ASK Talks with

Dr. Michael Hecht

Dr. Michael Hecht has been a member of NASA's Jet Propulsion Laboratory (JPL) staff since 1982. He is currently Project Manager and co-investigator for the Mars Environmental Compatibility Assessment (MECA)

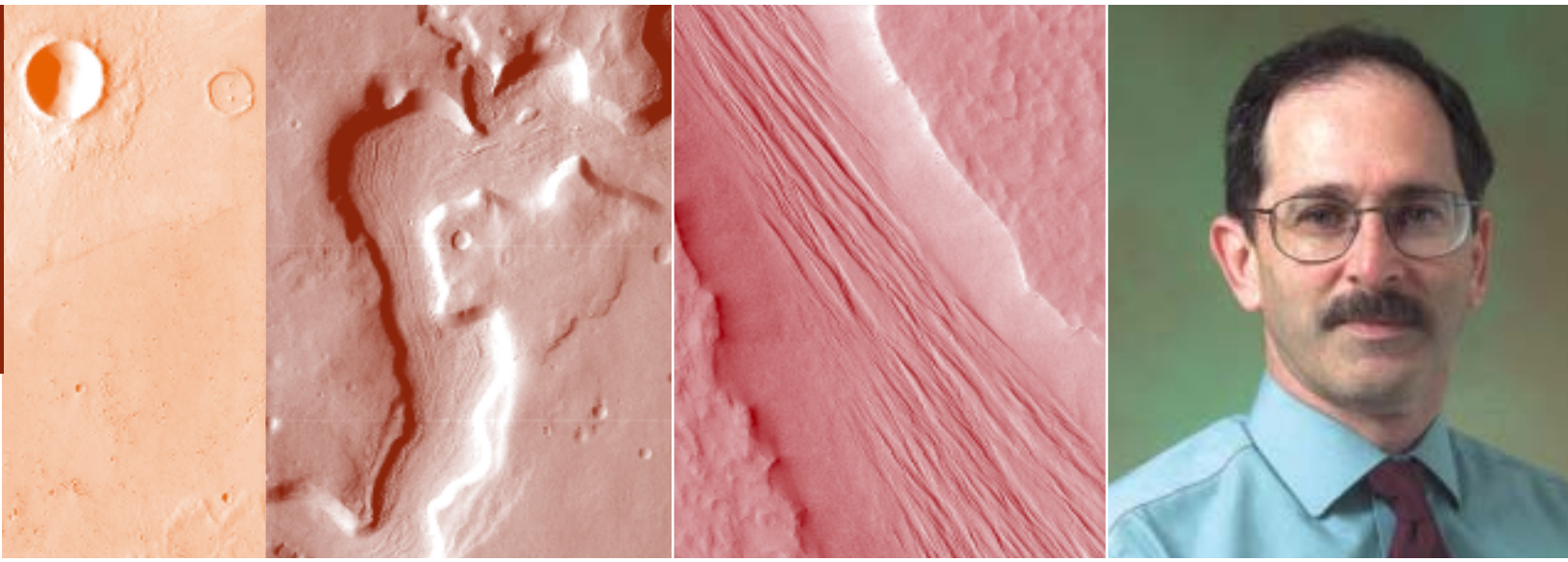
Developed for the 2001 Mars Surveyor Lander, MECA is a miniature chemistry, microscopy, and electrostatics laboratory. MECA was chosen by NASA from a field of 39 proposals and was developed to perform studies on the potential hazards that the soil and dust on Mars might pose to human explorers. (The MECA project was featured in an earlier article by Dr. Hecht in *ASK* 7.)

In his previous assignment with NASA's New Millennium Program, Dr. Hecht was instrumental in defining the "microlander" that was adopted as NASA's New Millennium Program Deep Space 2. Beginning in 1991, he led a microtechnology program at JPL's MicroDevices Laboratory.

