L.A.S.
Lima Astronomical Society

STAR GAZER

Night Sky Network
Astronomy clubs bringing the wonders of the universe to the public

Member of the Astronomical League and the NASA Night Sky Network

October 2022

Lima Astronomical Society • PO Box 201 • Lima, OH 45802 Schoonover Observatory • 670 N. Jefferson St. • Lima, OH 45801

SOCIETY NEWS AND EVENTS

Upcoming Events

MONTHLY MEETINGS

Board Meeting – October 7 @ 7:00 p.m.
Members Meeting – October 7 @ 8:00 p.m.
Held at Schoonover Observatory

Program / Observing

An astronomy-related video or presentation will be provided along with open discussion. A telescope will be set up for observing (weather-dependent).

ANNOUNCEMENTS

The Summer Viewing Program has come to a close. The last date was Friday, September 30. We were considering continuing the program into the Fall; however, those plans were cancelled so the Society can focus on replacing the stolen primary telescope and accessories.

Thanks to ALL those who visited Lima Astro this Summer and supported the club. It means a lot. We hope you had a great time, learned a few things, and enjoyed the experience!

Until next Summer, Schoonover Observatory will be open for observing on the first Friday of each month, concurrent with club meetings. You can also contact an officer and arrange for observing at another time.

One of the primary projects that club officers will focus on through the remainder of 2022 is the replacement of stolen equipment. A GoFundMe has been set up to help fund raise for replacement equipment.

Click on the link above help out.

UNDER THE DOME - PLEASE READ

We need to give a hearty thanks and a round of applause to the Lima Astronomical Society members and officers who have helped out this year!

In addition to keeping Schoonover Observatory open throughout the Summer, there has been a lot of behind-the-scenes work performed to organize outreach events, perform the business of the club, update and organize Schoonover Observatory, dealing with a major theft of equipment, and in planning a path for the club that will benefit future members and patrons for years to come.

Every member and officer is a volunteer. We enjoy what we do, and we believe in the importance of educating current and future generations. If you've been to Schoonover Observatory or one of the outreach events, you've met one of the individuals I'm referring to. We need volunteer help from members.

Each year, the club nominates and elects officers for the following year to perform the duties of the club. Nominations take place in Fall, with the election occurring at the last meeting of the year. Members can be nominated, or you can nominate yourself!

The club constitution and bylaws limits officers to holding (2) consecutive one-year terms (so 2-years back-to-back). Some officers are approaching or have exceeded this limit.

Consider nominating someone or yourself for a position as a Lima Astro officer. Help the club move forward, strengthen relationships, educate, and help pave the way for future members and patrons. **We encourage everyone who can attend to come to the next meeting and help shape the Lima Astro team for 2023**.

If you're reading this and you're a bit nervous about being an officer, believe me - I get it! I was too! But this has been a very rewarding and beneficial experience.

NASA RETIRING AIRBORNE OBSERVATORY

NASA.gov

The Stratospheric Observatory for Infrared Astronomy (SOFIA) was a mission of discovery, revealing unseen – and sometimes unseeable – parts of our universe. As the mission draws to a close, with flights ending on Thursday, Sept. 29, NASA is taking a look back at the scientific accomplishments of SOFIA and some of the feats of engineering that let it fly.

"From deepening our understanding of water on the Moon to revealing the invisible forces of cosmic-scale magnetic fields, none of it could have happened without the hundreds of people who contributed their expertise to the SOFIA mission," said Naseem Rangwala, the mission's project scientist at NASA's Ames Research Center in California's Silicon Valley.

From the start of its development in 1996, SOFIA required engineering ingenuity. A Boeing 747SP jetliner had to be modified to carry the 38,000-pound, 100-inch (more than 17,000-kilogram, 2.5-meter) telescope provided by NASA's partner on the SOFIA mission, the German Space Agency at DLR.

Engineers at Ames developed a garage door-like mechanism that rolled up to let the telescope observe the skies. In that configuration, it was "one of the largest open ports ever flown on an aircraft," said Paul Fusco, a NASA engineer, now retired, who helped design the door system, "and the largest certified to fly at all altitudes and speeds with the door open. It was a really thrilling aviation innovation."

The mission's pilots couldn't even feel when the door was open. And the stability of the telescope itself was equivalent to keeping a laser pointer steady on a penny from 10 miles away. SOFIA had achieved a smooth flight and a steady gaze.

And that was only the beginning. By 2014, the observatory had reached its full operational capability, and for eight years SOFIA helped astronomers around the world use infrared light to study an impressive array of cosmic events and objects invisible to other telescopes.

"SOFIA's unique scientific achievements were the result of the ingenuity of the incredible international community that grew up around the mission," said Alessandra Roy, SOFIA project scientist for the German

Space Agency, "which was only made possible by the collaboration of NASA and DLR."

A community of high school teachers also came to know SOFIA personally, through the NASA Airborne Astronomy Ambassadors program. This professional development opportunity included an immersion experience flying aboard SOFIA with scientists and crew members. Participating teachers were able to bring this real-world science content back to their classrooms and reveal diverse STEM-related careers to students.

Now, the observatory is being retired. Science flights have ended, and the team is exploring options for a fitting permanent home for this special aircraft. SOFIA's data from a total of 732 nights observing over the course of the mission will also be publicly available for scientists to study and conduct further research in the future.

