APOD 2016 Calendar

(It will get a cover, just not right now)

NGC 2903: A Missing Jewel in Leo

Image Credit & Copyright: Tony Hallas

Explanation: Barred spiral galaxy NGC 2903 is only some 20 million light-years distant. Popular among amateur astronomers, it shines in the northern spring constellation Leo, near the top of the lion's head. That part of the constellation is sometimes seen as a reversed question mark or sickle. One of the brighter galaxies visible from the northern hemisphere, NGC 2903 is surprisingly missing from Charles Messier's catalog of lustrous celestial sights. This colorful image from a small ground-based telescope shows off the galaxy's gorgeous spiral arms traced by young, blue star clusters and pinkish star forming regions. Included are intriguing details of NGC 2903's bright core, a remarkable mix of old and young clusters with immense dust and gas clouds. In fact, NGC 2903 exhibits an exceptional rate of star formation activity near its center, also bright in radio, infrared, ultraviolet, and x-ray bands. Just a little smaller than our own Milky Way, NGC 2903 is about 80,000 light-years across. ap150410.html

December 2015

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

Polar Ring Galaxy NGC 660

Image Credit & Copyright: Gemini Observatory, AURA, Travis Rector (Univ. Alaska Anchorage)

Explanation: NGC 660 is featured in this cosmic snapshot, a sharp composite of broad and narrow band filter image data from the Gemini North telescope on Mauna Kea. Over 20 million light-years away and swimming within the boundaries of the constellation Pisces, NGC 660's peculiar appearance marks it as a polar ring galaxy. A rare galaxy type, polar ring galaxies have a substantial population of stars, gas, and dust orbiting in rings nearly perpendicular to the plane of the galactic disk. The bizarre-looking configuration could have been caused by the chance capture of material from a passing galaxy by a disk galaxy, with the captured debris eventually strung out in a rotating ring. The violent gravitational interaction would account for the myriad pinkish star forming regions scattered along NGC 660's ring. The polar ring component can also be used to explore the shape of the galaxy's otherwise unseen dark matter halo by calculating the dark matter's gravitational influence on the rotation of the ring and disk. Broader than the disk, NGC 660's ring spans over 50,000 light-years. ap141108.html

January 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4 Quadrantids	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						

Rocket, Meteor, and Milky Way over Thailand

Image Credit & Copyright: Matipon Tangmatitham

Explanation: Can the night sky appear both serene and surreal? Perhaps classifiable as serene in the above panoramic image taken last Friday are the faint lights of small towns glowing across a dark foreground landscape of Doi Inthanon National Park in Thailand, as well as the numerous stars glowing across a dark background starscape. Also visible are the planet Venus and a band of zodiacal light on the image left. Unusual events are also captured, however. First, the central band of our Milky Way Galaxy, while usually a common sight, appears here to hover surreally above the ground. Next, a fortuitous streak of a meteor was captured on the image right. Perhaps the most unusual component is the bright spot just to the left of the meteor. That spot is the plume of a rising Ariane 5 rocket, launched a few minutes before from Kourou, French Guiana. How lucky was the astrophotographer to capture the rocket launch in his image? Pretty lucky — the image was not timed to capture the rocket. Also lucky was how photogenic — and perhaps surreal — the rest of the sky turned out to be. ap140212.html

February 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	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					

