



# AstrobiologyOU

The Open University  
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open.ac.uk/AstrobiologyOU

2020-2021  
ANNUAL REPORT





# Message from our Directorate



The last twelve months have been a time of adaptation for the group but, as this annual report will demonstrate, there have been many achievements to celebrate, new members of the group to welcome and much to look forward to.

Thanks to the phenomenal efforts of the University, particularly our technical support team, many members of the group have been granted access to campus for aspect of their work. This includes socially distanced face-to-face training in the laboratories, which has been of huge benefit to our Early Career Researchers.

Although COVID-19 has hindered international travel for over a year, we have used the pandemic as an opportunity to reach out to other research groups, particularly by adopting some of the good practice we have developed in working as a team online. Among many other

things, we have formed a 'brine discussion' group with institutions such as the NHM in Paris, to facilitate networking opportunities for Early Career Researchers. We have also hosted a series of workshops focused on aspects of astrobiology (e.g., analogue sites, simulations, and modelling) with the Lunar and Planetary Institute in the US, to develop new collaborations. Our seminar series has been active, and we have had an impressive list of international researchers speaking in our group meeting and in the specialist discussion meetings. Internally, we have also facilitated 'blue skies' meetings across the workstreams, leading to some exciting events planned for Autumn 2021.

We have had further grant success including being part of SMART (Landscape Sensor-based Monitoring Assessment Using Remote Technologies), that was funded by the UKSA and is building

on previous UKSA-IPP work monitoring mosquitos in Guyana.

We are proud of how the group has adapted and dealt with the uncertainty and changing circumstances of the last year, particularly our three new PhD students, Amy Dugdale, Silvio Sinbaldi and Chris Houghton, who faced the challenge of starting their PhDs in lockdown. The group has pulled together, supported each other, and successfully found ways to keep research, grant writing, conference attendance and publishing going.

Prof Karen Olsson-Francis  
*Director*

Dr Victoria Pearson  
*Associate Director*

Dr Susanne Schwenzer  
*Associate Director*

Dr Louise Thomas  
*Senior Manager*

Ask the expert: Mission to Mars event panellists



Susanne P Schwenzer



James Holmes



Mario Toubes-Rodrigo



Amy Dugdale

# A year in numbers

Languages published in **5**

  
**3448** Views on YouTube

New Members of Staff **2**

Engagement Comms & Events **29**

 **3** New PhD Students

**8** Journal Articles Published

**270** Hits on the Blog

**32** Conference Abstracts Submitted

**£1.3M** Grants Awarded

**7** Videos Published 

 **1594** Followers on Twitter

**4** White Papers Published

**27**  Bids Submitted

 **4** Book Chapters Published

**5** Workstreams

**4** Key Themes

**1** Aim



A still from the AstrobiologyOU  
stop motion video created by Dr  
Stacy Phillips:  
<https://bit.ly/IntroToAstrobiology>







Charlotte.Spencer-Jones

Grace.Richards

Ben.Tatton

Mario.Toubes-Rodrigo

Peter.Fawdon

Sevasti.Filippidou

Mark.Fox-Powell

Hannah.Cooper

Christopher.Houghton

Michael.Macey

Simon.Lee

David.N.Johnson

Claire.Batty

Grace.Duffield

Ann.Grand

Stuart.Turner

Susanne.Schwenzer

Alvaro.Del-Moral-Jime...

Richard.Holliman

Yiannis.Tsamis

Simone.Cogliati

Amy.Dugdale

Ezgi.Kucukkilic-Stephens

Julia.Semprich

Bea.Baharier

Jitka.Dojivova

Shonil.Bhagwat

Devyani.Gajjar

Victoria.Pearson

Karen.Olsson-Francis

Louise.Thomas

Alessandra.Marino

Rachael.Hamp

Silvio.Sinibaldi

Ceri.Gwyther

Kimberley.Slaney

The focus of this past year for the governance workstream has been expanding the conceptualisation of the 'environment' (all while our own personal environments have remained fairly restricted). The COSPAR Planetary Protection Policy, alongside the Space Debris Mitigation Guidelines and the recently announced Long Term Sustainability Guidelines, form a structural foundation for this reconceptualization but the driving force is the recognition that we are on the precipice of an expansion of human activities in the Solar System and therefore need to consider the broader impact this may have.

Most of the past year has therefore been spent engaging with the fields of environmental humanities and legal geography as well as engaging with the wider community. This kicked off back in September 2020 with a presentation at the London Science Fiction Research Community's annual conference on 'Ecological Imperialism in Science Fiction and Implications for Space Governance'.

Work was also done within the field of arms control, recognizing that the destructive testing of anti-satellite weapons is an environmental issue as well as a peace and security concern (blowing up satellites generates considerable space debris). I won the inaugural Arms Control Idol hosted by Kings College London's Centre for Science and Security Studies for this work, and also participated in Project Ploughshares norms building workshop in November. However, the year's highlight was the presentation during the COSPAR conference in Sydney (attended virtually, of course), which considered the suitability of the existing space law framework as a foundation for a space 'environmental law' framework.

This work will continue and will prove increasingly necessary as space activities and actors proliferate.

Thomas Cheney  
*Lecturer of Space Governance*

# The environment of space



Shonil Bhagwat, Luke Jerram and host Maria Nita at Gaia, Sacred Earth panel event at the IF festival.





# Bake your PhD

My PhD investigates whether space technologies being used in international development projects for the Sustainable Development Goals could aid inclusive development and social justice. I am using the lens of inclusive innovation to evaluate space projects in the International Partnership Programme, which was led by the UK Space Agency and funded by the UK government's official aid budget. In my second year, I am currently collecting data from project documents and semi-structured interviews with organisations involved in implementing space projects.

