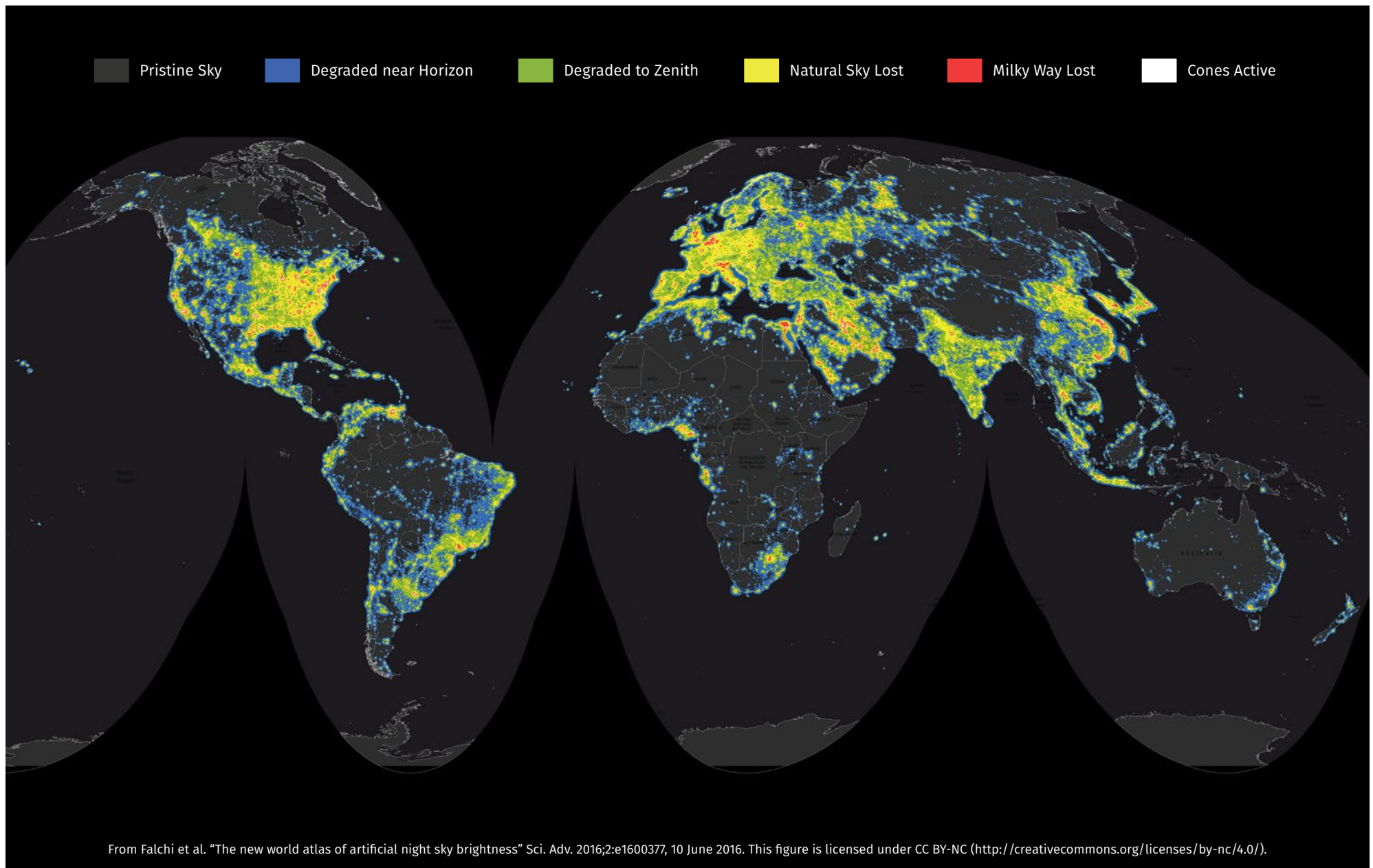




Astronomy  
of the  
2018  
picture  
day

The logo is a white graphic on a dark blue, starry background. It features a central vertical telescope. To the left is a comet with a long tail. To the right is a planet with horizontal stripes and a crescent moon. The word 'Astronomy' is written in a large, stylized font across the top, with 'of the' and '2018' below it. To the right, 'picture' is above and 'day' is below the planet and moon.



## The New World Atlas of Artificial Sky Brightness

Image Credit & License: F. Falchi et al., Light Pollution Atlas, ISTIL

How far are you from a naturally dark night sky? In increasing steps, this world map shows the effect of artificial night sky brightness on the visual appearance of the night sky. The brightness was modeled using high resolution satellite data and fit to thousands of night sky brightness measurements in recent work. Color-coded levels are compared to the natural sky brightness level for your location. For example, artificial sky brightness levels in yellow alter the natural appearance of the night sky. In red they hide the Milky Way in an artificial luminous fog. The results indicate that the historically common appearance of our galaxy at night is now lost for more than one-third of humanity. That includes 60% of Europeans and almost 80% of North Americans, along with inhabitants of other densely populated, light-polluted regions of planet Earth. (2016 June 30)

# December

# 2017

November

Su	Mo	Tu	We	Th	Fr	Sa
			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

Su	Mo	Tu	We	Th	Fr	Sa
	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
26	27	28	29	30	1	2
3 Oak Moon Supermoon	4	5	6	7	8	9
10	11	12	13 Geminids Meteor Shower	14 Geminids Meteor Shower	15	16
17	18	19	20	21 Solstice	22	23
24	25 Venus near Saturn	26	27	28	29	30
31	1 Wolf Moon Supermoon	2	3 Earth Closest to Sun	4	5	6 Mars near Jupiter

