AirSpace Season 2, Episode 2

Rover RESPECT

Matt Shindell:

Oh, hi, this is AirSpace. You know us as AirSpace, but really we are Matt Shindell and...

Emily Martin:

Emily Martin.

Matt Shindell:

And we're missing Nick Partridge today because he's had some big life things going on, like literally creating new life, welcoming it into the world. And speaking of life, they're looking for life on Mars.

Emily Martin:

Welcome to this episode of AirSpace from the Smithsonian's National Air and Space Museum with help from PRX. We're here today to talk about a new rover from the European Space Agency or ESA, and about how that rover got its awesome name. When are they launching?

Matt Shindell:

They're launching at the same time that our new rover is going to be-

Emily Martin:

So it's another 2020?

Matt Shindell:

Yeah, it's another Mars 2020 mission, or I shouldn't say Mars 2020, because that's what our rover at least for now is called. It might get a new name, which the ESA rover adjusted. The ESA rover just got its new official name.

Emily Martin:

Rosalind Franklin.

Matt Shindell:

Rosalind Franklin that's right. And it sounds like a real person because it is named after a real person.

Emily Martin:

We've had a lot of rovers named for abstract values like Curiosity and Spirit and Opportunity. And now we have a rover name for a really impressive biologist. Franklin and her colleagues played a key role in our understanding of the structure of DNA. The Rosalind Franklin Rover is pretty exciting too.

Matt Shindell:

We started seeing engineering models of this rover last summer and they are pretty beautiful.

Emily Martin:

They are.

Matt Shindell:

This is a nice looking rover.

Emily Martin:

It is. We were talking about this before we started recording. It's sort of like if you took one of the Mars Exploration rovers, Spirit or Opportunity, and you sort of like mashed it up with the Curiosity rover, which is on Mars right now. Like both of them, it's got that kind of like tall camera head that looks a little bit like Wall-e.

Matt Shindell:

Yeah. Kind of a mast with a camera on top.

Emily Martin:

Right. But the European Space Agency, he says Rosalind Franklin rover is going to do stuff that NASA's rovers haven't done yet.

Matt Shindell:

Yeah. It's going to drill down into the surface of Mars about two meters and look for signs of life.

Emily Martin:

So not dissimilar to what the Mars Insight Lander is doing right now on Mars.

Matt Shindell:

Right. But whereas the Insight Lander is a seismic experiment primarily, this is going to be all about looking for life.

Emily Martin:

Extraordinary claims require extraordinary evidence, right?

Matt Shindell:

Yes.

Emily Martin:

So it's really fitting that they end up naming this rover after Rosalind Franklin.

Matt Shindell:

Yeah. She was a very talented molecular biologist. In these days, she's recognized as a famously integral contributor to our understanding of the double helix structure of DNA.

Emily Martin:

Part of a team of molecular scientists who use really specialized tool, like a sort of x-ray process that can sort of zero in on and capture a visual of the actual structure of DNA. Rosalind Franklin is somebody with a pretty spectacular story.

Matt Shindell:

Back in the 1950s, scientists didn't have the understanding that we have today about DNA and how it works. They knew that DNA by that point was the genetic material, but they didn't understand its structure and they didn't understand-

Emily Martin:

So they knew it existed.

Matt Shindell:

Yeah.

Emily Martin:

Did they know it was made up of genes and other things, did they know its chemical composition?

Matt Shindell:

They hadn't quite figured out what you're alluding to, which is sort of the way that base pairs go together in a double stranded DNA double helix.

Emily Martin:

So kind of like a rigatoni? No, not rigatoni. What's the twisty one?

Matt Shindell:

Oh, what is that one called, rotini?

Emily Martin:

Rotini. It looks a little bit like rotini.

Matt Shindell:

like a rotini.

Emily Martin:

I had rigatoni on the mind. So getting back to Franklin, in 1950, she was awarded a really prestigious fellowship to work at the biophysics unit at Kings College in London. And she was a part of a team there that was studying the structure of DNA using highly specialized imaging. It took her a hundred hours to zero in on this one image, a famous image called Photo 51, which I think is awesome because it reminds me of Area 51 and those things are totally unrelated. But then took another year to decipher the double helix structure from the image.

