I can hear the sizzle of newborn stars, and know anything of meaning, of the fierce magic emerging here. I am witness to flexible eternity, the evolving past, and I know we will live forever, as dust or breath in the face of stars, in the shifting pattern of winds.

Joy Harjo

New Horizons and Friends

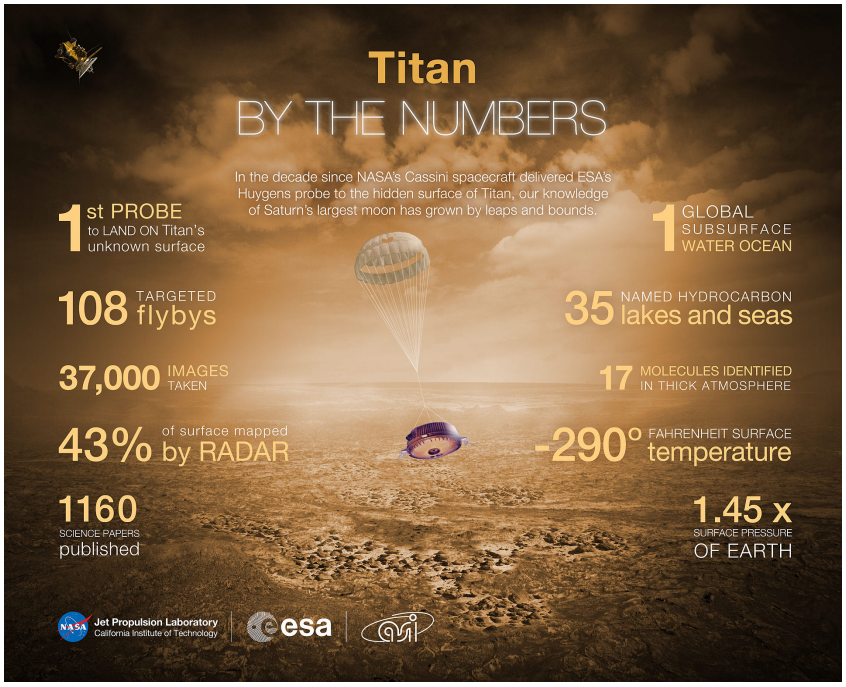
Hello AST 111. In this short module we'll talk about robotic spacecraft, some of the terms that are used, and some missions of note.

Spacecraft missions can be categorized basically as one of four different types. One is a "flyby", where you fly by another world, usually once. For example, New Horizons recent flyby of Pluto.

Second is an an "orbiter", where one goes into, well, orbit around another world. An example right now is the Lunar Reconnaissance Orbiter. Some of the camera operations and new science is being done right at ASU.

