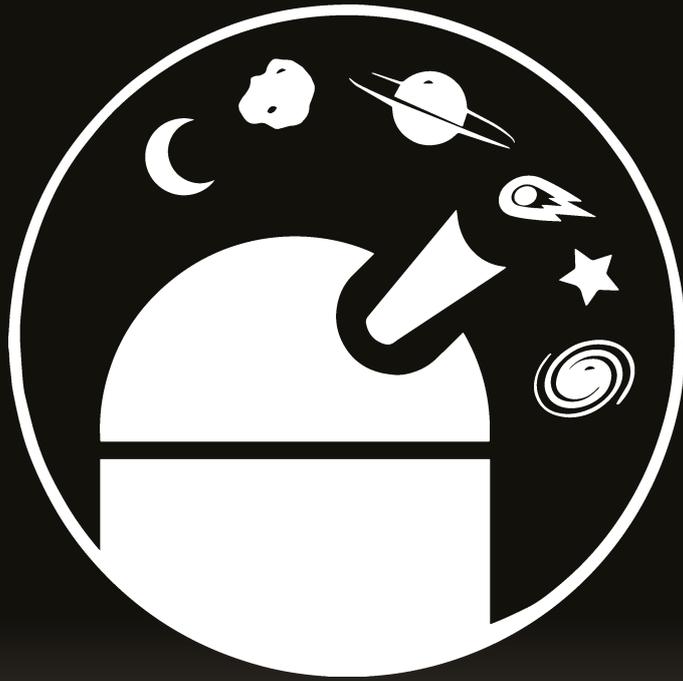


# All About Space



## LIVING IN A MARS SIMULATION

INTERVIEWED BY LEE CAVENDISH



# Living in a Mars simulation

Six candidates spent eight months away from civilisation on the side of the dormant Mauna Kea volcano. Astrobiologist Samuel Payler was one of the six chosen; here he tells **All About Space** about his 'Red Planet experience'

Interviewed by Lee Cavendish

**What made the simulation Mars-like and what were the objectives for the mission? What did you learn about life as it would be on Mars?**

HI-SEAS V was an isolation programme that occurred on the side of Mauna Kea [a dormant volcano in Hawaii] to test how we, as humans, would live on Mars. In terms of what made it a Mars-like environment was that we were cut off totally from the outside world. There were only six of us, and that's all the face-to-face interaction we had for eight months.

We also had a Mars-like delay on all communications, meaning there was a 20-minute delay following every email sent. We basically had no access to the wider internet during that time, so we just had that small outlet of email, and with the 20-minute delay it made it a long time to speak to anyone properly. We also ran off solar panels and

had to live off shelf-stable foods. This was anything that lasts for a significant amount of time, things like freeze-dried chicken, air-dried vegetables - sometimes freeze-dried vegetables and fruit. There were other aspects as well, such as we weren't allowed to use weights for exercise, we had to use exercise bands.

The goal of HI-SEAS is to understand what you have to go for in the crew composition to ensure the crew cooperate. So you have to ask questions like, how do you pick your team of astronauts? What [characteristics] do you look for in them? And what will picking certain things result in? Will it result in a team that works better together? This is intended to produce the most cohesive and productive team together for Mars, especially when you spend billions and billions of pounds on getting there. You don't want the team to fight and not be productive.

**Did you have many resupplies for the mission?**

Yes, we had a resupply every couple of months, and that was just to top up our food or water and other things that we were running low on. So it would normally be a delivery of freeze-dried chicken and other items, but we wouldn't see anyone in that delivery. The delivery would happen way down the hill and we'd shut up all the windows and everything, so we'd see nothing and hear nothing really. Then we'd go out a few hours later to collect it in our spacesuits, meaning we'd never interact with anyone on the deliveries that happened.

**What were your responsibilities?**

I was the science officer on the mission, I was responsible for ensuring that all the experiments we were conducting were running smoothly, and that all the researchers were getting the data they needed from us. There were lots of different experiments occurring, and they were looking at different aspects of the team working together.

Other than that we spent a lot of time doing social activities. Sunday was our main day off, we would have half a day off on Saturday and we'd have part of the evenings on weekdays off. We'd spend time doing activities that bonded us together, such as playing board games, and we'd try and have a bit of fun. Mostly we'd try and take our minds off of being stuck in a dome on the side of a volcano.

**Can you tell us about some of these experiments?**

I can tell you about some of them vaguely. Some of it we can't talk about because it's not published work yet, and they don't want the other crew knowing exactly what they'll be doing [on the next simulation, which was in January 2018].

I can talk about some things, such as we had various personal projects - we had things like 3D printing going on. We would see if we could make things with the materials available. If we needed a part of a machine, we could 3D print that part and that sort of stuff. Other people were trying to design a better way of managing the habitat system. Also we mapped the area around us with drones to get a 3D image of it, and use that for some of the geology tasks we were given.

“There were only six of us, and that's all the face-to-face interaction we had for eight months”



After eight months within the isolated simulation, the HI-SEAS V team can finally enjoy the finer things in life again!

NASA's journey to Mars will be a tricky one, but they plan to do it by 2030, and this simulation is a step in the right direction



## INTERVIEW BIO

### Samuel Payler

Payler is a doctoral candidate at the UK Centre for Astrobiology, University of Edinburgh. His research in astrobiology varies from searching for life in deep subsurface environments to assessing how to achieve high-quality science within the constraints of human flight in space. Payler has been involved in other analogue programmes before, including NASA's BASALT (Biologic Analog Science Associated with Lava Terrains) programme and MINAR (Mine Analog Research). He was also heavily involved in the formation of BISAL (Boulby International Subsurface Astrobiology Lab), which was the world's first deep-surface astrobiology laboratory.

