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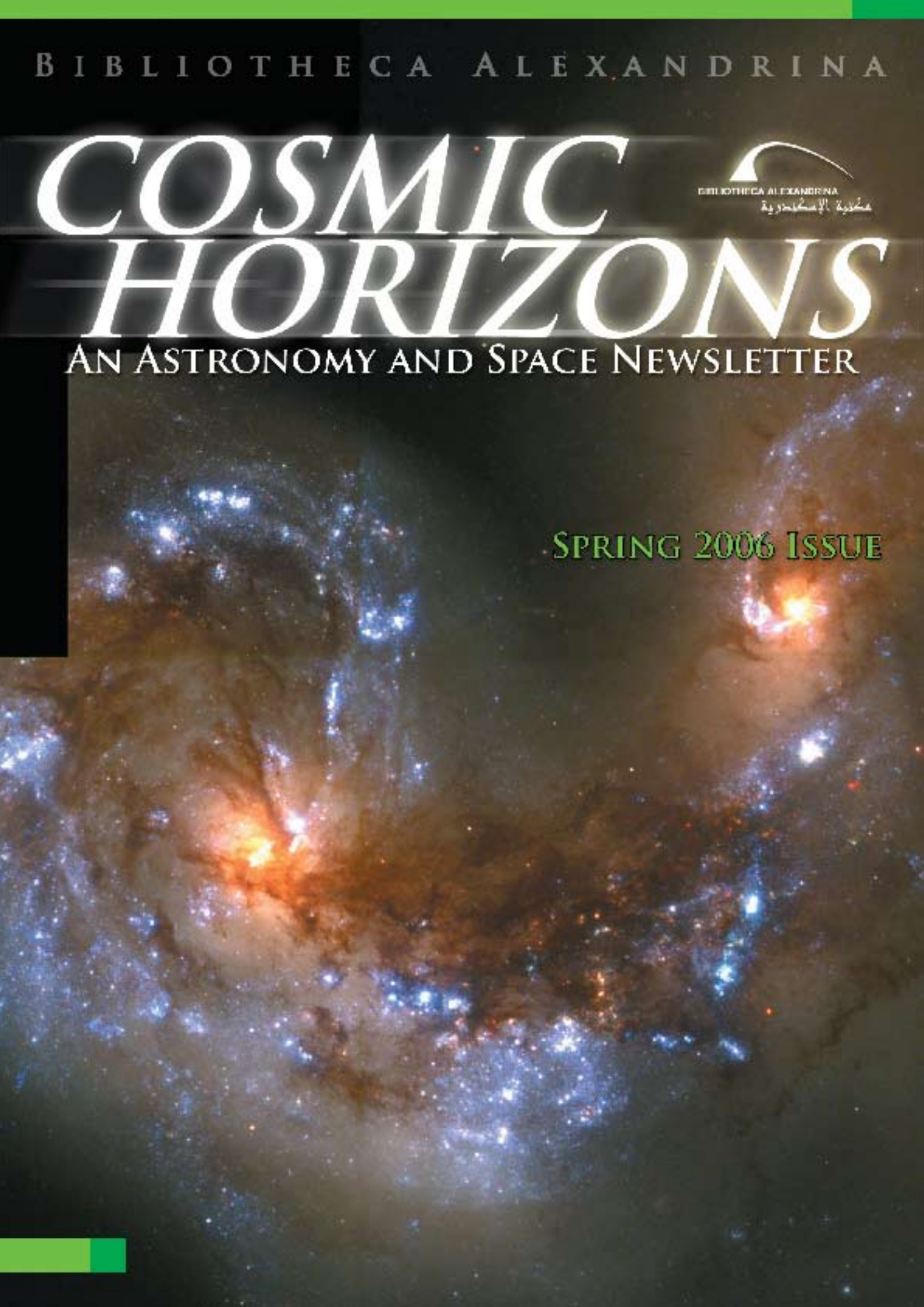
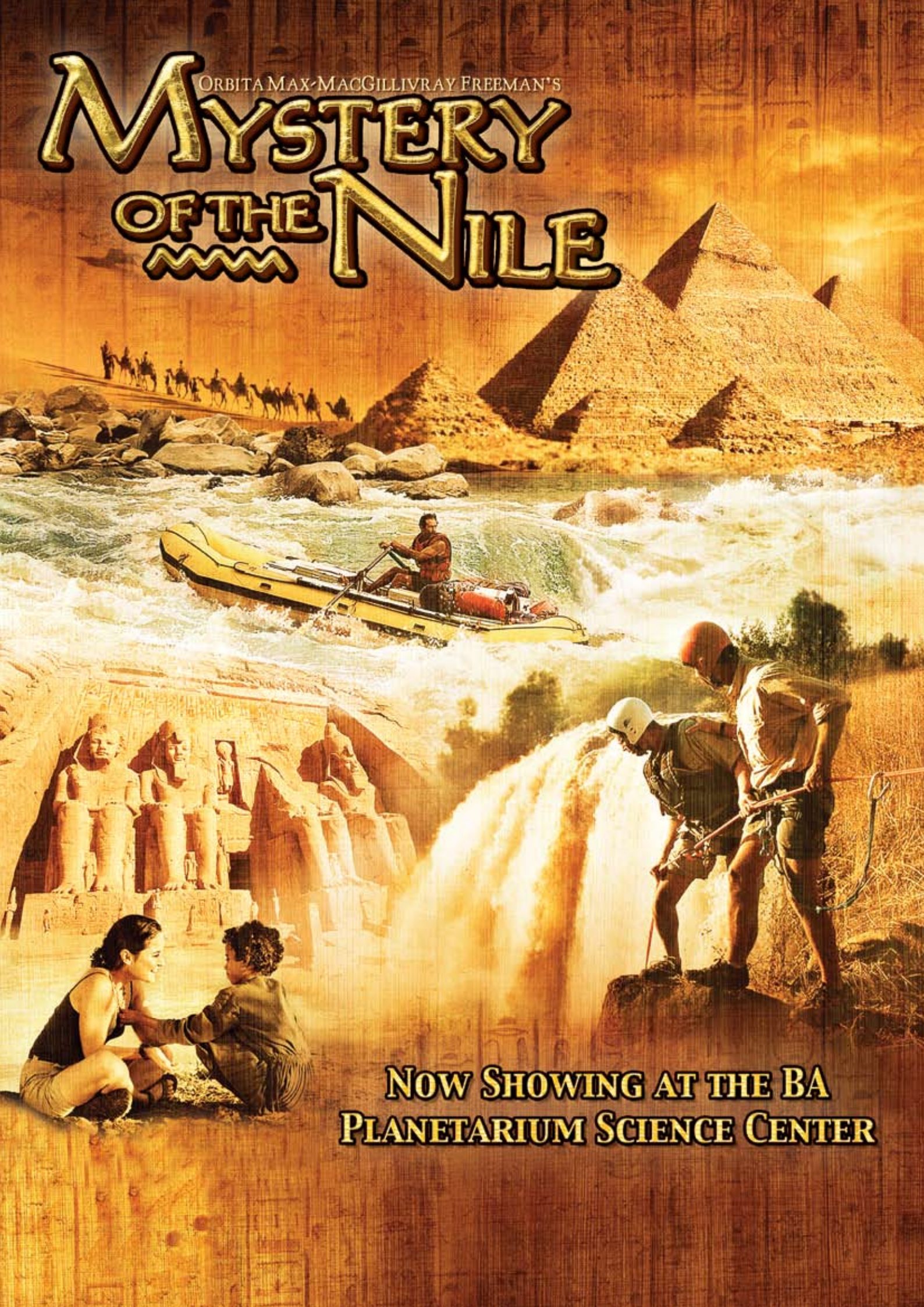
AN ASTRONOMY AND SPACE NEWSLETTER