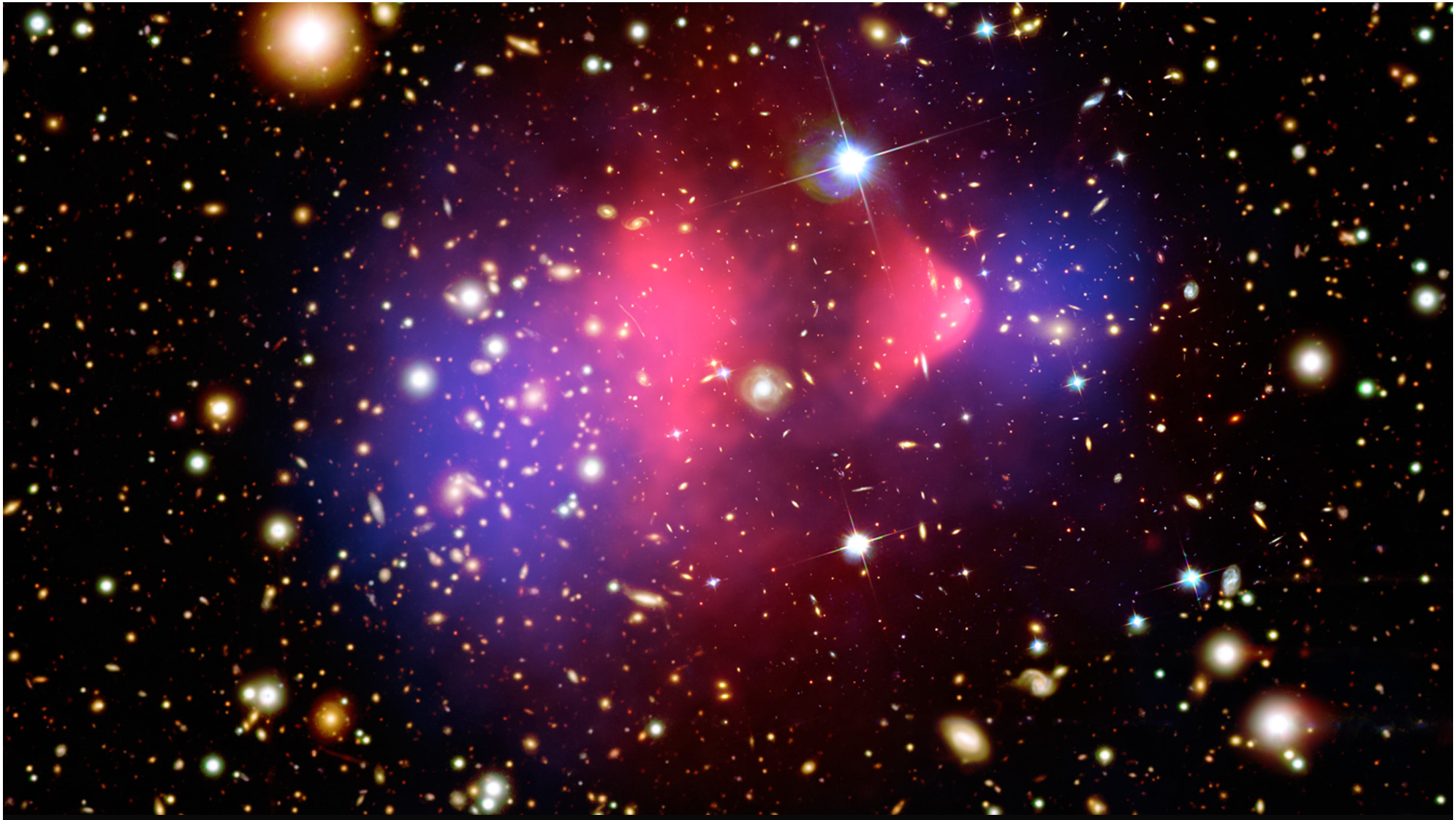
Plasma Jets from Radio Galaxy Hercules A

Image Credit: NASA, ESA, S. Baum & C. O'Dea (RIT), R. Perley and W. Cotton (NRAO/AUI/NSF), and the Hubble Heritage Team (STScI/AURA)

Explanation: Why does this galaxy emit such spectacular jets? No one is sure, but it is likely related to an active supermassive black hole at its center. The galaxy at the image center, Hercules A, appears to be a relatively normal elliptical galaxy in visible light. When imaged in radio waves, however, tremendous plasma jets over one million light years long appear. Detailed analyses indicate that the central galaxy, also known as 3C 348, is actually over 1,000 times more massive than our Milky Way Galaxy, and the central black hole is nearly 1,000 times more massive than the black hole at our Milky Way's center. Pictured above is a visible light image obtained by the Earth-orbiting Hubble Space Telescope superposed with a radio image taken by the recently upgraded Very Large Array (VLA) of radio telescopes in New Mexico, USA. The physics that creates the jets remains a topic of research with a likely energy source being infalling matter swirling toward the central black hole. ap121205.html

March 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8 Jupiter at Opposition	9 ● Total Solar Eclipse	10	11	12
13	14	15	16	17	18	19
20 Equinox	21	22	23 ○ Penumbral Lunar Eclipse	24	25	26
27	28	29	30	31		



