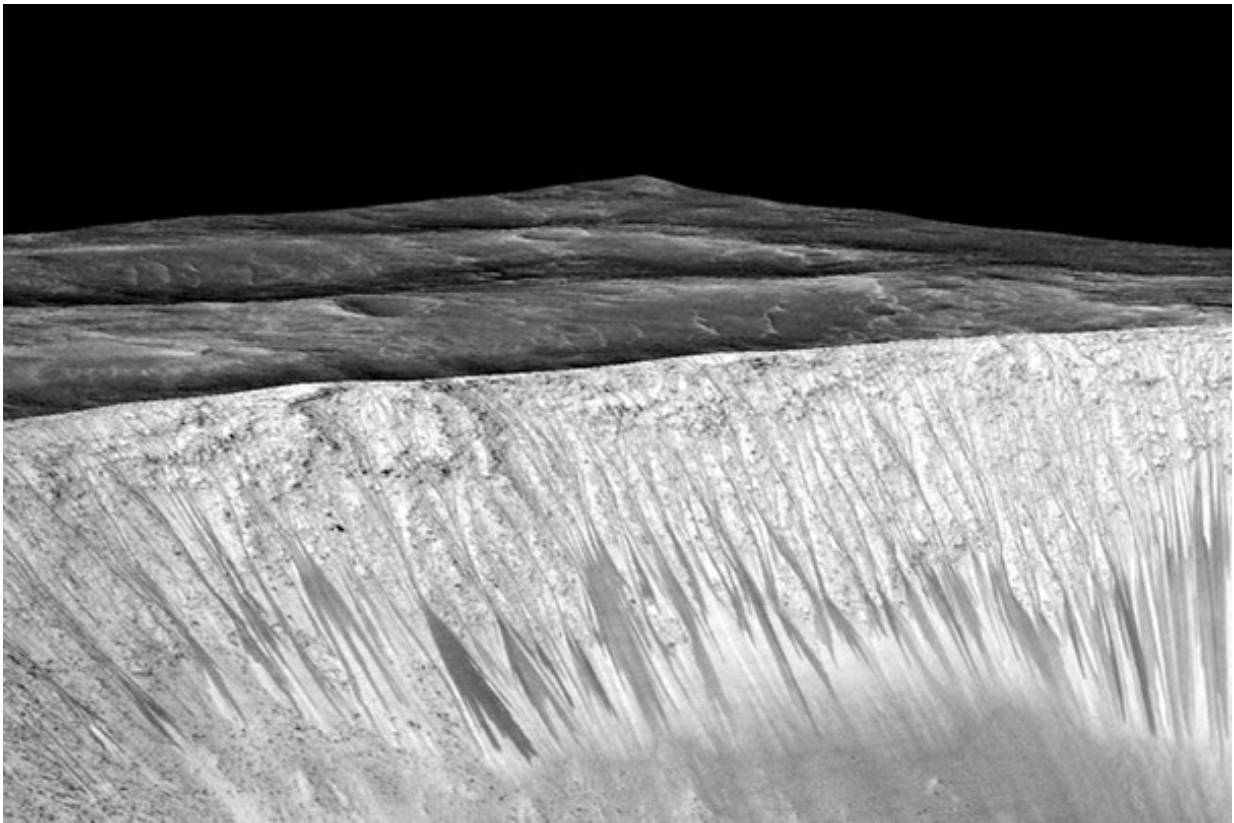


Finding that water is likely on Mars improves the prospects of microbial life there

September 30 2015, by Alvin Powell



The dark streaks pictured are up to a few hundred yards, or meters, long. They are hypothesized to be formed by the flow of briny liquid water on Mars. Credit: NASA/JPL-Caltech/University of Arizona

When NASA on Monday confirmed the presence of liquid water on Mars,

some scientists said the findings increased the likelihood of finding life on the Red Planet and of learning much more about its past. The discovery also boosted the prospect of an eventual human mission to explore the planet.

Robin Wordsworth, an assistant professor of environmental science and engineering, has studied Mars' water cycle to shed light on the planet's watery—or more probably icy—history. In work released in June, Wordsworth and colleagues found that ice is the likelier scenario to explain the physical features seen on the planet.

Harvard Gazette spoke with Wordsworth about NASA's latest findings and their implications for understanding the nature of other planets.

GAZETTE: What did you think when you heard the news out of NASA about liquid water on Mars?

