AirSpace Transcript - Season 10, Episode 3: Hypatia Mars

Emily: I just scienced the stuff[1] out of this.

Matt: The stuff.

Emily: That's not the quote, Matt.

Matt: I know, I quoted it in my book.

Emily: You did!

AirSpace theme in then under

Matt: Welcome to AirSpace from the Smithsonian's National Air And Space Museum. I'm Matt.

Emily: And I'm Emily. In April 2023, seven Catalan women landed on Mars. Okay, not, not real Mars, but they did run a two week mission out of the Mars Desert Research Station in Utah, the first all female crew at that analog.

Matt: The Hypatia I mission was the brainchild of two scientists who wanted to work together, advance space science, and encourage more women and girls to pursue careers in STEM.

Emily: Right now in February 2025, seven more women are on simulated Mars for Hypatia II. We spoke to some of them for AirSpace. Sponsored by Lockheed Martin.

AirSpace theme up and out

Matt: There are seven women at the Mars Desert Research Station[2] right now, doing experiments, working in close quarters, eating mostly dehydrated food, and doing simulating space walks out there in the desert, and generally just living and working like they're on Mars.

Places like the Mars Desert Research Station where scientists and others go to simulate living in space are called analogs, and the people that live and work there are analog astronauts.

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[1] https://www.imdb.com/title/tt3659388/
[2] https://mdrs.marssociety.org/

Emily: Analogs like Hypatia[3] are really important tools for space science to train astronauts that are planning on going to space, but they're also really useful and maybe more frequently used to test things like group dynamics and sociological and psychological impacts of living in isolation with small groups of people. They're also used for testing equipment and methods that might one day be used in real space missions.

Matt: Yeah and I found out about the Hypatia analog mission because we're working to incorporate the story of people who have gone through these analogs in a gallery[4] that I'm working on now. And also I got to meet one of the people who is at Mars right now at the Mars Desert Research Station when I was in Barcelona just this last summer and you're going to meet her later in this episode.

Emily: Matt, we've talked a lot about different analog missions[5] here on AirSpace and we've even talked to analog astronauts. So, this is maybe not a new one for us, but this is a new analog.

Matt: Yeah, we haven't talked about the Mars Desert Research Station before on this podcast. So I think this mission is a little bit unique compared to some of the other stuff we've talked about.

The first time that humans went to another world, during the Apollo missions, obviously they wanted to make sure that all of the equipment would work in the conditions of you know, what you're likely to find on the Moon. There is no really great analog for the Moon on Earth because there's so many gravity issues, atmosphere issues, right, all of that stuff is so different on the Moon.

But there's some incredible pictures[6] of the Apollo astronauts testing the lunar roving vehicle out in the desert, or dressed up in spacesuits, walking around in places like Meteor Crater in Arizona, or doing field work, learning how to do field geology in Hawaii and the deserts of Arizona and all of these other places.

So they didn't go on like an analog mission where they enacted the entire Apollo 11 mission on Earth before they then went and did it in space, but they used a lot of analog sites in order to test the equipment, train the astronauts on the equipment, and train the astronauts what they were going to do once they got to the surface.

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[3] https://hypatiamars.com/
[4] https://www.si.edu/exhibitions/futures-space%3Aevent-exhib-6737
[5] https://airandspace.si.edu/editorial/airspaces5ep5
[6] https://library.nau.edu/speccoll/exhibits/daysofarchives/lunar.html

Emily: Yeah, but sometimes these analogs are more for understanding how to create safe and healthy dynamics for people who are living in close quarters in really dangerous environments[7] and how they can make sure that they're doing a really good job taking care of these astronauts.

Matt: Right, in these cases, a lot of it really is about what you might call the human element, right? Understanding, you know, how people hold up under weeks of living in isolated environments[8], how small group dynamics might work, because by the time you do send a small team to Mars, to where they're going to be completely unreachable, by say a rescue crew or anything like that, you want to make sure that you've kind of explored all of what could potentially go wrong[9].

And I think what's what's interesting about these Mars analogs that people now do is that and especially in the case of Mars Desert Research Station, these are not things that NASA is necessarily funding in preparation for a specific mission to Mars, but it's private organizations like the Mars Society[10] who are sort of undertaking these missions with the goal that, you know, there will eventually be a Mars mission. And when there is, we'll be prepared for it.