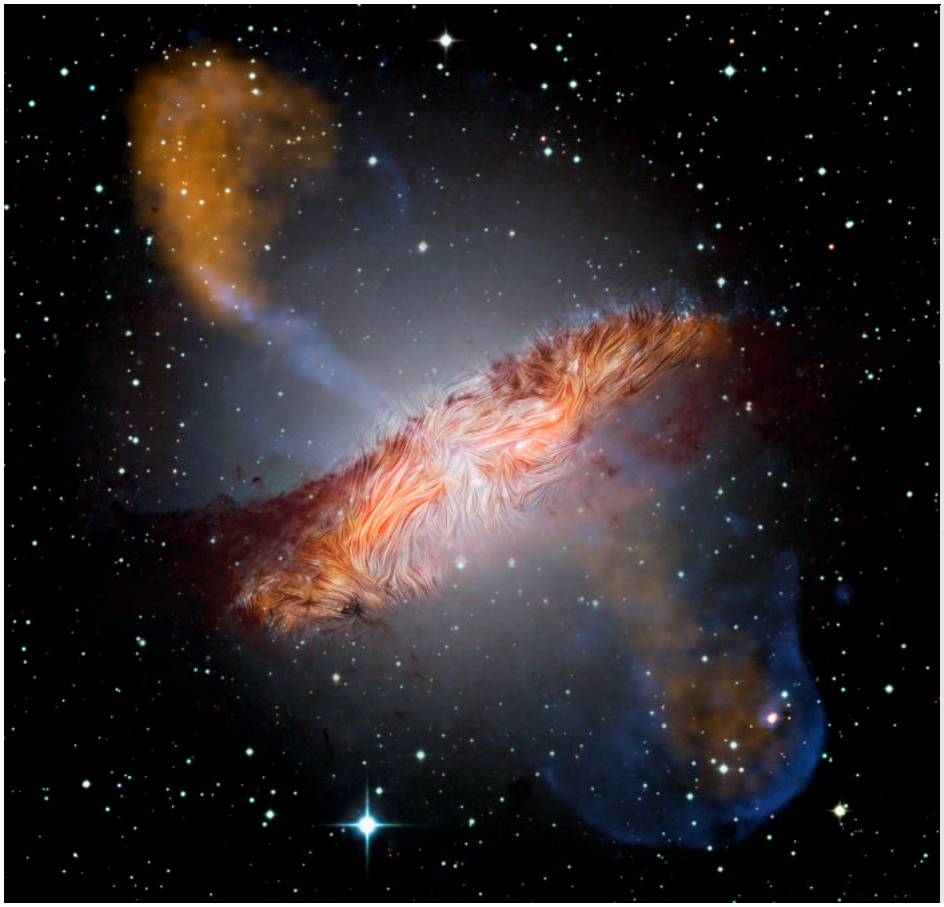
"Infrared astronomy will go on at NASA, most notably with the James Webb Space Telescope," said Paul Hertz, senior advisor for NASA's Science Mission Directorate, former Astrophysics Division director, and former SOFIA program scientist. "But SOFIA's many and diverse contributions to science have already left their mark."

Here are some ways in which SOFIA changed our understanding of the universe. *Click the link in the header to read more on NASA.gov..*

- Discovery of Water on Sunlit Portion of Moon
- Finally Detected: First Type of Molecule to Form in Universe
- Ultra-Time-Sensitive Observations
- Revealing the Magnetic Universe
- New Way to Study Earth's Atmosphere, Climate
- A Star Is Born – or Not

Astronomers learned all these things and many more as SOFIA explored the universe from 40,000 feet. Even as the mission winds down, making way for the next chapter in infrared astronomy, the discoveries made from the observatory's data will go on. SOFIA's legacy and that of the entire team who made the mission fly is to have taught humanity more about the cosmos and inspired others to do the same.

SOFIA was a joint project of NASA and the German Space Agency at DLR. DLR provided the telescope, scheduled aircraft maintenance, and other support for the mission. NASA's Ames Research Center in California's Silicon Valley managed the SOFIA program, science, and mission operations in cooperation with the Universities Space Research Association, headquartered in Columbia, Maryland, and the German SOFIA Institute at the University of Stuttgart. The aircraft was maintained and operated by NASA's Armstrong Flight Research Center Building 703, in Palmdale, California. SOFIA achieved full operational capability in 2014 and concluded its final science flight on Sept. 29, 2022.



Magnetic fields observed by SOFIA in the galaxy Centaurus A are shown as streamlines over a composite image taken at multiple wavelengths by several observatories. The large-scale magnetic fields, 1,600 light-years across, are parallel to the dust lanes seen in visible light and other wavelengths. However, the fields appear twisted and distorted near the middle – a remnant of the spiral-shaped magnetic field from one of the original galaxies that merged to form Centaurus A. The active, supermassive black hole at its core adds to the distortions. Visible and submillimeter wavelengths are shown in orange, X-ray wavelengths in blue, and infrared in dark red.

Credits: Optical: European Southern Observatory Wide Field Imager; Submillimeter: Max Planck Institute for Radio Astronomy/ESO/Atacama Pathfinder Experiment/A.Weiss et al.; X-ray and Infrared: NASA/Chandra/R. Kraft; JPL-Caltech/J. Keene; SOFIA/L. Proudfit

DART STRIKES ITS ASTEROID, IN 1ST PLANETARY DEFENSE TEST

EarthSky.org

DART – the Double Asteroid Redirect Test – has struck its target. DART is the first real test of our ability to defend ourselves from an asteroid on a collision course with Earth. For this test, DART targeted Didymos B – aka Dimorphos – a little asteroid moon just 525 feet (160 m) in diameter. It struck the little asteroid – hoping to nudge it slightly off-orbit – at 7:14 p.m. ET (23:14 UTC) on Monday, September 26, 2022.

In a NASA press release, the space agency explained:

The investigation team will now observe Dimorphos using ground-based telescopes to confirm that DART's impact altered the asteroid's orbit around Didymos. Researchers expect the impact to shorten Dimorphos' orbit by about 1%, or roughly 10 minutes; precisely measuring how much the asteroid was deflected is one of the primary purposes of the full-scale test.

In other words, NASA is trying to deflect little Didymos B from its orbit.