# Living in a Mars simulation

The core research was mostly things like playing certain games together. We'd have to try and solve a puzzle together, and they'd [HI-SEAS external researchers] record all of our interactions during this activity, noting things such as how we're working together as a team to solve that puzzle. They would then look at how this changed over the mission as we were stuck in the dome for longer and longer. Then - not that we did - if the team is starting to hate each other, or start to struggle to do these activities, and lots of things like that.

Also, we had monitors on us for most of the day, which monitored our interactions. They could tell if we were arguing, getting along, how close we were together, how often we interacted with each other and that kind of data to try and track any changes in the team over the course of the mission.

**“We became really good friends in there, and that’s maybe not what you expect after being there for eight months”**

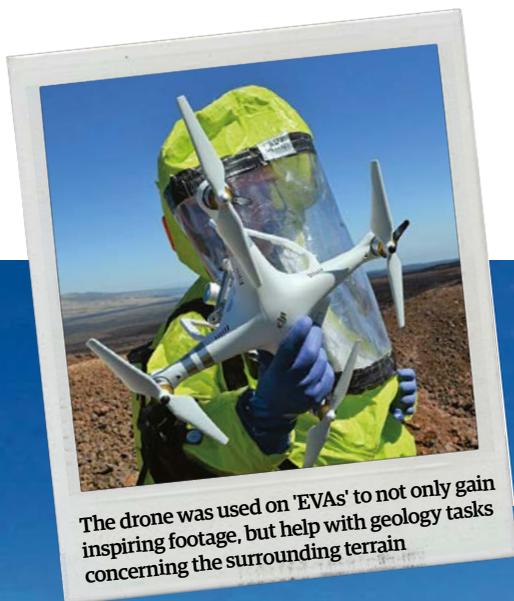
We also did a bunch of geology tasks, much like an astronaut crew would on Mars. So we'd have to go out on the 'Martian' surface and basically seek out some interesting things to sample. The science teams on 'Earth' would be directing that, and we had geology tasks set from mission support that would be along the lines of 'work out which feature this is' or something like that. So we'd spend a number of EVAs [Extra-Vehicular Activities] and a number of weeks trying to determine what it was, and then write up a big report on it. That made up a good part of our work in there as well; trying to fulfil these geology tasks by working together to understand the problem and deal with it.

It was both. We used the drone for media, so we got a lot of cool footage from it, but we also used it for 'photogrammetry'. We would fly the drone around, it would take lots of photos and then we would compile those photos to make a 3D model of the thing it was looking at. This is also known as a 'DEM', a Digital Elevation Model, which would be of very high resolution, and we used this for some of our geology tasks. It would help us determine the size of a certain object or tell us more about how it was formed. Because you can't really get that detail from looking at it on the ground or even satellite imagery, so using the drone was a good intermediate between the two.

**Drones were used in these 'EVAs' - were these just for a bit of fun or were they used to actually examine something?**

**How did you originally get involved?**

I've been involved in a number of analogue programmes, and then the opportunity to apply



The drone was used on 'EVAs' to not only gain inspiring footage, but help with geology tasks concerning the surrounding terrain





The 'EVAs' were treated as they would be on Mars, with the use of 'spacesuits' and constant communication with the base



The HI-SEAS V team spent eight months in the simulation to test the psychological effects of Martian isolation



On the move - These 'EVAs' took the team to some fascinating places, including nearby lava tubes



The HI-SEAS V crew finally left the simulation on 17 September 2017 after eight long months of primarily analysing crew dynamics for space exploration missions

for this came up. They [HI-SEAS] did a public open call, I think they ended up with nearly a thousand applicants - I'm not exactly sure how many - they then went through a number of different rounds in the selection process with us. We'd then have to go through psychological tests, interviews and so on, to which they ended up picking us six for the mission.

### Was the application process a long one?

Good few months, I kind of forget how long it was exactly. It probably went on for two or three months, something like that.

### What was your favourite memory of the mission?

We had a lot of fun exploring the lava tubes. Lava tubes are when lava flows down the volcano and solidifies, it's not like there's molten lava around the place and we're fighting for our lives! But when they solidify, they leave particular terrains and environments behind, lava flowing underneath the surface forms a big structure also known as a lava tube. You can go in those and explore them, so we have a lot of cool memories being inside these tubes and not really knowing what's around the next corner as it's pitch black and you're in a spacesuit.

So those kinds of memories, the more adventurous memories, were great, but a lot of my favourite memories are just us sat around having a lot of fun as a crew just chatting. It was the small things, because we became really good friends in there, and that's maybe not what you expect after being there for eight months.

### Is there anything you're going to miss in particular about the mission?

I'll miss being on the volcano, and I'll obviously miss my friends and being in that sort of situation; cut off from the world. It was pretty cool being totally separated from the Earth in a way, but also just being on the volcano was amazing. It is a really

spectacular environment there, it's really barren, and we had some amazing sunsets. We were also amazingly high up, I think we was at 8,200 feet (2,500 metres). Just by being up there, isolated on the volcano was kind of nice and different.

### There's going to be another simulation in January 2018, will you be involved in that one too?

No, I will not be involved. They [HI-SEAS programme runners] want to basically start afresh, so we have no interaction with the new crew. We don't want to mess up that experiment in any way, but we can get involved with the crews and the simulations after I think. But for the next cycle, I'll have almost no interaction with them.

### When we are capable of actually putting humans on Mars, would you want to try and be involved?

It's one of those things where, could you really turn it down? But on the other hand, it's easier to say yes than being actually faced with that challenge ahead of you. You'd probably have to really assess where you are in your life and whether you'd want to risk literally everything. I can't give you a definite answer, put it that way. However, it would be a hell of an adventure!