europlanet Magazine

Issue 1

All eyes on Mars

Europe's contributions to Mars exploration

ALSO IN THIS ISSUE

- The fall of the Winchcombe meteorite
- Exploring Planetary Field Analogues in Argentina

Memories of Europlanet's birth

A 'golden age' of planetary science in Europe

europlanet

The official magazine of Europlanet, the European community for planetary sciences

Since 2005, Europlanet has provided Europe's planetary science community with a platform to exchange ideas and personnel, share research tools, data and facilities, define key science goals for the future, and engage stakeholders, policy makers and European citizens with planetary science. The Europlanet Society promotes the advancement of European planetary science and related fields for the benefit of the community and is open to individual and organisational members.

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Take off

My first encounter with Europlanet was at its inaugural outreach workshop in Toulouse in March 2006. From there, I joined the press office team for the first European Planetary Science Congress (EPSC) in Berlin and I have never looked back. Europlanet has certainly kept me busy over the last 15 years and it has been a privilege to see it evolve from the initial network into the complex, global organisation it is today.

By launching a Europlanet Magazine, we hope to highlight the range of activities by Europlanet, our partners, and the wider planetary community. This first issue has a strong focus on Mars, including European contributions to current missions, experimental research in labs and in the field, and outreach initiatives to engage the next generation. We look back at the origins of Europlanet and its links to the Cassini-Huygens mission at the beginning of this century. We also have updates on the Winchcombe meteorite and on several new partnerships to support planetary science.

I would like to thank all the contributing authors and the community as a whole for giving us so many fascinating topics to draw from, now and in future issues.

Anita Heward
Editor

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In focus

Despite the challenges of the pandemic, there is a lot of activity within the Europlanet 2024 Research Infrastructure (RI), the Europlanet Society and the wider planetary science community. Here, we report on some of the news and opportunities.

Europlanet 2024 Research Infrastructure

(Transnational) Access All Areas

Above: The RioTinto TA field site in Spain.

A major activity of the Europlanet 2024 Research Infrastructure (RI) is to offer researchers free Transnational Access (TA) through fully-funded visits to research facilities in Europe and around the world. The facilities include a suite of seven field sites that provide analogues for studying environments found on other planets and over 40 laboratories for the simulation or characterisation of planetary conditions and materials, including 11 facilities in South Korea.

Despite the pandemic, 171 research teams have applied to visit the sites over two calls for applications since the start of the Europlanet 2024 RI project in February 2020. To date, 117 projects have been approved for funding.

Successful projects funded in Call 2, which were announced in April 2021, include the first funded visits by members of the European community to laboratory facilities in South Korea and vice versa. Further facilities in South Korea, China and Argentina (see article on page 20) will be included in the next calls for applications.

Six TA facilities are being upgraded with funding from the Europlanet 2024 RI. An ion beam facility for irradiating planetary ice analogues has been installed at the Atomki Ice Chamber for Astrophysics/Astrochemistry (ICA) in Debrecen, and was included in the first TA call in May 2020. The upgrades at ICA will support research to improve our understanding of the physical and chemical processes in the Solar System. A second chamber was shipped from Queen's University of Belfast to Debrecen in December 2020, to provide a complementary facility to the ICA, and should be operational for inclusion in TA Call 3.

To date, three TA visits have taken place, including a virtual and an in-person visit to the ICA facility in Hungary and a virtual visit to Cold Surfaces Spectroscopy laboratory at IPAG in France. Due to the Covid-19 pandemic, implementation time for successful applicants to conduct a TA visit has been extended from 12 to 20 months.

https://bit.ly/europlanet2024ri-ta

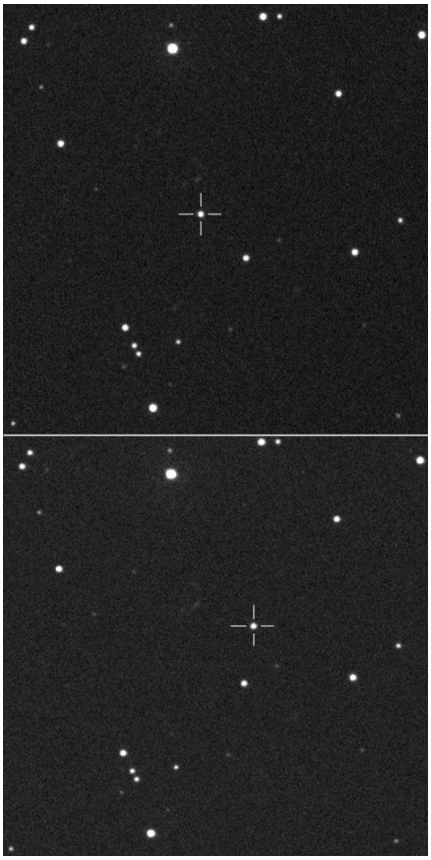
Europlanet 2024 Research Infrastructure

First Successful Observations with the Europlanet Telescope Network

Last June saw the launch of a new network of small telescope facilities to support planetary science observations by professional and amateur astronomers. The Europlanet Telescope Network currently comprises 16 observatories with telescopes ranging from 40 cm to 2 m in size. The network can be accessed to carry out projects on a wide variety of scientific studies about the Solar System and exoplanets, as well as related astronomical investigations.

The first round of successful proposals was announced in December 2020 and Polish astronomer, Anna Marciniak, performed the Europlanet Telescope Network's first observations in January 2021, remotely accessing facilities at Vilnius University's Moletai Observatory in Lithuania. Dr Marciniak's project aims to improve the determination of spin, shape, size and thermal parameters for a number of interesting asteroids that have been overlooked by most previous studies. Complemented with data from other sites, the successful observations will result in complete light curves (graphs of changes in the amount of light reflected as an asteroid spins) for five asteroids with rotation periods up to 38 hours.

Further projects funded through the Europlanet Telescope Network include observations of variable nebulae led by the UK amateur astronomer, Grant Privett. Initial results obtained at the University of Kent's Beacon Observatory are promising. Further proposals can be submitted at any time through the network's call for observations: https://bit.ly/2Br5LDt



These images were obtained remotely with the 35/51 cm telescope at the Moletai Observatory of Vilnius University in 2021 and show the change in position of asteroid Ljuba (58 km diameter) relative to the stars over a 5-hour period. Credit: A Marciniak.

Europlanet Society

EPSC2021 Virtual Congress

The Europlanet Science Congress (EPSC2021) will be held as a virtual meeting from 13-24 September 2021. EPSC2021 will be the second time that EPSC has been held as a virtual meeting, and is building on the success and the lessons learned from the first virtual edition in 2020.

EPSC2021 will have a hybrid format of live sessions and asynchronous scientific presentations. The ethos for EPSC2021 is to create a simple, flexible and inclusive virtual meeting that provides multiple opportunities for interaction, scientific discussion and networking. www.epsc2021.eu

Europlanet 2024 Research Infrastructure

Fireballs Workshop Series Planned

As well as illuminating our skies, meteors have been highlighted in recent news headlines (see the feature article on page 34). Fireball-tracking networks around the world are assisting in the recovery of fragments of fresh meteorites and understanding where in the Solar System they originated. Over the next two years, Europlanet 2024 Research Infrastructure (RI) will bring together observers from different fireball networks, along with machine learning experts, to advise on handling the data collected.

The first in a series of four workshops is taking place virtually on 11-12 June 2021, with follow-up sessions in the autumn 2021 and during 2022.

Participants will discuss the technical capabilities of the different fireball networks and explore possibilities for developing a common data format and a portal for all data, supported by the Europlanet Virtual Observatory for planetary science (VESPA).

http://bit.ly/FireballMLWorkshop

BepiColombo Revists Venus

The European-Japanese (ESA-JAXA) mission, BepiColombo, will arrive at Mercury in December 2025 after a roundabout interplanetary journey. It swung past Earth and Venus in 2020 and will perform a second flyby of Venus on 10 August 2021. The flybys are a unique opportunity to study Venus from multiple perspectives, with coordinated observations from BepiColombo, the Japanese Akatsuki mission and ground-based telescopes. Professional and amateur astronomers are encouraged to join the campaign, and to apply for time on the Europlanet Telescope Network.

pvol2.ehu.eus/bc/Venus/

Ariel Data Challenge 2021

'Machine vs Stellar and Instrument Noise' is a machine learning data challenge in support of the European Space Agency's Ariel mission, which will study the atmospheres of 1000 extrasolar planets. Building on the success of the first Ariel data challenge in 2019, which had over 100 teams participating, the 2021 contest asks participants to identify and remove noise in observations of exoplanets transiting in front of their host star caused by star spots. The closing date is 1 July 2021.

ariel-datachallenge.space

SSHADE Evolutions

SSHADE is a library of spectral databases for many different types of solid materials over a wide range of wavelengths, which can support astronomers and astrophysicists in interpreting observations from telescopes or space missions.

Over the last year, the content of the databases of the SSHADE solid spectroscopy infrastructure has evolved significantly, with now more than 3600 publicly available spectra on ices, minerals, rocks, organic matters and cosmomaterials. The spectra are synthesised in laboratories, collected or measured at planetary field analogue sites, or derived from extraterrestrial samples collected on Earth (meteorites) or from sample return missions.

About 140 new spectra are added to SSHADE every month, including over 700 spectra recorded with different techniques for more than 200 different meteorites. Two new partners have already started databases in SSHADE through Europlanet 2024 Research Infrastructure (RI) and more will join before the end of the year.

Major improvements in the user interface, in particular in the dynamic plotting tool, have also been implemented. http://www.sshade.eu/

Europlanet Summer School Goes Virtual

The Europlanet Summer School 2019, Moletai, Lithuania.

Summer schools have a long track record as an effective support for early career professionals and amateur astronomers within the planetary science community.

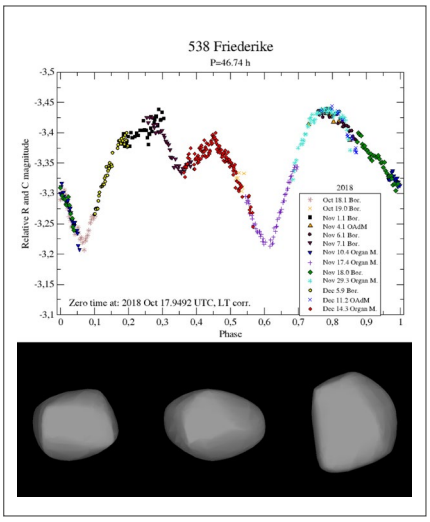
Due to Covid-19, Europlanet summer schools in 2020 were postponed and it is still not clear when face-to-face activities will resume. Nonetheless, virtual conferences such as the Europlanet Science Congress (EPSC2020) and the Planetary Mapping Winter School have shown that summer schools can work successfully in a virtual environment and, through this format, can also widen participation by giving students the opportunity to join from anywhere in the world.

The first virtual summer school organised by Europlanet 2024 Research Infrastructure (RI) will take place from 16 - 27 August 2021 and will be dedicated to observations of asteroids. The hands-on programme will be led by the astronomers Anna Marciniak (A. Mickiewicz University, Poland) and Gražina Tautvaišienė (Vilnius University, Lithuania).

Participants will be given practical experience of making photometric observations of asteroids, using the facilities at the Vilnius University's Molėtai Astronomical Observatory in Lithuania remotely, and analysing the resulting data.

Sessions will be accompanied by lectures from leading astronomers and the participants will also be trained in writing and submitting observing proposals to facilities participating in the Europlanet Telescope Network.

The deadline for applications is 15 June 2021. mao.tfai.vu.lt/europlanet2021



Upper panel: The lightcurve of asteroid (538) Friederike. Lower panel: The shape model of this asteroid, reproduced from its lightcurve. (Marciniak et al. 2019. DOI: 10.1051/0004-6361/201935129)

Europlanet 2024 Research Infrastructure

Mentoring Matters

The last year has been challenging for everyone, but young people have been hit particularly hard by the pandemic. Therefore, providing support for our early career community has never been more important.

In August 2020 Europlanet launched a mentorship programme to support early career professionals working in planetary science and related fields. The programme aims to help early career scientists to develop expertise, ask questions and discuss career plans with more established members of the planetary community. The programme is voluntary, informal and confidential, with mentors and mentees engaging with each other in a manner that is flexible and suited to their individual working environments.

A pilot programme started by matching ten pairs of mentors and mentees at different stages of their careers in planetary science. The Europlanet Mentorship programme already covers a wide geographical spread, with participants from 12 countries ranging from Sweden to Georgia. So far, feedback has been very positive. One mentee reported: 'For the past three months I've had several meetings with my mentor as part of the mentorship program. We have discussed my career goals at length, and looked into current opportunities adequate to my personal plans. These meetings gave me an opportunity to have an open conversation about topics that I dread to have with my supervisor. I strongly advise any students or post-docs to try it.'

Mentoring provides development opportunities for mentors as well as personal satisfaction. Mentees can benefit from the insights and advice of more experienced scientists, as well as clarify their personal and professional goals. The Europlanet Mentorship platform is part of the Early Careers Training and Education Portal, which provides information on PhD positions, job opportunities, summer schools and meetings relevant to early career professionals working in planetary science and related fields.

Everyone interested in participating in the Europlanet Mentorship is invited to sign up now and become a mentor or a mentee: https://www.europlanet-society.org/mentoring.

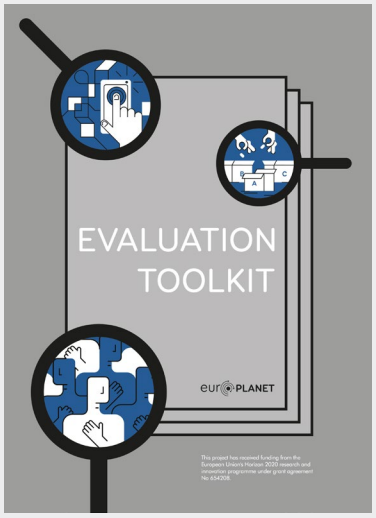
The Europlanet Mentorship programme is coordinated by Edita Stonkutė, Gražina Tautvaišienė and Šarūnas Mikolaitis of the Institute of Theoretical Physics and Astronomy, Vilnius University, Lithuania.

Evaluation Made Easier

Impact evaluation is becoming a standard requirement in many projects, but knowing how to approach this in a meaningful way - within the practicalities of time and budget constraints - can be daunting.

Since 2017, Europlanet has been developing an Evaluation Toolkit to provide easy-to-use data collection and analysis techniques for assessing the outcomes of activities. Although primarily designed for outreach providers, most of the tools can be applied to any kind of workshop or event. The toolkit guides users through the basics of evaluation and the selection processes for identifying the right tool for the right activity. Resources include worked examples, case studies and video tutorials.

The Europlanet Evaluation Toolkit can be ordered in hard-copy form (as a book and pack of activity cards), or accessed through an interactive set of pages on the Europlanet Society website. bit.ly/EuroplanetEvaluationToolkit



Europlanet 2024 Research Infrastructure

Planets in a Room

Mareks Matisons LSM.lv / LMT / Europlanet

Teaching planetary science using a spherical projector to show the planets' surfaces is a very effective but usually very expensive idea.

'Planets in a Room' is a low-cost version of a small, spherical projector that teachers, planetary scientists, museums and other individuals can easily build themselves and use to show and teach the planets. Initially funded by the Europlanet Outreach Funding Scheme, and developed by the Italian non-profit association Speak Science in collaboration with INAF-IAPS of Rome and the Roma Tre University, Planets in a Room is now being distributed through a dedicated website to the outreach community.

New educational projects and contents are under development. https://www.planetsinaroom.net

Italian Hub

April 2021 Superluna by Roberto Vaccaro, Vicenza, Italy.

Superluna!

Spring 2021 is a season of 'supermoons', with the Full Moon in April and May occurring within 10% of the closest point in the lunar orbit to Earth. These luminous supermoons, which are about 7% bigger and about 15% brighter than a typical Full Moon are opportunities to engage the public.

The supermoon on 26 May was the closest Full Moon of the year. Over 25,000 viewers joined a live event, 'Superluna!', on the social media channels of facilities from the Italian National Institute for Astrophysics (INAF). Members of the public were invited to contribute their views of the Moon across European skies in a Superluna! contest. The winning entry (above) and all submissions, as well as resources on observing the Moon, are available on the Europlanet Society website.

http://bit.ly/SuperLunaCampaign

Europlanet 2024 Research Infrastructure

Mars in the Classroom

The Mars Collection is a set of school resources exploring the possibilities of life on the Red Planet. The resources have been produced to be easily translatable, and link areas of the curriculum with research on Mars and places on Earth with martian characteristics (analogue field sites).

The project brings an astrobiological perspective to a range of topics, from geoscience and volcanoes, to pH and mineral deposition. Each resource pack includes downloadable presentations, teachers notes and videos of experiments. In Terra chiama Marte (Earth calling Mars), EduINAF has adapted the resources for Italian schools, giving a complete overview of the main chemical and physical features of the Red Planet through five video lessons, lasting ten minutes each, aimed at 10-14 year olds. http://bit.ly/EuroplanetMarsCollection

Diversity Committee

Planetary Science Wiki-Edit-A-Thon

With over a billion unique visitors per month, Wikipedia has a huge potential to change public perception of society, including who is doing science and what a scientist 'looks' like.