This test will show if we're ready to take on any threatening asteroids that could be headed our way.

WHAT WE SAW, THROUGH DART'S EYES

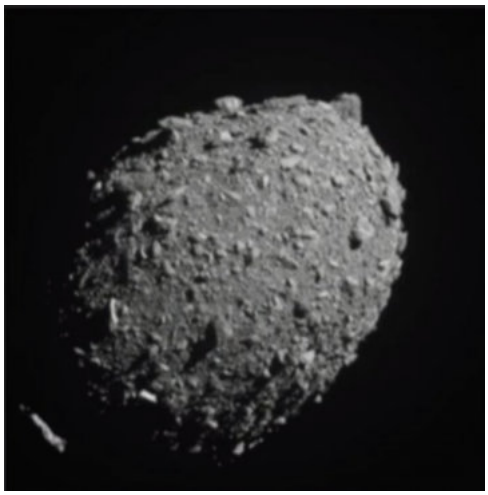
NASA said DART had its first look at its target, the asteroid system Didymos and its moon Dimorphos (or Didymos B), back in July.

On September 11, the LICIACube spacecraft, which witnessed the impact, successfully separated from DART.

And all the while DART was coming closer and closer to its target. DART carried a powerful camera, called DRACO. Four hours before impact, DART switched into autonomous control, using DRACO's images to guide itself to crash onto Didymos B. As the spacecraft neared the asteroid, DRACO transmitted back to Earth closeups of Didymos B's surface features, sharing its images at a rate of one per second, to provide a video-like experience for viewers.

If you watched (as many of us at EarthSky did), you saw Didymos B first appear as a separate tiny dot to the upper right of a brighter dot (Didymos A). Then, very quickly it seemed, DART came closer and closer … and Didymos A and Didymos B both resolved into actual rocky bodies in space. DART swept past Didymos A, and it left the




DART ASTEROID STRIKE IN PICTURES

frame. Then Didymos B got closer, and closer, and closer … then nothing.

Three minutes after DART struck the asteroid, LICIACube also flew past Didymos B, capturing images and video of a dust cloud wafting from the asteroid.

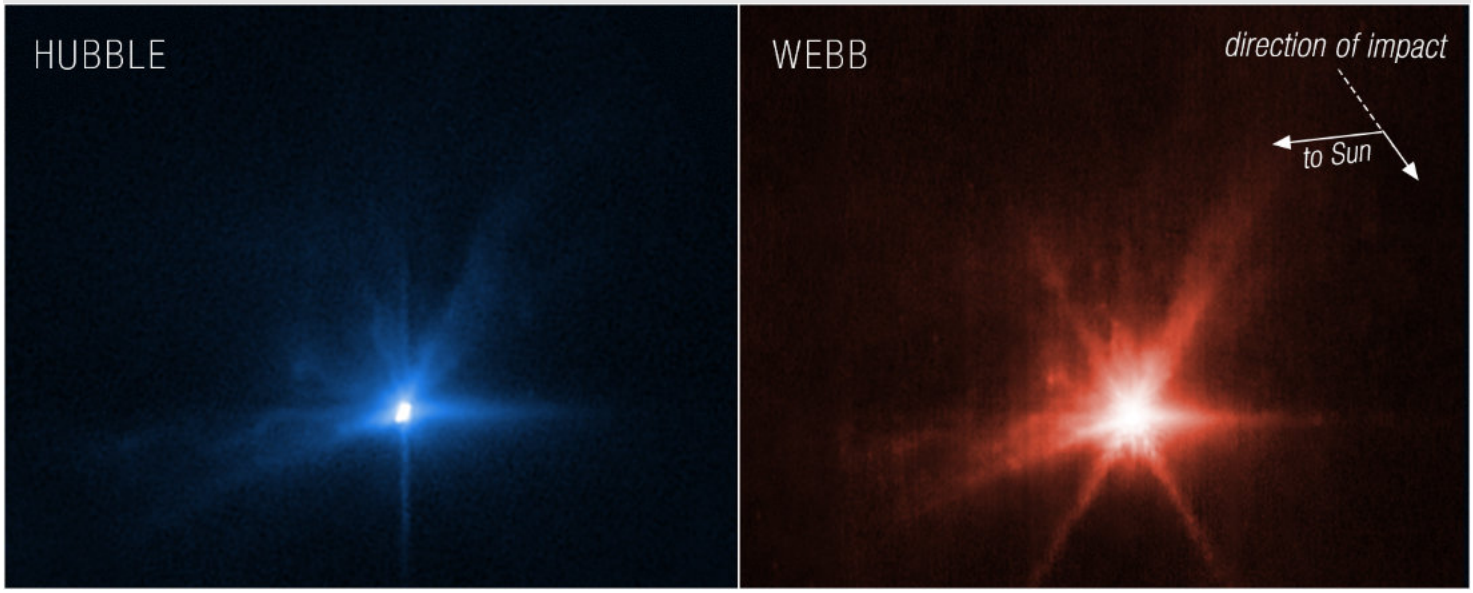
THE DART MISSION IS ONLY A TEST

Didymos B poses no threat to Earth. This little moonlet and its parent asteroid orbit the sun in an elliptical path that brings them close to Earth and then out past the orbit of Mars. Didymos B is the size of a typical asteroid that might threaten Earth. If DART is successful, it will be the world's first test of technology to defend Earth against threats of an asteroid on a collision path with our world. As NASA said:

This test will show that a spacecraft can autonomously navigate to a target asteroid and intentionally collide with it to change the asteroid's motion in a way that can be measured using ground-based telescopes. DART will provide important data to help better prepare for an asteroid that might pose an impact hazard to Earth, should one ever be discovered.

