NASA's Deep Impact Mission: Decision Making

Clarifying the Issues

SUMMARY INTERVIEW SHEET

Question: Please tell us about your involvement with the Deep Impact mission and your thoughts about optimizing the data being received during the impact of Comet 9P/Tempel 1 in July of 2005.

Interview of: Dr. Karen J. Meech
Job Title: Astronomer
Institution: University of Hawaii-Honolulu Institute of Astronomy
Interviewer: John Ristvey
Date: July 10, 2001
Conducted by phone at her hotel in Washington, D.C.

Karen J. Meech

Dr. Karen J. Meech
Astronomer

My involvement with the Deep Impact mission is that I am the coordinator of all of the ground-based observing for the mission. We have been making observations of Comet 9P/Tempel 1 for Deep Impact ever since the mission was accepted. We had a huge observing campaign in 1999 and 2000. We used many ground-based observatories to get data about Comet 9P/Tempel 1 prior to impact.

One goal of these observations are to understand how much dust the comet puts out and when it starts to make this dust. This knowledge will be needed so we will be certain that the Deep Impact spacecraft will be safe when it passes near the comet. A second goal is the need to measure the chemical composition of the gasses coming from the nucleus prior to impact. Because the mission is going to create a large crater, we will measure the change in the types of gas after impact, in order to have a starting point for comparison. A third goal is to measure how fast the comet spins, which is important for targeting the impactor. We want to target the impact on the large side of the comet.

Much of this information that we are searching for prior to launch will help inform mission science and mission planning. There are many factors that we need to consider in deciding on a time of impact. If you think about public appeal, we would like to have as many people in the United States able to see the impact while the comet is above the horizon at night. This would provide the biggest "Ooh! Aah!" factor.

From a scientific point of view, we would like to have as many observatories in the world as possible to be looking at the event at the time of impact so we can maximize the science. Every observatory specializes in something different. We have a lot of telescopes in Chile that could be used. Since Chile is a little further east than Florida, it would be night time on the U.S. East coast at the same time as it would be night at Chile. We have a nice concentration of telescopes at Kitt Peak National Observatory in Arizona, and of course here in Hawaii. The question of which observatories to use boils down to two questions, "Do we pick having the impact during night time in Chile and get a huge amount of ground coverage? Or do we choose night time in Hawaii, where there are not as many telescopes, but it is a superb observing site?" Since the telescopes are spread out in Chile, we would have more options if the weather were bad in one location. If the spread of the telescopes was the only consideration, it would be an easy decision, but we also need to get data from the spacecraft via the Deep Space Network (DSN). If we use Chile, we only are able to use one Deep Space Network site. If we use Hawaii, we would get an overlap of two DSN sites. There was a huge amount of discussion between scientists and engineers to which scenario to pick. With any decision, there will have to be a compromise somewhere.

Using orbiting telescopes like **Hubble** makes it even more difficult to schedule things, because Hubble has a 90-minute orbit and we would like to pick a time of impact when we can get as much of that

90-minute orbit as possible. There are certain periods when Hubble is not available. An advantage to using orbiting telescopes both prior to impact and during impact is that there are certain molecules, which emit light at wavelengths that are not accessible from the ground. Water is an example of a molecule that is not easily seen through our atmosphere. We will certainly use Hubble Space Telescope and other orbiting telescopes that we can.

So, we have a 90-minute time frame for Hubble, the need for two DSN sites, and the best ground-based viewing with sometime around July 4, 2005 for public viewing. It has been a challenge to mesh everything together to make sure it works when we want it to.