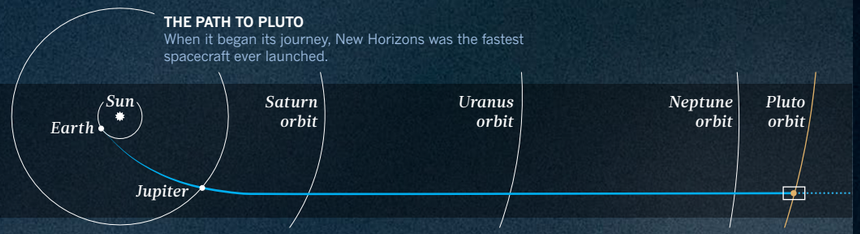


THE PATH TO PLUTO
When it began its journey, New Horizons was the fastest spacecraft ever launched.

JANUARY 2006
Launch at Cape Canaveral.

FEBRUARY 2007
Slingshot boost from Jupiter's gravity.

2007–14
Hibernation.

DECEMBER 2014
New Horizons awakens.

JULY 2015
Fly-by of Pluto and its moon Charon.

24 HOURS OF PLUTO

SPEEDING PAST AN ICE WORLD AT THE FRINGES OF THE SOLAR SYSTEM

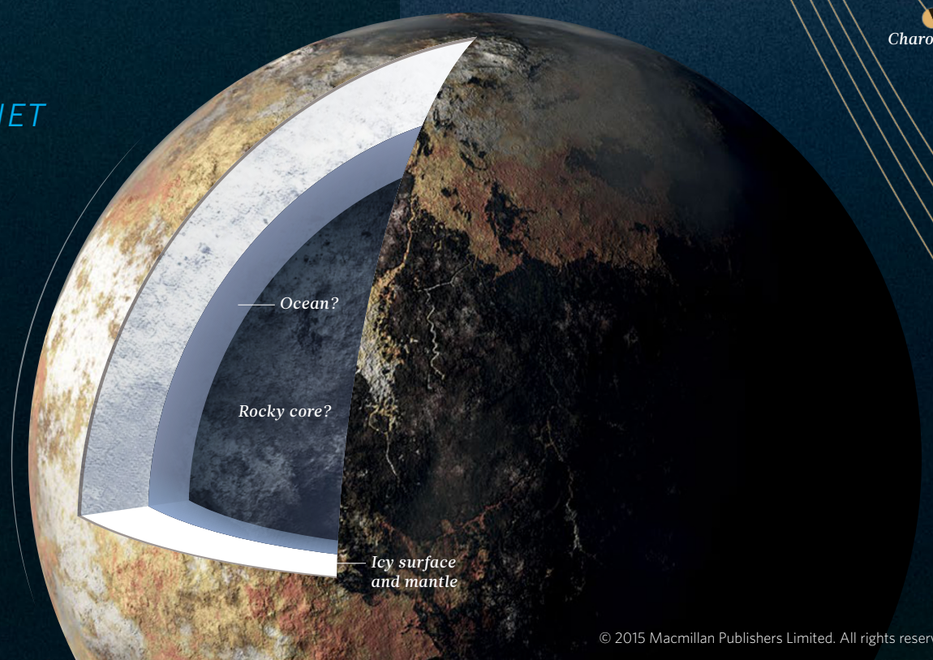
BY ALEXANDRA WITZE
DESIGN BY JASIEK KRZYSZTOFIAK

On 14 July, after a journey of nine and a half years and some 5 billion kilometres, NASA's New Horizons spacecraft will visit the frigid frontier of the Solar System: Pluto. It will be a fast and furious meeting — the spacecraft will whiz past at nearly 50,000 kilometres per hour, collecting photographs and scientific data on Pluto's surface, atmosphere and environment during the 24-hour event. No mission has ever visited Pluto or any of the other ice worlds that make up the Kuiper belt, the swarm of small and frosty bodies that orbit mostly beyond Neptune. With its huge moon Charon, Pluto also constitutes the Solar System's only known binary system.

THE DWARF PLANET

SURFACE
Pluto is covered with several types of ice, including methane, nitrogen and carbon monoxide. Its reddish surface is one of the most strongly mottled in the Solar System, and New Horizons should reveal the identities of these light and dark patches. Its closest analogue in the Solar System may be Neptune's icy moon Triton, which is thought to have been captured from the Kuiper belt.