And this is sort of their way of helping to prepare for it while at the same time advocating for it actually happening, showing that you know, we know what we're going to do when we get there.

Emily: And I love this particular story because it's a analog mission that started out as the result of two friends in two different scientific disciplines who had the idea to form a team.

Matt: Yeah, you hook up with your science bestie, and you go out and you do the work. I know you've done it, Emily.

Emily: I've done it.

Carla: Hypatia started back in 2021. This was an initiative co-founded by, uh, my colleague Mariona Badenas[11]. Both Mariona and I have been friends for years. So we

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7 https://www.mccormick.northwestern.edu/news/articles/2019/02/northwestern-study-of-analog-crews-in-isolation-reveals-weak-spots-for-mission-to-mars.html

8 https://pmc.ncbi.nlm.nih.gov/articles/PMC8743922/

9 https://www.nature.com/articles/s41526-024-00437-w

10 https://www.marssociety.org/

11 https://hypatiamars.com/mariona-badenas-agusti/

kind of coming from different backgrounds, me as a biologist, her as an astrophysicist. It was kind of difficult to find a common pathway and a common project to work on.

So my name is Carla Conejo Gonzalez[12]. I am the executive officer and biologist of Hypatia I crew and nowadays I work as a strategic projects officer at the Faculty of Information at the University of Toronto and I would say my professional background is in human biology and science communication.

Emily: Mariona had been to the Mars Desert Research Station with a crew in 2019 and had an opportunity to apply with a group to go again. And she reached out to Carla to see if she wanted to come and help her round up the rest of the crew.

Carla: And she had a very exciting opportunity and get back there but this time not with an international crew, but a more specific and unique type of crew which would be based on a regional level, in this case, Catalonia, and also that could be led by female. Um, because as you may know, uh, the space sector is, um, well, it's underrepresented when talking about women and essentially all STEM careers, um, suffer from this underrepresentation. So it was, um, in the vision of putting together Hypatia Mars, uh, we decided that we would like to try to empower the visibility of women in STEM and specifically in the space sector by putting together analog missions.

Matt: And if you're wondering what is Catalonia? And thinking you know isn't Barcelona in Spain well okay yeah but Catalonia[13] is also an autonomous community that's located in the Iberian Peninsula In Northeastern Spain and its biggest city is Barcelona. It has a deep, rich history and culture there. And even today, when you visit Barcelona, they still, many people still speak Catalan as opposed to Spanish and all signage is in Spanish and Catalan.

And from the beautiful area of Catalonia the Hypatia Crew went to the also beautiful Utah desert to live in a very small habitat and only leave while wearing simulated space suits.

Carla: The main place where you live and work is the Habitat[14], which is a cylinder of about eight meters of diameter of two floors. Um, so a two story apartment for the crew. So you live on the top floor and you have the kitchen, uh, little working, living, meeting space, whatever, and very small capsules where you sleep in.

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[12] https://hypatiamars.com/carla-conejo-gonzalez/
[13] https://en.wikipedia.org/wiki/Catalonia
[14] http://mdrs2016.marssociety.org/about/index.html

And then on the lower floor is where you prepare for these EVAs. So where you put yours, um, space suit on with the mock up for for the spacesuit that you will be using when you go outside. But this pod is connected to other spaces such as uh, maintenance pod, which is called rum. Then you also have a science dome where where you, if you need a wet lab or this kind of, um, scientific infrastructure, you get to work there. And then you also have connection to the telescope. One of the telescope, the other is, um, is managed remotely and also to the green hub, which is kind of, uh, nurtured in house in where, what it was the only place we could get fresh food.

Emily: Getting a mission off the ground is really hard[15] and analog missions are no different, even though you're not getting on a rocket. And so the Hypatia I mission wasn't really any different. When Mariona had an opportunity to lead a mission at the Mars Desert Research Station, she didn't have a lot of time to put together this proposal. So she called Carla and said, 'do you want to do this with me? We don't have a lot of time to put the proposal together. Who else can we call and help make this happen?'

Matt: So they reached out to their network of other women in STEM and in at least one case to one woman who'd really inspired them in their own STEM careers.

