of Chicago. Photo credit: NOAA

October 2020

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4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

December 2020

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Daylight Saving Time Ends	2	3 Election Day	4	5	6	7
8 Last Quarter	9	10	11 Veterans Day	12	13	14
15 New Moon	16	17	18	19	20	21
22 First Quarter	23	24	25	26 Thanksgiving Day	27	28
29	30 Full Moon					

DECEMBER 2020

South American Total Solar Eclipses. Exploratorium and the NASA Science Activation team produced live broadcast telescope images of the total solar eclipse on Tuesday, July 2, 2019, from the National Science Foundation's (NSF) Cerro Tololo Inter-American Observatory. The observatory is located in the foothills of the Andes, 7,241 feet (2,200 meters) above sea level in the Coquimbo Region of northern Chile. A total solar eclipse was visible across parts of Chile and Argentina while a partial eclipse was visible across much of South America. Studying the Sun during a total solar eclipse helps scientists understand the source and behavior of solar radiation that drives space weather near Earth, which can affect the health of astronauts in space and the durability of materials used to build spacecraft. Similar data will be important in planning NASA's return of astronauts to the Moon in 2024 and eventual crewed missions to Mars. On December 14, 2020, another total solar eclipse will be broadcast by the team from Argentina. Totality will last over 2 minutes. **Image credit:** Exploratorium

https://www.exploratorium.edu/video/total-solar-eclipse-2019-live-coverage

https://science.nasa.gov/learners

Born in 1940, **Jeanette A. Scissum** is a mathematician, space scientist, and diversity advocate. Scissum joined NASA's Marshall Space Flight Center in 1964, becoming the first African-American mathematician hired by the Center. In 1967 Scissum published "Survey of Solar Cycle Prediction Models," which put forward techniques that improved forecasting of the sunspot cycle. During her 39-year career at NASA, she held positions across the Agency, including at NASA's Goddard Space Flight Center in Greenbelt, Maryland, NASA Headquarters in Washington, D.C., and with the Space Shuttle Program. Photo credit: NOAO/AURA/NSF

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8 Last Quarter	9	10	11	12
13	14 New Moon	15	16	17	18	19
20	21 First Quarter	22	23	24	25 Christmas Day	26
27	28	29	30 Full Moon	31		

November 2020

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

January 2021

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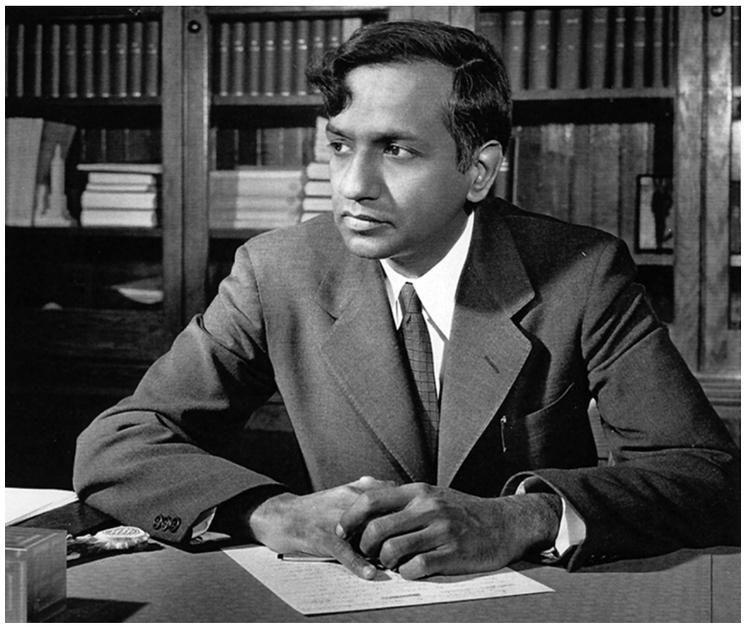
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JANUARY 2021