Dr. Hecht was the first recipient of JPL's Lew Allen Award for Excellence, which was established in 1990 to recognize and encourage significant individual accomplishments or leadership in scientific research or technological innovation by JPL employees during the early years of their professional career. He has published extensively in both the surface science and the planetary science literature. He received his Ph.D. from Stanford University in 1982. He has also been a member of the *ASK* Review Board since *ASK* 1.

A couple of years ago, you gave a conference presentation about a science instrument, MECA, that was going to fly on a Mars mission. You described yourself as both the project manager of the instrument team and the co-investigator. It's unique for a project manager to be involved so directly in the science of a project. Why are these normally kept as separate functions?

Generally, there is the concern—and it is a legitimate one—that someone who has an investment in the scientific return isn't going to be able to control the resources. At my institution, JPL—and I think at NASA in general—you'll find there's a creative tension between the science team on a mission and the project team. The model is that the science team pushes the capability, while the project manager holds the line and protects the resources. The science team will come and say, "We want more memory so we can do more analysis on the ground and return better data," while the project manager will say, "that will push the budget or schedule." Allowing a scientist to also have a project management role is generally viewed as the equivalent of letting the fox guard the chicken coop.



But MECA was different. How so?
MECA was a very unusual project. We were below the radar, if you will, so we could be a little more relaxed.

What kind of relationship did you have with the Principal Investigator (PI), someone you were working with closely as a scientist and at the same time managing?
On MECA, the principal investigator was expert in the general scientific issues we were studying, hazards associated with particles. He was a senior guy, very skilled and very knowledgeable, from whom I have learned a tremendous amount. But he knew almost nothing about Mars science, so that was really my role. I was the one defining the Mars science agenda.

When we have a discussion about who should be the principal investigator for an instrument or a mission, we recognize that there are two different jobs of the PI, and you seldom find an individual good at both of them. One job is to be the statesman, the spokesman, the senior individual with unimpeachable scientific credentials, who stands up in front of the cameras and speaks for the mission. The other job, frankly, is a day-to-day science management job. Most people in this community recognize that once you get past winning the proposal, it's more important to have a science manager than it is to have a statesman.

How does your background as a scientist, or researcher, help you as a project manager?
To me, the science is part of the whole system. When you optimize the system, the science is one of the factors that you can weigh. I'll give you a very simple example. This happened with MECA when we had an opportunity to add a component, a stirring device that would accelerate chemical reactions. Now, the reaction of the project manager of the overall mission was, "You're adding capability to the instrument." My reply was, "By doing this we can finish the experiment in one day instead of two days. We won't have to deal with an overnight freeze and thaw cycle, which not only imposes risks, but adds a great number of requirements on testing, specifically environmental testing."

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While I'm considering the science and engineering and project management as part of the overall risk picture, I have a different perspective than someone who is only treating the issue as a requirements driver.

Does this sensibility, being a scientist/project manager, affect how you select your team?

We all have a model of the kind of person we want working for us, and it often mirrors our own abilities and interests. That "sensibility," as you want to call it, defined my choice of all of our staff. On MECA I put the kind of team together that I could work with. I drew on a group that JPL likes to call "technologists," a group it doesn't normally look to for mission work. By technologists, they mean scientists in disciplines other than space science. That's not pejorative; it's just terminology, nothing more. You could have a Nobel Prize-winning biochemist and JPL wouldn't put him in a science category.

These were people that I had worked with for years, and years, and years. Many of them were physicists or chemists. I tend to be fond of physicists because I am trained in physics. The organization I came out of is called the MicroDevices Lab. We had people who are electron microscopists or spectroscopists, people who study the arrangements of atoms on surfaces. In fact, that's what I did most of my career. I studied surfaces and interfaces, semiconductor materials.