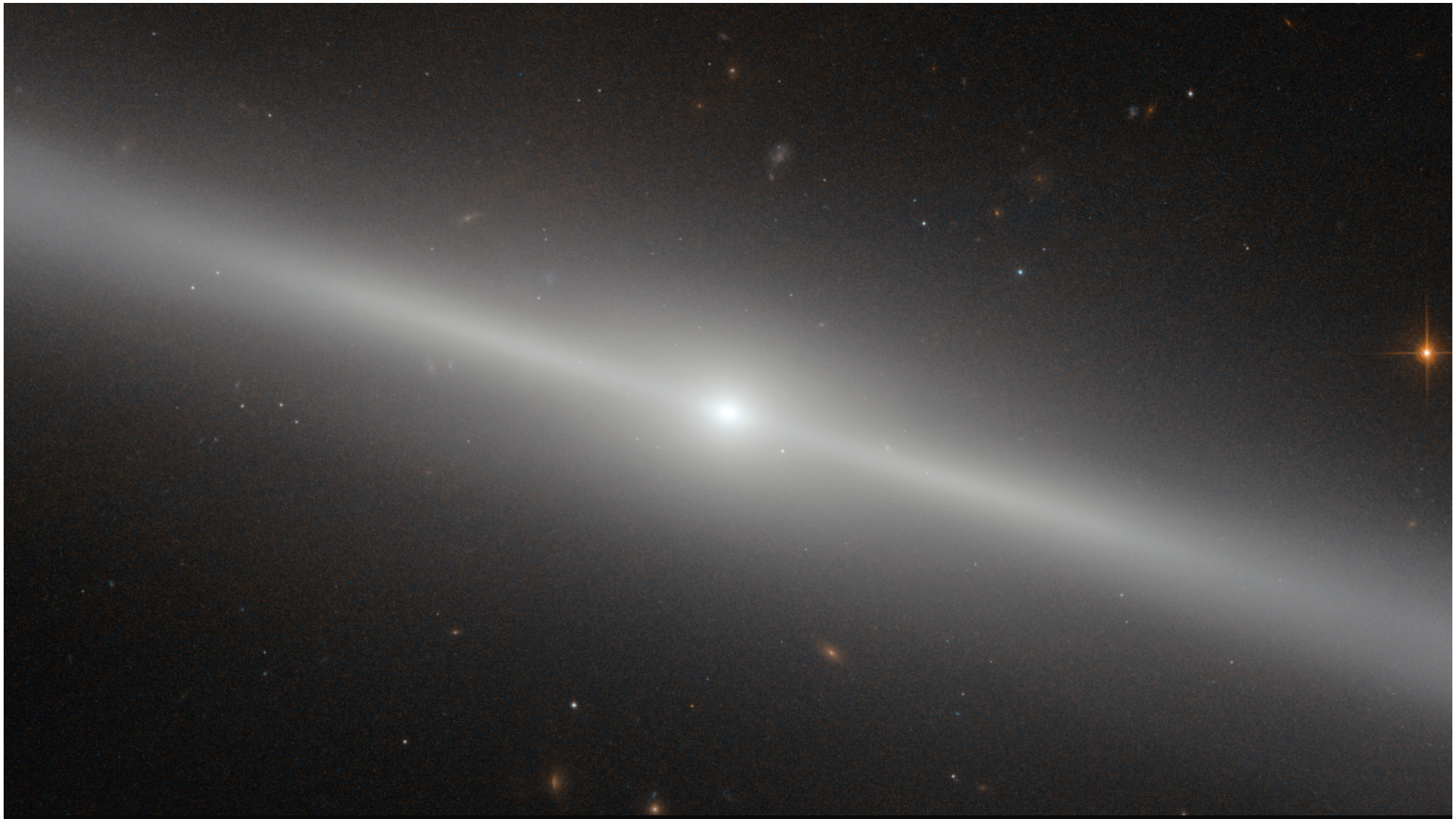
The Matter of the Bullet Cluster

Composite Credit: X-ray: NASA/CXC/CfA/ M.Markevitch et al.; Lensing Map: NASA/STScI; ESO WFI; Magellan/U.Arizona/ D.Clowe et al. Optical: NASA/STScI; Magellan/U.Arizona/D.Clowe et al.

Explanation: The matter in galaxy cluster 1E 0657-56, fondly known as the "bullet cluster", is shown in this composite image. A mere 3.4 billion light-years away, the bullet cluster's individual galaxies are seen in the optical image data, but their total mass adds up to far less than the mass of the cluster's two clouds of hot x-ray emitting gas shown in red. Representing even more mass than the optical galaxies and x-ray gas combined, the blue hues show the distribution of dark matter in the cluster. Otherwise invisible to telescopic views, the dark matter was mapped by observations of gravitational lensing of background galaxies. In a text book example of a shock front, the bullet-shaped cloud of gas at the right was distorted during the titanic collision between two galaxy clusters that created the larger bullet cluster itself. But the dark matter present has not interacted with the cluster gas except by gravity. The clear separation of dark matter and gas clouds is considered direct evidence that dark matter exists. apo80823.html