Notes



## The Swirling Core of the Crab Nebula

Image Credit: NASA, ESA Acknowledgment: J. Hester (ASU), M. Weisskopf (NASA / MSFC)

At the core of the Crab Nebula lies a city-sized, magnetized neutron star spinning 30 times a second. Known as the Crab Pulsar, it's actually the rightmost of two bright stars, just below a central swirl in this stunning Hubble snapshot of the nebula's core. Some three light-years across, the spectacular picture frames the glowing gas, cavities and swirling filaments bathed in an eerie blue light. The blue glow is visible radiation given off by electrons spiraling in a strong magnetic field at nearly the speed of light. Like a cosmic dynamo the pulsar powers the emission from the nebula, driving a shock wave through surrounding material and accelerating the spiraling electrons. With more mass than the Sun and the density of an atomic nucleus, the spinning pulsar is the collapsed core of a massive star that exploded. The Crab Nebula is the expanding remnant of the star's outer layers. The supernova explosion was witnessed on planet Earth in the year 1054. (2016 July 8)

# January


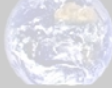



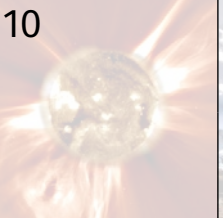

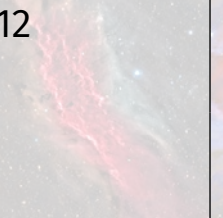


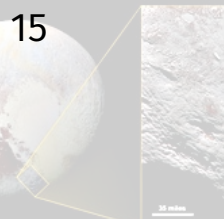



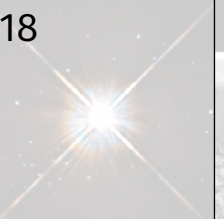

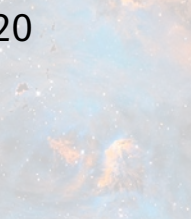



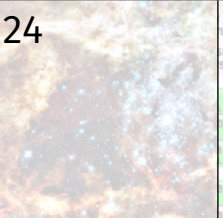



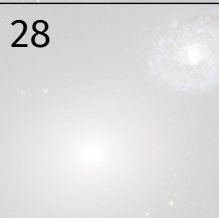
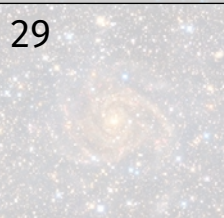
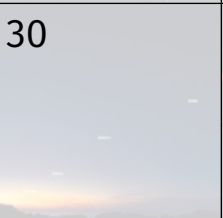


# 2018

December

Su	Mo	Tu	We	Th	Fr	Sa
					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

Su	Mo	Tu	We	Th	Fr	Sa
				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			

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31	1  Wolf Moon Supermoon	2	3 Earth closest to Sun	4 	5	6 Mars near Jupiter
7 	8 	9 	10 	11 	12 	13 
14 	15 	16  	17 	18 	19 	20 
21  <small>© 2018 Robert Herring www.rhphoto.com Twitter: @rhphoto</small>	22 	23 	24 	25  Large stars Small stars Supernovae Man-made	26 	27 
28 	29 	30 	31   Total Lunar Eclipse Blue Supermoon	1	2	3

Notes



## Young Suns of NGC 7129

Image Credit & Copyright: Robert Gendler, Roberto Colombari, Eric Recurt, Adam Block - *Additional Data*: Subaru (NAOJ)

Young suns still lie within dusty NGC 7129, some 3,000 light-years away toward the royal constellation Cepheus. While these stars are at a relatively tender age, only a few million years old, it is likely that our own Sun formed in a similar stellar nursery some five billion years ago. Most noticeable in the sharp image are the lovely bluish dust clouds that reflect the youthful starlight. But the compact, deep red crescent shapes are also markers of energetic, young stellar objects. Known as Herbig-Haro objects, their shape and color is characteristic of glowing hydrogen gas shocked by jets streaming away from newborn stars. Paler, extended filaments of reddish emission mingling with the bluish clouds are caused by dust grains effectively converting the invisible ultraviolet starlight to visible red light through photoluminescence. Ultimately the natal gas and dust in the region will be dispersed, the stars drifting apart as the loose cluster orbits the center of the Galaxy. The processing of this remarkable composite image has revealed the faint red strands of emission at the upper right. They are recently recognized as a likely supernova remnant and are currently being analyzed by Bo Reipurth (Univ. Hawaii) who obtained the image data at the Subaru telescope. At the estimated distance of NGC 7129, this telescopic view spans over 40 light-years. (2016 August 29)