Ariadna: And I was one of the teachers of one of the STEM programs that they participated. So Mariona was actually one of my students.

Hi so my name is Ariadna Ferrés[16]. On Hypatia I, I was the health and safety officer. And on Hypatia II I'll be the Crew Commander. I currently work at NASA Goddard Space Flight Center as an astrodynamic specialist. My background is in math and computer science

And Mariona sort of sent me a text and said, Look, me and Carla and a friend, we're thinking about this analog mission, all female, uh, would you like to join and come with us to Mars.

And I kind of immediately said yes, cause I knew Mariona's passion. And at that time I was like, sure, I'll come, uh, tell me when I'll just ask for vacations and I'm there. What do I have to do?

Emily: And so one of the goals inspiring the Hypatia I mission was to put together a group of women that other women and girls could relate to.

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[15] Pun intended

[16] https://hypatiamars.com/ariadna-farres-basiana/

Carla: Actually, when we came up with the idea of putting up a team, a crew for the first mission, we have two values in mind.

One was the crew to be multidisciplinary. So bringing different disciplines that might be or might not be as, um, mentally attached for people to space, such as engineering, mathematics. So I'm a biologist. I, I might not be part of a like regular crew, right?

And also another of the values that we had in mind is the crew to be intergenerational. So we wanted the crew to have younger people than us. Um, we are over 30s. Um, but so having some maybe undergrad students in our team and also having more senior members in our team. So we could picture different stages of a professional career for a woman in STEM.

So it was import, it was very important for us to try to build role models that were approachable. That were real and that were normal people, I'd say. I think you can see from, from the people you are now talking to that we are very normal people[17]. I mean, we are, of course, uh, have exciting jobs. We have passion in science, but, uh, at the end of the day, we are, uh, we are just girls, like the ones we try to inspire.

Emily: The Hypatia team didn't know it at the time, but Catalonia and to some extent, the wider world was going to be really interested in what the group was doing,

News clips in Catalan and Spanish[18][19][20]

Ariadna: when the first mission came, uh, I was already in the U.S. and I didn't fly to Barcelona for the press release. And I knew that they were all like covering press here, press there, interview here, interview there. But I was kind of, didn't pay much of attention. And then the next morning I wake up and the first thing I see is on my WhatsApp, a bunch of the news on the first four of them, I'm like, what did we just do? Like, it was like, what? So that was just mind blowing at the beginning.

Matt: Besides the news, Hypatia also drew the attention of a documentary filmmaker who followed the women before they left for Utah, then came to the Mars Desert Research Station for one day to get as much footage as they could. They ended up putting out the documentary Women on Mars in June of 2024

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[17] https://hypatiamars.com/hypatia-1/
[18] https://www.3cat.cat/tv3/sx3/la-missio-hypatia-a-lescola/video/6217288/
[19] https://www.3cat.cat/tv3/sx3/hypatia-missio-complerta/video/6227228/
[20] https://www.rtve.es/play/videos/telediario-1/mision-hypatia-nueve-cientificas-catalanas-se-preparan-para-simular-viaje-marte/16013659/

Carla: But the documentary[21] itself, I think it's a very useful outreach piece for us because it allows us to explain what we can, what, what we, why we travel there and what what we were doing while we were confined because this is something that we, of course, can explain in different talks and conference that we give once in a while. But having like a digital documentary that's accessible for everyone at any time. This makes us well, this makes the impact even larger for us.

Matt: So like we said earlier this crew was made up of women with STEM careers of their own, and so each brought their own, um, experiments and, and questions to this. So there was a pretty broad range of science going on over the course of this mission[22].

Carla: So in Hypatia I from Mariana, who's an astrophysicist, and she was using the couple telescopes that there, there are the Mars Desert Research Station to study the, the night sky.

Aas a human biologist as I was, I was leading different lines of research related to the human factors. We have little data on how a space mission would affect the female body because there's been a very small number of females going to space. So I was leading different lines of projects in collaboration with different international institutions, for example, on sleep cycle patterns, on menstruation and periods.

Emily: But then they also have more maybe traditional sounding kinds of experiments like an engineering project where one of the scientists of Hypatia I used all the other scientists urine to quote unquote "Martian" soil to create batteries.