SPRING 2006 ISSUE


Orbita Max-MacGillivray Freeman's
Mystery of the Nile
Now Showing at the BA
Planetarium Science Center

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Credit: Brad Whitmore (STScI) and NASA

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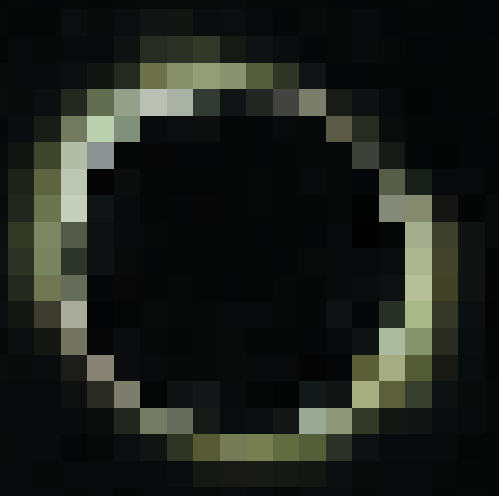
Editorial

Totality over Al Salloum



Aymen Mohamed Ibrahem

PSC Senior Astronomy Specialist

On 29 March 2006, a total solar eclipse was visible in Al Salloum, Matruh, Egypt. The Planetarium Science Center (PSC) organized an eclipse expedition to Al Salloum to observe the eclipse. The PSC staff, and the speakers and participants of the Frontiers of Astronomy School/ Workshop joined this expedition.

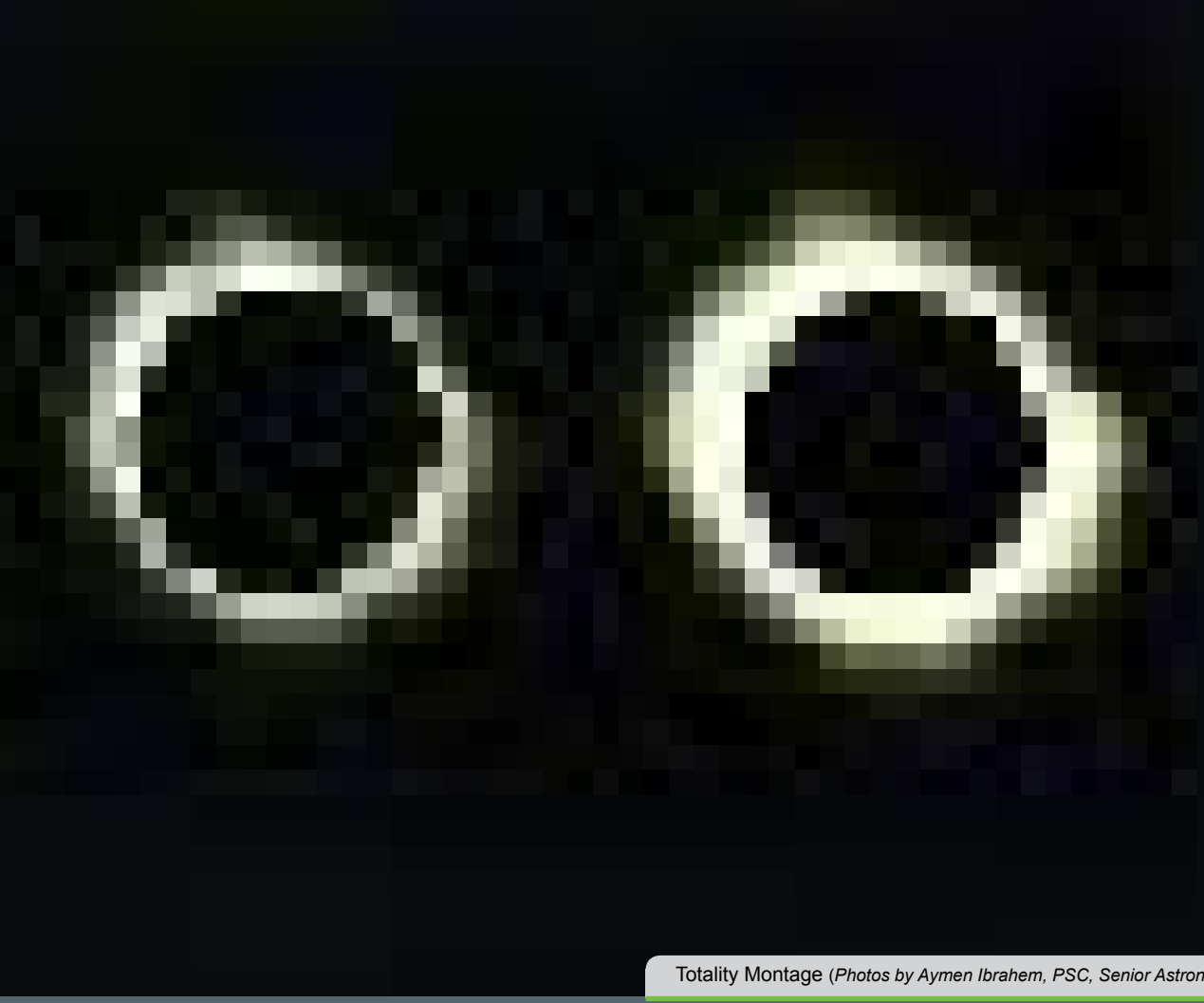
The PSC camp was atop Al Salloum plateau, one of the most splendid sites of the Egyptian Mediterranean shores. Over 20,000 eclipse enthusiasts from all around the world were also camping over the plateau.

I photographed the entire eclipse, recording the partial phases and totality. Many of my photos were published by publishers in Germany, Switzerland, UK, and USA.

About two hours before the first contact, the moment after which a solar eclipse begins, I toured the plateau. There were numerous tents, and thousands of eclipse chasers. They brought wonderful telescopes, cameras and camcorders to capture the graceful moments of totality. I talked briefly to some of them, as I was so interested in their equipment.

The eclipse began at 11:20 LT (09:20 UT); it was a great thrill to see the Moon taking the first bite out of the Sun. The dark New Moon then started to creep across the Sun disc. Daylight was considerably affected when the Moon blocked over 50% of the Sun, and the effect became much more pronounced about 15 minutes before totality. I was able to photograph the diamond ring prior to totality.