ATMOSPHERE
Pluto has a thin atmosphere generated by ices sublimating from its surface. Since its discovery in 1988, the atmosphere has mysteriously expanded — even though Pluto is getting farther from the Sun.



NATURE.COM
Visit **www.nature.com/pluto** for more on Pluto.

THE FLY-BY

Up to and including **12 JULY**
New Horizons will map the surface and study the atmosphere, looking for clouds and haze on Pluto, as well as rings and moons beyond the five known (Charon, Styx, Nix, Kerberos and Hydra).

13 JULY
Limited initial observations will be sent back to Earth in case the spacecraft does not survive the encounter.

14 JULY
New Horizons will remain radio silent for much of the day so that it can concentrate on gathering data at Pluto and Charon. It will collect colour Images of Pluto at a resolution of 0.5 kilometres per pixel, and black-and-white ones (in a narrow band across the dwarf planet's centre) at resolutions as high as 100 metres per pixel.

15 JULY
Close-up images of Pluto and Charon, along with scientific data, will start to be sent to Earth over a 26-month period. New Horizons' transmission rate is limited by its communications time with NASA's Deep Space Network and the sheer quantity of data that it will collect during the intense, close encounter. The highest-resolution images of Pluto that will be available from the encounter will be transmitted on 15 July, with those for Charon following the day after.

14 JULY

7:50 a.m. Eastern Daylight Time
Closest approach to Pluto, at 12,500 kilometres. Images taken in both visible and near-infrared wavelengths.

8:04 a.m.
Closest approach to Charon, at 28,800 kilometres. Because this is more than twice the distance of the closest approach to Pluto, the best pictures of Charon will be roughly twice as coarse as those of Pluto.

8:51 a.m.
Passes through Pluto's shadow, allowing it to probe Pluto's atmosphere.

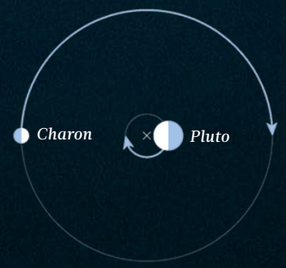
10:18 a.m.
Passes through Charon's shadow, allowing it to search for an atmosphere on Charon.

9:02 p.m.
Mission team on Earth should receive a preprogrammed 'phone home' signal which, if all went well, will indicate the spacecraft survived the encounter.

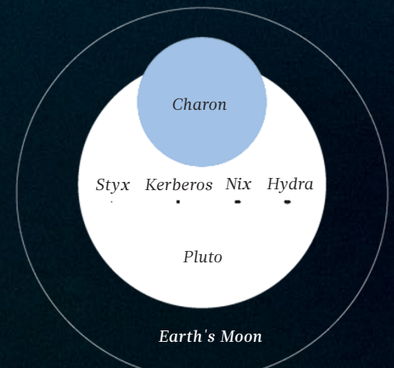
THE MOONS

FORMATION
Early in the Solar System's history, a proto-Charon probably walloped into a proto-Pluto, sending debris cascading out into space. Much of that may have condensed to form Pluto's four smaller moons.

BINARY SYSTEM
Pluto and Charon are locked in an intricate orbital dance. Because Charon is so large relative to Pluto — at one-eighth its mass — the two actually orbit a mutual centre of gravity that is located in space. They also both rotate on their axes once every 6.4 Earth days. Analyses of the shapes of Pluto and Charon could reveal whether one or both of them ever harboured an underground ocean, kept liquid by subterranean heat.



THE SMALLER MOONS
Nix and Hydra tumble chaotically on their axes, but Nix, Styx and Hydra are locked in an orbital resonance that has them travelling around Pluto in synchrony. Kerberos is surprisingly dark in colour, possibly reflecting a piece of the original impactor that formed the Pluto–Charon system. Of the small known moons, New Horizons will get the best view of Nix. It may also discover more moons, or dust rings, somewhere in the system.



PLUTO/ARTWORKS/TRAJECTORIES: NASA/JHU APL/SWRI MOON DATA: NASA/ESA/M. SHOWALTER (SETI INSTITUTE)