April 2016

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



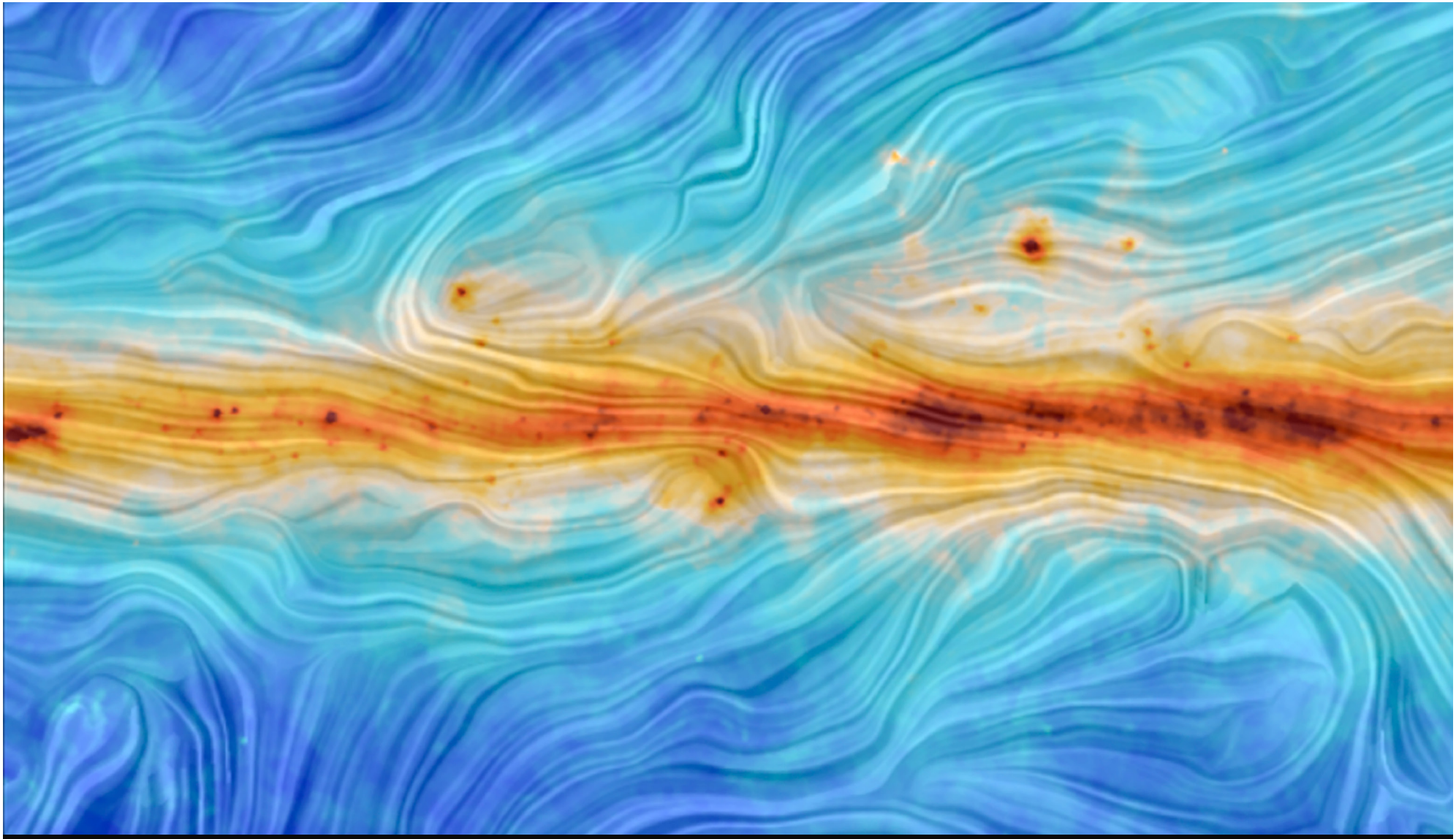
NGC 4762: A Galaxy on the Edge

Image Credit: ESA/Hubble & NASA

Explanation: Why is there a bright line on the sky? What is pictured above is actually a disk galaxy being seen almost perfectly edge on. The image from the Hubble Space Telescope is a spectacular visual reminder of just how thin disk galaxies can be. NGC 4762, a galaxy in the nearby Virgo Cluster of Galaxies, is so thin that it is actually difficult to determine what type of disk galaxy it is. Its lack of a visible dust lane indicates that it is a low-dust lenticular galaxy, although it is still possible that a view from on top would reveal spiral structure. The unusual stellar line spans about 100,000 light years from end to end. Near NGC 4762's center is a slight bulge of stars, while many background galaxies are visible far in the distance. Galaxies that appear this thin are rare mostly because our Earth must reside (nearly) in the extrapolated planes of their thin galactic disks. Galaxies that actually are this thin are relatively common — for example our own Milky Way Galaxy is thought to be about this thin. ap141105.html

May 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4 Eta-Aquarids	5	6 ●	7
8	9 Mercury transits the Sun	10	11	12	13	14
15	16	17	18	19	20	21 ○
22 Mars at Opposition	23	24	25	26	27	28
29	30	31				