The Moon concealed the Sun completely at 12:38 LT. The sky became dark enough through totality for the planets and brightest stars to appear; however, Venus, the brightest celestial object, next to the Sun and the Moon, shone even before totality, and remained visible for a few minutes past totality. Mercury, the closest planet to the Sun, was also easily visible, about halfway between the Sun and Venus.



Totality Montage (*Photos by Aymen Ibrahem, PSC, Senior Astronomy Specialist)*

During totality, it was difficult to the members of our team to see each other. It was as dark as evening twilight.

The solar corona, the mysterious outer atmosphere of the Sun, glowed like a shimmering pearl in the sky. It was a breathtaking view. Thousands of people were cheering and applauding for the spectacle.

The horizon was illuminated by a fascinating deep orange glow, and the whole scene resembled an alien landscape of a distant unknown planet. Unfortunately, totality lasted only 3 minutes 55 seconds, and in the most favorable solar eclipses, totality is about 7 minutes long.

After totality, the Sun reappeared gradually, and daylight returned to its normal level. The eclipse ended at 14:00 LT, when the Moon was externally tangential to the Sun; this stage is known as the fourth contact.

The eclipse was total in only three other cities in the North Coast of Egypt, near Al Salloum. Elsewhere; the eclipse was partial over the entire Egyptian territory. In Cairo and Alexandria, however, the Moon concealed over 80% of the solar diameter. At the time of greatest eclipse, daylight was much reduced in Alexandria.

A public observing session took place at Helwan Observatory, Cairo, on the eclipse day. In the Bibliotheca Alexandrina, there was a festivity featuring a public observing session, public astronomy lectures, and video conferencing with NASA and other institutions that observed the eclipse in Turkey. Over 4,000 visitors participated in the festivity.

It was my first total solar eclipse. It was incredible; the most spectacular observing campaign in my entire career! It was an experience of observing an observance.

Further reading

http://172.16.0.6/Eclipse2006/FrontiersOfAstronomy.htm

Sweet Sixteen

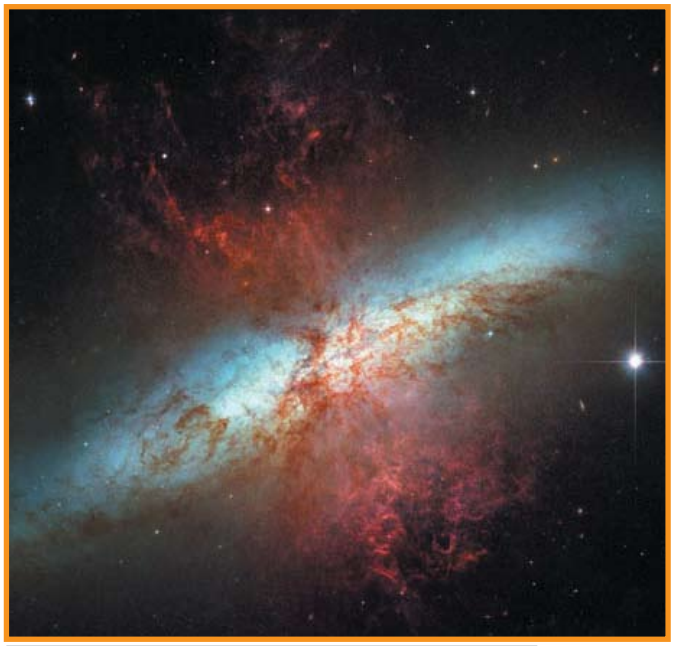


Fig (1) Starburst galaxy M82

The Hubble Space Telescope (HST) was launched on 24 April 1990. To celebrate HST's 16th anniversary, NASA and the European Space Agency (ESA), the responsibles for the Hubble project, released a new image obtained by HST.

The image shows the active galaxy M82. It is a "starburst galaxy", where a vigorous star formation process takes place. M82 is one of the nearest bright galaxies; it is located at a distance of about 12 million light years. (One light year is approximately 10^{13} km.)

M82 is well known for its bright, blue disc, webs of cosmic clouds, and fiery-looking plumes of hydrogen gas blasting off its central regions.

Stars are being born at a high rate in M82 central regions; this is the result of tidal interaction with its larger neighbor, galaxy M81. Actually, M81 and M82 are members of a group of galaxies that contains at least 19 galaxies. These galaxies are gravitationally bound, and lie in the constellation Ursa Major.

Astronomers postulate that M82 harbors a mid-size black hole, with a mass of 500 solar masses, in its core. Interestingly, M82 is nicknamed the "Cigar Galaxy", due to its elongated shape.

M81 and M82 were discovered in 1774 by German astronomer, Johann Elert Bode (1747-1826).

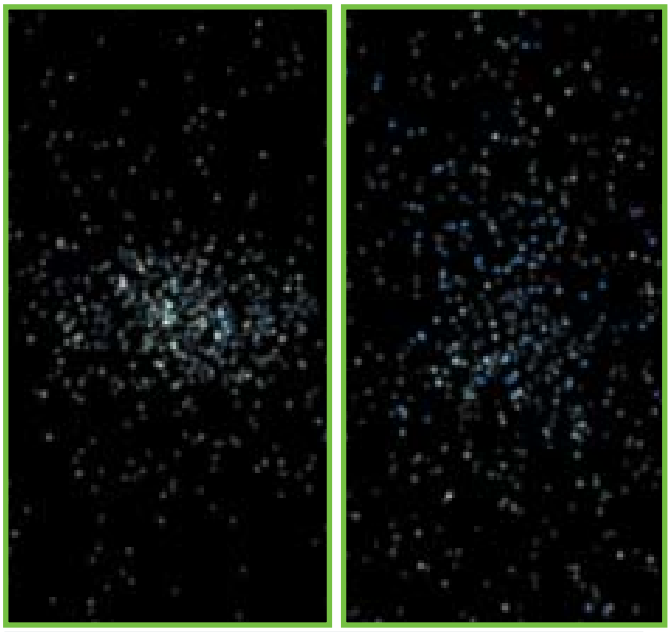
HST orbits Earth at an altitude of about 600 km. It was named in honor of the American astronomer Edwin P. Hubble (1889-1953), who made enormous contributions to astronomy, including the discovery of the expansion of the Universe.

Further reading

Happy Sweet Sixteen, Hubble Telescope!
http://hubblesite.org/newscenter/newsdesk/archive/releases/2006/14/

Galaxy on Fire
http://www.spitzer.caltech.edu/Media/releases/ssc2006-09/index.shtml

Discovery of Two Dwarf Galaxies



(Credit: Vasily Belokurov, SDSS-II Collaboration)

On 8 May 2006, the Sloan Digital Sky Survey (SDSS-II) announced the discovery of two dwarf companion galaxies to the Milky Way Galaxy.

The Cambridge University astronomer Daniel Zucker discovered the first dwarf galaxy in the constellation Canes Venatici (Hunting Dogs). The second galaxy was discovered by Vasily Belokurov in the constellation Bootes (the Herdsman).

