Vintage chromogenic print, watermarked “This Paper Manufactured by Kodak”, minor annotation and colour block to top margin, [P-19891].

THE FIRST COLOUR PHOTOGRAPH OF EARTH AND MOON TOGETHER IN A SINGLE FRAME

[Planet Earth and her Moon]

Author
NASA

Publication date
18 September 1977.

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NASA/ Jet Propulsion Laboratory, Voyager 1

Publication place

Physical description
Vintage chromogenic print, watermarked “This Paper Manufactured by Kodak”, minor annotation and colour block to top margin, [P-19891].

Dimensions
178 by 238mm. (7 by 9.25 inches).

Notes
Previous images had shown a part of the Earth, and a part of the moon, together, but, until this image was taken, the human eye had not seen the Earth and moon as whole worlds in space, in the same frame and in colour.

Voyager 1 left Earth on September 5, 1977. It lifted off from Cape Canaveral, Florida, aboard a Titan-Centaur rocket. It was 7.25 million miles (11.66 million km) from Earth – directly above Mount Everest, on the night side of the planet – when it captured this image.

The twin spacecraft Voyager 1 and Voyager 2 were launched by NASA in separate months in the summer of 1977 from Cape Canaveral, Florida. As originally designed, the Voyagers were to conduct closeup studies of Jupiter and Saturn, Saturn's rings, and the larger moons of the two planets.

"The Voyager mission was designed to take advantage of a rare geometric arrangement of the outer planets in the late 1970s and the 1980s which allowed for a four-planet tour for a minimum of propellant and trip time. This layout of Jupiter, Saturn, Uranus and Neptune, which occurs about every 175 years, allows a spacecraft on a particular flight path to swing from one planet to the next without the need for large onboard propulsion systems. The flyby of each planet bends the spacecraft's flight path and increases its velocity enough to deliver it to the next destination. Using this "gravity assist" technique, first demonstrated with NASA's Mariner 10 Venus/Mercury mission in 1973-74, the flight time to Neptune was reduced from 30 years to 12.

From the NASA Kennedy Space Center at Cape Canaveral, Florida, Voyager 2 was launched first, on August 20, 1977; Voyager 1 was launched on a faster, shorter trajectory on September 5, 1977. Both spacecraft were delivered to space aboard Titan-Centaur expendable rockets.

The prime Voyager mission to Jupiter and Saturn brought Voyager 1 to Jupiter on March 5, 1979, and Saturn on November 12, 1980, followed by Voyager 2 to Jupiter on July 9, 1979, and Saturn on August 25, 1981.

Voyager 1's trajectory, designed to send the spacecraft closely past the large moon Titan and behind Saturn's rings, bent the spacecraft's path inexorably northward out of the ecliptic plane — the plane in which most of the planets orbit the Sun. Voyager 2 was aimed to fly by Saturn at a point that would automatically send the spacecraft in the direction of Uranus.

After Voyager 2's successful Saturn encounter, it was shown that Voyager 2 would likely be able to fly on to Uranus with all instruments operating. NASA provided additional funding to continue operating the two spacecraft and authorized JPL to conduct a Uranus flyby. Subsequently, NASA also authorized the Neptune leg of the mission, which was renamed the Voyager Neptune Interstellar Mission.

Voyager 2 encountered Uranus on January 24, 1986, returning detailed photos and other data on the planet, its moons, magnetic field and dark rings. Voyager 1, meanwhile, continues to press outward, conducting studies of interplanetary space. Eventually, its instruments may be the first of any spacecraft to sense the heliopause — the boundary between the end of the Sun's magnetic influence and the beginning of interstellar space.

Following Voyager 2's closest approach to Neptune on August 25, 1989, the spacecraft flew southward, below the ecliptic plane and onto a course that will take it, too, to interstellar space. Reflecting the Voyagers' new transplanetary destinations, the project is now known as the Voyager Interstellar Mission.

Voyager 1 has crossed into the heliosheath and is leaving the solar system, rising above the ecliptic plane at an angle of about 35 degrees at a rate of about 520 million kilometers (about 320 million miles) a year. (Voyager 1 entered interstellar space on August 25, 2012.) Voyager 2 is also headed out of the solar system, diving below the ecliptic plane at an angle of about 48 degrees and a rate of about 470 million kilometers (about 290 million miles) a year.

Both spacecraft will continue to study ultraviolet sources among the stars, and the fields and particles instruments aboard the Voyagers will continue to explore the boundary between the Sun's influence and interstellar space. The Voyagers are expected to return valuable data for at least another decade. Communications will be maintained until the Voyagers' power sources can no longer supply enough electrical energy to power critical subsystems.

Eventually, between them, Voyager 1 and 2 would explore all the giant outer planets of our solar system, 48 of their moons, and the unique systems of rings and magnetic fields those planets possess.

As of September 18, 2022, Voyager 1 has operated for 45 years and 13 days. The spacecraft still communicates with the Deep Space Network to receive routine commands and return data.

Had the Voyager mission ended after the Jupiter and Saturn flybys alone, it still would have provided the material to rewrite astronomy textbooks. But having doubled their already ambitious itineraries, the Voyagers returned to Earth information over the years that has revolutionized the science of planetary astronomy, helping to resolve key questions while raising intriguing new ones about the origin and evolution of the planets in our solar system." (NASA description)

Bibliography

Provenance

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