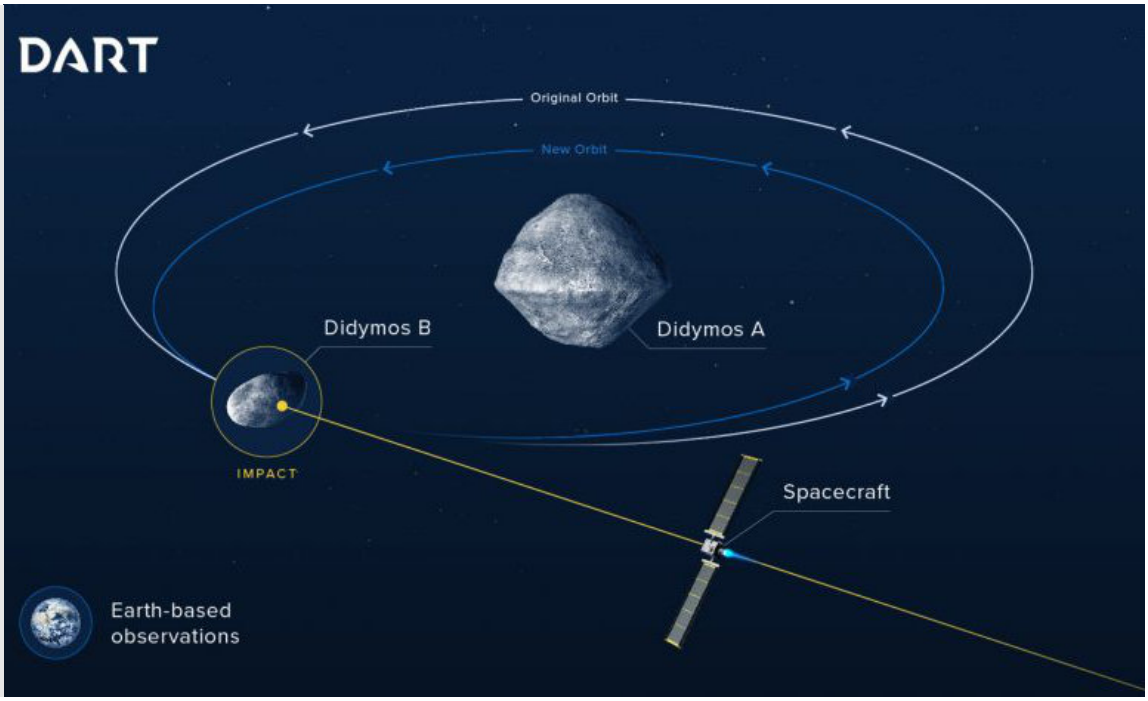
When the impact occurred, Italy's LICIACube was watching. LICIACube – or the Light Italian Cubesat for Imaging of Asteroids – was part of the DART mission and successfully separated from DART on September 11. The little spacecraft hopefully caught the impact plume, measured the impact site and observed the non-impacted hemisphere as well.

The Hubble and James Webb Space Telescopes both captured the impact of DART. ***Image via NASA***

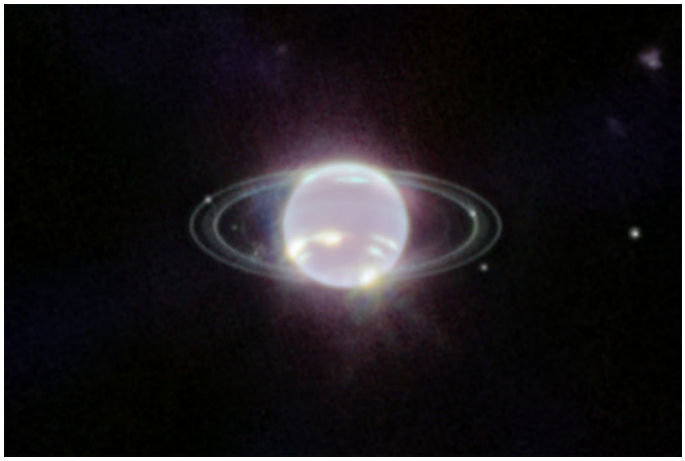


This graphic depicts what has now happened. DART reached the double asteroid system Didymos A and B on Monday, September 26. It steered itself into the smaller asteroid at a speed of about 4 miles per second (6.6 km/s).

Image via ESA/ NASA/ Johns Hopkins APL/ Steve Gribben.



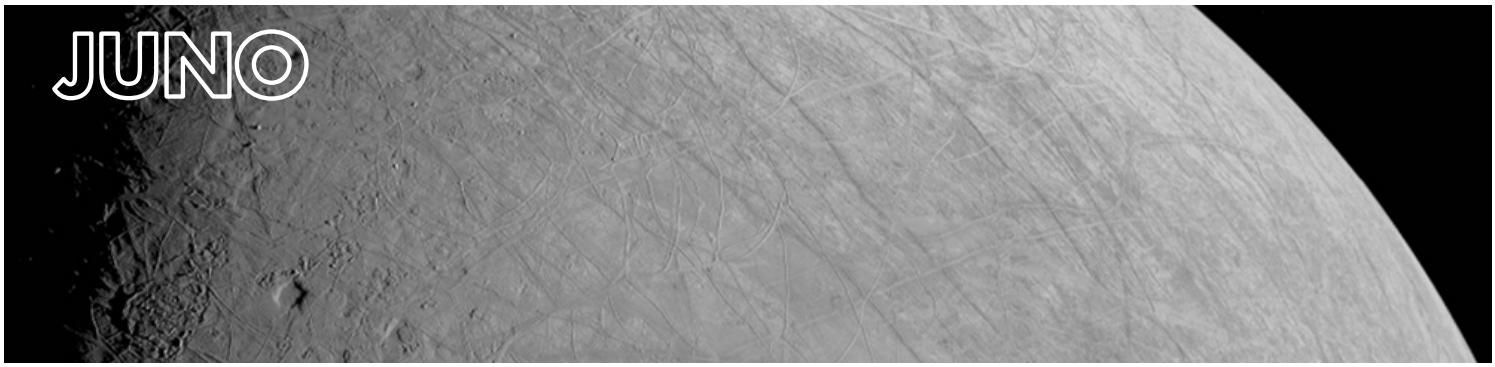
JAMES WEBB SPACE TELESCOPE



NASA's James Webb Space Telescope shows off its capabilities closer to home with its first image of Neptune. Not only has Webb captured the clearest view of this distant planet's rings in more than 30 years, but its cameras reveal the ice giant in a whole new light.

