AirSpace Season 1, Episode 8

Cute Little Robots in Danger?

Nick Partridge:

Welcome to this episode of AirSpace. I'm Nick Partridge.

Emily Martin:

I'm Emily Martin.

Matt Shindell:

And I'm Matt Shindell.

Nick Partridge:

Across the internet and across the solar system, there has been a lot of excitement about two new discoveries this summer.

Emily Martin:

From Mars.

Nick Partridge:

If you follow space news, it can sometimes feel like there's exciting news from Mars every few months. Sometimes it's hard to parse what's new and what's exciting but then Matt came up to us in the hall and said this hokey thing.

Matt Shindell:

I think Mars is trying to kill our robots.

Emily Martin:

Today on the show we'll talk about the new news from Mars and what data from the Curiosity Rover could reveal about potential for life on Mars.

Matt Shindell:

And why exploring the red planet remains a challenge.

Nick Partridge:

That's coming up next on Airspace from the Smithsonian's National Air and Space Museum, with help from PRX.

Emily Martin:

On June 7th, NASA made a big double announcement.

Paul:

Today we're announcing a discovery of a repeatable identifiable seasonal pattern in the methane measurements.

Emily Martin:

That was Paul Mahaffey. He's the director of the Solar System Exploration Division at NASA. And if that wasn't enough exciting news, it was paired with this from Jen Eigenbrode of NASA Goddard Space Center.

Jen Eigenbrodge:

Organic molecules and rocks from an ancient Lake bed. Those organic molecules could have come from life.

Nick Partridge:

Hey, Emily. I know you're an expert in the icy moons of Saturn and Jupiter but you have to admit Mars is the most logical place to find life in the solar system, right?

Emily Martin:

Shh... Stop... No!

Nick Partridge:

It's not?

Emily Martin:

No.

Nick Partridge:

No, it's going to be a Mars, right? It's always Mars. Mars

Emily Martin:

Enceladus, Europa, Titan. No, it's going to be on one of the moons of... I'm going to say Jupiter or Saturn, but Neptune's moon, Triton has a good case.

Nick Partridge:

But the case for Mars got a little stronger this week. If you can wade through all the organic chemistry.

Matt Shindell:

Yeah. The actual discovery is that they found in some rocks on Mars, that once existed in a lake... They found organic molecules and organic molecules on earth are usually associated with life.

Emily Martin:

Well, it's not so much organic as much as the life on our earth is carbon based.

Matt Shindell:

Yes.

Emily Martin:

We, all the microbes, all the animals on the earth. There's a lot of carbon there. So we think that as scientists, when we start looking for life outside of our planet on other planets, like Mars, finding carbon based molecules is enticing.

Matt Shindell:

Right.

Nick Partridge:

To further attempt to clarify.

Emily Martin:

Everybody loves chemistry this much.

Nick Partridge:

Exactly. So not all organic molecules are alive.

Matt Shindell:

Well, strictly speaking, no molecules are alive.

Nick Partridge:

Yes or no answers, please.

Emily Martin:

Repeat the question.

Nick Partridge:

Not all organic molecules are alive.

Emily Martin:

Correct.

Nick Partridge:

But everything that we know is alive is made of organic molecules.

Emily Martin:

Correct.

Matt Shindell:

Yes. We couldn't live without organic molecules.

Nick Partridge:

We are made of organic molecules.

Emily Martin:

Yes.

Matt Shindell:

Yes.

Nick Partridge:

And do we have found organic molecules on Mars but we do not have reason to suspect or know that they were once alive.

Matt Shindell:

Well...

Emily Martin:

Yeah.

Matt Shindell:

It's an interesting type of organic molecule.

Emily Martin:

They most resemble what on earth we would call kerogen.

Nick Partridge:

Is that what I put on my face? So I look youthful.

Emily Martin:

Yeah, no it's not collagen... No kerogen. So putting the organic molecules recently discovered on Mars into context, they were also discovered around the same time that scientists were able to link seasonal changes in the amount of methane in the atmosphere on Mars.

Matt Shindell:

They discovered cycles in the methane measurements.

Emily Martin:

Those two things could be linked to some kind of biology because here on Earth, methane in the atmosphere, there is a large contribution of methane to the atmosphere by things like farm animals and flatulence.

Matt Shindell:

More on that. After the break.

NASA made a big announcement about organic molecules on Mars and it was paired with an announcement about methane. Paul Mahaffey broke the news. He's the director of the solar system exploration division at NASA.

Paul:

You can see from the winter to the summer, this growth and the big surprise too, is not only have we got this wonderful repeatability but the seasonal cycle changes by a factor of three. That's a huge change. Completely unexpected.

Nick Partridge:

So we've known for a long time that there's methane on Mars, right?

Emily Martin:

Yes.

Nick Partridge:

The big deal this time around is that the fluctuations in the methane levels appear to be seasonal?

Emily Martin:

Just like here on Earth, we experienced sort of climate changes during different seasons. If you live in the Northern Hemisphere, the winter is a lot colder. The summer is a lot warmer. And so similar seasons on Mars actually are corresponding with these big fluctuations in methane in the atmosphere.