In November 2020, I entered the Open University's Bake you PhD competition, which was super fun! It was great to see so much creativity within the OU and all the bakes looked delicious. My cake concept was an edible fondant satellite orbiting the earth, made from a chocolate and coffee cake topped with chocolate buttercream and icing. The satellite is being used on Earth to aid the 17 chocolate biscuit Sustainable Development Goals. One example of a space project is using Earth observation satellites to assist small-scale farmers in improving coffee yields (hence the coffee flavour of the Earth cake). This use could aid SDG1: no poverty. In the theme of sustainability, everything was vegan.

Devyani Gajjar  
PhD Student



# A virtual success

From 2nd to 9th of November 2020, with the pandemic at one of its many peaks and lockdowns in place around the world, AstrobiologyOU – funded through an STFC grant and co-sponsored by the Astrobiology Society of Britain – held the “STFC Introductory Astrobiology Postgraduate Summer School”. Faced with a virtual environment, we decided to use the circumstances to our advantage.

Our programme focused on three avenues: training, international speakers of astrobiological interest, and a Mars mission simulation. The training programme ranged from lectures on budget training, grant writing skills, engaged research, and social media skills, and included a bespoke CV clinic. The interactive programme also saw lively panel discussions that allowed the participants to ‘Ask me anything’ on the PhD journey and on future career prospects inside and outside academia. Skills and topics of research interest ranged from bioinformatics to planetary protection, modeling and laboratory techniques.

The Open University’s OpenSTEM lab features a Mars mission simulation facility, which builds on the instruments of NASA’s Curiosity rover on Mars. We used this facility for a special edition of our Mars mission simulation, during which the participants used

our interactive interface to drive a rover around our simulation facility to answer the question: Is there water at the landing site?

Crowning it all, and taking advantage of the online environment, was a series of lectures given by international colleagues. Starting out with Dr. Paul Mahaffy (NASA Goddard, SAM Principal Investigator) on the MSL mission and the volatiles and organics found at Gale Crater, the focus next went to sample curation presented by Dr Kevin Righter (Curator at NASA JSC), how to find meteorites in Antarctica by Dr Vincianne Debaille (Université Libre de Bruxelles), and to analogue missions as reported by NASA astronaut Dr Stanley G Love (NASA JCS).

The overwhelming majority of the 30 attendees gave excellent feedback on the event, with one stating, “The course was well-organised and well-run and I think the whole week was executed really brilliantly”.

Despite the online constraints the event has sparked a journal club where the attendees have continued to meet regularly online to talk about astrobiology.

Dr Susanne Schwenzer  
*Associate Director*



# Veggie Wash: cleaning the 'Dirty Dozen'

The worldwide consumption of ready-to-eat fresh fruit and vegetables has increased with the global effort to improve health and nutrition. However, it has been estimated that, on average, a piece of fruit will have been handled by seven different people before the customer consumes it.

A 2020 FSA report highlighted that there are 2.4 million cases of food poisoning annually in the UK with a cost to society of £9.1 billion per year. Microbial contamination can occur at any stage in the farm to fork chain and consumers are advised to wash their fresh fruit and vegetables before use.

Official UK figures from November 2020 revealed 12 products that are most likely to contain cocktails of potentially hazardous pesticides. The 'Dirty Dozen' list was topped by strawberries with almost 90 percent of those tested containing residues of more than one pesticide. Lemons and pre-packed salad leaves came a close second and third, with pesticides found in more than 80 percent of tests.

We have received six months of funding, from the STFC Impact Accelerator Account, to explore how well a commercial product, Veggie Wash, performs in removing these harmful pesticides. Our researchers have an extensive track record of developing novel solutions to real-world problems

and this project with Food Safe Ltd brings together our complementary expertise in gas chromatography-mass spectrometry (GC-MS) and microbiology for the first time.

In partnership with Ceri Gwyther, Karen Olsson-Francis and myself, Sonia Garcia Alcega will use the latest in-house laboratory techniques and instrumentation available to develop assays to investigate the ability of the company's products to remove surface bacteria and to reduce the pesticide load from fruit and veg samples.

This detailed validation of the products' efficacy should add weight to the sales efforts whilst improving the safety and health of the consumer, especially given the added awareness on hygiene as a result of the COVID-19 pandemic.

We look forward to evaluating the results and, if proven to be effective, then I will be first in the queue to buy the product.

Dr Geraint (Taff) Morgan  
*Research Fellow*





# Simone Cogliati

Postdoctoral Researcher

I joined AstrobiologyOU in April 2021, right in the middle of the second national lockdown. Since I had previously been part of the group before COVID-19 on a short post-doctoral contract, I knew most of the members of the team and this has helped me to have a smooth and easy start despite the new situation.

Working remotely from home was not a problem for me. For my research I use a specific software to identify minerals that could form in simulated martian aqueous environments. I didn't need to be on campus for my study and I could continue to live in Manchester without being worried about finding new accommodation.

Since I started, I have been involved in many different online activities such as virtual meetings and conferences, and I had the possibility of meeting people from all around the world with just one click of my mouse, at zero cost. This helped me to develop new ideas and to grow professionally. I established connections with new colleagues and joined a new project led by Dr. Justin Filiberto (the then Manager for Geology and Petrology at the Lunar and Planetary Institute, USRA (US)). I am presenting the results of this project at an international meeting in late October 2021.

"They are what? Locking us down?! But I'm supposed to be starting my new PDRA!"

I am no stranger to variable working schedules but suddenly life was thrown into complete chaos, with childcare, working hours and generally avoiding a global pandemic!

I had just been offered the opportunity to return from maternity leave and expand my research area into astrobiology. What an amazing chance, to take my knowledge of using volatile organic compounds to diagnose disease, and apply it to finding possible indications of life on other planetary bodies! As the early part of the role was a lot of reading, the first few months working at home were relatively straightforward. I was also extremely lucky to be familiar with the OU and its laboratories, and through the amazing efforts of our lab managers and senior COVID-19 recovery teams, I was able to get back onsite and start to develop the practical aspect of my research.