My model for project management was the one I learned from hanging around small businesses. If someone is too busy to finish this job, the person at the next desk will finish it. Laboratory scientists are good at working this way, and have an instinctive grasp of the trades involved in defining the instruments. I thought it was easier to take those very bright, PhD scientists and train them how to do mission work than it was to take the people who typically worked on flight projects to train them in my management style. So, I had a team of generalists, and I think that's why it worked. I think that everyone felt like they could do any job on that team. They had an assigned job and they accepted that, but only because that was what had been negotiated. If tomorrow we changed the agreement, they could have stepped into a different role.

Was it difficult to convince people without flight experience to join the project?

It varied with each person. Of the hundred or so PhDs in the MicroDevices Laboratory, I have probably approached thirty of them with such an opportunity at one time or another. Of the thirty, perhaps five or six jumped at the opportunity. That's why they came to JPL, they told me. They'd always wanted to do space work, they'd always wanted to build things to fly; they never knew how to go about it, and they were completely isolated from the flight culture at JPL.

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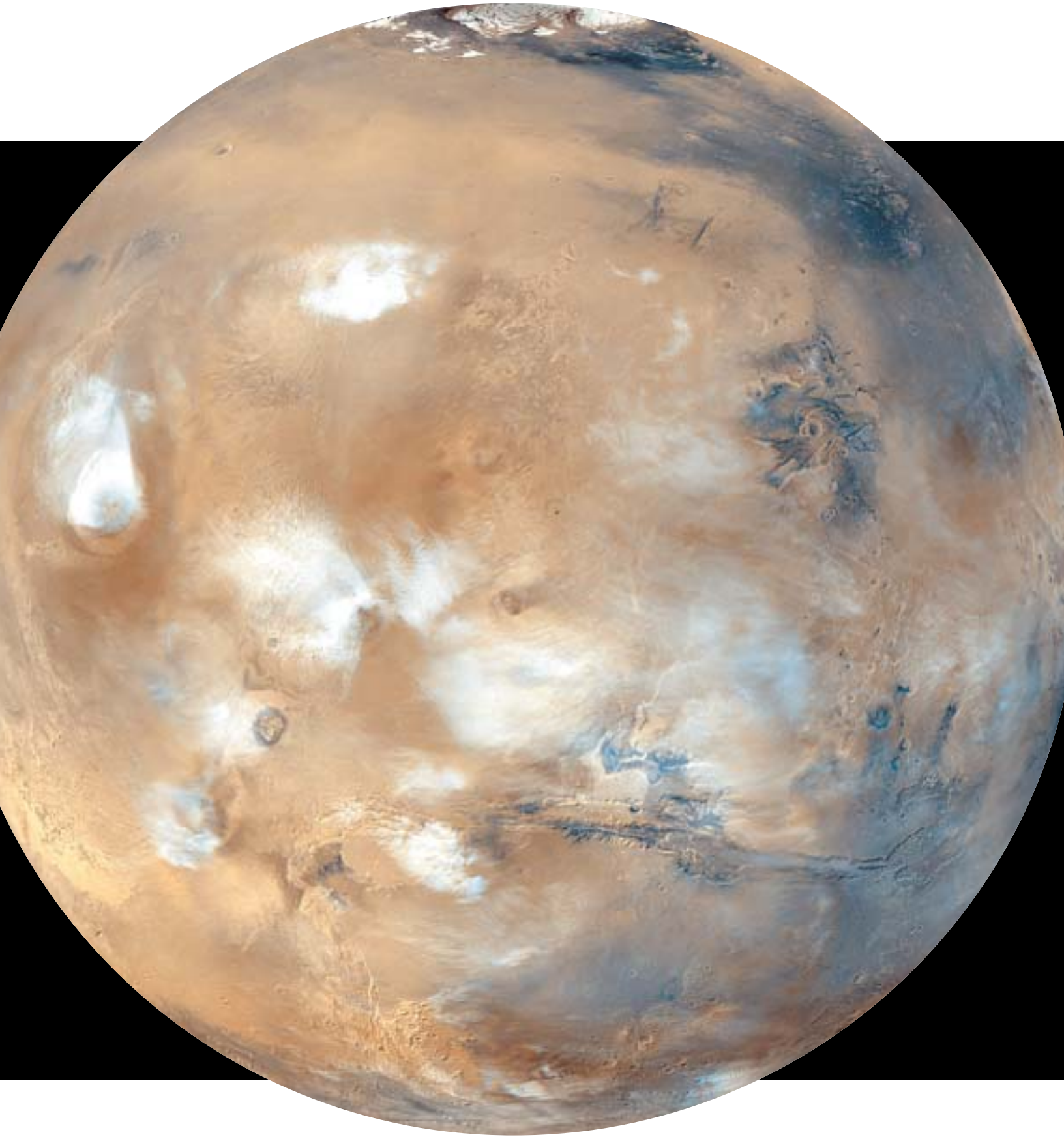
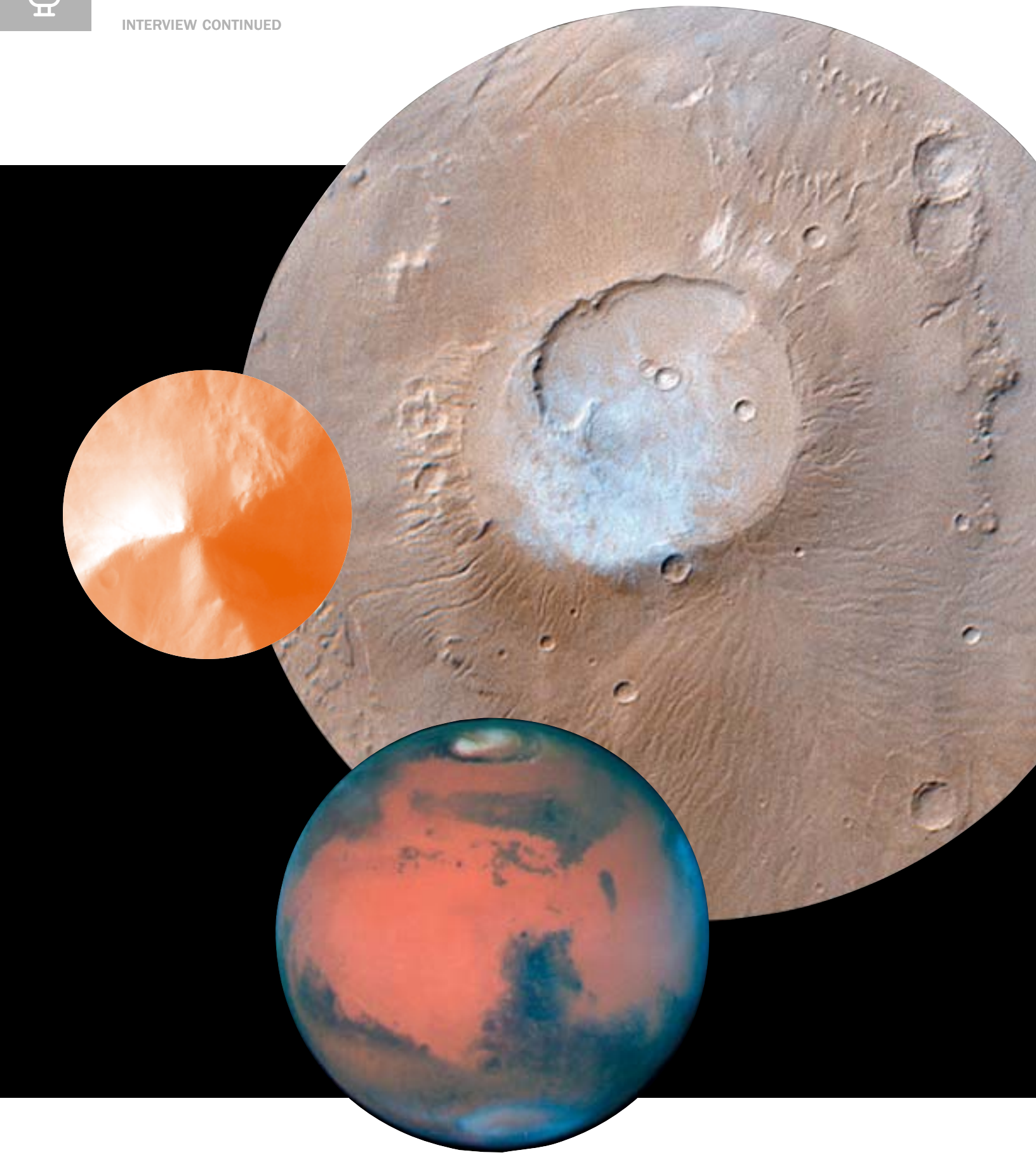
Did anybody think you were managing the project in an unorthodox way by building a team of "generalists"?