"I was poring over the survey's map of distant stars in the Northern Galactic sky — what we call a Field of Streams — and noticed an over density in Canes Venatici," Zucker explained. "Looking further, it proved to be a previously unknown dwarf galaxy. It is about 640,000 light years (200 kiloparsecs) from the Sun. This makes it one of the most remote of the Milky Way's companion galaxies."

Zucker emailed Belokurov about the discovery, who replied a few hours later reporting the discovery of a new, even fainter galaxy, in the constellation Bootes. Belokurov nicknamed this galaxy Boo. It is the faintest galaxy ever discovered, and located 190,000 light years away; its structure is disrupted, indicating strong tidal effects from our massive Galaxy.

The two galaxies are very near by cosmic standards; they are difficult to observe, however, due to their faintness.

Further reading
New Milky Way Companions Found
http://www.sdss.org/news/releases/20060508.companions.html

Cosmic Collision

Fig (1) The Tadpole Galaxy

The Hubble Site, the website for NASA's Hubble Space Telescope (HST), recently presented magnificent wallpaper for your PC: an exquisite image of the Tadpole Galaxy. The galaxy is named for its shape, distorted due to a collision with a small blue galaxy (visible in the upper left corner of the Tadpole Galaxy).

The Tadpole Galaxy is only 420 million light years away. It is a nearby galaxy by cosmic standards!

The Tadpole's tail of galactic debris, consisting of stars and gas, was created due to the strong gravitational forces of the interaction between the galaxy and the smaller intruding galaxy. This galactic interaction is similar in nature to the tidal interaction of the Earth-Moon system.

The "tidal tail" is 280,000 light years across. (Our Milky Way Galaxy, home to about 200 billion stars, is about 100,000 light years across!)

The impact resulted in the formation of numerous stars and star clusters, seen in the tidal tail and spiral arms of the Tadpole Galaxy. The clusters contain massive blue stars which are much hotter than the Sun.

Clumps of material have also been formed in the tidal tail. These clumps contain young massive stars, and are likely to evolve into small satellite galaxies of the Tadpole Galaxy.

About 6,000 galaxies are visible in the background of the Tadpole Galaxy!

The image was taken with HST's Advanced Camera for Surveys (ACS), a technological masterpiece that enables astronomers to detect the faintest and most distant objects in the Universe.

Further reading

The Hubble Site
http://hubblesite.org/
Wallpaper: The Tadpole Galaxy
http://hubblesite.org/gallery/wallpaper/pr2002011a/

Jupiter gains another Red Spot

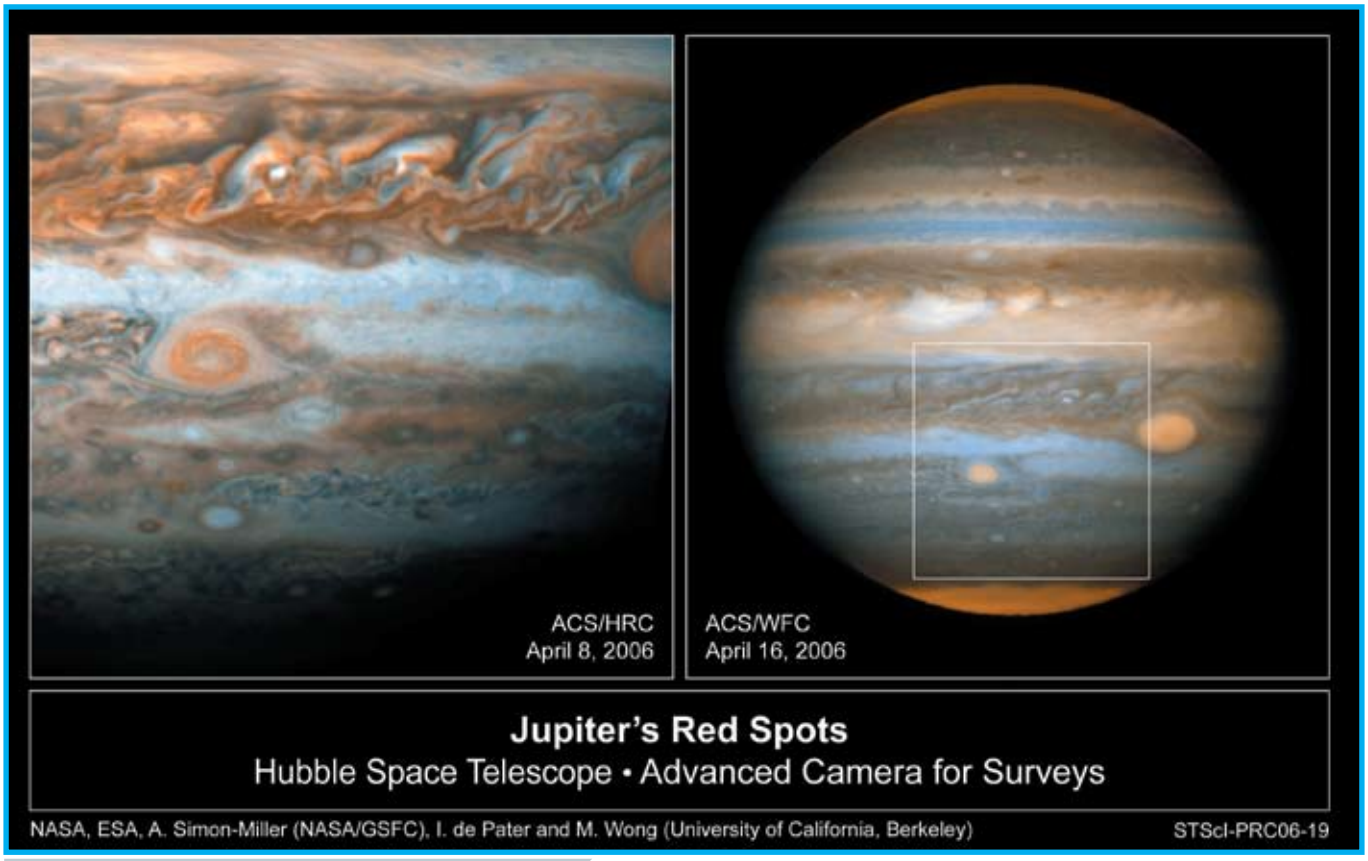


Fig (1) The Great Red Spot and Red Spot Jr.

For over 300 years, Jupiter, the largest planet, has been characterized by the Great Red Spot (GRS), a gigantic storm that swirls in the planet's dynamic atmosphere. Recent ground-based observations showed that another large Jovian storm has become red in color; it is nicknamed Red Spot Jr., as it is about half the size of GRS.

The new red spot is about half the size of GRS, and almost the same color. It is officially

designated Oval BA. It was first observed in 2000, when smaller storms collided and merged, but it remained white in color for 5 years. In December 2005, it became brown in color, and in February 2006, it turned red.