Most striking in Webb's new image is the crisp view of the planet's rings – some of which have not been detected since NASA's Voyager 2 became the first spacecraft to observe Neptune during its flyby in 1989. In addition to several bright, narrow rings, the Webb image clearly shows Neptune's fainter dust bands

Neptune has fascinated researchers since its discovery in 1846. Located 30 times farther from the Sun than Earth, Neptune orbits in the remote, dark region of the outer solar system. At that extreme distance, the Sun is so small and faint that high noon on Neptune is similar to a dim twilight on Earth.



NASA's Juno Shares First Image From Flyby of Jupiter's Moon Europa. Observations from the spacecraft's pass of the moon provided the first close-up in over two decades of this ocean world, resulting in remarkable imagery and unique science. The image was captured during the solar-powered spacecraft's closest approach, on Thursday, Sept. 29, at 2:36 a.m. PDT (5:36 a.m. EDT), at a distance of about 219 miles (352 kilometers).

This is only the third close pass in history below 310 miles (500 kilometers) altitude and the closest look any spacecraft has provided at Europa since Jan. 3, 2000, when NASA's Galileo came within 218 miles (351 kilometers) of the surface.

ARTEMIS

Teams at NASA's Kennedy Space Center in Florida conducted initial inspections Friday to assess potential impacts from Hurricane Ian. There was no damage to Artemis flight hardware, and facilities are in good shape with only minor water intrusion identified in a few locations. Next, engineers will extend access platforms around the Space Launch System rocket and Orion spacecraft inside the Vehicle Assembly Building (VAB) to prepare for additional inspections and start preparation for the next launch attempt, including retesting the flight termination system.

As teams complete post-storm recovery operations, NASA has determined it will focus Artemis I launch planning efforts on the launch period that opens Nov. 12 and closes Nov. 27. Over the coming days, managers will assess the scope of work to perform while in the VAB and identify a specific date for the next launch attempt. Focusing efforts on the November launch period allows time for employees at Kennedy to address the needs of their families and homes after the storm and for teams to identify additional checkouts needed before returning to the pad for launch.