Overall on Wikipedia, there are fewer contributions about women, especially in STEM fields, and the pages are usually less developed. However, action is being taken.

Following concerted efforts by the WikiProject, Women in Red, to address gender bias in Wikipedia, the number of biographies of women in the English version of Wikipedia has risen from 15.53% In October 2014 to 18.71% in January 2021. In June 2020, there were only 189 planetary scientist biographies on the English Wikipedia, including 48 biographies of female planetary scientists (25%). This percentage is in agreement with the percentage of women in the International Astronomical Union from all ESA's Member States (24%), but planetary scientists are clearly underrepresented on Wikipedia. Many of them either do not have a Wikipedia biography yet, or if they do, they are often misclassified under the category of 'astronomer' or 'astrophysicist'.

The Diversity Committee of the Europlanet Society, in collaboration with Women in Red and WikiDonne, organised the first Planetary Science Wiki Edit-a-thon during the Europlanet Science Congress (EPSC) 2020 to highlight diversity within the planetary science community. The idea of this type of 'edit marathon' is to bring together editors from an online community (Wikipedia in this case) to write, translate and improve articles on a specific topic. Thirty participants at EPSC2020 received a basic training in how to edit and create Wikipedia pages and participated in the Edit-a-thon during the three-week meeting in the autumn of 2020. A small subgroup still meets every month to continue the project, and results to date include one new article and 19 translated biographies. New members are welcome to join the group and a further edit-a-thon is planned for EPSC2021 from 13-24 September 2021. https://bit.ly/planetary-science-wiki-edit-a-thon

Dr Mae Jemison, American engineer, physician, and former NASA astronaut

South East Europe Hub

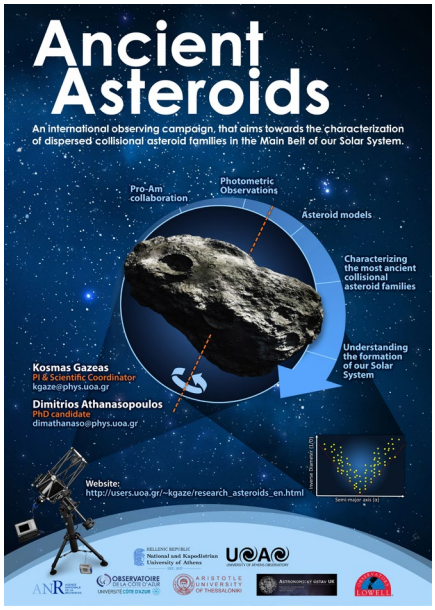
Observing Ancient Asteroids

Ancient Asteroids is an international observing campaign, launched in 2020, that aims to characterise asteroids and track their ancestry within asteroid families created from collisions of ancient bodies in the Main Belt of our Solar System.

The project is a collaboration between partners from Greece, France, Czechia, the US and Italy and will contribute to the Minor Planet Physical Properties Catalogue (MP3C) program that collects information about the physical properties of asteroids.

Professionals and amateurs with access to large telescopes and sensitive charge-coupled device (CCD) cameras are invited to contribute photometric observations in optical wavelengths to produce light-curves showing the asteroids' rotational properties and shapes.

http://bit.ly/AncientAsteroids



Supporting our Community

The Europlanet Society's Committee Funding Scheme provides awards of €1000 - €5000 to support projects that further the aims of the Europlanet Society and actively involve its members. Despite the challenges of the pandemic, two projects funded during 2020 have achieved a successful launch.

Benelux Hub — Theatre as a Tool for Science Outreach and Storytelling

Just as fiction can make imaginary worlds seem real, stories can help people of all ages reach a deeper understanding and appreciation of science and the experiences of scientists. 'Planetary Atmospheres Accessible to All' is a project organised by the Europlanet Society's Benelux Hub that aims to foster collaborations between researchers, performers and storytellers to use performing arts techniques to engage public audiences.

The project kicked off with an online seminar 'Theatre as a tool for science outreach and storytelling' in November 2020. Dr Andrea Brunello and Dr Pierre Echard of Jet Propulsion Theatre introduced various approaches used to blend science and theatre, including staged performances called 'augmented lectures'. The seminar was followed up by a series of online workshops for 10 Europlanet researchers to provide them with practical tools to become scientific storytellers for general audiences or students. Over three half-day sessions in the run-up to Christmas, participants defined and prioritised main themes for their planetary science story and their target audiences, connecting the scientific questions to societal issues. Each participant had the chance to prepare one short story on their topic of interest and present it to an audience of invited artists. Ongoing collaborations are being explored between arts-science pairs to co-create augmented lectures and further enhance the project.

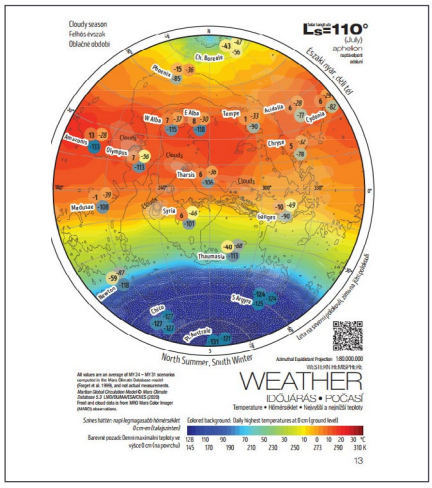
JPT is a collaboration between the Arditodesìo Theatre Company and the University of Trento. Planetary Sciences for All was organised by Dr Andrea Brunello (JPT), Dr Ann Carine Vandaele (BIRA-IASB), Dr Arianna Piccialli (BIRA-IASB), Dr Karolien Lefever (BIRA-IASB), Dr Pierre Echard (JPT).

Central Europe Hub — A Pocketful of Mars

The Pocket Atlas of Mars 36 is a new collection of maps that present the physical geography of the Red Planet in thematic layers on a topographic base map, as well as albedo, cloud cover, weather and climate maps and climate diagrams. Already in its second edition, due to high demand, the atlas has been created by Henrik Hargitai of ELTE University (Planetary Perspectives, page 16) for use in astronomy clubs and schools. The first edition, which is available in English, Hungarian and Czech, was funded by the Europlanet Society through the Central Europe Hub.

The main part of the atlas consists of a series of double spreads showing 30 cartographic quadrangles covering the whole surface of Mars. Landing sites and landforms created by water, ice, wind, lava and tectonic forces are highlighted, including features such as dune fields, mountain peaks, volcanic calderas, caves, ancient dried-up lakes and deltas. The climate maps describe the climatic zones, and the climate diagrams illustrate the variation in temperature through the martian year. Weather maps show the temperature at ground level across the western hemisphere of Mars at the two annual solstices, and the albedo maps reveal the amount of sunlight reflected from the surface. A one-page calendar for Mars year 36, covering the period from February 2021 to December 2022, explains the milestones in the seasonal changes on Mars

The second, extended edition of the atlas includes additional



information on people that have contributed to the mapping of Mars, missions, ideas for activities, a 'tourist guide', and exercises on how to read the martian landscape. http://bit.ly/MarsAtlas

Europlanet

European Space Agency, ESA/ESOC

Memories of Europlanet's Birth

Michel Blanc (Institut de Recherche en Astrophysique et Planétologie (CNRS-University of Toulouse-CNES), France), coordinator of the European Planetology Network (2005-2008) and the Europlanet Research Infrastructure (2009-2012) looks back on the origins and evolution of Europlanet.

Origins

At the start of the 21st Century, planetary science in Europe was entering a 'golden age'. European scientists were involved in all the major missions to the Solar System.

In particular, the ground-breaking Cassini-Huygens mission to the Saturnian system demonstrated that European partnership could create science that went way beyond anything any individual country could generate on its own.

Europe already had the European Space Agency (ESA), with its origins in the 1960s. What it lacked, however, was an organisation that would enable it to exploit the scientific data that ESA-supported missions were generating to the fullest extent. And it needed something that would enable European citizens to fully appreciate the contribution that Europe was making to the exploration of our Solar System, its planets, moons, comets and asteroids – and even of other planetary systems beyond ours – and the opportunities that they too had to become part of this great age of voyage and discovery.

Above: Jean-Pierre Lebreton at the Huygens landing press conference.

Inset: The Europlanet FP6 Kick-off meeting, Austrian Academy of Sciences, Vienna, 24 April 2005.

Europlanet was born as a result of heated and enthusiastic discussions around 2002-03, during the seven-year journey to Saturn and Titan with Cassini-Huygens. As members of the Project Science Group (PSG) of the Cassini-Huygens mission, American and European scientists and engineers were working together, hand-in-hand, on plans to tour the 'Lord of the Rings' and produce the wonderful science they had dreamed of for two decades.

European scientists were involved in nearly all the 16 instruments of the mission – but as representatives of individual European nations, and not of the continent as a whole. Although Europeans were nearly equal by number to our American colleagues, mission preparation and data analysis work were funded by one single agency, NASA; European contributions to scientific analysis came from different national agencies, without a consistent framework for this major European undertaking in space – except for the ESA-led Huygens probe itself.

A few of us on the European component of the Cassini-Huygens team, including David Southwood, who was the Principal Investigator of the Cassini magnetometer instrument, and Daniel Gautier who had dreamed for many years of seeing the emergence of a united European planetary science community, realised that this 'fragmentation' of our scientific activities and of their funding threatened to weaken the overall science produced, and decreased its profile in the eyes of European citizens. We knew exactly what united us and could make us work together: the science programme of ESA (Horizon 2000+ at the time, soon to be followed by Cosmic Vision), which promised to take us to all provinces of the Solar System – and even beyond, to the expanding family of exoplanets. But we also knew that ESA was not in a position to fund the data analysis of the beautiful missions it was flying.

In this context, only one institution could help us complement the national resources and produce the great science return that the ESA science programme deserved: the European Union (EU).

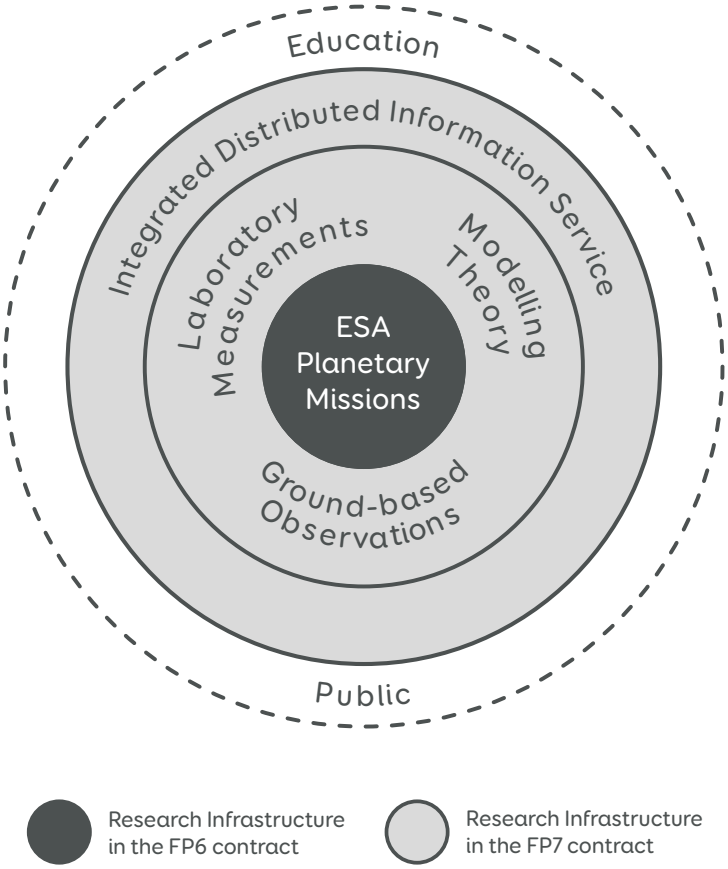


Figure 1: Architecture of the first Europlanet contract under Framework Programme 6 (2005-2009); while the Research Infrastructure supported by the network was first solely the ESA science programme, it was successfully expanded under Framework Programme 7 to include other key equipments contributing data to planetary sciences (second circle) and IDIS.

Shaping Framework Programme 6 (2005-2009), and beyond

Expanding beyond the core of Cassini-Huygens scientists, a small number of us met several times between 2002 and 2004 to brainstorm on ways to seek support from the EU. Soon, a delegation of our group went to visit the scientific officer in charge of our field at the Directorate General (DG) Research office in Brussels. This meeting was instrumental in firming up our plans: it helped us identify the 'Support to Research Infrastructures' instrument of Framework Programme 6 (FP6) as the programme that could fund us. It also helped us to later design a proposal that would meet, not only our needs, but also the expectations of the European Commission.

The architecture of this proposal progressively took shape during

The launch of the Europlanet Research Infrastructure (RI) , 3 March 2009, CNRS, Paris.

the year that separated our visit to Brussels from the submission deadline. Figure 1, adapted from one of the very first presentations of Europlanet to the community, shows the four key ideas that guided Europlanet's design, represented as four circles.

The first idea was to gather the pan-European community of European planetary scientists around a major transnational research infrastructure: the science programme of ESA, which was from the very beginning the core of Europlanet (inner circle). The second idea was that planetary science is not only fed by space observations: ground-based observations, modelling, theory and laboratory experiments play an equally important role and help maximise the science return of space missions; this is the 'second circle' of Europlanet. The third idea was that European scientists needed an efficient, web-based data-sharing and data-mining tool, the equivalent of a Virtual Observatory for planetology, to take full advantage of their shared infrastructure. This tool, called the 'Integrated and Distributed Information Service' (IDIS), which at the time existed only in our minds, was to be the 'third circle' of Europlanet.

Finally, one of our strongest motivations was to share with the European public and each national education system the science and benefits produced by European planetary missions. This 'public engagement' was to be the fourth circle of Europlanet.

Following a key meeting of the proposers on the occasion of the EGU general assembly in Nice in 2003, the first Europlanet proposal was successfully submitted to the European Commission as a Coordination Action.

Its seven networking activities (Table 1) were designed to implement the different elements shown in Figure 1 and their connection to the ESA science program. With a two-million Euro budget, it was a modest first step, but one that prepared what was to be a regular expansion and consolidation of Europlanet at each of its successive renewals.

With the next step four years later, under Framework Programme 7, Europlanet was successfully expanded into a full multi-faceted

Michel Blanc speaking at EPSC 2008, at the end of the first FP6-funded Europlanet project.

Research Infrastructure linking the first three circles of Figure 1 (space and ground-based observations, laboratory work, numerical simulation and the development and operation of a future Virtual Observatory for planetary scientists) with a significantly larger budget of 6 million Euros for the 2009-2013 period.

Echoing its origins, the first month of Europlanet's life, in January 2005, coincided with the successful landing of the Huygens probe on Titan, the first-ever landing of a space vehicle on a giant planet's moon. The cameras of Huygens revealed a surprisingly Earth-like world under the thick cover of Titan's clouds and confirmed Europe's outstanding place in the exploration of the Solar System. Jean-Pierre Lebreton, Huygens project scientist and an active member of the first Europlanet proposal team, appeared on the ESOC screens on 14 January 2005, just after the first signal had been received from the probe, to emotionally announce "we heard the baby crying".

It was at this moment Europlanet, in our hearts, was truly born too!

Acknowledgements:
I would like to acknowledge the dedication, talents and hard work of all the colleagues who worked together to turn our dreams of building a European planetary science community into reality by managing the seven activities of the first contract of Europlanet under FP6: Gérard Chanteur, Michele Dougherty, Odile Dutuit, Enrico Flamini, Manuel Grande, Christine Guidice, Ari-Matti Hari, Norbert Krupp, Jean-Pierre Lebreton, Steve Miller, Ingo Müller-Wodarg, Helmut Rücker, Ralf Srama, Karoly Szego, Olivier Witasse and John Zarnecki.

N1: Overall Management	Management of Coordination Action Networking	M Blanc, M Dougherty / I Müller-Wodarg, O Witasse, C Guidice
N2: Discipline Working Groups	To cover major fields of planetary science To anticipate future research areas	N Krupp, A-M Harri
N3: Coordination of Earth Based and Space Observations	To develop synergies between in-situ explorations, ground and Earth-orbit observations To establish a global observation strategy To exchange and jointly analyse data obtained	H Rucker, S Miller
N4: Outreach	To establish Europlanet as a contact point for planetary sciences in Europe To develop science communication on planetary observation and exploration programmes	J Zarnecki, J-P Lebreton
N5: Personnel Exchange	To fund short-term exchanges in support of joint research projects To foster long-term co-operations	O Dutuit, K Szego
N6: Meetings, Conferences	To organise Europlanet General Assemblies To create major planetary sciences meeting in Europe	R Srama, M Grande
N7: Integrated and Distributed Information Service (IDIS)	To coordinate preliminary studies of IDIS and the future development of a European planetary virtual observatory	G Chanteur, E Flamini

Table 1: The objectives and coordinators of the seven Europlanet Networking activities (N1-N7) in the project funded through FP6 from 2005-2008.