NASA's Chandra X-ray Observatory Celebrates Its 20th Anniversary with Cygnus OB2. On July 23, 1999, the Space Shuttle Columbia blasted into space carrying NASA's Chandra X-ray Observatory. To commemorate the 20th anniversary, the mission released several new images, including this composite image of Cygnus OB2. Stars come in different sizes and masses. Our Sun is an average-sized star that will have a lifespan of some 10 billion years. More massive stars, like those found in Cygnus OB2, only last a few million years. During their lifetimes, they blast large amounts of high-energy winds into their surroundings. These violent winds can collide or produce shocks in the gas and dust around the stars, depositing large amounts of energy that produce X-ray emission that Chandra can detect. In this composite image of Cygnus OB2, X-rays from Chandra (red diffuse emission and blue point sources) are shown with optical data from the Isaac Newton Telescope (diffuse emission in light blue) and infrared data from the Spitzer Space Telescope (orange). **Image and text credit:** X-ray: NASA/CXC/SAO/J. Drake *et al*; Optical: University of Hertfordshire/INT/IPHAS; Infrared: NASA/JPL-Caltech/Spitzer

http://chandra.harvard.edu/photo/2019/20th/more.html



Subrahmanyan Chandrasekhar (1910–1995) known to the world as Chandra, was an Indian-American scientist who was widely regarded as one of the foremost astrophysicists of the twentieth century. He studied at Presidency College, in Madras, India and at the University of Cambridge, in England, and was one of the first scientists to combine the disciplines of physics and astronomy. Chandra immigrated in 1937 from India to the United States, where he joined the faculty of The University of Chicago, in a position where he remained until his death. In 1983, Chandra was awarded the Nobel Prize in Physics for his theoretical studies of the physical processes important to the structure and evolution of stars. NASA's Chandra X-ray Observatory, launched in 1999, was named in his honor. Photo credit: University of Chicago

December 2020

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

February 2021

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	1	2	3	4	5	6
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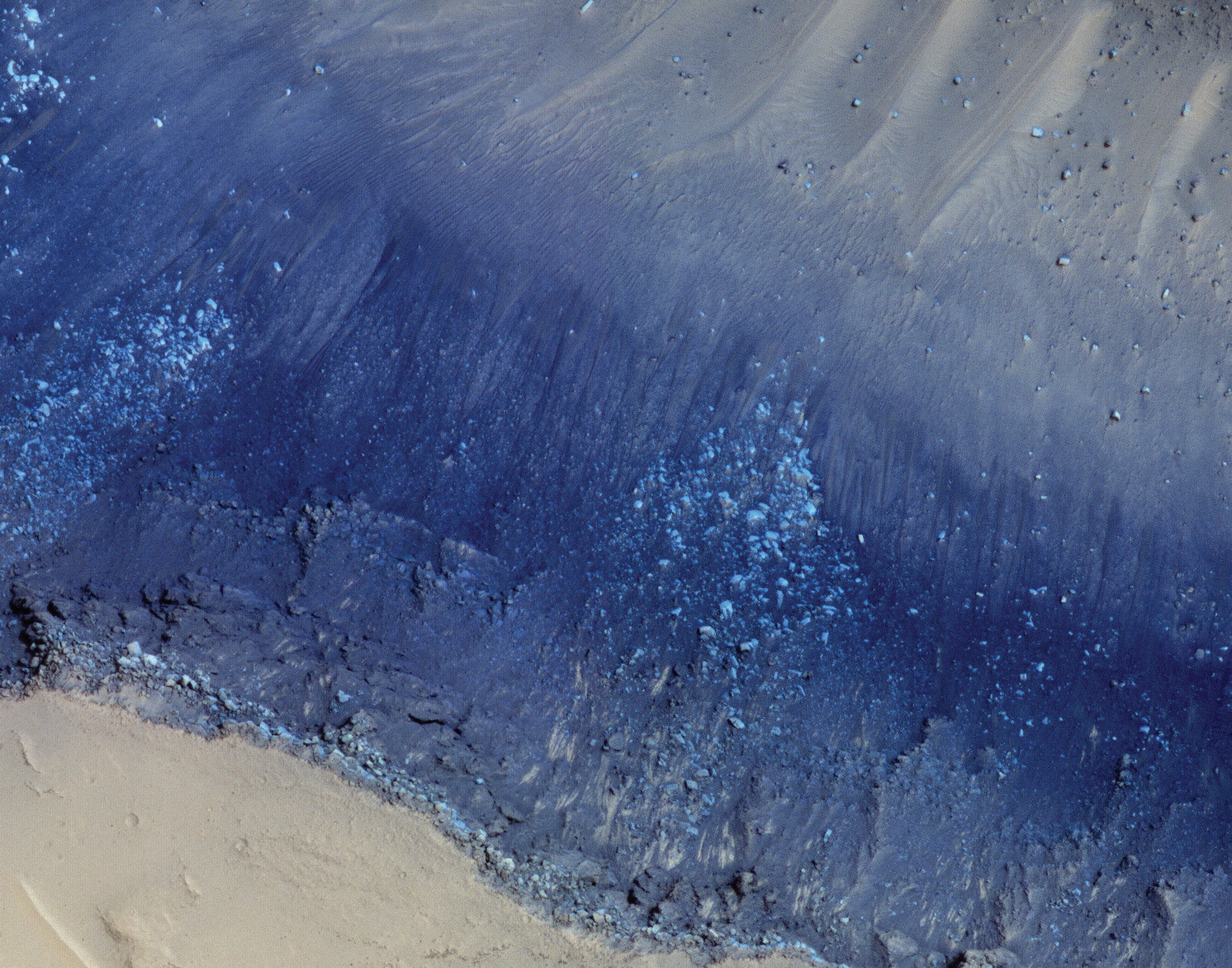
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 New Year's Day	2
3	4	5	6 Last Quarter	7	8	9
10	11	12	13 New Moon	14	15	16
17	18 Birthday of Martin Luther King, Jr. (observed date)	19	20 First Quarter	21	22	23
24 31	25	26	27	28 Full Moon	29	30