# February



# 2018

January

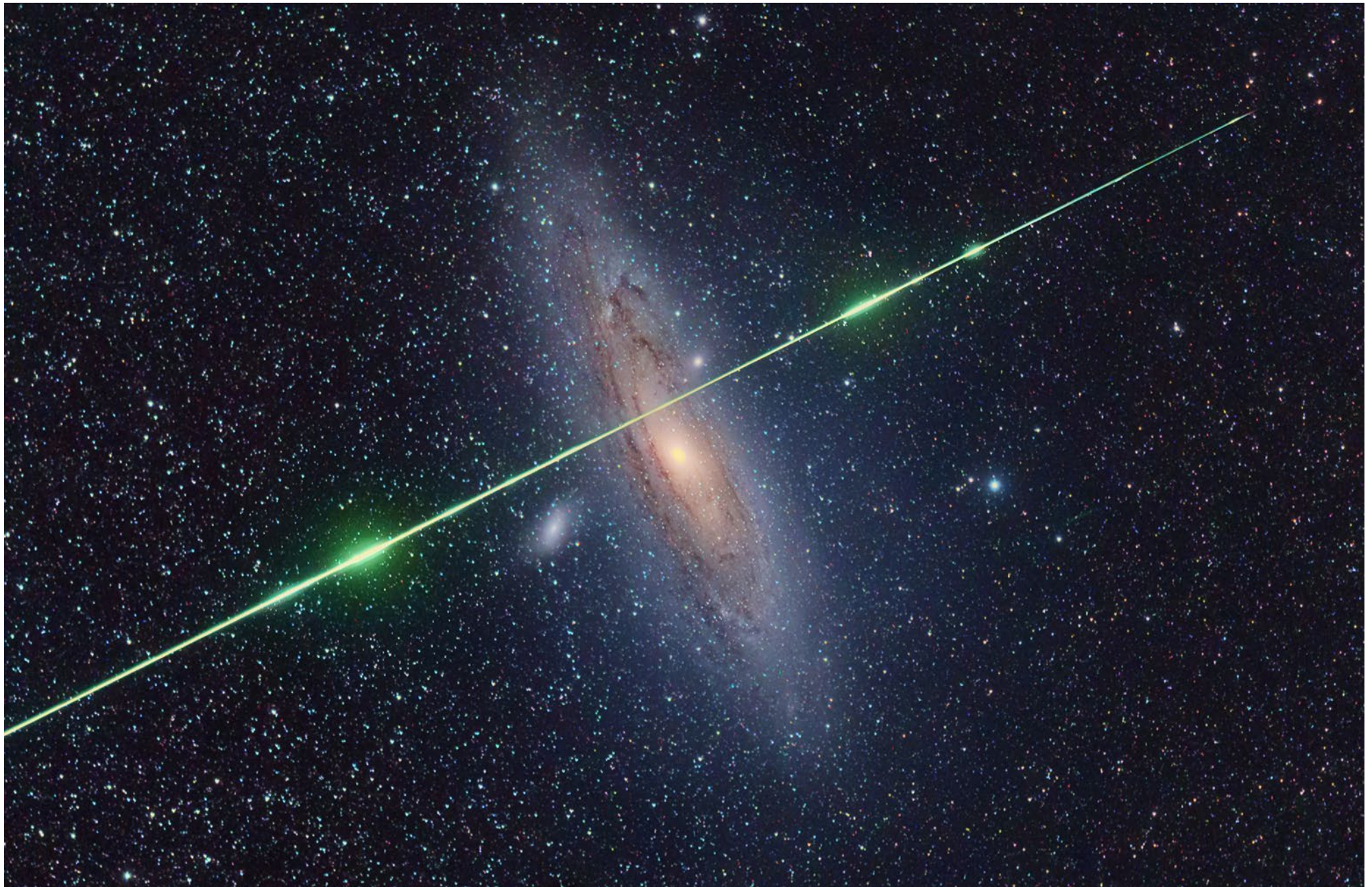
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

March

Su	Mo	Tu	We	Th	Fr	Sa
				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
28	29	30	31  Total Lunar Eclipse Blue Supermoon	1 	2 	3 
4 	5 	6 	7 	8 	9 	10 
11 	12 	13 	14 	15  Partial Solar Eclipse	16 	17 
18 	19 	20 	21 	22 	23 	24 
25 	26 	27 	28 	1  Crow Moon	2	3

Notes



## Meteor before Galaxy

Image Credit & Copyright: Fritz Helmut Hemmerich

What's that green streak in front of the Andromeda galaxy? A meteor. While photographing the Andromeda galaxy last Friday, near the peak of the Perseid Meteor Shower, a sand-sized rock from deep space crossed right in front of our Milky Way Galaxy's far-distant companion. The small meteor took only a fraction of a second to pass through this 10-degree field. The meteor flared several times while braking violently upon entering Earth's atmosphere. The green color was created, at least in part, by the meteor's gas glowing as it vaporized. Although the exposure was timed to catch a Perseids meteor, the orientation of the imaged streak seems a better match to a meteor from the Southern Delta Aquariids, a meteor shower that peaked a few weeks earlier. (2016 August 17)