Matt Shindell:

And meanwhile, there were other scientists at other universities who are also studying DNA to try to determine its structure.

Emily Martin:

The duo that ultimately became really famous was about a two hours drive away at the Cavendish Laboratory in Cambridge. I think most people have heard of Watson and Crick.

Matt Shindell:

Right. Well they, along with one other scientist Maurice Wilkins shared the Nobel Prize in the 1960s for that discovery.

Emily Martin:

And it turns out the way Watson and Crick ultimately made their discovery of the double helix structure was using Photo 51. They never told Rosalind Franklin that they used it. So maybe we should talk a little bit about the DNA research being done at the time by Watson and Crick.

Matt Shindell:

Some folks like Watson and Crick were trying to figure out the structure by building models. Building models based on the way that they knew that these chemicals that DNA was made up of or behave.

Emily Martin:

Like toothpick soda straws models or like...

Matt Shindell:

A little bit more sophisticated, but yeah.

Emily Martin:

Numerical models.

Matt Shindell:

If you ever were in college, you took a college chemistry class where you had to build chemical models.

Emily Martin:

Oh, like sticks and balls?

Matt Shindell:

Yes, exactly.

Emily Martin:

Yes. Oh, yeah. I did that.

Matt Shindell:

So that's the type of models that they were building. And a lot of people said, you know you guys, that's kind of dumb and childish. Why are you building models when you should be getting real data? And the

real data actually is the type of work that Rosalind Franklin was doing. So she was using a technique called x-ray crystallography to look at the actual structure through the patterns that that x-rays would make when you sort of pass them through the DNA material.

Emily Martin:

So maybe this is a picture we should post on Instagram, but the actual image, it's technically not an image, but work with me here. We're going to call it an image for simplicity sake. But the image that Rosalind Franklin actually took shows you this kind of X, which if you think about it as sort of a cross section or a representation of a cross section through that double helix. Because if you take a double helix and you cut it down the middle, it's going to look like an X. And that's really the sort of smoking gun, that's the sort of like extraordinary evidence you would need in order to make this claim.

Matt Shindell:

Right, exactly. So that type of evidence plus chemical evidence about what the different base pairings might be based on their chemical behavior, this is what gives Watson and Crick the clues that they need to build the model that they build. Her data was absolutely key to what they finally settled on.

Emily Martin:

And then she kind of got written out of it for awhile.

Matt Shindell:

Right. Written out of it and condescended to and...

Emily Martin:

Well and Watson hasn't really stood the test of time. He wasn't a particularly a cool dude.

Matt Shindell:

He's gotten himself into a lot of hot water making comments about race and gender that are way behind the times.

Emily Martin:

We're going to take a quick break. But when we come back, we'll debunk some of the crappy stuff Watson said about Franklin. And we'll talk about the super cool Rosalind Franklin rover and how it got its name.

So getting back to Franklin, when Matt you were showing me these quotations that you had copied, from what book was that?

Matt Shindell:

That was Watson's book, The Double Helix,

Emily Martin:

So he was writing this in 1968, which certainly doesn't excuse any of the language. It was appalling and it was-

Matt Shindell:

It's cringe-worthy.

Emily Martin:

It's cringe, it's every bad thing you could say when speaking about another human and in this case in particular about a woman, right?

Matt Shindell:

Right.

Emily Martin:

Talking about her clothes, her makeup.

Matt Shindell:

Here I'll read just a little bit. So for example, by choice, she did not emphasize her feminine qualities. Though her features were strong, she was not unattractive and might've been quite stunning had she taken even a mild interest in clothes. This she did not. By the way, that's false. She spent a lot of time in Paris and-

Emily Martin:

This is all completely irrelevant-

Matt Shindell:

Yes, of course it's irrelevant.

Emily Martin:

... to the ability that she had to actually do good work.

Matt Shindell:

So let me go on. There was never-

Emily Martin:

Oh please go on. Does it get better?

Matt Shindell:

Oh, it gets worse. There's never lipstick to contrast with her straight black hair. So-

Emily Martin:

So can we skip to the part where she does actual science?

Matt Shindell:

Yeah.

Emily Martin:

Because, right?