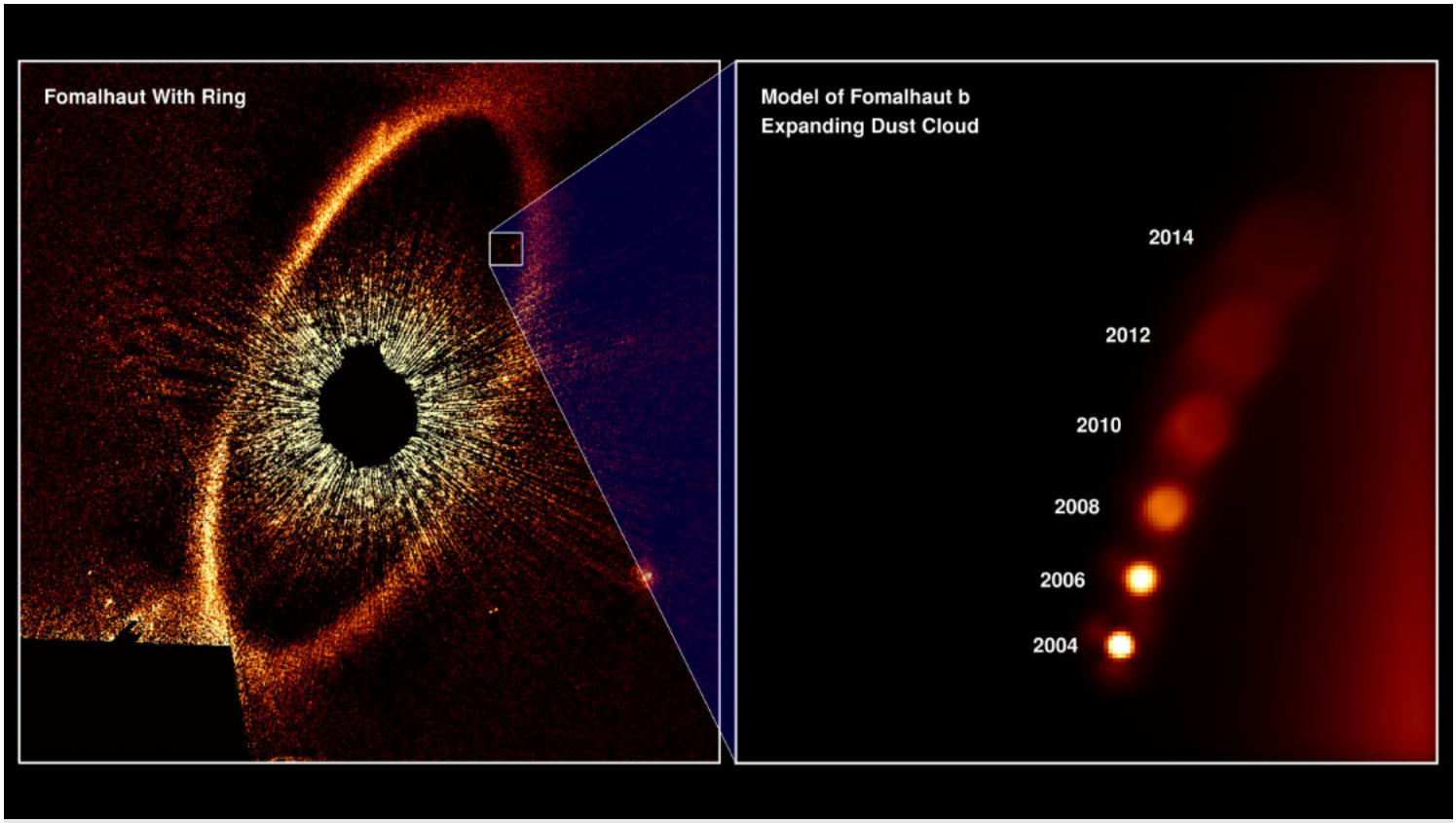
FOMALHAUT: NOT SO LONELY AFTER ALL

DAVID PROSPER - NIGHT SKY NETWORK

Fall evenings bring a prominent visitor to southern skies for Northern Hemisphere observers: the bright star Fomalhaut! Sometimes called "The Autumn Star," Fomalhaut appears unusually distant from other bright stars in its section of sky, leading to its other nickname: "The Loneliest Star." Since this star appears so low and lonely over the horizon for many observers, is so bright, and often wildly twinkles from atmospheric turbulence, Fomalhaut's brief but bright seasonal appearance often inspires a few startled UFO reports. While definitely out of this world – Fomalhaut is about 25 light years distant from us – it has been extensively studied and is a fascinating, and very identified, stellar object.

Fomalhaut appears solitary, but it does in fact have company. Fomalhaut's entourage includes two stellar companions, both of which keep their distance but are still gravitationally bound. Fomalhaut B (aka TW Piscis Austrini, not to be confused with former planetary candidate Fomalhaut b*), is an orange dwarf star almost a light year distant from its parent star (Fomalhaut A), and Fomalhaut C (aka LP 876-10), a red dwarf star located a little over 3 light years from Fomalhaut A! Surprisingly far from its parent star – even from our view on Earth, Fomalhaut C lies in the constellation Aquarius, while Fomalhaut A and B lie in Piscis Australis, another constellation! – studies of Fomalhaut C confirm it as the third stellar member of the Fomalhaut system, its immense distance still within Fomalhaut A's gravitational influence. So, while not truly "lonely," Fomalhaut A's companions do keep their distance.

Fomalhaut's most famous feature is a massive and complex disc of debris spanning many billions of miles in diameter. This disc was first detected by NASA's IRAS space telescope in the 1980s, and first imaged in visible light by Hubble in 2004. Studies by additional advanced telescopes, based both on Earth's surface and in space, show the debris around Fomalhaut to be differentiated into several "rings" or "belts" of different sizes and types of materials. Complicating matters further, the disc is not centered on the star itself, but on a point approximately 1.4 billion miles away, or half a billion miles further from Fomalhaut than Saturn is from our own Sun! In the



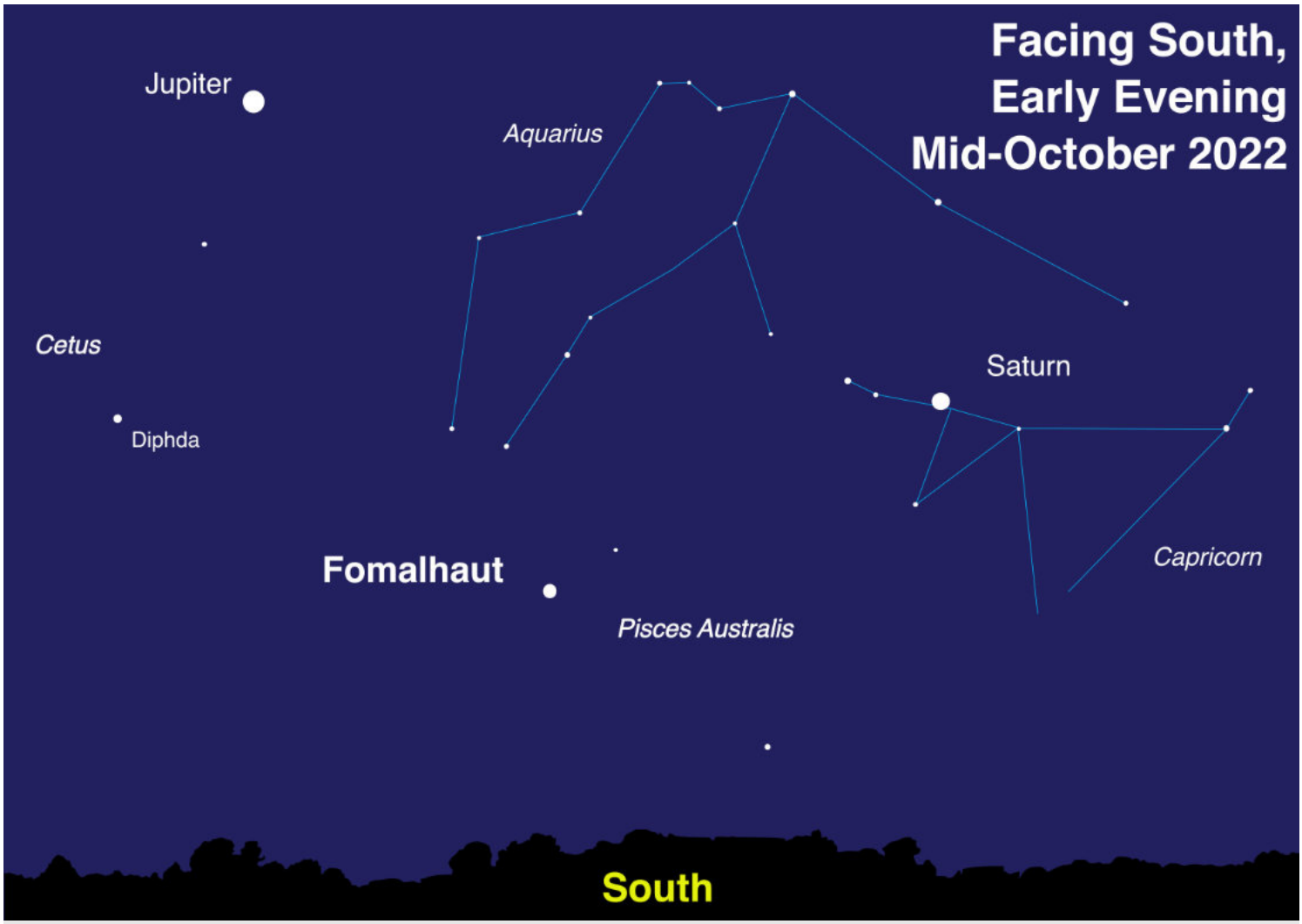
The magnificent and complex dust disc of the Fomalhaut system (left) with the path and dissolution of former planetary candidate Fomalhaut b displayed in detail (right).

