KAREN FOLEY: Well, welcome back to the Student Hub Live. It's the evening show of the second day of our (re)freshers orientation event to welcome you to The Open University community. And haven't we been having fun?

Well, in tonight's programme, we're going to start with something very remote because we're a distance learning institution. And so we thought we'd Skype Susanne, actually, who's on her travels somewhere. But let me just before we do that tell you what else we've got in store for you tonight.

We're going to talk about managing your workload. So all those time management and study hacks that you've got that have been coming through, we've been collating some of those. And HJ is going to feed those in to the chat, so we can have a good look at time management. And then we're taking a look at benchmarking and setting your expectations. So really thinking about what you're wanting to achieve on your module, in your TMAs, and whether those ideas are realistic.

So hopefully that will give you some food for thought to start planning your academic studies. But let me tell you what we've got in store for you now. Susanne Schwenzer, who's done many sessions at the Student Hub Live on planetary science and on time management, is abroad. So she couldn't come. But we thought that's no problem at all because we've got Skype. And this is the first time we've tried Skype. So if it spools a bit, just bear with us. But, Susanne, welcome to the studio.

SUSANNE SCHWENZER: Hello, Karen. I was totally missing being there this year, and I'm glad that you can have me this way. But I'm not alone because when you visit as a scientist, you always meet people. And I've met two really interesting people. In the middle of this group is Louise Prockter who is actually an OU alumni and these days leads a very big research institute. Louise, do you want to introduce yourself?

LOUISE PROCKTER: Hi. As Susanne said, I'm Louise Prockter. I started my research career with the Open University a long time ago. And I'm currently at the Lunar and Planetary Institute in Houston, Texas.

SUSANNE SCHWENZER: And the other person you see in the shot is Professor Justin Filiberto. And he studies Mars. Justin, do you want to introduce yourself?

JUSTIN FILIBERTO: Sure. So as Susanne said, I'm Justin. I'm a professor at Southern Illinois University. I'm also a visiting research fellow in the EEE department over at the OU. So I'm over there about once or twice a year helping to do research.

KAREN FOLEY: Fantastic. We love having talks about space here at the Student Hub Live because so many students don't realise that actually we have a lot of laboratories here at the Open University and that we've got a very esteemed department of planetary sciences. In fact, Dave Rothery held a Wheel of Ologies quiz yesterday, Susanne. Which we all had great fun learning our epistemology and differentiating that from our etymology.

HJ is manning our chat. So, HJ, we'd really like questions from the students at home. So if there's anything that you would like to know from our panel, then please do put those in the chat.

So Louise, you're specialising in Mercury. What is so fascinating about this planet, which is closest to the sun?

LOUISE PROCKTER: Oh, wow. Well, actually, I also study ice satellites, so I do-- I guess you could do ice and fire. But I started working on the Mercury mission when I finished my graduate degree in the US and then started as a postdoc on the Mercury mission. And quite simply, we didn't know a lot about Mercury. We had sent one spacecraft to Mercury in the 1970s.

And it was always planned that there would be a follow-on mission. It took another almost 30 years for that mission to happen. And so finally we got to see the other hemisphere of Mercury and find out what was there. And so Mercury is very Earth-like in a lot of respects, but we simply didn't know much about it.

And now with the Messenger mission, we do know a lot of more. And, of course, Dave Rothery at the OU is working on an ESA-led mission called BepiColombo. And they're going to fill in a lot of the gaps. They're going to fly a lot closer to the surface of Mercury and learn a lot more about the chemistry and composition than we did. But it's just a fascinating place.

KAREN FOLEY: Can you tell us about some of the challenges about getting a spacecraft there?

LOUISE PROCKTER: Oh, gosh, well it is so close to the sun. The thermal environment is huge. The sun is about 11 times hotter. Your electronics can basically melt in a matter of minutes if you're not careful. So we had to build, essentially, a sunshade and keep most of the spacecraft behind this

sunshade the whole time.

