The Challenges of Getting to Mars: Selecting a Landing Site

[00:00:01]{italic}(music){plain}

[00:00:02]'...Zero, and liftoff!'

[00:00:04]{italic}(music){plain}

[00:00:20]One of the most challenging aspects of this mission happens before we even land.

[00:00:24]And it's picking the right landing site for the mission.

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[00:00:30]We want to study the habitability of Mars. We want to really figure out if it was ever capable of supporting life.

[00:00:35]And the way we do that is to really follow the evidence of water on Mars.

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[00:00:47]One of the most interesting things about Mars is that it's changed over time.

[00:00:51]What we see on Mars today is very different from what occurred in the distant past.

[00:00:55]And water is the real interesting thing that we're looking for --

[00:00:57]the history of water and how it's changed over time.

[00:01:05]One of the biggest challenges to studying habitability on Mars,

[00:01:07]which is the goal of the Curiosity rover mission is to try and follow that signature of water.

[00:01:12]Where was the water? How long was it there? And where do we go to look for evidence of it?

[00:01:17]If we were somewhere like this where there's a pretty obvious geologic record of water flowing,

[00:01:22]carrying material down, that would be a home run.

[00:01:24]But the real challenge is finding that one spot on Mars to send this great rover mission to.

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[00:01:34]We have four wonderful landing sites. All very different in character.

[00:01:38]And the real challenge for us as scientists is to come to a consensus

[00:01:43]on which one of those sites offers the best chance of fulfilling the goals of the mission.

[00:01:47]There's a place on Mars called 'Mawrth Vallis,'

[00:01:50]which has the brightest mineral signature of clay minerals on Mars.

[00:01:53]And these clay minerals are known to form in the presence of water, and neutral ph water...

[00:01:58]...not acidic, not too basic. Just the kind of water that would be friendly to life.

[00:02:03]Then you have terrestrial geologists who say that the rock record should be the thing that we follow --

[00:02:08]the landforms that look like they were carved by rivers or floods.

[00:02:14]So you have sites like 'Holden Crater,'

[00:02:16]which is a big impact crater many miles across with a river coming into it,

[00:02:20]perhaps forming a lake multiple times, flooding the crater,

[00:02:23]leaving a geologic record that we can study with Curiosity.

[00:02:27]Just upstream a little bit from 'Holden Crater,' there's a place called 'Eberswalde Crater.'

[00:02:32]That same river system in Eberswalde, has left evidence of a delta.

[00:02:36]Just like the Mississippi River delta, these things form when muddy, silty water

[00:02:42]deposits its silt and mud into a standing body of water like a lake.

[00:02:46]So you have people that study deltas on Earth who think that's the place Curiosity should go.

[00:02:52]The final site is the best place on Mars if you want to just study layered materials.

[00:02:58]So, why do we like layered materials? Because just like this outcrop behind me,

[00:03:03]they give a record of time; of how things change over time.

[00:03:07]By studying different layers, you can rebuild the geologic history of Mars.

[00:03:11]So there's a place called 'Gale Crater,' which has a three mile stack of layered rocks.

[00:03:17]Now we don't know exactly how those layers formed,

[00:03:19]and the mineralogical evidence isn't as strong as other sites --

[00:03:23]but people who just think layers are the thing to study, really love 'Gale.'

[00:03:28]So you have these four different sites,

[00:03:30]and these four different groups, and very passionate arguments back-and-forth,

[00:03:33]to try to really narrow in on what is the one site to send the Curiosity Rover.

[00:03:39]{italic}(music){plain}