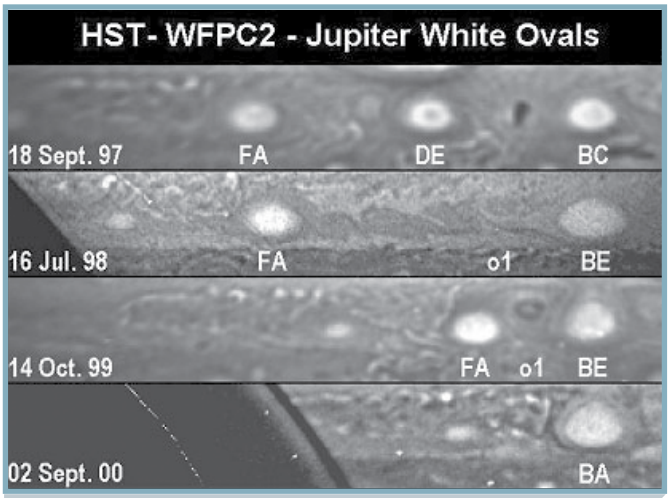


Fig (2) The formation of Oval BA

Oval BA can be observed with medium-size amateur telescopes.

GRS is about 30,000 km across, i.e., it is over twice the size of Earth. It has been under observation since telescopes became good enough to resolve features this size on Jupiter's shimmering disc. It is not precisely known why the GRS is red. One theory states that the GRS dredges material from beneath the clouds of Jupiter and lifts it up.

Further reading

Jupiter

http://www.nineplanets.org/jupiter.html

The Demise of a Comet

On 12 May 2006, Comet Schwassmann-Wachmann 3 passed closest to Earth, at a distance of about 11 million km. This is Earth's closest encounter with a comet in over 20 years. This comet is actually in a process of disintegration, the comet fragmented into dozens of mini comets.

The comet, also known as 73P, was discovered in 1930 by two German astronomers, Arnold Schwassmann and Arno Wachmann. It is a small periodic comet, with an estimated diameter of about 1 km, and orbits the Sun once every 5.33 years. It comes closest to Earth every 16 years.

In 1995, astronomers observed the comet breaking up into several fragments. In March 2006, the process of fragmentation continued, and in an image obtained by the Hubble Space Telescope (HST), there were about 40 fragments of the comet.

Fig (1) A Hubble Space Telescope Image of Comet 73P

Fig (2) A Spitzer Space Telescope Image of Comet 73P

However, this is not the first observed case of the death of a comet. In 1846, Biela's Comet was observed to split into two pieces. It was observed again in 1852, but then disappeared entirely. In 1872, astronomers observed a meteor shower radiating from the part of the sky where the comet had been expected to shine! These meteors are the debris of the comet.

In 1976, the nucleus of Comet West was split into four fragments.

In 1992, Comet Shoemaker-Levy 9 approached Jupiter, the largest planet, too closely. Due to the powerful gravity of Jupiter, the comet was shattered, and over twenty fragments were observed. The fragments collided with Jupiter consecutively, at a speed of approximately 60 km/s, over the period of one week, in July 1994.

NASA honors the "First Man"

On 18 April 2006, Neil Armstrong, the first man to walk on the Moon, was presented NASA's Ambassador of Exploration Award for all the great achievements he made for America's space program.

The ceremony was held in the Reakirt Auditorium at the Cincinnati Museum. Former Senator John Glenn, the first American to orbit the Earth, spoke at the ceremony. Glenn said that, given the opportunities he had had, he did not envy many people. "But for Neil," he said, "I make a big exception."

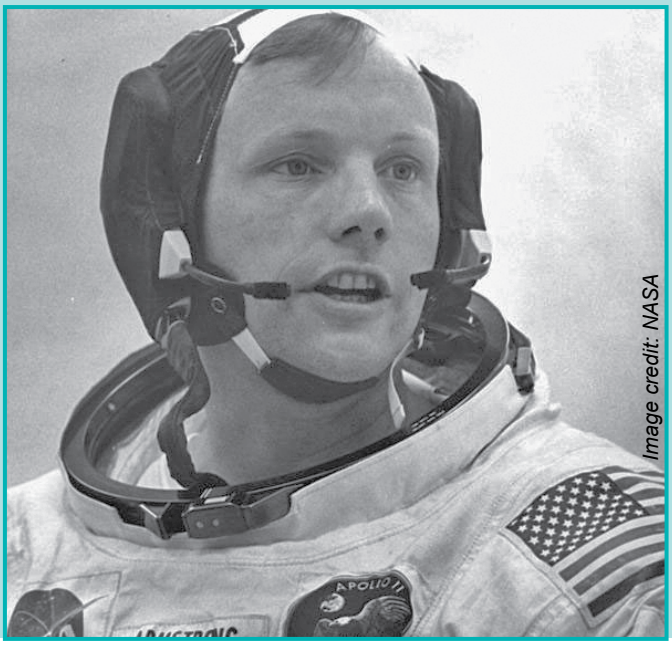


Image credit: NASA

NASA Administrator Mike Griffin spoke next, calling Armstrong a "test pilot's test pilot" as he outlined Armstrong's illustrious career.

Armstrong said the award was "very impressive", and went on to share what he called "a thin slice of natural history" with the audience. Using a moon rock he dubbed "Bok" as the central character, Armstrong outlined the geologic history of the Moon. He wrapped up his tale with a joke: "I was the strange creature that kidnapped Bok." He referred to the lunar sample that was part of the award as "a chip off the old Bok".

NASA is presenting the award to the 38 astronauts and key individuals who participated in the Mercury, Gemini and Apollo space programs for realizing America's vision of space exploration, 1961-1972.

Armstrong was born on 5 August 1930, in Wapokoneta, Ohio. He became an aviation enthusiast in his early childhood. Actually, he became a pilot at the age of 16, before he obtained his driver's license.