# March

# 2018

February

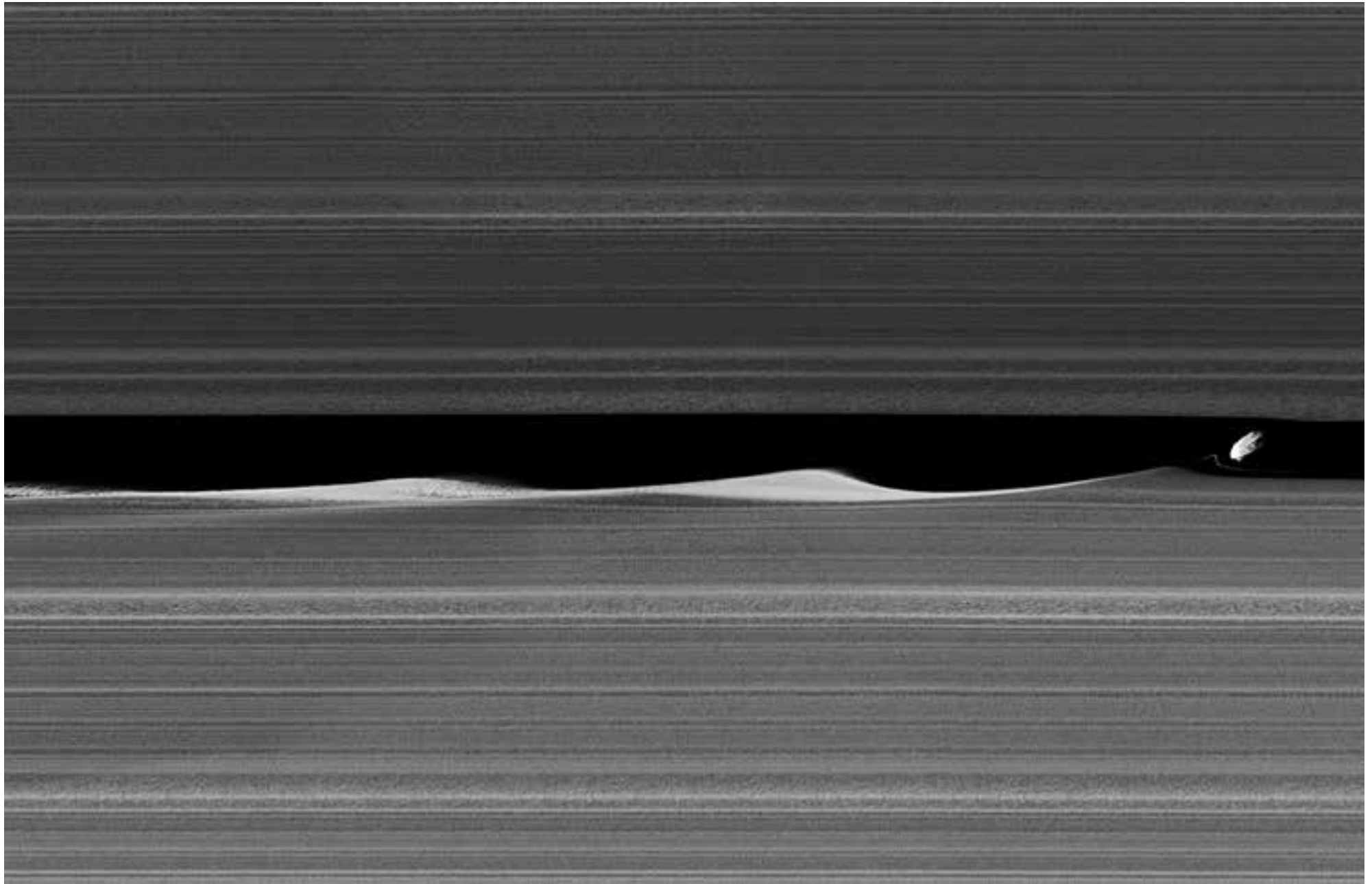
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

April

Su	Mo	Tu	We	Th	Fr	Sa
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					

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

Notes



## Daphnis and the Rings of Saturn

Image Credit: NASA, JPL-Caltech, Space Science Institute, Cassini

What's happening to the rings of Saturn? Nothing much, just a little moon making waves. The moon is 8-kilometer Daphnis and it is making waves in the Keeler Gap of Saturn's rings using just its gravity — as it bobs up and down, in and out. The featured image is a wide-field version of a previously released image taken last month by the robotic Cassini spacecraft during one of its new Grand Finale orbits. Daphnis can be seen on the far right, sporting ridges likely accumulated from ring particles. Daphnis was discovered in Cassini images in 2005 and raised mounds of ring particles so high in 2009 — during Saturn's equinox when the ring plane pointed directly at the Sun — that they cast notable shadows. (2017 February 22)

# April

# 2018

March

Su	Mo	Tu	We	Th	Fr	Sa
				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

May

Su	Mo	Tu	We	Th	Fr	Sa
		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  EUROPA	2  Mars near Saturn	3 	4 	5 	6 	7 
8 	9 	10 	11 	12 	13 	14 
15  ☾	16 	17 	18 	19 	20 	21 
22  Lyrids Meteor Shower	23  Lyrids Meteor Shower	24 	25 	26 	27 	28 
29  Egg Moon ☾	30 	1	2	3	4	5

Notes



## Gigantic Jet Lightning over China

Image Credit & Copyright: Phebe Pan

That's no meteor. While watching and photographing this year's Perseid Meteor Shower, something unexpected happened: a gigantic jet erupted from a nearby cloud. The whole thing was over in a flash—it lasted less than a second—but was fortunately captured by an already-recording digital camera. Gigantic jets are a rare form of lightning recognized formally only a few years ago. The featured high resolution color image, taken near the peak of Shikengkong mountain in China, may be the best image yet of this unusual phenomenon. The same event appears to have been captured simultaneously by another photographer, further away. The gigantic jet appears to start somewhere in a nearby thundercloud and extend upwards towards Earth's ionosphere. The nature of gigantic jets and their possible association with other types of Transient Luminous Events (TLEs) such as blue jets and red sprites remains an active topic of research. (2016 August 23)

# May




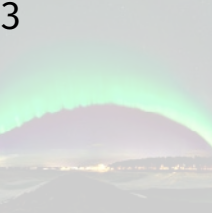
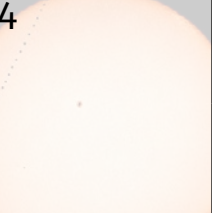

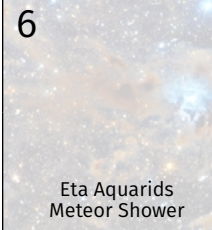




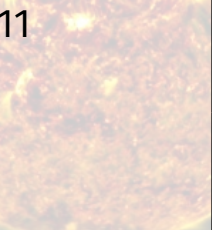
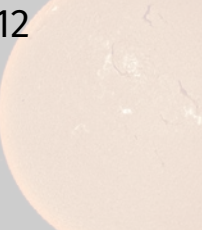