Nick Partridge:

So it's an inherently big deal. Every time we catch Mars doing something like Earth.

Emily Martin:

Yeah. I mean, we use Mars as an analog for what's going on here on Earth. Especially when we talk about climate, it's always really validating when we can draw those parallels.

Nick Partridge:

How do we measure the methane? What's up there measuring the methane? How do we know that there's methane there?

Emily Martin:

Robots.

Nick Partridge:

Robots.

Emily Martin:

Robots, lots of robots. Currently. There's a mission. There's a spacecraft orbiting Mars called Maven, which is specifically designed to test and measure fluctuations of methane in the atmosphere. And that's where these results are coming from.

Matt Shindell:

Yeah.

Emily Martin:

The big point is that here on Earth, most of the processes that produce methane or release methane into the atmosphere are generally tied with some kind of biological process. It doesn't mean that every process that releases methane into the atmosphere is related to biology. But this is a big clue on Mars that either there are some geologic process... Sort of non-biological process, that's releasing this methane into the atmosphere seasonally or the big flashy answer is that there's some kind of biological process that's still occurring on Mars, that's actually producing this methane and releasing it into the atmosphere.

Matt Shindell:

Related to life.

Part of the reason that this does move slowly and incrementally is that we usually only have one or two missions going on at a time. And right now we happen to have two robotic rovers working on Mars, Curiosity, which is the newer, bigger nuclear powered rover. And then Opportunity, which has been up there for 13 years, rubbing around with solar panels on its back. And just a few days after this big announcement was made about Curiosity's findings, there was a global dust storm that began on Mars and began to threaten one of those pieces of hardware in the field, Opportunity. And also isn't necessarily making it easy for Curiosity either because dust can be bad for electronics.

Nick Partridge:

Which is kind of like what happens in the Martian, right? Yeah. It's the dust storm that takes out there whole mission.

Quote from The Martian:

Visibility is almost zero. Anyone gets lost, hone into my [inaudible 00:06:54]. You ready?

Quote The Martian:

Ready.

Are you okay?

Quote from The Martian:

I'm okay.

Matt Shindell:

Which, you know, I have to insert here. That is the most scientifically inaccurate part of the movie to be Neil deGrasse Tyson for a second, even author and screenwriter, Andy Weir knew that a dust storm on Mars wasn't going to threaten a spaceship because of the thinness of the atmosphere.

Emily Martin:

I mean, what is it about Mars that makes us so dang hell, bent on determining that there is life there.

Matt Shindell:

Well, I think Mars has such a great historical story. IF you were to go back to the late 19th century. You would've seen a lot of speculation.

Emily Martin:

Like The Canali?

Nick Partridge:

Quick question... Canali. That sounds like what, Italian? Does that mean canals? Is it just Italian for canals?

Matt Shindell:

Well, the word canali was used in the 19th century by an Italian astronomer Giovanni Schiaparelli, who was one of the first people to draw like a map of the entire surface of Mars with telescopic observations. Which were not very clear. And he thought he saw channels in the surface. Now the word for channels in Italian is canali and some people did interpret that to mean canals. And to be fair, canali can be translated as canals, but it's not clear that Schiaparelli ever intended that.

Nick Partridge:

Beginning in the 1960s and continuing up to today, there have been multiple flybys and orbital missions exclusively to photograph the surface of Mars.

Emily Martin:

So, even after flying by Mars and seeing that there weren't... Venice wasn't on the surface of Mars. I mean, why would anybody even convince NASA to land on Mars if it was such a desolate landscape?

Nick Partridge:

You got such a wet blanket on planets that are in the inner solar system.

Matt Shindell:

Let me tell you about one more mission...

Nick Partridge:

From the 1870s.

Matt Shindell:

No, from the 1970s.

From 1972, we put Mariner 9 into orbit around Mars. What Mariner 9 saw when it got to Mars was a big cloud of dust. The entire planet was engulfed in a global dust storm.

Emily Martin:

So kind of like what just happened to Curiosity.

Matt Shindell:

Yeah. Kind of like what happened to Mars in June this year. And so the spacecraft, which was supposed to start mapping the planet... It had to wait.

Emily Martin:

Did it just take a bunch of pictures of clouds?

Matt Shindell:

Well, here's what happened. As that dust storm receded, the spacecraft saw the tops of the largest volcanoes ever seen in the solar system. So Olympus Mons, the biggest volcano in the solar system.

Emily Martin:

Still the biggest volcano in the solar system.

Matt Shindell:

Yes.

Emily Martin:

In the solar system.

Matt Shindell:

With a base the size of the state of Arizona. Never before seen by the three fly by missions that had gone past, suddenly starts to become visible as the dust storm recedes. Also, a huge rift valley... That if it were on earth would stretch from one side of the United States to the other. So, you know, it's this incredible story of discovery and of Mars, sort of finally deciding to reveal itself to humans.