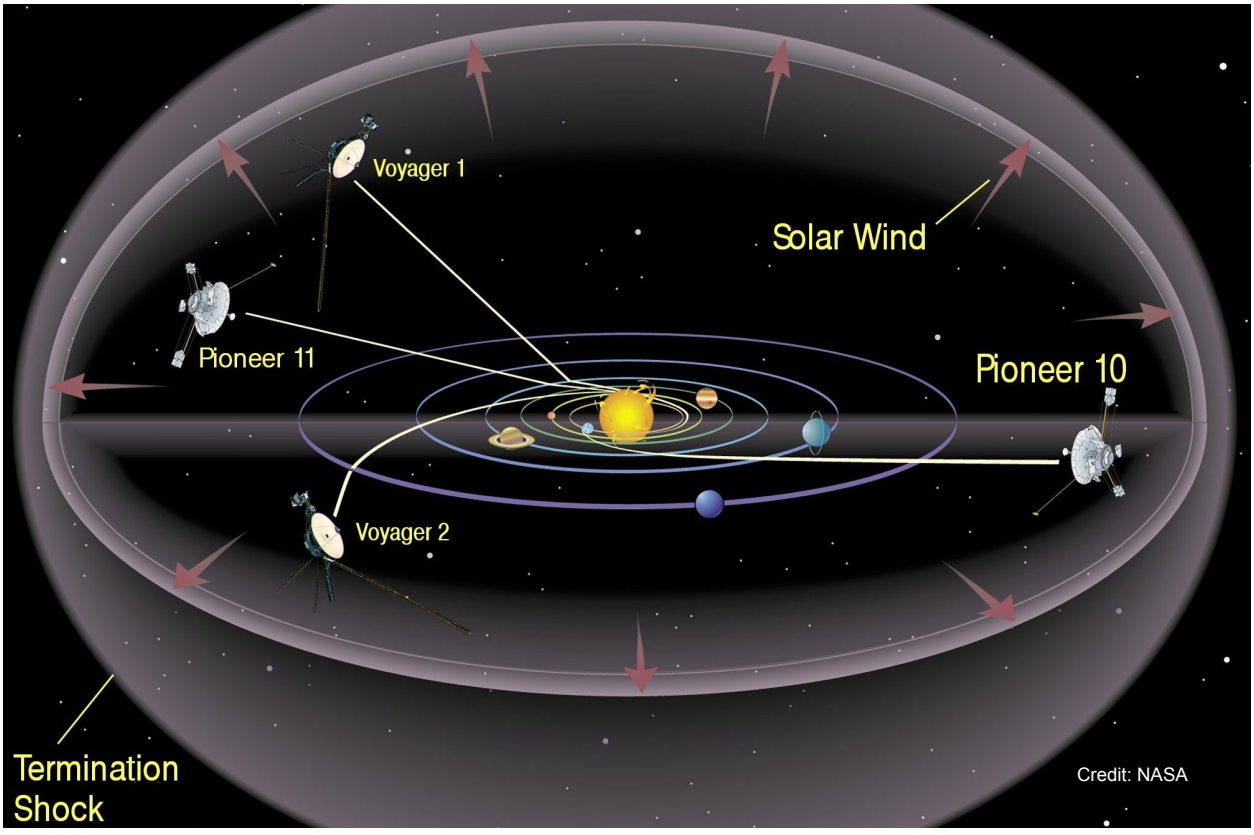
Third, you can do a "lander" and/or a "probe" that lands on the surface or drops a measurement package into an atmosphere. There's lots of examples of this on Mars, where we have Spirit and Opportunity running around the surface gathering samples. Or you drop into the atmosphere like what we did with Jupiter. or the Huygens probe that actually landed on the surface of Saturn's moon Titan.

Fourth, generally the most expensive option, is a sample return where you go to another world pick something up and bring it back to Earth. Examples are the Apollo missions returning Moon rocks, the Stardust collect dust from Comet Wild 2, and the Hayabusa probe which returned samples from asteroid 25143 Itokawa.



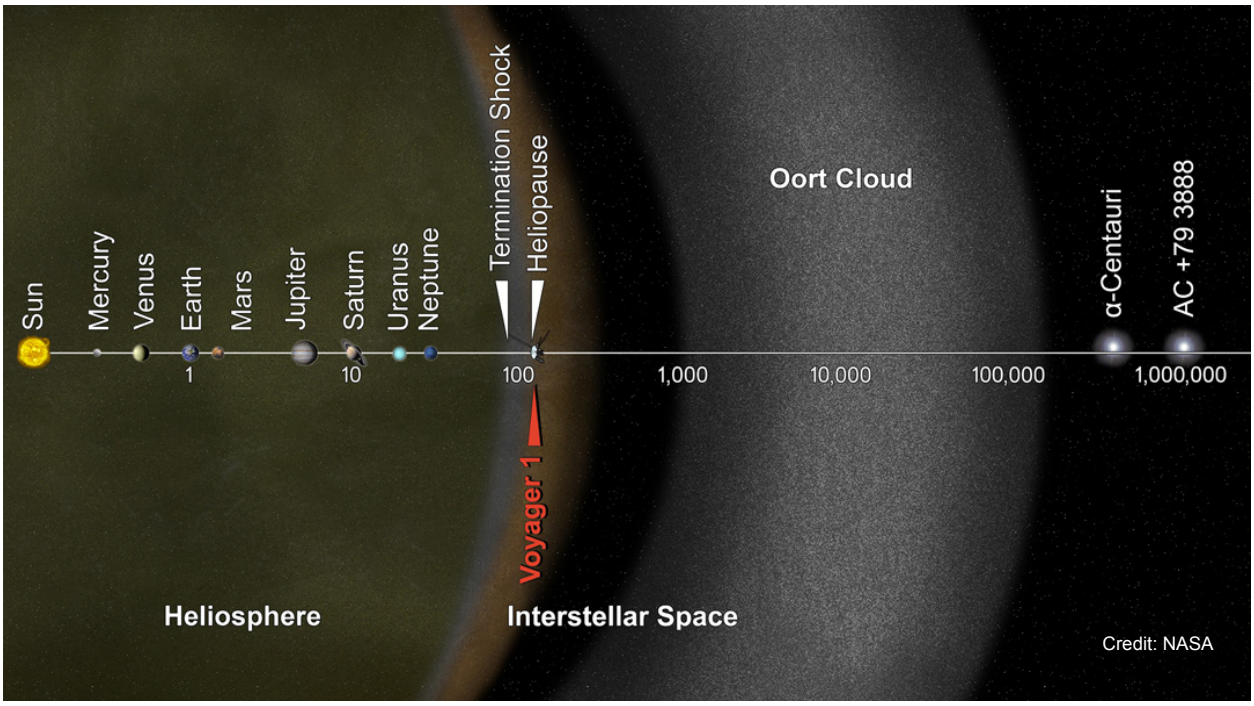
In all cases, robotic spacecraft carry their own propulsion, their own power, their own communication systems, and can generally operate preprogrammed to do what they're supposed to do. Or to get updated instructions from controllers. But because of the travel time -- the light travel time, the radio travel time between us and another planet -- the robot has to be able to make some rudimentary decisions on its own - like not drive off a cliff just because that's what the directions say!