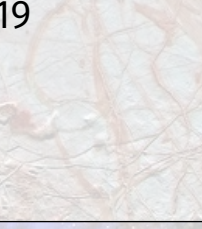
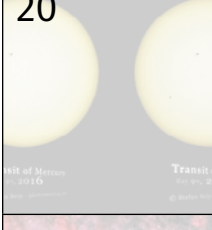
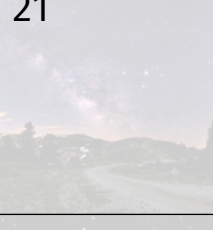
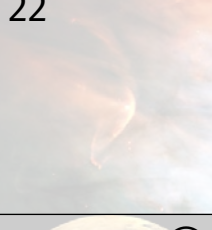
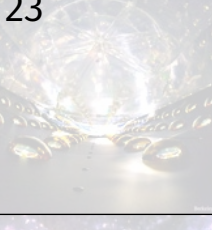
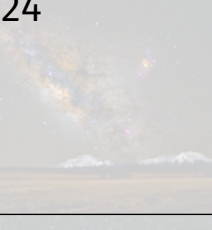





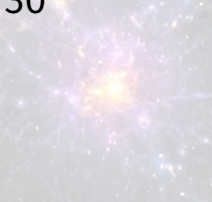

# 2018

April

Su	Mo	Tu	We	Th	Fr	Sa
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					

June

Su	Mo	Tu	We	Th	Fr	Sa
					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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29 	30	1 	2 	3 	4 	5 
6  Eta Aquarids Meteor Shower	7  Eta Aquarids Meteor Shower	8 	9 	10 	11 	12 
13 	14 	15 	16 	17 	18 	19 
20  Eclipse of Mercury 2018 Transit of Venus 2018	21 	22 	23 	24 	25 	26 
27 	28 	29  Milk Moon	30 	31 	1	2

Notes



## Retrograde Mars and Saturn

Image Credit & Copyright: Tunç Tezel (TWAN)

Wandering Mars and Saturn have spent much of this year remarkably close in planet Earth's night sky. In a sequence of exposures spanning mid-December 2015 through the beginning of this week, this composited skyview follows their time together, including both near opposition, just north of bright star Antares near the Milky Way's central bulge. In the corresponding video, Saturn's apparent movement is seen to be back and forth along the flattened, compact loop, while Mars traces the wider, reversing S-shaped track from upper right to lower left through the frame. To connect the dots and dates just slide your cursor over the picture (or follow this link). It looks that way, but Mars and Saturn don't actually reverse direction along their orbits. Instead, their apparent backwards or retrograde motion with respect to the background stars is a reflection of the orbital motion of the Earth itself. Retrograde motion can be seen each time Earth overtakes and laps planets orbiting farther from the Sun, the Earth moving more rapidly through its own relatively close-in orbit. (2016 September 15)

# June

# 2018

May

Su	Mo	Tu	We	Th	Fr	Sa
		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		

July

Su	Mo	Tu	We	Th	Fr	Sa
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
27	28	29  Milk Moon	30	31	1 	2 
3 	4 	5 	6 	7 	8 	9 
10 	11 	12 	13 	14 	15  2015 Hanford 0 Incs Time (sec)	16 
17 	18 	19 	20 	21  Solstice	22 	23 
24 	25 	26 	27 	28  Strawberry Moon	29 	30 

Notes



## M33: Triangulum Galaxy

Image Credit & Copyright: Giovanni Benintende

The small, northern constellation Triangulum harbors this magnificent face-on spiral galaxy, M33. Its popular names include the Pinwheel Galaxy or just the Triangulum Galaxy. M33 is over 50,000 light-years in diameter, third largest in the Local Group of galaxies after the Andromeda Galaxy (M31), and our own Milky Way. About 3 million light-years from the Milky Way, M33 is itself thought to be a satellite of the Andromeda Galaxy and astronomers in these two galaxies would likely have spectacular views of each other's grand spiral star systems. As for the view from planet Earth, this sharp composite image nicely shows off M33's blue star clusters and pinkish star forming regions along the galaxy's loosely wound spiral arms. In fact, the cavernous NGC 604 is the brightest star forming region, seen here at about the 1 o'clock position from the galaxy center. Like M31, M33's population of well-measured variable stars have helped make this nearby spiral a cosmic yardstick for establishing the distance scale of the Universe. (2016 September 17)



# July

# 2018

June

Su	Mo	Tu	We	Th	Fr	Sa
					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

August

Su	Mo	Tu	We	Th	Fr	Sa
			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 	5 	6  Earth farthest from Sun	7 
8 	9 	10 	11 	12  Partial Solar Eclipse	13 	14 
15 	16 	17 	18 	19 	20 	21 
22 	23 	24 	25 	26 	27  Mars closest to Earth Total Lunar Eclipse Thunder Moon	28  Delta Aquarids Meteor Shower
29  Delta Aquarids Meteor Shower	30 	31 	1 	2 	3 	4 

Notes



## Herschel's Orion

Image Credit & Copyright: ESA/Herschel/PACS/SPIRE

This dramatic image peers within M42, the Orion Nebula, the closest large star-forming region. Using data at infrared wavelengths from the Herschel Space Observatory, the false-color composite explores the natal cosmic cloud a mere 1,500 light-years distant. Cold, dense filaments of dust that would otherwise be dark at visible wavelengths are shown in reddish hues. Light-years long, the filaments weave together bright spots that correspond to regions of collapsing protostars. The brightest bluish area near the top of the frame is warmer dust heated by the hot Trapezium cluster stars that also power the nebula's visible glow. Herschel data has recently indicated ultraviolet starlight from the hot newborn stars likely contributes to the creation of carbon-hydrogen molecules, basic building blocks of life. This Herschel image spans about 3 degrees on the sky. That's about 80 light-years at the distance of the Orion Nebula. (2016 October 14)