And also you're very close to the sun, so the sun's gravity wants to pull your spacecraft in. So we had to plan a very circuitous route. It took us six and a half years to get there. And we had to go past a lot of other planets and use what was called a gravity assist-- use their gravity to just tweak out the trajectory of the spacecraft very slightly so that we just got captured into orbit around Mercury instead of getting captured into the sun's gravity well and just sucked in and burnt to a crisp.

You're dealing with a half-billion-dollar spacecraft. That would have been rather bad. So there's a lot of challenges, but we pulled it off. And we had a very successful mission.

KAREN FOLEY: Now the we is interesting because I know from Dave that a lot of people are working with various other professors to look at different aspects. So we've got the spacecraft. Often there are tools that are used to measure things. So there's a whole wealth of people working together, often in different organisations. It's really important, I guess, that you communicate and are able to work within your specialisms and also as part of a big team.

LOUISE PROCKTER: That's right. And with modern methods, it's made it a lot easier. The fact that we're several hours apart from you, several time zones, but we're able to talk through Skype. That makes it much easier than having to write a letter. 50 years ago, we wouldn't have been able to.

I think running some of these missions would have been very difficult just because you can't communicate with your colleagues. Face-to-face interaction is still very important. The fact that we can make decisions almost in real time is really important.

One of the issues with spacecraft, of course, is the time lag. You are dealing with a spacecraft that, in our case, it could take 20 minutes to get a signal back from Mercury. If you're dealing with an out of solar system mission, it can take sometimes an hour just to take a signal back.

So you have to preprogram everything. It's almost like programming your DVR. How many times have we programmed the-- well, maybe now it's a lot easier, right? We can just speak into our remote. But in the old days, [AUDIO OUT] recorder and get the wrong show. You're trying to programme something of a complicated sequence that things work in order to get a sequence back from spacecraft.

It's the same thing working with a big team. You're working with a big interdisciplinary team. But the science returned from that big interdisciplinary team can be phenomenal. And I'm

sure, with your students, the fact that you've got students working across the whole country together brings a whole new richness to your courses that you wouldn't necessarily have otherwise.

KAREN FOLEY: Yeah, absolutely. In fact, we often get them working together with some of our remote laboratories, and microscopes, and ways of looking at things, gathering data together, and having that experience, which is fantastic.

Now, you mentioned that Mercury wasn't your only area of focus. And you're also working on icy moons and other moons of the solar system. So Dave would get very cross if I didn't ask you about any of these.

LOUISE PROCKTER: My main area of study is actually Europa, which is one of Jupiter's icy moons. And it's of great interest because it has an icy crust. And we think it has a salt water ocean beneath that ice crust. And it may be one of the best places in the solar system to look for life. And so my area of expertise is really looking at the icy crust.

We like to think of it as being crispy on the surface and chewy underneath. But we are trying to understand what's going on in the subsurface just by looking at the surface. It's a little bit like being a detective.

We can look at images of the surface. It's like a crime scene. Can you tell what happened on the subsurface just looking at the evidence that we find presented to us. So it's quite a challenge.

KAREN FOLEY: So you mentioned chewy as in with, maybe, some interesting organisms beneath it?

LOUISE PROCKTER: We have no idea. But we think that it may have the right ingredients for life as we know it, as we understand it. So it's got liquid water.

We think it may have the right chemistry. It may have organics like we have on the Earth. And it [AUDIO OUT] to oceans, so it's tidally heated. It's kind of squeezed in the same way that the moon pulls tides on the Earth. So it has all the right ingredients.

We still have no idea whether there's actually life there, or whether-- is it giant squid with eyes the size of dinner plates? Or is it microbes or bacteria? Or is there nothing there? Is the water too salty. We have no idea.

But we probably have the technology now that we can go there and start trying to take measurements to find out, is it actually a habitable world. And so the mission I'm working on now is to try and figure that out.

KAREN FOLEY: So how do you choose what you're focusing on, Louise? Because you've got hot Mercury and freezing cold Europa. Are you just going to the most salacious-- because I can see Justin sitting there when you're saying this is the most exciting thing. I'm sure, Justin, you disagree. And we can talk about that in a minute. But how do you select some of these areas, Louise?

