To Pluto And Beyond

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The New Horizons mission launched on January 19, 2006, and in nine years it will fly by the planet Pluto and its moon Charon. After acquiring data and images of these distant objects, mission scientists hope to further investigate the mysterious Kuiper Belt that encircles the outer solar system.

As New Horizons prepared for launch, NASA presented a webcast in which scientists answered questions from the public. In this edited transcript, project scientist Harold Weaver Jr., of the Johns Hopkins University Applied Physics Laboratory, talks about what we could learn

when the spacecraft arrives at its destination.

Q: Could this mission prove that Pluto isn't a planet?

Harold Weaver (HW): That seems to be the question on everyone's mind right now. In fact, it was in Parade Magazine. It was the cover story: "How many planets are there? Hint: the answer is not nine." Some people want to demote Pluto, because Pluto is very small. It's only about 70 percent the size of the Earth's moon. Some people say Pluto shouldn't even be a moon for that reason. On the other hand, Pluto is spherical, which means it has enough mass to form a sphere; it has an atmosphere; it has similar attributes that we normally associate with planets. So a lot of people think that Pluto is legitimately a planet -- it's been a planet for 76 years, and there's no way we can take it off the list now.

But the problem is, earlier this summer, a new object was discovered out in the Kuiper Belt that's slightly larger than Pluto. So if you're going to call Pluto a planet, you have to call this other object a planet. It's been nicknamed, by the way, "Xena." I don't think that name is going to stick. (laughs). The interesting thing is, we've only uncovered the tip of the iceberg. There are probably lots of Pluto-sized or Charon-sized objects out in the Kuiper Belt, and we'll probably end up with on the order of 100 planets, eventually.

Q: Pluto's moon, Charon, is extraordinarily large as compared to Earth's moon. How do you suppose Charon formed?

HW: Pluto and Charon have a lot more in common with the Earth-moon system then you might think. They probably both formed from a giant cosmic collision, two objects colliding with each other about 4.6 billion years ago. In one case, we had the Earth and a Mars-sized object that collided with each other, and eventually separated into the Earth and the moon. In the case of Pluto, what we think happened was two Kuiper Belt

objects, probably Pluto-sized, smashed into each other and created two roughly equal-sized objects.

Q: Will New Horizons find ice geysers and ice plumes that fill Pluto's atmosphere, like on Neptune's moon, Triton?

HW: I love this question, because it forces us to think about this mission from a broader perspective. Sure, Pluto is our prime target, but we also want to know how Pluto fits in relative to all the other objects in the solar system. Triton is probably the best analog of Pluto in the solar system that we know of right now. We just got a faint glimpse of Triton back in 1979, when the Voyager spacecraft flew by Neptune. It took some really fascinating pictures of Triton showing these cryogenic geysers. It's like Old Faithful, except instead of being hot steam coming out, it's frozen nitrogen gas. We think that we'll probably see similar things on Pluto.

Q: Cassini had its surface probe Huygens. Why is there not a surface probe from New Horizons, as well? And why is the New Horizons mission to Pluto/Charon a flyby and not a Pluto orbital mission?

HW: Basically it's because we have to learn to walk before we can run. We've never even had a mission flyby Pluto yet, and that's the first step. In fact, you can't even do the more detailed stuff, like figure out where to send the probe, until you've taken your first detailed reconnaissance. That's what New Horizons is all about -- to flyby, map the surface, and then we'll have a better idea about what we might do for another mission sometime in the future.

Now, going into orbit around Pluto is going to be really tough. We've been able to do it around the gas giant planets, Jupiter and Saturn, but that's because they're big and they have very strong gravity. You can send a spacecraft by, and it will be captured by the gravity of Jupiter and

Saturn. Pluto is just a little guy. Sending a spacecraft by Pluto and then slowing it down enough to go into orbit around Pluto is going to be a big technological feat that I don't think I'll see in my lifetime.