# August

# 2018

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
29	30	31	1 	2 	3 	4 
5 	6 	7 	8 	9 <b>Mars in 2016</b> (apparent size)  MAR 16   APR 02   MAY 30   JUN 11   JUL 08	10 	11  Partial Solar Eclipse
12  Perseids Meteor Shower	13  Perseids Meteor Shower	14 	15 	16 	17 	18 
19 	20 	21 <b>Partial Solar Eclipse of 2017 August 21</b> 	22 	23 	24 	25 
26  Grain Moon	27 	28 	29 	30 	31 	1 

July

Su	Mo	Tu	We	Th	Fr	Sa
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				

September

Su	Mo	Tu	We	Th	Fr	Sa
						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						

Notes





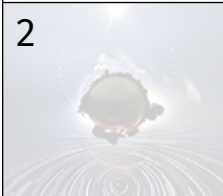
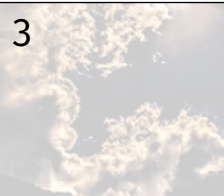




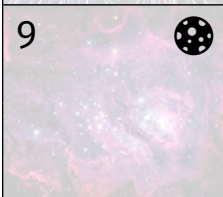



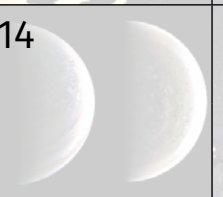

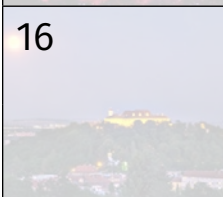

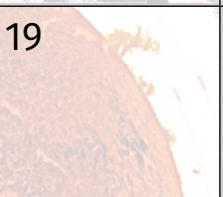
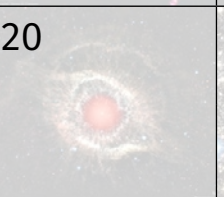
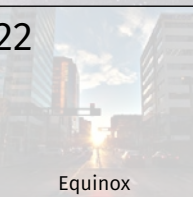
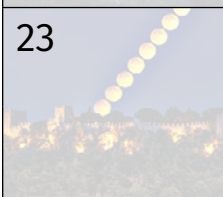

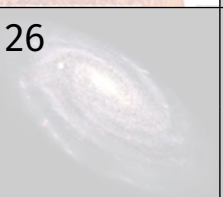

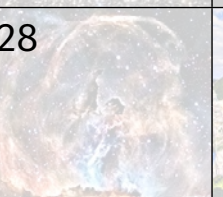

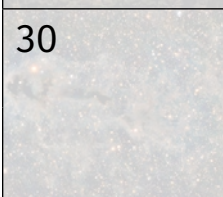
## **M27: Not a Comet**

Image Credit & Copyright: *Data; Subaru, NAOJ, Assembly and Processing; Roberto Colombari*

While hunting for comets in the skies above 18th century France, astronomer Charles Messier diligently kept a list of the things he encountered that were definitely not comets. This is number 27 on his now famous not-a-comet list. In fact, 21st century astronomers would identify it as a planetary nebula, but it's not a planet either, even though it may appear round and planet-like in a small telescope. Messier 27 (M27) is an excellent example of a gaseous emission nebula created as a sun-like star runs out of nuclear fuel in its core. The nebula forms as the star's outer layers are expelled into space, with a visible glow generated by atoms excited by the dying star's intense but invisible ultraviolet light. Known by the popular name of the Dumbbell Nebula, the beautifully symmetric interstellar gas cloud is over 2.5 light-years across and about 1,200 light-years away in the constellation Vulpecula. This spectacular color image incorporates broad and narrowband observations recorded by the 8.2 meter Subaru telescope. (2017 June 9)

# September

# 2018

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

## August

Su	Mo	Tu	We	Th	Fr	Sa
			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	

## October

Su	Mo	Tu	We	Th	Fr	Sa
	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			

## Notes



## Orbiting Jupiter

Video Credit & License: NASA, Juno, SwRI, MSSS, Gerald Eichstadt, Sean Doran

What would it be like to orbit Jupiter? The dramatic featured video (visit APOD online to watch!) depicts just this and was made from images taken by NASA's Juno spacecraft currently orbiting the Jovian giant. Juno recently completed its sixth pass near Jupiter during its looping elliptical six-week orbit. As the time-lapse video starts, alternating dark and light cloud bands passed underneath the spacecraft as it approaches Jupiter's South Pole. These clouds contain complex textures involving eddies, swirls, ovals, and extended clouds that have no direct analog from Earth. As the spacecraft passes beneath Jupiter, new cloud patterns devoid of long bands emerge but are again rich with alien swirls and ovals. Over the next few years, Juno will continue to orbit and probe Jupiter, determine atmospheric water abundance, and attempt to determine if Jupiter has a solid surface underneath these fascinating clouds. (2017 June 7)