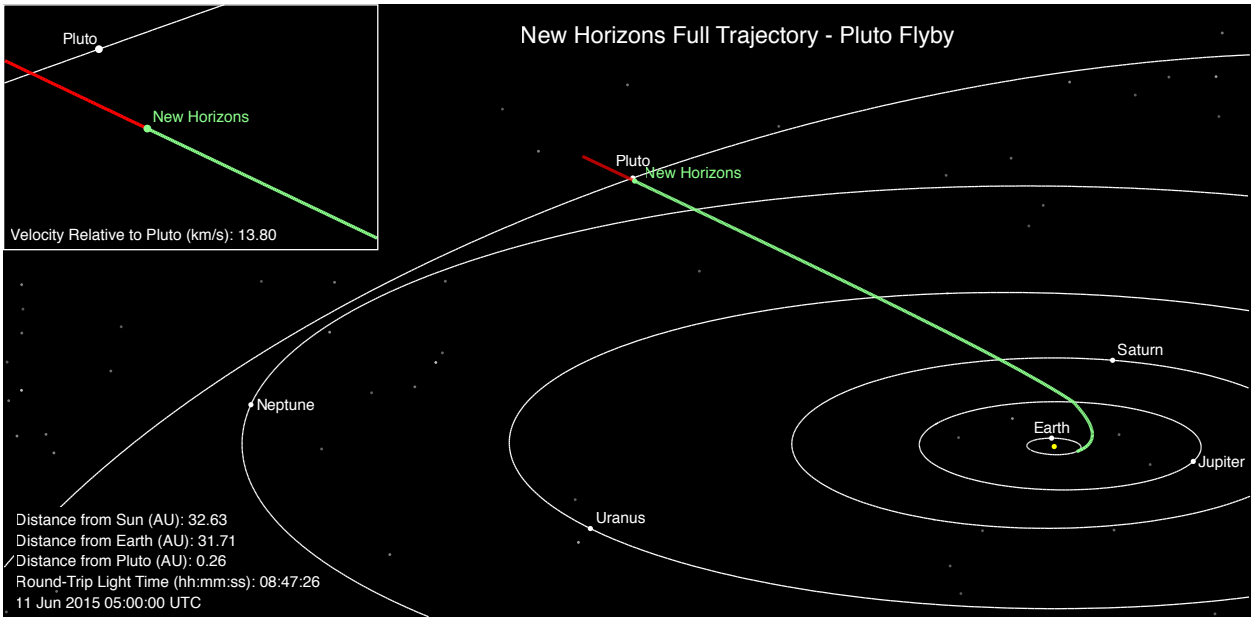
The image above shows some of the numbers generated by landing a probe on Titan. Note the hydrocarbon lakes and seas and the global subsurface water ocean.



The image above shows the location of four of our interstellar probes. These probes that have completed their solar system missions and are now headed out toward the stars.

The image below shows the location of one of those interstellar probes, Voyager 1. It has now travelled past the “heliopause” or the place where the Solar wind stops (helio + pause).





The New Horizons mission launched Jan. 19, 2006. It passed Jupiter for a gravity boost and scientific studies in February 2007, and reach Pluto and its moons in July 2015. That’s ten year from launch to destination! If NASA approves an extended mission, the spacecraft would head

deeper to the icy mini-worlds at least a billion miles beyond Neptune's orbit. A spacecraft on this looooong journey will help us answer basic questions about the surface properties, geology, interior makeup and atmospheres on these icy bodies.The image above shows the trajectory of the New Horizons mission on its way to its rendezvous with Pluto and beyond.

Thanks. Over and Out!