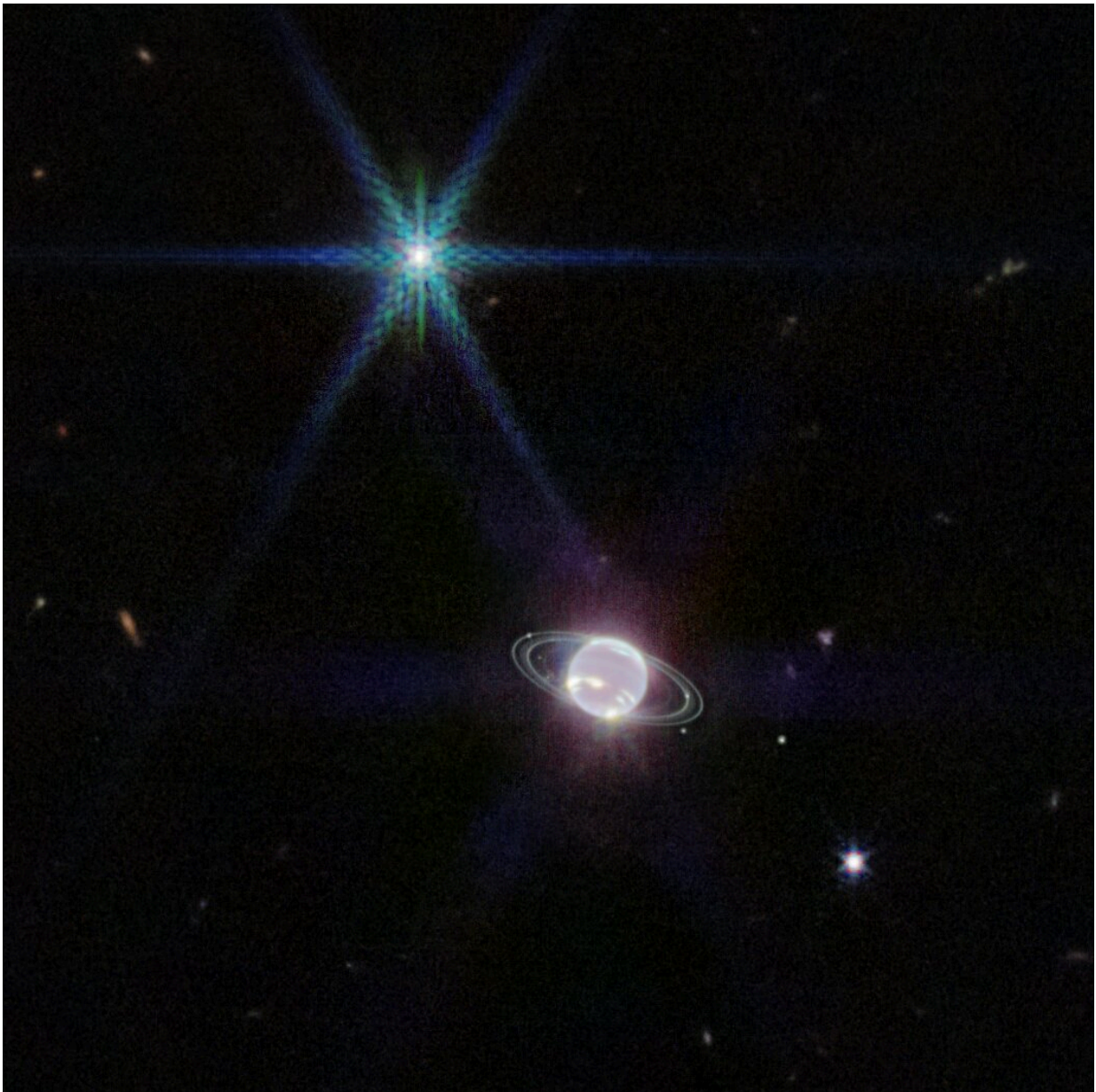


New Webb image captures clearest view of Neptune's rings in decades

September 21 2022, by Laura Betz



What do we see in Webb's latest image of the ice giant Neptune? Webb captured seven of Neptune's 14 known moons: Galatea, Naiad, Thalassa, Despina, Proteus, Larissa, and Triton. Neptune's large and unusual moon, Triton, dominates this Webb portrait of Neptune as a very bright point of light sporting the signature diffraction spikes seen in many of Webb's images. Credit: NASA, ESA, CSA, STScI

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.