Image credits: NASA, ESA, and A. Gáspár and G. Rieke (University of Arizona) Source: https://www.nasa.gov/feature/goddard/2020/exoplanet-apparently-disappears-in-latest-hubble-observations

mid-2000s a candidate planetary body was imaged by Hubble and named Fomalhaut b. However, Fomalhaut b was observed to slowly fade over multiple years of observations, and its trajectory appeared to take it out of the system, which is curious behavior for a planet. Scientists now suspect that Hubble observed the shattered debris of a recent violent collision between two 125-mile wide bodies, their impact driving the remains of the now decidedly non-planetary Fomalhaut b out of the system! Interestingly enough, Fomalhaut A isn't the only star in its system to host a dusty disc; Fomalhaut C also hosts a disc, detected by the Herschel Space Observatory in 2013. Despite their distance, the two stars may be exchanging material between their discs - including comets! Their co-mingling may help to explain the elliptical nature of both of the stars' debris discs. The odd one out, Fomalhaut B does not possess a debris disc of its own, but may host at least one suspected planet.

While Hubble imaged the infamous "imposter planet" of Fomalhaut b, very few planets have been directly imaged by powerful telescopes, but NASA's James Webb Space Telescope will soon change that. In fact, Webb will be imaging Fomalhaut and its famous disc in the near future, and its tremendous power is sure to tease out more amazing discoveries from its dusty grains. You can learn about the latest discoveries from Webb and NASA's other amazing missions at nasa.gov.

**Astronomers use capital letters to label companion stars, while lowercase letters are used to label planets.*



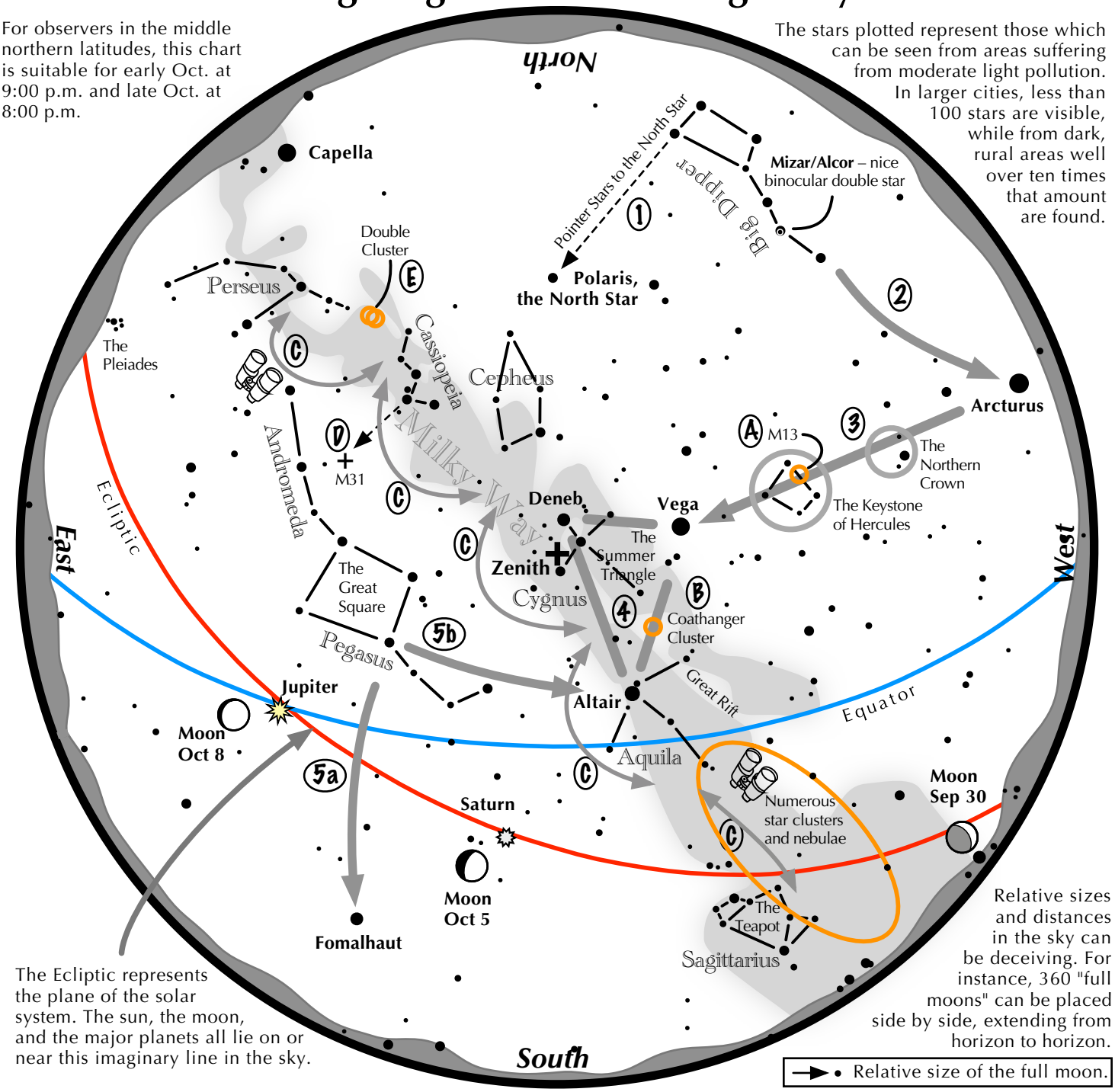
Sky map of the southern facing sky for mid-latitude Northern Hemisphere observers. With Fomalhaut lying so low for many observers, its fellow member stars in the constellation Piscis Australis won't be easily visible for many without aid due to a combination of light pollution and atmospheric extinction (thick air dimming the light from the stars). Fomalhaut is by far the brightest star in its constellation, and is one of the brightest stars in the night sky. While the dim constellations of Aquarius and Capricorn may also not be visible to many without aid, they are outlined here. While known as the "Loneliest Star," you can see that Fomalhaut has two relatively close and bright visitors this year: Jupiter and Saturn!