Emily Martin:

You know, I think the sheer fact that there was a dust storm that obscured the surface tells you that you've got an atmosphere that's dynamic enough to even have a dust storm. I don't think a lot of people fully appreciate the fact that just because you're a planet doesn't mean you have an atmosphere. Just because you're a Moon, doesn't mean you have an atmosphere. And there's actually very few planets that have atmospheres that are thick enough to even have weather.

Matt Shindell:

Yeah.

Nick Partridge:

And I'm really encouraged because this means that in addition to the weather on Earth, I can talk about the weather on Mars in elevators with strangers.

There's a story of history in the last several decades of anthropomorphizing our assets on Mars... Our rovers. We give them sort of... We make faces out of their lenses and cameras. We like to picture them rolling around with laser beams. Why do we do that?

Matt Shindell:

I think opportunity is definitely cute. It's of just the right size and scale. And that pan-cam camera system, that is up on the mast, it's really easy to anthropomorphize them.

Nick Partridge:

On the anniversary of its arrival on Mars, Curiosity sings itself, Happy Birthday. It's got an instrument that vibrates and it plays the tones of Happy Birthday to itself in the thin marsh and wind.

Matt Shindell:

So, I mean, the engineers obviously have kind of imbued these rovers with different things that make it even easier to anthropomorphize them.

Nick Partridge:

Some of the rovers even have human names, right?

Matt Shindell:

Yeah, the first rover that we ever rolled out on Mars was called Sojourner. It was named after Sojourner Truth, the 19th century abolitionist and human rights advocate.

Emily Martin:

Many of the rovers have been named from a public competition. People submitting names that they want the rovers to be named. I'm excited to see what they name the Mars 2020 rover.

Nick Partridge:

Have they already picked the sights for Mars 2020.

Emily Martin:

No.

Nick Partridge:

Okay.

Emily Martin:

They are actively in the process of narrowing down a list.

Nick Partridge:

Okay. So I know it's a really bad idea but I want them to send Mars 2020 to check on Spirit that got stuck in the sand a couple of years ago. We'll call it Hindsight 2020.

Matt, you started us off today with a hypothesis that Mars was being a little coy or rebellious with NASA scientists by kicking up dust storms, every time we find something promising or suggestive of life on the planet. It is really incredibly hard to find out information about this place, right?

Matt Shindell:

Yeah and in fact, in the early years of Mars exploration, journalists invented what they called the galactic ghoul, which would swat away spacecraft from Mars. And that was sort of the explanation for why so many early missions failed.

Nick Partridge:

It seems like a couple of times a year, NASA has a press conference about an awesome discovery on Mars that could mean life but still doesn't mean life. Is this what real space science is like? Incremental progress... Is there ever actually going to be a smoking gun?

Emily Martin:

Each one of these incremental discoveries... None of them are the smoking gun but if we continue to persist in exploring places like Mars or the outer solar system, then you know, eventually we're going to stack up enough evidence to say yes or no.

Nick Partridge:

Even with all these missions, we're only scratching the surface figuratively and literally. I read that the depth of the rovers digging into the planet is five centimeters.

Matt Shindell:

Yeah.

Nick Partridge:

Like we're really just scratching the top soil.

Emily Martin:

And I think that's actually just with Curiosity, the nuclear powered one. The MER rovers, Spirit and Opportunity. They had a tool. This is my favorite. It's called the RAT tool. The Rock Abrasion Tool. And it was kind of this, like...

Matt Shindell:

It was an homage to the 80s band Ratt...

Or was that a 90s band?

Emily Martin:

All it really managed to do was actually a braid Iraq. It sort of scraped away the surface... And that was it. I mean, we're not talking centimeters, we're talking millimeters or less.

Nick Partridge:

No, scientist's shallow. All of it counts.

Matt Shindell:

Well, you know, I think historically we've been fascinated with Mars as a culture because you know, it and Venus our nearest neighbors and we've for a long time, wanted to answer the question... Why are we here on this planet? What makes this planet habitable and our neighbors, maybe not habitable, maybe differently habitable.

Emily Martin:

And planetary exploration is really, really hard. And it costs a lot of money. And even here on Earth where we can touch and lick and pick up rocks and take them to our labs... Licking rocks. Don't do it by

the way. It's hard. And it's expensive to do it here on Earth. To study Mars, it's even harder which means the increments that we have to move forward are even smaller. But when you think about what we're ultimately trying to do, proving that we're not alone. I know that's like a big philosophical idea but that's why we continue to study Mars. And we continue to build these rovers and send them out there. Because of these kinds of discoveries, right? Methane and weird kinds of organic goo that we're finding out there. That's continuing to point us in the right direction, that maybe we're going to eventually find something on Mars or somewhere else. But I think it's kind of... It's worth it.

Nick Partridge:

That's it for this episode of AirSpace. You'll find us here again in two weeks to talk about air surveillance. Our AirSpace producer is Jocelyn Frank. Our executive producer is Katie Moyer. Mix by Tarek Fouda. Special thanks to Jason Orfanon and John Barth. You can subscribe to AirSpace wherever you get your podcasts. And please tell a friend.

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