

Charles Elachi

Highlight Video Transcript



What does it take to place an object on Mars?

The short answer: the ability to work out an extremely complex problem and then see it through to realization. Charles Elachi, Director of the Jet Propulsion Laboratory in Pasadena, California, brings both qualities to the interplanetary space missions his organization develops. His training as an engineer and geologist is just the beginning. Elachi also works to arrive at solutions that are workable and profitable without stifling creative input. Beyond that, he helps an organization that must succeed under tight budgetary constraints and remain answerable to the public.

The NASA logo, consisting of the word "NASA" in its characteristic orange, slanted font, is displayed on a dark background.

Vehicles move people. Transport goods. Shrink distances.

They also show us new – and sometimes amazing – vistas.

The vehicles developed by Charles Elachi and his team
open up truly remarkable landscapes.

They just happen to be millions of miles from Earth.



Scenes in Greenfield Village Top: horse-drawn omnibus, Bottom left: Detroit, Toledo & Milwaukee Roundhouse and turntable, Bottom right: A Model T

Charles Elachi, Director of the Jet Propulsion Laboratory, Vice President of Cal Tech, Physicist, Teacher and Constant Explorer

01:05:56

... We started by trying to get to the moon because that was easiest ... I mean, relatively speaking, the easiest. But since then, we have basically visited all the planets in the solar system, ranging from with the series of Mariners missions, which went to Venus, Mercury and then to Mars.

01:06:18

Then we have Voyager, which basically went through all the major planets and now it's leaving the solar system, to the next step of doing orbiters around Jupiter and around Saturn. So, as we speak today ... we have two spacecraft in orbit around Mars and two rovers which are working on the surface.

01:06:39

... We have spacecraft which are heading to comets, spacecraft heading to asteroids.

01:06:57

So ... the solar system is our backyard. So we go and play in that backyard, but in a serious way.

The Challenge

01:21:22

When we send the two rovers to Mars, after traveling about 450 million miles, we have to get them within, literally, within a mile distance on the top of the atmosphere of Mars to land accurately and not burn in the atmosphere. This is the equivalent of standing in California, hitting a golf ball towards St. Andrews in Scotland, and getting it straight in the cup. That's how challenging we have to do this navigation.



Charles Elachi

"The solar system is our backyard. So we go and play in that backyard, but in a serious way."
— Charles Elachi



Visitors to the Jet Propulsion Laboratory Museum in Pasadena, California, view models of space exploration vehicles on display.

01:21:46

And to make it a little bit more challenging, the cup is moving at high speed and we still have to get it in the cup. So that – illustrates in a day-to-day way the kind of things we work on . . . When we are coming into the atmosphere on Mars, we're coming at a speed where it's about 12,000 miles per hour . . . and literally in six minutes, we have to slow down, and stop, and land very softly on the surface, otherwise we crash.

01:22:16

The heat we get on our heat shield makes the shield hotter than the surface of the sun. And within those . . . minutes a lot of things have to work. Parachutes have to open, heat shield have to be dropped, airbags have to open, retro rocket have to fire, and everything has to be done, all autonomously, 'cause it takes ten minutes for the signal to go to Mars . . .

Staying Calm

01: 10:13

The thing I keep saying in this business, you have to stay calm, calm, calm. Which means when you have a problem, the first reaction is, "Okay, now how do I solve the problem?" You know, I have a challenge now, how do I solve that challenge versus, "Oh God, you know, we are in deep trouble." So I think that's characteristic of innovators.

01:10:29

You know, they – they don't take a setback easily . . . They keep saying . . . "I'm going to try again" . . .

Urge to Explore

01:17:11;06

. . . if our ancestors were not curious, probably we are still sitting in caves just doing drawings . . . But they were curious; they wanted to see what's outside. They knew it was dangerous, but they wanted to explore.

01:17:33; 22

I mean, that's part of the human character . . .

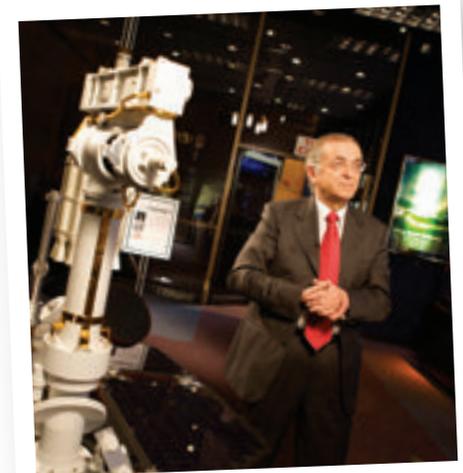
01:17:53; 12

. . . that urge to get to know things, be it for intellectual purpose, or economic purpose or political purpose, but that's an urge that we have as a human.



A screen in the Jet Propulsion Laboratory Museum displays the latest images coming from Mars Odyssey, a robotic spacecraft orbiting the planet Mars.

“...that urge to get to know things, be it for intellectual purpose, or economic purpose or political purpose, but that's an urge that we have as a human.”
— Charles Elachi



Charles Elachi stands next to a full-scale model of the Mars Exploration Rover in the Jet Propulsion Laboratory Museum.

Rovers: The Next Generation

02:05:18

... The two rovers we have now up there are what we call walking geologists. ... They can grind the rock, analyze the rock with an instrument and so on.

02:05:36

The next one is what we call a walking chemist. Because we want to go to the next step where actually we'll be able to take rocks, grind them, put them in ovens and do a chemical analysis of what's the composition of those rocks or the soil ... And that's a step toward ... what we call a walking biologist.

02:05:53

Because ultimately what we want to see is, did life evolve on Mars? Was Mars a life-friendly environment at some time in the past? If it was, did life evolve? If it evolved, where is it? So the next rover we are planning will have a much more extensive capability ... it will be nuclear powered ... so we can operate day or night.

A Job vs. A Passion

01:16:06

I try to meet with all the new employees ... every couple of weeks. And I tell them, "Look, if you are looking for a job, this is the wrong place for you. But if you have a passion for exploration, if you'd love to go home or tell ... your Mom ... "Guess what? I just landed a spacecraft on Mars", or "just brought a sample from a comet, or I just flew by Jupiter" – and you feel passion about that, then this is the right place."



In the museum the Mars Rover model stands next to photographs depicting the history of the Jet Propulsion Laboratory.



Charles Elachi

**Charles Elachi has a lot more to say.
Visit OnInnovation.com**

to see his full, unedited interview, read the complete transcript
and connect with other visionaries thinking out loud.