Q: New Horizons is supposed to get no closer than 10,000 kilometers from Pluto. Why can't New Horizons get closer, and how will this affect the resolution of the images returned?

In this artist's concept, Pluto and its moon Charon are seen from the surface of one of Pluto's newly discovered satellites. Credit: David A. Aguilar of the Harvard-Smithsonian CfA

HW: That's a great question, because why 10,000? In fact, the spacecraft could be directed to slam into Pluto if we wanted it to. (laughs) But that would end the mission catastrophically before we were able to send any data back, so we definitely don't want to do that.

We had a study many years ago to investigate exactly this question: what is the optimal distance to flyby? If we flyby too close, you're swinging by the planet so fast that the closer you get to it, you have to scan your instruments really fast. Even if you're moving at the same speed, the closer you are to the planet, you're going to have to scan your instruments so fast that all of your images would be blurred. So that resolution that you'd think you could pick up by flying closer is wiped out because you aren't able to scan the spacecraft fast enough to keep up with that motion. On the other hand, if you're too far away, then you just don't have the resolution. It turns out that something close to 10,000 kilometers is almost perfect, and satisfies all of the scientific requirements of the New Horizons mission.

Q: Is there a plan to send more missions to Pluto in the future, and is there a concept for a manned mission to Pluto?

HW: Not right now. A lot of us in the scientific community have already started thinking ahead, and we hope that we'll be able to build on the success of the New Horizons mission and get a mission approved to go to another interesting Kuiper Belt object. We hope that'll happen in the next couple of decades. But right now, there are some other missions that NASA has in mind ahead of that kind of mission.

Q: Are you planning on flying by an asteroid or other bodies in the solar system between Jupiter and Pluto?

HW: In fact, we have identified what is called a Centaur object, which is a Kuiper Belt object that has had its orbit changed so that it comes within Saturn's orbit. That's pretty close to the inner solar system for a Kuiper Belt object. The Centaur object is named 2002G09. We actually don't get that close to it – it's about three times farther away from the spacecraft than the Earth is from the sun -- but it is much closer than we are at the Earth from this object. We will be able to use it as practice for acquiring Kuiper Belt objects when we eventually go past Pluto.

No spacecraft from Earth has yet explored Pluto but astronomers have found ways of mapping its surface. This map of the distant, diminutive planet is based on direct images obtained by the Hubble Space Telescope. Above are two opposite hemisphere views of the computer-constructed map of Pluto's surface. Credit: A. Stern (SwRI), M. Buie (Lowell Observatory), NASA, ESA

Q: Will New Horizons visit the new 10th planet?

HW: That would be great. But unfortunately, that new 10th planet is much farther away even than Pluto. And also, unfortunately, our New Horizons spacecraft, even though it eventually will pass the orbit of Xena, the 10th planet, Xena will be in a completely different portion of space at that time. Space is huge, it's mostly empty, and you have to be

targeting something explicitly and specifically in order to get there. It's not just by luck that we'll be able to go to something like this.

Q: What are the chances of finding microbial life on Charon or Pluto, since we have the proof on Earth that life can evolve anywhere?

HW: We have life forming in extreme conditions on the Earth, but "extreme" on the Earth is pretty different than the extreme kind of conditions that we see on Pluto. Unfortunately I think that the chances are pretty slim that there's life on Pluto. First of all, the temperatures of the surface is about minus 390 degrees Fahrenheit. What could be moving in those kind of temperatures?

The other thing is that it's is so far away from the sun, the sunlight is a thousand times fainter at Pluto than it is at the Earth. Life as we know it needs energy, and most of our energy ultimately comes from the sun. Pluto, being so far away, doesn't get much energy there. So you would have to have some really sloth-like creatures at Pluto to survive.

Now, that's regarding the surface of Pluto. Maybe there's more hope for underneath the surface. There could be radionuclides heating the interior, or some kind of geological action that's taking place that causes some slush to form; you never know. But it'll be quite awhile before we're able to probe underneath the surface and prove it.