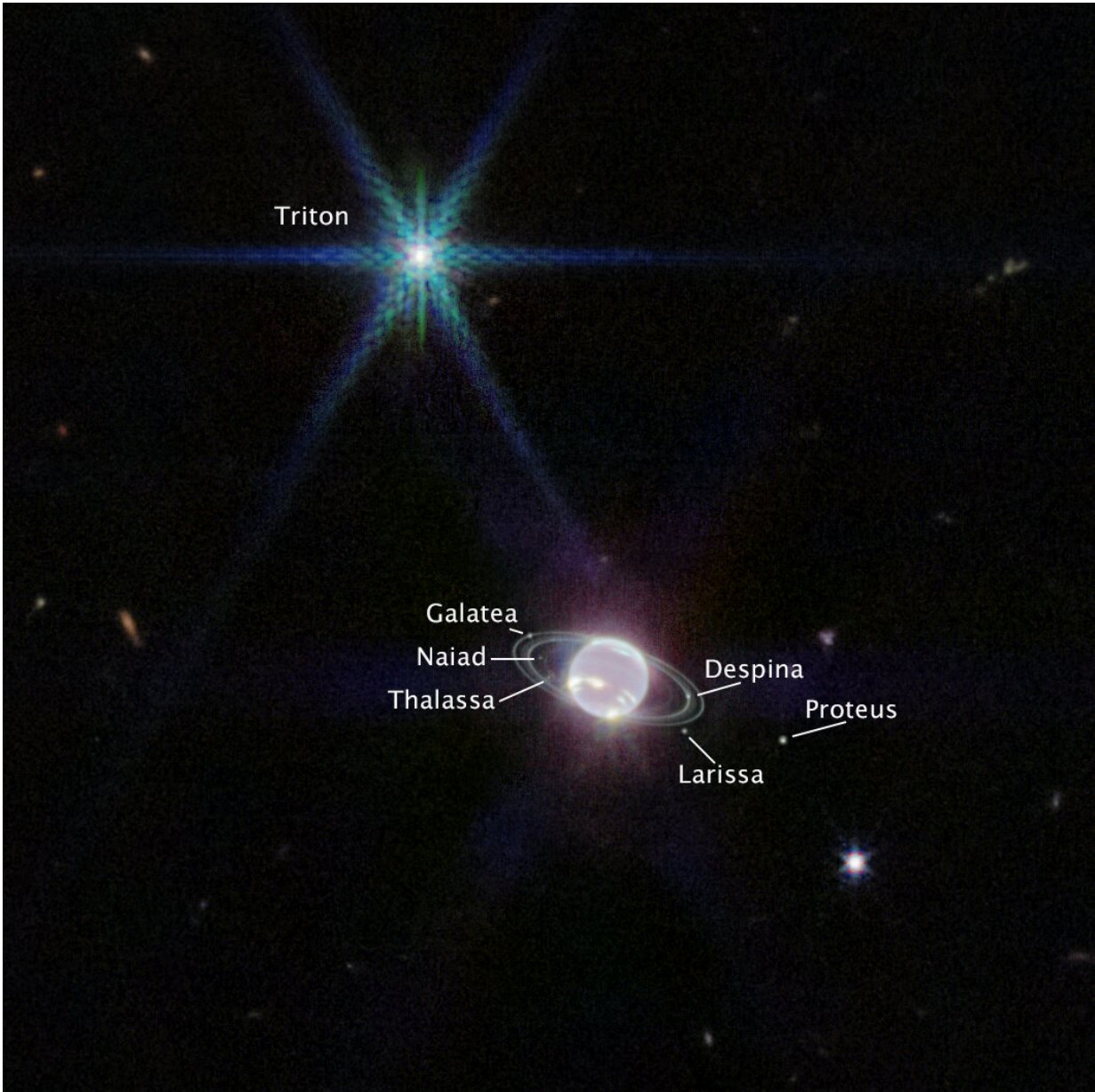
Most striking in Webb's new image is the crisp view of the planet's rings—some of which have not been detected since NASA's Voyager 2 became the first spacecraft to observe Neptune during its flyby in 1989. In addition to several bright, narrow rings, the Webb image clearly shows Neptune's fainter dust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

"It has been three decades since we last saw these faint, dusty rings, and this is the first time we've seen them in the infrared," notes Heidi Hammel, a Neptune system expert and interdisciplinary scientist for Webb. Webb's extremely stable and precise image quality permits these very faint rings to be detected so close to Neptune.

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.

This planet is characterized as an ice giant due to the chemical make-up

of its interior. Compared to the gas giants, Jupiter and Saturn, Neptune is much richer in elements heavier than hydrogen and helium. This is readily apparent in Neptune's signature blue appearance in Hubble Space Telescope images at [visible wavelengths](#), caused by small amounts of gaseous methane.



Credit: NASA, ESA, CSA, STScI

Webb's Near-Infrared Camera (NIRCam) images objects in the near-infrared range from 0.6 to 5 microns, so Neptune does not appear blue to Webb. In fact, the methane gas so strongly absorbs red and [infrared light](#) that the planet is quite dark at these near-infrared wavelengths, except where high-altitude clouds are present. Such methane-ice clouds are prominent as bright streaks and spots, which reflect sunlight before it is absorbed by methane gas. Images from other observatories, including the Hubble Space Telescope and the W.M. Keck Observatory, have recorded these rapidly evolving cloud features over the years.

More subtly, a thin line of brightness circling the planet's equator could be a visual signature of global atmospheric circulation that powers Neptune's winds and storms. The atmosphere descends and warms at the equator, and thus glows at infrared wavelengths more than the surrounding, cooler gases.

Neptune's 164-year orbit means its northern pole, at the top of this image, is just out of view for astronomers, but the Webb images hint at an intriguing brightness in that area. A previously-known vortex at the southern pole is evident in Webb's view, but for the first time Webb has revealed a continuous band of high-latitude clouds surrounding it.

Webb also captured seven of Neptune's 14 known moons. Dominating this Webb portrait of Neptune is a very bright point of light sporting the signature diffraction spikes seen in many of Webb's images, but this is not a star. Rather, this is Neptune's large and unusual moon, Triton.

Covered in a frozen sheen of condensed nitrogen, Triton reflects an average of 70% of the sunlight that hits it. It far outshines Neptune in this image because the planet's atmosphere is darkened by methane absorption at these near-infrared wavelengths. Triton orbits Neptune in

an unusual backward (retrograde) orbit, leading astronomers to speculate that this moon was originally a Kuiper belt object that was gravitationally captured by Neptune. Additional Webb studies of both Triton and Neptune are planned in the coming year.

Provided by NASA's Goddard Space Flight Center

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