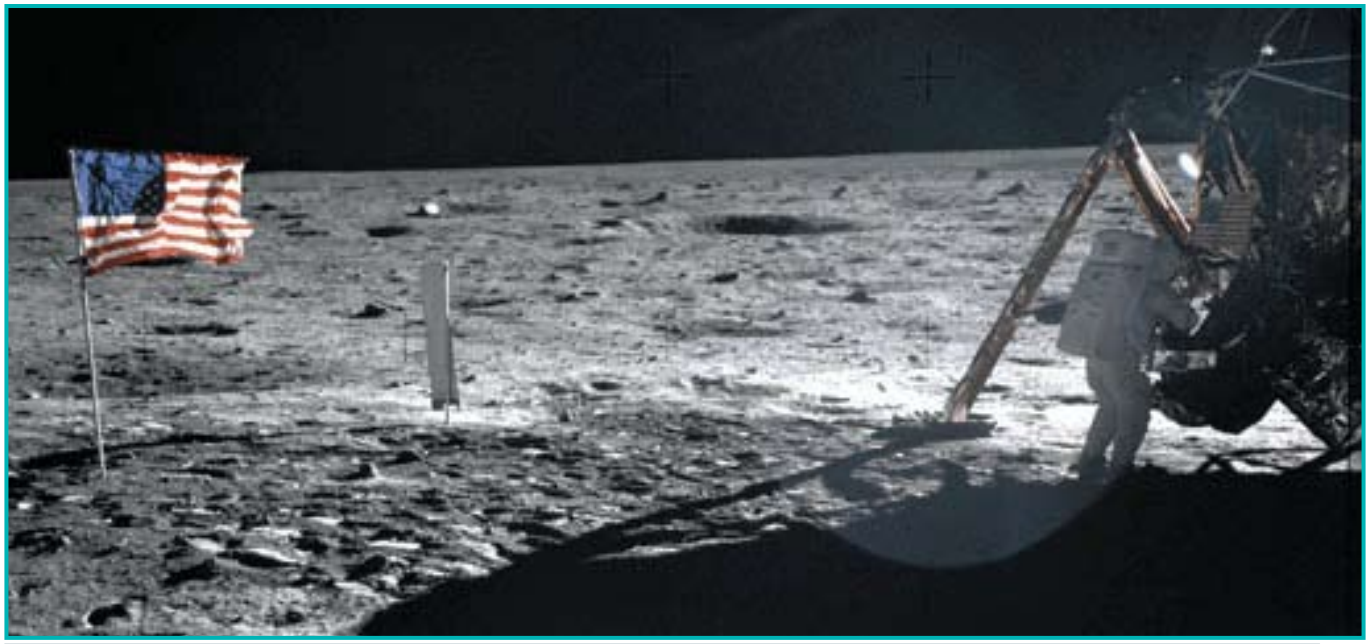


Fig (2): Apollo 11 commander Neil Armstrong was photographed by fellow astronaut Buzz Aldrin. This is one of only a few photos that show Armstrong on the surface. Image credit: NASA.

He obtained his aeronautical engineering degree from Purdue University, and flew 78 combat missions as a naval aviator during the Korean War.

His NASA career contains many "firsts". After joining the astronaut corps in 1962, he became the first civilian to fly a US spacecraft, Gemini VIII, in 1966; it was a real adventure. On that mission, Armstrong and fellow astronaut David Scott performed the first successful docking of two space vehicles. When a stuck thruster put their capsule into a dangerous spin, Armstrong used the re-entry rockets to regain control.

On 20 July 1969, Armstrong achieved his epic first, the first manned lunar landing. He became a symbol of space exploration.

Armstrong later served as deputy associate administrator for aeronautics at NASA Headquarters, and was a professor at the University of Cincinnati, 1971-1979. He co-founded the Society of Experimental Test Pilots and the Royal Aeronautical Society.

Armstrong flew over 200 airplanes, including jets, rockets, helicopters and gliders. He still works with NASA as part of the NASA Advisory Council.

In 2004, he offered his support for the Vision for Space Exploration, stating the plan has "substantial merit and promise". Commenting the high risks involved, Armstrong said, "to limit the progress in the name of eliminating risk is no virtue".

In 2005, the biography of Armstrong, written by former NASA historian James Hansen, was published under the title "First Man".

Further reading

Neil Armstrong
http://www.jsc.nasa.gov/Bios/htmlbios/armstrong-na.html

NASA Honors Neil Armstrong with Exploration Award
http://www.nasa.gov/vision/space/features/armstrong_ambassador_of_exploration.html

Venus Express obtains Images of Venus

On 12 April 2006, the European Venus Express spacecraft obtained the first images of Venus since entering orbit around the planet, a day earlier.

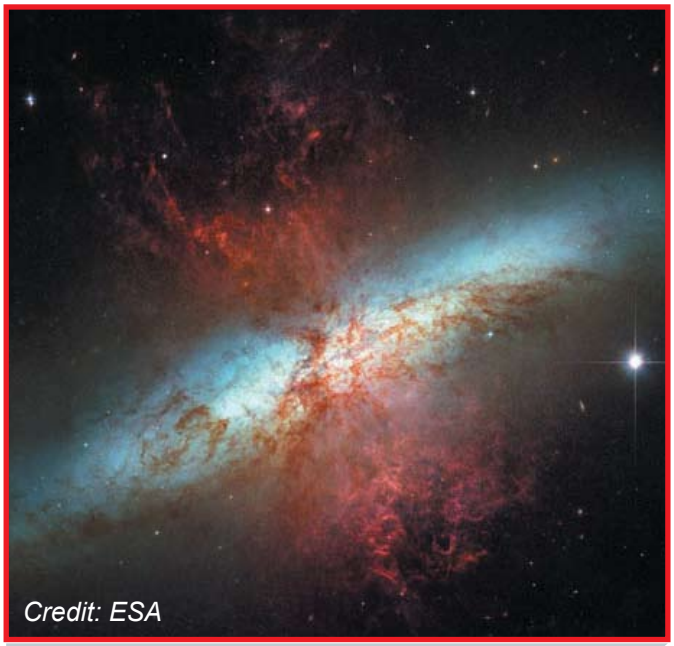


Fig (1) First images from Venus Express

The images show Venus' south pole from a distance of over 206,000 km, and reveal an intriguing atmospheric feature, a dark vortex. This discovery agrees with scientists' expectations. Previously, scientists discovered a similar vortex in Venus' north pole.

Scientists hope to learn more about these vortices; how they are stable, and how they are energized.

Venus, our nearest planetary neighbor, is similar to Earth in size and mass, but its atmosphere is entirely different from ours. It is composed mainly of suffocating carbon dioxide gas, and is characterized by an intense greenhouse effect.

By studying Venus' atmosphere, scientists hope to obtain new insights into the evolution of our atmosphere.

Further reading

Venus
http://www.nineplanets.org/venus.html

Venus Express
http://sci.esa.int/science-e/www/area/index.cfm?fareaid=64

Hot Topic Discovery of a Huge Crater in Egypt

A team of scientists from the University of Boston's Center for Remote Sensing made a startling discovery: a huge meteoritic crater in the Western Desert.

The crater is 31 kilometers across; it was found in satellite images of the area. Due to its large size, it is nicknamed Kebira, Arabic for "large".

Kebira far dwarfs the famous Meteor Crater (1.2 km across) in Arizona, USA. It is also over twice larger than the largest impact crater in the Sahara.

The crater, located near Gilf Kebir, in the southwestern corner of the Egyptian Sahara, is believed to be millions of years old.

"Kebira may have escaped detection because it is so large," said Dr Farouk El-Baz, Director of the University of Boston's Center for Remote Sensing.

