Louise Prockter, director of the Lunar and Planetary Institute.

USRA/LPI

Space exploration strategist

Moon, Mars and other destinations, Louise Prockter looks for answers to the big questions.

LAST SEPTEMBER, LOUISE PROCKTER became the first female director of the Lunar and Planetary Institute (LPI), a Houston-based research organization that was founded in 1968 as the Lunar Science Institute to support NASA's Apollo moon program.

Prockter is an internationally recognized planetary scientist who quickly rose through the ranks at the Johns Hopkins University Applied Physics Laboratory in Laurel, Marlyand, despite getting her science career off to a relatively late start — she was 27 when she enrolled as an undergrad at Lancaster University in the U.K. in 1991 to study geophysics, taking a PhD in planetary geology from Brown University in the U.S. in 1999.

During her nearly 17 years at the Applied Physics Laboratory, Prockter has overseen and developed teams of space researchers and engaged in several NASA space science missions, including its Messenger exploration of Mercury, the Near Earth Asteroid Rendezvous mission, and the Galileo Extended Mission at Jupiter.

As a member of the National Academies' panel that produced the 2013 decadal survey for planetary science, Prockter helped draft the 10-year-plan guiding NASA's solar system exploration strategy through 2022.

Next year, LPI marks the 50th anniversary of its founding. Two years later, it will mark the 50th anniversary of the Lunar and Planetary Science Conference — a seminal gathering of space scientists LPI has held every year since 1970. "I'm planning a lot of things to show what we've done over that time," Prockter said.

Not only has the community of planetary scientists grown since LPI opened its doors nearly 50 years ago, so too has the variety of science the community performs. Prockter recalled what it was like attending LPI's annual conference as a grad student in the late 1990s. "It felt then like you get your arms around everything," she said. "Now you can't."

Prockter is poised to give LPI her own brand of "gravity assist." There are many challenges ahead for planetary scientists, she said, but everyone is poised for a new cadence of exploration and discovery. >

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< > Prockter spoke with *SpaceNews* contributor Leonard David during this year's Lunar and Planetary Science Conference, held in March at The Woodlands, Texas.

For many years there has been tension between moon-first and Mars-first human spaceflight advocates. What's your view?

Just as beauty is in the eye of the beholder, I don't think anyone would be able to argue that one planetary object is more significant than another. It all depends on what your exploration objective is, or what scientific questions you are trying to ask. With respect to human exploration, the moon is an obvious stepping stone on the way to Mars, as it would be a great proving ground for many types of technology and astronaut training. So I don't see them as separate objectives; I see the moon as a crucial element in human Mars exploration. And in the same vein, robotic exploration is a crucial precursor to human exploration of any other body.

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Given the array of possible exploration targets, how difficult is it to prioritize missions?

With budgets that have been more constrained... the problem is that we want to do more with the same amount. Also, a lot of the low-hanging fruit has been picked off. Things are getting more complex. So the things that we do, I think by their very nature, are becoming more difficult and probably more costly.

That said, what's your advice on where best to spend limited dollars?

I think one of the things we need to get away from, for instance, is thinking about what's next on Mars and how do we move the Mars science forward? Or how do we move the Venus science forward? Or how do we move Earth science forward? We need to take a step back and think about what are the big questions for our whole community.

Let's try to think about the really big themes and how do we go after those themes...instead of keeping Mars almost in conflict with the outer solar system, in conflict with the moon, and then there's the poor Venus people still desperately trying to get a mission.

We need to step back, think bigger, and think more in a cross-disciplinary way. And the other thing I believe is asking whether a decade of planning is enough. A decade might be enough for the inner-solar system...but not enough for the outer solar system. We've almost grown out of the decadal mode. So maybe a multi-decade survey is the way to go with regular tweaks, decision points...if we find this, then we go in this direction.

You have a long interest in exploring Jupiter's moon, Europa. Why so passionate about that world?

As a geologist, you just look at the surface of Europa. It's like nothing you have ever seen before. It's phenomenal...a true alien world. In fact, you probably have a saltwater ocean there. If life is in the solar system, Europa is the primary place to look.

Why then has it taken so long to get the mission now known as Europa Clipper started?

Europa was the No. 1 priority in the Planetary Science Decadal Survey in 2003. The reason it wasn't flown was that it was perceived to be just too complex and too expensive. Over the intervening years...we realized that we had to show the radiation wasn't a show-stopper. We had to prove that you could last a long time. So a lot of work was done. Now people accept that the radiation issue is a tough one. It's not trivial, and we have to be careful handling the radiation, but we can still do a very valuable mission.