Matt Shindell:

Yeah. Unfortunately most of his attention is on how difficult of a person she was to work with. And wouldn't you be a little bit difficult to work with too if you were being condescended to by a bunch of hot shot, young biologists, all of whom think that they're going to be the-

Emily Martin:

You're not worthy to be there.

Matt Shindell:

Yeah and they're going to be the next big thing.

Emily Martin:

Yeah. I think there's one word in there where he says something to the effect of like, she is more or less competent I guess. But all of that said, we now have a rover going to Mars, honoring her, being named after her, that's going to go search for life. And she played such a large role in our understanding of life, how our DNA is built and what it does.

Matt Shindell:

Yeah. You know rover missions can be a great time to be a historian. Especially when they're named after historical figures and people want to know who that person was.

Emily Martin:

So I'm not particularly up on this Matt, so you're going to hopefully as the historian, you're going to fill this in. I'm sure NASA has a really specific way in which the rovers get named. I think it was a competition, right?

Matt Shindell:

Yeah. They've done a few different competitions over the years. So when we sent the Pathfinder Mission to Mars back in the '90's, it carried a Rover. And NASA held an essay contest, asking school kids to write about who their favorite female hero was from history and-

Emily Martin:

They specified female?

Matt Shindell:

Yeah they did.

Emily Martin:

Wow, I didn't know that.

Matt Shindell:

Yeah, they specified female.

Emily Martin:

And then Spirit, Opportunity and Curiosity, those were also contests, right?

Matt Shindell:

Yeah, so that again was an essay contest. For Spirit and Opportunity they had middle school students write about what would they name the rovers? And the winner was actually a child who had spent her early life in a Siberian orphanage and then was adopted by an American family. And she talked about the sort of spirit and opportunity that had been provided to her by becoming an American.

Emily Martin:

Huh. I didn't know that part of the story.

Matt Shindell:

Yeah.

Emily Martin:

So with the European Space Agency, their rover's going to go up around the same time as NASA's rover which has yet to be named. But-

Matt Shindell:

Right. We've been calling it Mars 2020, but that'll probably change.

Emily Martin:

It doesn't have a ring, doesn't quite have the same ring to it.

Matt Shindell:

Not quite.

Emily Martin:

Rosalind Franklin, that name was submitted in a competition. I don't think it was an essay competition, but it was about 36,000 entries suggesting different names.

Matt Shindell:

From all around Europe. Yeah. So and then a final committee from the ESA and the UK Space Agency decided that they wanted to go with Rosalind Franklin, which a lot of people had proposed.

Emily Martin:

I would have loved to see who else was on the top five list or something.

Matt Shindell:

Like, Rover McRover Face.

Emily Martin:

Boaty McBoat Face. I don't even remember what that boat was for, but Boaty McBoat Face. It won. That's what happens-

Matt Shindell:

Yeah, that was 2016. The year that crowdsourcing failed us.

Emily Martin:

Ultimately, it's why you sort of let everybody make their contribution and then you leave it up to a committee of professionals to finally come up with the top contender.

Matt Shindell:

Yeah. And Rosalind Franklin really is such a great name. It gives the science world a fresh occasion to honor an impressive scientist and to write what you could see as a historical wrong.

Emily Martin:

The knowledge of DNA structure has continued to drive cutting edge research.

Matt Shindell:

And we can only wait and see what cool discoveries Rosalind Franklin the rover might help us to find lifeforms on other planets like Mars.

That's...

Emily Martin:

It...

Matt Shindell:

... for...

Emily Martin:

... this...

Matt Shindell:

... episode...

Emily Martin:

... of...

Matt Shindell:

AirSpace.

Emily Martin:

We'll...

Matt Shindell:

Be...

Emily Martin:

... back...

Matt Shindell:

... in...

Emily Martin:

... two...

Matt Shindell:

... weeks. That's kind of fun.

Emily Martin:

That's kind of fun but I think they're going to cut it.

Matt Shindell:

Yeah, okay.

Emily Martin:

I feel like we should start back at the beginning.

Matt Shindell:

All right.

Emily Martin:

That's it for this episode of AirSpace. Airspace is produced by Katie Moyer, Jocelyn Frank and Lizzie Peabody. Mixed by Tarek Fouda.

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