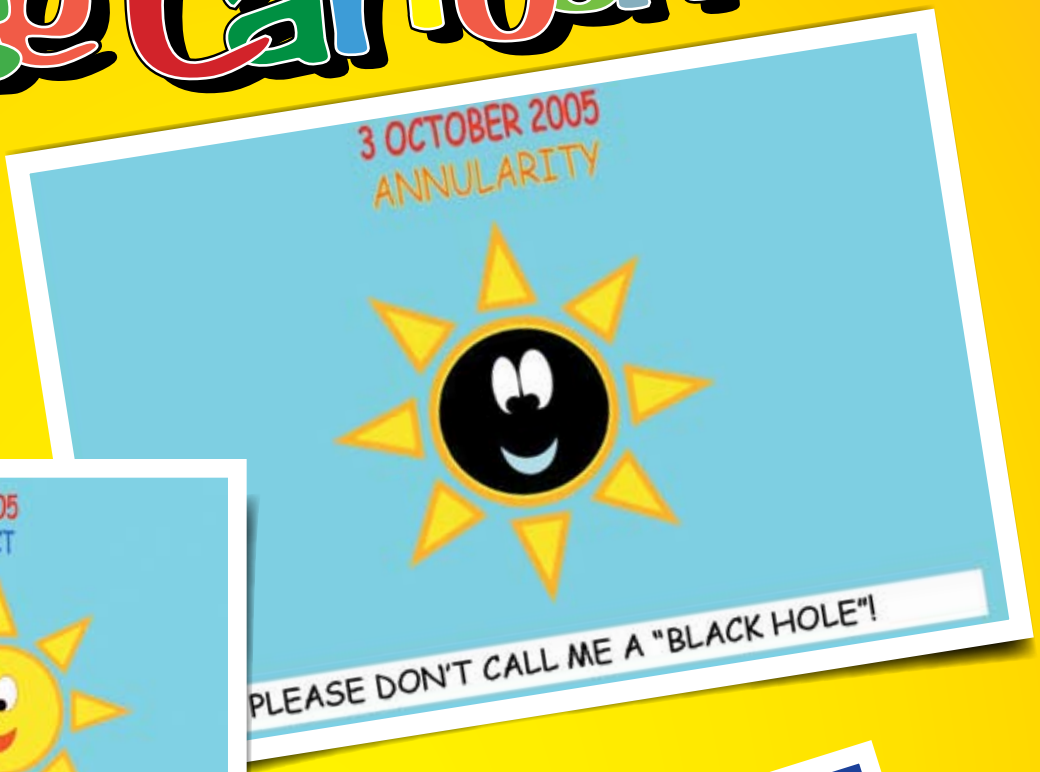
"Also the search for craters typically concentrates on small features, especially those that can be identified on the ground. The advantage of a view from space is that it allows us to see regional patterns and the big picture."

Interestingly, it is believed that the extinction of the dinosaurs was due to a tremendous impact of a 10-km-wide asteroid with Earth, 65 million years ago.

Further reading Meteor Crater http://barringercrater.com/
Meteors, Meteorites and Impacts http://www.nineplanets.org/meteorites.html

Fun Fact

Eclipse Cartoons



Caution: Never observe the Sun directly with your eyes or through telescopes, binoculars, or any other optical aid. The Sun can be viewed only, with proper protection, through special scientific devices.

Picture Gallery

A Photo Album of Saturn

The Cassini spacecraft entered orbit around Saturn on 1 July 2004, after flying in space for 7 years. In this issue, the gallery presents exquisite images of Saturn and its moons, obtained by the Cassini spacecraft. For more information and Cassini images, please visit the following link.

NASA - Archive
http://www.nasa.gov/mission_pages/cassini/multimedia/Cassini_Multimedia_Collection(Search_Agent)_archive_1.html

Fantasy or Reality?

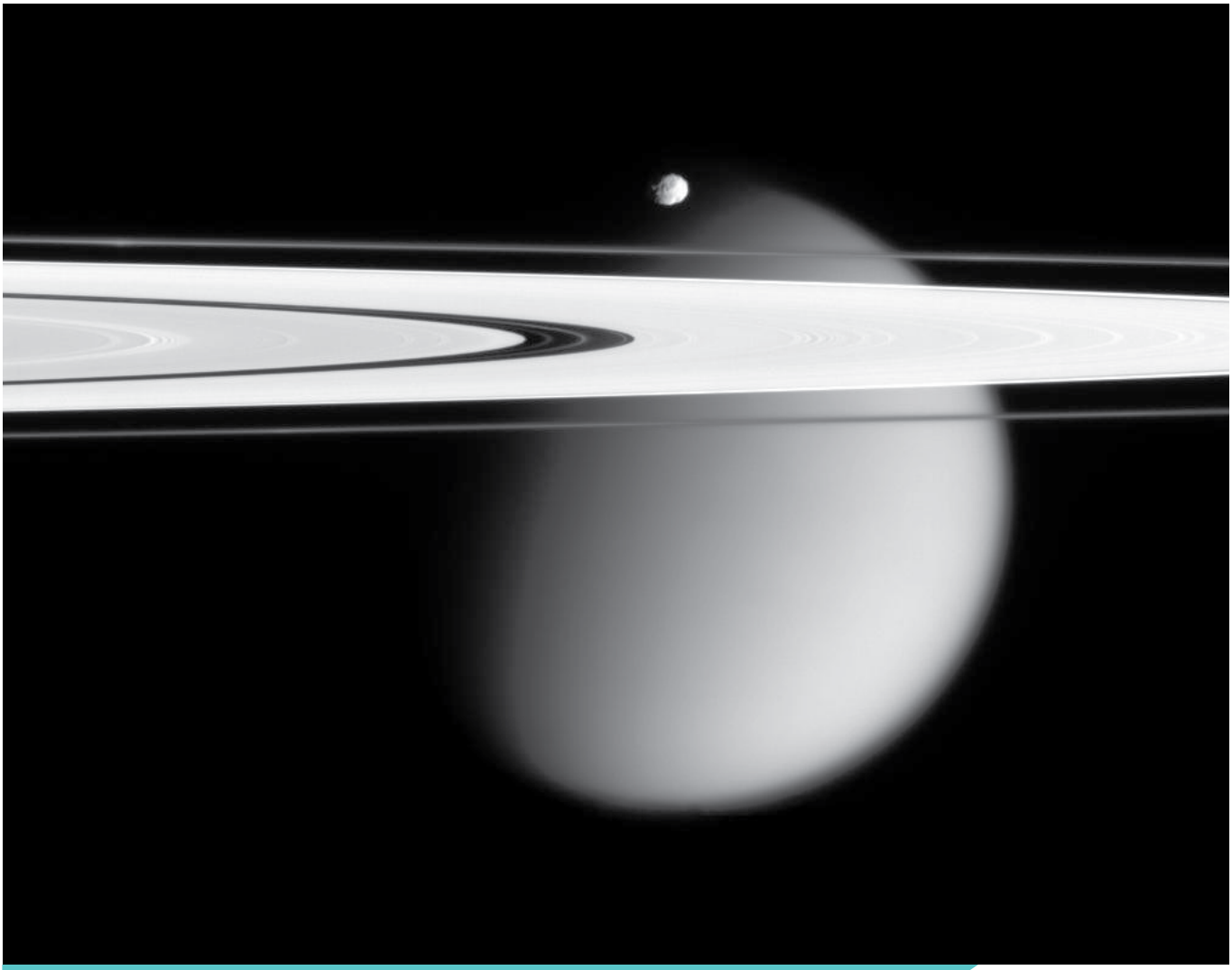


Image credit: NASA/JPL/Space Science Institute

This incredible image shows Titan (5,150 km across), Saturn's largest moon, Epimetheus (116 km across), a small battered moon, and two of Saturn's magnificent rings (A ring and F ring), stretching across the scene.