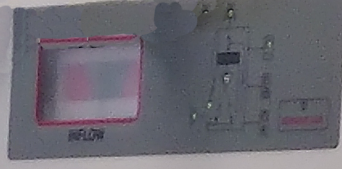
From working with microbial cultures and collecting the gases they produce, to preparing methods to then identify those compounds, it has been all go. But I think the nicest thing about starting with AstrobiologyOU is the sense of 'family' I have got since I joined. Sometimes research can be quite isolating (in or out of a pandemic!), especially if your field is very specialised like mine, and it is so nice to be part of something with such a diverse and interesting group of people.

Claire Batty  
Postdoctoral Researcher



**BioMAT<sup>2</sup>**

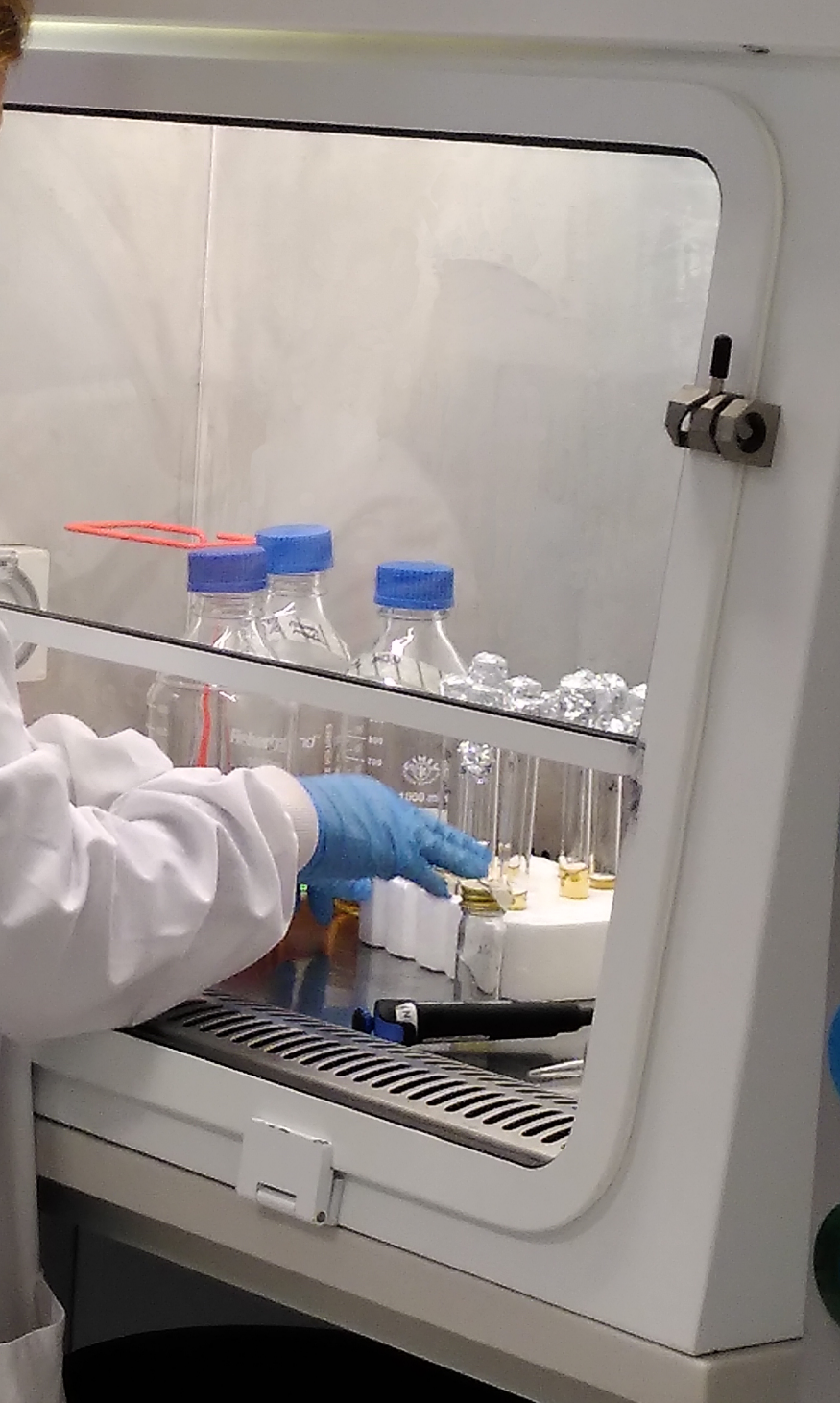
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TO  
OF





I am calling 2020-2021 the Year of Professional Development for the lab team. If we didn't focus on the positives, then I think we'd all be swimming in tears of frustration and fatigue. And the pandemic did provide us with opportunities to learn; I am now an expert in Roman Britain, and my Just Dance skills are, well...shocking...but I did learn I could run a marathon.

Back onsite, the lab team had to learn new skills by shouting to colleagues through the doorway or via teams. They shut down and then reopened labs, rearranged labs, moved and set up equipment, refurbished at least 3 labs, carried out labwork on behalf of lab users who couldn't get to site, worked odd hours so we could provide clean lab coats, and carried on with consultancy work alongside the day job.

For those who couldn't attend site, the amount of work they have done behind the scenes has also been phenomenal. They've written countless risk assessments, new SOPs, answered many a question such as 'Argh, how do I do this?', and managed the new Bookkit system; a feat in itself.

I would also like to bring to your attention the sheer amount of work that has gone into ensuring that equipment onsite is safe for use. The number of risk assessments that have been written to allow engineers onsite beggar's belief. The amount of organisation that goes into every visit is astounding. COVID-19 still does not make any visit simple.