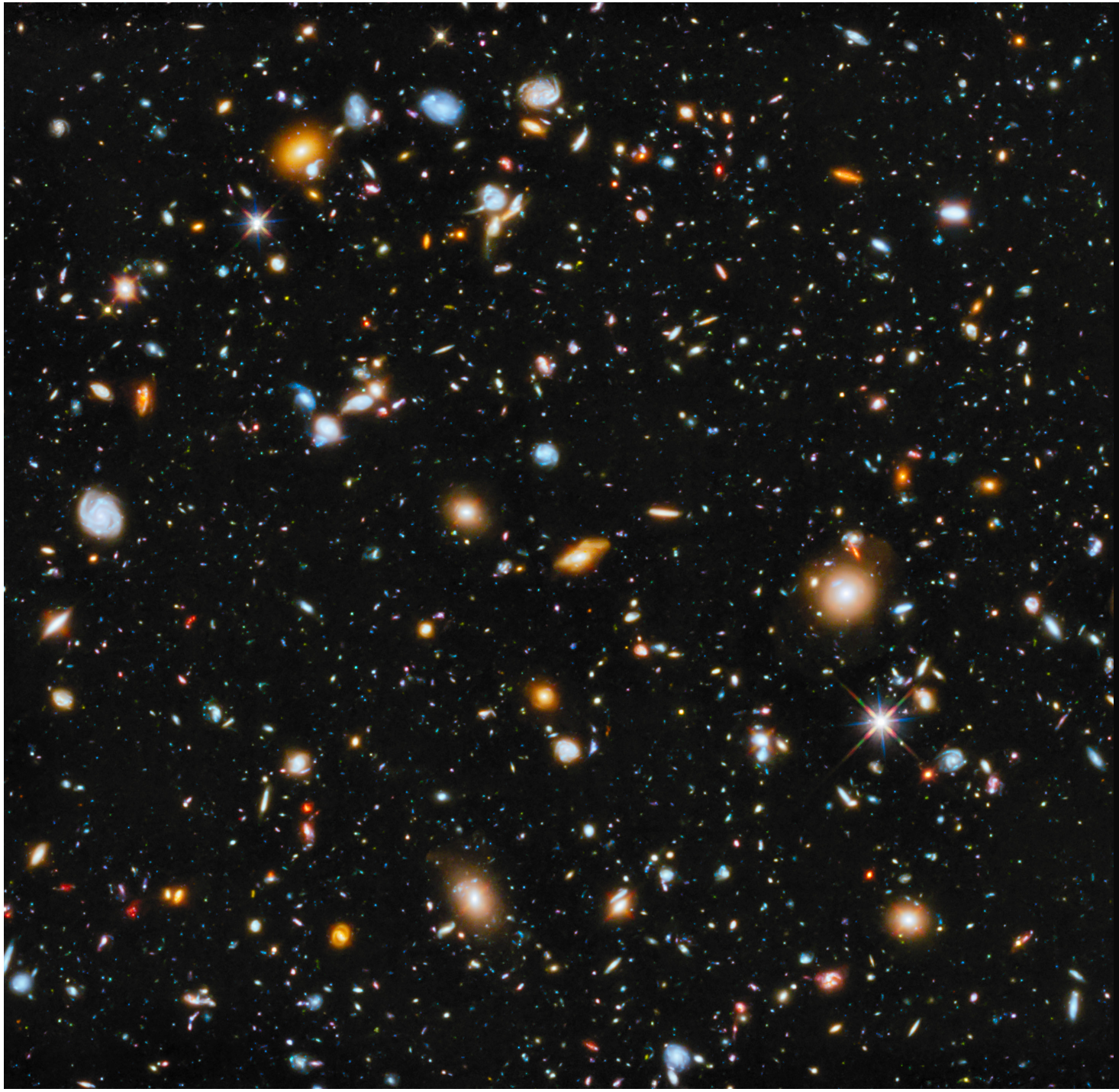
Our Galaxy's Magnetic Field from Planck

Image Credit & Copyright: ESA/Planck; Acknowledgement: M.-A. Miville-Deschênes, CNRS – IAS, U. Paris-XI

Explanation: What does the magnetic field of our Galaxy look like? It has long been known that a modest magnetic field pervades our Milky Way Galaxy because it is seen to align small dust grains that scatter background light. Only recently, however, has the Sun-orbiting Planck satellite made a high-resolution map of this field. Color coded, the 30-degree wide map confirms, among other things, that the Galaxy's interstellar magnetism is strongest in the central disk. The revolution of charged gas around the Galactic center creates this magnetism, and it is hypothesized that viewed from the top, the Milky Way's magnetic field would appear as a spiral swirling out from the center. What caused many of the details in this and similar Planck maps — and how magnetism in general affected our Galaxy's evolution — will likely remain topics of research for years to come. ap150127.html

June 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3 Saturn at Opposition	4
5 ●	6	7	8	9	10	11
12	13	14	15	16 APOD's 21st Birthday	17	18
19	20 ○ Solstice	21	22	23	24	25
26	27	28	29	30		



Hubble Ultra Deep Field 2014

Image Credit:

NASA, ESA, H.Teplitz and M.Rafelski (IPAC/Caltech), A. Koekemoer (STScI), R. Windhorst(ASU), Z. Levay (STScI)