Planetary Perspectives

Henrik Hargitai is a planetary geomorphologist and media historian. He is a professor of planetary geomorphology, planetary cartography, typography and media history at Eötvös Loránd University (ELTE), Budapest, Hungary and has a PhD in Earth Sciences and Philosophy (Aesthetics). He is the editor of the Pocket Atlas of Mars 36.

What was the first map that you created?

When I was really young, I made a Lord of the Rings-like map. Then, at high school, I made a poster of paleogeographic maps that was exhibited in the school corridor.

Who are your mapping inspirations?

When I was a student, around 1999, I wanted to have an atlas of the Solar System. I searched on the Internet and found a Russian atlas. I contacted the authors via email and to my surprise Kira Shingareva, who edited the atlas, invited me to Moscow. I was shown around the MIIGAiK University in Moscow, where the atlas was created. They had a project making a series of multilingual planetary maps, and I became the editor of its Central European edition.

How have you reached your current job position?

Like many other planetary scientists, I started as an intern at the Lunar and Planetary Institute where Paul Schenk introduced me to planetary science. When I came back to Hungary, I moved away from terrestrial geography towards planetary geography. In 2015, after 20 years of teaching at ELTE University, Budapest, I had the opportunity to work with Ginny Gulick at the NASA Ames Centre to map channels near Hellas Basin on Mars. Now I'm back in Hungary.

Why a Pocket Atlas of Mars?

Because I don't like screen maps and wanted to have a proper, map-like map of Mars that I can hold in my hands. I love browsing maps, old and new, for hours sometimes. That's much better than travelling on Street View. Perhaps I'm nostalgic because my examples were the atlases I had in the 1980s, when I was young, from A6-sized pocket maps of Hungary to A3-sized world atlases.

How long did the Atlas take you to put together?

A very long time! In 2011, I started editing the Encyclopedia of Planetary Landforms, and I created distribution maps for many landforms. Then I started preparations in 2016 at NASA, where I collected catalogues of surface landforms. By 2020 I had most of the data in hand. The actual full-time work started in the summer of 2020 at the foot of the Sümeg hill, during a two-family holiday, where I made the albedo map. Then I made the calculations for the climate maps in cafés in Budapest.

Where on Mars do you find most interesting, as a mapper?

It is always those regions that I studied and mapped in detail. I studied channels that were not mapped before: in north east Tharsis and north east Hellas. You could say that I 'lived' for a year in each site because I spent eight hours per day mapping those places.

Any unexpected outcomes from the Atlas?

When I developed the climate diagrams, I realised that Mars is more Earth-like than I previously thought. But also more alien

because of its vast history imprinted into the surface we see today. I also realised that what I am really looking for in making these maps is to get a little closer to understanding if Earth is a 'normal' planet, which we still don't know. You get to know yourself by looking at others. Mars is the best known 'other' we can compare our planet to. It is an alien planet: its surface is old and yet geologically 'primitive', not like the Earth. But is it a 'normal other'?

What's your next project?

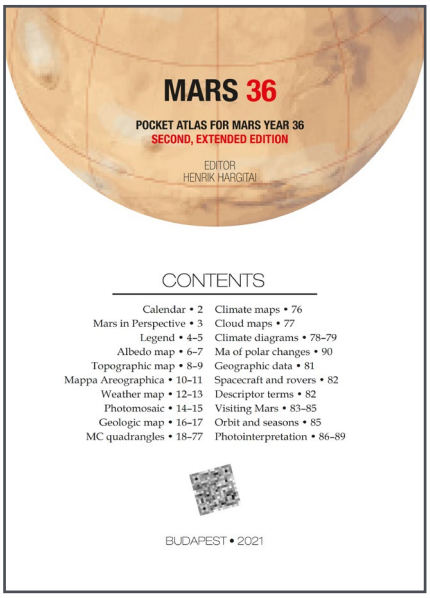
This was an outreach project but professional scientists also need maps like this for their planetary mapping projects. First of all, we need more planetary cartographers and we need planetary geographic maps. I think geographic maps are an important future direction in planetary mapping because these maps are the best tools to communicate planetary discoveries and generally our geo-knowledge. One of my former professors of literature wrote to me that she knew Mars is 'rugged' but never thought it would be rugged like this.

For professional work, we need a digital geographic information system (GIS) with thematic layers. I know some 60 catalogues of features scattered in the literature. The next project is to collect those catalogues and merge them into a Mars GIS, which could be used as a reference GIS for Mars. But the real next project is to emerge from the pandemic with my family as healthy as possible.

Above: Henrik Hargitai

Below: Contents page of the atlas

Next page: Albedo map from the atlas



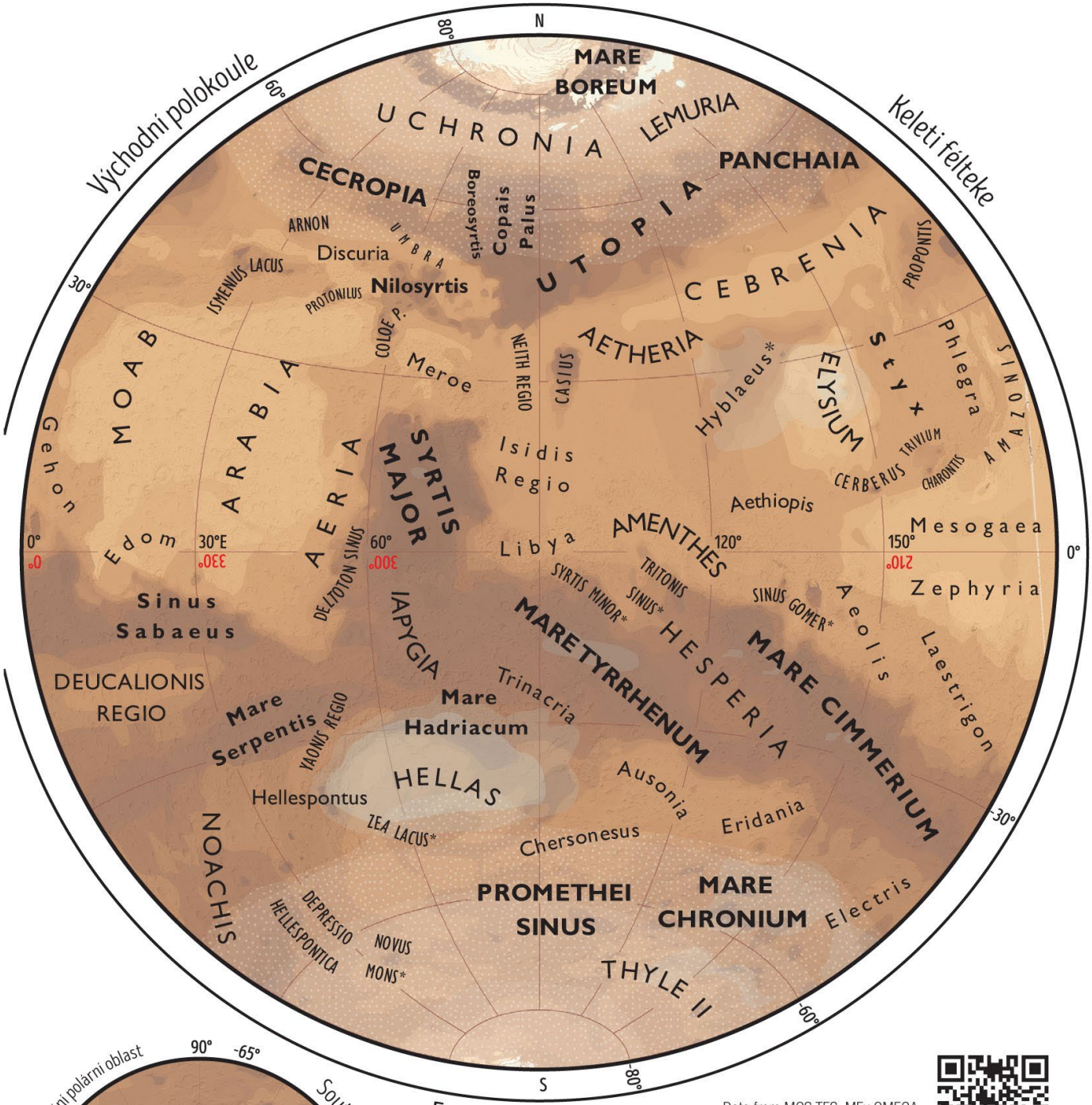
MARS 36

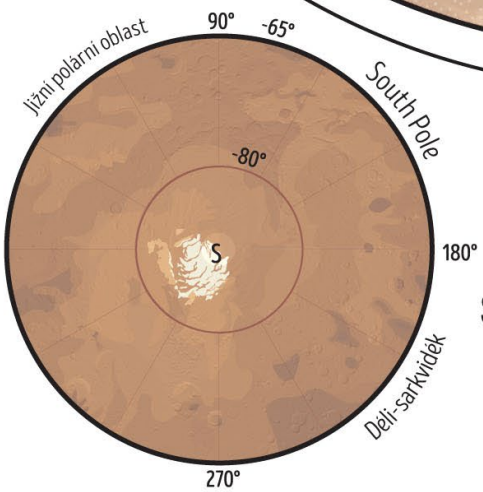
POCKET ATLAS FOR MARS YEAR 36
SECOND, EXTENDED EDITION

EDITOR
HENRIK HARGITAI

CONTENTS

BUDAPEST • 2021





Data from MGS TES, MEx OMEGA
Azimuthal Equidistant Projection
1:80.000.000

1997–2012
MY 23–31

ALBEDO

SURFACE MARKINGS, SEASONAL POLAR CAP, CLOUDS

A felszín foltjai, évszakos sarki sapkája és felhői
Povrchové útvary, sezónní polární čepička, mraky

ALBEDO is the amount of sunlight reflected by a surface
Az ALBEDÓ a felszínről visszavert fény aránya
ALBEDO je množství slunečního světla odražené povrchem

9

NASA/JPL/ASU/ESA/H. Hargitai.

The Europlanet Society Joins the International Planetary Data Alliance

Stéphane Erard (Observatoire de Paris) reports on Europlanet's participation in international consortia that manage access to planetary data.

For over a decade, Europlanet has supported the development of VESPA, a Virtual Observatory for planetary data. VESPA has adapted and built on existing concepts and tools from the Astronomy Virtual Observatory and tailored them for Solar System data. EPN-TAP, the VESPA data access protocol, has been a major development in providing access to multiple planetary datasets from space missions, ground-based observations, simulations and experimental work.

The impact of VESPA relies to a large extent on how well it is integrated with data infrastructures and the international consortia that manage access to data in planetary science. This was significantly enhanced in autumn 2020 when the Europlanet Society, represented by the VESPA coordinator, became a full member of the International Planetary Data Alliance (IPDA).

The IPDA brings together mostly national and international space agencies, with the aim of improving access to planetary science data and archives. Founded in 2006, the IPDA has developed a de facto standard for archiving planetary space data, NASA's Planetary Data System version 4 (PDS4).

Since 2009, VESPA has participated in the IPDA Technical Expert Group, presenting its own developments to space agencies and developing many fruitful connections. In particular, ESA's Planetary Science Archive (PSA) installed an EPN-TAP interface in 2017, making its full content accessible through the VESPA portal, but also through general Virtual Observatory tools e.g. Jupyter notebooks and workflow platforms. In parallel, an EPN-TAP PDS4 dictionary has been written to facilitate future interactions with NASA Planetary Data System tools.

As a new member of the IPDA steering committee, Europlanet Society attended its first meeting in December 2020 and full virtual meetings in February and March, organised by the Indian space agency (ISRO). Important current objectives for the IPDA are to provide access to derived data, which are not usually available in space agency archives, and also fully open access to data related to publications in authors' institutes. In addition to being a working project of the IPDA, the EPN-TAP protocol is currently in the final validation phase to become an International Virtual Observatory Alliance (IVOA) standard, and members of the VESPA management team chair the IVOA Solar System Interest Group. Similar validations are also in progress with the Heliophysics International Data Alliance and Research Data Alliance.

For more information on VESPA, see: http://www.europlanet-vespa.eu

VESPA
Virtual European Solar and Planetary Access

Searching for Answers to Life's Big Questions

The ability to differentiate between biologically and abiotically generated structures and processes observed in planetary landscapes is extremely important in answering our most fundamental question: are we alone in the Universe?

Sedimentary deposits contain the earliest evidence for life on Earth, therefore, sedimentary features are a key focus for missions searching for biosignatures on other planetary surfaces, such NASA's Perseverance rover at Jezero Crater on Mars.

Field studies of Earth analogues for extraterrestrial environments have proved useful in understanding and interpreting data sent back by planetary orbiters and rovers. Finding good analogues, although challenging, is possible, particularly on a global scale.

From 2021, two sites in the Argentinian Andes are being added to the suite of planetary analogue field sites offered by Europlanet 2024 Research Infrastructure (RI) to support the study of sedimentary systems from an astrobiological perspective.

Argentina, given its location, extended geographical range and variable geography provides a plethora of 'extreme' environmental conditions - from low to high altitude, cold to warm, wet to dry - where microbial life thrives. These sites are thus good targets for exploring how microbial life can adapt to environmental challenges, as well as how biosignatures are generated and preserved within sediments and sedimentary rocks.

Recent research at high-altitude Andean lakes in northwestern

Fernando J Gomez and Mateo Martini (CICTERRA-Centro de Investigaciones en Ciencias de la Tierra/CONICET-Universidad Nacional de Córdoba) explore planetary field analogues in Argentina.

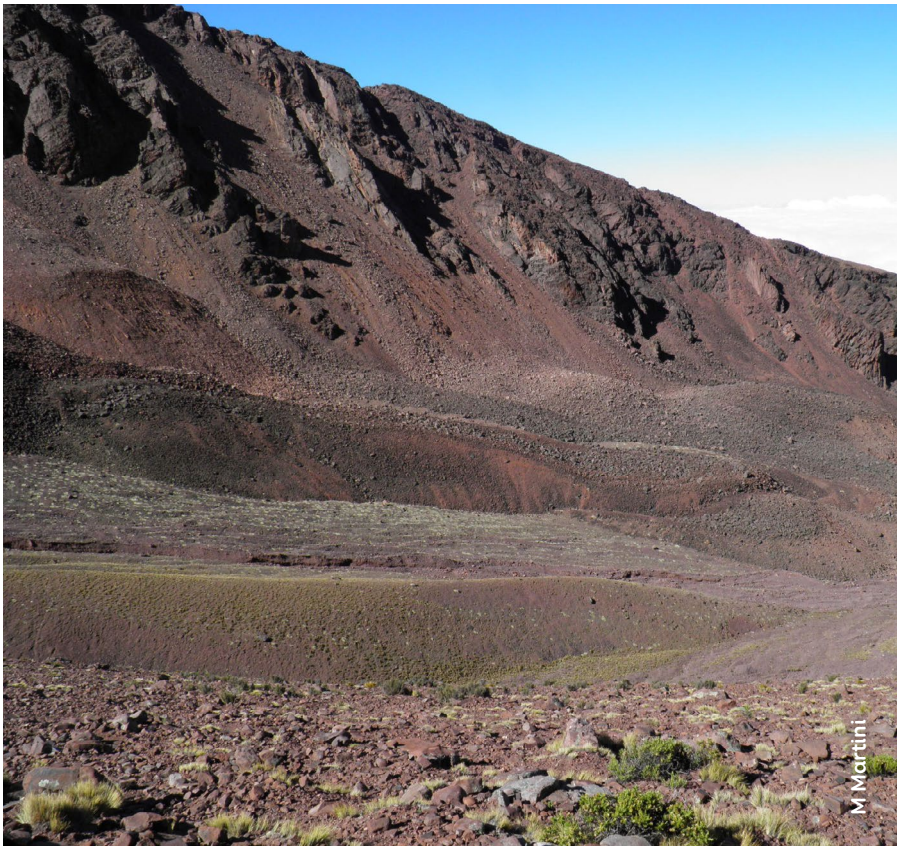

FJ Gomez

Argentina, such as the Laguna Negra (Gomez et al. 2014, 2018, 2020; Boidi et al. 2020; Mlewski et al. 2018; Beeler et al. 2020; Buongiorno et al. 2019), has focused on understanding microbial life and biosignatures in challenging environmental conditions such as high ultraviolet radiation influx, low water activity, variable pH, extreme temperatures and winds.

Microorganisms that thrive under these multiple forms of stress (poly-extremophiles), typically in hypersaline lakes and hot springs, are interesting targets to study because a combination of microbial processes, sedimentation and in-situ (authigenic) mineral precipitation drives the formation of 'microbialite' structures (Figure 2, overleaf). Microbialites are found in the Earth's ancient sedimentary record and represent our oldest biosphere fossil evidence.