I don't know. But one of the most interesting conversations I had when MECA started was with the fellow who was the section manager of the MicroDevices Laboratory at the time. He was concerned about what I was doing because he worried that once those people went to work on a mission, they would never want to come back into research. "Why is that so terrible?" I asked. I think it's a good thing for a research organization to have turnover—and for us to have alumni in the larger JPL community.

In the end, it turned out every one of them went back to research afterwards, but I think they all felt that they came back to their research with a broadened perspective. The flight world gives you street smarts about how to get things done on schedule and to cost that you never learn in the research lab.





Back to the conference we mentioned at the start of the interview. I remember you walked into the lobby one night and said that you had gone outside to look at Mars. Is that frontier aspect of it something that means a lot to you?
Yes, absolutely. I have to admit that is something that's fairly recent. That is something that has developed within the last decade, at most, that kind of passion for Mars.

And what is the source of it?
Several things, one of which I suppose is that I'm turning 50 this year. I also think it is far more common at JPL than almost any place at NASA to find that kind of passion. You find people who come to do jobs all over JPL—in contracts, in the machine shop, as scientists, as engineers—and they tell you, "I know I could have made more money in private industry, but I just fell in love with the idea of going out and exploring the solar system." That's very common.

Could you imagine being the project manager of a project that didn't allow you the freedom you had on MECA?
I don't know. I imagine that if I was on a project where I wasn't able to select the kind of people I wanted to work with, the experience would be much less satisfying to me.

Is it fair to ask which of these two, science or project management, matters the most to you?
If I have to choose whether my career is going to be in project management or in science, for me that's a very, very difficult choice.

Let me ask you one other question. You're on the ASK ***Review Board, and you participate in the Masters Forums. What's the value of the Knowledge Sharing Initiative for you?***
One of the most important messages you learn here is that as you delve into project management more deeply, you realize the idea that anyone is doing it to a blueprint is ludicrous. Nobody uses a blueprint.

Certainly every time I come to the Masters Forum, or read *ASK*, I come away with having learned something. I should say not just new tools, but new perspectives. I think learning, and not just learning other ways of doing things, but learning to have realistic expectations is very important. It is just like raising children. My first one was six years old before we had the second one. You somehow expect the second one will be like the first. Of course, they never are. They couldn't be more different human beings. I'm sure if we had a third the same thing would happen.

I'm at that stage in project management where I need desperately to learn that lesson. If I go in expecting the next project to be like the previous one, I will not only be severely disappointed, but I could very well fall flat on my face. •

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You began your career as a researcher, and then moved into project management. Was that a way for you to get to Mars?
Not entirely. I enjoy wearing a lot of different hats. I've slowly come to realize that this is something that drives me. I want to have some experience in every part of this process, basic instrument concepts through instrument development, through the actual building of flight instruments where I have done my project management, and through the study, the science of what I learn, both the data from the instrument and the modeling and theory. I've been driven to be that broad generalist. The only place in that whole chain where there is a conflict, an artificial conflict imposed by the institution, is in the role of science and project management.