LOUISE PROCKTER: Partly, I think it's what grabs you. I was very lucky At, actually, the OU, I learned about plate tectonics. I did Science Foundation courses at OU. That was where I was like, this is what I have to do. And it was the first time I'd really done earth science. And this was over 20 years ago.

And learning about plate tectonics just set me on fire. And I was like, this is what I have to do. [AUDIO OUT] on to do. I didn't finish my degree with the OU, but I gave up my job, and I went to do my degree, full time, at Lancaster University in geophysics. And I studied plate tectonics a lot.

And then I discovered planetary science. And I didn't even know that that could be a real job. Like, people will pay me to do this? This is fantastic. This is great! And I ended up in the US. And then I found that you could also get paid to work on space missions. So it got better and better.

And then I discovered Europa and Ganymede, the icy moons. And that's where my heart lay. And I started to work on space missions. But, really, the practicalities of it are that you can't always follow exactly what your heart desires.

And so I worked on the Mercury mission because, at that time, there was no funding to do the other solar system. But I still like mission work, and I had a wonderful experience there. And it's only now, where I'm probably in the later stages of my career, that I'm actually able to get back to Europa, that NASA has now started to fund this Europa mission. So I have been very patient.

But I've also been advocating throughout my career for a return to Europa. And now, I'm in a position where I can actually do that. So sometimes you have to be practical. You've got to pay the rent. But I'm still privileged and very lucky to be in a field that I could never have dreamed

of when I started my OU career, and I was just spending my evenings doing my homework and doing my pendulum experiments, the plumb bob hanging off my ceiling and all of those things.

And just this whole new world opened up to me. It's just been an amazing ride that I've been very privileged. And even if I didn't get to study the exact solar system body that I love, I still would feel incredibly privileged to do this work. It's just been a fantastic journey.

KAREN FOLEY: And you've got an OU family, haven't you?

LOUISE PROCKTER: Yeah, I have. I just discovered the OU [AUDIO OUT] Yeah, my dad was one of the very first people to start an OU degree when the OU started up. And I can't even remember when that was. I think it was probably in the late '70s, early on.

And he was always starting his OU degree. And then he'd get too busy at work and he'd, sort of, let it go. And then he'd start it up again, and he'd do another module, and then he'd let it go. But he did finally finish his degree. It took him about 20 years on and off.

And then my mum, when she retired, she also did her OU degree. Because we came from some working class families who didn't have degrees. But both of them now have-- well, my dad's passed away now-- but they both got their OU degrees. And they were incredibly proud. And we're very, very, fond of the OU and just the opportunities that it provided to us that we wouldn't have had otherwise. So we love that OU.

KAREN FOLEY: Oh, fab. The person in the background has been messing with the connection. But I think we're all right. HJ, what's everyone talking about at home?

HJ: So you've got lots of great chat. And we're focusing a lot here. We're not procrastinating with anything else that we have done earlier today. So we're really focusing an interest in this session.

Stewart's really glad that he made it home to talk to Susanne. Everyone's been looking forward to this session. Debra just says, brilliant. I think so too. Teri just says that she thinks it's an amazing experience, having the chance to go out there, and study, and work with lots of different scientists and different people.

And we've also been talking about how dangerous a trip to Mercury would be. So Stewart does say, it's fairly low on my list of holiday destinations. But he might pop along if they need

someone to go. And Jane says she would like to join this holiday to Mercury. And Stewart reckons that Europa would be a bit better for some skiing.

And Darvin just said he did the OU space move, got on [? Futurelin ?] and got a chance to use the remote telescopes there, which sounds like a really good experience. And Rachel also just says, I love space. I think that's a very definitive statement there. And Stewart's talking about the-- he's sad that Cassini's gone, and maybe our guests know when a probe will be sent to Enceladus, or Enceladus, perhaps.

KAREN FOLEY: I hate asking these questions with all these names I don't know quite how to pronounce. I think someone's gone to the guests' room and is doing something untoward with the connections. So Justin, if you can hear us, tell us what you're up to, please.