Hundreds of lakes and wetlands in the high-altitude Andes, including Laguna Negra (Figure 1 above), Socompa and Diamante are currently active in creating microbialites. The structures develop over variable volcanic bedrock (from andesitic to basaltic), where weathering processes, sediment generation, transport and deposition, as well as mineral precipitation can be studied. In addition to providing useful information to understand extraterrestrial environments observed today, the mineralising microbial systems in these Andean lakes are unique natural laboratories

Above: The Laguna Verde Saline complex where the Laguna Negra is located in the high-altitude Andes of northwestern Argentina (Figure 1).



Top: The mineralising microbial systems in the high-altitude Andean lakes, such as Laguna Negra, are unique natural laboratories (Figure 2).

Above: Rock glaciers in northwestern Argentina provide cover for flowing water and ice, and can provide habitable niches for microbial life (Figure 3).

that have many of the environmental criteria suggested for the early Earth and Mars.

In these systems, where microbialites are common, a spectrum of ongoing biotic and abiotic processes and potential biosignatures can be studied and tested, improving our ability to interpret the sedimentary record on our planet and beyond. Comparing microbialites with similar but abiotically-generated structures may provide some insights for similar sedimentary systems that are currently a target for investigation on the martian surface, such as Jezero Crater or the Oxia Planum, where ESA's Rosalind Franklin ExoMars rover will land in 2022.

The northwestern Andean region of Argentina and the Patagonia Andes of South Argentina also provide an interesting set of planetary analogues. These sites include a variety of sedimentary systems where glacier-related processes, active ice and rock glaciers (Figure 3 and 4) and sedimentary deposits from glaciers and glacial lakes have developed under variable climate conditions. Many of these systems occur over a basaltic bedrock, providing extremely useful Earth-based analogues for cold extraterrestrial environments on Mars and icy moons of giant planets.

Rock glaciers (Figure 3) in northwestern Argentina provide an interesting sedimentary system that has been somewhat overlooked from an astrobiology and climate-evolution perspective to date. Under cold and arid climate conditions, the protection provided by the rock cover for flowing water and ice can provide habitable niches for microbial life. An understanding of rock glacier dynamics is also useful in better constraining the evolution of Earth's climate over its history

(Martini et al. 2017), which can then be extrapolated to the climates of Mars and other planets.

The Patagonia Andean region is itself a record of glacial activity since the late Miocene (11.63 million years ago), and currently the Southern Patagonia ice field is the largest extra-polar ice mass in the southern hemisphere, covering 13 000 km^2. The glaciers are more developed in the west (wetter) side of the Patagonian Andes but, in the past, they extended eastward to the Patagonian Steppe and were associated with numerous lakes. The resulting sedimentary record can help us to understand recent paleoclimate evolution (Kaplan et al. 2016) and its impact in the biosphere record.

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Adding these new sites to the suite of Europlanet 2024 RI planetary field analogues will increase the range of environments for collaborative research between scientists from Europe, Argentina and the wider international community. The insights provided will help us to better understand current and future exploration of other planetary environments, and hopefully contribute to answering that fundamental question of whether we are alone in the Universe.

Below: Planetary analogue field sites in the Argentinian Andes include a variety of sedimentary systems where glacier-related processes have developed under variable climate conditions (Figure 4).

RoadMap to Understanding Atmospheric Dust on Mars

Ann Carine Vandaele (BIRA-IASB) describes how open scientific questions about dust and clouds in the atmosphere of Mars present major challenges to our current understanding of the Red Planet.

Dust in the atmosphere of Mars has a seasonal cycle and can vary substantially from year-to-year. Some years, dust storms are relatively small and regionally confined; in other years – like 2018 – a global, planet-encircling dust storm develops. Dust affects the thermal structure of the martian atmosphere, the water cycle and, potentially, the rate at which hydrogen is lost into space. However, we still have much to learn about the nature of its variability and the mechanisms involved in getting dust from the surface into the atmosphere.

Our knowledge of the physical processes governing the generation and transport of atmospheric mineral aerosols is based largely on observations and, in many cases, there is extremely limited experimental data. This is true for our understanding of aerosols in Earth's atmosphere, but it is an even greater problem for our understanding of dust particles in the martian atmosphere. To develop more reliable and predictive models to describe martian aerosols, we need to test conventional models through controlled, high-precision laboratory experiments.

RoadMap (ROle and impAct of Dust and clouds in the Martian AtmosPhere) is a new project, funded by the European Commission under Horizon 2020, that aims to create laboratory datasets and models to better describe martian dust and clouds. The project uses a simulant (analogue) for martian dust to investigate key dynamic processes, such as lifting, sedimentation, nucleation and scattering. The resulting data will be used to improve Global Circulation Models (GCMs) to provide more realistic atmospheric dynamics and climatology.

The team behind RoadMap brings together the laboratory community, scientists involved in space missions, and numerical modellers to promote synergies through their different perspectives and experiences. Laboratory scientists understand the reference data and know how to extract the most value from their experiments; mission scientists know the intricacies and potential of the instruments and the details of their calibration; and numerical modellers know what data, information and parameters are most pertinent to their simulations and how best to interpret the results.

RoadMap is led by the Planetary Atmospheres Research Group of the Royal Belgian Institute for Space Aeronomy (BIRA-IASB), which has been involved in multiple planetary missions, including SPICAM on Mars Express, SPICAV-SOIR on Venus Express, NASA's Phoenix Mars lander, and NOMAD on ESA's ExoMars Trace Gas Orbiter. As well as interpreting observed data, the group also provides state-of-the-art modelling of the martian atmosphere using clouds microphysics simulations and GCMs (Neary et al, 2020; Vandaele et al, 2019; Willame et al. 2017).

The first step of the RoadMap project is to synthesise

Acknowledgements:
The RoadMap (ROle and impAct of Dust and clouds in the Martian AtmosPhere) project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004052. The RoadMap team: (BIRA-IASB) A.C. Vandaele, N. Kalb, L. Neary, Y. Willame, A. Piccialli, B. Vispoel, F. Daerden, J. Erwin, L. Trompet,K. Lefèver, L. Lamort, S. Fratta; (AU) J. Merrisson, J.J. Iversen, A. Waza; (UDE) G. Wurm, J. Teiser, T. Becker; (CSIC-IAA&ICV) O. Munoz, J.C. Gomez Martin, T. Jardiel, M. Peiteado, J.A. Martikainen, F. Moreno, A. Caballero

a representative analogue for martian dust from powdered basaltic materials, and characterise the particles' size, shape and microphysical properties. The powder produced by the Funceramics team at CSIC-ICV can then be used in a diverse set of laboratory experiments at some of Europe's leading planetary simulation facilities.

The cryogenic low-pressure environmental chamber (Holstein-Rathlou et al, 2014; Merrison, 2011; Merrison et al, 2008) at Aarhus University is a unique facility that can generate wind flow to study the mobilisation and transport of particulates under martian conditions at temperatures down to -50 degrees Celsius. Mixtures of gas and dust analogue can be injected into the simulation chamber and dispersed via a jet. The velocity of individually suspended dust grains and the concentration and flow of the aerosol can be monitored by a Laser Doppler Velocimeter and a high-speed imaging system installed in the chamber in 2016 as part of the Europlanet 2020 Research Infrastructure project.

Complementary experiments at Duisburg-Essen University (UDE) track how dust particles can be liberated through the impacts of grains bouncing off the surface and study particle-lifting mechanisms at a microscopic level (Bila et al, 2020). Experiments at UDE also study particle-lift under reduced gravity (Musiolik et al, 2018) and under the influence of temperature gradients (de Beule et al, 2015), which is especially important for understanding the physics of gas-flow in granular material under the low-pressure conditions of Mars.

Finally, a unique database of the scattering properties of the martian dust analogues is being created through measurements at the Cosmic Dust Laboratory (CODULAB) at the Instituto de Astrofísica de Andalucía (CSIC-IAA), a worldwide reference for dust scattering studies (Muñoz et al, 2020; Muñoz et al, 2011). Scattering and absorption by the irregular particles of martian airborne dust and clouds is difficult to model accurately, but understanding these properties is vital for understanding how solar radiation heats the atmosphere and for interpreting space observations. Improved parameters for production, lifting and dynamics of dust resulting from the RoadMap lab experiments will be implemented and tested in the BIRA-IASB GCM. The scattering properties of the Mars dust analogue will be used to refine the radiative modules of Mars GCMs but also to improve the analysis of trace gases abundances in data from NOMAD and other mission instruments.

Overall, RoadMap aims to improve our vision of the martian atmosphere by providing a new generation of high-level data, increasing the science return of the past and current missions to Mars, and shaping future planetary missions.

More information can be found on the RoadMap project website.

https://roadmap.aeronomie.be/

Aarhus University

The Aarhus Mars Simulation Wind TunneL

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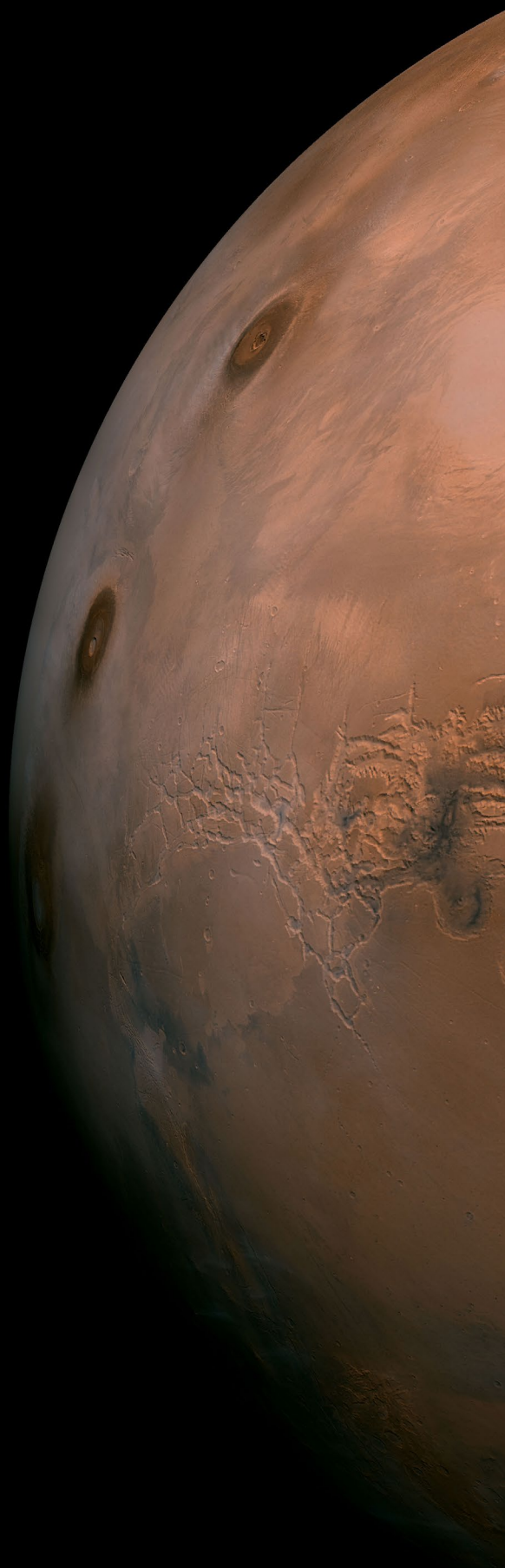
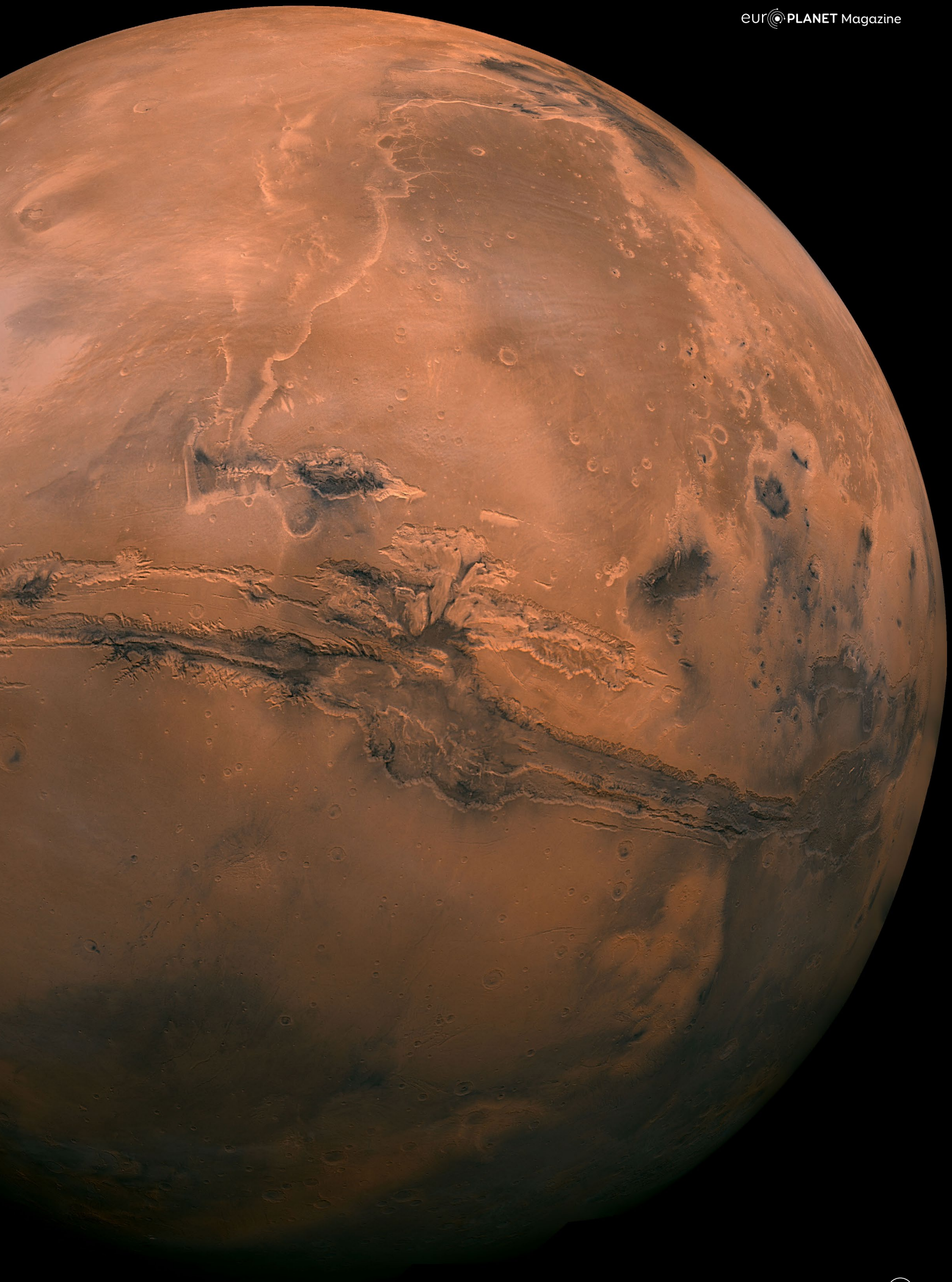
All Eyes on Mars

As history is made on Mars with the first powered, controlled flight on another planet, Anita Heward (Europlanet 2024 Research Infrastructure) rounds up some of the important contributions being made by the European community to Mars exploration.

It has been a busy few months for Mars exploration, with missions from the United Arab Emirates (UAE), China and NASA arriving in February 2021. While the European-Russian (ESA-Roscosmos) ExoMars Rosalind Franklin rover and surface platform are not part of this year's flotilla, and are scheduled to reach Mars in the spring of 2023, there is nonetheless, a great deal of activity across Europe, both in support of the international missions and in wider research on Mars that will put the results in context.





The historic first flight of NASA's Ingenuity helicopter on 19 April 2021 has, literally, opened up new horizons for future missions to the Red Planet. The ability to scout from the air will give additional perspectives on the geomorphology of areas explored on the ground and allow investigation of terrains inaccessible by rovers. However, the martian atmosphere itself – its variability, its global dust storms, its elusive hints of methane, and the mystery of how the majority of its volume has been lost – remains a key area for study.

The thin martian atmosphere, composed of 95% carbon dioxide, has a pressure of around 6 millibars, less than 1% of the pressure on Earth at sea level. While day-time temperatures at ground-level on Mars can exceptionally reach 30 degrees Celsius in equatorial regions, the lack of atmosphere means that the temperature drops rapidly away from the surface, by nearly 40 degrees within just two metres. Even if an astronaut standing on Mars were able to have warm feet on a sunny summer's day, they would still have a very cold head indeed.