# October

# 2018

September

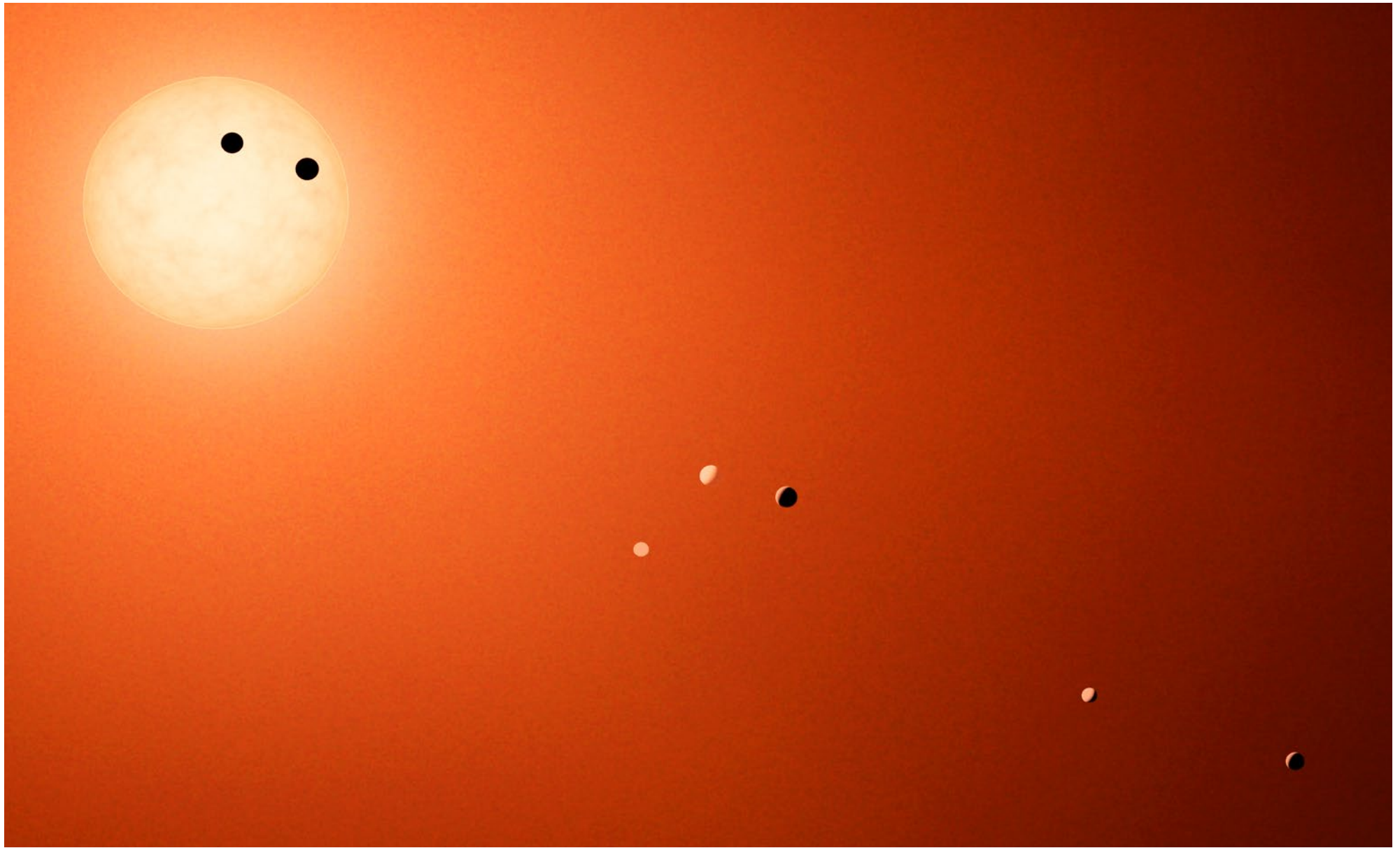
Su	Mo	Tu	We	Th	Fr	Sa
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16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

November

Su	Mo	Tu	We	Th	Fr	Sa
				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	

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	1	2	3	4	5	6
7	8 Draconids Meteor Shower	9	10	11	12	13
14	15	16	17	18	19	20
21	22 Orionids Meteor Shower	23	24 Blood Moon	25	26	27
28	29	30	31	1	2	3

Notes



## Seven Worlds for TRAPPIST-1

Illustration Credit: NASA, JPL-Caltech, Spitzer Space Telescope, Robert Hurt (Spitzer, Caltech)

Seven worlds orbit the ultracool dwarf star TRAPPIST-1, a mere 40 light-years away. In May 2016 astronomers using the Transiting Planets and Planetesimals Small Telescope (TRAPPIST) announced the discovery of three planets in the TRAPPIST-1 system. Just announced, additional confirmations and discoveries by the Spitzer Space Telescope and supporting ESO ground-based telescopes have increased the number of known planets to seven. The TRAPPIST-1 planets are likely all rocky and similar in size to Earth, the largest treasure trove of terrestrial planets ever detected around a single star. Because they orbit very close to their faint, tiny star they could also have regions where surface temperatures allow for the presence of liquid water, a key ingredient for life. Their tantalizing proximity to Earth makes them prime candidates for future telescopic explorations of the atmospheres of potentially habitable planets. All seven worlds appear in this artist's illustration, an imagined view from a fictionally powerful telescope near planet Earth. Planet sizes and relative positions are drawn to scale for the Spitzer observations. The system's inner planets are transiting their dim, red, nearly Jupiter-sized parent star. (2017 February 23)