WORDSWORTH: Well, I think it's exciting. There's a growing body of evidence that Mars has [liquid water](#), not just in its distant past but potentially in the present day as well. These "recurring slope lineae" [where scientists detected water] are geomorphological features—which we've seen from orbiters—that are changing over time. So there's been a suspicion for a long time that they are associated with the flow of liquid water, the transient flow of water. They've done a spectral analysis, looking for a spectral fingerprint, to show that perchlorates—a type of salt—occur in the location of these slope lineae.

That's a lot of terminology, but basically they're these weird features that we see on the surface of Mars, and for the first time they've now measured that there's evidence of salts beside them. And salts are strong indication that they're forming through transient pulses of water.

GAZETTE: Was this surprising to you at all, or is this something you may have suspected?

WORDSWORTH: I don't think it will be a complete surprise to people who work in the [Mars] community. What's exciting is it's another piece in the puzzle to help us understand how these features appear.

Physically, there seems no reason why you can't get transient pulses of water forming, but having this linking the chemistry to the photographic evidence is another piece of evidence in support of this idea. It's working toward this generalized understanding that you can get water flowing on Mars, even today.

GAZETTE: I think most people's concept of Mars is sort of cold and very dry. How can there be liquid water?

WORDSWORTH: It's absolutely correct that Mars in general is very, very dry and very cold. The other distinguishing feature of Mars is that it has a thin atmosphere compared to Earth. Earth's atmosphere acts kind of like a nice blanket, which keeps temperatures on the surface in the same range, in general, whereas on Mars there's less of this equalizing effect.

So although it is a colder planet in general, you can get specific times of the year with specific angles of the sun where temperatures can get much higher. So this is the key thing that can allow—even when you have a planet that's farther from the sun, so colder on average—transients points where temperatures can just peak above zero.

It's similar in some ways to what we see in places like Antarctica on Earth. Most of the time it's extremely cold, but then you just get little bursts at different times of the year when temperatures peak above zero,

and you get melting as a result. In those regions of Antarctica, even when there are very, very hostile conditions—by our own standards—you can get biospheres that flourish.

GAZETTE: What, to your mind, is the biggest implication of this finding?

WORDSWORTH: These findings are another step in our understanding that the diversity of potentially habitable environments in the solar system is much greater than previously thought. Mars is a more diverse and richer place than we thought a decade ago.

GAZETTE: And talking about habitability, we're talking about microbial life ...

WORDSWORTH: Yes. There's no strong reason to think you can get anything more than that. But I should emphasize that microbial life would be phenomenally exciting. The distinction for scientists between it being [microbial life](#) and something more complex is less important. Our reason for being interested in life on other planets is that we want to find out how likely it is that life could emerge in different locations spontaneously, and it being complex [life] isn't such an important aspect.

GAZETTE: Now, your own work looked at Mars' water past. How does this fit in with your modeling of Mars? Does it affect that at all?

WORDSWORTH: In our work, published this summer, we were modeling Mars in the late Noachian Period, so billions of years in the past compared to now. There's a lot of evidence for flowing liquid water in Mars' past, more extensively than we have today. In that sense, it's

clear that there were different things going on in the past from the present day. The main result of our work was to show that this early flowing water could have come from episodic bursts of melting, rather than a long-term warm and wet climate.

These studies of modern slope lineae show very strongly that even where the planet appears completely hostile, you can still get niche situations where you potentially get bursts of liquid water. So the diversity of environments on Mars is large, and you have to not just look at average conditions over the whole planet but think carefully about what happens due to a combination of [local] effects.

GAZETTE: Is this another data point for your modeling, or is the scientific background beneath this finding already in your models?

WORDSWORTH: That's a tricky question to answer. Directly, there aren't aspects of our modeling that will change straightaway because of this. But this more general understanding of how water behaves on planets really unlike Earth is part of constructing the big picture of how Mars' climate evolved over time, whether it was ever habitable, whether there were conditions under which life could have formed or, finally, in the future, whether there are conditions that could aid human habitation.

GAZETTE: Is there a benefit to this water discovery in that it sparks public interest in Mars research?

WORDSWORTH: I think it's clear that public interest in Mars is still extremely strong and that people care about [planetary science](#). People care about knowing whether planets other than Earth could potentially have had Earth-like conditions, and maybe life. It's a subject that always captures public attention. I think for this reason there'll be continued

interest in planetary science for a long time to come. It's just trying to get at some of the fundamental questions that we ask ourselves.

GAZETTE: How did you get interested in planetary science, and when did you first get interested in Mars research?

WORDSWORTH: I've been interested in planetary science since I was a child. Originally, it was just the sense of wonder from thinking about planets and the solar system and thinking about an environment like Mars.

What would it be like to stand there? What would it be like to experience that? And how has that environment changed over time? It's just something that captured my interest and my imagination very early and has continued to do so ever since.

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