Explanation: Galaxies like colorful pieces of candy fill the Hubble Ultra Deep Field 2014. The dimmest galaxies are more than 10 billion times fainter than stars visible to the unaided eye and represent the Universe in the extreme past, a few 100 million years after the Big Bang. The image itself was made with the significant addition of ultraviolet data to the Hubble Ultra Deep Field, an update of Hubble's famous most distant gaze toward the southern constellation of Fornax. It now covers the entire range of wavelengths available to Hubble's cameras, from ultraviolet through visible to near-infrared. Ultraviolet data adds the crucial capability of studying star formation in the Hubble Ultra Deep Field galaxies between 5 and 10 billion light-years distant. ap140605.html

July 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 Moon at Perigee (365983 km)	2
3	4 ●	5	6	7	8	9 Earth Gliese 832 c
10 Venus at Perihelion	11	12	13	14	15	16
17	18	19 ○	20	21	22	23
24	25	26	27 Delta-Aquarids	28	29	30
31						

Ring Galaxy AM 0644-741 from Hubble

Image Credit: Hubble Heritage Team (AURA / STScI), J. Higdon (Cornell) ESA, NASA

Explanation: How could a galaxy become shaped like a ring? The rim of the blue galaxy pictured on the right is an immense ring-like structure 150,000 light years in diameter composed of newly formed, extremely bright, massive stars. That galaxy, AM 0644-741, is known as a ring galaxy and was caused by an immense galaxy collision. When galaxies collide, they pass through each other – their individual stars rarely come into contact. The ring-like shape is the result of the gravitational disruption caused by an entire small intruder galaxy passing through a large one. When this happens, interstellar gas and dust become condensed, causing a wave of star formation to move out from the impact point like a ripple across the surface of a pond. The intruder galaxy is just outside of the frame taken by the Hubble Space Telescope. This featured image was taken to commemorate the anniversary of Hubble's launch in 1990. Ring galaxy AM 0644-741 lies about 300 million light years away. ap150419.html