In an optical illusion, the narrow F ring, outside the A ring, appears to fade across the disk of Titan. A couple of bright clumps can be seen in the F ring.

Cosmic Dancers

Image credit: NASA/JPL/Space Science Institute

This is a stunning close-up image of Saturn's amazing moons Janus and Epimetheus.

The orbits of Janus and Epimetheus are a unique dynamical case in the Solar System. As they orbit Saturn, every 4 years, the two moons exchange orbits!! There is no chance of collision, the minimum distance between the two moons is about 15,000 km.

The image was taken in visible light with the Cassini spacecraft narrow-angle camera on 20 March 2006, at a distance of approximately 452,000 km (281,000 miles) from Epimetheus and 492,000 km (306,000 miles) from Janus.

Ice Volcanoes

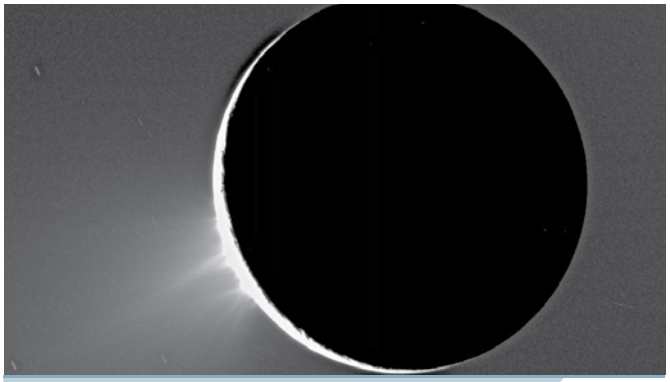


Image Credit: NASA/JPL/Space Science Institute

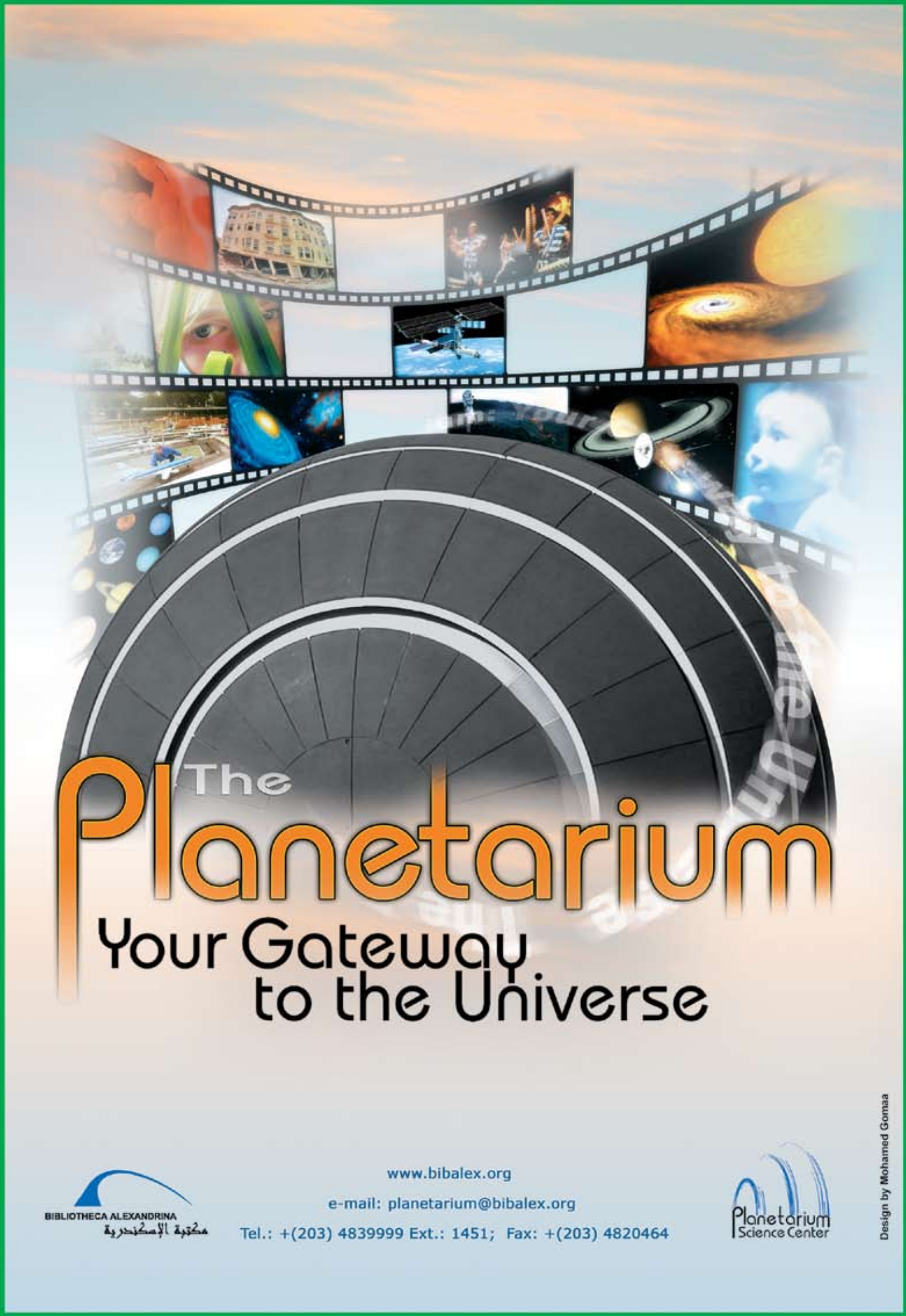
One of the most startling discoveries made by the Cassini spacecraft was that Saturn's icy moon Enceladus (498 km across) is volcanically active. The volcanoes of cold Enceladus, however, erupt icy particles. In this image we can see plumes of ejected material extending for hundreds of kilometers in space. Only two other moons in the Solar System have on-going volcanism, they are Io, Jupiter's moon, and Triton, the largest moon of Neptune.

Looking down on Rhea

Image Credit: NASA/JPL/Space Science Institute

Unlike Enceladus, Rhea (1,528 km across), Saturn's second largest moon, is geologically dormant. This image shows the densely cratered surface of Rhea. The myriads of craters indicate that Rhea's surface has changed only slightly over its geologic history. Recent planetary surfaces, however, show fewer numbers of craters due to resurfacing processes (e.g., tectonic activity).

Like the Moon, Rhea keeps the same side turned toward its magnificent parent planet. While our Moon (3,476 km across) orbits Earth once every 27.3 days, Rhea orbits Saturn once every 4.5 days, although it is further from Saturn than the Moon is from Earth! This is because Saturn is 95 times more massive than the Earth!



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