NASA's Deep Impact Mission: Decision Making

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SUMMARY INTERVIEW SHEET

Interview of: Dr. Michael A'Hearn
Job Title: Deep Impact Principal Investigator
Institution: University of Maryland
Interviewer: John Ristvey
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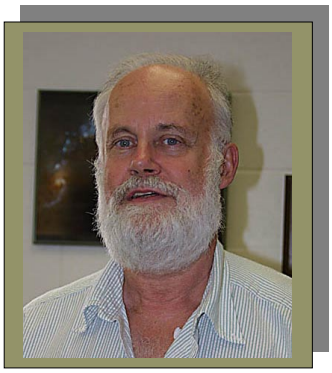

Dr. Michael F. A'Hearn

Dr. Michael A'Hearn
Deep Impact Principal Investigator

My name is Michael A'Hearn. I am a professor of astronomy at the University of Maryland. My interest in comets goes back at least thirty years. The field has changed dramatically since then. There are now huge numbers of people studying comets. I am interested in all aspects of comets. The most unknown part of a comet is its nucleus. We know a great deal about the gas and dust that make up the head and the tail of the comet, but our knowledge of the nucleus is limited. The Deep Impact mission is intended to probe the interior of a comet's nucleus for the first time.

The final decision on the timing of the impacting Comet 9P/Tempel 1 has not been made. We have baseline data that we are working from now, but this decision is one that will be made just prior to launch. We will have data coming back from the spacecraft through the Deep Space Network (DSN). In one sense, these data we get from the spacecraft are the most valuable. Because of this, we would like to use at least two antennas in the Deep Space Network, to make sure we get the data from the spacecraft.

On the other hand, the variety of data we get from the spacecraft is relatively small compared to the variety of data we can get from Earth-based facilities, both on the ground and in orbit around the Earth. We can get a much wider physical understanding of the characteristics of Comet 9P/Tempel 1 if we get a wide selection of data from Earth-based facilities, too.

Since it is not dark everywhere on Earth, the question that must be answered is, "From what observatories can we get the largest possible amount of data with the greatest diversity and the highest probability of success?" Some observatories are in locations where it is likely to be rainy, and others don't have the instrumentation in order to make a wide variety of measurements. So we must think very carefully about which ground-based observatories are the most important from the viewpoint of instrumentation and a probability of clear weather. This information is used for deciding the best time for impact. The two prime Earth-based sites with a large variety of instrumentation and telescopes are in Chile and in Hawaii.

The real choice is, how big of a priority is it to have two antennas in the Deep Space Network? Is it important to have two different sites, or is it adequate to have two antennas at the same site? This choice will also require an analysis of the instrumentation aboard the spacecraft. If these instruments are a lower reliability than the DSN, then perhaps it will be more valuable to get the Earth-based data than to have two antennas in the DSN.

Weather is not a factor for the Hubble Space Telescope (HST). We will have to make a small adjustment if we use the Hubble Space Telescope, because it is in a 90-minute orbit around the Earth, and if it is on the wrong side of the Earth, it will not be able to see the impact. We will need to be able to shift the impact time by plus or minus forty-five minutes to optimize the observability from the telescope. This is hard because the people who keep track of the space telescope do not know where it will be until two months in advance.

The science objectives of the Deep Impact mission are to understand as much as we can about the comet's nucleus. In order to do this, we need the widest possible selection of measurements of the material ejected from the impact crater, and the details of the outer layers of the comet's nucleus. The decisions we make for deciding the best scenario for optimizing our data collection will impact the extent to which we are able to meet these mission science objectives.