Matt: I don't, I don't know what you mean, about traditional experiments. This seems like something …

Emily: maybe it's not traditional but

Matt: … that Mark Watney[23] might have done on, on Mars. You know, he uses everything that comes out of him

Emily: Well, sure. But it sort of feels like the kind of experiment you would expect somebody who's thinking about traveling to Mars someday might be trying to figure out how to recycle things in creative ways. Maybe that's my science fiction brain. Or maybe I'm just thinking about poo potatoes.

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[21] https://caixaforumplus.org/v/women-on-mars
[22] https://hypatiamars.com/research/
[23] https://andyweirauthor.com/

Matt: Well, I mean, it's definitely it's definitely true that as the history of thinking about sending humans to Mars is really filled with these ideas about how would we use everything that's at our disposal in order to to get what we need because there's only a limited amount of stuff we can bring with us, right?

So either recycling or using everything that comes out of us. is a big part of thinking about how that future might look.

Carla: The other biologists in the crew created a project in which she would collect sand from different spots, um, around the station, and she would analyze for life because one of the longstanding questions for humanity about Mars is whether we are alone in the universe or whether we will be able to find life there. This was one of the experiments for our crew biologists, and she's been able to put that project together in an educational pack that's now being released in Catalan schools and kids are researching with 'Martian' sand and trying to find life in those samples.

Emily: So beyond running science experiments, there was a lot of educational components to Hypatia I, and that really included an awful lot of outreach.

Matt: Yeah, that outreach was primarily to Catalonian schools, but also other school groups and others around the world who could benefit from what they were doing. So in the beginning, a lot of that outreach was done to individual classrooms or to schools in person or virtually, but it kind of grew after that

Emily: So in addition to the outreach that they've been doing, Carla says that one of their ongoing projects with Hypatia is creating lesson plans, videos, and different kinds of teaching kits that teachers can use to present space science to their classes without Hypatia crew members having to be physically present in their classrooms[24].

Carla: In terms of the more outreach and educational aspect of the project, I think there's this ambition of having tried during 2024 some of the products that we created that were based on mission one that now we will try to put together and escalate in a in a broader scope for other publics and for other kind of communities during 2025.

Matt: Hypatia I was so successful that of course it needs a sequel. So Hypatia II[25] is going on right now. When we spoke to the members of the Hypatia team, they were busy preparing for everything they were going to do, but now they're out there on Mars busy with all of the science experiments and the outreach that they're doing with this new mission.

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[24] https://hypatiamars.com/blog-post/hypatia-leads-hundreds-of-students-in-search-for-life-on-mars/
[25] https://hypatiamars.com/hypatia-2/

Emily: The process for applying for Hypatia II, and it was a lot more deliberate and organized than how they had built the Hypatia 1 team. Applicants had to send in their curriculum vitaes, which are kind of like a long academic resume, and they had to also provide science and outreach plans, and seven crew members and two backups were eventually chosen, and that included analog astronaut Estel Blay[26]

Estel: I'm the scientist and the health and safety officer of Hypatia to Mission. And outside of Hypatia, I'm a program manager, um, running the Fill Up, uh, ESA program in the IEC, the Institute of Space Studies in Catalonia.

Matt: And Estel had actually been one of those folks who had been excited by and followed the exploits of that first Hypatia I crew.

Estel: Well, it, it was basically an open competition. I saw it in, in the press. I was like, Oh, wow, that's so cool. But you know, sometimes I think I will not be maybe good enough or my skills will, will not fit. So it was there in the back of my mind. And I was chairing an event with, with Mariona, the, the space conference here in Barcelona.

We were both presenting the, in two consecutive days. And she said, 'Oh, why, why you haven't applied yet?' It's like, 'Oh, I'm not sure.' And it's like, 'Oh, don't be silly. Try.' And I put some ideas together. I put my CV, some outreach exercises that, that I wanted to do with summer schools and they thought that I was a good fit. So it was, yeah, I remember the day that Ariadna called me. I was like, 'Oh, are you, are you sure? I, is, is that right?' 'Like, yeah, yeah, yeah,' you're in like, wow. I was incredibly excited, uh, with the idea to be part of Hypatia mission. So, yeah, it was. It was not a long process, but it was like different steps, having to think about experiment, having to think about the value in, in outreach also for, for schools and put all that in, in documents and express your interest was, yeah, it was an interesting also concept for me to understand what was my value to the association.