Now face to face training is back on the menu, I'd like to think we're supporting our lab users' PDP too. I'd like to take this opportunity to thank each and every one of the AstrobiologyOU lab team. I couldn't ask for a better bunch of people to work with.

Dr Ceri Cwyther  
*Lab Manager*

# Making the impossible possible

When I started my Laboratory Technician Apprenticeship almost two years ago, I had a very clear idea of what I wanted to achieve. Only a couple of months after starting, COVID-19 started to spread like wildfire, sending both the world into a science fiction dystopia and my apprenticeship plan up in flames.

It has been very odd working through a skills-based qualification, in an environment that was completely unknown to me and with a range of restrictions on contact and training, but it was essential for keeping all the lab users safe. Though this presented many challenges, the continuously evolving alien ways of working allowed professional developments which I had not foreseen.

Working from home, with a limited number of booking slots for the labs, freed up time for me to read more papers, attend more talks and online training sessions. I wrote an abundance of SOP's, Risk Assessments, and quality assurance procedures for the labs. Practices which are at the core of working in a research environment.

These activities also gave me an insight into the scientific procedures I was so desperately wanting to learn hands-on. So, though sometimes editing word document after word document from my sofa was at best testing, I am pleased to have developed a wide spectrum of knowledge and have aided the research of AstrobiologyOU throughout the pandemic. Playing my part in keeping the labs operational for students, post docs and academics while other members of the technical team were isolated at home also became a huge motivator for me, and was something which helped me cope with the difficulties presented by lockdowns and isolation.

I am writing this having completed my End Point Assessment (only yesterday). It is the testing process which determines whether I am awarded a fail, pass or distinction for my qualification. It is such a huge relief to finally have finished my apprenticeship. The process has been gruelling at times but is now a huge achievement regardless of my end grade. Plus, I know that as restrictions further

lift and the world becomes safer again, I will finally begin to develop the key micro and molecular biology skills that have mesmerised me since I began my scientific career in 2019.

Grace Duffield  
*Microbiology Technician  
Apprentice*

# Life as a lockdown Laboratory Technician Apprentice

# Martian impact craters and life

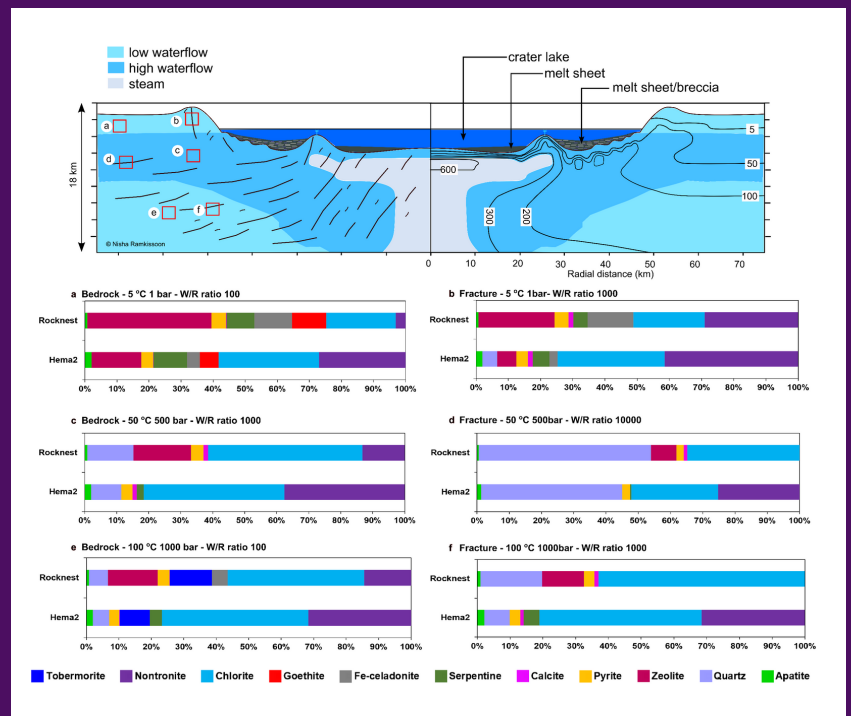
Impacts can have a devastating effect on solid bodies like Earth and Mars, forming huge craters and, in the case of Earth, destroying life. However, impacts have played key role in the formation of terrestrial bodies, the evolution of planetary atmospheres and may even have had a part to play in the development of life on Earth.

In a recently published paper, we explored whether martian impact craters could provide enough energy to support microbial life.

The team used computer modelling to mimic the water-mineral interactions that could occur within in theoretical impact craters in two martian soils known as Rocknest and Hema2. This identified potential secondary minerals that may form under a range of pressures and temperatures and in two geological settings.

Using this information, we were then able to calculate the amount of energy produced from iron-based oxidation and reduction reactions, which was then used to estimate how much biomass could be generated and how many microbes could be supported.

Our results have suggested that martian impact crater environments would be able to produce a significant amount of energy that could support cell numbers similar to those found in terrestrial environments, indicating that martian impact craters could provide sufficient energy to support potential microbial life on Mars.



Secondary mineral assemblages that could form within two separate martian impact crater environments at different pressures and temperatures. Mineral abundances are in wt.%. (Ramkissoon et al., 2021)

Dr Nisha Ramkissoon  
PDRA

Ramkissoon, N.K., Turner, S.M.R., Macey, M.C., Schwenzer, S.P., Reed, M.H., Pearson, V.K. and Olsson-Francis, K. (2021), Exploring the environments of Martian impact-generated hydrothermal systems and their potential to support life. *Meteorit Planet Sci*, 56: 1350-1368. doi.org/10.1111/maps.13697



Students joining in from home  
with our Ask the experts:  
Mission to Mars event



'Everyone's PhD project always changes, don't worry' is a phrase I have heard so often bounced around the PhD student office, reassuring each other that it is okay when plans don't work out and we must adapt. Currently, I am finishing writing my thesis, which looks very different to what I imagined it to be going into 2020.