JUSTIN FILIBERTO: Karen, we can hear you. Can you hear us still?

KAREN FOLEY: We can, but your picture is static. But that's no problem. The sound is good, and it might well come back. So Justin, you're looking very much at studying rocks and looking at magnetic rocks as well, and, to some extent, what they can tell us about habitability, is it?

JUSTIN FILIBERTO: Yeah, so one of the projects that I actually work with is looking at how the lavas, when they interact with the crust, could they produce a habitable environment. They bring up heat with them. They bring nutrients with salt. Now we're looking at a field site out in Utah and in the analogue for the Mars 2020 landing site, and possibly even the ESA's ExoMars.

KAREN FOLEY: Yeah, we've been looking at ExoMars. We're going to call you back and try and get a better connection, Justin, because everyone really wants to hear what you've got to say. But we're struggling with the sound a little bit. HJ, anybody else interested in studying space science with the OU, or even elsewhere?

HJ: Well, I know we've got lots of people who are telling us about the moon [INAUDIBLE], which they've done, which David Rothery was telling us about yesterday, which was really exciting. Rachel just said she'd love to go to Mars. She's going to be really busy because she's off to Mercury as well. So I don't know what one she's going to go to first.

Jane says, the OU on Mercury, I suppose because we're distance learning. You can always study from another planet. It just depends on how good the internet connection is. And we are interested in seeing people's study journeys as well.

So we've got a lot of people here who are excited to start their studies, and half way through, and thinking about their plans. So they've really been interested in hearing about how Justine went through her OU journey and where she's ended up now as well.

KAREN FOLEY: Excellent. Well, Justin, we've got you back, hopefully. Can you hear us OK?

JUSTIN FILIBERTO: Yeah, we can hear you now.

KAREN FOLEY: I'm sorry about that. So you were filling us in on the importance of studying rocks, in particular, magnetic rocks, and what they tell us about habitability and the conditions on planets.

JUSTIN FILIBERTO: Yes, so one of the projects I'm working on with OU people, we have a National Geographic grant to go to Utah to look at a Mars analogue site, where lava intruded sulphur rich rocks, baked them, metamorphosed them, brought energy, brought nutrients with them, as a potential habitable environment. And we're doing this for an analogue for the Mars 2020 landing site, and possibly even the ESA's ExoMars landing site.

KAREN FOLEY: Wow. So why is studying rocks on other planets, then, so important-- well, from other planets-- so important?

JUSTIN FILIBERTO: So one of the things we look at is how is Mars different than the Earth? And rocks can tell us that. We can look at the chemistry of the rocks, we can look at what minerals make it up, and see how Mars evolved and why did it evolve differently than the Earth.

KAREN FOLEY: Those are some very big questions. What sorts of tools are you using? What sorts of things are you doing to these rocks to look at them from different perspectives? Because I guess there are many ways you could cut them, so to speak.

JUSTIN FILIBERTO: Yes, so we look at spectroscopy, so how does light interact with a rock. And that tells us about the mineral make up. And we do this same thing on Mars. We compare our spectra of our rocks directly to the ones we're getting from Mars. We can also cut them open, make very thin sections of them, and actually measure the chemistry of each different mineral within a rock, and compare this with the Earth's as well.

SUSANNE SCHWENZER: And if you want to look at these Martian rocks, then go to the OU's virtual microscope. Because some of his samples are actually in there.

JUSTIN FILIBERTO: Yes, some of the samples Susanne and I have been working on together are in the virtual microscope.

KAREN FOLEY: Wow. That's fantastic. And there's a very clever way of getting OU students to compile a lot of data as well, by counting various things. So it is absolutely brilliant.

JUSTIN FILIBERTO: And not just OU students. My students at SIU, actually, use the virtual microscope as well.

KAREN FOLEY: We've just lost that connection there, very briefly. We lost you at the virtual microscope. HJ, can you search the virtual microscope so that people can find it and start to access some of the data? I'm sorry, people, we're having some problem with the transmission tonight.