August 2016

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

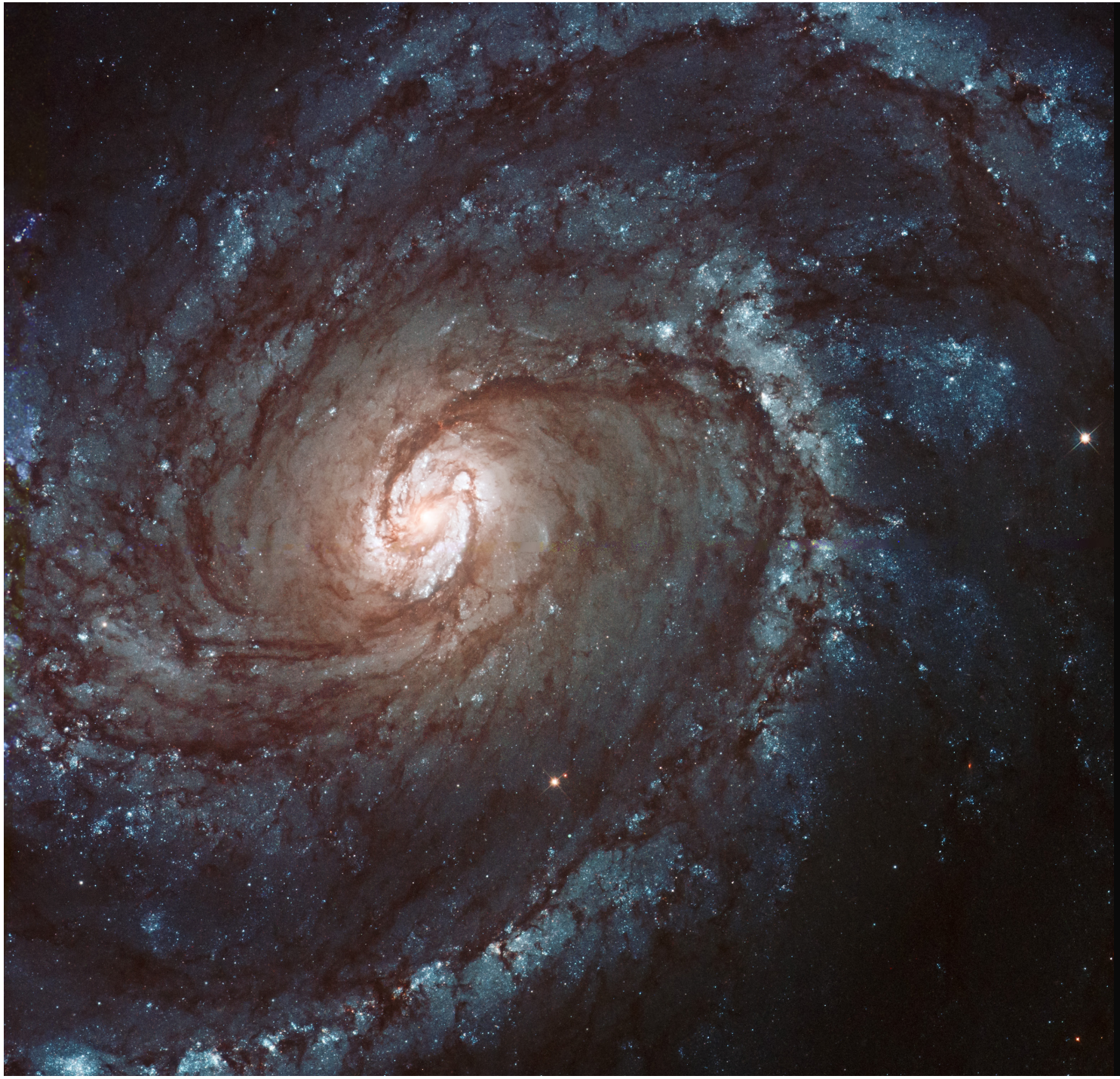
Starburst Galaxy IC 10

Image Credit & Copyright: Dietmar Hager, Torsten Grossmann

Explanation: Lurking behind dust and stars near the plane of our Milky Way Galaxy, IC 10 is a mere 2.3 million light-years distant. Even though its light is dimmed by intervening dust, the irregular dwarf galaxy still shows off vigorous star-forming regions that shine with a telltale reddish glow in this colorful skyscape. In fact, also a member of the Local Group of galaxies, IC 10 is the closest known starburst galaxy. Compared to other Local Group galaxies, IC 10 has a large population of newly formed stars that are massive and intrinsically very bright, including a luminous X-ray binary star system thought to contain a black hole. Located within the boundaries of the northern constellation Cassiopeia, IC 10 is about 5,000 light-years across. ap120104.html

September 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 ●	2 Neptune at Opposition	3
4	5	6	7	8	9	10
11	12	13	14	15	16 ○ Penumbral Lunar Eclipse	17
18	19	20	21	22 Equinox	23	24
25	26	27	28	29	30	