The pandemic caused lab closures and forced homeworking, causing delays to work due to social distancing restrictions. I, like many others, made the decision to adapt my, predominately lab-based, project to a principally modelling project to ensure I could still complete my PhD on time. With

the help and support of my supervisors and the astrobiology modelling group, I learnt a new modelling software during lockdown and applied this to study the freezing processes within Enceladus; something we did not consider initially to be within the scope of my project. At the time, this felt like a mountain to climb, and an overwhelming change to my project considering I was already in the third year of my PhD. However, from this experience I have learnt valuable new skills and generated what I consider to be the most interesting results from my PhD.

Lab work did resume, granted, on a much smaller scale and a lot of my

work was carried out by lab technicians, as restrictions did not allow for multiple people in the same lab. I would like to give a big shout out to Dom because without his tremendous work, I would not have been able to complete my PhD research.

Whilst the last year has felt like a struggle, I do take some positive lessons from this experience; I had the opportunity to learn new skills, work closely with new people, and have enjoyed being able to write my thesis between dog cuddles and walks.

Rachael Hamp  
*Final Year PhD Student*



A PhD thesis  
in a pandemic



# Co-creation with OU in Wales

One of the highlights of my year has been meeting and working with secondary science PGCE students studying with the OU in Wales. Wales is at the leading edge of change in initial teacher education and about to introduce the innovative new 'Curriculum for Wales'.

In November 2020, Sarah Davies and I gave a presentation about the aspirations of AstrobiologyOU's Education workstream to the School of Education, Childhood, Youth and Sport (Faculty of Wellbeing, Education and Language Studies). After the presentation, Jonathan Giddy, the Science Curriculum Tutor for the PGCE course offered by the OU in Wales, invited me to join a group of student teachers at one of their regular seminars to talk about AstrobiologyOU.

That led to a workshop in June 2021, when four student volunteers and I came together for a collaborative workshop. Our aim was to co-create the beginnings of an astrobiology-based learning resource for the students to build on and use in their own classrooms.

Two student teachers have experimented with lessons based on ideas we discussed, and early feedback is very encouraging. The pupils (Key Stage 3) enjoyed taking the lead on the direction of the lessons, engaging with current research and tackling difficult questions that no one really has the answers to yet, such as the ethics of exploring other planets.

They enjoyed it so much that some kept talking after the bell had gone and approached their teacher to

continue the discussion! Some outcomes went beyond the curriculum; one student teacher said:

*"I'm really happy with how much opportunity this gave me to understand the class, their levels of learning/understanding on other topics and to develop a stronger relationship with them."*

The student teachers and I hope to continue to work together – we are planning a follow-up meeting in October 2021 to discuss their feedback and consider how we can continue to co-develop the resources to support them in reaching Qualified Teacher Status and delivering key components of the new Curriculum for Wales.

Dr Ann Grand  
Lecturer in  
Astrobiology Education

# Planetary Protection: a new era

Planetary protection requirements are continuously evolving to meet the needs of increasingly sophisticated missions like Mars sample return, Icy Moons and human explorations to other planets. The collaboration of major stakeholders exploring New Worlds is required to fill the current knowledge and technological gap in identifying organic and microbial contaminants happily populating flight hardware. A multidisciplinary approach, involving scientists, academia and the space industry, is paramount to prevent contamination on 'search-for-life' instruments, protect space investment and outer space.

Facilitating collaboration and communication between the space industry and academia was my inspiration to start a part time PhD. In line with my current role as Planetary Protection Officer at Airbus UK, the aim of my study "Planetary Protection: a new Era" is to investigate innovative, rapid and cost effective methodologies to identify bio-loads on flight hardware visiting other planets and subject to planetary protection requirements. When I joined AstrobiologyOU in February, I was fascinated by the diversity and variety of topics studied by the team. It is stunning how many areas of collaboration industry can initiate with academia to improve existing technologies, save

resources and finally bring innovation to space explorations. It is all about knowing each other's needs.

It has been only few months since I have started this journey. I have spent this time refamiliarising myself with studying and researching (after a long time!), setting objectives and getting my topic as visible as possible at Airbus, so that additional collaborations can be triggered with AstrobiologyOU in the future. I have given local talks to inspire students; and I am proud to have contributed to getting STFC funds for analysing organic contamination in space cleanrooms.

I am looking forward to meeting in person the numerous virtual faces I have been chatting to in the past months.

Silvio Sinibaldi  
*1st Year PhD Student  
Planetary Protection Officer, Airbus*



Bea Baharier creating a video for the Dance Your PhD competition.





# The changing world of outreach and engagement



Throughout the last year our outreach events have changed significantly from what we thought they would look like when we originally planned them.

Stacy Phillips has created us a short series of LEGO videos about the group itself as well as the topic of astrobiology. "Are we alone? An introduction to astrobiology" and "AstrobiologyOU: Life, the Earth and beyond" are both available on YouTube.

Some of our students, PDRAs and academic staff have taken the time

to get involved in a range of creative activities. These included: Bea Baharier, who entered the "Dance your PhD" competition; Sevi Filippidou, who took part in "Soapbox Science"; Devyani Gajjar, who baked her PhD; and Mark Fox-Powell, who joined the "Cosmic Cast" podcast.

We have been able to hold several online events with schools, including "ask the expert" panels with primary school children. We have also been working in partnership with Dynamic Earth, Scotland to create a series of

activity cards available through their website. These have been translated into Gaelic! We have even held a stall at a virtual reality online careers event with 4ward Futures.

There are no plans to slow down either, there are more videos on their way, panel events and debates planned and many more creative outputs to come in the coming year.