Questioning the Heavens with Fire, Hope, Perseverance and Ingenuity

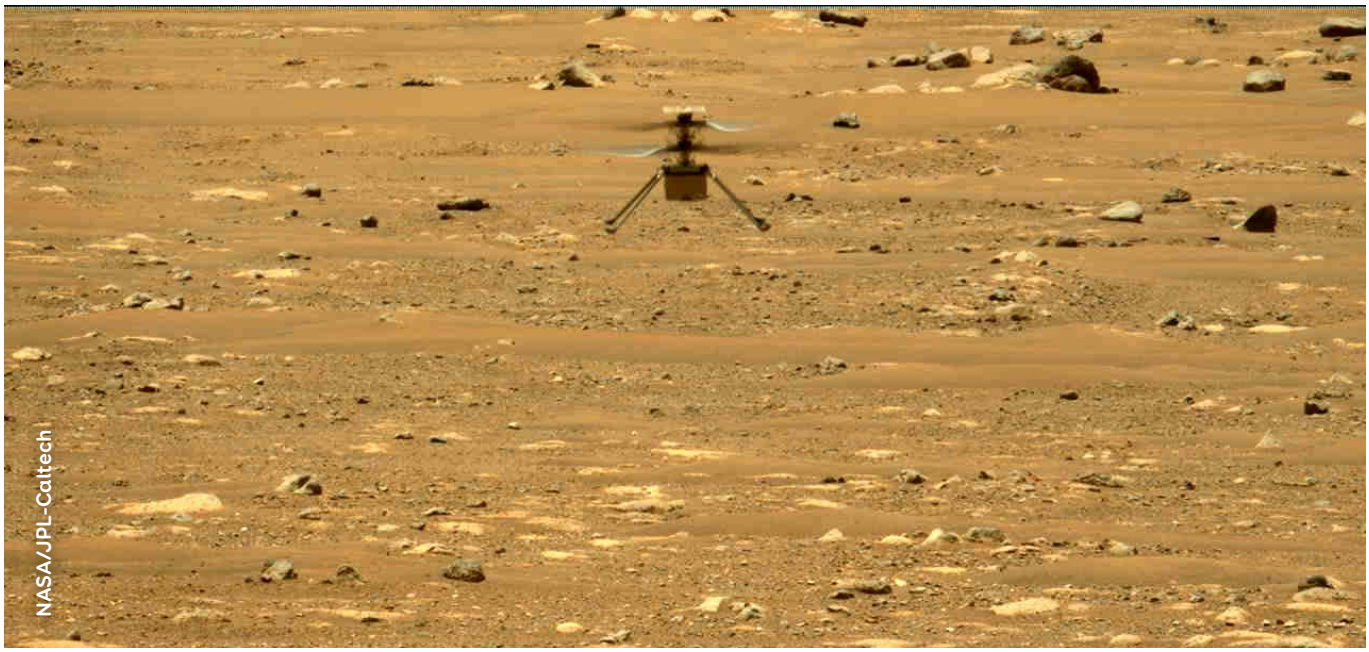
Named after a fourth century poem of the same name and meaning 'questions of the heavens', China's Tianwen-1, will analyse the chemical composition of rock and dust and search for pockets of ice, liquid water and organics. A rover, called Zhurong after a Chinese god of fire, landed on 14 May 2021 and will spend three months exploring Utopia Planitia, a flat plain within a large impact basin in the northern hemisphere of Mars. The region is covered by extensive sedimentary materials, with features that indicate that ice or water are present.

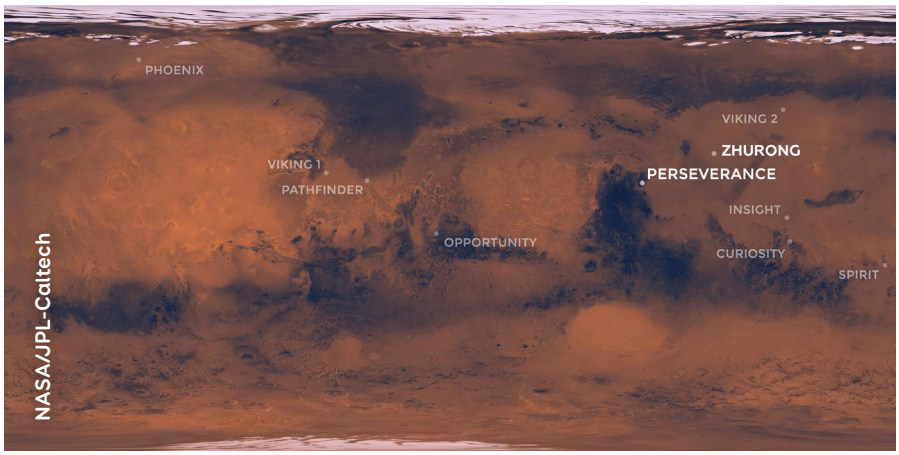
The UAE Space Agency's first mission to Mars, Hope, is studying dynamics in the martian atmosphere on a global scale, giving a more complete understanding of interactions between the atmospheric layers, and answering questions about how oxygen and hydrogen escape into space.

NASA's Mars 2020 mission, which includes the Perseverance rover and its helicopter partner Ingenuity, will look for signs that there were habitable conditions on Mars in its early geological history, and seek evidence of past microbial life.

While the Ingenuity drone is a technology demonstrator and will not carry out a scientific mission, the Perseverance rover will study the near-surface atmosphere through the Spanish-led Mars Environmental Dynamics Analyzer (MEDA) weather station. MEDA is a suite of environmental sensors that makes hourly recordings of dust levels, as well as wind speed and direction, pressure, relative humidity,

Below: The Ingenuity helicopter captured by the Perseverance rover during its second flight.





air temperature, ground temperature and radiation.

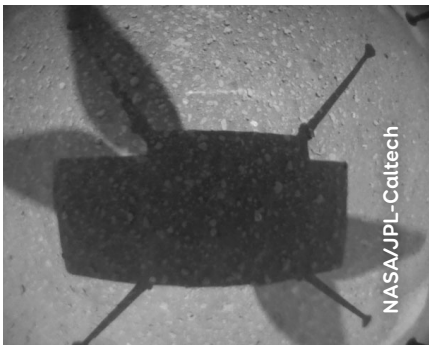
MEDA records the temperature at three heights, 0.84m, 1.45 m and 30 m above the surface, as well as at ground level. With these multi-level readings, MEDA will make significant advances on previous missions in being able to characterise the air temperature vertical profile throughout the day and night. MEDA joins sister instrument packages already on Mars (REMS on the Curiosity rover and TWINS on the InSight mission) to establish a three-station martian weather network, and enables researchers to compare and contrast the situation at Jezero with that at Gale Crater and Elysium Planitia, 3,700 km and 3,200 km away respectively.

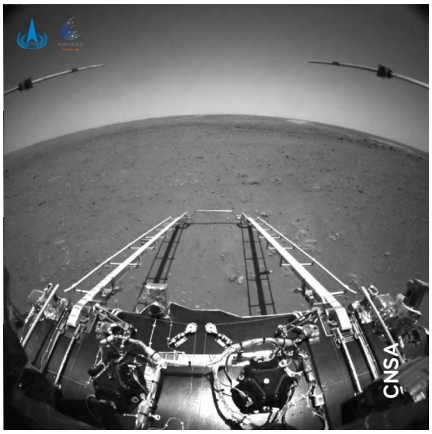
MEDA's first weather reports have shown stable night-time temperatures of below -80 degrees, but the day-time temperatures, averaging -20 to -25 degrees Celsius, have shown fluctuations of around 5 degrees over just 30 minutes. Winds, frost formation, and interactions with the surface and dust particles can all lead to unstable, variable air temperatures near the surface but the reasons for this are not well understood. Dust is present everywhere on Mars, yet there have been limited studies into its abundance, physical properties, size distribution as well as its impact on the composition, structure and dynamics of the atmosphere.

Above: Sites of successful landings on Mars.

Below: The shadow of Ingenuity on the surface of Mars during its historic first flight.

Bottom: The Zhurong rover takes its first drive on Mars.



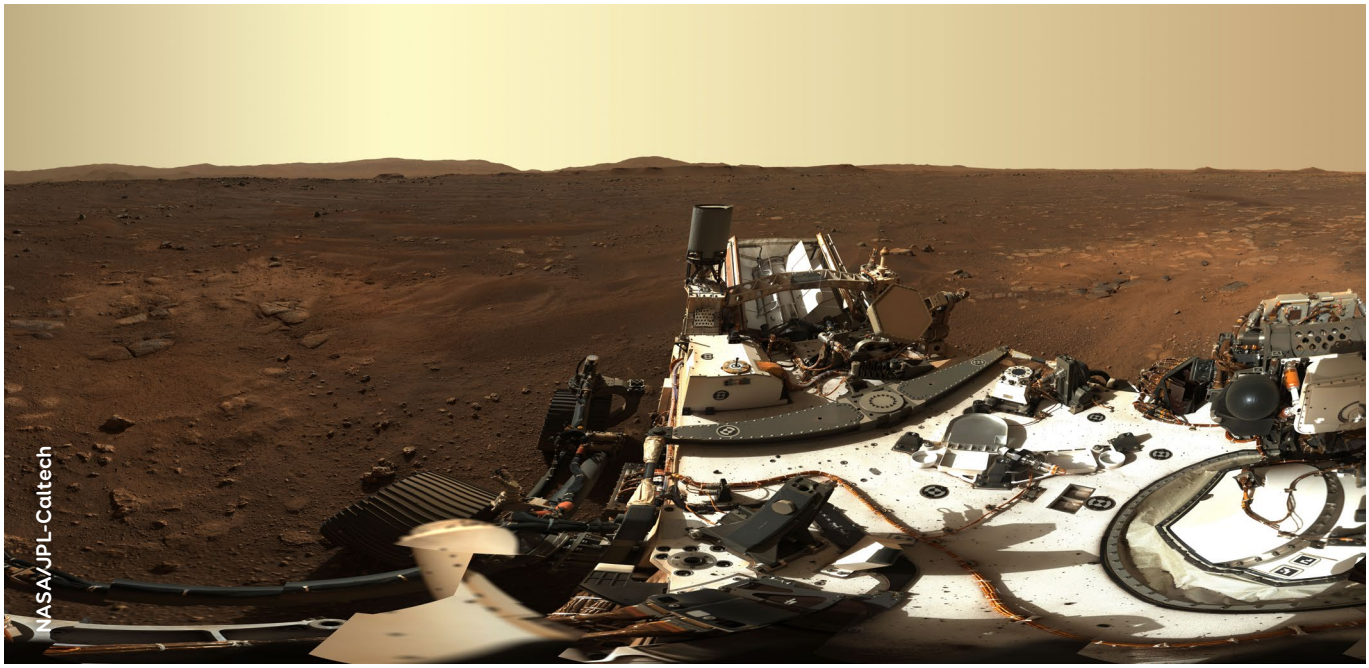


MEDA will focus on the study of the local environment and will provide data to validate models of atmospheric dust and the mechanisms that lift the dust into

European contributions to the missions

Tianwen-1 carries 13 instruments, and Europeans are involved in two of them: The Institut de Recherche en Astrophysique et Planétologie (IRAP), France, participated in the calibration of the LIBS spectrometer on the Zhurong rover's Mars Surface Composition Detector. The Space Research Institute (IWF-Graz) has contributed to the calibration of the magnetometer on the main satellite. Simulations and calibration measurements carried out at the spectroscopy laboratories at DLR and Grenoble (both accessible through Europlanet 2024 RI's Transnational Access programme) will be used to interpret the spectroscopic data obtained by the Tianwen-1 orbiter.

Of the seven primary scientific instruments carried by NASA's Perseverance rover, three include significant European contributions: the weather station MEDA (provided by the Centro de Astrobiología (CAB) in Spain with contributions from FMI in Finland), the remote-sensing laser micro-imaging SuperCam (developed jointly by Los Alamos National Laboratory (LANL) in New Mexico and a consortium of French research laboratories under the auspices of the Centre National d'Etudes Spatiales (CNES), with contributions from the University of Valladolid (UVA) in Spain) and the ground-penetrating radar RIMFAX (provided by the University of Oslo in Norway). Pre-flight tests at the Aarhus Wind Tunnel of Perseverance's SuperCam and MOXIE instruments were supported by Europlanet 2020 RI.



Above: The first 360-degree panorama taken by Perseverance's Mastcam-Z cameras. The panorama is a mosaic of 142 individual images taken three days after landing. The octagonal top of the MEDA radiation and dust sensor can be seen at the top centre of the body of the rover.

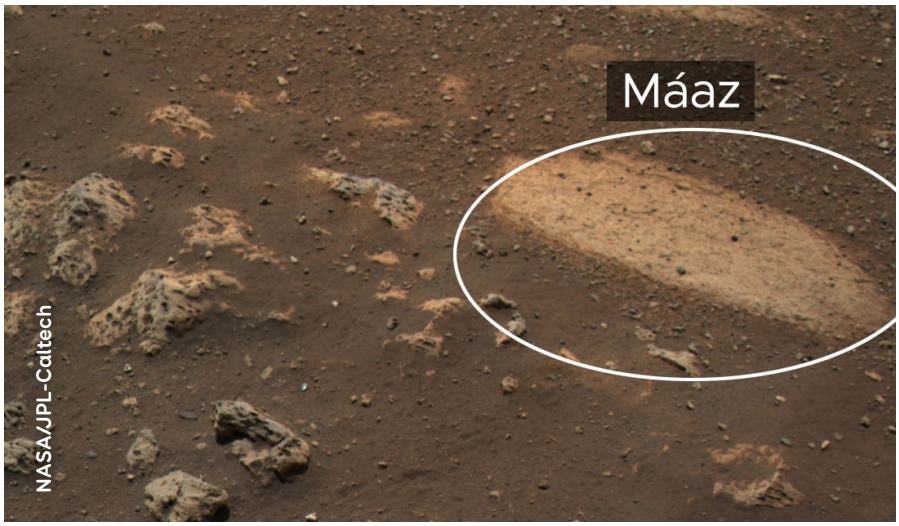
Below: A rock called Máaz (the Navajo word for Mars) was the first feature of scientific interest to be studied by Perseverance.

the atmosphere. This has important implications for future missions in understanding the potential effects and hazards caused by dust for surface operations and the health of astronauts.

Perseverance's overall mission is to look for signs that there were habitable conditions on Mars in its early geological history, and seek evidence of past microbial life. The rover will explore and characterise the geology of Jezero Crater, a 45 km-wide impact basin on the edge of the Isidis Planitia plain that contains the remains of an ancient, partially-eroded river-delta and rocks that date back to a time when life is thought to have first arisen on Earth.

The first geological results from Perseverance have come from the French co-led instrument, SuperCam, which has a suite of imagers, lasers and spectrometers to analyse the chemistry of target rocks. Data from the Laser Induced Breakdown Spectroscopy (LIBS) instrument have revealed that the rocks initially investigated around the Octavia E Butler landing site are of basaltic composition, thus either volcanic or composed of fine-grained volcanic sediments cemented together in an ancient lake or stream.

As a further historic milestone, SuperCam has obtained the first audio recordings from the surface of Mars: the sound of winds sweeping over Perseverance's deck a few hours after landing. The rhythmic clicks of the LIBS laser impacting on the target rocks have also been recorded by SuperCam, and these acoustic signals from the laser give additional information about the composition and history of the rocks studied, such as their hardness or whether they are covered with a coating.



After exploring the area around the landing site while Ingenuity completed its initial flight campaign, Perseverance is now starting its first science campaign and moving towards its first sampling site. It will then will head off towards the river delta to start its main task of searching for signs of ancient microbial life and laying the groundwork for future missions.

Simulating Mars on Earth

While it may be some time before humans are able to study the martian environment through a crewed mission to the Red Planet, researchers back on Earth are already studying simulated martian conditions in the laboratory. The 8m long, 2.5m wide Mars Wind Tunnel at Aarhus University in Denmark not only reproduces the low pressure and low temperatures of Mars but also allows the introduction of particles of sand and dust.

Complementing in-situ studies by MEDA, experimental research using the Aarhus wind tunnel is trying to better understand the role of dust in the martian atmosphere (see the article on page 24). The facility has also been used in pre-launch tests of another technology demonstrator on Perseverance, the Mars Oxygen ISRU Experiment (MOXIE). Experiments funded by Europlanet in the Aarhus wind tunnels were able to demonstrate that the High Efficiency Particulate Air (HEPA) filter could protect MOXIE's electrolysis subsystem from contamination by dust, both during operations and from passive accumulation of dust from the wind over the course of the mission.

Above: The Mars Oxygen In-Situ Resource Utilization Experiment (MOXIE) instrument during integration into the Perseverance rover.

