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Why Mars Mission Tops Wish List: Space Exploration Priorities Explained

http://www.pbs.org/newshour/rundown/2011/03/everybodys-got-the-budget-in.html

Video 1

MOB: The Planetary Decadal Survey. For those of us who are not imbued with this world of yours. It's a big deal. Explain what it means.

SS (:10): Once every ten years, at the request of NASA and the National Science Foundation, the National Research Council does what they call a decadal survey, and it's a decade-long planning process, as the name implies, to plan the next ten years, in our case, of planetary exploration. So we begin by talking to everybody in the planetary science community, in the United States and overseas, getting their inputs, getting their ideas, finding the highest priority science and then trying to craft a ten-year program that will do the most important science.

MOB: So you're trying to craft a ten -year program in a world of four-year political cycles. That's always difficult.

SS: A world of four-year political cycles and annual budgets, so we have to take a long view. But what we also do is we give NASA, we give the agency, a set of decision rules, we call them, that they can use to figure out what to do if the budget goes up or if the budget goes down. One thing that distinguishes this decadal survey from all the planetary ones and most of the other ones that have preceded it is that we were specifically told that we need to come up with a plan that is executable and affordable within the available funding. And man, let me tell you there was some serious sticker shock. Some of these things cost a heck of a lot more than we thought they were going to cost. But we accepted their numbers and planned based on those pessimistic numbers as opposed to other optimistic numbers we might have …

Video 2

Our highest priority flagship mission and this comes from [the] previous Decadal is Mars Sample Return. It's returning samples from Mars. What's different this time, two things: first of all, the idea is to take that very challenging task and break it up into more bite-size pieces. So it's actually three missions, of which only one, the first, would take place in the decade that we are recommending.

The first one is a mission called MAX-C, M-A-X-C uh, stands for Mars Astrobiology Explorer with Caching. What that does is it lands on the surface with a rover, selects a suite of samples, puts them in a can. Those are the samples that are sooner or later going to come back, but they can sit in that can for a while.

(45) Second mission is going to take place after the decade that we've talked about. What that does is it lands near that, drives over to it, picks up the can, puts it in the nosecone of a small rocket and puts that little spacecraft into orbit around Mars, so now the samples are in Martian orbit.

(1:01) The third mission rendezvous with that orbital sample, gathers it in, and brings it back to earth. And the beauty of this architecture is that you spread the costs of this very complex program over an extended period of time, so the costs per year become manageable.

MOB: these are tough times to be thinking about …. Make the case.

(1:30) The case for sample return is that there might once have been life on Mars. Are we alone? How does life first arise? These are fundamentally important questions. And we can seek to understand those questions if we can find out whether or not life ever emerged on Mars. The best way to get at that question is with the sample return. Look at the controversy that was generated by the Martian meteorite, ALH84001, the one that was argued might have some evidence of life in it. This was a rock we could put into our own laboratories, and still it was a very controversial scientific question. What we need is rocks that we can put in [terrestrial?] laboratories but that we selected, not just fallen from the sky, but that we have chosen for the maximum potential of preserving evidence of ancient Martian life. That's the best way to try to answer that problem, fundamentally important.

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Video 3
Number 3, I really like this one. Number 3 is the Uranus mission. Here's the thing. When you look at the solar system, there are basically three types of planets.

There's the terrestrial planets, Mercury, Venus, Earth, Mars. We know a lot about them. There's the gas giants, Jupiter and Saturn. We have been to both of those with Voyager, but we've also sent Galileo to Jupiter, Cassini to Saturn, and we've got a mission called Juno, which is another new frontier mission that's on its way to Jupiter soon.

We've never been to the other kind. The other kind, Uranus and Neptune, they're called Ice Giants, and they're fundamentally different from Jupiter and Saturn. They're big, they don't have solid surfaces, but that's what they have in common with Jupiter and Saturn. They're made of different stuff, very, very different composition. The interior of these objects is different, they're a fundamentally new and different class of planet. It's the one part of the solar system where there's probably the greatest opportunity for just completely new and different discoveries. We've just never looked at a planet like this in detail before.

You could pick Uranus, you could pick Neptune. The reason we recommend Uranus is just some practical issues having to do with trajectories that will get you there in appropriate time scales and the readiness of certain sorts of technologies. But we feel the Uranus mission has the same potential for exciting discoveries as Galileo in Jupiter and Cassini for Saturn, so that's the third highest priority flagship.