# November

# 2018

October

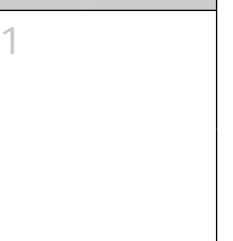
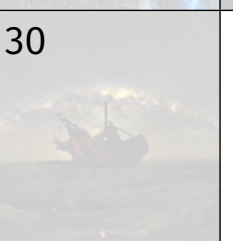
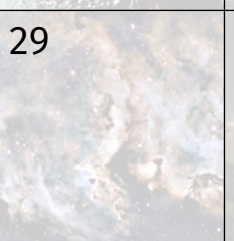
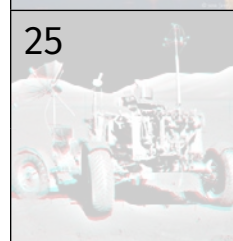
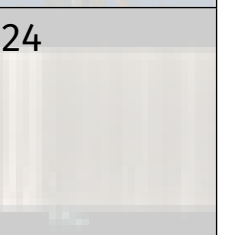
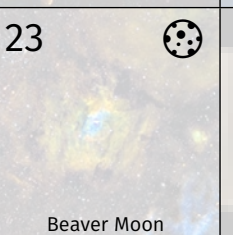
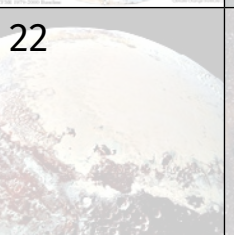
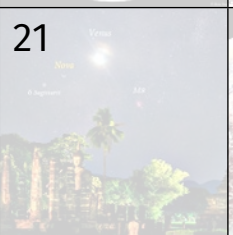
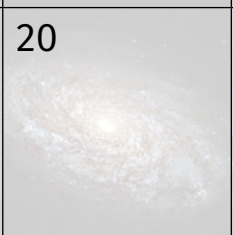
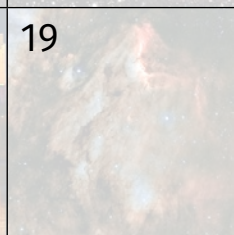
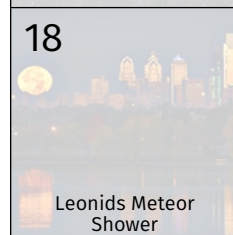
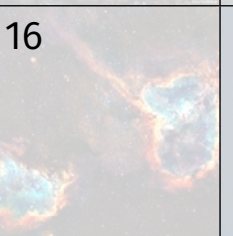
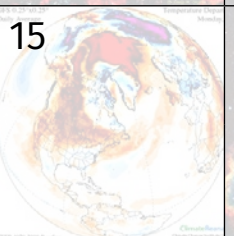
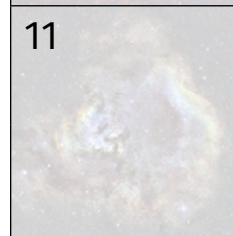
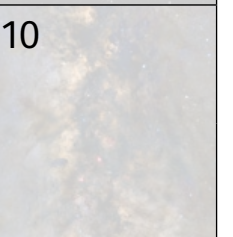
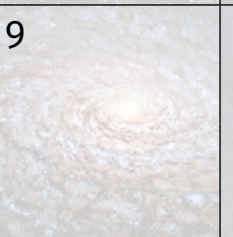
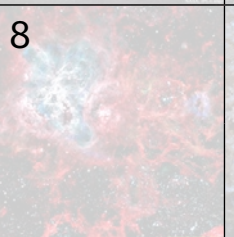
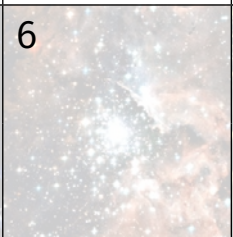
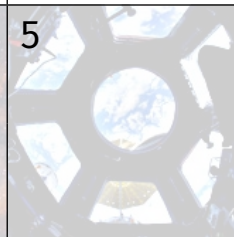
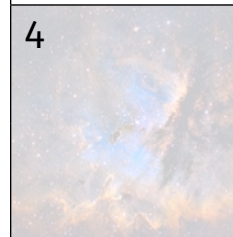
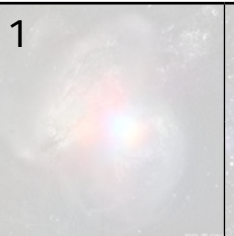
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

December

Su	Mo	Tu	We	Th	Fr	Sa
						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
28	29	30	31	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	1

Notes





## Galaxy Cluster Abell S1063 and Beyond

Image Credit: NASA, ESA, Jennifer Lotz (STScI)

Explanation: Some 4 billion light-years away, galaxies of massive Abell S1063 cluster near the center of this sharp Hubble Space Telescope snapshot. But the fainter bluish arcs are magnified images of galaxies that lie far beyond Abell S1063. About twice as distant, their otherwise undetected light is magnified and distorted by the cluster's largely unseen gravitational mass, approximately 100 trillion times the mass of the Sun. Providing a tantalizing glimpse of galaxies in the early universe, the effect is known as gravitational lensing. A consequence of warped spacetime it was first predicted by Einstein a century ago. The Hubble image is part of the Frontier Fields program to explore the Final Frontier. (2016 July 22)

# December

# 2018

## November

Su	Mo	Tu	We	Th	Fr	Sa
				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

Su	Mo	Tu	We	Th	Fr	Sa
		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
25	26	27	28	29	30	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	1	2	3	4	5

Geminids Meteor Shower

Geminids Meteor Shower

Solstice

Oak Moon

Quadrantids Meteor Shower

Quadrantids Meteor Shower

## Notes

Since June 1995, Astronomy Picture of the Day™ (APOD) has featured a different image or photograph of our fascinating universe along with a brief explanation written by a professional astronomer. The website was created and edited by Robert J. Nemiroff and Jerry T. Bonnell.

<http://apod.nasa.gov/>

This calendar features images that have appeared on APOD and is made available by Friends of APOD, a 501(c)(3) non-profit organized to provide financial support Astronomy Picture of the Day. Please help sustain APOD with a donation; more information is available online:

<http://friendsofapod.org/>