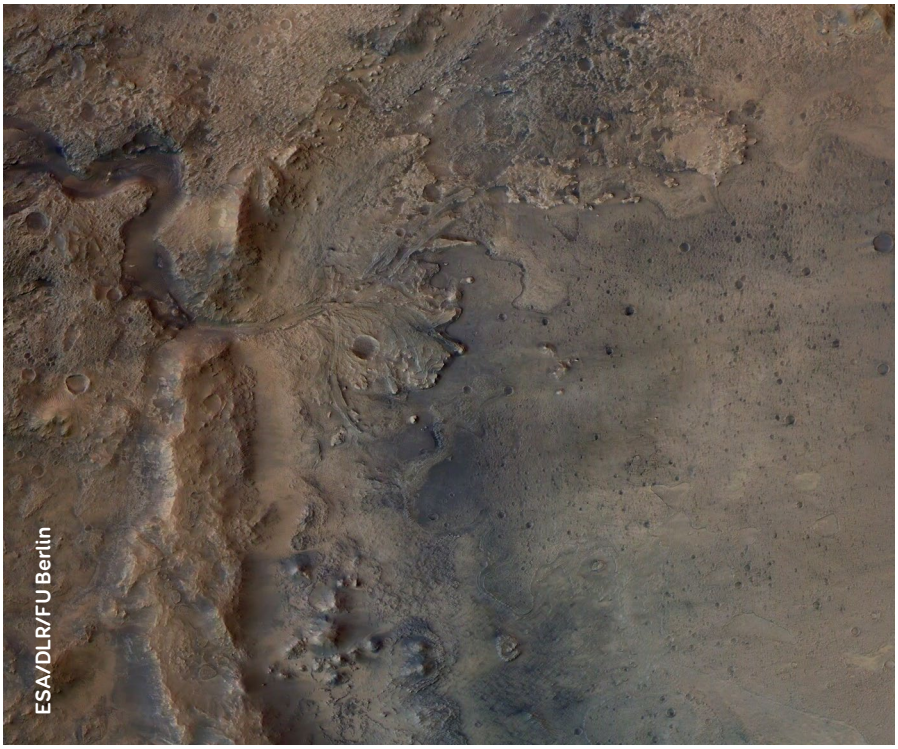
Dr Lauren McKeown at the OU Mars Chamber during a visit funded through Europlanet's Transnational Access programme. McKeown et al. 2021. DOI: 10.1038/s41598-021-82763-7.

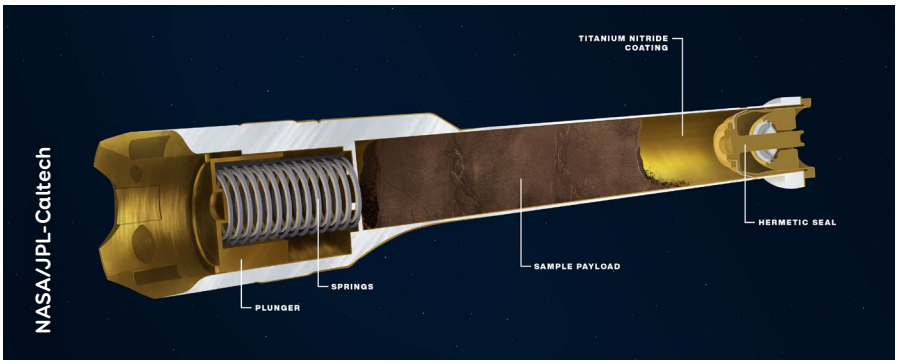
On Mars, MOXIE's first test successfully converted carbon dioxide from the martian atmosphere into oxygen. After an hour of operation MOXIE produced about 5.4 grams of oxygen: enough to keep an astronaut healthy for about 10 minutes of normal activity. If the rest of MOXIE's operations go to plan, the results will pave the way for scaled-up life-support for future astronauts and production of oxygen for use as rocket fuel.

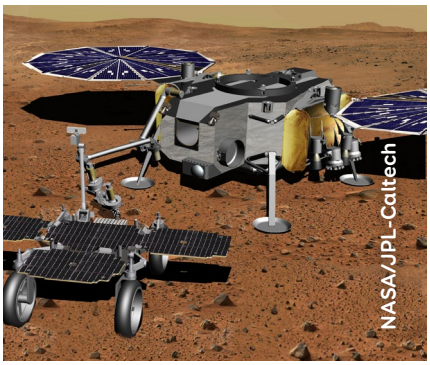
As well as testing instrumentation for missions, simulation facilities also enable experimental study of exotic phenomena caused by the low pressures and temperatures on Mars that do not occur on Earth. The Mars Chamber at the Open University (OU) in the UK has been used to investigate how features on the surface of Mars known as 'spiders' are formed. Theory suggests that spring sunshine penetrating slabs of carbon dioxide ice at the martian poles causes radial channels to form spidery patterns covering areas up to a kilometre across. As the carbon dioxide ice warms from the base, and sublimates directly from a solid into a gas, it cracks through the ice and vents material into the air.

Dr Lauren McKeown, funded by Europlanet 2020 RI, visited the OU Mars Chamber in 2018 to carry out experiments and find out if the hypothesis is correct. McKeown and colleagues drilled holes in blocks of carbon dioxide ice and observed what happened when they were gently lowered over a bed of sand at martian pressures. As the bottom of the block came into contact with the sand, the carbon dioxide sublimated and rushed to escape through the central vent, eroding the sand into spider patterns (McKeown et al 2021).

A doctoral candidate at the time of the visit, McKeown has since completed her PhD and joined the team at the Open University as a postdoctoral research associate,







Above: Preliminary concept for Mars Sample Return, where the samples collected by Perseverance are retrieved by an ESA Fetch rover and NASA Sample Retrieval Lander.

Left: The ancient river delta of Jezero Crater that will be explored by Perseverance, imaged by ESA's Mars Express orbiter.

Below left: Cutaway illustration showing the interior of a sample collection tube carried by Perseverance.

where she is continuing the collaborations developed during the Europlanet-funded project.

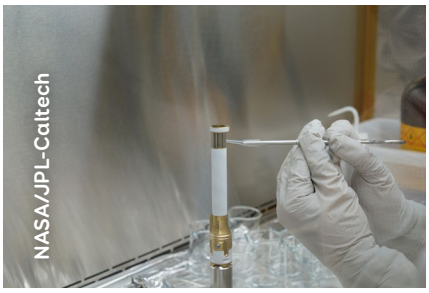
Preparing for sample return

However different Mars might be from Earth today, in the past it was wetter and warmer. Whether it may have hosted life remains one of the biggest questions.

Early life on Mars may have been destroyed 3-4 billion years ago after the loss of the martian atmosphere, which provided a shield against harmful ultraviolet radiation. This means that finding evidence for past life may only be possible through indirect means, for example by identifying chemical changes to minerals or specific reactions that are only induced by life. Samples taken from terrestrial analogues and analysed in laboratories can help interpret data from in-situ missions and refine analytical techniques. However, considering the limitations of what can be launched into space, it is likely to be difficult for robotic missions operating on the surface of Mars to provide conclusive evidence of whether life has ever existed there.

The Perseverance mission is the first step in a decade-long campaign involving NASA and ESA to bring samples from the martian surface back to Earth. Perseverance will collect a few core samples of the most promising rocks and soils for further study and set them aside in caches. Later this decade, a small ESA-led rover will 'fetch' and load the samples into a NASA Mars Ascent Vehicle, which will then launch them into Mars orbit. The sample container will be captured by an orbiter and returned to Earth, potentially arriving in 2031.

The samples collected by Perseverance will contain martian rocks, soil, dust and atmosphere. Samples will be stored in tubes, roughly the size of a stick of chalk, that hold around 15 g of material. Bringing carefully selected rocks from Mars back to Earth for detailed study will enable much more complex and complete studies using state-of-the-art lab equipment. This will provide a better quantitative understanding of whether the returned samples formed in environments where life could have existed and whether they contain biosignatures.



A technician tests a Perseverance sample tube for contanimation.

Researchers around the world are working together to prepare curation facilities and protocols for receiving the samples brought back from Mars. As part of this, a team from the Natural History Museum London, the Vrije Universiteit Amsterdam, ETH Zurich and the Open University, funded through Europlanet 2024 RI, are working on techniques for nondestructive or minimally invasive characterisation and analysis of material, which will ensure that samples returned from Mars are preserved for study by generations to come.

The discovery of traces of life in rocks from another planet would be a paradigm-changing moment for our understanding of how life on Earth fits into a wider picture of life in the Universe. Any such detection will be the result of years of international efforts.

In this era of viral pandemics, the importance of international collaborations and the consequences of the failure to work together have never been clearer. By demonstrating qualities of perseverance, ingenuity, hope, questioning, and following the inspiration of role models like Rosalind Franklin or Octavia E Butler, Mars exploration has the opportunity to be a much-needed exemplar and beacon of optimism for our time.

My Journey to Mars

Maria Hieta, Research Engineer at the Finnish Meteorological Institute.

Providing sensors for NASA's Perseverance rover has been a long, challenging and rewarding journey like no other. The Finnish Meteorological Institute (FMI) has been responsible for two sensors of the MEDA instrument: the pressure sensor (PS) and humidity sensor (HS). My main responsibility has been testing and calibrating the instruments, but I have also been involved in every phase of the sensor development, wearing many different hats.

I can trace the first documents and emails I received concerning the new Mars 2020 mission back to 2014, which means that the development of these sensors began at FMI more than six years before finally landing on the surface of Mars. And that doesn't mean starting from scratch; FMI has delivered pressure and humidity sensors for multiple missions before, including the Curiosity rover of the Mars Science Laboratory (MSL) mission and ExoMars 2016 Schiaparelli. Schiaparelli was the first mission I was involved in from the very beginning. I was excited and nervous during the launch, and extremely nervous during the landing, which eventually did not end happily.

The Schiaparelli lander crashed on the martian surface in 2016, when we were already working full steam on the sensors for Perseverance. But sometimes this happens with space missions and landing on another planet is still extremely challenging. It is important to remember that the hard work is not wasted even if a mission or a part of a mission fails. Schiaparelli helped us, for example, in the development of new-generation pressure sensor heads, which we used for Perseverance. Our team also gained a lot of experience and we were ready to tackle the Mars 2020 mission requirements of demanding tests and tight schedules.

Behind the Mars 2020 mission is a huge team consisting of dedicated, enthusiastic and highly motivated people. and I have enjoyed the opportunity of working with these amazing people. We landed less than two months ago and expect to operate on the surface of Mars for many years to come. But reaching this point is already a huge win for our team of sensor developers. Our instruments have survived the long interplanetary travel, the seven minutes of terror and the landing, and finally they are ready to do what they were designed for: to deliver high quality scientific measurements from another planet.

And that is not all: the MEDA instrument will act as a weather station network on Mars together with Curiosity's Rover Environmental Monitoring Station (REMS) and atmospheric instruments on the InSight platform. If everything goes well, they will be joined in 2023 by ExoMars, which carries a further meteorological package on the surface platform. These missions will provide a lot of new data for studying the Martian climate and will help prepare for future human exploration.

Ben Stanley/Markus Kempf/AllSky7 network

The Fall of the Winchcombe Meteorite

Sara Russell (Natural History Museum, London) describes the first UK meteorite fall recovery in thirty years.

On the evening of 28 February 2021, a bright fireball blazed across the skies over much of England and Wales. As well as being observed by sharp-eyed members of the public, the meteor was also recorded by camera networks specially set up to capture such events, including the French FRIPON network and a consortium of UK networks coordinated by UKFAll. The members of the camera network teams worked hard over the next few days to calculate that the fireball probably resulted in a meteorite fall in the area around Cheltenham in the west of England.

Rob Wilcock

Colleagues at Curtin University in Western Australia used the data to show that the object originated in the outer asteroid belt, near the orbit of Jupiter.

The morning after the fireball, a family from the Cotswolds town of Winchcombe, near Cheltenham, woke up to find what looked like a pile of barbecue coal on their driveway. Realising that it could only be a meteorite, they carefully collected all the material into clean plastic food bags and got in touch with the Natural History Museum in London. Soon after, Richard Greenwood from the Open University visited the family to verify the meteorite, followed by Ashley King from the Natural History Museum. Immediately, they knew that this remarkable discovery was a carbonaceous chondrite, an exceptionally rare but scientifically valuable type of meteorite.

What followed was surely the most exciting week of my career. I joined many of my colleagues from the museum, and Glasgow, Manchester, Plymouth and Open universities, to trek across the neighbouring fields and talk to the local population about the event.

Banner image: The fireball caught on video from the AllSky7 camera network. Left: The landing site of a fragment in a family's driveway.

Several other homeowners found small fragments of the meteorite on their driveways and lawns, and the traipsing across fields proved fruitful when a team led by the University of Glasgow found a relatively large intact stone, over 100g in weight, in a sheep field.

Winchcombe is the first UK meteorite fall to be recovered in thirty years. Before this, the most recent meteorite fall recovery was in 1991, when the Glatton meteorite dropped in the gardens of a Cambridgeshire village. Before then, the last UK falls were back in the 1960s, in Barwell in Leicestershire and Bovedy in Northern Ireland. Winchcombe is also the UK's first carbonaceous chondrite fall, perhaps the most studied meteorite type by the UK's meteorite researchers.

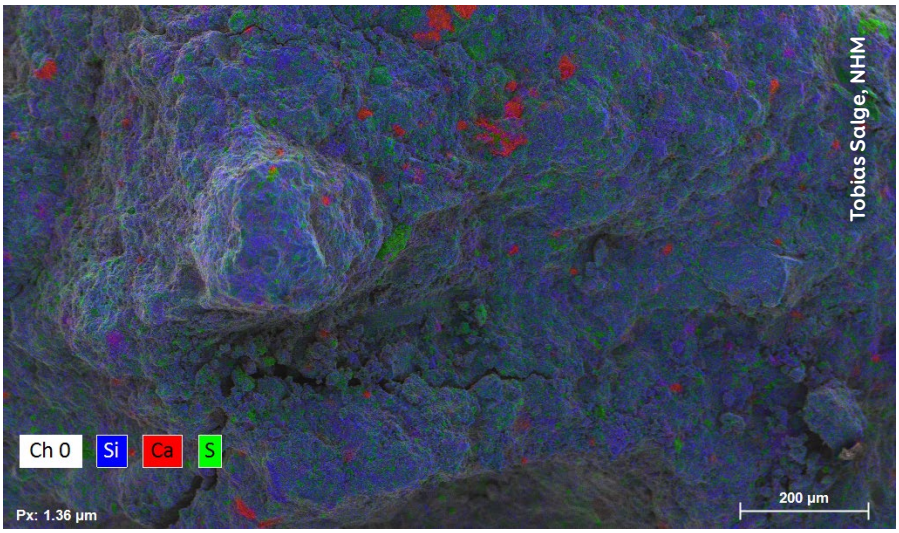
All the property owners agreed to donate their treasure to the Natural History Museum, and our preliminary examination of the meteorite has already begun. Oxygen isotopes, a fingerprint for meteorite classification,

were acquired within a week of the fall. They confirmed Winchcombe to be a carbonaceous chondrite, specifically of the CM type (a group of carbonaceous chondrites named after the Mighei meteorite found in Ukraine). Using a scanning electron microscope with a variable vacuum environment and low voltage settings we can image and map chips of the meteorite that have not experienced any preparation or coating (see image top right), preserving them to be used for more detailed analyses afterwards. We have also devised an analysis plan for the next months, led by Ashley King, to characterise the meteorite's mineralogy, petrology, physical characteristics (including magnetic properties), organic components, cosmogenic nuclides (rare isotopes created by the bombardment of cosmic rays), and isotope geochemistry.

The Winchcombe meteorite fall is particularly timely because it looks somewhat similar to the material returned in December 2020 by the JAXA Hayabusa2 space mission to asteroid Ryugu, and can potentially be used in analysis rehearsals for the mission material.

The fall of a meteorite such as Winchcombe is not only an important scientific event but also a planetary incident on a very human scale. It is an exceptional opportunity to engage the public in planetary sciences. We have talked to local school children about the meteorite by Zoom and a piece of the meteorite has now been put on display in the Natural History Museum in London. The local museum in Winchcombe is also acquiring some of the rock and planning to exhibit it for residents and tourists to learn about this event and its significance.

The Winchcombe meteorite fall is a wonderful asset for the UK and European science, and it has been a great example of collaboration, community spirit and teamwork that has led to the acquisition and characterisation of this exceptional object. Both the science community and the public have been excited about the meteorite story. It will be studied for many years to come and we welcome the Europlanet community in helping us to share its story.



Tobias Salge, NHM

Trustees of the NHM

Trustees of the NHM

Top: An uncoated, unprepared chip of the Winchcombe meteorite. This false colour element map shows that the sample is made mostly of silicates (XRD analysis shows these in the form of hydrated phyllosilicate), sulphides (which show as green in this image) and carbonates (which show as red in this image). The mineralogy is typical for a CM carbonaceous chondrite.

Above: Fragment of the Winchcombe meteorite.

Left: Held meteorite recovered from Winchcombe.