Emily: Hypatia II is similar to Hypatia I in that seven women will be at the Mars Desert Research Station for about two weeks. But this new crew is not all Catalonian, and the science projects they're working on are different.

Estel: I was quite fascinated with, with the idea of, of energy in Mars and that without having access to energy, we will not be able to survive. And that the obvious source of, of this energy was the sun and, and, and the solar energy and how the, the Martian dust could be a big problem, uh, in, in, in a future colony.

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[26] https://hypatiamars.com/estel-blay-carreras/

So basically the, the research experiments is, is linked to that is, is linked to understand, um, how different mechanisms to, to reduce the effect of dust in solar panels can be used and, and which ones could be a better option. And analyzing the dust because the, the Utah desert dust is similar in inverted commas, uh, to the Martian dust, uh, so it will help us to really understand these different factors.

Ariadna: When we are on Mars, uh, the radiation pressure is going to be way stronger than the one we have. We know that is one of the things that is going to affect astronauts over there, right?

Right now we have a lot of different telescopes, uh, on space that are tracking the geomagnetic storms of the sun and so on. So, if we were on Mars, could we use the telescopes over there to kind of track the sunspots and things like that and try to correlate those images with the ones from SOHO[27] and other telescopes that are up there, right, and kind of correlate those things.

Matt: Hypatia II is also doing some equipment testing for NASA. They'll have two different tools that Artemis astronauts might use for EVA/spacewalks on the Moon. One device for communications and one for safety.

Ariadna: It's something that has either one, a battery and some antennas and so on to produce support for the astronauts when they are on EVAs. And they also have another instrument that will be detecting Sun neutrons and protons and particles to kind of measure the radiation when they are on the EVAs.

So I've had the chance to be able to collaborate with them and they will be lending us some of the preliminary instruments that are there and they want us to test them when we go on EVAs and see, okay, how easy are they to move around? How good we can use them to communicate with each other and things like that.

So we'll be working a little bit of ConOps, with them, uh, and try to provide some feedback that will be hopefully meaningful for, for all of them.

Emily: So a lot of the outreach work done by Hypatia I happened after they left the Mars Desert Research Station. And what's different about Hypatia II is how well integrated the outreach components are with the science that they're going to be doing while they're actually at the Mars Desert Research Station.

Estel: But I will be also working in, in two different more outreach link exercises with, with groups of kids at different ages linked to tomato seeds, where I think it's the nice

[27] https://soho.nascom.nasa.gov/

aspect of that is, is to do a sort of chain of inspiration where. We will be working with kids around 16 years old that we hope that in the same way that Carla and Mariona were inspired by Ariadna at that age, they can get inspired by us, but also with six year olds that are quite far away from a person of my age.

So having this middle ground with a 16 year old in the same experiment to this sort of chain, where they see all the cool big girls are doing this and the cool big girls are inspired by Hypatia crew. And we from top to bottom, get all part of, uh, of this tomato, uh, seeds exercise that we will be doing there.

Emily: That's not to say they're not going to do additional outreach after the fact, but they've worked really hard to try and bring more kids into the classroom and really put those two things together.

Hypatia II is at the Mars Desert Research Station right now, as this episode drops. They will return from quote-unquote "Mars" on February 15th.

You can read more about all the crew members and learn about the other science experiments they're running at the Mars Desert Research Station as well as outreach efforts around the globe at their website, hypatiamars.com.

AirSpace theme up and under

Emily: AirSpace is from the National Air and Space Museum. AirSpace is produced by Jennifer Weingart and mixed by Tarek Fouda. Hosted by Dr. Matt Shindell and Dr. Emily Martin. Our managing producer is Erika Novak and our production coordinator is Sofia Soto Sugar. Our social media manager is Amy Stamm.

A big thank you to our guests in this episode: Carla Conejo Gonzalez, co-founder of Hypatia Mars. Dr. Ariadna Ferrés, currently on quote unquote Mars, as the crew commander of Hypatia II. And Dr. Estel Blay, also currently on 'Mars', as a scientist and health and safety officer of Hypatia II.

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