Illustration created with assistance from Stellarium

Navigating the October Night Sky

For observers in the middle northern latitudes, this chart is suitable for early Oct. at 9:00 p.m. and late Oct. at 8:00 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

→• Relative size of the full moon.

Navigating the October night sky: Simply start with what you know or with what you can easily find.

1. Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
2. Follow the arc of the Dipper's handle. It intersects Arcturus, the brightest star in the early October evening sky.
3. To the northeast of Arcturus shines another star of the same brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
4. Nearly overhead lie the summer triangle stars of Vega, Altair, and Deneb.
5. High in the east are the four moderately bright stars of the Great Square. Its two southern stars point west to Altair. Its two western stars point south to Fomalhaut.

Binocular Highlights

A: On the western side of the Keystone glows the Great Hercules Cluster, a ball of 500,000 stars. **B:** 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger. **C:** Sweep along the Milky Way for an astounding number of fuzzy star clusters and nebulae amid many faint glows and dark bays, including the Great Rift. **D:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **E:** Between the "W" of Cassiopeia and Perseus lies the Double Cluster.

OBSERVING LISTS

Top ten deep-sky objects for October	
K 12	NGC 7332
M 52	NGC 7339
NGC 7209	NGC 7640
NGC 7293	NGC 7662
NGC 7331	NGC 7789

Top ten binocular objects for October	
M 52	NGC 7510
NGC 7209	NGC 7686
NGC 7235	NGC 7789
NGC 7243	NGC 7790
NGC 7293	ST 12

Challenge deep-sky object for October

Jones 1 (PK104-29.1)

Jones 1 is a very faint, ghostlike planetary nebula in the constellation of Pegasus. It has its somewhat unusual name because it was discovered by Rebecca Jones of Harvard College Observatory in 1941.

Apparent Magnitude: 15.6
Surface Brightness: 19.0

THIS MONTH IN ASTRONOMY

- The first recorded solar eclipse took place on October 22, 2136 BCE.

- Supernova SN 1604 (Kepler's Supernova) became visible to the naked-eye on October 9, 1604.
- Giovanni Cassini discovered Saturn's odd satellite Iapetus on October 25, 1671.
- M51a (the Whirlpool Galaxy) was discovered by Charles Messier on October 13, 1773.
- William Lassell discovered Triton, Neptune's brightest satellite, on October 10, 1846.
- Maria Mitchell discovered Comet C/1847 T1 (Miss Mitchell's Comet) on October 1, 1847.
- Asteroid 8 Flora was discovered by John Russell Hind on October 18, 1847.
- Two of the satellites of Uranus, Ariel and Umbriel, were discovered by William Lassell on October 24, 1851.
- Edwin Hubble discovered Cepheid variable stars in M31 (the Andromeda Galaxy) on October 5, 1923.
- Charles Kowal discovered 2060 Chiron, the first Centaur asteroid, on October 18, 1977.
- Michel Mayor and Didier Queloz announced the discovery of the exoplanet 51 Pegasi b (Dimidium) on October 6, 1995.

NGC 7331

HUBBLE SPACE TELESCOPE / NASA

October 2022 Astronomy Events Calendar

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
						1 Mercury stationary
2 Mercury at ascending node	**3** **First quarter Moon**	**4** Moon at perigee	**5** Saturn 4° N of Moon	**6** Mercury at perihelion	**7** **LAS Meeting @ 8pm** **V**esta stationary	**8** Neptune 3° N of Moon **Jupiter 2° N of Moon** **Mercury greatest elongation W**
9 **Full Moon**	**10**	**11**	**12** **Uranus 0.8° S of Moon** **Double shadow transit on Jupiter**	**13**	**14**	**15** Mars 4° S of Moon
16	**17** **Last quarter Moon** Moon at apogee Mercury at greatest heliocentric lat. N **Pollux 1.8° N of Moon**	**18**	**19** Juno stationary **Double shadow transit on Jupiter**	**20** Mars at ascending node	**21** Orionid meteors peak	**22** Venus in superior conjunction
23 Saturn stationary	**24**	**25** **New Moon**	**26** **Double shadow transit on Jupiter**	**27**	**28**	**29** Moon at perigee
30 Mars stationary	**31**					