Hannah Cooper  
Public Engagement Officer



For the International Development workstream, August has emerged as a favourable month to start new projects. For the second year in a row, in August we find ourselves plotting and planning to begin new collective work through SMART – a spin-off of our previous project DETECT. DETECT was focused on co-creating a space-enabled system for the detection of mosquito breeding sites for malaria prevention with indigenous communities in Guyana. Funded for a proof-of-concept stage, the chances of implementing DETECT through a longer project were prematurely cut short by the UK government's decision to slash ODA spending from 0.7 to 0.5 percent. So, after a disappointing start to spring for us and our partners (ranging from indigenous community members, NGOs and government agencies), the news of funding for SMART feels like an exceptionally good end for a rocky academic year.

SMART attempts to use some of the know-how generated in DETECT, including the technological innovation consisting of a newly tested radar algorithm, and bring it to a high level of technology readiness. The aim is to

create a commercial plan that generates income in the Global North to support initiatives in the Global South that are led by local communities and agencies. Undoubtedly this is an ambitious plan that may take years to come to full fruition. In this perspective, SMART is step two on a much longer ladder, which we will climb together with our partners.

For all those involved in DETECT, working on an international project under pandemic conditions and restricted international mobility has undoubtedly made the year challenging. The indigenous researchers who were part of the DETECT team have had to shoulder increased workloads with more direct engagement with their communities as a result of the UK team not being on site to provide the support we hoped for. And it is in the communities that the effects of the cuts were felt the most. COVID-19 had already decreased people's access to economic opportunities and, despite our intentions, the halt to DETECT constituted another blow. For this reason, abandoning the project and its promises was not an option.

While navigating an uncertain funding landscape, we feel very grateful that SMART has been funded. It will provide some continuity to our efforts to create inclusive forms of innovation, as well as create and strengthen relationships with partners in the UK, Guyana and beyond. Stay tuned...

Dr Alessandra Marino  
*Senior Research Fellow*

# Caught between the pandemic and funding cuts

# AstrobiologyOU and the Lunar and Planetary Institute

AstrobiologyOU and the Lunar and Planetary Institute (LPI) initiated a series of meetings to enable researchers from both institutions and NASA's Johnson Space Center to engage in knowledge exchange and international research collaborations. While the envisioned in person visits and access to laboratory facilities had to be postponed due to travel restrictions, two virtual mini symposia were organized during the last year with around 15 presentations and 50 attendees at each.

The format of two half-day workshops worked well for attendants in both time zones and the program included fruitful discussions at the end of each topical session.

The first virtual mini-symposium in September 2020, focused on analogue field sites with presentations on sulfur-rich, hydrothermal, glacial, and salty environments representing extreme conditions relevant for habitability on Mars and Icy Moons.

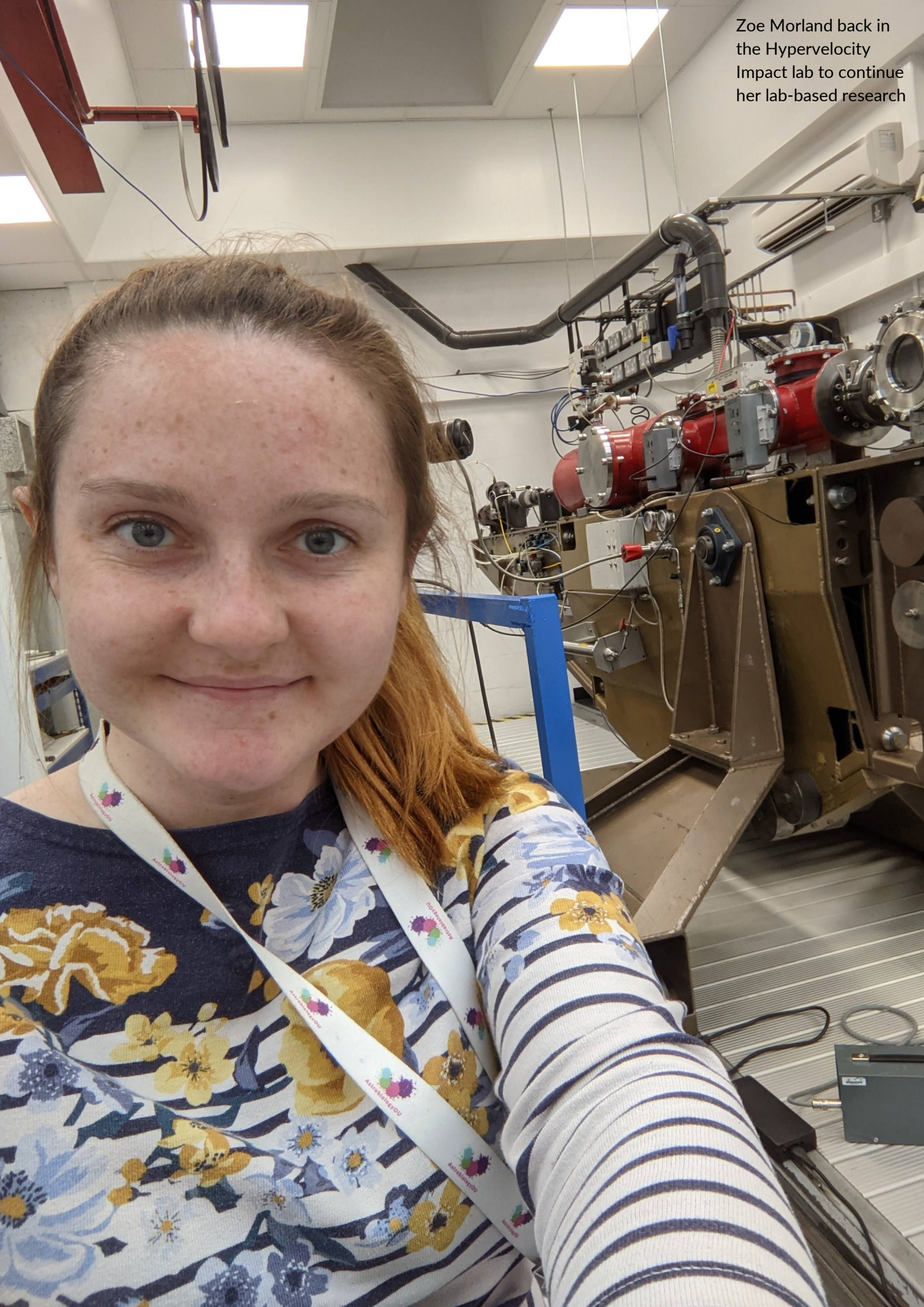
The second virtual mini-symposium in May 2021, was dedicated to experimental and modelling approaches in astrobiology with presentations on lab-based studies of extreme environments relevant for Mars and Ocean Worlds. Also included were geochemical, thermodynamic, and microbiological models to address temperature, pressure, and fluid conditions of potential habitable environments.

