

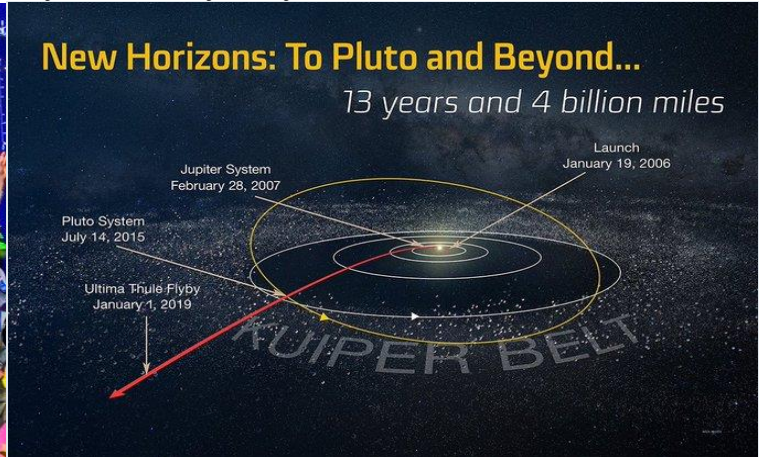
# KINEMATICS

Units 4 & 5, Dr. John P. Cise, Professor of Physics, Austin Com. College, Austin, Tx.

USA. [jpcise@austinctc.edu](mailto:jpcise@austinctc.edu) & New York Times, December 31, 2018 by Kenneth Chang. Dedicated to Dr. Mike Cise, Chem. Engineer

## NASA's New Horizons Spacecraft Signals Successful Flyby of Ultima Thule, the Most Distant Object Ever Visited

Now scientists await pictures and a bounty of new data about a small, mysterious icy body four billion miles from Earth.



S. Alan Stern, center, New Horizons' principal investigator, surrounded by children at Johns Hopkins University Applied Physics Laboratory in Laurel, Md., on Tuesday 1/1/19.

LAUREL, Md. — Thirty-three minutes after midnight, scientists, engineers and well-wishers here at the Johns Hopkins Applied Physics Laboratory celebrated the moment that NASA's New Horizons spacecraft made its closest approach to a small, icy world nicknamed Ultima Thule. Almost 10 hours later, the New Horizons team, based at the laboratory, finally received confirmation that the spacecraft had indeed done everything they had asked. In the days and months to come, the mission's scientists expect to receive pictures of Ultima Thule and scientific data that could shed light on how the sun and planets formed during the solar system's earliest days. During the flyby, the spacecraft was out of communication with Earth because it was busy making scientific observations. Only hours later did New Horizons turn its antenna toward home. Then, it sent a 15-minute update on its status, confirming it had survived the flyby.

**The message took six hours to travel the 4.1 billion miles at the speed of light to Earth.**

It did not contain any new pictures or readings from the flyby. At 10:31 a.m., the mission operations center at Johns Hopkins confirmed that a radio dish in Madrid, Spain, part of NASA's Deep Space Network, had locked in to the signal from New Horizons. "We have a healthy spacecraft," Alice Bowman, the mission operations manager, announced following a methodical check of the spacecraft's systems. "We've just accomplished the most distant flyby. We are ready for Ultima Thule science transmission." Clapping and cheering erupted in the room where the mood had been quiet and nervous a few minutes earlier.



**Brian May's music video U-Tube on New Horizon spacecraft:**

<https://youtu.be/j3Jm5POCAj8>

**QUESTION:** Confirm it took close to 6 hrs for signal to travel from New Horizons spacecraft to earth?

**HINTS:**  $c = 6.706 \times 10^8 \text{ mi./hr.}$ ,  $x = v t$

**ANSWER:**  $t = 6.11 \text{ hrs.}$

The night before, revelers at the lab, which manages the mission for NASA, celebrated both the start of 2019 and the flyby. They were treated to the debut of a recorded music video by Brian May, best known as the lead guitarist of the rock band Queen but also an astrophysicist collaborating with the mission's science team. **Dr. May's new song, "New Horizons," was written for the occasion at the request of Dr. Stern.** Dr. May said he was initially reluctant when Dr. Stern asked. "I thought this is going to be hard, because I can't think of anything that rhymes with Ultima Thule," he said. For most of the rest of his time here, Dr. May is working with other scientists. "I'm not here as a celebrity," he said.