HJ: So we'll pop the links for the virtual microscope and also the virtual telescopes as well. Because we also talked about the Open Science labs. And there's lots of different resources that we've been exploring. But Stewart just says, can't we just ask Matt Damon what it's like on Mars?

KAREN FOLEY: Oh, no. Because Susanne said no. Actually, when we started speaking about this, Susanne said, I'm going to get some very famous people. And I said, I'm really excited because I haven't met Matt Damon before. [LAUGHING]

SUSANNE SCHWENZER: Next time.

KAREN FOLEY: Justin's much better than Matt Damon, as a Mars expert should. Much more impressibility, published much more broadly. Justin, what do you think the most hot topic is, so to speak? We heard about how Louise is getting into certain areas. What's impressive for you?

JUSTIN FILIBERTO: So one of the things we've been focusing on in Mars is water and habitability in the Martian crust. And Susanne and I are actually publishing a book some time later this year, looking at volatile repertoires, where Mars could have been habitable, where there was water, what was the chemistry of the water, and could there have been life one billion years ago.

SUSANNE SCHWENZER: And he makes fake rocks, do you know?

JUSTIN So I also squeeze rocks and look at the interiors to see how the interiors are different on Mars

FILIBERTO: and the Earth. And we can't do that with Martian meteorites. And we can't do that with rocks on the surface of Mars. So I make, as Susanne said, fake rocks, where--

KAREN FOLEY: Take rocks and squeeze them, which sounds a lot less technical than the spectroscopy.

[LAUGHTER]

JUSTIN FILIBERTO: It is.

KAREN FOLEY: So why are you doing this, Justin?

JUSTIN FILIBERTO: So we want to look at the interiors. Heat comes out of the interior and helps the surface-- and helps keep the surface-- nice conditions. And so we look at the interiors of different planets to see how they've pooled through time. And we can't do that, as I said, with real rocks. So we make fake rocks, sort of like that, and then we can project what they were at a different time.

KAREN FOLEY: We've been talking in the chat about which planet or place people would like to study, given the choice. Tell us what people have been saying, HJ.

HJ: So Jane tells us that Neptune is one she'd like to study. Teri says Jupiter. We have got a lot of people talking about the moons as well, so maybe something a bit different there. But I'm just happy being on Earth and letting other people study those, to be honest. But yes, especially when it comes to holidays to Mercury. I'm not up for that one. We'll let Stewart keep to that one.

KAREN FOLEY: Stewart's got lots of plans though. So he's a very busy man. We've been talking about given the choice, which place our students would like to visit. And we've had lots and lots of different answers to that. I want you to finish telling us about these fake rocks, Justin. And then I'd also like to ask you what your dream area of research might be, given the choice, without any sort of funding. Or what areas-- what the most exciting thing you could do if you had complete free rein.

But anyway, back to these rocks, Justin. So you're modelling something, are you, just to look at the heat.

JUSTIN FILIBERTO: We've looked at what that tells us about different interiors. And one of the things I've been doing now is leaving Mars. My students still work on Mars, and I still do some work. But I'm

leaving Mars, at least for the near term, and going to Venus.

We know a lot less about Venus than we do Mars. We've had a lot less missions. We can't reach the surface very easily. And so one of the things we can do is synthesise Venus rocks the same way I do Mars, to compare them.

KAREN FOLEY: Well, you still are whizzing about the solar system today. Is this what happens? Do you get a bit bored with one area and then say, actually, we don't know so much about that. I can get some papers out.

JUSTIN FILIBERTO: Planetary science is never boring. There's always new missions, new data, and new experiences, something new going on that completely throws what we used to know for a loop and has to change everything.

KAREN FOLEY: So both of you, what would you study in terms of place, given the choice?

LOUISE PROCKTER: I think I'm studying it. I think Europa is my place.

KAREN FOLEY: Good for you, Louise.

JUSTIN FILIBERTO: Yeah, and Venus is where my direction is going and where my heart currently is.

KAREN FOLEY: So Jane would like to study Neptune. Stewart would like to study Titan. Teri would like to study Jupiter. Do you guys all fall out about which is the most fascinating place? Or do you just disagree, and live and let live?