The series will continue to cover additional exciting topics in astrobiology and to facilitate communication and collaborations between AstrobiologyOU and LPI.

Dr Julia Semprich  
*Research Fellow*



Zoe Morland back in the Hypervelocity Impact lab to continue her lab-based research





# Anushree Srivastava

2nd Year PhD Student

During the first year of my PhD, I had major disruptions due to the COVID-19 pandemic.

Working on-site wasn't an option meaning most of the year was spent working remotely. Although of course missing out on fieldwork and lab time was disappointing, it meant that I had the opportunity to develop other skills for data analysis.

Once I was able to come back on to campus, I began planning follow up experiments whilst also developing key lab skills that I will use throughout my PhD. Unfortunately, I was only able to get a handful of face-to-face training sessions initially, but this did give me the chance to learn independently and forced me to rely on my ability.

In the months following I also returned to an on-campus office that I shared with fellow PhD students. This was a major benefit, as getting to know my colleagues improved my PhD experience immensely, allowing me to learn from students who were further into their PhD journey, making me feel much more at ease.

Overall, it has been an unusual first 12 months but one where I have learned an immense amount about myself and my field of research.

The last year has been challenging as a PhD student. However, despite this, it has still given me the opportunity to attend large-scale scientific conferences as they were held virtually.

LPSC is one of the most prestigious international conferences in the field of planetary sciences and astrobiology. It exposes you to a wide community of astrobiologists, planetary scientists, early career researchers, and students. Despite being virtual, I was still surrounded by ideas and concepts in the field of astrobiology, including the latest updates on robotic missions to Mars and preliminary results. I was able to listen to, and interact with, NASA professionals during special sessions on career development, which has allowed me to develop important contacts. I also had the opportunity to present my research into whether there could be simple, microscopic life within the salty water on early Mars.

I feel that attending and presenting online, especially at an international conference, gives you similar scientific exposure and networking potential as being at an in-person conference, but without investing time and resources in visa-related matters and travel. Being an Indian citizen, based in the UK, and willing to be part of an American conference, I think it has worked in my favour!

# Ben Tatton

2nd Year PhD Student



# Our PhD



**Bea Baharier**

"From the Colorado Plateau to beyond Earth: using magmatic intrusions into sulfate-rich sediments as analogue for planetary habitable environments."



**Alvaro Del-Moral**

"Limits of habitability of the icy moons"



**Rachael Hamp**

"Geochemical cycling in the subsurface environment of Enceladus"



**Christopher Houghton**

"Defining a capitals approach to evaluating the socio-economic benefits of space exploration."



**Grace Richards**

"The feasibility of *in situ* VOC analysis on icy moons"



**Robert Seidel**

"Water rock reactions on Mars - as seen through analogs"



**Anushree Srivastava**

"Habitability of Mars brine chemistries"



**Scott Steele**

"The future of the COSPAR planetary protection guidelines: space governance and astrobiology"

# Students



**Amy Dugdale**

"Biosignature modification in the Oxia Planum region"



**Devyani Gajjar**

"The use of space technologies in International Development: Opportunities and Challenges"



**Zoe Morland**

"Impact and heat processing of Mars' moon Phobos"



**Vincent Rennie**

"Geomicrobiology of hydrothermal systems"



**Silvio Sinibaldi**

"Rapid detection techniques for Planetary Protection"



**David Slade**

"Searching for biogenic trace gases on Mars using laboratory experiments and the ExoMars Trace Gas Orbiter"



**Ben Tatton**

"The limits of microbial life"



# Our Directorate



**Prof. Karen Olsson-Francis**  
**Director and Professor of Geomicrobiology.**

Karen is a microbiologist by training, and her research focuses on life at the limits. She is particularly interested in microorganisms that live in extreme environments, including the International Space Station, and terrestrial environments that are analogues for extraterrestrial locations. She developed the simulation facilities at the OU to subject model organisms to simulated extraterrestrial environments.



**Dr Vic Pearson**  
**Associate Director and Senior Lecturer.**

Vic is a planetary scientist and she completed her PhD and postdoc roles in organic characterisation of carbonaceous chondrite meteorites at the OU. She is particularly interested in the origins of organic molecules in space, and their role in the origins of life on Earth and other planetary bodies. She also leads on a range of equality and diversity activities.



**Dr Susanne Schwenzer**  
**Associate Director and Senior Lecturer.**

Susanne is a mineralogist, who studies volatile-rock interactions including noble gases, methane, and water-rock reactions. Her main research target is Mars, where she also is a member of the NASA Mars Science Laboratory Science team. She is responsible for Early Careers Researchers within AstrobiologyOU, including their training and development.