FEBRUARY 2021

Mars' Landslide Cerberus Fossae. The image here shows Cerberus Fossae, a steep-sided set of troughs cutting volcanic plains to the east of Elysium Mons. Steep slopes on Mars have active landslides (also called "mass wasting"), and here we see evidence for two types of activity. First, the light bluish boulders on the slope appear to originate at a layer of bedrock (also light blue) near the top of the image. Second, the dark thin lines are recurring slope lineae, probably also due to mass wasting, but composed of finer-grained materials. This image was captured by the HiRISE camera on the Mars Reconnaissance Orbiter. **Image and text credit:** NASA/JPL-Caltech/University of Arizona

https://www.nasa.gov/image-feature/landslides-in-mars-cerberus-fossae

Mario H. Acuña (1940–2009) was a NASA astrophysicist best known for his work in planetary magnetism and his contributions leading to the discovery of Jupiter's ring, as well as the magnetic field of Mars. He began working at NASA's Goddard Space Flight Center in 1969, where he worked for 40 years. Acuña was principal investigator for NASA's Mars Observer Magnetic Field Investigation and also participated in the Defense Meteorological Satellite Program, which collected weather data for the military. His research laboratory was recognized worldwide for its development of instruments that have flown on more than 30 NASA missions to every planet in the solar system, including the Sun. Acuña was elected to the National Academy of Sciences in 2007. He also received NASA's highest honor in 1996, the Distinguished Service Medal. Photo credit: NASA/Chris Gunn

January 2021

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17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