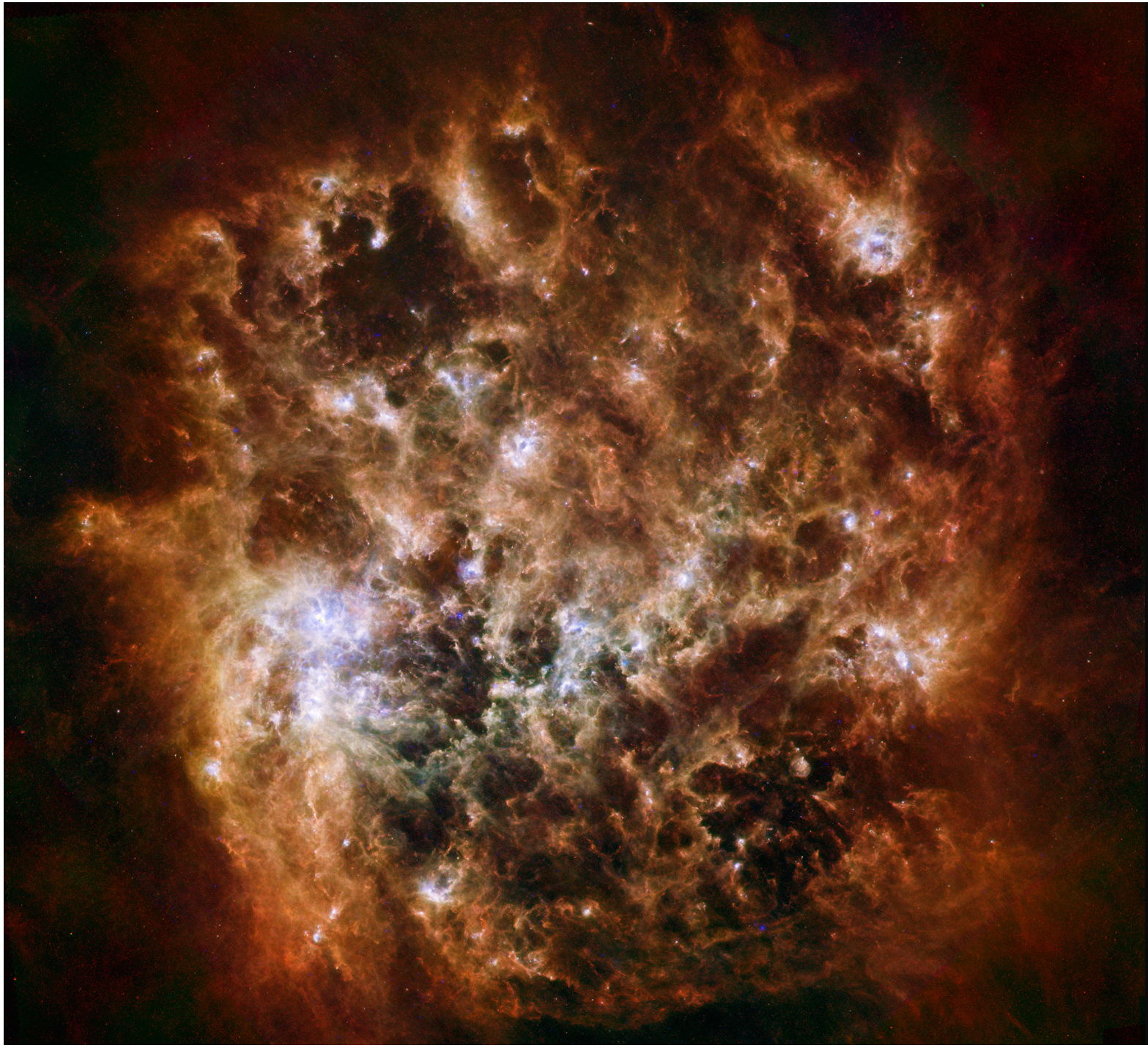
M100: A Grand Design Spiral Galaxy

Image Credit: NASA, ESA,
Processing & License: Judy Schmidt

Explanation: Majestic on a truly cosmic scale, M100 is appropriately known as a grand design spiral galaxy. It is a large galaxy of over 100 billion stars with well-defined spiral arms that is similar to our own Milky Way Galaxy. One of the brightest members of the Virgo Cluster of galaxies, M100 (alias NGC 4321) is 56 million light-years distant toward the constellation of Berenice's Hair (Coma Berenices). This Hubble Space Telescope image of M100 was made in 2009 and reveals bright blue star clusters and intricate winding dust lanes which are hallmarks of this class of galaxies. Studies of variable stars in M100 have played an important role in determining the size and age of the Universe. If you know exactly where to look, you can find a small spot that is a light echo from a bright supernova that was recorded a few years before the image was taken. ap150211.html

October 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 ●
2	3	4	5	6	7	8
9	10	11	12	13	14	15 Uranus at Opposition
16 ○	17	18	19 Juno arrives at Jupiter	20	21 Orionids	22
23	24	25	26	27	28	29 Mars at Perihelion
30 ●	31					



Infrared Portrait of the Large Magellanic Cloud

Credit:
ESA / NASA / JPL-Caltech / STScI

Explanation: Cosmic dust clouds ripple across this infrared portrait of our Milky Way's satellite galaxy, the Large Magellanic Cloud. In fact, the remarkable composite image from the Herschel Space Observatory and the Spitzer Space Telescope show that dust clouds fill this neighboring dwarf galaxy, much like dust along the plane of the Milky Way itself. The dust temperatures tend to trace star forming activity. Spitzer data in blue hues indicate warm dust heated by young stars. Herschel's instruments contributed the image data shown in red and green, revealing dust emission from cooler and intermediate regions where star formation is just beginning or has stopped. Dominated by dust emission, the Large Magellanic Cloud's infrared appearance is different from views in optical images. But this galaxy's well-known Tarantula Nebula still stands out, easily seen here as the brightest region to the left of center. A mere 160,000 light-years distant, the Large Cloud of Magellan is about 30,000 light-years across. ap120115.html

November 2016

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5 Southern Taurids
6	7	8	9	10	11	12 Northern Taurids
13	14 ○	15	16	17 Leonids	18	19
20	21	22	23	24	25	26
27	28	29 ●	30			

The Fornax Cluster of Galaxies

Image Credit & Copyright: Marco Lorenzi

Explanation: How do clusters of galaxies form and evolve? To help find out, astronomers continue to study the second closest cluster of galaxies to Earth: the Fornax cluster, named for the southern constellation toward which most of its galaxies can be found. Although almost 20 times more distant than our neighboring Andromeda galaxy, Fornax is only about 10 percent further that the better known and more populated Virgo cluster of galaxies. Fornax has a well-defined central region that contains many galaxies, but is still evolving. It has other galaxy groupings that appear distinct and have yet to merge. Seen here, almost every yellowish splotch on the image is an elliptical galaxy in the Fornax cluster. The picturesque barred spiral galaxy NGC 1365 visible on the lower right is also a prominent Fornax cluster member.

ap130111.html

December 2016

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

2017

January

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

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				

March

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	

April

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						

May

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			

June

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	

July

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					

August

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		

September

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

October

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				

November

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		

December

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						

2018

January

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

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			

March

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

April

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					

May

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		

June

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

July

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				

August

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	

September

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						

October

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			

November

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	

December

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					

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 is written and edited by Robert J. Nemiroff and Jerry T. Bonnell.

http://apod.nasa.gov/

This free downloadable calendar features images that have appeared on APOD. Moon phases and astronomical event dates/times are UTC.
The editors thank the many astrophotographers and professional astronomers whose images are submitted to and appear on APOD.
Astronomy Picture of the Day is a service of ASD at NASA / GSFC & Michigan Tech. U.