Voyager 2 Builds Suspense for Neptune

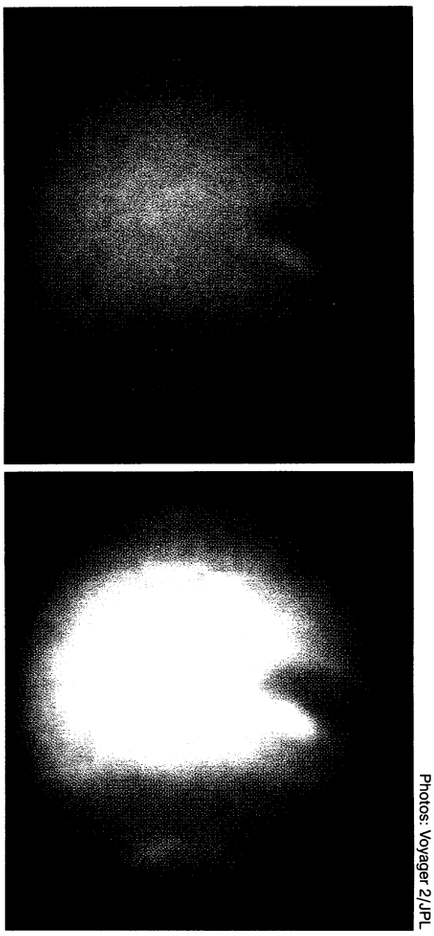
As Voyager 2 approaches Neptune, its newest findings are creating great expectations for the craft's Aug. 24 encounter with the planet. With six weeks and 37 million miles to go, Voyager's photos already have led to the discovery of only the third Neptunian moon identified since German astronomer Johann Galle found the planet itself in 1846. The images also reveal an oval cloud, wider than Mars, that may mark a huge atmospheric storm cell like Jupiter's Great Red Spot.

A scientist with the Voyager camera team, Stephen P. Synnott of NASA's Jet Propulsion Laboratory in Pasadena, Calif., first saw what turned out to be the satellite as a small, bright smudge in photos taken in mid-June. He confirmed the discovery on July 5, after later images showed it right where it should be according to an orbit calculated from the initial pictures.

Temporarily known only as 1989 N1, designating the first Neptunian moon discovered this year, it moves in a nearly circular orbit about 73,000 miles from the planet's center and some 57,600 miles above the cloud tops. It is also the only known moon that circles Neptune's equator. Nereid follows a long elliptical path tilted 28° from the equator, while Triton's circular orbit tilts 160° so that it actually travels backward (clockwise). Some scientists believe one or both of these moons may be former asteroids, or even ex-satellites of other planets, that somehow got knocked out of their original paths and captured by Neptune's gravity.

Although the surface appearance of the newly discovered moon remains unclear, Synnott suggests its diameter measures between 125 and 400 miles.

Besides the oval cloud, the photos reveal dark bands around Neptune's south pole, possibly consisting of carbon-rich compounds arising from chemical reactions driven by heat escaping from the planet's interior and by incoming charged particles.



Photos: Voyager 2/JPL

Voyager 2 photos show Neptune approximately as the human eye would see it (top), with its oval cloud and dark polar bands, and with colors enhanced (bottom) for contrast.

Synnott notes that the pictures have yielded "not a hint" of the short, comma-shaped arcs that may be Neptune's odd version of planetary rings. These arcs have not been seen from Earth either. But astronomers have inferred their existence from Earth-based observations of the way starlight flickers before and after Neptune gets in the way. Also absent so far from Voyager 2's data, says Michael L. Kaiser of the NASA Goddard Space Flight Center in Greenbelt, Md., is evidence of radio emissions indicating a magnetic field. Last year's Earth-based detection of possible radio emissions from Neptune (SN: 11/12/88, p.310) may be real but at a frequency too low for Voyager's instruments. — *J. Eberhart*

Brain and immunity: Mapping the link

New research shows that opiate drugs, such as morphine, act on a brain region that dampens the ability of natural killer cells to destroy cancer and viral-infected cells. The finding may eventually help explain why heroin addicts and people under stress have suppressed immune systems.

Richard J. Weber of the National Institute of Diabetes and Digestive and Kidney Diseases and Agu Pert of the National Institute of Mental Health picked six brain regions where opiate drugs act as likely candidates for immune system regulation. They injected six groups of male rats with enough morphine to make them drowsy — 6.6 nanomoles directed into one of the six regions to be tested. A seventh group of control rats got no morphine.

Three hours after morphine injection, the researchers harvested killer cells taken from the rats' spleens, mixed them with cancer cells and measured the killer cells' ability to destroy their tumor targets. Weber and Pert found a "dramatic" drop in killer cell performance when rats got morphine delivered to a brain region known as the periaqueductal gray matter of the mesencephalon (PAG). Rats in the PAG group showed a 63 percent drop in their natural killer cell activity as compared with controls, the researchers report in the July 14 SCIENCE. Rats receiving morphine injections in other brain areas showed no decline in killer cell activity when compared with controls.

John C. Liebeskind, a psychologist at the University of California, Los Angeles, calls the report an "important contribution." Liebeskind's research team first demonstrated in 1986 that morphine acts on the brain to suppress natural killer cell activity, but that report did not pinpoint the site of action. The evidence implicating the PAG region is not surprising, Weber says, noting that past research on animals showed that electric shocks delivered to the PAG spur cancerous tumor growth.

The new report suggests PAG's involvement in the immune suppression seen among people addicted to heroin. (Both morphine and heroin are derived from opium.) Scientists have long observed that opiate addicts have malfunctioning immune systems that leave them prey to infection. Weber and Pert's study suggests heroin may bind to opiate receptors in the PAG region to somehow produce sluggish killer cells.

The PAG area also may play a role in the immune suppression seen in people under a lot of stress, Weber says. His study hints that morphine-like substances released by PAG neurons may suppress immune function just as morphine reduces killer cell activity in the rat model. The body produces these natural painkillers in times of stress, perhaps compromising the immune system as an unwanted side effect. That theory remains highly speculative, but Weber's laboratory plans further research to elucidate the PAG-immunity link. — *K.A. Fackelmann*