March 2021

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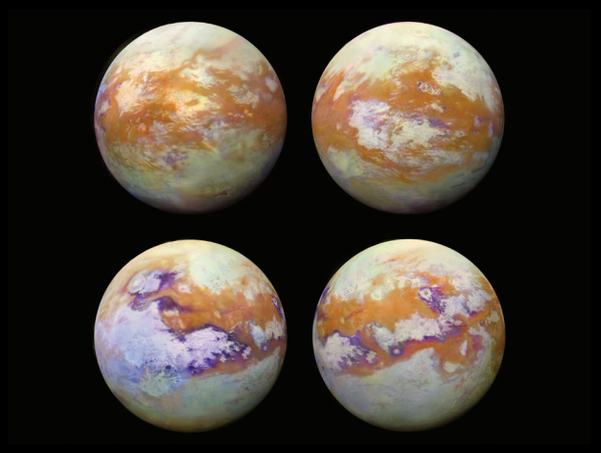
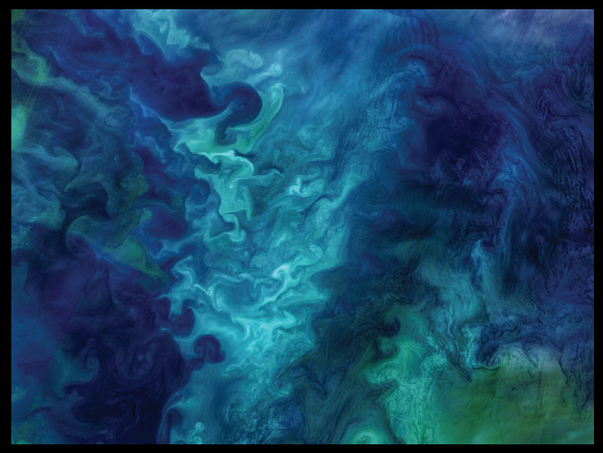
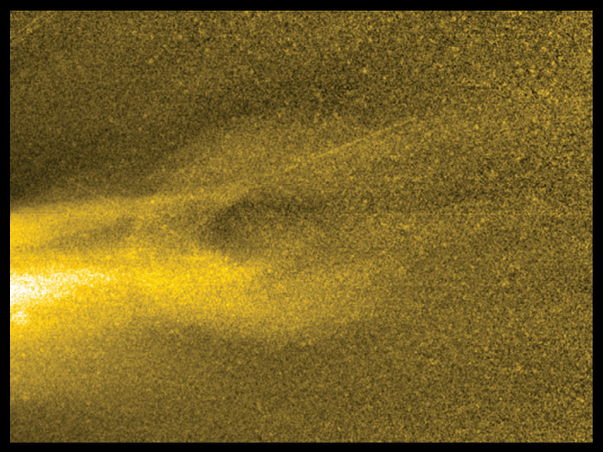
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

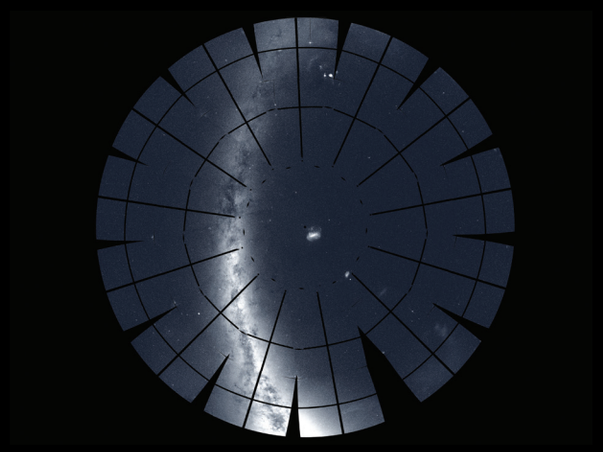
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4 Last Quarter	5	6
7	8	9	10	11 New Moon	12	13
14	15 Washington's Birthday (observed date)	16	17	18	19 First Quarter	20
21	22	23	24	25	26	27 Full Moon
28						

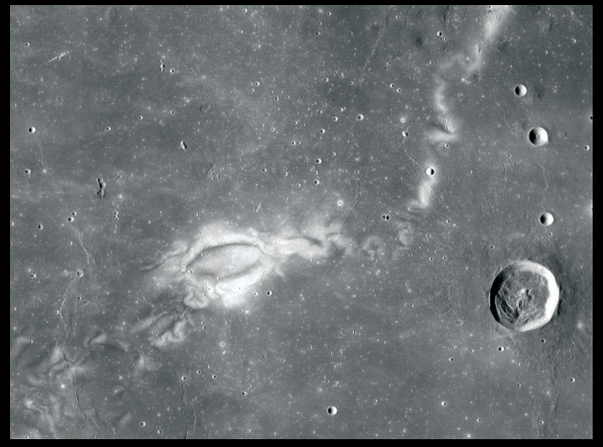
National Aeronautics and Space Administration