**Dr Louise Thomas**  
**Senior Manager.**

Louise is a geochemist by training, having attained her PhD at the OU, she worked as a research fellow in isotope geochemistry on lavas from Canary Islands, Iceland and Sumatra. She was the NERC Uranium Series Facility Lab Manager at the OU, then worked for 8 years in research management and was the finance project manager for the Europlanet 2020 Research Infrastructure project, before joining AstrobiologyOU.

# AstrobiologyOU Members

## Academic Staff:

Prof Shonil Bagwhat - Professor of Environment and Development  
Prof Matt Balme - Senior Lecturer  
Dr Thomas Cheney - Lecturer in Space Governance  
Dr Sarah Davies - Senior Lecturer  
Dr Ann Grand - Lecturer in Astrobiology Education  
Prof Richard Holliman - Professor of Engaged Research  
Prof Simon Lee - Professor of Law  
Dr Geraint (Taff) Morgan - Research Fellow  
Prof Christopher Newman - Professor of Space Law and Policy, Northumbria University  
Dr Manish Patel - Senior Lecturer

## Affiliated Members:

Dr Eddie Abbott-Halpin - Professor of Social and Human Rights Informatics; University of the Highlands and Islands  
Dr Andrea Berardi - Senior Lecturer; The OU  
Prof Leslie Budd - Professor of Regional Economy; The OU  
Dr Simon Sheridan - Senior Research Fellow; The OU

## Research Fellows:

Dr Mark Fox-Powell - Research Fellow  
Dr Ale Marino - Senior Research Fellow  
Dr Julia Semprich - Research Fellow

## Post Doctoral Research Assistants:

Dr Claire Batty  
Dr Simone Cogliati  
Dr Sevasti Filippidou  
Dr Michael Macey  
Dr Alex Price  
Dr Nisha Ramkissoon  
Dr Charlotte Spencer-Jones  
Dr Mario Toubes-Rodrigo  
Dr Stuart Turner

## PhD Students:

Bea Baharier  
Alvaro Del-Moral  
Amy Dugdale  
Devyani Gajjar  
Rachael Hamp  
Christopher Houghton  
Zoe Morland  
Vincent Rennie  
Grace Richards  
Silvio Sinibaldi  
Robert Seidel  
David Slade  
Anushree Srivastava  
Scott Steele  
Ben Tatton

## Support Hub:

Mrs Emma Boland - Administrator  
Mr Brandon Cook - IT Support Officer  
Miss Hannah Cooper - Public Engagement Officer  
Dr Yiannis Tsamis - Business Development Manager

## Lab Staff:

Mrs Jitka Dojivova - Laboratory Assistant  
Miss Grace Duffield - Microbiology Technician Apprentice  
Dr Ceri Gwyther - Lab Manager  
Dr Ezgi Kucukkilic-Stephens - Project Officer  
Mr Anthony Scales - Research Technician  
Mr Dominic Siggs - Project Officer  
Mrs Kim Slaney - Research Technician  
Mr Ben Stephens - Research Technician



# Publication Highlights

Ilieva, V., Steel, B., Pratscher, J., Olsson-Francis, K. and Macey, M. C., (2021): Assembly of Bacterial Genome Sequences from Metagenomes of Spacecraft Assembly Cleanrooms - Microbiology Resource Announcements Feb 2021, 10 (7) e01439-20; doi: 10.1128/MRA.01439-20.

Cheney, T., Newman, C., Olsson-Francis, K., Steele, S., Pearson, V. K. and Lee, S. (2020). Planetary Protection in the New Space Era: Science and Governance. *Front. Astron. Space Sci.* 7. pp1-8.

The COSPAR Panel on Planetary Protection (2020) COSPAR Policy on Planetary Protection. *Space Res. Today* 208, August 2020, pp. 10-22. doi: 10.1016/j.srt.2020.07.009.

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Toubes-Rodrigo, M., Potgieter-Vermaak, S., Sen, R., Oddsdottir S. R. and Cook, K (2021). Active microbial ecosystem in glacier basal ice fuelled by iron and silicate communication-driven hydrogen. doi: 10.22541/au.161339054.45143667/v1

Fox-Powell, M. G. and Cousins, C. R. (2021) Partitioning of Crystalline and Amorphous Phases During Freezing of Simulated Enceladus Ocean Fluids. *Journal of Geophysical Research: Planets* 126. e2020JE006628.

McGellin, R. T. L., Grand, A., Sullivan, M. (2021): 'Stop avoiding the inevitable: The effects of anthropomorphism in science writing for non-experts' - *Public Understanding of Science*. doi: 10.1177/0963662521991732.

Coutenis, A., Rodrigo, R., Spohn, T., Hand, K.P., Hayes, A., Olsson-Francis, K., Postberg, F., Sotin, C., Tobie, G., Raulin, F., Walter, N., L'Haridon, J. (Eds.) 2021 *Ocean Worlds - Habitability in the Outer Solar System and beyond*. Springer Netherlands, Space Sciences Series of ISSI Vol 77 p345.

Cavalazzi, B. and Filippidou, S. (2021) Microbial survival and adaptation in extreme terrestrial environments – the case of the Dallol geothermal area in Ethiopia. In: *Planetary Formation and Panspermia: New Prospects for the Movement of Life through Space*, (Ed. Branislav, V.). John Wiley & Sons.

Cavalazzi, B. and Filippidou, S. (2021): Microbial survival and adaptation in extreme terrestrial environments – the case of the Dallol geothermal area in Ethiopia. Book chapter accepted in *Diatoms: Biology & Applications* series, *Astrobiology Perspectives on Life of the Universe* series Wiley-Scrivener, series editors: Richard Gordon & Joseph Seckbach, 2021.

A still from the AstrobiologyOU  
stop motion video created by Dr  
Stacy Phillips:  
<https://bit.ly/AstrobiologyOULego>