Building a Community for Planetary Geological Mapping

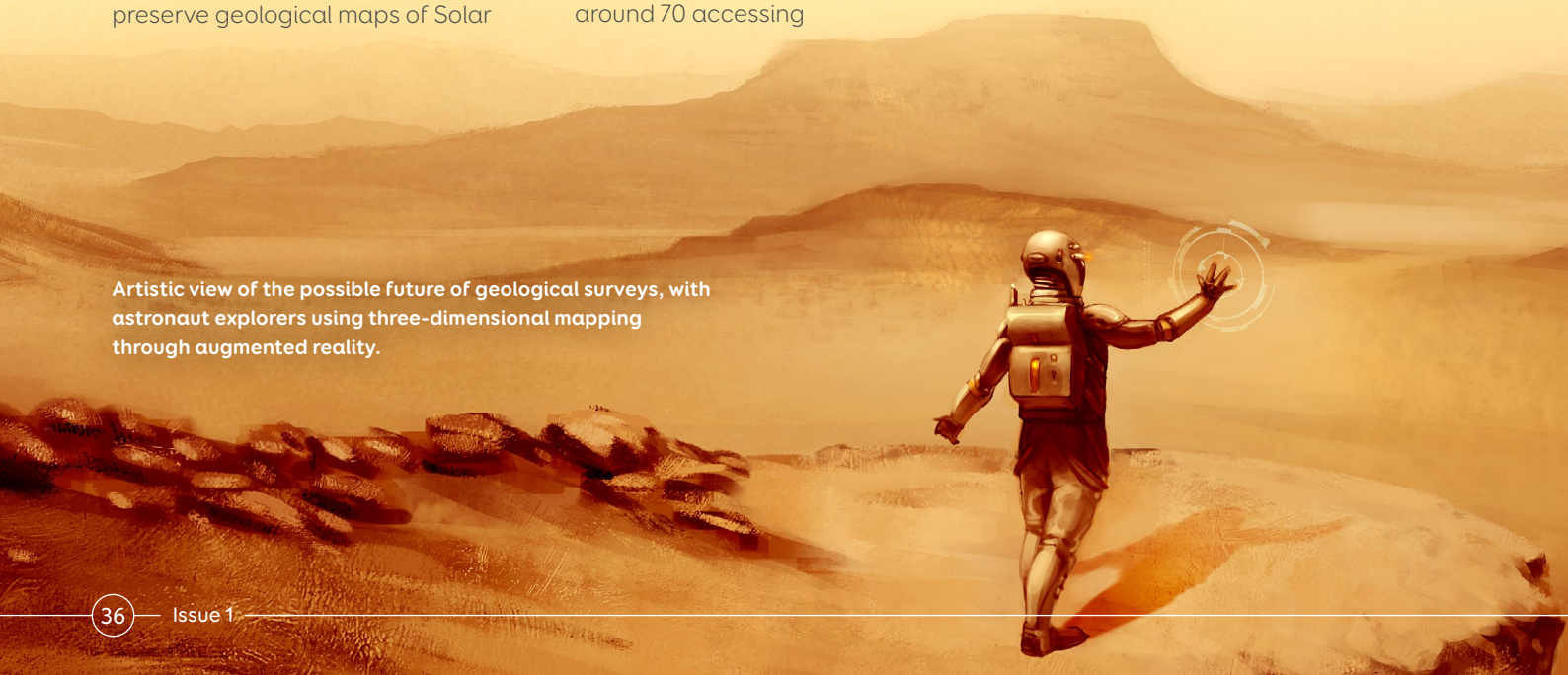
Angelo Pio Rossi (Jacobs University) describes Europlanet's new geological mapping activity, GMAP.

Planetary data have been used for geological mapping since the start of the space era half a century ago. Not only do geological maps increase our knowledge of planetary surfaces and their history, they are crucial for 'In-Situ Resource Utilisation' - identifying local materials that could be used sustainably for future human and robotic exploration of the Moon, Mars and beyond.

The Geological Mapping (GMAP) activity within the Europlanet 2024 Research Infrastructure (RI) project focuses on providing tools and services to create, publish and preserve geological maps of Solar System bodies. A major ambition of GMAP is to create an active user group that can provide standards, documentation and tools for the growing community of planetary mappers around the world.

Our first step in developing the GMAP user group was to hold a virtual Planetary Mapping Winter School in February 2021, co-organised with colleagues from the PLANMAP project. Registration was oversubscribed and the training school was attended by 200 early career researchers from every continent, with over 100 participating in live sessions, and around 70 accessing asynchronous content. Following up on the workshop, we launched the first call for registration of GMAP Community Mappers, and over 50 to date have signed up for information on the GMAP community mailing list.

GMAP already has links with several international partners, and the Chinese counterpart of GMAP has been funded recently within the framework of the China-EU co-funding mechanism. The project (Key Technologies and Demonstration of Standardised Planetary Geologic Mapping) aims to develop standardised geological mapping technologies and methods



Artistic view of the possible future of geological surveys, with astronaut explorers using three-dimensional mapping through augmented reality.

C Montagna/PLANMAP/GMAP

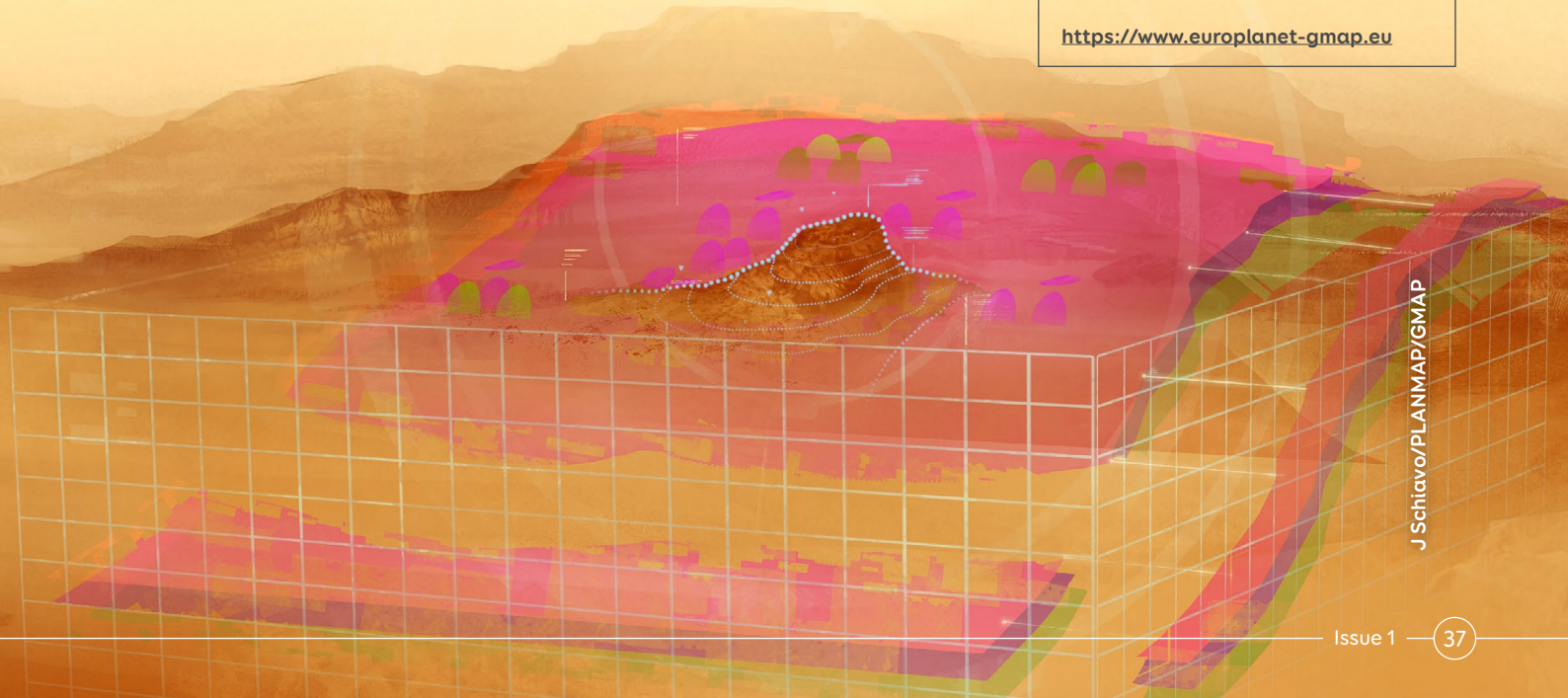
For decades, the process of geological mapping was manual, with hand-drawn and coloured units over a blank basemap. Digital mapping is now used, based on both orbital and rover/lander data, matched with modern technology and analytical tools.

for extracting features from thematic maps, and to make them accessible for implementation in the of upcoming Chinese and European lunar and planetary missions, such as Chang'E-5-8, Tianwen-1 and BepiColombo. Products that come out of the project will be disseminated through the GMAP data portals, and the joint activities will foster collaborations between mappers in Europe, Asia and beyond.

GMAP project team

University of Padova, Jacobs University Bremen, CBK PAN, DLR, ISPRA, INAF, Jacobs University Bremen, Università d'Annunzio, Westf lische Wilhelms-Universität, China University of Geosciences (Beijing), Wuhan University, Peking University, Shandong University and National Space Science Center of China Academy of Science.

https://www.europlanet-gmap.eu



J Schiavo/PLANMAP/GMAP

Mobilising Planetary Science in Africa

Fulvio Franchi (Botswana International University of Science and Technology) introduces a new network to support planetary science in Africa.

A major goal for higher education institutions in Africa is to promote their existing space and planetary science programmes on an international stage and to develop a solid system for credit recognition. Only by achieving these two objectives at a continental level can Africa tap into the growing planetary and space science market without relying on non-African expertise and resources.

February 2021 saw the launch of the Pan-Africa Planetary and Space Science Network (PAPSSN), a mobility scheme for students, academics and support staff across the African universities offering MSc and PhD programmes in planetary and space sciences.

The overarching objective of the new network is to educate young scientists to meet the requirements of the large planetary and space science projects expected to start in Africa in the very near future, including the Square Kilometer Array (SKA) and the Botswana Satellite (Botswana Sat-1). The next generation of African scientists, leaders and entrepreneurs will be part of a growing Science, Technology, Engineering and Mathematics (STEM) labour market that currently has a skills shortage in the areas of remote sensing from space, planetary geology, astronomy and astrophysics.

The tertiary education sector and industries of African nations will also benefit from the modernisation of academic programmes and the introduction of new, cutting-edge technologies designed for space and planetary exploration. These developments will lead to advances in technology-literacy, security, safety and productivity across a broad front of activities, such as the monitoring of land-use, climate change, drought, hydrology and natural disasters.

The central role played by space science and technology within the framework of the Agenda 2063 plan for Africa's socio-economic development has long been recognised by African governments. On 31 January 2016, the African Union (AU) adopted the African Space Policy and Strategy in the first concrete step towards realising an African Space Programme.

The AU urged Member States, Regional Economic Communities and Partners to promote STEM in general, and planetary and space science in particular. However, the complexity of scientific problems in these disciplines requires highly skilled university lecturers and technical staff. The coordinated mobility programme offered by PAPSSN will improve access to high-quality STEM education, with a particular emphasis on planetary and space science, and enhance the employability of graduate students in the science and technology labour market.

PAPSSN is funded by the European Commission (EC) through the Education, Audiovisual and

B Cavalazzi/F Franchi

Culture Executive Agency (EACEA) under the Intra-Africa Academic Mobility Scheme 2020. The project is led by the Botswana International University of Science and Technology (BIUST), and the consortium includes universities from Ethiopia, Nigeria, South Africa, Zambia and Italy, as well as observatories, research institutes and agencies related to planetary and space science in the partnering countries.

PAPSSN builds on existing working relationships with Europlanet (BIUST coordinates transnational access to the planetary analogue field site of the Makgadikgadi Salt Pans in Botswana), and the idea for the project was in fact initiated in 2018 during the first African Planetary and Space Science Network meeting, which was attended by members of the Europlanet management team amongst many African partners.

BIUST and Botswana will benefit directly from the achievement of PAPSSN's ambitious goals, and planetary and space science have the capacity to excite the imagination of the public and stimulate the interest of the youth in STEM at a local, regional and global level. Overall, the PAPSSN will support the STEM and planetary and space science labour market that is expected to grow across Africa over the next decades, generating both entrepreneurs and skilled workers for academia and industry.

The first PAPSSN Call is now open. For more information and to apply, visit the website.

https://www.papssnmobility.org

Banner image: Botswana International University of Science and Technology (BIUST).

Above: Students collect a core of sediments from the Makgadikgadi Salt Pans, Botswana, for sedimentological and geo-microbiological studies.

PAPSSN Consortium

BIUST (lead), Addis Ababa University, University of Nigeria Nsukka, University of the Witwatersrand, Copperbelt University, University of Bologna (technical partner), South African Radio Astronomy Observatory, the Ethiopian Space Science and Technology Institute, the National Remote Sensing Centre Zambia, and the National Space Research and Development Agency of Nigeria.

African Union

Funded by the Intra-Africa Academic Mobility Scheme of the European Union

Industry Engagement

Marcell Tessenyi (Blue Skies Space Ltd) and Jeronimo Bernard-Salas (ACRI-ST) discuss the mutual benefits for industry and academia in developing collaborations.

Increasing interactions between the planetary science community and industry, including small and medium-sized enterprises (SMEs), can lead to numerous opportunities and synergistic relationships.

The expertise of planetary scientists in a broad array of disciplines, from atmospheric research to machine learning, can help industry to explore new product applications and markets, whilst industry's focus on maximising commercial value from projects can support academics in accelerating and extending the impact of their work.

Space-related innovations can have global significance, and SMEs can be an important link in channelling these innovations to the economy of participating countries and into everyday life. Industry-academic collaborations can open new doors for funding, broadening eligibility for grants and participation in programmes, as well as co-funding of staff and PhDs. These partnerships can also facilitate pathways for academics that wish to transition to industry careers and provide opportunities for graduates and doctoral candidates to be involved in applied space research and innovation activities with an industry perspective.

The success of the Horizon 2020 EXPLORE project is one recent example of what is possible when industry, with its product-orientated vision, combines with academics' expertise in innovative, complex processes. EXPLORE has received 2 million Euros of funding from the European Commission to develop scientific data applications using state-of-the-art Artificial Intelligence (AI) and visual analytics to enhance science return and discovery from planetary and space science data. Technical developments from the project will be adopted into the commercial partner's product line and will potentially provide additional products and services for the industry.

The EXPLORE consortium has largely come about through collaborations developed in the Europlanet 2024 Research Infrastructure (RI) programme, which has demonstrated how fostering industry and academic interactions is central to the work of Europlanet in supporting the community. To facilitate the formation of more such partnerships, a company database that includes up-to-date technical domains and contact details for private sector organisations with an interest in planetary research is being developed by the Europlanet industry team and validated through the Europlanet Society's network of Regional Hubs.

Networking events and workshops organised in collaboration with the Regional Hubs, the annual Europlanet Science Congress (EPSC), and the Europlanet policy team, all provide opportunities to bring together academics, industry and policymakers, and for the planetary community to get involved. These activities put emphasis on the involvement of under-represented countries, linking them to leading European technological partners and, overall, widening participation in European planetary research and innovation.

www.europlanetsociety.org/industry/

explore-platform.eu

CommKit

Shorouk Elkobros (Europlanet Society/ESF) is Europlanet Magazine's columnist on science communication topics and tools.

Since the pandemic started, I expected social distancing to feel, well, distant. But I have found that regardless of isolating in my home office, I've been more connected than ever. In this issue's column I would like to share some of the useful tools I have used over the past year that have allowed me to facilitate workshops and embrace the new norm of remote working.

The Europlanet media team, of which I'm part, has recently organised a workshop in collaboration with the European Science Foundation on common challenges and actions for distributed research infrastructures in Europe. We had more than 130 registered participants from 23 countries within the EU and beyond. To make sure we fostered interesting outputs we used a Mural board, a digital workspace for visual collaboration to help participants brainstorm ideas. During the workshop, people collaboratively added and edited ideas live. After the workshop, we assessed the value of the Mural board for efficiency, time management, and creativity. The results were great! Similar online platforms are a game-changer not only for organising events but also for meetings, voting processes, etc.

You might wonder, if sessions are disseminated via platforms like Zoom and workshops are organised using visual collaboration tools such as the Mural board, how can we incorporate networking?

Europlanet joined Slack, a networking platform to formally and informally chat with colleagues. Slack is a great communication tool for communities and a perfect complement to emails. It simplifies communication between different teams, committees and working groups, and thus increases collaboration and productivity. Once workshops are done, Slack provides a space to continue the conversation and keep the collaboration alive.

We are on the brink of what Ezra Klein calls a 'social recession'. Using virtual platforms that can boost effective communication is thus crucial to maintain an active work culture. At Europlanet, we aspire to use digital tools that help us create connections on virtual meetings and allow us to come up with collective solutions. We want to question strategically how to have a healthy and robust version of digital culture. Yes, we are losing physical proximity, but we should stay positive and always think of new ways to revolutionise our digital spaces.

Planetary yours,

Shorouk

Mural: mural.co

Slack: slack.com

If you have science communication tips and tricks to share, please reach out to our Communications team at media@europlanet-society.org

EPEC Corner

The Europlanet Early Career (EPEC) network is open to all early-career planetary scientists and space professionals whose last degree (e.g. MSc or PhD) was obtained a maximum of seven years ago (excluding parental leave, serious illness and similar delays).

Europlanet Early Career Network:
A New Opportunity for Growing together

Melissa Mirino (doctoral candidate at The Open University and Chair of the EPEC Communications Working Group) explains how the EPEC network can support early career professionals.