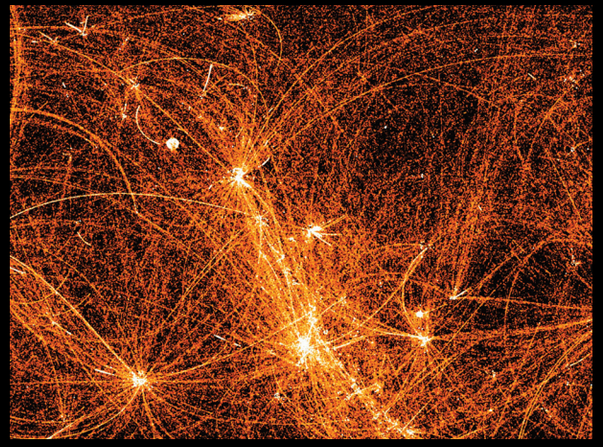


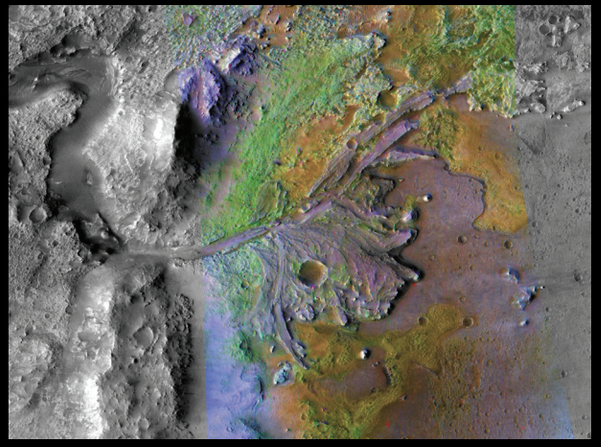


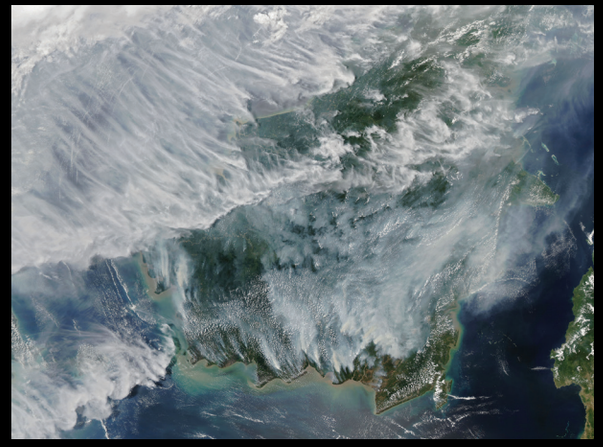


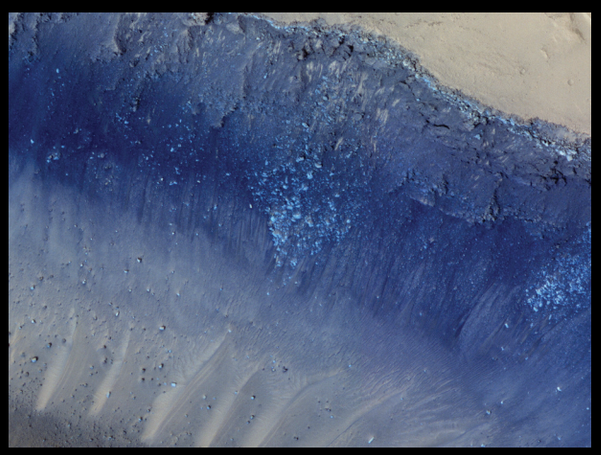












EXPLORE SCIENCE

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