A Europa mission was competing with other missions, no?

In the 2013 decadal survey, the Clipper design was equally first, scientifically, with Mars sample return. But Mars sample return was picked because they could do it in pieces. A Europa mission was sent back to the drawing board. We were told, see if you can get the cost down and get congressional support. Well, we got great congressional support. But we had to rein in our appetites a little bit. It forced us to think outside the box and, in actual fact, that's a good thing.

What was the upshot of thinking out of the box?

We were forced to come up with a very innovative design for the mission where we can last for 2.5-3 years by going in and out of the radiation belts. We can build up the same coverage around Europa by interacting with the moon at various points in its orbit, instead of being in orbit around it. So the mission, overall, is more cost effective. We still do most of the science we want to do but, don't get all of it.

Do you sense a lack of or need for more researchers within any specific space science field?

A colleague of mine, Kevin Hand at JPL, recently talked about the history of planetary science...how it started off with physicists, then astronomers, moved to geologists. Now that we can land on surfaces of other worlds, we see chemists and chemistry research which is hard to do remotely. We're now moving into astrobiology and that is starting to get really hot. So there has been this kind of progression. Exoplanets is another hot topic and almost getting back to the astronomers. So perhaps we have gone full circle. I don't know about particular areas where we might have a dearth of people. I think the type of work we're doing is different.

What new initiatives will LPI take in the near-term?

I see my job as showing the value of LPI, how we can facilitate science and how we can help bring the community together in ways that wouldn't be possible otherwise.

One example is a set of four conferences across a three-year span that starts this year in August. It's a big, new initiative called "The First Billion Years." The first conference is on accretion, the building of new worlds; a second on differentiation, building the internal architecture of planets; a third conference on bombardment and how it shaped planetary surfaces and their environments; and a last meeting on habitability in the early solar system.

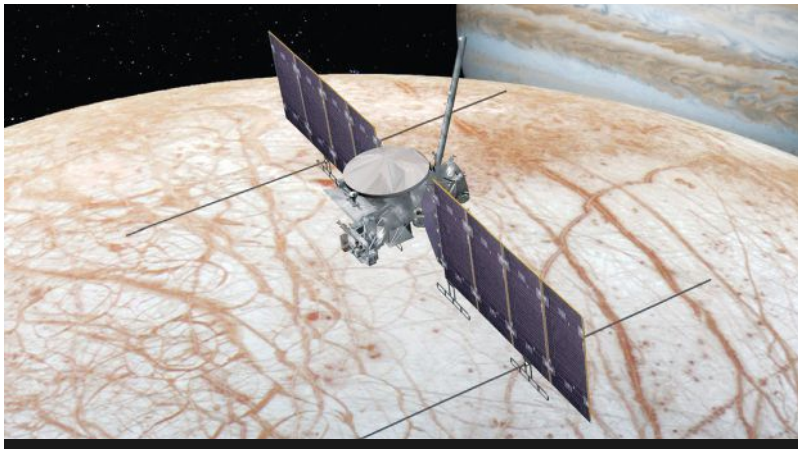
There's a lot of exciting, cutting-edge questions in each of these, so they all build upon each other. The idea is that we get the whole planetary community together...to bring in a lot of disparate groups that perhaps don't usually talk to each other. We start the community thinking, maybe beyond their little part of the solar system.

There is increasing international space activity. How do you gauge what other countries are doing in planetary exploration?

There's a lot of interesting things going on internationally. Some of the missions are very big and expensive. So partnering with other nations is absolutely the right thing to do.

I worry that the U.S. needs to be part of it or we're going to be left behind. This also gets to the arguments about International Traffic in Arms Regulations restrictions. A lot of other countries have just been going and developing their own technology, because they could no longer buy from the U.S. So now they have capabilities that they didn't have before.

I think diversity, internationally, is another place where you can bring the best to the table and spark ideas off each other and grow off each other. Diverse groups have been shown to come up with generally more creative solutions. Certainly there are some challenges, but there are some good things working internationally.



An illustration of the proposed Europa Clipper mission. An updated design of the spacecraft now features five solar panels on each array, versus the four illustrated.

NASA

Getting out your crystal ball, what discovery looms out there that would be astounding?

I don't know about a specific discovery. Obviously, finding some evidence — even ambiguous evidence — for life would really energize everybody. That would be pretty amazing. But every time we go somewhere we discover how much we don't know. That's what amazes me. You end up asking more questions than you started with. **SN**