JUSTIN FILIBERTO: Oh, no.

LOUISE PROCKTER: All the time.

JUSTIN FILIBERTO: All the time.

LOUISE PROCKTER: All the time, yeah. We all have our own favourites. And it gets a little bit difficult because the budget is only so big, and NASA always has to choose its priorities. So it can get a little bit

contentious.

KAREN FOLEY: OK, what's the most popular then? What is the most popular area to study, right now, of the solar system?

LOUISE PROCKTER: It has to be Mars. It's also one of the most-- [AUDIO OUT]

KAREN FOLEY: This transmission, actually, isn't coming from Mars. But you would think it might be, the way it's staggering. So you were saying, Louise, that the most popular area is Mars right now. We missed the rest.

LOUISE PROCKTER: Oh. Well, partly because it's very easy to get to, and a lot of launch opportunities. But also because of the potential, the recent potential, for life there. You know, we've had this theme of follow the water, which Justin mentioned earlier. And understanding a world that probably had the potential to be habitable, although we suspect that it isn't habitable today, although that hasn't been ruled out. And then if you want to say more about it's current potential for habitability?

JUSTIN FILIBERTO: So there are things, like recurrent slope whenever we see features that look like flowing water. Where there's flowing water, there could be life. And so those are one of the places to go look for potential habitability. The other area is underground. If there are aquifers, or frozen aquifers, in the cryosphere, those could still be habitable environments, even today.

KAREN FOLEY: And now we're looking for more to nearer for home, aren't we, with the moon. Is the moon very hot right now in terms of looking for water?

LOUISE PROCKTER: No.

[LAUGHTER]

But we know there is buried resources in water, probably at the poles, hydrogen storage at the poles.

JUSTIN FILIBERTO: The other thing that's hot about the Moon and water is water in the lunar interior. Up until about five years ago, no one thought there was any water in the lunar interior. And groups, including one from the OU over in DPS, found evidence for water in the lunar interior at levels

that we never expected. And so that's sort of reanalyzing samples from the Apollo times, and with new modern techniques, and answering new questions, and opening up new questions.

SUSANNE SCHWENZER: Yes.

KAREN FOLEY: Well, by the sound of rattling coffee cups, it sounds like you're all going to get some liquid refreshments soon. We're out of time, so we're going to have to leave you. But that has been absolutely wonderful. Could I just ask for one thing that you might say to students who really want to be planetary scientists?

Louise, you started by saying you never thought you'd get this sort of job. You couldn't believe that people would pay you money to do such an exciting thing. I know a lot of students maybe starting their journeys on S-111, the basic science level, first level module, think, wow, this is incredible. What advice would you give them about keeping going with their studies?

LOUISE PROCKTER: I think just don't be afraid to dream big. But also it's good to find a good mentor, expand your network. Don't be afraid to find great people like Susanne here. And just it's not what you know. It's who you know. Like, the more people you know, the more you can get connected into the community. It's not a huge community, so you might find good people and have them help you.

KAREN FOLEY: Brilliant point. Justin?

JUSTIN FILIBERTO: I would say take every opportunity that's afforded you. Because of opportunities and because of jumping on them, I became a planetary geologist and love it, and don't regret a single decision I made.

KAREN FOLEY: Thank you. So even the planets are within our reach now. So if you're an OU student, anyway. Susanne, a massive thank you to you. Thank you, Justin. Thank you, Louise, as well. And Susanne, you're coming back on the Student Hub Live for our next event in January, February. But thank you so much for arranging this. It's been really special, taking us on your travels with you. And it just goes to show what exciting things Open University academics get up to.

SUSANNE SCHWENZER: Thank you for having us.

JUSTIN FILIBERTO: Thank you.

LOUISE PROCKTER: Thank you,

KAREN FOLEY: Thanks, everyone. Right. So now we've got a short video break. And we're going to take a look at a Bob online trading video. And then we'll be back to do a time management session with Ruth MacFarlane. I'll see you in a minute.