Second EPEC Annual Week in Lisbon in 2019. Credit: EPEC

We all know that the space sector offers plenty of career paths, from aerospace engineering to astronomy, and from geology and to astronautics, to name just a few. However, for young professionals, it can be difficult to find a way through this jungle to learn about opportunities that could boost their career prospects (funding, awards, job position etc) or to gain the range of skills they need. In 2014-15, a group of young volunteer professionals decided to address these challenges by creating short courses at the Europlanet

Science Congress (EPSC) designed to benefit students or professionals at the beginning of their career journey. Based on the success of these activities, the initial members decided to involve more young scientists and create a permanent early career network within the European planetary community. At EPSC 2017 in Riga, initial members launched the Europlanet Early Career (EPEC) Network and at EPSC 2018 in Berlin, EPEC was officially adopted as the early career branch of the new Europlanet Society.

Since then, increasing numbers of people have shown an interest in EPEC, and more and more volunteers have subscribed to our network. Today, hundreds of early career professionals have joined EPEC to share their passion for space and to create something wonderful together. EPEC is committed to building a strong network between young professionals in an enthusiastic and friendly environment. The EPEC network is open to all early-career planetary scientists and space professionals whose last degree (e.g. MSc or PhD) was obtained a maximum of seven years ago.

Currently, EPEC engages in different projects through nine Working Groups. Our activities bring a young voice into the Europlanet Society and help to shape the future of planetary sciences and engineering. Each Working Group enables its members to expand their experience in event and meeting organisation, create new initiatives, develop specific skills and gain team-working and leadership capabilities within an international environment.

There are many ways that an early career professional can join our network:

- Subscribe to our mailing list to be updated about the news in our community: www.europlanet-society.org/early-careers-network/
- Become an active member of one or more Working Groups: www.europlanet-society.org/early-careers-network/epec-working-groups/
- Join our Slack channel: epec-network.slack.com
- Follow us on our social media pages
  - Facebook: epec.network/
  - Twitter: epec_epn
- Join the EPEC Annual Week: www.europlanet-society.org/epec-annual-week-2021
- Check the volunteer vacancies on our website: www.europlanet-society. org/early-careers-network/epec-vacancies/

All information about each working group and the current activities can be found at:

www. europlanet-society.org/early-careers-network/epec-working-groups/

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#PlanetaryScience4All:

A Video Contest for Virtual Science Communication

Melissa Mirino (doctoral candidate at The Open University and of the Chair EPEC Communications Working Group) shares how the extraordinary experiences of 2020 inspired her to launch a contest to bring together the early career community.

The year 2020 will be always remembered as a year of isolation, disruption of the normal daily activities, and in extreme cases a year of loss. However, during this period we all did our best to find alternative solutions to carry on with our lives, jobs and activities and remain positive and connected with each other using the current available technologies. Research and academia have not been an exception. Both the Europlanet Society and the Europlanet Early Career Network (EPEC) did their best to remain active, and to guarantee the usual sharing of ideas and scientific results by transforming the EPSC 2020 Conference into a virtual meeting.

As Chair of the EPEC Communications Working Group, I wanted to create an activity that could combine the EPEC goal of supporting early careers, our working group's aim of communication, and the need to transform face-to-face activities into a shareable, interactive and online form to support the EPSC2020 virtual meeting. The idea of a video contest came to mind. This format is already considered by many universities as a good way to train and challenge students in science communication. Since the main subject of EPSC is planetary science, the topic of the video contest was easy to identify. With support from the EPSC2020 Outreach and Europlanet Communications teams, and many months of planning, creating and sharing the new activity, the #PlanetaryScience4All video contest became a reality.

#PlanetaryScience4All challenges early career students to present their research in four minutes to a non-expert audience. The first edition (2020) of the contest was open to PhD candidates involved in planetary science studies, asking them to explain their PhD research using any type of creative video format (Lego movies, drawing, PowerPoint, storytelling etc.). The videos were judged based on criteria of scientific content, communication skills and creativity by a panel of experts from the Europlanet Community. All the contestants and their videos were featured in live sessions during EPSC2020, promoted on YouTube and shared widely on social media. The winning video was highlighted through the Europlanet website and newsletters, and it has also been used for EPEC outreach activities. The winner of the 2020 edition, Grace Richards, received a free registration to this year's EPSC2021 meeting. Recently, Grace and Gloria Tognon, another contestant, have also joined the EPEC Communications Working Group to support our activities.

Based on the success of the 2020 competition, I feel confident that #PlanetaryScience4All will become a traditional part of EPSC. The second edition is now open, this year welcoming Bachelor's and Master's students, as well as PhD candidates working on a thesis related to planetary science.

For more information FAQs, flyers and the submission form visit: https://www.europlanet-society.org/early-careers-network/epec-communications-group/planetaryscience4all-video-contest/

Videos from the 2020 #PlanetaryScience4All contest can be found at: https://www.youtube.com/playlist?list=PLPXeplhp1d00fmFd9vYXirNt_gyZrKOPA.

3rd EPEC Annual Week

Erica Luzzi, Chair of the EPEC Annual Week Working Group, looks forward to holding the 2021 event as a virtual meeting.

The 3rd Europlanet Early Career (EPEC) Annual Week is being held virtually from 7 - 11 June 2021. Early-career professionals attending the event will take part in a variety of workshops and seminars focused on helping them to build their future career, with time scheduled for open discussions with speakers. Topics covered in the programme include how to write a good paper, how to look for funding, and how to choose a career-path in industry versus academia.

The fundamental core of the EPEC Annual Week event is networking: every early career can be part of the EPEC community, sharing expertise but also contributing to EPEC's activities. The EPEC Committee oversees multiple Working Groups covering areas such as outreach, diversity, communications, future research and early career support.

The participants of the 3rd EPEC Annual Week will have the chance to become part of one of these Working Groups and brainstorm, network and nourish new ideas. Due to the pandemic, there will be no opportunity to explore a European city, as in past events, but looking on the bright side: with a virtual event there are no limits for the number of participants and EPEC looks forward to reaching its largest audience yet.

Every month on the Europlanet Society website, we publish the profile of an early career professional working in the planetary or space sector. If you would like an opportunity to be in the spotlight, please submit your story. http://bit.ly/epec-profiles

The Last Word

Europlanet: Moving Forward Together

The Europlanet Society's President and Europlanet 2024 RI Coordinator, Nigel Mason, reflects on a milestone for the European planetary community.

This year Europlanet celebrates its 16 birthday. The 'child' born in 2005 (see page 12) is now entering a new adolescent age where it is reaching out and exploring new boundaries. In growing up, Europlanet has developed facets and skills to address responsibilities on a personal and professional front. The Europlanet Society has been established to support the Europlanet family within the planetary community, aiming to provide a friendly, inclusive environment for networking, and sharing science and experiences. The Europlanet 2024 Research Infrastructure (RI) is now an international platform for scientists and engineers to perform pioneering research across Europe and around the world, with many hundreds of organisations and thousands of researchers using its services.

Planetary science and the community working in it are also growing and evolving over time. Going forward, Europlanet will need to adapt to changing circumstances and priorities, especially in the wake of the pandemic. The Europlanet Early Career (EPEC) network provides an active programme for those entering our field (see page 42) and the Europlanet Mentoring initiative offers informal and confidential support in career development. The distributed nature of both the Society, which is supported by 10 Regional Hubs, and the 2024 RI project, which has 57 partners around the world, enables Europlanet to listen to local needs and be flexible in the programme that it offers. However, the broad reach and drive to widen participation brings its own challenges in terms of coordination and sustainability. Europlanet is part of a larger population of nearly 300 research infrastructures funded by the European Union's Horizon 2020 programme. In recent months, we have taken active steps to get to know some of our 'cousins' through an initial workshop in March 2021 with other distributed research infrastructures. The meeting highlighted that Europlanet is not alone in the challenges it faces and that building a more coordinated network with other distributed research infrastructures offers a lot of potential to learn from some of our older relations and share best practice with organisations that are just starting out.

Although we are not able to meet face-to-face in Helsinki in September, we look forward to seeing everyone at the virtual Europlanet Science Congress (EPSC) 2021 and participating in an interactive programme of scientific and community events. Europlanet's activities are only possible through the efforts of many hundreds of individuals, and there are many open opportunities to shape the future by serving on committees and taking leadership roles in upcoming projects. If you are not a member, please join the Society and help us sustain the momentum we have generated, despite the pandemic.

Together we can ensure that the next decade is as exciting as the last and look forward to Europlanet's 18 and 21 birthdays, when it will not just 'come of age' but boldly go on to explore new worlds.

https://www.europlanet-society.org

Join us

The Europlanet Society promotes planetary sciences in Europe for the benefit of its community.

The Society is open to both individuals and organisations. Launched in 2018, it builds on 15 years of successful Europlanet projects funded by the European Commission. It is the parent organisation of the European Planetary Science Congress (EPSC) the largest annual meeting for planetary sciences in Europe.

Find out more at:
www.europlanet-society.org/join/

EUROPLANET

Organisational Memberships

For research organisations, institutions and industrial partners involved in planetary science and related fields.

Benefits:

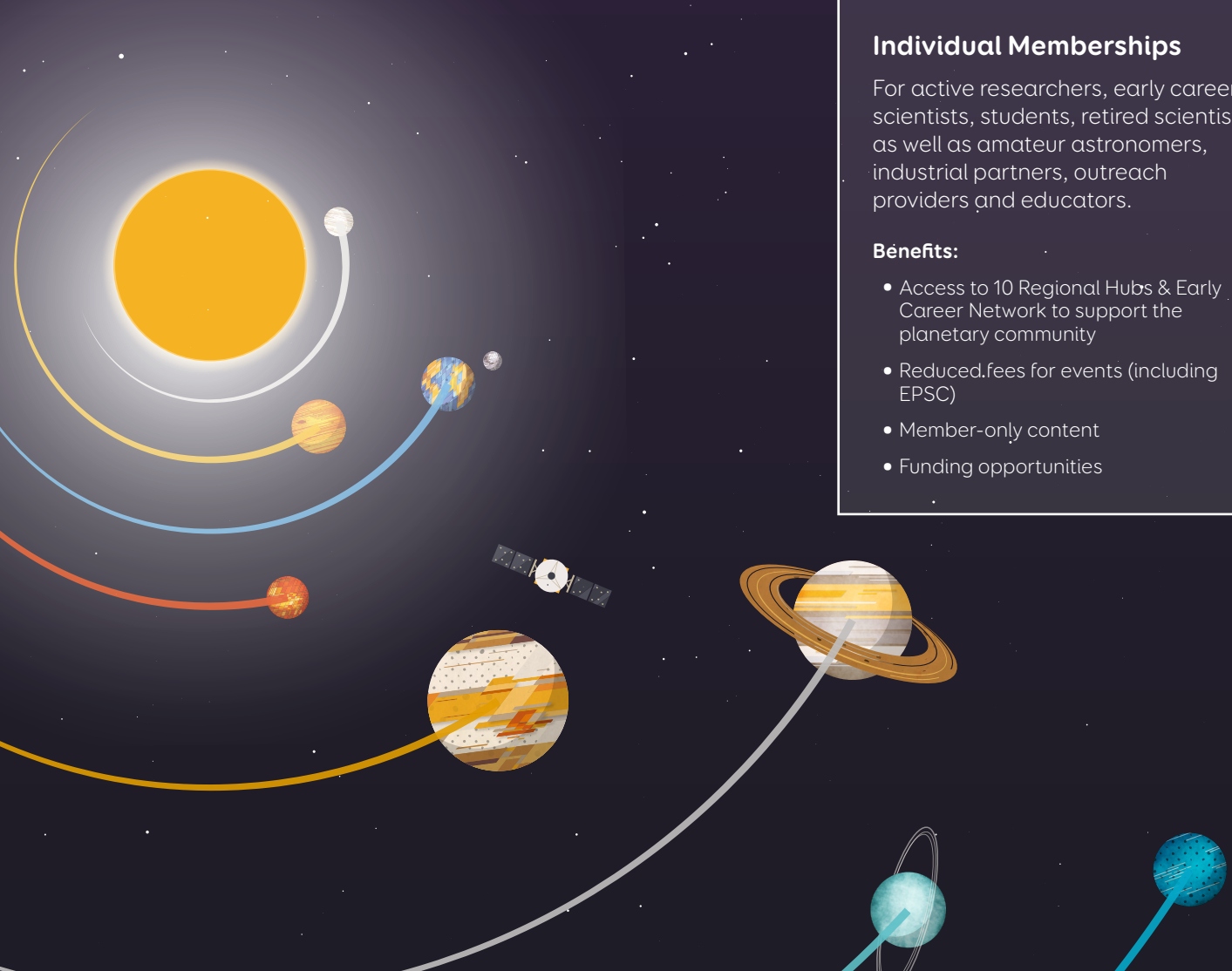
- Representation at the General Assembly
- Reduced fees for events (including EPSC)
- Member-only content
- Can include up to 10 individual memberships

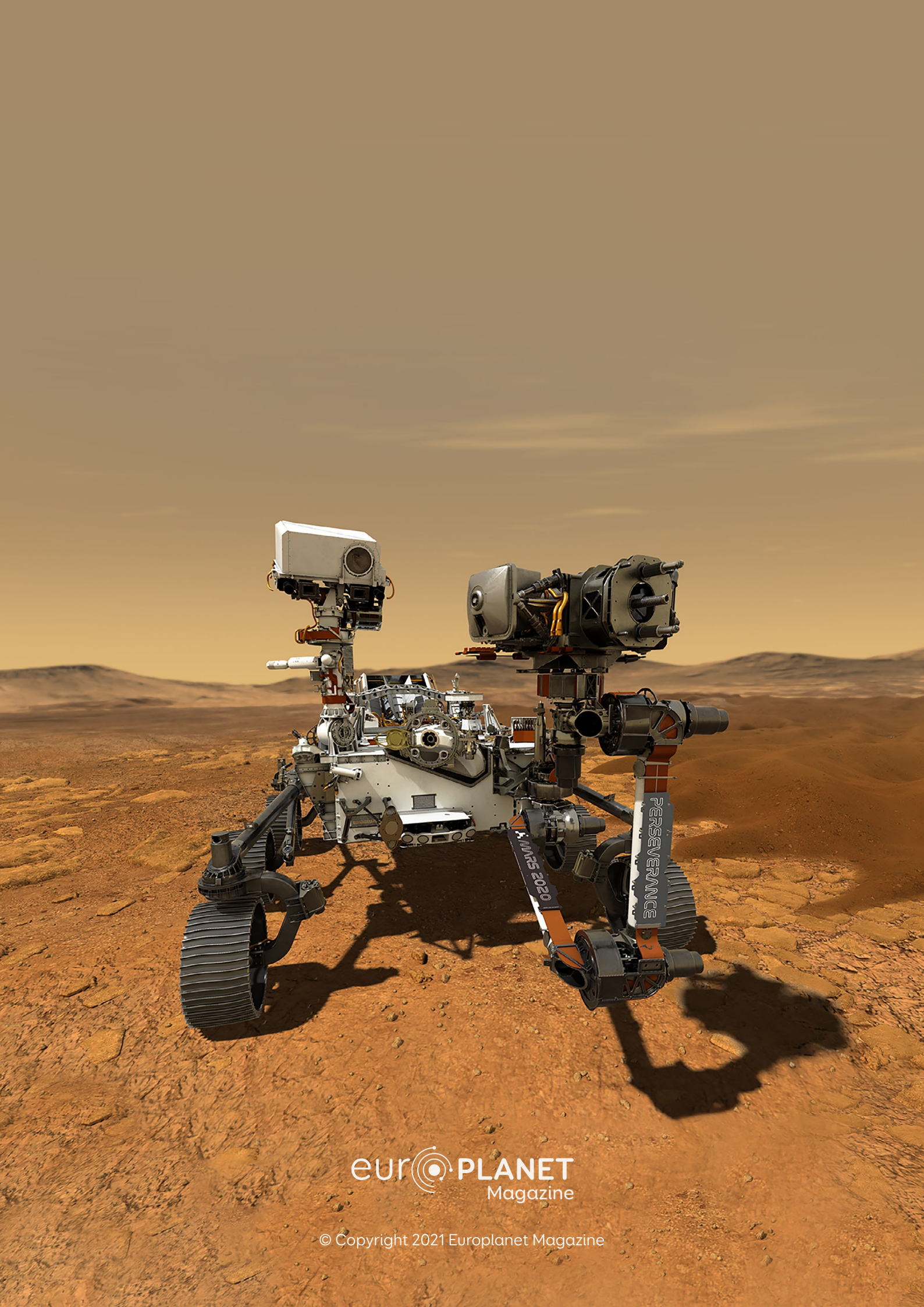
Individual Memberships

For active researchers, early career scientists, students, retired scientists as well as amateur astronomers, industrial partners, outreach providers and educators.

Benefits:

- Access to 10 Regional Hubs & Early Career Network to support the planetary community
- Reduced fees for events (including EPSC)
- Member-only content
- Funding opportunities





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